



# SCIENCE PROJECTS

Below are listed a number of science projects and energy activities for students, K-12. Each of them have a short description on this page and then a link to the actual activity. Some activity sheets will need to be downloaded or printed with your Web browser software. **Some activities require help from an adult. Check first with your teacher or parent before doing a project.**

Please note that because of lots of variables, **we cannot guarantee that these projects will work.** Some have been tested, and others have been adapted from science experiments and projects books.

Check with the [California Science Fair](#) for information about their annual contest.

For a **really** comprehensive list of every science fair accessible through the World Wide Web, both real and "virtual," go to <http://physics.usc.edu/~gould/ScienceFairs/>.

[What makes a good science project?](#)  **Read This First!**

## Project Categories

- [Chemical/Stored Energy Projects](#)
- [Electricity Projects](#)
- [Geothermal Energy](#) **New**
- [Hydro-Power/Water Energy Projects](#)
- [Nuclear Energy Project](#) **New**
- [Saving Energy](#) **New**
- [Solar Projects](#)
- [Transportation Energy](#)
- [Wind Energy Projects](#)
- [Other Projects](#) **New**
- [Links to Science Projects Websites](#)

### Chemical/Stored Energy Projects

**[Peanut Power](#)** - How much energy is in a single peanut? Find out...

### Transportation Energy Projects

**[Air Power](#)** - Use the force of compressed air to move a "vehicle"

### Electricity Projects

**[Battery Life](#)** - A Science Experiment (By Tracy and Emily)  
An experiment using the scientific method to determine which brand of battery lasts the longest.

### Wind Energy Projects

**[Measuring the Wind](#)** - A simple gauge to measure how strong the wind is blowing.

**[Making an Anemometer](#)** - Make a device to measure

[Electromagnet](#) - Here's an "attractive" project, create a magnet using electricity.

[Lemon Power](#) - Use a lemon to make a voltaic battery and even power a digital watch.

[Light By Friction](#) - Another static electricity project.

[Make Your Own Lightning](#) - Find out how lightning works in a storm by safely creating mini-lightning bolts.

[Open & Short Circuits](#) - Find out how to make an open and a short circuit.

[Make a Rheostat](#) - A small device that controls the voltage flow by a dial or knob.

### Geothermal Energy

[Geothermal Power Plant](#) - Make a model of a power plant that uses steam.

### Hydro-Power / Water Energy Projects

[Hydro-Power](#) - The force of water!

[Splitting H<sub>2</sub>O \(Water\) to Make Oxygen and Hydrogen](#) - Water is made up of two elements, hydrogen and oxygen, and these gases can be produced through electrolysis.

[Make a Steam-Powered "Rocket Boat"](#) - Even Fulton would have loved one of these.

wind speed.

### Other Projects

[Make a Candle Spinner](#) - **New** Learn to make an energy machine with birthday candles and popsicle sticks.

[Greenhouse Effect](#) - Why does it get really hot inside a car parked in the sun? It's the greenhouse effect.

[Make a Thermometer](#) - thermometer measures heat energy. Build a simple one.

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### Links to Other Science Projects Sites

[Bill Nye the Science](#)

[Guy™](#) - Click "Home Demos" for science projects.

[Experimental Science Projects: An Introductory Level Guide](#)

[For Kids Only](#) - NASA's Earth Science Enterprise

[KidSpace @ Internet Public Library - Science Fair Project Resource Guide](#)

[MadSci Net](#) - (science project help)

[Mike Peshkin's "ideas" links](#)

[PBS Program - ZOOM - Science Projects by Kids for Kids](#)

[Make a Turbine](#) - For every action there is an equal and opposite reaction.

[Using Water to Produce Energy](#) - Water can be used to do work. Build a couple of water projects.

### **Nuclear Energy**

[Nuclear Chain Reaction](#) - **New** A chain reaction demonstration

### **Saving Energy** **New**

[Cool House](#) - Using shade trees to keep your home cool.

[Heat From Light Bulbs](#) - the higher the watts, the hotter the bulb?

[Insulation](#) - What materials make the best insulation?

### **Solar Projects**

[Energy From the Sun](#) - Three activities that "bring the sun to life."

[The Sun's Jobs](#) - What jobs does the sun do? Make a "sun jobs" chart or book with students.

[Solar Hot Dog Cooker](#) - Instructions on building a solar-powered hotdog cooker.

[Science Club - Kids' Science Projects](#)

[Science Fair Project Resource Guide](#) - from Internet Public Library

[Science Fairs HomePage](#) - from the Eastern Newfoundland Science Fairs Council

[Score Science - Kid's Corner](#) - Hot links to science activities

[Solar Cooker](#) - A link to another site on the Internet to get instructions on building a real Solar Cooker. These cookers can prepare an entire meal...including dessert...just with the heat of the sun.

[Spike's Science Projects](#) - More than 400 science projects for teachers and students to browse, download or just read.

[Static Electricity Experiment](#) - from The Exploratorium Museum.

[Student science projects from NSRC](#) - (great for ideas!)

[Ultimate Science Fair Resource](#) - Excellent site for getting the big picture.

[Yahoo - Science Fair Guides](#)

[WWW Virtual Library: Science Fairs](#) - (huge index)

**If you know of other energy or science projects that are on the Internet, please let us know by [e-mail at baldrich@energy.state.ca.us](mailto:energy.state.ca.us).**

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Students, move the mouse over the objects in the room to find the places you can go.

Parents and teachers, click the apple on the desk.

[Text Only Page](#)

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# ENERGY STORY

## Introduction



Energy is one of the most fundamental parts of our universe.

We use energy to do work. Energy lights our cities. Energy powers our vehicles, trains, planes and rockets. Energy warms our homes, cooks our food, plays our music, gives us pictures on television. Energy powers machinery in factories and tractors on a farm.

Energy from the sun gives us light during the day. It dries our clothes when they're hanging outside on a clothes line. It helps plants grow. Energy stored in plants is eaten by animals, giving them energy. And predator animals eat their prey, which gives the predator animal energy.

Everything we do is connected to energy in one form or another.

Energy is defined as:

**"the ability to do work."**

When we eat, our bodies transform the energy stored in the food into energy to do work. When we run or walk, we "burn" food energy in our bodies. When we think or read or write, we are also doing work. Many times it's really **hard** work!

Cars, planes, light bulbs, boats and machinery also transform energy into work.

Work means moving something, lifting something, warming something, lighting something. All these are a few of the various types of work. But where does



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Photo credit: corbisimages.com



Photo credit: corbisimages.com

energy come from?

There are many sources of energy. In **The Energy Story**, we will look at the energy that makes our world work. Energy is an important part of our daily lives.

The forms of energy we will look at include:

- Electricity
- Biomass Energy - energy from plants
- Geothermal Energy
- Fossil Fuels - Coal, Oil and Natural Gas
- Hydro Power and Ocean Energy
- Nuclear Energy
- Solar Energy
- Wind Energy
- Transportation Energy

We will also look at turbines and generators, at what electricity is, how energy is sent to users, and how we can decrease or conserve the energy we use. Finally, we'll look at the "newer" forms of energy...and take a look at energy in the future.

You can start with **Chapter 1: Energy - What Is It?** by clicking the link below. Or you can go to any of the other chapters.

## The Energy Story - Table of Contents

Introduction

[Chapter 1:](#) Energy - What Is It?

[Chapter 2:](#) Electricity

[Chapter 3:](#) Static Electricity & Resistance

[Chapter 4:](#) Electrical Circuits

[Chapter 5:](#) Stored Energy & Batteries

[Chapter 6:](#) Generators, Turbines and Power Plants

[Chapter 7:](#) Electricity Transmission System

[Chapter 8:](#) Fossil Fuels - Coal, Oil and Natural Gas

[Chapter 9:](#) Natural Gas Distribution System

[Chapter 10:](#) Biomass Energy

[Chapter 11:](#) Geothermal Energy

[Chapter 12:](#) Hydro Power

[Chapter 13:](#) Nuclear Energy - Fission and Fusion

[Chapter 14:](#) Ocean Energy

[Chapter 15:](#) Solar Energy

[Chapter 16:](#) Wind Energy

[Chapter 17:](#) Renewable vs. Nonrenewable - Environment & Air Quality

[Chapter 18: Energy for Transportation](#)

[Chapter 19: Saving Energy and Energy Efficiency](#)

[Chapter 20: Hydrogen and Energy In Our Future](#)

[Conclusion](#)

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# ENERGY LIBRARY

## Library and Energy References

- [Ask Professor Quester](#)
- [Ben Franklin's - Poor Richards 'Energy' Almanac](#)
- [Books For \(and Recommended By\) Students](#)
- [Books For Teachers and Parents](#)
- [Conversion Calculator \(On-line Conversions\)](#)
- [Devoured By the Dark - An On-Line Energy Adventure](#)
- [Energy Quest Picks - Books Recommended by EQ Staff](#)
- [Glossary of Energy Words \(Definitions of energy terms\)](#)
- [Internet Citations - How to cite items found on the Internet in your bibliography](#)
- [Science Projects Books](#)
- [Student Resources for Reports on Energy](#)
- [Survey of Sacramento High School Students' Energy Knowledge](#)

### Books You Can Download ( Adobe Acrobat PDF files) or Links to On-Line Books

- [2002 Consumer Information Catalog](#) (PDF File, 264 kb)
- [ABCs of AFVs](#) (1999 report on Alternative Fuel Vehicles. Good background on AFVs, though some info may be dated. PDF file, 2.4 MB)
- [Daniel & His Electric Car](#) (Dept of Energy, Office of Transportation Technology)
- [Dept of Energy - Energy Savers Brochure](#) (PDF file, 724 kb)
- [Dept of Energy - Energy Savers Brochure, Spanish](#) (PDF file, 784 kb)
- [Energy Patrol](#) (PDF file, 216 kb)
- [NREL Solar Projects](#) (PDF file, 260 kb)
- [SMUD Energy Dog Coloring Book](#) (PDF file, 1.1 MB)
- [Sparky Fire Safety](#) (PDF file, 2.3 MB)
- [Texas Solar Coloring Book](#) (PDF file, 360 kb)

You'll need the FREE Acrobat Reader software from [Adobe Systems Inc.](#) to download, read and print these books.

If you have a book that should be included in our lists, please send Title, Author, Publisher and ISBN number to: [cetec@energy.ca.gov](mailto:cetec@energy.ca.gov)

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# GAMES AND PUZZLES

## Welcome to the EQ Games Page!

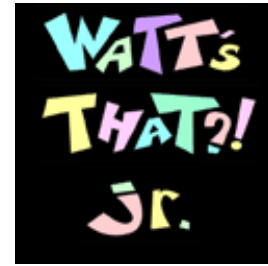


[Watt's That? "Interactive"](#)

You'll need FLASH installed in your browser!



[Watt's That Regular Version](#)



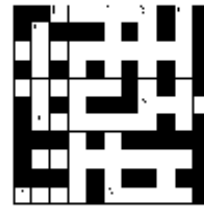
[Watt's That Junior](#)



[Coloring Books](#)



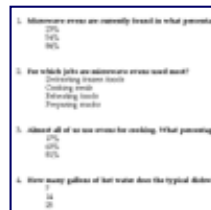
[Connect the Dots](#)



[Crossword Puzzles](#)

**How many students does it take to change a fluorescent light bulb?**

[Jokes & Puns](#)

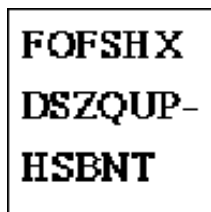


[Test Your Energy IQ](#)

## "Energy & Science Games" On Other Websites

- [Aliant Energy Power House Kids](#)
  - [Arithmattack](#)
- [British Energy Generation Game](#)
  - [Chevron Gasoline Kids' Page](#)
- [Dino De-Terminator, Principles of an Atlatl Game and Power Surge Game](#) (Games housed at the University of Texas)
  - [Jefferson Labs Games Page](#)
  - [Edison International Power Lab](#)
  - [Element Concentration Game](#)
    - [Element Flash Cards](#)

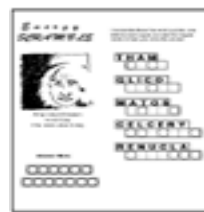
- [Element Math Game](#)
- [Energy Arcade](#) - San Diego Gas & Electric
  - [Energy Ed](#) - Ergon Energy
  - [Energy Matters - Energy Crisis Game](#)
- [Energy Net Games](#) - energy scavenger hunt
  - [Energy Quiz](#)
- [Energy & Electricity Vocabulary](#) - four games from Quia, Quintessential Instructional Archive
  - [Games of Matter](#)
  - [Geothermal Education Office "Fun Stuff"](#)
- [GPU Kids Arcade](#) (Jersey Central Power & Light Company, GPU Energy) Need Shockwave!
  - [Great Green Web Game](#) - Union of Concerned Scientists
  - [Homework Busters Games](#) from Southern Company
- [Monster Time](#) - great website on saving energy from the Ad Council, Earth Share and U.S. EPA (Need Shockwave)
  - [National Geographic Kids' Page](#)
  - [Natural Resources Canada - Games Room](#)
  - [Planet Energy Games for 7 to 11-Years-Old](#) (Need Flash)
  - [Planet Energy Games for 12 to 16-Years-Old](#) (Need Flash)
    - [Roofus' Solar and Efficient Neighborhood](#)
      - [Safety Race with Eddie Luz](#)
    - [Surfing the Net with Kids - Electricity Crossword](#)
  - [U.S. Environmental Protection Agency Explorers' Club Game Room](#)
    - [Vocabulary Hangman Game](#)
    - [Who Wants to Win \\$1,000,000?](#)
- [You Make the Decision](#) - National Safety Traffic Administration - A city wants to raise its speed limit. You gather the data and help make the decision.



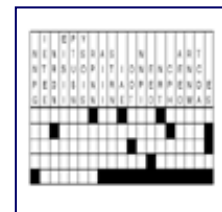
[Energy Cryptograms](#)  
*Be an energy spy and  
break the code*



[Seek-A-Word Puzzles](#)



[Word Scrambles](#)



[Word Fall Game](#)

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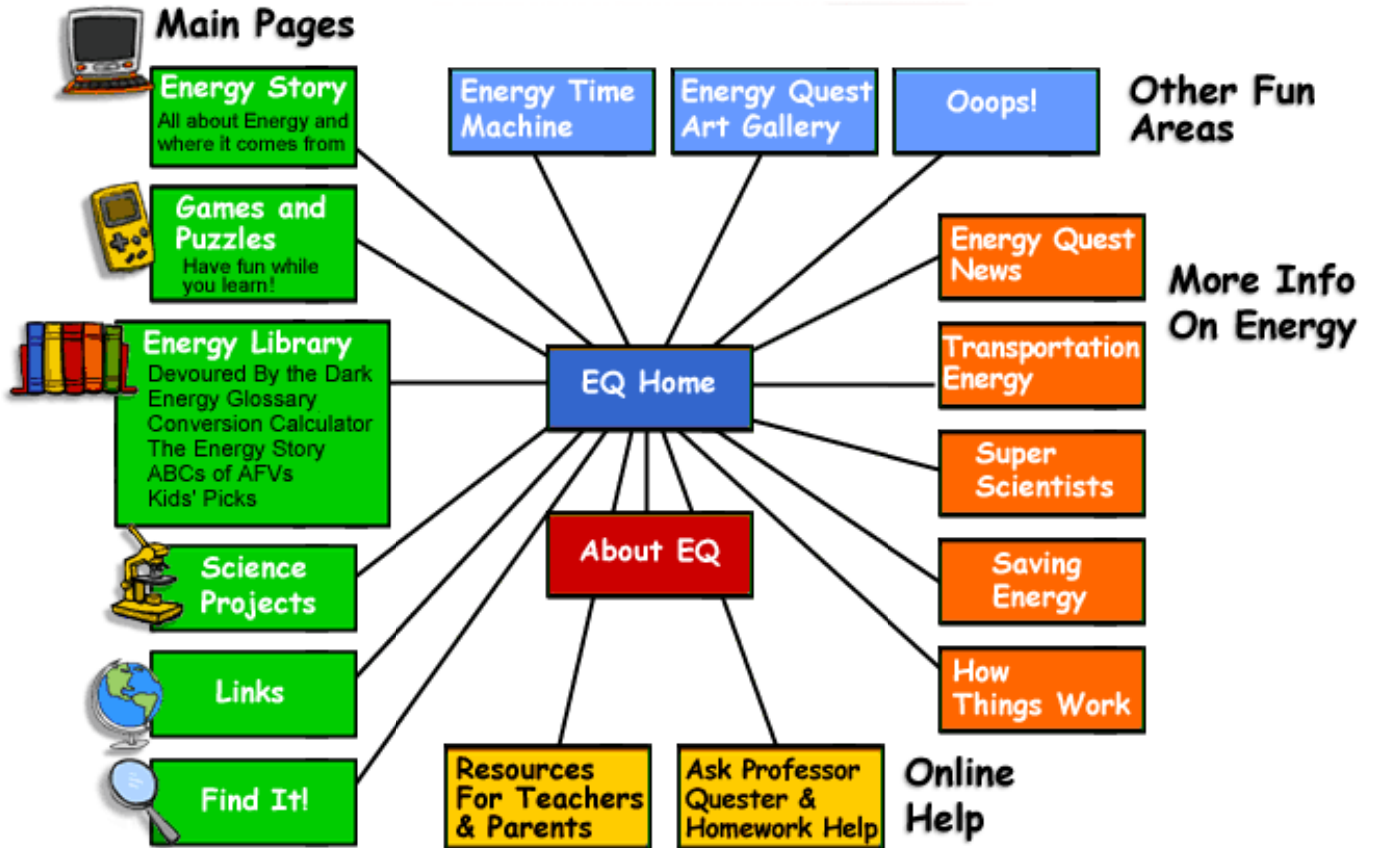
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# FIND IT!

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# LINKS

## Links to Other Sites on the World Wide Web

Energy

Environment

Mathematics

Science

Science Projects

Science & Energy Organizations

If you have an educational website link that should be listed here, please e-mail us the URL to:  
[mediaoffice@energy.state.ca.us](mailto:mediaoffice@energy.state.ca.us)

- 
- [California Energy Commission's Links to Energy Sites on the World Wide Web](#)

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### Energy

- [Alliant Energy - Geothermal](#) - Contains Information on Geothermal Technology and its Impact
- [American Gas Association](#) - All kinds of information and news on natural gas
- [California Consumer Energy Center Homepage](#)
- [California Energy Commission - Homepage](#)
- [California Environmental Protection Agency](#)
- [Consumer Energy Information For Your Home](#) - Tips on saving energy in your home and workplace
- [Department of Energy - Fossil Energy Homepage](#) - A website directed toward fossil fuel energy information and news
- [Electrical Safety World](#) - Sacramento Municipal Utility District
- [Energizer Learning Center](#) - The battery company's website with great interactive info, science projects and more.
- [Energy Education Resources](#) - list of generally available free or low-cost energy-related educational materials.
- [Energy Files](#) - A virtual library of energy science and news
- [Energy research Centre of the Netherlands](#)

- [Federal Energy Regulatory Commission - Students' Corner](#) - Information for students about energy and energy regulation.
- [Florida Solar Energy Commission](#) - A research center at the University of Central Florida
- [Foundation For Water and Energy Education](#) - A website dedicated to increasing the amount of hydropower
- [Fusion Energy Research Program At UC San Diego](#) - Information on on-going research
- [Gas Price Watch](#) - Contains gas prices and news
- [General Atomics Fusion Education Homepage](#) - Educational website on fusion aimed at children
- [Igniting Creative Energy Challenge](#) - An educational competition designed to encourage students to learn more about energy and the environment.
- [Kids World](#) - "Kidzworld Media Inc. is the ultimate in online entertainment for kids nine to 14."
- [Mr. Hand's 8th Grade Science Site - Energy Section](#) - Some great stuff for kids from an 8th grade science teacher at Mansfield Middle School in Storrs, Connecticut.
- [National Energy Education Development](#) - Website dedicated to increasing energy education and awareness in school
- [National Energy Foundation](#) - NEF, a nonprofit educational organization and a national leader in teacher training, student programs, instructional materials, development and distribution.
- [National Renewable Energy Laboratory](#) - A laboratory which researches in renewable energy solutions
- [Natural Gas Information and Educational Resources](#) - General information on natural gas
- [Oil Price Information Service](#) - Contains oil prices and information
- [Princeton Physics Plasma Lab - Fusion Energy Website](#) - General information on fusion energy
- [San Diego City Schools - Energy Utility Management Section](#)
- [The Science Lab Environmental Resources](#) - directory of environmental websites
- [Tom Elliot's Alternative Energy information Center](#) - A website about one man's house run by solar energy
- [U.S. Department of Energy - Solar](#) - Federal website for the US department of Energy
- [UIC Education - Uranium](#) - Information on Uranium

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## Environment

- [Adventures of Vermi the Worm](#) - Calif. Integrated Waste Management Board's interactive website on recycling
- [Canadian Environmental Website](#) - Canada's Environmental Agency website
-

- [Cloud Boutique](#) - Information on different cloud types
- [Earth Island Institute](#) - An organization dedicated to protecting the environment
- [Environmental Education Material on the Web](#) - A merger of different environmental protection organizations
- [European Environment Agency](#) - Europe's central environmental protection agency
- [Federal Environmental Protection Agency](#) - Federal EPA
- [Igniting Creative Energy Challenge](#) - An educational competition designed to encourage students to learn more about energy and the environment.
- [Jason Project](#) - Foundation aimed toward furthering students education in all areas
- [Peace Corps](#) - Federal program aimed at helping humans in other parts of the world
- [The Science Lab Environmental Resources](#) - directory of environmental websites
- [VolcanoWorld](#) - Information on volcanos and current eruptions

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## Mathematics

- [A+ Math](#) - Online math tutoring
- [Algebra Help](#) - Online math tutoring
- [Algebra Help](#)
- [Algebra Help Center](#) - Online math tutoring
- [Learner.org - Mathematics](#) - Online math tutoring
- [Math and Reading Help for Kids!](#)
- [Math In Your Daily Life](#) - Online math tutoring
- [Math is Fun](#)
- [Math Powers](#) - Online math tutoring
- [Math.com](#) - Online math tutoring

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## Science

- [American Association of Advancement of Science](#) - Website for their magazine
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[Department of Science - Website for the Office of Science within the Federal Department of Energy](#)

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[DirectoryScience](#)

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[Earth Floor](#) - Kid's wbesite focused on earth sciences

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[Earth Science Picture of the Day](#) - A new picture is put up daily with an explanation of what it is showing

o

[Earth Science World](#) - An organization dedicated to earth week every year

o

[Element List . com](#)

o

[Extreme Science](#) - Kid's website focused on unusual science facts and information

o

[Fun Science Songs](#) - This is a great website with a lot of fun science related songs

o

[Geotimes](#) - An online science magazine

o

[Globally Averaged Atmospheric Temperatures](#) - Average earth temperatures compiled chronologically over the years

o

[Interactive Journey through Modern Physics](#) - University of Colorado wbesite containing information on physics and atomic structures

o

[Kids' Science Projects](#) - Science projects designed by kids with instructions

o

[Learner.org - Science](#) - Different kinds of information from energy to earth science

o

[NASA](#) - Federal department focused on space travel

o

[National Science Foundation](#) - General information and news on Science

o

[NOAA Education](#) - Information on weather, planets, and other science related areas

o

[Planet Diary](#) - Science related phenomenas around the world

o

[Popular Science](#) - Science Magazine

o

[Savage Planet](#) - Site for the TV show Savage Planet

o

[Science Learning Network](#) - Contains online museums

o

[Science Magazine](#) - Online magazine

o

[Scientific America](#) - Online magazine

o

[Student Research Resources on the Internet](#) - Science projects on physics, earth science, ect.

o

[The Earth's Atmosphere](#) - Explains the history of atmosphere

o

[The Sciences Explorer](#) - A fun science website

o

[World Book Encyclopedia](#) - Online encyclopedia

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## Science Projects

- [ENERGY QUEST Science Projects Page](#)
- [Bill Nye the Science Guy™ - "Home Demos" science projects.](#)
- [Element List . com](#)
- [Energizer Learning Center - The battery company's website with great interactive info, science projects and more.](#)
- [Kids' Science Projects - from The Science Club.](#)
- [MadSci Net - \(science project help\)](#)
- [Mike Peshkin's "ideas" links](#)
- [Science Fair Project Resource Guide - from Internet Public Library](#)
- [Science Fairs HomePage - from the Eastern Newfoundland Science Fairs Council](#)
- [Science Fairs on the WWW - Online resource](#)
- [Static Electricity Experiment - from The Exploratorium Museum.](#)
- [Student science projects - from NSRC \(great for ideas!\)](#)
- [WWW Virtual Library: Science Fairs - \(huge index\)](#)
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# California State Science Fair

The California State Science Fair is the final science fair of the academic year for students throughout the State of California in grades 6 - 12, [serving California's future scientists since 1952](#). It is hosted by the [California Science Center](#) (formerly, the California Museum of Science and Industry).

The 54th annual California State Science Fair was held on May 23-24, 2005. This year 955 participants from about 350 schools throughout the State met in competition for awards totaling over \$50,000.

We are deeply grateful to the Science Fair's Major Benefactor over the past five years, THE MUSES of the California Science Center Foundation, along with Raytheon, another leading supporter. Both organizations provide essential funding and volunteer support to sustain the event.

## Latest News from the [Fair](#):

### **Award Checks Mailed**

Award checks for all category award winners (first, second, and third place awards) and all major Fair awards were mailed from the California Science Center on Thursday, June 23. Special and Recognition awards checks are mailed directly from the awarding organizations. Refund checks for overpayments are slated to be mailed on July 7.

### **More Photographs Posted**

[A chronological listing of photos](#) is now available, though still under construction with many more photos to come. A [collage of Fair scenes](#) taken by this year's Fair photographer, [Leroy Hamilton](#), is also available. [The portraits taken of all students](#)

have been posted. Annotated pictures from the Keynote Address, Orientation, Judging, and the Awards Ceremony are almost all annotated. Photos contributed by participants remain yet to be added to the collection.

### **Results**

All awards presented at the 2005 Fair: [Major Fair Awards](#), [Category Awards](#), and [Special and Recognition Awards](#).

The 55th annual California State Science Fair will be held on May 22-23, 2006. *That's only 225 days away!*

Haven't been to the Fair? [Here are some of the photographs from last year's Fair](#) taken by our photographer (and some participants as well). For the historically-minded, [here's a short photo essay](#) using photographs taken about ten years ago. Or [watch the Awards Ceremonies again](#), just as they were Webcast live from the Fair in recent years.

## **Information About the Fair for:**

<a href="#">Students</a>	<a href="#">Judges</a>	<a href="#">Affiliated Fairs</a>	<a href="#">Volunteers</a>	<a href="#">Sponsors</a>	<a href="#">Media Room</a>
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## **Help for Your Science Project**

<a href="#">Getting Started</a>	<a href="#">Fair Resources and by Subject</a>	<a href="#">Mentoring Opportunities</a>	<a href="#">Other Fairs (WWW VL)</a>
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## **CSSF Reference Library**

<a href="#">History Records from Prior Years</a>	<a href="#">E-Mail Directories: Participants Judges</a>	<a href="#">Search the Entire Fair</a>	<a href="#">Alumni Where Are They Now?</a>
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The California State Science Fair is made possible thanks to

- [California Science Center](#)
- The Muses of the California Science Center Foundation
- [Raytheon](#)
- [Our Benefactors](#)

## Coming to Los Angeles?

<a href="#">Local Maps and Directions</a>	<a href="#">Freeway Report</a>	<a href="#">Weather from weather.com USA Today.</a>	<a href="#">CA Office of Emergency Services</a>	<a href="#">USGS Earthquake Report</a>
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[Web Awards](#)

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California State Science Fair / 1,146,282 / [CalifSF@usc.edu](mailto:CalifSF@usc.edu)



- [European Science Fair](#)
- [Ireland: Esat BT Young Scientist & Technology Exhibition](#)
- [New Zealand: Realise the Dream](#) 

● **State Fairs (34)**

- [AK: Alaska State Science and Engineering Fair](#)
- [AL: Alabama State Science and Engineering Fair](#) 
- [CA: California State Science Fair](#)
- [CO: Colorado Science and Engineering Fair](#)
- [CO: Colorado Computational Science Fair](#)
- [CT: Connecticut State Science Fair](#)
- [FL: State Science and Engineering Fair of Florida](#)
- [GA: Georgia State Science & Engineering Fair](#)
- [HI: Hawaii State Science Fair](#)
- [IA: Iowa State Science and Technology Fair](#)
- [IL: Illinois Junior Academy of Science Fair](#)
- [LA: Louisiana Science & Engineering Fair](#)
- [MA: Massachusetts State Science Fair](#)
- [ME: Maine Middle School Science Fair](#)
- [MN: Minnesota Academy of Science State Fair](#)
- [MS: Mississippi Science & Engineering Fair](#)
- [MT: Montana Science Fair](#)
- [ND: North Dakota State Science Fair](#)
- [NE: Greater Nebraska Science & Engineering Fair](#)
- [NH: New Hampshire Science and Engineering Exposition](#) 
- [NM: New Mexico Native American Science & Engineering Fair](#)
- [NM: New Mexico Science and Engineering Fair](#)
- [NY: New York State Science and Engineering Fair](#)
- [OH: Buckeye Science & Engineering Fair](#) 
- [OK: Oklahoma State Science and Engineering Fair](#)
- [OR \(incl. some WA\): NorthWest Science Exposition Research Competition and Exhibition](#)
- [TX: Texas State Homeschool Project Fair](#)
- [TX: Texas State Science and Engineering Fair](#)
- [VA: Virginia State Science & Engineering Fair](#)
- [VT: Vermont State Science & Math Fair](#)
- [WA: Washington Homeschool Science Fair](#)
- [WA: Washington State Science & Engineering Fair](#)

- [WV: West Virginia State Science and Engineering Fair](#)
- [WY: Wyoming State Science Fair](#)

● **Regional Science Fairs (188)**

- [AK: Southeast Alaska Regional Science Fair](#)
- [AL: Mobile Regional Science Fair](#)
- [AR: Northeast Arkansas Regional Science Fair](#)
- [AR: Northwest Arkansas Regional Science and Engineering Fair](#)
- [AZ: Central Arizona Regional Science and Engineering Fair](#)
- [AZ: Northern Arizona Regional Science and Engineering Fair](#)
- [AZ: Southeast Arizona Youth Engineering and Science Fair](#)
- [AZ: Southern Arizona Regional Science and Engineering Fair](#)
- [CA: Central California Regional Science, Mathematics, and Engineering Fair](#)
- [CA: Chico Science Fair](#)
- [CA: Humboldt County Doris Niles Science Fair](#)
- [CA: Inyo County Science Fair](#)
- [CA: Kern County Science Fair](#)
- [CA: Los Angeles County Science Fair](#)
- [CA: Marin County Secondary Science Fair](#) 
- [CA: Mendocino County Science Fair](#)
- [CA: Monterey County Science and Engineering Fair](#)
- [CA: Orange County Science & Engineering Fair](#)
- [CA: RIMS \(Riverside, Inyo, ...\) Inland Science & Engineering Fair](#)
- [CA: Greater San Diego Science and Engineering Fair](#)
- [CA: Sacramento Regional Science and Engineering Fair](#)
- [CA: San Francisco Bay Area Science Fair](#)
- [CA: San Joaquin County Science Fair](#)
- [CA: Santa Barbara County Science Fair](#)
- [CA: Santa Cruz County Science Fair](#)
- [CA: Synopsys Silicon Valley Science & Technology Championship](#)
- [CA: Tri-Valley \(Alameda County\) Science and Engineering Fair](#)
- [CA: Ventura County Science Fair](#)
- [CO: Boulder Valley Science Fair](#)
- [CO: Denver Metro Regional & Engineering Science Fair](#)
- [CO: Long's Peak Science Fair](#)
- [CO: San Juan Basin Regional Science Fair](#)
- [CO: San Luis Valley Science Fair](#)
- [CO: Spanish Peaks Regional Science Fair](#)



- [CT: Science Horizons \(Western CT\) Science Fair & Symposium](#)
- [DE: New Castle County Science Research Expo](#)
- [FL: Alachua Regional Science Fair](#)
- [FL: Capital Regional Science and Engineering Fair](#)
- [FL: Indian River Regional Science and Engineering Fair](#) 
- [FL: Northeast Florida Kiwanis Regional Science and Engineering Fair](#)
- [FL: Orange County Regional Science and Engineering Fair](#)
- [FL: P.K. Yonge \(Gainesville\) Regional Science Fair](#)
- [FL: Sarasota County Regional Science, Engineering, & Technology Fair](#)
- [FL: South Florida Science & Engineering Fair](#)
- [FL: Ying \(Orlando Science Center\) Science Competition](#)
- [GA: Central Savannah River Area Regional Engineering and Science Fair](#)
- [HI: Northeast Kauai Regional Science & Engineering Fair](#)
- [IA: Eastern Iowa Science and Engineering Fair](#)
- [ID: Greater Idaho Falls Science Fair](#)
- [IL: Chicago Public Schools 48th Student Science Fair](#)
- [IN: Calumet Regional Science Fair](#)
- [IN: Central Indiana Regional Science and Engineering Fair](#)
- [IN: Northeastern Indiana Regional Science and Engineering Fair](#)
- [IN: Science & Technology Fair for Home Education \(Indianapolis\)](#)
- [IN: West Central Indiana Regional Science and Engineering Fair](#)
- [KS: City of Manhattan Science and Engineering Fair](#)
- [KY: Murray State University Regional Science Fair](#)
- [KY: North and Central Kentucky Exposition of Science](#)
- [LA: Greater New Orleans Science and Engineering Fair](#)
- [LA: Louisiana Region V Science and Engineering Fair](#)
- [MD: Calvert County Science Fair](#)
- [MD: Western Maryland Science Expo](#)
- [MD: Montgomery Area Science Fair](#)
- [MD: Prince George's Area Science Fair](#)
- [MI: Science and Engineering Fair of Metropolitan Detroit](#)
- [MI: Flint Area Science Fair](#)
- [MI: Mecosta-Osceola ISD Regional Science Fair](#)
- [MN: Northeastern Minnesota Regional Science Fair](#)
- [MN: Rochester Regional Science Fair](#)
- [MN: South Central & Southwest Minnesota Regional Science & Engineering Fair](#)
- [MN: Twin Cities Regional Science Fair](#)
- [MN: Western Minnesota Regional Science Fair](#)

- [MO: Greater Kansas City Science and Engineering Fair](#)
- [MO: Greater Saint Louis Science Fair](#)
- [MO: Mastodon Art & Science Regional Fair](#) (Jefferson Co.)
- [MO: Missouri Southern Regional Science Fair](#)
- [MO: Ozarks Science and Engineering Fair](#)
- [MO: Southeast Missouri Regional Science Fair](#)
- [MS: Mississippi Region VI Science & Engineering Fair](#) 
- [MS: Mississippi Region VII Science & Engineering Fair](#)
- [MT: Deaconess Billings Clinic Science Expo](#) (search for "Science Expo")
- [MT: Montana Region II \(Great Falls\) Regional Science and Engineering Fair](#)
- [MT: Northern Hi-Line \(Havre\) Regional Science and Engineering Fair](#)
- [MT: Southeastern Montana Regional Science and Engineering Fair](#)
- [MT: Southwestern Montana Regional Science and Engineering Fair](#)
- [NC: Southeast Regional Science Fair](#) (UNC)
- [NE: Greater Nebraska Science and Engineering Fair](#)
- [NJ: Burlington County College Science and Invention Fair](#) 
- [NJ: Coriell Institute \(Camden\) Science Fair](#)
- [NJ: Mercer County Science and Engineering Fair](#)
- [NJ: North Jersey Regional Science Fair](#)
- [NJ: Salem County Science Fair](#)
- [NJ: YAC \(Young Achievers Committee\) of Burlington County Science/Math Fair](#)
- [NM: Northeastern New Mexico Science and Engineering Fair](#)
- [NM: Northwestern New Mexico Regional Science and Engineering Fair](#)
- [NM: Southwestern New Mexico Regional Science and Engineering Fair](#)
- [NV: Southern Nevada Regional Science and Engineering Fair](#)
- [NY: Long Island Science & Engineering Fair](#)
- [NY: New York City Science and Engineering Fair](#)
- [NY: Suffolk County Elementary Science Fair](#) (Brookhaven National Laboratory)
- [NY: MOST \(Greater Syracuse\) Science Fair](#)
- [NY: Westchester Science and Engineering Fair](#)
- [NY: Western New York Science Congress](#) 
- [OH: Lake to River Science Day](#) (Youngstown State University) 
- [OH: Marion Area Science & Engineering Fair](#)
- [OH: Mohican District Science Day](#) 
- [OH: North Central District Science Day](#) 
- [OH: North Eastern Ohio Science & Engineering Fair](#)
- [OH: Northwest Ohio District 2 Science Day](#)
- [OH: Ohio District 13 Science Day](#) (Mount Union College) 

- [OH: Southeastern Ohio Regional Science and Engineering Fair](#)
- [OH: Southwest Ohio District Science Day](#)
- [OH: Western Reserve District 5 Science Day](#) 
- [OK: ARM/Mesonet Science Fair](#)
- [OK: Central Oklahoma Regional Science Fair](#)
- [OK: Northwestern Oklahoma State University Regional Science Fair](#) (includes southern Kansas) 
- [OK: Southeastern Oklahoma Science and Engineering Fair](#)
- [PA: Greater Philadelphia Homeschool Science Fair](#)
- [PA: Lancaster Newspapers Science & Engineering Fair](#)
- [PA: Lehigh Valley Science & Engineering Fair](#)
- [PA: Montgomery County Science Research Competition](#)
- [PA: Pittsburgh Regional Science and Engineering Fair](#)
- [PA, DE, NJ: Delaware Valley Science Fairs](#)
- [SC: Anderson-Oconee-Pickens Regional Science Fair](#)
- [SC: South Carolina Science Fairs](#)
- [SC: USC Region II Science & Engineering Fair](#)
- [SD: Eastern South Dakota Science Fair](#)
- [SD: High Plains Regional Science and Engineering Fair](#)
- [SD: South Central South Dakota Science & Engineering Fair](#)
- [TN: Chattanooga Regional Science and Engineering Fair](#)
- [TN: Cumberland Regional Science and Engineering Fair](#)
- [TN: Middle Tennessee Science & Engineering Fair](#)
- [TN: Southern Appalachian Science and Engineering Fair](#)
- [TN: West Tennessee Regional Science Fair](#)
- [TN \(incl. some NC, VA, KY\): Tate's School \(Knoxville\) Regional Science Fair](#)
- [TX: Brazos Valley Regional Science & Engineering Fair](#)
- [TX: Central Texas Science and Engineering Fair](#)
- [TX: Compaq SCI//TECH](#)
- [TX: Dallas Regional Science and Engineering Fair](#)
- [TX: East Texas Regional Science Fair](#)
- [TX: Fort Worth Regional Science Fair](#)
- [TX: High Plains Regional Science Fair](#)
- [TX: Science Engineering Fair of Houston](#)
- [UT: Central Utah Science & Engineering Fair](#)
- [UT: Salt Lake Valley Science and Engineering Fair](#) 
- [UT: Science & Engineering Fair of Utah](#) (Northern)
- [VA: Central Virginia Regional Science Fair](#)

- [VA: Fairfax County Regional Science and Engineering Fair](#)
- [VA: Metro Richmond Science Fair](#) 
- [VA: Piedmont Regional Science Fair](#)
- [VA: Shenandoah Valley Regional Science Fair](#)
- [WA \(incl. NE Oregon\): Mid-Columbia Regional Science & Engineering Fair](#)
- [WA: South Sound Regional Science Fair](#)
- [WA: Student Biotech Expo \(Seattle area\)](#)
- [WI: Fort Atkinson Science Fair](#)
- [WI: Waupaca School District Science Fair](#)
- [WV: Central and Southern West Virginia Regional Science and Engineering Fair](#)
- [WV: Eastern Regional Science Fair](#)
- [WV: MOV Regional Science Fair](#) 
- [WV: West Liberty State College Regional Science and Engineering Fair](#)
- [AB, Canada: Calgary Youth Science Fair](#)
- [AB, Canada: Edmonton Regional Science Fair](#)
- [BC, Canada: British Columbia Science Fairs](#)
- [BC, Canada: Vancouver Island Regional Science Fair](#)
- [MB, Canada: Western Manitoba Science Fair](#)
- [NF, Canada: Central Newfoundland Regional Science Fair](#)
- [NF, Canada: Eastern Newfoundland Science Fairs](#)
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- [NS, Canada: Annapolis Valley Regional Science Fair](#)
- [ON, Canada: Frontenac, Lennox, & Addington Science Fair](#)
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- [ON, Canada: Peterborough Regional Science Fair](#) 
- [ON, Canada: Quinte Regional Science and Technology Fair](#)
- [ON, Canada: Renfrew County Science Fair](#)
- [ON, Canada: Timmins Regional Science Fair](#)
- [ON, Canada: Toronto Science and Technology Fairs](#)
- [ON, Canada: United Counties Science Fair](#) Stormont, Dundas & Glengarry
- [ON, Canada: Waterloo - Wellington Science & Engineering Fair](#)
- [ON, Canada: York Region Science Fair](#) 
- [PE, Canada: Prince Edward Island Science Fair](#)
- [QC, Canada: Montreal Regional Science & Technology Fair](#)
- [SK, Canada: Moose Jaw Regional Science and Technology Fair](#)

- [SK, Canada: Saskatoon Regional Science Fair](#)
- [SK, Canada: South East Saskatchewan Regional Science Fair](#)
- [New Zealand: New Zealand Regional Science and Technology Fairs](#) 
- Henderson, New Zealand: ECNZ Waitakere City Science and Technology Exhibition
- [Manukau, New Zealand: Manukau City Science and Technology Fair](#) 
- Timaru, New Zealand: ECNZ Central South Island Science & Technology Fair
- [Wellington, New Zealand: Wellington Science and Technology Fair](#)

● **Local Science Fairs (85)**

- [AK: Iditarod Elementary School Science Fair](#)
- [AZ: DeGrazia Elementary School \(Tucson\) Science Fair](#)
- [AZ: Dilcon School \(Dilkon\) Science Fair](#)
- [AZ: Gila Crossing Science Fair](#)
- [CA: Brentwood School's \(Los Angeles\) Virtual Science Fair](#)
- [CA: California City Middle School Science Fair](#)
- [CA: Colina Middle School \(Thousand Oaks\) Science Fair](#)
- [CA: Commodore Sloat School \(San Francisco\) Science Fair](#)
- [CA: Emerson Elementary School \(Burbank\) Science Fair](#)
- [CA: Fremont Jr. High School \(Oxnard\) Science Fair](#)
- [CA: Jane Lathrop Stanford Middle School \(Palo Alto\) Science Fair](#)
- [CA: Monterey Academy of Oceanographic Science](#)
- [CA: Mount Miguel High School \(Spring Valley\) Science Fair](#)
- [CA: Nueva Math-Science-Computer Fair](#)
- [CA: Ridgeview Elementary School \(Yucaipa\) Science Fair](#)
- [CA: Saint Therese School \(Alhambra\) Science Fair](#)
- [CA: Springer Elementary School \(Mountain View\) Science Fair](#)
- [CA: San Benancio Middle School \(Salinas\) Science Fair](#)
- [CA: Stanley Intermediate School \(Lafayette\) Science Fair](#)
- [CA: Stone Creek Elementary School \(Irvine\) Science Fair](#)
- [CA: Sunnymeadows School \(Moreno Valley\) Science Fair](#)
- [CA: Valley Presbyterian School \(North Hills\) Science Fair](#)
- [CO: Goddard Middle School \(Littleton\) Science Fair](#)
- [CT: E.C. Adams Middle School \(Guilford\) Science Fair](#)
- [DC: Hine Junior High School \(Washington, D.C.\) Science Fair](#)
- [FL: Ascension Catholic School \(Melbourne\) Science Fair](#)
- [FL: Crystal River Middle School Science Fair](#)
- [FL: Park Maitland School Virtual Science Fair](#)
- [FL: Sebastian River Middle School Computer Science Fair](#)

- [GA: Glynn Academy High School \(Brunswick\) Science Fair](#)
- [HI: Dole \(Governor Sanford Ballard\) School \(Honolulu\) Science Fair](#)
- [HI: Kailua High School Science Fair](#)
- [IA: Kuemper Catholic High School \(Carroll\) Science Fair](#)
- [IA: Wapsie Valley Junior High School \(Oran\) Science Fair](#)
- [IL: McLeansboro High School Science Fair](#)
- [IL: Shepard \(Alan B.\) Junior High School \(Deerfield\) Science Fair](#)
- [IL: Timber Ridge Science Fair](#)
- [IN: Frankfort Middle School Science Fair](#)
- [MA: Massachusetts Academy of Mathematics and Science](#)
- [MA: North Attleboro High School Science Fair Program](#)
- [MA: Plymouth South High School](#)
- [MD: Matthew Henson Middle School \(Indian Head\) Science Fair](#)
- [MD: Sandy Springs Friends School Celebration of Science](#)
- [MI: Meads Mill \(Northville\) Science Fair](#)
- [MN: Dayton Elementary School Science Fair](#)
- [MN: Maple River Central \(Mapleton\) Science Fair](#)
- [MO: Truman Accelerated Middle School \(St. Joseph\) Science Fair](#)
- [MS: Rosa Stewart Elementary School \(Starkville\) Science Fair](#)
- [MT: Circle \(Billings\) Science Fair](#)
- [NC: General Greene \(Greensboro\) Annual & Terrific Science Fair](#) 
- [ND: Eric Ramstad Middle School \(Minot\) Science Fair](#)
- [NE: Omaha Public Schools Science Fairs](#)
- [NH: Milford High School Science and Engineering Exposition](#) 
- [NJ: Chester Schools Science Fair](#)
- [NJ: St. James Catholic School \(Woodbridge\) Science Fair](#)
- [NM: Oñate High School Science Fair](#)
- [NY: Clinton Central School Science Fair](#)
- [NY: Holy Name School \(New York\) Science Fair](#)
- [NY: Smithtown Middle School \(St. James\) Science Fair](#)
- [OH: Aurora Upper Intermediate School \(Bedford Heights\) Science Fair](#)
- [OH: Ferguson Junior High School \(Beavercreek\) Science Fair](#)
- [OH: Harmon Middle School \(Aurora\) Science Fair](#)
- [OH: Madeira High School Science Fair](#)
- [OH: Ripley-Union-Lewis-Huntington Elementary School Science Fair](#)
- [OR: Christ the King School \(Milwaukie\) Science Fair](#)
- [PA: Kensington High School \(Philadelphia\) Science Fair](#)
- [RI: Central High School \(Providence\) Science Fair](#)

- [TN: A.W. Spalding \(Collegedale\) Science Fair](#)
- [TX: H. E. Charles Middle School \(El Paso\) Science Fair](#)
- [VA: Battlefield Middle School \(Fredericksburg\) Science Fair](#)
- [VA: Jefferson Middle School \(at Northern Virginia Regional\) Science Fair](#)
- [VA: Mount Vernon High School \(Alexandria\) Pyramid Science Fair](#)
- [VA: Page County High School Science Fair](#)
- [WA: Madrona School \(Edmonds\) Science Fair](#)
- [WA: Olympic View \(Lacey\) Science Fair](#)
- [WI: Gilbert Stuart Elementary School \(Milwaukee\) Science Fair](#)
- [WI: Willow Glen \(St. Francis\) Elementary School Science Fair](#)
- [BC, Canada: College Heights \(Prince George\) Science Fair](#)
- [BC, Canada: MEI \(Clearbrook\) Science Fair](#)
- [BC, Canada: Point Grey Mini School \(Vancouver\) Science Fair](#)
- [MB, Canada: General Wolfe School \(Winnipeg\) Science Fair](#)
- [NF, Canada: Bishop's College \(St. John's\) Science Fair](#)
- [NF, Canada: Holy Family School \(Paradise\) Science Fair](#)
- [ON, Canada: St. Joachim School \(Ancaster\) Science Fair](#)
- [ON, Canada: Turnbull School \(Ottawa\) Science Fair](#)
- [SK, Canada: Melfort High School Science Fair](#)
- [England: Birkenhead \(Oxton\) School Science Fair](#)

## Virtual Science Fairs

- [eCYBERMISSION](#)
- [Toshiba/NSTA ExploraVision Awards](#)
- [Canada-Wide Virtual Science Fair](#)
- [The 2000 NASA Goddard Space Center Virtual Science Fair](#)
- [The 1996 Virtual Youth Science Forum](#) (hosted by Washington State Univ.)
- [The 1995 Virtual Science and Mathematics Fair](#) (hosted by Washington State Univ.)
- [CyberFair](#) (Mankato State University, Minnesota)
- [Cyberspace Middle School \(Florida\) Science Fair](#)
- [Internet Science and Technology Fair](#)
- [Innovations - The Virtual Science Fair](#)
- [The GREAT! Canadian Science Contest](#)

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## SCIENCE PROJECTS

# What Makes a Good Science Project?

Here's some advice from a science fair judge....

### SCIENCE PROJECTS

You're handed the dreaded assignment...the Science Project. Maybe you already know what you want to do or maybe you're clueless. Whatever you decide, here are steps you should consider when doing your project. Doing it right will not only get a thumbs up from your teacher but it may give you the boost to go to a regional Science Fair. Who knows? Your next stop could be the State Science Fair!

### BE FRESH!

Judges always look for original ideas. Original projects are those that take the textbooks one step further by exploring new ground and innovative techniques. Your project could be original in the scientific concept or maybe you've come up with a new way to solve an old problem or a new and better way to interpret the data. Whatever your project, make sure it is done well. Just having a great and new idea is only half of the solution.

### PASSING THE "HUH?" TEST!

It may be a super idea for a project but it won't impress the judges (or teacher) if you don't have a well-defined goal or objective of what you're doing. Just what scientific concept are you trying to prove or disprove with your project? A direct, often simple objective won't leave the judges scratching their heads, trying to figure out what exactly you were trying to prove. You've got to pass the "HUH?" test.

### UNDERSTAND IT - IT'S YOUR PROJECT, NOT YOUR FOLKS'!

Your project must show the judges that YOU understand and know how to use scientific theory, terms, techniques and methodologies properly. Judges look for students who know about the scientific principles and practices they used in their project. They want to see if you can interpret what you learned. It's important for judges to know that you have a depth of understanding of the basic science behind the project topic, that you comprehend the finer level of detail and that you're aware of any influence or effects the project has on related subject topics. If you don't know what a term or theory means... find out or don't use it in your presentation.

Keep your project at a level YOU can understand. Judges aren't expecting you to have access to university research laboratories or be a Ph.D. candidate for the topic area you've chosen. What is important is that the technical level of sophistication and complexity of your project reflect YOUR level of understanding - not someone else's. It's OK to receive help outside your school as long as you clearly say what is was and who helped you. IF YOU DON'T UNDERSTAND IT, DON'T DO IT because you won't be able to explain it! Chances are if it doesn't make sense to you, it won't make sense to the judge.

One more thing... know how all your equipment works, what it does and why it was used in your project. If you can't explain it to a judge, then you probably don't understand the science of what's going on.

### PROVE YOUR POINT!

Judges look for complete projects. That is, projects that are thorough in addressing the original question and thorough in answering other questions that come up during the experimentation process. As a scientist, it is your responsibility to provide all evidence to support whatever claims you are making. It isn't up to the judge or other scientists to prove your claim. Without data or results that support your claims, it's not a completed work.

### **PUT SOME TIME (and FUN) IN!**

How much time and energy have you put into your project? Was it a one-hour wonder or did you actually put in some effort and time? Did you fly by the seat of your pants or did you spend time reading and learning the subject? Either way, it will show. Pick a topic you like. Science is found everywhere. There must be something you enjoy that can be used as part of a science project. Think outside the box and have some fun with your project!

A judge considers time and effort as two important factors in a successful project. Judges can usually tell that the amount of effort that goes into your project reflects your motivation. Because if you're not motivated, you won't enjoy the experience and that shows!

### **CLEAR AS GLASS!**

If nobody understands what you were doing with your project, why bother with all that work? Be crystal-clear in both your written and verbal communication skills. Your ideas should be clearly presented and easy to understand. Judges look for well-written abstracts with easy to follow visual aids and clear and concise answers. Remember, the more you understand about the scientific principles, the easier it is for you to explain it in terms everyone understands. **KISS (Keep It Simple, Scientist!)**

### **WRAP- UP**

To sum this up, remember high marks go to:

- Clever experimental apparatus
- Correctly interpreting data
- Discovering knowledge not readily available to you
- Combining good research and experimentation
- Repeating steps to verify experimental results
- Predicting and/or reducing experimental results with analytical techniques
- Experiments that have a real world application
- Your ability to clearly portray and explain your project and its results
- Genuine scientific breakthroughs

### **QUESTIONS**

Judges will ask lots of questions about your project. Dazzle them with your brilliance and be prepared to answer questions like these:

- How did you come up with the idea for this project?
- What did you learn from your background search?
- How long did it take you to build the apparatus?
- How did you build the apparatus? How does it work?
- How much time (or many days) did it take to run the experiments (grow the plants or collect each data point)?
- How many times did you run the experiment with a different set of parameters?
- Did you try something else that didn't work?
- Can you explain to me how your project relates to (some scientific principle)?
- Do you think there is an application in industry for this knowledge (technique)?
- Were there any books that helped you do your analysis?
- When did you start this project? Or how much of the work did you do this year?
- What is the next experiment to do if you want to continue this study?

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## SCIENCE PROJECTS

### Peanut Power

Use the energy in a peanut to heat water!

Just about everything has potential energy stored in it. The problem is releasing that energy to be able to do some work.

A tiny peanut contains stored chemical energy. When we eat them, the stored energy is converted by our bodies so we can do work. We can also use the energy in a peanut to heat a container of water.

### What do you need?

1. A small bag/can of unsalted, shelled peanuts
2. A cork
3. A needle
4. A large metal juice or coffee can
5. A small metal can (like a soup can) with paper label removed
6. A can opener
7. A hammer
8. A large nail
9. A metal BBQ skewer (like the kind for kebobs)
10. About a cup of water
11. A thermometer
12. Some matches or a lighter (**ask an adult for help here**)
13. A piece of paper and pencil to record your observations

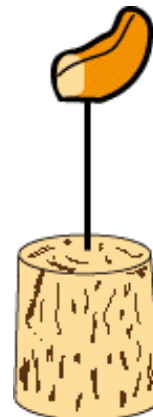
### What to do?

**1** Carefully push the eye of the needle into the smaller end of the cork.

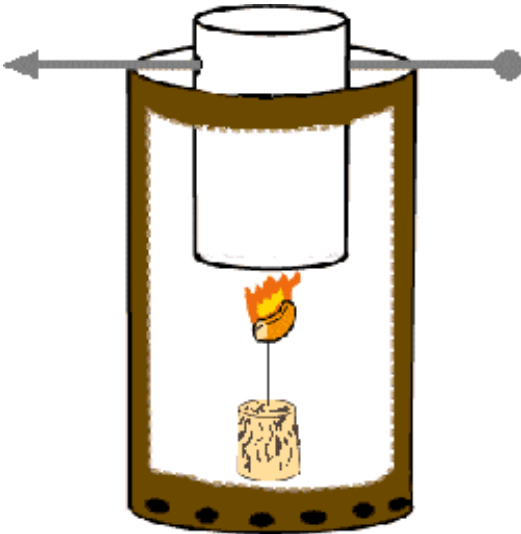
Then gently push the pointed end of the needle into a peanut. If you push too hard the peanut will break. If it does, use another peanut. It's also better to have the peanut at a slight angle.

**2** Remove the two ends of the large juice can with the can opener. Be careful as the top's and bottom's edge can be sharp!

**3** Using the hammer and nail, have an



adult punch holes around the bottom of the large can. These are air holes that will make the can act like a chimney and will contain the heat energy focussing it on the smaller can.



**4** Remove the top end of the small can (if it is not already removed).

Using the hammer and nail, punch two holes near the top of the small can exactly opposite each other.

**5** Slide the BBQ skewer through the holes of the small can.

**6** Pour 1/2 cup of water into the small can and let it sit for an hour. This will allow the water to be heated or cooled to room temperature. (Munch on some peanuts while you're waiting.)

Put the thermometer into the water and record the temperature on your paper.

**7** Place the cork and peanut on a nonflammable surface. Light the peanut with a match or lighter. **Have an adult help you!** Sometimes the peanut can be difficult to light, so the lighter may be easier to use.

**8** As soon as the peanut has caught fire, immediately place the large can around the nut. Balance the skewer holding the small can on the top of the large can.

Allow the nut to burn for several minutes or until it goes out.

Stir the water with the thermometer and record the temperature again.

## What you'll discover!

The chemical energy stored in the peanut was released and converted into heat energy. The heat energy raised the temperature of the water in the small can.

Try a couple of other experiments using different kinds of peanuts or other kinds of nuts. Try:

- Raw peanuts
- Dry roasted peanuts
- Vacuum-packed peanuts
- Freeze-dried peanuts
- Try cashew nuts, Brazil nuts, pecans, walnuts or other kinds of nuts. (Do they contain more energy than the peanut? Why or why not?)

You might want to try more than one peanut. You'll need extra needles. Use four or five peanuts to heat the water. Is the temperature four or five times higher?

Energy is measured in a unit called the Btu, which stands for British thermal unit. A Btu is the amount of heat required to raise the temperature of one pound of water by one degree Fahrenheit. Using math, you can figure out how many Btu are in the one peanut. (The plural of Btu is still Btu, not Btus.)

First you'll need to find out how heavy 1/2 cup of water is. Use a small scale and weigh the small can with nothing in it. Then weigh the can with 1/2 cup of water in it. That will tell you how much the water weighs.

Then, knowing how hot the water was, how many degrees its temperature was raised, you can figure out roughly how many Btu are in the peanut. (**PLEASE NOTE:** This will be an *approximate* figure because the entire peanut will not be completely burned...there is still some chemical energy left inside the partially burned peanut. In order to measure the heat energy exactly, you would need to use a sophisticated piece of machinery called a "calorimeter".)

**For example:** If the water weighed four ounces (1/4 of a pound), one Btu would raise the water temperature 4 degrees Fahrenheit. So, **if** your water temperature increased by 10 degrees (70 degrees at room temperature to 80 degrees), 10 divided by 4 would mean the peanut contained approximately 2.5 Btu. *This is only an example of the math and will not be the same as your calculations.*

One Btu equals approximately:

- One blue-tip kitchen match
- 0.252 kilogram Calories (food calories)

1000 Btu equal approximately:

- One average candy bar (252 kilogram Calories)
- One hour of bicycling
- 4/5 of a peanut butter and jelly sandwich

**NOTE:** You may see Btu defined as 252 calories. These are *International Table* calories which are equal to 1000 of the "Calories" or "kilocalories" we use for measuring food energy.

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## SCIENCE PROJECTS

# Battery Life -- A Science Experiment

(Based on an Experiment Submitted to us by Tracy and Emily)

## Problem Statement

The problem is: Which battery lasts the longest out of four different brands, Duracell, Energizer, Eveready and Rayovac?

## Hypothesis

We think that Duracell will last the longest because their advertising claims that no other battery "beats the copper top."

## Materials

1. Four of the same type, size and brand flashlights.
2. Two D-size batteries from each of the following brands:
  - o Duracell
  - o Energizer
  - o Eveready
  - o Rayovac
3. Two other D-size batteries to test each flashlight and bulb before starting tests.

## Procedure

We tested each of the flashlights by using the two test batteries. We then labelled each flashlight with the battery brand name and put the different batteries in each marked flashlight.

Before going to bed we will turn on all the flashlights at the same time and left them on overnight. We'll note down the time that the flashlights were turned on. When we wake up we will watch the flashlights until they go out and will record the time. If one goes out before we wake up, we will get two more of the same type of battery and watch it during the day.

## Variables

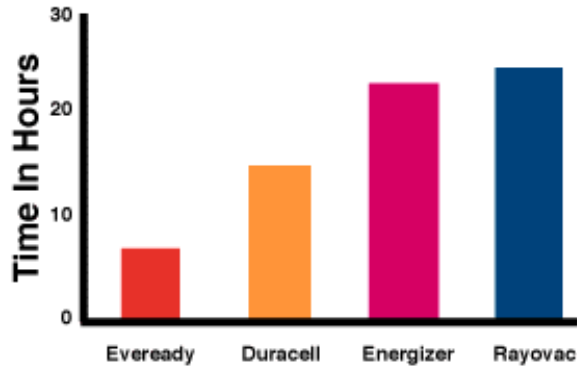
Our variable is the different brand of batteries. The controlled condition is the same type of flashlights.

## Results

Our experiment showed that Rayovac outlasted all of the other batteries we tested by at more than two hours. The Eveready battery, which is a regular, non-alkaline battery, lasted only 6



hours and 35 minutes. The Duracell lasted 15 hours. The Energizer lasted 22 hours and 15 minutes. The Rayovac lasted 24-1/2 hours.



The Eveready flashlight went out during the night, so we had to replace the batteries and watch it during the daytime. It was the only non-alkaline battery. We observed that when it was going dead, it got very dim. The alkaline batteries just went out completely.

Brand	Duracell	Energizer	Eveready #2	Rayovac
Turned on	9:00 p.m. Fri	9:00 p.m. Fri	10:00 a.m. Sat	9:00 p.m. Fri
Burnt out	12:00 p.m. Sat	7:15 p.m. Sat	4:35 p.m. Sat	9:30 p.m. Sat
Total Time Turned On	15 hours	22 hours 15 minutes	6 hours 35 minutes	24 hours 30 minutes

## Conclusion

We rejected our hypothesis that Duracell would last the longest. We came to this conclusion because our data show that Rayovac lasted longer than Duracell. This also proves that even though batteries may be more expensive (like the Duracell was), you might not be paying for a better battery.

We do suggest that further testing be done, due to a few errors made during the experiment. Some flashlights were accidentally dropped, which could have caused differences in the results. The expiration dates of the batteries were not all the same (there was a difference of a few months); so some batteries may not have been as "fresh" as the newer ones.

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## SCIENCE PROJECTS

# Air Power for Transportation

Use the force of the air to propel a vehicle!

(Adapted from Science Projects in Renewable Energy & Energy Efficiency written by the National Renewable Energy Laboratory, published and copyright 1991 by the American Solar Energy Society, and distributed by the National Energy Foundation. )

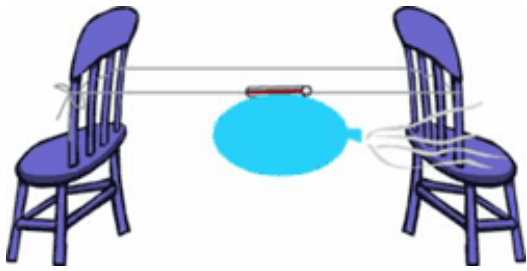
### What do you need?

1. Balloons of different sizes
2. Masking tape
3. 25 feet of thin fishing line (mono-filament line)
4. Plastic drinking straws (one for each balloon)
5. Some heavy books
6. A 25 foot tape measure
7. A pad of paper and pencil for writing measurements and observations

### What to do?

**1** Blow up each balloon, holding the end closed with your fingers so it stays full, and have someone else tape a straw to the middle of the balloons. Let the air back out of the balloons.

**2** Take the piece of fishing line and stretch it tight between the back of two chairs spaced about 20 feet apart. Leave one end with a bow knot so that you can untie it easily.



**3** Put some heavy books on the seats of the chairs to keep them from tipping over.

**4** Untie the fishing line and push the line through one of the straws with the front of the balloon facing and bring the balloon and straw back to the other end (the starting line). Retie the string to the chair so the fishing line is tight.

**5** Blow up the balloon as much as you can. Pinch off the end. Then let go of the balloon. Measure how far it went along the fishing line.

Try another balloon of different sizes, or try the same balloon blowing it 1/2 way full or 1/4 of the way full. Measure how far the balloon travels.

**6** Write down each of the balloons type (round, long, small, large) and how much you blew it up (full, 1/2 way, 1/4 full, just a little) and how far each of the balloons traveled.

## What you'll discover!

A law of physics says for every action, there is an equal and opposite reaction. The force of the air escaping from the balloon and pushing out the end forced the balloon to travel forward. This is the same principle used in rockets. Yet, instead of air...the rockets use rocket fuel.

The air you blew into the balloon became stored energy. When you released the balloon's end, the stored energy became mechanical energy moving the balloon.

Rather than flying all around the room, the straw and the fishing line kept the balloon traveling in a straight line. What balloons worked best: the long skinny ones or the round ones? What happened when you blew up the balloon only half way or 1/4 of the way?

Do you think air can be used for moving a car? What about moving an astronaut in space? Can you think of other things that compressed air can do?

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## SCIENCE PROJECTS

### Building a Wind Gauge

Measure how strong the wind blows.

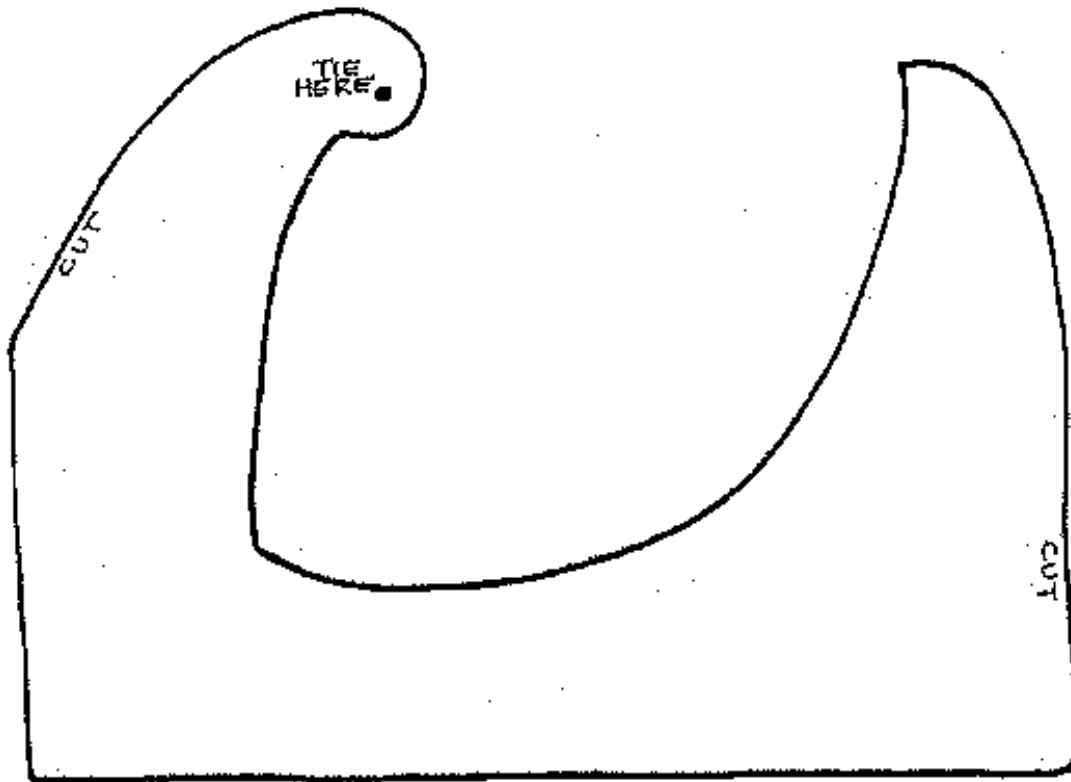
Here is a simple wind gauge for use in breezes.

It will indicate direction and relative speeds.

Use the wind gauge to find out where the wind blows strongest.

Compare gauge readings.

Do obstacles affect wind speeds and direction?



Left side toward direction wind is blowing from.

Bottom parallel to ground.

#### Directions:

1. Print out the pattern using your Internet browser software.
2. Trace the pattern onto cardboard.
3. Cut out the light cardboard wind gauge.
4. Tie thread or string in hole.

5. Move gauge until thread is blowing the same way edge furthest from the string is pointing. This indicates wind direction. Keep pointing the gauge in that direction.
6. Where the thread points along arc indicates a relative velocity. Make marks with a pen along the arc to show how hard the wind is blowing.

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## SCIENCE PROJECTS

# Make an Anemometer!

Measure how fast the wind blows.

An anemometer is a device that tells you how fast the wind is blowing. The device you can build is a model of a wind speed indicator. A real one will be able to accurately measure how fast the wind is blowing. Yours will give you only approximation of how fast it's blowing. It can't give you an exact wind speed.

The energy in the moving wind can be used to generate electricity. But you have to know how fast the wind is blowing before you can harness wind power.

## What do you need?

1. Scissors
2. 4 small paper cups (like drinking cups)
3. A marking pen (any color)
4. 2 strips of stiff, corrugated cardboard -- the same length
5. Ruler
6. Stapler
7. Push pin
8. Sharpened pencil with eraser on the end
9. Modeling clay
10. A watch that shows seconds

## What to do?

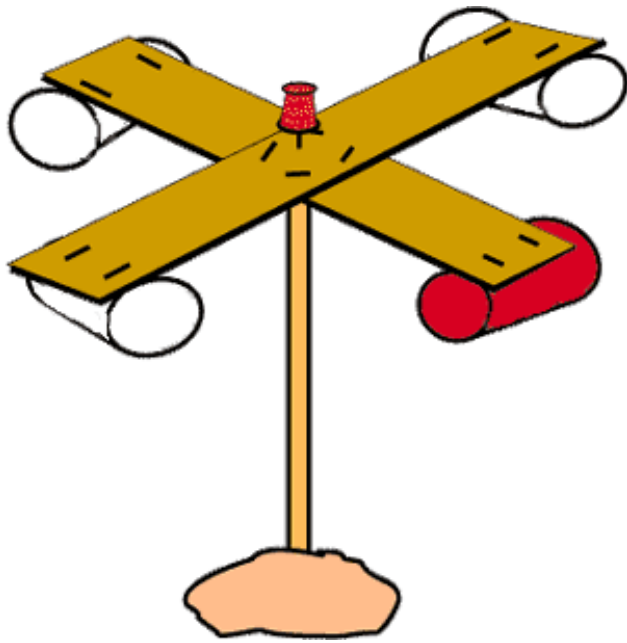
**1** Cut off the rolled edges of the paper cups to make them lighter.

**2** Color the outside of one cup with the marking pen.

**3** Cross the cardboard strips so they make a plus (+) sign. Staple them together.

**4** Take the ruler and pencil and draw lines from the outside corners of where the cardboard strips come together to the opposite corners. Where the pencil lines cross will be the exact middle of the cross.





**5** Staple the cups to the ends of the cardboard strips; make sure the cups all face the same direction.

**6** Push the pin through the center of the cardboard (where the pencil lines cross) and attach the cardboard cross with the cups on it to the eraser point of the pencil. Blow on the cups to make sure the cardboard spins around freely on the pin.

**7** Place the modeling clay on a surface outside, such as a porch railing, wooden fence rail, a wall or a rock. Stick the sharpened end of the pencil into the clay so it stands up straight.

## What you'll discover!

### Measuring Wind Speed

This anemometer cannot tell the wind speed in miles per hour, but it can give you an idea of how fast the wind is blowing.

Using your watch, count the number of times the colored cup spins around in one minute. You are measuring the wind speed in revolutions (turns) per minute. Weather forecasters' anemometers convert the revolutions per minute into miles per hour (or kilometers per hour). Keep a record of the wind speeds you're measuring for the next few days.

Measure the wind speed at different times of the day. Is it the same in the morning; the afternoon; the evening? Move your anemometer to another location. Is it windier in other places? Do trees or buildings block the wind?

**One of our readers, Heather Fluehr, and her mom, Paulina, of Apopka, Florida, devised a clever way to measure wind speed in miles per hour. With a slightly different anemometer, the whole family got into the car. One person drove the car, one held the anemometer out of the window -- these two were adults -- one held a stop watch, and one counted the revolutions of the anemometer. They drove exactly 10 mph. In one minute their anemometer made 100 revolutions. Assuming there was no wind that day, they determined that with their anemometer 100 rpms equals 10 miles per hour. If they wanted to they could verify the accuracy of their measurements by using a real anemometer like the ones used by weather forecasters and airports.**

Wind speed is important for wind energy. Wind turbines -- which are the machines that change the movement of the wind into electricity -- need a constant, average

wind speed of about 14 miles per hour before the wind turbines can generate electricity. That's why wind farms, where there are a lot of wind turbines grouped together, are located in windy spots. In California, these are in three main places -- the Altamont Pass east of San Francisco, Tehachapi south of Bakersfield, and in San Geronio near Palm Springs.

To read more about wind energy, please see Chapter 10 of our [Energy Story](#).

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## SCIENCE PROJECTS

### Electromagnet

Here's an "attractive" project; create a magnet using electricity!

#### What do you need?

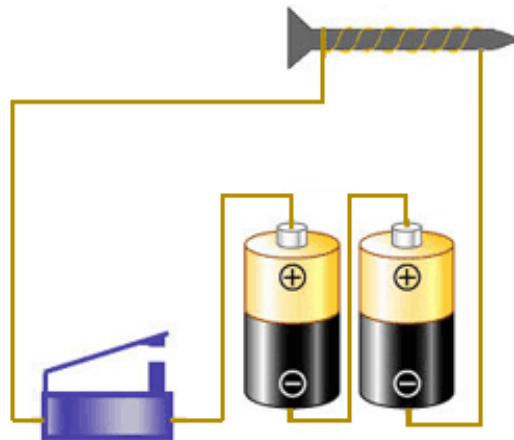
1. Thin wire
2. A long nail = 10p is a good size (10P = 10-penny - 3-inches, the size of the nail \*)
3. Two 1.5 volt D-cell batteries, **AND/OR** a 12-volt lantern battery
4. Wire cutter
5. Masking tape
6. A "knife" switch – you should be able to find this in a hobby shop, electronic supply or a hardware store. Get a DC (direct current) switch \*\*
7. Electrical tape
8. Some paper clips

#### What to do?

**1** Wrap the wire that has been stripped bare very tightly around the nail - at least 50 times. Cut the wire leaving a few inches of wire at each end.

**2** Tape down the end of the wire from the top of the nail to the negative pole of the battery. Make sure the wire is touching the battery end.

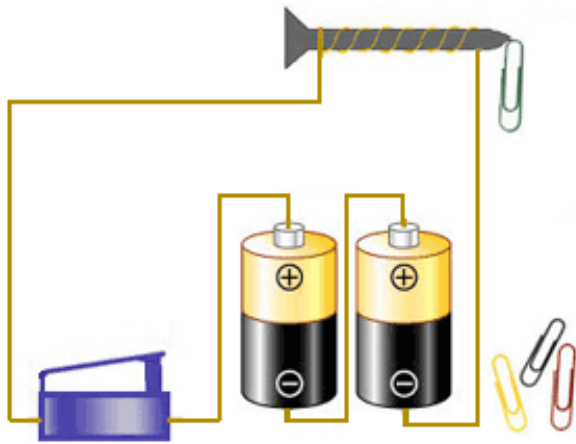
**3** Open the knife switch and connect the wire from the bottom end of the nail to the terminal on the knife switch.



**4** Cut another short piece of wire and tape the wire to the positive pole of the battery.

**5** connect the wire from the battery to other terminals on the knife switch.

**6** Close the circuit by closing the knife switch. When you do that, you create a circuit of electricity that passes through the wire round around the nail.



**7** Touch the point of the nail to a couple of paper clips and watch what happens.

## What you'll discover!

When the electric current passes through the wire round around the nail, it creates a magnetic field that reaches out in expanding circles. When a wire carrying electricity is twisted into a coil, it is called a solenoid. The magnetic field twists with the coiled wire, causing the magnetic field lines to concentrate inside the coil. This creates a powerful magnetic effect inside the coil called an electromagnet.

The magnetic field inside the coil causes the tiny magnetic fields in the metal of the nail to be aligned in one direction (all the north poles point the same way). These little fields all pointing in the same direction add to the coil and make the magnet strong enough to pick up some objects.

How many paper clips can you pick up by the electromagnet? What would happen if you used two batteries and connected them together (make sure you connect the positive to the negative poles if you're using the two batteries)? Try to see how many paper clips you can pick up. Now, try using the nine-volt battery. (Connect the positive and negative terminals like on the regular batteries.) How many paper clips can you pick up? Is there any relationship between the voltage of the batteries and the number of clips you can pick up?

**\* WHAT DOES "PENNY" NAIL MEAN?** The term penny (like 10p) originated in England many years ago. Ten penny, four penny, etc., nails got their names from the fact that one hundred nails of that size cost ten pence, four pence, etc. Today penny represents the definite length of a nail measured from the head to the tip of the point. The term penny is still shown by using the English Pence sign p.

**\*\* An inexpensive (\$2.99) knife switch can be found at Radio Shack (Catalog #: 275-1537) with screw terminals and for low-power use.**

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## SCIENCE PROJECTS

### Lemon Power

What to do with a lemon beside making lemonade!

Project to Make a Battery From a Lemon

#### What do you need?

1. 18-gauge copper wire (smaller gauge will work too, but 18-gauge is stiffer)
2. Wire clippers
3. Steel paper clip (Some people find that a 2-inch strip of zinc works better)
4. Sheet of coarse sandpaper
5. Lemon
6. Help from an older friend or an adult

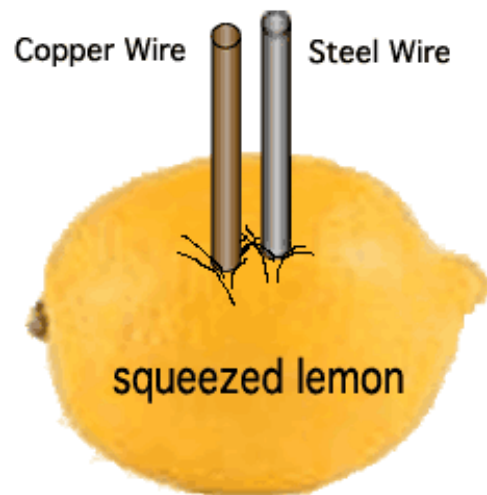
#### What to do?

**1** Have your older friend or an adult strip 2 inches of insulation off the copper wire. Clip the 2 inches of bare wire with the clippers.

**2** Straighten out the paper clip and cut about 2 inches of the straightened steel wire, or use a 2-inch piece or strip of zinc.

**3** Use sandpaper to smooth any rough spots on the ends of the wire and paper clip or piece of zinc.

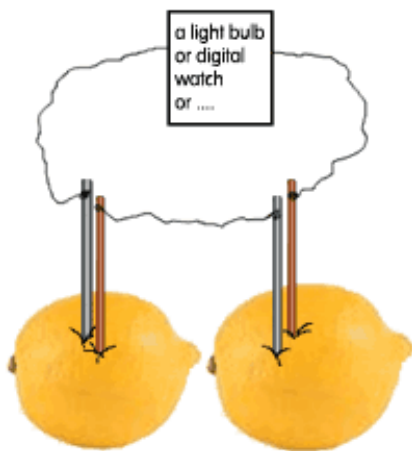
**4** Squeeze the lemon gently with your hands. But don't rupture the lemon's skin. Rolling it on a table with a little pressure works great.



**5** Push the pieces of the paper clip and the wire into the lemon so they are as close together as you can get them without touching.

**6** Moisten your tongue with saliva. Touch the tip of your wet tongue to the free ends of the two wires.

**You should be able to feel a slight tingle**



on the tip of your tongue and taste something metallic.

## What you'll discover!

The lemon battery is called a **voltaic battery**, which changes chemical energy into electrical energy.

The battery is made up of two different metals (the steel paper clip and the copper wire). These are called **electrodes**, which are the parts of a battery where electric current enters or leaves the battery. The electrodes are placed in a liquid containing an **electrolyte**, which is a solution that can conduct electricity.

In a solution of water and an electrolyte, like the acid in the lemon, an excess of electrons collects on one end of the electrodes. At the same time, electrons are lost from the other electrode.

Touching the electrodes to your tongue closes the circuit and allows a small electric current to flow. A single lemon produces about 7/10 of a volt of electricity. If you connected two lemons together, you can power an inexpensive digital watch (uses about 1.5 volts). (Use a length of thin, flexible wire to connect the silver wire of one lemon to the copper wire of the other lemon. Then attach thin wires from the other two wires in the lemons to where a battery's positive and negative poles connect to power the watch.)

The tingle felt in your tongue and the metallic taste is due to the movement of electrons through the saliva on your tongue.

### Note About Lemon Energy

We've had some students do this project and then try to use the lemon "battery" to light a small flashlight's light bulb. The lemons did not work. Why? The reason is that the lemons produce only a very small current (about one milliamp). This is not enough electric current to light the bulb. Even with multiple lemons, the amount of current flowing through the wire is not enough. Though the voltage is high enough (1.5 volts with two lemons), the current is too weak. But it was a great experiment! Even if an experiment doesn't work, it helps us to understand how things work. Good work!!!

You also may want to check out:

[Dr. Dan's Homepage: The Official Lemon-Power Website!](http://members.aol.com/dswart/index.html) - using lemons to power stuff!  
(<http://members.aol.com/dswart/index.html>)

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## SCIENCE PROJECTS

### Light By Friction

Crear static electricity! Excite the electrons!

#### What do you need?

1. A piece of Saran Wrap or clear plastic wrap
2. A piece of fake fur (we don't use real fur)
3. A piece of wool
4. A piece of cotton
5. A piece of other types of cloth
6. A fluorescent lighting tube (an old one will do)

#### What to do?

**1** In a dark room, hold the tube carefully in one hand and hold the piece of material in the other. Rub the fluorescent tube up and down vigorously with the saran wrap. Watch what happens.

**2** Try this again and again with the other pieces of fur and cloth. Watch what happens.

#### What you'll discover!

A fluorescent tube will glow when there is an electric field inside the glass. Normally this occurs when a current of electricity is passed through the tube when a wall switch is turn on. The electric field causes some electrons to separate from the nuclei of the gas. When the electrons fall back into their regular places, they cause the tube to glow. This is called a "ground state."

When you rub up and down with each of the pieces or cloth, fur or plastic, you create static electricity. This static electrical field excites the electrons.

Does the tube glow brighter when a different material? Why do you think this is? Warning: the electricity being generated is not dangerous. But be VERY careful with the fluorescent tube. If dropped, you could get cut with broken glass.



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## SCIENCE PROJECTS

# Make Your Own Lightning!

## Gettin A Charge Out of the "Sky"!

In a storm cloud, the moving air makes tiny water droplets and ice rub together so they become charged with static electricity. The positive electrical charges float up near the top of the cloud and the larger ones, with negative charges, stay near the bottom. This separation of electrical charges is very unstable and lightning is the way the charges are equalized or become balanced.

## What do you need?

### Method 1

1. A large iron or steel pot (not aluminum) with a plastic handle.
2. Rubber gloves.
3. An iron or steel fork.
4. A plastic sheet (a dry-cleaner garment bag is good source).

### Method 2

1. Inflated balloons.
2. Wool clothing - like a wool sweater - or a piece of real fur (**No, don't use your pet!**).
3. A metal surface like a filing cabinet or a metal door knob.

## What to do?

### Method 1

- 1** Tape the plastic sheet to a table top.
- 3** Put on the rubber gloves.
- 4** Darken the room as much as possible.
- 5** Hold the large iron pot or pan by its insulating handle and rub the pan vigorously to and fro on the plastic sheet.
- 6** Holding the fork firmly in the other

hand, bring its prongs slowly near the rim. When the gap between pot and fork is small, a tiny spark should jump across (A darker room will help you see the spark more clearly).

#### Method 2

- 1** Inflate balloons.
- 2** Darken the room as much as possible.
- 3** Rub the balloon(s) rapidly against a wool sweater or a piece of real fur about ten times or more.
- 4** Move the balloon close to something metal like a filing cabinet or a door knob.

## What you'll discover!

#### Method 1

It is as though the pan is the **thundercloud**, the fork is the **lightning rod** and you are the **Earth's surface**.

#### Method 2

The balloon is being used to create static electricity. The flash or spark that jumps from the balloon to the metal object is like lightning, though much, much smaller in scale.

**Please note: The humidity in the air can affect static electricity. If the air is damp, such as during the winter, then this experiment may not work.**

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## SCIENCE PROJECTS

# Electricity: Open and Short Circuits

Does the "short circuit" mean the electricity takes a shorter course!

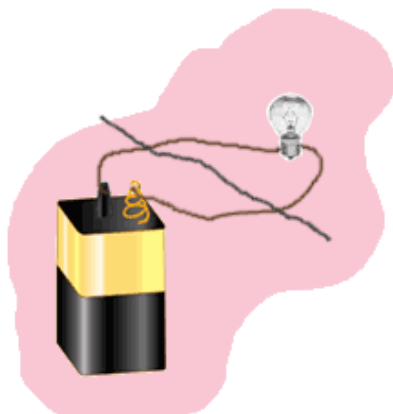
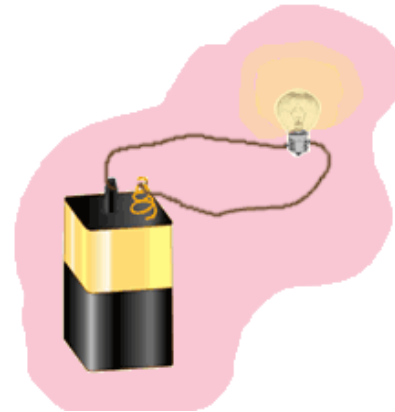
### What do you need?

1. Lantern battery - DO NOT USE ANYTHING HIGHER THAN A NINE-VOLT BATTERY
2. Small light bulb/lamp or small motor
3. Wire to connect battery and lamp terminal (bare wire, not plastics or rubber covered)
4. Wire clippers

### What to do?

**1** Cut three pieces of wire.

**2** Connect the wires from the battery terminals to the lamp terminals - lamp or motor will light up or run.



**3** Take third piece of bare wire and drop across the two bare wires leading between the terminals - notice what happens. The lamp or motor should go out or stop.

4

Take the third wire that was laying across the other two wires. Take the wire clippers and cut one of the wires leading from the battery to one of the lamp terminals. The lamp or motor should also go out or stop.



## What you'll discover!

When the third piece of wire was dropped across the two wires leading to and from the lamp, the wire created a "short circuit." This doesn't mean the electricity took a shorter course, it just took an easier path.

When you cut the wire with the clippers, you created an "open" circuit. If you placed a switch on this wire... you would create the same type of circuit you have with any electric light.

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## SCIENCE PROJECTS

### Making a Rheostat!

A small device that controls the voltage flow by a dial or knob.

#### What do you need?

1. A flashlight bulb and socket
2. Two "D" cell batteries or a dry cell lantern battery
3. About 16 inches of wire
4. A piece of wire about 2 inches long
5. A long, long spring -- the spring from a inside w roll up window will work great. You'll need to break open the wooden section that the shade rolls up on to get to the spring. Ask an adult to help you get this spring out.
6. Pair of wire clippers

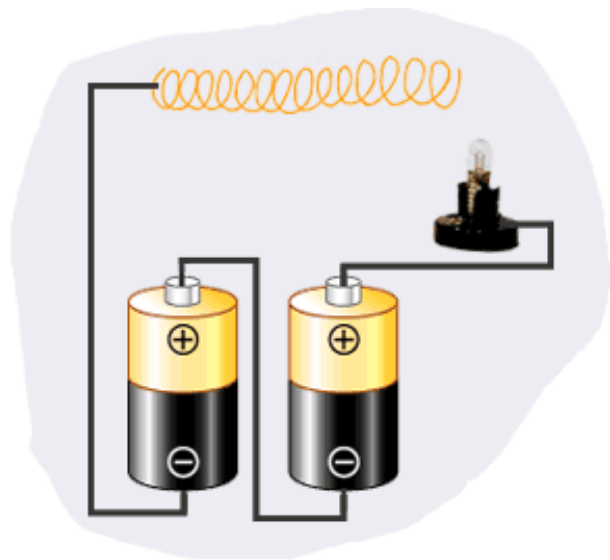
#### What to do?

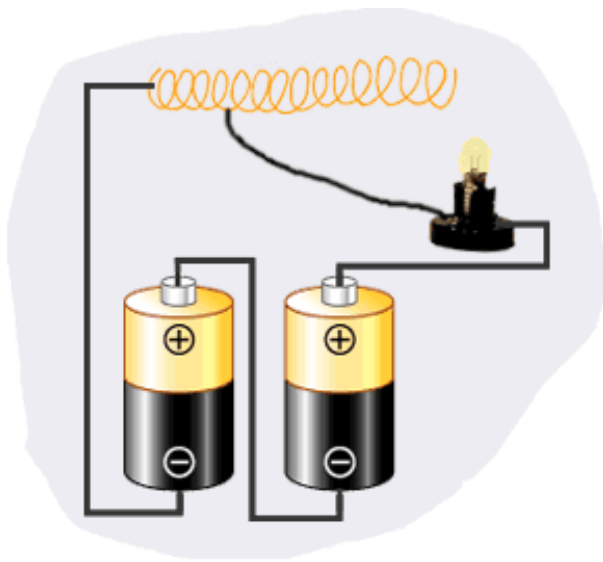
**1** Connect the two batteries so the positive pole connects to the negative pole of the other battery.

**2** Cut the 16 inch wire in half and attach each piece to the open end of the joined batteries.

**3** Connect the free end of one wire to one terminal of the light socket.

Connect the other free wire to one end of the spring.





**4** Connect the two-inch long wire to the other terminal of the light socket.

**5** Connect the wire coming off the terminal to the end where the other wire is. Watch how brightly the bulb glows.

**6** Now slowly move the short wire down the length of the spring. What happens?

## What you'll discover!

As you go further away from the end where the wire is attached to the spring, the light will get dimmer and dimmer. The steel wire in the spring is not a very good conductor of electricity. The more wire the electricity has to pass through the more resistance there is and the less electricity. What you've made is called a rheostat. This is a device to vary the amount of a current passing through it to complete a circuit.

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## SCIENCE PROJECTS

# Geothermal Power Plant Model

Make a model of a power plant that uses steam!

(Adapted from **Science Projects in Renewable Energy & Energy Efficiency** written by the National Renewable Energy Laboratory, published and copyright 1991 by the American Solar Energy Society, and distributed by the National Energy Foundation. )

**DO NOT ATTEMPT ALONE! YOU'LL NEED AN ADULT TO ASSIST YOU IN THIS PROJECT!**

## What do you need?

1. Child's pinwheel
2. Aluminum foil
3. Empty soup can or similar sized tin can with one end cut off
4. A wooden ruler
5. Small cooking pot
6. Hot plate
7. Hammer
8. 10p nail
9. Tape or rubber bands
10. Mitten type of pot holder

## What to do?

**1** Take hammer and nail and carefully punch a hole in the end of the tin can near the edge. Punch another whole directly across the top from it. The two holes should not be bigger than 1/8 inch across.

Tape or attach the ruler to can with rubber bands.

**2** Put water into the pot and cover the top of the pot with two layers of tin foil. Tightly crimp the tin foil around the edges so it seals the top tightly.

Using the nail, punch a hole in the top of the tin foil cover in the very center about 1/16 inch across. Put covered pot to side.



**3** Put the pot onto the hot plate and bring to a boil.

**4** Put on the mitten pot holder, and when steam starts coming out of the top, carefully hold the pinwheel over the one hole. Notice how fast the wheel spins.

**5** Take the can on the ruler and place it on the top of the pot so that the hole is in the center of the open end of the can. Steam should now be coming out of the top of the can through the two holes.

**6** Carefully hold the pinwheel. Turn the pinwheel so that the holes are on opposite sides of the pinwheel. Notice how fast the pinwheel turns.

**7** Take pot off the hot plate and let cool. Carefully take off the tin foil, add more water to the pot and put tin foil top back on. Take the nail and poke lots of holes all over the tin foil. Punch 5 holes close to the edge away from the center hole, repeat the experiment with ten holes around the edge, 20 holes around the edge.

**8** Bring the pot back up to boiling. Hold the pinwheel over only the one center hole. How much steam do you see? How fast is the pinwheel turning?

## What you'll discover!

With one hole the pinwheel, how fast did the pinwheel turn? With the can making the steam hit the wheel equally on either side, what happened? When you punched more holes in the tin foil what happened?

In a geothermal power plant, steam is used to turn a turbine. The turbine is attached to a generator to make electricity. There are two places in the world where natural steam is found under ground and is used to make electricity. One is in Italy. The other is north of San Francisco in an area called The Geysers. The Geysers produces enough energy to power a city of about one million people. But in recent years, the amount of steam produced by the area has decreased. Some

people think that it's because there are too many "holes" in the ground like the pot cover with 20 holes. It's like having a soda with 20 straws in it and all of your friends and you sipping at the same time. The soda glass will be drained VERY fast. That's what some people think is happening to the Geysers...that it's running out of steam.

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## SCIENCE PROJECTS

### Hydro Power

The force of water!

#### What do you need?

1. Half gallon paper milk carton (empty and washed out)
2. Gallon of water
3. Awl or 10p nail
4. Masking tape
5. Ruler
6. Magic marker
7. Pair of scissors
8. Pad of paper and pencil to make notes

Do this experiment over a sink.

#### What to do?

1

Cut off the top of the milk carton.

From the bottom of the milk carton, measure up 1/2 inch and using the awl or 10p nail punch a single hole in the center of the side of the carton

Measure up one inch from the bottom and punch another hole in the center.

Measure up two inches from the bottom and punch a third hole directly above the other two holes.

Measure up four inches from the bottom and punch a final hole in the center of the side.

**NOTE:** All holes should be the same size.

**2** Take a long piece of tape and tape up all four of the holes.

**3** Put the carton on the edge of the sink with the side with the holes pointing toward the sink.

**4** Mark a line on the carton near the top. Always fill or refill the milk carton with water to that line.

**5** Quickly remove the tape that's covering all the four holes. Watch what happens. Measure how far away each of the streams hits the sink.

**6** Let all the water empty out. Watch what happens as the water level drops. What happens to the streams of water?

**7** Now tape up all holes. Put the carton back on the sink edge. Refill the carton and remove the bottom tape. Measure how far out the stream goes. Retape the hole, and untape the next hole up; measure how far away the stream goes. Refill the carton with water. Retape the second hole and untape the third hole; measure how far away the stream goes. Refill the carton with water to the same level as before. Retape the third hole and untape the fourth hole; measure how far away the stream goes.

## What you'll discover!

How far away did the streams of water fall from the carton. Was there a difference between the stream from the water from hole the bottom than at the top?

Here's why? Water has weight. The closer to the bottom of the carton, the more water is above and the more weight is pressing down from above. The more weight, the more water pressure. And the more water pressure, the further away the stream will go and the faster it will go.

Hydroelectric facilities are built at the base of dams to take advantage of the high pressure of the water at the bottom of a reservoir. The water pressure is funneled through a tunnel through the dam called a penstock. The water then is focussed on the blades of a turbine. Water pressure of the water turns the turbine, and the turbine turns a generator making electricity.

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## SCIENCE PROJECTS

# H<sub>2</sub>O Electrolysis

## Splitting Water!

Electricity is "created" when certain chemicals react together. We use chemically- made electricity to power many machines from flashlights to a watch or sometimes a car. Yes, there are cars that run on electricity! The devices that store electricity are called batteries. Electricity can also be used to produce chemical changes.

Water is a simple chemical made from two gases -- hydrogen and oxygen. Every molecule of water has two atoms of hydrogen for every atom of oxygen. **H<sub>2</sub>O** is the chemical formula for a molecule of water.

If an electrical current is passed through water between electrodes (the positive and minus poles of a battery), the water is split into its two parts: oxygen and hydrogen. This process is called electrolysis and is used in industry in many ways, such as making metals like aluminum. If one of the electrodes is a metal, it will become covered or **plated** with any metal in the solution. This is how objects are **silverplated**.

You can use electricity to split hydrogen gas out of the water similar to the process called electrolysis.

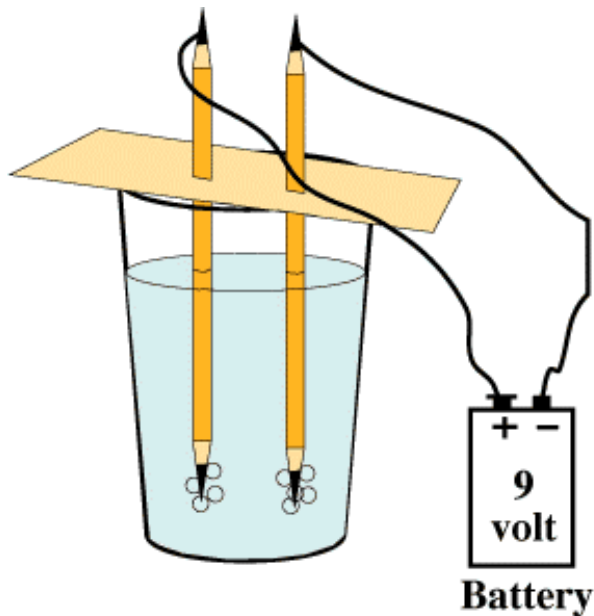
Try This!

### What do you need?

1. A 9 volt battery
2. Two regular number 2 pencils (remove eraser and metal part on the ends)
3. Salt
4. Thin cardboard
5. Electrical wire
6. Small glass
7. Water

### What to do?

- 1 Sharpen each pencil at both ends.
- 2 Cut the cardboard to fit over glass.
- 3 Push the two pencils into the cardboard, about an inch apart.



- 4 Dissolve about a teaspoon of salt into the warm water and let sit for a while. The salt helps conduct the electricity better in the water.
- 5 Using one piece of the electrical wire, connect one end on the positive side of the battery and the other to the black graphite (the "lead" of the pencil) at the top of the sharpened pencil. Do the same for the negative side connecting it to the second pencil top.
- 6 Place the other two ends of the pencil into the salted water.

## What you'll discover!

As the electricity from the battery passes through and between the electrodes (the pencils), the water splits into hydrogen and **chlorine** gas, which collect as **very** tiny bubbles around each pencil tip.

Hydrogen collects around the cathode and the chlorine gas collects around the anode.

How can you get chlorine from H<sub>2</sub>O? Good question! Sometimes in experiments, a secondary reaction takes place. This is what happens in this experiment.

Oxygen is not given off in this experiment. That's because the oxygen atoms from the water combine in the liquid with the salt to form hydroxyl ions. Salt's chemical formula is NaCl - sodium chloride. The chlorine gas is from the chloride in the salt. The oxygen in the hydroxyl ions stay in the solution. So, what is released in this reaction is not oxygen but is chlorine gas that collects around the pencil tip. Around the other pencil is hydrogen gas.

In real electrolysis systems, a different solution is used, and higher levels of electricity help to split the water molecules into hydrogen and oxygen without this secondary reaction.

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## SCIENCE PROJECTS

### Steamboat Power

#### Making a Steam-Powered "Rocket Boat"

#### What do you need?

1. Metal tube (a cigar tube works great -- ask an adult to get you one)
2. Two pieces of strong, stiff wire (like clothes hanger wire) about 18-inches long
3. Cork that fits snugly into the end of the tube
4. Two food warmer candles (in metal cups)
5. Balsa wood (4 inch by 8 inch, 1/2-inch thick)
6. Masking tape
7. Hammer and three nails
8. Matches

**You'll need an adult's help with the matches and the hammer and nails!**

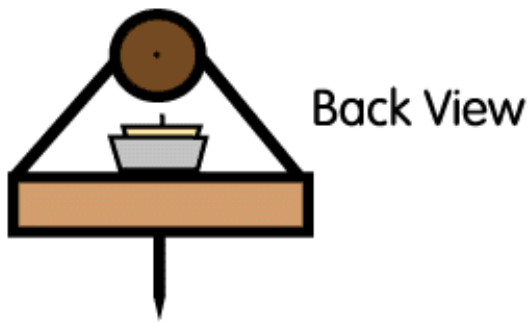
#### What to do?

**1** Put the cork into the end of the metal tube making sure its very tight. Carefully poke a hole through the cork with a nail.

**2** Take the two 18-inch lengths of wire. Wrap the wire around metal tube about one-inch from each end of the tube, and twist the wire tightly with the pliers so the tube is firmly held by the wire and won't slide.

**3** Cut a boat shape out of the balsa wood, making a triangle bow at one end. Hammer two large nails in each end about one inch in from each end. The nails will help to stabilize.





**4** Mount the two candles about 1-1/2 inches from each end of the wood. Use loops of masking tape to stick the metal cups to the wood.

**5** Take the tube with the wire and mount the tube so the wire will hold the tube just above the candles. Wrap the ends of the wire around and under the board and twist the ends neatly on the underside. (See picture.)

**6** Carefully remove the cork from the tube and fill the tube about three-quarters full with very hot water. Tightly replace the cork. Make sure water will drip out the hole in the tube.

**7** Fill up a bath tub or a large sink with water.

**8** Put your boat in the water and ask an adult to carefully light the candles.

## What you'll discover!

The heat of the candle will cause the water in the tube to boil. The water will change to steam and the steam will escape out the hole in the cork pushing the boat forward in the water.

Here are some questions to think about:

1. Why use hot water in the tube?
2. What would happen if you used cold water?
3. What would happen if you didn't put a hole in the cork (**DON'T TRY THIS!**)?
4. What would happen if the hole in the cork were larger?

### What's Happening

There are two different things to learn here.

A rocket works the same way. Hot gases and fire come out of the motor of a rocket. The gases coming out the nozzle at the bottom of the rocket come out in one direction. These escaping gases push the rocket in the opposite direction.

Second, energy from the candles changes the water into a gas (water vapor or steam). The steam can escape. Steam is used in a lot of energy power plants.

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## SCIENCE PROJECTS

### Make a Candle Spinner

Learn to make an energy machine with birthday candles and popsicle sticks.

This science project is courtesy of Tech TV's ([www.techtev.com](http://www.techtev.com)) Jeremy Edy, who demonstrated the Candle Spinner on the July 10, 2001, episode of "The Screen Savers." The project demonstrates the conversion of potential energy to kinetic energy using empty film canisters and birthday candles.

#### What do you need?

1. Plywood scrap, approx. 8x8 inches
2. Wood dowel, 1/4-inch diameter
3. Sewing Needle
4. Four Popsicle sticks, plus extras as needed
5. Two film canisters, plus extras as needed
6. Hot glue gun, or other glue source
7. Modeling clay
8. One pack of 24 birthday candles
9. Scissors
10. Cigarette lighter or matches **(Ask an adult for help. Do not use a lighter or matches on your own!)**

#### What to do?

- 1** Drill a hole in the center of the plywood scrap so that the dowel will fit snugly and stand upright.
- 2** Drill a small hole vertically into the top end of the dowel 3/4-inch deep.
- 3** Set the needle standing upright into this hole.
- 4** To make the propeller, glue four Popsicle sticks at their centers to make an eight-pointed star.

**5** Cut each of the two film canisters into four pieces by making vertical cuts in the curved canister wall every 90 degrees. Complete the cuts along the bottom of each canister, leaving a pie-shaped wedge of plastic (on the bottom of the canister) attached to each curved segment.

**6** Cut the small plastic lip (where the top of the canister normally fits) off of each canister piece.

**7** Glue one canister piece to each of the eight points of your Popsicle star. Each canister piece should overlap with about one inch of the Popsicle stick, with the edge of the curved canister wall flush with the edge of the Popsicle stick. Make sure each canister piece is oriented in the same direction, and that the pie-shaped wedges are all facing outward.

**8** Using a countersink drill bit if you have one (or the head of a large nail, if you don't), make an indentation on the undersurface of your propeller where all the Popsicle sticks intersect.

**9** Balance the propeller on the needle of the stand so that the indentation in the Popsicle stick rests on the needle point. Press small balls of modeling clay onto the pie-wedge points of each canister piece until the propeller balances on the needle without assistance.

**10** Roll the remaining modeling clay into a long, thin cylinder about one inch in diameter and about 15 inches long.

**11** Curve this piece of clay into a ring around the base of the dowel. Note: You may need to experiment with the length of the dowel. Try different heights of the spinner above the candle flames.

**12** Press the birthday candles vertically into the ring of modeling clay. Start with four or six candles and increase the number until the spinner is moving. Too many candles may make too much heat

and start melting the plastic canisters.

**13** Light the candles, and watch the propeller spin!

## What you'll discover!

### How Does the Candle Spinner Work?

Like all other substances around us, candles are made of molecules. The molecules that make up the wax in candles are large and store a lot of energy in the bonds between their atoms. When you light a candle, oxygen from the air is combined with the wax in the presence of heat, and these large molecules are broken down into smaller ones, mostly water vapor and carbon dioxide gas.

The energy that was stored in the bonds of the wax molecules is released in the form of light and heat. This heat energy causes the molecules in the air above the candles to move faster.

As the molecules speed up, they bump against each other with greater force and spread out, causing this heated air to be less dense than the cooler air outside the candle ring. The cooler, denser air pushes on the hot, low-density air, causing it to rise up through the propeller. This rising air strikes the blades of the propeller, which, due to their shape, shunt the air off to one side and are in turn pushed the opposite direction by the air. Because the needle point generates almost zero friction with the Popsicle stick, the propeller starts to rotate, and some of the potential energy stored in wax molecules is converted to the rotational motion of the propeller.

This spinner is similar to the Advent "angel carousels" seen during Christmas time. You may also want to substitute a plastic pin wheel, just don't get too close to the candle flame.

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## SCIENCE PROJECTS

### Greenhouse Effect

#### Recreating the Greenhouse Effect.

The Earth's climate has changed many times in the past. Subtropical forests have spread from the south into more temperate (or milder, cooler climates) areas. Millions of years later, ice sheets spread from the north covering much of the northern United States, Europe and Asia with great glaciers. Today, some scientists believe human beings are changing the climate. How can that be?

Over the past few centuries, people have been burning more amounts of fuels such as wood, coal, oil, natural gas and gasoline. The gases formed by the burning, such as carbon dioxide, are building up in the atmosphere. They act like greenhouse glass. The result some experts believe is the Earth heating up and undergoing **global warming**. How can you show the **greenhouse effect**?

#### What do you need?

1. Two identical glass jars
2. 4 cups cold water
3. 10 ice cubes
4. One clear plastic bag
5. Thermometer

#### What to do?

- 1** Take two identical glass jars each containing 2 cups of cold water.
- 2** Add 5 ice cubes to each jar.
- 3** Wrap one in a plastic bag (this is the greenhouse glass).
- 4** Leave both jars in the sun for one hour.
- 5** Measure the temperature of the water in each jar.

## What you'll discover!

In bright sunshine, the air inside a greenhouse becomes warm. The greenhouse glass lets in the sun's light energy and some of its heat energy. This heat builds up inside the greenhouse. You just showed a small **greenhouse effect**. What could happen if this **greenhouse effect** changed the Earth's climate?

Another version of a greenhouse is what happens inside an automobile parked in the sun. The sun's light and heat gets into the vehicle and is trapped inside, like the plastic bag around the jar. The temperature inside a car can get over 120 degrees Fahrenheit (49 degrees Celsius).

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## SCIENCE PROJECTS

### Make a Thermometer

Watch how a simple thermometer works.

A thermometer is an instrument that measures the temperature. Temperature is measured in a scale called Fahrenheit (by most people in the United States) and in Celsius or Centigrade (used by scientists and by people in many other countries). The point where water freezes is 32 degrees Fahrenheit (F for short) and 0 degrees Celsius (C). The point where water boils is 212 degrees F and 100 degrees C. If you want to know how to convert from F to C or from C to F, [see the end of this page](#).

Some scientific thermometers use the Kelvin scale, where 0 degrees Kelvin is called **absolute zero** -- a place where there is no movement of any parts of matter, where substances have no thermal energy. It's about minus 273.15 degrees C (below 0° C) or 459.67 degrees below 0° F. Scientists have never been able to measure anything at absolute zero, though they have gotten very close.

Thermometers help us know what the weather will be like. If it will be 90°F outside, we're not going to put on a winter coat. Or if it's below zero, we won't be wearing shorts. Here's a way to show how a simple thermometer works.

### What do you need?

1. Tap water
2. Rubbing alcohol (**do not drink this**)
3. Clear, narrow-necked plastic bottle (11-ounce water bottles work well)
4. Food coloring
5. Clear plastic drinking straw
6. Modeling clay

### What to do?

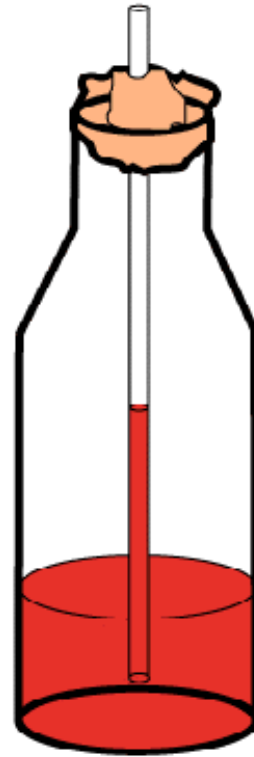
**1** Pour equal parts of tap water and rubbing alcohol into the bottle, filling about 1/8 to a 1/4 of the bottle.

**2** Add a couple of drops of food coloring and mix.

**3** Put the straw in the bottle, but don't let the straw touch the bottom (**DO NOT DRINK THE MIXTURE**).

**4** Use the modeling clay to seal the neck of the bottle, so the straw stays in place.

**5** Now hold your hands on the bottle and watch what happens to the mixture in the bottle.



## What you'll discover!

Congratulations!!! You just made a thermometer. Just like any thermometer, the mixture expanded when it was warmed. This made the liquid no longer fit in the bottom of the bottle. As the alcohol expanded the colored mixture moved up through the straw. If the bottle were to get very hot, the liquid would have come through the top of the straw.

You can watch your thermometer and see how the liquid changes throughout the day.

What happens if your thermometer is in shadow or in sunlight?

What happens when it gets colder?

How does wind affect the thermometer?

Of course, in order to accurately read the temperature, you will need to buy a real thermometer that is carefully calibrated for temperature changes. This one is to see how a thermometer works -- just for fun.

After you're done with your thermometer, dispose of the liquid properly and rinse the bottle well. Cut it in half, or have a parent cut it in half, so the bottle can't be reused. Then recycle the plastic. The used bottle could have some left over alcohol in it, and you don't want anyone to reuse the bottle for drinking water. So, it's best to recycle the bottle.

### Changing Temperature Scales

The Fahrenheit scale was named after Gabriel D. Fahrenheit who lived from 1686 to 1736. He devised a way of measuring temperature. The Celsius scale was named after Anders Celsius, its inventor, who lived from 1701-1744. The Celsius scale is also called Centigrade. The **Centi** in centigrade means 1/100 (one one-hundredth) for the 100 equal divisions on the scale and is

used by scientists. It is the temperature scale used by most of the world. The difference between the temperature where water freezes and boils is an even number of degrees...100. In the Fahrenheit scale, the difference between freezing (32° F) and boiling (212° F) is 180.

You can **change the temperature in Fahrenheit into Celsius** using math.

**Take your number; subtract 32° from it; and divide the remainder by 1.8.**

Example

Change 75 degrees Fahrenheit into Celsius.

$$75 - 32 = 43$$

$$43 / 1.8 = \mathbf{23.88^\circ C}$$

So, 75° F is equal to 23.88° C

To **change the temperature in Celsius to Fahrenheit** using math.

**Multiply your number by 1.8 and add 32°**

Example

Change 12 degrees Celsius into Fahrenheit.

$$12 \times 1.8 = 21.6$$

$$21.6 + 32 = \mathbf{53.6^\circ F}$$

So, 12° C is equal to 53.6° F

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DETECTING FLASH PLUGIN ...

# Experimental Science Projects: An Introductory Level Guide



This introductory level guide presents basic information for doing a science project. For a more detailed treatment see [Experimental Science Projects: An Intermediate Level Guide](#).

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The following material assumes you are doing an experimental science project, and not a written report to present information on a science subject. As you read the various steps, you may want to follow along with an [example science project](#).

## ■ INITIAL OBSERVATION

You notice something, and wonder why it happens. You see something and wonder what causes it. You want to know how or why something works. You ask questions about what you have observed. The first step is to write down what you have noticed.

## ■ INFORMATION GATHERING

Find out about what you want to investigate. Read books, magazines or ask professionals who might know in order to learn about the effect or area of study. Keep track of where you got your information.

## ■ TITLE THE PROJECT

Choose a title that describes the effect or thing you are investigating. The title should summarize what the investigation will deal with.

## ■ STATE THE PURPOSE OF THE PROJECT

What do you want to find out? Write a statement that describes what you want to do. Use your observations and questions to write the statement.

## ■ MAKE HYPOTHESIS

Make a list of answers to the questions you have. This can be a list of statements describing how or why you think the observed things work. *Hypothesis must be stated in a way that can be tested by an experiment.*

## ■ DESIGN AN EXPERIMENTAL PROCEDURE TO TEST YOUR HYPOTHESIS

Design an experiment to test each hypothesis. Make a step-by-step list of what you will do to answer your questions. This list is called an experimental procedure.

### ● Guidelines for Experimental Procedures

- Select only one thing to change in each experiment. Things that can be changed are called variables.
- Change something that will help you test your hypothesis.
- The procedure must tell how you will change this one thing.
- The procedure must explain how you will measure the amount of change.
- Each type of experiment needs a "control" for comparison so that you can see what the change actually did.

## ■ OBTAIN MATERIALS AND EQUIPMENT

Make a list of the things you need to do the experiments, and prepare them. If you need special equipment, a local college or business may be able to loan it to you. Another source of science materials are mail order supply houses such as Edmund Scientific in Barrington, New Jersey (phone 1-609-457-

8880 for a catalog). Professional science supply houses are located in larger cities. They will have just about anything you will need.

## ■ DO THE EXPERIMENT AND RECORD DATA

Do the experiment and record all numerical measurements made. Data can be amounts of chemicals used, how long something is, the time something took, etc. If you are not making any measurements, you probably are not doing an experimental science project.

## ■ RECORD YOUR OBSERVATIONS

Observations can be written descriptions of what you noticed during an experiment, or problems encountered. Keep careful notes of everything you do, and everything that happens. Observations are valuable when drawing conclusions, and useful for locating experimental errors .

## ■ CALCULATIONS

Perform any math needed to turn raw data recorded during experiments into numbers you will need to make tables, graphs or draw conclusions.

## ■ SUMMARIZE RESULTS

Summarize what happened. This could be in the form of a table of numerical data or graphs. It could also be a written statement of what occurred during the experiments.

## ■ DRAW CONCLUSIONS

Using the trends in your experimental data and your experimental observations, try to answer your original questions. Is your hypothesis correct? Now is the time to pull together what happened, and assess the experiments you did.

## ● Other Things You Can Mention in the Conclusion

- If your hypothesis is not correct, what could be the answer to your question?
- Summarize any difficulties or problems you had doing the experiment.
- Do you need to change the procedure and repeat your experiment?
- What would you do different next time?
- List other things you learned.

## ● TRY TO ANSWER RELATED QUESTIONS

What you have learned may allow you to answer other questions. Many questions are related. Several new questions may have occurred to you while doing experiments. You may now be able to understand or verify things that you discovered when gathering information for the project. Questions lead to more questions, which lead to additional hypothesis that can be tested.

## ● WHAT IF MY SCIENCE PROJECT DOESN'T WORK?

No matter what happens, you will learn something. Science is not only about getting "the answer." Knowing that something didn't work, is actually knowing quite a lot. Experiments that don't turn out as planned are an important step in finding an answer.



[Experimental Science Project: An Intermediate Level Guide](#)



[Example Science Project](#)

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# FOR KIDS ONLY

Earth Science Enterprise



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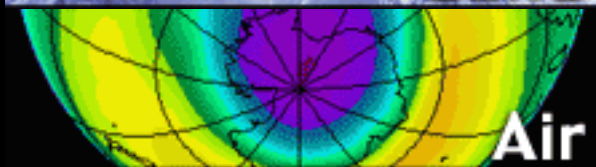
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## IPL: Science Fair Project Resource Guide

Are you looking for some help with a science fair project? If so, then you have come to the right place. The IPL will guide you to a variety of web site resources, leading you through the necessary steps to successfully complete a science experiment. If you have never done a science fair project before, it has been a while, or you just want to be sure you do a really great job be sure and look at the following websites for tips on **what makes a good project** before doing anything else. This way you will know ahead of time what will be expected of you.

1. Understanding the **Scientific Method**. It is important to understand the scientific method before beginning a project.
2. **Choosing a topic** is the next step. Here you will find a variety of websites some of which ask questions to give you ideas for your project. Others describe the projects step by step.
3. Now, with a subject in mind, you are ready to go forward. Along the way you might need some additional help so check out links to **resources** or **ask an expert** for help.
4. After you have found the answers to your scientific question, you are now prepared to build your project and make your presentation with knowledge and confidence. Check out the **tips and tricks** for writing your paper, making your display, and preparing for your presentation.

**NOTE** to teachers and mentors

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**From Start to Finish:  
 Taking you through all the steps**

### **Cyber Fair: Steps to Prepare a Science Fair Project**

<http://www.isd77.k12.mn.us/resources/cf/steps.html>

This site has one-sentence explanations of each part of a science fair. One of the steps described is presenting your project to judges. This may or may not be a part of your science fair. The site also has an explanation of what makes a good project and an explanation of how to come up with your own science fair project.

### **Discovery Channel School: Science Fair Central**

<http://school.discovery.com/sciencefaircentral/>

"Creative investigations into the real world." This site provides a complete guide to science fair projects. Check out the 'Handbook' which features information from Janice VanCleave, a popular author who provides everything you need to know for success. You can even send her a question about your project.

### **Experimental Science Projects: An Introductory Level Guide**

<http://www.isd77.k12.mn.us/resources/cf/SciProjIntro.html>

An excellent resource for students doing an experiment-based science fair project. There are links on this page to a more advanced guide and an example of an actual experiment-based project.

### **Gateway to Educational Materials: Science Fair Projects**

<http://members.ozemail.com.au/~macinnis/scifun/projects.htm>

The Gateway to Educational Materials extensive and detailed step-by-step guide to doing a science fair project.

### **Science Fair Primer**

<http://users.rcn.com/tedrowan/primer.html>

A site to help students get started and run a science fair project.

### **Science Fair Project on the Web: Step by step instructions**

<http://sciencefairproject.virtualave.net/observation.htm>

A detailed science fair help site. Step by step instructions on the science fair project. Categories include observation, question, hypothesis, method, result, conclusion, presentation.

### **Science Fair Project Guidebook**

[http://www.state.sc.us/energy/K-12/science\\_fair.htm](http://www.state.sc.us/energy/K-12/science_fair.htm)

The State of South Carolina publishes a K-12 science fair guidebook. It can be viewed using Adobe Acrobat Reader.

### **The Ultimate Science Fair Resource**

<http://www.scifair.org/>

A variety of resources and advice.

## **What Makes A Good Project**

### **What Makes A Good Science Fair Project**

[http://www.usc.edu/CSSF/Resources/Good\\_Project.html](http://www.usc.edu/CSSF/Resources/Good_Project.html)

A website from USC that gives a lot of good tips and ideas to think about regarding what makes a good science fair project. Advice for

students as well as teachers and parents is included.

**Mr. McLaren's Science Fair Survival Page**

[http://www.ri.net/schools/East\\_Greenwich/Cole/sciencefair.html](http://www.ri.net/schools/East_Greenwich/Cole/sciencefair.html)  
Tips from Archie R. Cole Junior High school on what makes a good project.

**Neuroscience for Kids: Successful Science Fair Projects**

<http://faculty.washington.edu/chudler/fair.html>  
Site made by Lynne Bleeker a former science teacher, science fair organizer, and judge. Gives a thorough and detailed description of the steps to a successful science fair project.

This resource originally created by Marie Wolffe. Updated and modified by  
Deborah Dunk.

# MadSci Net: Science Fair

**Note:** If you're looking for places from which to buy supplies and reagents, try the [reagents](#) page.

## **Ideas for Science Fair Projects:**

- Have you tried the [MadSci Search Engine](#)? Who knows.. someone else may have asked about a similar project in the past.
- [School Science Fairs Homepage](#): Everything you ever wanted to know about science fairs, age-specific ideas for projects, as well as how to put one together.
- [Science Fair Idea Exchange](#): Submit your ideas for science fair projects, or read through what others have submitted..
- [The Society for Amateur Scientists](#): resources and information on many topics, including science fairs.
- [IPL Science Fair Project Resource Guide](#): At the Internet Public Library
- [Ideas for Science Fair Projects](#)
- On [USENET](#), try the group [alt.sci.amateur](#).

## **How to set-up and organize a science fair project:**

- [Steps towards creating science fair projects](#)

## **SciFair Listings:**

- [Yahoo's listing of science fairs](#)
- [The WWW Virtual Library of Science Fairs](#)

## **Global Science Projects**

Many Internet projects have arisen whereby K-12 students can collect and submit data for projects at research institutions. Try your hand at science in the field!

- [Online Listing of Collaborative Internet Projects](#): Science and non-science projects..
- [Sharing NASA](#): Collaborative endeavors pairing students with ongoing NASA projects.

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[MadSci Library \(frameless version\)](#). | [MadSci Home Page](#)

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'Gorgonzola has forgotten the trephines again!'



by kids, for kids!

**ACTIVITIES FROM THE SHOW**

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Mix hot science with your cool ideas!

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**Z** = activities that help the environment



**TODAY ON ZOOM**

What's on?

Select your PBS Station

**Chemistry: Mix It Up**

- |   |  |
|---|--|
| <a href="#">Baking Soda Bubbles</a>     | <a href="#">Plastic Milk</a>                         |
| <a href="#">Butter</a>                  | <a href="#">Polishing Pennies</a>                    |
| <a href="#">Cabbage Juice Indicator</a> | <a href="#">Recycling Paper</a> <small>NEW!</small>  |
| <a href="#">Cauldron Bubbles</a>        | <a href="#">Saltwater Tester</a> <small>NEW!</small> |
| <a href="#">Color Splash</a>            | <a href="#">Yeast</a>                                |
| <a href="#">Fatty Foods</a>             | <a href="#">Yeast, Part II</a>                       |
| <a href="#">Glue</a>                    |  |

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**Engineering: Design It**

- |   |  |
|---|--|
| <a href="#">Balloon Brain</a>                         | <a href="#">Keep-a-Cube</a>                              |
| <a href="#">Balls and Ramp</a>                        | <a href="#">Marble Maze</a>                              |
| <a href="#">Bubble-Blowing Machine</a>                | <a href="#">Mechanical Grabber</a> <small>NEW!</small>   |
| <a href="#">Build a Tent</a> <small>NEW!</small>      | <a href="#">Pencil Balance</a>                           |
| <a href="#">Bungee Jump</a>                           | <a href="#">Puff-mobile</a>                              |
| <a href="#">Coin Sorter</a>                           | <a href="#">Puff-mobile II</a>                           |
| <a href="#">Deliver a Message</a> <small>NEW!</small> | <a href="#">Roller Coaster</a>                           |
| <a href="#">Door Alarm</a>                            | <a href="#">Rube Goldberg™</a>                           |
| <a href="#">Door Opener</a>                           | <a href="#">Invention</a>                                |
| <a href="#">Egg Boat</a>                              | <a href="#">Rube Goldberg™</a>                           |
| <a href="#">Egg Drop</a>                              | <a href="#">Invention II</a>                             |
| <a href="#">Electrical Messages</a>                   | <a href="#">Secret Candy Safe</a>                        |
| <a href="#">FIRST LEGO® League</a>                    | <a href="#">Seismometer</a>                              |
| <a href="#">Flashlight</a> <small>NEW!</small>        | <a href="#">Sneaker Launcher</a> <small>NEW!</small>     |
| <a href="#">Flinker</a>                               | <a href="#">Solar Cookers</a>                            |
| <a href="#">Flinker II</a>                            | <a href="#">Steady Tray</a> <small>NEW!</small>          |
| <a href="#">Food Elevator</a> <small>NEW!</small>     | <a href="#">Stick-o-Meter</a>                            |
| <a href="#">Future City</a>                           | <a href="#">Survival Raft</a> <small>NEW!</small>        |
| <a href="#">Game Timer</a>                            | <a href="#">Tennis Ball Lift</a>                         |
| <a href="#">Heat Saving Device</a>                    | <a href="#">Water Filter</a>                             |
| <a href="#">Hovercraft</a>                            | <a href="#">Water Filter Part II</a> <small>NEW!</small> |

**DAILY HIGHLIGHT**

[Rube Goldberg™ Invention II](#)

Complicated contraptions! Pour milk into a glass!

[You Can't Get There  
from Here](#)  
[ZOOM Egg Vehicle](#)

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### The Five Senses: Sense It

[Arrows Optical Illusion](#)  
[Blind Spot](#)  
[Clapping? Where?](#)  
[Penny Cup Game](#)  
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[Phenakistoscope](#)  
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[Cotton Ball Catapult](#)  
[Daredevil Ball Jump](#)  
[Daredevil Ball Jump II](#)  
[Delta Wing Flyer](#)  
[Electric Gelatin](#)  
[Electroscope](#)  
[Film Canister Rocket](#)  
[Funnel Lift](#)  
[Glider](#)  
[Hot Air Balloon](#)  
[Lemon Battery](#)

[Lemon Battery II](#)  
[Lemon Juice Rockets](#)  
[Lemon Juice Rockets II](#)  
[Measuring Boat Speed](#)  
NEW!  
[Moving Cans](#)  
[Paper Clip and Keys](#)  
[Pendulum Challenge](#)  
[Pet Can](#)  
[Snap, Crackle, Jump](#)  
[Soda Bottle Boat](#)  
[Spool Racer](#)  
[Static Electricity](#)  
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[Doorman's Code](#)

[Fingerprints](#) NEW!

[Guess My Rule](#)

[Mirror Messages](#) NEW!

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[Scytale Messages](#) NEW!

[Shower Estimation](#) NEW!

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[Crazy Straw Bridge](#)

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[Financial Support](#)

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[Gumdrop Dome](#)

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[Paper Cup Walk](#)

[Paper Cup Walk II](#)

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[Drops on Pennies II](#)

[Floating Paper Clips](#)

[Make An Egg Float](#)

[Pennies And Water](#)

[Soap-Powered Boat II](#)

[Solar Still](#) NEW!

[Thermometer](#)

[Water Density](#)

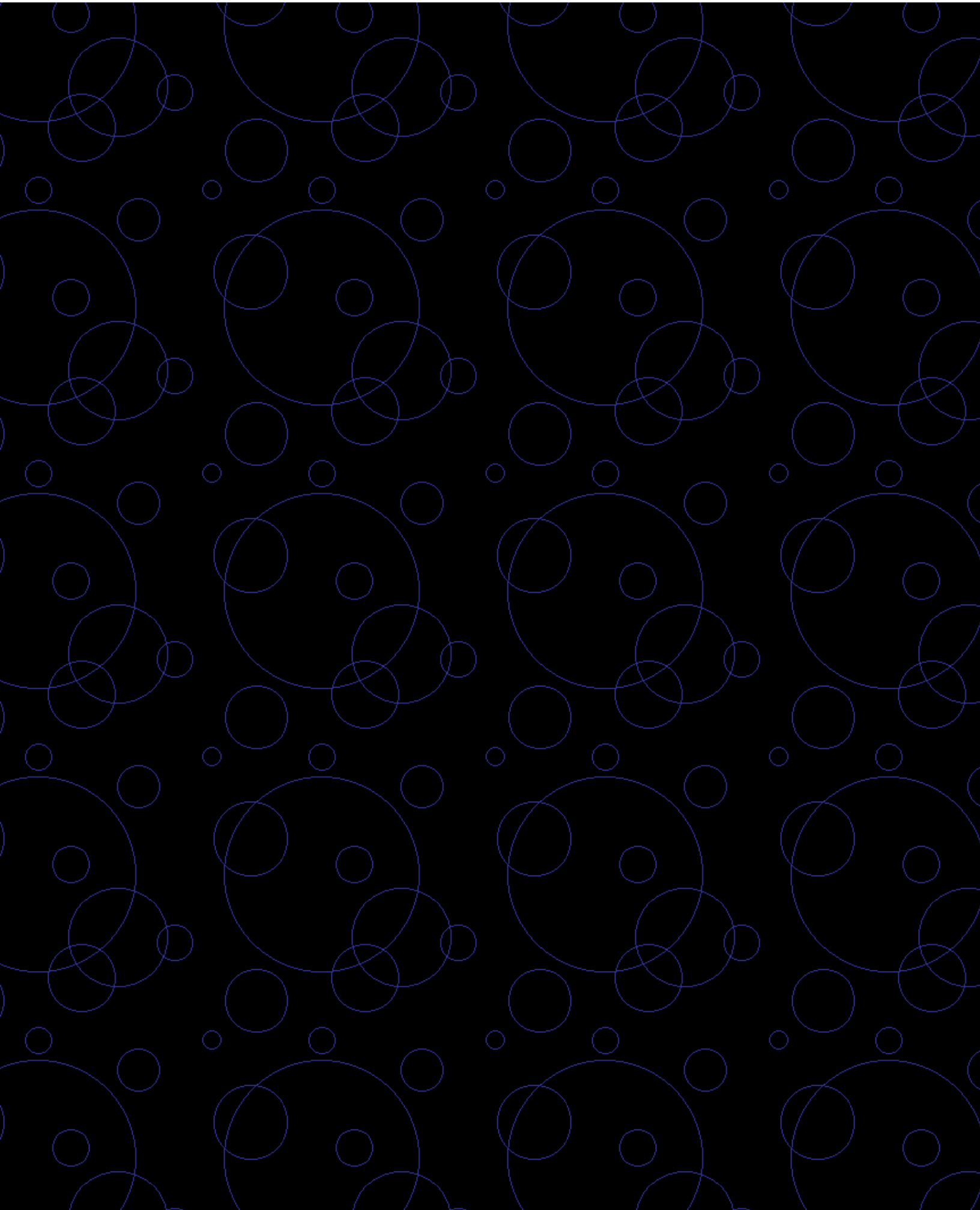
[Water on a String](#)

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## SCIENCE PROJECTS

### Make a Turbine

For every action there is an equal and opposite reaction!

#### What do you need?

1. A quart or half gallon milk carton
2. String
3. A nail
4. Water in another larger container
5. Masking tape

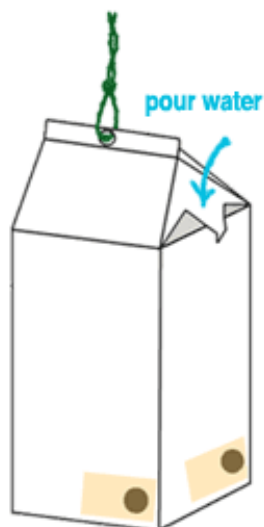
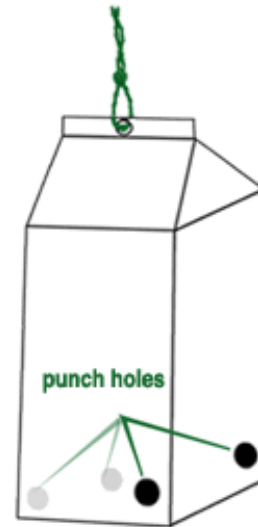
#### What to do?

**1** Using the nail, punch a hole in the bottom right corner of each side of the milk carton.

Punch another hole exactly in the middle of the top section of the carton

**2** Push the string through the top hole of the carton and tie securely so the carton will hang from the string.

Tape up each hole with masking tape.



**3** Go outside and hang the carton from a low tree branch or another place when the carton can hang freely and you won't mind if the ground gets wet underneath.

Fill the carton with water.

**4** Pull off the tape on one corner. Watch what happens.

Pull off the tape on two corners opposite each other. Watch what happens.

Pull off the tape on all corners and watch what

happens.

## What you'll discover!

Sir Issac Newton discovered the principle that for every action there is an equal and opposite reaction. This is called his Third Law. The water pours out of the small hole and its force pushes the carton in the opposite direction. This is what makes it turn. The more holes there are, the faster the carton turns.

This is similar to some turbines. Some turbines use water or steam that is forced a high speed through many small holes to turn a turbine around. The turbine is connected by a shaft to an electrical generator, which makes electricity when it is turned.

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## SCIENCE PROJECTS

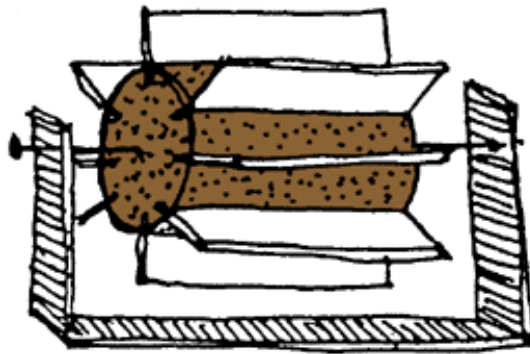
### Hydro-Power

#### Experiment with Water to Produce Energy

Water is a renewable resource that is an important source of electricity in California and the Northwest. The potential energy of water is harnessed to produce mechanical energy which can be used directly, or used to generate electricity.

### Moving Water -- Moving Blades

You can make a small water turbine model by taping cardboard strips on a cork. Put pins in the ends for axles and make a U-shaped holder for it. You can also slip metal or plastic fins into the slits made in the cork. This will turn as fast as the water stream is moving, so generally turbines have high speed jets directed toward them.

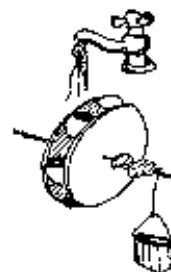


### An Overshot Waterwheel

This model is like the old waterwheels used for grinding grain or running machines. Great power and slow speed were needed to turn the heavy grinding stones at an even speed.

This device could use a relatively small stream. It is the weight of the water in the buckets that causes the wheel to overbalance and turn. You can equip your wheel with a string and bucket and find out how much weight the mechanism can lift.

STAPLE EGG CUPS TO DISKS



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## SCIENCE PROJECTS

# Nuclear Chain Reaction!

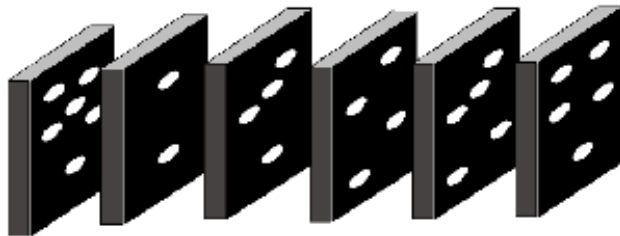
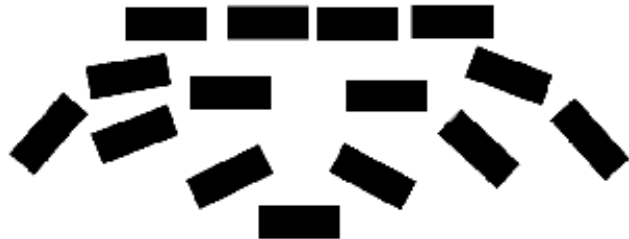
Demonstrate chain reaction!

## What do you need?

1. Bunch of dominos
2. Ruler
3. Flat table that doesn't shake

## What to do?

- 1 Arrange the dominos in the pattern shown.
- 2 On another section of the table, arrange two straight lines of dominos.
- 3 Knock over the single domino in front on the first pattern. Watch what happens.



- 4 Now, knock over the first domino in one of the two straight lines.

- 5 Take the ruler and hold it anywhere between the dominos lined up in the second straight line. Knock over the first domino and watch what happens. Not all the dominos fell over.

## What you'll discover!

In a nuclear fission reaction in a nuclear power plant, the radioactive element Uranium-235 is used in a chain reaction.

The fission of U-235 splits off two neutrons, which in turn strike two U-235 atoms.

Two neutrons are split from each of the two U-235 atoms. Each of these neutrons then go on to strike another U-235 atom. Each of those atoms are split releasing two neutrons, which go on and hit more Uranium atoms.

The chain reaction continues on and on, getting bigger and bigger with each split.

The things that slow down a chain reaction are the control rods. A control rod is made up of cadmium or boron, which absorb neutrons. If you insert the control rod between the uranium atoms, the amount of neutrons available to cause more splits is reduced.

In the second line up of dominos, the ruler served as a control rod. Putting it between two dominos breaks the chain reaction similar to what happens in a nuclear reactor.

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## SCIENCE PROJECTS

# Plants Help Keep a House Cool!

Using shade trees to keep your home cool.

## What do you need?

1. Two shoe boxes or small cardboard boxes
2. A reflector lamp with a one-hundred watt incandescent light bulb in it (you can also use the sun instead of a lamp)
3. Various types of plants in pots — small bonsai trees would work OK if you have one -- ask your folks first before using any of their plants.
4. Two good thermometers to measure air temperature. If you have a digital thermometer that measures inside temperature with an external sensor to measure outside temperature, that would work great!
5. Small can of black or dark-color paint and small can of white paint

## What to do?

This experiment is done in three steps. First you'll want to see if shading your "house" will keep it cooler. Then you'll want to see if painting the "house" different colors outside affects the temperature inside. Third you can combine the colored houses with or without shading.

### Step 1

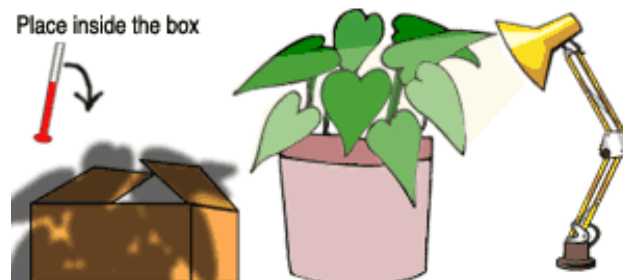
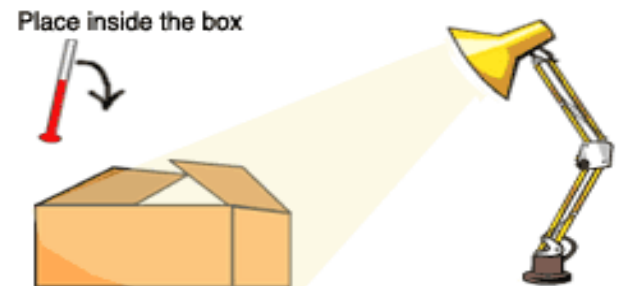
**1** Take both boxes and place them an equal distance from the lamp so that both of them get the same amount of light hitting them.

**2** Put the thermometers inside the boxes.

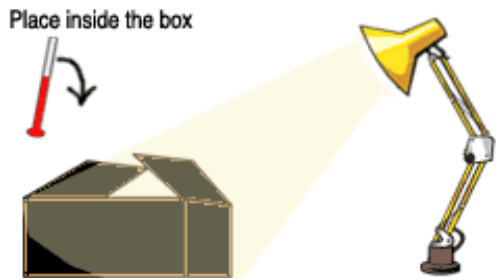
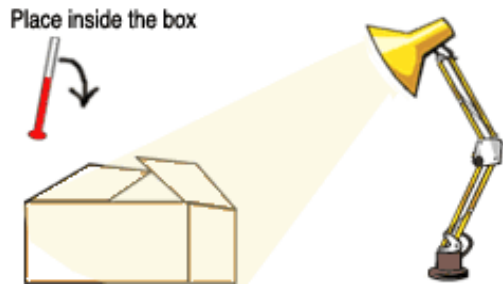
**3** Place plants between the lamp and one of the boxes so that the shadows cast by the plants cover most of the entire "house."

**4** Turn on the lamp.

**5** Measure the air temperature in each over a period of time. Which box has a higher temperature? Does the temperature change? Subtract or add plants...do the number of plants change the temperature



of the shaded "house?"

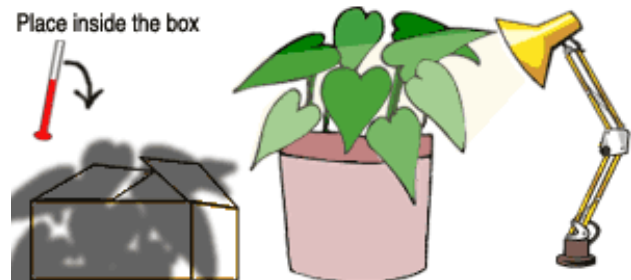


Step 2

- 1 Paint one of the boxes white and the other box black
- 2 Put both boxes and place them an equal distance from the lamp so that both of them get the same amount of light hitting them.
- 3 Put the thermometers inside the boxes.
- 4 Turn on the lamp.
- 5 Measure the air temperature in each over a period of time. Which box has a higher temperature? Does the temperature change?

Step 3


- 1 Place plants between the lamp and one of the boxes so that the shadows cast by the plants cover most of the entire "house."
- 2 Turn on the lamp.
- 3 Measure the air temperature in each over a period of time. Which box has a higher temperature? Does the temperature change? Subtract or add plants or change the house they are in front of. Which house stays the coolest?



## What you'll discover!

Plants can act as shades to block sunlight and help us keep our homes cooler. In the summer time a tree with leaves will shade the home, decreasing the amount of sunlight striking the house, keeping it cooler. In the winter, when a tree drops it's leaves, the sunlight is allowed to hit the home to assist in keeping it warm.

The color your home (and especially the roof) is painted can have an impact on heating and cooling it. Light colors will reflect the sunlight. Dark colors will absorb more sunlight. So, if you paint a house light colors or have a light-colored roof, the house will stay cooler in the summer.



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## SCIENCE PROJECTS

# Heat Produced from Light Bulbs

Increase the wattage, increase the heat.

### What do you need?

1. A goose-neck style lamp.
2. An extension cord.
3. Different wattage of incandescent light bulbs - 25 watt, 40 watt, 60 watt, 75 watt, 100 watt, 150 watt.
4. Compact Fluorescent light bulbs - 7 watt, 23 watt - They are expensive; so shop around for ones that don't cost so much.
5. Thermometer.
6. A ruler or yard stick to measure distance from the thermometer to the light bulb.
7. A white towel.
8. A watch or stop watch to measure the time.
9. A piece of paper and pencil to record your observations.

### What to do?

**1**

Put the towel on a flat table.

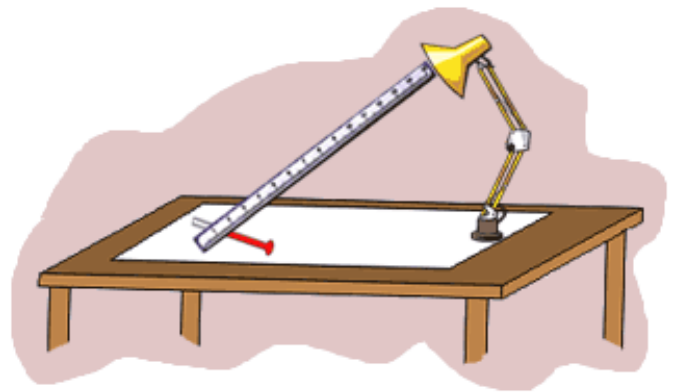
Put the goose neck lamp on the end of the towel on the table

**2**

Put the thermometer under the light of the lamp and measure the distance from the bulb.

**3**

Make sure the lamp is unplugged and screw in the smallest wattage light bulb



**4**

5. Measure the temperature and write down the start temperature

**5**

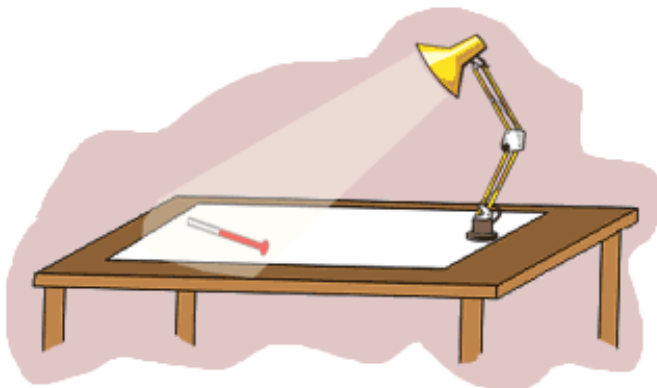
Angle lamp over thermometer and turn on lamp.

**6**

Leave lamp shining on the thermometer for at least five minutes

**7**

Start watch and at the end of five minutes read the temperature and mark down what the final temperature is.



**Repeat the steps above with each different light bulb.**

- Allow the lamp and desk to cool for half an hour between each bulb.
- Do not unscrew the light bulb right after turning off the lamp as the bulb may be hot and can burn you.
- Unplug the lamp before changing the bulb.
- Make sure the distance between the thermometer and the light bulb is the same for each different bulb. The thermometer should be in the same spot.
- The starting temperature for thermometer should be about the same for each light bulb.

## **What you'll discover!**

Incandescent lights give off heat as well as light energy. The higher the wattage of the light bulb the higher the temperature. A compact fluorescent bulb gives off very little heat energy because they do not use resistance and cause a light to glow hot.

In a home or office, lots of incandescent lights means that the air conditioner would have to use more energy during the summer to remove the extra heat given off by lights. Also, some lights such as torchieres, can be very dangerous as the bulbs are rated at 300 watts or more and get VERY hot. They can catch drapes or other materials on fire if you're not careful.

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## SCIENCE PROJECTS

### Insulation

What materials make the best insulation?

#### What do you need?

1. Down jacket
2. Gloves/mittens
3. Cotton sock
4. Wool sock
5. Other types of cloth or clothing
6. Plastic foam
7. Dirt
8. Large piece of paper
9. Aluminum foil
10. Leaves
11. Fiberglass insulation material (ask your parents if there is any extra around! Use gloves to handle so the fiberglass doesn't irritate your skin.)
12. Baby food jars with lids -- one for each of the different materials you'll be checking.
13. Large board to place all your items on -- a large tray will work too!
14. A gallon jug of water or hot water (don't scald yourself) from a sink.
15. A good thermometer
16. A note book and pencil

Do this experiment over a sink.

#### What to do?

- 1** On a page in the notebook, list all of the different items you'll be testing.
- 2** Quickly fill all the baby jars with hot water from the jug.
- 3** Measure the temperature of the water in each jar then screw on the lid. Record the temperature of each jar. They should all be the same temperature.

**4** Wrap or surround each of the jars in one of the materials. And place on the tray or board. Leave one jar uncovered as a "control."

**5** Carry the board outside where it's colder.

**6** After leaving the jars outside for a specific period of time, take off the materials, unscrew the lids and measure the temperature of the water in each jar. Write down the temperature in your notebook next to each item.

**7** Compare the differences between the temperatures of each of the jars. Which one(s) kept the water same temperature as before?

**8** Try the experiment again, but this time, leave the jars outside longer (one, two, three hours or more). What materials work better. Is there a point where none of the materials works to keep the jars hot?

## What you'll discover!

You'll learn that some materials make good insulators. These are the types of materials that we should use to keep a house warm in the winter and cool in the summer. This experiment should also can tell us what materials will keep our bodies warm in the winter -- for example would a jacket made of down be better than a jacket made from cotton? Or will wool socks keep your feet warmer than cotton socks in the winter? Should you switch in the summer because one type of material will help you stay cooler?

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## SCIENCE PROJECTS

### Meet the Sun

Use a sun puppet or sun mask (see below) for all of the following dialogue. Props -- one celery stick, tree branch, toy dinosaur, toy car.

**"Hello boys and girls. I'm the Sun. I don't want to brag, but I am a very important source of energy."**

***(Hold up celery)***

**"Plants don't eat like people do. Instead, they use sunlight for energy to grow and stay alive. If there were no plants, what would animals and people eat? You people certainly need me!"**

***(Hold up tree branch)***

**"As a tree grows it stores the sun's energy in its wood. When the wood is burned, it releases the sun's energy as heat and light."**

***(Hold up dinosaur)***

**"Long ago, when the dinosaurs were still alive, plants and animals used the sun's energy. When they died, the sun's energy was stored in them. Today some of these old dead plants and animals with the stored sun's energy have changed into coal, oil and natural gas."**

***(Hold up toy car)***

**"When we use gasoline in a car we are using very old sun's energy to make the car go!"**

**"By myself, I can keep you warm and give you light. I can be used to heat your home and heat your water. You must agree that I'm really quite wonderful!"**

### Make a Sun Mask

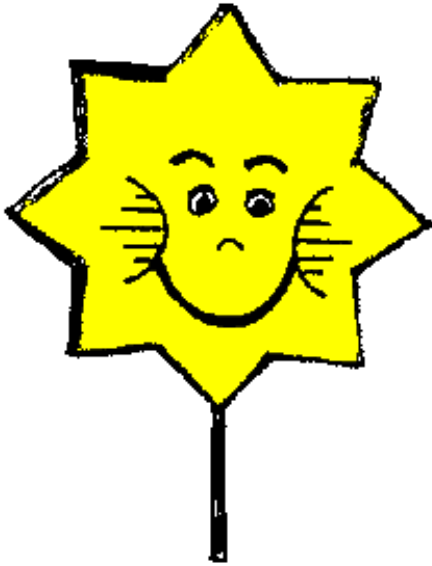
Glue two pieces of orange construction paper together. (This provides flexibility and strength.)

Cut out a sun with a center hole just big enough to fit around your face.

This mask should stay around your face without holding it.







## Make a Sun Puppet

Cut two identical sun shapes out of yellow construction paper.

Glue the two suns together leaving an unglued sleeve at the bottom that is large enough to insert half the length of a chopstick.

Color a sun face on one or both exposed sides. Store this puppet in a file folder and just insert a chopstick (pencil, ruler, etc.) when ready to use.

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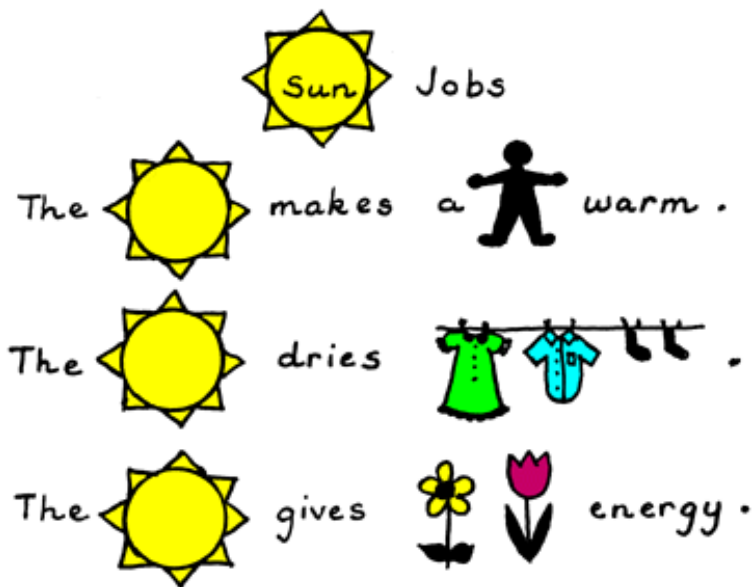
# SCIENCE PROJECTS

## Sun Jobs

What jobs does the sun do?

Make a sun jobs chart or book with students.

Below is a sample of how the chart may look with three examples.



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## SCIENCE PROJECTS

# Solar Hot Dog Cooker

Use the heat of the sun to cook.

**This project is for older students or for younger students with adult supervision.**

A reflective hot dog cooker can be built from a cardboard box, tin foil, and posterboard. Sunlight hits the reflective surface and focuses on the hot dog held in the center. Students can work in pairs or individually if there are enough materials.

## What do you need?

1. A cardboard box
2. tin foil
3. posterboard

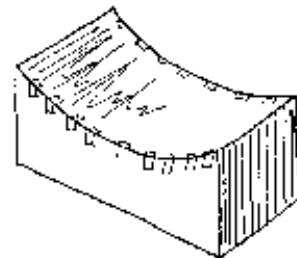
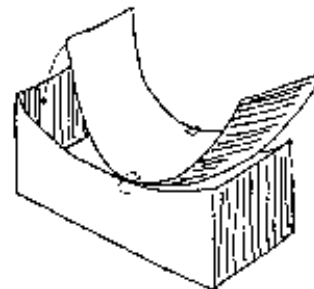
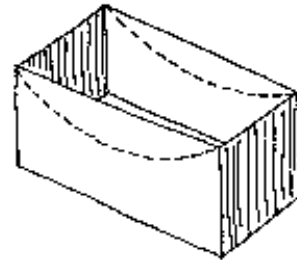
## What to do?

**1** Select a long narrow box; the longer the box the more heat collection is possible. Choose a focal length between 5" and 10" and design a parabolic curve as seen in the picture. One template could be used for all the cookers. Trace the curve on the open end of the box so that it is centered and straight.

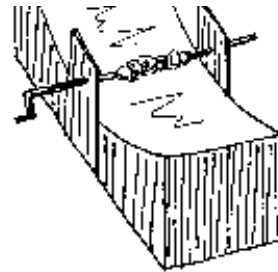
**2** Cut out the curve with a utility knife. Stress the importance of being exact. Measure and cut a piece of posterboard that will fit flush against the opening to the box. Attach this with tape beginning at the center and working toward to edges.

**3** Cover the curve with white glue and apply aluminum foil shiny side out. Start in the middle and smooth toward the edges. Try not to wrinkle or fold the foil; you want it as smooth as possible.

**4** Use two scraps of cardboard taped to each side as supports. Using the sun or a projector light, test the focal point. There should be a bright spot where light is concentrated; mark this spot and punch a hole for the skewer. Use a section of a coat hanger from which the paint has been removed for a skewer.



# 5 Enjoy your hot dog!



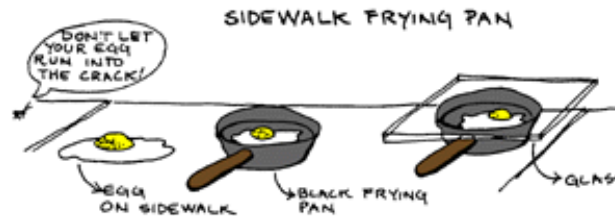
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## Hot Enough to Fry an Egg

You can also use the heat of the sun on a sidewalk or on black asphalt.

Take three eggs, two black/cast iron frying pans, and one piece of thick glass to cover one of the frying pans.

Put one egg directly on the sidewalk, one in the pan without the glass cover, and one in the pan with the cover. Which one do you think will fry the quickest. Make sure you clean up afterwards!



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# THE SCIENCE CLUB

## KIDS' SCIENCE PROJECTS

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Science Projects: **SIMPLE**, [medium](#), [advanced](#)

- [Simple Maglev Train](#)
- [Antibubbles!](#)
- [Quick and simple Telescope](#)
- [Acid/Base Goldenrod secret](#)
- [SEE magnetic fields](#): simple viewing bottle
- [Balloon demonstrations](#) from PIRA
- [Sticky Electrostatics](#)
- [Scroll Down!](#)

- [SCICLUB LINKS](#): Other sites with build-it projects
- [Comments from other experimenters!](#)
- [Science mail-order](#) and techno junk catalogs
- [Science Fair Ideas Exchange](#)
- [Great Books](#) and experiment/project sources
- [Powell's Books](#) for science experiments & projects
- [Amazon Books](#) for science experiments & projects
- [Book List](#) for kids' science experiments

[Turning demonstrations into science fair projects](#)

### [SCIENCE SUPPLIES](#)

and mail-order junk

[scroll down!](#)

## Medium-difficulty Science Projects

- [NEODYMIUM SUPERMAGNET](#) demonstration ideas
- [Ultra-simple Electric Generator](#)

- [Simple kid-lifting hovercraft](#)
- ["Antigravity" helium boulder](#)
- [Drawing holograms by hand!!!](#)
- [The DisgustoScope](#)
- Ridiculously Simple [Charge Detector](#)
- Making the [Lemon Battery](#) work
- [Smoke ring launchers](#)
- [Tornado Generator Box](#)
- [Gigantic low-cost solar furnace](#)
- [Explaining electricity](#) with colored plastic sheets.
- [Oilfilm colors](#)
- [TOUCH THE CLOUDS device](#)
- [ELECTROSTATIC MOTOR](#) made from plastic pop bottles.
- [ELECTROSTATIC GENERATOR](#), electrophorus, a simple one
- [ELECTROSTATIC GENERATOR](#), "Kelvin's thunderstorm"
- [Moving blobs lamp](#) ingredients
- [Thermal radiation demos](#)
- [Why is Science so difficult to learn?](#)
- [The secret to understanding Electricity](#)
  
- [Scroll Down!](#)

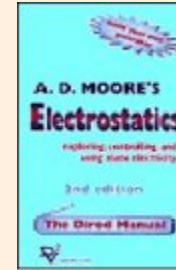
## Advanced Science Projects

- [MAGLEV](#), a non-cryo Meissner-like device
- [Plasma Globe](#) without vacuum pump or glass!
- [Demonstrations](#) performed w/[VanDeGraaff Gen.](#)
- [Electronics Hobbyist: interesting projects](#)
- [Electrostatic Loudspeaker](#)
- [Unwise microwave demos](#)
- [Human IR Vision](#)

Want books? Try searching [amazon.com](http://amazon.com):

See: [Science Projects & Experiment books](#)

- [Linear Motor](#) for your [Maglev Train](#)
- [Electrostatic generator](#), inline waterdropper
- [Threadlike electric wind](#)
- [Bouncing Pulse-wave](#) (Excel .xls)
- [Giant Rainbow Prism](#)
- [Antigravity Camera](#)
- [Pykrete](#) non-melting ice
- [Square Wheels](#)
- [e-field phosphor panel](#)
- [Tesla Page](#), plans, files, newsletters, etc.
- [ARRAY ELECTROMETER](#) Build this and SEE electrostatic fields!
- [VISIBLE CURRENT](#) Makes electricity visible in wires.
- [Incredibly easy way to make a 100-amp cable](#)
- [Change carbon to iron?!!!](#)
- [Interferometer: the Squealing Wall](#)
- [Vortex-blimp](#)
- [Electromagnetic Resonance](#), "energy-sucking"
- [Sound Sucker](#)
- [Raindrop diffraction](#)
- [Homopolar Electric Generators](#)
- [Hoaxes, Practical Jokes!](#)
  
- [Scroll Down!](#)



A great book:  
[ELECTROSTATICS](#) by A. D. Moore.  
"Static" electricity projects and demos  
(including Dirod Generator manual.)

Also try:  
R. A. Ford's [Homemade Lightning](#)  
Walt Noon's [Electrostatic Generators](#)

Help [support](#)  
[scienceclub.org](#)

---

LOOKING FOR BOOKS? Try searching [Powell's](#)



(try "science fair project" keywords too)

See: [Science Projects & Experiment books](#)

Help Support [the Science Club](#), use the above form to order your books.

(We make a few \$\$ on any books ordered via these links.)

---

<http://scienceclub.org/kidproj1.html>

Site created and maintained by [Bill Beaty](#)

[THE SCIENCE CLUB](#)





You are here: [Home](#) > [KidSpace](#) > [Science Fair Project Resource Guide](#)

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 This page was last modified on 12 Mar 2005.



### KidSpace Features

[Ask a Question](#)  
[Culture Quest](#)  
[Learning HTML](#)  
[Orca Search](#)  
[Poison Prevention](#)  
[POTUS](#)  
[Say Hello](#)  
[Science Fair](#)  
[Stately Knowledge](#)  
[Story Hour](#)



### KidSpace Subject Collections

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[The World](#)  
[Computers/Internet](#)  
[Health & Nutrition](#)  
[Reading Zone](#)  
[Math & Science](#)  
[Art & Music](#)  
[Sports & Recreation](#)  
[Fun Stuff](#)  
[Teachers & Parents](#)

## IPL: Science Fair Project Resource Guide

Are you looking for some help with a science fair project? If so, then you have come to the right place. The IPL will guide you to a variety of web site resources, leading you through the necessary steps to successfully complete a science experiment. If you have never done a science fair project before, it has been a while, or you just want to be sure you do a really great job be sure and look at the following websites for tips on **what makes a good project** before doing anything else. This way you will know ahead of time what will be expected of you.

1. Understanding the **Scientific Method**. It is important to understand the scientific method before beginning a project.
2. **Choosing a topic** is the next step. Here you will find a variety of websites some of which ask questions to give you ideas for your project. Others describe the projects step by step.
3. Now, with a subject in mind, you are ready to go forward. Along the way you might need some additional help so check out links to **resources** or **ask an expert** for help.
4. After you have found the answers to your scientific question, you are now prepared to build your project and make your presentation with knowledge and confidence. Check out the **tips and tricks** for writing your paper, making your display, and preparing for your presentation.

**NOTE** to teachers and mentors

---

**From Start to Finish:  
 Taking you through all the steps**

### **Cyber Fair: Steps to Prepare a Science Fair Project**

<http://www.isd77.k12.mn.us/resources/cf/steps.html>

This site has one-sentence explanations of each part of a science fair. One of the steps described is presenting your project to judges. This may or may not be a part of your science fair. The site also has an explanation of what makes a good project and an explanation of how to come up with your own science fair project.

### **Discovery Channel School: Science Fair Central**

<http://school.discovery.com/sciencefaircentral/>

"Creative investigations into the real world." This site provides a complete guide to science fair projects. Check out the 'Handbook' which features information from Janice VanCleave, a popular author who provides everything you need to know for success. You can even send her a question about your project.

### **Experimental Science Projects: An Introductory Level Guide**

<http://www.isd77.k12.mn.us/resources/cf/SciProjIntro.html>

An excellent resource for students doing an experiment-based science fair project. There are links on this page to a more advanced guide and an example of an actual experiment-based project.

### **Gateway to Educational Materials: Science Fair Projects**

<http://members.ozemail.com.au/~macinnis/scifun/projects.htm>

The Gateway to Educational Materials extensive and detailed step-by-step guide to doing a science fair project.

### **Science Fair Primer**

<http://users.rcn.com/tedrowan/primer.html>

A site to help students get started and run a science fair project.

### **Science Fair Project on the Web: Step by step instructions**

<http://sciencefairproject.virtualave.net/observation.htm>

A detailed science fair help site. Step by step instructions on the science fair project. Categories include observation, question, hypothesis, method, result, conclusion, presentation.

### **Science Fair Project Guidebook**

[http://www.state.sc.us/energy/K-12/science\\_fair.htm](http://www.state.sc.us/energy/K-12/science_fair.htm)

The State of South Carolina publishes a K-12 science fair guidebook. It can be viewed using Adobe Acrobat Reader.

### **The Ultimate Science Fair Resource**

<http://www.scifair.org/>

A variety of resources and advice.

## **What Makes A Good Project**

### **What Makes A Good Science Fair Project**

[http://www.usc.edu/CSSF/Resources/Good\\_Project.html](http://www.usc.edu/CSSF/Resources/Good_Project.html)

A website from USC that gives a lot of good tips and ideas to think about regarding what makes a good science fair project. Advice for

students as well as teachers and parents is included.

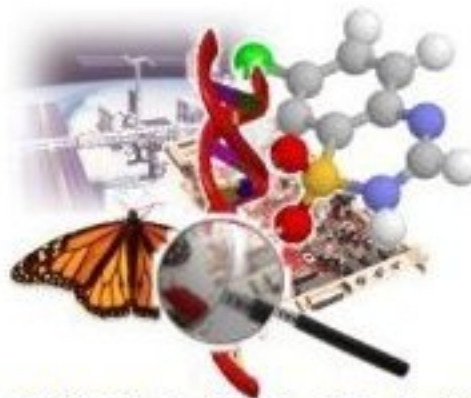
**Mr. McLaren's Science Fair Survival Page**

[http://www.ri.net/schools/East\\_Greenwich/Cole/sciencefair.html](http://www.ri.net/schools/East_Greenwich/Cole/sciencefair.html)  
Tips from Archie R. Cole Junior High school on what makes a good project.

**Neuroscience for Kids: Successful Science Fair Projects**

<http://faculty.washington.edu/chudler/fair.html>  
Site made by Lynne Bleeker a former science teacher, science fair organizer, and judge. Gives a thorough and detailed description of the steps to a successful science fair project.

This resource originally created by Marie Wolffe. Updated and modified by Deborah Dunk.



# SCIENCE FAIRS

H O M E P A G E

"You Never Know Where a Science Fair Project Can Take You"

SCIENCE FAIRS  
HOMEPAGE

PRIMARY  
PROJECTS

ELEMENTARY  
PROJECTS

INTERMEDIATE  
PROJECTS

SENIOR  
PROJECTS

COOL  
LINKS

CANADA WIDE  
SCIENCE FAIR

QUESTIONS/  
COMMENTS

Welcome to the New Science Fairs homepage. A project of the Eastern Newfoundland Science Fairs Council, this homepage is designed to aid students in the most difficult aspect of their science fair experience; getting an idea. We have everything from [coolinks](#) to information on the [Canada Wide Science Fair](#). We have included the listing of many science project ideas and hope to include more in the future. Keep posted for new help functions for science fair projects(see menu at left). We are also sponsoring the [Connaught Biotechnology Exhibit in Newfoundland](#), check it out.

Looking for Regional Science Fair Info including rules and regulations? [Click Here](#)

Send any comments, suggestions, ideas or contributions to [jbarron@calvin.stemnet.nf.ca](mailto:jbarron@calvin.stemnet.nf.ca).



Times since 10:30am on December 14, 1995.

Page Designed By  
[ShiNung Ching](#)

Best at 1024x768, 16 bit



# KID'S CORNER



Hi! Try one of these HOT links to science activities:



## [Amazing Space](#)

Web-based activities for all to enjoy. Learn about stars, comets, planets, galaxies and other space objects.

**Grades 3-12**



## [Cells Alive](#)

View living cells in images and movies. Learn more about the living world through text with each image.

**Grade 6-12**



## [Chem4Kids](#)

Learn about atoms, elements, matter and reactions at this kid-friendly site.

**Grades 3-8**



## [Eddy the Eco Dog](#)

Try an adventure with Eddy the Eco Dog. Learn about the planets, earth's environment and more.

**Grades K-5**



## [Explore Science](#)

Interactive science lab activities. Requires shockwave plug-in for browser (download link available at site.)

**Grades 7-12**



## [Kindergarten](#)

Lots of good ideas for learning about plants and gardens are included. Start with the "Fun Page for Kids".

**Grades K-3**

Check out the NEW [Student Projects Showcase](#)

## Previously Featured Sites

### [Amusement Park Physics](#)

Find out about the physics behind the fun. On-line activities, and off-computer experiments to try.

### [Ask Jeeves for Kids](#)

Here's a place on the Web that actually understands plain English. Simply type a question and let Jeeves give you a series of choices.

### [Bats, Bats, Everywhere](#)

Learn about bats with pictures, fun facts, games, quizzes and more.

### [California Science Fair Home Page](#)

A photo tour, frequently asked questions, and ideas from the California State Science Fair.

### [Chemicool Period Table](#)

Interactive periodic table of chemical elements with information on every element.

### [Close to Perfection](#)

Close-up photographic views of butterfly wings or leaves; see letters of the alphabet, numbers, shapes, unusual faces, and more.

### [Cool Science for Curious Kids](#)

Great interactive activities to explore biology on-screen, off screen, and in between.

### [Cybertiger](#)

Your zoo is about to receive its first Siberian tiger. (Only 400 exist in the world.) Your mission is to complete a Tiger Plan and to make certain this tiger thrives in his new zoo home.

### [Dairy Council of California](#)

Test your fitness, check your knowlege of nutrition by playing the food pyramid game, try interesting recipes and other fun activities.

### [Distortion Illusions](#)

Explore interactive optical effects, illusions, distortions, animations, artwork, and stories. Includes the work of M.C Escher.

### [DNA For Dinner](#)

Access current information about genetic engineering of food crops. Draft a law to address the labeling of genetically engineered foods in the United States.

## **Earth Explorers**

A SCORE Science lesson activity that has younger students use the Internet to investigate what animals need for their homes.

## **Energy Quest**

Energy Science Projects, Energy Game Show, Tips For Kids and more!

## **Exploratorium Exhibits**

On-line interactive activities from the famous San Francisco science museum.

## **Extreme Science**

Check out the gallery of world records in science and meet some of the way cool scientists who are out on the edge studying this stuff!

## **Froggy Page**

From silly to scientific. Sounds, pictures, songs, stories and more about frogs.

## **Future Feathered Friends**

A SCORE Science lesson activity that has students research a shorebird species and determine if it is showing signs of drastic population declines.

## **Homer's Hill**

A SCORE Science lesson activity that has students explore volcano locations around the world for on-location scenes in a movie.

## **Hyper Tech Exhibits**

Interactive activities from the Tech Museum of Innovation including a robotics, earthquakes, satellites, DNA and more.

## **International Tulip Study**

An on-line interactive project from the Journey North website. Plant tulips and use the tulips to compare the arrival of spring across North America.

## **Jake's Attic**

A library of hands-on activities for kids. There are sections on Learning Adventures and Expeditions, and Science Fair.

## **Jet Streams in the Classroom**

Find out how to predict the weather by looking at jet streams. Learn weather basics with science, geography and math connections.

## **Lawrence Hall of Science**

Hands-on activities plus information about animals and experiments; take the feline or bat quiz,

make a star clock, assemble Mr. Bones, map fish habitats, and more.

### **Little Shop of Physics**

At this site, you can find out how to do experiments with common things found around your house, with your computer, or with the shockwave plug-in.

### **Mad Scientist's Network**

Learn fascinating science facts as you explore thousands of questions and answers about science from around the world.

### **Microbe Zoo**

A clickable image leads to pictures and facts about microscopic living things and what they do in our world.

### **Mission Truly Possible**

A SCORE Science lesson activity in which students develop ideas to help rescue and restore endangered animals and plants to their rightful place in the habitats and niches they depend on.

### **Monterey Bay Aquarium**

Visit the on-line features of this great facility! Watch the live aquarium camera, look at pictures of the kelp and creature exhibits.

### **Neuroscience for Kids**

Discover the different parts of your brain and nervous system.

### **The Observatory**

One of NASA's websites filled with pictures, stories, games (requiring java) and more.

### **The O. Orkin Insect Zoo**

Rotate a grasshopper 360 degrees, watch a tarantula feeding, and learn everything you wanted to know about insects.

### **Reekos Mad Scientist Lab**

Experiment to find out why boats float and elephants sink, make a batch of plastic or a mixture of goo. Can you solve the mystery of the month puzzle?

### **River of Venom**

A mystery for science sleuthing. Solve it on-line or download it from the Access Excellence Mystery Spot.

### **Safari Touch Tank**

A virtual touch tank which gives pictures and information about life along the ocean shore by clicking on the parts of the picture.



### **Science On-Line**

A collection of lessons about the solar system, space science, seasons, earth, light, and cycles from U.C. Berkeley.

### **Sea World - Animal Resources**

Pictures and facts about animals from the Sea World education series.

### **The Space Place**

This site has a lot of Spacey things to make and do.

### **Sports Science**

What's the science behind a home run? Why do curveballs curve? Find the answers to these and other sports science questions at this site.

### **Tom Snyder Science Court**

Hands on activities for the Water Cycle, Work, Inertia, Gravity, Statistics, and Sound.

### **Virtual Frog**

An on-line frog dissecting activity.

### **Volcano World Kid's Door**

Explore pictures and video clips and try some great activities at this award-winning site.

### **Way Cool Science Scavenger Hunt**

A web search for answers to science questions both serious and silly with direct links to 10 websites.

### **Whale Times Kids Page**

Read about ocean animals, play games, and solve puzzles. Interactive story page and more.

### **Whelmers**

Easy-to-follow directions for 20 science activities from the book of the same name. Questions and ideas can lead to great science fair projects!

### **You Can with Beakman and Jax**

Interactive demos (requires Shockwave), pictures, and facts from the Beakman's World show.



[SCORE Science Main Page](#)

# The Solar Cooking Archive

Sponsored by Solar Cookers International



[July 2005 Newsletter Online](#) **NEW!**

[New Curtis and Meyer audio](#)

**NEW!**

[July 2006 Conference in Spain](#)

**NEW!**

[What else is new!](#) **NEW!**

- **Plans**

[Box-style](#)

[Panel](#)

[Parabolic](#)

- **Documents**

[Frequently-Asked Questions](#)

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[Country Reports](#)

[Water Pasteurization](#)

[Retained-Heat Cooking](#)

[Food Drying](#)

- **Translated Mini-Sites**

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[Conteúdo em Português](#)

[Contenu en Français](#)

[Contingut en Català](#)

- 

## Search

Visitors since 1996:

1 5 3 4 1 3 1

- **Multimedia**

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[Audio and Video](#)

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[Solar cooking online survey](#)

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View site in

About [Solar Cookers International](#)



# Spike's Science Projects



Home / Science /

**SHALOM**

ANIMALS  
 ASTRONOMY  
 ATOMS  
 ECOLOGY  
 GASES  
 GEOLOGY  
 LIQUIDS  
 METEOROLOGY  
 MICROORGANISMS  
 OCEANOGRAPHY  
 PLANTS  
 SOLIDS

## Welcome to Spike's Science Projects.

She has over 400 science projects for teachers and students to browse, download or just read.

In all the categories, you can try many different projects.

### SCIENCE PROJECTS

#### A Memorial to Ed Youngman, Ph.D.

The science projects on this site were written by a musician and philosopher; not a scientist. Notes for these projects were given to me by a Professor of Science Education at a prestigious American university. While writing the full projects, I did a great deal of research to make sure I said the right stuff. The finished product was reviewed by two professional people working in different scientific endeavors, and I was instructed to go forward with publishing them. Here they are, and they are donated as a service to the community of people, for the enlightenment and enjoyment of any who care to participate. It is hoped that my sense of fun and my humor is also enjoyed and appreciated.

All activities within this section of my web site are to be conducted and supervised by an adult, a parent, a professional educator, a community leader, or volunteer educator. They are not to be done without the supervision of an adult.

I especially wish to thank my friend and mentor, Ed Youngman. He was most helpful and encouraging throughout this writing process. Dr. Youngman's passing has been a great loss which has not diminished with time.

Jann McCormick  
Fremont, California  
July, 2000  
Shalom, from Spike the Grate

**Have fun!**

## Animals

What kinds of animals work?

## Astronomy

Of what possible use to us is astronomy?

## Atoms

How many atoms are in a pinhead?

## Ecology

What is an ecosystem and where is it?

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SCIENCE is COOL!

If necessity is the mother of invention, these guys must be orphans. Yes, those nutty Harvard professors are at it again. It's the Ig Nobel Awards -- the annual spoof of the Nobel Prizes -- handed out to people whose achievements "cannot or should not be reproduced." Let's check out this year's winners: **BIOLOGY**: Buck Weimer of Pueblo, Colo., for inventing Under-Ease, airtight underwear with a replaceable charcoal filter that removes bad-smelling gases before they escape.

**MEDICINE**: Peter Barss of McGill University, for his report "Injuries Due to Falling Coconuts," published in The Journal of Trauma.

**PHYSICS**: David Schmidt of the University of Massachusetts, for his partial solution to "the question of why shower curtains billow inwards."

**PSYCHOLOGY**: Lawrence W. Sherman of Miami University, Ohio, for his report, "An Ecological Study of Glee in Small Groups of Preschool Children."

**ASTROPHYSICS**: Dr. Jack and Rexella Van Impe for their discovery that black holes fulfill all the technical requirements to be the location of hell.

## Gases

How can we take a photo of gas?

## Geology

How are crystals formed?

## Liquids

What is the universal solvent?

## Meteorology

What makes wind? Is it those fans on the Altamont?

## Microorganisms

**TECHNOLOGY:** Australian John Keogh, for patenting the wheel in the year 2001, and to the Australian Patent Office, for granting him the patent.

**PUBLIC HEALTH:** Two Indian researchers, for their probing discovery that nose picking is a common activity among adolescents.

**PEACE:** Lithuania's Viliumas Malinauskus, for creating the amusement park known as "Stalin World."

**LITERATURE:** John Richards of Boston, England, founder of The Apostrophe Protection Society, for his efforts to protect, promote and defend the differences between plural and possessive.

**ECONOMICS:** Joel Slemrod of the University of Michigan Business School and Wojciech Kopczuk of University of British Columbia, for their conclusion that people should find a way to post-poner their deaths if that would qualify them for a lower rate on the inheritance tax.

What interesting stuff do we have in our refrigerators?

## Oceanography

What is kept in Davy Jones locker?

## Plants

How do plants migrate?

## Solids

How much does a grain of rice weigh?

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# Super Sparker

Make very, very, very tiny lightning,  
anytime you want!



## What do I need?

- scissors
- Styrofoam tray from your supermarket (ask at the meat or bakery counter for a clean, unused tray)
- masking tape
- aluminum pie tin



## What do I do?

**1** Cut a piece off one corner of the Styrofoam tray, as the picture shows. You'll have a long bent piece that looks a little like a hockey stick.



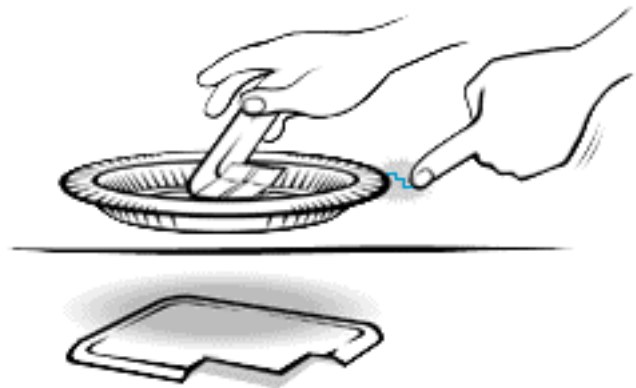
**6** Now--very slowly--touch the tip of your finger to the pie tin. Wow! What a spark! (Be careful. DON'T touch the Styrofoam tray. If you do, you won't get a spark.)

**2** Tape the bent piece to the center of the pie tin. **Now you have a handle!**



**7** Use the handle to pick up the pie tin again. Touch the tin with the tip of your finger. Wow! You get another great spark.

**3** Rub the bottom of the Styrofoam tray on your hair. Rub it all over, really fast.



**8** Drop the pie tin onto the Styrofoam tray again. Touch the pie tin. Another spark! Use the handle to pick up the pie tin. More sparks!

**9** You can do this over and over for a long time. If the pie tin stops giving you a spark, just rub the Styrofoam tray

**4** Put the tray upside down on a table or on the floor.

**5** Use the handle to pick up the pie tin. Hold it about a foot over the Styrofoam tray and drop it.

on your head again, and start over.

## Sparks in the Dark

Try using your Super Sparker in the dark. Can you see the tiny lightning bolts you make? What color are they?



## What's Going On?

### What makes the Super Sparker spark?

When you rub Styrofoam on your hair, you pull electrons off your hair and pile them up on the Styrofoam. When you put an aluminum pie tin on the Styrofoam, the electrons on the Styrofoam pull on the electrons. Some of the electrons in metals are *free electrons* --they can move around inside the metal. These free electrons try to move as far away from the Styrofoam as they can. When you touch the pie tin, those free electrons leap to your hand, making a spark.

After the electrons jump to your hand, the pie tin is short some electrons. When you lift the pie tin away from the Styrofoam plate,

you've got a pie tin that attracts any and all nearby electrons. If you hold your finger close to the metal, electrons jump from your finger back to the pie tin, making another spark. When you put the pie tin back on the Styrofoam plate, you start the whole process over again.

### **What does all this have to do with lightning?**

The lightning bolt is a dramatic example of static electricity in action. You see lightning when a spark of moving electrons races up or down between a cloud and the ground (or between two clouds). The moving electrons bump into air molecules along the way, heating them to a temperature five times hotter than the surface of the sun. This hot air expands as a supersonic shock wave, which you hear as thunder.



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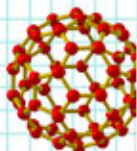
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My name is **Dr. Shawn Carlson\***. I am a physicist who always loved science fairs when I was young, so much so that I've devoted my life to helping anyone do great science projects.

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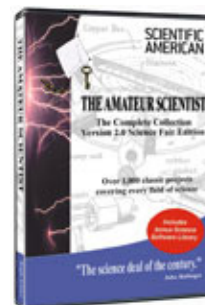
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**Prima-Rat: Lisa Glukhovsky**, 17 and top prize winner of the Jr. Intel Science Talent Search, poses inside the observatory built at her high school by the [Society for Amateur Scientists](#) Western Connecticut Chapter. (Dr. Shawn founded SAS in 1994.) Lisa was mentored entirely by community volunteers in her home town and **won over \$75,000 in scholarships**. Her success helped inspire [LABRats](#).

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\*Shawn Carlson, Ph.D. is a physicist and well-known science writer who lives to help young people do great science fair projects and science experiments. Dr. Carlson is the Founder and Executive Director of the Society for Amateur Scientists, a former columnist for Scientific American magazine, and the creator of LABRats. He has been awarded the MacArthur Fellowship for his efforts to promote science literacy. You can read his profile in Dan Rather's book, "The American Dream," Harper Collins Press, 2001 pg. 220.

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- [Science Fair Central](#) - from Discovery Channel School, a collection of project ideas, featured science fair participants, resources, and more.
- [Ultimate Science Fair Resource](#) - includes project steps and hints, report writing aid, display boards, and idea bank. For children, parents, and teachers.
- [IPL Kidspace: Science Fair Project Resource Guide](#) - designed to help students working on a science fair project. Includes Web resources, important steps to follow, and helpful tips.
- [School Science Fairs Homepage](#) - project of the Eastern Newfoundland Science Fairs Council.
- [Experimental Science Projects: An Intermediate Level Guide](#) - features sections on project steps, experimental errors, and 'what if my science project doesn't work?'
- [Successful Science Fair Projects](#) - advice from a former science fair organizer and judge on how to plan a successful science fair project.
- [Super Science Fair Projects](#) - offers recommendations and planning tips for science fair projects, topics, experiments, and ideas.
- [Science Fair Projects](#) - presents ideas for science fair and other projects. Includes tips on recording and presenting findings in various formats.
- [Science and Math Initiatives \(SAMI\)](#) - resources for math and science teachers including lesson plans, libraries, and an online help service.
- [CyberFair: Science Fair Ideas](#) - details the methodology behind getting good ideas.

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- [Energy and Science Projects](#) - features advice on what makes a good science project.
- [Cyber Fair](#) - projects created by students in third through sixth grades.
- [Math Projects for Science Fairs](#) - suggestions for possible projects and many references on topics that could make exciting and interesting projects, from the Canadian Mathematical Society.
- [Sarina Winterrowd's Science Fair Project](#) - about boomerangs and how they fly.
- [Brentwood School 1998 Virtual Science Fair](#)
- [Make It Solar Science Fair Projects](#) - offers solar energy related science project ideas, information, and puzzles. Provides students with free help regarding the scientific method, poster display boards, research, ideas, and planning tips.
- [Steve Spangler Science](#) - sells a wide variety of science toys, kits, and experiments. Also offers lots of videos and science experiments for both teachers and kids alike.

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# ENERGY QUEST NEWS

California Energy Commission

## Energy Quest Wins 2 'Dotties'

Energy Quest, the California Energy Commission's energy education website for children, received two **"Dottie Awards"** at a presentation ceremony October 10, 2002, in Sacramento.

The Commission's website won top honors in the Education and History category. And when all the numbers were tabulated and judges' votes added up, Energy Quest had the highest numerical score and was given the "Top Dot" award - the top website of all 80 finalists.

Energy Quest debuted on the World Wide Web on October 1, 1995, to celebrate October as National Energy Awareness Month! The newly updated version (EQ v. 2.0) debuted Memorial Day, May 27, 2002.

"Teaching an 'energy ethic' to conserve finite resources is essential to our energy future, which is currently dependent on fossil fuels," said Claudia Chandler, Assistant Executive Director for the Commission. "Our youth are tomorrow's scientists and inventors. They will discover our future means of energy production and innovative ways to use less energy. We hope Energy Quest will answer their questions and spur creativity and imagination."

Information on the website was developed and maintained by the Media & Public Communications Office of the Commission in consultation with Commission staff and educational experts. We appreciate comments, constructive criticism, and corrections.

The Dotties honor Northern California's best websites, and the awards were presented at its 6th annual awards ceremony at the Crest Theatre in Sacramento.

Northern Californians nominated more than 700 of the best websites from throughout the region. More than 50 evaluators reviewed each of the nominated sites, and a separate panel of judges then selected five finalists in each of the 16 categories.



The two DOTTIE Awards in front of Energy Quest homepage.

## 2004 Energy Art Contest Winners Chosen

Artwork by 12 California students has been selected in the California Energy Commission's 2004 Energy Quest Calendar Contest.

The drawings, paintings and posters by the 12 young artists will illustrate the Energy 2005 Calendar to be printed by the Energy Commission later this year.

In addition, the art will be displayed on the [Commission's new Energy Quest website](#).

Each student selected in the contest received a \$200 United States Savings Bond.



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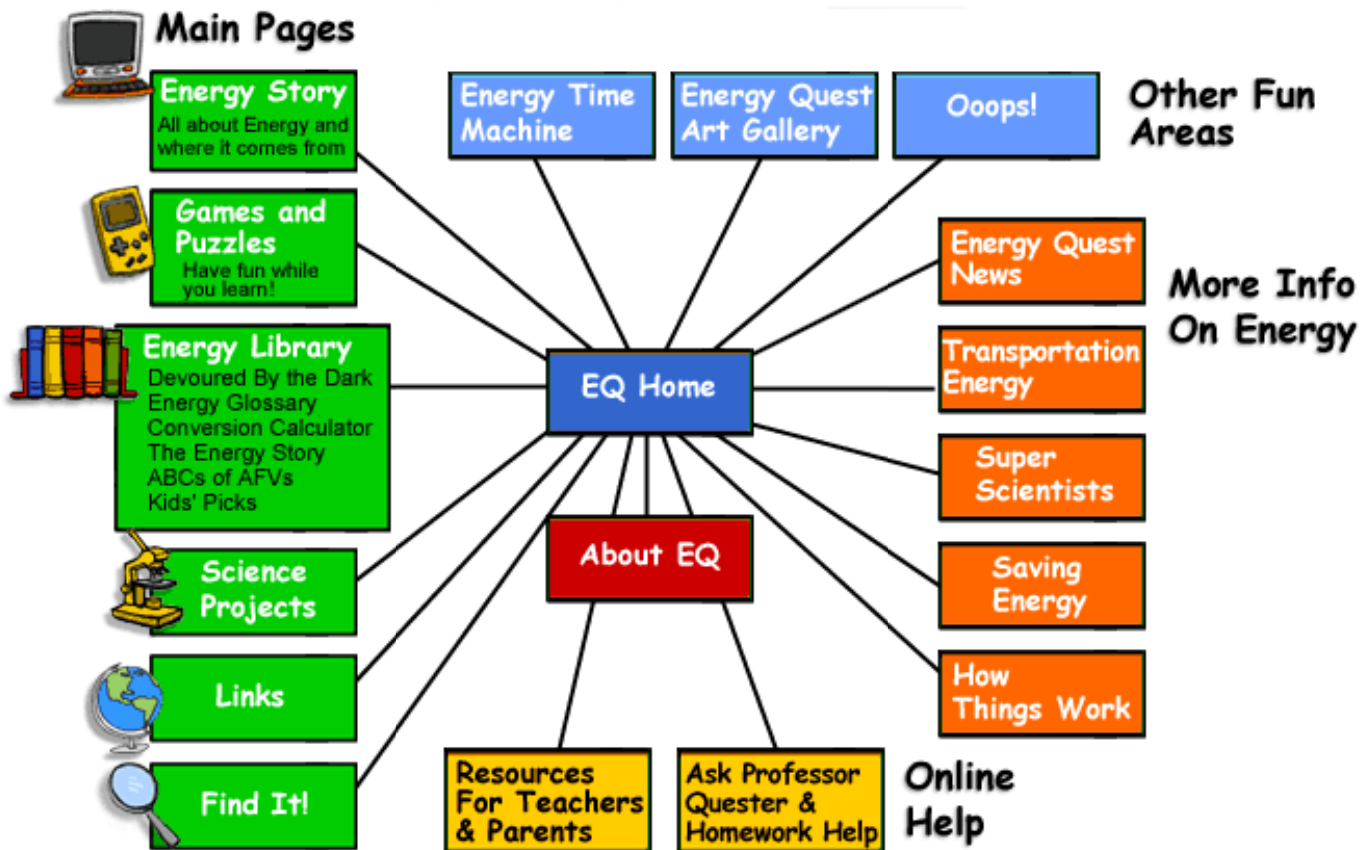
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## ABOUT ENERGY QUEST



**Energy Quest** is the [award-winning](#) energy education website of the California Energy Commission. It debuted on the World Wide Web on October 1, 1995, to celebrate October as National Energy Awareness Month! Our newly updated version (EQ v. 2.0) debuted Memorial Day, May 27, 2002.

Energy is an integral part of our daily lives. Without energy our society would decay into pre-historic savagery. Teaching an "energy ethic" to conserve finite resources is essential to our energy future, which is currently dependent on fossil fuels. We also must rely on our youth to help us create new ways to harness the elemental forces of our planet and the universe. They are tomorrow's scientists and inventors. They will discover new means of energy production and innovative ways to use less energy. We hope **Energy Quest** will answer their questions and spur creativity and imagination.

Albert Einstein once said:

"Imagination is more important than knowledge for knowledge is limited, whereas imagination embraces the entire world - stimulating progress, giving birth to evolution."

Information on our site was developed and maintained by the Media & Public Communications Office of the Commission in consultation with Commission staff and educational experts. We appreciate comments, constructive criticism, and corrections.

**Energy Quest** is dedicated to the memory of former Energy Commission Chairman [Charles R. "Chuck" Imbrecht](#), whose vision of a secure energy future and desire to teach lives on in this site.

### Credits and Acknowledgements

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California Government Code Section 11019.9 requires all departments and agencies of the State of California shall enact and maintain a permanent privacy policy, in adherence with the Information Practices Act of 1977 (Civil Code Section 1798 et seq.), that includes, but not necessarily limited to, the following principles:

- Personally identifiable information may only be obtained through lawful means.
- The purposes for which personally identifiable data are collected shall be specified at or prior to the time of collection, and any subsequent use of the data shall be limited to and consistent with the fulfillment of those purposes previously specified.
- Personal data may not be disclosed, made available, or otherwise used for a purpose other than those specified, except with the consent of the subject of the data, or as required by law or regulation.
- Personal data collected shall be relevant to the purpose for which it is needed.
- The general means by which personal data is protected against loss, unauthorized access, use, modification, or disclosure shall be posted, unless the disclosure of those general means would compromise legitimate agency objectives or law enforcement purposes.

Each department shall implement this privacy policy by:

- Designating which position within the department or agency is responsible for the implementation of and adherence to this privacy policy;
- Prominently posting the policy physically in its offices and on its Internet website, if any;
- Distributing the policy to each of its employees and contractors who have access to personal data;
- Complying with the Information Practices Act (Civil Code Section 1798 et seq.), the Public Records Act (Government Code Section 6250 et seq.), Government Code Section 11015.5, and all other laws pertaining to information privacy, and
- Using appropriate means to successfully implement and adhere to this privacy policy.

## Energy Quest Website Privacy

The California Energy Commission adheres to the above mentioned state laws relating to privacy. There are four pages on our Energy Quest website where information may be collected that could be subject to state and federal privacy laws and regulations:

1. **[Oops Page](#)**

Our "Oops Page" asks our visitors to report errors that they might find on our website to us. As a thank you, we send the finder a gift (usually an Energy Calendar and/or other items). The sender is asked to give us their and their parent's e-mail addresses and their mailing address. A reply is sent by e-mail to the student and their parents thanking them for finding the error. This information is destroyed after the gift is mailed.

2. **[Ask Professor Quester](#)**

Students looking for homework help can e-mail questions about energy to "Professor Quester." We do ask that students get parent or teacher's permission before responding. We ask the student for their name, age and school name for possible use if we post their question on line in our "Ask Professor Quester" responses. E-mail addresses are deleted after the questions have been answered.

3. **[Contact Us](#)**

Our "Contact Us Page" has an e-mail address link. It is possible that students may send us e-mail questions from this page. We do not ask for age or any other information from a student. E-mails are answered and original incoming copies of the e-mail are deleted.

4. **[Art Gallery](#)**

Our "Art Gallery" displays student-created pictures from our annual calendar art contest. The names, grades and schools of student winners are listed on the pages after our obtaining parental consent.

The Commission uses no "cookies" and does not use software for tracking specific visitors to its website.

Our website also adheres to the Federal Children's Privacy Act. For information on that act, please go to the [FTC Website About Kids' Privacy](#).

For other legal information about Energy Commission websites, including copyright information, please go to: [www.energy.ca.gov/legalstuff.html](http://www.energy.ca.gov/legalstuff.html).

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## ABOUT ENERGY QUEST



### How to Reach Us . . .

Dear Students:

We appreciate your e-mails, however... **FIRST look through** our website and **read** its pages to answer your homework questions. We will not do your homework for you!

You'll find a lot of information in [The Energy Story](#).

If you are looking for a science project, check out some great projects and experiments on our [Science Projects](#) page.

You can also visit our [Frequently Asked Questions](#) page.

#### How to Contact ENERGY QUEST By Regular Mail

Send mail to:

**ENERGY QUEST**  
California Energy Commission  
Media and Public Communications Office  
1516 Ninth Street, MS-29  
Sacramento, CA 95814-5504  
U S A

#### How to Contact ENERGY QUEST By Phone or FAX

Call us at: 916-654-4989    FAX us at: 916-654-4420

If you have website problems or are seeking permission to use something on our website, please contact our Webmaster Bob Aldrich at [mediaoffice@energy.state.ca.us](mailto:mediaoffice@energy.state.ca.us)

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# ENERGY LIBRARY

## Energy Library - Books for (and recommended by) Students

Title	Author	Publisher	ISBN Number	Year Published
100 Inventions That Shaped World History	Bill Yenne	Bluewood Books, San Francisco, CA	0-912517-02-6	1993
101 Things Every Kid Should Know About Science	Samantha Beres	Lowell House Junvenile, Los Angeles, CA	1-56565-916-3	1998
15 Simple Things Californians Can Do to Recycle	The Earthworks Group & California Dept. of Conservation's Division of Recycling	Earthwork Press, Berkeley, CA	1-879682-06-06	1991
25 Simple Things Kids Can Do to Save Energy	The Earthworks Group & Pacific Gas and Electric Company	Earthwork Press, Berkeley, CA	None - printed by PG&E	1992
30 Simple Energy Things You Can Do to Save the Earth	The Earthworks Group & Pacific Gas and Electric Company	Earthwork Press, Berkeley, CA	None - printed by PG&E	1990
50 Simple Things You Can Do to Save the Earth	The Earthworks Group	Earthwork Press, Berkeley, CA	0-929634-0603	1989
Attack of the Energy Vampire - Coloring Book	Random House / Disney	Random House, Incorporated	0736411976	2001
Batteries, Bulbs and Wires: Science Facts and Experiments	David Glover	Kingfisher	1-85697-933-4	1993
Charlie Brown's Encyclopedia of Energy: Based on the Charles M. Schulz Characters : Where We've Been, Where We're Going, and How We're Getting There	Charles M. Schultz	Random House Books for Young Readers	0394846826 may be out of print	1982
Done in the Sun: Solar Projects for Children	Astrid Hillerman	Sunstone Press	0865340188	1990
Dorling Kindersley Eyewitness Books: Electricity	Steve Parker	Dorling Kindersley, New York, NY	0-78945-577-3	2000
Dorling Kindersley Eyewitness Books: Energy	Jack Challonger	Dorling Kindersley, New York, NY	1-56458-232-9	2000
Electricity Book: The Junior Technician's Guide to How Electricity Works	Gene McWhorter	Pompt Publications, An imprint of Howard W. Sams & Company, Indianapolis, IN	0-7906-1023-X	1992
Energy from the Sun	Allan Fowler	Children's Press	0516262556	1998
Energy: Light, Heat and Sound	Jo Ellen Moor, Jill Norris, Marilyn Evans (Editor), Don Robison (Illustrator)	Evan-Moor Educational Publishers	1557996903	1999

Energy: Simple Experiments for Young Scientists	Larry White	Millbrook Press	0761300880	1996
Energy: A Multimedia Guide for Children and Young Adults	Judith H. Higgins	Neal-Schuman Publishers, Incorporated	0874362660	1979
Everyday Science Explained	Curt Suplee	National Geographic Society, Washington, DC	0-7922-7194-7	1998
Full of Energy	Sally Hewitt, Helaine Cohen (Editors)	Children's Press	0516263919	1998
Handy Physics Answer Book	P. Erik Gunderson	Visible Ink Press, Detroit, MI	1-57859-058-2	1999
Handy Science Answer Book, Second Edition	Compiled by the Science and Technology Dept. of the Carnegie Library of Philadelphia	Visible Ink Press, Detroit, MI	0-7876-1013-5	1997
Letting Off Steam: The Story of Geothermal Energy	Linda Jacobs	Carolrhoda Books, Inc., Minneapolis, MN	0-87614-510-1	1989
Marshall Brain's How Stuff Works	Marshall Brain	Hungry Minds, Inc.	0-76456-518-4	2001
New Way Things Work	David Macaulay	Houghton Mifflin Company, Boston, MA	0-395-93847-3	1998
Pass the Energy, Please	Barbara Shaw McKinney	Dawn Publications	1-58469-002-X	2000
Science Book of Energy	Neil Ardley	Harcourt	0152006117	1992
Scientific American How Things Work Today	Michael Wright and Mukul Patel	Scientific American	0-37541-023-6	2000
Usborne Young Scientist	Philip Chapman	Usborne Publishing Ltd., Scholastic Inc., New York, NY. Note: Scholastic Edition only available for distribution through the school market.	0-590-48703-5	1991
What to Do When Your Mom or Dad Says...'Turn Off the Water & Lights'	Joy Wilt Berry	Word, Inc., Waco, TX	0-941510-23-9 currently out of print	1984

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# ENERGY STORY

## Energy Conversion Calculators

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### Energy Conversion

Convert:

Into:

Output:

---

### Length / Distance Conversion

Convert:

Into:

Output:

---

### Weight Conversion

Convert:

Into:

Output:

---

### Area Conversion

Convert:

Into:

Output:

---

### Temperature Conversion

Convert:

Into:

Output:

---

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# ENERGY LIBRARY

## Glossary of Energy Terms



Click on the alphabet letter.

[\[A\]](#) [\[B\]](#) [\[C\]](#) [\[D\]](#) [\[E\]](#) [\[F\]](#) [\[G\]](#) [\[H\]](#) [\[I\]](#) [\[J\]](#) [\[K\]](#) [\[L\]](#) [\[M\]](#)

[\[N\]](#) [\[O\]](#) [\[P\]](#) [\[Q\]](#) [\[R\]](#) [\[S\]](#) [\[T\]](#) [\[U\]](#) [\[V\]](#) [\[W\]](#) [\[X\]](#) [\[Y\]](#) [\[Z\]](#)

Note: There are no entries for Y or Z.

### Other Dictionaries & Glossaries:

[Electric Power Industry Glossary](#)

[Glossarist.com's Listing of Various Energy Glossaries and Dictionaries](#)

If you would like to make a correction or add a term to this dictionary, please e-mail a complete definition and citation/reference for that word to: [mediaoffices@energy.state.ca.us](mailto:mediaoffices@energy.state.ca.us)

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# DEVOURED BY THE DARK



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by

**Patti Berg, Susanne Garfield &  
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# PROFESSOR QUESTER'S

## Frequently Asked Questions



Dear Students,

On this page you will find answers to most of your questions about energy.

**Choose a topic. Then look over the questions. Click on the question, and you'll find the answer!** If you need more information, check out [Energy Story](#) or How Stuff Works at [www.howstuffworks.com](http://www.howstuffworks.com). You can also do an internet search using your favorite search engine.

Thanks for visiting Energy Quest!

*Professor Quester*



### Topics

[General Energy Questions](#)

[Fossil Fuels Questions](#)

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[Electricity and Efficiency Questions](#)

[General Renewable Energy Questions](#)

[Wind Energy Questions](#)

[Geothermal, Tidal and Sound Energy Questions](#)

[Transportation Energy Questions](#)

---

### General Energy Questions

- [What is the scientific name for the energy in your body, like where you get your strength?](#)
- [What is radiant energy and mechanical energy \(friction, compression, distortion\)?](#)
- [What is the composition of a match head ...that is, what chemicals are used to manufacture them?](#)
- [Do you know of any more web sites that include games, activities or valuable information on energy?](#)
- [What is being done to solve the energy problems?](#)
- [What is the law of conservation of energy?](#)
- [Can you give a couple of examples of chemical energy?](#)

### Electricity and Efficiency Questions

- [My son is trying to gather information on fluorescent lighting. Can you help him](#)

out?

- What does a parallel bulb circuit look like? What does a series bulb circuit look like?
- Is it better to turn computers off if they are going to be used again within a couple of hours?
- What experiment was Millikan known for?
- Why is it so important to turn off the lights when you leave the room? My sister makes a big deal every time I forget.
- What is electricity?
- How do batteries work?

### **Fossil Fuels Questions**

- Which energy source, fossil fuel or uranium, will we run out of first? What are some advantages and disadvantages of both?
- Does fuel really come from dinosaurs and fossils?
- Who was the first person to discover oil?

### **General Renewable Energy Questions**

- Why can't we get all the power we need from renewable energy sources right now?

### **Hydro-electric Power Questions**

- Who discovered that water could be used to make electricity?
- What percentage of our energy comes from Hydro-electric?
- How do watermills, hydroelectricity, or dams work?
- I want to know, how to make a model in scale of a Pelton turbine.
- Is there is a minimum speed for water to be moving in order to use it for hydroelectricity.

### **Wind Energy Questions**

- How exactly is wind turned into electricity inside the wind turbine?
- How and when did someone figure out that they could use wind as a type of energy?
- How many lights can one wind mill light up?
- How do wind mills work?

### **Solar Energy Questions**

- [Will there ever be a cordless computer like some of our phones?](#)
- [I would like to know about the early developments of solar energy in the west.](#)
- [I need information on Solar Water Heaters.](#)
- [What is solar energy used for mostly?](#)
- [Are solar panels hot to the touch?](#)
- [Who invented solar panels?](#)
- [Can solar energy be used as energy for any instrument \(like a toy\) that needs energy?](#)
- [Does solar energy have any bad parts about it, except that it isn't always sunny?](#)
- [Why aren't people using solar energy more?](#)
- [How long has solar energy been in use in California? In the U.S.A?](#)

### **Geothermal, Tidal and Sound Energy Questions**

- [My friends and I are doing a report on sound energy. Can you could send us some information?](#)
- [What are the advantages of tidal energy, and where is tidal energy used today?](#)

### **Nuclear Energy Questions**

- [Why can't you try to split a positive and a negative atom to make cold fusion?](#)
- [Why does cold fusion only work with experimental error?](#)
- [What is nuclear energy used for?](#)
- [Why doesn't nuclear energy produce smoke?](#)
- [How many people does it take to operate a nuclear power plant?](#)
- [Who discovered nuclear fusion?](#)
- [Are there conditions you need to grow uranium?](#)
- [What states produce the most nuclear energy?](#)

### **Transportation Energy Questions**

- [How many lbs. or tons of carbon are used to burn a gallon of unleaded gasoline in the average American car?](#)
- [Why can't electric vehicles take advantage of the wind that is created by the vehicle in motion?](#)



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# RESOURCES FOR TEACHERS AND PARENTS



## Energy Education Resources for Teachers and Parents

- [Books & Other Printed Resources](#)
- [Videos and DVD Resources](#)
- [Energy Education Websites](#)
- ["EQ Picks"](#) - Our recommendations on books about energy
- [Lesson Plans](#)
- [Organizations](#)
- [A+ for Energy Program](#) - \$2 million in grants available to give teachers tools to teach children about energy and energy efficiency
- [Teacher's List Server & Bulletin Board](#)
- [Teacher Training, Workshops, Fellowships and Internships in Energy](#)
- [Higher Education Programs, Courses and Degrees in Energy](#)

### Note to Parents and Teachers...

Thank you for visiting the California Energy Commission's **Energy Quest** Website. We hope you find the information here informative and helpful.

In this section, parents and teachers will find various energy and environmental education materials and resources. We hope to add more energy education resources and material as they are developed, found or become available and are digitized for Internet use. Please check back with us regularly for new additions!

If you have materials that you think should be included or websites that we should know about, please send it to us or let us know. Or if you have a comment about one of our pages, please e-mail us or drop us a letter. Our address and other information can be found on our [contact us page](#).

You may also want to visit the U.S. Dept of Energy's Energy Information Administration's site. EIA publishes a written resources as well as providing info on line. **Energy Education Resources: Kindergarten Through 12th Grade** is a printed and on-line list of generally available free or low-cost energy-related educational materials. The entries are listed alphabetically by organization title. Each entry includes the address, telephone number, and description of the organization and the energy-related materials available. Most of the entries also include Internet (Web) and electronic mail (E-Mail) addresses. In the back of the book there is a subject index cross-referenced by number to the alphabetical entries.

Go to: [www.eia.doe.gov/bookshelf/eer/kiddietoc.html](http://www.eia.doe.gov/bookshelf/eer/kiddietoc.html)

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# ENERGY QUEST ART GALLERY

**New!**



The 2006 Calendar Contest Winners



The 2005 Calendar Contest Winners



The 2004 Calendar Contest Winners



The 2003 Calendar Contest Winners



The 2002 Calendar Contest Winners



The 2001 Calendar Contest Winners



The 2000 Calendar Contest Winners



The 1999 Calendar Contest Winners



## The 1998 Calendar Contest Winners

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| [Commission Homepage](#) | [Search Site](#) | [Energy Education Links](#) |

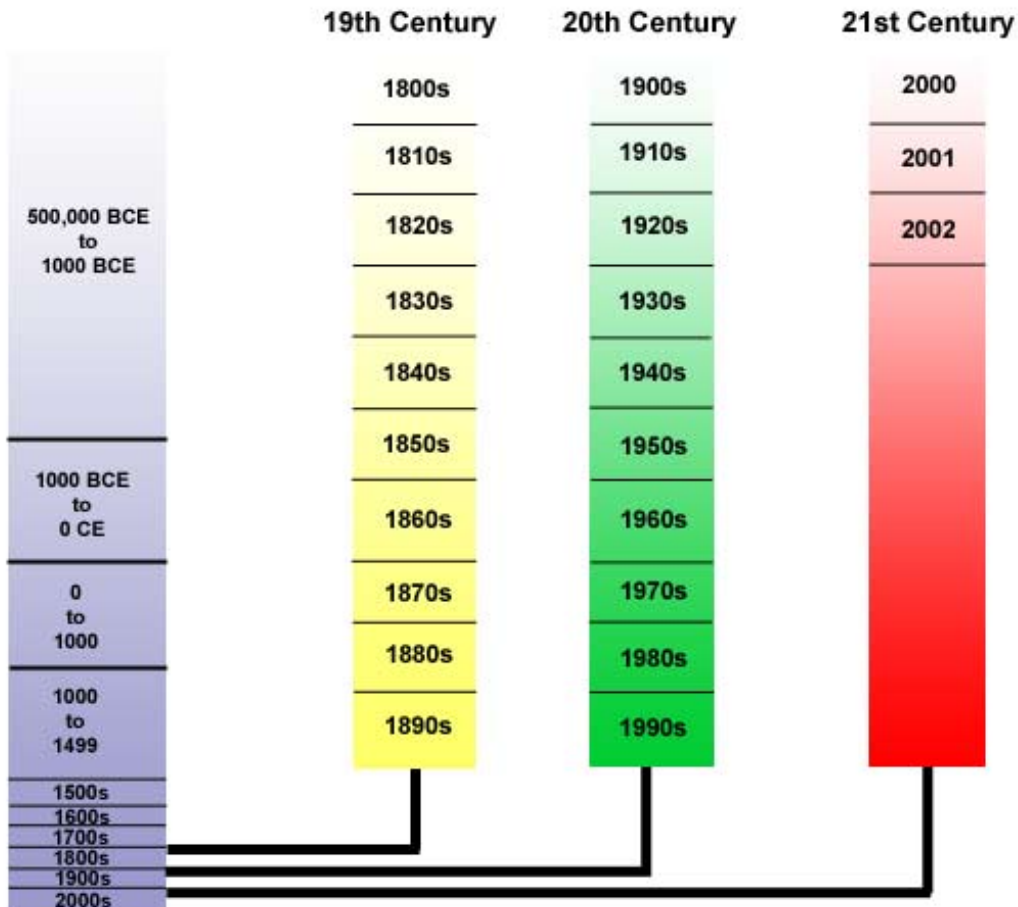
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# ENERGY TIME MACHINE

Click a date to learn about historical energy events that occurred during that era.



[YOU CAN ALSO LINK TO A TEXT-ONLY VERSION OF THIS PAGE.](#)

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# HOW THINGS WORK

## How Does It Work???

[How Does an \*\*Air Conditioner\*\* Work?](#)

[How Does \*\*Fire\*\* Work?](#)

[How Does a \*\*Refrigerator\*\* Work?](#)

[How Does a \*\*Thermometer\*\* Work?](#)

[How Does a \*\*Toaster\*\* Work?](#)

[How Does a \*\*Transformer\*\* Work?](#)

### Other Places You Might Want to Visit....

[Marshall Brain's How Stuff Works](#) - a great website that has hundreds of explanations about how various things work

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## SAVING ENERGY



I'm Professor Questor, inviting you to join me on an "Energy Quest." How many ways can you think of to save energy around your house?

California's electricity problems taught us **all** to think about the energy we use everyday. There's never enough energy to waste!

Many Californians learned to use their energy more efficiently. We also learned how to conserve energy - how to make thoughtful choices about ways we can use less. We learned how important it is to not waste energy, so there is enough for everyone.

Californians "[Flexed Their Power](#)" by using energy at different times of the day, by turning lights and machines off when not being used.

If you want to find out why California had its "Energy Crisis," the U.S. Department of Energy has a good background page at:

[www.eia.doe.gov/cneaf/electricity/california/california.html](http://www.eia.doe.gov/cneaf/electricity/california/california.html)

Are YOU and your family having an energy crisis? You may be if you're wasting energy. How many of these ways to save energy around the house do YOU know?

### Fight the Light!

Don't leave lights on when no one is in the room. If you are going to be out of the room for more than five minutes, turn off the light.

If you know of a light that is everyone forgets to turn off, make a sticker or a sign to hang next to the switch that says "Lights Out!" or "Don't Forget!"

Where possible, use compact fluorescent light bulbs. Those funny-looking bulbs produce the same amount of light by using 1/4 of the electricity. Plus, they last for years and years without burning out.

There's one light bulb that firefighters in Livermore, California, never turn off. It uses very little energy and has been burning for 101 years! Find out more about the [Centennial Bulb](#),

### Don't Leave Things Turned On

Turn off the TV when no one is watching it. The same goes for computers, radios and stereos - if no one using it, turn it off. Turn off all the appliances at the surge protector/control strip - that four- or six-plug extension chord that you plug all your computer things into. Some devices, like modems or other networking boxes are drawing small amounts of power all the time. Check with your folks first, but the best thing to do is turn them ALL off at the surge protector.



## **It's a Matter of Degrees!**

In warm weather, the thermostat at home should be set at 78 degrees. (Don't do this, of course, if it will cause health problems for anyone in your family.) When no one is home, set the thermostat at 85 degrees. That way, you'll reduce the need for air conditioning and you will save energy. If you have ceiling fans or other fans, turn them on. The blowing air can make you feel 5 degrees cooler, without running the family's air conditioner. Fans use a lot less electricity than air conditioners!

In cold weather, wear warm clothing and have your thermostat set to 68 degrees or lower during the day and evening, health permitting. When you go to sleep at night, set the thermostat back to either 55 degrees, or turn it off. When you leave home for an extended time, set the thermostat at 55 degrees or turn it off, too. That way, your family can save from 5 percent to 20 percent on your heating costs. (Don't do this, of course, if it will cause health problems for anyone in your family.)

## **Don't Heat - or Cool - the Great Outdoors!**

Americans use twice as much energy as necessary to heat their homes. That accounts for a lot of wasted energy!

If you have a fireplace, close the damper when you don't have a fire burning. An open fireplace damper can let 8 percent of heat from your furnace escape through the chimney! In the summer, an open fireplace damper can let cool air escape. It's like having a window open!

Make a map of your home, and mark all the windows, heating vents, and outside doors. Take a ribbon and hold it up to the edges of the doors and windows. If the ribbon blows, you've found a leak! Ask Mom or Dad to seal the leak with caulk or weatherstripping.

Think about your curtains. Keeping the curtains closed on cold, cloudy days helps block the cold outside air from getting inside. Also, keeping the curtains closed on very hot days keeps the hot air out!

## **In the Bedroom**

Turn off your electric blanket when you aren't in bed.

Don't leave on your computer, TVs, radios or games that use electricity when you're not using them.

## **In the Bathroom**

Wasting water wastes electricity. Why? Because the biggest use of electricity in most cities is supplying water and cleaning it up after it's been used!

About 75 percent of the water we use in our homes is used in the bathroom. Unless you have a low flush toilet, for example, you use about five gallons to seven gallons of water with every flush! A leaky toilet can waste more than 10,000 gallons of water a year. Wow!

Drippy faucets are bad, too. A faucet that leaks enough water to fill a soda bottle every 30 minutes will waste 2,192 gallons of water a year.

Another simple way to save water AND energy is to take shorter showers. You'll use less hot water - and water heaters account for nearly 1/4 of your home's energy use.

## **In the Kitchen**

According to researchers who are paid to study such things, a load of dishes cleaned in a dishwasher uses 37 percent less water than washing dishes by hand! However, if you fill up one side of the sink with soapy water and the other side with rinse water - and if you don't let the faucet run - you'll use half as

much water as a dishwasher does. Doing the dishes this way can save enough water for a five-minute shower!

If you need to warm up or defrost small amounts of food, use a microwave instead of the stove to save energy. Microwave ovens use around 50 percent less energy than conventional ovens do. For large meals, however, the stove is usually more efficient. In the summer, using a microwave causes less heat in the kitchen, which saves money on air conditioning.

Don't keep the refrigerator door open any longer than you need to. Close it to keep the cold air inside! Also, make sure the door closes securely. There is a rubber-like seal around the door that you can test. Just close the door on a dollar bill, and then see how easy it is to pull out. If the dollar slides out easily, the door is probably leaking cold air from inside.

Is there an old refrigerator sitting in the garage or someplace else at home? Old refrigerators are real energy hogs! An old refrigerator could be costing your family as much as \$120 a year to operate. Urge your parents to replace it if they don't need it, and remind them that one large refrigerator is cheaper to run than two smaller ones.

## **Shocking News About Batteries**

Did you know that Americans use an average of about eight batteries a year per person? Wow!

Batteries that are thrown away produce most of the heavy metals - dangerous substances like lead, arsenic, zinc, cadmium, copper, and mercury - that are found in household trash. These metals are toxic. They can be harmful to humans and wildlife. When discarded batteries from our trash wind up in landfills, these dangerous metals can seep into the ground water and eventually into the food chain. So, instead of throwing batteries in the trash, we should all take them to a toxic waste disposal area, if at all possible.

Turn off the toys and games (like GameBoys TM) that use batteries when you are not playing with them. That makes the batteries last longer, and you won't need as many of them.

Forty percent of all battery sales are made during the holiday season. Ask for holiday gifts that do not require batteries.

Ask your parents to buy rechargeable batteries and a recharger.

## **Outside the House**

Remember how saving water saves energy? Use a broom instead of a hose to clean off the driveway, patio or deck - this will save hundreds of gallons of water each year.

If you only have a small lawn, consider getting a manual push mower. It doesn't use any energy except your own. Pushing the mower spins the rotating wheels, which spins the cutter. Consider it good exercise!

Don't use an electric or gasoline leaf blower. Instead, use a rake.

If you need to leave a security light on over night, change the incandescent bulb to a compact fluorescent. It will last months and maybe years and save you energy and money. Some compact fluorescent bulbs even come in yellow so they won't attract bugs.

## **Think About What Your Family Buys**

If you buy things that can be used over and over instead of buying disposable items that are used once and then thrown away, you will save precious natural resources. You'll also save energy used to make them, and you'll reduce the amount of landfill space we need when they are thrown away.

Those same savings happen you buy things that will last instead of breaking right away. Well-made items

may cost a little more to begin with, but they are usually worth the money because they last for a long time, and you don't have to replace them.

When your family goes shopping, think about taking bags with you. Only about 700 paper bags can be made from one 15-year-old tree. A large grocery store can use that many bags before lunch! Plastic bags start out as either oil or natural gas. Oil and natural gas are non-renewable resources. This means they can't be reused, and when they are all gone, they are gone forever. And throw-away bags add a lot of pollution to the environment. If plastic and paper bags are used once and go to landfills, they stay there for hundreds of years. Some stores offer discounts for people who use their own bags. For every bag reused, they give money back - usually about five cents for each bag.

With your parents, pick a spot in your house to store bags that you get from the grocery store. These bags can be used to carry things to friends' houses or for trash linings. After bags wear out, recycle them.

## Other Recycling Tips

Make a scrap-paper pad. Gather pieces of used paper the same size with the blank side up. Find a piece of cardboard the same size as the paper and put it at the back. Staple the whole thing together, and use it as a place to write down grocery lists or things to do.

If every American recycled his or her newspaper just one day a week, we would save about 36 million trees a year. You can save a tree for every four feet of paper you recycle. It takes half as much energy to make recycled newspaper as it takes to make fresh newsprint from trees.

Recycle your newspapers. (Check to see if recycling centers want them tied together or in bags.) Anything that comes with the newspaper can also be recycled (except magazines, which must be recycled separately).

\* Recycle your old notebook paper. It is considered "white paper," and makes better recycled paper. "White paper" is writing paper, notebook paper, white envelopes, typing paper, index cards, computer paper, and white stationary.

Cereal boxes, egg cartons, wrapping paper are called "mixed paper." All these things can be recycled. Mixed paper can be made into paperboard, the paper that is used on roofs.

## In Your School

The energy-saving ideas you used at home can also be used in school. Consider creating a weekly "energy monitor" - someone who's job it is to make sure lights are out when there's no one in a room. He or she can also make sure that machines are turned off when not being used. Have your teacher or principal check with the California Energy Commission to see if your school can become a "[Bright School](#)."

## Links to Other Websites About Saving Energy

- [Alliance to Save Energy](http://www.ase.org) (www.ase.org)
- [California Energy Commission Bright School Program](http://www.energy.ca.gov/efficiency/brightschoools/) (www.energy.ca.gov/efficiency/brightschoools/)
- [California Energy Commission Conservation Web Links](http://www.energy.ca.gov/links/conservation.html) (www.energy.ca.gov/links/conservation.html)
- [Consumer Energy Center](http://www.ConsumerEnergyCenter.org) - Energy Efficiency at Home, Office and School(www.ConsumerEnergyCenter.org)
- [Energy Efficiency and Renewable Energy Network Dr. E's Energy Lab](http://www.eren.doe.gov/kids/) (www.eren.doe.gov/kids/)
- [Federal Consumer Information Center](http://www.pueblo.gsa.gov) (www.pueblo.gsa.gov)
- [Green Schools](http://www.ase.org/greenschools/) (www.ase.org/greenschools/)
- [PowerSmart](#) (tips to save money and the planet - Alliance to Save Energy>

- [Rocky Mountain Institute - for Kids](http://www.rmi.org/sitepages/pid468.php) (www.rmi.org/sitepages/pid468.php)
- [U.S. Dept of Energy Kids Zone](http://www.energy.gov/engine/content.do?BT_CODE=KIDS) (http://www.energy.gov/engine/content.do?BT\_CODE=KIDS)
- [U.S. Dept. of Energy - Energy Efficiency page](http://www.energy.gov/efficiency/) (www.energy.gov/efficiency/)

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# SUPER SCIENTISTS

## A Gallery of Energy Pioneers

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# TRANSPORTATION ENERGY



## A Student's Guide to Alternative Fuel Vehicles

**Alternative  
Fuel Vehicles...**  
*They're in Your  
Future!*



But, what is an alternative fuel vehicle?  
An alternative fuel vehicle is a vehicle that runs on alternative fuels.  
So, what is an alternative fuel?

"Alternative fuels" are vehicle fuels that aren't made from petroleum. There are many kinds of fuels that vehicles can run on that aren't made from petroleum. The United States Department of Energy officially recognizes this list of alternative fuels:

- **Alcohols** - ethanol and methanol.
- **Compressed natural gas (CNG)** - natural gas under high pressure.
- **Electricity** - stored in batteries.
- **Hydrogen** - a very special type of gas.
- **Liquefied natural gas (LNG)** - natural gas that is very, very cold.
- **Liquefied petroleum gas (LPG)** (also called propane) - hydrocarbon gases under low pressure.
- **Liquids made from coal** - gasoline and diesel fuel that doesn't come from petroleum.
- **Biodiesel** - a lot like diesel fuel, but made from plant oil or animal fat.

Almost all of the fuel we use for transportation is made from petroleum. Gasoline and diesel fuel account for all but about one-fourth of one percent of California's transportation fuel. Most California gasoline does contain a small amount of ethyl alcohol (also called ethanol), which increases the oxygen content of the gasoline for cleaner burning.

The fact that California is nearly 100 percent dependent on petroleum for transportation could cause a serious problem, like it did in 1973 and 1979 when the gas supply was limited and the prices went up.

- California's dependence on petroleum makes us vulnerable to price and supply disruptions.
- Air quality concerns have increased the importance of alternative fuels and advanced transportation technologies like electric vehicles.
- By increasing alternative fuel use, such as natural gas and electricity, consumers have fuel choices that compete with gasoline and



1979 Gas Shortage

diesel, broaden our supply base, and have lower environmental impacts.

Natural gas is the basic energy source for some of the alternatives to petroleum. On one hand, this is good because most of the natural gas we use comes from friendly North American countries, if not the United States itself. And at the present, there seems to be a plentiful supply of natural gas. So, the supply of natural gas is relatively stable and reliable. On the other hand, natural gas is a non-renewable fossil fuel, just like petroleum and coal, and so, it too will some day be used up if people continue to use a lot of it.

**Read more on...**

- **Gasoline** - how much it takes to make a gallon of gas.
  - **Alcohols** - ethanol and methanol.
  - **Compressed natural gas (CNG)** - natural gas under high pressure.
  - **Electricity** - stored in batteries.
  - **Fuel Cell Vehicles** - zero-emission vehicles of the future?
  - **Hybrid Vehicles** - using a couple of different energy sources or motors.
  - **Hydrogen** - a very special type of gas.
  - **Liquefied natural gas (LNG)** - natural gas that is very, very cold.
  - **Liquefied petroleum gas (LPG)** - hydrocarbon gases under low pressure.
  - **Liquids made from coal** - gasoline and diesel fuel that doesn't come from petroleum.
  - **Biodiesel** - a lot like diesel fuel, but made from plant oil or animal fat.
- 
- **Alternative Fuel Vehicles Available in California**
  - **Safety First with Motor Fuels**

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## **Sites With More Information About Electric and Alternative Fuel Cars**

- California Energy Commission - Alternative Fuel Vehicle Information
- Advanced Research Projects Agency - Electric & Hybrid Vehicle Data Center
- Alternative Fuels Data Center (U.S. Dept of Energy Funded)
- American Society of Engineering Technology
- CALSTART
- Museum of Modern Art's Different Roads: Automobiles for the Next Century (July 22-September 21, 1999)
- Links to Dozens of Other Places on the Internet About Alternative Fuel Vehicles.

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# OOPS!



## Did We Make a

## Mistake?

If you've found another mistake on our website....let us know and we'll send you a thank-you present!

### THESE ARE NOT MISTAKES!

- 1) On our home page, *spilling a can of soda* would definitely be a mistake, and *having soda or food* (an apple) near a computer would be a mistake. So, that's not the "mistake" we're looking for.
- 2) On our homepage, the *clock is supposed to run backwards* because it links to our "Energy Time Machine." So, that is not a mistake either.
- 3) The *title of our game Watt's That* is not misspelled. We meant it that way instead of "what's that." A watt is a measurement of energy and is named after James Watt, the Scottish engineer and inventor. Watt sounds like the word what. When two words sound alike but have different meanings, they are called homonyms. So, using the word "watt" instead of "what" is a play on words, a type of joke or pun.
- 4) The toys and phone on the floor *should be picked up*....but that's not a mistake.

So, if you found ANOTHER mistake, let us know!

**First, ask your parents if it's OK to send us your name and address.** We don't keep a copy of your name and address after we mail you your gift. If it is OK with your parents, please E-mail us the following information:

1. Your Name
2. Your Mailing Address
3. Your City, State/Province, Zip/Postal Code and Country
4. Your E-mail Address
5. Your Parent's E-mail Address
6. What the error was! Be specific and tell us what the correction should be (if you know)!

**Send your e-mail to: [baldrich@energy.state.ca.us](mailto:baldrich@energy.state.ca.us)**

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# Letter A

**ABSORPTANCE** - The ratio of the radiation absorbed by a surface to the total energy falling on that surface described as a percentage.

**ACCESS CHARGE** - A charge paid by all market participants withdrawing energy from the ISO controlled grid. The access charge will recover the portion of a utility's transmission revenue requirement not recovered through the variable usage charge.

**ACTIVE SOLAR ENERGY** - Solar radiation used by special equipment to provide space heating, hot water or electricity.

**ACTIVE SOLAR ENERGY SYSTEM** - A system designed to convert solar radiation into usable energy for space, water heating, or other uses. It requires a mechanical device, usually a pump or fan, to collect the sun's energy.

**ACOP (Adjusted Coefficient of Performance)** - A standard rating term that was used to rate the efficiency of heat pumps in California. ACOP was replaced by Heating Seasonal Performance Factor (HSPF) in 1988.

**ADDITION** - An alteration to an existing building that increases conditioned space.

**ADJUSTMENT BID** - A bid that is used by the ISO to adjust supply or demand when congestion is anticipated.

**ADVERSE HYDRO** - Water conditions limiting the production of hydroelectric power. In years having below-normal levels of rain and snow, and in seasons having less-than-usual runoff from mountain snowpack, there is then less water available for hydro energy production.

**AFTERMARKET** - broad term that applies to any change after the original purchase, such as adding equipment not a part of the original purchase. As applied to alternative fuel vehicles, it refers to conversion devices or kits for conventional fuel vehicles.

**AGGREGATOR** - An entity responsible for planning, scheduling, accounting, billing, and settlement for energy deliveries from the aggregator's portfolio of sellers and/or buyers. Aggregators seek to bring together customers or generators so they can buy or sell power in bulk, making a profit on the transaction.

**AIR CHANGE** - The replacement of a quantity of air in a space within a given period of time, typically expressed as air changes per hour. If a building has one air change per hour, this is equivalent to all of the air in the building being replaced in a one-hour period.

**AIR CONDITIONER** - An assembly of equipment for air treatment consisting of a means for ventilation, air circulation, air cleaning, and heat transfer (either heating or cooling). The unit usually consists of an evaporator or cooling coil, and an electrically-driven compressor and

condenser combination.

AIR FILM - A layer of still air adjacent to a surface which provides some thermal resistance.

AIR FILM COEFFICIENT - A measure of the heat transfer through an air film. [See ASHRAE Table 1, ASHRAE Handbook, 1985 Fundamentals]

AIR-TO-AIR HEAT EXCHANGER - A device with separate air chambers that transfers heat between the conditioned air being exhausted and the outside air being supplied to a building.

AIR POLLUTION - Unwanted particles, mist or gases put into the atmosphere as a result of motor vehicle exhaust, the operation of industrial facilities or other human activity.

ALTERATION - Any change or modification to a building's construction. [See [Addition](#)].

AMBIENT AIR TEMPERATURE - Surrounding temperature, such as the outdoor air temperature around a building.

ALCOHOL FUELS - A class of liquid chemicals that have certain combinations of hydrogen, carbon and oxygen, and that are capable of being used as fuel.

ALTERNATING CURRENT - (AC) Flow of electricity that constantly changes direction between positive and negative sides. Almost all power produced by electric utilities in the United States moves in current that shifts direction at a rate of 60 times per second.

ALTERNATIVE ENERGY SOURCES - See [RENEWABLE ENERGY](#).

ALTERNATIVE (transportation) FUELS - as defined by the National Energy Policy Act (EPAAct) the fuels are: methanol, denatured ethanol and other alcohols, separately or in mixtures of 85 percent by volume or more (or other percentage not less than 70 percent as determined by U.S. Department of Energy rule) with gasoline or other fuels; CNG; LNG; LPG; hydrogen; "coal-derived liquid fuels;" fuels "other than alcohols" derived from "biological materials;" electricity, or any other fuel determined to be "substantially not petroleum" and yielding "substantial energy security benefits and substantial environmental benefits."

ALTERNATIVE FUEL VEHICLE (AFV) - motor vehicles that run on fuels other than petroleum-based fuels. As defined by the National Energy Policy Act (EPAAct), this excludes reformulated gasoline as an alternative fuel.

AMBIENT - The surrounding atmosphere; encompassing on all sides; the environment surrounding a body but undisturbed or unaffected by it.

ANSI - American National Standards Institute is the national organization that coordinates development and maintenance of consensus standards and sets rules for fairness in their development. ANSI also represents the USA in developing international standards.

**ANCILLARY SERVICES** - The services other than scheduled energy that are required to maintain system reliability and meet WSCC/NERC operating criteria. Such services include spinning, non-spinning, and replacement reserves, voltage control, and black start capability.

**AMPERE (Amp)** - The unit of measure that tells how much electricity flows through a conductor. It is like using cubic feet per second to measure the flow of water. For example, a 1,200 watt, 120-volt hair dryer pulls 10 amperes of electric current (watts divided by volts).

**ANCILLARY SERVICES** - Services that the Independent System Operator may develop, in cooperation with market participants, to ensure reliability and to support the transmission of energy from generation sites to customer loads. Such services may include: regulation, spinning reserve, non-spinning reserve, replacement reserve, voltage support, and black start.

**ANGLE OF INCIDENCE** - The angle that the sun's rays make with a line perpendicular to a surface. The angle of incidence determines the percentage of direct sunshine intercepted by a surface.

**ANNUAL MAXIMUM DEMAND** - The greatest of all demands of the electrical load which occurred during a prescribed interval in a calendar year.

**ANIMAL WASTE CONVERSION** - Process of obtaining energy from animal wastes. This is a type of biomass energy.

**AFUE (Annual Fuel Utilization Efficiency)** - A measure of heating efficiency, in consistent units, determined by applying the federal test method for furnaces. This value is intended to represent the ratio of heat transferred to the conditioned space by the fuel energy supplied over one year. [See California Code of Regulations, Title 20, Section 1602(d)(1)]

**ANTHRACITE** - Hard coal, found deep in the earth. It burns very hot, with little flame. It usually has a heating value of 12,000-15,000 British thermal units (Btus) per pound.

**APPLIANCE EFFICIENCY STANDARDS** - California Code of Regulations, Title 20, Chapter 2, Subchapter 4: Energy Conservation, Article 4: Appliance Efficiency Standards. Appliance Efficiency Standards regulate the minimum performance requirements for appliances sold in California and apply to refrigerators, freezers, room air conditioners, central air conditioners, gas space heaters, water heaters, plumbing fittings, fluorescent lamp ballasts and luminaires, and ignition devices for gas cooking appliances and gas pool heaters. New National Appliance Standards are in place for some of these appliances and will become effective for others at a future date.

**APPLIANCE SATURATION** - A percentage telling what proportion of all households in a given geographical area have a certain appliance.

**APPLICANT** - Applicant means any person who submits an application for certification pursuant to the provisions of this division, including, but not limited to, any person who explores for or develops geothermal resources.

**APPLICATION** - Application means any request for certification of any site and related facility filed in accordance with the procedures established pursuant to this division. An applicant for a geothermal powerplant and related facilities may propose more than one site and related geothermal facilities in the same application. **AREA LOAD** - The total amount of electricity being used at a given point in time by all consumers in a utility's service territory.

**ASHRAE** - Acronym for American Society of Heating, Refrigerating and Air- Conditioning Engineers.

**ASH** - Non-organic, non-flammable substance left over after combustible material has been completely burned.

**ASSOCIATED GAS** - Natural gas that can be developed for commercial use, and which is found in contact with oil in naturally occurring underground formations.

**ATGAS** - Synthetic gas produced by dissolving coal in a bath of molten iron. The process was developed by Applied Technology, Inc. Synthetic gas may be used as a substitute for natural gas in industrial and home uses.

**ATOM** --The smallest unit of an element consisting of a dense positively charged nucleus (of protons and neutrons) orbited by negatively charged electrons.

**ATOMIC ENERGY COMMISSION** --The independent civilian agency of the federal government with statutory responsibility to supervise and promote use of nuclear energy. Functions were taken over in 1974 by the Energy Research and Development Administration (now part of the U.S. Department of Energy) and the Nuclear Regulatory Commission.

**ATOMIC NUCLEUS** - The positively charged core of an atom.

**AUXILIARY ENERGY SUBSYSTEM** - Equipment using conventional fuel to supplement the energy output of a solar system. This might be, for example, an oil- fueled generator that adds to the electrical output of a substitutes for the solar system during long overcast periods when there is not enough sunlight.

**AUXILIARY EQUIPMENT** - Extra machinery needed to support the operation of a power plant or other large facility.

**AVERAGE COST** - The revenue requirement of a utility divided by the utility's sales. Average cost typically includes the costs of existing power plants, transmission, and distribution lines, and other facilities used by a utility to serve its customers. It also included operating and maintenance, tax, and fuel expenses.

**AVERAGE DEMAND** - The energy demand in a given geographical area over a period of time. For example, the number of kilowatt-hours used in a 24-hour period, divided by 24, tells the average demand for that period.

**AVERAGE HYDRO** - Rain, snow and runoff conditions that provide water for hydroelectric

generation equal to the most commonly occurring levels. Average hydro usually is a mean indicating the levels experienced most often in a 104-year period.

**AVOIDED COST - (Regulatory)** The amount of money that an electric utility would need to spend for the next increment of electric generation to produce or purchase elsewhere the power that it instead buys from a cogenerator or small-power producer. Federal law establishes broad guidelines for determining how much a qualifying facility (QF) gets paid for power sold to the utility.

**AVOIDED COST -** The cost the utility would incur but for the existence of an independent generator or other energy service option. Avoided cost rates have been used as the power purchase price utilities offer independent suppliers (see [Qualifying Facilities](#)).

**AZIMUTH--**The angular distance between true south and the point on the horizon directly below the sun. Typically used as an input for opaque surfaces and windows in computer programs for calculating the energy performance of buildings.

# Letter B

**BALANCED SCHEDULE** - A Scheduling Coordinator's schedule is balanced when generation, adjusted for transmission losses, equals demand.

**BALLAST** - A device that provides starting voltage and limits the current during normal operation in electrical discharge lamps (such as fluorescent lamps).

**BARREL** - In the petroleum industry, a barrel is 42 U.S. gallons. One barrel of oil has an energy content of 6 million British thermal units. It takes one barrel of oil to make enough gasoline to drive an average car from Los Angeles to San Francisco and back (at 18 miles per gallon over the 700-mile round trip).

**BARRELS PER DAY EQUIVALENT (BPD-Equivalent)** --A unit of measure that tells how much oil would have to be burned to produce the same amount of energy. For example, California's hydroelectric generation in 1983 was 58,000 barrels per day equivalent.

**BASE LOAD** - The lowest level of power production needs during a season or year.

**BASE LOAD UNIT** - A power generating facility that is intended to run constantly at near capacity levels, as much of the time as possible.

**BASELINE FORECAST** - A prediction of future energy needs which does not take into account the likely effects of new conservation programs that have not yet been started.

**BASE RATE** - That portion of the total electric or gas rate covering the general costs of doing business unrelated to fuel expenses.

**BATTERY** - A device that stores energy and produces electric current by chemical action.

**BENZENE** - A type of colorless liquid hydrocarbon that can be used as a motor fuel. Its chemical symbol is C<sub>6</sub>H<sub>6</sub>.

**BIENNIAL REPORT** - A report issued by the California Energy Commission to the Governor and the Legislature every odd-numbered year assessing California's energy industry. (See also [Energy Commission reports page](#).) The Biennial Report is supported by four policy documents that are issued every even-numbered year: the Electricity Report, the Fuels Report, the Conservation (or Efficiency) Report and the Energy Development Report. The Biennial Report was replaced in 2000 by an annual Energy Outlook Report.

**BI-FUEL VEHICLE** - A vehicle with two separate fuel systems designed to run on either fuel, using only one fuel at a time. These systems are advantageous for drivers who do not always have access to an alternative fuel refueling station. Bi-fuel systems are usually used in light-duty vehicles. One of the two fuels is typically an alternative fuel.



**BI-GAS** - A process being developed as a means of making synthetic gas from coal. The synthetic gas would be intended to substitute for natural gas in meeting industrial and home energy needs.

**BILATERAL CONTRACT** - A two-party agreement for the purchase and the sale of energy products and services.

**BIOCONVERSION** - Processes that use plants or micro-organisms to change one form of energy into another. For example, an experimental process uses algae to convert solar energy into gas that could be used for fuel.

**BIODIESEL** - a biodegradable transportation fuel for use in diesel engines that is produced through the transesterification of organically- derived oils or fats. It may be used either as a replacement for or as a component of diesel fuel.

**BIOMASS** - Energy resources derived from organic matter. These include wood, agricultural waste and other living-cell material that can be burned to produce heat energy. They also include algae, sewage and other organic substances that may be used to make energy through chemical processes.

**BIOSPHERE** - The zone at and adjacent to the earth's surface where all life exists; all living organisms of the earth.

**BITUMINOUS COAL** - Soft coal containing large amounts of carbon. It has a luminous flame and produces a great deal of smoke.

**BLACKOUT** - A power loss affecting many electricity consumers over a large geographical area for a significant period of time.

**BOILER** - A closed vessel in which water is converted to pressurized steam.

**BOILING WATER REACTOR** - (BWR) A nuclear power unit in which water used as a coolant is allowed to boil at the core. The resulting steam may be used to drive electric turbines.

**BOTTLED GAS** - The liquified petroleum gases propane and butane, contained under moderate pressure (about 125 pounds per square inch and 30 pounds per square inch respectively), in cylinders.

**BOTTOMING CYCLE** - A means to increase the thermal efficiency of a steam electric generating system by converting some waste heat from the condenser into electricity rather than discharging all of it into the environment.

**BPA** - (short for Bonneville Power Administration) - One of five federal power marketing administrations that sell low-cost electric power produced by federal hydro electric dams to agricultural and municipal users. BPA serves Idaho, Oregon, and Washington as well as parts of Nevada and Wyoming. It also sells power to California companies in "wheeling" trades.

**BREEDER** - A nuclear reactor that produces more fuel than it consumes. The breeder, invented in the United States, is used as a power source in several European countries.

**BRITISH THERMAL UNIT (Btu)** - The standard measure of heat energy. It takes one Btu to raise the temperature of one pound of water by one degree Fahrenheit at sea level. For example, it takes about 2,000 Btus to make a pot of coffee. One Btu is equivalent to 252 calories, 778 foot-pounds, 1055 joules, and 0.293 watt-hours. Note: In the abbreviation, only the B is capitalized.

**BROKER** - A retail agent who buys and sells power. The agent may also aggregate customers and arrange for transmission, firming and other ancillary services as needed.

**BROWNOUT** - A controlled power reduction in which the utility decreases the voltage on the power lines, so customers receive weaker electric current. Brownouts can be used if total power demand exceeds the maximum available supply. The typical household does not notice the difference.

**BUILDING ENERGY EFFICIENCY STANDARDS** - California Code of Regulations (California Code of Regulations), Title 24, Part 2, Chapter 2-53; regulating the energy efficiency of buildings constructed in California.

**BUILDING ENVELOPE** - The assembly of exterior partitions of a building which enclose conditioned spaces, through which thermal energy may be transferred to or from the exterior, unconditioned spaces, or the ground. [See California Code of Regulations, Title 24, Section 2-5302]

**BULK POWER SUPPLY** - Often this term is used interchangeably with wholesale power supply. In broader terms, it refers to the aggregate of electric generating plants, transmission lines, and related-equipment. The term may refer to those facilities within one electric utility, or within a group of utilities in which the transmission lines are interconnected.

**BUNKER C FUEL OIL** - A very heavy substance, left over after other fuels have been distilled from crude oil. Also called NO. 6 FUEL, it is used in power plants, ships and large heating installations. California's Bunker C fuel oil has high sulfur content, which causes air quality concerns when burned as fuel.

**BUSBAR** - In electric utility operations, a busbar is a conductor that serves as a common connection for two or more circuits. It may be in the form of metal bars or high-tension cables.

**BUTANE** - A hydrocarbon gas found in the earth along with natural gas and oil. Butane turns into a liquid when put under pressure. It is sold as bottled gas. It is used to run heaters, stoves and motors, and to help make petrochemicals.

**BUY THROUGH** - An agreement between utility and customer to import power when the customer's service would otherwise be interrupted.

**BUYER** - An entity that purchases electrical energy or services from the Power Exchange (PX) or through a bilateral contract on behalf of end-use customers.

# Letter C

**CALIFORNIA ENDANGERED SPECIES ACT** - The state law originally enacted in 1970, expresses the state's concern over California's threatened wildlife, defined rare and endangered wildlife, and gave authority to the Department of Fish and Game to "identify, conserve, protect, restore, and enhance any endangered species or any threatened species and its habitat in California...." The statute is under the state Fish and Game Code as Chapter 1.5.

**CALIFORNIA ENERGY COMMISSION** - The state agency established by the [Warren-Alquist State Energy Resources Conservation and Development Act](#) in 1974 (Public Resources Code, Sections 25000 et seq.) responsible for energy policy. The Energy Commission's five major areas of responsibilities are:

1. Forecasting future statewide energy needs
2. Licensing power plants sufficient to meet those needs
3. Promoting energy conservation and efficiency measures
4. Developing renewable and alternative energy resources, including providing assistance to develop clean transportation fuels
5. Planning for and directing state response to energy emergencies

Funding for the Commission's activities comes from the Energy Resources Program Account, Federal Petroleum Violation Escrow Account and other sources.

**CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA** - pronounced See' quah) Enacted in 1970 and amended through 1983, established state policy to maintain a high-quality environment in California and set up regulations to inhibit degradation of the environment.

**CSE (CALIFORNIA SEASONAL EFFICIENCY)** - See [See Seasonal Efficiency](#).

**CALORIE** (energy calorie - small "c" - as opposed to food Calorie - capital "C") Any of several approximately equal values of heat, each measured as the quantity of heat require to raise the temperature of 1 gram of water by 1 degree Celsius from a standard initial temperature, esp. from 3.98 degress Celsius. 14.5 degrees Celsius, or 19.5 degrees Celsius, at 1 atmosphere pressure. A calorie is the unit of heat equal to 4.184 joules.

**CAPACITY RELEASE** - A secondary market for capacity that is contracted by a customer which is not using all of its capacity.

**CAPTIVE CUSTOMER** - A customer who does not have realistic alternatives to buying power from the local utility, even if that customer had the legal right to buy from competitors.

**CERTIFICATION** - process by which a motor vehicle, motor vehicle engine, or motor vehicle pollution control device satisfies the criteria adopted by the [California Air Resources Board \(ARB\)](#) for the control of specified air contaminants from vehicular sources (Health & Safety Code, Section 39018). Certification constitutes a guarantee by the manufacturer that the engine will meet certain standards at 50,000 miles; if not, it must be replaced or repaired without

change.

**CAULKING** - Material used to make an air-tight seal by filling in cracks, such as those around windows and doors.

**CALIFORNIA PUBLIC UTILITIES COMMISSION (CPUC)** - A state agency created by constitutional amendment in 1911 to regulate the rates and services of more than 1,500 privately owned utilities and 20,000 transportation companies. The CPUC is an administrative agency that exercises both legislative and judicial powers; its decisions and orders may be appealed only to the California Supreme Court. The major duties of the CPUC are to regulate privately owned utilities, securing adequate service to the public at rates that are just and reasonable both to customers and shareholders of the utilities; including rates, electricity transmission lines and natural gas pipelines. The CPUC also provides electricity and natural gas forecasting, and analysis and planning of energy supply and resources. Its main headquarters are in San Francisco.

**CALIFORNIA UTILITY RESEARCH COUNCIL (CURC)** - Public Utilities Code, Sections 9201-9203 requires the California Energy Commission, the California Public Utilities Commission, and the investor-owned utilities (Pacific Gas and Electric Company, Southern California Edison, and San Diego Gas & Electric) to coordinate and promote consistency of research, development and demonstration (RD&D) programs with state energy policy. The CURC provides coordination for and sharing of information on energy RD&D in California to avoid duplication of efforts.

**CALL-BACK** - A provision included in some power sale contracts that lets the supplier stop delivery when the power is needed to meet certain other obligations.

**CALORIE** - One energy calorie is equivalent to 4.2 joules. Thus, it takes 500,000 calories of energy to boil a pot of coffee. One food calorie equals 1,000 energy calories.

**CAPACITY (Electric utility)** - The maximum amount of electricity that a generating unit, power plant or utility can produce under specified conditions. Capacity is measured in megawatts and is also referred to as the NAMEPLATE RATING.

**CAPACITY FACTOR** - A percentage that tells how much of a power plant's capacity is used over time. For example, typical plant capacity factors range as high as 80 percent for geothermal and 70 percent for cogeneration.

**CARBON DIOXIDE** - A colorless, odorless, non-poisonous gas that is a normal part of the air. Carbon dioxide, also called CO<sub>2</sub>, is exhaled by humans and animals and is absorbed by green growing things and by the sea.

**CARBON MONOXIDE (CO)** - A colorless, odorless, highly poisonous gas made up of carbon and oxygen molecules formed by the incomplete combustion of carbon or carbonaceous material, including gasoline. It is a major air pollutant on the basis of weight.

**CARCINOGENS** - Potential cancer-causing agents in the environment. They include among others: industrial chemical compounds found in food additives, pesticides and fertilizers, drugs,

toy, household cleaners, toiletries and paints. Naturally occurring ultraviolet solar radiation is also a carcinogen.

**CATALYTIC CRACKING** - A refinery process that converts a high-boiling range fraction of petroleum (gas oil) to gasoline, olefin feed for alkylation, distillate, fuel oil and fuel gas by use of a catalyst and heat.

**CCR** - California Code of Regulations.

**CELSIUS** - A temperature scale based on the freezing (0 degrees) and boiling (100 degrees) points of water. Abbreviated as C in second and subsequent references in text. Formerly known as Centigrade. To convert Celsius to Fahrenheit, multiply the number by 9, divide by 5, and add 32. For example:

10 degrees Celsius  $\times 9 = 90$ ;  $90 / 5 = 18$ ;  $18 + 32 = 50$  degrees Fahrenheit.

**CFCs (CHLOROFLUOROCARBONS or CHLORINATED FLUOROCARBONS)** - A family of artificially produced chemicals receiving much attention for their role in stratospheric ozone depletion. On a per molecule basis, these chemicals are several thousand times more effective as greenhouse gases than carbon dioxide. Since they were introduced in the mid-1930s, CFCs have been used as refrigerants, solvents and in the production of foam material. The 1987 Montreal protocol on CFCs seeks to reduce their production by one-half by the year 1998.

**CHEMICAL ENERGY** - The energy generated when a chemical compound combusts, decomposes, or transforms to produce new compounds.

**CHILLER** - A device that cools water, usually to between 40 and 50 degrees Fahrenheit for eventual use in cooling air.

**CIRCUIT** - One complete run of a set of electric conductors from a power source to various electrical devices (appliances, lights, etc.) and back to the same power source.

**CLEAN FUEL VEHICLE** - is frequently incorrectly used interchangeably with "alternative fuel vehicle." Generally, refers to vehicles that use low-emission, clean-burning fuels. Public Resources Code Section 25326 defines clean fuels, for purposes of the section only, as fuels designated by ARB for use in LEVs, ULEVs or ZEVs and include, but are not limited to, electricity, ethanol, hydrogen, liquefied petroleum gas, methanol, natural gas, and reformulated gasoline.

**CLERESTORY** - A wall with windows that is between two different (roof) levels. The windows are used to provide natural light into a building.

**CLIMATE ZONE** - A geographical area in the state that has particular weather patterns. These zones are used to determine the type of building standards that are required by law.

**CLUNKERS** - also known as gross-polluting or super-emitting vehicles, i.e., vehicles that emit far in excess of the emission standards by which the vehicle was certified when it was new.

**COAL** - Black or brown rock, formed under pressure from organic fossils in prehistoric times, that is mined and burned to produce heat energy.

**COAL CONVERSION** - Changing coal into synthetic gas or liquid fuels. See GASIFICATION.

**COAL OIL** - Oil that can be obtained by distilling bituminous coal.

**COAL SEAM** - A mass of coal, occurring naturally at a particular location, that can be commercially mined.

**COAL SLURRY PIPELINE** - A pipe system that transports pulverized coal suspended in water.

**COP (COEFFICIENT OF PERFORMANCE)** - - Used to rate the performance of a heat pump, the COP is the ratio of the rate of useful heat output delivered by the complete heat pump unit (exclusive of supplementary heating) to the corresponding rate of energy input, in consistent units and under specific conditions. [See California Code of Regulations, Title 24, Section 2-1602(c)(4)]

**COGENERATOR** - Cogenerators use the waste heat created by one process, for example during manufacturing, to produce steam which is used, in turn, to spin a turbine and generate electricity. Cogenerators may also be QFs.

**COGENERATION** - Cogeneration means the sequential use of energy for the production of electrical and useful thermal energy. The sequence can be thermal use followed by power production or the reverse, subject to the following standards:

(a) At least 5 percent of the cogeneration project's total annual energy output shall be in the form of useful thermal energy.

(b) Where useful thermal energy follows power production, the useful annual power output plus one-half the useful annual thermal energy output equals not less than 42.5 percent of any natural gas and oil energy input.

**COKE** - A porous solid left over after the incomplete burning of coal or of crude oil.

**COKE OVEN GAS** - Gas given off by coke ovens. Coke oven gas is interchangeable with goal gas.

**COMBINED CYCLE PLANT** - An electric generating station that uses waste heat from its gas turbines to produce steam for conventional steam turbines.

**COMBINED HYDRONIC SPACE/WATER HEATING** - a system in which both space heating and domestic water heating are provided by the same water heater(s).

**COMBUSTION** Burning - Rapid oxidation, with the release of energy in the form of heat and light.

**COMFORT CONDITIONING** - The process of treating air to simultaneously control its temperature, humidity, cleanliness, and distribution to meet the comfort requirements of the occupants of the conditioned space.

**COMFORT ZONE** - The range of temperatures over which the majority of persons feel comfortable (neither too hot nor too cold).

**COMPETITIVE TRANSMISSION CHARGE** - A non-bypassable charge that customers pay to a utility for the recovery of its stranded costs.

**COMMERCIALIZATION** - Programs or activities that increase the value or decrease the cost of integrating new products or services into the electricity sector. (See "Sustained Orderly Development.")

**COMPRESSED NATURAL GAS (CNG)** - natural gas that has been compressed under high pressure, typically between 2,000 and 3,600 pounds per square inch, held in a container. The gas expands when released for use as a fuel.

**CONDENSATE** - Liquid fuel obtained by burning gas or vapor produced from oil and gas wells.

**CONDENSER** - A heat exchanger in which the refrigerant, compressed to a hot gas, is condensed to liquid by rejecting heat.

**CONDITIONED FLOOR AREA** - The floor area of enclosed conditioned spaces on all floors measured from the interior surfaces of exterior partitions for nonresidential buildings and from the exterior surfaces of exterior partitions for residential buildings. [See California Code of Regulations, Title 24, Section 2-5302]

**CONDITIONED SPACE** - Enclosed space that is either directly conditioned space or indirectly conditioned space. [See California Code of Regulations, Title 24, Section 2-5302]

**CONDITIONED SPACE, DIRECTLY** -- An enclosed space that is provided with heating equipment that has a capacity exceeding 10 Btus/(hr-ft<sup>2</sup>), or with cooling equipment that has a capacity exceeding 10 Btus/(hr-ft<sup>2</sup>). An exception is if the heating and cooling equipment is designed and thermostatically controlled to maintain a process environment temperature less than 65 degrees Fahrenheit or greater than 85 degrees Fahrenheit for the whole space the equipment serves. [See California Code of Regulations, Title 24, Section 2- 5302]

**CONDITIONED SPACE, INDIRECTLY** --Enclosed space that: (1) has a greater area weighted heat transfer coefficient (u-value) between it and directly conditioned spaces than between it and the outdoors or unconditioned space; (2) has air transferred from directly conditioned space moving through it at a rate exceeding three air changes per hour.

**CONDUCTANCE** - The quantity of heat, in Btu's, that will flow through one square foot of



material in one hour, when there is a 1 degree F temperature difference between both surfaces. Conductance values are given for a specific thickness of material, not per inch thickness.

**CONDUCTION** - The transfer of heat energy through a material (solid, liquid or gas) by the motion of adjacent atoms and molecules without gross displacement of the particles.

**CONDUCTIVITY (k)** - The quantity of heat that will flow through one square foot of homogeneous material, one inch thick, in one hour, when there is a temperature difference of one degree Fahrenheit between its surfaces.

**CONGESTION** - A condition that occurs when insufficient transfer capacity is available to implement all of the preferred schedules simultaneously.

**CONGESTION MANAGEMENT** - Alleviation of congestion by the ISO.

**CONSERVATION** - Steps taken to cause less energy to be used than would otherwise be the case. These steps may involve improved efficiency, avoidance of waste, reduced consumption, etc. They may involve installing equipment (such as a computer to ensure efficient energy use), modifying equipment (such as making a boiler more efficient), adding insulation, changing behavior patterns, etc.

**CONTRACTS FOR DIFFERENCES (CFD)** -- A type of bilateral contract where the electric generation seller is paid a fixed amount over time which is a combination of the short-term market price and an adjustment with the purchaser for the difference. For example, a generator may sell a distribution company power for ten years at 6-cents/kilowatt-hour (kWh). That power is bid into Poolco at some low /kWh value (to ensure it is always taken). The seller then gets the market clearing price from the pool and the purchaser pays the producer the difference between the Poolco selling price and 6-cents/kWh (or vice versa if the pool price should go above the contract price).

**CONTRACT PATH** - The most direct physical transmission tie between two interconnected entities. When utility systems interchange power, the transfer is presumed to take place across the "contract path," notwithstanding the electrical fact that power flow in the network will distribute in accordance with network flow conditions. This term can also mean to arrange for power transfer between systems. (See also Parallel path flow)

**CONTINENTAL SHELF** - The portion of the sea bottom that slopes gradually from the edge of a continent. Usually defined as areas where water is less than 200 meters or 600 feet deep.

**CONTROL AREA** - An electric power system, or a combination of electric power systems, to which a common automatic generation control (AGC) is applied to match the power output of generating units within the area to demand. The control area of the ISO is the state of California.

**CONTINGENCY PLANNING** - The Energy Commission's strategy to respond to impending energy emergencies such as curtailment or shortage of fuel or power because of natural disasters or the result of human or political causes, or a clear threat to public health, safety or welfare. The [contingency plan](#) specifies state actions to alleviate the impacts of a possible

shortage or disruption of petroleum, natural gas or electricity. The plan is reviewed and updated at least every five years, with the last plan being adopted in 1993. Legislative authority for the California Energy Shortage Contingency Plan is found in [Public Resources Code, Section 25216.5](#).

CONVECTION - Transferring heat by moving air, or transferring heat by means of upward motion of particles of liquid or gas heat from beneath.

CONVECTION - Heat transfer by the movement of fluid.

CONVENTIONAL GAS - Natural gas occurring in nature, as opposed to synthetic gas.

CONVERSION - device or kit by which a conventional fuel vehicle is changed to an alternative fuel vehicle.

CONVERTED VEHICLE - a vehicle originally designed to operate on gasoline that has been modified or altered to run on an alternative fuel.

CONVERSION FUEL FACTOR - A number stating units of one system in corresponding values of another system.

CONVERTER - Any technology that changes the potential energy in a fuel into a different form of energy such as heat or motion. The term also is used to mean an apparatus that changes the quantity or quality of electrical energy.

CONVECTION - Transfer by the movement of fluid.

COOLING CAPACITY, LATENT -- Available refrigerating capacity of an air conditioning unit for removing latent heat from the space to be conditioned.

COOLING CAPACITY, SENSIBLE -- Available refrigerating capacity of an air conditioning unit for removing sensible heat from the space to be conditioned.

COOLING CAPACITY, TOTAL - Available refrigerating capacity of an air conditioner for removing sensible heat and latent heat from the space to be conditioned.

COOLING DEGREE DAY - A unit of measure that indicates how heavy the air conditioning needs are under certain weather conditions.

COOLING LOAD - The rate at which heat must be extracted from a space in order to maintain the desired temperature within the space.

COOLING LOAD TEMPERATURE DIFFERENCE (CLTD) - A value used in cooling load calculations for the effective temperature difference ( $\Delta T$ ) across a wall or ceiling, which accounts for the effect of radiant heat as well as the temperature difference.

**COOLING TOWER** - A device for evaporatively cooling water by contact with air.

**CO-OP** - This is the commonly used term for a rural electric cooperative. Rural electric cooperatives generate and purchase wholesale power, arrange for the transmission of that power, and then distribute the power to serve the demand of rural customers. Co-ops typically become involved in ancillary services such as energy conservation, load management and other demand-side management programs in order to serve their customers at least cost.

**COOPERATIVE (Electric utility)** - A joint venture organized by consumers to make electric utility service available in their area.

**CORD** --A measure of volume, 4 by 4 by 8 feet, used to define amounts of stacked wood available for use as fuel. Burned, a cord of wood produces about 5 million calories of energy.

**CORPORATE AVERAGE FUEL ECONOMY (CAFE)** - A sales-weighted average fuel mileage calculation, in terms of miles per gallon, based on city and highway fuel economy measurements performed as part of the federal emissions test procedures. CAFE requirements were instituted by the Energy Policy and Conservation Act of 1975 (89 Statute. 902) and modified by the Automobile Fuel Efficiency Act of 1980 (94 Statute. 1821). For major manufacturers, CAFE levels in 1996 are 27.5 miles per gallon for light-duty automobiles. CAFE standards also apply to some light trucks. The Alternative Motor Fuels Act of 1988 allows for an adjusted calculation of the fuel economy of vehicles that can use alternative fuels, including fuel-flexible and dual-fuel vehicles.

**CRUDE OIL** - Petroleum as found in the earth, before it is refined into oil products. Also called **CRUDE**.

**CRUDE OIL STOCKS** - Stocks held at refineries and at pipeline terminals. Does not include stocks held on leases (storage facilities adjacent to the wells). In California, crude oil stocks in 1990 are approximately 18 million barrels on any given day.

**CUBIC FOOT** - The most common unit of measurement of natural gas volume. It equals the amount of gas required to fill a volume of one cubic foot under stated conditions of temperature, pressure and water vapor. One cubic foot of natural gas has an energy content of approximately 1,000 Btus. One hundred (100) cubic feet equals one therm ( $100 \text{ ft}^3 = 1 \text{ therm}$ ).

**CFM (cubic feet per minute)** - A measure of flow rate. **CURIE** - A measure of radioactivity.

# Letter D

**DAY-AHEAD MARKET** - The forward market for energy and ancillary services to be supplied during the settlement period of a particular trading day that is conducted by the ISO, the PX, and other Scheduling Coordinators. This market closes with the ISO's acceptance of the final day-ahead schedule.

**DAY-AHEAD SCHEDULE** - Day-ahead Schedule A schedule prepared by a Scheduling Coordinator or the ISO before the beginning of a trading day. This schedule indicates the levels of generation and demand scheduled for each settlement period of that trading day.

**DAYLIGHTING** --The use of sunlight to supplement or replace electric lighting.

**DAYLIGHTING CONTROL** - A control system that varies the light output of an electric lighting system in response to variations in available daylight.

**DEEP MINING** Extraction of coal or minerals at depths greater than 1,000 feet. Coal usually is deep-mined at not more than 1,500 feet.

**DEGREE DAY** - A unit, based upon temperature difference and time, used in estimating fuel consumption and specifying nominal annual heating load of a building. When the mean temperature is less than 65 degrees Fahrenheit the heating degree days are equal to the total number of hours that temperature is less than 65 degrees Fahrenheit for an entire year.

**DEINTEGRATION** - (See disaggregation)

**DELTA** - A difference in temperature. Often used in the context of the difference between the design indoor temperature and the outdoor temperature.

**DEMAND** - The rate at which energy is delivered to loads and scheduling points by generation, transmission or distribution facilities.

**DEMAND SITE MANAGEMENT** - Planning, implementation, and evaluation of utility-sponsored programs to influence the amount or timing of customers' energy use.

**DEMAND (Utility)** The level at which electricity or natural gas is delivered to users at a given point in time. Electric demand is expressed in kilowatts.

**DEMAND BID** - Demand Bid A bid into the PX indicating a quantity of energy or an ancillary service that an eligible customer is willing to purchase and, if relevant, the maximum price that the customer is willing to pay.

**DEMAND BILLING** The electric capacity requirement for which a large user pays. It may be based on the customer's peak demand during the contract year, on a previous maximum or on an agreed minimum. Measured in kilowatts.

**DEMAND CHARGE** The sum to be paid by a large electricity consumer for its peak usage level.

**DEMAND SIDE MANAGEMENT (DSM)** The methods used to manage energy demand including energy efficiency, load management, fuel substitution and load building. See [LOAD MANAGEMENT](#).

**DEMONSTRATION** - The application and integration of a new product or service into an existing or new system. Most commonly, demonstration involves the construction and operation of a new electric technology interconnected with the electric utility system to demonstrate how it interacts with the system. This includes the impacts the technology may have on the system and the impacts that the larger utility system might have on the functioning of the technology.

**DENSITY** - The mass of a unit volume of a substance.

[\(U.S.\) DEPARTMENT OF ENERGY \(US DOE\)](#) -- The federal department established by the Department of Energy Organization Act to consolidate the major federal energy functions into one cabinet-level department that would formulate a comprehensive, balanced national energy policy. DOE's main headquarters are in Washington, D.C.

**DEPENDABLE CAPACITY** The system's ability to carry the electric power for the time interval and period specified. Dependable capacity is determined by such factors as capability, operating power factor and portion of the load the station is to supply.

**DEPLETABLE ENERGY SOURCES** -- 1) electricity purchased from a public utility 2) energy obtained from burning coal, oil, natural gas or liquefied petroleum gases. [See California Code of Regulations, Title 24, Section 2-5302]

**DEREGULATION** - The elimination of regulation from a previously regulated industry or sector of an industry.

**DERIVATIVES** - A specialized security or contract that has no intrinsic overall value, but whose value is based on an underlying security or factor as an index. A generic term that, in the energy field, may include options, futures, forwards, etc.

**DIESEL OIL** - Fuel for diesel engines obtained from the distillation of petroleum. It is composed chiefly of aliphatic hydrocarbons. Its volatility is similar to that of gas oil. Its efficiency is measured by cetane number.

**DIFFUSE RADIATION** - Solar radiation, scattered by water vapor, dust and other particles as it passes through the atmosphere, so that it appears to come from the entire sky. Diffuse radiation is higher on hazy or overcast days than on clear days.

**DIRECT ACCESS** - The ability of a retail customer to purchase commodity electricity directly from the wholesale market rather than through a local distribution utility. (See also Retail Competition)

**DIRECT CURRENT (DC)** - Electricity that flows continuously in the same direction.

**DIRECT ENERGY CONVERSION** - Production of electricity from an energy source without transferring the energy to a working fluid or steam. For example, photovoltaic cells transform light directly into electricity. Direct conversion systems have no moving parts and usually produce direct current.

**DIRECT EXPANSION** - (refrigeration) - Any system that, in operation between an environment where heat is absorbed (heat source), and an environment into which unwanted heat is directed (heat sink) at two different temperatures, is able to absorb heat from the heat source at the lower temperature and reject heat to the heat sink at the higher temperature. The cooling effect is obtained directly from a fluid called a refrigerant that absorbs heat at a low temperature and pressure, and transfers heat at a higher temperature and higher pressure.

**DIRECT RADIATION** - Radiation that has traveled a straight path from the sun, as opposed to diffuse radiation.

**DIRECT SOLAR GAIN** - Solar energy collected from the sun (as heat) in a building through windows, walls, skylights, etc.

**DIRECTLY CONDITIONED SPACE** -- See [conditioned space, directly](#).

**DISAGGREGATION** - The functional separation of the vertically integrated utility into smaller, individually owned business units (i.e., generation, dispatch/control, transmission, distribution). The terms "deintegration," "disintegration" and "delamination" are sometimes used to mean the same thing. (See also "Divestiture.")

**DISSOLVED GAS** - Natural gas that can be developed for commercial use, and which is found mixed with oil in naturally occurring underground formations.

**DISTRIBUTION** - The delivery of electricity to the retail customer's home or business through low voltage distribution lines.

**DISTRIBUTED GENERATION** - A distributed generation system involves small amounts of generation located on a utility's distribution system for the purpose of meeting local (substation level) peak loads and/or displacing the need to build additional (or upgrade) local distribution lines.

**DISTRIBUTION SYSTEM (Electric utility)** - The substations, transformers and lines that convey electricity from high-power transmission lines to ultimate consumers. [See GRID](#).

**DISTRIBUTION UTILITY (Disco)** - The regulated electric utility entity that constructs and maintains the distribution wires connecting the transmission grid to the final customer. The Disco can also perform other services such as aggregating customers, purchasing power supply and transmission services for customers, billing customers and reimbursing suppliers, and offering other regulated or non-regulated energy services to retail customers. The "wires" and "customer

service" functions provided by a distribution utility could be split so that two totally separate entities are used to supply these two types of distribution services.

**DIVESTITURE** - The stripping off of one utility function from the others by selling (spinning-off) or in some other way changing the ownership of the assets related to that function. Most commonly associated with spinning-off generation assets so they are no longer owned by the shareholders that own the transmission and distribution assets. (See also "Disaggregation.")

**DOSE** - The amount of ionizing radiation energy absorbed per unit mass of irradiated material at a specific location, such as a part of a human body.

**DOUBLE GLAZING** - Windows having two sheets of glass with an airspace between.

**DRY BULB TEMPERATURE** - A measure of the sensible temperature of air.

**DRY HOLE** - A drilled well that does not yield gas and/or oil quantities or condition to support commercial production; also applied to gas that has been produced and from which liquid components have been removed.

**DRY STEAM** - The conventional type of geothermal energy used for electricity production in California. Dry steam captured at the earth's surface is used to run electric turbines. The principal dry steam resource area is the Geysers in Northern California; one of only two known areas in the world for dry steam - the other being Larderello, Italy.

**DUAL-DUCT SYSTEM** - A central plant heating , ventilation and air conditioning (HVAC ) system that produces conditioned air at two temperatures and humidity levels. The air is then supplied through two independent duct systems to the points of usage where mixing occurs.

**DUAL-FUEL or BI-FUEL VEHICLE** refers to a vehicle capable of operating on two different fuels, in distinct fueling systems, such as compressed natural gas and gasoline.

**DUAL-PANED (double-glazed)** - Two panes of glass or other transparent material, separated by a space.

**DUCT** - A passageway made of sheet metal or other suitable material used for conveying air or other gas at relatively low pressures.

**DUMP** - Excess hydropower that cannot be stored or conserved. Also know as **SPILL ENERGY**.

# Letter E

**ECOLOGY** - The study of interrelationships of animals and plants to one another and to their environment.

**ECONOMIC EFFICIENCY** - A term that refers to the optimal production and consumption of goods and services. This generally occurs when prices of products and services reflect their marginal costs. Economic efficiency gains can be achieved through cost reduction, but it is better to think of the concept as actions that promote an increase in overall net value (which includes, but is not limited to, cost reductions).

**ECONOMIES OF SCALE** - Economies of scale exist where the industry exhibits decreasing average long-run costs with size.

**ECONOMIZER AIR** - A ducting arrangement and automatic control system that allows a heating, ventilation and air conditioning (HVAC) system to supply up to 100 percent outside air to satisfy cooling demands, even if additional mechanical cooling is required.

**ECONOMIZER WATER** - A system which uses either direct evaporative cooling, or a secondary evaporatively cooled water loop and cooling coil to satisfy cooling loads, even if additional mechanical cooling is required.

**ECONOMY ENERGY (Electricity utility)** - Electricity purchased by one utility from another to take the place of electricity that would have cost more to produce on the utility's own system.

**ECOSYSTEM** - The interacting system of biological community and its nonliving environment.

**EDISON, THOMAS ALVA** - The "father" of the American energy industry, Thomas Edison was an American inventor who was born in 1847 and died in 1931. He patented a total of 1,093 inventions - more than any other person in American history. Among the most important were the incandescent electric light bulb (1879), the phonograph (1877) and the movie projector (1893).

**EELI** - Edison Electric Institute. An association of electric companies formed in 1933 "to exchange information on industry developments and to act as an advocate for utilities on subjects of national interest."

**ELCON** - Electricity Consumers Resources Council. ELCON is an association of 28 large industrial consumers of electricity. ELCON members account for over five percent of all electricity consumed in the United States. ELCON was formed in 1976 "to enable member companies to "work cooperatively for the development of coordinated, rational and consistent policies affecting electric energy supply and pricing at the federal, state, and local levels."

**ELECTRIC UTILITY** - Any person or state agency with a monopoly franchise (including any municipality), which sells electric energy to end-use customers; this term includes the Tennessee valley Authority, but does not include other Federal power marketing agency (from EPAAct).

**EMBEDDED COSTS EXCEEDING MARKET PRICES (ECEMP)** - Embedded costs of utility investments exceeding market prices are: 1) costs incurred pursuant to a regulatory or contractual obligation; 2) costs that are reflected in cost-based rates; and 3) cost-based rates that exceed the price of alternatives in the marketplace. ECEMPs may become "stranded costs" where they exceed the amount that can be recovered



through the asset's sale. Regulatory questions involve whether such costs should be recovered by utility shareholders and if so, how they should be recovered. "Transition costs" are stranded costs which are charged to utility customers through some type of fee or surcharge after the assets are sold or separated from the vertically-integrated utility. "**Stranded assets**" are assets which cannot be sold for some reason. The British nuclear plants are an example of stranded assets which no one would buy. (Also referred to as Transition Costs.)

**ENERGY EFFICIENCY** - Using less energy/electricity to perform the same function. Programs designed to use electricity more efficiently - doing the same with less. For the purpose of this paper, energy efficiency is distinguished from DSM programs in that the latter are utility-sponsored and -financed, while the former is a broader term not limited to any particular sponsor or funding source. "Energy conservation" is a term which has also been used but it has the connotation of doing without in order to save energy rather than using less energy to do the same thing and so is not used as much today. Many people use these terms interchangeably.

**EPA** - The Environmental Protection Agency. A federal agency charged with protecting the environment.

**EPAct** - The Energy Policy Act of 1992 addresses a wide variety of energy issues. The legislation creates a new class of power generators, exempt wholesale generators (EWGs), that are exempt from the provisions of the Public Utilities Holding Company Act of 1935 and grants the authority to FERC to order and condition access by eligible parties to the interconnected transmission grid.

**ESCO** - Efficiency Service Company - A company that offers to reduce a client's electricity consumption with the cost savings being split with the client.

**EXEMPT WHOLESALE GENERATOR (EWG)** - Created under the 1992 National Energy Policy Act, these wholesale generators are exempt from certain financial and legal restrictions stipulated in the Public Utilities Holding Company Act of 1935.

**EER** - (Energy Efficiency Ratio) the ratio of cooling capacity of an air conditioning unit in Btus per hour to the total electrical input in watts under specified test conditions. California Code of Regulations, Section 1602(c)(6).

**EFFICACY, LIGHTING** - The ratio of light from a lamp to the electrical power consumed, including ballast losses, expressed as lumens per watt. [See California Code of Regulations, Title 24, Section 2-5302]

**EFFICIENCY** - The ratio of the useful energy delivered by a dynamic system (such as a machine, engine, or motor) to the energy supplied to it over the same period or cycle of operation. The ratio is usually determined under specific test conditions.

**ELECTRIC GENERATOR** - A device that converts a heat, chemical or mechanical energy into electricity.

**ELECTRIC RESISTANCE HEATER** - A device that produces heat through electric resistance. For example, an electric current is run through a wire coil with a relatively high electric resistance, thereby converting the electric energy into heat which can be transferred to the space by fans.

**ELECTRIC RADIANT HEATING** - A heating system in which electric resistance is used to produce heat which radiates to nearby surfaces. There is no fan component to a radiant heating system.

**ELECTRICITY** - A property of the basic particles of matter. A form of energy having magnetic, radiant and chemical effects. Electric current is created by a flow of charged particles (electrons).

**ELECTROLYSIS** - Breaking a chemical compound down into its elements by passing a direct current through it. Electrolysis of water, for example, produces hydrogen and oxygen.

**ELECTROMAGNETIC FIELDS (EMF)** - Ordinary every day use of electricity produces magnetic and electric fields. These 60 Hertz fields (fields that go back and forth 60 times a second) are associated with electrical appliances, power lines and wiring in buildings.

**ELEMENT** - A substance consisting entirely of atoms of the same atomic number.

**ELEVATION** - 1) The height above sea level (altitude); 2) A geometrical projection, such as a building, on a plane perpendicular to the horizon.

**EMERGENCY CORE COOLING SYSTEM (ECCS)** - Equipment designed to cool the core of a nuclear reactor in the event of a complete loss of the coolant.

**EMISSION STANDARD** - The maximum amount of a pollutant legally permitted to be discharged from a single source.

**EMISSIVITY** - The property of emitting radiation; possessed by all materials to a varying extent.

**EMITTANCE** - The emissivity of a material, expressed as a fraction. Emittance values range from 0.05 for brightly polished metals to 0.96 for flat black paint.

**ENERGY** - The capacity for doing work. Forms of energy include: thermal, mechanical, electrical and chemical. Energy may be transformed from one form into another.

**ENERGY BUDGET** - A requirement in the Building Energy Efficiency Standards that a proposed building be designed to consume no more than a specified number of British thermal units (Btus) per year per square foot of conditioned floor area.

**EER (Energy Efficiency Ratio)** - The ratio of cooling capacity of an air conditioning unit in Btus per hour to the total electrical input in watts under specified test conditions. [See California Code of Regulations, Title 20, Section 1602(c)(6)]

**ENERGY MANAGEMENT SYSTEM** - A control system (often computerized) designed to regulate the energy consumption of a building by controlling the operation of energy consuming systems, such as the heating, ventilation and air conditioning (HVAC), lighting and water heating systems.

**ENERGY CHARGE** - The amount of money owed by an electric customer for kilowatt-hours consumed.

**ENERGY CONSUMPTION** - The amount of energy consumed in the form in which it is acquired by the user. The term excludes electrical generation and distribution losses.

**ENERGY/FUEL DIVERSITY** - policy that encourages the development of energy technologies to diversify energy supply sources, thus reducing reliance on conventional (petroleum) fuels; applies to all energy sectors.

**ENERGY EFFICIENCY RATIO (EER)** See EER.

**ENERGY RESERVES** - The portion of total energy resources that is known and can be recovered with presently available technology at an affordable cost.

**ENERGY RESOURCES** - Everything that could be used by society as a source of energy.

**ENERGY RESOURCES PROGRAM ACCOUNT (ERPA)** - The state law that directs California electric utility companies to gather a state energy surcharge of two-tenths of one mil (\$0.0002) per kilowatt hour of electricity consumed by a customer. These funds are used for operation of the California Energy Commission.

**ENERGY SECURITY/FUEL SECURITY** - policy that considers the risk of dependence on fuel sources located in remote and unstable regions of the world and the benefits of domestic and diverse fuel sources.

**ENTITLEMENT** - Electric energy or generating capacity that a utility has a right to access under power exchange or sales agreements.

**ENVIRONMENTAL PROTECTION AGENCY (EPA)** - A federal agency created in 1970 to permit coordinated governmental action for protection of the environment by systematic abatement and control of pollution through integration or research, monitoring, standards setting and enforcement activities.

**ENTHALPY** - The quantity of heat necessary to raise the temperature of a substance from one point to a higher temperature. The quantity of heat includes both latent and sensible.

**ESCO** - Efficiency Service Company. A company that offers to reduce a client's electricity consumption with the cost savings being split with the client.

**ETHANOL** (also know as Ethyl Alcohol or Grain Alcohol,  $\text{CH}_3\text{CH}_2\text{OH}$ ) - a liquid that is produced chemically from ethylene or biologically from the fermentation of various sugars from carbohydrates found in agricultural crops and cellulosic residues from crops or wood. Used in the United States as a gasoline octane enhancer and oxygenate, it increases octane 2.5 to 3.0 numbers at 10 percent concentration. Ethanol can also be used in higher concentration (E85) in vehicles optimized for its use.

**ETHYL TERTIARY BUTYL ETHER (ETBE)** - an aliphatic ether similar to MTBE. This fuel oxygenate is manufactured by reacting isobutylene with ethanol. Having high octane and low volatility characteristics, ETBE can be added to gasoline up to a level of approximately 17 percent by volume. ETBE is used as an oxygenate in some reformulated gasolines.

**ETHYLENE** - A colorless gas that burns and is an oil refinery product.

**EVAPORATIVE COOLING** - Cooling by exchange of latent heat from water sprays, jets of water, or wetted material.

**EXCEPTIONAL METHOD** - An approved alternative calculation method that analyzes designs, materials, or devices that cannot be adequately modeled using public domain computer programs. Exceptional methods must be submitted to and approved by the California Energy Commission. [See California Code of Regulations, Title 20, Section 1409(b)3] Two examples of exceptional methods are the controlled ventilation crawl space (CVC) credit and the combined hydronic space and water heating method.

**EXCHANGE (Electric utility)** - Agreements between utilities providing for purchase, sale and trading of power. Usually relates to capacity (kilowatts) but sometimes energy (kilowatt-hours).

**EXECUTIVE ORDER NUMBER 6** - A provision under the California Emergency Services Act permits the Governor to establish, by Executive Order Number 6, a state Petroleum Fuels Set-Aside Program after proclamation of an energy emergency.

**Exempt Wholesale Generator(EWG)** - Created under the 1992 Energy Policy Act, these wholesale generators are exempt from certain financial and legal restrictions stipulated in the Public Utilities Holding Company Act of 1935.

**EXFILTRATION** - Air flow outward through a wall, building envelope, etc.

**EXHAUST** - Air removed deliberately from a space, by a fan or other means, usually to remove contaminants from a location near their source.

**EXPORTS (Electric utility)** - Power capacity or energy that a utility is required by contract to supply outside of its own service area and not covered by general rate schedules.

**EXTRA HIGH VOLTAGE (EHV)** - Voltage levels higher than those normally used on transmission lines. Generally EHV is considered to be 345,000 volts or higher.

**EV (ELECTRIC VEHICLE)** - a vehicle powered by electricity, usually provided by batteries but may also be provided by photovoltaic (solar) cells or a fuel cell.

# Letter F

**FAHRENHEIT** - A temperature scale in which the boiling point of water is 212 degrees and its freezing point is 32 degrees. To convert Fahrenheit to Celsius, subtract 32, multiply by 5, and divide the product by 9. For example: 100 degrees Fahrenheit - 32 = 68; 68 x 5 = 340; 340 / 9 = 37.77 degrees Celsius.

**FAN COIL** - A component of a heating, ventilation and air conditioning (HVAC) system containing a fan and heating or cooling coil, used to distribute heated or cooled air.

**FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA)** - The federal agency in charge of disaster recovery in locations that have been declared disaster areas by a state's Governor and the President of the United States.

**FEDERAL ENERGY REGULATORY COMMISSION (FERC)** - An independent regulatory commission within the U.S. Department of Energy that has jurisdiction over energy producers that sell or transport fuels for resale in interstate commerce; the authority to set oil and gas pipeline transportation rates and to set the value of oil and gas pipelines for ratemaking purposes; and regulates wholesale electric rates and hydroelectric plant licenses.

**FENESTRATION** - In simplest terms, windows or glass doors. Technically fenestration is described as any transparent or translucent material plus any sash, frame, mullion or divider. This includes windows, sliding glass doors, French doors, skylights, curtain walls and garden windows.

**FIRM ENERGY** - Power supplies that are guaranteed to be delivered under terms defined by contract.

**FISSION** - A release of energy caused by the splitting of an atom's nucleus. This is the energy process used in conventional nuclear power plants to make the heat needed to run steam electric turbines.

**FISSIONABLE MATERIAL** - A substance whose atoms can be split by slow neutrons. Uranium-235, plutonium-239 and uranium-233 are fissionable materials.

**FLARE GAS** - Unwanted natural gas that is disposed of by burning as it is released from an oil field.

**FLAT PLATE** - A device used to collect solar energy. It is a piece of metal painted black on the side facing the sun, to absorb the sun's heat.

**FLEXIBLE FUEL VEHICLE (FFV)** - a vehicle that can operate on either alcohol fuels (methanol or ethanol) or regular unleaded gasoline or any combination of the two from the same tank.

**FLUE GAS** - Gas that is left over after fuel is burned and which is disposed of through a pipe or stack to the outer air.

**FLUIDIZED BED COMBUSTION** - A process for burning powdered coal that is poured in a liquid-like stream with air or gases. The process reduces sulfur dioxide emissions from coal combustion.

**FLUORESCENT LAMP** - A tubular electric lamp that is coated on its inner surface with a phosphor and that contains mercury vapor whose bombardment by electrons from the cathode provides ultraviolet light which causes the phosphor to emit visible light either of a selected color or closely approximating daylight.

**FLUOROCARBON GASES** - Propellants used in aerosol products and refrigerants that are believed to be causing depletion of the earth's ozone shield. [See CFCs.](#)

**FOOTCANDLE** - A unit of illuminance on a surface that is one foot from a uniform point source of light of one candle and is equal to one lumen per square foot.

**FORCED AIR UNIT (FAU)** - A central furnace equipped with a fan or blower that provides the primary means for circulation of air.

**FOSSIL FUEL** - Oil, coal, natural gas or their by-products. Fuel that was formed in the earth in prehistoric times from remains of living-cell organisms.

**FRACTIONAL DISTILLATION** the process of refining crude oil into various oil products. The various products are separated out in the order of their boiling points.

**FRAMING EFFECTS** - The effect of framing (wood or metal studs, joists, beams, etc.) on the overall U-value of a wall, roof, floor, window or other building surface. Framing generally increases the U-Value and decreases the R-Value of insulated surfaces.

**FRAMING PERCENTAGE** - The area of actual framing in an envelope assembly divided by the overall area of the envelope assembly. This percentage is used to calculate the overall U-value of an assembly.

**FREQUENCY** - The number of cycles which an alternating current moves through in each second. Standard electric utility frequency in the United States is 60 cycles per second, or 60 Hertz.

**FUEL** - A substance that can be used to produce heat.

**FUEL CELL** - A device or an electrochemical engine with no moving parts that converts the chemical energy of a fuel, such as hydrogen, and an oxidant, such as oxygen, directly into electricity. The principal components of a fuel cell are catalytically activated electrodes for the fuel (anode) and the oxidant (cathode) and an electrolyte to conduct ions between the two electrodes, thus producing electricity.

**FUEL GAS** - Synthetic gas used for heating or cooling. It has less energy content than pipeline-

quality gas.

FUEL OIL - Petroleum products that are burned to produce heat or power.

FUEL REPROCESSING (Nuclear) - The means for obtaining usable, fissionable material from spent reactor fuel.

FUEL ROD (Nuclear) - A long slender tube that holds fissionable material (fuel) for nuclear reactor use. Fuel rods are assembled into bundles called fuel elements or assemblies, which are loaded individually into the reactor core.

FUEL SECURITY - See [Energy Security](#).

FUSION ENERGY - A power source, now under development, based on the release of energy that occurs when atoms are combined under the most extreme heat and pressure. It is the energy process of the sun and the stars.

# Letter G

**GALLON** - A unit of volume. A U.S. gallon has 231 cubic inches or 3.785 liters.

**GAS** - Gaseous fuel (usually natural gas) that is burned to produce heat energy. The word also is used, colloquially, to refer to gasoline.

**GAS UTILITY** - any person engaged in, or authorized to engage in, distributing or transporting natural gas, including, but not limited to, any such person who is subject to the regulation of the Public Utilities Commission. **GASIFICATION** - The process where biomass fuel is reacted with sub- stoichiometric quantities of air and oxygen usually under high pressure and temperature along with moisture to produce gas which contains hydrogen, methane, carbon monoxide, nitrogen, water and carbon dioxide. The gas can be burned directly in a boiler, or scrubbed and combusted in an engine-generator to produce electricity. The three types of gasification technologies available for biomass fuels are the fixed bed updraft, fixed bed downdraft and fluidized bed gasifiers. Gasification is also the production of synthetic gas from coal.

**GASOHOL** - In the United States, gasohol (E10) refers to gasoline that contains 10 percent ethanol by volume. This term was used in the late 1970s and early 1980s but has been replaced in some areas of the country by terms such as E-10, Super Unleaded Plus Ethanol, or Unleaded Plus.

**GASOLINE** - A light petroleum product obtained by refining oil, and used as motor vehicle fuel.

**GAS SYNTHESIS** - A method producing synthetic gas from coal. Also called the **FISCHER-TROPSCH PROCESS**.

**GENERAL LIGHTING** - Lighting designed to provide a substantially uniform level of illumination throughout an area, exclusive of any provision for special visual tasks or decorative effects. [See California Code of Regulations, Title 24, Section 2-5302]

**GENERATING STATION** - A power plant.

**GENERATION COMPANY (GENCO)** - A regulated or non-regulated entity (depending upon the industry structure) that operates and maintains existing generating plants. The Genco may own the generation plants or interact with the short term market on behalf of plant owners. In the context of restructuring the market for electricity, Genco is sometimes used to describe a specialized "marketer" for the generating plants formerly owned by a vertically-integrated utility.

**GENERATION DISPATCH AND CONTROL** - Aggregating and dispatching (sending off to some location) generation from various generating facilities, providing backups and reliability services. Ancillary services include the provision of reactive power, frequency control, and load following.(Also see "Power Pool" and "Poolco" below.)

**GEOHERMAL ELEMENT** - an element of a county general plan consisting of a statement of geothermal development policies, including a diagram or diagrams and text setting forth



objectives, principles, standards, and plan proposals, including a discussion of environmental damages and identification of sensitive environmental areas, including unique wildlife habitat, scenic, residential, and recreational areas, adopted pursuant to Section 65303 of the Government Code. **GEOTHERMAL ENERGY** - Natural heat from within the earth, captured for production of electric power, space heating or industrial steam.

**GEOTHERMAL GRADIENT** - The change in the earth's temperature with depth. As one goes deeper, the earth becomes hotter.

**GEOTHERMAL STEAM** - Steam drawn from deep within the earth.

**GIGAWATT (GW)** - One thousand megawatts (1,000 MW) or, one million kilowatts (1,000,000 kW) or one billion watts (1,000,000,000 watts) of electricity. One gigawatt is enough to supply the electric demand of about one million average California homes.

**GIGAWATT-HOUR (GWH)** - One million kilowatt-hours of electric power. California's electric utilities generated a total of about 270,000 gigawatt-hours in 1988.

**GLAZING** - A covering of transparent or translucent material (typically glass or plastic) used for admitting light.

**GLOBAL CLIMATE CHANGE** - Gradual changing of global climates due to buildup of carbon dioxide and other greenhouse gases in the earth's atmosphere. Carbon dioxide produced by burning fossil fuels has reached levels greater than what can be absorbed by green plants and the seas.

**GREENHOUSE EFFECT** - The presence of trace atmospheric gases make the earth warmer than would direct sunlight alone. These gases (carbon dioxide [CO<sub>2</sub>], methane [CH<sub>4</sub>], nitrous oxide [N<sub>2</sub>O], tropospheric ozone [O<sub>3</sub>], and water vapor [H<sub>2</sub>O]) allow visible light and ultraviolet light (shortwave radiation) to pass through the atmosphere and heat the earth's surface. This heat is re-radiated from the earth in form of infrared energy (longwave radiation). The greenhouse gases absorb part of that energy before it escapes into space. This process of trapping the longwave radiation is known as the greenhouse effect. Scientists estimate that without the greenhouse effect, the earth's surface would be roughly 54 degrees Fahrenheit colder than it is today - too cold to support life as we know it. See [GLOBAL CLIMATE CHANGE](#).

**GREENHOUSE EFFECT (relating to buildings)** - The characteristic tendency of some transparent materials (such as glass) to transmit radiation with relatively short wavelengths (such as sunlight) and block radiation of longer wavelengths (such as heat). This tendency leads to a heat build-up within the space enclosed by such a material.

**GRID** - A system of interconnected power lines and generators that is managed so that the generators are dispatched as needed to meet the requirements of the customers connected to the grid at various points. Gridco is sometimes used to identify an independent company responsible for the operation of the grid.

**GRID** - The electric utility companies' transmission and distribution system that links power

plants to customers through high power transmission line service (110 kilovolt [kv] to 765 kv); high voltage primary service for industrial applications and street rail and bus systems (23 kv-138 kv); medium voltage primary service for commercial and industrial applications (4 kv to 35 kv); and secondary service for commercial and residential customers (120 v to 480 v). Grid can also refer to the layout of a gas distribution system of a city or town in which pipes are laid in both directions in the streets and connected at intersections.

**GROSS AREA** - The area of a surface including areas not belonging to that surface (such as windows and doors in a wall).

**GROSS NATIONAL PRODUCT (GNP)** - The total market value of the goods and services produced by a nation before deduction or depreciation charges and other allowance for capital consumption and is widely used as a measure of economic activity.

# Letter H

**H-COAL PROCESS** - A means of making coal cleaner so it will produce less ash and less sulfur emissions.

**HSPF** - See [HEATING SEASONAL PERFORMANCE FACTOR](#).

**HEAT BALANCE** - The outdoor temperature at which a building's internal heat gain (from people, lights and machines) is equal to the heat loss through windows, roof and walls.

**HEAT CAPACITY** - The amount of heat necessary to raise the temperature of a given mass one degree. Heat capacity may be calculated by multiplying the mass by the specific heat.

**HEAT ENGINE** - An engine that converts heat to mechanical energy.

**HEAT GAIN** - an increase in the amount of heat contained in a space, resulting from direct solar radiation, heat flow through walls, windows, and other building surfaces, and the heat given off by people, lights, equipment, and other sources.

**HEAT LOSS** - A decrease in the amount of heat contained in a space, resulting from heat flow through walls, windows, roof and other building surfaces and from exfiltration of warm air.

**HEAT PUMP** - An air-conditioning unit which is capable of heating by refrigeration, transferring heat from one (often cooler) medium to another (often warmer) medium, and which may or may not include a capability for cooling. This reverse-cycle air conditioner usually provides cooling in summer and heating in winter.

**HEAT RATE** - A number that tells how efficient a fuel-burning power plant is. The heat rate equals the Btu content of the fuel input divided by the kilowatt-hours of power output.

**HEAT TRANSFER** - Flow of heat energy induced by a temperature difference. Heat flow through a building envelope typically flows from a heated, or hot area to a cooled, or cold area.

**HEATING DEGREE DAY** - A unit that measure the space heating needs during a given period of time.

**HEATING LOAD** - The rate at which heat must be added to a space in order to maintain the desired temperature within the space.

**HEATING SEASONAL PERFORMANCE FACTOR** - A representation of the total heating output of a central air-conditioning heat pump in Btus during its normal usage period for heating, divided by the total electrical energy input in watt-hours during the same period, as determined using the test procedure specified in the California Code of Regulations, Title 20, Section 1603(c).

**HEATING VALUE** - The amount of heat produced by the complete combustion of a given amount of fuel.

**HEAVY WATER** - A type of hydrogen atom that may be used as fuel for fusion power plants. Also called DEUTERIUM, it is found in abundance in the seas.

**HEDGING CONTRACTS** - Contracts which establish future prices and quantities of electricity independent of the short-term market. Derivatives may be used for this purpose. (See Contracts for Differences, Forwards, Futures Market, and Options.)

**HELIOCHEMICAL** - Using solar radiation to cause chemical reactions.

**HELIO THERMAL** - A process that uses the sun's rays to produce heat.

**HERTZ** - A unit of electromagnetic wave frequency that is equal to one cycle per second. - It is named after Henrich R. Hertz.

**HIGH-SULFUR COAL** - Coal whose weight is more than one percent sulfur.

**HOME ENERGY ASSISTANCE PROGRAM (HEAP)** - A centrally operated direct payment program that assists eligible households in offsetting the cost of heating and cooling their homes. Payments are generally made in the form of dual party warrants (checks) made payable to the applicant and their designated utility company. The program is administered by the California Department of Economic Opportunity using federal and state funds. The toll-free number for the HEAP Program is (800) 433-4327.

**HORSEPOWER (HP)** - A unit for measuring the rate of doing work. One horsepower equals about three-fourths of a kilowatt (745.7 watts).

**HOT** - (Colloquial) - The word is sometimes used to describe electric utility lines that are carrying electric currently. It also is used to refer to anything that is highly radioactive.

**HOT DRY ROCK** - A geothermal resource created when impermeable, subsurface rock structures, typically granite rock 15,000 feet or more below the earth's surface, are heated by geothermal energy. The resource is being investigated as a source of energy production.

**HSPF (Heating Seasonal Performance Factor)** - A measure of heating efficiency for the total heating output of a central air-conditioning heat pump. Efficiency is derived according to federal test methods by using the total Btus during its normal usage period for heating divided by the total electrical energy input in watt-hours during the same period. California Code of Regulations, Section 2-1602(c)(7).

**HVAC (Heating Ventilation and Air Conditioning)** - A system that provides heating, ventilation and/or cooling within or associated with a building.

**HYDROELECTRIC POWER** - Electricity produced by falling water that turns a turbine generator.

Also referred to as HYDRO.

**HYDROELECTRIC SPILL GENERATION** - Hydroelectric generation in existence prior to January 1, 1998, that has no storage capacity and that, if backed down, would spill. This term also refers to a hydro resource that has exceeded or has inadequate storage capacity and is spilling, even though generators are operating at full capacity.

**HYBRID VEHICLE** - Usually a hybrid EV, a vehicle that employs a combustion engine system together with an electric propulsion system. Hybrid technologies expand the usable range of EVs beyond what an all-electric-vehicle can achieve with batteries only.

**HYDRONIC HEATING** - A system that heats a space using hot water which may be circulated through a convection or fan coil system or through a radiant baseboard or floor system.

**HYDROTHERMAL SYSTEMS** - Underground reservoirs that produce either dry steam or a mixture of steam and water.

**HYGAS** - A process that uses water to help produce pipeline-quality gas from coal.

# Letter I

**IMBALANCE ENERGY** - The real-time change in generation output or demand requested by the ISO to maintain reliability of the ISO-controlled grid. Sources of imbalance energy include regulation, spinning and non-spinning reserves, replacement reserve, and energy from other generating units that are able to respond to the ISO's request for more or less energy.

**ILEV (Inherently Low Emission Vehicle)** - Term used by federal government for any vehicle that is certified to meet the California Air Resources Board's Low Emission Vehicle (LEV) standards for non-methane organic gases and carbon monoxide, ULEV standards for nitrogen oxides and does not emit any evaporative emissions.

**IMPORTS (Electric utility)** - Power capacity or energy obtained by one utility from others under purchase or exchange agreement.

**IMPOUNDMENT** - A body of water confined by a dam, dike, floodgate or other artificial barrier.

**INCANDESCENT LAMP** - An electric lamp in which a filament is heated by an electric current until it emits visible light.

**INDEPENDENT POWER PRODUCER** -- An Independent Power Producer (IPP) generates power that is purchased by an electric utility at wholesale prices. The utility then resells this power to end-use customers. Although IPPs generate power, they are not franchised utilities, government agencies or QFs. IPPs usually do not own transmission lines to transmit the power that they generate.

**INDIGENOUS ENERGY RESOURCES** - Power and heat derived from sources native to California. These include geothermal, hydro, biomass, solar and wind energy. The term usually is understood to include cogeneration facilities.

**INDIRECTLY CONDITIONED SPACE** - See conditioned space, indirectly.

**INFILTRATION** - The uncontrolled inward leakage of air through cracks and gaps in the building envelope, especially around windows, doors and duct systems.

**INFILTRATION BARRIER** - A material placed on the outside or the inside of exterior wall framing to restrict inward air leakage, while permitting the outward escape of water vapor from the wall cavity. [See California Code of Regulations, Title 24, Section 2-5302]

**INFRASTRUCTURE** - generally refers to the recharging and refueling network necessary to successful development, production, commercialization and operation of alternative fuel vehicles, including fuel supply, public and private recharging and refueling facilities, standard specifications for refueling outlets, customer service, education and training, and building code regulations.

**INJECTION - (Petroleum)** - Forcing gas or water into an oil well to increase pressure and cause

more oil to come to the surface. See [THERMALLY ENHANCED OIL RECOVERY](#).

**IN-SITU COMBUSTION** - An experimental means of recovering hard-to-get petroleum by burning some of the oil in its natural underground reservoir. Also called **FIREFLOODING**.

**IN-SITU GASIFICATION** - Converting coal into synthetic gas at the place where the coal is found in nature.

**INSOLATION** - The total amount of solar radiation (direct, diffuse, and reflected) striking a surface exposed to the sky.

**INSULATION, THERMAL** - A material having a relatively high resistance of heat flow and used principally to retard heat flow. See [R-VALUE](#).

**INTERCHANGE (Electric utility)** - The agreement among interconnected utilities under which they buy, sell and exchange power among themselves. This can, for example, provide for economy energy and emergency power supplies.

**INTERCONNECTION (Electric utility)** - The linkage of transmission lines between two utilities, enabling power to be moved in either direction. Interconnections allow the utilities to help contain costs while enhancing system reliability.

**INTERESTED PARTY** - any person whom the commission finds and acknowledges as having a real and direct interest in any proceeding or action carried on, under, or as a result of the operation of, this division.

**INTERNAL COMBUSTION ENGINE** - An engine in which fuel is burned inside the engine. A car's gasoline engine or rotary engine is an example of a internal combustion engine. It differs from engines having an external furnace, such as a steam engine.

**INTERRUPTIBLE SERVICE (Electric utility)** - Electricity supplied under agreements that allow the supplier to curtail or stop service at times.

**INTERTIE** - A transmission line that links two or more regional electric power systems.

**INVESTOR-OWNED UTILITIES** - A private company that provides a utility, such as water, natural gas or electricity, to a specific service area. The investor-owned utility is regulated by the California Public Utilities Commission. In California the investor-owned utilities supplying energy are:

- Canadian Pacific National Corporation
- Pacific Gas and Electric Company
- Pacific Power and Light Company
- San Diego Gas & Electric
- Sierra Pacific Power Company
- Southern California Edison Company

- Southern California Gas Company (The Gas Company)
- Southwest Gas Corporation

ION - An atom or group of atoms that is electrically charged.

IOU - An investor owned utility. A company, owned by stockholders for profit, that provides utility services. A designation used to differentiate a utility owned and operated for the benefit of shareholders from municipally owned and operated utilities and rural electric cooperatives.

INTEGRATED RESOURCE PLANNING(IRP) - A public planning process and framework within which the costs and benefits of both demand- and supply-side resources are evaluated to develop the least-total-cost mix of utility resource options. In many states, IRP includes a means for considering environmental damages caused by electricity supply/transmission and identifying cost-effective energy efficiency and renewable energy alternatives. IRP has become a formal process prescribed by law in some states and under some provisions of the Clean Air Act amendments of 1992.

INTEGRATED RESOURCE PLANNING PRINCIPLES - The underlying principles of IRP can be distinguished from the formal process of developing an approved utility resource plan for utility investments in supply- and demand-side resources. A primary principle is to provide a framework for comparing a variety of supply- and demand-side and transmission resource costs and attributes outside of the basic provision (or reduction) of electric capacity and energy. These resources may be owned or constructed by any entity and may be acquired through contracts as well as through direct investments. Another principle is the incorporation of risk and uncertainty into the planning analysis. The public participation aspects of IRP allow public and regulatory involvement in the planning rather than the siting stage of project development.

IPP - INDEPENDENT POWER PRODUCER. An private entity that operates a generation facility and sells power to electric utilities for resale to retail customers.

ISDN - INTEGRATED SERVICES DIGITAL NETWORK. A 128 Kbps(kilobytes per second) digital telephone service available in many parts of the country though not universally available that may be able to substitute for fiber optic cable in every respect except possibly television transmission.

ISO - INDEPENDENT SYSTEM OPERATOR. A neutral operator responsible for maintaining instantaneous balance of the grid system. The ISO performs its function by controlling the dispatch of flexible plants to ensure that loads match resources available to the system.



# Letter J

**Joule** - A unit of work or energy equal to the amount of work done when the point of application of force of 1 newton is displaced 1 meter in the direction of the force. It takes 1,055 joules to equal a British thermal unit. It takes about 1 million joules to make a pot of coffee.

# Letter K

**KEROSENE** - Certain colorless, low-sulfur oil products that burn without producing much smoke.

**kBtu** - One-thousand (1,000) Btus.

**KILOVOLT (kv)** - One-thousand volts (1,000). Distribution lines in residential areas usually are 12 kv (12,000 volts).

**KILOWATT (kW)** - One thousand (1,000) watts. A unit of measure of the amount of electricity needed to operate given equipment. On a hot summer afternoon a typical home, with central air conditioning and other equipment in use, might have a demand of four kW each hour.

**KILOWATT-HOUR (kWh)** -- The most commonly-used unit of measure telling the amount of electricity consumed over time. It means one kilowatt of electricity supplied for one hour. In 1989, a typical California household consumes 534 kWh in an average month.

# Letter L

**LANDFILL GAS** - Gas generated by the natural degrading and decomposition of municipal solid waste by anaerobic microorganisms in sanitary landfills. The gases produced, carbon dioxide and methane, can be collected by a series of low-level pressure wells and can be processed into a medium Btu gas that can be burned to generate steam or electricity.

**LASER** - A very intense, uniform beam of electromagnetic radiation. Acronym for Light Amplification by Stimulated Emission of Radiation.

**LATENT HEAT** - A change in the heat content that occurs without a corresponding change in temperature, usually accompanied by a change of state (as from liquid to vapor during evaporation).

**LATENT LOAD** - The cooling load caused by moisture in the air.

**LATITUDE** - The angular distance north or south of the equator, measured in degrees of arc.

**LAYOFF (Electric utility)** - Excess capacity of a generating unit, available for a limited time under the terms of a power sales agreement.

**LAY UP** - Lay up is another term for cold storage and describes the status of equipment (such as a power plant) that has been placed in storage ("mothballed") for latter use.

**LEADED GASOLINE** - Gasoline containing tetraethyl lead, an important constituent in antiknock gasoline. Leaded gasoline is no longer sold in the United States.

**LOAD CENTERS** - A geographical area where large amounts of power are drawn by end-users.

**LIFE-CYCLE COST** - Amount of money necessary to own, operate and maintain a building over its useful life.

**LIFE EXTENSION** - A term used to describe capital expenses which reduce operating and maintenance costs associated with continued operation of electric utility boilers. Such boilers usually have a 40 year operating life under normal circumstances.

**LIFELINE RATES** - Rates charged by a utility company for the low income, the disadvantaged and senior citizens. The rates provide a discount for minimum necessary utilities, such as electricity requirements of typically 300 to 400 kilowatt/hours per month.

**LIGHT WATER REACTOR (LWR)** - A nuclear power unit that uses ordinary water to cool its core. The LWR may be a boiling water reactor or a pressurized water reactor.

**LIGNITE** - Brownish black coal having qualities in between those of bituminous coal and peat. The texture of the original wood often is visible in lignite.

**LIQUEFACTION** - The process of making synthetic liquid fuel from coal. The term also is used to mean a method for making large amounts of gasoline and heating oil from petroleum.

**LIQUEFIED GASES** - Gases that have been or can be changed into liquid form. These include butane, butylene, ethane, ethylene, propane and propylene.

**LNG (LIQUEFIED NATURAL GAS)** - Natural gas that has been condensed to a liquid, typically by cryogenically cooling the gas to minus 327.2 degrees Fahrenheit (below zero).

**LPG (LIQUEFIED PETROLEUM GAS)** - A mixture of gaseous hydrocarbons, mainly propane and butane that change into liquid form under moderate pressure. LPG or propane is commonly used as a fuel for rural homes for space and water heating, as a fuel for barbecues and recreational vehicles, and as a transportation fuel. It is normally created as a by-product of petroleum refining and from natural gas production.

**LIQUID BRINE** - A type of geothermal energy resource that depends on naturally occurring hot water solution found within the earth. Technology for this novel energy source is being developed in the Salton Sea area in Southern California.

**LIQUID PETROLEUM GAS** - See [LPG](#).

**LOAD** - The amount of electric power supplied to meet one or more end user's needs.

**LOAD** - An end-use device or an end-use customer that consumes power. Load should not be confused with demand, which is the measure of power that a load receives or requires.

**LOAD DIVERSITY** - The condition that exists when the peak demands of a variety of electric customers occur at different times. This is the objective of "load molding" strategies, ultimately curbing the total capacity requirements of a utility.

**LOAD FACTOR** - A percent telling the difference between the amount of electricity a consumer used during a given time span and the amount that would have been used if the usage had stayed at the consumer's highest demand level during the whole time. The term also is used to mean the percentage of capacity of an energy facility - such as power plant or gas pipeline -- that is utilized in a given period of time.

**LOAD MANAGEMENT** - Steps taken to reduce power demand at peak load times or to shift some of it to off-peak times. This may be with reference to peak hours, peak days or peak seasons. The main thing affecting electric peaks is air-conditioning usage, which is therefore a prime target for load management efforts. Load management may be pursued by persuading consumers to modify behavior or by using equipment that regulates some electric consumption.

**LOOP FLOW** - The difference between scheduled and actual power flows on electric transmission lines.

**LOSSES (Electric utility)** - Electric energy or capacity that is wasted in the normal operation of a power system. Some kilowatt-hours are lost in the form of waste heat in electrical apparatus such as substation conductors. **LINE LOSSES** are kilowatts or kilowatt-hours lost in transmission and distribution lines under certain conditions.

**LOW-E** - A special coating that reduces the emissivity of a window assembly, thereby reducing the heat transfer through the assembly.

**LOW EMISSION VEHICLE (LEV)** - a vehicle certified by the California Air Resources Board to have emissions from zero to 50,000 miles no higher than 0.075 grams/mile (g/mi) of non-methane organic gases, 3.4 g/mi of carbon monoxide, and 0.2 g/mi of nitrogen oxides. Emissions from 50,000 to 100,000 miles may be slightly higher (See chart in Chapter 2.) **LOW-SULFUR COAL** - Coal having one percent or less of sulfur by weight.

**LOW-SULFUR OIL** - Oil having one percent or less of sulfur by weight.

**LUMEN** - A measure of the amount of light available from a light source equivalent to the light emitted by one candle.

**LUMENS/WATT** - A measure of the efficacy of a light fixture; the number of lumens output per watt of power consumed.

**LUMEN MAINTENANCE CONTROL** - An electrical control device designed to vary the electrical consumption of a lighting system in order to maintain a specified illumination level.

**LUMINAIRE** - A complete lighting unit consisting of a lamp or lamps together with the parts designed to distribute the light, to position and protect the lamps and to connect the lamps to the power supply. California Code of Regulations, Section 2- 1602(h)].

**LUX** - A unit of illumination equal to the direct illumination on a surface that is everywhere one meter from a uniform point source of one candle; a unit of illumination that is equal to one lumen per square meter. Also see footcandle.

# Letter M

**M85** - a blend of 85 percent methanol and 15 percent unleaded regular gasoline, used as a motor fuel.

**M100** - 100 percent (neat) methanol used as a motor fuel in dedicated methanol vehicles, such as some heavy-duty truck engines.

**MAGMA** - The molten rock and elements that lie below the earth's crust. The heat energy can approach 1,000 degrees Fahrenheit and is generated directly from a shallow molten magma resource and stored in adjacent rock structures. To extract energy from magma resources requires drilling near or directly into a magma chamber and circulating water down the well in a convection- type system. California has two areas that may be magma resource sites: the Mono-Long Valley Caldera and Coso Hot Springs Known Geothermal Resource Areas.

**MAGNETO HYDRO DYNAMICS (MHD)** - A means of producing electricity directly by moving liquids or gases through a magnetic field.

**MAJOR NATURAL GAS PRODUCER** - any person who produces natural gas in amounts determined by the commission as having a major effect on energy supplies. **MAJOR MARKETER** - any person who sells natural gas or oil in amounts determined by the commission as having a major effect on energy supplies. **MAJOR OIL PRODUCER** - means any person who produces oil in amount determined by the commission as having a major effect on energy supplies. **MANUFACTURED GAS** - Gas produced by certain processes from oil, coal or coke.

**MARGINAL COST--** The sum that has to be paid the next increment of product of service. The marginal cost of electricity is the price to be paid for kilowatt-hours above and beyond those supplied by presently available generating capacity.

**MARKETER** - An agent for generation projects who markets power on behalf of the generator. The marketer may also arrange transmission, firming or other ancillary services as needed. Though a marketer may perform many of the same functions as a broker, the difference is that a marketer represents the generator while a broker acts as a middleman.

**MARKET-BASED PRICE** - A price set by the mutual decisions of many buyers and sellers in a competitive market.

**MARGINAL COST** - In the utility context, the cost to the utility of providing the next (marginal) kilowatt-hour of electricity, irrespective of sunk costs.

**MARKET CLEARING PRICE** - The price at which supply equals demand. The Day Ahead and Hour Ahead Markets.

**MARKET PARTICIPANT** - An entity, including a Scheduling Coordinator, who participates in the energy marketplace through the buying, selling, transmission, or distribution of energy or ancillary services into, out of, or through the ISO-controlled grid.

**MASTER FILE** - A file maintained by the PX for use in bidding and bid evaluation protocol that contains information on generating units, loads, and other resources eligible to bid into the PX.

**MARSH GAS** - A common term for gas that bubbles to the surface of the water in a marsh or swamp. It is colorless, odorless and can be explosive.

**MCF** - One thousand cubic feet of natural gas, having an energy value of one million Btu. A typical home might use six MCF in a month.

**MECHANICAL SYSTEM** - [See HVAC system.](#)

**MEGAWATT (MW)** - One thousand kilowatts (1,000 kW) or one million (1,000,000) watts. One megawatt is enough energy to power 1,000 average California homes.

**MEGAWATT HOUR (MWh)** - One thousand kilowatt-hours, or an amount of electricity that would supply the monthly power needs of 1,000 typical homes in the Western U.S. (This is a rounding up to 8,760 kWh/year per home based on an average of 8,549 kWh used per household per year [U.S. DOE EIA, 1997 annual per capita electricity consumption figures]).

**METER** - A device for measuring levels and volumes of a customer's gas and electricity use.

**METHANE (CH<sub>4</sub>)** - the simplest of hydrocarbons and the principal constituent of natural gas. Pure methane has a heating value of 1,1012 Btu per standard cubic foot.

**METHANOL** (also known as Methyl Alcohol, Wood Alcohol, CH<sub>3</sub>OH) - a liquid formed by catalytically combining carbon monoxide (CO) with hydrogen (H<sub>2</sub>) in a 1:2 ratio, under high temperature and pressure. Commercially it is typically made by steam reforming natural gas. Also formed in the destructive distillation of wood.

**METHYL TERTIARY BUTYL ETHER (MTBE)** - an ether manufactured by reacting methanol and isobutylene. The resulting ether has a high octane and low volatility. MTBE is a fuel oxygenate and is permitted in unleaded gasoline up to a level of 15 percent. It is one of the primary ingredients in reformulated gasolines.

**METHANE** - A light hydrocarbon that is the main component of natural gas and marsh gas. It is the product of the anaerobic decomposition of organic matter, enteric fermentation in animals and is one of the greenhouse gases. Chemical formula is CH<sub>4</sub>.

**MICROWAVE** - Electromagnetic radiation with wavelengths of a few centimeters. It falls between infrared and radio wavelengths on the electromagnetic spectrum. The radio wave beam can deliver electrical energy over long distances.

**MIL** - One-tenth of one cent \$0.001.

**MINIMUM GENERATION** - Generally, the required minimum generation level of a utility

system's thermal units. Specifically, the lowest level of operation of oil-fired and gas-fired units at which they can be currently available to meet peak load needs.

**MONOPOLY** - The only seller with control over market sales.

**MONOPSONY** - The only buyer with control over market purchases.

**MTBE (METHYL TERTIARY-BUTYL ETHER)** - A clean-burning oxygenate with high octane and low volatility added to unleaded gasoline to reduce carbon monoxide emissions.

**MUNICIPAL ELECTRIC UTILITY** - A power utility system owned and operated by a local jurisdiction.

**MUNICIPAL SOLID WASTE** - Locally collected garbage, which can be processed and burned to produce energy.

**MUNICIPALIZATION** - The process by which a municipal entity assumes responsibility for supplying utility service to its constituents. In supplying electricity, the municipality may generate and distribute the power or purchase wholesale power from other generators and distribute it.

**MUNICIPAL UTILITY** - A provider of utility services owned and operated by a municipal government.



# Letter N

**NARUC** - the national association of regulatory utility commissioners. An advisory council composed of governmental agencies of the fifty States, the District of Columbia, Puerto Rico and the Virgin Islands engaged in the regulation of utilities and carriers. "The chief objective is to serve the consumer interest by seeking to improve the quality and effectiveness of public regulation in America."

**NASUCA** - The National Association of Utility Consumer Advocates. NASUCA includes members from 38 states and the District of Columbia. It was formed "to exchange information and take positions on issues affecting utility rates before federal agencies, Congress and the courts."

**NATURAL GAS** - Hydrocarbon gas found in the earth, composed of methane, ethane, butane, propane and other gases.

**NATURAL GAS VEHICLE** - vehicles that are powered by compressed or liquefied natural gas.

**NATURAL MONOPOLY** - A situation where one firm can produce a given level of output at a lower total cost than can any combination of multiple firms. Natural monopolies occur in industries which exhibit decreasing average long-run costs due to size (economies of scale). According to economic theory, a public monopoly governed by regulation is justified when an industry exhibits natural monopoly characteristics.

**NCSL** - The National Conference of State Legislatures. A national advisory council which provides services to state legislatures "by bringing together information from all states to forge workable answers to complex policy questions."

**NGV (NATURAL GAS VEHICLE)** - vehicles that are powered by compressed or liquefied natural gas.

**NATURAL GASOLINE** - A mixture of liquids extracted from natural gas and suitable for blending with ordinary oil-derived gasoline.

**NEUTRON** - An uncharged particle found in the nucleus of every atom except that of hydrogen.

**NEWTON** - A unit of force. The amount of force it takes to accelerate one kilogram at one meter per second.

**NON-DEPLETABLE ENERGY SOURCES** - Energy which is not obtained from depletable energy sources. [See California Code of Regulations, Title 24, Section 2-5302]

**NONRESIDENTIAL BUILDING** - -- any building which is heated or cooled in its interior, and is of an occupancy type other than Type H, I, or J, as defined in the Uniform Building Code, 1973 edition, as adopted by the International Conference of Building Officials.

**NON-FIRM ENERGY** - Electricity that is not required to be delivered or to be taken under the terms of an electric purchase contract.

**NOPR** - A Notice of Proposed Rulemaking. A designation used by the FERC for some of its dockets.

**NOx** - Oxides of nitrogen that are a chief component of air pollution that can be produced by the burning of fossil fuels. Also called nitrogen oxides.

**NRTA** - Northwest Regional Transmission Association. A subregional transmission group within the Western Regional Transmission Association.

**NUCLEAR ENERGY** - Power obtained by splitting heavy atoms (fission) or joining light atoms (fusion). A nuclear energy plant uses a controlled atomic chain reaction to produce heat. The heat is used to make steam run conventional turbine generators.

**NUCLEAR REGULATORY COMMISSION (NRC)** - An independent federal agency that ensures that strict standards of public health and safety, environmental quality and national security are adhered to by individuals and organizations possessing and using radioactive materials. The NRC is the agency that is mandated with licensing and regulating nuclear power plants in the United States. It was formally established in 1975 after its predecessor, the Atomic Energy Commission, was abolished.

**NUG** - A non-utility generator. A generation facility owned and operated by an entity who is not defined as a utility in that jurisdictional area.

# Letter O

**OAPEC** - Acronym for Organization of Arab Petroleum Exporting Countries founded in 1968 for cooperation in economic and petroleum affairs. [See OPEC.](#)

**OBLIGATION TO SERVE** - The obligation of a utility to provide electric service to any customer who seeks that service, and is willing to pay the rates set for that service. Traditionally, utilities have assumed the obligation to serve in return for an exclusive monopoly franchise.

**OCEAN THERMAL GRADIENT (OTG)** - Temperature differences between deep and surface water. Deep water is likely to be 25 to 45 degrees Fahrenheit colder. The term also refers to experimental technology that could use the temperature differences as a means to produce energy.

**OCCUPANCY SENSOR** - A control device that senses the presence of a person in a given space, commonly used to control lighting systems in buildings.

**OCTANE** - A rating scale used to grade gasoline as to its antiknock properties. Also any of several isometric liquid paraffin hydrocarbons, C<sub>8</sub>H<sub>18</sub>. Normal octane is a colorless liquid found in petroleum boiling at 124.6 degrees Celsius.

**OCTANE RATING** - A measure of a gasoline's resistance to exploding too early in the engine cycle, which causes knocking. The higher the rating, the lower the chance of premature ignition.

**OFF-ROAD** - Any non-stationary device, powered by an internal combustion engine or motor, used primarily off the highways to propel, move, or draw persons or property, and used in any of the following applications: marine vessels, construction/farm equipment, locomotives, utility and lawn and garden equipment, off-road motorcycles, and off-highway vehicles.

**OHM** --A unit of measure of electrical resistance. One volt can produce a current of one ampere through a resistance of one ohm.

**OIL SHALE** - A type of rock containing organic matter that produces large amounts of oil when heated to high temperatures.

**OLIGOPOLY** - A few sellers who exert market control overprices.

**OPEC** - Acronym for Organization of Petroleum Exporting Countries founded in 1960 for unify and coordinate petroleum policies of the members. Headquarters is in Vienna, Austria.

**OPTIONS** - An option is a contractual agreement that gives the holder the right to buy (call option) or sell (put option) a fixed quantity of a security or commodity (for example, a commodity or commodity futures contract), at a fixed price, within a specified period of time. May either be standardized, exchange-traded, and government regulated, or over-the-counter customized and non-regulated.

**ORIENTATION** - the position of a building relative to the points of a compass.

**ORIGINAL EQUIPMENT MANUFACTURER (OEM)** - refers to the manufacturers of complete vehicles or heavy-duty engines, as contrasted with remanufacturers, converters, retrofitters, up-fitters, and repowering or rebuilding contractors who are overhauling engines, adapting or converting vehicles or engines obtained from the OEMs, or exchanging or rebuilding engines in existing vehicles.

**OUTAGE (Electric utility)** - An interruption of electric service that is temporary (minutes or hours) and affects a relatively small area (buildings or city blocks). [See BLACKOUT.](#)

**OUTER CONTINENTAL SHELF (OCS)** - The submerged lands extending from the out limit of the historic territorial sea (typically three miles) to some undefined outer limit, usually a depth of 600 feet. In the United States, this is the portion of the shelf under federal jurisdiction. [See CONTINENTAL SHELF.](#)

**OUTSIDE AIR** - Air taken from outdoors and not previously circulated through the HVAC system.

**OVER GENERATION** - A condition that occurs when total PX participant demand is less than or equal to the sum of regulatory must-take generation, regulatory must-run generation, and reliability must-run generation.

**OVERHANG** - Any horizontal projection that serves as a shading element for a window.

**OXYGENATE** - a term used in the petroleum industry to denote octane components containing hydrogen, carbon and oxygen in their molecular structure. Includes ethers such as MTBE and ETBE and alcohols such as ethanol or methanol. The oxygenate is a prime ingredient in reformulated gasoline. The increased oxygen content given by oxygenates promotes more complete combustion, thereby reducing tailpipe emissions.

**OXIDES OF NITROGEN** - [See NOx.](#)

**OZONE** - A kind of oxygen that has three atoms per molecule instead of the usual two. Ozone is a poisonous gas, but the ozone layer in the upper atmosphere shields life on earth from deadly ultraviolet radiation from space. The molecule contains three oxygen atoms (O<sub>3</sub>).

# Letter P

**PARALLEL PATH FLOW** - As defined by NERC, this refers to the flow of electric power on an electric system's transmission facilities resulting from scheduled electric power transfers between two other electric systems. (Electric power flows on all interconnected parallel paths in amounts inversely proportional to each path's resistance.)

**PARTIAL LOAD** - An electrical demand that uses only part of the electrical power available. [See California Code of Regulations, Title 24, Section 2-5342(e) 2]

**PARTICULATE MATTER (PM)** - Unburned fuel particles that form smoke or soot and stick to lung tissue when inhaled. A chief component of exhaust emissions from heavy-duty diesel engines.

**PASSIVE SOLAR ENERGY** - Use of the sun to help meet a building's energy needs by means of architectural design (such as arrangement of windows) and materials (such as floors that store heat, or other thermal mass).

**PASSIVE SOLAR SYSTEM** - A solar heating or cooling system that uses no external mechanical power to move the collected solar heat.

**PEAK LOAD OR PEAK DEMAND** - The electric load that corresponds to a maximum level of electric demand in a specified time period.

**PERFORMANCE-BASED REGULATION (PBR)** - Any rate-setting mechanism which attempts to link rewards (generally profits) to desired results or targets. PBR sets rates, or components of rates, for a period of time based on external indices rather than a utility's cost-of-service. Other definitions include light-handed regulation which is less costly and less subject to debate and litigation. A form of rate regulation which provides utilities with better incentives to reduce their costs than does cost-of-service regulation.

**PEAK DEMAND** - See PEAK LOAD.

**PEAK LOAD** - The highest electrical demand within a particular period of time. Daily electric peaks on weekdays occur in late afternoon and early evening, usually between 4 to 7 p.m. in the winter and 12 to 8 p.m. in the summer. Annual peaks occur on hot summer days.

**PEAK LOAD POWER PLANT**-- A power generating station that is normally used to produce extra electricity during peak load times.

**PEAKING UNIT** - A power generator used by a utility to produce extra electricity during peak load times.

**PEAT** - A heterogeneous mixture of partly decomposed organic matter that has accumulated in a water saturated environment over a very long period of time. Peat geologically is considered a very young form of coal and has a heating value of 6,600 Btu/pound in situ. California has minor

peat resources.

**PETROCHEMICALS** - Chemicals made from oil.

**PETRODOLLARS** - Money paid to other countries for oil imported to the United States.

**PADD (PETROLEUM ADMINISTRATION FOR DEFENSE DISTRICTS)** --The United States is divided by the U.S. Department of Energy into five PADD regions for planning purposes. The states within PADD V are Alaska, Arizona, California, Hawaii, Nevada, Oregon and Washington, which are linked closely by their oil supply network. Since very little petroleum product is export outside the district, PADD V is essentially a self-contained oil supply system with Alaska and California the main producers and California refining the majority of the crude oil consumed in the PADD.

**PERM** - The measurement of water vapor through different materials measured in perm-inch (mass of water vapor moving through a unit area in unit time).

**PETROLEUM** - Oil as found in its natural state under the ground.

**PHOTOCELL** - A device that produces an electric reaction to visible radiant energy (light).

**PHOTOSYNTHESIS** - A process by which green plants change carbon dioxide into oxygen and organic materials. The energy for this process comes from sunlight.

**PHOTOVOLTAIC CELL** - A semiconductor that converts light directly into electricity.

**PIPELINE** - A line of pipe with pumping machinery and apparatus (including valves, compressor units, metering stations, regulator stations, etc.) for conveying a liquid or gas.

**POOLCO** - Poolco refers to a specialized, centrally dispatched spot market power pool that functions as a short-term market. It establishes the short-term market clearing price and provides a system of long-term transmission compensation contracts. It is regulated to provide open access, comparable service and cost recovery. A poolco would make ancillary generation services, including load following, spinning reserve, backup power, and reactive power, available to all market participants on comparable terms. In addition, the Poolco provides settlement mechanisms when differences in contracted volumes exist between buyers and sellers of energy and capacity.

**PORTFOLIO MANAGEMENT** - The functions of resource planning and procurement under a traditional utility structure. Portfolio management can also be defined as the aggregation and management of a diverse portfolio of supply (and demand-reduction) resources which will act as a hedge against various risks that may affect specific resources (i.e., fuel price fluctuations and certainty of supply, common mode failures, operational reliability, changes in environmental regulations, and the risk of health, safety, and environmental damages that may occur as a result of operating some supply resources). Under a more market-driven power sector with a "powerpool" or POOLCO wholesale market structure, a portfolio manager would: aggregate and manage a diverse portfolio of spot-market purchases, contracts-for-differences, futures contracts

and other market-hedging-type contracts and mechanisms.

**PCBs (POLYCHLORONATED BIPHENYLS)** - A group of organic compounds used in the manufacture of plastics and formerly used as a coolant in electric transformers. In the environment, PCBs are highly toxic to aquatic life. They persist in the environment for long periods of time and are biologically accumulative.

**POWER** - Electricity for use as energy.

**POWER AUTHORITIES** - Quasi-governmental agencies that perform all or some of the functions of a public utility.

**POWER PLANT** (Note: Two separate words, not one word.) - A central station generating facility that produces energy.

**POWER POOL** - An entity established to coordinate short-term operations to maintain system stability and achieve least-cost dispatch. The dispatch provides backup supplies, short-term excess sales, reactive power support, and spinning reserve. Historically, some of these services were provided on an unpriced basis as part of the members' utility franchise obligations. Coordinating short-term operations includes the aggregation and firming of power from various generators, arranging exchanges between generators, and establishing (or enforcing) the rules of conduct for wholesale transactions. The pool may own, manage and/or operate the transmission lines ("wires") or be an independent entity that manages the transactions between entities. Often, the power pool is not meant to provide transmission access and pricing, or settlement mechanisms if differences between contracted volumes among buyers and sellers exist.

**POWER POOL** - Two or more interconnected utilities that plan and operate to supply electricity in the most reliable, economical way to meet their combined load.

**PPM (PARTS PER MILLION)** - The unit commonly used to represent the degree of pollutant concentration where the concentrations are small.

**PREFERRED DAY-AHEAD SCHEDULE** - A Scheduling Coordinator's preferred schedule for the ISO day-ahead scheduling process.

**PREFERRED HOUR-AHEAD SCHEDULE** -- A Scheduling Coordinator's preferred schedule for the ISO hour-ahead scheduling process.

**PREFERRED SCHEDULE** - The initial schedule produced by a Scheduling Coordinator that represents its preferred mix of generation to meet demand. The schedule includes the quantity of output (generators) and consumption (loads), details of any adjustment bids, and the location of each generator and load. The schedule also specifies the quantities and location of trades between the Scheduling Coordinator and all other Scheduling Coordinators, and is balanced with respect to generation, transmission losses, load, and trades.

**PRESSURIZED WATER REACTOR (PWR)** - A nuclear power unit cooled by water that is

pressurized to keep it from boiling when it reaches high temperatures.

**PRIMARY FUEL** - Fuel consumed in the original production of energy, before conversion takes place.

**PROGRAMMABLE CONTROLLER** - A device that controls the operation of electrical equipment (such as air conditioning units and lights) according to a preset time schedule.

**PROPANE** - A gas that is both present in natural gas and refined from crude oil. It is used for heating, lighting and industrial applications. [See also LPG.](#)

**PROVIDER OF LAST RESORT** - A legal obligation (traditionally given to utilities) to provide service to a customer where competitors have decided they do not want that customer's business.

**PUBLIC ADVISER** - A appointee of the governor who attends all meetings of the California Energy Commission and provides assistance to members of the public and intervenors in cases before the Commission.

**PUBLIC INTEREST GOALS** -- Public interest goals of electric utility regulation include: 1) inter- and intra-class and intergenerational equity); 2) the equal treatment of equals (horizontal equity); 3) balancing long- and short-term goals that have the potential to affect intergenerational balance; 4) protecting against the abuse of monopoly power; and 5) general protection of the health and welfare of the citizens of the state, nation, and world. Environmental and other types of social costs are subsumed under the equity and health and welfare responsibilities.

**PUHCA** - The Public Utility Holding Company Act of 1935. This act prohibits acquisition of any wholesale or retail electric business through a holding company unless that business forms part of an integrated public utility system when combined with the utility's other electric business. The legislation also restricts ownership of an electric business by non-utility corporations.

**PUMPED HYDROELECTRIC STORAGE** - Commercial method used for large-scale storage of power. During off-peak times, excess power is used to pump water to a reservoir. During peak times, the reservoir releases water to operate hydroelectric generators.

**PURPA** - The Public Utility Regulatory Policy Act of 1978. Among other things, this federal legislation requires utilities to buy electric power from private "qualifying facilities," at an avoided cost rate. This avoided cost rate is equivalent to what it would have otherwise cost the utility to generate or purchase that power themselves. Utilities must further provide customers who choose to self-generate a reasonably priced back-up supply of electricity.

**PURPA** - The Public Utilities Regulatory Policies Act of 1978 (PURPA) is implemented by the Federal Energy Regulatory Commission and the California Public Utilities Commission (CPUC). Under PURPA each electric utility is required to offer to purchase available electric energy from cogeneration and small power production facilities.

**PX** - The California Power Exchange Corporation, a state chartered, non-profit corporation



charged with providing Day-Ahead and Hour-Ahead markets for energy and ancillary services, if it chooses to self-provide, in accordance with the PX tariff. The PX was a Scheduling Coordinator, and was independent of both the Independent System Operator (ISO) and all other market participants. The PX closed in 2001 because the fault deregulated electricity system for power purchasing was taken over by the State.

**PX GENERATION** - Generation being scheduled by the PX.

**PX LOAD** - Load that has been scheduled by the PX, and which is received through the use of transmission or distribution facilities owned by participating transmission owners.

**PX PARTICIPANT** - An entity that is authorized to buy or sell energy or ancillary services through the PX, and any agent authorized to act on behalf of such an entity.

## Letter Q

**QUAD** - One quadrillion ( $10^{15}$  or 1,000,000,000,000,000) British thermal units (Btus). An amount of energy equal to 170 million barrels of oil. Total U.S. consumption of all forms of energy is (in the 1990s) about 83 quads in an average year.

**QUALIFYING FACILITY** - A cogenerator or small power producer which under federal law, has the right to sell its excess power output to the public utility.

**QUALIFYING FACILITY** - QFs are non-utility power producers that often generate electricity using renewable and alternative resources, such as hydro, wind, solar, geothermal or biomass (solid waste). QFs must meet certain operating, efficiency, and fuel-use standards set forth by the Federal Energy Regulatory Commission (FERC). If they meet these FERC standards, utilities must buy power from them. QFs usually have long-term contracts with utilities for the purchase of this power, which is among the utility's highest-priced resources.

**QUALIFYING FACILITY (QF)** - Under PURPA, QFs were allowed to sell their electric output to the local utility at avoided cost rates. To become a QF, the independent power supplier had to produce electricity with a specified fuel type (cogeneration or renewables), and meet certain ownership, size, and efficiency criteria established by the Federal Energy Regulatory Commission.

# Letter R

**R-VALUE** - A unit of thermal resistance used for comparing insulating values of different material. It is basically a measure of the effectiveness of insulation in stopping heat flow. The higher the R-value number, a material, the greater its insulating properties and the slower the heat flow through it. The specific value needed to insulate a home depends on climate, type of heating system and other factors.

**RAD** - A unit of measure of absorbed radiation. Acronym for radiation absorbed dose. One rad equals 100 ergs of radiation energy per gram of absorbing material.

**RADIANT BARRIER** - A device designed to reduce or stop the flow of radiant energy.

**RADIANT ENERGY** - Energy transferred by the exchange of electromagnetic waves from a hot or warm object to one that is cold or cooler. Direct contact with the object is not necessary for the heat transfer to occur.

**RADIATION** - The flow of energy across open space via electromagnetic waves such as light. Passage of heat from one object to another without warming the air space in between.

**RANKINE CYCLE** - The steam-Rankine cycle employing steam turbines has been the mainstay of utility thermal electric power generation for many years. The cycle, as developed over the years uses superheat, reheat and regeneration. Modern steam Rankine systems operate at a cycle top temperature of about 1,073 degrees Celsius with efficiencies of about 40 percent.

**RATE-BASING** - refers to practice by utilities of allotting funds invested in utility Research Development Demonstration and Commercialization and other programs from ratepayers, as opposed to allocating these costs to shareholders.

**RAW FUEL** Coal, natural gas, wood or other fuel that is used in the form in which it is found in nature, without chemical processing.

**REAL-TIME MARKET** - The competitive generation market controlled and coordinated by the ISO for arranging real-time imbalance energy.

**REAL-TIME PRICING** - The instantaneous pricing of electricity based on the cost of the electricity available for use at the time the electricity is demanded by the customer.

**REACTOR** - A device in which a controlled nuclear chain reaction can be maintained, producing heat energy.

**RECOOL** - The sensible cooling of air that has been previously heated by HVAC systems serving the same building. [See California Code of Regulations, Title 24, Section 2-5302]

**RECLAIMED OIL** - Lubricating oil that is processed to be used over again.

**RECOVERED ENERGY** - Reused heat or energy that otherwise would be lost. For example, a combined cycle power plant recaptures some of its own waste heat and reuses it to make extra electric power.

**RECOVERY EFFICIENCY** - (Thermal efficiency) In a water heater, a measure of the percentage of heat from the combustion of gas which is transferred to the water as measured under specified test conditions. California Code of Regulations, Section 2- 1602(e)(7).

**REFINER** - means any person who owns, operates, or controls the operations of one or more refineries.

**REFINERY** - A facility that separates crude oil into varied oil products. The refinery uses progressive temperature changes to separate by vaporizing the chemical components of crude oil that have different boiling points. These are distilled into usable products such as gasoline, fuel oil, lubricants and kerosene.

**REFORMULATED GASOLINE (RFG)** - A cleaner-burning gasoline that has had its compositions and/or characteristics altered to reduce vehicular emissions of pollutants. It was sold in California beginning in 1996 with the oxygenate additive MTBE. On March 25, 1999, Governor Gray Davis released Executive Order D-5-99 that ordered the removal of the additive MTBE (Methyl Tertiary-Butyl Ether) from gasoline at the earliest possible date, but no later than December 31, 2002. On March 15, 2002, the Governor issued a new Executive Order and announced a one-year extension to the phase out of MTBE. "Under the newly announced timeline, the MTBE phaseout will be accomplished no later than December 31, 2003. Individual refineries have may continue to make the transition to ethanol earlier than December 2003 if the (State) determines it is feasible and will not risk supply shortages or price spikes."

**REFRIGERANT** - A fluid such as freon that is used in cooling devices to absorb heat from surrounding air or liquids as it evaporates.

**RDF (REFUSE DERIVED FUEL)** - The fuel component of municipal solid waste (MSW), which is the by-product of shredding MSW to a uniform size, screening out oversized materials and isolating ferrous material in magnetic separation. The resulting RDF can be burned as a fuel source.

**REGULATION** - The service provided by generating units equipped and operating with automatic generation controls that enables the units to respond to the ISO's direct digital control signals to match real-time demand and resources, consistent with established operating criteria.

**REGULATORY MUST-RUN GENERATION** - Utilities will be allowed to generate electricity when hydro resources are spilled for fish releases, irrigation, and agricultural purposes, and to generate power that is required by federal or state laws, regulations, or jurisdictional authorities. Such requirements include hydrological flow requirements, irrigation and water supply, solid-waste generation, or other generation contracts in effect on December 20, 1995.

**REGULATORY MUST-TAKE GENERATION** - Utilities will be allowed to generate electricity from those resources - identified by the CPUC - that are not subject to competition. These

resources will be scheduled with the ISO on a must-take basis. Regulatory Must-Take Generation includes QF generating units under federal law, nuclear units and pre-existing power-purchase contracts that have minimum-take provisions.

REID VAPOR PRESSURE (RVP) - a standard measurement of a liquid's vapor pressure in pounds per square inch at 100 degrees Fahrenheit. It is an indication of the propensity of the liquid to evaporate.

RELIABILITY - Electric system reliability has two components-- adequacy and security. Adequacy is the ability of the electric system to supply the aggregate electrical demand and energy requirements of the customers at all times, taking into account scheduled and unscheduled outages of system facilities. Security is the ability of the electric system to withstand sudden disturbances such as electric short circuits or unanticipated loss of system facilities.

RELIABILITY MUST-RUN GENERATION -- The ISO will allow utilities to generate power that is needed to ensure system reliability. This includes generation:

- Required to meet the reliability criteria for interconnected systems operation.
- Needed to meet load (demand) in constrained areas.
- Needed to provide voltage or security support of the ISO or of a local area.

RELIABILITY MUST RUN UNIT - In return for payment, the ISO may call upon the owner of a generating unit to run the unit when required for grid reliability.

REHEAT - The heating of air that has been previously cooled either by mechanical refrigeration or economizer cooling systems.

REID VAPOR PRESSURE (RVP) - a standard measurement of a liquid's vapor pressure in pounds per square inch at 100 degrees Fahrenheit. It is an indication of the propensity of the liquid to evaporate.

RENEWABLE ENERGY - Resources that constantly renew themselves or that are regarded as practically inexhaustible. These include solar, wind, geothermal, hydro and wood. Although particular geothermal formations can be depleted, the natural heat in the earth is a virtually inexhaustible reserve of potential energy. Renewable resources also include some experimental or less-developed sources such as tidal power, sea currents and ocean thermal gradients.

RENEWABLE RESOURCES -- Renewable energy resources are naturally replenishable, but flow-limited. They are virtually inexhaustible in duration but limited in the amount of energy that is available per unit of time. Some (such as geothermal and biomass) may be stock-limited in that stocks are depleted by use, but on a time scale of decades, or perhaps centuries, they can probably be replenished. Renewable energy resources include: biomass, hydro, geothermal,

solar and wind. In the future they could also include the use of ocean thermal, wave, and tidal action technologies. Utility renewable resource applications include bulk electricity generation, on-site electricity generation, distributed electricity generation, non-grid-connected generation, and demand-reduction (energy efficiency) technologies.

**REREGULATION** - The design and implementation of regulatory practices to be applied to the remaining regulated entities after restructuring of the vertically-integrated electric utility. The remaining regulated entities would be those that continue to exhibit characteristics of a natural monopoly, where imperfections in the market prevent the realization of more competitive results, and where, in light of other policy considerations, competitive results are unsatisfactory in one or more respects. Reregulation could employ the same or different regulatory practices as those used before restructuring.

**RESEARCH AND DEVELOPMENT (R&D)** - Research is the discovery of fundamental new knowledge. Development is the application of new knowledge to develop a potential new service or product. Basic power sector R&D is most commonly funded and conducted through the Department of Energy (DOE), its associated government laboratories, university laboratories, the Electric Power Research Institute (EPRI), and private sector companies.

**RESERVE** - The extra generating capability that an electric utility needs, above and beyond the highest demand level it is required to supply to meet its users' needs.

**RESERVE GENERATING CAPACITY** - The amount of power that can be produced at a given point in time by generating units that are kept available in case of special need. This capacity may be used when unusually high power demand occurs, or when other generating units are off-line for maintenance, repair or refueling.

**RESERVE MARGIN** - The differences between the dependable capacity of a utility's system and the anticipated peak load for a specified period.

**RESIDENTIAL BUILDING** - means any hotel, motel, apartment house, lodging house, single and dwelling, or other residential building which is heated or mechanically cooled.

**RESIDUE** - any organic matter left as residue, such as agricultural and forestry residue, including, but not limited to, conifer thinnings, dead and dying trees, commercial hardwood, noncommercial hardwoods and softwoods, chaparral, burn, mill, agricultural field, and industrial residues, and manure.

**RESISTANCE (ELECTRICAL)** - The ability of all conductors of electricity to resist the flow of current, turning some of it into heat. Resistance depends on the cross section of the conductor (the smaller the cross section, the greater the resistance) and its temperature (the hotter the cross section, the greater its resistance).

**RESISTANCE (THERMAL)** --The reciprocal of thermal conductance. [See R-VALUE.](#)

**RESOURCE EFFICIENCY** - The use of smaller amounts of physical resources to produce the same product or service. Resource efficiency involves a concern for the use of all physical

resource sand materials used in the production and use cycle, not just the energy input.

**RESTRUCTURING** - The reconfiguration of the vertically-integrated electric utility. Restructuring usually refers to separation of the various utility functions into individually-operated and -owned entities.

**RETAIL COMPETITION** - A system under which more than one electric provider can sell to retail customers, and retail customers are allowed to buy from more than one provider. (See also direct access)

**RETAIL MARKET** - A market in which electricity and other energy services are sold directly to the end-use customer.

**RETAIL WHEELING** - See Direct Access.

**RETORTING** - The heating of oil shale to get the oil out from it.

**RETROFIT**-- broad term that applies to any change after the original purchase, such as adding equipment not a part of the original purchase. As applied to alternative fuel vehicles, it refers to conversion devices or kits for conventional fuel vehicles. (Same as „aftermarket“.)

**RTG** - A Regional Transmission Group. A voluntary organization of transmission owners, users, and other entities interested in coordinating transmission planning, expansion, operation, and use on a regional and inter-regional basis. Such groups are subject to FERC approval.

**RULES OF CONDUCT** - Rules set in advance to delineate acceptable activities by participants, particularly participants with significant market power.

**RURAL ELECTRIC COOPERATIVE** -- A nonprofit, customer-owned electric utility that distributes power in a rural area. As of June 1990, there are three rural electric cooperatives in California:

- Anza Electric Cooperative in Anza
- Plumas-Sierra Rural Electric Cooperative in Portola
- Sunrise Valley Electrification Corporation in Alturas

# Letter S

**SAE VISCOSITY NUMBER** - A system established by the Society of Automotive Engineers for classifying crankcase oils and automotive transmission and differential lubricants according to their viscosities.

**SE (Seasonal Efficiency)** - a measure of the percentage of heat from the combustion of gas and from associated electrical equipment which is transferred to the space being heated during a year under specified conditions. California Code of Regulations, Section 2-1602(d)(11).

**SEER (Seasonal Energy Efficiency Ratio)**--The total cooling output of a central air conditioning unit in Btus during its normal usage period for cooling divided by the total electrical energy input in watt-hours during the same period, as determined using specified federal test procedures. [See California Code of Regulations, Title 20, Section 1602(c)(11)]

**SETTLEMENT** - The process of financial settlement for products and services purchased and sold. Each settlement involves a price and quantity. Both the ISO and PX may perform settlement functions.

**SCHEDULING COORDINATOR** - Scheduling coordinators (SCs) submit balanced schedules and provide settlement-ready meter data to the ISO. Scheduling coordinators also:

- Settle with generators and retailers, the PX and the ISO
- Maintain a year-round, 24-hour scheduling center
- Provide non-emergency operating instructions to generators and retailers
- Transfer schedules in and out of the PX. (The PX is a marketplace. As bids are accepted, power is being bought and sold. Once a bid is accepted, the power sold is "transferred out" of the PX, since it is no longer available. Power that is available for sale is "transferred in" to the PX. These transfers may also take place directly between the buyer and seller, without involvement of the PX.)

The PX is considered a scheduling coordinator.

**SECONDARY ENERGY** - [See NON-FIRM ENERGY](#).

**SECURITIZE** - The aggregation of contracts for the purchase of the power output from various energy projects into one pool which then offers shares for sale in the investment market. This strategy diversifies project risks from what they would be if each project were financed individually, thereby reducing the cost of financing. Fannie Mae performs such a function in the home mortgage market.



**SEER (Seasonal Energy Efficiency Ratio)** - the total cooling output of a central air conditioning unit in Btus during its normal usage period for cooling divided by the total electrical energy input in watt-hours during the same period, as determined using specified federal test procedures. (Title 20, Section 2-1602(c)(11)).

**SELF-GENERATION** - A generation facility dedicated to serving a particular retail customer, usually located on the customer's premises. The facility may either be owned directly by the retail customer or owned by a third party with a contractual arrangement to provide electricity to meet some or all of the customer's load.

**SELF-SERVICE WHEELING** -- Primarily an accounting policy comparable to net-billing or running the meter backwards. An entity owns generation that produces excess electricity at one site, that is used at another site(s) owned by the same entity. It is given billing credit for the excess electricity (displacing retail electricity costs minus wheeling charges) on the bills for its other sites.

**SENSIBLE COOLING CAPACITY** - [See COOLING CAPACITY, SENSIBLE.](#)

**SENSIBLE HEAT** - Heat that results in a temperature change.

**SERVICE AREA** - Any contiguous geographic area serviced by the same electric utility.

**SETBACK THERMOSTAT** - [See THERMOSTAT, SETBACK.](#)

**SERVICE AREA** - The geographical territory served by a utility.

**SET POINT** - Scheduled operating level for each generating unit or other resource scheduled to run in the Hour-ahead Schedule.

**SHADING** - 1) The protection from heat gains due to direct solar radiation; 2) Shading is provided by (a) permanently attached exterior devices, glazing materials, adherent materials applied to the glazing, or an adjacent building for nonresidential buildings, hotels, motels and highrise apartments, and by (b) devices affixed to the structure for residential buildings. [See California Code of Regulations, Title 24, Section 2-5302]

**SHADE SCREEN** - A screen affixed to the exterior of a window or other glazed opening, designed to reduce the solar radiation reaching the glazing.

**SHADING COEFFICIENT** - the ratio of solar heat gain through a specific glazing system to the total solar heat gain through a single layer of clear, double-strength glass.

**SIDE FINS** - Vertical shading elements mounted on either side of a glazed opening that blocks direct solar radiation from the lower, lateral portions of the sun's path. **SITE** - any location on which a facility is constructed or is proposed to be constructed.

**SITE ENERGY** - The energy consumed at a building location or other end-use site. **SKYLIGHT** -

Any opening in the roof surface which is glazed with a transparent or translucent material. [See California Code of Regulations, Title 24, Section 2-5302]

**SKY TEMPERATURE** - The equivalent temperature of the clouds, water vapor, and other atmospheric elements that make up the sky to which a surface can radiate heat.

**SMOG** - A mixture of smoke and fog generally used as an equivalent of air pollution, particularly associated with oxidants.

**SOLAR COLLECTOR** - A component of an active or passive solar system that absorbs solar radiation to heat a transfer medium which, in turn, supplies heat energy to the space or water heating system.

**SOLAR CELL** - A photovoltaic cell that can convert light directly into electricity. A typical solar cell uses semiconductors made from silicon.

**SOLAR COLLECTOR** - A surface or device that absorbs solar heat and transfers it to a fluid. The heated fluid then is used to move the heat energy to where it will be useful, such as in water or space heating equipment.

**SOLAR ENERGY** - Heat and light radiated from the sun.

**SOLAR ENERGY RESEARCH INSTITUTE (SERI)** -- Established in 1974 and funded by the federal government, the institute's general purpose is to support U.S. Department of Energy's solar energy program and foster the widespread use of all aspects of solar technology, including photovoltaics, solar heating and cooling, solar thermal power generation, wind ocean thermal conversion and biomass conversion.

**SOLAR HEAT GAIN** - Heat added to a space due to transmitted and absorbed solar energy.

**SOLAR HEAT GAIN FACTOR** - An estimate used in calculating cooling loads of the heat gain due to transmitted and absorbed solar energy through 1/8"-thick, clear glass at a specific latitude, time and orientation.

**SOLAR HEATING AND HOT WATER SYSTEMS** - Solar heating or hot water systems provide two basic functions: (a) capturing the sun's radiant energy, converting it into heat energy, and storing this heat in insulated storage tank(s); and (b) delivering the stored energy as needed to either the domestic hot water or heating system. These components are called the collection and delivery subsystems.

**SOLAR IRRADIATION** - The amount of radiation, both direct and diffuse, that can be received at any given location.

**SOLAR POWER** - Electricity generated from solar radiation.

**SOLAR RADIATION** - Electromagnetic radiation emitted by the sun.

**SOLAR SATELLITE POWER** - A proposed process of using satellites in geosynchronous orbit above the earth to capture solar energy with photovoltaic cells, convert it to microwave energy, beam the microwaves to earth where they would be received by large antennas, and changed from microwave into usable electricity.

**SOLAR THERMAL POWER PLANT** - means a thermal powerplant in which 75 percent or more of the total energy output is from solar energy and the use of backup fuels, such as oil, natural gas, and coal, does not, in the aggregate, exceed 25 percent of the total energy input of the facility during any calendar year period.

**SOLAR THERMAL** - The process of concentrating sunlight on a relatively small area to create the high temperatures needed to vaporize water or other fluids to drive a turbine for generation of electric power.

**SOURCE ENERGY** - All the energy used in delivering energy to a site, including power generation and transmission and distribution losses, to perform a specific function, such as space conditioning, lighting, or water heating. Approximately three watts (or 10.239 Btus) of energy is consumed to deliver one watt of usable electricity.

**SPECIAL CONTRACTS** - Any contract that provides a utility service under terms and conditions other than those listed in the utility's tariffs. For example, an electric utility may enter into an agreement with a large customer to provide electricity at a rate below the tariffed rate in order to prevent the customer from taking advantage of some other option that would result in the loss of the customer's load. This generally allows that customer to compete more effectively in their product market.

**SPECIFIC HEAT** - In English units, the quantity of heat, in Btu, needed to raise the temperature of one pound of material one degree Fahrenheit.

**SPILL ENERGY** - [See DUMP.](#)

**SPLIT-THE-SAVINGS (Electric Utility)** - The basis for settling economy-energy transactions between utilities. The added costs of the supplier are subtracted from the avoided costs of the buyer, and the difference is evenly divided.

**STANDBY LOSS** - A measure of the losses from a water heater tank. When expressed as a percentage, standby loss is the ratio of heat loss per hour to the heat content of the stored water above room temperature. When expressed in watts, standby loss is the heat lost per hour, per square foot of tank surface area. [See California Code of Regulations, Title 20, Section 1602(f)(5)]

**STEADY STATE EFFICIENCY** - A performance rating for space heaters; a measure of the percentage of heat from combustion of gas which is transferred to the space being heated under specified steady state conditions. [See California Code of Regulations, Title 20, Section 1602(e)(13)]

**STEAM ELECTRIC PLANT** - A power station in which steam is used to turn the turbines that generate electricity. The heat used to make the steam may come from burning fossil fuel, using a controlled nuclear reaction, concentrating the sun's energy, tapping the earth's natural heat or capturing industrial waste heat.

**STIRLING ENGINE** - An external combustion engine that converts heat into useable mechanical energy (shaftwork) by the heating (expanding) and cooling (contracting) of a captive gas such as helium or hydrogen.

**STORAGE TYPE WATER HEATER** - A water heater that heats and stores water at a thermostatically controlled temperature for delivery on demand. [See California Code of Regulations, Title 20, Section 1602(f)(6)]

**STRANDED BENEFITS** - Public interest programs and goals which could be compromised or abandoned by a restructured electric industry. These potential "stranded benefits" might include: environmental protection, fuel diversity, energy efficiency, low-income ratepayer assistance, and other types of socially beneficial programs.

**STRANDED COSTS/STRANDED ASSETS** - See embedded Costs Exceeding Market Prices.

**STRATEGIC PETROLEUM RESERVE** - The strategic petroleum reserve consists of government owned and controlled crude oil stockpiles stored at various locations in the Gulf Coast region of the country. These reserves can be drawn down in response to severe oil supply disruptions. The target is to have a reserve of 750 million barrels of oil. Use of the reserve must be authorized by the President of the United States.

**SUBSTATION** - A facility that steps up or steps down the voltage in utility power lines. Voltage is stepped up where power is sent through long-distance transmission lines. It is stepped down where the power is to enter local distribution lines.

**SUNK COST** - In economics, a sunk cost is a cost that has already been incurred, and therefore cannot be avoided by any strategy going forward.

**SUPERCONDUCTOR** - A synthetic material that has very low or no electrical resistance. Such experimental materials are being investigated in laboratories to see if they can be created at near room temperatures. If such a superconductor can be found, electrical transmission lines with no little or no resistance may be built, thus conserving energy usually lost in transmission. Superconductors could also have uses in computer chips, solid state devices and electrical motors or generators.

**SUPERTANDKER** - A very large ship designed to transport more than 500,000 deadweight tonnage of oil.

**SUPPLY BID** - A bid into the PX indicating a price at which a seller is prepared to sell energy or ancillary services.

**SUPPLY-SIDE** - Activities conducted on the utility's side of the customer meter. Activities

designed to supply electric power to customers, rather than meeting load through energy efficiency measures or on-site generation on the customer side of the meter.

**SURPLUS** - (Electric utility) Excess firm energy available from a utility or region for which there is no market at the established rates.

**SUSTAINED ORDERLY DEVELOPMENT** - A condition in which a growing and stable market is identified by orders that are placed on a reliable schedule. The orders increase in magnitude as previous deliveries and engineering and field experience lead to further reductions in costs. The reliability of these orders can be projected many years into the future, on the basis of long-term contracts, to minimize market risks and investor exposure. (See also "Commercialization.")

**SWRTA** - The Southwest Regional Transmission Association. a subregional RTG within WRTA, and awaiting FERC approval.

**SYNCRUDE** - Synthetic crude oil made from coal or from oil shale.

**SYNFUEL** - Synthetic gas or synthetic oil. Fuel that is artificially made as contrasted to that which is found in nature. Synthetic gas made from coal is considered to be more economical and easier to produce than synthetic oil. When natural gas supplies in the earth are being depleted, it is expected that synthetic gas will be able to be used widely as a substitute fuel.

**SYNGAS** - Synthetic gas made from coal.

**SYSTEM** - A combination of equipment and/or controls, accessories, interconnecting means and terminal elements by which energy is transformed to perform a specific function, such as climate control, service water heating, or lighting. [See California Code of Regulations, Title 24, Section 2-5302]

**SYSTEM INTEGRATION (OF NEW TECHNOLOGIES)** - The successful integration of a new technology into the electric utility system by analyzing the technology's system effects and resolving any negative impacts that might result from its broader use.

# Letter T

**TAKING** - Reducing the value of someone's property through government action without just compensation.

**TAKE-OUT POINT** - The metering points at which a metered entity takes delivery of energy.

**TAR SANDS** - Sedimentary rocks containing heavy oil that cannot be extracted by conventional petroleum recovery methods.

**TAX CREDITS** - Credits established by the federal and state government to assist the development of the alternative energy industry. Beginning in 1976, California had a solar tax credit. From 1978 to 1985, both California and the federal government offered tax credits for alternative energy equipment. The state provided a 55 percent tax credit on solar, wind, geothermal and biomass for residential applications. However, the residential tax credits were reduced by applicable federal credits. State commercial tax credits for alternative energy systems in commercial and industrial sectors ranged from 10-15 percent. During this same time, the federal government offered a 40 percent tax credit on residential applications and a 10-15 percent credit on commercial and industrial applications. California in 1990 instituted a new 10 percent tax credit for commercial solar systems in excess of 30 watts of electricity per device. This credit expired December 31, 1993. Other tax credits have been implemented since then. Please check with your tax preparer or the Franchise Tax Board or IRS for current credits.

**TAME (TERTIARY AMYL METHYL ETHER)** - another oxygenate that can be used in reformulated gasoline. It is an ether based on reactive C5 olefins and methanol.

**TARIFF** - A document, approved by the responsible regulatory agency, listing the terms and conditions, including a schedule of prices, under which utility services will be provided.

**TASK LIGHTING (task-oriented lighting)** - Lighting designed specifically to illuminate one or more task locations, and generally confined to those locations. [See California Code of Regulations, Title 24, Section 2- 5302]

**TEMPERATURE** - Degree of hotness or coldness measured on one of several arbitrary scales based on some observable phenomenon (such as the expansion).

**THERM** - One hundred thousand (100,000) British thermal units (1 therm = 100,000 Btu).

**THERMAL BREAK (thermal barrier)** - An element of low heat conductivity placed in such a way as to reduce or prevent the flow of heat. Some metal framed windows are designed with thermal breaks to improve their overall thermal performance.

**THERMAL (ENERGY) STORAGE** - A technology that lowers the amount of electricity needed for comfort conditioning during utility peak load periods. A buildings thermal energy storage system might, for example, use off-peak power to make ice or to chill water at night, later using the ice or chilled water in a power saving process for cooling during the day. See THERMAL

## MASS.

**THERMAL MASS** - A material used to store heat, thereby slowing the temperature variation within a space. Typical thermal mass materials include concrete, brick, masonry, tile and mortar, water, and rock or other materials with high heat capacity.

**THERMAL POWER PLANT** - any stationary or floating electrical generating facility using any source of thermal energy, with a generating capacity of 50 megawatts or more, and any facilities appurtenant thereto. Exploratory, development, and production wells, resource transmission lines, and other related facilities used in connection with a geothermal exploratory project or a geothermal field development project are not appurtenant facilities for the purposes of this division. Thermal powerplant does not include any wind, hydroelectric, or solar photovoltaic electrical generating facility.

**THERMALLY ENHANCED OIL RECOVERY (TEOR)** - Injection of steam to increase the amount of petroleum that may be recovered from a well.

**THERMODYNAMICS** - A study of the transformation of energy into other manifested forms and of their practical applications. The three laws of thermodynamics are:

1. Law of Conservation of Energy - energy may be transformed in an isolated system, but its total is constant
2. Heat cannot be changed directly into work at constant temperature by a cyclic process
3. Heat capacity and entropy of every crystalline solid becomes zero at absolute zero (0 degrees Kelvin)

**THERMOSTAT** - An automatic control device designed to be responsive to temperature and typically used to maintain set temperatures by cycling the HVAC system.

**THERMOSTAT, SETBACK** - A device, containing a clock mechanism, which can automatically change the inside temperature maintained by the HVAC system according to a preset schedule. The heating or cooling requirements can be reduced when a building is unoccupied or when occupants are asleep. [See California Code of Regulations, Title 24, Section 2- 5352(h)]

**TLEV (TRANSITIONAL LOW EMISSION VEHICLE)** - a vehicle certified by the California Air Resources Board to have emissions from zero to 50,000 miles no higher than 0.125 grams/mile (g/mi) of non-methane organic gases, 3.4 g/mi of carbon monoxide, and 0.4 g/mi of nitrogen oxides. Emissions from 50,000 to 100,000 miles may be slightly higher (See chart in Chapter 2.)

**TON OF COOLING** - A useful cooling effect equal to 12,000 Btu hours.

**TRANSMITTANCE** - The time rate of heat flow per unit area under steady conditions from the air (or other fluid) on the warm side of a barrier to the air (or fluid) on the cool side, per unit temperature difference between the two sides.

**TIDAL POWER** - Energy obtained by using the motion of the tides to run water turbines that drive electric generators.

**TIME-OF-USE (TOU) RATES** -- The pricing of electricity based on the estimated cost of electricity during a particular time block. Time-of-use rates are usually divided into three or four time blocks per twenty-four hour period (on-peak, mid-peak, off-peak and sometimes super off-peak) and by seasons of the year (summer and winter). Real-time pricing differs from TOU rates in that it is based on actual (as opposed to forecasted) prices which may fluctuate many times a day and are weather-sensitive, rather than varying with a fixed schedule.

**TIME-OF-USE METER** - A measuring device that records the times during which a customer uses various amounts of electricity. This type of meter is used for customers who pay time-of-use rates.

**TIME-OF-USE RATES** - Electricity prices that vary depending on the time periods in which the energy is consumed. In a time-of-use rate structure, higher prices are charged during utility peak-load times. Such rates can provide an incentive for consumers to curb power use during peak times.

**TRADING DAY** - The 24-hour period beginning at midnight and ending at the following midnight.

**TRANSFER (Electric utility)** - To move electric energy from one utility system to another over transmission lines.

**TRANSFORMER** - A device, which through electromagnetic induction but without the use of moving parts, transforms alternating or intermittent electric energy in one circuit into energy of similar type in another circuit, commonly with altered values of voltage and current.

**TRANSITION COSTS** - See Embedded Costs Exceeding Market Prices.

**TRANSMISSION** - Transporting bulk power over long distances.

**TRANSMISSION-DEPENDENT UTILITY** - A utility that relies on its neighboring utilities to transmit to it the power it buys from its suppliers. A utility without its own generation sources, dependent on another utility's transmission system to get its purchased power supplies.

**TRANSMISSION OWNER** - An entity that owns transmission facilities or has firm contractual right to use transmission facilities.

**TRANSMITTING UTILITY (TRANSCO)** - This is a regulated entity which owns, and may construct and maintain, wires used to transmit wholesale power. It may or may not handle the power dispatch and coordination functions. It is regulated to provide non-discriminatory connections, comparable service and cost recovery. According to EPAct, any electric utility, qualifying cogeneration facility, qualifying small power production facility, or Federal power marketing agency which owns or operates electric power transmission facilities which are used for the sale of electric energy at wholesale. (See also "Generation Dispatch & Control" and



"PowerPool.")

**TURBINE GENERATOR** - A device that uses steam, heated gases, water flow or wind to cause spinning motion that activates electromagnetic forces and generates electricity.

# Letter U

**UA** - A measure of the amount of heat that would be transferred through a given surface or enclosure (such as a building envelope) with a one degree Fahrenheit temperature difference between the two sides. The UA is calculated by multiplying the U-Value by the area of the surface (or surfaces).

**UDC** - Utility distribution company. An entity that owns a distribution system for the delivery of energy to and from the ISO-controlled grid, and that provides regulated, retail service to eligible end-use customers who are not yet eligible for direct access, or who choose not to arrange services through another retailer.

**UNCONDITIONED SPACE** - A space that is neither directly nor indirectly conditioned space, which can be isolated from conditioned space by partitions and/or closeable doors. [See California Code of Regulations, Title 24, Section 2-5302]

**ULEV (ULTRA-LOW EMISSION VEHICLE)** - a vehicle certified by the California Air Resources Board to have emissions from zero to 50,000 miles no higher than 0.040 grams/mile (g/mi) of non-methane organic gases, 1.7 g/mi of carbon monoxide, and 0.2 g/mi of nitrogen oxides. Emissions from 50,000 to 100,000 miles may be slightly higher (See chart in Chapter 2.)

**ULTRAHIGH VOLTAGE TRANSMISSION** - Transporting electricity over bulk-power lines at voltages greater than 800 kilovolts.

**UNBUNDLING** - Disaggregating electric utility service into its basic components and offering each component separately for sale with separate rates for each component. For example, generation, transmission and distribution could be unbundled and offered as discrete services.

**UNIVERSAL SERVICE** - Electric service sufficient for basic needs (an evolving bundle of basic services) available to virtually all members of the population regardless of income.

**UNLEADED GASOLINE** - Gasoline that has had tetraethyl lead removed in conformance with federal and state regulations.

**UPGRADE (Electric utility)** - Replacement or addition of electrical equipment resulting in increased generation or transmission capability.

**UPRATE (Electric utility)** - An increase in the rating or stated measure of generation or transfer capability.

**URANIUM** - A radioactive element, found in ores, of which atoms can be split to create energy.

**URANIUM ENRICHMENT** - The process of increasing the percentage of pure uranium above the levels found in naturally occurring uranium ore, so that it may be used as fuel.

**UTILITY** - A regulated entity which exhibits the characteristics of a natural monopoly. For the purposes of electric industry restructuring, "utility" refers to the regulated, vertically-integrated electric company. "Transmission utility" refers to the regulated owner/operator of the transmission system only. "Distribution utility" refers to the regulated owner/operator of the distribution system which serves retail customers.

**U-value or U-factor** - A measure of how well heat is transferred by the entire window - the frame, sash and glass - either into or out of the building. U-value is the opposite of R-value. The lower the U-factor number, the better the window will keep heat inside a home on a cold day.

# Letter V

**VAV System (Variable Air Volume System)** - A mechanical HVAC system capable of serving multiple zones which controls the temperature maintained in a zone by controlling the amount of heated or cooled air supplied to the zone.

**VAPOR BARRIER** - A material with a permeance of one perm or less which provides resistance to the transmission of water vapor. [See California Code of Regulations, Title 24, Section 2-5302]

**VENTILATION** - The process of supplying or removing air by natural or mechanical means to or from any space. Such air may or may not have been conditioned or treated.

**VERIFICATION PHASE** - The step of the California Energy [Contingency Plan](#) to determine the existence and scope of an energy shortage and report to Energy Commission executives, the Governor and the Legislature where required under the plan.

**VERTICAL INTEGRATION** - An arrangement whereby the same company owns all the different aspects of making, selling, and delivering a product or service. In the electric industry, it refers to the historically common arrangement whereby a utility would own its own generating plants, transmission system, and distribution lines to provide all aspects of electric service.

**VISIBLE LIGHT TRANSMITTANCE** -- The ratio of visible light transmitted through a substance to the total visible light incident on its surface.

**VOLT** - A unit of electromotive force. It is the amount of force required to drive a steady current of one ampere through a resistance of one ohm. Electrical systems of most homes and office have 120 volts.

- **VOLTAGE OF A CIRCUIT (Electric utility)** - The electric pressure of a circuit, measured in volts. Usually a nominal rating, based on the maximum normal effective difference of potential between any two conductors of the circuit.

**VOLUMETRIC WIRES CHARGE** - A type of charge for using the transmission and/or distribution system that is based on the volume of electricity that is transmitted.

# Letter W

**WARRANTY**-- A seller's guarantee to purchaser that product is what it is represented to be and, if it is not, that it will be repaired or replaced. Within the context of vehicles, refers to an engine manufacturer's guarantee that the engine will meet "certified" engine standards at 50,000 miles or the engine will be replaced. Retrofits may generally void an engine warranty.

**WATER HEATER** - An appliance for supplying hot water for purposes other than space heating or pool heating. [See California Code of Regulations, Title 20, Section 1602(f)(8)]

**WATSCO** - The Western Association for Transmission System Coordination.

**WATT** - A unit of measure of electric power at a point in time, as capacity or demand.

**WATT-HOUR** - One watt of power expended for one hour.

**WEATHERSTRIPPING** - Specially designed strips, seals and gaskets installed around doors and windows to limit air leakage.

**WET-BULB TEMPERATURE** - The temperature at which water, by evaporating into air, can bring the air to saturation at the same temperature. Wet-bulb temperature is measured by a wet-bulb psychrometer.

**WHEELING** - The transmission of electricity by an entity that does not own or directly use the power it is transmitting. Wholesale wheeling is used to indicate bulk transactions in the wholesale market, whereas retail wheeling allows power producers direct access to retail customers. This term is often used colloquially as meaning transmission.

**WHOLE HOUSE FAN** - A system capable of cooling a house by exhausting a large volume of warm air when the outside air is cool.

**WATT** - A unit of measure of electric power at a point in time, as capacity or demand. One watt of power maintained over time is equal to one joule per second. Some Christmas tree lights use one watt. The Watt is named after Scottish inventor James Watt and is capitalized when shortened to w and used with other abbreviations, as in kWh.

**WATT-HOUR** - One watt of power expended for one hour. One thousandth of a kilowatt-hour.

**WHEELING** - Using a utility's lines to transport power from one neighboring system to another.

**WHOLESALE COMPETITION** - A system whereby a distributor of power would have the option to buy its power from a variety of power producers, and the power producers would be able to compete to sell their power to a variety of distribution companies.

**WHOLESALE POWER MARKET** -- The purchase and sale of electricity from generators to

resellers (who sell to retail customers) along with the ancillary services needed to maintain reliability and power quality at the transmission level.

**WHOLESALE TRANSMISSION SERVICES** --The transmission of electric energy sold, or to be sold, at wholesale in interstate commerce (from EPCRA).

**WIRES CHARGE** - A broad term which refers to charges levied on power suppliers or their customers for the use of the transmission or distribution wires.

**WRTA** - The Western Regional Transmission Association, an RTG.

**WSSCC** - The Western System Coordinating Council. A voluntary industry association created to enhance reliability among western utilities.

**WSSP** - The Western Systems Power Pool. A FERC approved industry institution that provides a forum for short-term trades in electric energy, capacity, exchanges and transmission services. The pool consists of approximately 50 members and serves 22 states, a Canadian province and 60 million people. The WSSP is headquarter in Phoenix, Arizona.

## Letter X

X-RAY - A type of electromagnetic radiation having low energy levels.

XENON - A heavy gas used in specialized electric lamps.

XYLOID COAL - Brown coal or lignite mostly derived from wood.

# Letter Y

No entries for the letter Y.



# Letter Z

No Entries for the letter Z

# Electric Power Industry Glossary

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[\(A - E\)](#) [\(F - J\)](#) [\(K - O\)](#) [\(P - T\)](#) [\(U - Z\)](#)

- **Above-market Cost** - The cost of a service in excess of the price of comparable services in the market.
- **Access Charge** - A charge for a power supplier, or its customer, for access to a utility's transmission or distribution system. It is a charge for the right to send electricity over another's wires.
- **Actual Peak Load Reductions** - Reduction in annual peak load by consumers who participate in a DSM program that reflect changes in demand.
- **Affiliate** - A company that is controlled by another or that has the same owner as another company.
- **Affiliated Power Producer** - A generating company that is affiliated with a utility.
- **After-Market** - Broad term that applies to any change after the original purchase, such as adding equipment not a part of the original purchase. As applied to alternative fueled vehicles, it refers to conversion devices or kits for conventional fuel vehicles.
- **Aggregation** - The process of organizing small groups, businesses or residential customer into a larger, more effective bargaining unit that strengthens their purchasing power with utilities.
- **Aggregator** - An entity that puts together customers into a guying group for the purchase of a commodity service. The vertically integrated investor owned utility, municipal utilities and rural electric cooperatives perform this function in today's power market. Other entities such as buyer cooperatives or brokers could perform this function in a restructured power market.
- **Alaskan System Coordination Council (ASCC)** - One of the ten regional reliability councils that make up the North American Electric Reliability Council (NERC).
- **Allowance for Funds Used During Construction (AFUD)** - Construction activities may be financed from internally generated funds (primarily earnings retained in the business), or from funds provided by other external sources (short- and long-term debt). The allowance for funds used during construction is intended to recognize the cost of these funds dedicated to construction activities during the construction period. To arrive at the "allowance", a common procedural method makes use of a formula that is based on the assumption that short-term debt is the first source of construction funds. The cost rate for short-term debt is based on current costs. Since a utility plant is subject to depreciation, the allowance for funds used during construction is recovered in the form of depreciation from ratepayers over the service life of the plant to which it applies.
- **Alternating Current (AC)** - Flow of electricity that constantly changes direction between positive and negative sides. Almost all power produced by electric utilities in the United States moves in current that shifts direction at a rate of 60 times per second.
- **Ampere** - Unit that measures electrical current in a circuit by 1 volt acting through a resistance of 1 ohm.
- **Ancillary Services** - Services necessary for the transmission of energy from resources to loads.
- **Annual Effects** - Effects in energy use and peak load resulting from participation in DSM programs in effect during a given period of time.
- **Annual Equivalent** - An equal cash flow amount that occurs every year.
- **Annual Fuel Utilization Efficiency** - A measure of heating efficiency, in consistent units, determined by applying the federal test method for furnaces. This value is intended to represent the ratio of heat transferred to the conditioned space by the fuel energy supplies over one year.
- **Annual Maximum Demand** - The greatest of all demands of the electrical load which occurred during a prescribed interval in a calendar year.
- **Annuity** - A series of equal cash flows over a number of years.
- **Appliance Saturation** - The percentage of households or buildings in a service area that have the type of equipment to which the demand-side technology applies. For example, if 50 percent of the residential customers have a central air conditioner, the appliance saturation is 50 percent.
- **Applicability Factor** - The percentage of end-use energy and demand used by a technology to which the demand-side management (DSM) measure applies. For example, the high-efficiency fluorescent lighting DSM measure applies to fluorescent lighting but not all lighting. Applicability therefore represents the percent of the lighting end-use attributable to fluorescence for which there could be high-efficiency replacements installed.
- **Area Load** - The total amount of electricity being used at a given point in time by all consumers in a utility's service territory.
- **Attributes** - Attributes are the outcomes by which the relative "goodness" of a particular expansion plan is measured e.g. fuel usage. Some attributes, such as fuel usage, are measured in well-defined parameters. Other attributes (e.g. public perception of a technology) are more subjective. Attributes may be grouped in several ways. Categories include financial, economic, performance, fuel usage, environmental, and socio-economic. The attributes chosen must measure issues that directly concern the utility and have an impact on its planning objectives. Limiting the number of attributes reduces the complexity and cost of a study.
- **Available but not Needed Capability** - Capability of generating units that are operable but not necessary to carry load.
- **Average Cost** - The revenue requirement of a utility divided by the utility's sales. Average cost typically includes the costs of existing power plants, transmission, and distribution lines, and other facilities used by a utility to serve its customers. It also includes operations and maintenance, tax, and fuel expenses.
- **Average Demand** - The energy demand in a given geographical area over a period of time. For example, the number of kilowatt-hours used in a 24-hour period, divided by 24, tells the average demand for that period.

- **Average Revenue per Kilowatt-hour** - Revenue by sector and geographic area calculated by dividing the monthly revenue by monthly sales.
- **Avoided Costs** - These are costs that a utility avoids by purchasing power from an independent producer rather than generating power themselves, purchasing power from another source or constructing new power plants. A Public Utility Commission calculates avoided costs for each utility, and these costs are the basis upon which independent power producers are paid for the electricity they produce. There are two parts to an avoided cost calculation: the avoided capacity cost of constructing new power plants and the avoided energy cost of fuel and operating and maintaining utility power plants.
- **Base Bill** - The base bill is calculated by multiplying the rate from the electric rate by the level of consumption.
- **Base Load** - The minimum load experienced by an electric utility system over a given period of time.
- **Base Load Unit** - A generating unit that normally operates at a constant output to take all or part of the base load of a system.
- **Base Rate** - The portion of the total electric or gas rate covering the general costs of doing business unrelated to fuel expenses.
- **Base Year** - The first year of the period of analysis. The base year does not have to be the current year.
- **Baseline Forecast** - A prediction of future energy needs which does not take into account the likely effects of new conservation programs that have not yet been started.
- **Baseload Capacity** - Generating equipment operated to serve loads 24-hours per day.
- **Basic Service** - The four charges for generation, transmission, distribution and transition that all customers must pay in order to retail their electric service.
- **Bilateral Contract** - A direct contract between the power producer and user or broker outside of a centralized power pool.
- **Biomass** - Plant materials and animal waste used as a source of fuel.
- **Blackout** - A power loss affecting many electricity consumers over a large geographical area for a significant period of time.
- **British Thermal Unit (BTU)** - The standard unit for measuring quantity of heat energy. It is the amount of heat energy necessary to raise the temperature of one pound of water one degree Fahrenheit.
- **Broadband Communications** - The result of utilities forming partnerships to offer consumers "one-stop-shopping" for energy-related and high-tech telecommunications services.
- **Broker** - A retail agent who buys and sells power. The agent may also aggregate customers and arrange for transmission, firming and other ancillary services as needed.
- **Brownout** - A controlled power reduction in which the utility decreases the voltage on the power lines, so customers receive weaker electric current. Brownouts can be used if total power demand exceeds the maximum available supply. The typical household does not notice the difference.
- **Bulk Power Market** - Wholesale purchases and sales of electricity.
- **Bulk Power Supply** - Often this term is used interchangeably with wholesale power supply. In broader terms, it refers to the aggregate of electric generating plants, transmission lines, and related equipment. The term may refer to those facilities within one electric utility, or within a group of utilities in which the transmission lines are interconnected.
- **Buy Through** - An agreement between utility and customer to import power when the customer's service would otherwise be interrupted.
- **Capability** - Maximum load that a generating unit can carry without exceeding approved limits.
- **Capacitor** - This is a device that helps improve the efficiency of the flow of electricity through distribution lines by reducing energy losses. It is installed in substations and on poles. Usually it is installed to correct an unwanted condition in an electrical system.
- **Capacity** - The maximum load a generating unit, generating station, or other electrical apparatus is rated to carry by the user or the manufacturer or can actually carry under existing service conditions.
- **Capacity (Purchased)** - Energy available for purchase from outside the system.
- **Capacity Charge** - An assessment on the amount of capacity being purchased.
- **Capacity Factor** - The ratio of the average load on a machine or equipment for a period of time to the capacity rating of the machine or equipment.
- **Capital Recovery Factor (CRF)** - A factor used to convert a lump sum value to an annual equivalent.
- **Captive Customer** - A customer who does not have realistic alternatives to buying power from the local utility, even if that customer had the legal right to buy from competitors.
- **Circuit** - Conductor for electric current.
- **Cogeneration** - Production of heat energy and electrical or mechanical power from the same fuel in the same facility. A typical cogeneration facility produces electricity and steam for industrial process use.
- **Cogenerator** - A facility that produces electricity and/or other energy for heating and cooling.
- **Coincidence Factor** - The ratio of the coincident maximum demand of two or more loads to the sum of their noncoincident maximum demands for a given period. The coincidence factor is the reciprocal of the diversity factor and is always less than or equal to one.
- **Coincidental Demand** - Two or more demands that occur at the same time.
- **Coincidental Peak Load** - Two or more peak loads that occur at the same time.
- **Combined Cycle** - Similar to the combustion turbine simple cycle, but includes a heat recovery steam generator that extracts heat from the combustion turbine exhaust flow to produce steam. This steam in turn powers a steam turbine engine.

- **Combined Cycle Plant** - An electric generating station that uses waste heat from its gas turbines to produce steam for conventional steam turbines.
- **Combustion Turbine** - A fossil-fuel-fired power plant that uses the conversion process known as the Brayton cycle. The fuel, oil, or gas is combusted and drives a turbine-generator.
- **Commercial Operation** - Commercial operation occurs when control of the generator is turned over to the system dispatcher.
- **Commercialization** - Programs or activities that increase the value or decrease the cost of integrating new products or services into the electric sector.
- **Comparability** - When a transmission owner provides access to transmission services at rates, terms and conditions equal to those the owner incurs for its own use.
- **Competitive Bidding** - This is a procedure that utilities use to select suppliers of new electric capacity and energy. Under competitive bidding, an electric utility solicits bids from prospective power generators to meet current or future power demands. When offers from independent power producers began exceeding utility needs in the mid-1980's, utilities and state regulators began using competitive bidding systems to select more fairly among numerous supply alternatives.
- **Competitive Franchise** - A process whereby a municipality (or group of municipalities) issues a franchise to supply electricity in the community to the winner of a competitive bid process. Such franchises can be for bundled electricity and transmission/distribution, or there can be separate franchises for the supply of electricity services and the transmission and distribution function. Franchises can be, but typically are not, exclusive licenses.
- **Competitive Transition Charge (CTC)** - A "nonbypassable" charge generally placed on distribution services to recover utility costs incurred as a result of restructuring (stranded costs - usually associated with generation facilities and services) and not recoverable in other ways.
- **Comprehensive National Energy Policy Act** - Federal legislation in 1992 that opened the U.S. electric utility industry to increase competition at the wholesale level and left authority for retail competition to the states.
- **Conductor** - An object or substance which conducts or leads electric current. A wire, cable, busbar, rod, or tube can serve as a path for electricity to flow. The most common conductor is an electrical wire.
- **Connection** - The connection between two electrical systems that permit the transfer of energy.
- **Conservation** - A foregoing or reduction of electric usage for the purpose of saving natural energy resources and limiting peak demand in order to ultimately reduce the capacity requirements for plant and equipment.
- **Consumer Education** - Efforts to provide consumers with skills and knowledge to use their resources wisely in the marketplace.
- **Consumption (Fuel)** - Amount of fuel used for gross generation.
- **Contract Path** - The most direct physical transmission tie between two interconnected entities. When utility systems interchange power, the transfer is presumed to take place across the "contract path", notwithstanding the electric fact that power flow in the network will distribute in accordance with network flow conditions. This term can also mean to arrange for power transfer between systems.
- **Contract Price** - Price marketed on a contract basis for one or more years.
- **Contract Receipts** - Purchases that cover at least one year.
- **Control Area** - A power system or systems to which an automatic control is applied.
- **Converter** - Any technology that changes the potential energy in fuel into a different form of energy such as heat or motion. The term also is used to mean an apparatus that changes the quantity or quality of electric energy.
- **Cooperative Electric Utility** - A utility established to be owned by and operated for the benefit of those using its services.
- **Cross-subsidization** - This refers to the transfer of assets or services from the regulated portion of an electric utility to its unregulated affiliates to produce an unfair competitive advantage. Also, cross-subsidization can refer to one rate class (such as industrial customers) subsidizing the rates of another class (such as residential customers).
- **Current (Electric)** - Flow of electrons in an electric conductor.
- **Current Transformers** - These are used in conjunction with metering equipment. They are designed to permit measurement of currents beyond the range of a meter.
- **Customer Assistance Programs** - Alternative collection program set up between a utility company and a customer that allows customers to pay utility bills on a percentage-of-the-bill they owe or percentage-of-customer-income instead of paying the full amount owed. These programs are for low-income people who can't pay their bills. These customers must agree to make regular monthly payments based on their new payment plans.
- **Customer Class** - A distinction between users of electric energy. Customer class is usually defined by usage patterns, usage levels, and conditions of service. Classes are usually categorized generically by customer activity (e.g. residential, commercial, industrial, agricultural, street lighting).
- **Customer Costs** - Costs that are related to and vary with the number of customers. Customer costs include meters, meter readers, or service equipment costs.
- **Customer Service Charge** - That portion of the customer's bill which remains the same from month to month. The charge is determined separately from the amount of energy used. It is based on the costs associated with connecting a customer to the company's distribution system, including the service connection and metering equipment. This charge also recovers expenses such as meter reading, billing costs, customer accounting expenses records and collections, and a portion of general plant items such as office space for customer service personnel.

- **Customer Service Protection** - The rules governing grounds for denial of service, credit determination, deposit and guarantee practices, meter reading and accuracy, bill contents, billing frequency, billing accuracy, collection practices, notices, grounds for termination of service, termination procedures, rights to reconnection, late charges, disconnection/reconnection fees, access to budget billing and payment arrangements, extreme weather, illness or other vulnerable customer disconnection protections, and the like. In a retail competition model, would include protections against "slamming" and other hard-sell abuses.
- **Daily Peak** - The maximum amount of energy or service demanded in one day from a company or utility service.
- **Degree-day** - A unit measuring the extent to which the outdoor mean (average of maximum and minimum) daily dry-bulb temperature falls below (in the case of heating) or rises above (in the case of cooling) an assumed base. The base is normally taken as 65 degrees for heating and cooling unless otherwise designated.
- **Demand (electric)** - The rate at which electric energy is delivered to or by a system, part of a system, or a piece of equipment. Demand is expressed in kW, kVA, or other suitable units at a given instant or over any designated period of time. The primary source of "demand" is the power-consuming equipment of the customers.
- **Demand Billing** - The electric capacity requirement for which a large user pays. It may be based on the customer's peak demand during the contract year, on a previous maximum or on an agreed minimum. It is measured in kilowatts.
- **Demand Charge** - The sum to be paid by a large electricity consumer for its peak usage level.
- **Demand Controller** - An electrical, mechanical, or electromechanical device or system that monitors the customer demand and causes that demand to be leveled and/or limited.
- **Demand Ratchet** - This is the minimum billing demand based upon a given percentage of the actual demand use, recorded during the last eleven months of demand history.
- **Demand-Side Management (DSM)** - A technology or program that encourages customers to use electricity differently.
- **Demonstration** - The application and integration of a new product or service into an existing or new system. Most commonly, demonstration involves the construction and operation of a new electric technology interconnected with the electric utility system to demonstrate how it interacts with the system. This includes the impacts the technology may have on the system and the impacts that the larger utility system may have on the functioning of the technology.
- **Departing Member** - A member consumer served at retail by an electric cooperative corporation that has given notice of intent to receive generation services from another source or that is otherwise in the process of changing generation suppliers. These persons shall nonetheless remain members of the electric distribution cooperative corporation for purposes of distribution service.
- **Dependable Capacity** - The system's ability to carry the electric power for the time interval and period specified. Dependable capacity is determined by such factors as capability, operating power factor and portion of the load the station is to supply.
- **Depletable Energy Sources** - This includes: 1) electricity purchased from a public utility and 2) energy obtained from burning coal, oil, natural gas or liquefied petroleum gasses.
- **Depreciation, Straight-line** - Straight-line depreciation takes the cost of the asset less the estimated salvage value and allocates the cost in equal amounts over the asset's estimated useful life.
- **Deregulation** - The elimination of regulation from a previously regulated industry or sector of an industry.
- **Designated Agent** - An agent that acts on behalf of a transmission provider, customer or transmission customer as required under the tariff.
- **Direct Access** - The ability of a retail customer to purchase commodity electricity directly from the wholesale market rather than through a local distribution utility.
- **Direct Current (DC)** - Electric that flows continuously in the same direction.
- **Direct Energy Conversion** - Production of electricity from an energy source without transferring the energy to a working fluid or steam. For example, photovoltaic cells transform light directly into electricity. Direct conversion systems have no moving parts and usually produce direct current.
- **Direct Load Control** - Activities that can interrupt load at the time of peak by interrupting power supply on consumer premises, usually applied to residential consumers.
- **Direct Utility Cost** - A cost identified with one of the DSM categories.
- **Disaggregation** - The functional separation of the vertically integrated utility into smaller, individually owned business units (I.e. generation, dispatch/control, transmission, distribution). The terms "deintegration", "disintegration" and "delimitation" are sometimes used to mean the same thing.
- **Discount/Interest Rate** - The discount rate is used to determine the present value of future or past cash flows. The rate accounts for inflation and the potential earning power of money.
- **Dispatchability** - This is the ability of a generating unit to increase or decrease generation, or to be brought on line or shut down at the request of a utility's system operator.
- **Distributed Generation** - A distributed generation system involves small amounts of generation located on a utility's distribution system for the purpose of meeting local (substation level) peak loads and/or displacing the need to build additional (or upgrade) local distribution lines.
- **Distribution** - The system of wires, switches, and transformers that serve neighborhoods and business, typically lower than 69,000 volts. A distribution system reduces or downgrades power from high-voltage transmission lines to a level that can be used in homes or businesses.
- **Distribution Line** - This is a line or system for distributing power from a transmission system to a customer. It is any line operating at less than 69,000 volts.

- **Distribution System** - That part of the electric system that delivers electric energy to consumers.
- **Distribution Utility (Disco)** - The regulated electric utility entity that constructs and maintains the distribution wires connecting the transmission grid to the final customer. The Disco can also perform other services such as aggregating customers, purchasing power supply and transmission services for customers, billing customers and reimbursing suppliers, and offering other regulated or non-regulated energy services to retail customers. The "wires" and "customer service" functions provided by a distribution utility could be split so that two totally separate entities are used to supply these two types of distribution services.
- **Distributive Power** - A packaged power unit located at the point of demand. While the technology is still evolving, examples include fuel cells and photovoltaic applications.
- **Diversity Exchange** - Exchange of capacity or energy between systems that have peak loads occurring at different times.
- **Diversity Factor** - The ratio of the sum of the non-coincident maximum demands of two or more loads to their coincident maximum demand for the same period.
- **Divestiture** - The stripping off of one utility function from the others by selling (spinning-off) or in most other way changing the ownership of the assets related to that function. Most commonly associated with spinning-off generation assets so they are no longer owned by the shareholders that own the transmission and distribution assets.
- **DSM Measure Technology Program** - Single devices, equipment, or rates as listed in the Reference Data. A demand-side management program is usually a group of DSM measures or technologies. However, a DSM program could in some cases be a single measure.
- **East Central Area Reliability Coordination Agreeeme** - One of the ten regional reliability councils that make up the North American Electric Reliability Council (NERC).
- **Economic Dispatch** - The distribution of total generation requirements among alternative sources for optimum system economy with consideration to both incremental generating costs and incremental transmission losses.
- **Economic Efficiency** - A term that refers to the optimal production and consumption of goods and services. This generally occurs when prices of products and services reflect their marginal costs. Economic efficiency gains can be achieved through cost reduction, but it is better to think of the concept as actions that promote an increase in overall net value (which includes, but is not limited to, cost reductions).
- **Economy Energy** - Energy produced and substituted for the traditional but less economical source of energy. Economic energy is usually sold without capacity and is priced at variable costs plus administration costs.
- **Efficiency Service Company** - A company that offers to reduce a client's electricity consumption with the cost savings being split with the client.
- **Elasticity of Demand** - The ratio of the percentage change in the quantity demanded of a good to the percentage change in price.
- **Electric Capacity** - This refers to the ability of a power plant to produce a given output of electric energy at an instant in time, measured in kilowatts or megawatts (1,000 kilowatts).
- **Electric Distribution Company** - The company that owns the power lines and equipment necessary to deliver purchased electricity to the customer.
- **Electric Plant (Physical)** - A facility that contains all necessary equipment for converting energy into electricity.
- **Electric Power Supplier** - Non-utility provider of electricity to a competitive marketplace.
- **Electric Rate Schedule** - An electric rate and its contract terms accepted by a regulatory agency.
- **Electric Reliability Council of Texas (ERCOT)** - One of the ten regional reliability councils that make up the North American Electric Reliability Council (NERC).
- **Electric System** - This term refers to all of the elements needed to distribute electrical power. It includes overhead and underground lines, poles, transformers, and other equipment.
- **Electric Utility** - A legal entity that owns and/or operates facilities for the generation, transmission, distribution, or sale of electric energy.
- **Electric Utility Affiliate** - This refers to a subsidiary or affiliate of an electric utility. Many utilities form affiliates to develop, own, and operate independent power facilities.
- **Electric Wholesale Generator** - A power producer who sells power at cost to a customer.
- **Embedded Cost** - A utility's average cost of doing business, which includes the costs of fuel, personnel, plants, poles, and wires.
- **End-Use** - The specific purpose for which electric is consumed (i.e. heating, cooling, cooking, etc.).
- **Energy** - This is broadly defined as the capability of doing work. In the electric power industry, energy is more narrowly defined as electricity supplied over time, express in kilowatt-hours.
- **Energy Charge** - The amount of money owed by an electric customer for kilowatt-hours consumed.
- **Energy Consumption** - The amount of energy consumed in the form in which it is acquired by the user. The term excludes electrical generation and distribution losses.
- **Energy Costs** - Costs, such as for fuel, that are related to and vary with energy production or consumption.
- **Energy Deliveries** - Energy generated by one system delivered to another system.
- **Energy Effects** - Changes at the consumer meter that reflect activities undertaken in response to utility-administered programs.
- **Energy Efficiency** - Programs that reduce consumption.

- **Energy Policy Act of 1992** - This act which was the first comprehensive federal energy law promulgated in more than a decade will help create a more competitive U.S. electric power marketplace by removing barriers to competition. By doing so, this act allows a broad spectrum of independent energy producers to compete in wholesale electric power markets. The act also made significant changes in the way power transmission grids are regulated. Specifically, the law gives the Federal Energy Regulatory Commission the authority to order electric utilities to provide access to their transmission facilities to other power suppliers.
- **Energy Receipts** - Energy generated by one utility system that is received by another through transmission lines.
- **Energy Reserves** - The portion of total energy resources that is known and can be recovered with presently available technology at an affordable cost.
- **Energy Resources** - Everything that could be used by society as a source of energy.
- **Energy Services Companies (ESCOs)** - ESCOs would be created in a deregulated, openly competitive electric marketplace. The Energy Services industry would be made up of power aggregators, power marketers and brokers, whose job is to match buyers and sellers, tailor both physical and financial instruments to suit the needs of particular customers, and to allow even the smallest residential customers to form buying groups or cooperatives that will give them the same bargaining power as large industrial customers.
- **Energy Source** - A source that provides the power to be converted to electricity.
- **Energy Use** - Energy consumed during a specified time period for a specific purpose (usually expressed in kWh).
- **Entitlement** - Electric energy or generating capacity that a utility has a right to access under power exchange or sales agreements.
- **Entrance Cable/Service Entrance Conductor** - This is the cable running down the side of a customer's house into the meter. This cable is owned by the customer and its maintenance is the customer's responsibility. Work on this cable should be performed only by a licensed electrician.
- **Environmental Attributes** - Environmental attributes quantify the impact of various options on the environment. These attributes include particulate emissions, SO<sub>2</sub> or NO<sub>x</sub>, and thermal discharge (air and water).
- **Escape Provision** - A contract provision which allows a party, such as an electric customer, to get out of it. Usually, there is a penalty.
- **Exempt Wholesale Generator (EWG)** - An EWG is a category of power producer defined by the Energy Policy Act of 1992. EWG's are independent power facilities that generate electricity for sale in wholesale power markets at market-based rates. The Federal Energy Regulatory Commission is responsible for determining EWG status.

[\(A - E\)](#) [\(F - J\)](#) [\(K - O\)](#) [\(P - T\)](#) [\(U - Z\)](#)

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## RESOURCES FOR TEACHERS AND PARENTS

### Energy Education Resources BOOKS & OTHER PRINTED MATERIAL



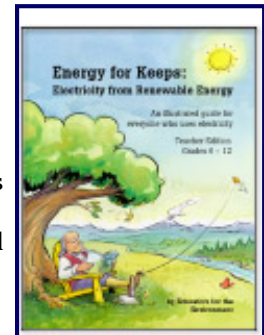
Books, other documents and links listed below do not cover all the books on energy -- there are literally thousands. Nor does any mention of a book mean that we recommend it. See our "[Top Picks](#)" page for Energy Quest book recommendations. You may want to go to your library or bookstore to see if they have these books. Or you can write the publisher. If you know of other books on energy for children, please let us know by sending an e-mail to: [baldrich@energy.state.ca.us](mailto:baldrich@energy.state.ca.us)

Note: Some documents listed here are Adobe Acrobat PDF files and can be downloaded using your computer. These files will show a PDF icon  You will need the free Acrobat Reader software available from [Acrobat Systems Incorporated](#) to download, navigate and print these documents.

#### **Energy For Keeps: Electricity From Renewable Energy**

By Educators for the Environment, a division of The California Study, Inc., a nonprofit educational organization.

**Description:** This 240-page balanced, and up-to-date review of energy resources covers the history, availability, impacts, technologies and management of the energy resources we use to generate electricity. It was sponsored by the Energy Commission with additional contributions from the Bonneville Power Administration and others. ISBN 0-9744765-0-1. For more information and ordering, please go to: [www.energyforkeeps.com/](http://www.energyforkeeps.com/)



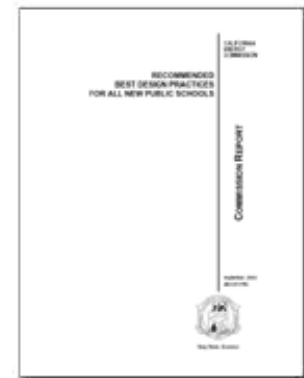
#### **California Energy Commission**

##### **Recommended Best Design Practices for all New Public Schools**



Adobe Acrobat PDF, 28 pages, 287 kb, October 2003.

**Description:** This report recommends increasing funding above standard allotment for the building of public schools to school districts that voluntarily build High Performance Schools, to cover those integrated new building projects that have a cost recovery period of seven years, using either life cycle cost analysis or simple payback benchmarks of economic performance.





### California Energy Commission

#### CONSERVE & RENEW: An Energy Educational Activity Package for Grades 4-6

 Download Adobe Acrobat PDF, 135 pages, 1.0 MB, March 2003.

**Description:** This manual is a collection of energy education activities that are written and organized to be used either as a unit on energy or as individual activities to complement existing curricula. The focus is on conservation and renewables because these important aspects of energy education have not received as much curricular attention as the more "traditional" sources of energy.



**SUBJECTS:** Virtually every discipline is addressed in these activities. Studying energy lends itself well to both problem-solving and critical thinking. Because energy is something that permeates every aspect of life, it can be wonderful motivator for getting students engaged in their projects in all the traditional disciplines.

Printed copies of the document are available by calling the Commissions' Publications Unit at 916-654-5200 and asking for publication # 180-03-002F. Call for price on multiple copies.

### California Energy Commission

#### The Universal House - Energy Shelter and the California Indian

 Acrobat PDF, 37 pages, **1.1 MB - note file size!**

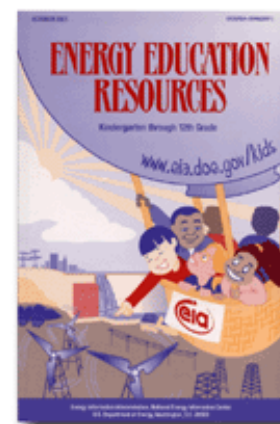
**Description:** - *The Universal House - Energy Shelter and the California Indian* links energy awareness with traditional California Indian cultures for 3rd to 6th graders. The teacher's overview and activity pages offers the student a unique way to incorporate science, social studies, art, math and language arts as they discover the different ways native tribes constructed shelters within the natural environment.



### U.S. Dept. of Energy


#### Energy Education Resources: Kindergarten Through 12th Grade

- **Description:** Published and updated yearly (in October) by the National Energy Information Center (NEIC), a service of the Energy Information Administration (EIA), this publication provides students, educators, and other information users, a list of generally available free or low-cost energy related educational materials.



### State of California

#### Environmental Education: Compendium for Energy Resources

 Download Adobe Acrobat PDF, 109 pages, **3.6 MB - note file size!**

**Description:** Updated in July 1998, this 109-page document lists energy education material from various sources, evaluating the material on its teaching and learning, presentation and organization, and energy content. It is 3.6 megabytes in size and available to download as a PDF file. Downloading on a 56 kbps modem will take about 10-15 minutes, depending on network speed.

Printed copies of the document are available by calling the Commissions' Publications Unit at 916-654-5200 and asking for publication # P180-98-001. Call for price on multiple copies.

Other Compendia are available. But the on-line versions are scanned copies kept by the Berkeley Digital Library. They are more difficult to download and view.

Also Available:

- [Compendium for Air Quality](#)
- [Compendium for Human Communities](#)
- [Compendium for Integrated Waste Management](#)
- [Compendium for Natural Communities](#)
- [Compendium for Water Resources](#)



## **BOOKS AND OTHER PRINTED MATERIALS - IN ALPHABETICAL ORDER**

*101 things You Don't Know About Science and No One Else Does Either*, James Trefil, Mariner Books / Houghton Mifflin Company, 1996, ISBN: 0-395-87740-7.

*Art and Science Connection - Hands-On Activities for Primary Students*, Kimberley Tolley, Addison-Wesley Publishing Company, 1993, ISBN: 0-201-45544-7.

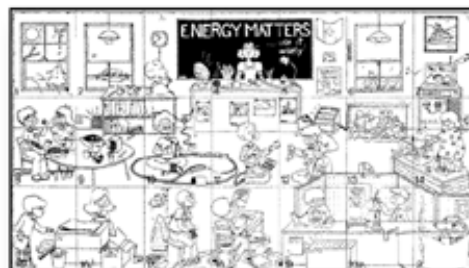
*Ben Franklin Book of Easy & Inedible Experiments, Activities, Projects and Science Fun*, Franklin Institute Science Museum Book, ISBN: 0-471-07639-2, 1995.

[BullFrog Films](#) - distributor of science and educational films.

### Classroom Energy Poster Puzzle

 (Acrobat PDF file, 28 pages, 230 kb)

**Description:** The document contains a three foot by five foot poster that can be assembled in the classroom from 21 separate pages. The poster depicts energy *use* and *abuse* in a classroom. The poster puzzle is a useful teaching aid for any grade four teacher wishing to incorporate energy conservation in the regular teaching program. The introductory material also explains each of the pages, and all of the pages can be hand-colored by students. Note that laser or dot matrix/inkjet printer limitations may cut off 1/4-inch of the drawings because of margins around the edge of each page, so reducing the percentage of print size and then trimming the edges back to the picture will make it match up to next picture.



[Eco Mall List of Books](#)

[Education World® Books on Science](#)

*Energy Primer - Solar, Water, Wind and BioFuels*, - Portola Institute, 1974. ISBN: 0-914774-00-X. Is out of print, but it's a great "Whole Earth Catalog" style of book that explains just about everything.

*ENERGY: Stop Faking It!* - (Part of "Stop Faking It! - Finally Understanding Science So You Can Teach It" series by [National Science Teachers Association](#)), William C. Robertson, NSTA Press, Arlington, VA, 2002, ISBN: 0-87355-214-8.

*Experimenting with Energy*, by Alan Ward, [Chelsea House](#), ISBN:0-7910-1510-6, 1991.

*Exploring Energy With Toys - Complete Lessons for Grades 4-8* Beverly A.P. Taylor, Terrific Science Press (National Science Foundation funded) - McGraw-Hill, 1998, ISBN: 0-07-064747-X.

*From Space To Earth: The Story of Solar Electricity*, John Perlin, Aatec Publications, 01999, ISBN: 0937948144.

*Hands-On Physics Activites with Real-Life Applications (for Grades 8-12)*, James Cunningham and Norman Herr, Center for Applied Research in Education, 1994, ISBN: 0-87628-845-X.

*Hands-On Science - 112 East-to-Use High Interest Activites for Grades 4-)*, Dorothea Allen, Center for Applied Research in Education, 1991, ISBN: 0-87628-906-5.

[Helping Your Child Learn Science](#) - U.S. Dept. of Education Website

[Home Energy Magazine Website](#)

*How Things Work - The Physics of Everyday Life*, Louis A. Bloomfield, John Wiley & Sons Inc., 1997, ISBN: 0-471-59473-3.

[Jiminy Cricket's Environmentalty](#) - **Description:** Yearly contest sponsored by State of California and Disneyland for **California** Fifth Graders (note open to students in other states) with an environmental theme. Winning classroom gets a trip to Disneyland.



[National Agricultural Library, Kids' Science Page](#) - Books on Geology, Natural Resources, Soil, and Water Science

[North American Association for Environmental Education](#) - The Environmental Education Collection: A Review of Resources for Educators.

[PicoTurbine](#) - **Description:** Private company that sells plans, books, videos, and kits for renewable energy education. They have an excellent on-line list of books on energy.

[Powells Books](#) - **Description:** On-line listings of new and used books on energy and the environment.

*Power Up! 20 Thematic Science Experiments for Home and School*, by Sharon Franklin, GoodYear Books, ISBN: 0-673-36216-7, 1995.

*Rads, Ergs, & Cheeseburgers: The Kid's Guide to Energy & the Environment*, by Bill Yanda and John Muir, John Mui Publishing, 1991, ISBN: 0-945465-75-0.

[READ California](#) - **Description:** reated by the California Legislature through Assembly Bill

2X, which established READ California, an advertising/public relations campaign to promote the involvement of all Californians in encouraging youngsters to read. READ California combines a multi-media approach using advertising, special events and publicity to promote the good works of reading programs and the people behind them.

*Renewables Are Ready - A Guide to Teaching Renewable Energy in Junior and Senior High School Classrooms*, by Union of Concerned Scientists, 617-547-5522, 1994. Includes a list of books, videos and other materials available from the UCS and elsewhere.

*Renewable Energy: A Concise Guide to Green Alternatives*, by Jennifer Carless, [Walker & Co](#), ISBN: 0-8027-8214-0, 1993.

*Science & Stories - Integrating Science and Literature (Grades 4-6)*, by Hilarie N. Staton and Tara McCarthy, GoodYear Books, 1994, ISBN: 0-673-36804-9.

[SciencePlus "Communicator" Newsletter](#) - **Description:** SciencePlus is an integrated, process-oriented program which is designed to teach the way students learn best -- by thinking, talking, writing, and doing science. It provides a forum for science teachers.

*Science Projects in Renewable Energy and Energy Efficiency*, published by [American Solar Energy Society](#), distributed by [National Energy Foundation](#), 5160 Wiley Post Way, Suite 200, Salt Lake City, UT 84116, (801) 539-1406, 1991.

#### [Solar Energy International Bookstore](#)

*Teaching Physical Science Through Children's Literature - 20 Complete Lessons for Elementary Grades*, Susan E. Gertz, et.al., Terrific Science Press (National Science Foundation funded) - McGraw-Hill, 1998, ISBN: 0-07-064723-2.

*Teach with Energy! Fundamental Energy, Electricity and Science Lessons for Grades K-3*, [National Energy Foundation](#), 5160 Wiley Post Way, Suite 200, Salt Lake City, UT 84116, (801) 539-1406, 1990.

*Teach with Energy! Fundamental Energy, Electricity and Science Lessons for Grades 4-6*, [National Energy Foundation](#), 5160 Wiley Post Way, Suite 200, Salt Lake City, UT 84116, (801) 539-1406, 1992.

[Texas Solar Energy Coloring Book](#) -  Acrobat PDF file, 12 pages, 365 kilobytes.

*Understanding Garbage and Our Environment*, Andrea J. Nolan, Editor, Terrific Science Press (National Science Foundation funded) - McGraw-Hill, 1999, ISBN: 0-07-064760-7.

*Who Owns the Sun? People, Politics, and the Struggle for a Solar Economy*, Daniel M. Berman and John T. O'Connor, Chelsea Green Publishing Company, 1996, ISBN 0-930031-86-5.

*Why Toast Lands Jelly-Side Down*, Robert Ehrlich, Princeton University Press, 1997, ISBN 0-691-02887-7

*Yes, We Have No Neutrons - An Eye-Opening Tour Through the Twists and Turns of Bad Science*, A.K. Dewdney, John Wiley & Sons Inc., 1997, ISBD: 0-471-29586-8.

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## RESOURCES FOR TEACHERS AND PARENTS

### Energy Education Resources AUDIO, VIDEO and DVD MATERIAL



Video and DVD and links listed below do not cover all the audio/video materials on energy - there are many. You may want to go to your library or bookstore to see if they have and of these items. Or you can write the publisher. If you know of other videos on energy for children, please let us know by sending an e-mail to: [baldrich@energy.state.ca.us](mailto:baldrich@energy.state.ca.us)

#### The Video Project

Educational videos on environment, science and social studies.

**Description:** San Francisco-based, the Video Project has a number of resources for teachers developing lessons plans around energy, renewables and the environment. Many award-winning energy films include teacher / curriculum guides. For more information and ordering, call 1-800-4-PLANET or please go to: [www.videoproject.net](http://www.videoproject.net)



#### Library Video Company

**Description:** Library Video Company is a distributor of educational video, CD-ROM, audiobook and DVD to schools and public libraries nationwide. The company stocks more than 17,000 titles covering a diverse range of topics for all ages and grade levels. Each program has been carefully reviewed and selected for content that is appropriate for the classroom and public library setting. Please go to: [www.libraryvideo.com](http://www.libraryvideo.com)



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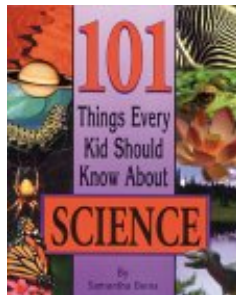
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# ENERGY LIBRARY

## EQ PICKS

On this page you'll find Energy Quest staffs' "PICKS" (our recommendations) on books about energy and science. We find these books to be top notch when it comes to helping children understand scientific concepts in the world around them.



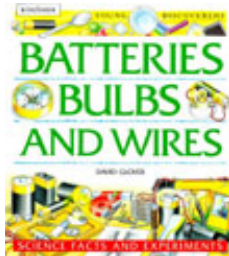
### Title: **101 Things Every Kid Should Know About Science**

Author: Samantha Beres

Publisher: Lowell House Juvenile, Los Angeles, CA

ISBN: 1-56565-916-3

Description: This 96-page, inexpensive paperback has everything from chemistry to zoology is explained in this easy to understand book. Fun facts, biographies of famous scientists and hands-on experiments add to the descriptions of 101 scientific ideas and theories.



### Title: **Batteries, Bulbs and Wires: Science Facts and Experiments**

Author: David Glover

Publisher: Kingfisher

ISBN: 1-85697-933-4

Description: this book is geared for grades 4 to 8. It includes projects ranging from building a basic battery-connected circuit to a do-it-yourself burglar alarm, children will have fun discovering the properties and principles of electricity.



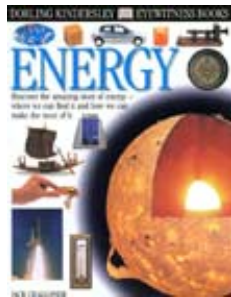
Title: **Dorling Kindersley Eyewitness Books: Electricity**

Author: Steve Parker

Publisher: Dorling Kindersley, New York, NY

ISBN: 0-78945-577-3

Description: The story of electricity from its discovery to its uses today. It covers the entire big picture of how important electricity is in our daily lives.



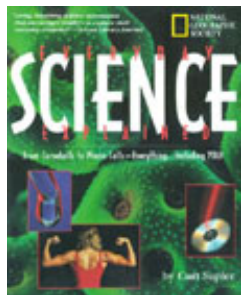
Title: **Dorling Kindersley Eyewitness Books: Energy**

Author: Jack Challoner

Publisher: Dorling Kindersley, New York, NY

ISBN: 1-56458-232-9

Description: Another in the DK series. It is filled with wonderful pictures about energy from the past and today. It's a wonderful book to sit down and explore and just leaf through page by page.



Title: **Everyday Science Explained**

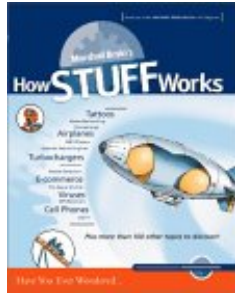
Author: Curt Supplee

Publisher: National Geographic Society

ISBN: 0-79227-194-7

Description: A 272-page paperback looks at everything from curve balls to cell phones and even things about the human body. From "Booklist": "This reader-friendly picture book takes a cleverly lighthearted and unfailingly effective approach to science by explaining such diverse phenomena as gravity, halogens, evolution, cellular structure and perception in terms of everyday life. The illustrations, drawn from every imaginable source, including old movie stills (a scene featuring Laurel and Hardy helps dramatize inclined planes), sports photography, cartoons, and aerial views as well as original diagrams and drawings, set the tone."





Title: **Marshall Brain's How Stuff Works**

Author: Marshall Brain  
 Publisher: Hungry Minds, Inc.  
 ISBN: 0-76456-518-4

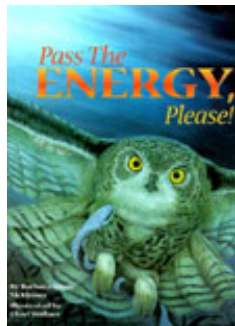
Description: This huge 307 page book explains just about everything. from a toaster to a jet engine, there are clear easy-to-understand pictures and explanations of how things do what they do and why. They also have a great website at: [www.howstuffworks.com](http://www.howstuffworks.com)



Title: **The New Way Things Work**

Author: David Macaulay  
 Publisher: Houghton Mifflin Company, Boston, MA.  
 ISBN: 0-395-93847-3

Description: A very comprehensive reference book that anyone can enjoy. This award-winning book was expanded in 1998 and has sold over a million copies. Wonderful drawings and text cover the workings of hundreds of machines.



Title: **Pass the Energy, Please! (Sharing Nature With Children Book)**

Author: Barbara Shaw McKinney  
 Publisher: Dawn Publications  
 ISBN: 1-58469-002-X

Description: Each of nature's creatures "passes the energy" in its own unique way. In this upbeat rhyming story by poet Barbara McKinney, the food chain connects herbivores, carnivores, insects and plants together in a fascinating circle of players. All beings on Earth - from the anchovy to the zooplankton - depend upon the green plant, which is the hero of the story. Barbara McKinney's special talent shines again for being able to present the science curriculum so concisely, creatively, and cleverly.



Title: **Scientific American How Things Work Today**

Editors: Michael Wright and Mukul Patel

Publisher: Scientific American

ISBN: 0-37541-023-6

Description: In this book, you'll find more than 100 topics explored in easy-to-understand text and made absolutely clear with the aid of more than 600 fully annotated, three-dimensional illustrations and color photographs. It's written in the **Scientific American** magazine style, which is straight, matter of fact, and has lots of details.



Title: **Stop Faking It! ENERGY**

(Part of "Stop Faking It! - Finally Understanding Science So You Can Teach It" series by National Science Teachers Association)

Author: William C. Robertson

Publisher: NSTA Press, Arlington, VA

ISBN: 0-87355-214-8

Description: A super book for teachers that explains what you NEED to know about the science of energy. Each chapter ends with a summary and explains real-world examples of the concepts. Also some excellent hands-on experiments using household objects.



Title: **What to Do When Your Mom or Dad Says...'Turn Off the Water & Lights!'**

(Part of "The Survival Series for Kids")

Author: Joy Wilt Berry

Publisher: Word, Inc., Waco, TX

ISBN: 0-941510-23-9

Description: A wonderful book for kids published in 1984, it is now out of print. If you can find a used copy, usually for \$2.00 to \$5.00, you should consider adding it to your library. This book explains in simple to understand words, with wonderful drawing by "Batholomew," the hows and whys of energy and water conservation.

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# RESOURCES FOR TEACHERS AND PARENTS

## Energy & Science Lesson Plans

This list is in no way "complete." It is a snapshot of some of the resources and lesson plans currently available on the Internet (and a couple of books) that deal with energy and science education. There are numerous websites that offer various lesson plans and information for teachers about teaching about energy in the classroom. If you have lesson plans that teach about energy or know a website that contains lesson plans, please let us know. Send an e-mail to: [baldrich@energy.state.ca.us](mailto:baldrich@energy.state.ca.us)

- [U.S. Dept of Energy's Kid Zone](#) - what teachers should know
- [U.S. Dept of Energy's Energy Efficiency and Renewable Energy](#) - Energy Lesson Plans, Curriculum, and Educational Materials
- [Energy Information Administration's Kids Page](#)
- [Alliance to Save Energy](#) - hundreds of teacher-submitted lesson plans
- [Ask ERIC Lesson Plans Database](#) (US Dept. of Education's "Educational Resources Information Center")
- [The Atoms Family](#) - learn about atoms, electricity and more
- [Bang! Boing! Pop!](#) - interactive physics tutor
- [Blue Web'N](#) - PacBell/SBC's Blue Ribbon Learning Sites
- [Bonneville Power Authority](#) - energy efficiency and "Classroom-In-A-Box" program.
- [Canada On-Line Science Lesson Plans](#) - Energy Lessons, K-8
- [Discovery Channel School](#) - The Teacher Channel offers lesson plans for all major school subjects, teaching worksheets and other free stuff for teachers.
- [Education World](#) - lessons on energy
- [EdUniverse.com](#) - Search 2000+ lessons on a wide range of subjects for all grade levels. Lessons come from the teacher participants in the Intel ACE Program from around the country.
- [Eisenhower National Clearinghouse for Math/ Science Education](#)
- [Electronic Desktop Project - Virtual Courseware](#) - Web-based lab activities that enhance the learning and teaching of Geology and other Earth and Environmental Science topics for introductory College and High School courses.
- [Environmental Resources](#) - Project LINK is a one-year initiative involving selected New York City school districts. It is being directed by Teaching Matters, Inc. and the Center for Improved Engineering and Science Education (CIESE) at Stevens Institute of Technology.
- [Explore Science](#) - interactive on-line exploration site
- [The Explorer](#) - collection of educational resources (instructional software, lab activities, lesson plans, student created materials ...) for K-12 mathematics and science education.

- [\*Exploring Energy With Toys - Complete Lessons for Grades 4-8\* Beverly A.P. Taylor, Terrific Science Press \(National Science Foundation funded\) - McGraw-Hill, 1998, ISBN: 0-07-064747-X.](#)
- [Florida Solar Energy Center](#) - teacher's resources page with various curriculum
- [Franklin Institute On-Line](#) - Lesson Plans by subject matter
- [Franklin Institute Wind Learning Center](#)
- [General Electric \(GE\) Learning Unit on Light & Lighting](#)
- [Girl-tech Lesson Plans](#) - to teach mathematics and science concepts in new and exciting ways.
- [Hands-On Universe](#) - Lawrence Hall of Science, University of California at Berkeley.
- [Houston Museum of Natural History - Energy Lesson Plans](#)
- [Imagine the Universe Lesson Plans](#) - lesson plans and info from NASA
- [InfinitePower.com Lesson Plans](#) - Texas State Energy Conservation Office lesson plans on renewable energy
- [Instructional Materials Collected By Vicki & Dick Sharp](#) - dozens of links to on-line resources
- [LessonPlansPage.com](#) - The Lesson Plans Page is a collection of over 1,000 lesson plans, primarily at the elementary level, that were developed by Kyle Yamnitz, students, and faculty at The University of Missouri. More recent lesson plans were submitted by the users of the website.
- [National Science Teachers's Association](#) - Integrated Energy Lessons
- [New York Times Daily Lesson Plan](#) - geared toward middle school and senior high. Various plans developed to use internet and on-line resources.
- [NOVA Online](#) - PBS programs on-line website.
- [Project Learning Tree](#) - PLT's Energy & Society program kit provides formal and nonformal educators with tools and activities to help students in grades PreK-8 learn about their relationship with energy and investigate the environmental issues related to energy's role in society.
- [Illinois Educational Website About Peaker Power Plants](#)
- [Rutgers University](#) - lesson plans for elementary students by subject matter (note: links may not have been updated in long time)
- [Science Netlinks](#) - Internet-based learning activities for the classroom.
- [\*Teaching Physical Science Through Children's Literature - 20 Complete Lessons for Elementary Grades\*, Susan E. Gertz, et.al., Terrific Science Press \(National Science Foundation funded\) - McGraw-Hill, 1998, ISBN: 0-07-064723-2.](#)
- [The Teacher's Corner](#) - magnets and electricity
- [Teachers First](#) - science lesson plans
- [Teacher's Lab](#) - A Place for Teachers to Explore New Ideas in Learning
- [Teach Net](#) - smart tools for busy teachers

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# RESOURCES FOR TEACHERS AND PARENTS

## Science & Energy Organizations



If you know an organization that should be listed, please send the URL to: [baldrich@energy.state.ca.us](mailto:baldrich@energy.state.ca.us)



California Environmental Education Interagency Network - The California Environmental Education Interagency Network (CEEIN) is a consortium of environmental educators representing California state departments, boards, and commissions of the Department of Education, California Environmental Protection Agency (Cal/EPA), and the California Resources Agency with oversight responsibility to protect California's environment.

Environmental Education Council for the Californias - The Environmental Education Council for the Californias (EECC) is a bi-national network of environmental research, policy, outreach, advocacy and grassroots hands-on organizations. The Council has the mission of advancing a culture of sustainability in the region by addressing the environmental, economic and social access issues surrounding environmental education in the Californias and focusing on increasing environmental awareness and understanding and the subsequent behavior leading to responsible action for the environment. The EECC's draws its expertise from environmental education professionals throughout the region whose work is based on recent, high-quality scientific inquiry into the region's environmental challenges.



Collaborative for High Performance Schools - "High Performance School" refers to the physical facility. Good teachers and motivated students can overcome inadequate facilities and perform at a high level almost anywhere, but a well-designed facility can truly enhance performance and make education a more enjoyable and rewarding experience. A high performance school is healthy, comfortable, well lit, and resource efficient.

CHPS is helping school districts and design teams bring better performance into the classroom to improve the over-all quality of education for California's children.

[EnergySmart Schools](#) was founded in 1998 by the U.S. Department of Energy. It is managed by DOE's Office of Building Technology, State and Community Programs, and operated through the program, Rebuild America.

Rebuild America helps schools and other building operators create local partnerships to plan and implement cost-saving building improvements using energy efficiency and renewable energy. More than 240 such community partnerships have already been formed, involving 2,000 schools. The program also has national partners, businesses and other organizations, that support school energy improvements nationwide.



Both Rebuild America and its EnergySmart Schools effort share information and resources with other DOE programs affecting schools: Clean Cities, which focuses on alternatively fueled buses; the President's Million Solar Roofs Initiative, aimed at increasing use of solar technologies; the State Energy Program, a DOE grant program administered through state energy offices; and ENERGY STAR®, a joint DOE/EPA program focused on building energy performance improvements.

For more information about EnergySmart Schools, check their website or call DOE's hotline at 1-800-DOE-3732.

## Other Organizations Arranged Alphabetically

- [Academy of Energy](#) - site presents energy-related activities and lessons for teachers and students. Sponsored by Johnson Controls, Inc., it contains a great deal of information on energy as well as contests, tips for conservation, links to other sites and much more.
- [Adventures of Vermi the Worm](#) - Calif. Integrated Waste Management Board's interactive website on recycling
- [Alliance to Save Energy](#) - Educators' page
- [American Association of Physics Teachers](#)
- [American Gas Association](#)
- [American Petroleum Institute](#) - offers educational materials as well as facts and statistics about energy.
- [American Public Power Association](#)
- **Ask A Scientist...**  
A number of organizations have set up e-mail systems where students can send questions and receive answers.
  - [ASK PROFESSOR QUESTER!](#) (send questions to California Energy Commission experts)
  - [Ask A Young Scientist Project](#) (Students K-6 can email questions to [apscichs@pen.k12.va.us](mailto:apscichs@pen.k12.va.us))
  - [Dr. Math](#)
  - [MAD SCIENTIST NETWORK](#) Recommended! Large group of scientists! A duplicate site can also be found at: <http://madsci.wustl.edu/>
  - [New Scientist Magazine](#)
- [Bayer Corporation's "Making Science Make Sense"](#) - has fun activities for students as well as information for teachers.
- [BIG CHALK](#) - The Web site for teacher, parents and students on a wide range of subjects.
- [Bill Nye the Science Guy](#) - Website for the Popular TV series.



- [Bonneville Power Administration](#) - K-12 instructional materials about water, hydroelectricity, energy conservation and more BPA.
- [Brain-Pop](#) - Killer, interactive website for kids with info about science, technology, math and much more.
- [Brookhaven National Laboratories](#)
- [Character Counts!](#) is a nonpartisan, nonsectarian coalition of schools, communities and nonprofit organizations working to advance character education by teaching the Six Pillars of Character. Free teaching tools are offered on this site, along with excellent quotes and articles.
- [Classroom Connect](#) - On-line curriculum on using the Internet in your classroom.
- [Cleaner and Greener](#) is an environmental program with an emphasis on pollution reduction. The site contains curriculum materials, resources, and activities.
- [Coalition for Affordable Reliable Energy](#) is a wide-ranging group of organizations representing businesses and individuals that support the development of a sound energy policy for America.
- [Curious Kids Science Newsletter](#) - Science Help For Parents, Science Fun For Kids! - "Childrens science experiments, simple science projects & kids science questions answered by **Science Made Simple**. Kids learn science the easy, hands-on way with Science Made Simple. Get fun science projects & great experiments using household materials. Clear, detailed answers to childrens science questions. Science News. And more!"
- [Earth Day Network](#) - Main homepage for Earth Day information
- [Edison Electric Institute](#)
- [EduGreen: Making Environmental Learning Fun for the Young](#) - Environmental education brought to you by TERI (Tata Energy Research Institute) in India. Some excellent on-line games and other activities.
- [EE-Link -- Environmental Education Link](#) - Environmental Education Link is a project of the National Consortium for Environmental Education and Training and is supported by the U.S. Environmental Protection Agency. Located at the University of Michigan, EE- Link is a repository of environmental information on the Internet for educators.
- [Eisenhower National Clearinghouse for Mathematics and Science Education](#) - The Eisenhower National Clearinghouse (ENC) is a nationally-recognized information source for K-12 math and science teachers.
- [Energy Efficiency and Renewable Energy Network \(EREN\)](#) - This includes information about U.S. schools that are installing solar and other renewable energy systems, often with accompanying curriculum and data-monitoring.
- [Electric Power Engineering Education](#) - Web archive on power engineering education maintained by University of Wollongong, Australia.
- [Electric Power Research Institute](#)
- [Energy Ideas Clearinghouse](#) - offers Pacific Northwest clients FREE assistance on energy-related research and information. Teachers can use the toll-free number, 1-800-872-3568, email to [info@energyideas.org](mailto:info@energyideas.org) or visit the website. Students can use the Energy Solutions Database to search for additional resources and information for projects and papers.
- [EnergyNet](#) - EnergyNet is a classroom project that integrates technology, standards-based learning and workplace skills. Created and managed by Educational Dividends in conjunction with Illinois teachers, EnergyNet helps prepare students for today's workplace.
- [EnviroLink Network](#) - Network for Change is a collaboration between the EnviroLink Network, the Animal Concerns Community, the Sustainable Business Network and GreenMarketplace.com, who are working together to develop a comprehensive resource for individuals, organizations and businesses working for social and environmental change.

- [Exploratorium](#) - the museum of science, art and human perception in San Francisco.
- [Federal Resources for Educational Purposes](#) - Covers all subject areas and grade levels.
- [Fermilab Education Office](#) K-12 Science Resources
- [Florida Solar Energy Center](#) - "Solar Matters" curriculum is available on line
- [Foundation for Water and Energy Education](#) - The Foundation is a consortium of hydro companies and utilities "...committed to providing balanced information regarding the use of water as a renewable energy resource in the Northwest."
- [Gateway to Educational Materials](#) - Website that allows teachers to retrieve lessons, instructional units and other free educational materials via search engine.
- [Geothermal Education Office](#) - promotes public understanding about geothermal resources and its importance in providing clean sustainable energy while protecting our environment. Free materials are also available on this interesting site for educators and students.
- [Green Frog News](#) - offers downloadable and reproducible science and environmental student newsletters, experiments and an original cast of cartoon characters.
- [KEEP - \(Wisconsin K-12 Energy Education Program\)](#) - The Wisconsin K-12 Energy Education Program (KEEP) was created to help promote energy education in Wisconsin. KEEP is the product of an innovative public private partnership between educators and energy professionals. The Wisconsin Center for Environmental Education (WCEE) launched this effort in 1995. The majority of KEEP's funding comes from Wisconsin individuals and businesses, through the energy conservation dollars collected as part of utility rates.
- [Kids World](#) - "Kidzworld Media Inc. is the ultimate in online entertainment for kids nine to 14 (a.k.a. Tweens.) Our multimedia web site leverages the latest technological advances, revolutionizing the way Tweens interact, communicate and explore the digital world. Kidzworld aims to enrich and empower Tweens worldwide by providing a responsible platform, in which they can play, discover, voice, gather and belong. Kidzworld is a safe and secure portal to the best the web has to offer."
- [Living Wise Resource Resource Action Programs ®](#) - offer a remarkable program format to achieve environmental, conservation education and business goals. The innovative design combines classroom activities with hands-on learning projects for students grades 4-8.
- [National Energy Foundation](#) - NEF, one of the nation's premier nonprofit developers of energy, natural resource, and environmental education materials and programs, is pleased to make these resources more accessible to Internet users. Using the latest technologies afforded users of the Internet, NEF's Internet-version of the catalog includes full-color, high resolution images of all NEF educational materials, along with product descriptions and other information. Users who access the site can even place orders directly from the scene.
- [National Energy Information Center \(NEIC\) Energy Education Resources: Kindergarten Through 12th Grade](#) - Published by the National Energy Information Center (NEIC), a service of the Energy Information Administration (EIA), this publication provides students, educators, and other information users, a list of generally available free or low-cost energy related educational materials.
- [National Renewable Energy Lab](#)
- [National Science Foundation](#)
- [National Science Teachers Association \(NSTA\) Science Line.](#) -- Curriculum Information
- [National Science Teachers Association](#)
- [Natural Gas Vehicle Coalition](#) - Promotes use of natural gas to power vehicles
- [NEED - National Energy Education Development](#) - "The mission of the NEED Project is to promote an energy conscious and educated society by creating effective networks of students,

educators, business, government and community leaders to design and deliver objective, multi-sided energy education programs."

- [Odyssey of the Mind](#) - Odyssey of the Mind is a world-wide, nonprofit organization that promotes creative team-based problem solving in a school program for students from kindergarten through college. The program helps students learn divergent thinking and problem solving skills while participating in a series of challenging and motivating activities, both inside and outside their regular classroom curriculum. Link to OM's HomePage on the Internet.
- [Office of Science Education Highlights](#) - Oak Ridge National Laboratory's VISION program, a benchmark for the premier and most comprehensive science education program in the Department of Energy's family of laboratories and contractors.
- [Optical Engineering Page \(SPIE\)](#)
- [Rocky Mountain institute - Kids' Page](#)
- [School Shows](#) - A database of organizations, groups and people who put on school assemblies. Searchable by subject matter.
- [Smithsonian Institution](#) - Great stuff for kids from the nation's Museums.
- [Southern Company - Learning Site on Energy](#)
- [SciencePlus "Communicator" Newsletter](#) - SciencePlus is an integrated, process-oriented program which is designed to teach the way students learn best--by thinking, talking, writing, and doing science. It provides a forum for science teachers.
- [Student Environmental Action Coalition \(SEAC\)](#) - SEAC is a grassroots coalition of student and youth environmental groups working together to protect our planet and our future.
- [U.S. Department of Education](#) - Publications Center
- [U.S. Department of Energy](#) official website
- [United States Energy Association](#)
- [Web 66 K-12 Internet Project](#) - Just as U.S. Route 66 was a catalyst for Americana, those at Web 66 see the World Wide Web as a catalyst that will integrate the Internet into K-12 school curricula. The **Web 66** project is designed to facilitate the introduction of this technology into K-12 schools.

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## RESOURCES FOR TEACHERS AND PARENTS



### ENERGY QUEST Teachers' & Parents' List Server



You can sign up on this page to become a member of the energy educators' e-mail LIST SERVER and EQ FORUM.



**LIST SERVER** - Our automated mailing list was set-up by the California Energy Commission to promote interest among California educators in energy-related curriculum and other materials.



Using this list as a means of information teachers about the Commission's annual calendar contest, educators will be reminded of contest deadlines. Information, suggestions and new resources will also be shared among the teachers via this List Server. The Commission may also use this list to ask for input from teachers and parents on improving the content of our website and other environmental education materials. In keeping with state and federal [privacy laws](#), your e-mail address is kept confidential.



**To subscribe to our ENERGY QUEST List Server, enter your e-mail address completely:**



Note: Your e-mail address must be exact and complete. Incorrect or incomplete addresses will not work. You will receive a welcoming e-mail to confirm your subscription.

**EQ FORUM** - You can also use our List Server as a bulletin board and discussion forum. We'd like to encourage teachers to dialogue with other teachers and parents. Our list server is a way by which educators can discuss lesson plans, share what is working and not working in the classroom, and ask questions and get answers. This list is moderated (we approve what is being mailed out before it goes to all subscribers), so "spam" and inappropriate e-mails will not be sent. We hope you will use our Education List Server & EQ Forum to make energy education better.

Thank You!

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*Bringing you a prosperous future where energy is clean, abundant, reliable, and affordable*

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## Energy Education & Training



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### **Teacher Training, Workshops, Fellowships, and Internships in Energy**

Teachers—here you'll find resources about training, workshops, fellowships, and internships that will give you the tools and skills for educating your students about energy and science.

#### **[Albert Einstein Distinguished Educator Fellowship Program](#)**

A U.S. Department of Energy fellowship program for elementary and secondary school mathematics and science teachers.

#### **[Education Web sites at DOE Labs and Facilities](#)**

Links to all the education programs at DOE laboratories and facilities, some of which may offer teacher workshops, training, and fellowship opportunities.

#### **[KEEP Professional Development](#)**

Professional development opportunities through Wisconsin's K-12 Energy Education Program in energy and environmental education for teachers.

#### **[KidWind Project](#)**

Offers workshops that help teach students about wind power through hands-on science activities, which are challenging, engaging, and teach basic science principles.

#### **[NREL Teacher Programs](#)**

Offers teachers research and development opportunities at the National Renewable Energy Laboratory to enhance their content knowledge, instructional strategies, and leadership abilities.

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### **[NSEA Teacher Training on Transportation and the Environment](#)**

Describes workshops for middle school and high school teachers offered by the Northeast Sustainable Energy Association.

### **[Pre-Service Teacher Program](#)**

A U.S. Department of Energy program that places students—who have decided on a teaching career in science, math, or technology—in paid internships at DOE laboratories.

### **[Solar Now Teacher Workshops](#)**

Offers intensive workshops that expose teachers to extensive curriculum and comprehensive information on renewable energy education.



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### Higher Education Opportunities

Here you'll find resources on higher education opportunities in energy, particularly those concerning energy efficiency and renewable energy.

### Students

Find energy-related [university and college degree programs](#), as well as college [student internships, fellowships, and scholarships](#).

### Energy Professionals

Find energy-related [university and college programs](#) to help further your education.

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## **Energy Education Resources: Kindergarten Through 12th Grade**

*Energy Education Resources: Kindergarten Through 12th Grade* is published by the National Energy Information Center (NEIC), a service of the Energy Information Administration (EIA), to provide students, educators, and other information users a list of generally available free or low-cost energy-related educational materials.

The entries are listed alphabetically by organization title. Each entry includes the address, telephone number, and description of the organization and the energy-related materials available. Most of the entries also include Internet (Web) and electronic mail (E-Mail) addresses. In the back of the book there is a subject index cross-referenced by number to the alphabetical entries.

Some of the organizations represented in this list take policy positions on certain energy issues and express them even in educational materials. Because EIA is the independent statistical and analytical agency within the U.S. Department of Energy (DOE), it does not advocate any policy position of DOE or any other organization. EIA has completed this list solely to aid educators and students in locating materials.

This year's edition was done by Curley Andrews.

To include a new entry, contact EIA at the following address:

National Energy Information Center, EI-30  
Energy Information Administration  
Room 1E-238, Forrestal Building  
1000 Independence Avenue, S.W.

Washington, DC 20585  
(202) 586-8800 (9 a.m. to 5 p.m., Eastern time, M-F)  
E-Mail: [infoctr@eia.doe.gov](mailto:infoctr@eia.doe.gov)

Copies of this publication are available free of charge from NEIC.

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URL: <http://www.eia.doe.gov/bookshelf/eer/kiddietoc.html>

### **Need Help Now?**

Call the [National Energy Information Center \(NEIC\)](#)

(202) 586-8800 9AM - 5PM eastern time

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If you are having technical problems with this site, please contact the EIA Webmaster at [wmaster@eia.doe.gov](mailto:wmaster@eia.doe.gov)



## HOW THINGS WORK



### How Does an Air Conditioner Work?

Air conditioners and refrigerators work the same way. Instead of cooling just the small, insulated space inside of a refrigerator, an air conditioner cools a room, a whole house, or an entire business.

Air conditioners use chemicals that easily convert from a gas to a liquid and back again. This chemical is used to transfer heat from the air inside of a home to the outside air.

The machine has three main parts. They are a compressor, a condenser and an evaporator. The

compressor and condenser are usually located on the outside air portion of the air conditioner. The evaporator is located on the inside the house, sometimes as part of a furnace. That's the part that heats your house.

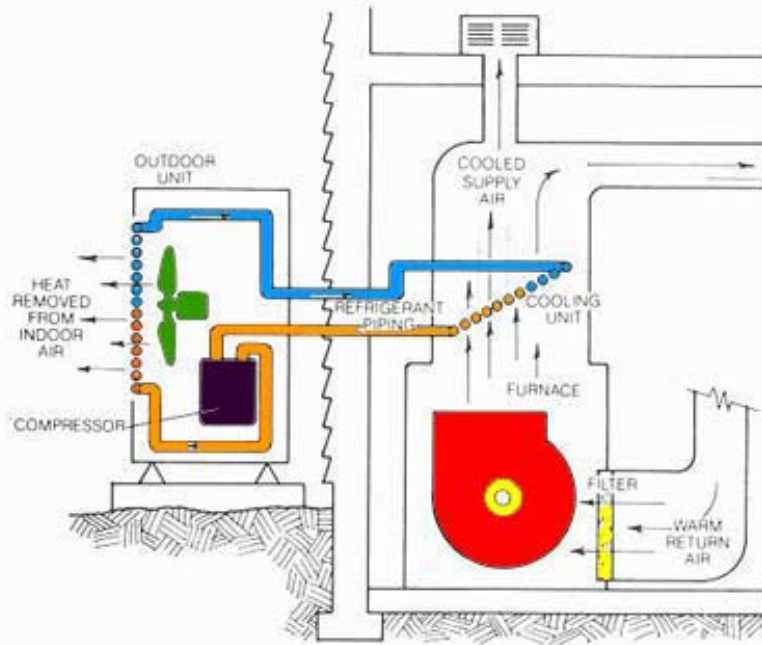
The working fluid arrives at the compressor as a cool, low-pressure gas. The compressor squeezes the fluid. This packs the molecule of the fluid closer together. The closer the molecules are together, the high its energy and its temperature.

The working fluid leaves the compressor as a hot, high pressure gas and flows into the condenser. If you looked at the air conditioner part outside a house, look for the part that has metal fins all around. The fins act just like a radiator in a car and helps the heat go away, or dissipate, more quickly.

When the working fluid leaves the condenser, its temperature is much cooler and it has changed from a gas to a liquid under high pressure. The liquid goes into the evaporator through a very tiny, narrow hole. On the other side, the liquid's pressure drops. When it does it begins to evaporate into a gas.

As the liquid changes to gas and evaporates, it extracts heat from the air around it. The heat in the air is needed to separate the molecules of the fluid from a liquid to a gas.

The evaporator also has metal fins to help in exchange the thermal energy with the



**Central Air-Conditioning & Heating System**

Graphic courtesy: Air-Conditioning & Refrigeration Institute

surrounding air.

By the time the working fluid leaves the evaporator, it is a cool, low pressure gas. It then returns to the compressor to begin its trip all over again.

Connected to the evaporator is a fan that circulates the air inside the house to blow across the evaporator fins. Hot air is lighter than cold air, so the hot air in the room rises to the top of a room.

There is a vent there where air is sucked into the air conditioner and goes down ducts. The hot air is used to cool the gas in the evaporator. As the heat is removed from the air, the air is cooled. It is then blown into the house through other ducts usually at the floor level.

This continues over and over and over until the room reaches the temperature you want the room cooled to. The thermostat senses that the temperature has reached the right setting and turns off the air conditioner. As the room warms up, the thermostat turns the air conditioner back on until the room reaches the temperature.

## Heat Pump

Imagine that you took an air conditioner and flipped it around so that the hot coils were on the inside and the cold coils were on the outside. Then you would have a heater. It turns out that this heater works extremely well. Rather than burning a fuel, what it is doing is "moving heat."

A heat pump is an air conditioner that contains a valve that lets it switch between "air conditioner" and "heater." When the valve is switched one way, the heat pump acts like an air conditioner, and when it is switched the other way it reverses the flow of the liquid inside the heat pump and acts like a heater.

Heat pumps can be extremely efficient in their use of energy. But one problem with most heat pumps is that the coils in the outside air collect ice. The heat pump has to melt this ice periodically, so it switches itself back to air conditioner mode to heat up the coils. To avoid pumping cold air into the house in air conditioner mode, the heat pump also lights up burners or electric strip heaters to heat the cold air that the air conditioner is pumping out. Once the ice is melted, the heat pump switches back to heating mode and turns off the burners.



Picture courtesy: The Trane Co.

### Other Places to Visit:

- [ARI - Air Conditioning & Refrigeration Institute](http://www.ari.org/consumer/howdoesitwork/howACwks.html) (www.ari.org/consumer/howdoesitwork/howACwks.html)
- [How Stuff Works - Air Conditioner](http://www.howstuffworks.com/ac.htm) (www.howstuffworks.com/ac.htm)
- [Trivia Planet page on AC](http://www.triviaplanet.com/airconditioner.htm) (www.triviaplanet.com/airconditioner.htm)

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## HOW THINGS WORK



### How Does Fire Work?

What is fire? How does it work? According to the American Heritage Dictionary, 2nd College Edition, fire is, "A rapid, persistent chemical reaction that releases heat and light, especially the exothermic combination of a combustible substance with oxygen."

That's a mouthful. Before we explain that definition, let's look way back in history.

Right after the sun, fire is the oldest form of energy used by man. Fire can be extremely dangerous and destructive, like shown in the photo on the right. But it can also be beneficial when used properly.



Fire behavior analyst, JOHN MCCOLGAN took this photo while on the Sula Complex fire just north of Sula, Montana, on August 6, 2000. John is a Bureau of Land Management employee for the Alaska Fire Service in Ft. Wainwright, Alaska.

In L'Escale Cave in southeastern France, a layer of ash was found on the roof of the cave that dates from 700,000 to 400,000 BCE (Before the Common Era). This layer is viewed by some scientists as the earliest known evidence of fire used by hominids in Europe, although it cannot be established that the ash is not the result of naturally caused fires.

Middle Pleistocene humans controlled fire (burning wood) as early as 500,000 BCE. Direct evidence was found outside a cave at Chou k'ou-tien, China. Here charcoal was found along with traces of a stone toolmaking industry in an open gully deposit. This deposit appears to be slightly older than the cave deposit itself, which contained the bones of Homo erectus, early man.

Fire was treated as a gift from the gods. Usually fire was found naturally from a lightning strike or near volcanic areas. Fire helped early man cook food, provided warmth and kept wild animals away. Today, fire is used in homes to do much the same...except for maybe keeping the animals away.

Let's explain what fire is...

Fire is a chemical process. Three things are needed for this process: oxygen, heat and fuel. Without one of these elements a fire cannot start or continue.

In a chemical process, the molecules rearrange themselves. Energy is either released or absorbed. The process in a fire is called oxidation, where oxygen atoms combine with hydrogen and carbon to form water and carbon dioxide. Oxidation is the same chemical process that turns iron into rust. But with iron, the reaction is VERY slow. So, the heat energy that is released is VERY low.

With certain things, like paper or wood, the oxidation rate of the molecules can be very fast. If the heat cannot be released faster than it is created, then combustion happens.

Besides heat, there must also be flames or smoldering present during the chemical process for it to be called fire. Exhaust gases also are produced. If the burning process is very clean, you don't see the exhaust gases. If some of the particles of the fuel are not completely burned, you see smoke. Smoke is made up of evaporated water, carbon dioxide and unburnt particles of the fuel.

**Other Places to Visit:**

- [PBS Website on fire](http://www.pbs.org/wgbh/nova/fireworks/fire.html) (www.pbs.org/wgbh/nova/fireworks/fire.html)
- [Think Quest Website page on fire](http://library.thinkquest.org/C003157/fire/indexfi.htm)  
(http://library.thinkquest.org/C003157/fire/indexfi.htm)

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## HOW THINGS WORK



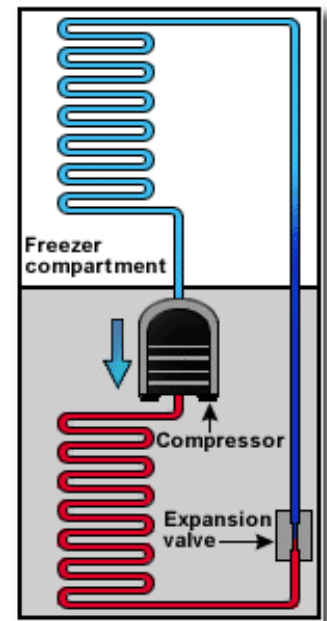
### How Does A Refrigerator Work?

In the summertime, have you ever gotten out of a swimming pool and then felt very cold standing in the sun? That's because the water on your skin is evaporating. The air carries off the water vapor, and with it some of the heat is being taken away from your skin.

This is similar to what happens inside older refrigerators. Instead of water, though, the refrigerator uses chemicals to do the cooling.

There are two things that need to be known for refrigeration.

1. A gas cools on expansion.
2. When you have two things that are different temperatures that touch or are near each other, the hotter surface cools and the colder surface warms up. This is a law of physics called the Second Law of Thermodynamics.



Graphic courtesy:  
Science Treasure Trove

### Old Refrigerators

If you look at the back or bottom of an older refrigerator, you'll see a long thin tube that loops back and forth. This tube is connected to a pump, which is powered by an electric motor.

Inside the tube is Freon, a type of gas. Freon is the brand name of the gas. This gas, chemically is called Chloro-Flouro-Carbon or CFC. This gas was found to hurt the environment if it leaks from refrigerators. So now, other chemicals are used in a slightly different process (see next section below).

CFC starts out as a liquid. The pump pushes the CFC through a lot of coils in the freezer area. There the chemical turns to a vapor. When it does, it soaks up some of the heat that may be in the freezer compartment. As it does this, the coils get colder and the freezer begins to get colder.

In the regular part of your refrigerator, there are fewer coils and a larger space. So, less heat is soaked up by the coils and the CFC vapor.

The pump then sucks the CFC as a vapor and forces it through thinner pipes which are on the outside of the refrigerator. By compressing it, the CFC turns back into a liquid and heat is given off and is absorbed by the air around it. That's why it might be a little warmer behind or under your refrigerator.

Once the CFC passes through the outside coils, the liquid is ready to go back through the freezer and refrigerator over and over.

## **Today's Refrigerators**

Modern refrigerators don't use CFC. Instead they use ammonia gas. Ammonia gas turns into a liquid when it is cooled to -27 degrees Fahrenheit (-6.5 degrees Celsius).

A motor and compressor squeezes the ammonia gas. When it is compressed, a gas heats up as it is pressurized. When you pass the compressed gas through the coils on the back or bottom of a modern refrigerator, the hot ammonia gas can lose its heat to the air in the room.

Remember the law of thermodynamics.

As it cools, the ammonia gas can change into ammonia liquid because it is under a high pressure.

The ammonia liquid flows through what's called an expansion valve, a tiny small hole that the liquid has to squeeze through. Between the valve and the compressor, there is a low-pressure area because the compressor is pulling the ammonia gas out of that side.

When the liquid ammonia hits a low pressure area it boils and changes into a gas. This is called vaporizing.

The coils then go through the freezer and regular part of the refrigerator where the colder ammonia in the coil pulls the heat out of the compartments. This makes the inside of the freezer and entire refrigerator cold.

The compressor sucks up the cold ammonia gas, and the gas goes back through the same process over and over.

## **How Does the Temperature Stay the Same Inside?**

A device called a thermocouple (it's basically a thermometer) can sense when the temperature in the refrigerator is as cold as you want it to be. When it reaches that temperature, the device shuts off the electricity to the compressor.

But the refrigerator is not completely sealed. There are places, like around the doors and where the pipes go through, that can leak a little bit.

So when the cold from inside the refrigerator starts to leak out and the heat leaks in, the thermocouple turns the compressor back on to cool the refrigerator off again.

That's why you'll hear your refrigerator compressor motor coming on, running for a little while and then turning itself off.

Today's refrigerators, however, are very energy efficient. Ones sold today use about one-tenth the amount of electricity of ones that were built 20 years ago. So, if you have an old, old refrigerator, it's better to buy a new one because you'll save money (and energy) over a long period of time.

For more information go to:

- [Argone National Laboratory - Ask A Scientist](http://newton.dep.anl.gov/newton/askasci/1993/eng/ENG30.HTM)  
(<http://newton.dep.anl.gov/newton/askasci/1993/eng/ENG30.HTM>)
- [Mr. Hand's 8th Grade Science Site](http://www.mansfieldct.org/schools/mms/staff/hand/heatrefrig.htm)  
([www.mansfieldct.org/schools/mms/staff/hand/heatrefrig.htm](http://www.mansfieldct.org/schools/mms/staff/hand/heatrefrig.htm))
- [How Stuff Works - Refrigerator](http://www.howstuffworks.com/refrigerator.htm) ([www.howstuffworks.com/refrigerator.htm](http://www.howstuffworks.com/refrigerator.htm))
- [Science Treasure Trove - refrigerator page](http://www.education.eth.net/acads/treasure_trove/refrigerator.htm)  
([www.education.eth.net/acads/treasure\\_trove/refrigerator.htm](http://www.education.eth.net/acads/treasure_trove/refrigerator.htm))

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## HOW THINGS WORK

### How Does the Thermometer Work?



A thermometer is a device that measures the temperature of things. The name is made up of two smaller words: "Thermo" means heat and "meter" means to measure. You can use a thermometer to tell the temperature outside or inside your house, inside your oven, even the temperature of your body if you're sick.

One of the earliest inventors of a thermometer was probably Galileo. We know him more for his studies about the solar system and his "revolutionary" theory (back then) that the earth and planets rotated around the sun. Galileo is said to have used a device called a "thermoscope" around 1600 - that's 400 years ago!!

The thermometers we use today are different than the ones Galileo may have used. There is usually a bulb at the base of the thermometer with a long glass tube stretching out the top. Early thermometers used water, but because water freezes there was no way to measure temperatures less than the freezing point of water. So, alcohol, which freezes at temperature below the point where water freezes, was used.

The red colored or silver line in the middle of the thermometer moves up and down depending on the temperature. The thermometer measures temperatures in Fahrenheit, Celsius and another scale called Kelvin. Fahrenheit is used mostly in the United States, and most of the rest of the world uses Celsius. Kelvin is used by scientists.

Fahrenheit is named after the German physicist Gabriel D. Fahrenheit who developed his scale in 1724. Ice freezes at 32 degrees Fahrenheit (F for short), and water boils at 212 degrees F. He arbitrarily decided that the difference between the freezing point and boiling point of water should be 180 degrees.

The Celsius scale is named after Anders Celsius. The Celsius scale used to be called the "centigrade" scale. Centigrade means "divided into 100 degrees." Anders Celsius developed his scale in 1742. He started with the freezing point of water and said that was 0 degrees Celsius (C for short). At the point where water boils, he marked that at 100 degrees C. This scale is much more scientific because the measurement is broken down into an even 100 degrees. This is similar to the scientific system of measuring distance and weight called the metric system.

Kelvin is named after Lord Kelvin, whose full name is Sir William Thomson, Baron Kelvin of Largs, Lord Kelvin of Scotland. His scale starts at 0 degrees Kelvin, which is called absolute temperature.

Lord Kelvin took the idea of temperature one step further with his invention of the Kelvin Scale in 1848. The Kelvin Scale measures the coldest temperature there can be. He said there was no upper limit of how hot things can get, but he said there was a limit as to how cold things can get. Kelvin developed the idea of Absolute Zero. This is at minus 273.15 degrees Celsius (or -523.67 F)! At this temperature, everything, including the movement of electrons in an atom, stops completely.



Galileo Thermometer  
Photo courtesy:  
Wind & Weather

As far as scientists know, nothing in the universe can get that cold!

## How A Thermometer Works

When you look at a regular outside bulb thermometer, you'll see a thin red or silver line that grows longer when it is hotter. The line goes down in cold weather.

This liquid is sometimes colored alcohol but can also be a metallic liquid called mercury. Both mercury and alcohol grow bigger when heated and smaller when cooled. Inside the glass tube of a thermometer, the liquid has no place to go but up when the temperature is hot and down when the temperature is cold.

Numbers are placed alongside the glass tube that mark the temperature when the line is at that point.



Spring Thermometer  
Photo Courtesy:  
Wind & Weather

The other type of common thermometer is a "spring" thermometer. A coiled piece of metal that is sensitive to heat is used.

One end of the spring is attached to the pointer. As the air heats, the metal expands and the pointer moves higher. As the air cools, the metal contracts and the pointer moves lower.

Typically, these type of thermometers are less accurate than bulb or digital thermometers.



Bulb Thermometer  
Note reservoir at bottom.  
Photo courtesy:  
Wind & Weather

To convert Fahrenheit to Celsius or Celsius to Fahrenheit

### [Go to Our On-Line Calculator](#)

#### Other Places to Visit:

- [About Inventors page on Thermometers](http://inventors.about.com/library/inventors/blthermometer.htm)  
(<http://inventors.about.com/library/inventors/blthermometer.htm>)
- [How Stuff Works - Thermometer](http://www.howstuffworks.com/therm1.htm) ([www.howstuffworks.com/therm1.htm](http://www.howstuffworks.com/therm1.htm))
- [Galileo and Thermometer](http://es.rice.edu/ES/humsoc/Galileo/Things/thermometer.html)  
(<http://es.rice.edu/ES/humsoc/Galileo/Things/thermometer.html>)

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## HOW THINGS WORK

### How Does A Toaster or Hair Dryer Work?



Appliances that heat up, such as a hair dryer, a clothes iron, toaster, electric toaster oven, or an electric space heater all work on the same idea. They change electrical energy to heat energy.

The devices all plug into a source of electricity. Electric current runs from your wall socket down the wire and into the appliance.

Inside each of the appliances are loops of special mixture of metals. One type is called nichrome. Nichrome is a nickel / chromium alloy.

Electricity cannot pass through this special metal very easily. The metal slows down the electrons and "holds up" the current flowing through it. This is called the "resistance" of the metal. When the resistance of a metal is higher, the metal will get hot because of the friction of the electrons in the current of electricity. For more on resistance, see [Chapter 3 of The Energy Story](#).

As the electricity is forced through the wires, the wires begin to heat up and glow very hot. If you look inside your toaster, you'll see those coils or wire glowing orange. It's those coils or loops of wire that cause the bread to brown making your toast.

In older toasters, the hot wires heat up a small device called a thermocouple. When it reaches the right temperature, which is about the same time as your toast is properly toasted, it releases a catch allowing the toast to pop up. At the same time, it shuts off the electricity. In some newer toasters, the thermocouple is replaced by a small timer.

In a hair dryer, a small fan is turned on at the same time the heater coils are turned on. The moving air is forced over the glowing wires, warming the air. The warm air blows out of the front of the hair dryer and causes the water in your hair to evaporate and dry.



Photo courtesy: Cuisinart®

#### Other Places to Visit:

- [How Stuff Works - Toaster](http://www.howstuffworks.com/toaster.htm) (<http://www.howstuffworks.com/toaster.htm>)

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## HOW THINGS WORK

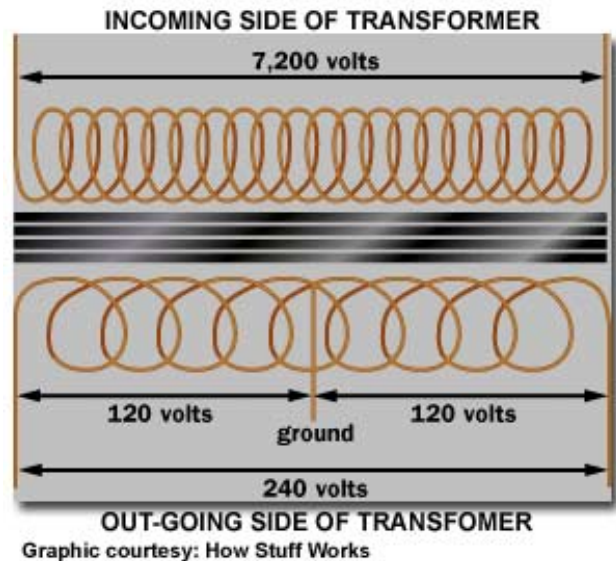


### How Does a Transformer Work?

A transformer is an electrical device that takes electricity of one voltage and changes it into another voltage. You'll see transformers at the top of utility poles and even changing the voltage in a toy train set.

Basically, a transformer changes electricity from high to low voltage using two properties of electricity. In an electric circuit, there is magnetism around it. Second, whenever a magnetic field changes (by moving or by changing strength) a voltage is made. Voltage is the measure of the strength or amount of electrons flowing through a wire. (You may also want to read [Chapter 7 on the](#)

[Electrical transmission system in The Energy Story.](#)



If there's another wire close to an electric current that is changing strength, the current of electricity will also flow into that other wire as the magnetism changes.

A transformer takes in electricity at a higher voltage and lets it run through lots of coils wound around an iron core. Because the current is alternating, the magnetism in the core is also alternating. Also around the core is an output wire with fewer coils. The magnetism changing back and forth makes a current in the wire. Having fewer coils means less voltage. So the voltage is "stepped-down."

### Transformers on the Electrical Grid

Let's look at the electricity that comes to your home. When electricity moves from a power plant it is put into a very high voltage to be able to travel long distances. The high voltage lines can be as high 155,000 to 765,000 volts to travel many hundreds of miles.

In order for your home or a store to use the electricity, it has to be at a lower voltage than on the long-distance lines. So, the electricity is "stepped-down to a lower level using a transformer. This lower voltage electricity is put into the local electric wires at a substation. The substation breaks the larger amount of power down into smaller pieces at lower voltage. It then is stepped down again and again.

Once smaller transformers take that voltage down to usually 7,200, the power leaves this substation.

In your neighborhood, a transformer on top of a utility pole, or one connected to underground wires, transforms the 7,200 volts into 220-240 volts. This is then sent into your home over three wires. The three wires go through the electric meter, which measures how much electricity you use. One of the three wires is the ground, and the other two are the positives.

Some of the electrical appliances in your home use the 220-240 volts. These are things like a water heater, stove and oven, or air conditioner. They have very special connections and plugs. Other devices, like your TV or computer only use one-half of the electricity -- 110-120 volts.

In a toy train set, the voltage is reduced even more from 110-120 and is changed from alternating current into direct current.

Some businesses use higher voltage power to run big machines. So, they don't need to have the voltage reduced as much.



Photo credit:  
Oak Ridge National Laboratory

#### **Other Places to Visit:**

- [How Stuff Works - Power Distribution System](http://www.howstuffworks.com/power.htm)  
(www.howstuffworks.com/power.htm)
- [Physics Link](http://www.physlink.com/Education/AskExperts/ae427.cfm) (www.physlink.com/Education/AskExperts/ae427.cfm)
- [Science Net](http://www.sciencenet.org.uk/database/Physics/ACCircuits/p00382c.html) (www.sciencenet.org.uk/database/Physics/ACCircuits/p00382c.html)

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**How RAM Works**

Random access memory (RAM) is as important to your computer's operation as the CPU. It plays a huge role in determining how quickly and efficiently your computer can perform your requested tasks.

[Find out](#) how RAM works, how much you need and which type of RAM is best.

Coming Tomorrow: How Teleconferencing Works



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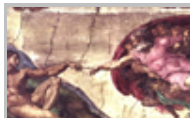
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**How Podcasting Works**

Podcasting combines the freedom of blogging with the technology of MP3 to create an almost endless supply of content.



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The public debate between Christian creationism and evolution has heated up once again in the United States.



**How Laptops Work**

Laptops are now outselling desktops. Learn how all the equipment found in a desktop can fit into such a small package.



**How Internet Infrastructure Works**

A feud between big Internet providers Cogent and Level 3 is keeping their customers from accessing parts of the Internet.

Smart Shopper

Portable Music Scene...



**The iTunes Phone**

[This iTunes-enabled phone](#) combines the features of an iPod and a cell phone in one device. [Check it out.](#)



**World's Smallest Player**

[Mobiblu's new player](#) is less than one cubic inch and features an organic LED display and built-in recorder. [See it here.](#)



**iPod Nano Released!**

[The new iPod Nano](#) is now available. It's unbelievably small and has a full-color screen. [Check it out.](#)

Today's Question

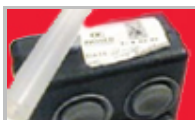
[What is baking powder and how does it work?](#)

October 6, 2005

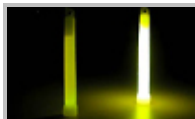


[Alligators Work.](#)

[Alligators and pythons are battling it out in the Everglades](#) - this fight was particularly gruesome! (w/pic) See also [How](#)



[New sport: see how high you can blow on a breathalyzer at a bar.](#) Some aren't amused. See also [How Breathalyzers Work.](#)



["Milky sea" makes the ocean glow at night](#) and it is totally unexplained! (with pic) See also [How Light Sticks Work.](#)



[WiMax is getting ready for market](#) and may change the world! See also [How WiMax Works.](#)



[43 robots competing to be in the Grand Challenge](#) are actually completing the course (w/pics)! See also [How Robots Work.](#)

quickstuff

**Fact of the Day:**

A wasp's nest the size of a football can house over 10,000 wasps.

**Quote of the Day:**

"Almost all our faults are more pardonable than the methods we resort to hide them."  
- Francois Duc de La Rochefoucauld

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### ComputerStuff

#### [Full Audio - How Sound Cards Work](#)

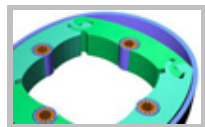


Before the invention of the sound card, a PC could make one sound -- a beep. Sound cards truly ushered PCs into the world of multimedia. Learn how a sound card allows a computer to create and record real, high-quality sound.

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#### [Like a Wankel ... Only Better - How Quasiturbine Engines Work](#)



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If museum sign-reading bores you, you're in luck. The Node Explorer is a portable media player with interactive presentations that include guided tours, images, maps, videos and sound clips. Learn all about it.

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#### [Web Slinger - How Spiders Work](#)



Movies like "Arachnophobia", "Spider-Man", "Eight Legged Freaks" and "Spider-Man 2" spin their stories around spiders. Check out the real-life web-slinging, wall-crawling, venom-injecting inspiration.

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### EntertainmentStuff

#### [Behind the Graphics - How PlayStation 3 Works](#)

[Home Theater](#)

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The PS3 boasts an incredible microprocessor, a brand-new graphics processor and what may be some of the most phenomenal on-screen images ever. Learn all about PlayStation 3 and check out the new controller.

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[Scaling the World - How Rock Climbing Works](#)



Rock climbing is an exhilarating sport that involves strength, control and finesse. From indoor climbing to bouldering, there's something for almost everyone. Find out what it takes to really get high on life.

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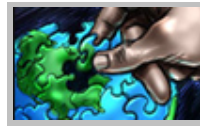


Long before GPS satellites and other high-tech navigational aids, people used the Earth's natural magnetism to navigate the unknown. Learn how a compass works and how to create your own!

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Of the following tropical and exotic fruits, which is your favorite?

- Avocado
- Banana
- Bread fruit
- Guava
- Kiwi
- Lychee
- Mango
- Papaya
- Passion fruit
- Pineapple
- Pomegranate
- Starfruit
- Tamarind
- I have never eaten any of these.

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# Saving Energy. It's a Way of Life.

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## Energy Saving Tools & Information

Flex Your Power's website is your resource for energy efficiency and conservation information. Find incentives/rebates, technical assistance, retailers, product guides, case studies and more for:

- [Residents](#)
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- [Industry](#)
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» [Go to hot topics index](#)

[Energy Efficiency Awards and Congratulatory Ads](#)  
Seeking applications for 2005.

[Energy Savings for Commercial Office Buildings](#)  
A best practice guide on planning and funding energy projects, building tools, and technologies.

[Demand Response Programs](#)  
Help California reduce electricity demand at peak times.

[When You Hear "Flex Your Power NOW!"...](#)  
It means California's peak energy demand is high and everyone needs to take action now.

[Energy Efficiency Helps Combat Climate Change](#)  
Learn the latest statistics regarding climate change in California.

[Natural Gas Prices Are on the Rise](#)  
But energy efficiency can help stabilize the natural gas market.



### When You Hear "Flex Your Power NOW!"...

Pitch in this summer, California. When you hear the "Flex Your Power NOW!" alert, immediately conserve energy. [Learn more](#) about what to do when you hear the alert.



### California ISO - Conserve-O-Meter

The Conserve-O-Meter shows the level of energy conservation requested of Californians. [Get real-time updates.](#)



### Conserve Gas - Save Money

Fend off high fuel prices, reduce petroleum and electricity demand and help ensure reliable and affordable transportation fuel and electricity. [Save gas.](#)



### Call for Awards Nominations Closed

The "2005 Flex Your Power Energy Efficiency Awards and Congratulatory Ads" applications are in! Stay tuned for announcement of the award winners.



### Change a Light, Change the World

Changing just one light in your home to an ENERGY STAR qualified bulb or fixture is as good for our environment as not driving your car for more than 2 weeks! So, [take the pledge today](#) and join the growing number of people who are changing the world, one light at a time.

## Quick & Easy Energy Saving Tips

» [More energy and money saving tips](#)

- **Adjust your thermostat dial and turn up energy savings.**  
Setting your thermostat to keep air conditioning at 78°F when it 's hot outside, and your heating system at 68°F when it 's cold, can help save

[CPUC Holds Series of Energy Efficiency](#)

[Workshops](#)

CPUC votes on 2006-08 Portfolio Applications

[Save Gasoline, Save Money](#)

Learn how to lower gasoline consumption and reduce fuel costs.

## What is Flex Your Power?

**Flex Your Power**, California's energy efficiency marketing and outreach campaign, has been helping Californians save energy since 2001. » [Learn more](#)



up to 20% in heating and cooling costs.

- **Turn off unneeded lights.**

Avoid lighting an empty room and take advantage of natural light whenever possible.

- **Use appliances wisely.**

To help prevent electricity outages, use major appliances after 7 p.m. Don't forget to turn off equipment like ceiling fans, stereos and computers when not in use.

- **Test for air leaks.**

Hold a lit incense stick next to windows, doors, electrical boxes, plumbing fixtures, electrical outlets, ceiling fixtures, attic hatches and other locations where there is a possible air path to the outside. If the smoke stream travels horizontally, you have located an air leak that may need caulking, sealing or weather stripping.

- **Change the air filters in your cooling and heating system.**

This simple change will produce real results for your annual energy bill and overall health. Replace air filters monthly for maximum benefit.

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[CSU Adopts Clean Energy Policy, Plans to Reduce Energy Consumption by 15% by 2010](#)

The California State University (CSU) Board of Trustees has adopted a revised policy on energy efficiency, sustainability, energy independence and global warming.

[CPUC Approves \\$2 Billion in 2006-08 Energy Efficiency Funding](#)

The California Public Utilities Commission (CPUC) has authorized energy efficiency plans and \$2 billion in funding for 2006-08 for the state's investor-owned utilities, reaffirming that cost-effective energy efficiency is the state's top priority for meeting our future energy needs.

[A Quick, Cheap Way to Lower Heating Bills This Winter: Home Sealing](#)

With home heating bills expected to increase significantly this winter, one of the most cost-effective ways to keep bills low is to effectively seal your home envelope.

[Seagate Property Management Reduces Peak Power Use By As Much As 30%](#)

As a member of the Business Energy Coalition, a group of Bay Area businesses committed to reducing power use at peak times, Seagate has routinely reduced its peak power demand at 44 Montgomery Street in San Francisco by 27-30% -- all without having to ask its tenants to make any changes in their energy use.

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# Status of the California Electricity Situation

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- [Background](#)
- [California Assembly Bill 1890](#)
- [Subsequent Events](#)

## ▶ Electricity [Shortage](#) in California: Issues for Petroleum and Natural Gas Supply

## ▶ Trends in California's Electricity Retail Prices [Fact Sheet](#)

## ▶ California's Electricity Situation Briefing for the staff of the U.S. House of Representatives [A Powerpoint Presentation](#)

(March, 2001, Energy Information Administration)

## ▶ Selected California Electric Energy [Statistics](#) for 1999

▶ **Useful Information on California's Electricity & Natural Gas.** The information shown below provides a quick-reference guide to the Energy Information Administration's (EIA) data sources related to the California electricity crisis. The publications cited are developed from data collected from respondents to various electricity surveys managed by the EIA, as well as information on the California Power Exchange and ISO. Products from EIA's Natural Gas Division are also provided.

- [Electricity Information](#)
- [Natural Gas Information](#)
- [Other Related Sites](#)

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## ENERGY TIME MACHINE



### World's Oldest Continuously Burning Light Bulb The Livermore Centennial Light

Hanging on an electrical cord over the fire engines at the Livermore - Pleasanton Fire Department's Station Number Six is a light bulb. But it's not just any light bulb. This light bulb has been **burning since 1901!** It is considered the longest-burning bulb in the world.

The **Livermore Centennial Light** was manufactured in 1901 by the Shelby Electric Company. It is a hand-blown bulb with a carbon filament. It uses approximately 4 watts of electricity. The bulb has been left burning continuously in the firehouse as a night light over the fire trucks since 1901.



Photo credit: Dick Jones  
Courtesy: [www.centennialbulb.org](http://www.centennialbulb.org)

Regular incandescent light bulbs last about 750 to 2,000 hours, if they were left continuous burning. Fluorescent lights can last 20,000 hours. As of June 8, 2002, its 101st Birthday, this bulb has reportedly been burning more than 800,000 hours!! It's even made the Guinness Book of Records.

There's a website that's devoted to the Centennial Lightbulb at [www.centennialbulb.org/](http://www.centennialbulb.org/). There, you can see a "live" picture of the light bulb 24-hours a day.

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Page updated: June 8, 2002

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## The Bright Schools Program

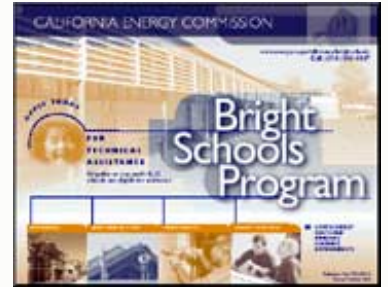
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## The Bright Schools Program

Energy Efficient Schools For a Brighter Future

**MOST SCHOOLS SPEND MORE MONEY ON ENERGY EACH YEAR THAN ON SCHOOL SUPPLIES**

You can change that by lowering your school's energy bills using readily available, energy-efficient lighting and HVAC systems. Installing energy-efficient equipment reduces annual maintenance costs, conserves finite resources and improves indoor air quality. Administrators confirm that our recommendations and assistance led to better learning environments. Savings from these systems are proven to typically reduce annual utility costs by an average of 20 percent. All of your district's programs can share these savings, thereby benefiting the students!



### The Bright Schools Program Can Help!

Whether you are renovating an existing school, building a new one, or want to save on energy bills, the Bright Schools Program can help. This California Energy Commission program offers specific services to help you become more energy wise. Together we can identify cost-effective energy efficient systems to meet your needs and provide design and implementation assistance for your projects.

#### Existing Schools



The Bright Schools Program can help you get the most from your renovation and maintenance investments. With an evaluation of your maintenance plans or an energy audit of your facilities, we can identify energy-related projects that should be implemented immediately as part of a comprehensive Bright Schools energy package. School organizations planning major renovations can also benefit from our technical assistance services during the planning and design processes. For existing schools, the Bright Schools Program can:

- Conduct energy audits and feasibility studies
- Review existing proposals and designs
- Develop equipment performance specifications
- Assist with contractor selection
- Review equipment bid specifications
- Review commissioning plans

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#### New School Construction

Schools built with energy efficient designs will cost less to operate, offering continuous savings and leaving more money for education. Many new schools being built today just barely meet current California Title 24 energy efficiency standards and could save more energy. Many of these designs could be improved with little or no additional expense. The Bright Schools Program provides technical assistance to your district's architectural and engineering team early in the design phase, before the plans are finalized. The savings accumulate from the first day of operation! For new school construction projects, the Bright Schools Program can:

- Provide design consultation
- Identify cost-effective energy-saving measures
- Compare different technologies
- Provide equipment specification consultation
- Develop computer simulation models of your planned project
- Help select design professionals with energy efficiency expertise
- Review schematics and construction plans
- Assist with system commissioning



### **Is There a Cost to Participate in the Bright Schools Program?**

The Energy Commission has contracted with experienced engineering and architectural consultants who provide the technical assistance. We provide up to \$20,000 of our consultants' cost. For some applicants this could cover all the costs for analyzing one or more schools. With some cost sharing, the program can analyze additional schools. The cost of the study depends on the type and scope of project and size of facility(ies).

### **Bright Schools Program Collaborates with Key State Programs**

Our staff works closely with the Office of Public School Construction, the Division of the State Architect, and the California Department of Education to ensure that recommended projects meet program eligibility requirements. We can help you secure low-interest loans to provide all or a portion of the funds you need for your energy-related projects.

### **Download Brochure**

The Bright Schools Program Brochure is available in Adobe Portable Document Format (PDF). For more information about PDF files or to download Acrobat Reader, please visit Adobe's Web site at [www.adobe.com](http://www.adobe.com).

 [Bright Schools Brochure](#) (6 pages, 2.4 megabytes).

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## **The Application Process**

### **How do I apply for technical assistance?**

1. Complete the application.

 [Download PDF Application](#) (2 pages, 32 kilobytes)

 [Download Interactive Word Application](#) (184 kilobytes)

2. Provide supplemental information, such as past energy studies, preliminary plans or proposals, 12 months of energy bills (e.g., gas and electric), and energy using equipment inventories for the buildings or facilities that you are requesting assistance for.
3. Complete the Governing Board Resolution. The resolution may be mailed separately, but no technical assistance will be provided until we receive the resolution.

 [Download PDF BSP Resolution](#) (1 page, 12 kilobytes)

 [Download Interactive Word BSP Resolution](#) (48 kilobytes)

4. Mail your application, Governing Board Resolution, and supplemental information to:

California Energy Commission  
Bright Schools Program  
Public Programs Office  
1516 Ninth Street, MS 42

Sacramento, CA 95814-5512

**How will you evaluate my application?**

The application must indicate how your district plans to execute and fund recommended projects. Also, the Governing Board Resolution must demonstrate your district's commitment to implementing the Bright Schools Program's energy efficiency recommendations.

**When is my application due?**

The Bright Schools Program is continuously open program with no final filing date. Program funds are limited, however, so filing promptly will help increase your chances of receiving assistance. Applications will be accepted on a first-come, first-served basis.

**Who is eligible for the Bright Schools Program?**

All publicly funded California K-12 school districts and non-profit K-12 schools are eligible for assistance from the Bright Schools Program.

**What if I need funding for my energy saving projects?**


If you need funds to finance and implement the projects recommended by the Bright Schools Program or as a result of your independent analysis, you can apply for a low interest loan from the Energy Commission. Loans are available at competitive rates for public K-12 schools. For information, go to [www.energy.ca.gov/efficiency/financing/](http://www.energy.ca.gov/efficiency/financing/).


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**Other Information**

Costs for school operations keep going up, but one way to save money is by reducing energy costs. Find out how some California schools have reduced their operating costs by exploring the PDF documents below.

**Case Studies of Program Participant's Energy Saving Projects****School Case Studies**

 [Murrieta Valley Unified School District](#)  
updated: July 2005. (2 pages, 396 kb)

 [Rio Linda Union School District](#)  
updated: July 2005. (2 pages, 688 kb)

 [Sanger Unified School District](#)  
updated: July 2005. (2 pages, 212 kb)

 [Willits Unified School District](#)  
updated: July 2005. (2 pages, 212 kb)

**General Technical Assistance Document**

 [Schools](#)  
updated: July 2005. (2 pages, 740 kb)

## Contact Us

Contact:  
Elizabeth Shirakh  
California Energy Commission  
1516 Ninth Street, MS-26  
Sacramento, CA 95814  
Phone: 916-654-4089  
E-mail: [eshirakh@energy.state.ca.us](mailto:eshirakh@energy.state.ca.us)

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ALLIANCE TO SAVE ENERGY

Creating an Energy-Efficient World

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The Alliance to Save Energy promotes energy efficiency worldwide to achieve a healthier economy, a cleaner environment, and greater energy security.

Energy efficiency is the quickest, cheapest, cleanest way to extend our world's energy supplies.

[En Español](#)

Spotlight

**Energy 'Security' Bill Won't Help Record-High Prices**



*Bill encourages more carpooling but does little to promote reduction in energy use.*

Washington, D.C., October 7, 2005 – With the nation struggling to recover from two devastating hurricanes, in the midst of record-high gas prices, and facing skyrocketing heating costs this winter, the House of Representatives has

passed an energy bill that provides no relief, the Alliance to Save Energy said today.

“The House Energy and Commerce Committee’s ‘Gasoline for America’s Security Act of 2005’ relies far too heavily on the long-term approach of increasing energy supplies,” said Alliance President Kateri Callahan. *(Continued...)*

Did you know...

At today’s gas prices (\$2.61), the average U.S. household will spend \$2,800 on gasoline in one year.--Alliance to Save Energy.

At today's gas prices (\$2.61), U.S. households driving SUVs can expect to spend \$3,140 on fuel in one year; paying \$920 per year more for gas in 2005 than they did in 2004.--Alliance to Save Energy.

At today’s gas prices (\$2.61), the average U.S. household will spend \$2,800 on gasoline in one year.--Alliance to Save Energy.

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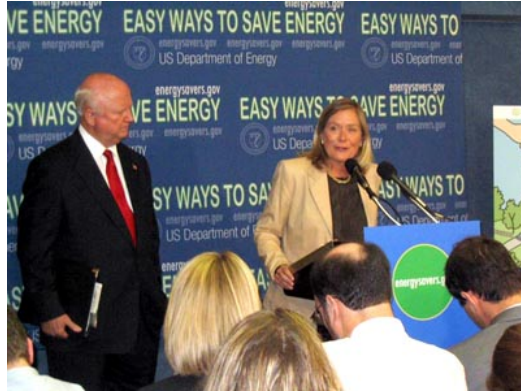
YOU DON'T WANNA CLICK HERE!



News



**Alliance President Kateri Callahan Remarks at DOE/Alliance News Conference About Ways to Save Energy and Money**



*Kateri Callahan speaks to the press about Powerful Savings at the DOE / ASE news conference Oct.3, with Samuel Bodman, DOE Secretary.*

"I am honored to be joining Energy Secretary Bodman to inform you about important partnerships between the

Alliance and the Department of Energy that are designed to empower consumers to save energy and money. These initiatives are important not only to providing relief to consumers and businesses now reeling from high energy costs, but also our partnerships seek to benefit the nation as a whole. Consumers are the critical key to lowering overall energy demand in the U.S. quickly, which will, in turn, improve our economy, our national security and our environment." (Continued...)

[Read remarks made by Samuel Bodman, DOE Secretary.](#)

*USNews.com:*  
[Capital Commerce: Tax break for energy savings may come soon](#)  
(10/7/2005)

*MSNBC TV Nightly News:* [Winter heating bills expected to surge](#)  
(10/6/2005)

*WashingtonPost.com:*  
[Bush Prepared to Tap Heating Oil Reserve](#)  
(10/4/2005)

*New York Times:*  
[Shifting Message, Energy Officials Announce Conservation Plan](#)  
(10/4/2005)

*Wall Street Journal (by subscription):*  
*U.S. to Consumers: Turn Down Heat*  
(10/4/2005)

*NPR All Things Considered:*  
[Energy Dept. Sends Mixed Messages on Conservation](#)  
(10/4/2005)

*Los Angeles Times:* [Bush Team Revs Up Media Campaign on Conserving Energy](#)  
(10/4/2005)

*NPR All Things*

**DOE/Alliance to Save Energy Powerful Savings Campaign Urges U.S. Consumers to Use Energy Efficiency to Curb Energy Use, Costs**



A Partnership of the U. S. Department of Energy and the Alliance to Save Energy

**Washington, DC, October 3, 2005** – Energy Secretary Samuel Bodman and Alliance to Save Energy President Kateri Callahan, in a joint

news conference today, urged consumers to use energy more efficiently to reduce demand and soaring energy prices. DOE and the Alliance are continuing to collaborate on the [Powerful Savings campaign](#), which empowers consumers to easily reduce their energy bills.

As part of the ongoing campaign, DOE and the Alliance debuted three new radio public service

announcements (PSAs) recorded by Bodman, as well as new print PSAs for the Ad Council's [Energy Hog campaign](#), now housed at the Alliance.  
(Continued...)

[Listen](#) to the news conference.

**[E&ETV OnPoint: Energy Efficiency: Alliance to Save Energy president explains the consumer response to energy prices](#)**



*Kateri Callahan, president of the Alliance to Save Energy, discusses President Bush's call for energy conservation on OnPoint E&ETV.com*

President Bush recently urged consumers to reduce their use of gasoline, in an attempt to lessen demand for gasoline after

hurricanes Katrina and Rita damaged Gulf Coast oil facilities. Does Bush's call for conservation suggest a new approach on energy at the White House? Or will Bush and Republican leaders in Congress focus solely on building new oil refineries and opening up new areas to energy exploration? Kateri Callahan, president of the Alliance to Save Energy, talks about energy legislation moving through the House and Senate and the potential for a fuel economy increase. Plus, she explains what consumers are doing to lessen their energy use and the role for the Department of Energy.

**[2005 Stars of Energy Efficiency Award Winners](#)**



The 2005 Stars of Energy Efficiency awards go to DFW International Airport, Burlington Electric Department, Ultra Light Steel Auto Body - Advanced Vehicle Concepts. The Charles H. Percy Award goes to the president of the California Public Utilities Commission, Michael Peevey. **Save the date for the dinner: [October 20, 2005](#)**

[Considered: Consumers Urged to Conserve Energy \(10/3/2005\)](#)

[GreenBiz.com: Web Index of State Energy-Efficiency Policies Launched \(10/3/2005\)](#)

[New York Times/Reuters: Government Unveils Energy Hog to Promote Conservation \(10/3/2005\)](#)

[CNN Money: U.S. urges efficient energy use \(10/3/2005\)](#)

[EV World: U.S. DOE and Alliance to Save Energy Join Forces on Energy Conservation Initiatives \(10/3/2005\)](#)

[Forbes: AFX Europe Summary \(10/3/2005\)](#)

[GreenBiz.com: Web Index of State Energy-Efficiency Policies Launched \(10/3/2005\)](#)

[Reuters AlertNet: Bush to push Americans to cut energy use as costs soar](#)

**President Bush Signs Energy Policy Act of 2005:  
Offers Consumer Tax Credits**



President

*Bush holds The Energy Policy Act of 2005 after signing in New Mexico Aug. 8. From left: Alliance Vice Chair Rep. Ralph Hall (R-TX), Rep. Joe Barton (R-TX), Sen. Pete Domenici (R-NM), and Alliance Vice Chair Sen. Jeff Bingaman (D-NM).*

The Energy Policy Act of 2005 includes tax credits for consumers who purchase hybrid-electric vehicles and make energy-efficiency improvements to existing homes. The tax incentives will help develop the markets for energy-efficient products while lowering consumers' energy bills, reducing pollution, and contributing to greater electricity reliability.

The Alliance has a [detailed analysis](#) of the energy-efficiency provisions in the new energy law. The Alliance urges full implementation and full funding of these new energy-efficiency provisions. [News release.](#)

(10/3/2005)

Philadelphia  
Enquirer: [Editorial |  
Summon the  
energy](#) (10/2/2005)

Burlington Free  
Press: [Burlington  
Electric marks 100  
years](#) (10/2/2005)

EarthToys  
Emagazine: [Paving  
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## Energy Web Directory

### Conservation and Energy Efficiency

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- [Abraxas Energy Consulting](#)
- [Active National Directory of Source Emissions Testing](#)
- [Advanced Foil Systems](#) - **manufacturers of Aluma-Foil Radiant Barrier.**
- [Advanced Glazings Limited](#) - **manufactures "InsolCore"**
- [Affordable Comfort Housing Performance Association](#)
- [Air Conditioning Contractors of America](#) - **(professional association)**
- [Air-Conditioning and Refrigeration Institute](#)
- [Alliance to Save Energy](#)
- [Alliance to Save Energy's Home Energy Checkup](#)
- [AM Conservation Group](#)
- [American Consulting Engineers Council](#) - **(professional association)**
- [American Council for an Energy Efficient Economy](#) - **(ACEEE)**
- [American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.](#) - **(ASHRAE)**
- [Arges Technologies, Inc.](#) - **Energy Saving Lighting Power Controllers**
- [Best Practices Benchmarking for Energy Efficiency Programs](#)
- [Better World](#)
- [Builder Magazine](#)
- [Building and Home Improvement Products Network](#)
- [Building Industry Exchange Foundation](#)

- [Building Performance](#)
- [Building with Awareness](#)
- [buyenergyefficient.org](#)
- [California Association of Building Energy Consultants - \(CABEC\)](#)
- [California DSM Measurement Advisory Committee](#)
- [California Straw Building Association](#)
- [CHEERS - California Home Energy Efficiency Rating System](#)
- [Conservation Web \(Con.WEB\) - \(monthly online newsletter\)](#)
- [Consumer Research Council - publishes "Save Money & Save the Environment: A Consumer Guide To Buying Energy-Efficient Products for the Home"](#)
- [CRS Light](#)
- [Department of Energy's Office of Energy Efficiency and Renewable Energy - Sustainable Development](#)
- [DOE-2.1E - The current, official version of the DOE-2 software program from the Simulation research group at Lawrence Berkeley laboratory. \(Also see EnergyPlus.\)](#)
- [DOE2.COM - DOE-2, eQUEST and PowerDOE freeware/software for residential and nonresidential buildings' energy use. \(Not affiliated with U.S. Department of Energy\)](#)
- [e-design On Line - \(Florida-based energy efficiency, high performance design and building commissioning\)](#)
- [Earth Sheltered Buildings](#)
- [Electrical Contractor Network](#)
- [Electrical-Safety Forum](#)
- [Electricity Forum](#)
- [EMCOR Energy & Technologies - Formerly Newcomb Anderson Associates](#)
- [Enerchron - Sells heat reflective coating materials](#)
- [Energy and Technical Service](#)
- [Energy Concepts Co.](#)
- [Energy Conservation Society](#)
- [Energy Crossroads - LBL's listing of energy-efficiency resources on the Web](#)
- [Energy Design Resources - Tools for architects, designers, building managers and others to build energy-efficient commercial and industrial buildings](#)
- [Energy Design Update](#)
- [Energy Efficiency and Renewable Energy - \(EERE\)](#)
-

- [Energy Efficient Building Association, Inc.](#)
- [Energy Federation Inc.](#)
- [Energy Hawk](#)
- [Energy Ideas](#)
- [Energy Institute Press](#)
- [Energy Solutions](#)
- [EnergyPlus - The best features of DOE-2 and BLAST, whole-building simulation programs from the Simulation Research Group at Lawrence Berkeley Laboratory.](#)
- [Environment and Energy Daily - Legislation dealing with environment and energy](#)
- [environmentalsustainability.info](#)
- [Graywater Heat Recovery System: GFX](#)
- [Green Home Builder](#)
- [Green Ribbon Pledge](#)
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- [Home Ideas](#)
- [Home Power Magazine](#)
- [Institute for Market Transformation](#)
- [Institute for Research in Construction - \(Canada\)](#)
- [KW Engineering](#)
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- [Lighting Research Center](#)
- [Micropas - Efficiency standards compliance software](#)
- [Minnesotans for an Energy Efficient Economy](#)
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- [NAIMA Free Isulation Thickness Software](#)
- [National Fenestration Rating Council](#)
- [Natural Lighting Company](#)
- [North American Insulation Manufacturing Association](#)
- [Northwest Energy Efficiency Alliance](#)

- [Oak Ridge National laboratory - Energy Efficiency & Renewable Energy](#)
- [Optimum Utility Systems - 250 ways to reduce industrial utility costs.](#)
- [Pacific Northwest National Laboratory](#)
- [Polar-Ply™ Radiant Barriers](#)
- [Power Smart - Canada's endorsement label for energy-efficient products](#)
- [Power Tec International](#)
- [Ra Jac Air Online - Air Conditioning and Heating Information](#)
- [Residential Energy Audit Software - \("Easy Audit" by CRN Applications\)](#)
- [Rocky Mountain Institute](#)
- [Save More Resources Inc.](#)
- [Simply Insulate](#)
- [Solar Plus - Full service renewable energy provider](#)
- [Staber Industries, Inc. - Manufacturer of a top load horizontal-axis clothes washer](#)
- [Straw Building Association \(California\)](#)
- [Teledyne Energy Systems Inc.](#)
- [The Construction Site](#)
- [Thermalex Inc.](#)
- [This Old House](#)
- [Toxics Use Reduction institute](#)
- [Trace Air - Home Energy Rating Service](#)
- [U.S. Department of Energy - Building Standards and Guidelines Program](#)
- [U.S. Department of Energy - Energy Efficiency and Renewable Energy Network](#)
- [University of Oregon Energy and Environment Home page](#)
- [WarmAir.COM - Site includes a number of Energy Efficiency calculators](#)
- [Western Area Power Administration](#)
- [Wholesale solar.com - Solar Panels, inverters, wind generators and more.](#)





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**The US Department of Energy Office of Energy Efficiency and Renewable Energy can now be found at <http://www.eere.energy.gov/>.**

The US Department of Energy's Office of Energy Efficiency and Renewable Energy has updated and redesigned its Web site. Formerly known as the Energy Efficiency and Renewable Energy Network (EREN), the site is now US DOE Energy Efficiency and Renewable Energy (EERE).

The page you requested has changed, moved, or is no longer available. To locate the information you are looking for, please visit <http://www.eere.energy.gov/>. From the home page, you can access a selection of EERE Web sites, or you can browse from here to find the page you are looking for. In addition, you can use the search feature in the upper right corner of the home page to locate your requested page.

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### FCIC's Most Popular Publications

We've pulled together a [listing of our top sellers](#) to make it easy to find and get the "most popular" items.

### Consumer Action Website



The **Consumer Action Website** is based on the 2005 Consumer Action Handbook. It features general advice and information on how to solve consumer problems, as well as addresses, telephone

numbers, and websites where you can file consumer complaints.

### FirstGov.gov

The U.S. Government's Official Web Portal where citizens can get easy-to-understand information and services from the government. **FirstGov.gov** pulls together more than 26 million state and local government pages.

### Mymoney.gov!

The Federal Government has created a website [www.mymoney.gov](http://www.mymoney.gov), dedicated to helping you understand more about your money, and where you can **order your free "My Money" Tool Kit**.

### PARADE - Personal Financial Choices

[Click here to order your free publication](#) from Visa and the Federal Citizen Information Center. You get great information on your personal finances.

### Hints from Heloise Offer

[Click here to order your free Packet of Publications](#) as mentioned in Heloise's newspaper column and radio show.

### Consumer Focus

#### The 529 Plan and How It Works

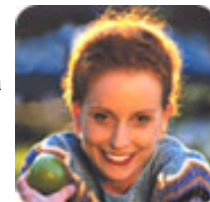
Anyone at any income level can put aside money tax-free for a child or even himself for college. States and colleges offer different plans, so read on and explore the 529 plan options available.



Visit our [Consumer Focus Archive](#)

### Menopause

The decision whether or not to use hormone therapy for symptoms of menopause is a personal one. We encourage you to **get the facts** about the benefits and risks.

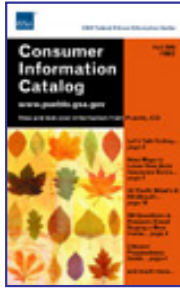


### Federal Information in Other Languages

For many Americans, English is their second language. Our [Spanish resources page](#) offers news, tips, and Spanish language publications you can order. Also, visit our [multi-language gateway](#) for information in many other languages.

## Consumer Information Catalog

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## National Contact Center

Have a question about Federal agencies, programs, benefits, or services? The **National Contact Center** is only a toll-free call away. Call us weekdays toll-free at **1 (800) FED INFO** currently open 24 hours 7 days a week due to Hurricane Katrina. We also have recordings of **frequently requested information** available around the clock. Or just [e-mail us](#) - we can answer your question or get you to someone who can.

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SAVE ENERGY***Creating an Energy-Efficient World*

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Strengthen Schools*

Energy costs are an enormous expense for our nation's schools. To help free up more resources for education while strengthening academic learning, the Alliance's Green Schools Program engages students in creating energy-saving activities in their schools, using hands-on, real-world projects. Through basic changes in the operations, maintenance, and individual behavior, Green Schools has achieved reductions in energy use of 5 to 15 percent among participating schools. In addition, Green Schools encourages students to apply the lessons of energy-efficiency message in their homes and communities.

**[August 2005 Update Newsletter](#)**

In Issue 32, read about the Alliance's new Energy Hog campaign, energy conservation best practices awards received by two California Green Campuses, energy in the news, and more!

**[Summer 2005 Gazette Newsletter](#)**

In this issue of the Gazette, you'll learn how elementary students in San Bernardino, Calif., created draft guards to save energy in their classrooms, how Green Schools in Washington, DC, are spreading the word about energy efficiency through a project rap, and much more!

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**EASY TIPS TO SAVE  
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The Alliance to Save Energy is a coalition of prominent business, government, environmental, and consumer leaders who promote the efficient and clean use of energy worldwide to benefit consumers, the environment, economy, and national security. It is a nonprofit 501 (c) (3) organization.

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Illustrations by Jim Carson

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# RMI for Kids



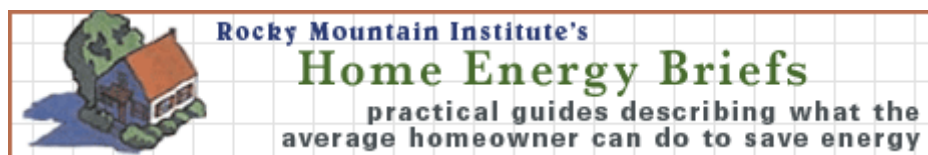
## Welcome to RMI for Kids.

These pages are designed to give kids and teachers a look at the information Rocky Mountain Institute (RMI) has to share about different subjects, such as energy and water. They're designed for kids in grades 4–6, but the links and teacher information are useful for students of many ages. The program first looks at energy and water. They are something we use every day and have many impacts on our world. As this program grows, we hope to add sections about different things we study at RMI. Check back for new sections, new links, and new tips from other kids.

- [RMI for Kids—Energy](#)
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### energy tip

Cars and trucks are responsible for more than half the smog-forming pollution in our country. One of the biggest ways any of us can help keep our air clean is to **drive less**, and to **bike, walk, take the bus or train, telecommute, or carpool, more**. When we do drive, we can keep our cars tuned up, and combine car trips.



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Other RMI web sites include:

*Winning the Oil Endgame* ([www.oilendgame.org](http://www.oilendgame.org))

*Natural Capitalism* ([www.naturalcapitalism.org](http://www.naturalcapitalism.org))

National Energy Policy Initiative ([www.nepinitiative.org](http://www.nepinitiative.org))

*Small Is Profitable* ([www.smallisprofitable.org](http://www.smallisprofitable.org))

The Community Energy Opportunity Finder ([www.energyfinder.org](http://www.energyfinder.org))

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Our vision is to provide online energy and science education. Our mission is to create a friendly portal through which energy and science education resources can be accessed and enjoyed.

Energy can be understood through science, engineering, social systems, and education. It is the common thread that puts energy-related patterns of relationships into perspective. One goal is to present various roadmaps to learning this concept - including one or more that match your own preferred learning styles. This concept is viewed through the eyes of Electra, the hands of Geo, and Windy's patterns.

Select a guide to learn more about energy basics:



**ELECTRA**

PROFILE:  
Electra loves to read. Just give her the facts!



**GEO**

PROFILE:  
Geo loves to use his hands and work on projects.



**WINDY**

PROFILE:  
Windy enjoys finding patterns related to energy.

FUN FACTS



The Energy Information Administration has revamped the popular Energy Kid's Page section of its Web site.

[More >](#)



Kids, smart energy use is a good habit!



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# SIMPLE MAGLEV TRAIN

## (c)1996 W. Beaty

Lots of people have emailed me about building some sort of maglev train as a science project. Here are my suggestions.

A truly levitated maglev train is a very complex device. Permanent magnets alone cannot suspend a train car. You'd also need coils, amplifiers, and negative feedback too. I'd only recommend the [coils/sensors approach](#) to college students or fairly advanced highschoolers.

However, there's a way to make a simple permanent-magnet maglev train. Instead of using coils and electronics, we just put guide rails on the sides of the track. The guide rails will lightly touch your train and keep it centered. Because real science involves striking out into the unknown, I'm not going to give detailed plans here. Just enough info to get you started.

The lifter-rails under your train will be small square ceramic magnets. Radio Shack stores in the US sell a good type, the 1" x 3/4" square with a hole in the center. Each foot of train track will require 32 of these magnets. Less expensive magnets are available from All Electronics, but I haven't tried these (see links at end of article).

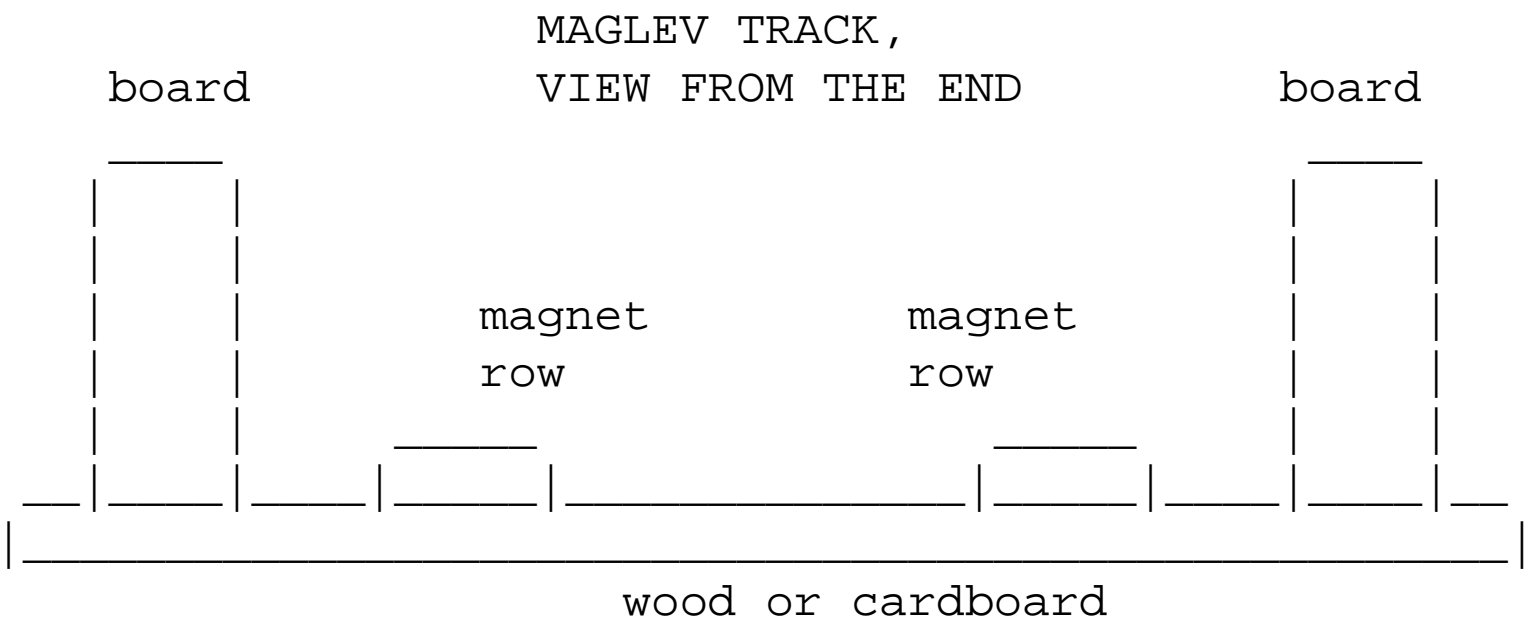
First mark one pole on all of your magnets so you later can lay them down with the same pole facing upwards. To do this, stick your magnets all together in one big long stack. Now use a permanent marker to make an "X" on flat face of one end of the stack. Pull the marked magnet off the stack, make an "X" on the next one, etc., until you're out of magnets. Mark every single one on the same side.

Before building an entire huge track, make a "test bed" about one foot long. For

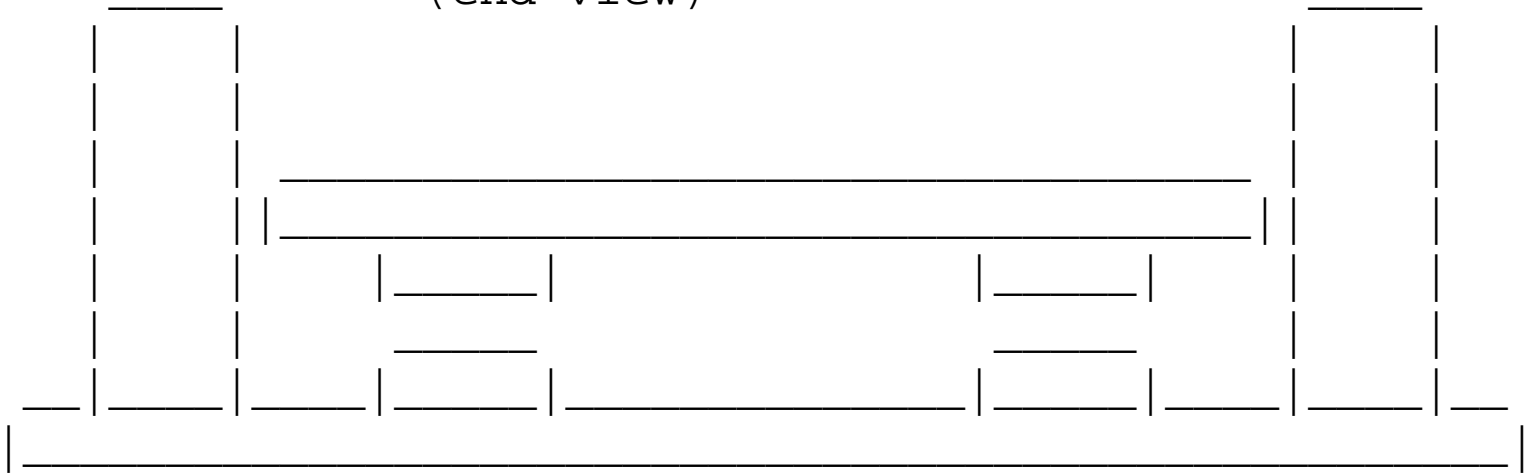
a base, you can use cardboard or wood. Don't use iron or steel of course. You'll be lining up your magnets side by side in long rows. One way to do this is to stick them to a strip of duct tape, then lay the strip down on the cardboard or wood and rub the tape down to hold the magnets underneath. Position each magnet carefully on the tape so the row is very straight. Make two parallel rows of magnets with about 5cm of space between the rows. Make sure the rows are perfectly parallel. It might help to measure with a ruler and draw lines on the base first.

For a temporary "car", cut out a square of cardboard 9cm by 15cm . Tape four magnets to the corners, flipping the magnets correctly so they will repel from the tracks when the cardboard is layed down. Position the magnets on the cardboard so they will be exactly over the magnets on the track.

If you place your cardboard "car" on your magnet track, you'll find that it will twist or flip over and fall, and will not hover. But if you gently hold it by its sides, you can keep it floating in position. Does this give you ideas? What if you place one long board on each side of your track? The "car" will touch the two boards and will stop slipping sideways, but the boards will not stop the car from slipping down the track.



MAGLEV TRACK, WITH FLOATING  
CARDBOARD CAR IN PLACE  
(end view)



Once you get this part working, you can build a much longer track. You can build a real car too, one that looks like a train, although you'll have to find very lightweight construction materials. You can try thinking up ways to reduce the friction with the side rails. Maybe try aluminum angle strips instead of wood, or sand the wood smooth and paint it with something hard and shiny.

But how can you drive your train forward? I don't know. You'll have to think of something. There are only two ways to move a hovering object. One is to grab something on the ground and pull or push forwards (this includes tilting the rail to become a ramp; using gravity to pull the car forwards.) The other way is to force something out the back, which drives the car forward. Use the car to launch marbles rolling down a tiny ramp? Use a propellor? Squirt water? Rocket engine?

Advanced project: [Linear Motor Train Propulsion](http://amasci.com/maglev/train.html)

Someone else's version:

MAGNET MAN, levitating train

<http://my.execpc.com/~rheadley/magtrain.htm>

## MAGNET SUPPLIERS

[Radio Shack 1in rectangle, \\$2.60 for 5](#)

[All Electronics: 1-7/8" x 3/4" x 1/4" magnet \\$0.25 each](#)

<http://amasci.com/maglev/train.html>

Created and maintained by [Bill Beaty](#). Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

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This [Fun Science Ring](#) site owned by [billb@amasci.com](mailto:billb@amasci.com) William J. Beaty.

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This organization is supported in part by grants from the National Science Foundation, the Rathman foundation, the Office of the Superintendant of Public Instruction of Washington State, and the generous donations of folks like you! The Science Club is a 501(c)(3) non-profit organization that uses humor and science to get children and adults to learn and play together. All our activities, which use common household materials, promote curiosity and the excitement of experimentation.

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<http://www.scienceclub.org>

Created and maintained by [BillBeaty](#).

Email me at [billb@amasci.com](mailto:billb@amasci.com)

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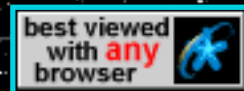
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On WWW since Sept, 1994

I've had to temporarily give up answering science questions. Too many at once, I'm backed up by weeks! Try [Science Questions](#) instead. Or see some of my [Answers](#) - Bill Beaty

[Stats for all pages](#)

bill beatty amascicom wwwamascicom

Do you lack WWW access? Try web-to-email gateways!

some info is at:

<http://www.bellanet.org/email.html>

<http://www.noodlebug.demon.co.uk/nuggets/inetmail.htm>

"Free website" services:

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[http://web.archive.org/web/\\*/](http://web.archive.org/web/*/)

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<http://amasci.com> in Seattle, Washington, USA

Created and maintained by [Bill Beaty](#). Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

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October 9, 2005 03:15PM  
2245  
408

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Please stay relatively on-  
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October 9, 2005 03:47AM  
273  
59

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more frivolous,  
speculative, or off-  
topic nature!

October 9, 2005 10:24AM  
191  
9

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views which are either  
not mainstream or are  
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not readily provable, or are highly theoretical. Also use this forum for ALL debates on religion/creationism. Do your best at bringing up your case in a scientific and respectable manner. Personal attacks will be taken very seriously - at the risk of being banned from these forums, NO FLAMEWARS.

October 7, 2005 09:12AM

98

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## Experimenters' Corner

Use this forum if you are actually performing experiments or building technical projects, or to ask for or provide help or direct knowledge with such projects. Stay on-topic!

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longwinded miscellany, webmaster hints

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- [COOL SCIENCE](#), links collection, mostly links to the large, commercial "cool science" indexes, plus my own "coolsci" collection.
- [WEIRD SCIENCE](#), subpages full of articles ranging from unusual to crack-brained. Pages and pages full of link collections.
- [TESLA COIL PAGE](#), some articles and SW on coil building, plus lots of links to fellow "coilers"

and sites.

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- [SCIENCE DEMOS](#), some of my more complicated science projects, links to physics edu. sites (part of SAS)
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# ANTIBUBBLES

## A simple science project

They're skins of air which float around underwater,  
and vanish when touched!

1997 [William J. Beaty](#)

Everyone is familiar with bubbles! There are three basic types:

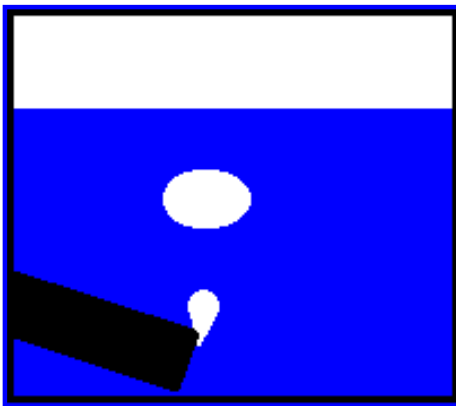


fig. 1

Pockets of air under water

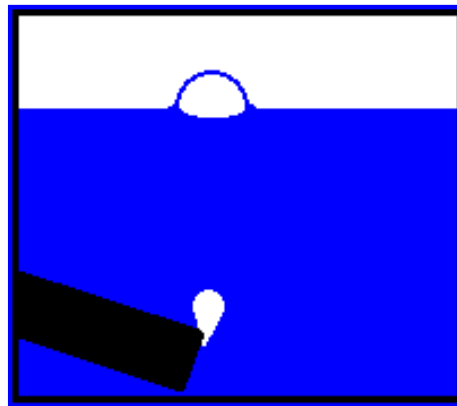


fig 2.

Air trapped under a water film

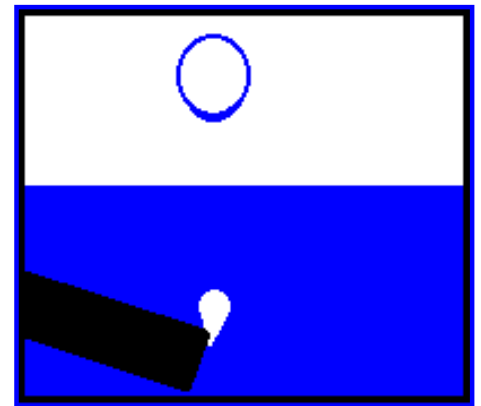


fig. 3

Bubbles which float in the air

Besides the above bubbles, there are three other kinds which are not as familiar. These are the ANTIBUBBLES. An Antibubble is similar to a bubble, but the roles of the water and the air are reversed.

The first type of antibubble is familiar. it is simply a drop of water falling through the air. It is the opposite of an underwater bubble: rather than being a blob of air in the water, it is a blob of water in the air.

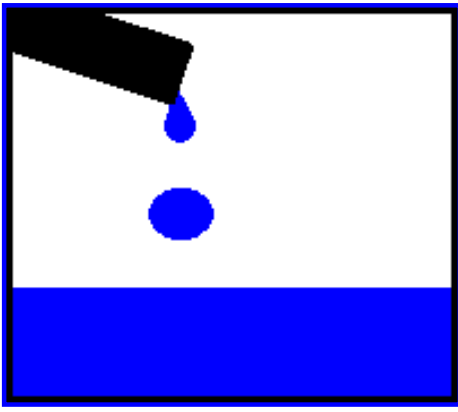


Fig. 4 Falling droplet of water

When a drop of water falls into water, we expect it to vanish. But sometimes it does not. If the water is very clean, then a thin skin of air will become trapped between the water droplet and the rest of the water. This effect is sometimes called a "Water Globule" or "floating drops." If you've spent any time sitting in a car on a rainy day, you will have seen water globules skittering across the hood. When raindrops splash on the car hood, you'll see the splashing droplets roll across the wet surface without melding into the rest of the water.

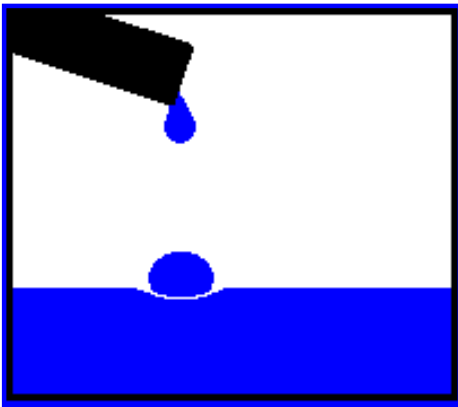


Fig. 5 "Water Globule" on the surface

A water globule is the opposite of an air bubble on the surface of water. Rather than being a pocket of air with a thin skin of water separating it from the air, it is a blob of water with a thin skin of air separating it from the water.

The last type of Antibubble is usually called by the name... "Antibubble." It is a very thin skin of air which floats around under the water. Antibubbles don't form easily, and they usually pop quickly, so most people have never seen them. However, it is possible with a little practice to create them yourself.

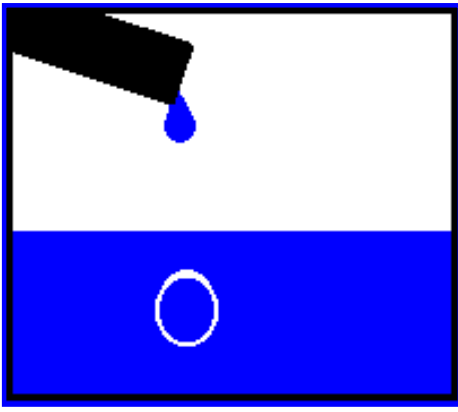


Fig. 6 "Antibubble" floats underwater

Antibubbles have many of the characteristics of soap bubbles. They float underwater weightlessly, and will only rise to the surface of the water very slowly. When poked, they will pop. When a soap bubble pops it leaves behind a tiny drop of water, but when an antibubble pops it leaves behind a tiny normal bubble. Antibubbles also display rainbow colors. Normal soap bubbles have rings of color at the top of the bubble where the soap film is thinnest, while antibubbles have their colors at their bottom.

---

## BLOW YOUR OWN UNDERWATER ANTIBUBBLES

### Needed:

- Kitchen sink
- Large clean jar
- Elmer's (tm) glue bottle, emptied and cleaned
- Dishwashing detergent

The key to creating antibubbles is to make a very clean water surface. The tiniest bit of surface dirt will prevent antibubbles from forming, or will make them quickly pop. To create a clean surface, allow a container of water to continuously overflow . The overflow causes the surface of the water to stretch and be pulled sideways, and any dirt on the water surface will be skimmed off. Fill your large jar, place it in the sink, and adjust your faucet to allow a continuous stream of water to pour in and overflow the jar.





Fig. 7 Constant overflow cleans the surface

Add some soap to the jar of water and stir well. Fill your glue bottle with soapy water from the jar.

To get familiar with how antibubbles behave, first try making some "globules." Spray some droplets up from below, so the droplets land on the surface of the water. If you can build up lots of globules, you'll see them bounce off each other, or "pop" and join the rest of the water. Sometimes they'll join together into larger and larger ones.

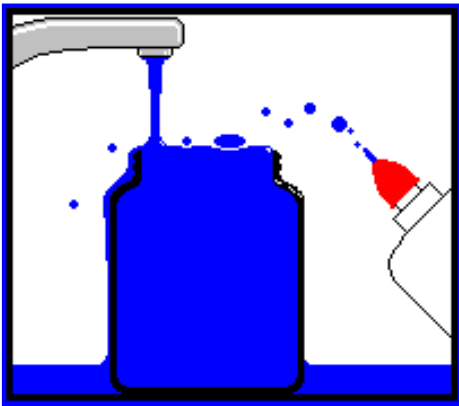


Fig. 8 Squirt some globules onto the water

You can demonstrate that the thin film of air is disrupted by electrostatic forces. Comb your hair to give the comb an electric charge imbalance. Spray some globules on the surface of the water, then wave the charged comb near them. They will abruptly vanish! They all "pop" and rejoin the water. The electrified comb causes the water in the globule to split into areas of positive and negative charge. This imbalanced charge attracts the water below the globule, and the globule crashes into the water below. On a dry day, your body can become electrified from walking on the floor, and this can disrupt antibubbles and globules. If your globules and antibubbles refuse to form, try touching the metal faucet to remove any charge imbalance from yourself. ["Static electric" page](#)

OK, let's make some real antibubbles. Follow the three steps below. First place the tip of your water-filled squirt bottle very near the water surface. Give it a gentle puff and create a single water globule. Immediately give a longer squeeze. This will send a jet of water through the

globule and down into the jar. If your squeeze is gentle and brief, the water jet will take the air layer along. A long silvery worm will extend into the water. This "worm" is water which is coated with air. Do this several times, and sometimes the worm will break up into antibubbles of different sizes.

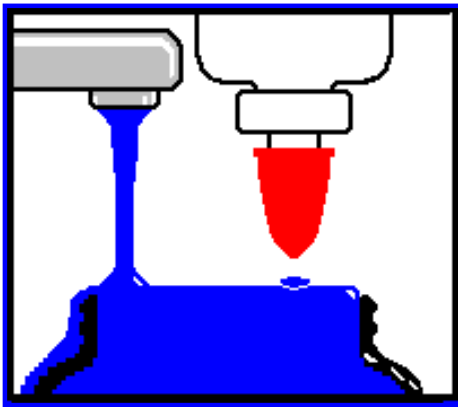


Fig. 9 Make a globule.

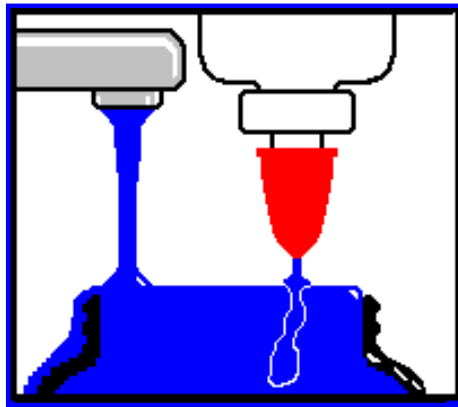


Fig. 10 Squirt through the globule.

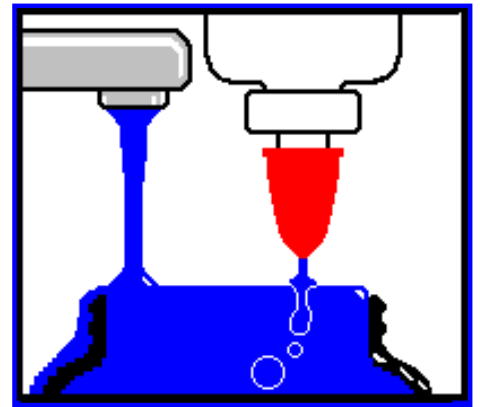


Fig. 11 Watch for antibubbles!

Your first underwater antibubbles will probably be small, under 1/8 inch across. With practice it is possible to blow 1/4" antibubbles, and occasionally 1/2" antibubbles.

To prove that this is no ordinary bubble, poke it with a pencil or fork. It will instantly vanish.

Antibubbles will slowly rise to the surface, where they will often pop. To extend their life time, stick the bottle tip in the water and squirt at them to drive them deeper into the jar. Vibration is supposed to extend their lifetimes, so squirting them with underwater jets may keep them alive longer. Temperature difference is also said to lengthen their lifetimes. Try filling your glue bottle with hot water, while putting cold water in your overflowing jar.

Antibubbles display rings of color, but these colors appear at the bottom of the bubbles rather than at the top. Look closely at your antibubbles under bright light, and you'll see that each one has "soap film colors." But in this case we should call them "air film colors." The color of soap films (and of oil on water) are caused by light reflections from a very thin, transparent layer. Light reflects from the front of the thin layer and from the back. If the layer is almost as thin as light waves, the certain colors of light waves from the two reflections cancel out, producing a "subtractive rainbow" with cyan/magenta/yellow instead of red/green/blue. In a normal bubble the thin water layer creates the colors. In an antibubble, the colors are created by the thin layer of air.

Conventional bubbles can be filled with cigarette smoke, and they release a little cloud when they pop. Antibubbles can also be filled with colors. Just put some food coloring in your squirt bottle. If several kids have squirt bottles with differing colors of water, everyone can keep track of their own antibubbles in the same jar.

## OIL BOTTLE:

To demonstrate all the various bubbles (antibubbles, bubbles, globules, antibubbles inside bubbles, anti-foams, etc.) make yourself an oil/alcohol bottle. Clean out a small jar and fill it half with salad oil, then fill the rest with rubbing alcohol. Try to fill it perfectly, right up to the top, so no air is trapped. Screw on the cap, then slosh it *gently* to create waves, or a bit harder to create all sorts of bubbles-within- bubbles. (Don't shake it hard, or it will take hours for the misty mixture to settle out.)

## MORE INFO:

For more information about all of this, find a local library with back issues of Scientific American magazine. ( Or, order them through your library's Interlibrary Loan.) The "Amateur Scientist" columns for April 1974 and for August 1976 discuss antibubbles. On WWW, search for keyword "coalescence."

---

THIS CDROM HAS THE ORIGINAL ANTIBUBBLES ARTICLE FROM SCIENTIFIC AMERICAN:

### [THE AMATEUR SCIENTIST](#)



Now on CDROM, all the Scientific American magazine columns.  
~1000 projects by C.L. Stong, Jearle Walker, and Shawn Carlson. pp2100, \$24.99

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- [Terry's advanced antibubbles](#)
  - [Chris N's antibubbles](#)
  - ["Inverse Bubbles"](#) at Nicolet HS
  - [Bubble Page](#) at Exploratorium

## Science Papers:

- [Electric field-enhanced coalescence of spherical drops](#)
- C.L. Stong, "Curious Bubbles in Which a Gas Encloses a Liquid Instead of the Other Way Around", Scientific American Magazine, THE AMATEUR SCIENTIST, April 1974

Note: a CDROM of THE AMATEUR SCIENTIST is sold by [amazon.com](http://amazon.com)

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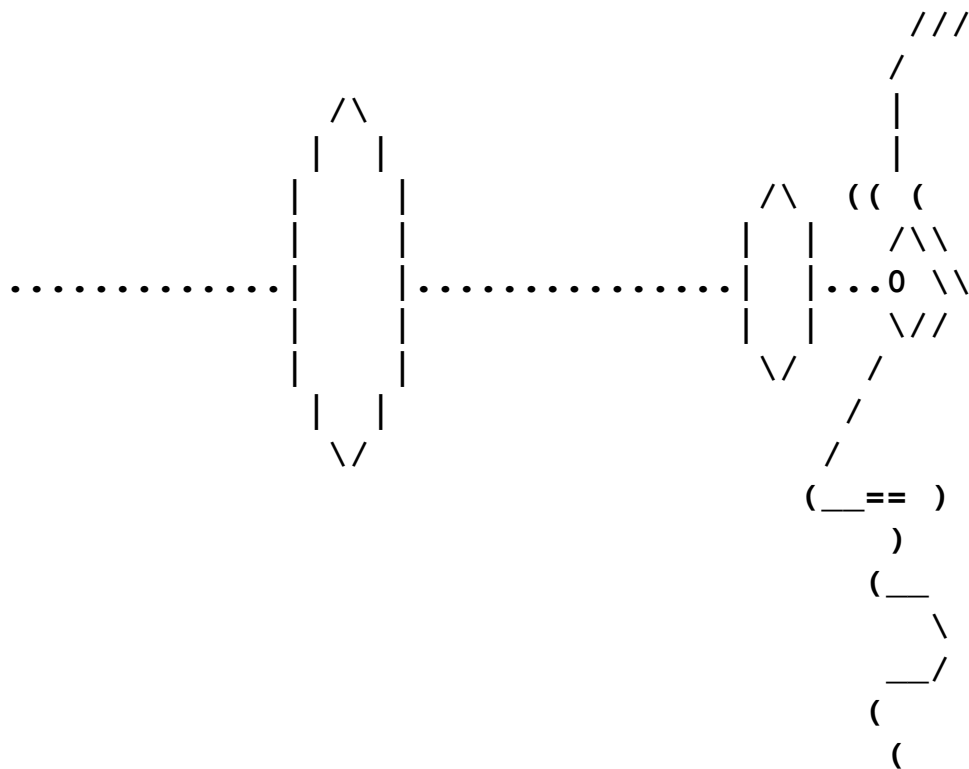
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Created and maintained by [Bill Beaty](#).

Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

# ULTRA-SIMPLE TELESCOPE



## MAKE A BEGINNER'S TELESCOPE

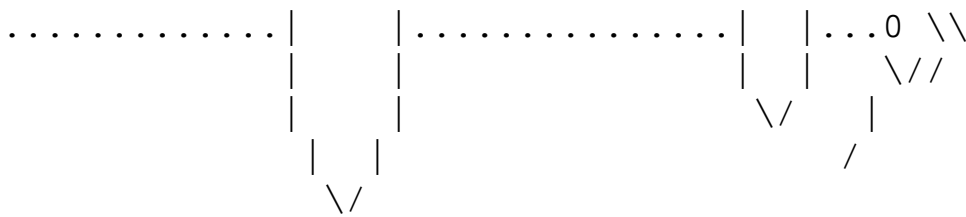
A telescope with a tube is nice, but it's more complicated than necessary. A telescope with adjustable focus is useful, but it's hard to build. A project that's too complex and difficult will drive people away, when the goal is to tempt them into building it.

Here is an extremely easy version of a Telescope Build-it project. No cardboard tube or adjustable focus mechanism is required. All that you need is a pair of lenses. Tempting?

## THE LENSES

Two lenses are needed to build a telescope. We call these the "objective" lens and the "eyepiece" lens.





OBJECTIVE

LENS:

- \* large
- \* weak
- \* convex only

EYEPIECE

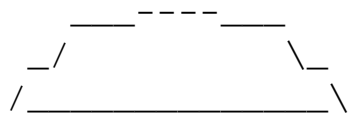
LENS:

- \* small
- \* powerful
- \* convex OR concave

The "Objective" lens should always be a convex lens. Convex lenses are thicker in the middle, and can be used as magnifying glasses or for concentrating sunlight. Try to find one which is large and weak. The weaker it is, the more powerful your telescope will be. The thinner it is in the center, the weaker it is.



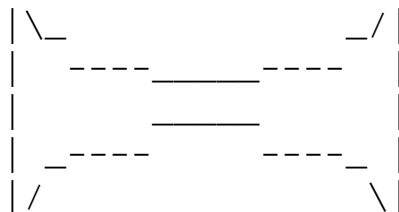
Side view of convex lens



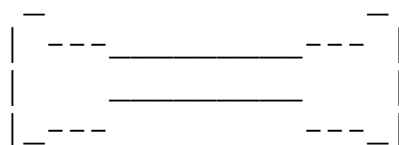
This type of convex lens also will work

The "eyepiece" lens can be either a convex or concave lens. If you use a convex eyepiece, your telescope will turn everything upside-down. This kind of telescope is called a "Newtonian." And if you use a concave lens as your eyepiece, your telescope will not turn things upside-down. This type of scope is called a "Galilean."

For your eyepiece, try to find a lens which is small and powerful. A small, powerful magnifying loupe makes a good telescope eyepiece.



Powerful concave lens.



Weak concave lens.

You can buy cheap lenses from the [suppliers below](#).

t

## USING YOUR TELESCOPE

Face a distant, well-lighted object such as a lamp, or distant trees outdoors.

Hold your Eyepiece Lens right on your eye and look through it. It's OK to close your other eye.

Hold your Objective lens right in front of your eyepiece.

Slowly move your Objective lens forward until the scene comes into focus. Sometimes it's hard to find the right distance, so try many different places. Look through your lenses and find the blurry edge of trees or lightbulb, then move the objective lens in or out so that the blurry edge looks sharper.

Your lenses are now a telescope!

Now that you know the trick, you can make a telescope whenever you find two different lenses lying around. If a friend happens to have two magnifying glasses, grab them, put the more powerful one right on your eye, move the other in and out, and you'll have an instant telescope.

## HOW TELESCOPES WORK

I've read many different explanations of telescopes. Most of them are confusing and complicated. Some are even wrong. So, if you read an explanation and don't understand it, don't blame yourself. Blame the author of the book or encyclopedia for not being a good explainer!

Having said this, do I think I can do better? I don't know. A good explanation of a telescope should be easy to understand. I've never seen a really good one, so all I can do is try to explain things in a different way than books usually do, and see how well it works.

## MY SIMPLE EXPLANATION:

If you put a lens right on your eye, it makes things blurry, but it does not magnify distant scenes. This is how eyeglasses work. They change the blurry-ness or sharpness of what you see, but they don't act as magnifiers when used normally.

Now if you move a lens away from your eye, and keep looking through it, everything WILL change size. If the lens is concave (thinner in the center,) everything you see in the lens will get smaller and smaller as you move the lens farther away from your eye. If you use a convex lens instead, everything will get bigger and bigger as you move it away.

The convex lens is the interesting one because it makes things bigger when you move it farther from your eye. Keep moving it farther and farther away. You'll find that everything will become VERY big, even infinitely big. And infinitely blurry too. Move the lens a little farther, and things get small again, but now everything seen through the lens is upside-down.

By moving the convex lens in and out, we can change the size of everything, or make it all go upside-down or rightside-up. Unfortunately everything is very blurry when you're looking through the lens. If only there was some way to remove the blurriness, we could hold a convex lens in front of our eye and use it to magnify distant scenes.

There is a way to remove the blur: wear glasses! Glasses are used to correct blurry vision, and they can fix this blur too. Put another lens right upon your eye. It acts like eyeglasses and makes the image sharp. If you do this, you have constructed a telescope. The objective lens creates a magnified view of distant objects, while the eyepiece lens removes the blur. That's how telescopes work.

## MAKE A TELESCOPE USING JUST ONE LENS

Here's an interesting question. If human beings could focus their eyes better, could we build telescopes with only one lens? Suppose you were able to focus your eyes on an object that was 1/10 inch away from your eye. Couldn't you hold an "objective" lens a few inches away, look through it, then focus really hard with your eyes and create a telescope? The answer is yes!

Even if you don't have a superhuman ability to overfocus your eyes, you can still make a simple one-lens telescope. Here's how. Hold a weak convex lens in front of your eye. Close your other eye. Move the lens far away so that everything turns upside-down. Move the lens a bit closer so that everything stays upside-down, but gets bigger and blurry. Now focus your eyes really hard by crossing them. (This might take a bit of practice! Crossing your eyes while one eye is closed is not that easy to do.)

The image you see in the lens will become sharper. If it doesn't become completely sharp, then move the lens farther away. Also try moving the lens closer while focusing really, REALLY hard. Everything you see in the lens will be clear, sharp, and magnified! You have made a telescope with nothing but a single lens! Tell your friends about it and they won't believe you. Then show them the trick and they'll be amazed.



## MAKE A TELESCOPE WITH A LENS AND SOME FOIL

It is also possible to make a telescope using aluminum foil and one lens. The lens will act as the telescope's objective lens. To make an eyepiece, we just poke a tiny hole in the foil, and use this pinhole as the telescope eyepiece lens. The tiny hole in the foil removes the blur. But it also makes the image very dim. That's alright, just use this telescope to watch a bright outdoor scene.

To make a good pinhole, stack up several layers of aluminum foil, poke the stack with a pin, then separate the layers and choose whichever one has a very round, very small hole. Experiment with different holes; put one on your eye, look through it a brightly-lit scene, and see how sharp everything looks. Smaller holes generally give sharper, dimmer images, but VERY small holes cause blur because of "optical diffraction" effects. You want your pinhole to be very small, but not so small that things become blurry.

To make a telescope, hold the best pinhole against your eye and look through it. Look at a brightly lit scene, such as the sunny outdoors outside a classroom window. Now place your objective lens against the pinhole, then move it slowly outwards. When you see a magnified scene, your telescope is working! You can hold your lens in different spots so the scene is either upside down or right side up.

An aluminum foil pinhole can be made sturdier by using rubber cement to glue it to a piece of cardboard which has a 1cm hole punched in the center (don't get cement in the tiny pinhole though!)

You can use your pinhole-telescope to create a "zoom lens" effect by moving the objective lens towards the pinhole or away. And depending on the distance between the pinhole and the lens, the scene you see can either be upside-down or right-side-up. It's very complicated to build a zoom-lens telescope with real eyepiece lenses, but if you use a pinhole it becomes simple.

### Get yourself some lenses:

American Science and Surplus sells inexpensive kits of miscellaneous lenses. Contact them at <http://sciplus.com>. Get a "large" kit for objectives, and a "small" kit for eyepieces:

3707 Kit, small lenses, ten for \$2.00

6901 Kit, tiny lenses, ten for \$1.75

5 Lens kit, 30 for \$19.95

Another supplier is Surplus Shed, with ["educational" lenses](#) costing about two dollars each.

Edmund Scientific sells lenses too. Check out their website at <http://www.edsci.com>, and request a mail-order catalog. Get two convex lenses, one with 200mm focal length or more, and one with 75mm or less.

## Links

- [Advanced telescope, Fun Sci Gallery](#)

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Created and maintained by [Bill Beaty](#). Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

# GOLDENROD PAPER: GIANT ACID/BASE INDICATOR

## Bill Beaty 1995

The Goldenrod Paper Secret was passed on to me around 1987 by Dr.

[Roy Gould](#) of the [Harvard CFA](#), who got it from his brother, an R&D chemist in NYC, who heard about it as the "secret" traveled from chem lab to chem lab across the country. I wrote up this paper and posted it on the web around 1995. Since then it has spread [all over the place!](#)

### TAKE NOTE:

On 4/98 somebody bought some Astrobrights Goldenrod paper which DID NOT WORK, it did not change colors. Therefore, perhaps it is time to run out and buy reams of "goldenrod" quickly, before the "good" kind is entirely replaced with the "doesn't work" kind. Also, take some baking soda with you to the stationery store, so you can test the paper (the "good" kind will turn red when moist baking soda is rubbed on it.)

The "good" kind is Astrobrights Galaxy Gold WAAB57A, from Wausau Papers.

Goldenrod paper is available at [Teachersource](#)

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THE "GOLDENROD PAPER" SECRET  
[Beaty](#)

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Office supply stores and Kinko's copy centers sell a type of paper called Astrobrights(tm) Galaxy Gold. It's "goldenrod" in color, sort of a yellow/orange. Big deal. However, IF ALKALINE SUBSTANCES HIT IT, IT TURNS MAGENTA! Spray it with Windex, and it instantly turns bright red! Cool!!

Astrobrights Galaxy Gold paper is the worlds largest acid/base indicator strip. Dip it in a base solution (like ammonia cleaner, baking soda in water, etc.) and it turns bright red. Dip it in acid (vinegar, lemon juice, etc.) and it turns yellow again.

(Note: there are other brands of goldenrod which do not work. If in doubt, wet a sample of the paper with ammonia glass cleaner. Kinko's usually has bottles of Windex around)

The fact that an 8.5 x 11 sheet of goldenrod is enormously larger than your typical acid/base litumus paper test strip makes numerous classroom demonstrations possible that never could be done before.

=====

**TRY THESE:**

Cut it into strips, dip it in acid or base. It turns colors. duh.

Dip it in base so it turns red, then dry it out. This gives you an acid-indicating paper which starts out red ...and turns yellow in acid.

Put dilute vinegar in one jar, baking-soda solution in another. (Baking soda dissolves better in warm water.) Use paintbrushes to paint on the goldenrod. Baking soda solution turns the yellow paper red. The vinegar solution turns previously-reddened paper yellow. Paint an

invisible

picture with vinegar on yellow goldenrod, let it dry, then spray it with baking soda solution. It turns red everywhere except the places having vinegar.

Draw "invisible" patterns or messages on the paper with rubber cement, diluted Elmer's glue, transparent tape, etc., then spray it with alkaline solution. The paper turns red except where your drawing has sealed it. Yellow artworks on red background appears.

Wet a strip of previously-reddened goldenrod, then lower the strip into a half-full glass of carbonated beverage. Don't let the strip touch the liquid. The strip turns orange as the transparent pool of carbon dioxide forms carbonic acid in the wet paper. This lets you "see" the invisible pool of CO<sub>2</sub> gas which fills the cup. (Only works in a draft-free room, where the CO<sub>2</sub> gas remains atop the cola.)

Dust your hands with baking soda. Claim that you have "Alien DNA Test Paper," and if it turns red, it indicates that you are not human. Have your audience put their thumbprints on some wet Goldenrod paper. Anyone with baking soda on their fingers (you!) will leave a thumbprint which slowly turns red.

ELECTROLYSIS: wet some goldenrod paper with salt water and place it on a sheet of aluminum foil. Use clipleads to connect the positive terminal of a 6v or 9v battery to the foil. Connect a wire to the negative battery terminal. Now drag the negative wire across the wet goldenrod, and it turns red. Write with electrochemistry! If you reverse the polarity of

the battery, you can erase your red drawings. If you replace the goldenrod with previously-reddened paper, the reversed battery connections let you draw in yellow on a red background. (the positive plate creates acidic solution, while the negative plate makes alkaline.)

MY OLD ACID RAIN DEMO: Wet the inside of a glass jar. Light a match, blow it out, then collect the smoke inside the upside-down jar. After awhile the drops of water collect nasty combustion products from the smoke and become acidic. Touch the drops to previously reddened goldenrod paper, and it turns yellow, indicating acid. Instant acid rain! And might you think twice about smoking cigarettes and putting acid in your lungs? I thought up this one while working at the Museum of Science in Boston.

-----  
--  
NOTE: Young kids shouldn't perform the following demonstrations.

Ammonia is somewhat toxic, is nasty if inhaled, and is dangerous if splashed in eyes. Adult supervision only. Wear safety goggles.

-----  
--  
AMMONIA DEMOS:

Wet some goldenrod paper, then drip some ammonia-based cleaner upon it. Notice that the red drops have red haloes around them? Just the ammonia fumes alone can turn the paper red.

Wet some goldenrod paper. Put some ice cubes in a jar, then pour in a little ammonia and wait for some cold ammonia gas to build up. Carefully pour the transparent ammonia gas over the wet goldenrod paper, and

it  
flares red. Dip a wet strip of un-reddened goldenrod into the  
seemingly-empty jar, and you'll discover the depth of the pool of  
cold  
ammonia gas. Make wet marks on dry goldenrod, and when cold  
ammonia gas  
is poured over it, the wet marks turn red. (Don't leave the jar  
of ice  
cubes sitting around, dump it out so that passersby can't take a  
sip from  
your glass of "icewater.")

Use a [smoke-ring box](#) to shoot invisible ammonia "smoke rings" at  
wet  
goldenrod paper. Little red puffs appear where they hit.

Freak out Kinko's Copies employees by buying one sheet of  
goldenrod,  
asking for the bottle of glass cleaner, then yelling "look!" while  
spraying the paper with the ammonia-based cleaner. But be warned,  
I've  
been doing this for awhile, so the secret is spreading from  
Kinko's to  
Kinko's like a mind-virus. They may already know about it.

## LINKS

- [Teachersource](#) sells goldenrod paper
- [The pH Factor](#) (Miami Mus. of Sci.)
- [Acid-base indicators](#), frequent questions
- [Google: goldenrod paper](#)

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(try "[science experiment project](#)" too)

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<http://amasci.com/amateur/gold.html>

Created and maintained by [Bill Beaty](#). Mail me at: [billb@amasci.com](mailto:billb@amasci.com).



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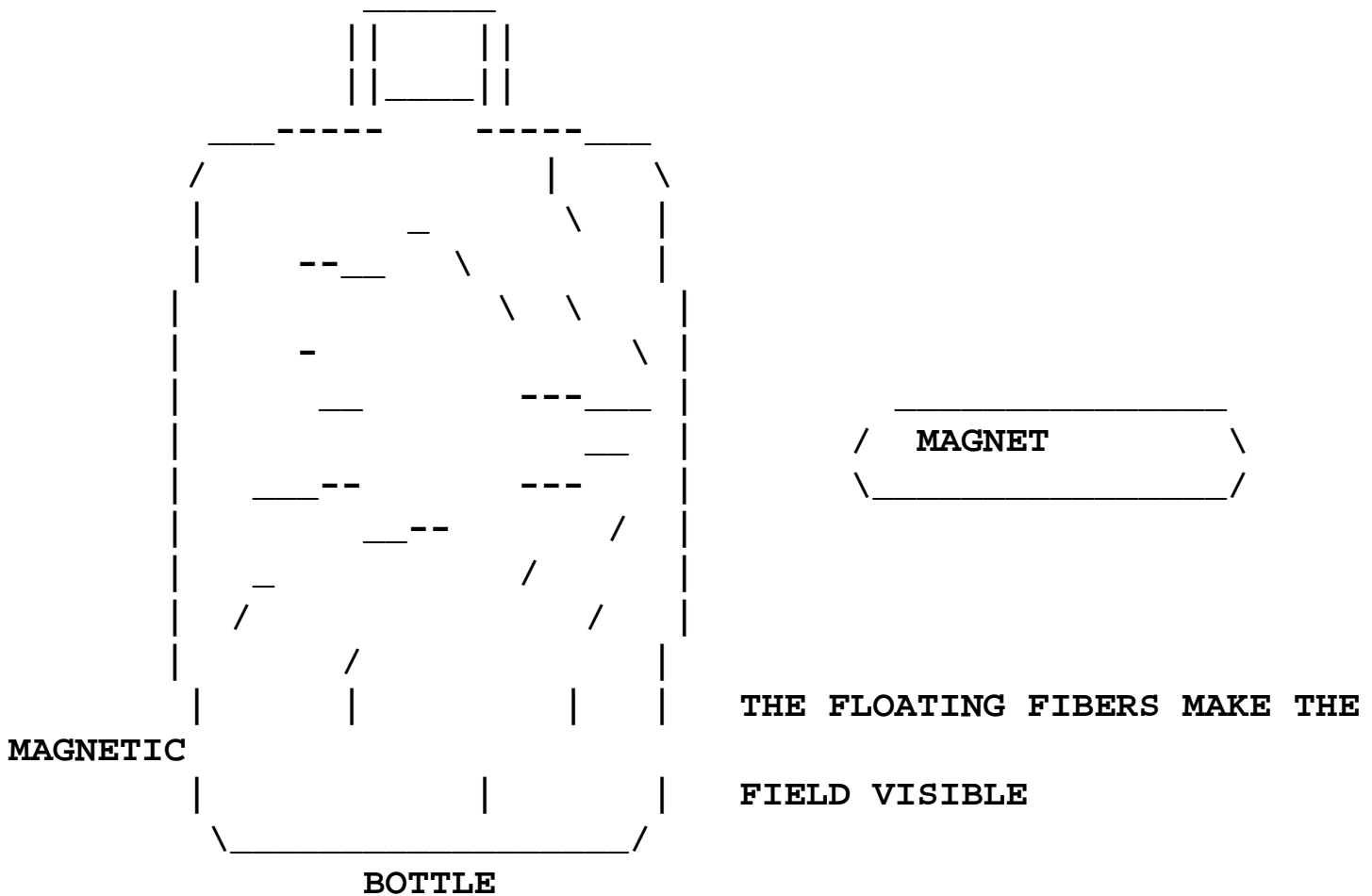
Google:

# SEEING MAGNETIC FIELD PATTERNS IN 3D

## A simple science project

1988 [William Beaty](#), Museum of Science, Boston

Iron filings align themselves in strong magnetic fields. This reveals the shape of the field patterns. A similar thing happens with the electric fields created by high voltage and by "static electricity." If small fibers are exposed to a very strong electric or magnetic field, they will align with the field and make it visible.



### 3D MAGNETIC AND ELECTRIC FIELD VIEWING BOTTLE

MATERIALS:

- Magnet
- Extra-fine steel wool (type 000 or 0000, hardware store)
- Plastic bottle full of baby oil with paper label
- Scissors
- OPTIONAL:
  - rubbing alcohol to remove label
  - pan or shallow dish for the alcohol
  - White spray-paint, if desired

[Links to magnetism sites](#)

[Other build-it projects](#)

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## **REMOVE THE LABEL**

Make sure to buy baby oil with a removable paper label, NOT the kind with a permanent, painted-on label. Even better, try to find a bottle that has a label only on one side.

If your bottle has labels on both sides, peel the label from one side of the oil bottle. You can do this by picking at the paper label with fingernails while running warm water on it. An easier way is to soak one side of the bottle in a shallow dish of rubbing alcohol for about 10 or 15 minutes. Peel off the gooey label. Use a bit of alcohol and a paper towel to clean off the remaining glue. (It really is easier to find a bottle at the store that only has a label on one side!)

## **MAKE THE STEEL FIBERS**

Obtain extra fine steel wool. This is the kind that looks like a rolled-up wad of grey hair, NOT the kind that looks like a coppery coarse net used for scrubbing dishes. Any grade of wool will work, but extra-fine wool will settle more slowly, so you don't have to shake the bottle so often.

Find the end of the roll, and unroll the steel wool part way. We will use the scissors to make cuts ACROSS the wool. First trim the wool straight across to remove the frayed fibers, then repeatedly cut across the wool to make many very narrow strips, narrower than 1/8 inch. Try to cut them 1/16 inch if you can. This will give you thousands of short steel fibers. Cut up about a heaping teaspoon of fibers, or about one square inch of unrolled steel wool. Don't pack them down too much if you can help it. If you use a really tiny bottle of baby oil, use less than a teaspoon of fibers. If you use too large an amount of fibers, the fibers will clump and settle to the bottom of the bottle too fast. If you use too small an amount, the fibers will be hard to see.

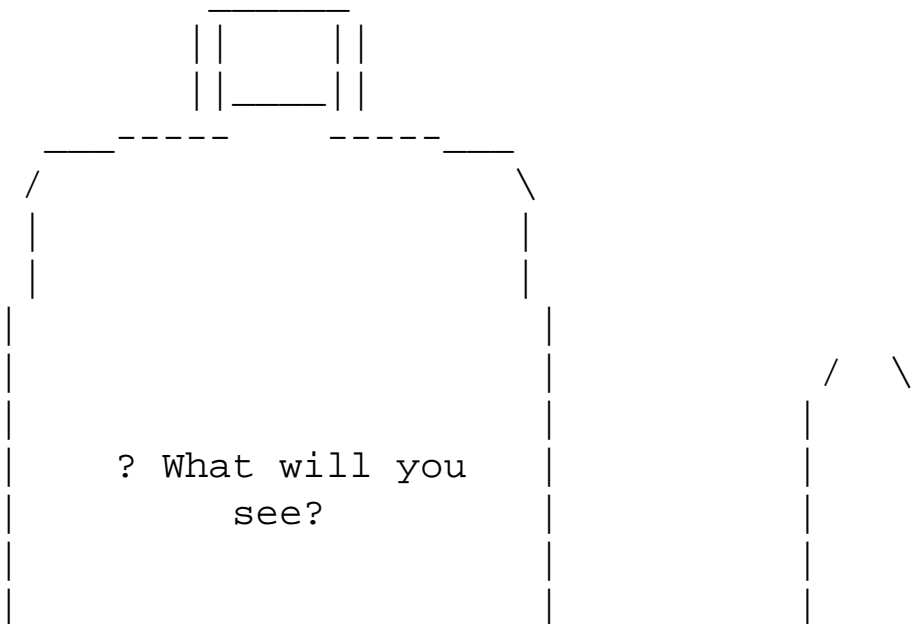
## **MIX THE FIBERS INTO THE OIL**

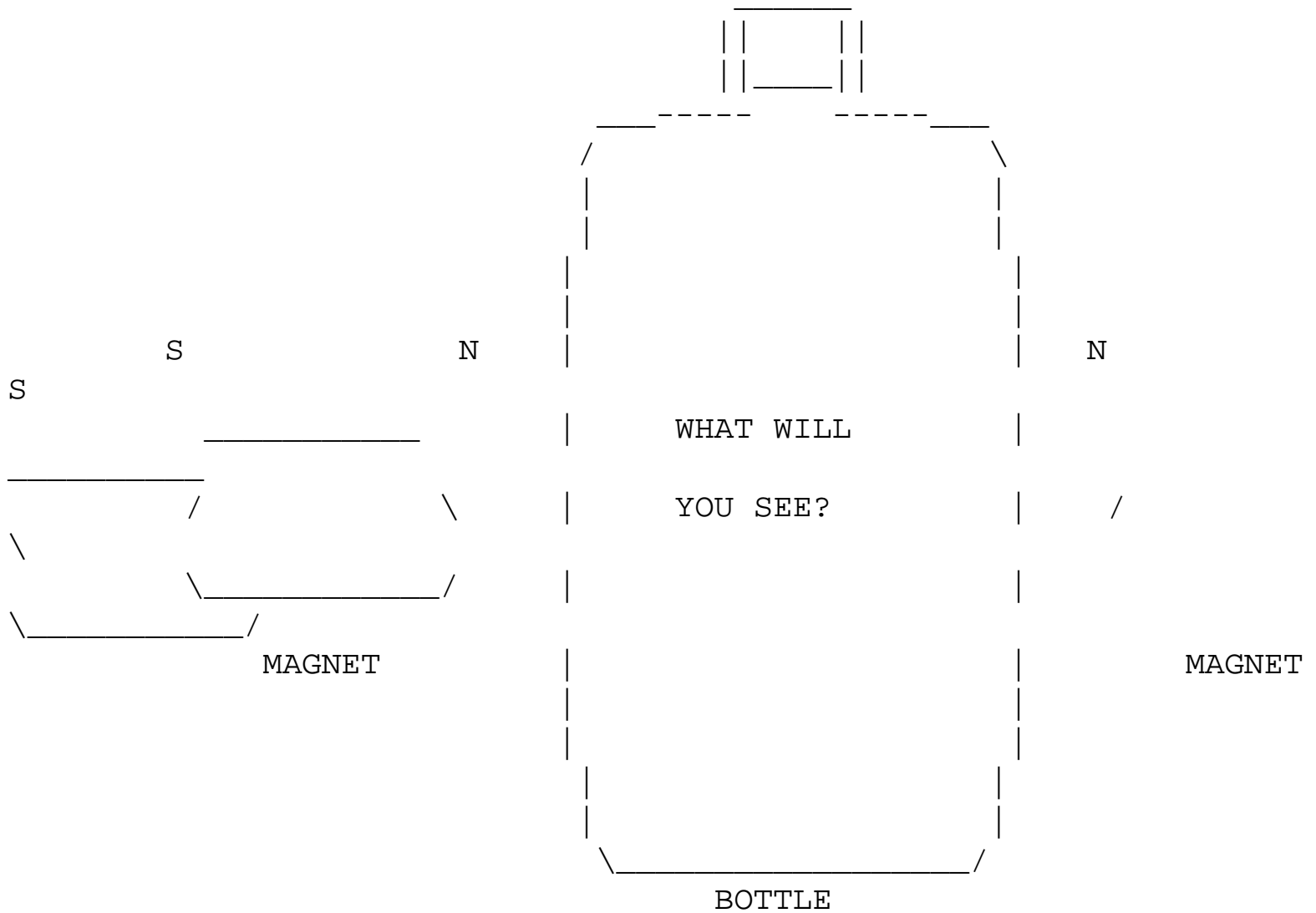
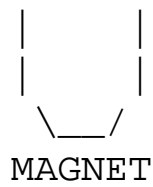
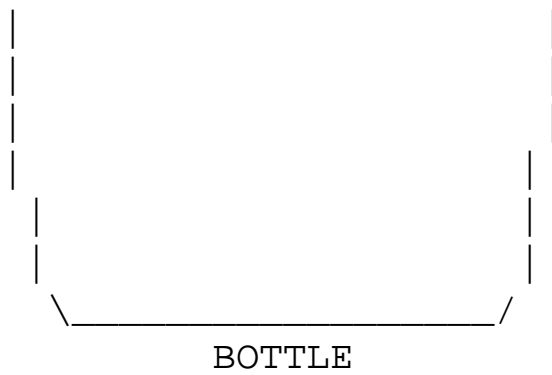
Gently wad up the fibers, drop the wad into the bottle of baby oil, cap it securely and shake the bottle. Shake until the wad of fibers is spread evenly throughout the oil. It helps to shake the bottle with a violent rotating wrist motion rather than just shaking straight up and down. Up-and-down shaking only works if there is a large bubble, rotation- shaking works good even with no bubble at all

If you have difficulty finding a magnet, try Radio Shack stores. They sell small disk magnets which can be stacked up to form bar magnets. A few dollars worth of their 1-inch "donut" disk magnets will be enough to make several big stacks. These can be used in other future science projects. You'll also wind up with a lifetime supply of refrigerator magnets! Don't forget to keep magnets away from credit cards, computer disks and video tapes, magnets can erase these. Keep them away from color TV and computer screens, since they can create permanent color blotches which can only be removed with a TV repair "degausser" coil or a cassette tape bulk eraser. (Hint: wave your magnets around an old Black&White TV screen, see what happens to the picture!)

While the fibers are still mixed into the oil, hold a magnet near one side of the bottle and watch the tiny fibers. They will all align themselves and reveal the three-dimensional magnetic field pattern. It helps to have the bottle in bright light so you can see the tiny fibers against the white label on the back of the clear bottle. The fibers start to settle to the bottom in 10 or 15 seconds, so you'll have to shake the bottle every so often if you want to keep experimenting.

When the fibers settle out, shake them up again. If the fibers clump against the magnet, then you are holding the magnet too close to the bottle. Hold it about 1/2 inch or 1 inch away. Try holding the magnet sideways as shown above. Also try it up and down. Also try holding one magnet pole near each side of the bottle. Try an "N" pole with an "N" pole (the poles which repel each other.) Also try an "N" pole facing an "S" pole (the poles which attract.)





You can improve your bottle by removing all labels and painting one side of the bottle with white spray paint. This gives you a smooth white background against which to view the floating dark fibers.

Want books? Try searching [amazon.com](http://amazon.com):

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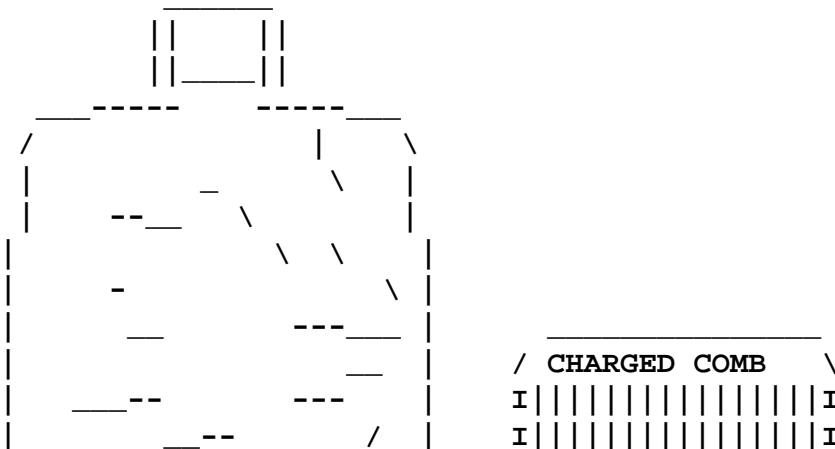
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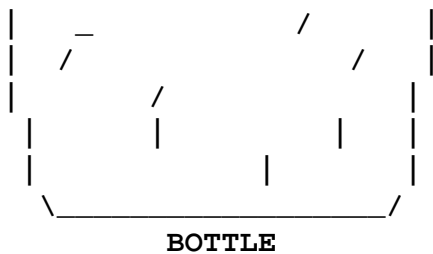
## LINKS ABOUT MAGNETISM

- [Beakman](#)
  - [Levitating Frog](#) (ultra-strong magnets repel water)
  - [Experimenting with supermagnets](#)
  - [Magnetic Levitation](#)
  - From [MadSci](#):
    - [What is a magnetic field?](#)
    - [What is a magnet made of?](#)
    - [Collecting meteorite dust?](#)
  - From [Textbook Errors](#):
    - [It's not just Iron and Steel.](#)
    - [The 'south' is in the North!](#)
    - [Earth's poles are \*deep\*.](#)
- 

## ELECTRIC FIELD VIEWING BOTTLE

Magnetic fields can be seen by using steel or iron fibers. Did you know that there is another kind of field besides the magnetic kind? These are called Electric Fields, or e-fields, or electrostatic fields, or voltage-fields. Electric fields exist around any object having an imbalance of electric charge. Rub a balloon on your arm and then use the balloon to make your arm hair stand on end. When you do this, the imbalanced charge remains on your hairs and on the balloon surface. What reaches out from the surfaces and makes the hairs stand up? Electric fields! And while iron and steel can be used to make a Magnetic Field Viewing Bottle, you can use hair to make an Electric Field Viewing Bottle.





**THE FLOATING FIBERS MAKE THE  
ELECTRIC FIELD VISIBLE**

Follow the instructions above for making a magnetic field viewing bottle, but instead of using steel wool, use hair! Straight black hair works best. If you don't want to cut chunks out of your hairdo, you can also use the artificial hair from a halloween mask, from an old doll, etc. Use black hair so the fibers are easily seen. Gather a hank of hair, trim the end straight across with scissors, then cut across the hair repeatedly to create thousands of short fibers. Try to make them shorter than 1/8 inch. 1/16 inch fibers are best. Make about one teaspoon of hair fibers, then dump them into a new bottle of baby oil and shake them up.

The E-Field viewing bottle works best with small charged objects like balloons, combs, pieces of cloth attached to plastic rulers, etc. Try combing your hair with a black plastic comb, then hold the comb near the bottle and watch the fibers slowly line up with the spreading field created by the comb. As usual, charging by contact (friction) only works when the humidity in the room is low.

I've tried the bottle on VandeGraaff machines, but the field from these generators is so powerful that the fibers can become charged if the bottle is held too close. This causes the fibers to stick to the inside of the bottle. There's no way to get the fibers loose again, but if you wait several days they will become discharged and float free.

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<http://amasci.com/electrom/statbotl.html>

Created and maintained by [Bill Beaty](#).

Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

## **BALLOON DEMONSTRATIONS, science classroom Physics Instructional Research Association, PIRA**

From the PIRA FTP site at  
<ftp://ftp.phys.ksu.edu/pub/pira/news+info/balloon.txt>

Collected from the TAP-L discussion group (Teaching Apparatus in Physics) [tap-l@listserv.appstate.edu](mailto:tap-l@listserv.appstate.edu)

Info:

<http://www.wfu.edu/physics/pira/tapl/PIRATapL.html> about TAP-L forum

<http://listproc.appstate.edu:8000/guest/listutil/TAP-L> Archive

Date: Wed, 15 Feb 1995 13:04:37 -0500

From: MAIULLO@ruthep.rutgers.edu

Subject: Balloon Demonstrations

Hello fellow Tap-ler's:

I'm doing a demonstration show on friday night, and I wanted to do a series of demonstrations using balloons as the basis for each one. Example: Balloon in bell jar, pull vaccuum, watch expand. or, balloon in liquid Nitrogen, etc.....

Does anyone out there have a demo that they think is really neat using a balloon? Either post it here, or, send it to me direct at [maiullo@rutphy.rutgers.edu](mailto:maiullo@rutphy.rutgers.edu), or fax it to me :908-445-2009. I have about 10 or so already in mind, and would love to see some novel ideas come through the network. Wouldn't make a bad article, once I got them all collected, would it Roger?

Thanx again,

Thanx in advance,

David Maiullo

Date: Wed, 15 Feb 1995 13:27:08 -0500

From: Lecture Demo

Subject: Re: Balloon Demonstrations

Dave -

How about the water balloon heat capacity demo? Fill a balloon with water and hold a lit match or candle up to the surface of the balloon. It will easily withstand the flame because of the high heat capacity of the water. You can even hold it over your head while you torch it if you want some drama. A candle or match works best since it burns cooler than a butane lighter; you can use a lighter but it will sometimes burn through after prolonged heating. Use a good balloon and fill it pretty full so that the skin is stretched thin, but if you get soaked I don't want to hear about it. Wouldn't mind seeing it, though.

Brett

Date: Wed, 15 Feb 1995 13:49:23 -0500  
From: FNILON@POMONA.EDU  
Subject: Re: Balloon Demonstrations

Dear Dave:

Balloon electroscope: charge 2 balloons on opposite ends of a string and hold the string in the middle. Charge a balloon and put on the wall, podium, or whatever. You can also raise a little hair holding a charged balloon over someones head.

Change of phase in CO<sub>2</sub>: Place a small pellet of dry ice in a small



test tube and cover the top with a balloon (deflated). Inflate the balloon by warming it in your hands until the dry ice has sublimated. Immerse the test tube in liquid nitrogen and dry ice will form on the sides of the test tube and the balloon will deflate (and sometimes get sucked into the small test tube).

Best wishes on your lecture  
Frank Nilon  
Pomona College

Date: Wed, 15 Feb 1995 14:38:07 -0500  
From: William Beaty  
Subject: Re: Balloon Demonstrations

BALLOON-COATED BOTTLE INTERIOR: I recall a demo in T.P.T. where a balloon is quickly stretched across the mouth of a flask containing a small amount of rapidly boiling water. The flame is then removed, and as the flask cools, the balloon is sucked entirely inside until it "coats" the inside of the flask. When offered as a pre-made item, the balloon-coated flask is immensely befuddling. How the heck did that balloon get in there?!!!

William Beaty voice:206-789-0775  
EE/Programmer/Science exhibit designer  
Seattle, WA 98117  
page

<http://amasci.com/>  
SCIENCE HOBBYIST web

From: Steve Luzader

Subject: Re: balloons tricky problem

If we assume that the balloon is moving slowly near the surface of the planet, where the gravitational field (measured by  $g$ ) is uniform, the density of the atmosphere is constant, and the effects of air resistance are smaller than the buoyant force, then the upward acceleration of the balloon is proportional to  $g$ .

Let  $m$  = mass of the rubber balloon itself,  $V$  = the volume of the balloon (assumed constant),  $d(\text{air})$  = density of the atmosphere, and  $d(\text{gas})$  = density of gas inside the balloon. Then the downward force on the balloon is  $mg + d(\text{gas})Vg$ , and the upward buoyant force is  $d(\text{air})Vg$ . The upward acceleration then turns out to be

$$a = ((d(\text{air}) - d(\text{gas}))V - m)g / (m + d(\text{gas})V)$$

(Too bad we can't write proper equations on the net...) Anyway, if air resistance is neglected, the upward acceleration is proportional to  $g$ , and a balloon will rise more slowly if  $g$  is the only thing that changes. Even allowing for a lower atmospheric density as a result of a smaller  $g$ , the upward acceleration decreases with decreasing  $g$ . I haven't worked out the case with air resistance yet.

Date: Wed, 15 Feb 1995 14:38:36 -0500

From: William Beaty

Subject: Re: Balloon Demonstrations

Here's one from Daedalus in Britain: a cardboard box which is not stable, and falls over, even though it is a perfect cube. In reality, the box is brown paper stretched on a frame, and has a large helium balloon in one side, so that it's center of gravity is shifted to OUTSIDE the base of the box.

Another: creating neutral density with carrots and duct tape. Tie a stick of carrot (etc.) to a helium balloon, and eat it shorter until the balloon just hangs in the air without rising or falling. If you bite too much, add weight by sticking patches of duct tape to the balloon. A roomful of these is great fun. If you make a custom mylar-bag balloon, fill it with helium, then cover it with duct tape until it's buoyancy is neutralized, you can play catch with it and show that air has considerable mass even when weightless.

Here's one that a friend found: SOUND LENS. A balloon acoustic lens. Normally a balloon is under pressure and has a higher index of acoustic refraction than the surrounding air, so it bends sound waves and behaves as a lens. Sound from distant sources will be focused behind the balloon. Practice with a balloon and a microphone, and you'll soon be able to listen in on distant conversations. Use a balloon and a tiny loudspeaker, and you'll be able to project a sound beam to an individual

listener. Blow

up your balloon so the rubber is really tight, this compresses the air more.

William Beaty voice:206-789-0775

EE/Programmer/Science exhibit designer

Seattle, WA 98117

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Date: Wed, 15 Feb 1995 14:46:21 -0500

From: EBERT@UCRPH0.UCR.EDU (Ron Ebert - UC Riverside Physics

Department - 909 7

87 5730)

Subject: RE: Balloon Demonstrations

David, how about sticking a long darning needle through a balloon without

busting it? [go through the soft areas: through the fill-spout and the

"nipple" -bill b.]

Or a 2 to 1 mixture of hydrogen and oxygen in the balloon, which has a tube in the stem that has a wire connected to a small Tesla coil. The Tesla coil is turned on by a remote foot switch (loadest bang you ever heard.)

Or tie a small weight to the end of the balloon and suspend the balloon in

an air jet, tilting the jet away from a vertical angle.

Ron Ebert

UCR Physics Department

ron.ebert@ucr.edu

Date: Wed, 15 Feb 1995 14:46:45 -0500  
From: cbettis@unlinfo.unl.edu (clifford bettis)  
Subject: Re: Balloon Demonstrations

>  
While you have the dry ice and the balloon:

Put some in a balloon, tie off the ballon and weigh it on a balance,  
watch the "weight" change as the dry ice sublimes. When the balloon is fully inflated it can be used as a sound lens (I usually use a weather balloon for this). The effect is most striking if you use a fairly incoherent source of sound (e.g. running water).

Cliff

Date: Wed, 15 Feb 1995 14:47:31 -0500  
From: EBERT@UCRPH0.UCR.EDU (Ron Ebert - UC Riverside Physics Department - 909 787 5730)  
Subject: RE: Balloon Demonstrations

Fill a balloon with helium and tie it to a weight. Put the balloon on a cart and then place a large bell jar around the balloon. When you shove the cart forward, the balloon moves forward, contrary to what you would expect.

Ron Ebert  
UCR Physics Department  
ron.ebert@ucr.edu

Date: Wed, 15 Feb 1995 14:55:06 -0500  
From: Lecture Demo  
Subject: Re: Balloon Demonstrations

Dave -

Another balloon demo is the helium balloon in helium. I do it with a large glass battery jar. Blow up a helium balloon so that it's buoyant in air, then put it inside the upside-down glass jar and let it float to the top. Then squirt some helium into the jar until it displaces the air.

The helium balloon then sinks to the bottom as it's no longer lighter than the "air" in the jar. If you pick the jar up, the balloon will float at the bottom of the jar on the air/helium interface. Tip the jar to let the helium escape and the balloon rises back to the top of the jar.

If you don't have a large-enough glass jar, you can remove one side of a cardboard box and replace it with a piece of acrylic or other plastic sheet. Just make sure to seal all the edges with some duct tape etc. so the helium won't leak too fast.

Brett

Date: Wed, 15 Feb 1995 14:55:31 -0500  
From: cbettis@unlinfo.unl.edu (clifford bettis)  
Subject: Re: Balloon Demonstrations

One more thing I do to explain the sound lens is use an oscilloscope

and microphone to measure the speed of sound through the CO2 filled balloon. I then calculate the index of refraction and focal length (at least for the higher frequencies).

Cliff

Date: Wed, 15 Feb 1995 15:03:10 -0500  
From: EBERT@UCRPH0.UCR.EDU (Ron Ebert - UC Riverside Physics Department - 909 787 5730)  
Subject: RE: Balloon Demonstrations

Expanding universe demo - connect a balloon to an air supply. As you slowly inflate it, paint dots on it in different colors. Every dot moves away from every other dot, emulating the behavior of galaxies in our universe.

Ron Ebert  
UCR Physics Department  
ron.ebert@ucr.edu

Date: Wed, 15 Feb 1995 15:54:13 -0500  
From: Richard\_E\_BERG@umail.umd.edu (rb22)  
Subject: Re: Balloon Demonstrations

Dave, et. al.:

For this demonstration you need two identical balloons (about 12 inch maximum diameter models), a plastic tube a few inches long of diameter such that the

balloons can be blown up and connected over the end of the tube, and a wire hose clamp.

Connect one balloon to one end of the tube, blow it up to about three inches in diameter and clamp it so no air can flow out of the balloon. Blow up the second balloon to about six inches in diameter and slip it onto the other end of the tube. No air can flow between the balloons because of the hose clamp.

What will happen when the clamp is removed:

- (a) Will the smaller balloon become smaller and the larger balloon larger?
- (b) Will they become equal in size?
- (c) Will they stay the way they are?

Let the group vote, then perform the experiment with the smaller balloon on top. Suggest that the reason for the resulting effect is that when the clamp is removed gravity pulls the air downward. After the boos and hisses subside, tell them the real reason, if you can think of one.

Dick Berg

Date: Wed, 15 Feb 1995 16:01:46 -0500  
From: chuckr@u.washington.edu (Chuck Robertson)  
Subject: RE: Balloon Demonstrations

Fill a balloon with a gas that has a molecular weight greater than air. Don't blow it up all the way. If you leave it set, air molecules



will  
diffuse into the balloon and it will get bigger.

```
=====
Charles E. Robertson           Phone: (206) 685-1745
Department of Physics FM-15    FAX:    (206) 685-0635
University of Washington
Seattle, WA 98195
=====
```

Date: Wed, 15 Feb 1995 16:02:08 -0500  
From: William Beaty  
Subject: RE: Balloon Demonstrations

On Wed, 15 Feb 1995, Ron Ebert - UC Riverside Physics Department -  
909 787 5730  
wrote:

> Expanding universe demo - connect a balloon to an air supply. As  
> you slowly inflate it, paint dots on it in different colors.  
Every dot  
> moves away from every other dot, emulating the behavior of  
galaxies  
> in our universe.

And the opposite, while not exactly a physics demo, is also fun:  
Totally  
inflate a small balloon, then write on it in ink, in the smallest  
writing  
you can manage. When deflated, the writing becomes unreadably  
small.  
Kids can then use a 50x microscope to decode it. Make your own  
microscope  
slides? Send secret messages and drawings?

William Beaty voice:206-789-0775  
EE/Programmer/Science exhibit designer  
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SCIENCE HOBBYIST web  
page

Date: Wed, 15 Feb 1995 16:18:02 -0500  
From: MAIULLO@ruthep.rutgers.edu  
Subject: Re: Balloon Demonstrations

Everyone: Thanx for the tremendous response to my request for "balloon" demonstrations. Some of them I had already thought of, but there's always lot's of great variations in everybody's descriptions of what they do, and some I can't wait to try. Keep them coming!!

Dave

Date: Wed, 15 Feb 1995 16:35:11 -0500  
From: William Beaty  
Subject: Re: Balloon Demonstrations

Variation on the balloon electroscope:

Add weights (carrot?) to a helium balloon to make it neutrally-buoyant (or slightly heavy) (in a low humidity environment) rub the balloon with fur, wool, etc. to electrically charge its entire surface. Now each of two "players" also uses fur to charge a spot on one or two balloons held in the hands. Then play slow-motion pingpong, using the neutralized balloon as the ball.

Something similar can be done with a single air-filled balloon and

two hand-held balloons, all which were given extreme surface charge. Use the two hand held balloons to levitate, or even "juggle" the single balloon. This can be quite hilarious, as the demonstrator gains and loses control over the balloon, while running all over the stage and crashing into things.

Another one pops into mind which I have not tried. Charge the surface of a dark colored balloon, write a large character upon it with a dry finger, then clap some chalkboard erasers near the balloon. Xerography effects will create a dark character upon a light background.

Adhere a small mirror chip to a balloon, use the mirror chip to bounce a laser beam to a distant screen, then hum, yell, sing, etc. at the balloon. You should get spirograph patterns as multiple resonances create Bessel-function-type patterns all over its surface.

Hold an electrically charged balloon near your mouth as you blow bubbles with a bubble ring, and the bubbles will end up with an opposite charge from the balloon. They will be strongly attracted to the balloon, and can be held suspended by keeping the balloon overhead (at least as long as there is no motion of the air)

Build a transparent enclosure with an open top, place a cake of dry ice within, allow it to fill with CO<sub>2</sub>, then drop fully-inflated balloons in. They should sit on the transparent gas. I haven't tried this one,

but it  
DOES work with soap bubbles. If balloons end up being too heavy,  
this  
can be cured by inflating them with a helium/air mixture to lower  
their  
densities.

Fill one balloon with helium, another with sulphur hexaflouride.  
Breathe  
from one to talk higher, from the other to talk lower. If you  
cannot get  
these gases in safe, high-purity form, then don't take any chances  
in  
breathing them!

Draw a face upon a helium balloon, then use fur to charge only the  
area  
of the face. Suspend it from a string. Do the same with a second  
balloon, but hold it by hand. The balloons refuse to speak with  
each  
other, since the suspended balloon will rotate its face away from  
the  
approaching charged balloon. A "Friendly" version of this can be  
had by  
charging the surface of the suspended balloon OPPOSITE the face,  
so the  
face will rotate to face the oncoming hand held balloon.

William Beaty voice:206-789-0775

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Date: Wed, 15 Feb 1995 16:35:39 -0500  
From: William Beaty  
Subject: Re: Balloon Demonstrations

On Wed, 15 Feb 1995 MAIULLO@ruthep.rutgers.edu wrote:

> Everyone: Thanx for the tremendous response to my request for  
"balloon"  
> demonstrations. Some of them I had already thought of, but  
there's always  
> lot's of great variations in everybody's descriptions of what  
they do, and  
> some I can't wait to try. Keep them coming!!  
>  
> Dave  
>

Make sure to try all these in advance, since I'm just pulling some  
ideas  
out of the air as I go along, and have no idea whether you might  
encounter  
difficulties when you actually try to perform them!

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Date: Wed, 15 Feb 1995 16:36:29 -0500  
From: John Mocko  
Subject: RE: Balloon Demonstrations

Hello out there! I just joined the list-server today so I don't  
know if  
anyone recently suggested this experiment. Mix a small amount of  
cupric  
chloride ( or Lithium chloride, Barium Bromide, something colorful  
when  
it burns) with a little methanol and put it inside a large  
balloon. Fill the  
balloon with Hydrogen and attach it to a heavy weight using along  
string.  
Attach a candle to a long pole and ignite the balloon. It explodes  
and

shows the color of the chemical inside.

John Mocko

Univ. of Fl, Dept. of Physics

Date: Wed, 15 Feb 1995 16:36:54 -0500

From: William Beaty

Subject: Re: Balloon Demonstrations

Take two circular sheets of mylar, one transparent and one aluminized, seal them edge to edge, then inflate. When under solar illumination, I wonder if the inside mirror curve is uniform enough to light fires at its focus. If 100-meter mylar sheets were employed, you could go into competition with that French research station with the giant mirror. Or roast REALLY BIG hotdogs on a sunny day...

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Date: Wed, 15 Feb 1995 16:44:51 -0500

From: Richard\_E\_BERG@umail.umd.edu (rb22)

Subject: Re: RE: Balloon Demonstrations

There is a great little paperback book which is probably exactly what Dave is looking for, if one can get it quickly.

Glenn McGlathery and Larry Malone: Tons of Scientifically Provocative and Socially Acceptable Things to Do with Balloons under the Guise of

Teaching

Science. Copyright 1991 Libraries Unlimited, Inc. Available from  
TEACHER

IDEA PRESS, A Division of Libraries Unlimited, Inc., P. O. Box  
6633,  
Englewood, CO 80155-6633.

Contains 83 experiments covering nine broad areas of science.

Written for

elementary and middle school students, but many of us never got  
beyond that  
point.

Dick Berg

Date: Wed, 15 Feb 1995 16:45:19 -0500

From: William Beaty

Subject: Re: Balloon Demonstrations

A friend, Jim Burrows of THE SCIENCE CLUB outreach company, uses a  
balloon

demo as one of the few safe explosions that kids can do. Inflate  
a

balloon, tape a short length of fine steel wire to its surface,  
connect

this wire to the bare ends of some heavy "zip cord," speaker wire  
then

connect the other end of the cord to a 6V lantern battery. The  
thin wire

gets red hot and bursts the balloon. The best source of thin  
steel wire

is steel wool (use the grey kind, and the ultra-fine XXXX type  
works

well.) To assure a good contact between the steel and the copper,  
wrap

the steel fiber around the copper wire then clamp it with an  
"alligator

clip." I've always wanted to rig up a bunch of these with various  
balloon

sizes and have a computer and an interface card do the popping automatically. Then I can write a program to play the balloon-popping version of THE WILLIAM TELL OVERTURE ! I'd need a couple of hundred balloon-circuits though...

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Date: Wed, 15 Feb 1995 19:26:47 -0500  
From: wayne@pen.k12.va.us (Tony Wayne)  
Subject: Re: Balloon Demonstrations

Blow up 4 balloons to the same size. Rub them with a rabbit fur. They hover away from each other.

Take a lit match and hold it in the center of the group after they have been charged. The balloons will come together again. The fire is a source of free ions that will neutralize the charges on the balloons.

After the balloons have been charged, spray a mist of water on the balloons. The water vapors allow for conduction of charge to neutralize the balloons.

Take a flip flash apart. Cut out each flash bulb. Hold a balloon 10 feet away and rub it with a fur. Hold one lead from the flash bulb with a pair of pliers. Bring the other lead close to the balloon. Charge will jump from the balloon to the bulb and light it. If the bulb doesn't light, then the bulb charged too slowly (not enough current through it). Just touch the bulb to something grounded -like a sink faucet. this discharge will light it.

Take a 2 liter bottle, put a straw in it -a bendy straw. Put a



balloon in it. Keep the mouth of the balloon exposed so you can blow it up. Inflate the balloon. While it is inflated, remove the straw quickly and keep the balloon over the mouth of the bottle. The balloon will stay inflated. (You can do similar things with one of those (sun tea bottles. Use the built in valve instead of a straw.)

rest an 8 ft 2x4 on an old double convex lens. Bring a charged balloon close to the board and it will rotate.

Bring a charged balloon close to an empty drink can. The can will race to the balloon.

-tony

--

Tony Wayne  
wayne@pen.k12.va.us  
understand, teach.

Those that can, do,  
-those that

Date: Thu, 16 Feb 1995 10:02:25 -0500

From: Paul Nord

Subject: RE: Balloon Demonstrations

>Fill a balloon with helium and tie it to a weight. Put the  
balloon on  
>a cart and then place a large bell jar around the balloon. When  
you  
>shove the cart forward, the balloon moves forward, contrary to  
>what you would expect.  
>  
>Ron Ebert

Don't forget the balloon in the car trick!

It might work with your demo bell jar if you can get enough  
acceleration.

Works like this: Helium filled balloon tied to a string so that  
it is free to

roam around the car. When you hit the breaks, you get pushed toward the front of the car - the balloon gets pushed toward the rear. Have fun watching them explain that one.

Paul Nord  
Valparaiso University

Date: Thu, 16 Feb 1995 10:10:21 -0500  
From: lauterburg@phim.unibe.ch (Urs Lauterburg)  
Subject: Re: Balloon Demonstrations

Hello David,

As already mentioned by others I find one nice experiment making use of a balloon to show how balloons filled with different gases either focus or defocus sound waves. Fill the ballon with Helium, CO2 or air. Place the balloon between a small speaker and a microphone and measure the microphones output. I get best results with a sine frequency of about 2.5 kHz. CO2 focuses the sound and Helium defocuses, with air of course there is no difference.

And when you have a balloon filled with Helium, you can inhale some of it and explain the experiment sounding like a little baby. Students like it a lot. But probably this is an old one and therefore well known.

greetings from Switzerland      Urs

Date: Thu, 16 Feb 1995 10:58:51 -0500

From: FNILON@POMONA.EDU

Subject: Re: Balloon Demonstrations

Dear fellow balloonner:

Our astro professor likes to fill a luminous painted (spots) punch ball with hydrogen and illuminate it with a black light: the expanding universe. Then we do the big bang by igniting the balloon with a propane torch (at arms length of course).

You can also fill the punch ball with compressed air and do the Newton's third law action-reaction.

Put an tied and uninflated balloon in a vacuum chamber and pump out the air. Put a balloon on the end of a tube in a one hole bell jar and pump out the air; or, stretch a rubber membrane across the bottom on the bell jar and show how our diaphragm works.

2 more cents  
Frank Nilon  
Pomona College

Date: Thu, 14 Mar 1996 05:19:44 -0800 (PST)

From: William Beaty

To: tap-1@listserv.appstate.edu

Subject: balloon 0-G boulder

On Fri, 8 Mar 1996 gaulf@anubis.westmoreland.cc.pa.us wrote:

> Hello, I am a Lab.Tech. at Westmoreland County Community College.

> I set up the Chemistry and Physics Labs and also work with the Horticulture

> Lab.

> This is my first message on Tap-1.

&gt;

> Has anyone ever tried to make a balloon from mylar ? I often see mylar balloons being sold and wonder about what kind of mylar I would need and where to find it.

Try a "space blanket." This is an aluminized mylar sheet sold as an emergency heat-reflective blanket and usually found in camping stores and auto parts stores. ("Heat" reflective???)

One thing I did: make a 3ft. tetrahedron balloon, inflate with helium and seal it, then apply enough duct tape to the surface to produce neutral buoyancy. I took some time with the duct tape and distributed it uniformly over the surface in small strips so that no face of the balloon was heavier than others, and the balloon would only barely rotate to a particular orientation.

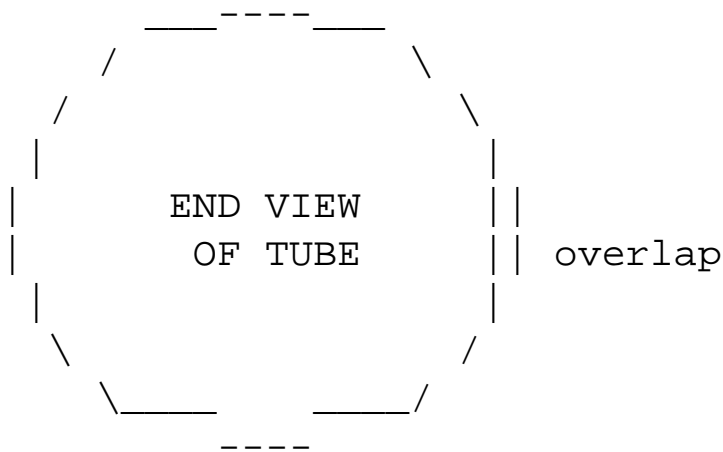
The end result was a strange lumpy boulder with considerable mass but zero weight: a zero-gee object! The mass could be felt by shaking it, or by playing a violent game of catch. But when released, it would just hang in the air. The helium only escaped slowly, and I compensated by removing duct tape. The large diameter of the balloon made for considerable buoyant force, with corresponding considerable duct tape mass. It lasted for several days before needing more helium.

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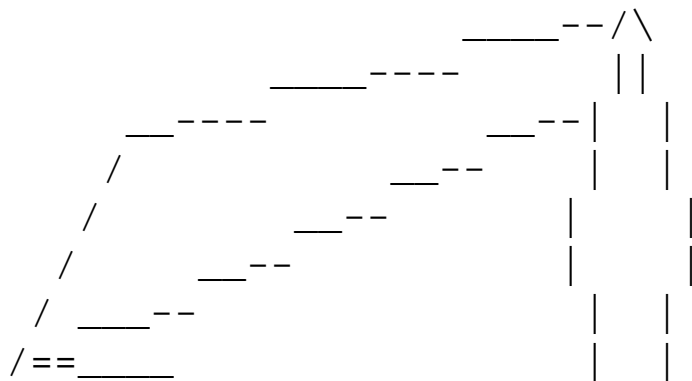
It's not too hard to make a tetrahedron balloon using mylar and

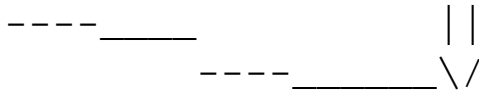
rubber

cement. Overlap and glue opposite edges of the sheet together to form a tube, with about 1.5" overlap for strength, and minimal rubber cement for low weight. Strong bonds are made by lightly coating opposite faces with rubber cement, waiting a couple minutes for partial drying, then laying the glued sheets together.



You then flatten and glue one open end together to form a long "pillowcase" shape, sweep the bag through the air to inflate it, then flatten the other end closed, but on a line perpendicular to the first sealed end. Flatten enough of this end so that the inflated part is tetrahedral, trim the extra back to 1.5", and overlap/glue this joint together.





Yes, the points of the tetrahedron are a problem. You can fold them over and glue the fold to the rest of the balloon, which makes the finished shape closer to a lumpy sphere than to a tetrahedron. Or make 2" mylar disks, fold them into cones (filter-paper style fold) and overlap/glue them to the points of the balloon. Don't forget to leave one point open for inflation.

Challenge: determine the dimensions needed for the sheet so that a perfect tetrahedron will be formed when the edges are glued together.

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Another one: put a penny in a balloon, blow up the balloon and tie it off. Now shake the balloon to get the penny bouncing, then "swirl" the balloon in a circular motion, and the penny will begin rolling on edge.

The penny orbits in the balloon with the inner balloon surface acting like a strange "gravity well."

Once you can produce the orbiting penny effect, lay your head on a table, hold the balloon in one hand and get the penny to orbit, then

place the  
balloon on your ear. The sound from the penny is fabulous!  
Decreasing  
frequency motor noises from all directions! Sounds like UFOs  
landing.

With skill you can pull this prank: Make two penny/balloons, orbit  
the  
pennies VERTICALLY, so the pennies roll up over the top rather  
than in a  
horizontal plane. Now, approach someone from behind, get the  
pennies  
going fast, and clamp the balloons on either side of the head of  
your  
victim. They will experience the ufo-landing noise, but coming  
from all  
directions. This gets interesting reactions. And gives the  
perpetrator  
a certain reputation!

Oh, I just had a thought. It hasn't happened to me yet, but it's  
possible that the above prank could seriously backfire if the  
victim was  
wearing sharp earrings, or if the balloons were inflated to nearly  
the  
point of rupture. Maybe it would be better not to take someone by  
surprise with this, since one of the balloons might pop!

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[EXPLANATIONS/MISCONCEPTIONS](#)

# STICKY ELECTROSTATICS

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## Electrical experiments using plastic adhesive tape

There are several things which interfere with our understanding of "[Static Electricity](#)." Most demonstrations incorrectly focus on friction. Also, the nature of matter and the fundamental reasons for charge conservation are usually ignored. And the materials used in demonstrations (silk, fur) are hard to obtain and have a finicky dependence on humidity. The following demonstrations are my attempt to fix these problems.

### "STATIC CHARGING" WITHOUT FRICTION

Get a spool of plastic tape. Pull a couple of long strips from the roll, about 20cm each. Hold them up by their ends so they hang downwards, then slowly bring them side by side. Notice that they repel each other? If you try to force the dangling lengths of tape to touch together, they'll swerve and gyrate to frustrate your efforts. You can stick the strips to a door jamb and on a dry day they will keep repelling each other for several minutes. They will also "attack" anyone who passes through the door. Obviously the tape has become electrically charged. But how? After all, no friction was involved. Something odd is going on.

These demonstrations won't work when the relative humidity is high. Try the first one above. If the lengths of tape don't repel each other, then the humidity in the room is probably too high, and none

of the other demonstrations will work either. Move yourself into an air-conditioned building, then try again!

Also, 3M SCOTCH Magic(tm) brand tape doesn't work as well as similar tape from other companies. Perhaps 3M puts "anti-static" chemicals in the adhesive?

Next, pass the entire length of each of the hanging strips lightly between two fingers several times, then hold the two strips near each other again. This time they won't repel each other. You've managed to discharge them by fondling them, and the strips are now nearly neutral. (If your fingers are extremely dry, this might not work. Wet your fingers very slightly, but don't get the tape wet.)

Next, fold over a couple of cm of the top of the strips. This gives you a non-sticky tab on each strip. (It makes it easy to get the strips apart again in the next part.) Now carefully stick the two strips together so the sticky side of one strip adheres to the "dry" side of the other. To show that friction plays no part in the following, try to avoid rubbing the tape. You should end up with a double-thick layer of tape which is sticky on one side and has two tabs at one end. Grasp those tabs and rapidly pull the strips apart. Hold them distantly separated, then slowly bring them together. You'll find that this time they attract each other quite strongly. Before they repelled. Now they attract.

## **REPULSION AS WELL AS ATTRACTION**

Next, do the same thing as above, but twice: take four pieces of tape and prepare two \*pairs\* of tape, each pair having one piece stuck to the back of the other as before. Pull both pairs apart, and either ask a friend for help, or stick a couple of the tapes to the edge of a table so they hang down. As before, you'll find that the lengths of tape which were stuck together now attract each other. But try holding a strip from one pair near each strip of the other pair. You'll find that your single strip will attract one of the other strips, but repel the other. When you peeled each pair apart, one the strips took on opposite charge polarities. The "sticky" strip now repels the other "sticky" strip, but it attracts

the "dry" strip. When you have four strips, you can demonstrate that opposite charges attract, but also that alike charges repel.

## UN-CANCELLED CHARGES

What's going on here? How did the strips of tape become electrified? There is a simple answer. Contrary to popular belief, "static electricity" is not caused by friction. It's actually caused by contact between dissimilar insulating materials, and is greatly amplified when those materials are forcibly separated. When you stuck the tape strips together, you instantly caused a separation of charges. When you peeled them apart, you pulled the oppositely-charged areas away from each other, causing "un-cancelling" of charges. Another name for this phenomena is "contact electrification." A less accurate description is "generate static electricity."

In explaining everyday electrostatic phenomena, most authors wrongly emphasize the need to rub materials together to generate separations of charge. They often directly state that the friction **CREATES** the charge separation. This is misleading, since friction really only plays a secondary role in the process. The physics behind "static" electrification usually doesn't involve friction, it involves chemistry.

When the surfaces of two everyday objects are touched together, they always adhere slightly. Chemical bonds form between the atoms which make up the adjacent surfaces, and this causes the adhesion. If the surfaces are not composed of the same sorts of material, then chances are the chemical bonds will be polar, and the bonding electrons will stay with the atoms of one surface more than with the other. The surfaces become oppositely electrified when they touch, because one surface immediately steals electrons from the other as the chemical bonds form. One surface ends up with more negative electrons than positive protons, and then has an overall negative charge. The other surface has fewer electrons than protons, so it has overall positive charge.

## "CREATING" CHARGES?

I must take the opportunity here to point out something that bugs me. Books will often state that charges are "created" or "made" during static electrification. This is extremely misleading. Atoms are composed of positive and negative particles (protons and electrons.) The opposite charges are in intimate proximity so the atoms are normally electrically neutral. We cannot avoid the conclusion that **ALL MATTER IS COMPOSED OF CANCELLED ELECTRIC CHARGE**. If we define "electricity" to be that quantity carried by electrons, then we could also say that **ALL MATTER IS MADE OF NEUTRALIZED ELECTRICITY**. Strange, no? But true. Static electrification is a separating, an un-cancelling, of positive and negative particles which were already present in the materials involved. Static electrification is more properly called **CHARGE SEPARATION**. If you grab an atom by its protons and electrons and separate them far apart from each other, you create "static electricity" or charge separation.

Touch two dissimilar surfaces together and the pos/neg charges in their surfaces become separated. When you pull the surfaces apart again, the chemical bonds rupture, and one surface may end up with more electrons than it started with. The other surface has protons which now lack their nearby cancelling electrons. Oppositely charged particles which had once been adjacent to each other and "cancelled out" within the atoms have now been sorted out and separated by a great distance.

# AN ATOM THE SIZE OF YOUR HEAD!

From another viewpoint, peeling the tape causes atoms to become enormously stretched, because the outer electrons of one set of atoms has been pulled far away from their protons. Weird fields of force are still connecting the separated protons and electrons, but these fields had originally existed only down within the microscopic world of the atoms. Stretching out the atoms in this way also "stretches" the tiny atomic force fields. This adds energy to them and causes them to balloon outwards and grow so large that they start to affect us here up in our "macro" world. The invisible attracting/repelling fields which surround electrified objects are the same force-fields normally only found inside of atoms.

So everyday "static electricity" has little to do with rubbing or friction. Instead it involves contact, chemistry, and imbalances in the electrical charges of which matter is made. Electrostatic attraction and repulsion between electrified objects is a feeble residue of the same immense forces which hold solid matter together. Our bodies are held together by "static electricity!" And when a huge crane lifts a steel beam, the immense force within the steel cable is actually an electrostatic force field between the atoms of the cable.

If the surfaces involved in contact electrification are rough or fibrous, then only a tiny part of the surfaces can be touched together at a time. If a balloon is touched against hair, the hair only touches the rubber in tiny spots. The "footprint" of contact area will be a tiny percentage of the total surface. In a situation like this, friction does play a role. If the balloon is DRAGGED across the hair, then the successive areas of contact add up to a much larger percentage. Rubbing a balloon on your head increases the total area of rubber and hair that's being touched, so it also increases the total amount of separated charges. Friction aids the charging effect, but friction does not create it.

## ELECTRIFICATION BY "PEELING"

So why do strips of tape become charged? Adhesive tape is not a single material. The adhesive and the plastic backing are two different insulators. When they are touched together, one surface steals electrons from atoms of the other, and the surfaces become electrified. When they are peeled apart, atoms are torn open and opposite charges are separated. The tape can then attract and repel distant charges.

## **CONFUSE YOUR VICTIMS**

There are other things you can try. Take two lengths of tape, discharge them between fingers so they no longer repel each other, then fold little tabs and stick them *so the adhesive sides stick together*. Adhesive to adhesive. Now peel them apart, then bring them near again. They will neither repel nor attract. No separation of charge occurred because the materials on both sides were the same. **DISSIMILAR** materials are required in order to create separated charge. (This trick can be used to fool people. If you stick **YOUR** tape strips back to front, but tell someone else to stick **THEIRS** front to front, they won't notice the difference. When then peeled apart, your strips will attract, but theirs will not! You can then explain your trickery, and teach them a bit of Electrostatic trivia at the same time.)

## **CHARGED ATTRACTS UNCHARGED**

You may have noticed that your charged tape-strips don't only attract and repel other strips, they also attract everything else! Hold a charged strip near your arm, or the wall, near most any neutral object, etc., and the strip will be attracted. Regardless of whether your tape strip is positive or negative, it will attract a neutral object. A general rule: charged objects always attract uncharged objects. Why? Because the charged object causes the charges inside the uncharged object to separate a bit. If you hold a positively charged strip of tape near the wall, the charge on the tape strip will cause negative charges in the substance of the wall to move a bit toward the tape. At the same time, positive charges in the wall move away from the tape. The tape is then attracted

to the negative charges in the wall. This is called "attraction by induction," since the charged tape "induces" a separation of charge to occur in the wall. Induction works better with conductors, since the charges in a conductor are free to move. If you hold your tape strip near a metal object such as a refrigerator door, it will be pulled a bit more strongly than the wall pulls it. Hold the strip near your arm, and the pull is strong. Your body is salty water, you are a conductor.

## WHICH ONE IS WHAT?

How can you tell which tape strip is positively charged, and which is negative? Easy: by comparing them against a known polarity. An expensive and dangerous way to do this is to string 9-volt batteries together until the voltage adds up to several thousand volts. The positive end of the chain will attract negatively charged tape and repel the positive. Don't touch the battery chain, the high-current capability makes them lethal! A safer, easier way: When you rub a balloon on hair, the balloon's rubber always becomes negatively charged. To determine the polarity of a tape strip, hold it near a hair-charged balloon. If the strip is negative, the balloon will repel it. If the strip is positive, the balloon will attract it.

## CHALK DUST PHOTOCOPIES

Here's a way to demonstrate part of the "Xerographic" process used by photocopiers and laser printers. Obtain a flat piece of clear or dark plastic 1/16" thick or thicker, talcum powder, a rag, and some tape. Peel off a strip of tape, discharge it between fingers, fold a tab at one end, and stick it securely over the surface of the plastic. Put down some newspaper so you don't get talcum powder all over, then sprinkle talcum powder on the rag and rub it in. Now peel the tape off the plastic, then shake the rag to make a cloud of talcum powder dust in the air near the plastic. The charged area on the plastic surface will attract the powder, and a "charge image" will appear. If your plastic was clear, try holding it against a dark background to make the white powder more

visible. (This experiment works best when humidity is fairly low.)

If you can find a big piece of acrylic from a hardware store, try laying several pieces of tape on it to form your initials or to form a simple word. (Always fold little tabs at one end of each strip.) When you peel all the strips of tape and make a dust cloud, you should then be rewarded with a clear example of electric-charge writing.

Another demo: get some wide packaging tape, a marker, and a paperclip (as well as talcum powder, etc.) Stick the tape to the plastic, and unbend the paperclip to give you a sharp pointed tool. Use the marker to outline the tape (and where the charged area will be.) Peel the tape from the plastic, then lightly draw a large invisible "X" on the invisible charged area on the plastic. Flap the talcum-cloth, and you'll find that the dust cloud is attracted to the charged area as usual, but the "X" will be visible as a dust-free zone. The sharp point of the paperclip wire acted to discharge the plastic. Actually, a tiny corona discharge or "St. Elmo's Fire" was generated on the sharp wire point. Alike-charged air spewed out of the corona, and the opposite-charge air settled onto the plastic, cancelling out the surface charge. With skill (and a big piece of plastic,) you should be able to write several words on a long tape-charged area. Hint: paint one side of the plastic black for contrast. Another hint: try charging the plastic by rubbing it with fur or wool cloth, then write big invisible letters with the paperclip end. Clouds of talcum dust should make it visible.

In a copier, the talcum powder is replaced by black "toner" powder. The plastic plate is replaced by a light-sensitive coating on a metal drum, which discharges bits of itself wherever light lands on it. The charging device is a long thin wire with high-voltage corona on it that sweeps over the drum. The flapping cloth is replaced by a fuzzy brush made of iron filings stuck to a long magnet, and covered with black toner powder. And finally, the black powder melts when heated, so a red-hot "fuser" bar passes over the black dusty paper and makes the writing permanent.



- NOTE: for other static-electric demonstrations, don't miss PIRA BALLOON DEMOS on Science Club site, <http://scienceclub.org/kidproj1.html> , also try my page on '[Static electricity](#)'
- "In the peel zone: Tape's electric gooeyness," by I. Peterson, SCIENCE NEWS, Vol 146, p277 Oct. 29, 1994
- List of books and articles on [Electrostatics](#)
- Paul Hewitt has included an earlier version the above article in the lab manual of his excellent physics textbook [CONCEPTUAL PHYSICS](#)
- Hey, Chabay and Sherwood use tape-peeling to introduce electrical physics in their undergraduate physics textbook [ELECTRIC AND MAGNETIC INTERACTIONS](#). Alright!

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Want books? Try searching [amazon.com](#):

(try "[science experiment project](#)" too)

Help Support [AMASCI.COM / Science Club Inc.](#), use the above form to order books.

(We make a few \$\$ on any books ordered via these links.)

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**LIKE THIS ARTICLE? WHY NOT**  
**[SUPPORT AMASCI.COM](#)**

<http://amasci.com/emotor/sticky.html>

Created and maintained by [Bill Beaty](#). Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

## OTHER WEBSITES for

# KIDS' DO-IT-YOURSELF SCIENCE

(These sites are not part of The Science Club Inc.)



Skip down to [Advanced Projects](#)

### Some sources

- [Fuel cell kits](#)
- [Solar cell kit](#)
- [Internet Directory: "Science Experiments" websites](#)
- [Science Toymaker](#)
- [Make a solar cell \(cupric oxide\)](#)
- [Links: solar power projects](#)
- [Crystal Radios](#)
- [Simplest water pump](#)
- [World's simplest engine](#) (Bob Blick's projects)
- [Hunkins' Experiments](#) (in cartoon form!)
- [SCIENCECLUB: Kids Projects Here](#)
- [Yahoo Index: Science Activities](#)
- [Science Fair Idea Exchange](#)
- [Lesson-Plan Sites](#) for Science Teachers
- [Free Stuff](#) for Science Teachers

V V [MORE](#) V V

- [SCIENCE TOYS](#) you can make with your kids
  - [Heat your home with chicken poo](#)
  
  - [Bizarre Stuff You Can Make In Your Kitchen](#)
  - [Book: build a solar cell](#)
  - [Science Bob](#)
  - [Experiments List](#) at [Reeko's](#) mad sci lab
  - [View magnified sunspots](#), fast and cheap
  - [Air/Smoke experiments](#)
  - [Science Playwiths](#)
  - [The Electric Club](#) electricity & electronics projects
  - [Dobsonian Telescope Plans](#)
  - [Fun Science Gallery](#)
  
  - [Floating Magnets!](#), from [SCITOYS](#)
  - [Spark, Bang, Buzz](#)
  - [Table-top Earthquakes](#) from the USGS
  - [Energyquest Projects](#)
  - The [Thinking Fountain](#)
  - [Newton's Apple TV show](#)  
"Science Try-its"
  - [Exploratorium's](#) projects for kids
  - [Yucky](#) website!
  - [Yesmag Projects](#)
- V V [MORE](#) V V

- [Mr. Magnetix magnet experiments](#)
- [Vicki Cobb's page \(excellent sci. activity books\)](#)
- [Beakman Motor project, world's simplest motor](#)
- [Kids' Chemistry Experiments](#)
- [Chem Demos \(adult\)](#)
- [Helping Your Child Learn Science online book](#)
- [Mad Science Network edible/inedible experiments](#)
- [Sci. is Fun, chemistry experiments](#)
- [Activities from YOU CAN with Beakman & Jax"](#)
- [Physical Science Activity Manual from CESME](#)
- [Guide to doing Science Projects](#)
  
- [CURIOUS KIDS Science Newsletter](#)
- [Science Friday Kids Talk discussion area](#)
- [Balloon Demonstrations, large list from PIRA](#)
- [Bill Nye the science guy](#)
- [Optics for Kids](#)
- [NSTA Kid's Science Books 1995](#)
- [kidbuilt dot com](#)



RECOMMENDED CDROM: " [The Amateur Scientist](#)," all 810 columns from Scientific American magazine. C.L. Stong, Jearle Walker, Shawn Carlson. ~1000 amateur projects, pp2100 \$24.99

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## Advanced Activities

- [STM \(scanning tunneling microscope\) construction project and others](#)
- [Scientific American: current THE AMATEUR SCIENCE columns](#)
- [Making Superconductors in a highschool lab](#)
- [Laser Steam Patterns](#)
- [Induction motor as generator! cool!](#)
- [Phil's Magnetometer and Prospecting page](#)
- [R. Fergus, storm/tornado EM](#)
- [J. Hannon, cosmic ray detector](#)
- [Homebuilt Lasers](#)
- [Homebrew Scanning Tunneling Microscope Page, another and another](#)
- [Nitrogen Pulse Laser on the Bert Pool page](#)
- [Proton precession magnetometer](#)
- [The Belljar vacuum experimenters journal](#)
- [X-ray project](#)
- [VLF Radio Home Page and another](#)
- [Fred's World o' Sci, homebuilt linac & cyclotron](#)
- [Pulsejet aircraft engines](#)
- [Stirling Engine](#)
- [Soap-film windtunnel](#)
- [Hands-on Science from MIT](#)
- ["Scientific AmeriKen"](#)
- [Magnetic Levitation Kit](#)
- [Plans for a Hilsch Vortex Tube](#)
- [Online Experiments, from Little Shop of Physics](#)
- [Classroom Demos from Sci Teach Lounge](#)
- [Public Seismic Network, build a seismograph](#)
- [INSPIRE, the NASA VLF listening project](#)

Also try: [SCIENCECLUB: Kids Projects Here](#)

[SCIENCE CLUB](#) [GUESTBOOK](#) [SCI. HOBBYIST](#)

<http://scienceclub.org/kidlink1.html>  
Created and maintained by [Bill Beaty](#)

# Surplus Electronics and Equipment for Amateur Scientists

[LINKS](#)  
[SURPLUS SUPPLIERS](#)

[ELECTRONICS](#)  
[NONSURPLUS MAIL-ORDER](#)

[OPTICS](#)  
[MAIL-ORDER SUPPLIES](#)

[CATALOGS](#)  
[MAIL-ORDER SURPLUS COMPANIES](#)

[SCIENCE SUPPLIERS](#)  
[LINKS](#)

[SCI. EDUCATION](#)  
[LINKS](#)

[DIGIKEY](#)

[NEWARK](#)

[ALLIED](#)

[MOUSER](#)

[JAMECO](#)

[ALL](#)  
[ELEC](#)

[H&R](#)

[ECG/NTE](#)



# LINKS

## Some Surplus sources on WWW

- [Excess Solutions](#) huge qty surplus parts
- [Electronic Goldmine](#)
- [Surplus Shed](#) (optics stuff)
- [Am. Science & Surplus](#) (formerly Jerryco)
- [H&R Surplus](#)
- [Ramsey Electronics](#)
- [Marlin P. Jones](#)
- [C & H Sales](#)
- [Brigar Electronics](#)
- [Wacky Willy's](#) in Portland
- [House of Science](#) electronic surplus
- [Fair Radio Sales](#)
- [Toronto Surplus](#)
- [Surplus Traders](#) (large)
- [All Electronics Corp.](#)
- [Alltronics](#)

## Whacky wehirdo products on WWW

- [Am. Science & Surplus](#), hilarious catalog
- [Archie Mcphee](#), glow-in-dark roaches, tiki lamps, boxing nuns.
- [Johnson Smith](#) tricks, gags, costumes, amazing stuff

## Other collections of surplus links

- [Surplus outlets in Silicon Valley](#)
- [Bob B's catalog list](#)

- [R&D Electronics](#)
- [Ebay: electronic parts](#)
- [Lee Frank Surplus](#)
- [Wondermagnet](#) surplus supermagnets and [other stuff](#)
- [MG Electronics](#)
- [EIO](#) surplus electronics, hobby forums
- [BG Micro](#)
- [Sterling Resale Optics](#) surplus opto/laser
- [Surp. Sales of Nebraska](#)
- [MWK Ind.](#) (cheap laser stuff)
- [Laser Surplus Sales](#)
- [Commercial & surplus](#) links from Experimenter's Corner
- [Auction/liquidation](#)
- [Electronic Surplus \(cleveland\)](#)
- [Mendelson's Electronics](#)
- B. Merriman's [Chemical Suppliers list](#)
- [DIGI-KEY \(non-surplus electronics\)](#)
- [DOD](#) surplus
- [ECSC](#) surplus store
  
- [Inexpensive optics kit](#)
- [Excellent student microscope](#) (Bill B. recommended)

- [WA state surplus & swap meets](#)
- [WA State suppliers, PNW VHF Society](#)
- [Fil's giant surplus list](#) and [supplier list](#) from [SCI.ELECTRONICS](#) FAQ , repairfaq
- B. Merriman's [Chemical Suppliers list](#)
- [Arrick Robots, surplus sources](#)
- [KG4ERX's list](#)
- [Radioswapmeet's suppliers list](#)

## Cheap CCD Video Cameras

- [Action Electronics](#)
- [Super circuits \\$12 board cam](#)
- [Webtronics](#)
- [All Electronics](#)
- [Marlin P. Jones](#)
- [Herbach & Rademan](#)
- [Infrared LED-array floodlight boards](#)
- [Tiny viewfinder](#), small [B&W monitor](#) , and a [NTSC \\$25 toy LCD](#)

## Local Seattle/NW surplus stores

- [Online Materials Exchange](#)

- [House of Science](#) (defunct)
- [Vetco Electronic Surplus](#) (Bellevue)
- [Old Technology Shop](#) 7712 Aurora Ave. N (206-527-2829)
- [Supertronix](#) is back, as Alphantronix
- [Re-PC](#)
- [Supertronix](#) (Retail store is GONE!!!)
- [Fry's Electronics](#), new store in Renton (425) 525-0200
- [Laird Plastics](#)
- [Boeing Surplus](#) (Kent, no longer open every day)
- [U. of Washington Surplus Auction](#)
- [Electronic Dimensions](#) (surplus, Tacoma)
- [The Creation Station](#), Lynnwood

## Science Equip. Catalogs

### Mechanical:

- [Stock Drive Products](#)
- [Small Parts Inc.](#)
- [Ried Tool](#)
- [W. Berg](#)
- [JJC drive components](#)
- [PIC design](#)
- [More...](#) via [J. Howell Stirling/Steam kits](#)
- [Arbor Scientific](#)'s catalog of cool science demos, toys, etc.
- [B&B Electronics](#) lo-price data loggers, A/D, D/A
- [Carolina Bio Supply](#)
- [CR Scientific](#) (new/used)
- [Edmund Scientific](#)
- [Fisher Scientific Catalog](#)
- [Indigo Edu. Supplies](#)
- [Lasermotion Catalog](#)
- [Lynxmotion](#) Robot Kit
- [Mondo-tronics](#) Robot Store

## Scientific Equipment: surplus dealers

- [American Science Surplus: labwarehouse](#)
- [eBay:Bus. & Indust.: Lab equipt](#)
- [LabX classified ads](#)
- [Intl Equip Trading](#) used lab equip
- [used-line](#) lab equipt
- [Surplus Traders](#)
- [Best Lab Deals](#)
- [BMI Surplus](#)
- [Johnstone](#) Surplus equpt., vac, lasers
- [PhysicsNet](#) physics equipment archive & search
- [Scientific Equip. Exchange.](#)
- [Scientific Equipment Liquidators](#)
- [W.J. Ford Enterprises](#) Surplus
- [Used Lab Equip.](#)
- [PhysicsNet](#) physics equipment archive & search
- [Surplus\\_Shed](#) (optics & electrn)
- [W.J. Ford Enterprises](#) Surplus

- [NADA](#) Scientific, cool edu. devices!
- [Ottawa Sci. Surplus](#)
- [PASCO](#) physical science ed. supplies
- [Pitsco](#) science edu. catalog (cool devices!)
- [Platte Data](#) lo-price data loggers
- [Sargent-Welch](#) catalog site
- [Sci. Kits & Boreal Labs](#)
- [SCITECH](#) science store
- [Top Bulb](#), every bulb imaginable
- DMOZ index: [Sci. Equipment New](#)
- DMOZ index: [Sci. Equipment Used/Surplus](#)
- DMOZ index: [Chemistry Equip. Used/Surplus](#)

## The complete Mad Scientist lab should at the very least have these catalogs:

- [AMERICAN SCIENCE SURPLUS/JERRYCO](#)
- [HERBACH & RADEMAN \(H&R\)](#)
- [C&H SALES](#)

Others I recommend:

- [Electronic Goldmine](#)
- [Marlin P. Jones & Assoc.](#)
- [Servo Systems](#) (robotics stuff)
- [Archie Mcphee](#) (weird toys)
- [All Electronics Corp.](#)
- [Ramsey Electronics](#)
- [Fair Radio Sales](#)
- [MWK Ind.](#) (cheap laser stuff)
- [Surplus Traders](#)
- [DIGI-KEY \(non-surplus electronics\)](#)

- [Mouser \(non-surplus electronics\)](#)
- [Ebay: electronic parts](#)

You can't go wrong in calling ALL these places for their mail-order catalogs.

Marlin P. Jones & Assoc.  
P.O. Box 12685  
Lake Park, FL 33403-0685  
(407) 848-8236  
Fax: (407) 844-8764  
<http://www.mpja.com>  
(Excellent electronic surpl,  
cheap ccd cameras)

HERBACH & RADEMAN (H&R)  
353 Crider Ave.  
Moorestown, NJ  
(856)802-0422  
Fax: (856)802-0465  
<http://www.herbach.com>  
(Excellent electrn surp, motors,  
robots, HV, interesting devices,  
some optics)

Sintec Company  
28 8th St., Box 410  
Frenchtown, NJ 08825  
(800) 526-5960  
(201) 996-4093

R&D Electronics  
5363 Broadway Ave.  
Cleveland, OH 44127  
(800) 642-1123 (216)-441-5577  
(surpl electronics, many interesting devices)  
<http://www.electronicssurplus.com>

American Science Surplus/Jerryco  
PO Box 1030  
Skokie, IL 60076  
voice: 847-647-0010  
fax: 800-934-0722  
(Whacko surplus stuff, great

MWK Industries  
1269 W. Pomona, U112  
Corona, CA 91720  
909-278-0563  
<http://www.mwklasers.com/>  
(Excellent & cheap laser

stuff)

catalog, electron, mech, opto)

<http://www.sciplus.com>

Electronic Goldmine

PO Box 5408

Scottsdale AZ 85261

Tel: (602) 451-7454

<http://www.electronic surplus.com>

Fax: (602) 451-9495

<http://www.goldmine-elec.com/>

(Great catalog, electronic parts, Geiger tubes, peltier modules, solar cells, kits.)

Alltronics

2300-D Zanker Rd.

San Jose, CA 95131

408-943-9773

<http://www.altronics.com>

Edlie Electronics

2700 Hempstead Tpke.

Levittown, NY 11756-1443

(800) 645-4722

(516) 735-3330

<http://www.edlieelectronics.com/>

(Cheap test equip, components)

American Design Components

6 Pearl Ct.

Fairview, NJ 07022

<http://www.adc-ast.com/>

MG Electronics

1177 Park Ave.

Suite 5, Box 124

Orange Park, FL 32073

Phone (904)-287-0721

Fax (904) 287-4933

Electronic Surplus

Cleveland, OH

Circuit Specialists, Inc.

P.O. Box 3047

Scottsdale, AZ 85271-3047

(800) 528-1417

(602) 966-0764

Fair Radio Sales Co.

1016 E. Eureka St.

PO Box 1105

Lima, OH 45802

fax (419) 227-1313

(419)-227-6573

<http://www.fairradio.com/>

(War surplus radio stuff)

e-mail [mike@mgte.com](mailto:mike@mgte.com)  
<http://www.mgte.com>

C & H Sales  
2176 E. Colorado Blvd.  
PO Box 5356  
Pasadena, CA 91107  
(800) 325-9465

<http://www.servosystems.com/>  
<http://www.aaaim.com/CandH/>

Steppers, mech,  
(Great surp., mil., motors,  
hi volt, opto, electronics)

Allegro Electronic Systems  
3 Mine Mountain Rd.  
Drawer NV  
Cornwall Bridge, CT 06754  
(laser stuff, kits)

<http://www.allcorp.com/allcorp/>

Mendelson's ElectronicsMECI  
field)  
340 E First St.  
Dayton, Ohio 45402  
phone: 1-800-344-4465  
ff@wondermagnet.com  
e-mail: [meci@meci.com](mailto:meci@meci.com)

<http://www.wondermagnet.com>  
<http://www.meci.com>

(cheap!)

MCM Electronics  
650 Congress Park Dr.  
Centerville, OH 45459-4072  
800-543-4330  
513-434-6959

Surplus Center  
1015 West "O" Street

Servo Systems  
115 Main Rd.  
Montville, NJ 07045-0097  
(800) 922-1103

( Surplus motors,  
robotics. )

All Electronics Corp.  
P.O. Box 567  
Van Nuys, CA 90408  
(818) 904-0524  
[allcorp@allcorp.com](mailto:allcorp@allcorp.com)

Wondermagnet (force  
Colorado  
phone: 1-877-944-6247  
email:

Surplus supermagnets

Pioneer Supply Co., Inc.  
3524 Charlotte St.  
Pittsburgh, PA 15201  
Tel : 412. 678. 2300  
FAX : 412. 687. 0091

Meredith Instruments  
(Cheap Laser stuff!)

P.O. Box 82209  
Lincoln, NE 68501-2209  
402-474-4055 402-474-5198  
<http://www.surpluscenter.com>

1-800-722-0392.

Edmund Scientific  
101 E. Gloucester Pike  
Barrington, NJ 00807-1380  
609-573-6250

Johnstone Associates  
101 State St. Ste. 162  
Los Altos, CA 94022  
(used vacuum, sci.

equipt)

(Sci edu, opt, expensive surplus)  
<http://www.edsci.com>

Small Parts, Inc.  
13980 NW 58th Court  
P.O. Box 4650  
Miami Lakes, FL 33014-0650  
(305)-557-7955

Surplus Sales  
1502 Jones St.  
Omaha, NE 68102  
[www.surplussales.com](http://www.surplussales.com)  
Ham radio parts, High

voltage

(Excellent catalog. Small gears,  
bearings, shafts, drive belts,  
everything for mech. prototypes)

connectors, HV capacitors

The Surplus Shed  
8408 Allentown Pike  
Blandon, PA 19510  
877-778-7758

<http://surplussed.com/>

(Lots of surplus optics, some  
exotic stuff, some electronics.)

SURPLUS TRADERS  
PO Box 276  
Alburt, VT 05440  
(514)-739-9328  
<http://www.73.com>

SHF Microwave  
7102 W 500 S  
La Porte Indiana 46350  
<http://www.shfmicro.com>  
(Microwave RF Parts and

equip for

hams & experimenters)



## ELECTRONICS SUPPLIERS (NON-SURPLUS)

Get [DIGIKEY](#), [Jameco](#), and [MOUSER](#) catalogs at the very least.

Also try [FINDCHIPS.COM](#) partnumber search on several companies

Allied Electronics  
catalog

<http://www.alliedelec.com>

1-800-433-5700

Large electronics supply

Allegro Semiconductor  
Semiconductor.

<http://www.allegromicro.com>

stepper

Took over Sprague

Linear hall effect chips,

drive chips, power op-amps.

[All Electronics Corp.](#)

surplus

P.O. Box 567

Van Nuys, CA 90408

(818) 904-0524

Some cheap components, lots of

Arrow Electronics  
semi)

<http://www.arrow.com>

Large supply catalog (mostly

Avnet Electronics  
semi)

<http://www.avnet.com/em>

Large supply catalog (mostly

BG Micro  
AVR,

<http://www.bgmicro.com>

ICs, parts, motors, proto, PIC,

ooPic, RF, audio, opto.

Dataq, famous [\\$25 A/D converter \(data acquisition system\)](#)

241 Springside Drive Suite 200

Akron, OH 44333

1-800-553-9006

Digi-Key Corporation

Highly recommended. Fair

prices,

701 Brooks Ave. South  
catalog

very \*fast\* shipping, monthly

P.O. Box 677

Thief River Falls, MN 56701-0677

(800) 344-4539

(218) 681-6674

<http://www.digikey.com>

Easylink: 62827914

Telex II: 9103508982 "DIGI-KEY CORP"

Fax: (218) 681-3380

Edlie Electronics

Cheap test equipment, lots  
of components

2700 Hempstead Tpke.

Levittown, NY 11756-1443

(800) 645-4722

(516) 735-3330

### [ELECTRONIX](#)

Halted Specialties Co. (HSC)  
components,

Surplus electronics,

3500 Ryder Street

computer peripherals.

Santa Clara, CA 95051

<http://www.halted.com>

+1-800-4-HALTED Orders only

+1-408-732-1573 inside California and outside US

Future Electronics  
semi)

Large supply catalog (mostly

<http://www.future-active.com/>

[Jameco](#) Electronics  
electronics

Cheap PC source, some

1355 Shoreway Rd.

components, ICs, etc. Cheap  
prototyping boards, power

Belmont, CA 94002

supplies,

(415) 592-8097

etc.

<http://www.jameco.com>

Telex: 176043

Fax: (415) 592-2503

JDR Microdevices  
electronics  
110 Knowles Dr.  
Los Gatos, CA 95030  
<http://www.jdr.com>  
(800) 538-5000  
(408) 866-6200  
Telex: 171-110  
Fax: (408) 378-8927

Cheap PC source, some  
TTL, Linear ICs

Magnet Sales  
ceramic, Alnico,  
1-800-421-6692  
catalog.  
<http://www.magnetsales.com>

All sorts of magnets,  
neodymium. Get their

Mendelson Electronics  
340 E First St  
Dayton, OH 45402  
<http://www.meci.com/>  
800-344-4465  
fax 937-461-3391

Surplus in Dayton

Mouser Electronics  
catalog.  
2401 Hwy. 287 North  
Mansfield, TX 76063  
(800) 346-6873  
(800) 992-9943 (to order a catalog)  
(201) 328-3322  
Fax: (817) 483-0931  
<http://www.mouser.com>

Another good new-parts

Newark Electronics  
catalog  
<http://www.newark.com>

Large electronics supply

NTE Replacement Semi  
semiconductors  
<http://www.nteinc.com/>

Cross reference for

American Microsemi semiconductors <a href="http://www.americanmicrosemi.com">http://www.americanmicrosemi.com</a>	Obsolete/discontinued
Unicorn Electronics other ICs 1142 State Route 18 Aliquippa, Pa. 15001 800-824-3432 unielect@aol.com	Interesting audio-storage and

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## SOME SOURCES OF CHEAP SURPLUS OPTICAL DEVICES & EQUIPMENT

Allegro Electronic Systems lasers, 3 Mine Mountian Road, etc. Drawer NV Cornwall Bridge, CT 06754	Mail-order supplier of hobbyist kits, hard-to-find components,
Anderson Lasers, Inc. used. 288 West Royalton Road Broadview Heights, OH 44147	Ind. and Sci. lasers, new and Not hobbyist.
Colorado Photonics test equip. <a href="http://www.coloradophotonics.com">http://www.coloradophotonics.com</a>	New & used research optics &
Edmund Scientific Corp Wide 101 E. Gloucester Pike equipment, Barrington, NJ 00807-1380	Ask for their optics catalog. variety of sci. and edu. comprehensive optics supplies

609-573-6250

[email: TECHSUP@EDSCI.COM](mailto:TECHSUP@EDSCI.COM)

Harbor Freight Tools  
microscope,

3491 MISSION OAKS BLVD

Camarillo, CA 93011

800-423-2567

1-805-445-4791

<http://www.harborfreight.com/>

[Night Vision Scopes](#) under \$100,

cheap laser pointers

Images Company  
power

PO Box 140742

Dept N

Staten Island, NY 10314

718-698-8305

Holography supplies, lasers,

supplies, steppers, optics

Laser Surplus Sales

214-824-LASER

<http://www.lasersurplus.com/>

Meredith Instruments

<http://www.mi-lasers.com/index1.html>

1-800-722-0392.

Low price lasers & supplies

Midwest Laser Products  
inexpensive

PO Box 2187

Bridgeview, IL 60455

708-460-9595

New and use laser equipt,

beginner's systems.

MWK Industries

1269 West Pomona, U112

Corona, CA 91720

909-278-0563

<http://www.mwklasers.com/>

Cheap Laser stuff

The Surplus Shed  
lens/mirror/eyepieces

8408 Allentown Pike

stuff

Lots of surplus optics,

telescope/microscope, some exotic

Blandon, PA 19510

877-778-7758

<http://surplussed.com/>

<http://amasci.com/supliers.html>

Created and maintained by [Bill Beaty](#). Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

[SCIENCE EXPERIMENTS](#) | [SCIENCE CLUB](#) | [SCI. HOBBYIST](#) | [FORUM](#) | [SEARCH](#)



# SCIENCE FAIR IDEA EXCHANGE

LOOKING for a science fair idea? Check out the archive below!

## SCIENCE PROJECTS IDEA ARCHIVE:

- [BIOLOGY IDEAS](#)
- [CHEMISTRY IDEAS](#)
- [PHYSICS IDEAS](#)
- [PSYCHOLOGY IDEAS](#)
- [NEW IDEA ADDITIONS](#)
- SCICLUB: [SCIENCE PROJECTS & PLANS](#)
- SCICLUB: [Electronics links](#), also [project schematics](#)
- SCICLUB: [physics demos](#)
- [LINKS](#) to other websites

[ADD YOUR IDEA](#) (currently turned off)

## Other websites for Science Fair ideas



RECOMMENDED CDROM:

" [The Amateur Scientist, Science Fair Edition](#)" all 810

columns from Scientific American magazine. ~1000 amateur projects from C.L. Stong, Jearle Walker, Shawn Carlson. \$24.99

Now also out on CDROM: [Amateur Astronomer](#), Also a book: [Amateur Biologist](#)

- SCICLUB: [SCIENCE PROJECTS & PLANS](#)
  - SCICLUB: [Electronics links](#), also [project schematics](#)
  - SCICLUB: [physics demos](#)
  - ["ScienzFair" Ideas page](#) (cached, archive.org)
  - [Ideas List](#): Advanced Science Projects
  - [Student sci. projects](#) from [NSRC](#) (great for ideas!)
  - [Sci-Journal](#), written by students in UK
  - [The Empiricist](#), student research journal
  - [Mike P's "ideas" links](#)
- 

## Other Science Fair Sites

- [ASK SCIENCE QUESTIONS](#)
  - [SCI. PROJECTS & PLANS](#)
  - [COOL SCIENCE JUNK](#), mail order catalogs!
  - [Science Fair Help](#) (madsci site)
  - USENET Newsgroup: [ALT.SCI.AMATEUR](#), discuss projects
  - [Build a VOLCANO](#)
  - [Yahoo - Science Fair Guides](#)
  - [Sci Fair Resource Guide](#) from IPL
  - [Science Fair Home Page](#)
  - [Neltec sci. fair resources](#)
  - [School Science Fair Websites](#) (huge index)
  - [Science Project Introduction](#)
  - [Society for Amateur Science](#) (join the SAS forum, look under FORUM, under SCHOOL PROJECTS)
  - [SCIENCE FAIR HINT](#)
  - [SSE Young Investigators](#) (unusual science)
  - [Index of projects in Scientific American backissues](#)
- 
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[Back to SCIENCE HOBBYIST](#)

Guestbook script from [Matt's Script Archive](#)

## NEWLY ADDED IDEAS, MISC.

Name: Coaster Dude

About two years ago I did a project on roller coasters and why you don't fall out of your seat when you go through a loop. I tested it with three experiments. #1 was to fill a bucket of water and swing it over my head. With nothing holding the bucket of water in, the gravity or G forces kept it in the bucket. Then I launched a Hotwheel car through a loop. It went through. Then I bought the set of K'nex roller coaster and assembled it. Even though nothing held the car to the track, it went right through the loop with no problems. It was really fun. Plus I got to go to the amusement park (Paramount's Great America) and ride all kinds of stuff. People stood and looked at my pictures for the longest time. I got first place in my school and an honorable mention at the regional fair. People still ask me today about all the roller coasters.

URL: <http://www.scronline.com/public/users/silvas/index.html>

<[Silvas4@Juno.com](mailto:Silvas4@Juno.com)>

Vallejo, CA USA - Monday, August 18, 1997 at 15:40:15 (PDT)

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Name: David VAn NEst

Does Different Concentrations of salinity have an effect on the Growth of Red Mangroves? This

project got me second place in the engineering fair and there were 102 others in my same category and I would second out of all of them. I grew them hyproponicaly it was a fun project that any one can do.

URL: [wsite.com/fishingworld](http://wsite.com/fishingworld)

<[fedtitl@digital.net](mailto:feditl@digital.net)>

Cocoa, FL USA - Sunday, August 17, 1997 at 11:47:38 (PDT)

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Name: Anna

Devise a way to drink coca cola hot and carry out research to see what the public think

URL: [NA](#)

<[NA](#)>

New Zealand - Thursday, August 14, 1997 at 12:44:42 (PDT)

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Name: Jo

I did an experiment called "Distinctive Eyesight" for my 6th grade project. Though it was a little higher level than 6th grade. I got 2nd at my school fair but I won Best of Fair in the county SF and 2nd at regionals. I took 10 illusions out of a Magic Eye book and I showed them to 10 (you can use more) different people in each of 4 age groups. I tested them by making up a test with the illusions.

Welling, OK USA - Wednesday, August 13, 1997 at 14:25:36 (PDT)

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Name: Angela Miller

the effects of electromagnetic fields on eremosphaera algae cells (any type of microscopic algae can be used)

Angela Miller <[Storm863](#)>

Coral Springs, FL USA - Tuesday, August 12, 1997 at 19:05:16 (PDT)

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Name: NONE

Last year I did a science project on computers. The topic was "How much RAM (Random Access Memory) Do You Need for Your Computer?" The catchy name was "Should You CRAM Your RAM?" I won Superior at my school fair & went on to win Superior, again, at the county fair. I put different amounts of RAM in my computer & timed how long it took to open & close programs. I looked to PC World magazine for helpful reference. It was a lot of hard work, but it was worth it

URL: [NOPE](#)

<[NOWHERE](#)>

SORRY, NO USA - Friday, August 01, 1997 at 17:16:13 (PDT)

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Name: Henrietta

Can plants make photographs??

Henrietta <[szczepan@sprynet.com](mailto:szczepan@sprynet.com)>

solon, oh USA - Thursday, July 31, 1997 at 19:02:20 (PDT)

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Name: Christie Klein

Well, I haven't done this yet, but I thought that it would be really neat. What is very interesting, is that rats can swim, walk on tight ropes, and climb on almost anything. My idea was, you could take 30 mice, 15 females and 15 males, and see which gender can do better in the maze that you make. You should make the maze, so it has some of it underwater, and some of it above water. Mice learn quickly, and make sure that when you make the maze, that the mice can't climb out. Also make sure, that they don't have to go under water too long. If you have any questions, go ahead and e-mail me at [kleinfam@erols.com](mailto:kleinfam@erols.com)

Christie Klein <[kleinfam@erols.com](mailto:kleinfam@erols.com)>

Leesburg, VA USA - Thursday, July 31, 1997 at 11:06:54 (PDT)

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Name: Steven Schwartz

In school, I did a science project on acid rain and its effects on plant growth. In an earlier experiment, we determined (using pH paper) that there indeed was acid rain in the Los Angeles area. We recreated a solution of acid rain that matched the pH of the actual rain. We then grew tomato plants in both local soil and plain sand and watered plants with "acid rain" and with normal tap water with less acid content. We then measured the growth of the plants and compared results. Very cool. Enjoy!!

Steven Schwartz <[schwartz@vrinet.com](mailto:schwartz@vrinet.com)>

Springfield, VA USA - Thursday, July 31, 1997 at 06:50:17 (PDT)

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Name: Terri Lawson

What bat weight will allow you to hit the ball farthest?

Terri Lawson <[tlawson1@gmu.edu](mailto:tlawson1@gmu.edu)>

Woodbridge, va USA - Wednesday, July 30, 1997 at 07:34:14 (PDT)

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Name: Jocques Stalkes

To test the way animals react to different types of music.

Jocques Stalkes <[Ltabb@juno.com](mailto:Ltabb@juno.com)>

Paris, USA - Monday, July 28, 1997 at 17:06:11 (PDT)

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Name: Vicki Brown

Many of the science fair projects compare different brands or types of products. My project tested the difference between different types of ear plugs. Get a wig stand made of styrofoam, drill holes where the ears belong, put a decimeter (sound measuring device) into the center of the head, and place the ear plugs into the ear holes. Varying sounds can be made outside of the head which are recorded by the decimeter. The exact same sound must be used for each of the ear plug styles. The sound that we used was a song from a CD at the same volume, and a gun shot. This project received a first place at the regional science fair.

Vicki Brown <[jrbrown@wtaccess.com](mailto:jrbrown@wtaccess.com)>

Seminole, tx USA - Saturday, July 26, 1997 at 13:12:00 (PDT)

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Name: Mandy Brown

Build an apparatus that measures the amount of capacity that you have in your lungs (called a spirometer). Take two plastic buckets (one which fits into the other). The idea is to fill the larger bucket with water, invert the smaller bucket into the water, and blow air into the smaller bucket through a tube. The small bucket will rise as the bucket is filled. Yardsticks were glued to the outside of the large bucket so that the rise of the top of the small bucket could be measured in centimeters. As different people try the apparatus you will get different amounts of air and different measurements of the rising of the bucket. This project has been used to test which sex has the greatest lung capacity, and whether athletes or non-athletes had the greater capacity. The two projects each took first place overall in the regional science fair.

Mandy Brown <[jrbrown@wtaccess.com](mailto:jrbrown@wtaccess.com)>

Seminole, tx USA - Saturday, July 26, 1997 at 13:05:17 (PDT)

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Name: James Lyon

My idea is you take 10 kids at the same age (as close as possible) and give them an E.S.P test to find out how common E.S.P is in their age group. You would have to test them about 10 times to make sure it's not just luck. I have a basic E.S.P test programme and if you would like it E-mail me with your address and i will send the file to your address (file will be pkzipped) My address is [dlyon@pl.net](mailto:dlyon@pl.net)

URL: [dlyon@pl.net](mailto:dlyon@pl.net)

Auckland, -- New Zealand - Friday, July 25, 1997 at 16:58:53 (PDT)

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Name: Kristen wesoly

What is the effect of a disinfectant on the growth of bacteria? Fun experiment, I placed high in school fair, controlled

Kristen wesoly <[THERADR@aol.com](mailto:THERADR@aol.com)>

USA - Thursday, July 24, 1997 at 08:33:36 (PDT)

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Name: Unknown

Can Earthworms Be used to Recycle Kitchen Wastes into fertile Garden Soil?

Unknown

USA - Thursday, July 24, 1997 at 08:10:21 (PDT)

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Name: Derek Butchart

Music's Affect On Teen Studying

Derek Butchart

Sturgeon Falls, ONT Canada - Monday, July 21, 1997 at 15:59:03 (PDT)

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Name: Alice Everage

There are many different ways to do science fair-- what are the real reasons that you may be doing one? If you think of this as a opportunity then you science fair will be more fun. If you need help with the whole project E-mail me. I am a pharmaceutical chemist and a science advisor to 4 different high schools. I encourage parents to e-mail too for help with their children's project. Hope to be hearing from you soon.

Alice Everage <[diedforus@iwaynet.net](mailto:diedforus@iwaynet.net)>

Columbus, OH USA - Saturday, July 19, 1997 at 09:18:14 (PDT)

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Name: Desarae Muller

for science fair, i found that impressing the judges with what you know about your project is the most important thing. i did an extensive study of aquatic habitats. i created environments in jars and sealed them. simular experements can be done. e-mail me at [studentgirl@hotmail.com](mailto:studentgirl@hotmail.com) if you have any questions.

Desarae Muller <[studentgirl@hotmail.com](mailto:studentgirl@hotmail.com)>

Lolo, MT USA - Thursday, July 17, 1997 at 22:15:24 (PDT)

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Name: Fred Niell

I suggest building a small particle accelerator. I built three: a linear accelerator, and two cyclotrons. Particle accelerators demonstrate and prove several laws of physics. They are not so hard to build, either. For more information, see my web site.

URL: <http://student-www.uchicago.edu/users/fmniell>

<[fmniell@midway.uchicago.edu](mailto:fmniell@midway.uchicago.edu)>

Chicago, IL USA - Monday, July 07, 1997 at 09:07:05 (PDT)

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Name: UNKNOWN

Well, when I was in the seventh grade I did a project called 'How does lack of sleep affect behavior?' Well I typed up a questionnaire for four different ages groups:

toddlers

5-10

teenagers

adults

well some of the question were to determine how much sleep that person usually gets and how did they feel when they didn't get there normal

hours of sleep. I got third place at my school and went on to the

## Regional Science Fair.

URL: [OneBadSis@aol.com](mailto:OneBadSis@aol.com)

<[OneBadSis](mailto:OneBadSis)>

Jxn, MS USA - Saturday, July 05, 1997 at 10:18:42 (PDT)

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Name: Stephanie

I kinda' read this idea in a science fair book, so it's not really mine, but this one girl at our science fair used it and she won best in fair. Ok, it's about using beta carotene to fight cancer in plants. You need to infect the plants with *Agrobacterium tumefaciens* (some plant carcinogen) first and then treat them with beta carotene. The rest is up to you to figure out, it's really not that hard, good luck! Oh, and I'm kinda looking for a good science fair project too, so if you have any great ideas then pleeeaaassseeee e-mail. Thanks a bunch!!!

Stephanie <[Swttppea@aol.com](mailto:Swttppea@aol.com)>

Round Rock, TX USA - Saturday, June 28, 1997 at 17:32:41 (PDT)

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Name: Laura Cohn

Please visit our school's Virtual Science Fair website for lots of fantastic science fair ideas!

Drawings, photographs, and related websites are included.

URL: <http://www.parkmaitland.org/sciencefair>

<[laurac@netpass.com](mailto:laurac@netpass.com)>

Maitland, FL USA - Monday, June 23, 1997 at 14:24:27 (PDT)

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Name: Matt Graham

Last year, I did a project using a cheap \$45 laser and measured with a solar pannel how different kinds of mirrors and "strobing" the laser beam with a cardboard disk affected its output. It took me to the regionals and won we a couple awards. This year I am manufacturing my own holograms, but now I am unsure what parctical experiments I can do using this teachnology can you help me?

Matt Graham <[692199@mail.ican.net](mailto:692199@mail.ican.net)>

Bolton, Ontario Canada - Friday, June 20, 1997 at 18:43:26 (PDT)

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Name: Meghan

At my school science fair I recieved a superior rating, third place, the best in my category, and the principals award. I caught 15 tadpoles and divided them into 3 groups of 5 and gave each the same amount of food, water, and sunlight. I gave each a different kind of food though. High protein freeze dried worms, Tetra fin fish food, and the tadpoles natural pond plant were the three different kinds of food I fed them. Then I weighed them once a week. I wanted to find out which food would cause them to gain the most weight over a period of 15 weeks. High- protein made them gain the most weight!

Meghan

Ostrander, Oh USA - Saturday, June 14, 1997 at 10:57:15 (PDT)

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Name: meghan eyerman

which food would cause tadpoles to gain the most weight? high-protein freeze dried worms, tetra fin fish food, or their natural pond plant?

meghan eyerman

ostrandetr, oh USA - Saturday, June 14, 1997 at 10:46:25 (PDT)

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Name: Lindsay Trawick

I'm interested in doing a science fair project on the Microsoft Voice software that came with my computer. I'm thinking about things such as finding the most needed voice commands and then the words that are needed to train the program to recognize that command. The word won't always do it. If you have any suggestions on this project or any suggestions on Science Fair projects in general PLEASE, PLEASE, PLEASE e-mail me at [trawick@power1.net](mailto:trawick@power1.net). Thanks in advance.

Lindsay Trawick <[trawick@power1.net](mailto:trawick@power1.net)>

Hot Springs, AR USA - Wednesday, June 11, 1997 at 12:55:53 (PDT)

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Name: Jess Zabell

What I did for my 6th grade Science fair this year was, I wanted to know if a dog's mouth or a human's mouth was cleaner so I took a sample of spit from each specimen and spread it on agar(bacteria food) then I covered it and waited to see if the dog's dish or human's dish had more bacteria on it. The specimen with the bigger and nastier black and brown spots on their plate of agar had the dirtier mouth. I guess I should tell you how it turned out but you might get different results. It all depends on how you do the project. Back to what I was saying, in my project the dog had the dirtier mouth. In the science fair there was 69 people in the 6th grade this year and I got 3rd place so it's a pretty good project. This is a good project if you one can't think of anything else or just wants an easy project. Email me for more details if you need 'em.

URL:

rickz@

Marietta, GA USA - Wednesday, May 28, 1997 at 17:44:17 (PDT)

---

**test which bubblegum flavor lasts the longest**

sara <[ccsn123@aol.com](mailto:ccsn123@aol.com)>

USA - Sunday, February 02, 1997 at 08:56:33 (PST)

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**If you grow 16 plants, 4 in soda, 4 in coffee, 4 in vinegar and 4 in water as your control, which plant will grow faster? Answer: coffee**

d.l.

Wilmington, DE USA - Saturday, February 01, 1997 at 16:49:58 (PST)

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**We used a Fresnel lens to boil water and compared the results to that of gas and electric stove's time. If you have any more ideas on what we could do with a Fresnel lens let us know.**

joe

USA - Saturday, February 01, 1997 at 08:06:08 (PST)

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**You grow 18 plants from seeds. 6 of them you grow in sand, 6 in half sand and half dirt, and 6 of them in all dirt. Fertilize half of the plants in each growing substance. See how tall each grows and how many leaves. It's easy and got me third place last year.**

Elizabeth

Martinsburg, WWWV USA - Friday, January 31, 1997 at 08:27:45 (PST)

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**My sons won first place at the county science fair by answering the question "How does the size of the sand particles used to make bricks affect it's strength?" They took sand and sifted it into three different size particles and made flat bricks by combining the sand with Elmer's glue and water. The bricks had to sit for a week or so before they hardened. They then tested which brick was strongest by clamping the bricks to the edge of a table surface and gradually increasing weights attached to the brick using vise grips until the bricks broke.**

Dawn Baddock <[amtek19@ally.ios.com](mailto:amtek19@ally.ios.com)>

Arnold, Md USA - Friday, January 31, 1997 at 08:01:23 (PST)

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**Beer drinkers normally are loyal to a brand. Let them try different brands on unmarked glasses, ask them wich one is their preferred brand. I did it with beer and orange juice, I submitted the orange Juice because is more "politically correct".**

Javier Andres Rivas <[yanethr@aol.com](mailto:yanethr@aol.com)>

Miami, FL USA - Friday, January 31, 1997 at 02:54:19 (PST)

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**The best sceince fair project is cryobiology. It is when you freeze somthing and then bring it back to life. I got first place at the regional science fair. GOOD LUCK!!!**

Viper

North Bay, Ont. Canada - Thursday, January 30, 1997 at 18:46:25 (PST)

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**does the colour of your skin affect the amount of friends you have?**

khurram <[shuja@aztec-net.com](mailto:shuja@aztec-net.com)>

georgetown, ont canada - Wednesday, January 29, 1997 at 12:49:23 (PST)

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**What about taking bread and the affect of different amounts of say sugar and yeast.E-mail me for more info P.S I got good in Grade 6**

Jenny Greenop <[greenop@recorder.ca](mailto:greenop@recorder.ca)>

Canada - Tuesday, January 28, 1997 at 16:34:34 (PST)

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**Last Year I did projecton mold. It was really interesting. What I did was I took bread; homemade and storebought and put them in 3 different temperatures. We also got different types of bread brown and white. It got is really far in the science fair like A+**

Jenny Greenop <[greenop@recorder.ca](mailto:greenop@recorder.ca)>



Canada - Tuesday, January 28, 1997 at 16:21:23 (PST)

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**I am going to do my science project on what percentage of people really stop at at the stop sign. All you have to do is stand near a stop sign and see if they completely stop, slow down and roll past or if they just go. You can record if it was a male, female, young, or a old person. Other variables can be at what time you do it and at which stops you do it at.**

Christine Philip <[pphilip@juno.com](mailto:pphilip@juno.com)>

Dallas, TX USA - Saturday, January 25, 1997 at 12:43:12 (PST)

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**my project is on bio rusting you get eight jars and 4 common nails 4 galvanized nails put water in all jars but two which you just leave with for a control sand the common nails add salt to two jars and stir leave one with water and one I'm not telling. then you wait a few days and see what happens.**

Matt Wlos

Lansing, Il USA - Friday, January 24, 1997 at 15:27:43 (PST)

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**We used a Fresnel lens to boil water and compared the results to that of gas and electric stove's time. If you have any more ideas on what we could do with a Fresnel lens let us know.**  
joe

USA - Sunday, January 19, 1997 at 09:12:34 (PST)

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**What do you do if you have to orient in space and have no "horizon", such as we have on earth? I am thinking of a space ship situation, where events can happen in any direction from your position, but there is no easy and immediate way to identify the direction. Current co-ordinate system (cartesian co-ordinates) has three axes in 90 degree co-ordination. But the three axes only cover a squarish space that is delimited by the axes, such as a room, with the axes starting in one of the corners of the room. This is not very good for orientation in space, as in that case, we have to look beyond the enclosed space of the room. We normally do this, by assigning negative figures to the distances on each axis in order to distinguish 'inside' from 'outside'. Too complicated for immediate orientation in space. My idea is, to use the geometry developed by Buckminster Fuller, and make a system of four axes, which cover all space, in 120 degree co-ordination with each other. Each one of the axes is assigned a color, starting as full intensity at the axis, and gradually lessening in intensity as the direction diverges towards the next axis. If we do this with each one of the four axes, we get a unique color coding for each and every possible direction. You can "attach" this system to your spaceship and everyone in the ship can immediately agree which direction you are indicating, without any complications. Important in battle situations... Read more about my idea in my home page <http://www.agora.stm.it/J.Hasslberger>**

**[Josef Hasslberger](mailto:j.hasslberger@agora.stm.it) <[j.hasslberger@agora.stm.it](mailto:j.hasslberger@agora.stm.it)>**

Rome, Italy - Friday, January 17, 1997 at 05:44:59 (PST)

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**test the memery of a mause**

unknoun

USA - Thursday, January 16, 1997 at 12:34:18 (PST)

---

**cut a bunch of flowers and then try to find which one can stay alive the longest using different kinds of water, fertilizers and maby even soils**

Matt Morrison <[Dan\\_Morrison@msn.com](mailto:Dan_Morrison@msn.com)>

North Vancouver, B.C. Canada - Wednesday, January 15, 1997 at 16:55:25 (PST)

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**people are still talking about this project ! I tested false nutrition claims against true nutrition claims . I told what kind of foods are OK to eat and put out good cooking tips and nutritional information . I had samples of food which caused a greatintrest in the project . It is really great but a little expensive. I think it was a good price to pay for an A though !!**

Leslie Dewees <[Star2be 12](#)>

Dallas, PA USA - Monday, December 09, 1996 at 12:07:56 (PST)

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**More science fair ideas can be had at [AMATEUR SCIENCE](#) webpage. Don't miss the [Hand-drawn Hologram](#) project. Go [here](#) to find links to other sites for science fair ideas.**

Bill B <[billb@amasci.com](mailto:billb@amasci.com)>

USA - Friday, November 22, 1996 at 15:53:59 (PST)

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Guestbook script from [Matt's Script Archive](#)

# SCIENCE HOBBY BOOKS, ETC.

## Titles

[THE AMATEUR SCIENTIST](#) magazine column, C. L. Stong, Scientific American (magazine) [SAS Index](#) of SciAm Amateur Science column (huge and wonderful resource!)

[INVITATIONS TO SCIENCE INQUIRY](#) by Tik Liem, 1981. A big fat book of hundreds and hundreds of classroom science demonstrations in chem, physics, etc. Detailed author's introduction on philosophy of Enthusiasm and attitude in science teaching. ISBN:0-536-05768-0, Science Inquiry Enterprises, 505 W Madison Ave #12, ElCajon, CA 92020

[PROCEDURES IN EXPERIMENTAL PHYSICS](#), by J. Strong The classic book for the advanced amateur. Get one at any cost! Avail. from [LINDSAY PUBLICATIONS](#)

**THE ART OF SCIENCE:**The Art of Science : A Practical Guide to Experiments, Observations, and Handling Data, J. Carr

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[BUILDING SCIENTIFIC APPARATUS:](#) A Practical Guide to Design and Construction by Moore, Davis, and Greer Mechanical design, working with glass, vacuum techniques, designing and building electronic equipment. Adds to Strong's "Procedures.." above. Avail. from [LINDSAY PUBLICATIONS](#)

**BUILDING YOUR OWN HOME SCIENCE LAB** An old classic, great for highschool level.

[STRING AND STICKY TAPE EXPERIMENTS](#) by Ronald Edge, AAPT, 1981. From Publications Dept., 5112 Berwyn Rd. College Park, MD 20740. Large collection of physics demos and experiments with no exotic materials or equipment needed.

[CONCEPTUAL PHYSICS](#) (Sixth Edition), Paul Hewitt, Scott, Foresman, 1987. The best physics textbook I know. Entirely non-math, heavily illustrated with photos and the author's cartoons. I push this one on friends who are interested in physics but don't know where to start.

[SEEING THE LIGHT](#) by David Falk, Dieter Brill, and David Stork, John Wiley, 1986. An amazing compendium of all of optical science. Heavy on the conceptual/qualitative side, with occasional stories and bits

of twisted humor. If you want to teach yourself optics from scratch, this book you must have.

[THE FLYING CIRCUS OF PHYSICS WITH ANSWERS](#) by Jearl Walker, John Wiley, 1977

[THINKING PHYSICS](#) by Lewis Carroll Epstein, Insight Press, 1986 Illustrated multiple-choice conceptual physics problems related to the real world - with solutions. This is one of those "secret books" recommended by the student grapevine...

[TURNING THE WORLD INSIDE-OUT](#) by Robert Ehrlich, Princeton University Press, 1990

[PHYSICS BOOKLIST](#) from [Sci.Physics FAQ](#)

[Kids Books](#), Dewey Decimal 507

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Have you discovered BACK ISSUES OF SCIENTIFIC AMERICAN? This magazine has had the Amateur Scientist column since about 1950, and it's loaded with all kinds of incredible project descriptions. A sample: electron microscope, 1/2 Megavolt particle accelerator, antibubble machine, CO2 high wattage laser, satellite image receiver, much more. Here's the index, provided by the SAS:



SAS Index of Sci Am Amateur Science column (excellent!)

NEWS FLASH: Dr. Shawn Carlson, founder and head of the Society for Amateur Scientists, is taking over SciAm's AMATEUR SCIENTIST column beginning in October. And the SAS Website is being completely overhauled in preparation!

## ELECTROSTATICS BOOKS

ELECTROSTATIC MOTORS, by Dr. Oleg Jefimenko

Order from: Electret Scientific Co.

PO Box 4132

Star City, W. VA 26505

ELECTROSTATICS, by A.D. Moore

By the grand old man of electrostatics. Great book, has the Di-Rod generator construction project. Find it in libraries.

Article: ELECTROSTATIC MOTORS YOU CAN BUILD

(by Dr. Jefimenko)

Popular Science magazine, April 1971, May 1971

ELECTROSTATICS HANDBOOK, by Charles Green

Howard W. Sams Co., 1973, #21023

ISBN: 0-672-21023-1

Numerous projects, including Kelvin Thunderstorm,  
VandeGraaff, e-motors.

NATURE'S ELECTRICITY, by Charles K. Adams

1987, Tab Books Inc.

ISBN: 0-8306-2769-3(pbk.)

STATIC ELECTRICITY, by J. H. Pepper

1889, J. B. Lippincott

Reprinted by Lindsay Publications

DESCHANEL'S STATIC ELECTRICTY, by A. Privat Deschanel

1884 D. Appleton Co.

Reprinted by Lindsay Publications

Some electrostatics books available from International Tesla Society,  
PO Box 5636, Colorado Springs, CO 80931, 719-475-0918:

- THE DESIGN & CONST. OF VANDEGRAAFF ELECTROSTATIC GENERATORS by K. Scott
- FUNDAMENTALS OF APPLIED ELECTROSTATICS by J. M. Crowley
- HOMEMADE LIGHTNING by R.A. Ford (has Wimshurst plans)
- SECRETS OF BUILDING ELECTROSTATIC LIGHTNING BOLT GENERATORS by W. Noon  
(Wimshurst machine)
- THE INFLUENCE MACHINE, HOW TO MAKE IT, HOW TO USE IT, by J. Wimshurst  
several others...

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Blue Ridge Summit, PA 17214

They carry several books on kid's science  
experiments.

[LINDSAY PUBLICATIONS](http://www.lindsay.com) Inc.  
P.O. Box 538  
Bradley, IL 60915-0538

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off your butt and get on their mailing list!

<http://amasci.com/amateur/ambooks.html>

Created and maintained by [Bill Beaty](mailto:billb@amasci.com). Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

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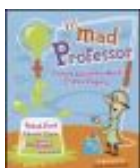
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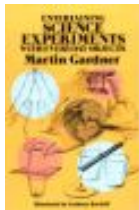
by Edwin Sobey

### **Publisher Comments**

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by Joe Rhatigan

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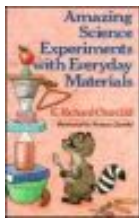
by Gabriel Reuben

#### **Publisher Comments**

55 projects in electricity, magnetism, electronics; making a compass, wiring a simple electromagnet, obtaining electricity from a lemon, reactivating a dry cell, making a flashlight, constructing a Geiger counter. All safe. Unabridged republication of...

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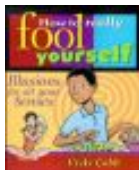
by E Richard Churchill

### **Synopsis**

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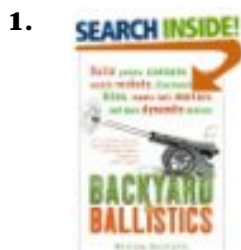
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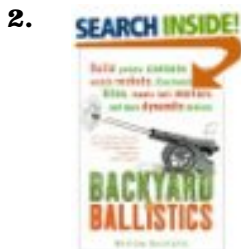
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A list by M. MITCHELL, Slightly

4.  **Science Play!: Beginning Discoveries for 2-To 6-Year-Olds (Williamson Little Hands Series)**

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by Ken Silverstein (Paperback -- January 11, 2005)

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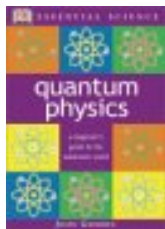
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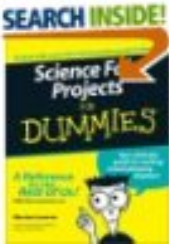
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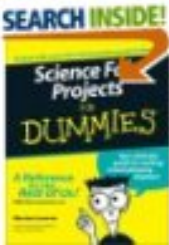
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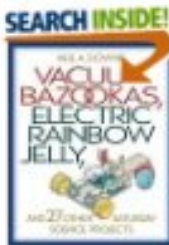



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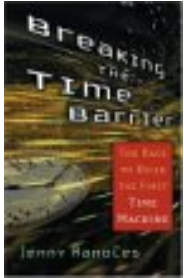
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CHILDREN'S SCIENCE PROJECT LIBRARY BOOK LIST

This should get you started on doing home science demonstrations with your kids. I highly recommend the series by Bob Brown, which can also be had via mail order from Tab Books, Inc. If you hang out at libraries, check out the 507 area in the Dewey Decimal shelving. Lots of books there on science projects and experiments for kids.

If you are particularly interested in any single book, you should be aware that public libraries have a service called Interlibrary Loan, so you can usually order your book from another library nationwide.

- Bill B.

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# DOING REAL SCIENCE

## How to run a science fair project

- Become curious.
- Wonder about something.
- Write down some questions you'd like to ask.
- Pick a good question, then convert it into a statement.
  - Example question: *Does* the smell of cats cause fear in mice?
  - Example statement: The smell of cats *causes* fear in mice.
- This 'statement' is your Hypothesis.
- Dream up an experiment to prove or disprove your statement.
  - How can you get some cat's scent?
  - How can you tell when mice show fear?
  - How would you keep the scent away from the mice until you're ready?
- Perform the experiment.
- Options:
  - Perform the experiment several times, to find out if it always works.
  - Perform a "control" experiment that lacks the important part. For example, repeat your experiment exactly, but with pure water without cat scent. This shows that mice were afraid of the cat smell. Maybe mice are actually afraid of YOU, not of the cat smell.
- Discuss your results, decide whether your results proved your statement.
- Write up your results so others can see them too.
- Was there anything wrong with your experiment? Think of a much better experiment.
- Do it on your own, even if there is no Science Fair.
- Uh-oh, you've become a real scientist.

Site created and maintained by [Bill Beaty](#)

THE SCIENCE CLUB, [sciclub@halcyon.com](mailto:sciclub@halcyon.com). If you are using Lynx, type "c" to send comments.

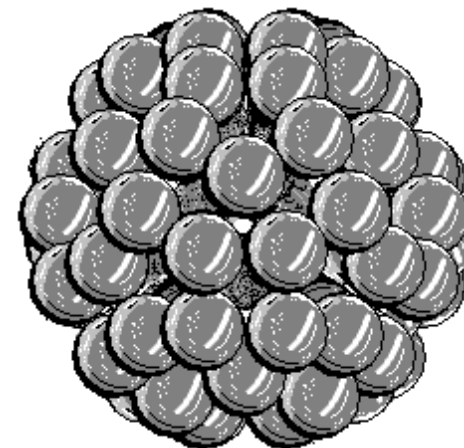
# MAGNET BEAD TRICKS

The price on 8mm or .25" spherical Neodymium supermagnets has come down enough that now we can afford to play with huge blobs of them. They behave like giant atoms. ...giant atoms existing in the everyday world! Play with atoms while observing the strange behavior of the chemical bonding force, 3D molecular structures, spontaneous self-assembly, and various biological phenomena. [scroll down](#) [other supermagnet stuff](#)

## BUCKYBALL

Make twelve 5-magnet pentagons, and assemble them into a 60-atom Buckyball (but not exactly Carbon Fullerene. The one in this diagram has patterns of pents, but with squares instead of hexagons.) For this to work, all the circular direction of north/south poles in the pentagons must be the same.

More realistic buckyball: Once you're successful in making Buckyballs, try duplicating the way they form in nature. Build two 30-atom hemispheres like so: first form two pentagons, place each one against a circle of ten beads to form a little cup, then place a circle of 15 beads on the lip of each cup. This is how buckyballs actually form, and if the two cups come together, they merge seamlessly to form a 60-magnet hollow sphere. AH! THAT'S how Fullerene molecules end up with metal ions trapped inside. It's like a clamshell closing on a stone. (NOTE: this two-hemisphere technique is not trivial! The polarity of the chain-circles are important, an they must be placed so they merge with beads adjacent, NOT with beads moving into the clefts. Also, you must "knit" the lips of the hemispheres together in a zigzag pattern, otherwise you'll get something that looks like a clam. It's a puzzle needing some thought and experiments to solve.)



Build a "decorated" Fullerene: add 12 extra magnets to the centers of the twelve pentagons. Looks like a cold virus. Build a C-180 Fullerene: form twelve pentagons, but add 10 beads to the rim of each, then assemble the super-size buckyball. Also note: pentagons can connect to form a "fabric" in square array.



## **Mysterious Energy Source**

On a smooth but not polished surface, throw two beads together so they connect. They will spin for a very, very long time. A VERY long time. Something weird is going on. Why doesn't friction slow them down? Have you discovered a new source of energy? No, but you've discovered a gravity motor. This is similar to the physics demonstration called "precessing spinning pipe," where the "pipe" very slowly lays down as it spins, and the Potential Energy of gravity \*powers\* the spinning. Friction apparently doesn't slow it down as it normally would, since there's an energy source keeping it running. A gravity-powered motor! Bring a thick conductive object near the spinning pair (or move an aluminum plate up from below the table) and the spinning halts rapidly. Observe the spinning bead-pair closely and you'll see two glowing circles which slowly come together as the raised bead lays down. The circles are caused by overhead lights; they're from the reflected "highlights" in the two silver spheres. Since one sphere is tilted upwards, one circle hovers above the other. And since the raised sphere slowly settles, the two glowing circles will slowly merge just before the spinning spheres grind to a halt.

## **Compass, Coupled Rotary Oscillators**

Make rings of six beads, then push one extra bead into center, and the center one slightly sticks out, and the chunk of 7 becomes a compass. Place two "compasses" a few inches apart, and if one is forced to turn, the other turns too. Spin one, and watch it stop while the other spins (coupled oscillators.) Make a chain of three compasses in a row a few inches apart, turn one, and the changes propagate. But if spacing is wrong, changes won't happen (the domain-wall won't shift.) Use black beads to mark one spot on the compass rim...

## **Bracelets**

Wind long chains around your wrists. Touch them together. If the pair is wound in one direction, they merge to form handcuffs, but if one of them is wound in the other direction they just stick together and part again without damage. Note that they still exhibit the same effect even if you flip them over, (just as screw threads behave.) To change behavior, you have to actually disassemble one of them and re-wind it with reverse screw-wise "chirality." (Or pass it through a matter-transporting mirror, as in "Through the Looking Glass.")

## **SPIRAL Nanotubes:**

Start a "winding-order seed" by winding a chain of beads on a pencil. Wind a couple of turns, then remove the pencil and keep winding, and the chain will self-assemble into a nanotube. This is much easier than building hexagonal rings and then stacking them up!

Make a very long chain, then start two "seeds" of slightly different winding order on either end, then wind them up equally. You'll end up with a two-region nanotube with a defect between them in the center. This defect can move! Twist only one end of the nanotube, and the defect clicks along, changing the tube diameter as it goes. The narrow tube can consume the wide one, making the whole assembly longer. Or vice versa. Start three seeds, creating two defects, then twist the center segment of the nanotube and the defects move in the same direction (the center segment moves along.)

If you can figure out a special "bent seed," successively wound spiral layers also have a bend, and you'll end up with turns with increasing length of 4,5,6, etc. The resulting nanotube becomes a nano-funnel or a Tibetan monk's hat.

### **Useless Machine**

Make a tube by winding a chain around a pencil. Leave the ends long, then hook the ends together to form a loop. If you pull on one end of the loop, the tube unwinds at one end and winds up at the other, while the beads flow constantly through the loop.

### **Travelling Defects**

Make a big circle, then squeeze it together to form two chains side by side. Now place the chain-pair on the table and bend the tip. It goes "snap" and forms a bend ...a kink ...but with the same sort of chain pattern on either side of the kink. **YOU CAN MOVE THE KINK ALONG.** Push it, and the beads click into place as the kink/defect moves through the chain. Form two opposite kinks, then push them around.

Or form many kinks in the same direction, then bring the ends together and make a crude circle with two parallel strands. It's like a tiny amoeba with a crystalline bi-layer cell membrane, with lots of movable kinks allowing changes of shape when you apply pressure to the little creature.

### **"Magnet-eating Amoeba:**

Make a chain of three beads, then bend it to form a triangle. Lay it down and roll a fourth bead to it. It will "eat" the extra bead, becoming a square. Roll a fifth bead and the square eats the extra bead, becoming a pentagon. The pentagon can become a hexagon. But any more beads than six will just stick to the outside and not merge with the ring unless the ring is put under stress. This is an analogy for surface-energy in curved fluids. Well, it works backwards from the way fluids do! So...

Stick a bead to the side of a long chain, and it doesn't merge. But put your chain under tension, and any beads touching the side will be eaten.

## **2-State Memory**

Make three squares and stack them up. They won't remain stable, but instead form a pair of hexagons side by side. Try to make them back into squares by squeezing the vertices of the hexagons together, and SNAP!, it becomes two hexagons again, but rotated 90deg.

## **BIOLOGY (self-assembly)**

Make a buckyball, or just collect a bunch of beads into a glob. Touch it with one end of a long chain, then pull, and the object will unravel and become a long chain. As each succeeding "carbon atom" joins the chain, its powerful dangling bonds will immediately grab any neighboring "atom." Long-chain self-assembly tends to happen spontaneously! Ah, THAT'S why human beings appeared from nothing: because chains of atoms are also able to appear from nothing. Supply a cloud of carbon atoms, and the rest is just details.

Plasmid gene transport: a long loop of bead-chain can be bent, necked-down, and a tiny ring pulled off like the DNA plasmid from bacterial chromosome. Move the tiny plasmid to another spot on the chain, then merge it by reversing the process. Or make two large rings which represent two separate bacteria, then perform "gene transfer" by moving a ring between them (for effect, make the large rings out of random black and silver beads.) Or form one chain into an "S" shape, touch the lobes of the "S" together, then split the touching parts 90deg differently, and the chain will be whole again, but with a segment in reverse order. Now make a "chromosome" by wrapping the long chain into a tight square-section nanotube. With enough magnets you could wrap this nanotube into a spiral, to form a thick hollow tube, then wrap THAT tube into a spiral to form a bigger tube, etc.

## **Ferromagnetism:**

Shouldn't iron atoms repel each other? After all, if you place their alike-poles together side by side, they repel. Why doesn't solid iron spontaneously evaporate? Or why don't the atoms all rotate so Iron is non-magnetic? Let's see. Make some bead-chains, then merge them side by side with their strongly-repelling alike-pole ends together. The ends repel, yet the main body of the chains attract strongly and "zipper" together to form crystalline "permanent magnets." Add more and more chains to the side to build entire single-domain

magnetized crystals. See, iron atoms **DO** stick together to form large magnets. Now make some "compass" clumps (see above,) and use them as field sensors: test at what distance your "single domain" crystal fragment affects them.

### **Antiferromagnetism:**

Chains of beads can merge with north ends near south ends, where the overall field is zero (it forms rings.) Or, if you just gather a wad of beads together, it will have no large external field, since the beads have a strong tendency to form internal rings. Use rotating "compass" clumps to detect the field, and you'll find that a ring of magnets has almost no effect on them.

<---- BACK TO [SUPERMAGNET DEMONSTRATIONS](#)

Magnet Suppliers:    [Wondermagnet](#)    [Engconcepts](#)    [KJM](#)    [Neoworld](#)

<http://amasci.com/beads.html>

Created and maintained by [Bill Beaty](#). Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

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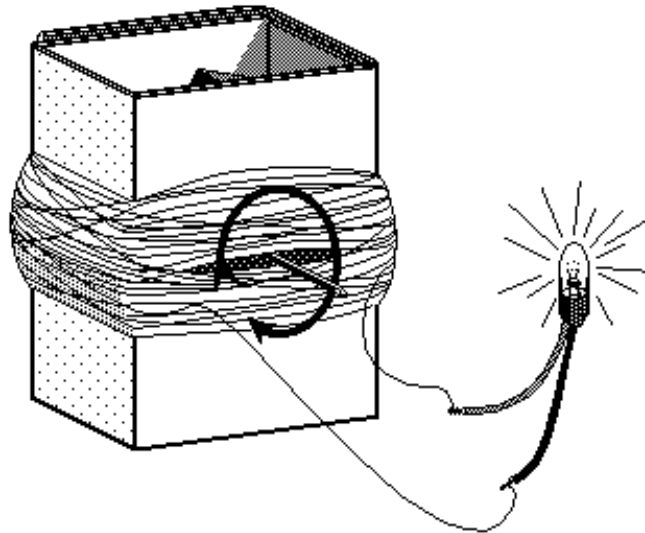
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# Ultra-simple Electric Generator

(c)1996 [William Beaty](#)

PARTS:

- 4 - 1cm x 2cm x 5cm [ceramic magnet](#), Radio Shack #64-1877 \$3.96 for 4
- 1 - #30 Magnet wire 200ft, Radio Shack spools #278-1345 \$3.99
- 1 - Miniature Incandescent Lamp, 1.5V 25mA Rad. Sh. #272-1139 \$1.29
- 1 - Cardboard strip, 8cm x 30cm
- 1 - Large nail, 8cm long or more
- Misc. - Knife or sandpaper to strip the wires
- Misc. - tape to hold wire down
- Optional: hand drill or electric drill to spin it (hand drill is best)



This is an AC electric generator which is capable of lighting up a tiny incandescent light bulb. The generator is made up of a hollow-ended cardboard box with a nail through the center, many turns of copper wire wound around the box, and four larger magnets clamped around the nail. When the nail and magnets are spun fast by hand, the little light bulb lights up dimly.

I wrote this article because I found lots of projects for making a simple electric motor, but nobody gave the secret for making a generator. Well, here it is: use strong magnets, lots of

fine wire, and a special light bulb which only needs 1/2 volt. Also, don't bother making a "commutator", just hook the wires directly to the bulb. It's much simpler that way but the generator will produce AC (alternating current).

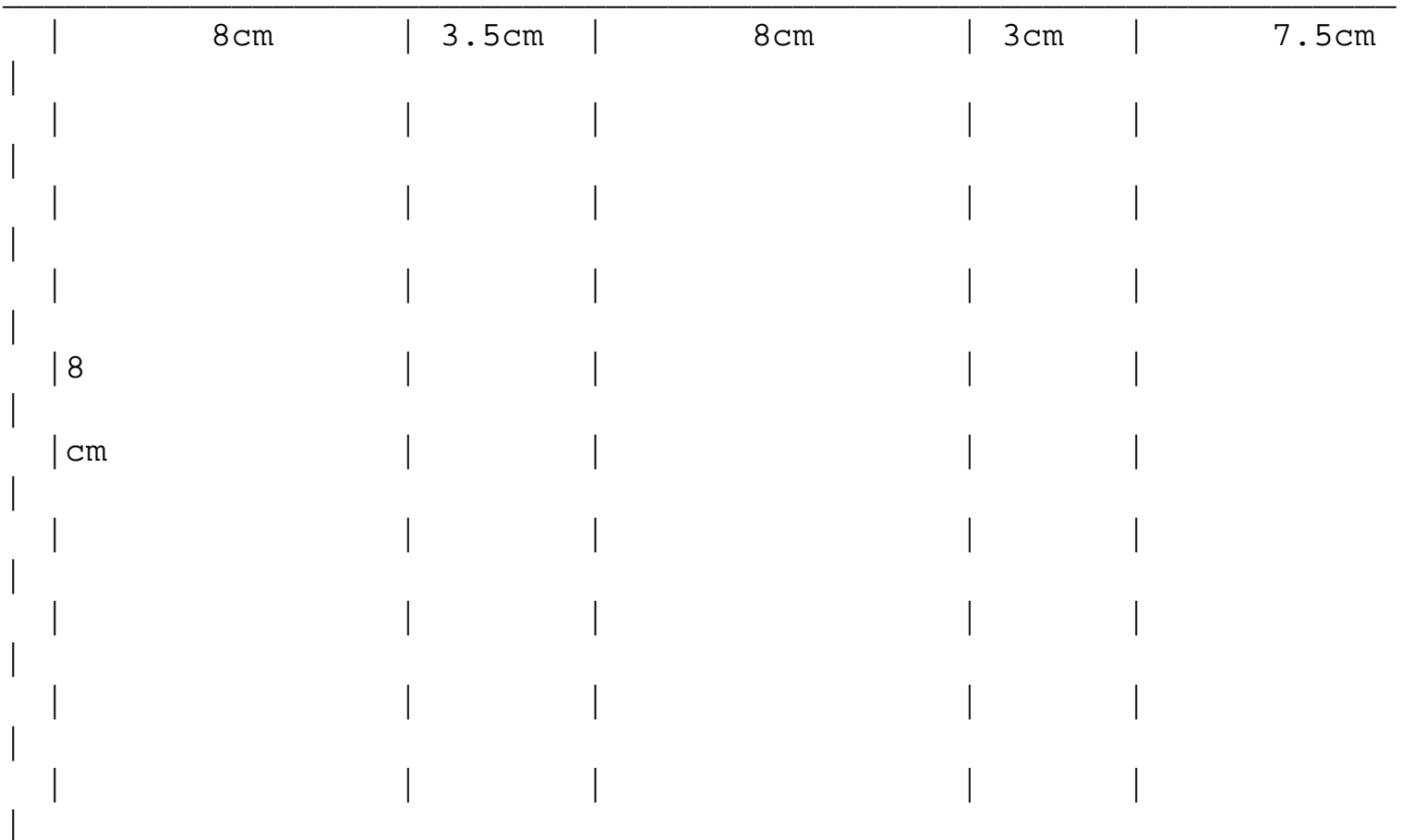
## INDEX:

- [Construction](#)
- [Testing](#)
- [How It Works](#)
- [Other Things To Try](#)
- [WARNING: magnets!](#)
- [Motor Challenge!](#)
- [If it doesn't work...DEBUGGING](#)

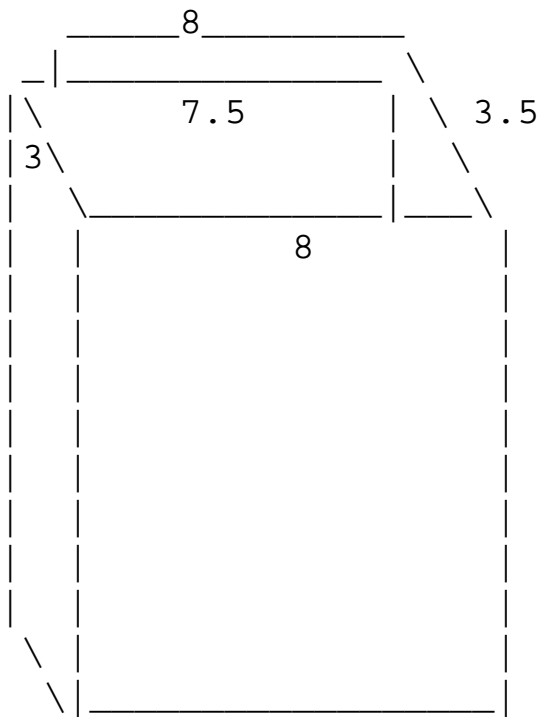
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## CONSTRUCTION

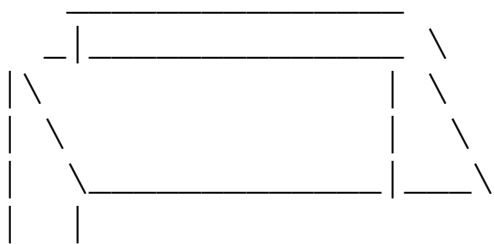
First make the hollow-ended box. Score the cardboard strip like so:



NOTE: this page must be displayed in COURIER FONT, otherwise these pictures will be wrecked and unreadable. Most browsers do this automatically.



Fold it like this and tape it securely.



perfectly  
the  
and all  
pull  
all

(hole)

0

Use the nail to poke a hole  
straight through the center of  
box, going through both sides  
three layers of cardboard. Then  
the nail out and use it to widen  
the holes slightly, so when you

put

be a



the nail back through, it will

bit loose and able to spin.

At this point you should clamp your four magnets around the nail and give it a spin. This makes sure the box is large enough. The nail and magnets should spin freely. The corners of the magnets should NOT bump the inside of the box as they spin. If the box is a bit too small, start over and make it a little bigger. Either that, or try a thinner nail.

[YES, you can build a plexiglas box instead if you wish.

However,

don't make it any larger than this. You want the wire to stay very close to the spinning magnets, so keep the box as small as possible.]

magnet wire from

thinnest.

magnet wire

all of

It's OK

the taped

down both

unwind.

wire left

Pick the spool of number-30

the kit of spools. This is the

Tape one end of the number-30

to the side of the box, then wind

the wire onto the box as shown.

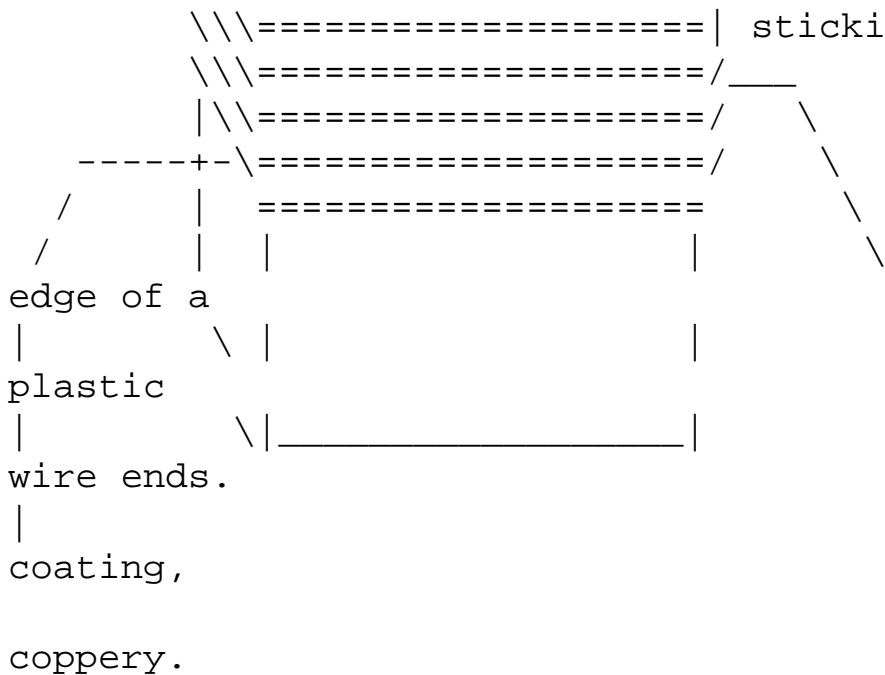
to cover up the nail hole. Pull

end of the wire out, then tape

of the wires so the coil doesn't

You should have about 10cm of



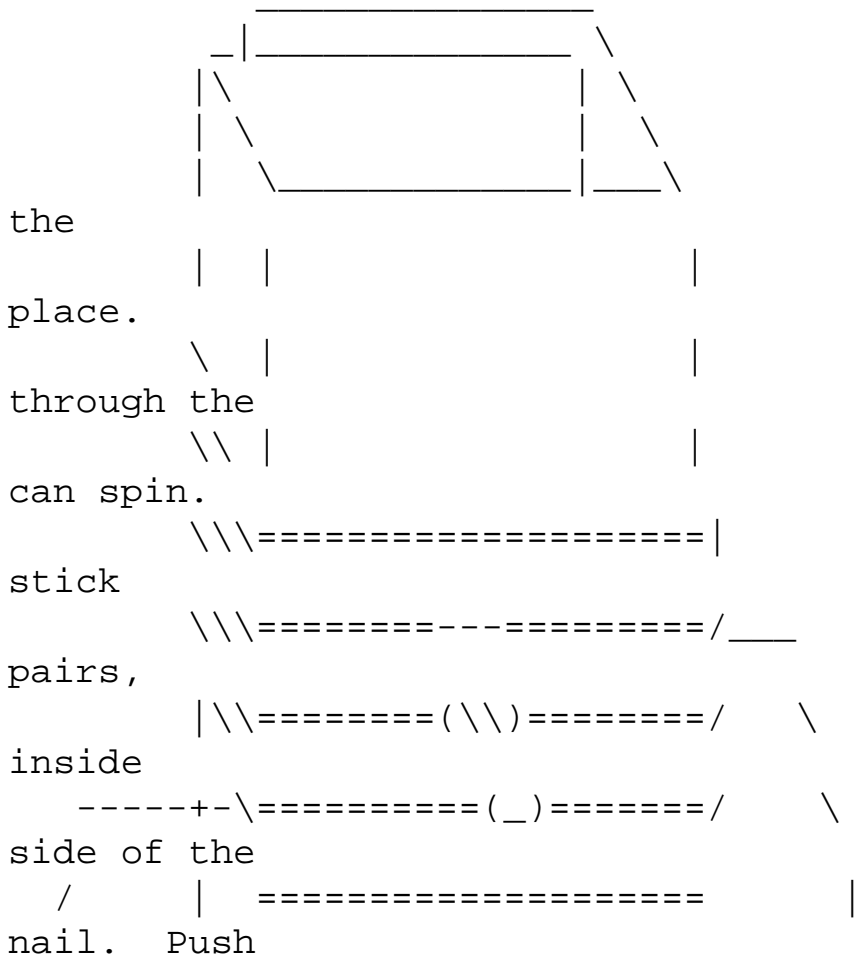


sticking out.

edge of a plastic wire ends. coating, coppery.

Use sandpaper or the knife to scrape the thin coating off 2cm of the Remove every bit of red so the wire ends are

(note: the five lines of wire shown above are not real, that's the 'equals signs' I used to draw with. The real wire can just be wound up in a big wad in the center of the cardboard box.)

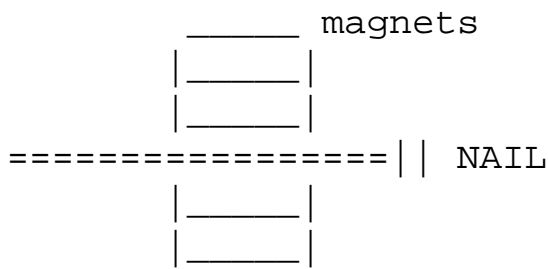


Spread the wire away from nail hole and tape it in place. Stick the nail back through the holes and make sure it can spin. Take your four magnets, them face to face in two pairs. Then stick the two pairs inside the box and on either side of the nail. Push

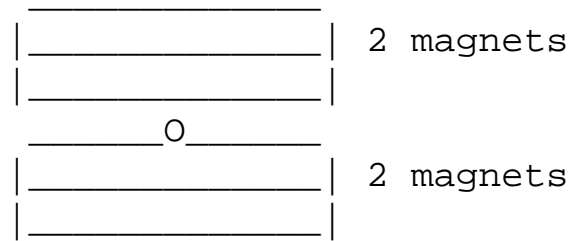


turn  
can  
cardboard  
straighten  
magnets so they  
nail.

them around until they  
what balanced and even,  
the nail and see if they  
freely. If you wish, you  
stick 2cm squares of  
between the magnets to  
them, and tape the  
don't move around on the



SIDE VIEW OF THE  
NAIL AND MAGNETS

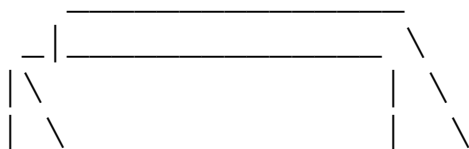


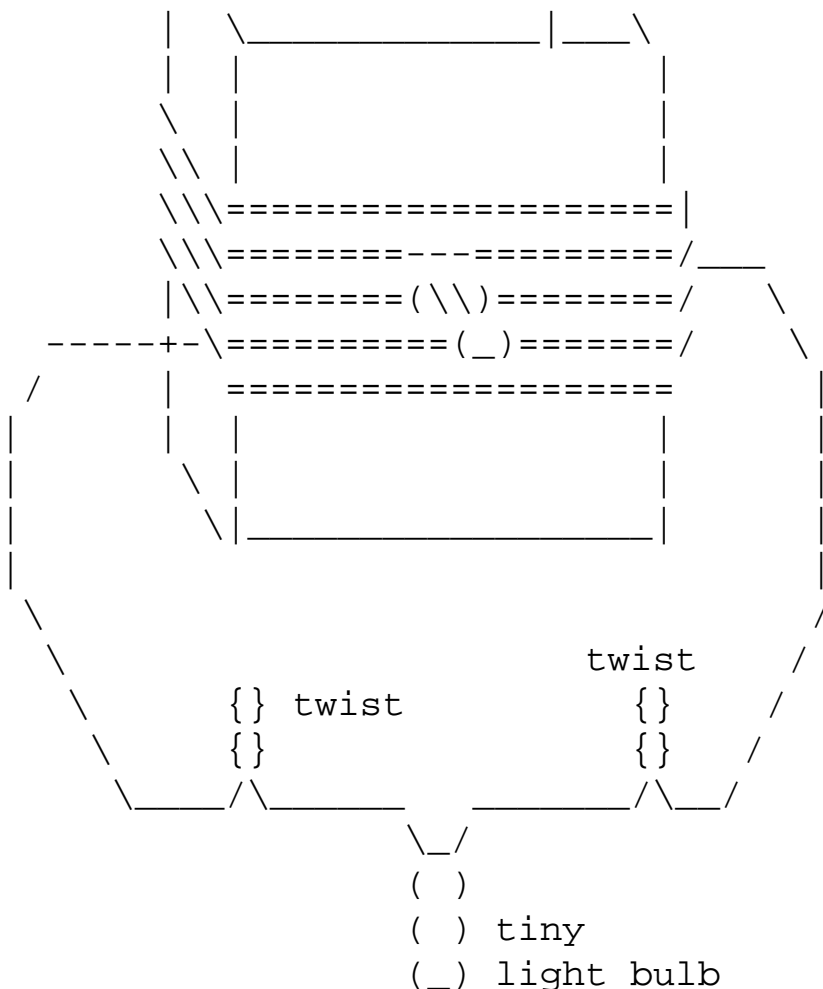
VIEW FROM THE END

## TWIST THE WIRES TOGETHER

Make sure that each end of the generator's wires are totally cleared of red plastic coating. If there is a bit of plastic left, it can act as an insulator which turns off your light bulb circuit.

Twist the scraped end of each generator wire securely around the silver tip of each wire from the small light bulb. (If necessary, use a knife to strip more plastic from the ends of the light bulb wires.) One generator wire goes to one light bulb wire, the other generator wire goes to the other light bulb wire, and the two twisted wire connections should not touch together. In the twisted wires, metal must touch metal with no plastic in between.





## TEST IT

Spin the magnet REALLY fast and the bulb will light dimly. If it doesn't work, try spinning it in a dark room so you don't miss the dim glow. If needed, adjust the position of the magnets so they don't hit or scrape the cardboard. This thing has to spin \*fast\*, and if the magnets whack the cardboard and slow down, you won't see any light. (IF IT DOESN'T WORK, SEE "[DEBUGGING](#)" BELOW)

Once you get it to work, try clamping the point of the nail into the chuck of a hand-crank drill. Spin the magnets fast with the drill and the bulb will light brightly. Don't go too fast or you'll burn out the bulb, or maybe fling magnets all over the room. You can try this with an electric drill as well, although electric drills don't spin as fast.

Note: your generator produces Alternating Current, not Direct Current. The output voltage is about 2 volts max, so there is no electric shock hazard at all.

## HOW IT WORKS

All metals contain a movable substance called "electric charge". Even uncharged wires are full of charge! After all, the atoms of the metal are made half of positive protons and half of negative electrons. Metals are special because their electrons don't stay connected to the metal atoms, instead they fly around inside the metal and form a type of electric "liquid" inside the wires. All wires are full of electric fluid. Modern scientists call this the "electron sea" or "electron gas." It is not invisible, it actually gives metals their silvery shine. The electron gas is like a silvery fluid. Sort of.

When a circle of wire surrounds a magnetic field, and the magnetic field then changes, a circular "pressure" called Voltage appears. This circular voltage tries to force the movable charges in the wire to rotate around the circle. In other words, moving magnets create electric currents in closed circles of wire. A moving magnet causes a pumping action. If the circuit is not complete, if there is a break, then the pumping force will cause no charge flow. But if the circuit is "complete" or "closed", then the magnet's pumping action can force the electrons of the coil to begin flowing. This is a basic law of physics, and it is used by all coil/magnet electric generators.

When the circuit is closed and the magnet is moving, charges in the metal are forced to flow. The charges of the light bulb's filament are pushed along. When the charges within the copper wire pass into the thin light bulb filament, their speed greatly increases. When the charges leave the filament and move back into the larger copper wire, they slow down again. Inside the narrow filament, the fast-moving charges heat the metal by a sort of electrical "friction". The metal filament gets so hot that it glows. The moving charges also heat the wires of the generator a bit, but since the generator wires are so much thicker, almost all of the heating takes place in the light bulb filament.

---

## OTHER THINGS TO TRY

Disconnect one wire from the light bulb. Spin the magnet. While still spinning the magnet, have a friend touch the wires together so the bulb lights up again. Is the nail still easy to spin? Keep spinning the magnet while your friend connects and disconnects the bulb. Feel any differences in how hard you must spin the nail? Also try spinning the magnets while your friend connects the generator wires directly together (with no bulb connected.)

## SO WHAT?

When you crank the generator and make the lightbulb turn on, you are working against electrical friction in order to create the heat and light. You can FEEL the work you perform, because whenever you connect the bulb, it suddenly gets harder to crank the generator. When you disconnect the bulb, it gets easier.

Think of it like this. If you rub your hands together lightly, the skin stays cool, but if you rub your hands together hard, your skin gets hot. It takes more effort to rub skin hard so that it heats up; it takes work. And in a similar way, it's hard to heat the lightbulb filament, it takes work. You twist the generator shaft, the generator pushes the wire's charge through the tiny filament, and if you don't keep spinning the magnet, the magnet will be slowed quickly.

---

## **FEEL THE ELECTRONS**

When your hand spins the magnet, you can feel the extra work it takes to light the bulb. This happens because your hand is connected to the flowing charge in the bulb, and when you push on it, you can feel it push back on you! How is your hand connected to the flowing charges? Your hand twists the nail, the nail spins the magnet, the magnet pushes the invisible magnetic fields, the fields push the movable charges, the charges flow slowly through the light bulb filament, and the tiny filament causes friction against the flow of charge and heats up. But then the reverse happens! The charge can't move much because of the tiny filament, so it resists the pressure from the magnetic fields, which in turn resist the pressure from the magnet, which resists the twisting pressure from the nail, which resists the twisting pressure from your fingers. So, in a very real way, you can FEEL the electrons in the light bulb filament. When you push them, you can FEEL their reluctance to move through the narrow filament!

---

## **TURN OFF THE FIELD**

Try changing the magnets' position. Remove the magnets, then tape them around the nail so that the two stacks are clinging side by side, rather than stacked up in a line. Spin the magnets. Does the light bulb still light up? No. This happens because The N pole of one magnet stack is very close to the S pole of the other, and vice versa. The magnetic field is now stretching between the two stacks of magnets, and isn't spreading outward. Most of the field is trapped between the adjacent magnet poles, so the field doesn't extend out through the coil. On the other hand, when you make a single stack of magnets instead, the field extends outwards for many inches, and if you spin the single magnet stack, the field cuts through the wires and pumps their electrons into motion.

---

## **MOTOR CHALLENGE!**

There is a simple way to convert your generator into a motor. It involves using paint or tape to insulate a spot on one side of the nail, then using a 6V battery and using the generator's wires, touching the nail to form a switch. The rotating magnets turn the nail, which turns the coil on and off at just the right times. Can you discover the trick?

---

## MAKING DC

You can change this generator so it makes DC rather than AC. The voltage is still very low, so it's not very useful. If spun very fast, you might be able to recharge a tiny 1.2v rechargeable battery. (Maybe you could add lots more turns of wire to the coil to increase the voltage?)

Converting to DC, the hard way: add a spinning "commutator" switch and sliding metal "brushes," so that each time the magnets turn half way, the switch reverses the generator connections. There is an easier way: Add a one-way valve! An "electricity valve" is called a diode or rectifier. If you connect a diode in series with one of your motor wires, it will only let the charges flow in one direction. It will change the Alternating Current into one-way flow (called "pulsating direct current.") Try diodes from Radio Shack such as 1N4000 or 1N4001. Unfortunately it takes about 3/4 volts to force charges through a diode, and this voltage subtracts from your generator output. Try using a special diode with lower voltage, such as 1N5819 from digikey.com.

---

## MAGNET WARNING

**WARNING:** Keep the magnets away from computers, disks, videotapes, color TV sets, and wallets and purses containing credit cards. Try this: Keep the generator far from your color TV, turn on the TV, start spinning the nail so the magnet is spinning fast, then bring the generator about 2ft away from the TV screen. **DON'T BRING IT CLOSER!!!** Keep spinning the magnets, and you'll see a cool wobbling effect in the TV picture, along with some color changes. The field from the magnet is bending the electron beam that paints the picture on the screen. Be careful, if you bring the magnet about 15cm away, the iron sheet inside the TV picture tube will become magnetized and the distorted colors will be permanent.

---

## DEBUGGING

**SPIN IT FAST, IN THE DARK.** Sometimes your generator is working fine, but you're not spinning it fast enough. Or perhaps the dim glow of the light bulb is being missed in a brightly lit room. So, go into semi-darkness. Then spin the thing **REALLY FAST**. Try cranking it with an old-fashioned drill. Or try sticking a little wheel on the nail, then rub it on the spinning tire of an upside-down bicycle (don't go too fast or the bulb will burn out.)

**DON'T USE DIFFERENT PARTS.** This generator cannot power a normal flashlight bulb, it needs the special 25-milliamp, 1.5-volt bulb sold by Radio Shack. Don't use a normal flashlight bulb, since that kind of bulb requires way more energy before it starts to glow. If you simply cannot find the Radio Shack 25mA bulb, you can use a 1.5V 40mA bulb, but add twice as much magnet wire to your coil (buy two of those kits of magnet wire.)

**DON'T USE OTHER MAGNETS**, use the large Radio Shack large rectangular magnets. They cost about \$1 each, and have no holes through the center. Most other magnets are way too weak and will not work unless you spin the magnets incredibly fast, at thousands of RPM (revolutions per minute.)

If the generator refuses to work, inspect the spot where the wires twist together. The generator coil has a very thin red plastic coating, and you must clean ALL of this coating off the wire ends before twisting them to the light bulb wires. Also, the tips of the light bulb wires must be stripped clean of plastic. The metal wires must touch together. If there is plastic between the metal of the generator wire and the light bulb wire, the circuit will be "open" and no charge will flow.

Make sure the magnets are positioned correctly. Do this: stack up all four magnets so their widest faces are clinging together. Then jam the nail through the crack in the middle of the stack. Then take this apart, and re-assemble it inside the generator in the same way.

Be sure to follow the instructions and diagrams. You **MUST** wind the coil so the coil goes across the side of the box which has the nail hole. If you wind it so no coil is crossing the nail-hole side of the box, then the magnetic fields won't cut across the wires, and no electric voltage will be created.

Also, don't wind the coil over the open end of the box, otherwise you won't be able to get your fingers inside to make changes to the magnet.

If you cannot spin the magnets fast enough with your fingers, try a "twist drill" or hand-crank drill. Clamp the nail in the end of the drill and spin the magnets as fast as you can. An electric drill may work too, but most electric drills don't move as fast as the hand-cranked type.

**DON'T SUBSTITUTE THE MAGNETS OR THE LIGHT BULB WITH A DIFFERENT TYPE.** It needs strong magnets and a low-voltage, low-current incandescent bulb. If your generator doesn't work, check the parts again and make sure you have the right type of magnets and the right type of light bulb. Don't use fewer magnets. Weaker magnets may work in theory, but you won't be able to spin them fast enough by hand, and a high speed motor will be required in order to spin them. Don't use an LED. A red LED could work in theory, but you need at least 1-1/2 volts to barely light one up (the green or blue kind need even higher volts.) The light bulb is better because it lights up at less than 1/2 volt. (If you really must light up an LED, use the red kind, and also add about three more spools of #30 wire to your generator coil.)

Perhaps your luck is bad and you got a dead light bulb. To test it, get any new, fresh 1.5V battery, take the bulb off the generator, then touch one wire to the top of the battery and one wire to the bottom. The light bulb should light brightly. If it stays dark, the bulb is bad.

The generator can be improved by using more turns of wire. You used only the spool of #30 wire. With more wire, the magnets don't have to spin as fast to light the bulb. Connect the thinnest of the remaining spools of wire to the wire that's there, making sure to scrape the wire ends totally clean before twisting them together. Make sure to wind the extra wire in the same direction as the rest of the coil.

Or, if you want to light your light bulb REALLY bright, buy a second kit of wire, hook the second #30 spool to the coil you have already made, then wind all the wire onto the coil. Be sure to clean all the red plastic off the ends of the extra wire you've added.

---

## LINKS

- [Beakman's motor](#)
- [Ancient motors, generators](#)

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Created and maintained by [Bill Beaty](#).

Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

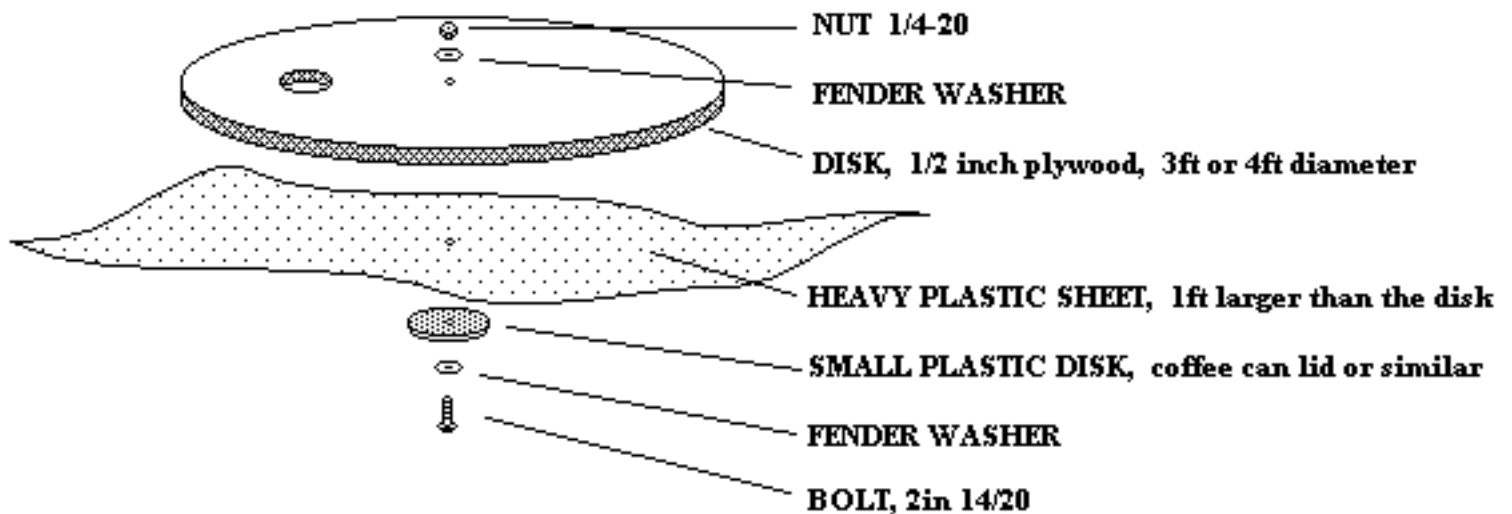
Best if viewed with [ANY Browser](#).



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# Science Fair Project ULTRA-SIMPLE HOVERCRAFT can lift several adults!

1997 [William J. Beaty](#)



## NEEDED:

- PLYWOOD, 3ft or 4ft square, 3/8in or 1/2in thick (or buy a 48in precut round tabletop).
- PLASTIC SHEET, 1ft larger than the above wood (Avoid using 1mil thickness garbage bags, instead use a heavy 4mil or 6mil plastic dropcloth from a paint store, or 'Visqueen' sheet, or an old plastic shower curtain)
- LEAF BLOWER (battery powered, or gasoline), or use the type of old-style 'ShopVac' cannister vacuum cleaner which has a blower outlet.
- SMALL PLASTIC DISK, coffee can lid, or 6" disk 1/8in thick plastic or thin wood.

- BOLT, 2in, 1/4-20, NUT, 1/4-20, FENDER WASHERS (TWO)
  - or instead use four small self-tapping wood screws
- SMOOTH FLOOR (linoleum, ball court, or smooth concrete)
- electric saber saw, drill, razor knife, staplegun, duct tape
- Optional: lawn chair and clamps/screws to hold it down.
- Optional: some sort of rubber bumper for the edge. Nail on some old bike tires? Just cover it with duct tape?

## [LINKS](#)

# INSTRUCTIONS:

## MAKE THE WOOD DISK

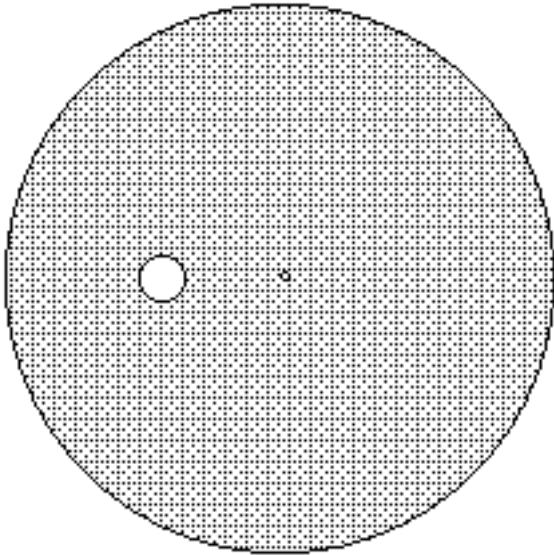
Cut out your plywood disk. You can leave it square, or experiment with other shapes instead of round, but the sharp corners can hurt people. Round is best for safety.

Drill a 5/16in hole in the exact center, and make sure that the 2in bolt easily passes through it.

**NOTE: people tell me that you can avoid using a big bolt. Instead, fasten down the small plastic disk with several short wood screws. This is a big improvement! Kids sitting on the hovercraft won't get poked in the butt anymore by that big bolt sticking up.**

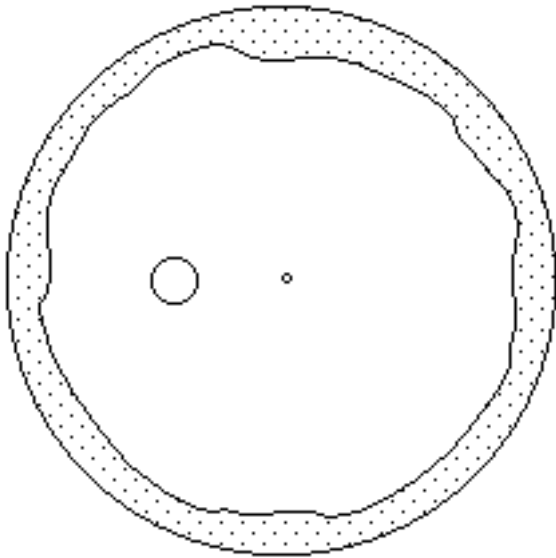
Make a hole in the plywood which exactly fits the end of your leaf blower or shopvac hose. This hole must be placed half

way between the center of the disk and the edge, as shown below. It's a good idea to trace the hole in pencil on the wood (place the mouth of the leaf blower on the wood and trace around it.) It DOES NOT have to fit perfectly. Later you can seal any leaks with duct tape. Or just let it leak. The hose should be flush with the bottom surface (don't let it stick out or the floor will block the air flow.)



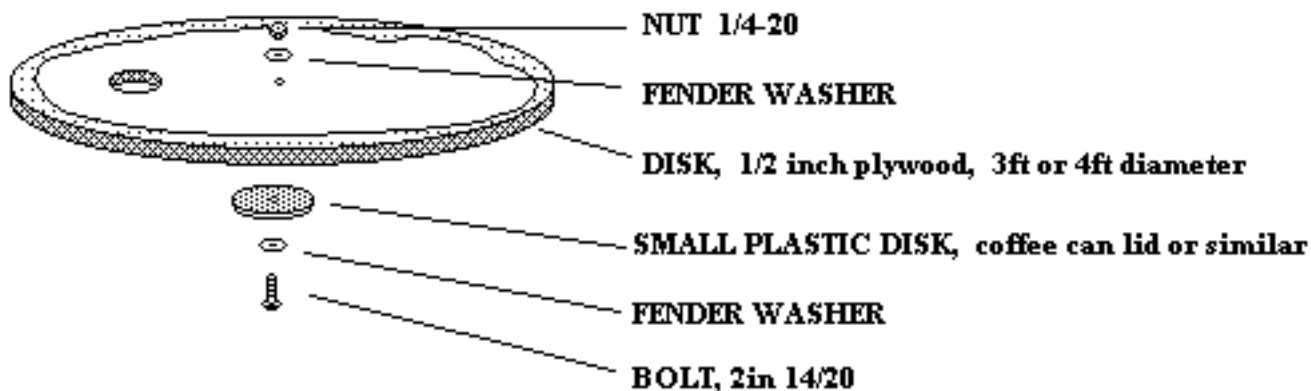
### MAKE THE PLASTIC SHEET

Next, lay your plywood disk on the center of your large plastic sheet. Fold the edges of the sheet up over the plywood, then use the staplegun to staple it to the top of the plywood disk. Put a staple about every 4 inches. The plastic should be tight against the wood, but don't pull it TOO tight or the plastic will tear loose when inflated. When finished, you can cut off the excess plastic. If you wish, used duct tape to tape the edge of the plastic down to make it look nice. From above, it should look like this:



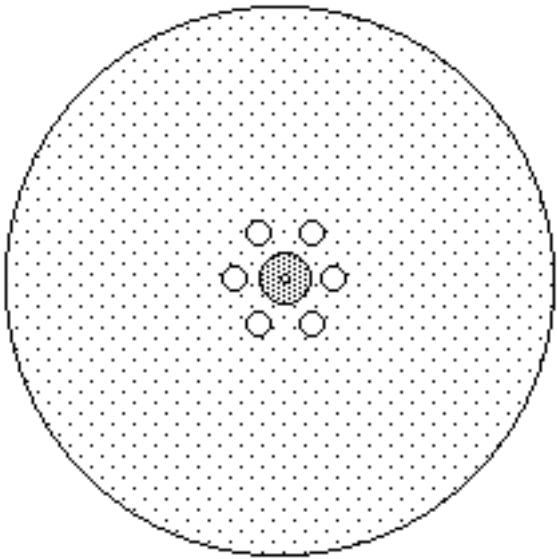
### ADD THE "SKIRT LIFTER"

Poke a hole in the center of the coffee can lid. Attach it to the bottom of the hovercraft as shown below. It goes over the plastic sheet. It pins the plastic sheet firmly against the plywood. (The coffee can lid forms the "donut hole" when the leaf blower slightly inflates the plastic into a "donut" shape.)



## CUT THE CENTER HOLES

Use your razor knife to cut six vent holes in the plastic as shown below. They should be about 2in diameter. They must be placed within a few inches of the coffee can lid. Space them out so that there is plenty of plastic between each of them. But if they are too far away from the center, they will become plugged when the plastic sheet lays flat against the floor. If the plastic between the holes is too narrow, it will tear. If you wish, reinforce the thin necks of plastic between the holes using a couple of layers of duct tape.



## DONE!

Flip your hovercraft over so the plastic sheet is on the bottom. Place it on a smooth floor. Stick the leaf blower into the hole and turn it on. The plastic on the bottom should inflate. **If it does not, lift the plywood up a bit to let the air get in and inflate the "skirt."** The hovercraft will lift up slightly and start gliding around.

## DEBUGGING

If it doesn't work, first read the above article again to see if you missed anything.

Always make sure to lift the wood disk up a few inches while the blower is running. If the disk stays flat against the floor, then the air can't get out of the blower, and the plastic sheet will never inflate.

When you turn it on for the very first time, run it on a smooth shiney floor such as linoleum or a wooden Gym floor. Try other kinds of rough floors and rugs later, after you know it works. Smooth dirt works OK, but it makes a big cloud of dust. I've never tried it on water.

If too much air is leaking from the around the leaf blower, add some temporary duct tape at the point where the nozzle goes into the hole in the wood.

Still no luck? Maybe your plastic sheet is too loose. Turn the hovercraft up on edge and turn on the blower. The plastic sheet should inflate, and it should lift up from the wood by only three or four inches. If the sheet is too tight then it will tear loose from the staples. But if it's too loose it will form a floppy bag and won't glide around.

**DON'T** use a hair blow-dryer, it won't work. You need either a "Shopvac"-style vacuum cleaner, or a lawn leaf blower. If you use a Shopvac, remove the dust bag and use the Shopvac's blower outlet (the hovercraft needs pressure, not suction!)

## HOW IT WORKS

The air inflates the plastic which pushes upon the floor and provides a ground-hugging "skirt." This lifts the entire hovercraft. The coffee-can lid provides "strain relief" for the plastic sheet, so that the inflated plastic doesn't tear loose from the center. The coffee can lid also lifts up the plastic so air can escape through the vent holes and pressurize the center donut-hole. The air then leaks along the floor and out from the edges of the hovercraft. This creates an "Air Film Bearing" which has very low friction. The plastic isn't touching the floor. Instead it is riding on a thin layer or "film" which is made out of air. Climb aboard!

This hovercraft can support many hundreds of pounds. It works best on very smooth surfaces (linoleum, or school gym floor.)

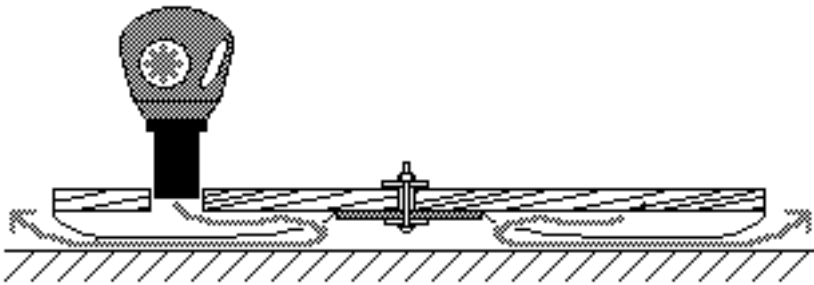
PS

if you want to experiment, maybe you could try four or five blow-dryers with their heat turned off. I know that a single blow-dryer doesn't supply enough wind, but several blow-dryers might do the job. Also, think of ways to drive your hovercraft forwards. Maybe a big fan would work. (I KNOW that a couple of CO2 fire extinguishers work well as rocket propulsion, but they're too dangerous for kids to use.

PPS

Where did this hovercraft idea come from? The device is called an "air film bearing" and has been used to move heavy loads on flat floors for many decades. Physics teachers used them for classroom

demonstrations, and we had one when I worked at the Museum of Science in Boston. I first saw the home-built plastic sheet version in [THE PHYSICS TEACHER](#) magazine in late 1989 or early 1990, called "human hockey puck." I built one in 1990 and found that the holes in the plans didn't work right, so I moved them close to the center. We used hovercrafts for outreach classes at [The Science Club](#) for years; giving out plans to kids so they could secretly build one and amaze their friends. Finally I realized that people on internet didn't know about this cool device, so I wrote my own hovercraft article in 1997 (first one on the internet, as far as I know.) Here's a set of [photocopied plans](#) for "Human Hockey Puck," from 1990 from a college physics teacher. I wonder if David Arlander is the original inventor? Or maybe they copied it from The Physics Teacher magazine?



Lift it up at the start,  
otherwise the bag might  
not inflate.

## SAFETY ISSUES

**ADULT SUPERVISION REQUIRED!** Don't let little kids play alone with this device.

- To be safest, operate the hovercraft in a small classroom. (In the school gym adults must control it, since it can get going too fast!)



- Climb aboard carefully, since the thing is darned slippery. Or climb aboard BEFORE turning on the blower
- Bystanders should watch their feet, since the edge of the moving board can give stubbed toes. (WEAR SHOES!!)
- Don't push it too fast, and remember how to stop it quickly: yank the leaf blower out of its hole.
- Don't jump off it while it's moving, or you'll launch it at high speed in an unexpected direction (it could crash into somebody's feet.)
- Don't remove the leaf blower suddenly while it's moving fast, because the hovercraft will stop, but the passengers will keep going... fast!
- SUGGESTION: attach a long rope to the hovercraft, and let it trail behind. That way it can be grabbed if it starts going too fast in the wrong direction. Even better: use an AC-powered leaf blower or shopvac, and have an adult remain near the wall outlet. If the hovercraft moves too fast, yank the power plug to put on the "brakes." Use this only in emergencies, since the passengers will fly off when the hovercraft suddenly halts.

## HOVERCRAFT LINKS:

- [Brian's](#)
- [H. Rheam](#) version
- [C. Palmer](#)
- [Twofoos square version](#)
- [Simple version](#)
- [Hovercraft races](#)
- [U of MN 'Human hockey puck'](#)
- [U. of Virginia 'Human hockey puck'](#)
- [Photos of similar device](#)
- [D. Williamson](#) hovercraft, ceiling-sucker
- [Lots more links \(google search\)](#)

- [Plans GIF](#)
- [Another plans GIF](#)
- [A more complicated version](#)
- [Lots more links](#)
- [SRL Hovercraft](#), driven by four home-built jet engines

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Created and maintained by [Bill Beaty](#). Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

# BUILD AN ANTIGRAVITY BOULDER

[Bill Beaty](#) 2003

Tie a piece of carrot to a mylar helium balloon. The weight of the carrot will drag it down. Nibble the carrot smaller. If you do it carefully, you can find the weight that cancels out the bouyancy. The balloon will neither rise nor sink. Instead it will drift annoyingly around the room.

Years ago there was a helium tank at work, and I had a mylar "emergency blanket" in my car. I have an idea: giant floppy helium balloon! So I duct-taped the mylar into a roughly tetrahedral bag-shape about 80cm across and filled it with helium. It gave considerable lift, and it needed a considerable counterweight in order to attain neutral bouyancy. I tied a plastic cup full of water to the bag and adjusted the amount of water.

Brainstorm! Cover the whole balloon with duct tape so the counterweight is distributed completely evenly. There would be no single weight at the bottom. That way the balloon would behave like a boulder in free fall: it would remain in whatever orientation I put it in (rather than rotating to put the weight at the bottom.) And when gently spun (or after any collision) it should continue rotating around any axis for a long time.

So I started applying 20cm strips of black duct tape to the mylar bag, letting the balloon stablize before applying the next strip to the (new) top location. That way the balloon tells me

how to distribute the duct-tape-mass evenly (I always put the next piece of tape directly across from the heaviest spot.) Then I applied smaller and smaller strips as I got closer to zero lift.

It worked great. I ended up with a huge, black, misshapen "boulder" which drifted around the room. If bumped, it would rotate end over end like an asteroid. I could grab it and fling it at somebody, and it would strike them with considerable impact (since it probably massed about half a kilogram not including the surrounding air mass it would entrain.) When thrown, it looked very unnatural, since we'd expect an object to fly in a parabolic trajectory. This one was completely straight. It also seemed very strange to encounter a large thing drifting around in the warehouse. After about half a day it settled to the floor as a bit of helium slowly escaped and increased the downwards net force so much that air convection could no longer waft it around the space. But I could then remove one or two tape strips from the bottom to restore it to "zero weight" again.

Next time: use white tape instead of black, then use an airbrush or spray paint to sketch in lots of lunar craters. Or perhaps print out some actual asteroid photos on 11x17 paper and plaster them all over the surface with #33 spray-on rubber cement (then add some extra helium to compensate.)

Someday I also want to make about fifty of these things and leave them in a big lab at work early in the morning before the victims arrive.

Anyone remember the Rocky & Bullwinkle episode about the old prospector and his mine where he was digging out negative-mass mineral called "upsi-daisium?"

- Interesting: [hover-disk](#) neutral density toy
- More detrius: [hoaxes](#)
- More detrius: [cracked-brain variety](#)

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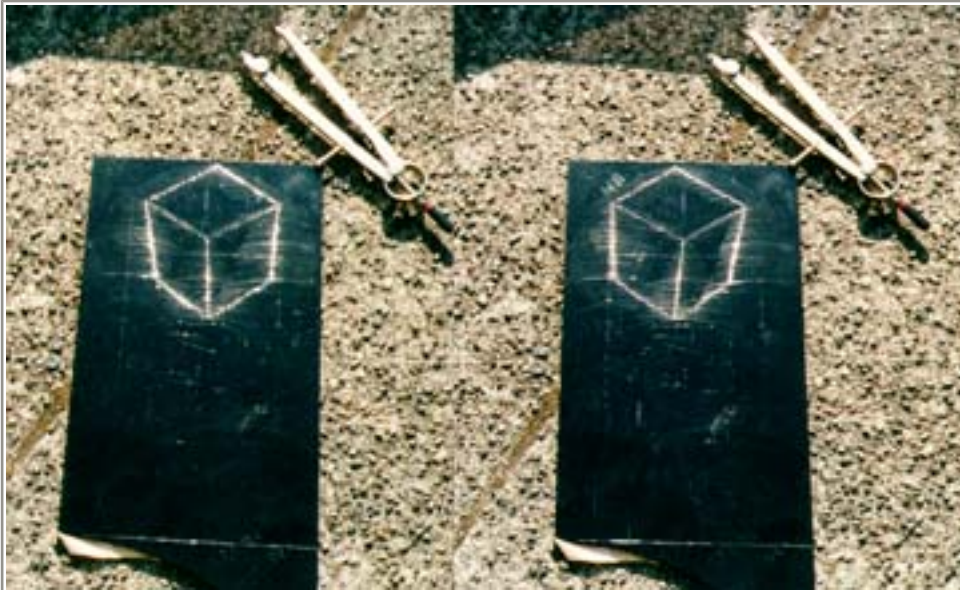
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# HAND-DRAWN HOLOGRAMS

(c)1995 [William J. Beaty](#)



([stereo](#) pair, crosseye technique)

**Giant-fringe holography? nondiffractive holograms? single-fringe holograms? scratch holograms? sandpaper holograms? abrasion holograms? scratch-o-grams? holosketches? wire-brush holograms? car-hood holograms? phonograph holograms? incoherent holography?**

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[SPIE paper](#) | [FAQ](#) (fabrication hints) | [Other instances](#) | [Not true holograms?](#)

I've stumbled across a technique for drawing holograms directly upon a plastic plate by hand. It sounds impossible, but I've been sitting on the livingroom sofa making holographic images of floating polyhedra, words, 3D starfields, opaque objects, etc. No laser, no isolation table, no darkroom, no expensive film plates. This takes nothing more than a compass and some scraps of plexiglas. Too cool, if I say so myself!

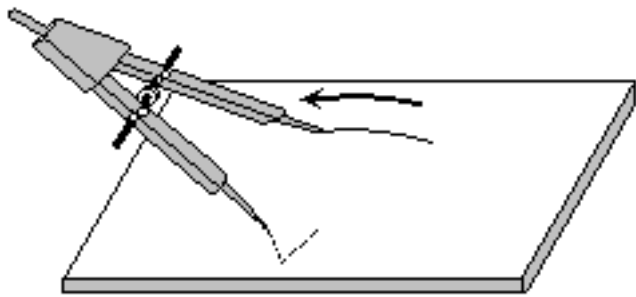
There's an interesting story behind this technique, but first, the instructions.

Obtain a small piece of acrylic plastic and a good, non-wobbly set of "dividers" (a compass with two points.) I used a \$10 compass from an art supply store and replaced the pencil lead with the supplied metal point. The compass must be the type with an adjusting screw to set the spacing of the points. Or, you can use a 4-in. piece of wood with a couple of finishing nails driven through it to form a pair of points.

Next, use a marker to draw a simple pattern such as the letter "V" near the lower edge of the plate. This will be the image that we'll encode onto the surface. Draw your "V" about 1 in. tall (2cm). Set the spacing of the compass points to a couple of inches. Place one point on the tip of the small "V" at the bottom of the square, and \*gently\* drag the other point lightly across the plastic so you make an arc-shaped scratch that looks something like the figure below. [[BETTER IMAGES](#)] This is your first scratch. It helps to tilt the compass so the point trails



across the surface and does not dig in or chatter. The scratch should be easily visible, but not extremely deep. The scratch should be dark and polished, not

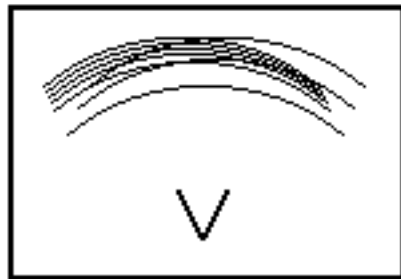


white and dusty. It should show a small highlight when viewed in sunlight or under a

pointsource illuminator such as a small, clear light bulb. Now, while keeping the dividers at exactly the same spacing, place the point at a different place on the little "V" and use the other point to make a single circular scratch as before. Do this again and again, ten times or more, each time placing the point on a different spot on the little "V". When completed, the overlapping arc-shaped scratches should look like you've swept a bit of sandpaper across the top of the plastic plate. The little letter "V" should be full of holes made by the other point of the compass.

[\[Detailed Instructions\]](#)

To view the resulting hologram image, observe the scratches in sunlight. If your plate is



transparent it helps to place something black behind it, or to paint the rear surface dark for contrast.

While holding the plate chest-high with the little "V" towards your body, rotate yourself around so you

face the sun, tilt the plate up and down, and look at the scratches. At a certain angle you will see a moving highlight in the scratches. It will look like a collection of little stars, a mini- constellation in the shape of the letter "V". That's the hologram. If you go back and add more and more scratches in between the ones you already made, eventually your letter "V" hologram will look like solid white lines rather than rows of stars.

When viewed with both eyes open, the "V" seems to float deep within the plastic. Its virtual depth is determined by the compass: if the spacing of the points was set to 1 in., the image appears 1 in. below the plastic surface. You can also hold the plate upside down, with the scratches at the edge of the plate towards your body, and the holographic image will float in space above the plate.

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"Research is to see what everybody else has seen,  
and to think what nobody else has thought."  
- Albert Szent-Gyorgi

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- [How do they work?](#) (SPIE Imaging 2003 paper)
- [Frequently Asked Questions \(FAQ\)](#)
- [MORE HINTS FOR MAKING/VIEWING](#)
- [Email discussion](#)

- [But are these really holograms?](#)



Several [hologram plates](#).

(Obviously you cannot see the 3D effect in this flat photograph.)

Depending on the tilt of the plate with respect to the sun, you might accidentally discover the "pseudoscopic" image of the "V," and it may appear to float \*above\* the surface of the plastic. Tilt the plate to bring the far edge up and towards you and you'll then find the "orthoscopic" image floating deep within the plate.

If you had inscribed your entire name on the plastic, you'd now be seeing it down there within the surface. (hint hint!) It's also possible to draw complicated 3D objects by varying the compass spacing as you slowly draw glowing lines one point at a time. The distance between the compass points controls the depth of the hologram-dots you are making. I've been drawing cubes, pyramids, and

holes with glowing stars at the bottom. As with conventional holograms, opacity effects can be achieved by controlling the location of the endpoints of the scratches. And many other sophisticated effects produced by conventional rainbow holography can be duplicated in black plastic and scratch patterns.

## **CHANCE FAVORS THE \*CURIOUS,PLAYFUL\* MIND**

All this all started while I was walking along the rows of cars in the parking lot at work. I noticed this one black station wagon hood that had a number of glowing highlights created by the sunlight. Typical science hobbyist response: I stopped and began playing with them. I was moving my head back and forth in order to make them slide around, when I noticed that some of the highlights seemed to exist a few inches **WITHIN** the surface of the car hood. I've long been interested in stereo images, so I started examining these "deep" highlights in detail. Some of the larger ones had an interesting structure, appearing as an 8 in. circular blotch of light with a radial pattern of filaments and a mottled central area. All these highlight-patterns seemed identical, and were floating at various depths within the car hood.

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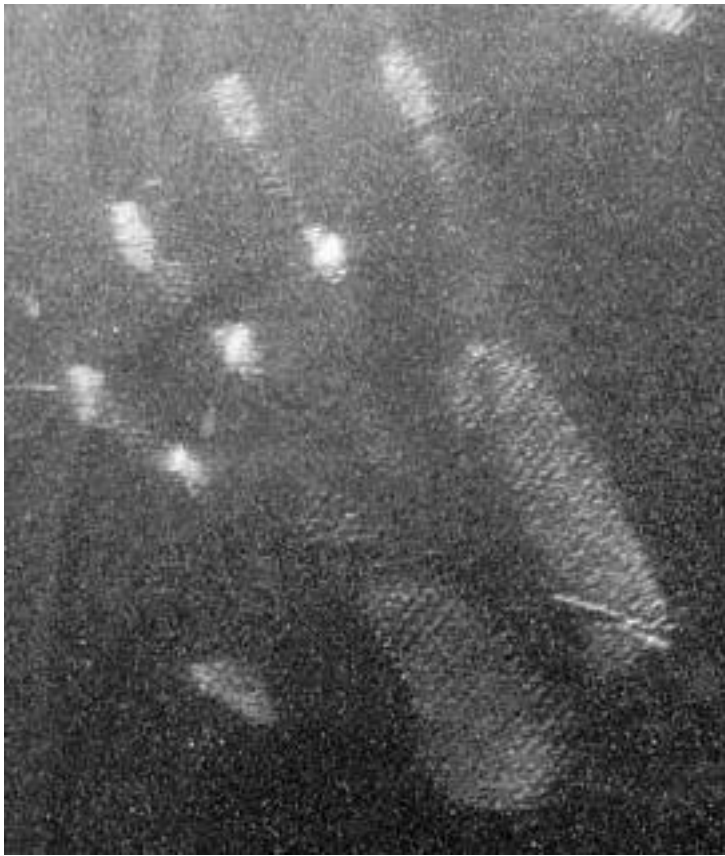


[Gritty car hood after careful "polishing" with a dry paper towel.](#)

The handprints in the above photo might appear to be on the surface of the hood, but in real life they look holographic and seem to float about one foot deep within the surface of the hood. Looks like white fish in a dark pond.

---

With a start I suddenly I realized what I was seeing. It was incredible: each highlight was in the shape of a wool polishing mit, with matted fibers in the center surrounded by outwards-pointing wooly filaments! The matted part was in the shape of a human hand! There were several of them floating at various depths all over the car hood, with some of them even floating in space \*above\* the hood. They had been invisible to me, but then they weren't. [Science is perception!](#) It wasn't long before I had half the engineering department out there acting like fools, moving their heads back and forth in front of this black station wagon. I searched through the rest of the sunlit parking lot and found several other cars with glowing handprints deep within various surfaces.



[Closeup of handprint pattern, 6" virtual depth](#)

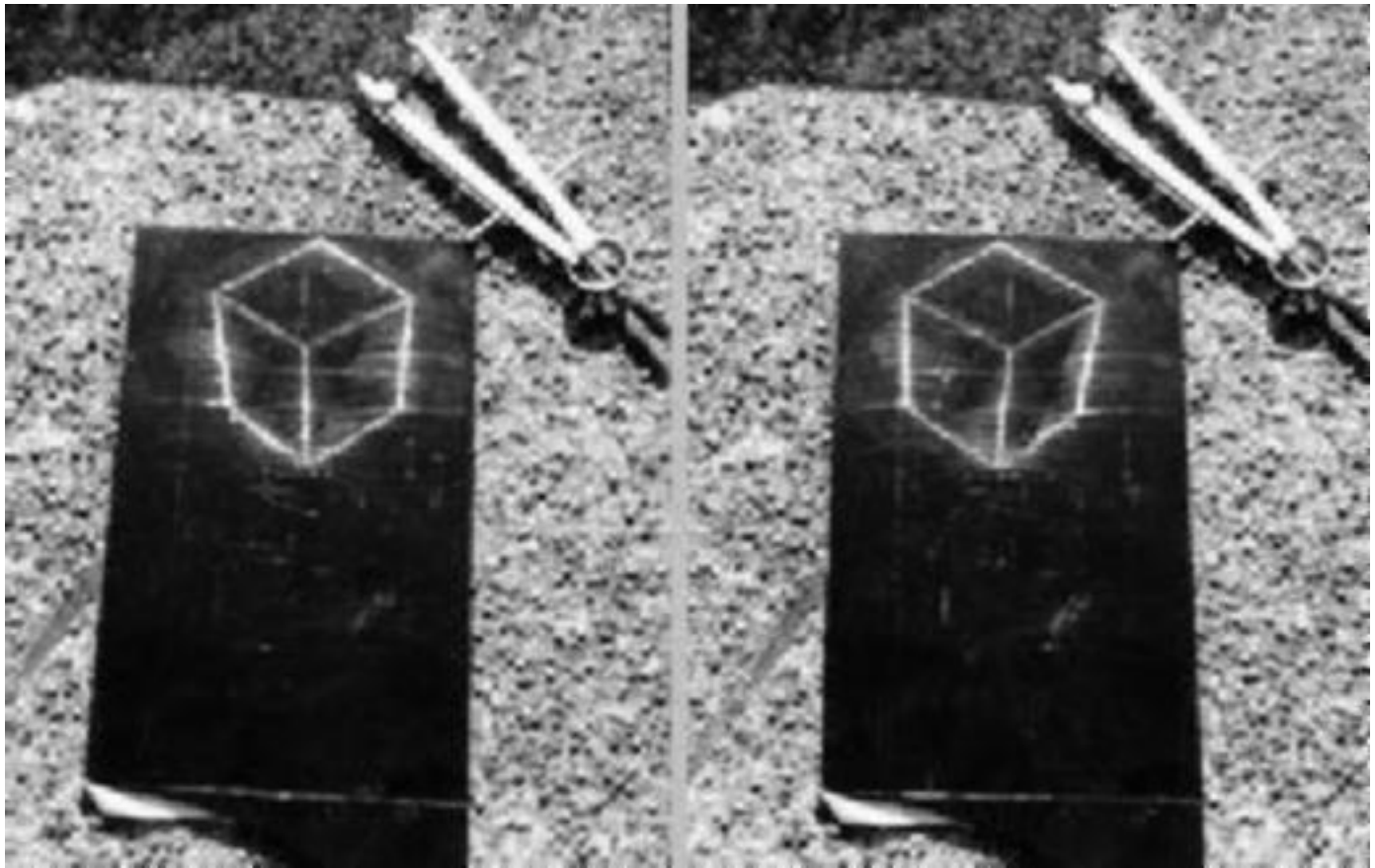
I proposed several crude theories to explain the phenomena, as well as numerous hoaxes which could be done via [Elvis-shaped polishing mitts](#) to encode miraculous images onto everyday objects. (The Hood of Turin?) It was about a week before I figured out what was really going on. The images were naturally-occurring holograms. The owner of the car had obviously polished the hood with a dirty mit, and the millions of particles of grit in the mit traced out millions of nearly-parallel scratches in the black paint. The particular hand motion had created a geometry of abrasion patterns which turn out to be nearly identical to the interference patterns which make up those embossed-foil Benton whitelight

But there was something extremely weird about the abrasion patterns on the hood (I mean even more weird than their causing images!) These scratches have random spacing. They seemed to be functioning as holograms without the benefit of optical interference. This is impossible of course, since holography is completely based upon interference effects. However, the "Rainbow" hologram technique invented by Benton allows a hologram to function regardless of

illumination frequency. The classic single-stage "Rainbow" holography setup includes a horizontal slit which produces relatively large horizontal swatches of fine-line interference patterns on the film, and these encode the depth information as variations in orientation of the fringes across the stripe. In Benton's Rainbow Holograms, only the fringe orientation is important. Once I was clued in by the existence of the car-hood holograms, I realized that I could also interpret Benton's technique as allowing holograms to function regardless of \*fringe spacing.\* Frequency independence leads to size independence of fringes. No one seems to realize that a Rainbow Hologram will still function if the spacing of its fringes was made random. Or if it were to be made immensely large.

(See: [Are they \\*really\\* holograms?](#), and [Scratch-holography FAQ](#))

No one seems to realize that the well-known "Rainbow Hologram" technique can also let you produce holograms which are not based on optical interference at all. It makes it possible for you to create holograms where the "interference fringes" are so large that they are easily seen by the naked eye,; where they are more like the grooves of an LP record than like the patterns on a CDROM. And if the arrays of hyperbolic interference fringes in a conventional Rainbow Hologram are replaced by widely-spaced, hand-ruled scratches on a plastic plate, it becomes possible to draw complicated holographic images directly by hand with a sharp tool. Multiple parallel scratches aren't necessarily required, and circles can replace the hyperbolae. The circular-scratch technique is able to produce holographic images, and sweeping circular motions of gritty polishing mits can produce these holograms accidentally.



[Hand-drawn cube hologram](#)

**(STEREO PAIR, for crosseyed viewing)**

Has anyone heard of this trick before? I've yet to find it mentioned in any holography article or text. It's starting to look like this is something new...

(AHA! Someone clued me in. A 1992 paper by Plummer & Gardner (ref. below) details just such a discovery. The authors completely analyse the math behind the reflections made by arrays of circular scratches produced by the orbits of a lapping tool on a metal mirror. - Bill B., 10/23/95

Noah Spurrier points out a SciAm article on phonograph record optics from 1989. And Nils Abramson points out a predecessor of the curved-scratch technique from 1930!)



Now I hear that Gabriel Liebermann was making scratch-holograms with an NC-machine back in 1981! See an article on his piece called "[World Brain](#)"

The scratch-hologram technique might be very useful in reducing the amount of data required for computer-generated holography. The size independence characteristic suggests that billboard-sized holograms wouldn't be impossible to build. Also, an incoherent-light holo-camera is feasible: if an object is illuminated with structured light resembling a dense random starfield and is photographed at  $2f$  distance by a camera having a curved slit-aperture over its lens, and if the resulting plate is used to etch fine lines onto a metal or plastic surface, the result will be a photographically produced "scratch hologram" of the original object.

Conventional Rainbow Embossed holograms do trounce it badly in the brightness and sharpness categories, but conventional techniques won't let you create a "physics demo" hologram with giant interference fringes easily viewed with the unaided eye. And conventional holography won't let you sit by the side of a lake in Vermont with plexi and dividers, drawing holographic virtual images of floating polyhedra by hand.

- Bill Beaty [billb@amasci.com](mailto:billb@amasci.com)

P.S. The required tools are so simple that primitive peoples could have drawn these images in hardened sooty resin pools with wooden tools, had they but known the trick. Several ancient civilizations were heavily into geometry. I wonder if any artifacts exist in storage somewhere which appear to have some 'sandpaper marks' on their polished surfaces... ;)

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## REFERENCES

Nils Abramson, [Incoherent Holography](#), Proc. SPIE Vol. 4149, p. 153-164, Holography 2000, Tung H. Jeong; Werner K. Sobotka; Eds.

W. Plummer & L. Gardner, Applied Optics, V.31 No.31, Nov. 1992, pp. 6585-6588, *A mechanically generated hologram?*,

[Hans Weil, 1930s work](#)

E. Garfield, Essays of an Information Scientist, V5 pp348-354 1981-82 ISI's "World Brain" by Gabriel Liebermann: The World's First Holographic Engraving (3ft x 4ft scribed aluminum), also [Liebermann's site](#) and some [machine drawings](#)

Jearl Walker, WHAT DO PHONOGRAPH RECORDS HAVE IN COMMON WITH WINDSHIELD WIPERS? The Amateur Scientist, Scientific American. July 1989 Vol261 No1. pp106-109

"A Binocular Illusion" by Paul Kirkpatrick in American Journal of Physics. Vol. 22, No 7. Page 492. October 1954.

"Reflections on a gramophone record" by J.B. Lott in Mathematical Gazette. Vol. 47, No. 360. Pages 113-118. May 1963.

F. S. Yu, A. Tal, H. Chen, Optical Engineering, Vol.19 No.5, pp. 666-678, "One-step rainbow holography: recent development and application."

W. Siemens-Wapniarski, M. Givens, Applied Optics, March 1968, vol 7 no 3, p535 "Experimental Production of Synthetic Holograms."

## LINKS

- Hand-drawn Hologram [Frequently-asked Questions](#)
- [Email discussion](#)
- [Other occurrences](#) of "scratch holograms"
- [It's not holographic?](#)
  
- [Laser Focus WOrld](#) covered scratch-holos in 3/2003
- TLC's show [While you were Out](#) had a scratch-holo in [Thinking man's room](#) (see the "after" version)
- "[World Brain](#)", scratch-holos in 1980
- Discussion of scratch-holograms on [metafilter](#)
- [John Gusty's page](#) on old-master painting techniques
- [Engine Turning](#)
- [Integraf](#), laser-pointer holograms, Russian film plates
- [3D Hacker](#)
- [3D Links](#)
- [Webseum](#) holography links page
- "[Virtual Window](#)" video display (Jesse E.)
- [Holo Hardcopy](#), S. McGrew, NLI
- [Hologram history](#)
- [3DVG](#) anomalous stereopsis

## SOME HOLOGRAM HOBBYISTS

- [Holography Forum](#)
- [Laser pointer Holograms](#)
- [Holography in Norway!](#)
- [Holografie](#) (Deutch)
- [3Dimagery](#), make your own holograms

- [DeFreitas' Webseum](#) (excellent!)
- [SAS: Amateur Holography](#)
- [LASER](#) Laser Arts Soc. for Edu. & Research
- [Practical Holography](#), online book

Buy these books at AMAZON.COM:

[Homemade \(laser\) Holograms : The Complete Guide to Inexpensive, Do-It-Yourself Holography](#)

[The Complete Book of Holograms : How They Work and How to Make Them](#)

[Holography Handbook : Making Holograms the Easy Way](#)

[Practical Holography](#)

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ALSO: the hand-drawn hologram project now appears in:

[Laser Focus World](#), March 2003

TLC's show [While you were Out](#) had a scratch-holo in [Thinking man's room](#) (see the "after" version)

[Helix](#) #65, April/May '99

[Yesmag](#) Science Magazine, #9, Spring '98 p25

...and was featured in an old episode of "The Big Bang", a children's science TV show in the UK.

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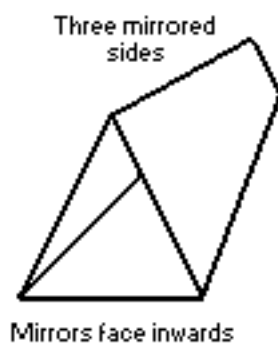
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# THE DISGUSTOSCOPE

(c)1998 [William J. Beaty](#)

Beautiful radial symmetry and pristine mathematics,  
perverted into a revolting, horrible,  
yet highly amusing little optical toy.



[\(links\)](#)

In 1988 I was playing with some 12" squares of mirror while looking for interesting decorative effects to use in a museum exhibit on electronics. I found that a trio of mirrors placed together on edge upon a tabletop would cause a "kalidoscope" effect. Even better, the view inside this 3-sided mirror-chamber revealed infinite vistas of three-dimensional polished wood, stretching off into the distant horizon. And if I tilted the mirrors slightly outwards, the flat tabletop became a sphere. Cool!

This was different than a regular kaleidoscope because the effect was 3D. In a normal kaleidoscope we look at colorful patterns inside a triangular mirror-tube, but we use just one eye. If the end of the kaleidoscope tube was enlarged so that both eyes could look into the end, then the scene would become 3-dimensional. The 3D scene within the mirrors is eerie, since it stretches off into the distance in all directions. Reminds me of childhood, and looking into the tilted world within those mirrors at the shoestore.

I used this idea and built the kaleidoscope below. By placing it against any textured surface, it would convert the surface into a spherical geodesic dome, where little triangular facets are all made from the original textured surface. Quite beautiful.

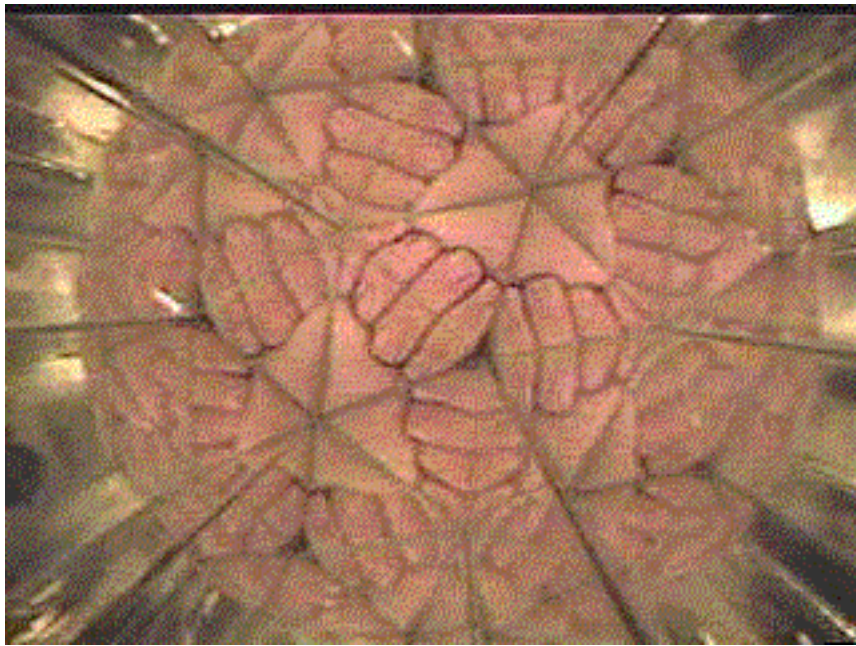
Unfortunately the esthetic history of this device immediately was diverted from "wow!", and became "feh!"

I placed the device against the table and made a beautiful wooden sphere. I stuck it on paper and made a "Japanese lantern." Shadows on the paper created animated, symmetric geometrical patterns. I moved it in and out, and the "lantern" would change size. I stuck it against my arm and... **YEESH! A FLESHY BALL OF SKIN, COVERED WITH SWEATY HAIR!**

I moved my arm up and down. The ball of flesh throbbed. I put the palm of my hand on the end of the mirror device, and made a nice clean smooth sphere of

skin. I cupped my hand to fold the skin, and this produced an obscenely pulsing wrinkled flesh-ball. I shoved some fingers into the end, and saw a spiny sphere of waving fleshy pseudopods. I placed it against the side of my fist, clenched and unclenched it, and created throbbing organic orifices. I grabbed coworkers, placed my mouth against the end, made biting and tongue movements, and said "Look into this thing." They recoiled in revulsion and/or hilarity.

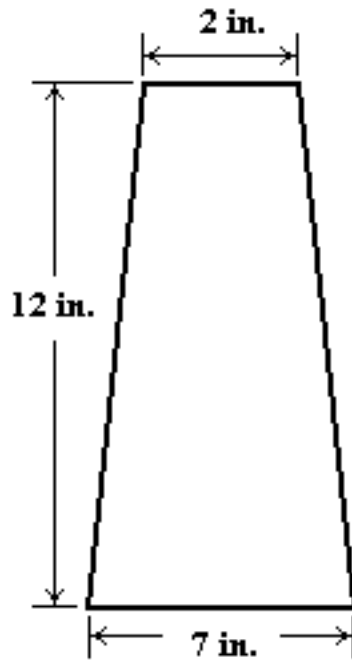
Thus was born THE DISGUSTOSCOPE.



## Construction:

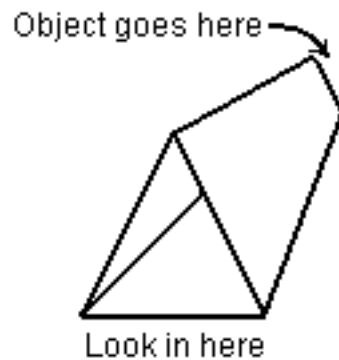


Obtain some mirror material. Glass mirror works best, although acrylic mirror is very easy to cut with a saw and is much safer for kids. (Glass looks better though. The 3D images in the glass mirror are clearer because it's flat, and the acrylic mirror is always very slightly wavy.) I used a package of 12" glass mirror tiles bought from a large hardware store, and cut them with a glasscutter-scribe and a straightedge. The 1/16 inch mirror works fine, although it is easily broken, therefore young children shouldn't use a Disgustoscope made from glass. For a plastic disgustoscope, use 1/8" acrylic mirror.



Make three mirrors in the above shapes. Use duct tape to fasten the shapes together edge to edge, with the mirror facing inwards. If you use glass, then either use emery sandpaper to grind down the sharp glass edges, or cover them with more tape.

Note: to make a much smaller Disgustoscope, cut your mirrors so they are 8.5 inches long, so the narrow end is 2.5 inches across, and the wide end is 6.5 inches.



Try it out. Place yourself under a ceiling light. Put the smaller end of the Disgustoscope flat against a wooden tabletop, and look down into the wider end. You'll see the wooden geodesic sphere. (Note that it isn't a real geodesic shape, since lots of the triangles overlap strangely.) Place your hand there instead, and you'll see the throbbing ball of skin. Place the smaller hole upon your eye, then have a friend look into the larger hole while you glance from side to side. They will see a spherical glob-monster covered with eyes, and the eyes will be swerving about crazily. **WARNING**, your victim may become overly amused, and experience a sudden need to collapse onto the floor with uncontrollable giggling.

## Illumination

With your face on the big hole and your hand upon the small, both ends are plugged and it gets dark inside. To solve this problem, I cut pieces off the corners of the mirrors on the larger end. This leaves holes through which outside light can shine. If you've made your Disgustoscope of plastic, you can scrape off some of the mirror material near the sides of the larger hole. This leaves translucent patches. Or, rather than taping the three mirrors together, you could glue an acrylic half-round rod between two or more of the acrylic mirrors. (Orient the rod so the rounded part faces inwards.) This would produce a

transparent slot for illumination.

## Spoiling the fun

It's possible to convert your Disgustoscope into a non-Disgust-oscope. Cut out a triangle of clear acrylic plastic to match the size of the small opening in the device. Sandpaper one surface of the plastic to give a frosted finish. Glue the triangle permanently into the end of your nonDisgustoscope. This gives a "Japanese Lantern" effect, and all sorts of moving colorful patterns may be placed upon the sanded plexiglas. But those 3-D... uh... "organic" shapes... are no longer possible.

## Am I insane? I could get rich!

The original Kaleidoscope was invented in 1816 by Sir David Brewster, a Scottish physicist. He demonstrated it during a lecture, and soon the streets were full of Kaleidoscope-sellers. Brewster did patent his idea the next year, but he was far too late. The cat was out of the bag, the light had escaped from the mirrored box! Word is that he never made any money from it at all.

So in the grand tradition, I put Disgustoscope on the internet. If it gets really really popular, then I can go and get a worthless patent.

Just like Sir David! :)

OK, now go and [DRAW YOUR OWN HOLOGRAM](#). Man, if I was alive in 1930, I could have founded holography. But with my luck, I would end up in 1500, and after taking a look at the images inside the d-scope, I'd be burned at the stake...

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## Kaleidoscope Links

- [Infinity Mirrors](#)
- [Kaleidoscope Heaven](#) webpage
- [Symmetry & Harmonics](#)
- [Kaleidoscope History](#)
- [Mark N's Spherical Kaleidoscope Images](#)
- [Todd's animated spheres](#)
- [Kaleidotile program](#) (Macintosh)
- [Video Kaleidoscope](#)
- [Walk-in kalidoscope](#) at Exploratorium Museum (and [JPEG image](#))
- [Exploratorium: build the kaleidoscope](#)
- [Cliff Pickover's Space Kaleidoscope](#)

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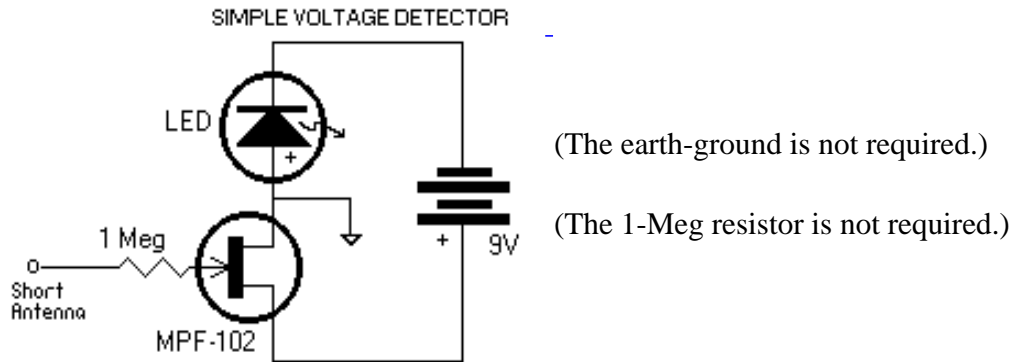
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# RIDICULOUSLY SENSITIVE CHARGE DETECTOR

(C)1987 [William J.](#)

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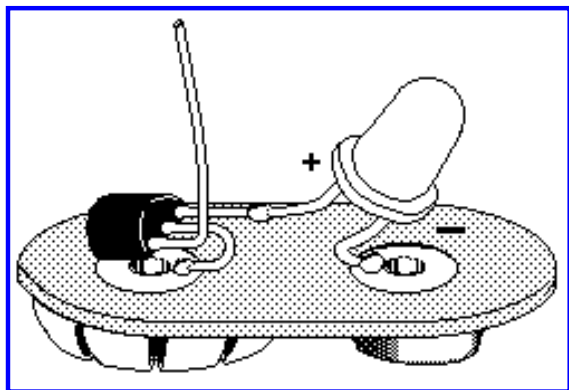
This simple circuit can detect the invisible fields of voltage which surround all electrified objects. It acts as an electronic "electroscope."

Regular foil-leaf electroscopes deal with electrostatic potentials in the range of many hundreds or thousands of volts. This device can detect one volt. Its sensitivity is ridiculously high. Since "[static electricity](#)" in our environment is actually a matter of high voltage, this device can sense those high-voltage charged objects at a great distance. On a low-humidity day and with a 1/2 meter antenna wire, its little LED-light will respond strongly when someone combs their hair at a distance of five meters or more. If a metal object is lifted up upon a non-conductive support and touched to the sensor wire, the sensor can detect whether that object has an electrostatic potential of as little as one volt!

- Note: I use the term "electrification" rather than "charging", in order to avoid confusion between charge and net-charge. Charge is the stuff on the negative electrons and positive protons, while net-charge is the imbalance between positive and negative particles which appears on everyday objects. Realworld objects become "electrified" whenever their pre-existing + and - charges are not equal.

## PARTS LIST:

- 1 - Standard 9-volt battery
- 1 - MPF-102 N-channel Field Effect Transistor (FET) [Radio Shack #276-2062](#)
- 1 - Red Light Emitting Diode (LED) Radio Shack #276-041
- MISC:
  - Battery connector (#270-325)
  - Alligator Clip Leads (#278-1156)
  - solder, if desired
  - 1-meg resistor (not required)
  - plastic, fur, foil, comb, tape dispenser, plastic cup



(Tiny version built atop a 9v battery connector)

### Shortcuts:

- [1.CONSTRUCTION HINTS](#)
- [2. SENSE E-FIELDS](#)
- [3. SENSE POSITIVE ELECTRIFICATION](#)
- [4. CHARGE IS CONSERVED](#)
- [5. PEELING CAUSES ELECTRIFICATION](#)
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- [13. UNTESTED SUGGESTIONS](#)
- [14. HOW IT WORKS](#)
- [15. WHERE IT CAME FROM](#)
- [15. FET-PANEL MUSEUM EXHIBIT](#)
- [17. OTHER LINKS](#)

Recommended book: [Electrostatics](#) by A. D. Moore (lots of projects) , also [others](#)

---

## CONSTRUCTION HINTS

**Warning: don't connect the battery until you are SURE you've hooked everything up exactly right. It's possible to burn out the FET or the LED if they are connected incorrectly. Don't let the transistor's wires bump together even briefly, or it will flash the LED and burn it out.**

**NOTE: Don't ever connect any LED directly to a 9-volt battery, it will burn out the LED. Without the transistor to limit the current, a bare LED needs a 1000-ohm resistor wired in series if connected to the 9-volt battery.**

**Warning: Avoid touching the Gate wire of the FET. Any small sparks jumping from your finger to the Gate wire can damage the transistor internally.**

## QUICK INSTRUCTIONS:

Use three clipleads. Bend the Gate wire of the FET upwards (see the small diagram above to see which lead is the Gate, or check the diagram on the cardboard of the Radio Shack FET.) The Gate acts as an antenna, so leave it unconnected. Use one cliplead to connect the middle transistor lead to the red positive lead for the 9V battery clip. Connect the remaining transistor lead to the positive lead of the LED (the longer LED lead is usually the positive one.) Connect the LED's remaining lead (the negative one) to the black negative lead for the



9V battery clip. Check all connections twice, then carefully connect the 9V battery to the battery clip. The LED should light up. If the LED remains dark, try lighting it up by waving a charged plastic pen or ruler near the gate lead (charge it by rubbing it on hair.)

The 1-meg resistor helps protect the FET from being harmed by any accidental sparks to its Gate lead. The circuit will work fine without this resistor. Just don't intentionally "zap" the Gate wire with a charged object or your charged finger.

To test the circuit, charge up a pen or a comb on your hair, then wave it close to the little "antenna" wire. The LED should go dark. When you remove the electrified pen or comb, the LED should light up again.

IF IT DOESN'T WORK, the humidity might be too high. Or, your LED might be wired backwards, or the transistor is connected wrong, or maybe your transistor is burned out. Make sure that the transistor is connected similar to the little drawing above. Also, if the polarity of the LED is reversed, the LED will not light up. Try changing the connections to your LED to reverse their order, then connect the battery and test the circuit again. If you suspect that humidity is very high, test this by rubbing a balloon or a plastic object upon your arm. If the balloon does not attract your arm hairs, humidity is too high.

## **SENSE E-FIELDS**

Connect the circuit to its battery, and the LED will turn on. Comb your hair, then hold the comb near the Field Effect Transistor (FET) gate wire. The LED will go dark. This indicates that the comb has an excess of negative charge, and the FET responds to the electrostatic field surrounding the comb. It acts as a switch and turns off. Remove the comb and the LED brightens again. Wiggle the comb, and find at how great a distance the circuit still detects it. It's amazing how far an e-field extends around an electrified object. (But then, e-fields should extend to infinity, no?)

On a very low-humidity winter day the circuit will respond at a much greater distance. This happens because, when humidity is low, the combing of your hair then generates a much stronger separation of charge upon the comb's surface. Note that a metal comb will not work, since any separated charge immediately weakens by spreading to your hand and across your whole body. A plastic or hard rubber comb works well because rubber is an insulator and the imbalanced charge can't leak off the comb.

Try simply TOUCHING a plastic pen briefly to hair. The FET will detect even this tiny negative net-charge on the pen. The sensor will usually not indicate the equal positive that

appears on your hair, since hair is made conductive by humidity, and the positive net-charge leaks to your head. The polarity of the surface charge on the comb or plastic pen is negative. The rule for this FET is, negative charge turns the switch (and the LED) off.

## **SENSE POSITIVE ELECTRIFICATION**

This FET sensor is not an ideal educational device because it responds differently to positive than to negative. Create some positive net-charge by affixing a small tuft of hair or wool to the end of a plastic object (pen or ruler), then rub the hair upon another plastic object. (If we electrify some hair, we can avoid leakage losses by not touching it with fingers or other grounded object.) Bring the positively-electrified hair near the FET. Note that the LED becomes brighter, but when the hair is removed, the LED goes dark and stays that way. Bring the hair close by again, and the LED lights up again. Rules for this FET:

- negative objects turn the LED off, it lights again when removed.
- positive objects make the LED bright, then dark when removed.

Turn the LED back on by simultaneously touching fingers to the "Gate" wire and to some other part of the circuit. Or, touch a plastic pen to some hair, then wave it near the sensor, and the LED will light up. Remember this trick when doing other demonstrations. (Note: professional electrometers do not suffer from this "reset" effect, but professional electrometers cost several hundred dollars at the very least!)

## **CHARGE IS CONSERVED**

Mount a tuft of hair on a plastic rod, verify that it is completely discharged and does not affect the FET. Take a second plastic rod (or plastic pen!) and verify that it is also completely neutral. (Fondle the whole pen with slightly damp hands if not.) Now hold the plastic handle and touch the hair-tuft to the tip of the pen, separate them, then hold them up to the sensor one at a time. You'll discover that the end of the plastic pen is now negative and turns the LED momentarily off. The hair tuft is positive and turns the LED on, then off.

Contact between the hair and the plastic caused some asymmetrical sharing of the equal positive and negative "electricity" within them. When they separated, some negative charges stayed with the plastic, leaving it with more negatives than positive (net negative charge.) At the same time, the hair was left with fewer negatives than positives, for a net positive charge. Atoms were torn apart, "ionized", and pairs of electrons and protons were yanked apart and separated to vast distances. Note: "static electricity" is not caused by friction, it is caused by contact between dissimilar materials, followed by separation. We could say that it's caused by "peeling".

## PEELING CAUSES ELECTRIFICATION

The "peeling" effect can be demonstrated with a roll of plastic adhesive tape. Peel a few inches of tape off the roll and hold it near the circuit. The LED will show that the tape is strongly electrified. Now use the sensor to test the tape dispenser. You will discover that the roll of tape has an opposite polarity compared to the strip of tape. This illustrates that "static" electrification does not require friction, it only requires intimate large-area contact between dissimilar materials.

Matter is made of positive and negative charge, and the peeling of tape can separate the charges that were already there in the matter. Because the plastic backing of the tape is a different material than the adhesive, when they touch together there is asymmetric bonding and electron-sharing. This leads to separation of opposite charge when we peel tape from its roll. Also, try taking two strips of tape, stick them back to front (fold little tabs so you can separate them again,) pat them down with moist hands to discharge them, then peel them apart. Hold each near the sensor. One strip indicates strongly positive, the other is equally negative. The strips will attract each other. Try other demonstrations from [Sticky Electrostatics](#), using the Charge Detector to show polarity of various parts of the tape.

[NOTE: people have found that "Scotch" brand tape doesn't work as well for the above activity. It contains some chemicals that prevent electrification. Use some other, inexpensive brand of tape instead.]

## JUMPING ELECTRONS, "VOICE CONTROL"

If you build a tiny compact version of the FET circuit (solder it to a torn-open battery connector), you can try the following trick. Hold the circuit in your hand, make sure the LED is lit, stand on a rug, then jump up and down. The LED will flash on and off. Walk around, and the same thing happens. As your shoe soles make contact with the rug and then peel away from it, your entire body becomes electrified. This makes the sensor respond. AND when jumping, if you place your shoes back onto the oppositely electrified footprints, you cancel out the net charge and the sensor indicates another polarity change. Scuff your shoes, stomp up and down, jump around, and the sensor will flash wildly. Demonstrate to onlookers that the sensor does not respond when you shake it up and down, but it does respond when you jump. On a dry day, you can control the sensor with the tiniest motion: scuff one shoe, then lift the toe to turn the sensor on and off. Say "on", "off" while moving your toe, and you have a "voice control" magic trick. Let some poor fool examine the sensor, yell at it, etc. It will only respond to your voice! (grin!)

## VARIABLE GAIN

Obtain a small capacitor with a value below 100 picofarads. Connect it between the FET gate lead and one of the other FET leads (doesn't matter which one.) This greatly reduces the sensitivity of the device. In situations where the sensor is TOO sensitive, this can make a big difference. Capacitors larger than 100pF can be used, they REALLY wipe out the sensitivity in inverse proportion to the capacitance value. The capacitor does this because it forms part of a circuit called a "Capacitive voltage divider," a sort of loudness control for invisible voltage fields.

Now make the circuit MORE sensitive. Obtain an alligator clip-lead, and connect it to the Gate lead of the FET. Let it hang loose without touching anything. You'll find that this has vastly increased the sensitivity of your FET circuit. On a dry day it will respond to hair-combing from 20ft away. If a TV screen is present, the sensor will act weird (especially when people walk between the screen and the sensor.) The clip lead acts as an antenna, and the longer it is, the more sensitive the FET circuit becomes.

## FIELD DISTORTIONS

Electrify a plastic object, place it on an insulating support, place the FET sensor near it, then make sure the LED is turned on. If you now wave your hand near the object or the sensor, the LED will respond. Your hand causes the e-field around the object to distort and change. Even though your hand is not electrified, the FET responds. You've created a sort of "DC Radar" system which sends out a signal and then responds when nearby objects "reflect" the signal. Some types of industrial sensors ("proximity" or "capacitive" sensors) use this effect. Some burglar alarms do as well.

## VANDEGRAAFF SENSING

See at what distance your FET electrometer can sense the e-field from an operating tabletop VandeGraaff electrostatic generator. Suddenly discharge the generator by using a grounded sphere electrode, and watch the distant FET respond. You are actually sending out radio waves with nearly zero frequency when you do this. The FET does not actually respond instantly, there is a speed-of-light delay (about one nanosecond per foot of distance.) It takes a short while for the wave of vanishing e-field to reach the sensor. Radio waves are simply propagating changes in electric fields, so your [VDG](#) machine and FET sensor constitute a simple radio transmitter and receiver.

## HOMEMADE CAPACITORS

The FET circuit is so sensitive that it will detect the energy stored on a tiny homemade capacitor. Build a simple capacitor out of aluminum foil, styrofoam (from a coffee cup), and wires. Store energy in the capacitor by briefly connecting it to a 9V battery. Now touch one

capacitor wire to the negative battery terminal of the FET circuit, and touch the other capacitor wire to the Gate terminal (avoid touching the wires with fingers, this will discharge the capacitor.) The LED will indicate the stored energy. Use the 9V battery to reverse the polarity of the capacitor, then test it again with the FET and note that the polarity is indeed backwards. Note: don't use paper for your capacitor dielectric, paper becomes slightly conductive when humidity gets high, and your stored energy will mysteriously vanish because the paper offers a leakage path so the separated charges can recombine. Another note: this experiment demonstrates that "static electricity" and battery circuits are the same. The FET detects the potential difference created by the 9V battery, just as it detects the much larger potentials in the space around electrified objects. It is not too far wrong to say that "static electricity" is simply "voltage." Everyday circuits are driven by the "static electricity" produced by their low voltage power supplies.

## **DIPOLE ANTENNA**

After you use this FET device for awhile, you'll get the idea that it has just a single antenna terminal. However, like all voltmeters, it actually has two. The rest of the circuit acts as the other terminal. To demonstrate this, build a miniature version of the detector circuit onto the top of a 9V battery. If you hold the battery as usual, the Gate does act as the antenna, and negative objects make the LED go dark. Now carefully grasp the Gate wire between fingers and lift the whole device into the air. Avoid touching the battery. If you now hold a negatively electrified object near the battery, the LED will get brighter instead of dimmer. Polarity of operation has been reversed. If you lay the whole unit down upon an insulating surface and approach it with electrified objects, you'll find that the FET gate wire responds with one polarity, while the battery and the rest of the circuit responds with the other. Try connecting the gate wire to earth ground, then suspend the rest of circuit with an insulating handle. If you hold up objects having various polarities, you'll find that polarity of operation is opposite that of the gate wire.

## **'SCUSE ME, WHILE I SENSE THE SKY**

All over the earth, thunderstorms are transporting negative charge downwards and positive charge upwards. As a result, the earth is electrified negatively everywhere, while the sky is positive. (Actually, it's the conductive ionosphere which is positive.) The FET sensor can detect this. Take it outdoors, away from trees or buildings. Hold it high in the air, then lower it to the ground while watching the LED. (Maybe get a tall adult to do this.) The LED will get darker when the device is lowered, and get brighter when it is raised up. The earth is negative! Maybe hang a cliplead antenna on the sensor wire to improve sensitivity. (This polarity reverses when there is a thunderstorm directly overhead, but I wouldn't suggest standing out in the open when there is a chance that lightning may strike!)

## UNTESTED SUGGESTIONS

Here are a couple of things to try out. I haven't tested them, I don't know how well they work. You be first!

Electrify a large plastic object while no one sees, then have a group of people with FET charge detectors try to find which object in the room has the imbalanced charge.

Have everyone build FET electrometers. Line them all up in a row, electrify a plastic object, then sweep the object back and forth. You'll be able to "see" the electrostatic field that surrounds the object. Hold your hand near the row of detectors while standing on a rug. Jump up and down and see what happens.

Use a piece of cloth to create a small electrified spot on a plastic book cover. Use the FET device to find the spot. Draw an electrified shape using the cloth as a paintbrush, then see if you can use the sensor to figure out what the shape is.

Build many FETs and LEDs in a row on a wooden stick. Connect them all to one battery. Place a negatively electrified object on a table in a dimly lit room, then sweep the FET-stick rapidly past the object. Go back and forth really fast, and you should see a row of red lines caused by the moving LEDs. In the middle of the red lines will be a black splotch caused by the electrostatic field surrounding the negative object! Repeat this test, but this time use a bit of cloth to write the letter "A" on a plastic book cover in invisible, negative net-charge. Can you see the "A" when you sweep the stick back and forth? Mount your row of LEDs on some sort of motorized propeller, and you'll have an automated "charge detector disk."

## WHERE IT CAME FROM

The charge detector circuit is based on a much earlier circuit called "electronic electrometer" made with a vacuum tube. As a kid I found the schematic in an old paperback book on ham radio projects. It used a [6J7 tube](#) and an NE2 bulb and 100K resistor connected to the plate terminal. I blew away my allowance for weeks to buy that tube (plus a 6.3V transformer, plus a fancy bakelite box.) It used 120VAC line voltage connected to the cathode and the LED (the tube then acts as a rectifier.) The 6J7 tube has a terminal on the top which connects to the tube's Grid terminal (a "grid cap," rather than the more usual plate cap.) When a negatively charged plastic pen was waved near the grid, the glowing NE2 would turn off.

Other modern devices also respond to nearby charged objects. When FETs first came out, I bought one and used an ohm meter to measure across source/drain. Sure enough, when a charged object was waved near the unconnected grid wire, the ohmmeter reading went crazy. Also, if you have an FET-type opamp chip (TL072, etc.), and you leave the input floating, or

if you have CMOS logic chips with the inputs floating, they will sometimes act crazy when you wave your hand around them. Unless the humidity is very high, your body usually has enough DC charge to turn them on or off.

I tested several common FETs to find a sensitive one, and discovered that MPF102 was much more sensitive than the original vacuum tube I had as a kid. With a couple feet of gate terminal wire, I could turn it on and off by waving a charged plastic comb back and forth from over ten feet away. (With longer antennas it started picking up 60Hz hum, and was overloaded.) Later at the Museum of Science in Boston I designed an exhibit, an array of many hundreds of these things, each with a small steel screw as the antenna. See "[Aura Tester](#)". Also see a bit more [about the circuit](#).

## HOW IT WORKS

A complete description of this device requires delving into the physics of solid state electronics. Instead, here is a quick description based on the fluid analogy for electric charge.

Metals act as conductors NOT because charge can pass through them. Instead, they are conductors because they contain charge which can move. Think of a metal wire as being like a hose that's always full of water. And remember, vacuum is an insulator, even though it presents no barrier to charges.

The "sea of charge" in a metal is not compressible, and to remove even a tiny bit of it would take a huge amount of energy. In metals, each atom contributes one electron to an "electron sea", where the electrons don't stick to single atoms but instead orbit all throughout the material. If we could remove all the movable electrons from a metal, that metal would become an insulator. Unfortunately, removal of electrons from even the thinnest metal wire requires gazillions of Newtons of electrostatic force, and develops gazillions of volts of potential difference. ("Gazillions" means some huge number with way too many zeros!). Metals are conductive, and we can't easily change that.

This is where silicon comes in. While a metal's electron-stuff within acts like a dense fluid, the mobile charges in silicon act like a compressible gas. In silicon, only very few atoms contribute an electron to the "sea." In fact, the silicon doesn't really contribute electrons at all, and ultra-pure silicon is an insulator. Instead, only the impurities in the silicon contribute movable electrons. If we only put a gazillionth of a percent of impurities into the silicon mix, then the resulting material's movable electron-stuff becomes much more compressible than the "electron sea" within a metal. This reduces the voltage and force (by a gazillion times!) that is required to convert the material from a conductor to an insulator. The electron-sea of a metal is not very compressible. The electron-gas within silicon is very compressible.

So what? Well, if we can push the "electron sea" out of a conductor, we can change it into an insulator. It would be like turning off a switch, but almost no work is required to do it. Just apply an electrical "push" in the form of electrostatic repulsion, and large currents can be switched on and off.

The Field Effect Transistor is basically a tiny wafer of silicon with its edges connected to the Source and Drain leads, and the Gate lead connected to a metal plate layed upon the wafer. When the gate lead is electrified negative, it repels the electron-gas out of the silicon and converts it into an insulator. It acts like a switch that is turned off by pure voltage. If we picture the silicon as being like a rubber hose full of water, then the gate applies a sideways force which pinches the hose closed. Placing a negative net charge on the gate wire causes the "switch" to turn off and the LED to go dark. Merely holding a negatively electrified object near the Gate lead will apply a force to the electrons in that little lead wire, which pushes them into the metal plate, which repels away the electrons in the silicon, which pinches the conductive path closed.

Interesting part: it really takes no energy to turn off the FET. It does take electrostatic force, but force is not energy! And so, even a very distant object with a feeble net-charge can affect the FET and control the much larger energy directed to the LED.

The FET is not really turned off by negative net-charge. That is an overly simplified description. It is really turned off by a DIFFERENCE in the net-charge of the silicon and of the metal plate. You can either electrify the metal plate negatively, or electrify the silicon (and the battery, LED, and circuit wires) positively. Both will turn the FET off by pushing (or pulling) the electrons out of the silicon. Think of the rubber hose again: either you can squeeze it shut with fingers, or you can lower the pressure of the whole water circuit, and the hose will be collapsed by "suction" (by air pressure, actually.)

What are FETs good for? Well, most modern computers are constructed almost entirely from FETs. The megabytes of memory are formed from little grids of millions of microscopic FETs, each with a net-charge stored on its gate lead signifying a zero or a one. The processor chips are built of logic switches with Gate voltage as their input, and on/off switching as their output. Other things: super-FETs can be built which actually contain many thousands of small FETs hooked in parallel. These VFETs or HEXFETS are often used as the main transistors of large stereo amplifiers. A tiny vibrating voltage on their gate lead can route many amperes of sound-frequency charge flow through the loudspeakers, and a handful of FET wafers the size of your fingernail control the audio power for a whole rock concert.

## OTHER LINKS

- [pos/neg charge detector](#) w/Red & Green LEDs



- [Paul Z. fieldmill](#)
- [Home-build pro electrometer](#) "field mill"
- [build a Cloud Charge Monitor](#)
- [Senstive e-field & b-field meter](#)
- Richard Hull's [Op-amp Electrometer](#), project from the [SAS Bulletin](#)
- [Storm voltage sensor](#) measures e-field indirectly
- [E-field Disturbance Monitor](#) , project from [IOL Magazine](#)
- [Electrostatic Gradiometer](#) (from WEIRD SCIENCE section!!!)
- [Ion Detector](#)
- ["static electricity" detector](#)
- [BOOKS: static elect.](#)

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# RECURRING SCIENCE MISCONCEPTIONS IN K-6 TEXTBOOKS

[William J. Beaty](#)

## ALWAYS UNDER CONSTRUCTION

**WARNING:** This file is currently being written, edited, corrected, etc. It does still contain some mistakes of its own. I placed it online as a sort of 'trial by fire' in order to hear readers' responses so I could target weak or unclear sections for improvement. (And, as my site points out, NOBODY is perfect so we should always practice critical thinking. Take all information with a grain of salt, including everything here!) Please feel free to send public comments to me with the [COMMENT BOOK](#). If you prefer that nobody else sees your comments, send private comments to me via this [form](#).

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AM I JUST A [NITPICKER?](#)

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*"Errors, like straws, upon the surface flow; He who would search for pearls must dive below."* - John Dryden

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## THE MISCONCEPTIONS:

- SCIENTISTS USE THE SCIENTIFIC METHOD? not quite.
- LAKES AND OCEANS ARE BLUE BECAUSE THEY REFLECT THE BLUE SKY? No.
- CLOUDS REMAIN ALOFT BECAUSE WATER DROPLETS ARE TINY? Wrong!
- THE SKY IS BLUE BECAUSE OF COMPLICATED PHYSICS No, it's simple.
- A LEMON-BATTERY CAN LIGHT A FLASHLIGHT BULB? doesn't work!
- SOUND TRAVELS BETTER THROUGH SOLIDS & LIQUIDS? No it doesn't.
- GRAVITY IN SPACE IS ZERO? It's actually strong.
- FILLED AND EMPTY BALLOONS DEMONSTRATE THE WEIGHT OF AIR? Misleading.
- GASES ALWAYS EXPAND TO FILL THEIR CONTAINERS? Not quite.
- FRICITION IS CAUSED BY SURFACE ROUGHNESS? Obsolete idea!
- ICE SKATES FUNCTION BY MELTING ICE VIA PRESSURE? nope.
- THE EARTH HAS 92 CHEMICAL ELEMENTS?
- LIGHT FROM THE SUN IS PARALLEL LIGHT? The sun is \*wide\*!
- A WING'S LIFTING FORCE IS CAUSED BY ITS SHAPE?, no, by trailing edge angle.
- FOR EVERY ACTION, THERE IS AN EQUAL AND OPPOSITE REACTION? Newton said otherwise.
- BEN FRANKLIN'S KITE WAS STRUCK BY LIGHTNING? He'd have died.
- THE MAIN LENS OF YOUR EYE IS INSIDE THE EYE?
- WHEN ONE PRISM SPLITS LIGHT INTO COLORS, A SECOND

- IDENTICAL PRISM CAN RECOMBINE THEM?
- CLOUDS, FOG, AND SHOWER-ROOM MIST ARE MADE OF WATER VAPOR?
- RAINDROPS HAVE POINTS?
  
- AIR IS ALMOST ENTIRELY WEIGHTLESS?
- SHADOWS VANISH ON CLOUDY DAYS BECAUSE THE SUN ISN'T BRIGHT ENOUGH?
- INFRARED LIGHT IS A FORM OF HEAT?
- THERE ARE SEVEN COLORS IN THE RAINBOW?
- THE EARTH'S NORTH AND SOUTH MAGNETIC POLES RESIDE JUST BELOW THE SURFACE?
- LASER LIGHT IS "IN PHASE" LIGHT?
- LASER LIGHT IS PARALLEL LIGHT?
- LASERS ARE COHERENT BECAUSE ATOMS EMIT IN PHASE?
- IRON AND STEEL ARE THE ONLY STRONGLY MAGNETIC MATERIALS?
- RE-ENTERING SPACECRAFT ARE HEATED BY AIR FRICTION?
  
- CARS AND AIRPLANES ARE SLOWED DOWN BY AIR FRICTION?
- THE NORTH MAGNETIC POLE OF THE EARTH IS IN THE NORTH?
- SALT WATER IS FULL OF SODIUM CHLORIDE MOLECULES?
- LIGHT AND RADIO WAVES ALWAYS TRAVEL AT "THE SPEED OF LIGHT"?

---

That's the way all the books were: They said things that were useless, mixed-up, ambiguous, confusing, and partially incorrect. How anybody can learn science from these books, I don't know, because it's not science.  
- Dr. Richard Feynman, in "Surely you're Joking, Mr. Feynman," Part 5, Judging Books By Their Covers

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## **CORRECT: THERE IS NO *SINGLE* LIST CALLED "THE SCIENTIFIC METHOD." IT IS A MYTH**

The rules of a science-fair typically require that students follow THE SCIENTIFIC METHOD, or in other words, hypothesis-experiment-conclusion. The students must propose a hypothesis and test it by experiment. This supposedly is the "Scientific Method" used by all scientists. Supposedly, if you don't follow the rigidly defined "Scientific Method" listed in K-6 textbooks, then you're not doing science. (Some science fairs even ban astronomy and paleontology projects. After all, where's the "experiment" in these?)

Unfortunately this is wrong, and there is no single "Scientific Method" as such. Scientists don't follow a rigid procedure-list called "The Scientific Method" in their daily work. The procedure-list is a myth spread by K-6 texts. It is an extremely widespread myth, and even some scientists have been taken in by it, but this doesn't make it any more real. "The Scientific Method" is part of school and school books, and is not how science in general is done. Real scientists use a large variety of methods (perhaps call them methods of science rather than "The Scientific Method.") Hypothesis / experiment / conclusion is one of these, and it's very important in experimental science such as physics and chemistry, but it's certainly not the only method. It would be a mistake to elevate it above all others. We shouldn't force children to memorize any such procedure list. And we shouldn't use it to exclude certain types of projects from science fairs! If "The Scientific Method" listed in a grade school textbook proves that Astronomy is not a science, then it's the textbook which is wrong, not Astronomy.

*"Ask a scientist what he conceives the scientific method to be and he adopts an expression that is at once solemn and shifty-eyed: solemn, because he feels he ought to declare an opinion; shifty-eyed because he is wondering how to conceal the fact that he has no opinion to declare." -*  
Sir Peter Medawar

There are many parts of science that cannot easily be forced into the mold of "hypothesis-experiment-conclusion." Astronomy is not an experimental science, and

Paleontologists don't perform Paleontology experiments... so is it not proper Science if you study stars or classify extinct creatures?

Or, if a scientist has a good idea for designing a brand new kind of measurement instrument (e.g. Newton and the reflecting telescope) ...that certainly is "doing science." Humphrey Davy says "Nothing tends so much to the advancement of knowledge as the application of a new instrument." But where is The Hypothesis? Where is The Experiment? The Atomic Force Microscope (STM/AFM) revolutionized science. Yet if a student invented the very first reflector telescope or the very first AFM, wouldn't such a device be rejected from many school science fairs? After all, it's not an experiment, and the lists called "Scientific Method" say nothing about exploratory observation. Some science teachers would reject the STM as science; calling it 'mere engineering,' yet like the Newtonian reflector, the tunneling microscope is a revolution that opened up an entire new branch of science. Since it's instrument-inventing, not hypothesis-testing, should we exclude it as science? Were the creators of the STM *not* doing science when they came up with that device? In defining Science, the Nobel prize committee disagrees with the science teachers and science fair judges. The researchers who created the STM won the [1986 Nobel prize in physics](#). I'd say that if someone wins a Nobel prize in physics, it's a good bet that their work qualifies as "science."

Forcing kids to follow a caricature of scientific research distorts science, and it really isn't necessary in the first place.

Another example: great discoveries often come about when scientists notice anomalies. They see something inexplicable during older research, and that triggers some new research. Or sometimes they notice something weird out in Nature; something not covered by modern theory. Isaac Asimov said it well:

"The most exciting phrase to hear in science, the one that heralds new discoveries, is not 'Eureka!' (I found it!) but 'That's funny...'"

This suggests that lots of important science comes NOT from proposing hypotheses or even from performing experiments, but instead comes from unguided observation and curiosity-driven exploration: from sniffing about while learning to see what nobody else can see. Scientific discovery comes from something resembling

"informed messing around," or unguided play. Yet the "Scientific Method" listed in textbooks says nothing about this, their lists start out with "form a hypothesis." As a result, educators treat science as deadly serious business, and "messing around" is sometimes dealt with harshly. See:

## BOOKS:

- [The Art of Scientific Investigation](#)
- [Advice to a Young Scientist](#)
- [The Seeds of Discovery](#)
- [Scientific literacy and the myth of the scientific method](#)

## ARTICLES:

- [Ten Science Myths](#) (McComas)
- [What is Science?](#) R. Feynman
- [Scientific Methods](#) (Denker)
- [The Scientific Method](#) (Simanek)
- [On Scientific Method](#) (Bridgman)
- [About Science](#) (Stanbrough)
- [Theories DON'T become laws](#)
- [Dispelling Common Science Myths](#)
- An improved version: [What Is Science?](#) (about.com)

*"Why should there be the method of science? There is not just one way to build a house, or even to grow tomatoes. We should not expect something as motley as the growth of knowledge to be strapped to one methodology." -Ian Hacking*



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**CORRECT: THE OCEAN IS BLUE BECAUSE WATER IS A BLUE SUBSTANCE.**

Some authors state that bodies of water are blue because the water reflects the sky. But wouldn't this only make the shiny surface-reflections look blue? And doesn't water sometimes [remain blue on cloudy days](#)? Exactly. There's no mystery here; water looks blue because water *\*is\** blue. It's not just the sky that creates the colors we see.

But what if you pour yourself a drink; in that case the water is clear, right? Well ...it's not blue as far as your eyes can tell. But what if the water in your cup was very very *slightly* blue. You'd never see it. You'd only notice the blue color if your cup was many feet deep.

In fact, that's exactly how it works: pure water is nearly clear, but it's very very slightly blue. A small amount of water is too thin, so a small amount looks clear rather than blue. But look through thirty feet of water, and you'll see a strong color. Gaze into a hundred feet of deep pure mountain lake water against a white rocky bottom on a sunny day You'll see exactly what color the water actually has. Yet if you scoop a canteen full of that lake water, it will look totally clear.

See:

["Why is water blue?" J. Chem. Edu., 1993,70\(8\), 612](#)

To see some obvious blue, go to the Bahamas and compare the difference between the white sand beaches, the underwater sand in shallow water, and the sand in deeper water:

- [Bahamas: Man o War Cay](#)
- [Bahamas: Cat island](#)

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**CORRECT: THE SKY IS BLUE BECAUSE AIR IS BLUE.**

This one isn't purely an error. Still, it involves misconceptions on the part of authors.

Why is the sky blue? Usually the books start going on about wavelengths of light, Tyndall effect, and Rayleigh scattering. First they teach some correct but complicated physics. Then they use it to explain blue sky and sunsets. But what happens when you don't understand the physics? Doesn't this make their explanation useless? And do you just give up?

They're wrong: you don't need complicated physics to understand this. The sky is blue for a very simple reason:

**AIR IS NOT A TRANSPARENT MATERIAL. INSTEAD IT IS BLUE!**

The sky is blue for much the same reason that a cloud of powder is white. *Powder isn't invisible*. Throw some dust into the air on a sunny day and you'll see a visible white cloud. But what happens if you could throw some AIR? You might think that a cloud of air would be invisible. You'd be wrong. Air isn't invisible, instead it's a powdery-blue substance.

It's true that small amounts of air are almost perfectly transparent. So are small amounts of water. Go to an opaque muddy river or pond and use a cup to dip out some water. The water looks fairly clear, no? Yet the deep river is opaque brown. When you try to look through ten cups of water, or a hundred cups, the water seems to turn into brown paint. Yet a single cup of river water almost looks clean.

Air behaves like this too. A mile of air looks clear, but ten miles of air looks misty blue, and a thousand miles of air looks opaque white. The air is acting like the dirty river water, where a thin layer looks clear but a thick layer does not.

The sky is blue because air is a powdery blue material, and when the sun shines on it, you can see this blue color. Each molecule of air behaves like a bluish-looking mote of dust. Stare upwards on a sunny day, and you're looking into a thick cloud of air. (There really is no "sky" up there. You're not looking at a blue surface. Instead you're just seeing the Earth's layer of blue air against the blackness of outer space. )

Suppose you could go far out into space away from the Earth, then build yourself a thin hollow glass bubble a thousand miles wide. Viewed from the Earth, your empty glass bubble would be almost invisible. OK, now fill your bubble with air. It won't be invisible any more. It will look like a giant droplet of bright blue paint. It might even look whitish in the middle, since very thick layers of air seem as white as milk. What if you let your giant glass bubble crash into the moon? The air inside would pour out over the moon's surface and form a thick temporary layer of atmosphere. The moon wouldn't look white anymore. It would turn blue.

Photos of sunlit air, observed against black space:

- [Astronomy Picture of the Day: Moonrise](#)
- [Spacewalk](#),
- [Spacewalk 2](#)

OK, now here's a question. Smoke is white, milk is white, and powder is white. A big cloud of particles should look like white smoke, not like a blue dye. **WHY IS AIR BLUE INSTEAD OF WHITE?** And even more important, why are sunsets red? (Does this mean that air is also a red substance?!!)

Ah, if you start wondering about such things, then *\*now\** you finally need the advanced physics explanations. Many physics books will explain Rayleigh scattering; explain why an air molecule looks like a bluish dust mote.

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**CORRECT: CLOUDS ACTUALLY REMAIN ALOFT BECAUSE THEY ARE WARM INSIDE.**

Clouds are heavy. Evaporated water (the H<sub>2</sub>O gas) is not heavy, it actually is less

dense than air, so moist air rises. But when the water-gas condenses to form clouds, it contracts by about 1000 times and turns into very dense liquid water. (Imagine that the helium in a balloon condensed into a liquid. Would a tiny liquid-filled balloon still be buoyant? Nope.)

Even a small cloud contains many tons of liquid water. How can clouds remain aloft?

Many sources claim that clouds remain aloft because the water droplets are so small and widely separated that gravity has less effect on them. This is wrong. It doesn't matter if you break up a body of water into tiny droplets; its weight remains the same. You can't fool gravity. If a cloud contains tons of water, it will be pulled down to the Earth's surface with the same force whether the water forms a cloud or whether it forms raindrops. The answer lies elsewhere.

Some sources claim that clouds remain aloft because of updrafts: because the air had been rising, and the rising air blows the cloud droplets upwards. Wrong again: An updraft should be quickly halted as soon as the low-density water vapor turns into a dense liquid. The excess weight will slow the updraft, stop it, then reverse it. To keep clouds aloft, we'd need some sort of weirdly constant updraft, not an updraft that's easily reversed by a falling cloud.

Still other sources claim that clouds stay up there because the droplets are very tiny, so they settle through the air very slowly. This is true, but it still doesn't explain how weighty water can remain aloft. Stop and think a bit... if we have hundreds of tons of water, will its weight disappear simply because it has been divided into tiny droplets? No, instead the heavy droplets drag the air downwards as they fall. Air which contains water droplets is denser than normal air. Its weight is increased by almost exactly the weight of the suspended water droplets, which works out to around 1/10 percent of the weight of the air in a particular volume.) Dense air falls fast! In other words, the tiny droplets will still race downwards because they form heavy white cloud-stuff, and both the droplets and the air between them will be dragged downwards by gravity. Anyone playing with [humidifier fog](#) knows this: dense white pours downwards like a liquid. Yet even some professional meteorologists are saying these things about droplets. They should know better.

So why *\*DO\** clouds stay up there? Why don't they pour downwards to form a ground-hugging fog? The answer is simple: the weight of the cloud's droplets is countered by the buoyancy of *heated air* between the droplets. *Clouds are like hot air balloons!*

Whenever liquid water condenses from H<sub>2</sub>O gas, it releases thermal energy. When moist air turns into droplet-filled air, the droplets are hot, and they warm the air too. The heated air expands and becomes less dense. Is this enough to stop the falling droplets? Yes, it's more than enough, and the warm foggy air flows upwards. Clouds stay up there because they're significantly less dense on average than the surrounding air. In fact, if the water droplets should meld together, then fall out of the cloud as rain, then the remaining hot air is no longer weighed down by tons and tons of water, and it races upwards. This rising hot air is the "engine" which drives the violent updrafts in thunderstorms and hurricanes. Hot air with its water removed no longer floats serenely along as clouds, instead it forms upward jets with hurricane velocity.

Try making this ["Touch The Clouds"](#) device and you'll discover that droplet-filled air can be very dense. You can easily pour it from a pitcher and fill some cups. But we also know that hot air is less dense than cool air of the same pressure, so hot must rise through cooler air. Mix the two ideas together: dense air which is full of water droplets becomes less dense when heated, and at a certain high temperature it should be buoyed upwards by the atmosphere even though it's still full of heavy water droplets. If we could make the humidifier-mist warm enough, it would rise and form indoor clouds.

More thinking: helium gas rises in air, but liquid helium does not. Liquid helium is heavy, like liquid water (though not quite as heavy as an equal quantity of water.)

So, what happens when helium gas condenses into liquid? It shrinks greatly, becoming more dense than the surrounding air, then it dribbles downwards like any liquid. It falls downwards if it's a large blob of liquid, and it falls downward even if it takes the form of tiny droplets. If the helium in a balloon was changed into liquid, the balloon would fall. **THE SAME IS TRUE OF WATER.** Water vapor (H<sub>2</sub>O gas,) like helium, is lighter than air, and it will rise. However, if that vapor should condense into droplets, it greatly contracts in size and greatly increases in density. A cloud of water droplets is heavy, and it **SHOULD** fall downwards. Even if the

droplets are so tiny that they individually settle slowly, the droplets together have significant weight, so the droplets should drag the air downwards as they go. The dense, droplet-filled air can fall very fast, even though the individual droplets remain "stuck in the air" because of forces of viscosity.

Whenever vapor condenses to form droplets, it releases "heat of condensation" which causes the remaining air to expand. The warm air can even expand MORE than the volume left empty by the condensing vapor, causing the average density to fall and causing clouds to rise upwards rather than just float. When clouds first form, they usually pour upwards, not downwards. They are a bit too hot, so they try to rise to a higher level.

- Wrong: [Scientific American "Ask an Expert"](#) Tell them to calculate the heat released by condensation of cloud water, the temperature of resulting air, and the weight of a 1KM cloud compared to 1KM of nearby air which is cooler yet droplet-free.
- Wrong: [New Scientist "Last Word"](#)
- Wrong: [National Geographic Kids](#)
- Wrong: [UK ScienceLine](#)
- Wrong: [Star Tribune: kid's weather questions](#)
- Wrong: [Madsci: ask an expert](#)
- Wrong: [U. Indiana Moment in Science](#)
- Wrong: [U. Corp. Atmos Research](#)
- Wrong: [NASA p.u.m.a.s.](#) (they even mention "lighter than air"... then deny it!
- Wrong:
- Wrong: [Starbase outreach pgm](#)

Correct:

- [Steve's Weather FAQ](#)
- [n](#)

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## **CORRECTED: A SINGLE LEMON BATTERY CANNOT LIGHT A FLASHLIGHT BULB**

Gradeschool science books sometimes contain "experiments" which do not work. The [prism experiment](#) below is one of them. Another is the "lemon battery" or "potato battery" used to run a light bulb. Stick some copper and zinc into a single lemon, and this "battery" does create a small voltage. Touch your lemon-cell to the wires of a loudspeaker or headphones and you'll hear a clicking sound. Connect it to an old-style panel meter (voltmeter or milliamp-meter, the kind with the moving needle,) and your lemon can make the meter needle move. Three or four lemon-cells connected in series can run an LCD digital clock or light a red Light Emitting Diode LED. (If you try the digital clock or LED, remember that polarity is important, and if it doesn't work, try reversing the connections.)

However, the lemon's electrical output is far too feeble to light a standard flashlight bulb. Same with motors, buzzers, etc. The lemon battery is too weak. The experiment described in the books doesn't work.

How can I be certain? All those books say one thing, and I'm just one person who says differently. Doesn't the majority rule? No, because reality stays the same and ignores what humans vote upon. Let's look at a real world example: I stick a fairly wide copper strip and a similar zinc strip into a lemon. (This works much better than copper pennies or zinc nails.) First use the strips to tear up the inside of the lemon, then insert the metal strips very close together to give best results. The area of each "battery plate" is around 1 inch square. Measured voltage: 0.91V. Measured short-circuit current: two milliamps (0.002 Amps) immediately decreasing to a constant half a milliam (0.0005 amps.) What does this mean? Well, a typical flashlight bulb



draws an ENTIRE 1/4 AMPERE when lit. Not half a milliamp, but 250 milliamps or 0.250 Amps. You'd need 500 lemons wired in parallel!  $0.250\text{amps} / 0.0005\text{amps} = 500$  lemons.

However, there are specialized light bulbs which draw very tiny currents. Maybe the experiments in the books weren't talking about a standard flashlight bulb? From Radio Shack we can get a #272-1139 incandescent bulb which only draws around fifteen milliamps (0.015 amps) at 0.7 volts when lit very dimly in a darkened room. This is the most sensitive incandescent bulb I've ever encountered. To light this bulb we only need  $0.0150\text{A}/0.0005\text{A} = 30$  lemons wired in parallel. THIRTY LEMONS. And the bulb is so dim that you can't see the glow unless the room is dark. But wasn't the lemon's electric current higher at the start? 0.002 amps, not 0.0005 amps? Yes, so with only TEN LEMONS wired in parallel, maybe we could cause a special hyper-sensitive light bulb to blink on for a second or two before going dark.

This still translates into "**the experiment doesn't work.**" One single lemon cannot light up any sort of incandescent bulb. At best we can use several lemons to [light an LED](#).

If a textbook contains the bulb-lightning experiment, it means that the author never performed the experiment to see if it works. LOTS of books and websites say that a single lemon can light a flashlight bulb. Every single one of these is wrong. The mistake is like a kind of infection. If you aren't careful, then your science website can [catch a disease!](#)

Can't we build a larger lemon-juice battery in a jar which will light a small bulb? Yes, but your battery needs to be fairly large; much larger than a couple of metal parts stuck into a lemon. At the very least you'll need a jar for the juice, plus some sheets of copper and zinc several inches wide. If you don't have that special Radio Shack bulb, then you'll need more than one lemon-juice jar hooked in series to make the 1.5 volts needed by a standard flashlight bulb.

If you really want to light up a small lightbulb, why not build an [ELECTRIC GENERATOR](#) instead?

**How to cheat!**

There is a secret way to make a lemon-cell light up an incandescent bulb. You have to cheat! Buy yourself a "super capacitor" or "memory backup capacitor" via mail-order surplus. They cost a few dollars. You want a value between 0.1 farad and 0.5 farads. Try one of these suppliers:

- [All Electronics](#)
- [Electronics Goldmine](#)
- [Jameco Electronics](#)

Build a lemon battery and connect it to the terminals of the super capacitor. (Me, I use alligator clip-leads bought from Radio Shack.) Wait for a few minutes. Now connect your flashlight bulb to the supercapacitor terminals and it should light brightly for a few seconds. (If not, then remove the bulb and try connecting your lemon cell to the capacitor for 15 minutes to make sure the capacitor gathers enough energy.) The capacitor slowly collects electrical energy from the lemon battery, then it dumps that energy into the flashlight bulb over a very short time. You can even use this trick to let your lemon battery run a low-voltage buzzer or turn a small motor (look for "solar cell motors" from various mail order suppliers or Radio Shack.) As with the bulb, you must charge up the capacitor for many minutes, then use it to run your bulb or motor for a few seconds.

It's not an ideal experiment, and it's hard to explain how [capacitors](#) work. But it's easier than trying to connect thirty lemon-cells in parallel!

- [Four lemons light an LED](#)
- [Note about Lemon energy](#)
- [Tongue tingle, but no lightbulb](#)
- [Digital watch yes, lightbulb no](#)

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## **CORRECTED: ICE SKATES *DO NOT* FUNCTION BY MELTING ICE VIA PRESSURE**

It is commonly stated that ice skates have low friction because ice melts when pressure is applied to it. This is not quite correct. A demonstration using an ice cube, a wire, and two weights is often provided to illustrate the phenomena. However, while pressure does affect the melting point of ice, the pressure provided by the skates is not enough to melt ice except when the temperature is a fraction of a degree below 0C. Also, the icecube and wire demonstration is very misleading because it is always performed in a heated room, and the wire doesn't melt ice entirely by pressure, it melts the ice by thermal conduction of warm room temperature along the wire. (Also, narrow gaps in ice always freeze closed because the simultaneous melt/freeze process at water/ice boundary acts to flatten points and fill crevices) Another point: the weight of small objects is too low to create high pressure, yet small objects do experience low friction when on ice. The low friction of ice is probably caused by a layer of liquid water a few hundred molecules thick which always spontaneously develops on the surface of ice. Also, melting from frictional heating can provide liquid water as lubrication. Here's [more](#) on this whole debate, and also a bit from [BAD CHEMISTRY](#)

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## **CORRECTED: THERE ARE *NOT* 92 ELEMENTS ON EARTH**

Uranium has the highest atomic number of the elements commonly found in the environment, and some books will tell you that there are 92 elements found on earth: atomic numbers 1 through 92 (hydrogen through uranium). This is wrong. Unfortunately there are two elements below Uranium which are radioactive and have extremely short half lives. These are Technetium and Promethium. These two elements do not occur naturally on Earth, and this reduces the total number of elements found in the environment to 90. However, in the 1970s a natural uranium reactor was found in an ancient streambed in Africa, and the mineral deposits at the site contained traces of a long-lived [Plutonium](#) isotope (atomic number 94.) This brings the total number of elements on the Earth back up to 91. (Note: Technetium, though not found naturally on Earth, is present in some stars, detected by spectral analysis.) See THE PHYSICS TEACHER, Vol.27 No.4 p282

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## **LIGHT FROM THE SUN IS PARALLEL? NOPE.**

Some books state that because the sun is so far away, sunlight arriving at the Earth is almost perfectly parallel. This is incorrect. The books reason that the more distant the object, the more parallel the light, and since the sun is so far away, sunlight is perfectly parallel. They make a mistake. While it is true that light from \*each tiny

point\* on the sun's surface is just about perfectly parallel by the time it reaches our eyes, light from the sun as a whole is not. This is because the sun, though very distant, is very large. A similar situation exists with light from the sky. We wouldn't say that the blue sky emits parallel light. Yet light from the sky comes from many miles away.

If sunlight were perfectly parallel, there would be some interesting effects which are usually smeared out by the sun's disklike image. First of all, if the sun were tiny, then to us it would look like a very bright point, like an intensely bright star or a welding arc. Also, shadows on the ground would lack penumbras and be almost perfectly sharp. Without the penumbras, diffraction of waves would be revealed, and parallel dark and bright lines would appear at the edges of shadows. At nightfall the advancing shadows of distant mountains would be seen to race across the ground. During sunset the sun wouldn't gradually sink below the horizon, instead it would wink out. During the day the variations in air density would cause the ground to be covered by moving patterns of light; patterns similar to those seen on the bottom of a swimming pool but in this case made by "waves" in the sky. Solar and lunar eclipses would lack penumbræ. Looking at the sun might burn your retina, since the parallel light would be focused to a tiny point. And if sunlight were perfectly parallel, a large convex lens could concentrate sunlight into an intense pinpoint rather than into a small disk. Also, a if a small concave lens were placed near the focus of a large convex lens, the pair lenses could be used to concentrate sunlight and form it into a thin, dangerously powerful parallel beam. Try to do this with the real sun, and all you get is a large, projected image of the sun's disk.



WRONG



BETTER

FUZZY!

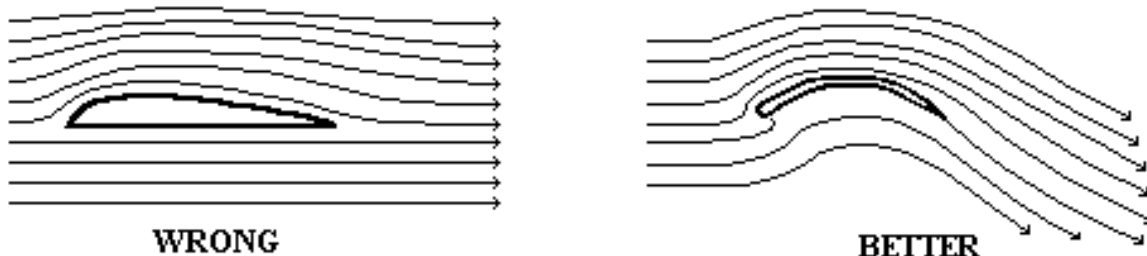
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**CORRECTED: WITH AN AIRCRAFT WING, THE LIFTING FORCE *DOES NOT* COME FROM THE DIFFERENCE IN CURVATURE BETWEEN THE TOP AND BOTTOM SURFACES**

Also: [wings/lift webpage](#)

Some books say that the lifting force appears because the wing's upper surface is longer than the lower surface. They state that air dividing at the leading edge of the wing must rejoin at the trailing edge, therefore the upper air stream must move faster, and so the wing is pulled upwards by the Bernoulli effect. This is not correct: the air divided by the leading edge [does NOT rejoin](#) at the trailing edge, and there is no "race" to catch up.

The same books often contain a misleading diagram showing a flat-bottomed wing with flow lines of the surrounding air. (see below.) This diagram actually shows a zero-lift condition. The lifting force is zero because the air behind the airfoil does not descend. In order to create lift in a three-dimensional situation, A WING MUST DEFLECT AIR DOWNWARDS.



Both the explanation and the diagram have serious problems. They wrongly imply that inverted flight is impossible. They wrongly imply that an aircraft with a symmetrical wing (a wing with equal pathlengths above and below) will not fly. They also wrongly suggest that an aircraft can violate the conservation of

momentum by remaining aloft without reacting against the air, and without causing a downward motion of the air.

Yet upside-down flight is far from impossible; it is a common aerobatic move. And many wings have equal pathlengths, including even the thin cloth wings of the Wright Brothers' flyer! And anyone standing under a slow, low-flying plane, or below the thin, fast wings of a helicopter will know that there is a very great downward flow of air below the wings. All of this indicates that there is a serious problem with the "curved top, flat bottom" explanation. Below is an alternative.

Go listen to [NPR Science Friday Radio Archive](#), where physicist D. Anderson debunks the various lifting-force myths.

As a plane flies, its wings cut through the air at an angle. This "angle of attack" causes the wing to apply a downward force to the air. Or rather than being tilted, the wings can be curved or "cambered", making the trailing edge of the wing tilt down at an angle. Since the rear half of an airfoil has more effect on the air than the front half, this causes the departing air to move *downwards* at an angle. As a result, the wing is pushed upwards and backwards. (These two forces are called "lift" and "induced drag.")

The tilted lower surface of the wing causes air to move down, but that's not the only important effect. Because the flowing air "attaches" to the TOP of the wing, the tilt of the wing also causes the upper surface of the wing to pull downwards upon the air above it. The air ABOVE the wing moves down and the wing is forced upwards.

In other words, as any plane flies, a stream of air is sent diagonally downwards by its wings, and the wing acts like a 'reaction engine' much like a jet engine or a rocket. Unless a wing is either tilted or cambered, it cannot force the air downwards and cannot generate any "lift."

It may help to imagine a hovering helicopter: a helicopter can hover because its rotor applies a downward force to the air, and the air applies an upward force to the rotor. As a result, the air flows downwards and the upward force supports the craft. But

like any airplane, a helicopter rotor is a moving wing, and it's this small wing which sends the air downwards. Like any wing, helicopter rotors are reaction engines, they push air downwards, and the air pushes them upwards. They are not "sucked upwards," and neither are airplanes.

You may have seen a plane's downwash of air in movies: a "cropduster" plane sends out a trail of fertilizer mist, and the trail of mist does not float, instead it moves immediately down into the crops, driven downward by the moving air. Air from wings can even be dangerous: if a plane flies too low, the downwash from its wings can knock people over.

The "Bernoulli effect" is still true. It explains how the top of the wing is able to "pull downwards" on the air flowing over it. And the Bernoulli Effect proves extremely useful in calculations of the lifting force during classes in airplane physics and during experimental work in aerodynamics. But airplanes also obey Newton's laws: accelerate some air downwards, and you'll experience an upwards force.

- [WEBSITE: Airfoil misconceptions in K-6 textbooks](#)
- [SOME EMAIL DEBATE](#)
- My improved explanation: [DISK BALLOONS](#)



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## **SOUND TRAVELS BETTER THROUGH SOLIDS? NO.**

Many elementary textbooks say that sound travels better through solids and liquids than through air, but they are incorrect. In fact, air, solids, and liquids are nearly transparent to sound waves. Some authors use an experiment to convince us differently: place a solid ruler so it touches both a ticking watch and your ear, and the sound becomes louder. Doesn't this prove that wood is better than air at conducting sound? Not really, because sound has an interesting property not usually mentioned in the books: waves of sound traveling inside a solid will bounce off the air outside the solid. The experiment with the ruler merely proves that a wooden rod can act as a sort of "tube," and it will guide sounds to your head which would otherwise spread in all directions in the air. A hollow pipe can also be used to guide the ticking sounds to your head, thus illustrating that air is a good conductor after all. Sound in a solid has difficulty getting past a crack in the solid, just as sound in the air has difficulty getting past a wall. Solids, liquids, and air are nearly equal as sound conductors.

It's true that the speed of sound differs in each material, but this does not affect how well they conduct. "Faster" doesn't mean "better." It is true that their transparency is not exactly the same, but this only is important when sound travels a relatively great distance through each material. It's also true that complex combinations of materials conduct sound differently and may act as sound absorbers (examples: water with clouds of bubbles, mixtures of various solids, air filled with rain or snow.) And last: when you strike one object with another, the sound created inside the solid object is louder than the sound created in the surrounding air. So, before we try to prove that solids are better conductors, we had better make sure that we aren't accidentally putting louder sound into the solids in the first place.

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## **GRAVITY IN SPACE IS ZERO? WRONG.**

Everyone knows that the gravity in outer space is zero. Everyone is wrong. Gravity in space is not zero, it can actually be fairly strong. Suppose you climbed to the top of a ladder that's about 300 miles tall. You would be up in the vacuum of space, but you would not be weightless at all. You'd only weigh about fifteen percent less than you do on the ground. While 300 miles out in space, a 115lb person would weigh about 100lb. Yet a spacecraft can orbit 'weightlessly' at the height of your ladder! While you're up there, you might see the Space Shuttle zip right by you. The people inside it would seem as weightless as always. Yet on your tall ladder, you'd feel nearly normal weight. What's going on?

The reason that the shuttle astronauts act weightless is that they're inside a container which is **FALLING!** If the shuttle were to sit unmoving on top of your ladder (it's a strong ladder,) the shuttle would no longer be falling, and its occupants would feel nearly normal weight. And if you were to leap from your ladder, you would feel just as weightless as an astronaut (at least you'd feel weightless until you hit the ground!)

So, if the orbiting shuttle is really falling, why doesn't it hit the earth? It's because the shuttle is not only falling down, it is moving very fast sideways as it falls, so it falls in a curve. It moves so fast that the curved path of its fall is the same as the curve of the earth, so the Shuttle falls and falls and never comes down. Gravity strongly affects the astronauts in a spacecraft: the Earth is strongly pulling on them

so they fall towards it. But they are moving sideways so fast that they continually miss the Earth. This process is called "orbiting," and the proper word for the seeming lack of gravity is called "Free Fall." You shouldn't say that astronauts are "weightless," because if you do, then anyone and anything that is falling would also be "weightless." When you jump out of an airplane, do you become weightless? And if you drop a book, does gravity stop affecting it; should you say it becomes weightless? If so, then why does it fall? If "weight" is the force which pulls objects towards the Earth, then this force is still there even when objects fall.

So, to experience GENUINE free fall just like the astronauts, simply jump into the air! Better yet, jump off a diving board at the pool, or bounce on a trampoline, or go skydiving. Bungee-jumpers know what the astronauts experience.

Space isn't remote at all. It's only an hour's drive away if your car could go straight upwards. --Fred Hoyle

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## **CORRECTED: FOR EVERY ACTION, THERE *IS NOT* AN EQUAL AND OPPOSITE REACTION**

Newton originally published his laws of motion in Latin, and in the English translation, the word "action" was used in a different way than it's usually used today. It was not used to suggest motion. Instead it was used to mean "an acting

upon." It was used in much the same way that the word "force" is used today. What Newton's third law of motion means is this:

For every "acting upon", there must be an equal "acting upon" in the opposite direction.

Or in modern terms...

For every FORCE applied, there must be an equal FORCE in the opposite direction.

So while it's true that a skateboard does fly backwards when the rider steps off it, these MOTIONS of "action" and "reaction" are not what Newton was investigating. Newton was actually referring to the fact that when you push on something, it pushes back upon you equally, EVEN IF IT DOES NOT MOVE. When a bowling ball pushes down on the Earth, the Earth pushes up on the bowling ball by the same amount. That is a good illustration of Newton's third Law. Newton's Third Law can be rewritten to say:

**FOR EVERY FORCE THERE IS AN EQUAL AND OPPOSITE FORCE.**

Or "you cannot touch without being touched."

Or even simpler: Forces always exist in pairs.

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## **CORRECTED: BEN FRANKLIN'S KITE WAS *NEVER* STRUCK BY LIGHTNING**

Many people believe that Ben Franklin's kite was hit by a lightning bolt, and this is how he proved that lightning is electrical. A number of books and even some encyclopedias say the same thing. They are wrong. When lightning strikes a kite, the electric current in the string is so high that just the spreading electric currents in the ground can kill anyone standing nearby, to say nothing of the person holding the string! What Franklin actually did was to show that a kite would collect a tiny bit of electrical charge-imbalance out of the sky during a thunderstorm.

Air is not a perfect insulator. The charges in a thunderstorm are constantly leaking downwards through the air and into the ground. Electric leakage through the air caused Franklin's kite and string to become charged, and the hairs on the twine stood outwards. The twine was then used to charge a metal key, and tiny sparks could then be drawn from the key. Those tiny sparks were the only "lightning" in his experiment. (He used a metal object because sparks cannot be directly drawn from the twine; it's conductive, but not conductive enough to make sparks.)

His experiment told Franklin that some stormclouds carry strong electrical charges, and it **IMPLIED** that lightning was just a large electric spark.

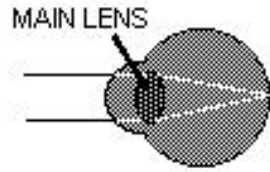
The common belief that Franklin easily survived a lightning strike is not just wrong, it is dangerous: it may convince kids that it's OK to duplicate the kite experiment as long as they "protect" themselves by holding a silk ribbon and employing a metal key. Make no mistake, Franklin's experiment was extremely dangerous. Lightning goes through miles of insulating air, and will not be stopped by a piece of ribbon. If lightning had actually hit his kite, he would have been gravely injured, and most probably would have died instantly. See [LIGHTNING SURVIVOR RESOURCES](#)

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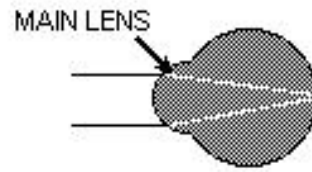
## **THE MAIN LENS OF YOUR EYE IS INSIDE THE EYE? NOT QUITE.**

Some textbooks assume that the small lens found deep within the eyeball is the eye's main lens, and the cornea of the eye is simply a protective window. The textbook diagrams even depict light rays passing into the eye and only bending as they pass through this internal lens. But in the human eye, the small lens found within the eyeball is not the main imaging lens. The cornea is actually the main lens; it is the strongly curved transparent front surface of the eye. Most of the bending of the light occurs at the place where the light enters the surface of the cornea. When you look at your eye in the mirror, you are looking directly at the eye's main lens. When you want to change the focusing power of your eye, you apply "contact lenses" to the cornea surface, or you undergo surgery which re-sculpts the cornea's curvature. The smaller lens inside the eye acts only to alter the focus of the eye as a whole. Muscles change its shape in order to correct the focus for near and far viewing. Without this small internal lens, human vision would be blurry, and vision would be unable to accommodate for near and far views. But without the cornea lens, [the human eye would be blind] **IMPROVED VERSION:** without the cornea lens, human vision would rely upon the pinhole-camera effect of the eye's pupil, and vision would be

incredibly blurry. Open your eyes underwater in dimly-lit conditions to see what vision would be like without a cornea.



**WRONG**



**BETTER**

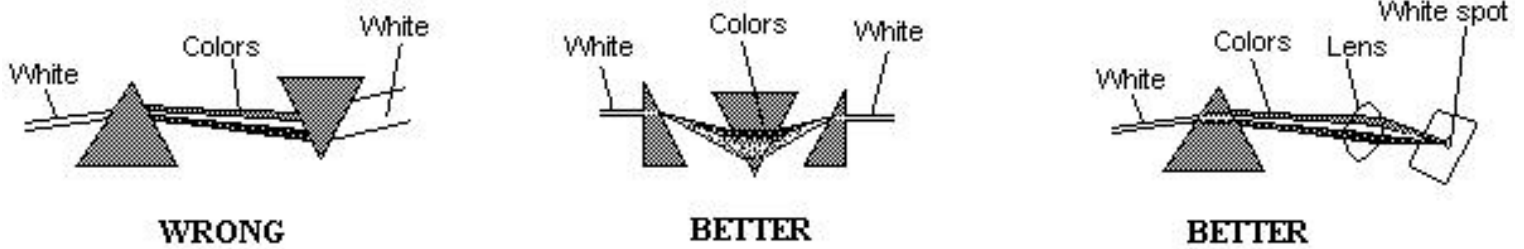
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## **CORRECTED: WHEN ONE PRISM SPLITS LIGHT INTO COLORS, A SECOND IDENTICAL PRISM CANNOT RECOMBINE THEM**

A single prism can split a sunbeam into a rainbow. Many children's science books show how a second similar prism can be used to recombine the colors. This is incorrect, two prisms do not work as shown. Prisms of two DIFFERENT sizes can split and then focus the colors into momentary recombination at a particular distance. With THREE prisms in a special arrangement, the splitting and complete recombining of colors can be accomplished. But books which depict one prism splitting the colors and a second identical prism recombining the colors into a single white beam are in error, and are no doubt the source of endless frustration for those of us who try to duplicate the effect with real prisms.

The "rainbows" can also be recombined by placing a screen at just the right place, and by bouncing the colors off many small mirrors so the colored beams converge upon a screen. Recombination can also be done with a convex lens or a concave mirror and a screen. I hope that very few students will attempt to perform the color recombination experiment depicted in their books, for disappointment awaits.

[\(MORE\)](#)




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## **CLOUDS, FOG, AND SHOWER-ROOM MIST ARE WATER VAPOR? NO.**

All three things are made of small droplets of liquid water hanging in the air. When water evaporates, it turns into a transparent gas called "water vapor." When it condenses again, it can take the form of rain, snow, rivers, and oceans, but it also can take the form of clouds, mist, fog, etc. Fog can make surfaces wet, but not because of condensation. Instead, the fog droplets collide with the solid surface. Fog is liquid water, not a vapor. Fly an ultralight aircraft slowly through a large dense cloud, and you'll become damp. To look for water vapor, look at the bubbles in rapidly boiling



water. Look at the small empty space at the spout of a boiling teakettle. Look at the far end of the teakettle's plume of mist, where the mist seems to vanish into the air. Look at the empty air above a wet surface. In these situations you see nothing, and that's where the vapor is. Water vapor seems invisible because it is transparent. Clouds and fog are not transparent. They are composed of liquid droplets.

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## **CORRECTED: RAINDROPS DON'T HAVE POINTS!!**

Nearly every drawing of raindrops depicts them as having a sharp upper point. This is wrong. Surface tension of water acts like a stretched "bag" around the water, and unless some other force is acting, it pulls the water into a spherical shape. Our eyes do see tiny droplets as a blur, but a flash photograph reveals that small raindrops are nearly spherical. The larger ones are distorted by the pressure of moving air, but this doesn't make points, it makes them somewhat flattened. Think of it this way: underwater bubbles are not pointed as they rise, just as falling water drops are not pointed as they fall. And while it's true that the **SYMBOL** for water is a droplet with a point, **REAL** water droplets look nothing like the symbol. And when water drips from a faucet, it never actually has a point. Instead it has a narrow neck, and after the neck has snapped, it is yanked back into the falling ball of water. See Dr. Fraser's [BAD SCIENCE](#) for lots more about this.

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## **AIR IS WEIGHTLESS? NO.**

We are not conscious of air's weight because we are immersed within it. In the same way, even a large bag of water seems weightless when it is immersed in a water tank. The bag of water in the tank is supported by buoyancy. In a similar way, buoyancy from the atmosphere makes a bag of air seem weightless when it's surrounded by air. One way to discover the real weight of air would be to take a bag of air into a vacuum chamber. Another way is to weigh a pressurized and an unpressurized football. A cubic meter of air at sea-level pressure and 0C temperature has a mass of 1.2KG. The non-metric rule of thumb says that the air that would fill a bathtub weighs about one pound. Here's a simple way to detect the mass of air even though the air seems weightless: open an umbrella, wiggle it slightly forwards and back, then close it and wiggle it again. When you wiggle it when open, you can feel its increased mass because of the air the umbrella must carry with it. (Ah, but then we must explain the difference between weight and mass!)

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## **CORRECTED: FILLED AND EMPTY BALLOONS DO NOT DEMONSTRATE THE WEIGHT OF AIR**

Many books contain an incorrect experiment which purports to directly demonstrate that air has weight. A crude beam-balance is constructed using a meter stick. Deflated rubber balloons are attached to the ends, and the balance is adjusted. One balloon is then inflated, and that end of the balance-beam is supposed to sag downwards. This is supposed to demonstrate that a large amount of air weighs more than a small amount of air.

Unfortunately this experiment lies. When immersed in atmosphere, buoyancy causes full and empty balloons to weigh the same. But then why does the above experiment work? It doesn't! In fact, the experiment will fail unless you know the trick: you must inflate the balloon near to bursting. The experiment secretly relies on the fact that the air within a high-pressure balloon is denser than air within a low pressure balloon. Obviously this does not **DIRECTLY** demonstrate anything about the weight of air, and it's dishonest to tell students that it does.

To illustrate the problem, try this instead: attach two opened paper bags to the balance, adjust it, then crush one bag so it contains little air. The balance **WILL NOT CHANGE**. What does this teach your class; that air is... weightless? Yet air does have significant weight. We just can't detect this weight directly by using paper bags. Or balloons.

Here's a way to make the experiment more honest. Perform the balance-beam experiment again, but blow one balloon **REALLY** full so the rubber feels hard and the balloon is about to pop. Blow up the second balloon so it is **ALMOST** full, but

still a bit stretchy. Try to keep the balloons the same size. Now the balance will show that, even though the balloons are nearly the same size, the "hard" balloon is heavier. Does this teach misleading things to your class? No, instead it exposes the dishonesty of the original demonstration. In truth, balloons filled with air will not weigh more than empty ones as long as the balloons remain immersed in the atmosphere. However, COMPRESSED air does weigh more than UNCOMPRESSED air.

Can we demonstrate the weight of water to a fish? What if we lived underwater, how could we use the balance-beam to measure the weight of water directly? The answer is that we cannot. If a water-filled balloon and an uninflated balloon were compared underwater, the experiment would show that they weigh the same, which seems to prove that water is weightless. When underwater, a bag full of water weighs just the same as a flattened bag which contains nothing. The situation with air is similar: if we live our lives immersed within a sea of air, we cannot use a balance to easily detect the actual weight of the air. (In fact, a bathtub full of air weighs about a half kilogram, but we cannot sense this weight while living in an atmosphere.)

It's hard to teach the weight of water to the fishes, and hard to teach the weight of air to human grade-schoolers. These experiments could only work if performed in a vacuum environment (say, on the moon's surface.) We humans are like fish underwater: we're not aware that our ocean of air has any weight.

To better demonstrate the weight of air directly, hook a heavy bottle to a vacuum pump, pump all the air out, seal it, then weigh the bottle. Break the seal and let the air in, then weigh it again. The difference in weight is the weight of the air contained in the bottle. Another: use a balance to compare the weight of two vacuum-containing bottles, then open one of them so it becomes filled with air. The bottles will then weigh differently, and the difference is the true weight of the air in one bottle. Or another: build a balance using upside-down paper bags, then place a candle below one of them, then remove the candle again. That bag rises, indicating that a volume of warm air weighs slightly less than a volume of cool air. (Don't set the bag on fire!!) But note that this candle experiment says nothing simple and direct about the actual weight of a volume of unheated air.

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## **CORRECTED: IN THE EVERYDAY WORLD, GASES DO NOT EXPAND TO FILL THEIR CONTAINERS**

What is the difference between a liquid and a gas? Both are "fluids", both can flow. Gases are USUALLY less dense than liquids, although gases under fiercely high pressure can approach the density of liquids, so that's not a good criterion. The main difference is that gases are a different phase of matter: a gas can be made to condense into a liquid form, and a liquid can be made to evaporate into gas. Another major characteristic: because there are bonds between its particles, when a liquid IS PLACED INTO A VACUUM ENVIRONMENT, it will not expand continuously, while a gas in a vacuum chamber will expand continuously until it hits the walls.

This is very different than the oft-quoted rule that "gases always expand to fill their containers." This rule only works correctly if the container is *totally* empty: the container must "contain" a good vacuum beforehand. However, we all live in a gas-filled environment. All our containers are pre-filled with air. In our environment, any new quantity of gas will not expand, it will just sit there. If you squirt some carbon dioxide out of a CO<sub>2</sub> fire extinguisher, it will not instantly expand to fill the room. Instead it will pour downwards like an invisible fluid and form a pool on the floor. It behaves similarly to dense sugar-water which was injected into a tank of water: it pours downwards, and only after a very long time it will mix with the rest of the water. "Mixing" is very different than "expanding to fill!" The rule about gases does not involve mixing, instead it involves compressibility and instant expansion into a vacuum.

In an air-filled room, dense gases act much like liquids; they can be poured into a cup or bowl, poured out onto a tabletop, and then they run off the edge onto the floor where they form an invisible mess. :) Less dense gases will stay where they are put, like smoke or like food coloring which has just been injected into a fishtank. Gas of even lesser density rises and forms a pool on the ceiling. Only in the world of the physicist, where "empty container" always implies a vacuum, does the rule about gasses work properly.

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## **CORRECTED: SHADOWS DO VANISH ON CLOUDY DAYS, BUT NOT BECAUSE THE SUN ISN'T BRIGHT ENOUGH**

Shadows appear when an object blocks a light source. The shape of the shadow is created by the shape of the opaque object AND by the shape of the light source. On a cloudy day the whole sky acts as a light source, and a person's shadow spreads out and becomes a dim fuzzy patch which surrounds the person on the ground on all sides. The shadow is so spread-out that it seems absent entirely. When the sun is visible, the same shadow is concentrated in one specific place and becomes easy to see. But even the shadows made by sunlight will have fuzzy borders, since the sun is a small disk rather than a tiny dot. On cloudy days, the fuzzy borders of your body's shadow become much much larger than the shadow itself, so that the shadow seems to vanish.

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## **CORRECTED: FRICTION IS NOT CAUSED BY SURFACE ROUGHNESS**

Some books point to surface roughness as the explanation of sliding friction. Surface roughness merely makes the moving surfaces bounce up and down as they move, and any energy lost in pushing the surfaces apart is regained when they fall together again. Friction is mostly caused by chemical bonding between the moving surfaces; it is caused by stickyness. Even scientists once believed this misconception, and they explained friction as being caused by "interlocking asperites", the "asperites" being microscopic bumps on surfaces. But the modern sciences of surfaces, of abrasion, and of lubrication explain sliding friction in terms of chemical bonding and "stick & slip" processes. The subject is still full of unknowns, and new discoveries await those who make surface science their profession

When thinking about friction, don't think about grains of sand on sandpaper. Instead think about sticky adhesive tape being dragged along a surface.

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## **CORRECTED: NO, INFRARED LIGHT IS *NOT* A KIND OF HEAT**

Infrared light is invisible light. When any type of light is absorbed by an object, that object will be heated. The infrared light from an electric heater feels hot because the light is **EXTREMELY BRIGHT LIGHT**. Just because human eyes cannot see the light which causes the heating does not mean that the light is made of some mysterious entity called "heat radiation." When bright light shines on an absorbtive surface, that surface heats up.

And this is no benign misconception. Those who fall under its sway may also come to believe that *\*visible\** light cannot heat surfaces (after all, visible light is not "heat radiation.") Misguided science students may wrongly believe that warm objects emit no microwaves (since only IR light is "heat radiation"), even though hot objects actually do emit microwaves. Or they may believe that the glow of red hot objects is somehow different than the infrared glow of cooler objects. Or they may believe that IR light is a form of "heat," and is therefore fundamentally different than any other type of electromagnetic radiation.

In his book "[Clouds in a Glass of Beer](#)," Physicist C. Bohren points out that this "heat" misconception may have been started long ago, when early physicists believed in the existence of three separate types of radiation: heat radiation, light, and actinic radiation. Eventually they discovered that all three were actually the same stuff: light. "Heat radiation" and "actinic radiation" are simply invisible light of various frequencies. Today we say "UV light" rather than "actinic radiation." Yet the obsolete term "heat radiation" still lingers. Since human beings can only see certain frequencies of light, it's easy to see how this sort of confusion got started. Invisible light seems bizarre and mysterious when compared to visible light. But "invisibility" is caused by the human eye, and is not a property carried by the light. If humans could see all the light in the infrared spectrum, we would say things like this: "of



COURSE the electric heater makes things hot at a distance, it is intensely BRIGHT, and bright light can heat up any surface which absorbs it."

PS, if you're interested in physical science misconceptions, [Bohren's Book](#) is an excellent resource. He's like me, and complains about several specific misconceptions which keep his students from understanding science.

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## **CORRECTED: THERE ARE NOT SEVEN COLORS IN THE RAINBOW**

Actually here is a very large number of distinct colors in any rainbow. And neither are there sharp divisions between the bands of color, yet numerous textbooks depict them. In reality, between yellow and green we find yellow-green, and between green and yellowgreen is GREENISH yellowgreen, and on and on. How many colors are in a rainbow? Thirty? Sixty? It's not easy to say, for it depends on the particular eye, and the particular rainbow. What of the teachers and students who look in vain for the yellow-green in their textbook's depiction of rainbows? They've crashed into a long-running textbook misconception: the strange idea that rainbows have exactly

seven distinct bands of color and no more, and with nothing in between those uniform bands of 'official' color.

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## **CORRECTED: ACTUALLY, THE EARTH'S NORTH AND SOUTH MAGNETIC POLES RESIDE DEEP WITHIN THE EARTH'S CORE**

Many textbooks have an erroneous diagram of the earth which shows a bar magnet within it, and the ends of this bar magnet extend to just beneath the earth's surface. These diagrams depict the magnet's field lines as radiating from spots on the earth's surface. This is very misleading. The earth's magnetic poles actually behave as if they're deep within the earth, down inside the core. The Earth's magnetic field does not come from a giant bar magnet, but if we IMAGINE that it does, then the imaginary "bar magnet" inside the earth is short, stubby, disk-shaped, and part of the iron core deep inside the planet.

The typical textbook diagram is incorrect, and there are NO INTENSE MAGNETIC FIELDS at the land surface near the earth's "north pole" and "south pole." If you stand at the Earth's south magnetic pole, metals aren't attracted to the ground more strongly than anywhere else. The Geomagnetic "poles" on the earth's surface are not places where the field is strong. They are simply the points on the landscape where the field lines are perfectly vertical.

Proper diagrams should instead show the field lines to be radiating from poles inside

the earth's core. They should show the field lines around the northern and southern areas of the earth's surface as being approximately vertical and parallel, not "radial" like a spiderweb and not concentrated into special points on the surface.

Another error associated with the above: some books claim that the earth's field at the magnetic poles is much stronger than elsewhere. This is untrue. The field strength at the north magnetic pole above Canada is about the same as the field strength in Virginia! And the strongest field in the Earth's northern hemisphere does not appear at the north magnetic pole at all, the north pole actually has a weaker field than elsewhere. The strongest fields in the northern hemisphere are not in one but in two places: west of Hudson bay in Canada, and in Siberia.

## LINKS

- [Correct diagram of Earth's field](#)
- [NOAA questions about Earth's field](#)
- [Field strength map](#)
- [The Great Magnet, the Earth](#)

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**LASER LIGHT IS "IN PHASE" LIGHT? WRONG.**

It's incorrect to say that "in laser light the waves are all in phase." When two light waves travelling in the same direction combine, they inextricably add together, they do not travel as two independent "in-phase" waves. The photons in laser light are in phase, but the WAVES are not. Instead, ideal laser light acts like a single, perfect wave.

When the light wave within a laser causes atoms to emit smaller, in phase light waves, the result is not "in phase" light. Instead the result is a single, more intense, amplified wave of light. In-phase emission leads to amplification, not to multiple in-phase waves. If the atoms' emissions weren't in phase, the result would NOT be light that's out of phase. Instead the the atoms would absorb light rather than amplifying it.

Each atom in a laser contributes a tiny bit of light, but their light vanishes into the main traveling wave. The light from each atom strengthens the main beam, but loses its individuality in the process. 99 plus 1 equals 100, but if someone gives us 100, we cannot know if it is made from 99 plus 1, or 98 plus 2, or 50 plus 50, etc.

All the \*PHOTONS\* in a single wave of light are in phase. This might be one reason that people say that laser light is "in phase" light. However, in-phase photons are nothing unique, and they don't really explain coherence. Any EM sphere-wave or plane-wave is made of in-phase photons. For example, all the photons radiated from a radio broadcast antenna are also in phase, but we don't say that these are special "in phase" radio waves, instead we just say that they are waves with a spherical wavefront. Even if all the photons in laser light are in phase, it is still incorrect to say "all the WAVES are in phase." Photons are not waves. They are quanta, they are particles, and they do not behave as small, individual "waves." Yes, all the photons are in phase, but only because they are part of a single plane-waves.

The light from a laser is basically a single, very powerful light wave. Single waves are always in phase with themselves, but it's misleading to imply that a single plane-wave or sphere-wave is something called an "in phase" wave. Laser light could more accurately be called "pointsource" light. Sphere waves or plane waves behave as if they were emitted from a single tiny point. The physics term for this is "spatially coherent" light. Light from light bulbs, flames, the sun, etc. are the opposite, and are called "extended-source" light. Extended-source light comes from a wide source, not

from a point-source, and the waves coming from different parts of the source will cross each other. Starlight and the light from arc welders is "point-source" light and is quite similar to laser light. Light from arc-welders and from distant stars has a higher spatial coherence than light from most everyday light sources. (Note: the sun is a star, correctly implying that light becomes more and more spatially coherent as it moves far from its source. This is a clue as to the REAL reason that lasers give spatially coherent light! (See below)

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## **CORRECTED: LASER LIGHT IS NOT PARALLEL LIGHT**

Light from most lasers is not parallel light. However, if laser light is passed through the correct lenses, it can be formed into a tight, parallel beam. The same is not true for light from an ordinary light bulb. If light from a light bulb were passed through the same lenses, it would form a spreading beam, and an image of the lightbulb would be projected into the distance. Laser light can form beams because a laser is a pointsource, and when you project the image of a pointsource into the distance, you form a narrow parallel beam! However, it is simply wrong to state that laser light is inherently parallel light. Laser light can be FORMED INTO parallel light, while the light from ordinary sources cannot.

Most types of lasers actually emit spreading, non-parallel light. Lasers in CD players and in "laser pointers" are semiconductor diode lasers. They create cone-shaped light beams, and if a parallel beam is desired, they require a focusing lens. The same is true for the lasers in inexpensive "laser pointers." Take apart an old laser-pointer, and you'll find the plastic lens in front of the diode laser inside.

Classroom "HeNe" lasers also create spreading light. The laser tube within a typical classroom laser contains at least one curved mirror (called a "confocal" arrangement,) and it creates light in the form of a spreading cone. It's a little-known fact that manufacturers of classroom lasers traditionally place a convex lens on the end of their laser tubes in order to shape the spreading light into a parallel beam. While it's true that a narrow beam is convenient, I suspect that part of their reason is to force the laser to fit our stereotype that all lasers produce thin, narrow light beams. The manufacturers could save money by selling "real" lensless laser tubes having spreading beams. But customers would complain, wouldn't they? We have been brought up to believe that laser light is parallel light.

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## **CORRECTED: LASERS EMIT COHERENT LIGHT, BUT *NOT* BECAUSE THE ATOMS EMIT IN-PHASE LIGHT WAVES**

In-phase emission causes the **AMPLIFICATION** of light, it doesn't cause coherent light. Because the atoms emit light in phase with incoming light, they will amplify the light, but they amplify incoherent light too, and they don't make it coherent. The coherence of laser light has another source... Laser light has two main characteristics: it is "monochromatic" or very pure in frequency (this also is called "temporally coherent.") Laser light also has a point-source character of sphere waves and plane waves (also called "spatially coherent.")

Even fairly advanced textbooks fail to give the real reason why laser light is spatially coherent. They usually point out that the laser's atoms all emit their light in phase, and pretend that this leads to spacial coherence. Wrong. It is true that the fluorescing atoms in a laser all emit light that's in-phase with the waves already traveling between the mirrors. But the in-phase emission only creates *amplification* of the traveling waves, it does not create spatially *coherent* light. For example, if you were to feed incoherent light into a HeNe laser tube, the atoms would emit in-phase waves, and the laser would amplify the light. But the brighter light would still be incoherent! Lasers certainly can amplify the **COHERENT** wave which is trapped between their mirrors. But how did the light within the laser get to be coherent in the first place?

Lasers create coherent light because of their mirrors.

The mirrors in a laser form a resonant cavity which preserves coherent light while rejecting incoherent light. How does it work? Imagine a simplified laser having flat, parallel mirrors. As light bounces between the mirrors, the light "thinks" that it's traveling down an infinitely long "virtual tunnel". (Have you ever held up two mirrors facing each other? Then you've seen this infinite tunnel.) When a laser is first turned on, it fluoresces; it emits light which is **NOT** coherent. Different random light waves start out from different parts of the laser. After a few thousand mirror bounces, all the waves have added and subtracted to form just one single wave. In the case of flat-mirror lasers, this wave is a nearly perfect plane wave. A single plane wave is coherent (to be incoherent, you must have at least two *different* waves.)

This can be a bit confusing. After all, the individual atoms each emit a wave. Don't all these waves add up to messy incoherent light? No. The in-phase emission preserves coherence as it amplifies. It's true that each atom emits light waves in all directions. However, these sideways waves cancel each other out, and only the waves that travel in the same direction as the incoming light will be preserved. It's as if the atoms "know" which direction to send out a beam. But in reality, the atoms don't know this. Instead, they just emit a light wave which is in phase with the incoming light, and for this reason the wave from the atom will cancel out everywhere except in a line with the incoming light. If the light in a laser were **ALREADY** coherent, then the atoms will amplify it but won't make it more coherent. The coherence comes from the great distance that the light has travelled as it bounced between the mirrors.

A similar thing happens with starlight: starlight is coherent! Starlight travels far from its original source and all the waves add up to form a wave with a single wavefront. Light from distant stars is spatially coherent, even though sunlight is not, yet the sun is a star. The farther the light travels from its source, the more it approaches the shape of a perfect plane wave. And a perfect plane wave is perfectly coherent. Laser light is spatially coherent because, among other things, the bouncing light has traveled millions of miles between mirrors, and all the various competing waves have melded together to form a single pure plane-wave or sphere-wave.

P.S. The pure color (monochrome) laser light is **ALSO** created by the mirrors. Huh? Yes, but the reason for this is not totally straightforward (and it's quite a bit beyond the K-6 level of these webpages!)

The two mirrors of a laser can trap a standing wave of light. The space between the mirrors is like the string of a guitar: there can be a fundamental wave, or overtone waves, or complicated waves which are a mixture of these. But waves of non-overtone frequencies cannot exist between the mirrors. Since the distance between the crests of a lightwave is very small, **LOTS** of different overtones can fit between the mirrors, and each overtone is a slightly-different pure color of light. Light from a neon sign is reddish, but it doesn't have the extreme purity of laser light. Now for the weird part: when a Helium-Neon laser first operates, many different overtones of red light are amplified and the beam contains many slightly-different colors of red at the same time. It's not yet monochromatic. As time goes on, some of these colors are



amplified a bit more than others, and this uses up the available energy coming from the power supply. In other words, the different waves start competing for limited resources! Just one wave "wins" in the end, and all of the other overtones drop out of the running. The laser light is not just red light. Instead it is a **SINGLE PURE OVERTONE-WAVE**, a pure frequency where the string of waves just perfectly fits in the space between the two mirrors. Change the spacing of the laser's mirrors, and you change the frequency of the light.

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## **CORRECTED: IRON AND STEEL ARE *NOT* THE ONLY STRONGLY MAGNETIC MATERIALS**

There are numerous others. Nickel and Cobalt metals are very magnetic. (U.S. "nickel" coins contain copper which spoils the effect, so try Canadian nickels made before 1985.) Most other materials are "diamagnetic," and are repelled visibly by very strong magnets, although some materials are "paramagnetic" and are attracted.

Supercold liquid oxygen is attracted by magnets. Some but not all types of stainless steel are nonmagnetic. There are even some metals which are individually nonmagnetic, but which become strongly magnetic when mixed together, chromium and platinum for example, and compounds of manganese and bismuth.

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## **CORRECTED: RE-ENTERING SPACE CAPSULES ARE *NOT* HEATED BY AIR FRICTION**

They are heated as they plow into the atmosphere and compress the air ahead of them. Ever pump up a bicycle tire and discover that the pump and the tire have become hot? The same effect causes spacecraft and supersonic aircraft to heat up as they compress the air at their leading edges. The heat doesn't come from *\*rubbing\** upon the air, it comes from *\*squeezing\** the air. This applies mostly to blunt objects such as Apollo reentry vehicles. It does not apply as much to the Space Shuttle: with wings oriented mostly edge-on to the moving air, the surfaces of the Shuttle **ARE** heated by friction. But when the Shuttle first reenters the atmosphere, the bottom of the craft faces forwards, and in that case the Shuttle is heated by air compression, **NOT** by friction.

---

## **CORRECTED: CARS AND AIRPLANES ARE *NOT* SLOWED DOWN BY AIR FRICTION**

They are slowed because it takes energy to stir the air. While direct friction between the air and the car's surface does play a part, the work done in stirring the air far exceeds the work done in direct frictional heating. If vehicles did not send air swirls and vortices spinning off as they moved, they would barely be slowed by the air at all. Eventually the swirling air is slowed by friction and ends up warmer, but this occurs long after the vehicle has passed.

---

## **CORRECTED: THE NORTH MAGNETIC POLE OF THE EARTH IS *NOT* IN THE NORTH**

Opposite poles attract. If we hold two bar magnets near each other, the "N" pole of one magnet is attracted by the "S" pole of another. If we suspend a bar magnet by a thread, the "N" pole of that magnet will point... *toward* the Earth's north!

Something is wrong here. Shouldn't the "N" pole of a magnet point towards the "S" of the Earth? Alike poles should repel, not attract. Either the "N" and "S" printed on all bar magnets is reversed, or the "N" and "S" on the Earth is backwards. Which is it?

This problem has a simple solution. Physicists define "N-type" magnetic poles as being the north-pointing ends of compasses and magnets. This definition is built into all of modern science and engineering and is part of Maxwell's equations. Wind an electromagnet coil, see which end points towards the Earth's north pole, and that end is the "N pole" of the electromagnet. And this means that the magnetic pole found deep inside the northern hemisphere of the Earth is a south-type magnetic pole. The Earth's northern magnetic pole is an S! It has to be this way, otherwise it would not attract the N-pole of a compass.

This is a long-standing but arbitrary physical standard, much the same as defining electrons as being negative. Like it or not, we are stuck with negative electrons, with seconds which last about 1/100,000 of a day, with backwards Earth poles, with centimeters which are about as wide as a small finger, etc.

[Interesting email](#) msgs on magnetic polarity

See [Dexter Magnetics](#) for more on this.

Also try this [Google search](#)

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## **CORRECTED: ACTUALLY THERE ARE NO SODIUM CHLORIDE MOLECULES IN SALT WATER**

Salt is not made of NaCl molecules. Salt is made of a three-dimensional checkerboard of oppositely charged atoms of sodium and chlorine. A salt crystal is like a single gigantic molecule of ClNaClNaClNaClNaClNaClNa. When salt dissolves, it turns into independent atoms. Salt water is not full of "sodium chloride." Instead it is full of sodium and chlorine! The atoms are not poisonous and reactive like sodium metal and chlorine gas because they are electrically charged atoms called "ions." The sodium atoms are missing their outer electron. Because of this, the remaining electrons behave as a filled electron shell, so they cannot easily react and form chemical bonds with other atoms except by electrical attraction. The chlorine has one extra electron and its outer electron shell is complete, so like sodium it too cannot bond with other atoms. These oppositely charged atoms can attract each other and form a salt crystal, but when that crystal dissolves in water, the electrified atoms are pulled away from each other as the water molecules surround them, and they float through the water separately.

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## **CORRECTED: LIGHT AND RADIO WAVES DO NOT ALWAYS TRAVEL AT "THE SPEED OF LIGHT"**

They only travel at the "speed of light" (186,000 miles per second) while moving through a perfect vacuum. Light waves travel a bit slower in the air, and they travel LOTS slower when moving through glass. Why does light bend when it enters glass at an angle? Because the waves SLOW DOWN. Why can a prism split white light into a spectrum? Because within the glass THE SPEED OF LIGHT WAVES IS DIFFERENT FOR DIFFERENT WAVELENGTHS. And while the numerical value for the speed of light in a vacuum, "c," is very important in all facets of physics, as far as light waves are concerned there is no single unique speed called "The Speed Of Light." [note for advanced students: ok ok, I'll add this: light \*waves\* within a transparent medium are slow, even though the wave's photons are thought to jump from atom to atom always at a speed of c.]

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Created and maintained by [Bill Beaty](#). Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

If you are using Lynx, type C to email.

# RING-VORTEX (smoke ring) LAUNCHERS

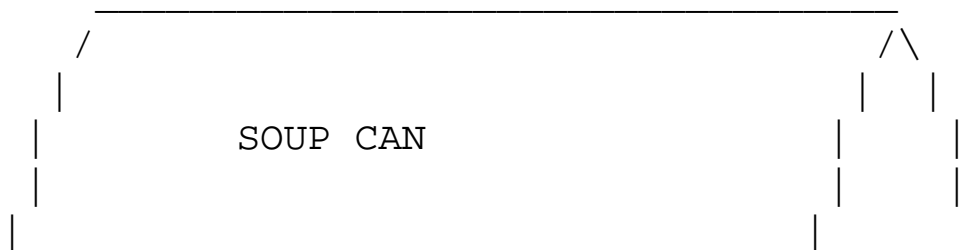
- [SMOKE-RING ANIMATION](#)
- [SMALL SMOKE-RING CANNONS](#)
- [GIANT VORTEX CANNON](#)
- [COMPUTER-WAVEFORM VORTEX LAUNCHER](#)
- [WEIRD IDEAS](#)
- [SCIENCE FAIR HINTS](#)
- [HIGH-SPEED BLIMP](#)
- [LINKS](#)

## SMALL SMOKE-RING CANNONS

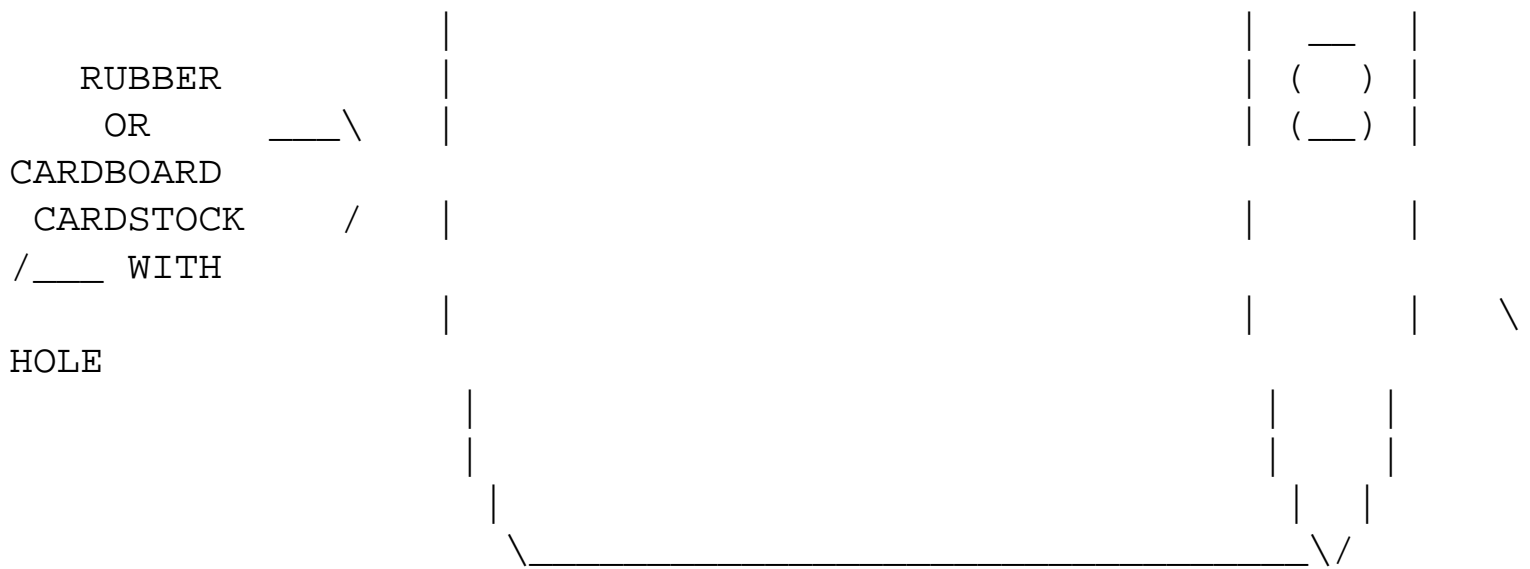
Many years ago WHAM-O sold a plastic air-puff gun. The puffs of air could fly across a room and knock over cardboard targets.

It turns out that this gun used ring-vortices, or "invisible smoke rings" as its ammunition. Also turns out that smoke-ring guns are extremely easy to make. Take a soup can, cut out the top and bottom, tape a piece of cardboard over one end, and cut a 1" hole in the center of the cardboard. Tape a disk of thin card stock or heavy paper over the other end (or better yet, snip a balloon in half and stretch it across the other end.)

When you gently whack the covered end of your vortex launcher, a transparent ring of spinning air will shoot out of the hole. Aim the device at your face or arm, and you'll feel the puff of air when it hits your skin.







The vortex rings can be made visible with a bit of smoke. I use stick incense, and just shove the end of the stick into the hole for awhile (don't set the cardboard on fire!!)

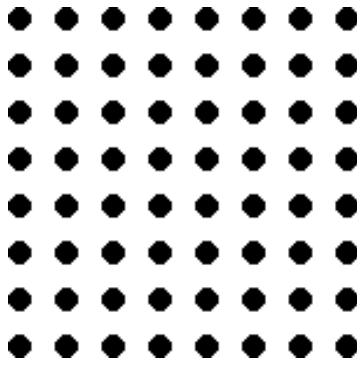
Tap the bottom gently, and slowly spinning smoke rings will be launched. Tap it hard, and the smoke rings will zoom so fast that you'll only see a grey blur. Tap it too hard and you generate air turbulence but no smoke rings.

To see the details of the smoke rings it helps to have bright lights and a dark background. Work in a darkened room while placing your device between you and a bright table lamp. The light should shine towards you, through the smoke, but position things so you observe the smoke against a darkened wall. Smoke rings are similar to tornadoes, but the ends of the tornado is curved around so its ends are joined into a circle.

Try shooting slow rings then immediately shoot faster ones. The faster ones will catch up to the slower ones and move through them (the slower ones open wider to allow the fast ones to pass.)

Rather than using smoke, you could instead use scent. Any fumes in the can will end up inside the air in the smoke ring. Try putting perfume in the can. When you launch your ring vortices, they will be invisible. But if you target a distant nose, your victim will know when they've been hit.

Or even easier than building the soup-can launcher, K. Larsen suggests using a 1-gallon polyethelene milk jug. Whack the bottom and a vortex ring is launched from the spout. Aim it at your face and you can feel the rings of air hitting you, even if you don't use smoke.



## Other similar sites:

- [Wirbelrohr](#), vortex tube acoustics
- [Suggested experiments w/ programmable vortex generator](#)
- [Airzooka\(tm\)](#) small, powerful
- [Zero Toys](#) smoke-ring toy
- [Vortex collisions, leapfrogging](#)
- [Vortex gallery](#)
- [Falaco Solitons](#), underwater half-rings
- Ned Kahn's [Fog Fountain](#)
- [Dolphins](#) launch [Underwater Bubble-rings](#)
- [The SRL vortex cannon](#)
- [Santa Barbara Sci](#)
- [PS-99 Vortex Cannon](#)
- [Famous WHAM-O Air Blaster](#)

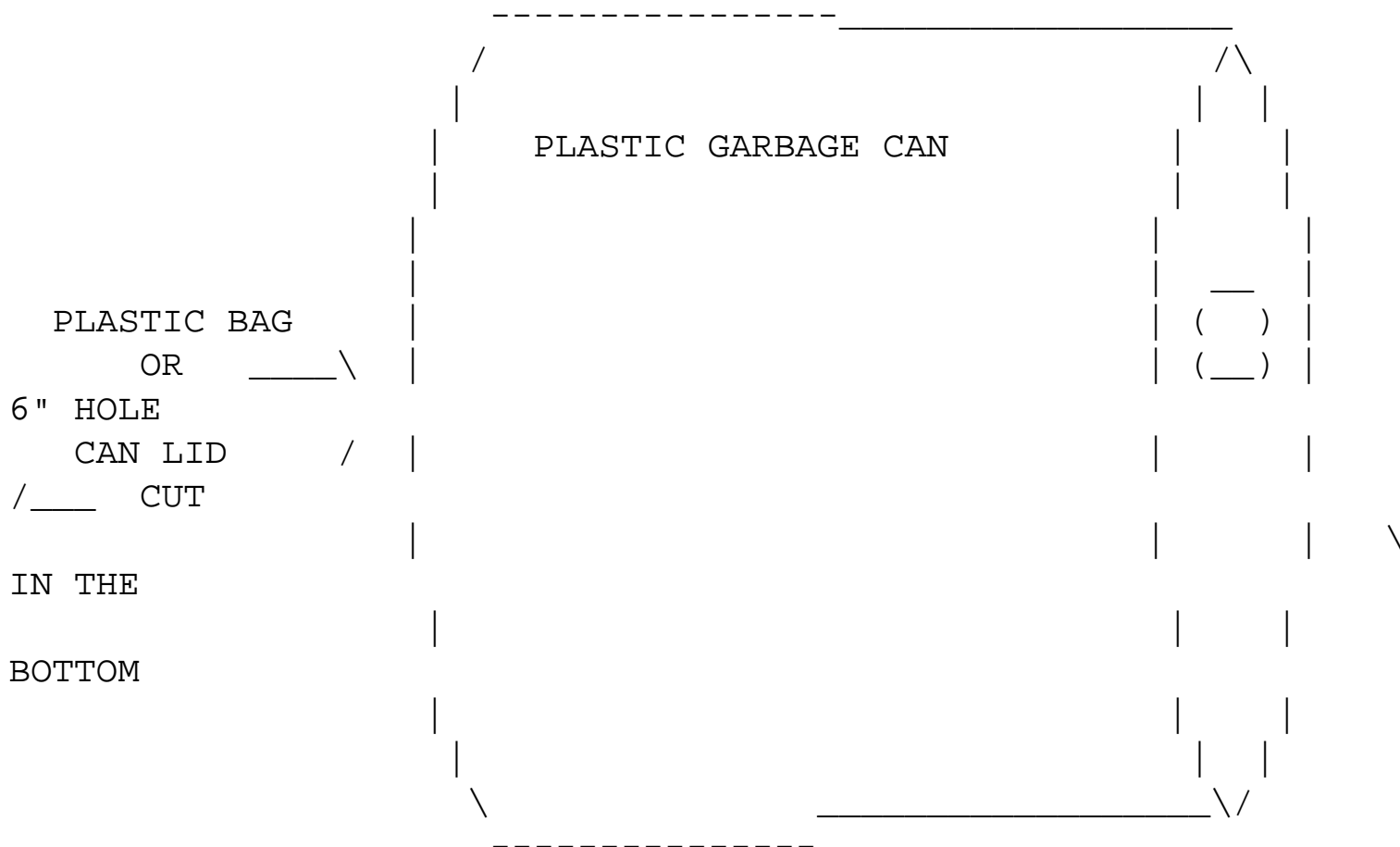
## HINTS FOR SCIENCE FAIR

The vortex cannon is a cool physics demonstration. How can we convert it into an experiment? Easy. Ask a question, change your question into a statement, then perform an experiment to prove or disprove your statement.

For example, ask this question: how far can a 4-inch vortex cannon send a ring vortex? Change this into: "A 4-inch vortex cannon can project a smoke ring across xx centimeters." Then do the experiment, and find out what xx is. (PLEASE DON'T USE THIS EXAMPLE AS YOUR EXPERIMENT. THAT'S BORING. BE DIFFERENT. THINK UP A WEIRD AND *INTERESTING* QUESTION, ONE THAT YOU DON'T KNOW THE ANSWER FOR.)

## GIANT VORTEX CANNON

It's not hard to make a giant vortex cannon. Instead of a soup can, get an old plastic garbage can. Cut a six inch circular hole in the center of the bottom. Put the plastic can cover on the can and whack on the cover to launch vortices. Or better, use duct-tape and a plastic garbage bag to form a sort of "drum head" over the open top of the garbage can.



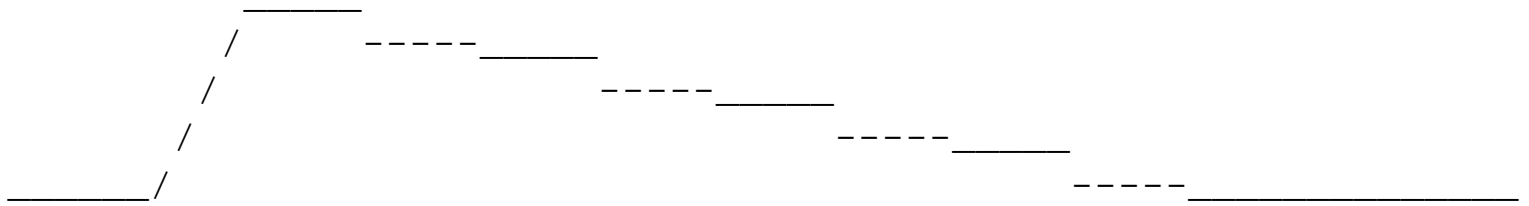
## COMPUTER INTERFACE VERSION

Suppose we replace the drumhead with a large bass loudspeaker, hook the speaker to a power amp, and drive the power amp with the output of a soundblaster card? This would give us total control of the impulse waveform applied to the vortex generator. Instead of a garbage can, use a wastebasket for the body of the device, and maybe mount it on a tilt/pan tripod.

I haven't completed one of these devices. I went as far as building the body, then using an audio power amp and a square wave generator to run the device. Even this was pretty cool, since the amplifier level would control the speed of vortex launch, the duty cycle controlled launch speed and spin rate (I think!), and the repetition rate of the square wave generator allowed me to create streams of vortices.

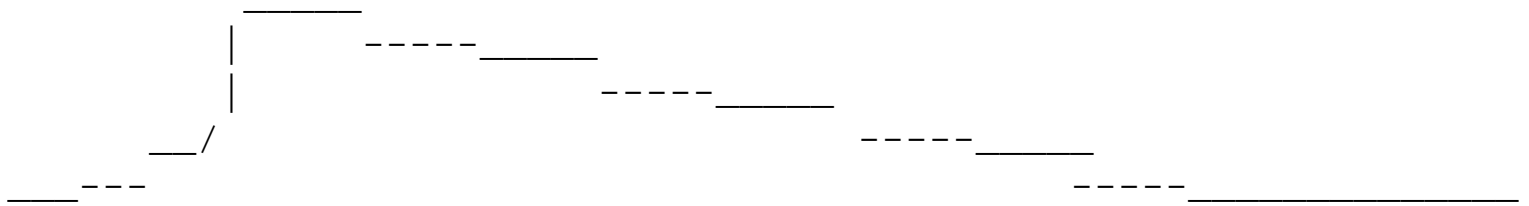
As far as sound cards go, in theory there should be some shapes of pulse waveform which give very robust smoke rings. I would try creating various shapes with a waveform editor, then see how far and fast the resulting smoke ring would travel. It might be possible to vastly extend the maximum range of vortex travel by designing the perfect waveform.

Here are some waveforms to try. The waveform is a single pulse. The steep leading edge of the pulse creates the vortex. The edge of the pulse would last maybe 1/5 second or 1/10 second or so depending on the size of the hole and the loudspeaker. Also you'll want to try pulses of different shapes. The loudspeaker cone should move forward quickly, then suddenly stop, then slowly return to its original position. The signal pulse would look like this:



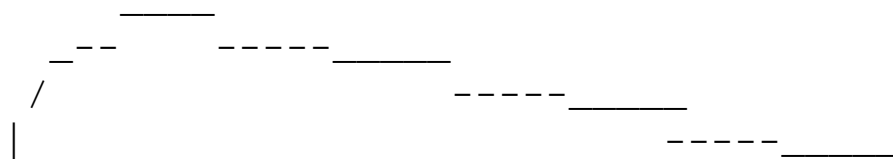
The steep part of the pulse should last about 1/10 second, and the slow part afterwards should last maybe 1/2 second. Feed this signal to an amplifier and a loudspeaker (turn the volume way down at the start, just in case the pulse is so big that it might damage the loudspeaker.)

To create smoke rings which fly fast, change the start of the pulse so it looks like this:



It starts rising gradually, then rises very fast, then it stops at the peak. That should make the core of the smoke ring spin slowly, while the outer regions spin fast, and the whole smoke ring will travel quickly forwards. (The outer region of the smoke ring touches the outside air, so if the outer region is rotating fast, it will drive the smoke ring forward at high speed. )

To make smoke rings where the core spins fast, change the pulse so it looks like this:



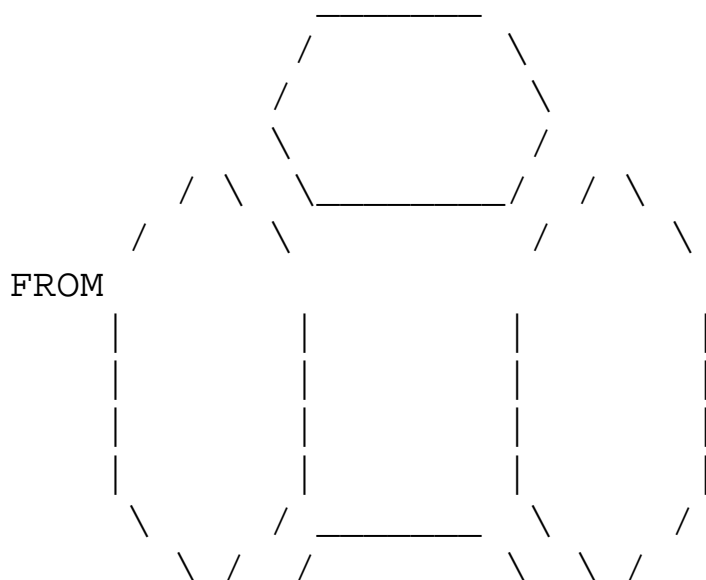
It starts off very fast, then rises more slowly to the peak. That makes the core of the smoke ring spin fast, but the outer regions move more slowly, so the whole smoke ring drifts along slowly.

Also, fast-spinning vortices can act as "time bombs", they drift along for awhile and then suddenly shatter into turbulent smoke. Perhaps a particular waveform will make this effect programmable. The resulting smoke rings would move for a particular distance, then shatter into a smoke cloud. A stream of these rings would fly out and shatter, which would allow me to pump smoke out to a distant cloud which just sits there in the air. [Suggested experiments w/ programmable vortex generator](#)

## HIGH-SPEED VORTEX BLIMP

While discussing a friend's small prop-driven helium blimp, I had an interesting insight: could we build a blimp which flew like a ring-vortex does? Suppose we made a big stack of disk-shaped helium balloons and threaded them onto a big thin steel rod, then bent the rod to form a ring. It would look like a sliced donut. When this "donut" of balloons was forcibly flung broadside through the air, all of the helium balloons would rotate, and the air friction would be very low, just like a ring vortex. If such a device could be motorized, so that the disk-balloons would be forced to rotate on axis, then the whole affair would travel forwards. (And if selected sectors of the balloon-stack were run backwards, then the entire device would turn, sort of like steering an army tank.)

Rather than a circular stack of disks, perhaps it could take the form of several large football-shaped blimps, where the tips of the blimps are connected together. Six blimps? Or even four or two. Like this:



"SQUARE DONUT" AIRCRAFT MADE  
ROTATING BLIMPS



The above "square smoke-ring" craft could go tearing horizontally across the sky like some sort of big silver water-weenie! If the blimps were rigid, turbulence wouldn't tear them apart. To steer, spin one of the blimp-motors a bit faster than the others.

Heyyyyyyy! Maybe they wouldn't need helium! If the "smoke ring" was oriented horizontally like a donut on the ground, and if the gasbags were spinning, maybe it would act like a helicopter and drive itself upwards. It would be VERY quiet since the air flow would be almost laminar. It would look like a flying saucer. With the large surface area it would need, it may as well have some helium fill for a bit of extra lift. But with enough power, maybe helium wouldn't be necessary for flight.

How would it behave? If it was hovering, and if the blimp-motors were suddenly cranked up fast, it would eject a "starting vortex" and be strongly accelerated. Being neutrally bouyant, it would only experience parasitic drag and not "induced drag," and because the surfaces are rotating WITH the air and perhaps maintaining laminar-flow conditions, the parasitic drag would be minimal too. The craft would coast along like a big flywheel, just as smoke-rings do. If the spinning of the blimps was suddenly halted (use electromagnetic braking and recover their energy!), maybe it would create another starting-vortex in the air, and would stop on a dime? Maybe not.

Hmmmm. EM braking. What if the whole thing was powered by electric motors, so that the kinetic energy of the spinning blimps could be quickly removed and stored in big internal capacitors? This might give a high-G acceleration capability.

The whole idea is SO STUPID!! Just think of a 50ft silver donut hovering erect above the airforce runway. Turn the balloons one way and it moves forwards. Turn them a different way, and the whole thing rotates. Everyone laughs really hard. But then the pilot kicks in the ultracapacitors... and the whole aircraft blinks out of sight. Huh? It accelerates at 30G and unexpectedly goes tearing across the sky, but because it is a laminar-flow propulsion system, it is SILENT. Just don't aim the "exhaust" side of the blimp at a building when you punch the accelerator, because it launches a huge "starting vortex" which has enough overpressure to do some serious damage.

Imagine getting into a military dogfight with such a beast. It might not need weapons. During sudden accelerations it would launch "clear air turbulences" which would have enough wind-shear to shread conventional craft into confettii. It would be like battling a UFO that's equipped with a titanic "Wham-O" air-puff gun!

Hmmm. Can smoke rings move faster than the speed of sound?

## OTHER STUFF

In messing with the square-wave generator mentioned above, it looks like the "stink gun" is feasible. The vortex launcher emitted a beam of fast smoke rings which went all the way across the room. Lots of smoke drifted out of the generator though, so if I were to put a nasty odor in the device, the operator (me) would suffer as much as the victims.

If the vortex launcher emits a stream of vortices, does this drive the launcher backwards? Is there a reaction force? If so, then hang the whole device from a helium blimp and use it to drive the blimp forward. A loudspeaker inside a bucket is a very strange aircraft engine! Or use it underwater. A ship with no propellor, just a big piston. Maybe even get rid of the piston and instead use a large bubble. Expand and contract the bubble using a steam boiler? What if this technology had been invented long before "ships' screws?" Today we live in an age of propellers where the Wham-O air blaster is just a toy, but things could just as well have been the opposite!

Suppose the computer-based launcher created a string of smoke rings with varying speeds. If the string was made of fast-slow-fast-slow rings, then pairs of rings would pass through each other periodically, as if they were square dancing. Or, what if you shot a string of slow-fast-faster-faster rings? In this case the later rings would overtake the first, and the whole string might squash down to the length of a single ring. The string of smoke rings would momentarily become a disk of concentric smoke rings! If the vortex generator was fairly powerful, maybe this "vortex disk" would be able to knock over larger objects. The vortex generator sends out energy in a long stream of rings, but then the varying speeds make it concentrate into a brief burst. Remember, a stick of dynamite will burn for hours as fuel, or it will "burn" all at once in a fraction of a second.

Pure argon gas allows you to create very long electric sparks. When a stream of argon is sprayed at a tesla coil, long sparks jump up through the stream. So, what would happen if a string of pure argon smoke-rings was sent towards a very large tesla coil? Would the arcs jump from ring to ring, so the "lightning" would reach out and strike the smoke ring generator? What would happen if a battery-powered smoke ring device (and an argon tank) was installed inside the oblate terminal of a really large tesla coil? Hobbyists' directed energy weapon?

A [VandeGraaff](#) electrostatic generator with a wire connected to its sphere is a source of charged air. Electrified air flows out from the wire tip. If a VDG was used to supply electrified air to a vortex launcher, the result would be a "static electricity gun". Victims would suddenly feel 'lethal' levels of clothes-dryer cling, and they'd get zapped by anyone they might bump against. If the string of charged vortices was sent to a [pop-bottle electrostatic motor](#), the motor should spin without needing any wire connections. Can you say "perpetual motion hoax?" And if the vortex generator was supplied with pure argon, maybe you'd see a blue flash whenever a charged argon smoke ring touched a grounded object or person. (Note: the body of the vortex launcher might need to be metal, or at least cover the interior with grounded aluminum foil.)

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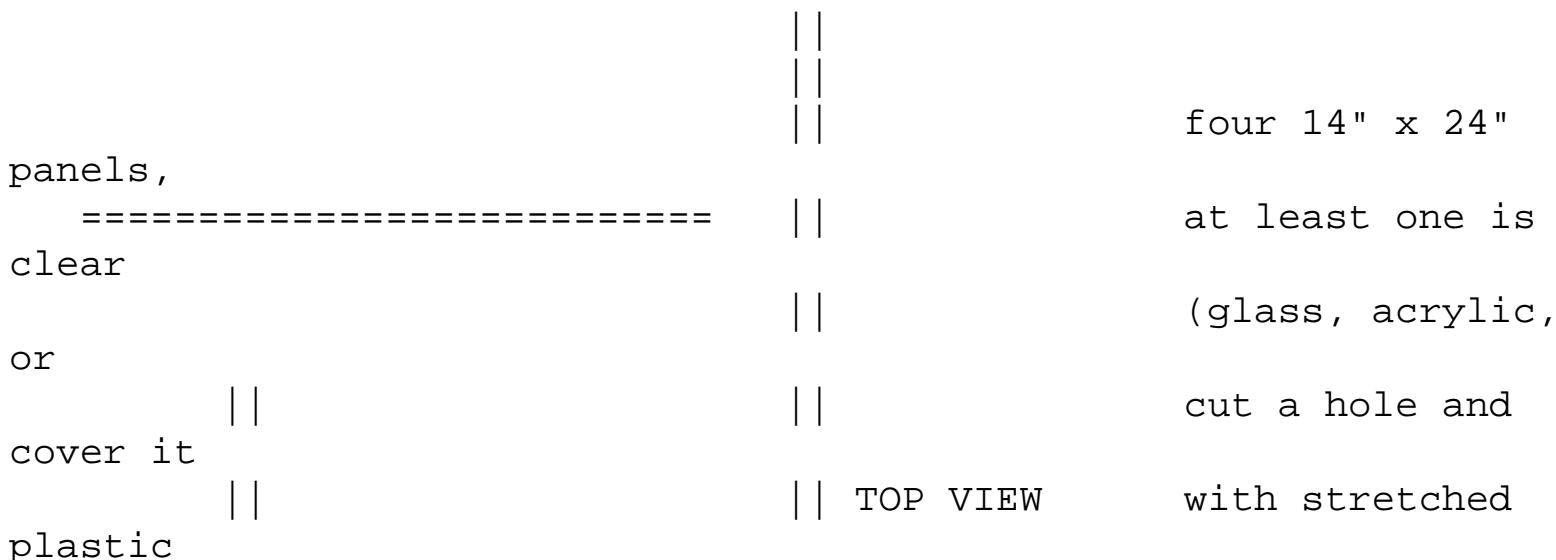
# TORNADO GENERATOR BOX

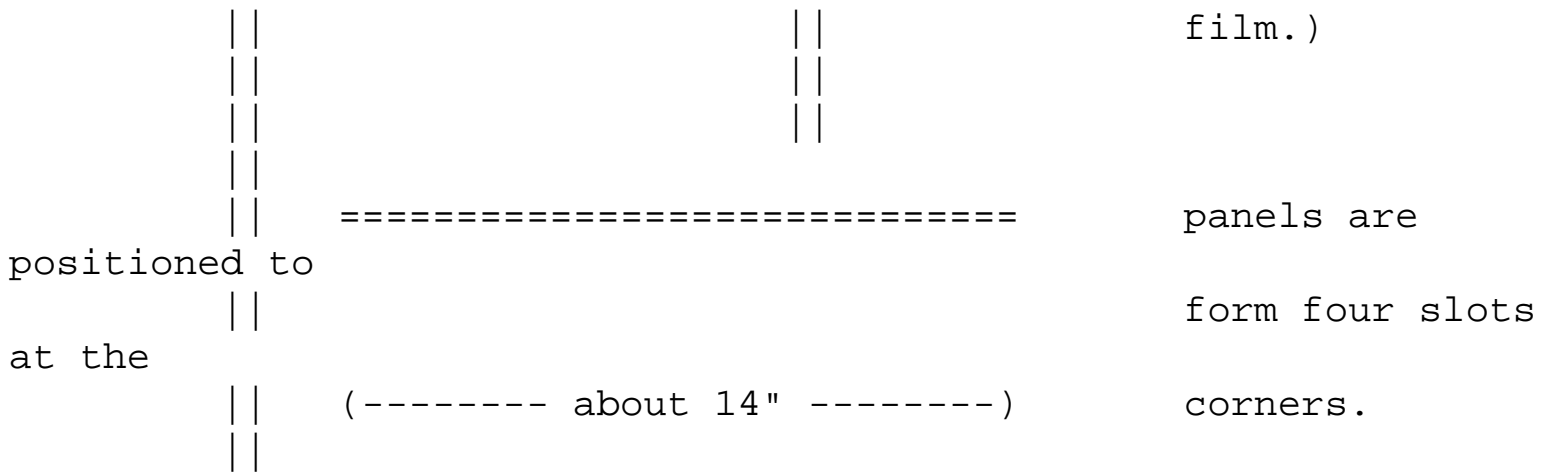
(c)1996 William J. Beaty

Doug Smith and I put together this tornado chamber as part of a semi-permanent science museum exhibit in Boston in 1988. The main body was built from 1/4" thick plexiglas, a small 3in "boxer fan" on top of the case supplied the propulsion, and an ultrasonic humidifier supplied the white mist.

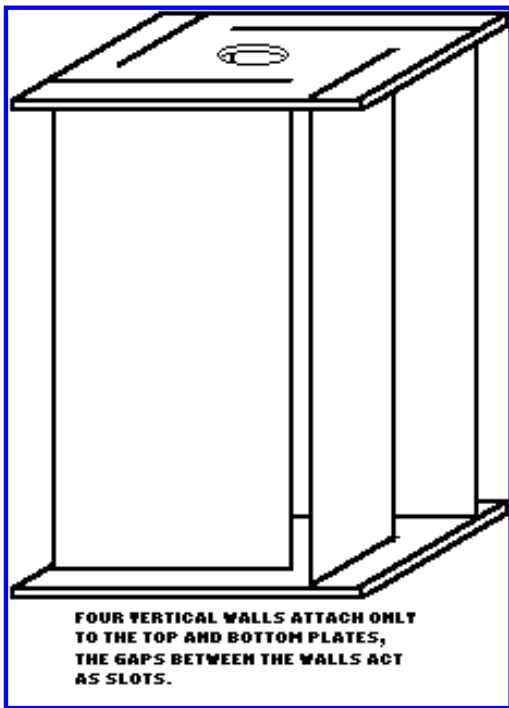
**SCIENCE FAIR NOTES:** If you don't need the device to last forever, you could build this out of cardboard or "gatorfoam" instead of plexiglas. Use duct tape instead of glue, and use incense sticks to make "smoke" instead of a humidifier. The bottom panel should not be cardboard, since it's a fire hazard with incense, or humidifier mist will make it soggy after awhile. If you use opaque materials, then make a big hole in one of the side panels and tape clear plastic over it to form a window. The fan creates the tornado, and the mist or incense smoke makes it visible. Instead of using an ultrasonic humidifier, you can use burning incense sticks or cones, but supply a large dish or pan on the bottom so the burning incense cannot become a fire hazard! If desired, put a small (15W) light bulb at the rear of the chamber to light up the mist tornado, and paint the inside of the chamber black to give good contrast. Try using the "12-volt micro fan" from Radio Shack, part number 273-240, and run it from a 9V battery. However, if the slots in the side of your tornado box are too wide, you'll need a more powerful fan. R. Grummer suggests using dry ice, which can sometimes be had at no cost by asking your local grocery store.

Top view of the tornado box looks like this (if the square top panel is removed) :





The four vertical panels are fastened to square top and bottom plates, but are not fastened to each other. Gaps between the vertical panels form the slots. With 18in square top and bottom panels, and 14in walls, the slots are 1in across, and the square central chamber is 12in. Air rushes in through the narrow slots at the four corners, swirls inwards to form the tornado, then exits through the the top. A small fan was installed in the center of the top plate (with a hole cut for the fan.) The device can be any size, keeping the scale of the slots about the same of course: with a 12" square inner chamber, the slots end up being about 1" across. The total height is up to you. My device was about 2ft. tall. If you make yours lots taller, you either need to use a fairly strong fan, or you need to make the width of the slots smaller.

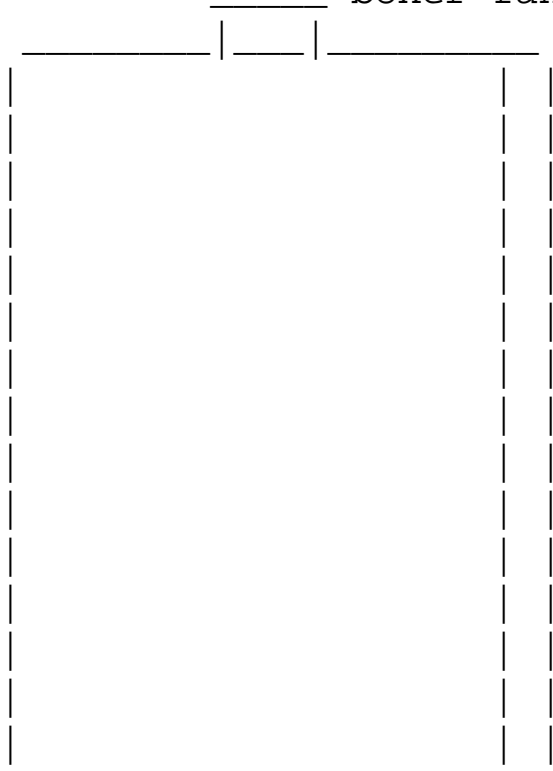


The top plate of the version I built was a flat panel with a 2" hole in the center, with a high speed 120volt 3" box fan screwed over the hole. Fan air direction was aimed out of the box of course. This type of fan is available at surplus electronics outlets, and I think Radio Shack carries one version.

In order that it stand up to many weeks of wetness, I made the bottom of mine from a heat-formed plexi sheet, formed into a shallow funnel shape in an oven, w/crude frame to hold the edge, and a piece of ABS pipe used temporarily to punch the "funnel" shape into the hot, soft sheet. A hole was cut at the bottom of the funnel shape, and the edge of the hole was glued to a short piece of ABS sewer pipe. A perforated plexi disk covers the funnel mouth and provides

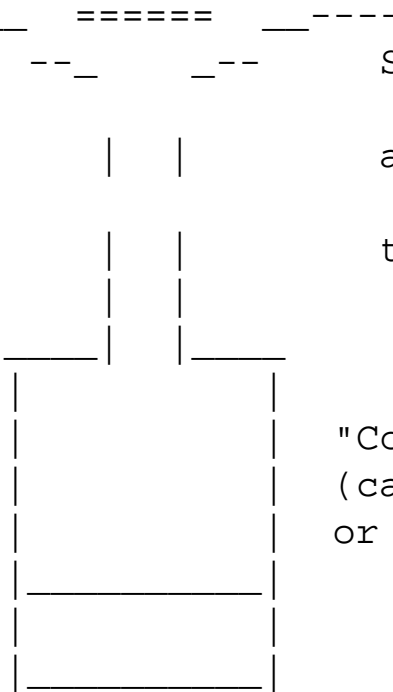
the flat surface that the tornado needs in order to form properly. The ABS pipe led down into an ultrasonic humidifier which provided the marker-mist and made the vortex visible.

boxer fan (cooling fan from mail order surplus)



SIDE VIEW

with  
the



Shallow funnel-shape for water return,  
a disk supported in the center so that  
tornado isn't disrupted by the open pipe.

"Cool Mist" Ultrasonic Humidifier  
(can be found in some drug stores,  
or garage sales)

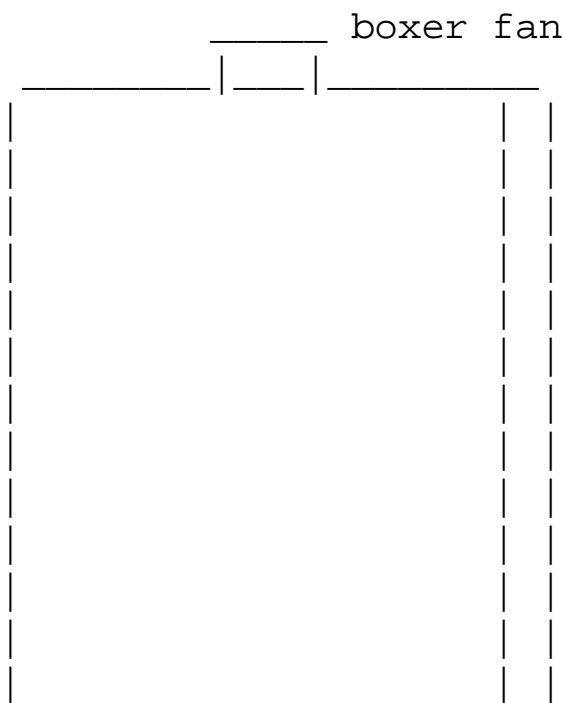
Ultrasonic humidifiers normally emit a blast of mist rather than a slow flow. To eliminate the blast, I plugged the little air-jet aperture down inside the humidifier's mist compartment with a plexiglas block, with a few small holes drilled to point downwards. (Pools of water develop everywhere inside the humidifier, so properly angled air holes in the small plexiglas plug are needed to prevent water buildup from filling the air holes.) When the holes are the right size, dense white mist fills the humidifer and pours out the top like a white fluid. The quick version:

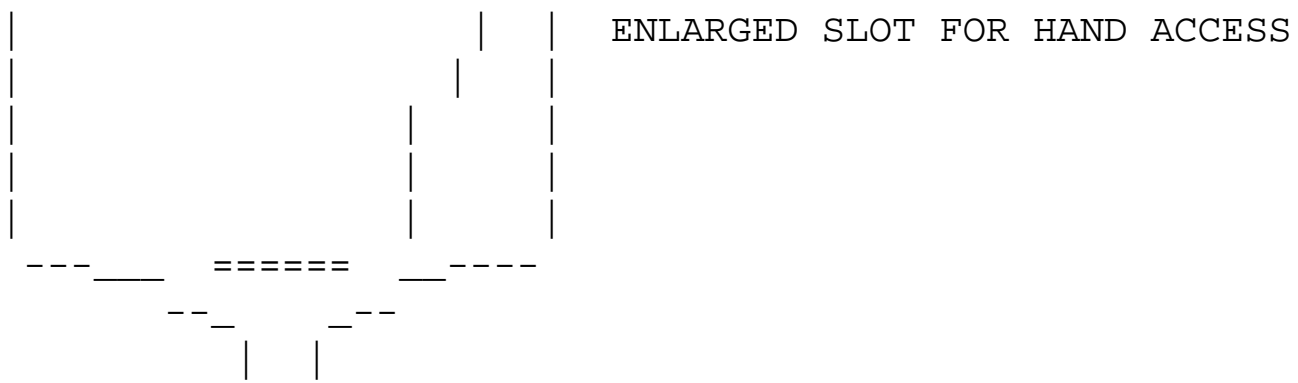
crimp some aluminum foil over the air-jet aperture inside the humidifier, wrap rubber bands around it to hold it in place, then stab it with a pencil point to make small holes in the foil. See the ["Touch the clouds"](#) exhibit article for more info on humidifiers.

The shallow funnel-shape allows the water which builds up in the bottom of the tornado chamber to run back into the humidifier, rather than pooling up in the bottom of the chamber and growing algae. Over the heat-formed funnel I placed a 6" dia. perforated plexiglas disk with 1/8" legs around the edge. The legs raise up the circular plate so water can run past the edge, but the slot is narrow enough that debris from museum visitors won't end up in the humidifier water. The perforations in this flat plate were closely-spaced 1/4" holes made in a large circle, and the mist from the humidifier exits through these holes. It is important to provide a central, flat, unperforated surface for the vortex to "work against", and therefore this plate has an unperforated center, with a circle of holes about 3" dia. to feed mist into the vortex from around its perimeter.

I found that the tornado is hard to see against a light background, so I made the two back walls opaque black, the bottom funnel and plate black, and two front walls transparent, then I lighted the whole thing heavily from the top and from slightly behind. If I had to do it over again, I might try installing a flourescent tube running the length of the box. This tube would need to be in the rear from the viewpoint of users, but with some sort of light shields added, so it illuminates the mist column from behind, but doesn't shine directly in the user's eyes.

To allow people to stick their hands inside, I cut the vertical slot in the front of the box larger at the bottom, as shown below. This distorts the vortex, but allows "hands on" access. If you use a tiny, weak fan, you probably should skip this part, since the large hole will divert air from the vertical slots and prevent the vortex from forming.





And last, I built a small electronic controller which allowed users to vary the fan speed by pushing and holding a "faster" and "slower" button. (Speed control knobs tend to get wrecked pretty fast in an exhibits environment, while pinball machine flipper-buttons are long-lasting.) As the fan runs faster and faster, the tornado suddenly undergoes transition to turbulence, changing from an onion-layered smoke column into a whirling turbulent cloud. To preserve the contents of the water tank, the controller would disable the humidifier if none of the buttons were pushed for about two minutes. Once the mist had started, there was one last button which allowed the user to turn the mist off and on, and even to make "pulses" of mist which would travel upwards in the vortex.

The speed of the fan and the size of the slots must be adjusted correctly in order to create a robust vortex. I used a handheld incense stick to inject smoke into the air so I could see if the vortex was working. If your fan is too powerful, the vortex will be turbulent and won't create beautiful complicated "onion layers" of laminar flow in the smoke pattern. The fan's air stream can be slowed by partially blocking its exit with cardboard and duct tape. If the side slots of the main chamber are too large and the fan too weak, the vortex will form very slowly and will vanish at the slightest disturbance. If this occurs, either move the chamber walls to make the side slots smaller, or find a more powerful fan.

Forever on my "wish list" was to install a scanned laser beam "sheet-of-light" generator. This would allow visual cross-sections of the mist to be created. Simply aiming a handheld laser through the rear slot of the chamber and waving the beam rapidly back and forth through the mist caused momentary but spectacular "wind tunnel" turbulence patterns to appear, but I never went any further with this. Shielding the beam would be an issue, since to be efficient, the illumination must be directed through the mist column from behind, and towards (but not hitting) the users' eyes.

Other ideas for variations: a sculptor in New York converted an entire room into a tornado chamber. He/she provided a large exhaust fan in the center of the ceiling, then arranged a large circle of vertical pipes into the shape of a skeletal cylinder, with the center of the cylinder pattern aligned with the ceiling fan. These pipes extended from floor to ceiling, and each pipe presumably contained its own fan, and a series of holes or slots running one along side of the pipe. The pipe

slots blew air sideways so all the air in the room rotated slowly, and the central fan pulled air towards the center of the circle. The large "cylinder" of pipes acts as the walls of the chamber and provides tangential air jets, so any air which flows towards the center of the room is forced to spiral inwards. A powerful vortex forms in the center of the room, extending from floor to ceiling. A big pile of leaves, shredded plastic, etc. completes the exhibit.

The Exploratorium museum in San Francisco contains one large, famous example of a tornado generator chamber. ([www.exploratorium.org](http://www.exploratorium.org)) Only two walls are provided, the walls being made of huge curved sheets of plexiglas, with a fan in the ceiling of the exhibit. Ultrasonic humidifiers provide mist in the floor of the exhibit. Children can walk into the device and interrupt the spinning mist vortex.

Also see [HOMEMADE HURRICANE](#), the one from World Book that inspired me as a kid. That's on [Bizarre Stuff you can make in your kitchen](#).

[Smoke-ring Launcher](#), shoot ring-shaped tornadoes across the room, or construct a stench-gun. Silent but deadly!

[Tornado in a bubble](#)

[Detailed Plans](#) for 4-foot tornado machine

[SRL Flame Hurricane](#), fire tornado driven by jet engines

[4ft Tornado Generator](#) (complete plans)

[Stormchaser Dave's](#) Tornado Machine

[Tornado Simulator](#) from Tornadoproject

[Huge man-made tornadoes](#) from [Reelex](#) Inc

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Created and maintained by [Bill Beaty](#).

Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

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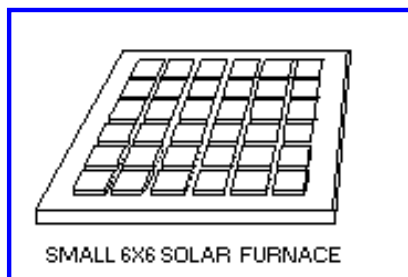
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# INFINITELY LARGE SOLAR FURNACE

(c)1996 William Beaty

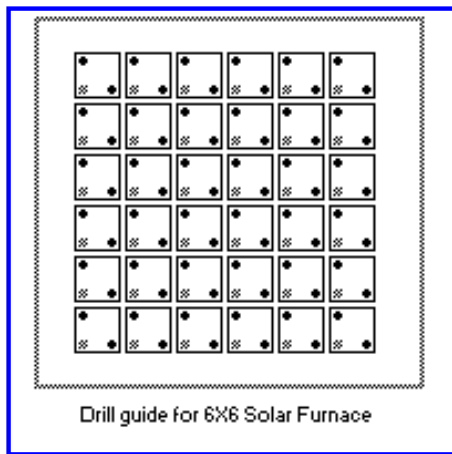
For those who dream of giant solar collectors which can generate temperatures high enough to melt steel, here is a method for building your own Solar Furnace of any size you desire.

These diagrams show a tiny 6 X 6 mirror-array as an example. Also, I used the silicone-glue "hinges" for this version so my array could be reprogrammable. If you only want a fixed-focus furnace, you can use screws to adjust the mirror chips, then glue them permanently into position. Obviously you can increase the size of the array to large as you wish. My dream is to build an array the size of a 4ft X 8ft sheet of plywood. With 1 inch mirror chips, it should create a focused spot which is 4000 times brighter than normal sunlight.

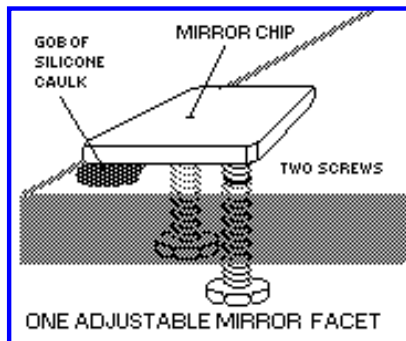


The trick is simple: Make or buy a large number of mirror chips of glass or plastic, each one about 2cm or 3cm in size. 12in glass mirror tiles can be had from the larger hardware stores, and these can be scored and broken into 2cm chips with a glass cutting tool. Note that an "oil-fed" glass cutter from a stained glass supply store works *far* better than the cheap little diamond-wheel cutters they sell in hardware stores. Or if glass-cutting is too weird for you, you can cut up some acrylic mirror-plastic with a power saw. Search for plastic mirror scrap at window-glass companies, or find larger pieces at plastic sheet suppliers. The smaller your mirrors, the hotter the focus.





Obtain a sheet of plywood and a big bag of screws which are about 1/4in longer than the thickness of the wood (if the wood is 1/2in thick, buy screws that are 3/4in. or slightly longer.) I used 6-32 machine screws because they were cheap, but most any screw will probably work. If your mirrors are larger than 1 in., use longer screws. If your furnace is going to be extremely wide, use thicker plywood to prevent warping. Lay out and drill the holes as shown, choosing a drill bit which is only slightly smaller than the screw diameter. The screws should turn easily with a screw driver. If your furnace is going to be wide, consider making four square regions where the mirrors in each region tilt towards the center. If not done this way, then the toothpick spacer mentioned below might not make the glue-globule tall enough. In that case the aim of some mirrors might be unable to hit the focus. Or, instead of complicated pre-aimed regions, just start aligning your entire array using a focus that is appropriately off-center from the whole furnace! (Idea: make four separate furnaces with the focus in the corner, then arrange them in a square.)



To make "hinges" for all the mirrors, I put a small glob of RTV silicone caulk at the corner of each mirror. Since this glue blob must stand up and not be smashed flat, I cut a number of round wooden toothpicks into 1/8inch segments, placed a small dollop of silicone sealant at the corner position of each mirror, laid each toothpick sideways into the silicone glob as a spacer, then laid down the mirror on the correct spot on the wood. The silicone lightly attaches the corner of a mirror to the wood, while the toothpick segment will lift up the corner of each mirror; tilting each mirror and giving it a greater adjustment range. The toothpick spacers also keep the mirror from smashing the silicone into a too-thin layer. Carefully perform this operation for all your mirrors. The toothpick in the corner will tilt each mirror one way, and when you later add the screws to the corners, the screws can lift the mirror as desired.

Let the mirrors harden for 24hrs. When the silicone has cured, screw all your screws into their holes just enough to let them touch the mirrors.

## Programming the array as a solar furnace

Cut up some Post-it(tm) notes, and stick a square of paper to each mirror to block the light. LEAVE ONE MIRROR NEAR THE CENTER OF THE ARRAY UNCOVERED. This one

mirror will act as a reference for adjusting all the others. (As the position of the sun changes, the position of this spot will also change, so you shouldn't need to move the whole device to track the sun while adjusting mirrors.) Take your mirror array out in the sun, and position it a few feet from a convenient target. The distance between the mirrors and this target will become the focal length of the Solar Furnace.

First use your screwdriver to adjust the single bare mirror chip so it is no longer tilted by the silicone glob. Bounce some sunlight from this small mirror towards your target, and move the whole device so the spot of light hits the target. Now remove the Post-it(tm) note from one other mirror chip, and use the screwdriver to adjust this other mirror so the spots of sunlight from the two mirrors combine together. Cover this newly-adjusted mirror, and uncover the next one. Repeat the adjustment process, then cover it and go to the next. Do not of course change the setting of your central "reference" mirror. When each mirror has been adjusted to combine with the "reference" mirror, peel all the paper from the mirrors and see what you've accomplished. All the bright spots should now shine on the same place. Tweak any stragglers to put them in line. If you wish, go through and glue down each mirror permanently and remove all the screws.

A 6X6 array is pretty safe for experimenting. It won't set anything on fire, but in the summer sun it will heat a black garbage bag almost to the melting point. Once you have the whole process learned, try making a 16 X 16 array (256 mirror chips), or even larger. The above process lets you slowly "coat" any flat wooden surface with solar-furnace arrays. With thoughtful planning you could even cover a non-flat surface with a solar furnace array. If you had enough time, you could build one of ANY size and temperature. \*\*\*WARNING\*\*\* if you build a big one, keep it covered when not in use. If you leave it around the house, moving sunbeams might unexpectedly bounce off it and start a fire!

## **WOODBURNER**

Once I had a brainstorm, and when I tried it out, it actually worked: send intense light into one end of a fiber-optic cable, and use the other end as a woodburner. I used an expensive glass-fiber cable 1cm in diameter which was about 1/2m long, and I placed one end of the cable at the focus of a 12-in fresnel lens in summer sunlight. The other end of the cable could char a wood surface, but just barely. A bigger solar furnace might have made it impressive. Sign your name as charcoal! Note: if you try this stunt, realize that you probably will damage your fiber optic cable, so don't try it with one that you can't afford to lose! Plastic opto fibers might melt, so use glass if anything.

## **MIRROR SIZE AND LONG FOCAL LENGTH**

The smaller your mirror chips, the smaller and hotter the focus. After all, the hotspot is approximately the size of a single mirror. An array of 1in. mirrors a foot across will make 144

beams, but if you use 2in. mirrors for your 1ft furnace, the hotspot only receives 36 beams.

However, if you use small mirror chips and adjust your solar furnace for a very long focal length, you'll find that the hotspot grows larger, fuzzier, and cooler. This occurs because the sun is not a tiny point, instead it is a disk, and the mirror-facets act as the pinholes of a "pinhole camera." Small mirror-chips form an image of the sun, rather than an image of the mirror-chip shapes. Each little square of light will develop a blurry edge, and only the center of each square image will get "full sun."

To compensate for this blurring effect, use larger mirrors. Here's the rule: choose a focal length which is lots shorter than 120 times the width of a mirror-chip. (This 120 comes from  $1/\tan(.5\text{deg})$ , the sun being about 1/2 degree in angular size.) For example, the 1in. mirrors would give a blurry hotspot if F.L. was longer than a few feet, and at 9.5ft the blurred regions swallow the hot center of the hotspot. This "blur" is an image of the sun. If you want to burn objects from 120ft away, you'll have to build a furnace using mirrors which are wider than 1ft each. The size of the sun-disk is the cause. (If our sun was tiny, but still just as bright, then this blur would be gone, and you could form its light into an intense parallel beam like a laser!)

For a 2-ft solar furnace:

MIRROR CHIP	MAX F.L.	BRIGHTNESS
1 in.	9 ft.	576
2 in.	19 ft.	144
3 in.	28 ft.	64
4 in.	38 ft.	36

## MIRROR ART

Rather than "programming" your adjustable array to form a solar furnace, you could instead use it to form any desired pattern of light spots. For example, make it project your initials. First adjust all the mirrors so they are flat. In the sun, the array should reflect a square grid of light spots. Now choose one-half of the mirrors and adjust them so they form one of your initials. Do the same with the other half, for your second initial. Now you have a "magic mirror" which looks like a bunch of little squares; like an almost-flat mirror, but when exposed to sunlight it creates a giant projection of the initials of your name.

## Chinese "magic mirror"

Some science museums have ancient Chinese "magic mirrors" on display. These look just like a flat mirror, but if you bounce the sun off them, you'll see a picture in the projected sunbeam. The surface of these mirrors contain tiny wobbles. We can program the solar furnace to do something

similar. First program your solar furnace so it's perfectly flat; so it projects a square array, and so it acts like a big flat mirror when you use it to look at your own face. Then go out in the sun, aim the beam at a far distant wall, then program the mirror chips to make a tiny pattern (such as a number, or your initials). Now use the furnace as a mirror to look at your own face. It acts like a flat mirror, no? The deflections used to produce the pattern are tiny, so the mirror is ALMOST flat, just like the Magic Mirrors.

## MISC

DeathMeK says to use old CDROMS (or free ones from junkmail) as zero-cost mirrors. Unfortunately the silicone glue used as a "hinge" just makes the thin mirrors bend, so you'll have to attach them some other way.

## LINKS

- ["Solar Death Ray" 112-grid](#), Seattle
- [Mirror Parabola](#), cockeyed.com
- [Chinese Migic Mirrors](#)
- [Forno Solar](#) (portugese)
- [Mirror-array Links](#) Red Rock Energy
- [Giant Fresnel Lens](#) random destructive acts
- [Curved-mirror sculpture could fry pigeons](#)
- [ALT.ENERGY.SOLAR](#)
- [ALT.SOLAR.THERMAL](#)
- [Heliostats](#)

Date: Sat, 27 Nov 1999 12:31:50 -0700

From: rwduncan

To: [billb@amasci.com](mailto:billb@amasci.com)

Subject: Solar Furnace

Hello Bill,

My name is Robert Duncan and I live in the Phoenix, Arizona metropolitan area. While searching for solar energy-related subjects, I found your website through Infoseek. After reading your 1996 article on the Infinitely Large Solar Furnace, I became interested in your technique and

constructed my own. The finished product is a 48 inch by 48 inch solar furnace with 1440 mirrors. While this is hardly infinite, I was able to transform an aluminum beverage can into smoke.

The materials and method of construction differed only slightly from the information posted on your website. I used drywall screws instead of machine screws because they were cheap. I pre-adjusted all the drywall screws for a thirty inch focal length prior to gluing the mirrors in place. I also omitted the toothpick spacers since my final adjustments would be very small. The programming was done by placing an unfrosted lightbulb at the focal point, allowing each mirror to reflect the light onto a grid pattern drawn on a piece of plywood placed along the focal plane. Each mirror was adjusted until its reflection was aligned with it's corresponding grid square on the focal plane.

The result was approximately 1000 watts of solar influx concentrated on an area the size of a silver dollar. Wood ignited with an audible "pop" the instant it entered the focal point. Toast burns instantly. Aluminum melts after 15 seconds. Half inch copper tubing deforms under it's own weight after 20 seconds. Steel glows red in about the same time. The temptation for onlookers to stick thier hand in front of the furnace is strong, so I keep a cardboard box handy to demonstrate what will happen to them if they try.

I appreciate the information and I wanted to pass along this success story. All this was accomplished with less than a \$100 investment in materials. My next step is to build a heliostat and attenuator to create an apparatus similar to the ones at the National Solar Thermal Test facility in New Mexico.

Thanks again,  
Robert Duncan  
rwduncan atsign gateway period net

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Created and maintained by [Bill Beaty](http://Bill Beaty). Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

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# RED AND GREEN "[ELECTRICITY](#)"

(c)1994 [William J. Beaty](#)  
Electrical Engineer



ALSO SEE: my [visual electricity](#) demonstrator

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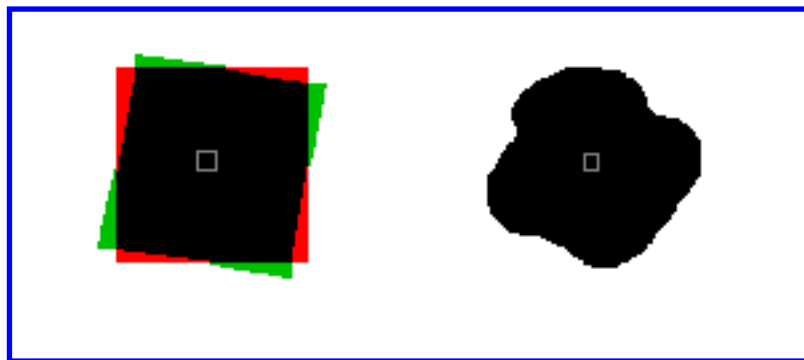
Here's a simple technique for demonstrating some basic electricity concepts. For classroom use, the colored shapes can be placed on an overhead projector. Also try using a white desktop, or a whiteboard. This demonstration is like an animated diagram, rather than a demonstration of any actual electrostatic effects. It is probably best used for grades five and above. I suspect that this demo is very effective for teaching basic electricity, because while I was working with these colored sheets, I discovered many new concepts myself, and I am supposed to be an electricity expert! Therefore don't be shy in using these with adults as well as kids. By making "static electricity" visible, *anyone* can gain insights which we never had before.

You'll need some red plastic film, green plastic film, tape, and scissors.

The colored film must be transparent if you intend to use it on an overhead projector. For use upon a desktop, translucent film is fine. I used some red and green clear plastic report covers from Fred Meyer stores. Larger sheets are available as "filter gel" from theatrical supply stores.

### **First, make a model of ordinary matter:**

- Roughly cut out a couple of red and green pieces, about 3" across.
- Place a bit of folded tape in the center of one sheet, sticky sides facing out.
- Stick the sheets together with the folded tape between them.
- Carefully cut around the edges so you end up with a perfectly overlapped BLACK shape, which is actually a sandwich containing red and green layers.
- Remove the tape.

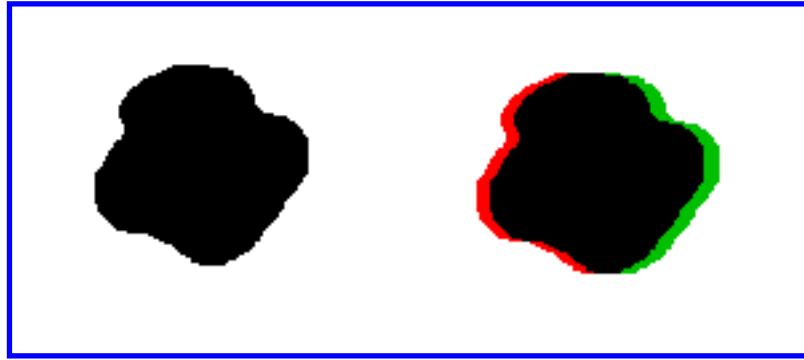


**Fig. 1 Red and green sheets stuck together, cut around the edge**

This is your model of a piece of ordinary matter. Matter is composed of atoms, and atoms are composed of positive nuclei surrounded by negative electrons. So, ordinary matter is actually composed of equal quantities of positive and negative charge. The red plastic sheet



represents the positive part of matter, and the green represents the negative:



**Fig. 2 Matter is composed of positive (red) and negative (green) in equal proportions**

In everyday matter, the positive and negative charges are equal, so they cancel each other out, and the matter has an overall electric charge of zero. The plastic sheets illustrate this: when we combine the red and green, the result is colorless black. Normal "uncharged" matter is actually made of positive and negative charge, just as the black plastic sheet is actually made of bright red and green colors. Matter is entirely MADE of 'electricity', yet because the positives and negatives cancel out, we rarely encounter electrical effects in everyday life. Think about it: even our bodies are made out of electric charge, yet it took mankind until the 1700's before we became curious enough to start seriously investigating electricity.

Make several more red/green cutout sandwiches of various shapes, so you have a collection of everyday "objects" with which to work. Or have your students make their own.

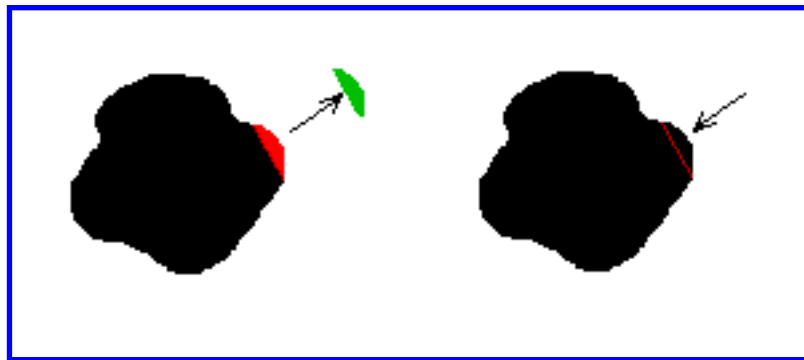


**Fig. 3 Various everyday objects, all made with red and green plastic sheets (and all made of opposite charge.)**

Hint: For a summer lecture I stamped out several hundred red and green circles 2 inches across, this gave me a give-away item to include with the lecture. A die-cutting print shop can do this for you.

## **DEMONSTRATE ELECTROSTATIC CHARGING**

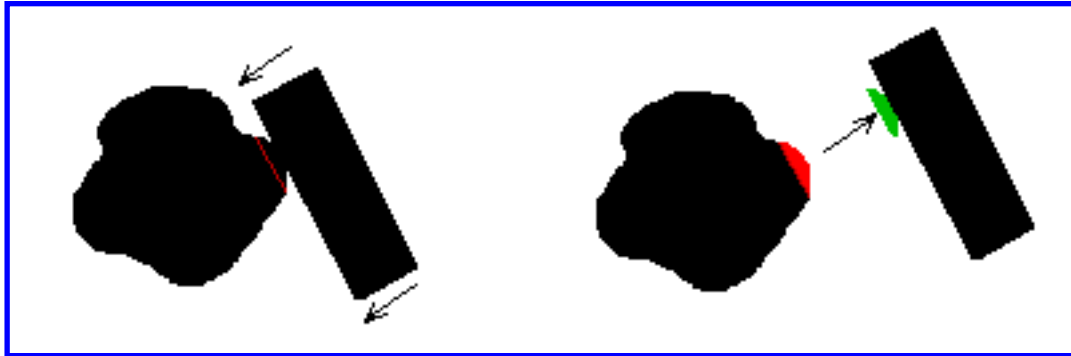
Cut a sliver out of the edge of the green part of one of your objects, while leaving the red sheet uncut. You now have a sliver made out of green "negative charge." You also have a black object that has a red stripe of "positive charge" on its edge.



**Fig. 4 Remove some green "negative" from your object. This leaves behind some red "positive."**

Place the object, green side up, on the overhead projector, and carefully replace the green sliver, so you end up with a black object again.

To tell the story of how "static electricity" can arise, touch a second black object against the one you have modified. Touch it only against the part of the object having the cut sliver of green. Use a finger to hold the sliver against this new object. This shows how one object can steal some "electricity" from the surface of another object.



**Fig. 5 Here's how "static electricity" is caused by friction. It would be less misleading if instead we said: "Here's how CHARGE SEPARATION is caused by CONTACT."**

Now separate the two objects. You'll end up with the original object with a red stripe on its "surface" or outer edge, while the new object has a green stripe being held against its "surface." This process is called "SURFACE CHARGING," or "ELECTRIFICATION BY CONTACT." Or in somewhat misleading everyday language, we call it "static" electricity.

**The demonstration above illustrates a number of distinct concepts:**

- Conservation of Charge: separated positive and negative charges always appear in equal proportions when they are pulled from matter.
- Electron transfer: it's most often the green "negative" stuff that is exchanged between objects, not the red "positive" stuff.

- Existence of cancelled charge within matter: it shows that matter is actually made of vast quantities of positive and negative charge in near-perfect balance. It shows that charges are not CREATED, so much as SEPARATED and un-cancelled.
- The role of contact: it shows that charging arises through contact between surfaces, which implies that the surfaces must have had dissimilar electrical characteristics. (If the two objects in the above figure have identical composition, there would be no reason for one object to steal the green from the other.)
- We commonly state that "static electricity is caused by friction." This is not quite correct. While friction sometimes plays a secondary role in surface charging, its the contact and the electron-stealing which are the fundamental elements in the process. I try to avoid saying that "static electricity is caused by friction." It would be misleading. Instead I say: "charge imbalance is caused by contact and peeling!"
- A bit about the misleading label "static electricity"... What's being created here is not an invisible substance called "static." Instead, we are creating an *imbalance* between the quantities of negative and positive electrical "stuff" which were already there in the matter. Once they are separated, it's not necessary that the charges remain "static" upon the surfaces. The charge does not need to remain unmoving. It's not the static-ness of the charge which creates all the interesting effects, it's the imbalancing and separation of the plus and minus. Also, "Static electricity" is not the complement of "current electricity," since "imbalance" is not the opposite of "motion." Charge-flow and charge-imbalance are actually two different phenomena which can even occur together.

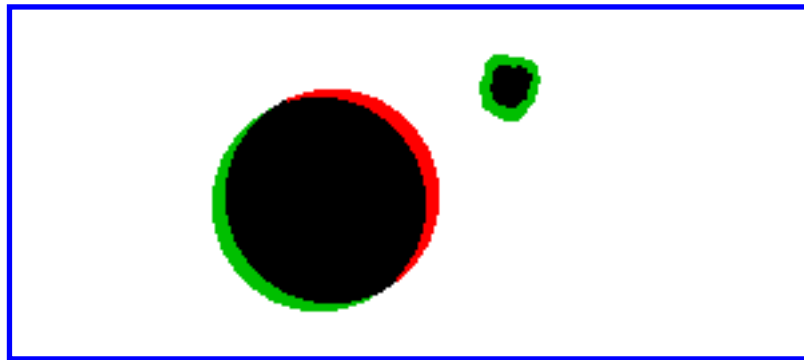
How can "static" electricity flow? How can "static" and "current" be simultaneous? Easy: "static" is not static, it

is imbalanced, and the imbalance can actually flow along. Is this a FLOW of STATIC electricity?!

It would be less misleading if we called the imbalance by some other name besides "static." Maybe "Voltage electricity?"  
"Imbalanced electricity?"

## DEMONSTRATE INDUCTIVE CHARGING

Place one of your "black" objects on the overhead projector. Place a small piece of green plastic on the overhead an inch away from it. Since alike charges repel, and green repels green, slide the green part of your large "black" object away from the small green piece. Slide it just a tiny amount, just enough to expose some bands of color on the black object:



**Fig. 6 CHARGING BY INDUCTION: the negative (green) object causes the charges in the neutral ball to separate.**

This illustrates charging by induction. The small green piece represents a negatively charged object. It pushes upon the "green stuff" within the black object. On the black object you'll see a band of red appear on the side towards the small green piece, while a band of green appears on the side facing away. These bands of color represent the areas of "induced charge." See why they must be equal and opposite? See how a charge-

imbalance can be induced upon any neutral object, even though another charged object has not actually touched the neutral one?

## "STATIC" MEETS CURRENT

Cut out two perfect circles of red and green plastic. (It helps to use a compass to mark them.) Remove any tape, superimpose them upon the overhead projector green side up, place a pencil point against their exact centers as a pivot, then carefully rotate the green disk while leaving the red disk stationary. This demonstrates electric current. See any colors? No, since electric current is a flow of the \*neutralized\* charge within a metal. The green can flow through the red, yet the two colors remain mixed together. Now un-overlap the two disks a bit to expose some red/green colors and to demonstrate "static" electricity. Can you see the difference between "static" and "current?" "Static" is when the red and green (the plus and minus) is imbalanced. "Current" is when the red and green move relative to each other. Obviously "static" and "current" are not opposite kinds of electricity. Instead they are two independent phenomena. If your textbooks say that "static electricity" is the opposite of "current electricity," then they are propagating a [misconception](#) which must be *UNlearned* if students wish to make good progress in later understanding electrical science. An imbalance need not be "static", and an imbalance is not the opposite of a flow. In the same way, "static" electricity is not necessarily unmoving, and imbalanced charge is not the opposite of charge-flows.

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### More Ideas:

Once the red/green plastic gets boring, you can put together some other demonstrations based on the same effect...

### MICROSCOPIC VIEW: Giant Atoms

To crudely illustrate the nature of the red and green plastic analogy, I made an overhead projector demo which depicts the red and green atoms in the plastic. To do this you need two transparent, uncolored sheets, a red marker, and a green marker.

In the center of one of the sheets draw a bunch of red dots spaced randomly 1/2" apart. Draw your "dots" large enough that the audience can easily see them when projected. These dots are protons or simple positive nuclei.

Now place your second transparent sheet over the first, align them perfectly, and draw one green dot on top of every single red dot. Make the green dots large enough so that the red and green overlap to produce black.

Now move the red and green dot sheets so that the dots only overlap partially. This illustrates induced dipoles, as well as piezoelectric charge separation. (When you squeeze a quartz crystal, the electrons and protons separate a bit, and opposite ends of the crystal will mysteriously display opposite charges.)

Now rotate the "green" sheet over the "red," and you've shown how a metal conductor operates, with the negative charge-sea able to flow along while every red metal atom still always has a green electron nearby.

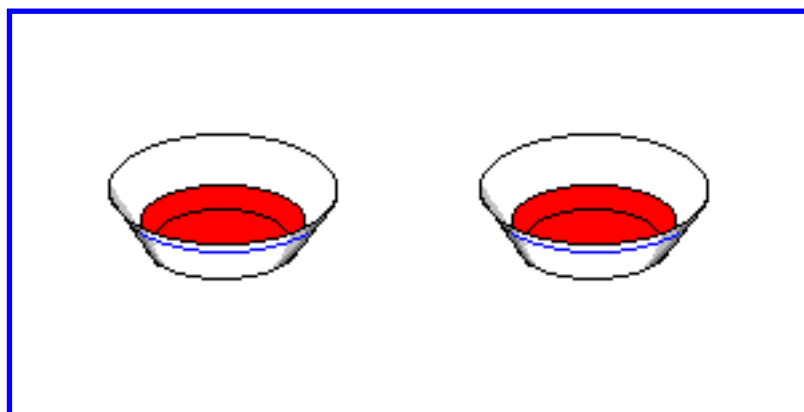
Now rotate the "red" sheet and "green" sheet in opposite directions, and you've shown how electrolytic conductors (batteries and human bodies, for example,) can support electric current via opposite flows of positive and negative atoms. In salt water, electric current is made from moving sodium and chlorine ions, and no free electrons are present.

I admit it, I stole the above idea from Monty Python's "Holy Grail", where the hundred-eyed animated monster attacks our heroes in the

caves. Crazy-swerving eyes, rather than nucleus-orbiting electrons.

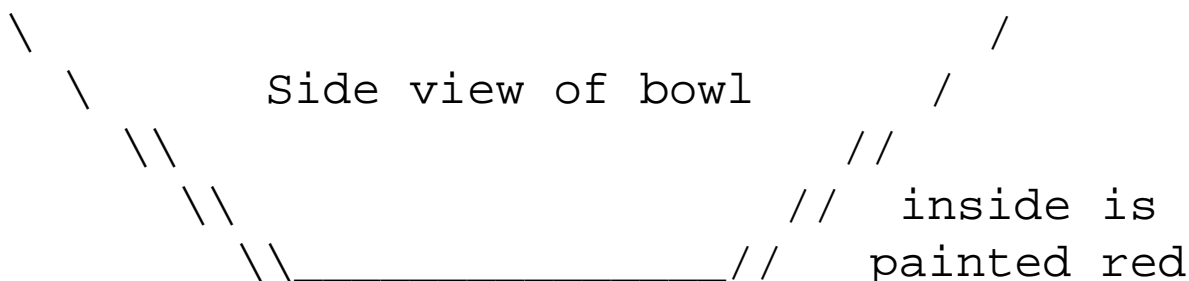
## SPIFFY SELF-ATTRACTIVE DYNAMIC FLUIDS

If electric charge was REALLY large and colored, we could do all sorts of visible demonstrations which show how electrostatic fields and forces work. The connections between electric fields and electric charge might then be intuitively obvious to students. Here's a way to accomplish this by using gravity fields and colored water.



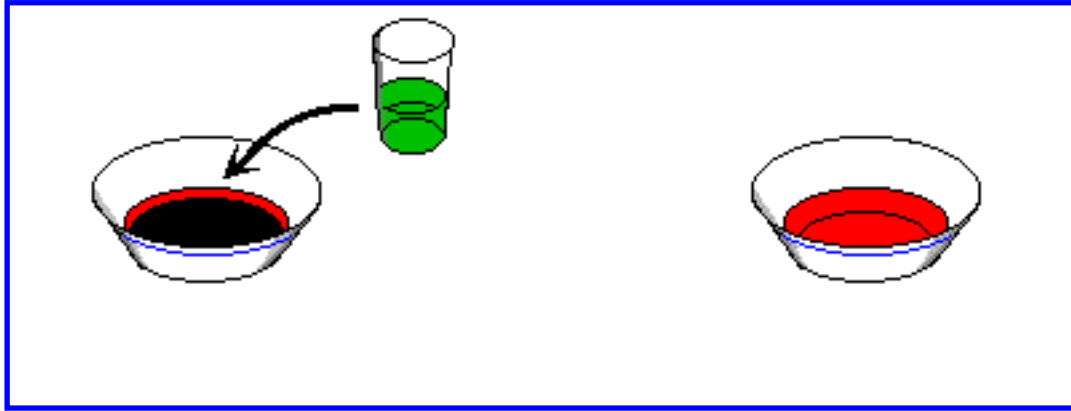
**Fig. 7 CONDUCTOR DEMONSTRATION: Slope-sided bowls with the lower half painted red**

Obtain two light-colored ceramic chili-bowls having sloped sides. Paint the insides partially red as follows: place the bowls on a very level surface. Fill each bowl half-full of red paint. Use latex or oil paint, since it will be in contact with water.





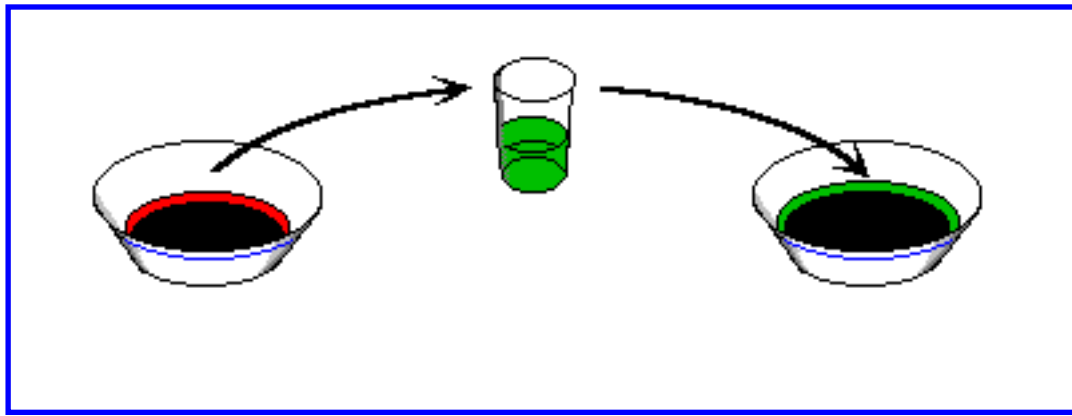
Now carefully spoon all the excess paint out, taking care not to disturb the "high water mark" left by the paint. Use a small brush to smooth out the red coating and to remove the last bits of excess. Allow the paint to dry thoroughly. You should end up with a bowl having a red area inside, and with the red part surrounded by a light, unpainted border.



**Fig. 8 Fill both bowls with green water so the red part is exactly covered**

Next, fill both bowls with water so the water exactly covers the red paint. Mix drops of green food coloring into the water, using just enough so that the red paint and green coloring cancel out and appear dark grey. You have just created electric fluid analogy devices which represent two metal balls, along with their internal electron seas and positive ion arrays.

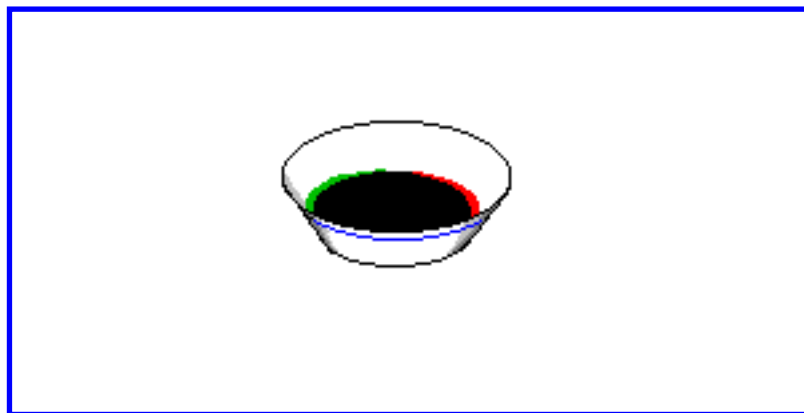
Here's the simplest demonstration. Scoop some green water out of one bowl and dump it into the other. The bowl which has some green water missing now has a red border uncovered.



**Fig. 9 To "Charge" a pair of metal objects, scoop some negative green water from one "object" and drop it into the other.**

The bowl with extra green water now has a green border. Transferring electrons between neutral conductive objects causes them to acquire a charge imbalance. And the self-repelling imbalances move to the outside of the objects, while the inside remains neutral (black.)

INDUCTION: take one bowl, fill it with green water to cover the red. Now tilt the bowl.

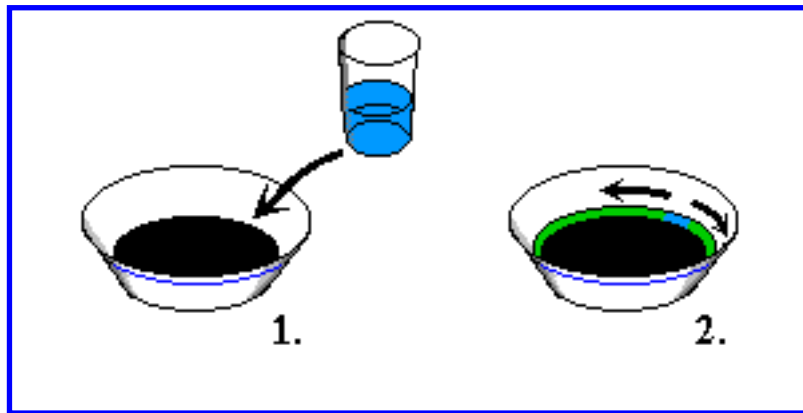


**Fig. 10 An electric field (tilted table) can slosh the negative liquid and create areas of opposite charge on a conductor.**

This will produce areas of red and green on opposite sides of the bowl. The tilting is an analogy for an electric field coming from outside. The red and green areas are the induced charge imbalances. You have

demonstrated how induced charges might look if we could see them.

**A SPREADING IMBALANCE:** take one bowl, fill it with green water to cover the red paint. Now carefully pour some green water into the bowl from its edge, so the water runs down the tilted incline.



**Fig. 11 Charge seems to spread instantly over the conductor, even though it was deposited in one small place.**

Although you add the "charge" to the object in \*one small spot\*, and although that particular bit of green water remains in the place where you put it, the excess charge increases everywhere (the water level rises.) Try adding blue-colored water instead of green, and you'll see that the blue "marked" charges stay in one part of the bowl, even though the green water level rises all around the rim. It APPEARS that the charge you've added has instantly distributed itself all over the entire surface of the object. If we could dump a bucket of electrons into a conductive object, then the excess charge will get bigger everywhere on the object's surface, even though the electrons stay approximately where we dumped them. Even if we could place just ONE electron on a metal object, that one electron would SEEM to distribute itself across the entire surface. It would raise the "water level" everywhere, but by a very tiny amount.

**ELECTROMAGNETIC WAVES:** take one bowl, fill it with green water to cover the red. Place it on a rickety table such as a portable card table. Now gently shake the table so that the green water in the bowl starts to

slosh. See the alternating red and green areas? You are showing how an antenna can pick up electromagnetic energy. The moving table surface is an analogy for incoming EM waves. They make the electrons in your conductive object slosh back and forth, which creates an alternating current and an alternating plus/minus red/green charge signal. Wiggle the table too fast or very slow and the green water won't slosh. This shows how resonant frequencies are important with antennas: if you wiggle the table at exactly the right rate, you can build up a huge wave in the bowl.

**RADIO TRANSMITTER:** place the two bowls on a rickety card table. Fill them with green water to cover the red. Use a spoon to force the green water to slosh mightily in one bowl, and the sloshing bowl will shake the table, which can cause the other bowl to slosh a \*tiny\* bit.

**CONDUCTORS AND INSULATORS:** mix up some jello, color it green, fill one bowl with liquid jello-mix just enough to cover the red, then allow it to harden. Fill the other bowl with green water so you cover the red. You now have models of a conductive object (liquid) and an insulating object (solid.)

How is a conductor different than an insulator? In an insulator, the "green" charge does not flow when electric force is applied. In a conductor, when electric force is applied, the charges do start flowing. If you apply too much force to the jello (the insulator), cracks will shoot through the material and the green stuff suddenly moves for a moment, leaving a path of destruction. Jello-cracks are like electric sparks! Lightning happens when the "jello" in the air has "cracked" because of the strong electric forces in the space below the thundercloud.

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# SCIENCE HOBBYIST: SITE STATISTICS

## via [IDSTAT](#)

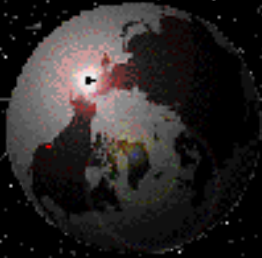
- [Total hits per page](#) (37 pages tracked, out of ~550 pages, 3 mos in 2004)
- [Hits per page](#) (half day)
- [Total hits per day](#) (3 mos in 2004)
- [URLs of Referring pages](#) (one day's worth!)
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NOTE: "Referring pages" are sites which link to my pages.

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- We're now ranked in the top 0.00001% by [Google](#) under keyword "science" (#28 out of 216,000,000 sites)
- [Weekly Link Award](#), linksgiving.com Oct 26, 2003
- [Scratch Holograms](#) had a brief appearance on the show [While You Were Out](#)
- The site made [The Seattle Times](#), Sept 13, 2003
- Site nominated for 2003 [Webby Awards](#)  
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- [Awsomelibrary](#) likes Kids Projects (2/2001)

- Traffic Waves made the [BBC NEWS](#) on 11/21/2000
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- [Toronto Sunday Sun](#)
- Traffic waves fell into [The Memepool](#) on 2/16/2000
- Traffic Waves was [CARS.COM site of the week](#) for 11/29/99
- [Linky Dinky Award](#) (microwave oven 10/8/99)
- [Site du jour Of The Day: 6/14/99 Microwave oven experiments](#)
- [USA TODAY Hotsite](#) for 9/14/98
- [Jumpcity's](#) best of the web
- Traffic Waves was [Cool Site of the Day](#) Aug. 17, 1998
- Microwave Experiments was [Event Horizon Hotspot](#) 8/98
- [Traffic Waves](#) was [Pick of the Week](#) at Yahoo 8/17/98
- Nitroglycerine [Dynamite Site Award](#) 7/16/98
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- [Bild der Wissenschaft Top Ten](#) 4/97 (German)
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- [Tech 10](#) Tech Museum of Silicon Valley
- [Yahoo! Internet Life: Best science homework starting point](#)
- [PLANET SCIENCE](#) Site of the Day
- [Dr. Matrix](#) student resource site
- [Fortean Times](#) WIRED FOR WEIRD Site 12/96
- [Blue Web'n](#) science [site](#)
- [ZIA](#) family site
- [TKM Education](#) 5-checkmark site (Oct 28)
- [IGUIDE](#) Kids Science Reviews



- [Windows Magazine Hotspot](#) for 10/10/96
  - [Popular Science](#) "Science on the Web" Sept. issue
  - [Medaille d'Or Award](#)
  - [Netwatch](#) Top Ten: Science, 6/96
  - [Geek Site of the Day](#) Sept.'95
  - [I-WAY 500](#) Science site
  - [Short Attention Span Site](#)
  - [Spider's Pick](#) May 27, 1995
  - [Exploratorium Top 10](#) Sept '95
  - [Wave of the Day](#) July '95
- 

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# SCIENCE HOBBYIST: new articles & updates



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09/28/2005 Added entries to [Electricity FAQ](#), doorknob sparks, other stuff.

## A moon that fell

As a kid in the 1960s I remember staring at the world map in the classroom and \*knowing\* that the Americas fit with Europe and Africa like a jigsaw puzzle. In 1965 this was geological heresy, but the grade school kids like me were seeing something real, something that professional geologists denied. So now I'm looking at the map of Mars over my desk, and I know enough to take my first impressions seriously. The [Valles Marineris](#) is too straight. WAY too straight. Well, actually it's curved in a sine wave on the map which extends as a discoloration across more than half the planet. (World maps with sine waves drawn on them are plots of orbiting spacecraft, where the angled circular orbit is "unrolled" to form a wave.) Also, Valles Marineris is aligned with the Martian equator, so it's also aligned with the plane of the ecliptic where moon orbits lie. Also, Valles Marineris has many widely separate parallel features which are also perfectly straight. Also there are all kinds of [crater chains](#) parallel to the valley all around the same region. Yet explanations of this valley talk about a cracking crust. I don't believe it. There are linear gouges and discoloration way downstream from the main valley. I predict that within a few decades the expert opinion will shift: Valles Marineris is an astrobleme, it was carved out by a moon that fell from orbit. The Valles region doesn't extend all the way around the planet, so it probably wasn't caused by a

planetary ring. Imagine the event! It's even more impressive than those craters left by direct asteroid strikes. An entire moon gradually hits the top of the atmosphere and starts heating up from gas compression. If it survives for several orbits, its heat output will bake everything below, perhaps turning continent-wide deserts into glass and leaving a scar so large that the professionals will miss it when looking right at it. Then it breaks up into two or three huge chunks plus lots of rubble, into a hundred asteroids, which then descend and roll across the land at orbital velocity from horizon to horizon like incandescent bowling balls the size of Manhattan. Downrange of the main strike the air is full of big dirt: flying boulders the size of large buildings which rain down and ...disturb the surface.

09/11/2005 Added four MPEG videos to [The Secret to Plasma Globes Without Vacuum Pumps](#).

09/07/2005 Added a [new electricity misconception](#) to the [Electricity](#) section.

### Speed freak

In his book "Surely You're Joking...", R. Feynman experimented with personal time sense, and he wondered what determines it. I think it might be social, not physiology. My first summer job was raking leaves on Elmira College campus, and it quickly became apparent that my normal rate of work was *wrong*. I did things much faster than the seasoned workers, and I attracted funny looks, so I adjusted my performance. I thought it was sort of stupid; why didn't everyone rake leaves normally instead of in slow motion? But slow raking was the "way you're supposed to do it," and anyone who strayed from the norm would encounter group pressure to slow down. But... that's how infants become people!!! We change behavior as we encounter immense nonverbal pressure from parents, friends, outsiders, etc., otherwise we'd all behave as one-year-olds even when adult. In different societies the standards are different; I've heard that tourists south of the border complain that everyone does everything slowly... and islanders complain about crazy Americans who are always rushing about. WHAT IF HUMAN TIME SENSE IS SOCIETALLY DETERMINED? I've experimented with this and find that it is. If I'm alone I can push myself to perform tasks much faster until "faster" becomes habitual and unnoticed, but I get huge amounts of work done, and it takes forever for the clock to get to lunchtime. It feels like really waking up, at least until it starts being normal. Also, my usual body movements become tiring, and I find it's much easier to move in curves rather than starting/stopping the considerable mass of limbs. (Like switching to 'racewalk' rather than just speeding up my normal walk.) And when I tried it for days at a time, I started losing weight and had to eat extra meals. If I asked someone a question or tried conversing, their slow responses and slow thinking was quite irritating. But whenever I kept all this up in public, people responded badly. They seemed to be thinking "what's WRONG with that guy? What drug is HE on? Is he insane or something?" Bingo!

That's the societal pressure which usually keeps its members living at the "proper" speed. It's the same as if I started acting like a 2-yr-old, or if I moved to a country where things happened at different speed: I'd encounter the same type of pressure to adapt. So... I wonder how far this can be pushed. Can we live at 5x normal? Will we get huge amounts of work done, then have a crash from "exhaustion of manic energy" or perhaps die prematurely of old age? Or go the other route and let the outer world speed up to 5x faster while we stay "the same."

08/15/2005 More about nanobacteria in the [biology](#) section. (This is a fairly exciting controversy!) Suppose that when a bacterium splits in half, each half takes half the genome. If the two bacteria remained together, they could trade metabolic molecules and survive. Suppose they split into two, four, eight, etc. If this slowly happened over millenia, we could end up with species of bacteria smaller than viruses, where each cell isn't viable alone since they act as specialized organs of a colony. Wouldn't just such an evolutionary trick be the result of a deep underground nano-crevice environment and evolution pressure favoring smallness?

Random thoughts: if you pass a current through a bar magnet, it should create extremely intense circular fields inside. After all, the path surrounding the current is a closed loop of iron, and a low current should saturate the material. But wouldn't this path be disrupted if the current fell? The axial field of the permanent magnet would take over. Apply a weak AC to the bar magnet and create immense pulses of internal b-field. Are these detectable? Instead perhaps pass a cable through a narrow iron pipe to give the pipe internal circular flux patterns. Apply AC to the axial cable and look for pulses. Perhaps wrap a coil around the pipe to apply a bias.

---

More randomness. In the Vasserfadden demo below, how thin could the water thread become? I should think that e-field forces would cause it to resist evaporation, as with [electric ice needles](#). The water filament would be like an electret. But if the thread broke, would it contract to form a droplet, or would the e-field preserve its threadlike form? If it stayed threadlike, this means we could build a network, an aerogel, from nothing but water. The threads would be maintained by the strong e-field (unless closed loops of electrified water filaments are also stable, so the external field could be removed.) An electrically-stabilized aerogel made from water vapor would possibly explain the observation of [invisible wall](#) phenomena.

07/25/2005 More old stuff: [The Wasserfadden experiment](#) and [Giant natural water-thread?](#)

Check out this [discussion thread on tesla coils forum](#) about x-ray tubes and powering entire homes and cars with wireless. And here's another one about [Bob Golka, arc welders and ball lightning](#).

07/16/2005 An old article never listed here: [Mother and daughter detect plasma-spheres through walls](#)

Don't miss [SEATTLE WEIRD GENIUS REAL SCIENCE 2005](#), the 'science fair' in bldg #30 at Sand Point, Saturday July 16. I'll have a demo table there with microwave oven, Tesla coil, and bowl of argon gas.

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Remember [Plasma Globes without vacuum](#)? Getting ready for the above event; I executed some microwave oven mayhem at Wednesday's [Seattle Outsider Artist Project: Dorkbot Mad Science night](#). New high voltage effects discovered! A microwave oven with nothing inside is a 2.5GHz high voltage source. A bag or balloon of pure Argon usually does nothing... unless you include a tiny fragment of carbon fiber. After the plasma outbreak, the glowing violet-white cloud will grow and grow, melting the bag, then crawling all around looking for every last scrap of argon left in the wilting glob of plastic. Argon inside a glass bowl was similar: when triggered by a speck of carbon fiber, it exploded into a radial burst of wiggling lightning. This was a first: it was normal-looking mini-lightning, but at 2.5GHz frequency! As soon as the argon heated up, the spark-brush turned into a bright fuzzy cloud which rose to the top of the bowl and melted holes in the plastic plate laying across the opening. With a bigger bowl we actually saw some spherical lightning: a small spark at the bottom of the bowl became a 2" glowing hemisphere which rapidly rose, becoming more and more spherical before being disrupted by the plastic plate.

06/26/2005 Many new entries can be found on the [Brain Modification Page](#)

When you drop a dish, usually it bounces once. Then it shatters on the second bounce. After noticing this effect I started listening for it. Sure enough, in restaurants (etc.), when you hear a plate go "DONGGGGG" when it hits, it usually goes "smash/tinkle" during the second bounce. I FIGURED IT OUT! When the dish hits the first time, it bounces upwards, but it also starts wobbling fiercely. It rings like a bell, and the vibrating edges of the dish are probably moving at several hundred miles per hour. [NO THEY'RE NOT! It's like a spring, and the edge can only move as fast as the plate was moving when it struck. When it comes back down, the wobbling edge could hit at twice the plate's velocity at most.] Now "view the movie in slow motion." The edge of the dish is going in-out-in-out as the dish slowly falls towards the floor. When it arrives, the wobbling edge whacks the floor again and again and again... and it hits at such high speed that it seems like the dish fell from 100ft altitude [wrong, it will seem as if the plate fell from \*twice\* the altitude of the bounce], not the two feet it fell after the bounce. My conclusion: if you grab for a falling dish but you're not fast enough, don't give up. You have a good chance of either catching it after the first bounce ...or even just \*touching\* it briefly which will damp out the intense vibrations that usually make the dish explode on contact with the floor.

06/21/2005 ["Spirit Orb Photographs"](#) made with water mist, dry ice frost clouds, fumed silica, etc. I find that a parallel grid of human hair w/separation around 0.5mm on camera lens will cast shadows, essentially drawing lines on each false ghost-orb. If your camera had a hexagonal iris, the "orbs" would all be little hexagons.

### **SHOOT PLASMA BOLTS FROM FINGERTIPS!**

This one was a brainstorm during [Dorkbot Tesla Night](#) at COCA gallery in Seattle. Get a tank of argon plus regulator, a glass vase or bowl, some hose, and an aquarium airstone. In a draft-free room, slowly fill the vase with cool dense argon. Argon is different than air or CO2: it supports immensely long electric sparks. Poke the end of your Violet Wand or Tesla coil into the argon pool and watch the huge flaming white streamers spew forth. Now for the next part. Ready? Place the HV electrode against the outside of the glass, then stick your hand inside. Blazing white plasma streamers spew from your fingertips! Feels like being poked by needles. Make a fist (it stings less!) Next trick: a larger bowl, one which my head fits within. Yes, I wanna become the central electrode in a "plasma globe" device. Shouldn't be too painful unless the arcs shoot from my eyeballs...

06/15/2005 [Supermagnet bead tricks](#). Buy a big wad of 1/4" supermagnet spheres (~\$.50 each.) Make buckyballs, mysterious spinners, DNA chains, etc. (I really need to add photos to these!)

05/27/2005 Added spam buster to [Main amasci guestbook](#). Now you can see your entries instantly, not weeks later.

## WAVE-MOTION COLA

Put some crushed ice in a translucent or transparent cup. Fill it half way with dark cola (the kind with sugar.) Then fill it the rest of the way with diet 7-up or diet lemonade (or even water.)

The ice will disrupt the stream, keeping the two layers from mixing very much. You end up with dark cola at the bottom, and clear stuff at the top. (Sugar is denser.) If you tilt the cup back and forth, you can make slow-motion waves in the cola!

Even if the pizza place doesn't have see-thru cups, you can still use the trick. First add ice, then fill half way with full-sugar drink, then fill it up with diet drink. This creates two layers. You can drink the diet Coke first, leaving the layer of non-diet Sprite for later. Just remember to add the diet drink second, and use a thick layer of ice to disrupt the stream.

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Idea for future hoaxes: leave messages on the cardboard tube inside toilet paper rolls. It's not so difficult to remove the tube if you bend it. Write a message, or even apply a professional looking sticker. Or perhaps carry around a rubber stamp made for just this purpose. "HELP, I AM BEING HELD PRISONER IN THIS SCOTT FACTORY." Or "HERE IS THE SECRET PHONE NUMBER, DO YOU DARE TO DIAL IT?" Put several copies on the same tube so it's hard to miss. Or even cause total amazement by wrapping a dollar bill around the thing. Reinstall the tube and put the roll back on the holder.

05/01/2005 Added better 3D diagrams to [In electric circuits, WHERE does the energy flow?](#)

04/21/2005 Is this thing a blog? I'm not constantly adding interesting links to other sites as bloggers are supposed to (those kinds of links are mostly on [coolsci](#) , [wpage](#), and [weird art](#), also [stumble](#).)

OK, how about this. Here's the Skeptic versus Woo-woo fight reduced to it's essentials:

[mung cartoon A](#), and [mung cartoon B](#) . Also hundreds of [others](#).

04/16/2005 Added months of messages to the [Main Guestbook](#)

04/10/2005 Added: [When I die, I wanna be...](#)

03/25/2005 I built a [Large art device](#). Eighty four tesla coils driving 84 fluorescent tubes. It was up at [COCA gallery](#) this March (Seattle,) and is going to be at [Bumbershoot](#), Sept 2-5.

03/24/2005 Added [The \\$1 Tesla Coil](#)

The DC electric motor was invented by accident!

Huh. I totally missed this fact in my schooling. Michael Faraday demonstrated the "motor" effect in the early years, but like Ben Franklin's electrostatic motors, it was only a lab curiosity. Volta's "pile" caused power supplies to become all the rage in science labs, and by the mid 1800s, several types of DC electric generators or "dynamos" were already in use as power supplies. So people were generating voltage with rotating coils and commutators. Then during an inventors' exhibition at Vienna in 1873, inventor Z. Gramme accidentally connected a steam-driven dynamo to a second similar unit, and to everyone's surprise the second one started spinning as a motor. Thus the modern multi-HP electric motor was "invented." We add the DC motor to the list of other accidental discoveries: Becquerel's radioactivity, Roentgen's x-rays, the Leyden capacitor, Oersted's electromagnets, etc.

02/21/2005 Added [Determining Charge Polarity](#) to [Static Electric](#) page

02/09/2005 Wow! I had a "[Vanishing Object](#)" experience while stirring my coffee. Scary.

Ant trails at work. A narrow stream of black ants is flowing across my lab bench, up the side of a water bottle, into the squirt-tube and down inside. They're harvesting distilled water?! The trail is coming from the floor, up the side of a box, across the top edge of some papers standing on edge, then up the voltmeter wires which happen to dangle over the edge of the tabletop. Following the trail backwards, I find that it goes about a HUNDRED AND TWENTY FEET back to the Mass Spectrometry lab at the end of the hall! It disappears under a fume hood. There must be several thousand ants in the trail. I guess the Chem. building ant nest must be hard up for water. I brush away ants and create a 3ft gap by cleaning away their scent trail with alcohol. But an hour later the gap has closed again. Ants trapped on the far side of the gap apparently find their way across.

Playing with ant trails! I move the water bottle, but then the arriving ants start spreading all over the desk. So I give the ant colony a wet cookie (placed 120ft away near the origin of the



trail.) If the ants are a signal in an optical fiber, then the cookie should act like an impedance mismatch; reflecting the outbound ants back to the nest. Sure enough, after an hour the ant stream decreases greatly. I brush the remaining ants onto the floor and disrupt their scent trail. But in the morning it has re-formed, this time traveling up to an old bottle of Moxie Cola with a tiny bit of dried syrup in the bottom. They're still using the edge of the papers in the box on the floor, this time crawling up another test lead, transferring to the power cable of the oscilloscope, then up to the shelf with the bottle. OK, this time I convert the entire "ant-flow optical fiber" into a Bragg mirror: I drip some sugar water at many places along the 120ft trail. Quickly the stream of ants at my end of the trail has dropped to zero.

Hmmm: pranking possibilities. If I put a tiny bit of sugar water on a victim's desk, and also deposit a blob of ants, won't a few ants find their way back to the nest and create a new 120ft stream?

12/29/2004 Update (large) to [Science Misconceptions Comment Book](#)

12/28/2004 Small addition to "[Time-flow Distortion Sensor](#)"

Another brainstorm! It's crackpot physics time. Remember [Pyramid Power](#)? The original claim was that a cardboard pyramid could sharpen a disposable double-edge razor blade. While reading an "[Uncle Al](#)" physics note about laser ultra-black beam-dumps composed of stacks of hundreds of standard razors, suddenly several concepts aligned in my brain. First concept: Uncle Al notes that the blackness of the razor-stack can be compromised by knocking the arrayed razor edges against even a soft object. Second concept: by stropping an old-fashioned straight-razor, we do not sharpen it, instead we straighten the bent-over micro-edge of the hard steel. The very tip of the sharp edge becomes folded over with use, and abrading it on a soft surface will grab the edge and bent it straight. Third concept: What if Pyramid Power was genuine after all, but it was actually triggering some sort of memory-metal effect? Not sharpening the blade, but essentially it would spontaneously "strop" a razor blade? Fourth concept: shine a bright LED at a slightly damaged razor-stack beam-dump and use a photodiode to measure any slow changes in the return reflection. Spontaneous blade-straightening would now be measurable. Stick the thing in a pyramid overnight (perhaps with power turned off, if that has any effect.) See if you can detect any auto-stropping effects!

12/20/2004 Have you met [The Krampus?](#) Santa Claus has an evil assistant who punishes bad children. He's a demon from ancient pagan solstice celebrations.

A great mystery within microwave ovens: WHY DOES THE TURNTABLE SOMETIMES ROTATE BACKWARDS? I always wondered about this. The obvious explanation is that the turntable motor is a 60Hz synchronous induction motor. But why? Synchronous motors aren't as good as the normal kind. One thing might make sense: it forces your turntable to end up in the same position as it started. That way your coffee mug will be at the front, or the handles on the cassarole dish will be positioned correctly. But my microwave oven doesn't do this. Most of the time the mug ends up in a crazy position.

Testing is required. I heated a mug of tea at work for a minute, and for the first time I actually watched the clock as the turntable rotated. AHA! IT ROTATES ONCE EVERY TEN SECONDS!!!! I verified the effect and it does work: as long as you punch in multiples of 10 seconds, your food will come back to its original position. But something's screwy. My oven at home doesn't do this, yet its turntable randomly starts off clockwise or CCW, so it must contain a synchro motor. So I timed the oven at home. Bingo: it rotates every 20 seconds. That explains everything. At home, if I punch in 30 seconds, or 10 seconds, then the turntable rotates an extra half turn, putting the soup bowl on the opposite side. Not to smart. How many people cook things for 20 seconds, or 40 seconds? A 3RPM turntable speed only works if you cook something for one minute. But now that I know about the problem, I can start only using multiples of 20 seconds.

12/15/2004 Added more to [Science Toys](#), and [Weird Links](#)

I'm playing with a UV keychain LED light. It's not very deep UV (400nm). More like violet. But it will make your teeth glow green, and your fillings are easy to see (I mean the white non-metal ones.) Fluorescing aqueous humor gives you some green pupils! I see little flecks of green all over my arm: fungus? Yep. The thick edges of my heel fluoresce green as well. Huh, what else are these things good for? They will light up the plastic strip inside \$5 US dollar bills. They will charge up some ZnS "Glow In The Dark" plastic to very high phosphorescence. Ah, if you draw all over yourself with yellow-green Hi-lighter markers, the UV keychain flashlight makes the invisible lines light up brightly. Draw some finger bones.

12/3/2004 The [toolbar](#) from the [Stumbleupon](#) service is addictive. TOO addictive.

I'm having fun with a perl command: global search/replace all files in a unix directory. Throughout the whole amasci.com site I've changed all the www.amasci.com addresses into amasci.com, changed all my email addresses into GIF images (harder for spam spiders to read 'em,) and other such things. Here's the single-line unix command syntax below.

```
perl -pi -e 's/www.amasci.com/amasci.com/i' \*.html
```

It's easy to cause trouble if you mess with such things. You'd be lucky not to destroy all your files with a single command. Better first download your whole site to offline storage!

12/2/2004 Added real [Site Statistics](#) Try clicking on some [referring URLs](#)

I stumbled across a new food. I feel like the discoverer of yogurt must have felt: disgusted, but not adverse to putting weird things in their mouth.

I'd purchased some eggplants, and they were in the fridge for a couple of weeks along with some button mushrooms. When I finally got around to inspecting them, one was still OK, but the other one had a large brown spot several inches across. Strange, there was a mushroom stuck to the eggplant in the middle of the brown region. It was merged. The mushroom mycelia were still alive, and they were trying to absorb the eggplant! The brown region was somewhat soft, and when I tore the eggplant skin, the hole smelled like mushrooms. I returned the eggplantmushroom organism back to the fridge. A few days later I checked again and found that the entire eggplant had been assimilated. It was soft and mushroom-smelly within. Resistance was futile.

Now I have to try sticking mushrooms against all sorts of different vegetables and see what results. Can mushrooms take over cold salmon? Since the storebought mushrooms are *Agaricus Bisporus*, we could call the process "Bis-porizing." I also need to try actually cooking one of these mutant beasts. Hmmm. What would happen if you fell into a coma while lying on a mushroom? You'd wake up all brown and mushroomy? With an unstoppable desire to hide inside a compost pile?

11/28/2004 Ideas for a gallery installation: [Demented Pushbuttons](#)

11/26/2004 I learned a new word: [Pyrrhonian skepticism](#)

10/18/2004 Added [The width of a coulomb](#) to "Speed of Electricity"

Sometimes my subconscious delivers fully-formed visions in answer to questions from years ago. Today's vision: AC Kelvin water-drop generator. Half of a Kelvin electrostatic generator could be placed in the exhaust of a jet engine and produce megavolts at milliamps! There's more. I have a La Violette idea of military aircraft covered with Barium Titanate or perhaps PZT ceramic. How weird. Why PZT sheath? Ah, it's Jean Louis Naudin's "plasma sheet" idea where sonic booms can be eliminated by covering the airplane wings with a glow-discharge. But why use insulating ferroelectric? Well, I know that long dielectric filaments can act as "wires" for high frequency AC (the "right angle circuitry" idea.) If JL Naudin replaced his plastic covered hi-volt wires with PZT-encased wires, he'd still get purple plasma even if his operating frequency was greatly reduced. (Barium titanate acts almost like a metal conductor, as long as you use AC.) BINGO! Drive the Kelvin water-drop "inductor" electrode with slowly changing polarity, and your megavolts output will slowly change polarity also. With a jet engine driving it, how fast could this polarity change be made? Maybe raise it to a few hundred Hz? Without the PZT your metal aircraft would spew lightning bolts. But with the PZT layer, the whole thing would develop a sheet of plasma. It might even absorb radar pulses at the same time it modifies the transonic shock wave fluidics. Whew. It all hangs together and makes some kind of sense. I couldn't assemble the ideas piece-by-piece intentionally. They just pop up when I'm half dazed.

10/10/2004 Added [Seeing Sound](#), an untested idea involving mirrors, strobes, and razor blades

A new traffic-wave phenomenon: the infinitely large traffic jam! I need to add this to [Traffic Waves](#).

The "infinite jam" occurs whenever a traffic wave stops moving backwards and instead becomes pinned to a certain point on the highway. It happens when each driver in the jam must sloooooowly crawl past the "pinning point" before accelerating freely again. A cop car by the roadside can cause this. So can a bridge crest or blind curve. In other words, the trailing edge of a traffic wave stops evaporating normally... yet its leading edge still grows as before, since more cars are piling on from behind. The region of solidly-packed traffic grows larger and larger with nothing to halt its growth. HOWEVER... if a single driver can pull the edge of the wave back away from the pinning point, then the wave begins moving again. The edge of the jam begins evaporating normally, and cars which pass the former pinning point have no reason to slow down (i.e. the "pinning" effect only occurs if a slow dense traffic-wave goes past.) Once un-pinned, the huge jam stops growing. It doesn't dissipate, but if it had yet to grow enormous, one driver can nip the gigantic traffic jam in the bud. It only takes one car to unplug one lane. In Seattle we have at least three of these continuously-growing jams: the bridge crest on I-5 at the ship-canal bridge, and on 520 at the

bridge crest just before the Lake Washington floating brige, and on I-5 North near the Senaca St. exit where cars exit into the express lanes. I've also seen these on 520 many times, where a cop has pulled someone over, causing a two-mile traffic jam to form (people won't roar off into the empty roadway if a cop is right there, so they drive many yards past before peeling out... so the wave remains pinned, and the backup grows enormous.)

10/11/2004 Finding some old files never linked here:  
[2D "gravity" sensor](#), also detects e-fields and strong magnets  
[Plasma/aerogel life forms](#) in our atmosphere  
[Fringe Science and breakthroughs](#)

I was imagining crowds of people walking on city sidewalks, versus crowds driving on highways. The atmosphere is totally different. Our cars act as our masks, making us anonymous. (Well, some of us make tatoos with spraycans and stickers.) But while commuting, we're silenced and cannot talk (or even communicate) with everyone around us. Hmmm. Maybe I could build myself a voice? How about an ultra-powerful broadband comb-frequency FM transmitter which could override nearby car radios regardless of which station they're tuned to? Too much work. Brainstorm! Cellphones. An experiment for the daring: print out a large bumper-sticker on adhesive paper and stick it on the rear of your car. (Cover it with clear tape to waterproof the paper.) The sticker reads:

DRIVER'S CELLPHONE  
425-222-4321

(use your real cell number.) What will happen? Death threats from road-ragers? Random members of the opposite sex hitting on you? Do you *dare* to find out? It might actually be interesting, since all those thousands of drivers on the highway near you have absolutely no way to send messages to anyone around them... except to you.

09/12/2004 Added "Reality Detector Goggles" to [Misc Screwy Ideas](#)

09/12/2004 I've been volunteering at Seattle's new [UFO/Bigfoot](#) museum.

09/12/2004 Added more to [Childhood Brain Modification](#), and [Toys](#)

Idea for "Orbs" believers. "Orbs" are bright sphere- or disk-objects that show up when photographing cemeteries, haunted houses, etc. But many of these are simply the photoflash-illuminated dust motes or mist droplets hanging a few inches in front of the camera. The circular "orb shape" is a blurred image of a bright dot, and the shape is determined by the camera iris edge. If your camera iris is circular, the "orb" will appear as a disk, but if the iris is octagonal, the orb will look like an octagon. Ooo, idea! To settle the matter, place an opaque object on your camera lens! E.g. stick a thin slice of black electric tape across the lens. Or even make an "X shape" from thin tape slices. Now whenever you photograph a bright, small, blurred object such as a dust mote, the dark strips of tape will show up in the bright circular "orb image." On the other hand, if the "orb" is real, and is large and distant from the camera, you'll see no shadow-image of the opaque tape cutting across the "orb." Presto: any possible "orbs" can be instantly separated from the dust-mote images; the real orbs won't have a big fuzzy "X" across them. Also see some more [ghost hunting](#) suggestions.

08/27/2004 Adding more to [Why Airfoils Are Hard To Understand](#)

08/26/2004 Hey, should I start using some blog software, so passerbys can comment on these entries and turn this into an entire forum? The "[slashdot](#) of science?"

07/22/2004 Working on: [What is laser "coherence?"](#) (VERY under construction)

I never really understood laser "coherence." While working on science museum exhibits, I found that books were full of mistaken explanations. Over the years I've noticed that even the advanced textbooks get it wrong. They talk as if laser coherence is caused by stimulated emission. Nope. The laser-medium amplifies light. But if you give it some incoherent light, it will only amplify it while preserving the incoherence. But then why do lasers emit coherent light? I finally figured it out. It's because the laser mirrors cause the laser to behave as a near-perfect "point source." As light bounces between the mirrors, any light which doesn't seem to come from a single tiny point will eventually wander away and be lost off the edge of the mirrors, while any light which DOES come from one tiny point will keep bouncing and be amplified. Get two parallel mirrors and look into the "infinite tunnel." Only light that comes from the distant "infinite" point will avoid crashing into the walls of the tunnel. (How many physicists or even laser researchers know that laser coherence is *caused by the laser cavity*? Textbooks

teach that it's caused by individual atoms, by "in-phase emission!")

07/17/2004 Added [Complaints of suppression are not Conspiracy Theories](#)

07/13/2004 Massive ISP server crash, things being restored from backups

07/12/2004 Added [Bigger Better Balls](#), M. Crowley's paper on easy ball-lightning

07/12/2004 Added lots more "things" to [Childhood Brain Modification](#) tricks page

07/09/2004 Added a GIF anim, a [Fake Live Webcam](#)

WSCI: Demented idea, INBOX POETRY: send a string of blank  
 WSCI: messages where the subject lines form a poem to be  
 WSCI: read directly from their inbox without opening any  
 WSCI: email. Send them slowly, otherwise the vagarities  
 WSCI: of web traffic will jumble the order... but not TOO  
 WSCI: slowly, or every other line will be the subject line  
 WSCI: from some spam message. OOOoooo! Design the lines  
 WSCI: of the poem to be read in ANY order, then send 'em all  
 WSCI: in one glob and let the net have it's way with 'em.  
 WSCI: Internet Haiku is born!

07/05/2004 [Animated](#) background-GIFs are possible? Oh the humanity.

We live in a free country? Well, I personally know two science people who've been raided in the last five years. One was invaded by the local cops because they decided that his home lab was a "crack lab." Another was raided by the FBI after they decided he was a child pornographer. They of course found nothing at all in either case. And in past years the state of California tried to make it illegal for individuals to own chemistry glassware. And now the guy below is hassled for having biology lab equipment at home. This crap is DANGEROUS. I'm not very political, but I know exactly who is the poster-child for the highly ignorant "dark forces" pouring fecal matter on the US constitution. I advise any science-hobby people in the USA to think very carefully about this trend before casting votes in the upcoming election. Consider [writing your elected official](#). So few people do this, that if you decide to write, your voice will have an unusually large impact.

**BAD NEWS: [FBI GOES AFTER A SCIENCE-ARTIST](#) | [Cops tackle, cuff scientist for being in woods](#)  
[Forum](#) | [WIRED story](#) | [CSM Article](#) | [TV coverage](#)  
[Defense fund](#) | [More news](#) | ["Free Range Grain"](#)**

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I just bought my own overhead projector. Apparently Boeing engineers are ditching all of theirs, so they're only \$25 at [Boeing Surplus](#) warehouse in Seattle; (more for the fancy collapsible portable versions.) In the past at very small conferences I've had problems because they'll set up video for laptops, yet balk at tracking down an overhead. I've always wanted one of my own. Some evolution:

1. Dirt and a pointy stick (isn't it all we could ever want?)
2. Clay tablet (well, it does have "save." Lacks instant-erase)
3. Napkin (for restaurants lacking dirt floors)
4. Chalkboard (good for audiences above 5 members)
5. Dry-erase whiteboard (less messy than chalk)
6. Overhead projector (for huge audiences)
7. Powerpoint (huh! wtf! CANNOT DRAW ANYTHING?!!! )

Powerpoint: twenty thousand years of technical advancement has given us a "chalkboard" where nobody can draw sketches or schematics while thinking out loud, or while answering audience questions. Yet **NOBODY NOTICED?!!! GAH!!!!** Powerpoint is a computer-based slide projector, and cannot replace overhead viewgraphs or even chalkboards. I shudder to think what the next stage could be. And I'm even more convinced that guys like "The Iceman" with their woven grass backpacks and wickedly sharp flint weaponry were the peak of advancement, while everything afterwards has been slow creeping unnoticed degradation. :)

05/15/2004 More shameless self promotion: here's my only invention for sale:  
[Visible Electricity](#), sold by [Arbor Scientific](#)

05/09/2004 Slapped together a tiny site for [Seattle Outsider Artist Project](#) S.O.A.P.



05/04/2004 I'm making a [Seattle Links](#) page. Abnormal resources.

05/08/2004 Moved [microwave pyrex lava](#) to Unwise Experiments

Friday, time for another [Weird Science Salon](#), the monthly meetings at my place in Seattle. But after all these years they've finally grown too large for this small livingroom. Tonight's meeting will be at Seattle's new UFO museum, the [Museum of the Mysteries](#), on Broadway in the the Capitol Hill region. 730PM to midnight. The usual bulk-purchase stuff will be for sale: supermagnets, levitation graphite, ferrofluid samples, scihobb bumper stickers, copper Lenz-law tubes, 7,500Vdc power supplies, etc.

05/07/2004 Added a bit to [Physics Sermon #49](#)

04/26/2004 Old article, never linked here: [The Research Game](#)

04/10/2004 New addition to [mental derangement page](#)

03/22/2004 Added [On defeating shyness](#)

03/22/2004 Added [Nipple Cola](#)

03/16/2004 The Network54 free web-forum service [has unethical features](#): some of their popup ads take over your IE browser and install a new default homepage; an advertisement.

03/15/2004 Heh. Traffic in the year 2050, another [traffic animation](#) :)

03/03/2004 Holy creeping Capitalism Batman! It's the end of an era. Sci. Hobbyist now has [BANNER ADS](#). But wait, there's more! The ads are run by [Google](#), there's no graphics, and the products are somewhat chosen via the website keywords: science toys, kits, high voltage devices, etc. I'm putting most of them along the site edge like ads in a magazine. [Comments?](#) Is google an [evil](#) giant corporation? Not just yet. We'll see...

03/01/2004 Our group got some publicity in [Seattle Times](#) (back in Sept)

Here's the [photo](#) that went with the above.

02/17/2004 A [talking creepy billb head](#) made by Sandra P. RATS!!! the Hanes veepeers site is now dead. Try [this one](#) instead. Or this [Al Jarry head](#) talking in his infamous monosyllables.

Huh. If you search Google for keyword "[microwave oven](#)," guess which site is right at the top of the list?



NEWS FLASH: Molten lava in your microwave oven! I had a piece of volcanic glass from a science store, so I perched it on the end of a vertical metal cylinder placed in my microwave, heated it to a dull red glow with a propane torch, then turned on the oven for several minutes. A hotspot appeared on the obsidian, grew bright, then moved to the interior. After awhile the obsidian fragment glowed red again and the surface softened and cracked open, revealing a brightly glowing yellow interior which started flowing outwards. Mini lava flow! When cooled, I found that the hottest part of the melted obsidian had foamed up and turned white. Pumice! Creating pumice in your kitchen from home-made molten lava. Apparently this obsidian is full of dissolved gasses, so it must have originally cooled while still underground (under pressure) where it couldn't turn into pumice or into an ash cloud. Note that I only succeeded after removing the glass platter from the oven. With no other big absorbers in the oven, the platter was eating all the watts.

OLDER: trying to melt pumice in a microwave oven. It does glow orange when nuked (pre-heat with propane to trigger the effect.) But only the sharp edges soften. Next to try: changing ash from Mt. St. Helens back into lava again.

EVEN OLDER: microwave ovens can melt glass, but only if the glass is first pre-heated to dull red heat. I melted a hole in the side of a bottle by nuking it, after first heating up a small spot with a plumber's torch. I had to stop it after 60 seconds or the stream of liquid glass might touch and shatter the rotating glass platter. The bottle shattered during cooling, so wear goggles!

11/12/2003 Added more to [Unwise Microwave Oven Experiments: FAQ](#)

10/27/2003 SCIAM SCIENCE PROJECTS ARE BACK! I fixed the links on [sciam1.html](#) so they now point to backup copies at archive.org

Igor says repeat this loudly over and over until your IQ drops significantly: LITTLE TINY HEAD. NO ROOM FOR BRAIN! Little TINY head. NO room for BRANE...

10/24/2003 Found some more interesting [toys](#)

Sometimes at a boring party you'll find some helium balloons used as

decorations. Your task is to release them from bondage. Fly! Be free! But sitting against the ceiling is not freedom. So, collect carrot sticks and celery from the food trays, tie a hunk to each balloon, trim down their strings to a minimum, then carefully nibble down the hanging vegetable until the balloon neither falls nor rises. Leave it hanging in air, and it will float annoyingly around on the air currents, or perhaps be attracted to the back of various hair-dos by electrostatic forces (especially if you've thoroughly rubbed the entire surfaces of each balloon against your arm-hair before letting it loose.) OK, Dr. Von Fronk-en-steen, now combine several mylar balloons to make a single monster duct-tape zero-gee asteroid! (See link below)

10/22/2003 Added [Antigrav Boulder](#). Your pet asteroid drifts around the house.

The [Rijke tube](#)" is a very strange device. Jam some metal screen into one end of a metal pipe, hold it vertically with the screen end downwards, and heat the screen with a flame. The thing starts loudly howling. The gentle convection-breeze with the hot screen acts as an audio amplifier. The howl is feedback (a longer tube makes a lower tone.) Brainstorm: inject helium or CO2 into the lower end to change the tone. Send it a sequence of gasses and it will change your gas-data stream into music. Or be boring, and just add a telescoping pipe to create a Thermal Trombone.

09/30/2003 Added an [Excel numerical toy](#), a pulse-wave crawling along a power line.

Poor man's liquid nitrogen: chunks of dry ice in an insulated container of rubbing alcohol. Amazingly enough, many of the things you can do with liquid nitrogen are associated with its great thermal coupling power. It's a liquid, so it touches the entire surface of any object dipped within. Dry ice is cold, and SEEMS to work poorly, so most people assume that this is because it's only -110F, not -320F. Wrong. It's because dry ice is not a liquid, and any object stuck into a dry ice container is insulated by the layer of gas. It cools down, but only very slowly. So, use dry ice chunks to chill some alcohol! Then try freezing and shattering a rose or a rubber band. Make springs and chimes out of solder or lead sheets. Dip an operating LED into the stuff and watch it grow intensely bright. Some supermarkets carry dry ice (such as QFC in Seattle.) Or check your yellow pages. A buck a pound.

09/22/03 Added a separate [Comment Book](#) to [Electricity Questions](#) page

As a kid I tried to grow crystals using table salt. But first I made a big jar of salt solution so the white stuff would settle out (salt is normally full of anti-caking agent.) But then, my salt solution ESCAPED! It crawled out and made a run for freedom. You see, salt grows crust, but the crust is wet with concentrated salt solution. So then the crust grows crust. And more crust grows on that. Within a matter of hours your jar of salt solution can grow crust on the glass which extends up the side and over the lip, and then the wet crust becomes a siphon. If the humidity is low, the

salt water crawls out and forms a large pool on the floor, leaving a mysteriously empty jar. Hey, maybe this explains how battery acid can escape from your car battery and form those big white crusty things on the battery terminals.

08/01/03 Always adding more to [Weird Links, non-science](#)

People spend years learning to sound just like Jimmy Stewart or Elvis. Why not do something far more useful: do impressions of YOURSELF, but a version of yourself who has a trachea full of Helium. Make tapes of yourself on helium, then learn to speak the same way but without any helium. Get several others together and go on the road... "Barbershop Faux Helium Singers." Maybe do some Mitch Miller numbers.

07/22/03 Added [PFI](#), a local Seattle legend, gourmet food warehouse store.

07/18/03 Added [Fingernails on blackboard, explained!](#)

Hey, that "[threadlike electric wind](#)" phenomenon from 1998 won the Nobel prize last year. [Dr. J. Fenn](#) uses it to make a row of micro droplets each with protein molecules inside, then evaporates the water, leaving a "beam" of charged proteins which can be accelerated in a vacuum chamber and their mass determined. "Electrospray ion-trap mass spectrometry." The tiny droplets can travel at tens of MPH through the air apparently because they behave like a moving column, not like individual droplets. Nikola Tesla wanted to use liquid mercury electrospray micro-droplets accelerated by a 100 Megavolt VandeGraaff machine. He claimed that it was an effective weapon over many kilometers. Like a water-jet cutter, but with a much smaller and denser "blade."

06/10/03 Adding more to [How Transistors REALLY work](#). Also a [short version](#).

If escalators are driven by standard AC motors, then as more and more people pile onto the descending escalator, finally the current phase will reverse and energy will be dumped into the power grid. The escalator's induction motor becomes a generator! The escalator lowers all those heavy flesh hunks, and the energy has to go somewhere. If you want to make a small donation to a company whose building has escalators, then walk up the stairs, but ride the escalator down.

06/05/03 Experimenting with cyborg text brain implants: the RSVP speed-reading protocol. It's like text-to-speech software, but aimed at your retinas rather than ears. Disable your eyes' muscles and pour the text directly into your brain at high speed. Here are three examples done in GIF animation: [slow](#), [fast](#), [faster](#). See [Speeder reader](#) museum exhibit.

06/04/03 Making [The Ice which does not Melt](#)

05/24/03 At long last added an actual [biology](#) section.

05/24/03 Added [Human IR sense detects hail?](#) to the 'weird sci.' section. It's subjective and might not be real, so I didn't put it under 'amateur sci.'

Sheep mowing your lawn? Forget it! You'd have to build a barn for 'em and clean up the sheep poop. BRAINSTORM: plant your whole yard with catnip, and let the neighborhood cats keep it trimmed. Actually this might even work. I noticed that at the end of winter my flowerpot of catnip on the front porch wasn't regrowing, yet the stump had many tiny leaves. I put a cage over it and within a day there were large green shoots taking off. Neighborhood cats had kept it trimmed way back.

05/20/03 Added to misconception list: [a Lemon Battery can't light a bulb.](#) This classic school science experiment actually doesn't work. It never did. Fortunately there are other things you can do with a lemon battery. Also, if you have a supercapacitor, then you can cheat.

04/18/03 Found old article: [making square wheels](#)  
Anyone with some machine shop skills should try making a set of these things. They look really cool when made in gleaming polished acrylic. Stick them on a little axel and they'll roll smooth and silently across a glass tabletop... yet they're CUBES. The tetrahedron version looks almost as odd.

Where's the dividing line between "site update news" and "Blog"?  
Have I injected sufficient humorous comments to qualify?

03/30/03 Added [OK, how do wings REALLY work](#) to the [Airfoil mistake](#) section

02/11/03 Updated [hoaxes page](#) with "Radioactive Nightmare"  
Also "megavolt body charger." Make yourself into a human VandeGraaff generator. Use laying-on-of-hands to perform anti-healing ceremonies on cellphones and laptops.

The word of the day is "Serrodyne." I've heard of Heterodyne and even Superheterodyne, but "Serrodyne" is a new one on me. How could I have missed it? Simple: it's very recent. Also it's very weird: change an incoming high-freq signal's frequency by using Doppler shift! Then just add your frequency-shifted signal to the original, and then a nonlinear detector will give you a nice low-freq signal at the difference frequency. Hobbyists take note: it lets you treat a light signal as if it were a radio channel. Split any laser into several different frequencies, then put separate data streams on each!

For a microwave signal, just pipe it through a TWT (Travelling Wave Tube) while constantly increasing the drive voltage on the electron beam. For a light signal, just constantly move one end of an optical fiber (or instead wrap the fiber around a cylinder

of piezo material and then constantly increase the cylinder diameter.) This shifts the frequency by a constant value. Mix it with the original, shine it on a photodiode, and you've moved a piece of the optical spectrum down into the radio spectrum! Pretty cool, eh? Serrodyne lets you treat light as if it were radio frequency.

Of course you can't keep up the constant change forever, and that's where the "Serro" part comes in. Just move things in a sawtooth wave. Give your optical fiber constant drift in order to create doppler shift, but every so often jump it back to the start. Except for those brief jumps, the signal frequency will end up shifted. In other words, you've created "Serrated heterodyne."

- 02/07/03 Updated misconceptions list with [why do clouds float?](#)  
 Clouds DON'T stay up there because the droplets are small, or because they're so light that existing updrafts can lift them. They stay up there because the air inside the cloud is warm. Oh, and why is the sky blue? Simple answer, but not one I've ever seen in any book.
- 12/28/02 Added [Drawing Holograms By Hand \(2003\)](#), presented at SPIE [Imaging](#) conference.  
 I actually submitted a paper to a science journal. It's just a conference proceedings, but still. Last thing I "published" was around 1980 as a coauthor on an instrumentation design for vision studies.
- 09/03/02 Added [IR filter-goggles, \\$10](#)  
 These really do work. Greenery in the landscape looks very weird. They let you see right through certain types of black IR filter. Be careful though, it might not be wise to use them without good solid UV protection.
- 06/12/02 Added [Dishonest Argument](#) section to [Closedminded Science](#)  
 During the next flamewar you can point out all your opponents' illegal ploys. Or not. "Never argue with an idiot. They just drag you down to their level, then beat you with experience."
- 06/07/02 Added [more](#) to [Electricity Misconceptions](#)
- 05/07/02 Added [Local Seattle Tech Jobs](#)  
 During job-search I couldn't find a good Seattle jobs portal with all these company pages. So I made a primitive one.
- 05/07/02 Writing [Ridiculed Discoverers, a list](#)  
 Aimed at those people who are certain that scientific concensus never makes mistakes, certain that crazy claims in science are never proved valid in later decades.
- 04/28/02 Added more to Skeptic Fallacies: [They Laughed at the Wright Brothers](#)

Three very common arguments I constantly encounter in online Skeptic forums.

- 04/28/02 Found an old article of mine: [Watts, Ohms, Volts, and Amps](#)  
Two things flow in wires: charge and energy... but they are deeply interconnected via voltage and Ohm's law.
- 04/23/02 Updated the [High-voltage diodes and coil-winding](#) page
- 02/23/02 Sorted the [UNUSUAL PHENOMENA](#) archive
- 02/08/02 Added some [ebay sections](#) to Electronics Hobbyist
- 11/17/01 Merged the english text into [Grebennikov](#) insect-antigrav book chapter  
Best crackpot article I've ever seen! It has all the earmarks of a genuine discovery. That, or the guy spins a very believable tale. Biological nanostructures which harness undiscovered elements of gravitational physics! Since he kept the "antigrav" insect species name secret, we'll never know if it was real.
- 10/30/01 Fixed up [weird newsgroups](#)
- 08/20/01 Added [Brief testing](#) of the [Morton Effect](#)  
I couldn't reproduce his claims. But then later I realized that my VDG machine has the wrong polarity. I'll have to take it apart someday and reverse the rollers.
- 08/16/01 Update to [carbon-to-iron experiment](#)  
Alchemy! heresy! Striking an arc between big carbon blocks apparently creates a form of stainless steel, but without the usual problem of "radioactive grad students" or even incandescent chickens.
- 08/11/01 Added [How do Transistors Work?](#)  
No, how do they REALLY work. What if we don't trust textbooks, but instead figure out the physics from first principles? This is the "Babylonian" method espoused by Feynman (as opposed to the Euclidian math-worshipping method used by contemporary science.)
- 08/09/01 Old article: "[Bions, leukocytes, and floaters](#)"  
Wilhelm Reich's "orgone energy" is partly based on a misperception; strange wigglers in the environment are actually inside your eye.
- 07/05/01 Added GIF diagrams to [Tesla's Greatest Mistake](#)  
He used the Earth as a giant waveguide for 5KHz power transmission.
- 05/30/01 Got [Adobe Atmosphere?](#) (free!) Try [FREUDIAN](#)  
Ever wanted to try building 3D objects? Or wondered whether the www of the future will be holographic? Get in on the ground floor! The free beta software lets you make complicated 3D objects and then

publish them on the web as 3D 'worlds.' Make your own online science museum or sculpture gallery. Best of all, there's a realtime chat server, and your users can see each other!

- 04/07/01 Playing with Adobe's [Virtual Reality](#) beta plugin & worlds
- 04/04/01 Added entries to [Electricity Misconceptions](#)
- 03/20/01 Added a CUPPA BURNING PLASMA to [microwave demos](#)  
Your microwave oven can create a pool of fluorescent gas. Poke at it quantum mechanically with salt grains. It gets fiercely hot though, and can shatter your Pyrex glassware.
- 03/18/01 Added a [graph](#) of leakage for a small gravcap test (no thrust!)
- 03/04/01 Added a couple of GIF drawings to [INLINE KELVIN'S THUNDERSTORM](#)  
Make high voltage with no moving parts except dribbling water.
- 01/30/01 Added [Ultra-simple hovercraft](#) plans.  
These blower-driven plates can lift immense weights. We piled on as many kids as would fit, yet the darned things still glided along.
- 01/28/01 Added photos to [BEHAVIOR INSTRUCTIONS](#) Skull awareness!  
Slowly, ever slowly my text-only prejudice is eroding...
- 01/25/01 Added more answers to [My Answers at Madsci](#)
- 01/05/01 Tesla's Shade whispers: ["Coupled Oscillators."](#) OoooooOoo.  
The last wisps of summertime visionary experience still stun.
- 02/17/00 More [Energy Suction](#) [LINK WAS BAD]  
What can yuh do with a drunken photon?
- 12/25/00 Added [Energy: a property? Or a substance?](#)
- 12/22/00 Added [FPD: Newsgroup flaming as mental illness](#)
- 12/18/00 Added crude diagrams to [Capacitor Complaints](#)
- 12/10/00 Added [WHERE in the circuit does energy flow?](#) (lots o' pictures!)
- 11/20/00 Added [Right Angle Circuitry](#)
- 11/14/00 Added animation to [Flight Analogy](#)
- 11/11/00 Added more to [Interesting Toys](#)
- 07/22/00 Added [Airfoil Explanations](#)
- 07/22/00 Added an exerpt from [TEXTBOOKS FLUNK OUT](#)
- 06/30/00 Added ['Squealing wall'](#) laser demonstration



- 06/01/00 Sorted the [UNUSUAL PHENOMENA](#) archive
- 05/13/00 Added [Smoke Ring Animation](#)
- 03/31/00 FOOD FOR THOUGHT: [How can long EM waves be sent through a tiny hole?](#)
- 03/25/00 New report of a success with "[gravity capacitor](#)". To follow the discussion, see [escribe](#). To see how to subscribe to this forum, see the [FREENRG-L](#) page.
- 03/25/00 Added [Pure Horganism](#) to [Closeminded Science](#) section
- 03/16/00 Major "energy-sucking antenna" debate on the [SCI.PHYSICS.ELECTROMAG](#) and the [SCI.ELECTRONICS.DESIGN](#) newsgroups caused me to add this [simplified analysis](#) of the "small resonant antenna" phenomenon.
- 03/07/00 Added a new page: [INTERESTING TOYS](#)
- 02/20/00 A freeware ["traffic waves" screensaver](#) sent to me. (.SCR for MS-WIN)
- 02/17/00 More [Energy Suction](#)
- 12/30/99 Added more stuff to [What Is Electricity?](#) and [FAQ](#)
- 11/16/99 Added an animation to [traffic experiments](#)
- 10/26/99 Added [High-speed blimp-vortex](#), a silly idea.
- 9/25/99 Added [WHO REALLY INVENTED "LEVITRON?"&](#)
- 9/25/99 Added [Levitron& and dishonesty](#)
- 09/20/99 Added [Nerd/Misfit Resources](#) and [Don't blow up your school](#)
- 09/18/99 Added [Cognitive Processes and Science-suppression](#)
- 09/17/99 Added [Crackpot Theory the 3rd: "Invisible Wall" acoustic effect](#)
- 09/08/99 Added [Crackpot Theory the 2nd: Energy-sucking Quantum Electrodynamics](#)
- 09/08/99 Added VDG WEIRDNESS: [The Morton Effect](#)
- 09/01/99 Added [WEIRD STUFF: anti-chirp scalar wave for Star Trek 'force field'](#)
- 09/01/99 Added [Publicize inventions via "infection"](#)
- 09/01/99 Added [UPDATE: Vector-potential free-energy device idea!](#)
- 08/29/99 Added [My first crackpot theory: vector-potential energy source](#)

07/30/99 Added [Energy-sucking radio antennas](#)

06/27/99 Added [Tesla's Big Mistake](#)

06/15/99 Added [Benveniste's "water memory" send over wires](#)

05/28/99 Started a new discussion group for Amateur Science: [SCICLUB-LIST](#)

05/17/99 Boston Globe article: [TEXTBOOKS FLUNK OUT](#)

05/13/99 Added [Exploding Coffee Water](#) to Microwave oven page

05/13/99 Old file that I never put on miscon page: [Capacitor Complaint](#)

04/14/99 Started an [Electricity FAQ](#) [UNDER CONST.]

04/12/99 More about [What is Voltage](#) [STILL UNDER CONST.]

03/30/99 Added [Electricity is not a form of energy!](#)

03/25/99 Added [The difference between "current" and "static"](#)

02/25/99 Added [Evolution Heresy](#)

02/15/99 Updated [Ion Experiments](#) (untried, suggested experiments.)

02/05/99 Added ["Static Electric" means "HIGH VOLTAGE"](#)

02/05/99 Worked on [FAQ: Why I'm involved in Fringe Science.](#)

02/04/00 Added [Weird science IS perception.](#)

02/02/99 Added [LINKS: The Amateur Scientist](#) column at SciAm magazine

01/31/99 Added [Physics Sermon](#)

01/30/99 Added more "abhorrence" to [Abhorrent ideas in Science](#)

01/22/99 Added [What a Shocking career!](#)

01/21/99 Added [Fringe-sci and Crackpots and Breakthroughs, Oh My!](#)

01/18/99 Added a couple of Torsion-waves papers to [Spin Waves](#) page.

12/26/98 Added hardware diagram to ["Electrostatic Air Threads"](#) page.

12/20/98 New **DOMAIN NAME**: <http://amasci.com> = <http://www.amasci.com/>

Just remember "AMASCI". No more of that "eskimo ,dot, com, slash, tilde... you know, \*tilde\*, the spanish "enya," that little squiggle thing, the one over the backwards apostrophe key? OK? ..then billb, with

two L's, NO, NOT billD, billB, with a "B" as in "boy," ...etc.

12/14/98 Added [Commercial sources](#) links page for electrostatic generators

12/07/98 Fixed up [THE END OF SCIENCE](#)

12/06/98 Added '[Gotchas](#)', antigravity experimental artifacts

12/03/98 Late notice: added [FREE STUFF for teachers](#) links

11/28/98 Added [PARASCIENCE VS. PSEUDOSCIENCE](#)

11/27/98 Broke my [Quotes Collection](#) loose from [Closeminded](#)

11/26/98 Added Feynman book links to [Feynman Page](#)

11/26/98 Addition to [Audio Illusion](#)

11/25/98 Added [WEIRD NEWSGROUPS](#)

11/08/98 Added [ALT.SCI.AMATEUR](#)

10/28/98 Sorted the [UNUSUAL PHENOMENA](#) archive

10/25/98 Weeded dead links & organized [Electronics Hobbyist](#) page

10/8/98 Added newsgroup links to [sci. ed. groups](#), [sci. amateur groups](#),  
and [homeschooling](#) page

9/24/98 Added [Skeptics Links](#) page to WEIRD SCIENCE

9/13/98 Added [AIP Misconceptions List](#) to the [Miscon Page](#)

7/13/98 Added [TRAFFIC EXPERIMENTS](#)

7/8/98 Added [TRAFFIC JAM CURE](#)

6/27/98 Added [You'll go Blind!](#)

6/18/98 Added a [Site Map](#) (this is a big site, eh? Large, even.)

6/5/98 [Bookstore](#): Buy books, help out [THE SCIENCE CLUB](#)

6/6/98 Added [Mysterious Electrostatic Air-threads](#)

6/2/98 Added [Science Museum Exhibits](#) addable database

6/2/98 Made [The Instructions](#) into an addable database

5/25/98 Added [What is Voltage](#) [UNDER CONST.]

5/22/98 Added [Ion Experiments](#) (untried, suggested experiments.)

- 5/1/98 Added [Anti-spam resources](#)
- 5/8/98 Added [VandeGraaff Generator Debugging](#)
- 5/4/98 Added [Edu Newsgroups](#) collected links to Dejanews service
- 5/1/98 Added [The DISGUSTO-SCOPE](#), a reprehensible use of innocent optical physics
- 4/25/98 Added Mark Rehorst's [Building Electrostatic Loudspeakers](#)
- 4/25/98 Added [SCIENCE DISCUSSIONS](#) to [AMATEUR SCI.](#)
- 4/1/98 Added [The Instructions](#)
- 4/3/98 Added a [Comment Book](#) to [Miscon](#) page
- 3/14/98 Figured out Dejanews archive access, added one to [Closeminded](#) (see Philosophizin')
- 3/11/98 Started [MADSCI ANSWERS](#) page, answers I submitted to the "[Ask a Scientist](#)" project.
- 3/8/98 Started [Spin Waves](#), about a little-known backwater in physics which might explain Psi, also 'free energy' and antigrav reports.
- 3/5/98 Started [Who's Who in Frontier Physics](#)
- 2/25/97 Added more stuff to [site FAQ](#)
- 2/22/97 Added "[Am I just a pedantic science-nitpicker?](#)" to [Misconceptions](#) page
- 2/21/97 Added [Todd Knudtson](#) "Brown's Gas" article
- 2/21/97 Added [Abhorrant Ideas in Science](#) to [Closeminded](#).
- 2/19/97 Added a [SEARCH](#)page, w/sorted list of most popular pages here
- 2/14/97 Added [PHYSL's](#) Textbook Misconceptions List
- 1/31/97 Added [NEGATIVE ION GENERATOR](#) to [ELECTROSTATIC MOTOR](#)
- 1/30/97 Added some explanation to [Mechanical Maglev](#)
- 1/27/97 Added [TRAFFIC WAVES](#)
- 1/08/97 Added more to [Vandegraaff Explanations](#) (w/GIFs), and a [VDG FAQ](#)
- 1/04/97 Added [Science/Spiritual](#) section to Weird Science
- 12/01/97 Added [Balloon Analogy](#) to [Wings Misconception Page](#)

- 11/30/97 Updated edu.html with [Science Lesson Plans](#) links
- 11/16/97 Added [THAT WHICH IS NOT SO... YET](#)
- 10/25/97 Added [HOW \\*SHOULD\\* WE TEACH ELECTRICITY?](#)
- 10/12/97 Added [KEEPING YOUR BEAD ON THE WIRE](#) to [Closeminded Science](#)
- 10/4/97 Accidental rm of dir. /weird, mostly restored now  
( any new URL additions to Weird Sci. page were lost)  
I need to build a kicking machine like in coyote/roadrunner,  
to gently remind myself not to use rm \*.\*
- 9/15/97 Working on [Dry Ice Demos](#)
- 8/31/97 Started a [Free Energy FAQ](#)
- 8/31/97 Redid [Science Misconceptions](#), added an index.
- 8/23/97 Added [Vortex Cannons](#)
- 8/21/97 Added [Antibubbles!](#)
- 8/16/97 Added [Prometheus Game](#)
- 8/11/97 Remembered to add here: [Crackpot Inventor's Rules](#)
- 8/11/97 Added [Screwy Ideas Archive](#)
- 7/31/97 Digests at eskimo.com are malfunctioning, including freenrg-digest
- 7/24/97 Added ["Acoustimagnetolectricism"](#) to Misconceptions page
- 7/16/97 Added [Pseudoscience](#) to Closeminded Sci.
- 7/14/97 Added [Ridiculously sensitive charge detector](#)
- 7/9/97 Added [The Electricity Map](#)
- 6/28/97 Added [Lens vs. Pinhole](#) to [Miscons](#) page.
- 6/16/97 Created [Chemistry and magnetism](#) page.
- 6/8/97 Created [ELECTRICITY ARTICLES](#) page
- 5/22/97 Added [They Laughed at the Wright Brothers](#) to [Closeminded Science](#)
- 4/9/97 Added [Flowing "static electricity"](#), Enlarged [Site FAQ](#)
- 4/7/97 Added [Hum Notes](#), [Hum References](#), and  
[Bristol Hum](#) to the [Taos Hum Page](#)

- 4/5/97 Bill B. on the Laura Lee radio show on alternative science.  
Topic: the "Taos Hum". Go to [TSTRADIO](#) for realaudio archive  
(warning: after free demo time, costs \$\$)
- 3/28/97 Added [A germ theory of education](#)
- 3/25/97 Added [Heretic's booklist](#) to [Closeminded Science](#)
- 3/15/97 Added [Hints for building electrostatic devices](#)
- 3/15/97 Added a site [FAQ](#).
- 3/14/97 Enlarged the [Seattle Weird Sci. Hobbyists](#) page
- 3/9/97 Enlarged [Sticky Electrostatics](#)
- 3/5/97 Enlarged the [LED explanation article](#)
- 3/4/97 Enlarged the [Hologram Hints](#) page
- 2/23/97 Added [What is a VDG](#)
- 2/23/97 Added [Tornado Chamber](#)
- 1/17/97 Added [Tampere Replication](#) and [Test Ideas](#) to [Antigravity Page](#)
- 1/15/97 Added [Gravity distortion viewer](#) to [Not your average const. project](#)
- 1/8/97 Added [Audio Absorber](#) to [Not your average const. project](#)
- 12/25/96 Merry X-mass! Added [UFO Binoculars](#) to [Not your average const. project](#)
- 12/15/96 Added Swartz editorial on lift calc. to [Bernoulli Misconception](#) page
- 12/14/96 Added "ice skate" misconception to [K-6 Misconceptions](#) page
- 12/7/96 Created [Webpage Flaws](#) page
- 12/7/96 Created a separate [Plasma Sphere](#) page
- 12/7/96 Extended [Sparks & Lightning](#) article
- 11/30/96 Extended my [Homopolar Generator](#) article
- 11/17/96 Added [SPEED OF ELECTRICITY](#) article to misconceptions page
- 11/17/96 Started [Science Fair Ideas Exchange](#)
- 10/27/96 Started [Airfoil Misconception](#) page
- 10/26/96 Started small [Richard Feynman](#) page for bookmarks

- 10/18/96 Started [SCIENCE EXHIBITS](#) bulletin board (unused, now deleted.)
- 10/18/96 Started science exhibits discussion [WEBHEAD-L](#)
- 10/16/96 eskimo.com off the net. Any mail lost?
- 9/26/96 Added Maverick versus Conventional Science (to [Closeminded Sci.](#))
- 9/25/96 Bill B. on the Laura Lee radio show on alternative science.  
Topic: Science ridicule of new ideas, infectious textbook errors,  
drawing holograms by hand. Go to [TSTRADIO](#) for realaudio  
archive (warning: after free demo time, costs \$\$)
- 9/18/96 Created [REPORT YOUR UNUSUAL PHENOMENA](#) subpage
- 9/18/96 Created guestbooks for main page, Taos Hum, and kids expt's.
- 9/14/96 Created [ANTIGRAVITY](#) subpage
- 9/13/96 eskimo.com router crash, WWW and mail no work. Incoming and  
outgoing email vanishes.
- 8/31/96 Added SCIENTIFIC CENSORSHIP AND EVOLUTION to 'Closeminded Sci'
- 8/31/96 Added THE RESEARCH GAME: RULES to 'Closeminded Sci'
- 8/6/96 eskimo.com Listproc is hung up. No list messages since Sun nite,  
staff fixed it late tuesday nite. Looks like those messages may  
be lost.
- 8/4/96 Connected a [Pop Bottle Motor](#) to a bundt-pan Waterdrop Generator  
for the first time. Igor, IT LIVES! The motor turns a couple of  
revs and discharges the generator, silently charges up for about  
20 seconds, then repeats. Things to try: it might be persuaded  
to run continuously by installing 20KV diodes in series with the  
wires to the inducer rings, so that shorting the generator output  
doesn't discharge the rings instantly.
- 8/3/96 Added lots of links to the "Asking Science questions" site.
- 5/27/96 Created "[Ball Lightning](#)" subpage.
- 2/7/96 Created [Vandegraaf](#) and [Static Electricity](#) subpage.

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LONG AGO

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- 3/95 Met Mike Huffman, mad inventor. Started a temporary majordomo  
list for discussing his device, calling it Vortex-L.
- 12/94 Uploaded some keelynet files called "MRA DEVICE," and spread  
some announcements on various newsgroups. The resulting flamewar  
on alt.sci.fusion and sci.physics continued for weeks!
- 8/94 Figured out how to use NCSA MOSAIC freeware. Created a webpage on

eskimo called Amateur Science, [typed in some old science museum](#) ideas, schematics, etc. Uploaded 10meg of Keelynet files and started "Weird Science." Convinced Yanoff, Virt. Library, and some guys on "akebono" to list my page. Those were the days, huh?

??/93 Heard about a service in Seattle called "Connected dot com" which gave real internet access for only \$30 per month (at 2400baud!!!!) I think my addr was [billb@connected.com](mailto:billb@connected.com). Then I noticed that I wasn't getting billed. And when I missed payments, nothing happened! I contacted other users and found that nobody else was receiving bills either. I later heard that the whole user base at connected.com simply stopped paying. Then the Sheriff's department [raided the ISP](#) and shut it down, confiscating all the hardware (which apparently was stolen property.)

??/92 Discovered a secret "hole" that gave free internet access. This was a big deal back in 1992. On the BBS card catalog for the Seattle Public Library BBS there was an option for searching periodicals, but the search window was something called "Gopher" which then led off into a vast network of other sites. After discovering this thing called "Archie", I could find sites that accessed something called "Usenet Newsgroups." I wasted months searching around in all that stuff. I REALLY wanted to learn how to write my own Gopher pages. Too bad it didn't have pictures. Now that would have been a good idea: hypertext like Gopher was, but with graphics! Why, that would let people publish their own free textbooks. People could display anything they wanted, and the whole world could come and look at it! What if billions of people could poke around in your filing cabinet? What would you put in it for them to find?

[Ping Blogwise](#)

[weblogs.com ping site form](#)

[Daypop](#) top 100 blogs

Search [Popdex](#):



[Blogstreet](#)

[Ping technorati](#)

[Technorati science](#)

News:

Brain:





<http://amasci.com/news.html>

Created and maintained by [Bill Beaty](#). Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

# VARIOUS INTERESTING SCIENCE TOYS

Science Amateurs Gotta Have 'Em!  
W. Beaty, May 2005

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ALSO: COOL [MAIL ORDER](#) STUFF

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Sept 22, 2005 [DOWN](#)



[Hardwood 'Pirolette'](#), an image of your face

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Aug 23, 2005 [DOWN](#)



[Frozen Lightning](#), 3D Lichtenberg figures in acrylic

An electron beam is injected into the plastic, then a sharp pin triggers the three-dimensional discharge.

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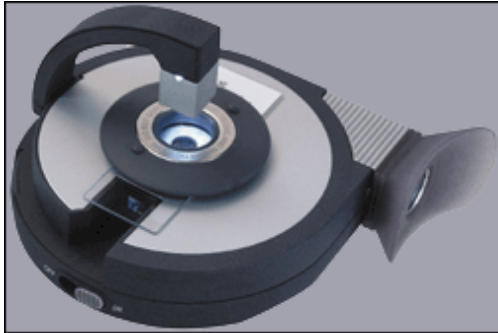
Aug 23, 2005 [DOWN](#)



## [Shrunken Quarters](#), magnetically crushed

A kilo-joule capacitor bank generates a contracting magnetic field which 'sledgehammers' the coin from all sides.

July 7, 2005 [DOWN](#)



## [Portable Microscope](#), \$99

Also see: [Trekker microscope](#) \$75

Meade Readiview, 160X or 80X (eyepiece is a 10X loupe)  
w/fold-down LED illuminator

Apr 24, 2005 [DOWN](#)



## [Record Playing VW van](#)

Drives around on your record, while a needle in the undercarriage guides the path while picking up vibrations from the groove.

Dec 29, 2004 [DOWN](#)



## [Virtual Depth lenticular optics footstool](#)

Physics furniture with "Mod" atoms/spangles motif, upholstered in flexible lenticular Three-D vinyl.

From the infamous [Archie McPhee](#) catalog.

Dec 13, 2004 [DOWN](#)



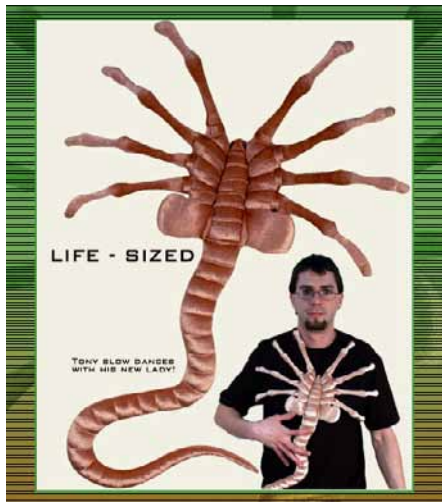
## ["Mighty Blaster" ring-vortex launcher](#)

Dec 13, 2004 [DOWN](#)



## [Corpse face Reconstruction Kit](#)

Dec 13, 2004 [DOWN](#)



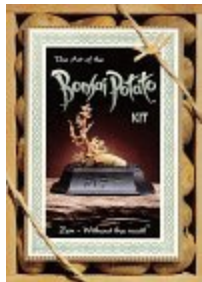
[Face-Hugger from ALIEN](#),  
cute li'l plush toy

Dec 13, 2004 [DOWN](#)



[Robotic Vacuum Cleaner](#), iRobot Roomba, \$249  
(or try the [earlier version](#),  
wo/virtual walls, \$149)

Dec 12, 2004 [DOWN](#)



[Bonsai Potato Kit](#)

Dec 8, 2004 [DOWN](#)



Malaria

Bacterial ties & scarves ,  
anthrax bowties,  
gonorrhea boxers, etc.  
Newly added: t-shirts &  
baseball caps



Gonorrhea

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Nov 3, 2004 [DOWN](#)



Hover copter!

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Nov 3, 2004 [DOWN](#)



Fisher-Price [Pixter](#), \$74.99

mutant progeny of Etch-a-sketch with CPU , and [ROM-pack \(software\)](#) , [camera](#).  
Also, the older , [non-color version](#), \$29.99

Oct 28, 2004 [DOWN](#)



For halloween...

[Gasoline Supersoaker](#)

w/matches and refillable gas can

yes it's fake

Oct 13, 2004 [DOWN](#)

[Hand-blown Glass Radiometers](#)

[science toys](#), and [other stuff](#)



Sep 27, 2004 [DOWN](#)



## [Digital Camera Microscope](#)

The [Intelplay](#) microscope has gone away? This link points to a similar microscope from another company. Or try a \$99 [eyepiece camera](#).

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Sep 27, 2004 [DOWN](#)

## [Magnetoids](#) rare earth supermagnet toy



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[DOWN](#)

Electronics kit: [Deluxe BAT DETECTOR](#).  
Or simply [listen](#) to ultrasound.



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[DOWN](#)

## [The OTHER kind of hovercraft](#).

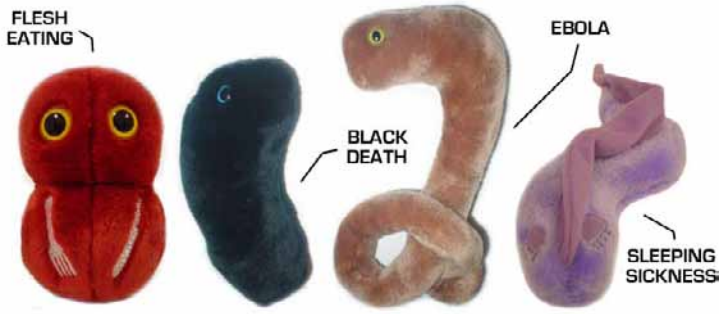


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[DOWN](#)



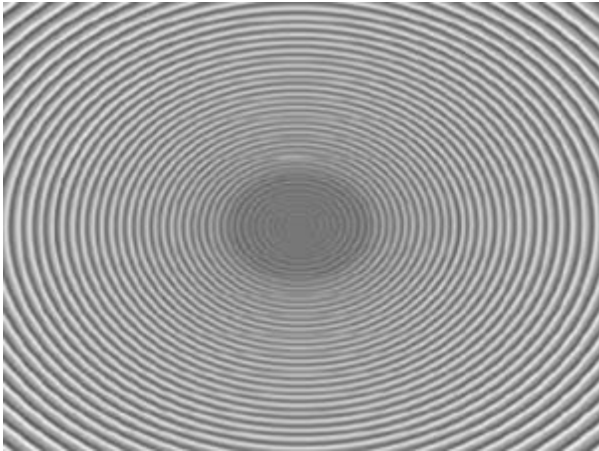
## Cute and fluffy disease



[DOWN](#)

[B&W Video camera](#). So what?  
How about \$15.00 each!!  
Or try [Infrared](#) and a [video monitor](#),  
or a [webcam](#) , or add some [A.I.](#)

[DOWN](#)



[Giant 40" x 31" Fresnel Lens](#) from [Electronics Goldmine](#)

[DOWN](#)

[ZORB! zorb zorb zorb.](#)

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[DOWN](#)



[X-ray Exploration Dino Books](#)  
from [Uncle Milton Toys](#)

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[DOWN](#)

[Foama Lation!](#)

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[DOWN](#)



## Exoskeletal [power-tootsies](#)

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[DOWN](#)



## Phage necklace, [DNA Jewlery](#)

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[DOWN](#)



## Stoner toy alert!

## [Skyliner](#) manually-scanned LED messages

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[DOWN](#)



[Spare brain](#) (deluxe model)

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[DOWN](#)



Rideable [Bicycle Replicas](#)

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[DOWN](#)



[Wizard Stick](#) smoke generator

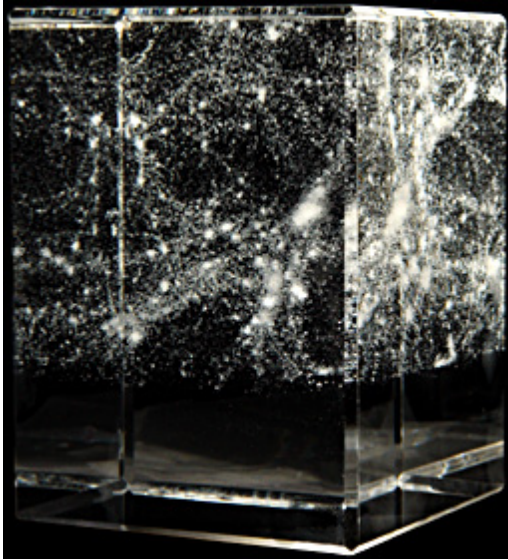
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[DOWN](#)

## [Linux hack: Billy Bass mods](#)



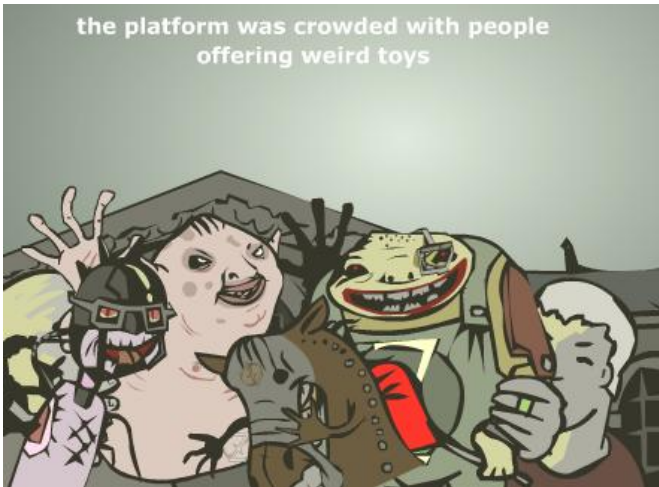
[DOWN](#)



[100 Megaparsec cube](#), Sloan survey, \$72  
(thats only \$2 per cubic megalightyear...)  
also [DNA](#), [b-Fields](#), [others](#)

[down](#)

the platform was crowded with people  
offering weird toys



[Some 'toys' for Halloween. Flash required](#)

[down](#)

## [Neutral buoyancy frisbee!](#)

[down](#)

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## [Snap Circuits](#)

[down](#)

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[Not](#) the 'Beanie Babies:' Frida Kahlo, Nietzsche, etc.

[down](#)

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## Experimental Home-built "Segway"

[down](#)



Green plastic army man, eight hundred dollars.

(BTW, 6ft tall.)

[more...](#)

[down](#)



UV invisible ink pen with black light LED. Secret messages. Draw bones on your hands, secret tatoos, networks of glowing blood vessels... Also UV nail polish, stickers, hair gel, etc. [Play Visions](#), a local Seattle toy company.

Or make your own with [UV keychain LED, \\$2.95](#), and some yellow/green hi-liter markers.

[down](#)

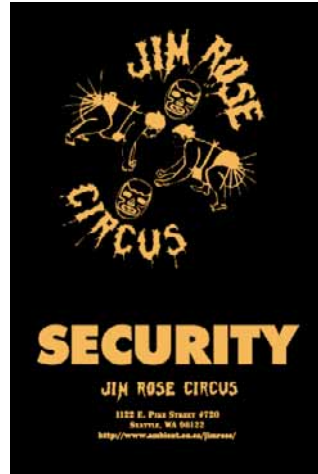
## FAVORITE T-SHIRTS FROM VARIOUS SITES:



Nikola Tesla's business card on [black t-shirt](#).



Museum of Jurassic Tech's logo on [black t-shirt](#). The [MJT](#) will stun! A thin layer of normalcy covers depths of [profound](#) mental twistedness.



Be backstage staff. Or a [freak](#)

[Strongbad Email!](#)

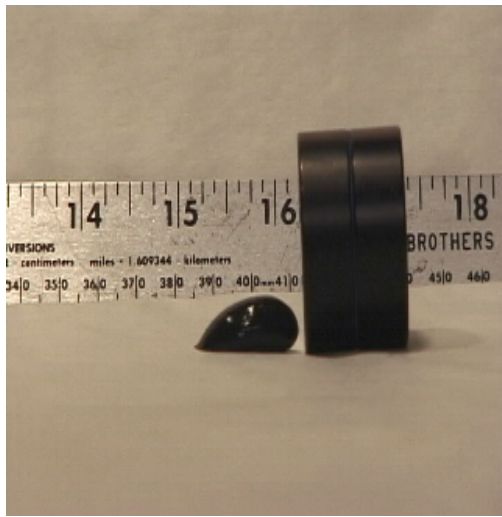
[down](#)



Real live [ultracapacitor](#) for only \$1.00. A whole farad, yet the size of toothpaste tube cap. Make electric flying toys? Insect robots? Charge em with a lemon battery and run flashlights!

[down](#)





Black magnetic silly putty! From [Thinking Putty](#)

[down](#)

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"Airzooka" fires invisible smokerings. Powerful! Blasts your hair back and makes your eyes water.

[down](#)

---



Coffee Cup Stirling Engine Kit! \$99

[down](#)



[Hokey spokes.](#) Turn your bike wheel into a mechanically-scanned vision disk like the [Baird Televisor](#) from 1930's television. More like a stoner toy with brain-enhancing LED strobes. Are they selling these at Burning Man yet? [NO, BUT PEOPLE ARE [BUILDING THEIR OWN VERSIONS.](#)]

[down](#)



The "[Leg-way](#)", Dean Kaman's "IT" or "[Segway](#)" balancing scooter... made from

# Lego!

[down](#)

---



Cheap [Geiger Counter Kit](#) (w/alpha window!) \$110. They also sell the [GM tube](#) alone for \$55.

[down](#)

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Wooden [standing wave](#), also check out their magnetic levitation toys

[down](#)

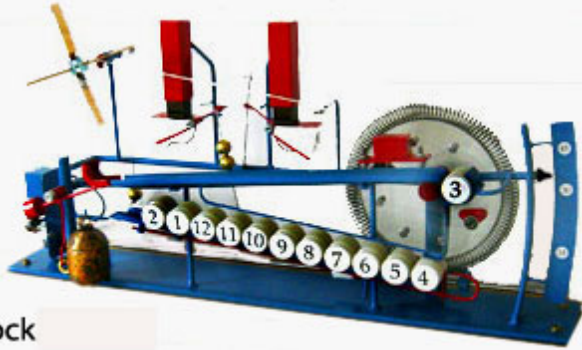
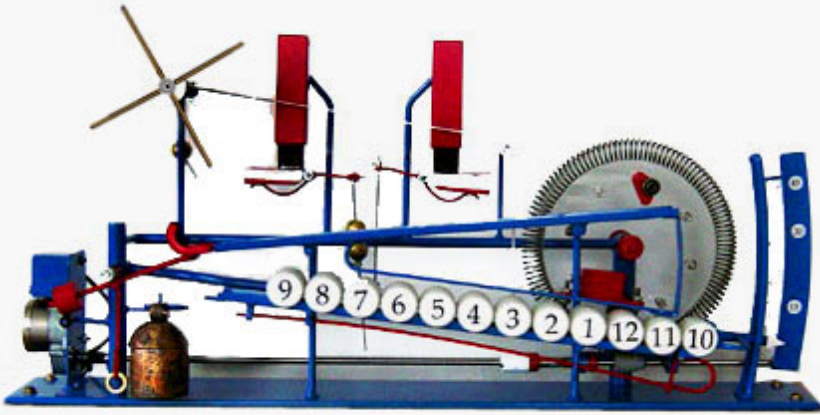
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[Zero Blaster](#) from [Zero toys](#) , a vortex launcher with smoke generator, \$20  
[Igor! The [Stench Ray](#) Weapon is alive! IT'S ALLI I I I IVVVVE!!!]

[down](#)

### Cuckinetic Clock



Limited Edition Clock

George Rhoads [Kinetic Sculpture](#), also see [Little Ball Blue](#) and [Lunatic](#)

[down](#)



[Plasma Mug](#) , \$30

[down](#)



[Draganflyer](#) VTOL platform, camera optional , \$750

[down](#)

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[ERECTOR SETS](#), also [STEAM ENGINE KITS](#)

[down](#)

---



A toy for your cubical: [mini rovers](#) from [ThinkGeek](#)

[down](#)



[Portrait of Lewis Carroll](#), strange anamorphic collage-art

[Morph Magic](#) anamorphic jigsaw puzzles



[Klein Mugs](#) for thirsty topologists. A rugged borosilicate 1-sided torus instantiation. Also lots more [Klein-ware](#). The finest closed, non-orientable, boundary-free manifolds sold anywhere!



The prices have been coming way down on [Russian-made night vision scopes](#). Here's one from Harbor Freight Tools for \$110, which includes a hand-driven generator (no batteries needed.) The battery-powered version is [even cheaper](#). For the curious, here's how to [look inside](#) a Famous Trails FT-300

scope. I These have the old single-stage image intensifier tube (they advertise "1/4 moon illumination needed"), as opposed to the truly [expensive](#) 3rd-generation true night-vision microchannel plate converters which can see in near-total darkness. Rather than pay \$2000, just rig up a superbright LED floodlight (use IR leds so things stay dark!)



The famous [Wham-o Air Blaster gun](#) shot a high-speed vortex, an invisible smoke-ring that could knock over cardboard targets. Not available since the late 1970s (some kids blow out their eardrums?), but sometimes seen on ebay and [other](#) toy [auction](#) sites. Or just get yourself a [Zero Blaster](#)



The microscope from Harbor Freight seems to have vanished. Rats! Here's one from [American Science Surplus](#) for \$129.



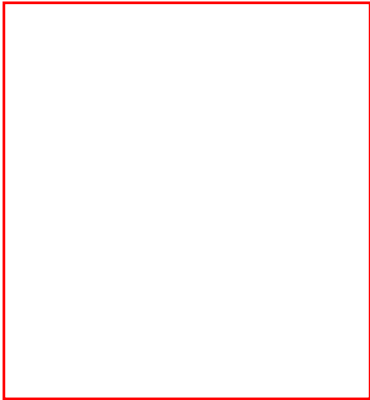


### [Magnetic Levitation Toy](#)

sold at [Johnson Smith Co.](#) (search on LEVITATING GLOBE)

This one uses fairly large neodymium magnets, also with a coil-pair in the base that makes the globe rotate (a low frequency synchronous motor, Tesla would be proud!)

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[Nitinol Memory Spoon](#) at [Grand Illusions](#)

Has the Amazing Randi seen this one yet?

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[LEVITATED MAGNET TOY](#) From Dr. Martin Simon at UCLA

(no longer sold, 9/2000)

However, you can buy a similar [Diamagnetic Levitator](#) \$60



[X-10 CCD Cam w/RF link](#), only \$80!!!

Runs off 12Vdc 200mA. Low quality color video, 2.4GHz microwave link w/directional antennas. Wireless spycam? Put it on a balloon or kite?



At amazon.com, see the new Lego Mindstorms sets (with onboard computer and IR link to PC!)

- BOOK: [Extreme Mindstorms](#)
- [Lego Mindstorms: Robotics Invention System 2.0](#) \$199.99
- [Lego Mindstorms: Vision Command \(camera\)](#) \$99.99 (needs RIS above)
- [Lego Mindstorms: Darkside Developer's kit](#) \$69.99
- [Lego Mindstorms: Exploration Mars](#) \$99.99 (needs RIS above)
- [Lego Mindstorms: Extreme Creatures](#) \$49.99 (needs RIS above)
- [Lego Mindstorms: Robo Sports](#) \$49.99 (needs RIS above)
- [Lego Mindstorms: Robotics Discovery Set](#) \$149.99
- [Lego Mindstorms: Droid Developer Kit](#) \$99.99
- [Lego Mindstorms: Ultimate Builder's Kit](#) \$59.99
- [Hacking the Mindstorms RCX](#)

Also:

- [Lego Mindstorms](#) home page
- [Lego Users Group](#)

NOTE: the gearmotors in the above Lego kits make dandy motor/generators for electricity demonstrations, and cost under \$10!

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## FURBY HACKERS

- [Furby Autopsy](#)
- [Hackfurby](#)

## ELECTRONICS KITS

(soldering required)



[Ultrasonic Listener](#) 18.50

(note: I've not purchased anything from this company)

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## OTHER GREAT TOYS SITES

- [Wham-O Toys](#), from [Secret Fun Spot](#) (excellent! go explore!)
- [Tick Tock Toys](#)
- [eBay:toys:science](#)
- Geek gadgets, devices
  - [ThinkGeek](#) toys for your Dilbert cubical
  - [Engadget](#)
  - [Gizmodo](#)
  - [Cool tools archive](#)
- [PLAYTHINGS: toy industry news](#)

- [Explore 4 fun: science toys](#)
- [Magic Cabin](#), the most interesting toy catalog in the world
- [Favorite Sci. Toys](#) on Ed Haas' site
- [EM toys list](#) (Magnet Man)
- [Arbor Scientific](#) science teaching stuff, toys too
- [Science Toys](#) you can make with your kids
- [Memepool: Toys section](#)
- [Science stuff: toys](#)
- [HTOY: Science](#)
- [Playvisions catalog](#)
- [Educational Innovations](#) (lots of sci. toys)
- [Mechanical Toys](#) (make these.)
- [Edmund Scientific](#)
- [Archie McPhee](#), brain jello molds, magic 8 balls, spud guns, tiki lights
- [Gobler Toy](#), twisted parody site
- [Creepie Crawlers](#)
- [Make a Disgustoscope](#)

## Glow in the Dark

- [Live wire EL](#)
- 

<http://amasci.com/amateur/toys1.html>

Created and maintained by [Bill Beaty](#). Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

[SCIENCE](#)  
[HOBBYIST](#)

[GUESTBOOK](#)

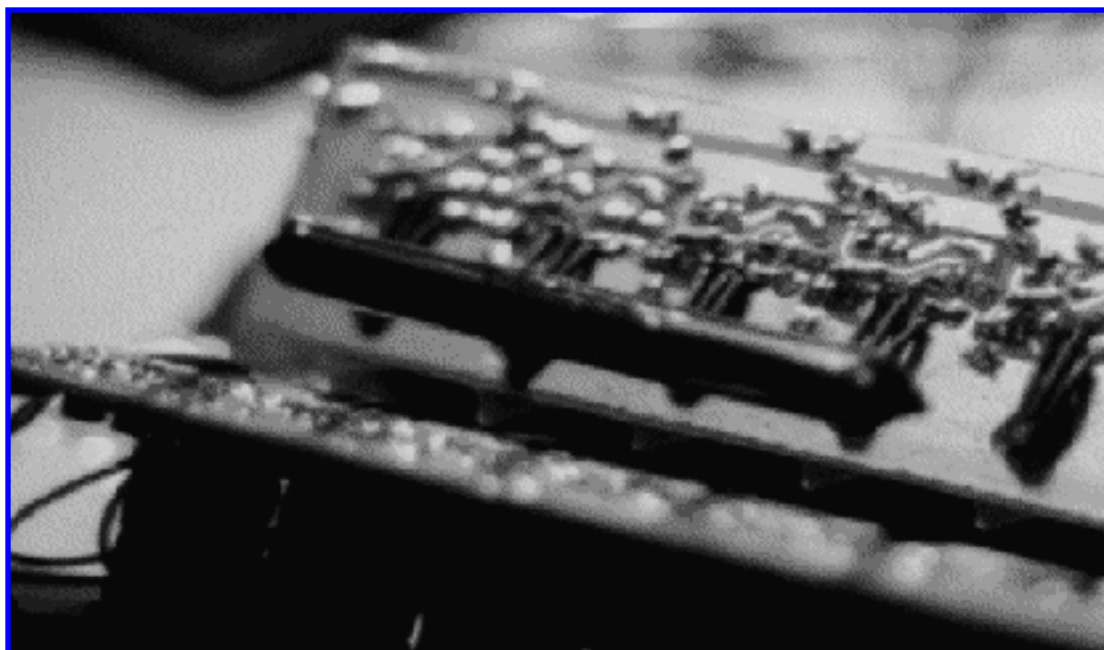
[GOOD](#)  
[STUFF](#)

[NEW](#)  
[STUFF](#)

[SEARCH](#)

# Magnetic Levitation cradle

Lifts a magnet from below



**Based upon an electrically-produced Meissner-like effect**

[Scroll down](#)

I'm a science hobbyist and occasional exhibit designer for science museums. The mult-coil device shown in the photo was part of a prototype "room-temperature superconductive table" which never made it to a museum. I thought I'd place it here so students and hobbyists could experiment with this strange maglev effect.

The device in the articles is not trivial to build, so I would recommend it mostly for **ADVANCED HIGH-SCHOOL LEVEL AND ABOVE**. If you've never built any electronic devices before, I wouldn't recommend the Meissner maglev cradle as your first

project. I built mine using parts from a [mail-order surplus store](#). Since you'll be using DIFFERENT surplus parts, my plans are only guidelines for experienced hobbyists rather than detailed instructions for a beginner. Experimentation will be required in order to get this device to work. For a much simpler project, check out "[Simple maglev train](#)", which uses only permanent magnets, and the [Science Projects page](#). [Dowling magnetics](#) sells SDK-100, a maglev train kit which uses only permanent magnets. DON'T MISS MY "[AMATEUR SCIENCE](#)" WEBSITE

**RECOMMENDED LINK: [WHO REALLY INVENTED "LEVITRON®?"](#)**

## My Maglev Articles:

- Feedback-stablized multi-coil Cradle
  - [Photo, cores diagram](#)
  - [Schematic & info](#)
  - [Hall-effect sensors](#)
- [Simple maglev train](#)
- [Doin' it Mechanically!](#)
- [Independent discovery](#) (patented!)
- [Hall-effect sensors](#)
- [Some Maglev theory](#)
- [Linear motor maglev drive](#)
- ["Superconductor" plate w/visible current](#)
- [More links \(below\)](#)

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A Maglev book. Get it through "interlibrary loan" at your public library:

"Electromagnetic Levitation and Suspension Techniques", B.V.

Jayawant, Publishers: Edward Arnold, London, 1981,  
ISDN:0713134283

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A project article:

POPULAR ELECTRONICS magazine, May 1989, Vol 6 No. 5,  
pp35-37, The "Antigravity" Generator, by V. Vollono. A coil lifts a  
plastic ball and magnet from above, controlled by photocell.  
Instructions, schematic, parts list.

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LOOKING FOR BOOKS? Try searching [amazon.com](http://amazon.com):

(try "science fair" too)

Help Support [the Science Club](#), use the above form to buy your books.

(We make a few \$\$ on any books ordered via these links.)

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## Some Maglev Links

### Kits & curric

- ['Hover engine'](#) maglev kit (PCB w/processor pre-assembled)
- [Tiny Diamagnetic Levitator](#), \$59
- [Large Diamagnetic levitator](#), \$23
- [Maglev Globe Kit](#)
- [Levitation Train Kit](#) from [Dowling Magnetics](#)
- [Levitation Train Exhibit Kit](#)
- [Argonne](#) maglev curriculum
- [Kyrene](#) maglev curriculum
- [Kelvin](#) maglev curriculum (\$)
- [Wondermagnet, inexpensive supermagnets](#)



## LINKS

- [Levitron®'s Hidden History](#) (a stolen invention), and [\(mirror site\)](#)
- [Skeptic](#) momentarily suspects that Levitron® is pseudoscience?!
- [WHO REALLY INVENTED "LEVITRON®?"](#), and [PART II](#)
- [Levitron® and dishonesty](#)
- [Mike & Karen Sherlock](#)
  
- [Levitating train](#) project from [Magnet Man](#) website
- [Electromag levitator project](#)
- [Maglev Toy](#) uses Hall-effect feedback (NEW 11/2000)
- [Maglev Toy](#) uses photosensor feedback
- [Lamb's seismometers](#), with a [graphite levitation](#) version
- [Halbach Array](#) inductive maglev
- [Diamagnetic Levitator](#) (no spin, no batteries!)
- [Scitoys: levitator](#)
- [M. Lamb diamagnetics](#)
- [Wondermagnet, inexpensive supermagnets](#)
- [Look inside](#) a commercial "maglev world globe"
- [Levitating World-globe](#)
- [Levitation Train Kit](#) from [Dowling Magnetics](#)
- [IMPOSSIBLE](#) with permanent magnets?
- [Colorado Superconductor](#)
- [TRAC](#) maglev education project & products
- [Student lab MAGLEV](#)
- [Allegro Inc.](#), source for hall-effect sensors
- [Levitron](#) maglev toy
- [Levitron toy](#)
- [Maglev display stand](#)
- [DOT Research on EMF due to Maglev systems](#)

- [maglev for VR feedback](#)
- [Maglev train sound](#)
- [Energywise options](#)
- [RTRI: Japanrail Maglev Project](#)
- [RTRI: Overview of Maglev Test Lines](#)
- [RTRI: Superconducting Maglev Technology](#)
- [USAF to develop Maglev](#)
- [Maglev Gets a Boost](#)
- [Prof. Schetz Maglev](#)
- [Designing and Testing "Maglev" Vehicles and Systems](#)
- [LAH HIGH SPEED/AUTOMATED TRANSPORTATION](#)
- [LAH ARCHIVES MAGLEV](#)
- [French TGV project](#)
- [Maglev turbine energy storage](#)
- [NASA LARC papers '92](#)
- [NASA LARC papers '94](#)
- [NASA LARC paper instructions](#)

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<http://amasci.com/maglev/maglev.html>

Created and maintained by [Bill Beaty](#).

Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

[UP](#) | [GOOD](#)  
[STUFF](#) | [NEW](#)  
[STUFF](#) | [SEARCH](#) [FORUM](#)

[UP](#) | [GOOD STUFF](#) | [NEW STUFF](#) | [SEARCH FORUM](#)

# FOLLOW THESE INSTRUCTIONS

1998 [William J. Beaty](#)

ATTENTION ALL GROWNUPS. Your "inner child" has long been waiting for a chance to usurp control of your body and force it to perform certain actions. The time is now at hand. Read and follow the instructions below. Do this now.

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[Blog](#) | [New ones](#) | Various stuff [added by visitors](#) | [Forum](#)

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"The secret of genius is to carry the spirit of childhood into maturity." - T. H. Huxley

## Pulsing Bloodbags

Shake your hand really hard, for a fairly long time, until your fingertips feel like they're turning into rubber. Stop for a moment. Now do it again. It takes less time the second time for "rubberization" to commence, eh?



## **Enhanced Awareness**

Look in the mirror, use both hands to pull your lips wide, then snap your teeth open and closed as shown in the photo. This makes you "AWARE OF YOUR SKULL." Why, your face is just a thin layer of meat! Now be honest, can't you feel your Death sitting up there in the future, patiently waiting? You Americans, you talk and you talk, but you don't consider The Salmon Mousse! All too

soon that skull in the mirror won't be moving any more. Might there be something important you should be doing right now? (Once the full-blown skull awareness wears off, find another mirror and restore it to full strength.)

## **(kaboom)**

While yawning, notice that rumbling sound right near the end of the yawn. You can control it consciously, and make a "boom" sound which only you can hear. Walk down the street while accompanying yourself on the Invisible Bass Drum. Launch thought-balls at irritating drivers and hear them explode. Burst out giggling while walking along at work, and nobody knows why!

## **Garden of delights**

Keep a pocketful of dimes and quarters with you at all times, and constantly leave them in knee-level weird places where only a child would ever look. Inside the hollow shafts of toilet-paper holders. Balanced along the ridges of decorative molding. Inside pencil sharpeners at the local elementary school. In the coin slots of gumball-dispensers (give 'em a half-turn.) Imagine the eventual entertainment that will result.

## **Gleeking**

Yawn. (no, REALLY yawn), then immediately curl your tongue backwards and force it against the roof of your mouth. The saliva glands under your tongue will squirt like a squirtgun! You can only squirt once or twice before another yawn is required. Also works while eating (or sucking on hard candy.) Practice this in front of a mirror until you can slightly part your lips and silently hit a target with deadly accuracy. Hey! Is it raining in here?

## **Waskilly Wabbit**

Say "aah-eeee-ahh-eee" with a deep voice, but relax your face and shake your head back and forth hard and fast so that your cheeks flap. Sounds like Elmer Fudd when he's trying to shake off the dizziness that comes from being hit on the head. Try this next time you get flattened by a falling anvil, see if it helps.

## **A [Feynman](#) trick**

Before you eat that apple, sniff it well. Smelling can be better than eating. Smell the table. Smell the floor. Smell the computer screen. Why should dogs have all the fun?

## **Greenblatt's Legacy**

Rub your palms together hard, so you make those little black rolls of dead skin. Those are called "Blatties." They're named after an early computer hacker at MIT.

## **Zen Fluid Dynamics**

Sit in a sunbeam in a dimly-lit room. Light a stick of incense, hold it vertically, then move it upwards and stop suddenly, with a jerk. A perfect smoke-ring will be launched from the burning tip. Move the incense upwards, then suddenly jerk downwards, then repeat. You can launch fast smoke-rings through the center of slow ones, create side-by side rows, etc. In a draft-free room they persist for ages, and soon the air will be full of huge grey thin circles. Contemplate the silent Chaos.

## **Where'd I leave it?**

Teach yourself to talk understandably while your mouth is wide open. If you ever accidentally cut your lips off or misplace your lower jaw, this will come in quite handy. "Tleese take ne tll a hos-thitle innnediatly!"

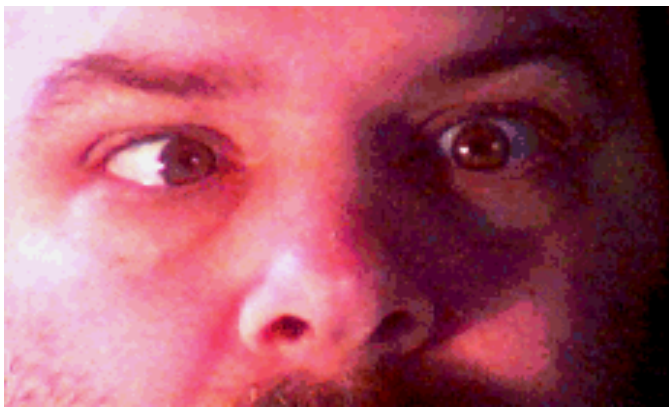
Use both hands to stretch your lips wide, then talk to friends with your jaw clamped shut. They will become VERY aware of your skull, and it won't wear off very quickly either. Maybe never.

### **Gravity warped**

Another childhood trick: when riding in the car, and approaching some railroad tracks (or other large hump), hold your arms upwards! The sudden drop in g-forces makes your stomach feel VERY weird, and holding your arms over your head seems to amplify the effect. Like lifting your arms while going downhill on the roller-coaster at the amusement park

### **Two-inch sparks**

Create REALLY BIG "static" sparks: on a winter's day, scuff your feet on the rug so that your body becomes electrified. Now stand near a victim. Wiggle your shoes while pressing on the rug, so that you build up some charged footprints. Now suddenly LEAP INTO THE AIR and touch your victim with your finger at the same time, while you're still in flight. The spark will be much stronger than normal. (It's called "capacitve voltage multiplication." and [VandeGraaff](#) generators employ this effect.)



### **Cross one eye**

This is a very simple trick. Just cross your eyes at somebody so everything becomes doubled, then stare at just one of the pair of people you see. If you look at the left-hand twin, that person will see your right eye cross, but your left eye will not. Crossing

one eye is supposed to be a come-on in the South Pacific and Indonesia. In Kabuki theater it's called 'mie.'

### **Plasma jellybeans**

While waiting in the dark outside a movie theater or pub, violently shake your head back and forth while observing nearby neon signs. (this only works with clear-tube orange signs.) See those frilly filgerees in the bands of light? All neon signs have them, but normally they wiggle back and forth so fast that humans can't see them. Physicists call them "positive column striations," while neon signmakers call them "jellybeans". Tell bystanders what you are doing, and soon you'll have a crowd of people shaking their heads in the dark like fools.

### **Sticky eyeballs**

Learn to cross just one eye (see above.) Walk near a victim, cross one eye, then say "Hey something's wrong!" Shake your head as if to fix the stuck eye. No good. Blink repeatedly. Finally strike yourself on the side of the head repeatedly, then straighten your eyes. Whew! Don'cha hate it when that happens?

### **Backwards Student**

Teach yourself to read upside-down. Comes in handy: you can read the books of people sitting across the table from you. Teach yourself to write backwards in cursive. Da Vinci did this, it was years before people realized that his notebooks weren't written in unbreakable cypher.

### **Do the Celestial Crawl**

On a cloudless warm night, walk around until you can put a nearby building or tree very close to a bright star in the eastern sky. Now lay on the ground and move yourself until the corner of the building or the top of the tree just BARELY covers that star. Wait a moment. The star will reappear. Wiggle along to cover up the star again. It reappears. Keep wiggling along. (Um... notice that the entire Earth is rotating beneath you?)

### **Burst of flavor**

While reading, eat something. Notice that the flavor vanishes as soon as you get involved with the story you're reading? Now concentrate on your mouth, and the flavor explodes into reality. By concentrating on the text or on your mouth,



you can make the flavor flash on and off. WEIRD!

## **Finger of PAIN**

After getting out of the car, quickly touch one of your passengers. Snap! Why waste a good "zap" on the [car door?](#) (If you don't enjoy sparks, then use the car keys to touch your passenger. The shock still occurs, but YOU won't feel it!)

## **Visible Touch**

Look to the left, close your eyes, then touch the rightmost edge of your right eyeball with a fingertip. (Push gently on your eyelid, don't touch the eye itself!) Wiggle your finger up and down. See anything off to the left? That's the "image" of your fingertip, but the retina of your eye is feeling it, not seeing it. Move your finger UP, and the black/silver splotch moves DOWN. Use two fingertips, and you see two splotches. This is the realm where touching meets seeing.

Some more [cool things](#) involving eyelashes, light waves, etc.

## **Twang Optic Nerve**

Here's the other way to "touch your retina." Much funnier. First teach yourself to cross just one eye (see above.) Now jam one finger up your nose, tap your friend on the shoulder, and say "I can touch my optic nerve!" Simultaneously tense your hand and swerve one eye back and forth, as if your finger is pushing upon it from within.

NOTE: don't really insert a finger in your nostril. Instead create the illusion: extend all fingers but fold your pinky finger under, then push your pinky finger knuckle against your nostril. Practice in the mirror to perfect this "skill."

## **Restaurant Super-candle**

...with a foot-high flame. While in a restaurant, tear off a bit of a napkin or other paper, and twiddle it into a little rod the thickness of a pencil lead. Dip both ends into the liquid candle wax so the whole thing is wetted, then wait for it to harden (or chill it in your drink.) Carefully jab this hard wax rod into the top of the candle so it becomes a second wick. Tilt the candle to expose this extra

wick to flame. Now REPEAT THE PROCESS! Five wicks create a tall flame like a blow torch which makes a soft roaring noise.

### **Tube of Boob**

Tune your TV to a blank station and adjust it for good "snow". Stare into the snow. Imagine the number "3", and it will appear as a 3-shaped flickering. But then it will start to slowly rotate. Mentally erase the 3, then imagine a horizontal line. It appears, but it won't stay still, it wants to drift and rotate. Make it shrink and vanish. Keep staring, and soon the snow will smoothly ripple, as if you were looking through the distorting water of complicated waves in a swimming pool. Think of more stuff to create. Who says that watching TV for hours isn't worthwhile?!

### **Music of Infinity**

While painting murals in the "graffiti tunnel" under the U. of Rochester quad, I was humming and hit a resonance which got very loud. Over weeks I made it my habit to hum at the fundamental acoustic resonance of the width of the long concrete corridor. The slight humming would slowly grow until I could almost feel the hair on my arms buzzing. It didn't work as well with crowds of people in the tunnel (acoustic damping of sentient protein-blobs), but I doubtlessly weirded-out the lone student late at night.

### **Un SELF -ishness**

This person (I?) has just remembered an idea from last year. Write a long email or a story, but do not say "I" or "me", instead say "this one" or "the body." After a couple of hours of this, THIS ONE encounters a slightly drunken state, and THE BODY becomes prone to fits of giggling, and certain childish verbal gyrations begin to arise spontaneously in the writing. Beware, for if the body should accidentally send the resulting email message to a similar body at another location, that distant body will acquire the conviction that the originating body has gone entirely whack-o. Expose numerous extraneous bodies to the same message and they will forever gaze on the initiating body with perhaps valid suspicions about its sanity. THIS ONE also suggests employing this self-cancellation technique when dressed as an alien for Halloween. A

genuine hivemind organisms would refer to the hive members as "this one", and if all selfreferential internal selftalk terminology is altered until a certain temporal threshold is exceeded, the body will not only THINK borg, but will become in danger of BEING borg!

Now go forth and also [eliminate the verbs "is, was, were..."](#) Aha! [The experts](#) already know about this "[self-cancellation](#)" stuff.

### **Balloon gyroscope.**

Put a coin inside a balloon, then blow it up and tie it off. Shake it and then swirl the balloon around, and the penny will start rolling around in a circle! It makes a whirring noise and smoothly circulates. Get it going fast, then let it go, and the balloon whirrs and wobbles maniacally.

Once you get good at spinning the coin, get it going in a vertical circle, and place the balloon gently against one ear. Loud mechanical roaring noise! Do this with TWO balloons at the same time, and put one balloon against each of your ears. It's LOUD, and has stereo effects. Better yet, sneak up behind your victims and put them on THEIR ears. Sounds like UFOs touching down right outside your building.

### **The noise from the Monolith**

Get a "bloogle" (one of those corrugated plastic hose noisemakers.) Spin it around while holding the end over your mouth, then say "eeeeeeeeee" with a deep voice. The sound comes from all directions and inside your head. WEEEEEEIRD. Now go "ooooo" like a police siren, and it sounds like a UFO full of elephants.

### **Make 'smoke' with your mouth**

Compress the air in your mouth, then let off the pressure, then let the air out slowly. You'll see fog!

**Detailed version:** Face a light source such as a bare light bulb. Tightly close you lips. Fill your cheeks with air partially, breathe normally through your nose,

then fiercely tense your cheeks and lips while blowing to compress the air inside. (It helps if you push fingers on your lips to keep air from spurting out.) Now relax your cheeks, part your lips, and spit the air out very slowly. (Don't breathe out, instead spit the air out with cheeks and tongue.) Smoke! Fog comes out of your mouth. It's just like the fog in the neck of a freshly opened bottle of cola. This works great in the dark with a flashlight.

### **Psych. Experiment**

Get some epoxy or crazy-glue and attach a quarter to the floor. Who can resist stopping to grab it? Arrrg! Put it in a spot that you pass by every day and see how long it survives. Eventually somebody will come along with a pocketknife and pry it loose. Once I did this in the entrance of the Psychology department at the U. of Rochester. The quarter lasted for weeks. After awhile a black blossom of markings appeared around it. People were scuffing the floor while trying to kick it loose. Years later at a party somebody mentioned seeing the quarter there, but they were afraid to mess with it because they assumed that some psychology student was watching it with a hidden video camera as part of some experiment.

### **Make your 'self' vanish**

As a child, while all alone, pretend that you are not who you think you are, but that you have suddenly woken up in this human body, and your memories of your whole entire life have just been placed in your head. Your real memories of your "real" life are gone. Your mom and dad are not your real parents, they are the parents of the child you've just been forced to occupy. You know you were just somewhere else a moment ago, but now you are here on this "Earth" thing, and you don't know how to escape and go back to your real home!

When done right, the shivers and black sparklies encroach, and you feel like you are nearing a precipice in the darkness. EEWWWWW!

### **The Hot Chocolate Effect**

Get a mug, a METAL spoon, and some hot water. Mix in the chocolate powder,

then while the spoon is still immersed in the liquid, tap it against the bottom or sides of the mug. It goes "thunk" instead of "clink." Keep tapping, and you'll hear the pitch rise higher and higher. Now stir the liquid. Resume tapping, and hear that the pitch is low again (but then it rises.) If you keep tapping for long enough time, the tone will eventually become a high-pitched "clink" sound. Acoustics researchers give this phenomenon the exotic name... hot chocolate effect! (The underwater foam-cloud is the cause. The speed of sound is slower in foam. Beaten egg-whites or ice cream in root beer create similar effects.)

### **Swimming pool "hot chocolate effect"**

Take two rocks into a swimming pool. Splash around in order to create a huge cloud of underwater bubbles. Quickly knock the rocks together underwater inside the bubble-cloud. You'll hear a loud musical tone, like a gong, and as you hit the rocks together repeatedly, the pitch rises. (No rocks? Sometimes you can whack your knuckles together hard enough to make the "dong" sound. Hurts though.)

### **Foam blast**

Mix a bit of whipped cream with a little water, stir well, then pour in a large amount of warm cola. FOOSH! Giant explosion of foam all over. If you do the same with milk and cola, very little happens. The microscopic bubbles in the whipped cream are the cause. The same thing happens when melted ice cream hits carbonated beverage, thus explaining why "rootbeer floats" make foam, yet pouring milk into rootbeer creates only boredom. Ice cream is actually a "miniaturized foam," and it only needs some carbonated water to let it expand back its true size. Prepare a trap: put a small dab of the dilute whipcream or melted ice cream in a cup, then ask someone to pour in your chosen carbonated beverage. Make a cola-rocket by injecting a turkey-baster-full of diluted whipcream deep into a full bottle of warm carbonated liquid. And finally, if you ever see people eating ice cream, offer them a big gulp from your cup of cola. It will tend to spray out of their nostrils.

### **Longer Seeing**

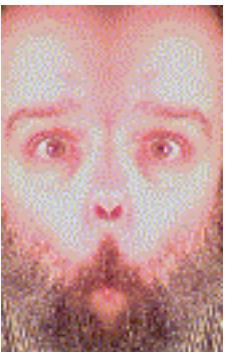
Modify your perceptions with physics rather than psychopharmacology: put an

infrared filter in some welding goggles, then wear them outdoors on a bright, sunny day. (Choose a filter that is in the near-IR, so a bit of light is visible still. Or try theatrical gels, congo blue combined with primary red, several of each.) The world will become EXTREMELY BIZARRE. Wait a couple of minutes until your eyes grow accustomed to the darkness. Then the bright pink clouds drift in the dark sky above the frosty white trees. The world is dusk, yet the sun still shines. Car tail-lights blaze brightly. The houses and roads are dark. But the grass! The trees! They are frosty blazing red, like snow which has been sprayed with cherry Kool-aid powder. Everyone's clothes are altered. Blue-jeans are almost white. Some black clothing turns light grey. The artwork of T-shirts is almost invisible, and everyone's hair is grey. (New: see the [article](#).)

I've heard that some types of clothing are transparent to the infrared, so stagger on down to the beach and verify if this is so. "Mister, why are you wearing those goggles?"

### Caught in a Facewarp

Find a piece of mirror material about 30cm across (or just take a small mirror out of its frame.) If your mirror has sharp glass edges, grind them off with emery paper or put scotch tape on the edges. Next, stand in front of a larger mirror so you can see your reflection. Place your smaller mirror against your face so that its edge runs vertically down the middle and is slightly crushing your nose. Tilt your mirror sideways until you see your reflection in the bigger mirror. Your face will look perfectly symmetrical because your small mirror is reflecting the other half: you'll have a face that's composed of two left halves or two right halves.



Look to the side and **YOUR EYES MOVE IN OPPOSITE DIRECTIONS!** Gah! Tilt your head one way and your cranium expands hugely, tilt it the other way and you become a pinhead with a gigantic neck. Move the edge of the mirror so your nose has one nostril and you develop a single large eye. Hide one hand behind the non-reflective side of the mirror and extend one finger under the mirror's edge against your face. A worm appears on your face (a worm with fingernails.) Wiggle your finger. Open your mouth and

and grasp your finger between your teeth, and the fatnecked-pinhead has bitten the worm! Swallow it (and perhaps use your hidden hand to push your neck flesh sideways, to form a lump that moves down your throat.)

By this point I will have become "overly amused" and in danger of damaging myself.

### **See your Blood**

Get one of those red LED keychain flashlights. Close your eyes, then glance rapidly back and forth while placing the bright red LED against your eyelid. You see sharply-focused "trees"! If it doesn't work, move the LED to different spots while continuing to wiggle your eyes by glancing back and forth. The "trees" are the blood capillaries that cover your whole retina. The spot where they all converge is your blind spot, and in the exact center of your viewpoint is a small dark blotch that has no capillaries. Very strange that your eye is constructed with the blood vessels ON TOP of the retina, where they can cast shadows! Remember those "retina pattern ID" readers from SF stories, that read your eyes like fingerprints? These blood vessels are what they detect. Now try the same thing with your other eye.

### **The Vanishing Rod**

If you're in a place where cotton candy is available, you can make a large "rod" vanish. Get a small cup of warm water (or use your cup of stale cola so you don't draw attention to your preparations.) Then stretch and wad one whole batch of cotton candy into a solid rod-shaped mass. Then take your rod and shove it into your cup. The entire thing vanishes! The water soaks the tight-packed fibers, which dissolve almost instantly, so the wave of "sludge-ification" is very fast.

### **Vanishing Mass**

This one's dangerous, so take your life in your hands. (Better do it outside.) Connect up an aquarium air-stone to your gas kitchen stove, dunk it in a bucket of sudsy water, and let it create a gigantic mass of bubbles. Carefully light the mass with a match. It doesn't flame. It doesn't go bang. Instead it WINKS OUT OF EXISTENCE! Every tiniest bubble vanishes in an instant. This big white

"object" is suddenly not there anymore. (After getting overconfident, I held these white bubble-masses in my hand and lit them. No burns, just slightly warm water.) Probably the water in the bubbles boils, which slows down the flame-front. **[DANGER! DON'T USE PROPANE! I used city gas in Rochester NY. I tried the same trick using propane. YAAARRG, it creates a huge fireball which will leave soot on your ceiling and perhaps ignite your curtains!]**

## **THE NULL ZONE**

Stare straight ahead, then concentrate on things in your peripheral vision. Try wiggling your fingers while moving your hand out "beyond the edge." Is the edge fuzzy? What color is it out there? It's not black. It's too weird, since there's a boundary, but there's NOTHING on the other side of it. It's not really an edge at all, since an edge divides two regions. This "edge" has NO REGION on the other side!

## **NEPTUNE'S HAMMER**

Obtain some V8 juice or orange juice in a small glass bottle. (Any vacuum-packed non-carbonated liquid should work.) Hold it in one hand and strike the top with the heel of your other hand. If you strike it hard, the glass bottom will fly off and the liquid will blast downwards. If you strike it more softly, you'll hear a loud "snap" sound. Practice striking it softly enough to obtain the interesting noise. Now break the seal and let in the air, and you'll find that you can't create the snapping sound anymore. The sound is caused by cavitation, by a "water hammer" effect. Liquids are held together by atomic bonding, and if you create negative pressure, you can tear open some bubbles made of vacuum. When the bubbles slam shut again, the water pressure becomes momentarily immense. But if the liquid is at atmospheric pressure to begin, you can't create enough negative pressure to get to the cavitation realm. (This works with canned vegetables too, and with glass jars of pasta sauce.)

## **Aware of your ENTIRE SKELETON**

Taverns with black light tubes are rare now, but if you should find one, make sure to have a couple fluorescent green "highlighter" markers in your possession.



Under black light the skin on human arms looks purple-brown. Draw a marker line on your knuckle. Blazing yellow-green! Sketch in some crude finger bones and your hand looks like a moving skeleton. Do up both of your hands. Add arm bones, Ulna and Radius. Metacarples even! On a busy night the onlookers may demand that you to set up a phosphorescent tatoos parlor. (This all *seems* to wash away in the shower, but try viewing it again under black light the following evening. It's still there!)

### Never drive with a Jerk

As you slow your car at a traffic light, the deceleration is relatively constant, but when your car actually halts, the deceleration vanishes. Your passengers feel the sudden change as they fall back into their seats. This effect is so common and expected that we can play with everyone's heads: remove the jerk! As you brake to a halt, simultaneously ease off the pedal so your car decelerates less and less. Time it right and you will stop braking entirely just as the car halts entirely. Unless your riders are looking out the window, they won't realize that the car has actually stopped. (This works particularly well with a van full of kids who are waiting to leap out as soon as you come to a complete stop.) **[I'm told by a commercial pilot that this is a common practice on airlines. At the end of the flight when passengers are waiting to leap up and rush to the overhead bins, they'd better look out the airplane windows. The passengers who run by inertial guidance (waiting for the final jerk) will be intentionally misled!]**

### Wearing the Invisible Mask

During primitive festivals (Mardi Gras, halloween) we hide our identities, and if we take the right mental turning, we discard our everyday personalities. A stranger takes charge. But why wait for Fat Tuesday? No masks needed! Take a lesson from the little kid in "The Shining" and just start talking funny. Continuously. For hours. Donald Duck Voice works, but I prefer a mutant version of Grover from Sesame Street. Open your eyes wide and stare into the distance (altered states are attracted with the eyes.) Eliminate the word "I," if you really must. Scare loved ones. **"THIS ONE IS SORRY, MRS. BEATY, BUT THE WILLIAM FRAGMENT IS NOT CURRENTLY PRESENT. FULL**

CONTROL OF VOCAL CHORDS IS ATTAINED, BUT OTHER MAJOR MUSCLES ARE NOT ON LINE." (jerk arms spastically for effect.) When they stop smiling and loudly insist that we cut it out, we're approaching the proper "Mask Wearer" state.

### **Dry your tongue!**

Get a clean cloth or paper towel. Stick out your tongue, then dry it thoroughly with the cloth. Keep sticking it out so it will air-dry a bit more. Now challenge your friends to feel your dry tongue surface. Weird and creepy. Grab the hands of an unsuspecting passersby, and force them up against your warm dry tongue.

### **Suck a paperclip up your nose!**

This one's from [Jim Burrows](#) Get a medium-small rubberband and a paperclip. Put the rubberband around your palm and the back of your hand. Thread the paperclip onto the band, then hold the paperclip between thumb and forefinger. If you let it go, the paperclip should instantly snap back, vanishing from sight. OK, now hold the paperclip again, draw attention to yourself. When everyone's watching, stick the paperclip partly up your nose, then snort violently while letting it go. The rubberband will make it vanish. [Alternately, put a second paperclip in your mouth beforehand. After you've vanished the first one, "cough up" and spit out the second one.]

### **BE THE GOD OF THE GNATS**

On NPR "Living on Earth", an entomologist mentioned that swarms of gnats will move towards anything that emits the low humming sound of female gnat wings. Apparently you can "suck" an entire cloud of (male?) gnats towards you by humming with low pitch... and they'll stop drifting the instant you stop the sound. Two people can "pull" the insect cloud back and forth between them. But... does this mean that gnat-clouds are always male? Really? Maybe instead your humming is screwing up the gnat navigation. If the gnat-cloud can remain on station while ignoring small breezes, they're doing something exotic, and perhaps the incoming sound waves at nearly their wing-beat frequency causes them to misjudge their horizontal speed, so the whole cloud moves towards the sound source. I wonder what various frequencies will do to the cloud. Maybe

you could play a very special tune to them, and cause the gnat-cloud to sculpt itself into shapes. Letters. Ads for Pepsi, etc.

## **TWO-LAYER COLA**

Diet drinks will float on full-sugar drinks, but only if you add a thick layer of crushed ice to disrupt the flow from the spigot. Do this: first add ice, then fill half way with normal NON-diet cola, then top it off with a different color of diet drink (such as Lite lemonade, or diet orange, or lemon-lime, etc.) It's like a "Black & Tan" beer! Then you can either drink the first layer and leave the second one, or dip your straw to different levels to drink one layer at a time (and people will see the two colors of beverage going up your clear straw. Strange!) If you use a clear plastic cup, then you can also make subsurface waves that slosh back and forth in slow motion like those blue "ocean wave" paperweight thingies.

## **PENNY CYCLOTRON ACCELERATOR**

I had a big potato-chip bowl. I had a penny. After some practice I could fling the penny along the inside surface so it would run around about seven times before hitting bottom. (If this is too difficult, then first practice with a marble or ball-bearing) Then I realized, OF COURSE! AH HAAAAAAA, YES! WE CAN CREATE \*INFINITE COIN VELOCITY\* by swirling the bowl along the table as the penny rolls. Pump the penny each time it passes. Yep, it works, and the sound-effects are notable, but the penny climbs to the top edge of the bowl then flies outwards in a random direction. Observe, Eegore, for if we wish to attain a coin velocity which approaches the Relativistic, we cannot use a snack bowl which is at all cone-shaped.

## **Dare to be Different**

Besides daring to sing loudly where others can hear, have you ever dared to "think out loud" in public? Perhaps even start a long conversation with yourself? Now finally it's possible without embarrassment: just get an old defunct cellphone and an earphone/mike. Sit in the park with the cellphone in your lap and say anything you want, right out loud. Nobody will care. (Just don't dare to try this WITHOUT an obvious cellphone and microphone-

headset!) Hmm. Even better. Just wear a mike-headset alone, but with the plug dangling loose in your lap. Passersby will assume that you have a cellphone. But perhaps one or two people will look more closely, realize that no cellphone is involved, then suddenly stop smiling. And back away from you carefully.

## SEATTLE GUERRILLA ART MEME

Kids tie their old sneakers together and then pitch them over a phone line. Harness their raw power, little one! Print out a sign you've designed, seal it with clear spray paint, glue it onto cardboard, and then find a rock or a large iron bolt and a length of twine. Tie the rock to the sign, and hurl them over a phone line above a street. How many years will it remain there, twirling in the breeze? (Um... be sure to make the sign large enough to read from a distance! Testing is required...) Print two different words, one on each side, so it flashes them alternately while it spins.

## POP YOUR EYEBALL WITH A FORK

At a restaurant with friends, give everyone the jitters by playing with a fork very close to your eyeball. Use the tines to pull your eyelid down, etc. Everyone is creeped out. Now take one of those tiny plastic cups of ultrapasturized creamer, cup it in your hand and hold it up to your eye without anyone noticing, use the fork to poke holes in the paper lid (looks like you're stabbing your eye,) then squeeze the cup and scream while dropping the fork! White gunk will squirt all over the table. *This one comes from [Penn & Teller's PLAY WITH YOUR FOOD](#), a book that readers of this website just GOTTA have! Twisted insightful tricks by vengeful nerd social outcasts.*

## BIG GIANT HEAD

Get two identical cola cans or yogurt cups or bottles of white-out. Place them in front of you on the desk, a couple of inches apart horizontally, then rotate them so they look identical. Then cross your eyes so you see three of them. Concentrate on the middle one, and tilt your head a bit so it isn't doubled (maybe rotate one object until the middle one looks perfect.) The middle object looks perfectly 3D... but it's tiny! Actually, the angles of your eyes make them

act farther apart than usual, as if your head was huge. OK, now carefully grasp the two objects and very slowly draw them apart while concentrating on the middle one. It will get smaller and smaller while staying exactly the same size. (Or your head will grow larger and larger.)

## **LOBSTER BOY!**

Cross your fingers, and curl your middle finger around your index finger. Now grab your ring finger and curl it over the back of your curled middle finger. Do the same with your pinky. Your hand looks damaged. **LOBSTER BOY!!** Now do the same with the other hand too. **LOBSTER BOY IS HERE TO TAKE AWAY THE BAD CHILDREN.**

## **GIANT CLOWN LIPS**

In front of a mirror, stick out your lower lip. Curl it way down using fingers. Now stick out your tongue at the same time and use it to push your lower lip down. Presto, **GIANT CLOWN LIPS!** Now make lobster-boy hands and cross one eye as well. Too bad the giant clown lips make gleeking impossible.

## **MISPLACE YOUR HEAD**

Stolen from Michael Jackson "Thriller" video. Stand facing away from friends. Bend your head down, chin resting on chest, and hunch your shoulders up a bit. Your friends will see your head **TOTALLY DISAPPEAR.** Stagger around while feeling the empty spot with hands. Make noises like a wet esophagus.

## **MONSTER STATIC DISCHARGES**

Another good one: buy some "snap-n-pops"; the little paper-wrapped sand balls that go "bang" when stepped on. Find a colleague who is working on live electronic equipment. Hold up a snapper and twiddle it in your fingers **HARD.** The little explosion sounds **EXACTLY** like an accidental short to 120V, or maybe like a capacitor discharge.

Now scuff on the rug, then twiddle a snapper while touching somebody on the elbow. The "bang" sounds like the worlds most painful electric spark. (Obviously this is for the benefit of onlookers, since your victim felt nothing.)

## COLA CAN BEATBOX

Crush two sides of a coke can inwards, but only near the top, then rotate it 90deg and crush two sides inwards near the bottom. Now push the top and bottom together (or stomp on it) and it very easily collapses into a small round puck. Now pull it partway apart again and you'll hear all sorts of snaps and poings. Push it in and out and the sequence of poings will play forwards and back like a recording. It's a mechanical beatbox sequencer, a toy marimba, a percussion accordion. Make mouthsounds to accompany the noises (such as whistling while humming, or sucking lips to make swarms of mosquitoes.)

## Living with an echo

Try speaking a simple sentence, but repeat each word twice. "Testing-testing one-one two-two three-three." It sounds a bit like a genuine echo. OK, now speak each individual syllable twice: "Tes-Tes Ting-Ting One-One Two-Two Three-Three." Say it a few times fast. That sounds very much like an echo. Finally, say it with the accent on the first of each syllables, with no pause between pairs but a slight pause between the different syllables. Speak with constant tone, not like conversation but like making a PA announcement at a ball game. Keep the timing between syllable-pairs always exactly the same. "TES(tes,) TING(ting,) ONE(one,) TWO(two,) THREE(three). It echos! Sounds disturbingly real!

SOUNDSsounds

DISdis

TURBturb

INGing

LYly

REALreal

Now practice until you can do it fast. Go find unattended microphones, and screw with the sound engineer's head. How to get rid of that echo? Try different hookups. Is it still there? YEP-yep. DAMN! UH-uh. TIC-tic. TUH-tuh. TES-tes.

### **Head without a body**

Walk smoothly. Walk REALLY smoothly. Try to walk so your body and head do not move up and down at all. Especially keep your head from bouncing slightly as you walk. Try to drift along like the princess descending the stairs; like the vampire's wives approaching the sleeping victim's bed. You'll start to feel like a floating TV camera, a disembodied viewpoint. Not really there. Or move fast along the hall, and you become a jet plane flying down the shafts of the gigantic Alien Construction. Put your face next to the side of the hall and race along, and the wall becomes the floor, racing below you at supersonic speed. Soar upwards to avoid the thermostat and the drinking fountain, and don't fall into the chasm or you'll end up in somebody's math class.

### **Nipple Cola**

I accidentally pulled the ring off a can of soft drink. Yet there was a tiny hole in the center. I started drinking. I could shake and invert the can, producing an intense squirtgun effect. Like drinking from a cow?! It's hard to make a small enough hole with the pull-tab, so instead use a needle, or use the awl on your swiss army knife. If the hole is tiny, the can will squirt like a squirtgun for a good long time after each shake. If the hole is too large, it drains quickly. In that case just turn it sideways and suck powerfully on the tiny hole, draining the can and causing it to collapse. When colleagues ask you what the hell you think you're doing, be sure and tell them what the technique is called.

### **Another [Feynman](#) trick**

Hold out your arms and point your index fingers at each other with fingertips touching. Now move your arms in a circle with fingertips together. Easy. Do the same but with fingertips at opposite points of the circle, as if you're rolling an invisible cylinder. Easier! OK, now keep circling one arm, but suddenly stop the other one. Harder, eh? And it makes you feel like a machine. Now start

circling both again, then suddenly stop the other one this time. Now for the hard part. Keep one arm circling, but **CIRCLE THE OTHER ONE BACKWARDS**. Your fingertips should pass each other twice per revolution. Hard? No, that's trivial. Trivial! The **REALLY** hard trick is to circle both arms in the same direction, but circle one of them **SLIGHTLY FASTER** than the other. Say for every seven turns of one arm, your other arm should turn around eight times so the phasing fingertips approach and pass each other every eight turns.

## **Unibrow**

In third grade I remember this kid on the playground who could only close both eyes. She hadn't yet learned to close just one. That's no big flaw, since most of us never learned how to raise and lower *just one eyebrow*. The Unibrow is a state of mind, not something on your face. Much sporadic practice in front of convenient mirrors can cure our sad ignorant state.

## **The Ultimate Challenge**

Say you've learned to cross your eyes. And maybe you've learned the above simple trick for crossing just one eye. And maybe you can quiver your eyes at high speed or change your pupil diameter. That's nothing. **NOTHING!** Your eye muscles are perfectly capable of moving your eyes to a huge variety of positions, and there is no physical connection between your two eyes. So go to a mirror and learn to move one eye up... *and the other eye down!* Or cross your eyes, then bring them out to converge on the distant horizon, then keep going and *really* uncross your eyes. Read a book with one eye while surfing the web with the other. (Is any of this even possible? It might require brain damage. Perhaps tread the path of free-eye viewing of stereopticon cards... then slowly move the two stereo photos to some very un-Viewmasterly positions..)

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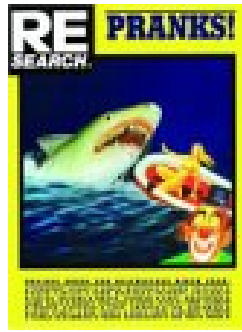
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The Big Book of [Pranks](#). \$19.99.

A great book. Interviews with world famous troublemakers.

A wakeup call for anyone who's not entirely dead. Inspiring!

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SUGGESTIONS ADDED BY OTHERS (Add [your own](#))

**A trick to see the Fibanocci pattern of your own retina (or brain?):**

**Sleep overnight in a very dark room (you may need to put a blanket over the window - most shades aren't good enough). In the morning while it's still dark in the room, turn on a bright light while your eyes are closed.**

**This works better if you turn on the light almost immediately upon awaking, and try to open your eyes as little as possible before you do so.**

**The (almost painful) brightness behind your eyelids will, for a fraction of a second, appear in a Fibanocci pattern just like a sunflower.**

**I assume this is the result of retinal light-sensors delivering "raw" information to the brain. Since the optical part of the brain is pretty calm (I use the analogy of a still pond where the ripples have all died down), it 'sees' the pattern of light just as the retina receives it. OR the brain itself forms this pattern after the light is delivered.**

Stefan <[amasci @\\_curl.n0t \(remove underscore, 0 is really an 'e'\)](mailto:amasci@curl.n0t(remove underscore, 0 is really an 'e'))>

SF, CA USA - Thursday, September 29, 2005 at 09:47:48 (PDT)

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**best in the morning when you wake up and really really need to wee, quickly grab a glass of water and when you sit down drink slowly and start to wee, stop drinking and flex your mussels to stop going too. start to drink and wee again.**

**-this is the most incredible feeling, like your body has no organs and is completely empty and you can pour water straight through it!**

kayla <[sQuishy.Benevolence@hotmail.com](mailto:sQuishy.Benevolence@hotmail.com)>

Australia - Saturday, September 24, 2005 at 04:39:52 (PDT)

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**This is a weird thing, but it works, if you have a good sense of rhythm.**

**The trick: How to knock down a metal lamppost with one hand in seconds? You can do it with a lamppost, but it can be dangerous, as they are rather heavy.**

**Push/thwack the lamppost so, that you see little movement at the top. Now, you must find the right rhythm to increase the amplitude of the effect. So, you must start with a fast wiggle, and every wiggle should amplify the resonance. When the amplitude increases, the frequency ascends. If you get it right, in a ten or so seconds you'll have the top swinging in an amplitude of meters! Just keep swinging the pole, and the metal will break! Be careful not get it falling on yourself (or anyone else for that matter).**

**The most important thing to accomplish this trick is to learn to find the right "frequency" first, and not to make a wave that would cancel the previous ones. The beginning is the hardest, but it gets a lot easier in the end!**

**This principle is based on harmonic oscillation, and the principle can be applied to just about anything, where resonance is found. For instance, try the trick with a basketball in a center of a pool. You can make a 6 foot tidal wave with harmonic waves, and get half of the water from the pool away!**

NamEniKin

Finland - Saturday, September 17, 2005 at 15:36:32 (PDT)

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**get drunk.that will be a pleaser**

maddie

memphis , tn USA - Wednesday, September 07, 2005 at 20:19:05 (PDT)

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**ok now get where there is a white wall and take out a picture  
or look at somthing that isn't the white wall.look at it for a good 15-20 secs  
w/out blinking.then look at the wall u should see the thing u were looking  
but in a different color**

maddie <[ilikedaboyzzz@yahoo.com](mailto:ilikedaboyzzz@yahoo.com)>

memphis, TN USA - Wednesday, September 07, 2005 at 20:16:07 (PDT)

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**Try this out first on yourself then on your friends!**

**Link your two little pinky fingers together and pull apart. Nothing right?**

**Now bite down, relatively hard, on these fingers nails for around 20-30  
seconds. Now link your pinky fingers together again and pull...**

**Try it on your friends...**

Mark <[markboo@yahoo.com](mailto:markboo@yahoo.com)>

Central Coast, NSW Australia - Wednesday, August 31, 2005 at 00:26:12 (PDT)

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**Haven't read the entire site so maybe this is in there. With a friend stand  
very close together facing each other. Your faces should be less than 2-4  
inches apart. On the count of three, scream into each others faces as loud as  
you possibly can. You'll hear some amazing noises which I suspect must be  
the audible interference patterns of the sound waves reinforcing and  
cancelling.**

Kevin

Canada - Monday, August 29, 2005 at 16:20:41 (PDT)

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**Most everyone knows how to make music with their mouths by clapping (if  
you don't, follow these instructions - cup your hands slightly and put them**

**together. A triangular hole should be formed above your thumbtips. Now clap the hands and you should feel air being forced through that hole at the moment of impact. Make a face like a monkey saying "OO!" and direct the blast of air into your mouth. After a while you should get a clear, hollow noise. Moving your tongue - like when you whistle - will give different notes. If you're still having trouble, ask your friends, one of them will probably know the trick)**

**So, now you can do that, here's a trickier thing - try opening your throat out, like you were yawning, but keeping your mouth in the "OO!" shape. You should get a much deeper and hollower note. That takes a little practice.**

**Once you get good at it, try using it for other things - like when you click with your tongue.**

**My absolute favourite use for this is to create a human flanger, as follows. Get a fairly decent mobile phone (or something else that generates noise - phones with polyphonic ringtones made of deep notes and high percussion work the best I've found). Open your mouth and point the speaker in then do the yawning throat jibby - you should hear the sound change noticeably. From there, it's just move your mouth and throat mechanics around any which way. Anything that makes the sound change is a good thing...**

**Joey Ford <[inc\\_b@hotmail.com](mailto:inc_b@hotmail.com)>**

**Brisbane, QLD Australia - Friday, August 26, 2005 at 22:08:59 (PDT)**

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**Try biting your own elbow. So someone once said to me some proverb saying something like "so close and yet you can't bite it." ... "Right..." I tried. Nope, not working. I pulled off my coat because I figured out it was preventing me from bending my hand close enough. Nope, my chin got in the way this time. I tried it from all possible angles for about 5 minutes until I finally managed to bite it. Then I said it to my classmates and they all started trying it. Teacher was pretty freaked out when she came into class...**

**By the way your foot is just as long as your forearm, try it.**

Vlad aka Bunny

Prague, Czech Republic (EU) - Wednesday, August 24, 2005 at 12:15:51 (PDT)

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**Contrary to popular belief, coffee will not make you sober up nor will it cure a hangover.**

**HOWEVER, coffee, or rather the caffeine in coffee, will effectively DOUBLE the strength and absorption of painkillers such as aspirin or ibuprofen.**

**So, for a surefire hangover destroyer, chase those pills with a strong cup (or pot) of coffee.**

**-JG**

John Gonzales <[Pipboy2077@yahoo.com](mailto:Pipboy2077@yahoo.com) 1>

Santa Fe, NM, You-Ess-Ay! - Monday, August 15, 2005 at 23:53:21 (PDT)

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**Old bartender's trick: to lessen foam in some drinks dab the outer part of your nose or your forehead with your finger and touch it to the foam. The grease will cause a chain reaction in the tiny bubbles, quickly popping the ones you touch and spreading out rapidly amongst the others.**

**This trick works especially well with carbonated soft drinks like coke, root beer sprite, dr pepper, pepsi and the like. It works with lager/ale (i.e. standard beer) to a limited degree.**

**-JG**

John Gonzales <[Pipboy2077@yahoo.com](mailto:Pipboy2077@yahoo.com) 1>

Santa Fe, NM You-Ess-Ay! - Monday, August 15, 2005 at 23:44:29 (PDT)

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**dont go to the bathroom for a while, then when u have to piss realy bad, go, but while u piss relax, and after ur done, just stand there, and relax, even when ur done, just feel how good it feels to not hold it in, its like a half orgasim. haha**

Sal <[spotthedog](#)>

tampa, florida USA - Monday, August 15, 2005 at 08:51:02 (PDT)

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**yeah, another 9-volt batterie trick. This time, stick your tounge waaay out. Now put the battery in the very middle of your tounge, and your tounge will start to wiggle involuntarily.**

Caleb <[cofeelover@yahoo.com](mailto:cofeelover@yahoo.com) (yes, I luv cofee...)>

minneapolis, MN USA - Saturday, August 06, 2005 at 11:10:21 (PDT)

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**Here's one probably everyone knows:**

**Spit Yo-Yo:**

**Gather that thick gooey saliva in your mouth. Eating chocolate or other sweet helps. The thick stuff gathers around where your tonsils are, so you need to "suck" it to your mouth from there. By closing your mouth and pumping the saliva down and up, a significant amount of "the stuff" can be gathered quite fast. Looking down at your feet, carefully pump just a little bit of the spit down, and suck it in really fast, before it is separated. One can learn to "pump" the spit really low and long. I could pick up a popcorn from the floor, while standing! Talk about a lizard effect!!**

**And another one I discovered as a kid. Maby someone has as well.**

**FreakFace: You need 2 mirrors for this. 1 on the wall, and find a decently sized square or round mirror you can handle easily. About 2ft in diameter is good. Open your mouth and place the mirror as far as you can (not the corner though) in your mouth. When you tilt your head down (chin to chest) facing the wall mirror, see the image in the mirror you are holding. Now stare it, and make your brain belive that your head is like that.. Doing this too long makes the corners of your mouths hurt a little.. But the most important thing is to remember not to bite the mirror, as glass is not fun in the mouth.**

**This is pretty self-explanatory.**

## **Cell-Phone-Echo:**

**You need 2 cellphones. Call to the other, and answer. Put the other in to your left, and the other to your right ear, and speak,, it's hard! Still, normally we don't have this delay,, or do we??**

**I remembered one more, but as I was unable to reproduce the effect, so the trick will remain unpublished for now:)**

NameniKin

Finland - Tuesday, August 02, 2005 at 13:58:33 (PDT)

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**"Blue 'eyes' are an optical illusion of some kind that I see when I look at a small, dim light such as an LED in darkness. I presume it's my eyes trying to use whatever light they can get. One last oddity: I'll never forget the day I realized that a vague image I was used to seeing out of the corner of my eye was in fact my own eyeballs reflected on the inside of my glasses."**

**(From end notes in the book ['Finder' by Carla Speed McNeil](#))**

billb

USA - Monday, August 01, 2005 at 14:30:27 (PDT)

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**Look up! Especially inside of buildings, you may notice things you never noticed before; pipes, lights, ductwork and who knows what else. It seems not many people look up inside buildings, so hide a secret message on the ceiling where the few people who look up will notice it. Steeped or dar ceilings make things less noticeable so try to avoid putting your message on low ceilings where it will be immediatly noticed. Try making things out of paperclips, pen parts, rubber bands, and almost anything you can find in your immediate environment. You can make interesting mechanisms this way.**

Manion

TX USA - Tuesday, July 26, 2005 at 08:53:31 (PDT)

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**I was a teenage pyro. take a matchbook carefully tear off the striker pad and then peel the paper off the back of the striker then fold it lengthwise**



**like so ^. now find a hard nonflammable surface and burn it. this really stinks but it will leave a gooey residue. scoop up as much as you can on your fingertip. now walk up to your victim rub your fingers together and say in your best evil voice ( Do I have a deal for you ) watch their face as smoke starts drifting up from your fingers. one guy I did this too still avoids me after twenty years LOL**

Papa Wrath

Lancaster, OH USA - Wednesday, July 06, 2005 at 18:51:15 (PDT)

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**Shake up a half empty soda bottle then breath out of it. You will start coughing but if you keep inhaling you'll go all dissy and feel great. Best to do this sitting down and w/ a friend so they can wake you up when you passout afterwards!**

Public Static Void Main <[matteboy2001\[at\]yahoo\[dot\]com](mailto:matteboy2001@yahoo.com)>

Columbia, MO USA - Thursday, June 30, 2005 at 18:40:50 (PDT)

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**WHEN YOU ARE TALKING TO SOMEONE ASK THEM TO SAY "CRAZY", AND MAKE THEM SAY IT OR IF SOMEONE SAYS IT YOU SHOULD SAY THIS.**

**"CRAZY, I'LL TELL YOU CRAZY THEY PUT ME IN A WHITE PADDED ROOM BURIED ME UNDER A TREE THE ROOTS TICKLED MY NOSE IT DROVE ME CRAZY." THEN SAY "CRAZY, I'LL TELL YOU CRAZY..." AND KEEP REPEATING. BUT SAY IT AND YOU WILL LAUGH THE FIRST TIME YOU TRY SAYING IT. BUT GET OVER LAUGHING BEFORE EVER TRYING TO SAY IT TO SOMEONE. IT WILL ANNOY THEM AND WHEN THEY TELL YOU TO STOP, STOP.**

TENOR <[SETH\\_HIKARU@YAHOO.COM](mailto:SETH_HIKARU@YAHOO.COM)>

SOMEWHERE IN, ND USA - Wednesday, June 22, 2005 at 15:06:45 (PDT)

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**WHEN YOU ARE TALKING TO SOMEONE ASK THEM TO SAY "CRAZY", AND MAKE THEM SAY IT OR IF SOMEONE SAYS IT YOU SHOULD SAY THIS.**

**"CRAZY, I'LL TELL YOU CRAZY THEY PUT ME IN A WHITE**

**PADDED ROOM BURIED ME UNDER A TREE THE ROOTS TICKLED MY NOSE IT DROVE ME CRAZY." THEN SAY "CRAZY, I'LL TELL YOU CRAZY..." AND KEEP REPEATING. BUT SAY IT AND YOU WILL LAUGH THE FIRST TIME YOU TRY SAYING IT. BUT GET OVER LAUGHING BEFORE EVER TRYING TO SAY IT TO SOMEONE. IT WILL ANNOY THEM AND WHEN THEY TELL YOU TO STOP, STOP.**

TENOR <[SETH\\_HIKARU@YAHOO.COM](mailto:SETH_HIKARU@YAHOO.COM)>

SOMEWHERE IN, ND USA - Wednesday, June 22, 2005 at 15:05:29 (PDT)

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**Lick your top teeth for a moment.Now,put your index fingernail under the gum between you're two front teeth.It should tickle rather than hurt.**

Lyna <[rockoutloud21@yahoo.com](mailto:rockoutloud21@yahoo.com)>

New York, NY USA - Tuesday, June 21, 2005 at 15:31:05 (PDT)

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**Trick 1--Close your eyes not too tight or not too loose,close them like you are about to fall asleep (but don't sleep!) or this will not work.Then lightly put your fingers on your top eyelid while your eyes are still closed.Then let your finger on it get heavier and heavier while holding it there for about 10 to 15 seconds.Now let go.You should see blue before opening your eyes a little,then the image appears distorted.Look quickly though!DO IT WITH BOTH EYES OR IT WILL NOT WORK.**

**Trick 2--Pretend you're throat is "closed".You know,the feeling you get before you swallow food.Now,put water in your mouth and start gargling while you're throat still feels "closed."Sounds like someone is drowning or something.Scary,huh?**

**Trick 3--Lay down stomach-up on a bed,with your legs up,making a triangle from knees to waist.Start wiggling your toes at that position.Then at the same position,wiggle you're fingers while the toes,and now--QUICK!!-look back at you're toes.You're fingers almost stopped wiggling.Now do the same thing but look at you're fingers.Sam with the toes.**

**Trick 4--While at the same position at Trick 3,wiggle just your toes then quickly drop your legs at the same position but keep wiggling them.For a second there-doesn't quite wiggle the same,now,does it?Helps if you did trick 3 for a while.**

Sammy the CHICKSTER <[imnottellingyou dude@irock.com](mailto:imnottellingyou dude@irock.com)>

New York, NY USA - Tuesday, June 21, 2005 at 15:23:08 (PDT)

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**VODKA drink some vodka have some beers... did you guys try that 9 volt battery trick lick it its like a tung orgasm... take naked photos of yourself and sell them online and email them to me females only... carefully make a slit along the seem of some m&ms and drain the bag of the candy then refill it with something else like cat litter or something then reseal it with like rubber cement give away its good if your eating a bag and have the other to offer to your good friend... dont kill bugs and soon they wont bug you... call your work and pretend your the other guy you hate and tell the boss that you quit and call him names and hang up then when you go to work the next day you'll have something to laff aboot... eat more fruits and vegetables it'll make you better at pleasing your partner in the bedroom stay away from crack and tweek... support your local brewery... it must suck to be chinese because you couldnt call it chinese food it would just be food... buy your mother flowers for no reason... change all the clocks in your friends house and hour back... go to the shooting range with some friends and load your friend clip with blanks and ask him why he cant hit the target... when teaching a dog to sit and shake use a made up language that only you know the commands too... leave obscene messages on your parents answering machine... glue fake dog poop on a phone booth and watch people... get the ice cream man song and play it loud on your stereo or if you have p.a. and drive around with it on... put up garage sale signs to someones house you know and watch everyone drive by... put rainbow stickers on peoples cars... take a nap in the isle at the grocier store while holding a box of cereal... cover your friends toilet seat (the part where males pee) with syran wrap and when they pee it bounces off onto them... put baby formula in their milk carton... get rid of those stupid altezza lights and air plane wings and those stickers that give your car extra 100hp...**

switch the "M" and "N" key on their keyboard... make a ruler from wood but make the inch marks slightly off like 7/8ths instead of inch. and replace it with somones... if they have a number 3 on their license plate change it to 8 with paint then report the car stolen... put a sardeen in their couch cushions it will start to stink... tear off the numbers of the month on the calender but leave the name so the days are off the people with freak out... well its late or early 4am and im out of ideas for now so have fun with those and stay safe dont be the one that ruins it for everyone else (i.e. government) and have good one peace out...

Ron Burgandy <[ihatehotmail@yahoo.com](mailto:ihatehotmail@yahoo.com)>

SD Baby, CA USA - Sunday, June 19, 2005 at 02:22:38 (PDT)

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"MAGNETIZE ROCKS" takes two people one person holds 2 rocks (about the size of a 9v battery) one in each hand and presses them firmly to each other then the second person takes another rock of equal size and passes it from hand to hand orbiting the other two rocks usually about 50 times and then stop and the person holding the rocks "gently" and "slowly" pulls them apart it feels as if the rocks have been magnetized for a brief couple seconds... light a lighter and fart on the flame... sit in a changing room and yell out "There's no toilet paper in here!" ... eat mushrooms that usually does the trick... stare at a white wall for along time and try not to look around soon you'll see soap bubble colored balls of light leave your forehead well atleast for me during meditation... fill sobe bottle up with gasoline and screw on the cap but put a lil pinhole in the center of the lid and place the bottle in a bond fire stand back the gas boils then explodes like 50 feet in the air not safe we only do in the desert... take old school super soaker fill tank with gas and take a stick lighter and light it and put it near the barrel and fire nice size flame thrower yes i a am redneck... at a friends house that has flash on their phone dial a sex hotline then hit flash then dial their phone number then hang up immediatly the phone rings and its the sex hotline great at partys hide in another room when dialing... take the igniter out of an electric style lighter not bic it'll be about 2in. long white and black and you can squeeze it and get a good shock from it.. 2liter bottle fill with dry ice and water reseal cap and throw pretty dangerous can

**hurt you if goes of in your hand... just an idea dont try but if you had a cat put in a swivle style computer chair and spin the cat around an round for about ten times the cat trys to walk but is real dizzy then try it to your self jk dont be cruel to animals... well i guess thats all i can give you for now be crazy not stupid tip your watress and keep passin that sh\*t!!!**

Frank Rizzo <[itmustbe@yahoo.com](mailto:itmustbe@yahoo.com)>

san diego, ca USA - Sunday, June 19, 2005 at 01:35:56 (PDT)

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**In addition to talking to yourself with a broken headset you can say, to people who look at you funny when they see theres no phone, "excuse me but i am on a very important business call at the moment. i am trying to get nasa to accept my time machine. so please move along." or " WHAT ARE YOU LOOKING AT FREAK!!!!!!!!!!!!!!!"**

Donahoo

UT USA - Friday, June 17, 2005 at 13:46:23 (PDT)

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**Ok spit bubbles. This takes some practice but is worth it when you see the amazed/disgusted looks on the faces of passers-by.**

**First of all you need the right kind of spit. If it's too watery or sticky it won't work. Your saliva changes consistency when you eat different types of food or drink so try experimenting. I find drinking hot tea or coffe with milk helps.**

**Gather some saliva at the front of your mouth. Next move your tongue through the saliva and then position it against the inside of your mouth under your bottom lip. Your mouth should be closed and tongue relaxed. Your tongue should be touching the sides of your mouth on all sides so a kind of seal is formed.**

**Now gently pull your tongue back from your mouth. If you've done it right you should feel a film of saliva stretching between the tongue and your mouth. You need to get this step right first so keep practising until you get a film.**

**Once you have a film you can open your mouth and gently move your tongue down and forward. Moving the tongue down has the effect of pushing the air under your tongue upwards, through the film forming a bubble. Moving your tongue forward will seal the bubble.**

**Eventually you will get to the point where you have a small bubble perched on the tip of your tongue.**

**The next part is the easiest. Poke your tongue out of your mouth and gently blow the bubble from your tongue, not too hard or it will burst.**

**Once you have mastered this, try blowing the bubble straight up and then catching it in your mouth. See how many times you can catch the same bubble!**

Richard

Blackpool, UK - Thursday, June 16, 2005 at 07:07:02 (PDT)

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**Further to the "Head without a body" idea, when you are flying down the shafts of the gigantic Alien Construction, keep your arms down at your sides but lift them slightly away from your body at 30-45 degree angle. Curl your fingers and touch them with your thumb so each hand makes a circle. Hey presto! Your own pair of 'wings' with attached 'jet engines' on the end. To add to the effect make a soft roaring or whooshing noise with your mouth.**

**Also when you are walking outside, imagine that your are not moving at all, but that the Earth is revolving underneath you. You will find you can make the Earth move in different directions by altering the way you are facing. You can also make faraway objects come nearer to you by revolving the Earth until they reach you.**

**If you are walking along next to a low fence or wall, pretend you have a little friend by walking your fingers along the top of the wall. You can make your friend perform amazing stunts by leaping from one wall to the**

**next.**

**On a bright sunny day look at a part of the sky where there are no clouds. Relax your eyes and you will start to see little white objects zipping around very fast. They look similar to smoke particles in a Brownian Motion experiment if you ever did that at school. These are white blood cells moving through the vessels in your eyes though I like to pretend they are UFOs engaged in a space battle. These aren't the same as the dark objects you sometimes see. They are called vitreous floaters and are the shadows of dead cells floating in the fluid in your eyeball.**

Richard

Blackpool, UK - Thursday, June 16, 2005 at 06:28:30 (PDT)

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**Kitchen Vortex- If you have a garbage-disposal in your sink, turn the water on about half-way and have a bottle of liquid dish-soap (classic, not the dishwasher type)ready. Turn on the garbage disposal and decrease the water stream until it is a thin stream. Aim the soap bottle at the hole and give it a full squeeze and turn off the water right after.**

**Ok, nothing should be happening yet, as the Vortex is only primed and ready. To open the vortex, slowly allow more water into the drain, just a little at a time. The effects of each dose of water will come a few seconds delayed. What to look for: listen for a growling sound and notice as a white whirlpool slowly constricts inside the opening. You can feed your vortex a mixture of more water and soap, to get it to full maturity. A mature vortex fills the cavity, with a shaft in its center, about the size of a roll of dimes. A fully grown vortex will have a much deeper voice than the smaller ones, and it will try to form words like "mama" or "Moam-g-g-g-AmoowOOowowaaAAAHH"**

**You will find yourself shaking-off moments where you realize you are staring at it in wonder.**

**-Tungston**

Tungston

Seattle, WA USA - Thursday, June 16, 2005 at 04:46:26 (PDT)

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**If you live with a baby, and have walkie talkies, try this. Take the baby monitor and turn both sides on (the base and the handset) Then turn the walkie talkies on, and talk through them. The baby monitor will spit out what you are saying, no matter how quiet you say it. Wierd, I wonder why. (I discovered this when my brother was spying on me with his friend, and they were using walkie talkies, and I happened to turn on the baby monitor, thus hearing every word they said and ruining their game)**

E <[none](#)>

USA - Sunday, June 12, 2005 at 10:05:32 (PDT)

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**ok this is from my err .. phycedlic days ..**

**get a frying pan , a good sized one about 12 inches or so ..**

**put 1 inch of milk into it**

**grab a pack of food coloring , you know the pack that has 1 blue 1 red 1 yello and 1 green.**

**randome place a drop of each color in the milk .. like 5 drops of blue ( 5 differnt places ) 5 of green , etc .. dont let any of the drops touch each other.**

**grab some liquid dish washing soap .. put 3 or 4 drops of the liquid in the pan ...**

**the surface tension of the milk gets moved around by the soap cauzing the food coloring to mix around .. this looks like a living moving tie-dye .. lasts a good 30 mins ( then it just look a dull brown ) anyone on any sort of mind altering substance ( or just those with naturaly weird minds ) will get lost in it.**

lucindrea <[lucy-spam-@lucindrea.com](mailto:lucy-spam-@lucindrea.com)>

wanye, pa USA - Friday, June 10, 2005 at 07:38:12 (PDT)

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**take the foil wrapper of a big red, lick it, then stick it on your forehead. it**



**burns, we have contests at my school to see who can hold it longest**  
me <.>

1, t USA - Monday, June 06, 2005 at 20:26:12 (PDT)

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**smoke weed, that'll be interesting**

ben xavier

USA - Sunday, June 05, 2005 at 22:19:24 (PDT)

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**Can you turn your eyelids inside out? I bet you can't, but some people who can don't even know they can.**

**Turning your eyelids inside out does not hurt at all. In fact, it feels kind of good, like if your arm was in a cast for a long time and it finally got taken off. Beware, though, because while your eyelid is inside-out, you will be able to blink, but air will still get through the corners, meaning you can only keep your eyelids that way for as long as you can go without blinking. I am an expert at turning my eyelids inside out, as you can see at my website. There are a few methods for turning one's eyelids inside out. You can use whichever one works best for you, because different people's eyelids react different ways to these. Be warned, though - if you are unfortunate and like 99.7% of the population, you won't be able to do any of these.**

### **1. The obvious way**

**Place your thumb beneath your eyelashes and your forefinger above them, with the tip resting on your eyelid. It's usually easiest if you use your right hand for your right eye, and your left hand for your left eye. Rotate your hand upwards, so that your forefinger is pointing downwards, until your hand is obstructed by your head. You now need to get your forefinger out from under your flipped eyelid. While keeping your thumb where it is, slide your forefinger gently out of the pocket you made. Press your entire thumb on the inside-out eyelid. At this point, you may be done. Lift your hand off the eyelid. If it stays, good job. If it doesn't, do everything over again, but this time, before taking your thumb off, carefully place your**

**forefinger back on the eyelid. Now that your thumb and forefinger are both on top, slowly slide them apart while gently pushing until they are both off of the eyelid. This gives it increased stability. After time, your eyelids will become looser, and this step will be unnecessary.**

## **2. The temple method**

**Only a very few people are able to turn their eyelids inside-out using this method. Even if you are one of the select few, you will have to practice a few times the first way to loosen up your eyelids before this will work. Here's what you do: Place your middle and forefinger on the temple corresponding to the eyelid you want to flip. This part will probably take practice: Close your eye with force at the same time you pull your hand away from your eye, while applying pressure. Now, keep your face and hand in that same position, and use your other hand to hold the eyelid in the flipped position. Now repeat the optional last step of #1, and you'll be done. Again, after time these last two steps will be unnecessary.**

## **3. The blinking method.**

**Personally, I cannot use this method, although it seems to be the most popular way to do this. As far as I can tell, this is the same as #1, but instead of rolling your hand upwards, you simply pull the eyelid out gently and blink with force. Then you can use the same steps to finish it.**

## **Have fun!**

fhqwghads <[jic2000@\[domainname\].com](mailto:jic2000@[domainname].com) (change [domainname] to aol)>  
Gaithersburg, MD USA - Saturday, June 04, 2005 at 14:38:50 (PDT)

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## **Hot Pens**

**Take a pen and rub the tip of it against a surface (like a school desk or table) with the side of the tip so you won't write on the surface. If you do this the tip will get hot. If you do it for about five minutes the tip gets hot enough to char (or burn!) paper. Be careful.**

manion <[cam626@verizon.net](mailto:cam626@verizon.net)656345436432>

USA - Thursday, June 02, 2005 at 20:41:15 (PDT)

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## **Freaky Lift...**

**You need a few people to do this but it is really amazing when it works!**

**Get together 5 people. Get one to sit in a chair, the other four make their hands into guns like shapes, boths middle fingers and index fingers together, thumbs crossed little and ring fingers interlocked. One person puts their hand under the sitting persons left knee, another puts their hand under the right knee, the next the right armpit the last the left armpit. Try to lift the sitting person...unless this person does not weigh much or you have 4 incredibly strong people you won't be able to lift them. THEN the four people place thier hands on the sitting persons head, pressing down lightly. Then they return to their places, left knee, right armpit etc, and try to life the sitting person again..this time you'll lift them right up!**

**(i can honestly say this works... i am 13 and me and threeof my friends lifted my dad, a 6'2" guy above our heads!..i have no idea how this works! perhaps if you know you could tell me?)**

Lea Forester <[leaforesterstar@yahoo.co.uk](mailto:leaforesterstar@yahoo.co.uk)>

Teddington- near london, UK - Thursday, June 02, 2005 at 06:38:01 (PDT)

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**When your in a car, lie down so you can ONLY see the sky. Then relax and listen to the sound of the engine of the car and imagine you're in an aeroplane, or flying in some way, its really cool!**

**i had another one but i forgot what it is.**

**heres a good one though. flick the side of your cheek while pushing the air out of your mouth, not breathing. it should make a "ploink" sound!**

Steve <[AAAH](#)>

Aberdeen, Scotland Scotland - Thursday, June 02, 2005 at 04:15:43 (PDT)

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**Ok, this is good when staying with ya friends.**

**What you do, you wake up when everyones asleep and quietly fil a bowl( the bigger, the better) with warm water(not to hot or theyll wake up) and place their hand in it**

**In a few minutes theyll piss their pants!!!!!!**

Anonomous

Sydney, NSW USA - Thursday, June 02, 2005 at 03:31:47 (PDT)

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**One I've always done-**

**Look at something, preferably a tree outside on a clear day. Well, I say "look" rather loosely, because you kinda have to look through your whole image you see. After a minute or two, the image starts to all go white, and almost rotates. It looks alot cooler than I can decscribe. If you dare move an eye, though, the illusion is lost.**

**This also works in a dim-lit room, only the illusion is much quicker in a reverse effect; everything goes dark.**

Lucas

G'ville, AL USA - Wednesday, June 01, 2005 at 23:08:48 (PDT)

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**Here's one you smokers can try right this very minute - Perfect smoke rings! Take a hard pack of cigarettes that still has the cellophane on the bottom. Light a cig and smoke it. Carefully pull down the cellophane wrapper so it is three quarters of the way off the box. Using the lit cigarette, poke a hole in the larger side of the cellophane, (it will melt away a circle). Then take a drag and blow the smoke into the hole you just made, filling the cellophane "chamber". Now, flick the bottom of the cellophane with your finger. Little smoke rings will pop up. As with smoke rings made orally, you'll get a better ring if you don't inhale the smoke before blowing it into the chamber.**

Kate

Philly, PA USA - Sunday, May 29, 2005 at 20:27:21 (PDT)

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**Ok I know its 2005 and no one has been here in forever but, ssqueez the skin on your chin really hard in your hand. squeeze it really hard for about 10-20 seconds and let go. Now, as soon as you let go use your finger to Flick your chin where you were just squeezing. Flick it REALLY hard about 3 - 5 times. It should leave a really big red, ugly and very noticable broose for about 5 days. It's very annoying and you can trick people easily.**

fart screwer <[fsg](#)>

asafa, afg USA - Thursday, May 19, 2005 at 16:03:45 (PDT)

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**Pick up a large ceramic or glass vase and hum into its neck, making a siren noise from low to high pitch. Usually one pitch will be louder than all of the others. Hum this exact pitch into the vase and stop quickly; you can hear the vase resonating at its fundamental frequency. The closer your pitch is to the vase's fundamental, the louder the vase resonates. There are similar tricks you can do with guitars and pianos: just play one note very loudly and, if the string an octave above it is free, it will start vibrating by sympathetic vibration.**

**Using a spoon, tap a coffee mug at 3 o'clock from its handle. Now tap it at 6 o'clock and 9 o'clock- it makes the same pitch. However, if you tap the mug at 1:30, 4:30, 7:30 or 10:30 from its handle, the mug makes a different, slightly higher pitch. This is because when you tap the mug, the mug vibrates at antinodes 90 and 180 degrees from wherever you hit it. Directly between the antinodes are the nodes, where the mug doesn't vibrate. When you hit the mug at 3,6 or 9, the handle of the mug is on an antinode and has to vibrate, which increases the mass of the resonator and decreases its frequency. When you tap the mug at 1:30, 4:30, 7:30 or 10:30, the handle is on a node doesn't vibrate, so the mug makes a higher pitch.**

Jimmy <[withheld](#)>

Moraga, CA USA - Wednesday, May 18, 2005 at 22:50:55 (PDT)

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**i have recently learnt to gleak but i cant do it very far, could someone please help?**

**If you have a trampoline (or access to one) bounce for a while then as soon as you get off try to jump. you can jump as high as you normally can it just doesnt feel like it. its weird.**

**lucas**

lucas <[heidi.radford@tesco.net](mailto:heidi.radford@tesco.net)>

Honiton, devon uk - Monday, May 16, 2005 at 11:05:22 (PDT)

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**after reading some of the "Do This Now" page, i came across your Neptune's hammer. This is very similar to a party trick i picked up recently, where you take someone's empty bottle of booze, refill it with water, and bash like a maniac. i can only seem to get it to work after two hits, never on the first try.**

tom <[t0m3e\\_\(at\)H0TMA1L.COM](mailto:t0m3e_(at)H0TMA1L.COM)>

sydney, australia - Sunday, May 15, 2005 at 01:17:14 (PDT)

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**There is a book, Phantoms In The Brain by V. Ramachandran that is fascinating. One thing that is great about Ramachandran is that he creates experiments without any expensive lab. equipment, so you can try them out yourself.**

**Convince yourself that a table is actually part of your body, what fun!**

[AinSophist](#)

san diego, ca USA - Thursday, May 05, 2005 at 21:12:24 (PDT)

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**Take a strobe light into a dark room where you have a fan. Ground fans work better than ceiling fans. Set the strobe light facing towards the fan and turn the fan on. The fan will appear to be slowly moving in a circle and will even change directions of travel. This works with spinner belt buckles, and spinner watches, get it spinning fast and it will appear to rock back and forth sometimes. May help to be high when you do this too.**

[T.J. <mr\\_tjalicious@hotmail.com!!!!!!!>](mailto:mr_tjalicious@hotmail.com)

K-town, AZ USA - Tuesday, May 03, 2005 at 12:53:30 (PDT)

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**i would like to know more information on how to make ur tounge make that loud sound**

[Jay <Jason18967@aol.com>](mailto:Jay<Jason18967@aol.com>)

Agawam, Ma USA - Thursday, April 28, 2005 at 11:49:39 (PDT)

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**Just a simple physical trick; this works best with a small, weaker person and a big larger person. Have the smaller person put their hand on their head. Have the larger person try to pull the hand off. The larger person will be able to whip the little person around, but never pull of the hand.**

[Antonio <antonio@sarkis-webdesign.com>](mailto:Antonio<antonio@sarkis-webdesign.com>)

USA - Monday, April 25, 2005 at 00:41:18 (PDT)

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**take a medium sized mirror and place it under your chin so it is parallel with your view. make sure your house is clean. and start walking around while looking down. it will seem like you are walking on the ceiling. just make sure you don't trip on anything on the floor.**

[lana](#)

Africa - Sunday, April 24, 2005 at 13:53:30 (PDT)

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**make the sound from the grugde by :having you mouth open but dont breathe, then talk and very slowly let air out your stomach.**

Remi

USA - Saturday, March 19, 2005 at 09:26:07 (PST)

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**this site has cool stuff try the "ghost bottle" and the "mirror under your chin" one they are best**

bolby

USA - Wednesday, March 16, 2005 at 12:32:13 (PST)

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**Right I saw this done quite a few times way back and it was always fun make a hot air balloon from a large bin bag by attaching a wire frame to the bottom with tape and at the center of this frame a few inches below the opening of the bin bag create a fuel holder. I have seen this done with a small tin can wired in place.**

**Right go outside at night, somewhere remote and light a small fire. Now inflate the balloon from the heat riseing from the fire ( hold tightly as the**

lift is something to be believed) Now before you let go place a couple of fire lighters (alight) in the can at the bottom and let go.

At this stage it will rise at about 10feet a second most impressive. This is if you have the right sort of volume to your bin bag. Now go home and watch the local tv for ufo reports. Once you become good at this you can look for larger bags or as we did make them from tissue paper (multi coloured looks awsome).

Phil <[xxxxdormousebookshopxxx@xxbtconnect.comxx](mailto:xxxxdormousebookshopxxx@xxbtconnect.comxx)>

norwich, uk - Saturday, March 12, 2005 at 08:16:04 (PST)

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**K, Heres a couple :-D**

**1. Put your each of your hands into a fist position and put them side by side. Let a friend pat them lightly whilst you push your balled up fist together (trying to make them merge) Do this for a good 4 minutes or so. Then slowly move your balled up fist away from each other around 4 or 5 inches. Your fist should try resume the former position they were in! Simple, yet ODD! Like me! Rofl x]**

**2. Fool people into thinking your levetating!! Omgz0rz! Turn to a side angle where your friends can only see the right side of you. then lift your right foot up of the ground whilst tilting your left foot to the left! this creates a optical illusion type thing. Tis best if you do it in a sightly dim or dark area!**

**3. Have fun Snewblets! :-D**

PwNz0rZ <[ImNotTellingMyE-](mailto:ImNotTellingMyE-MailBecauseMyMomSaysIllGetRapedIfIDo@yahoo.com)

[MailBecauseMyMomSaysIllGetRapedIfIDo@yahoo.com](mailto:ImNotTellingMyE-MailBecauseMyMomSaysIllGetRapedIfIDo@yahoo.com)>

Derry Derry South, ATL USA - Saturday, March 05, 2005 at 17:10:52 (PST)

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**ok i know like nobody will know how but will somebody PLEASE PLEASE PLEASE teach me how to blow bubbles with your own spit? PLEASE! its gotta be kinda detailed but easy to follow, THANK YOU! EMAIL ME IF**



## **YOU KNOW HOW**

tricktickler ian wicked <[ianbadeanbaboanbabean@hotmail.com](mailto:ianbadeanbaboanbabean@hotmail.com)>

here, somewhere uuuuusa! - Wednesday, March 02, 2005 at 15:05:48 (PST)

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**If you take a disposable and hold down the flash and hit youe hand the flash will go of but it won't use film.**

Paul McCartney

USA - Tuesday, February 15, 2005 at 15:15:06 (PST)

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**Old school display boards which have huge pixels on them - like the ones in airports or movie theater lobbies. Its great if you can find the resonance which they seem to wobble at while humming. Try to keep your pitch as deep as possible and hum from your chest or stomach - not from your throat.**

**Even stereo displays sometimes work. I discovered this with 5 friends at a cinema. 6 people lined up, staring into space, humming and occasionally bursting into hysterics. Got some crazy looks.**

Bumcivilian

uk - Tuesday, February 15, 2005 at 03:24:29 (PST)

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## **THE VANISHING PIECE OF FOOD:**

**Extend your hand flat with your palm facing down and your index and middle fingers together. Place a small piece of food--M&Ms or a kernel of popcorn works great--on the crack where your two fingers meet towards the end. Now smack the base of your fingers with the other hand. Even though you can't see it, your fingers act like a springboard and launch the food into your mouth. Open and close your mouth very quickly while you do this, and it will look like the food just disappeared. Warning: don't try this with peanut M&Ms or something large, unless you want to chip a tooth or choke to death.**

## **WATCH YOUR SOFT PALATE MOVE:**

**Open your mouth wide in front of a mirror. Inhale deeply, and watch your**

**soft palate move upwards. Where does it go?**

### **CONFUSING PHONE NUMBER:**

**When telling someone your phone number, break the digits up into a group of 4 and then a group of 3. For example, instead of 5-5-5 \*pause\* 1-2-3-4, say 5-5-5-1 \*pause\* 2-3-4. It messes with people's heads. Also works with social security numbers.**

### **LIGHTER PYROTECHNICS:**

**Turn the flint grinder thing on a lighter slowly (so as not to ignite the flint dust created) several times. Turn the lighter over and tap it over a piece of paper to collect the dust. Now light the lighter and pour the dust about five inches above the flame. The dust will light up like a sparkler several inches above the flame. Also, if you're a smoker, wet one side of a cigarette slightly, sprinkle the dust on it, and let it dry. Every time you take a drag off of it, it will sparkle. Give one of these cigarettes to an unsuspecting victim and enjoy the show.**

### **LOOK OVER THERE. OVER THERE!**

**Tell someone to "look over there" without pointing or indicating a direction in any way. They'll look around and then ask "where?" Look in a different direction and say, "over there." Repeat.**

Aaron

OH USA - Monday, February 14, 2005 at 15:17:13 (PST)

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**i tried lighting a lighter and leaving it on the ground to blow up. theres this cloud of fire that appears once it blows up.**

denis malyshev <[bioniglobe@yahoo.com132](mailto:bioniglobe@yahoo.com132)>

brooklyn, ny USA - Sunday, February 13, 2005 at 08:34:41 (PST)

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### **( Psychic Pressure )**

**meditate for a few minutes, imagining that there is 'energy' that can flow thru your body. start at your feet and imagine 'energy' swirling around**

**your feet and up around your legs and body and then down both arms at the same time. now imagine the 'energy' building/swirling up at your hands. and bring your palms close to each other, but don't let them touch. leave them a few inches from each other, and slowly bring them closer. (but don't touch) bring them apart and slowly together again, repeatedly, slowly, barely moving them.**

**You should feel pressure from between your hands! like a 'force-ball' or bar-shaped, like a magnet.**

The Architect

USA - Monday, February 07, 2005 at 21:17:04 (PST)

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**Here's one to try that is a little different.**

**Everyone has an inner monolog. Try changing your inner monolog's "voice." So when you're thinking, you don't hear yourself, you hear instead, say, Sean Connery or Bill Clinton or someone.**

**Keep doing it for 10 minutes or more. It really messes with your mind. I find it raises the hackles on the back of my neck when I use a female voice (being male myself.)**

**At any rate, unless you want people looking at you strangely when you burst out laughing for no reason, try it by yourself first :)**

Sam

USA - Monday, February 07, 2005 at 12:28:23 (PST)

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**Stand in the middle of a doorway and let your arms hang loose at your side. Slowly raise your arms straight out until the backs of your hands are touching sides of the door frame. Continue to press hard against the frame and count to 50. Now step away from the door and totally relax your arms again. They will "levitate" without you even trying.**

brian lottis <[bjlottis@yahoo.com](mailto:bjlottis@yahoo.com)MM>

Portland, OR USA - Thursday, February 03, 2005 at 15:58:22 (PST)

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**Sit in front of a computer monitor and hum loudly at a low frequency. Watch the monitor. At certain frequencies, the image will start to wobble up and down, because your retina is vibrating in sync with the monitor.**

Kent Lottis <[kentlottis@mindspring.com](mailto:kentlottis@mindspring.com)>

Bellevue, WA USA - Thursday, February 03, 2005 at 15:36:34 (PST)

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**The amazing ghost bottle**

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**ok Freeze about half a bottle of water. Then when it's frozen take it out and sit a small thin light coin on top of the lid, to block the top. The coin will move. AMAZING**

Mat Hobson

USA - Sunday, January 30, 2005 at 07:09:05 (PST)

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**i need help!!! ok i learned how to wink than ross my eyes than cross one eye now i wont to no how to make one eye look up and the other down and/or make my left eye look left and my right eye to look right (at the same time) [I haven't spent much time trying to do this one. It might be impossible (it might require brain damage!) -billb] please help me thankz tons e-mail me how**

ray <[supersniper707@yahoo.com](mailto:supersniper707@yahoo.com)>

gilbert, az USA - Sunday, January 23, 2005 at 23:21:03 (PST)

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**do stuff that is fun now go home**

genral <[ddhbucbeucec@wdkjbwebj.com](mailto:ddhbucbeucec@wdkjbwebj.com)>

washington, oclahoma USA - Monday, January 17, 2005 at 12:21:57 (PST)

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**Okay, here's an awesome microwave trick that I really like. First, get a toothpick or a match; second, put the toothpick or match in something that will hold it erect (like a robitusen cup with a hole punched in the bottom). Next, put the cup with toothpick, or match, intact into the microwave. Now light it, and turn the microwave on! Do this for only a few seconds, any**

**more and your microwave may either melt or break. Fireballs pop out the burning toothpick(the toothpick doesn't have to be on fire, just a decent cherry will work). Don't believe me? Try it for yourself**

casey <[csyjensen@yahoo.com7867](mailto:csyjensen@yahoo.com7867)>

Loveland, Co USA - Saturday, January 08, 2005 at 19:00:38 (PST)

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**I love this site. find an ordinary metal yard fence. look at it while allowing your vision to relax and go blurry. It will appear to be closer than it is, and you will feel that you can put your hand right through it.**

shatda <[shekem180@yahoo.com](mailto:shekem180@yahoo.com)>

Rochester, NY USA - Tuesday, December 28, 2004 at 10:22:52 (PST)

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**Okay, my friend taught me this... get a friend to hold out both your hands. Slap them. Ask them which hand hurt more. Have them turn it over, palm-up. Run your finger gently along each of their fingers (aka tickling their fingers)... ask which one tickled the most. ask them to concentrate on either A, B, or C. Then stretch the skin on their fingertip so it is mostly whiteish coloured. The letter will appear slightly pinkish in their fingertip. Me and my brother have found that all letters work for this, only mistakes are made, like you might msitake a G for an O for a C... it's just easier to do just A B and C. This is really really creepy and works almost every single time.**

Jesse <[sugarstars@gzusgirl.com](mailto:sugarstars@gzusgirl.com)>

Lalaland, KS USA - Monday, December 27, 2004 at 21:12:53 (PST)

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**Yo, u know whuts kool, if u lay on the ground and take like 30 deep breaths, then stand up real fast and hold ur breath, u'll like pass out 4 like a couple seconds. its awesome, u like start laughing and doing shit if u stay standing up, its like smoking weed, only doesnt last as long, lol. ill hit u back up if i think of n e thing else. PZ**

Dixie Normous <[Iforgot@lotsa.cum](mailto:Iforgot@lotsa.cum)>

321 sesamea street, NY USA - Wednesday, December 22, 2004 at 11:13:53 (PST)

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**youve all propably read the one with the hand mirror under your chin  
bellow a little ways well try wiggling the mirror while you walk  
FREEAAKKYY just dont fall or try if you get mostion sicknes**

bobby fringer <[noobsaibot2000@html.com](mailto:noobsaibot2000@html.com)>

USA - Saturday, December 18, 2004 at 23:19:28 (PST)

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**try this take an 2 litter orange soda bottle to a shooting range leave about  
2 inches of soda in the bottom shake it up good and soot it witha 22 right in  
the bottom corner it launches about 20 ft in the air try this with different  
guns and soda bottles**

bobby fringer <[noobsiabot2000@html.com](mailto:noobsiabot2000@html.com)>

cloverdale, nv USA - Thursday, December 16, 2004 at 10:30:17 (PST)

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**I discovered this in my pick-up truck ,but it can be done in most any car as  
well. have your passenger hold one of those mirrors (about 4 foot tall & 12  
inches wide)that you have on a door or wall, horizontally, across the top of  
the front seats just behind the driver`s head while driving. the driver can  
watch in his rear view mirror. man it is a weird sensation. Try videoing  
this with a camcorder mounted on the dashboard facing the mirror & play  
it back on our tv for friends & family! it`s a freaky feeling!!!!!!!!!!!!!!!!!!!!!!**

ken f. <[marlenesuf@sympatico.ca](mailto:marlenesuf@sympatico.ca)>

london , ont canada - Wednesday, December 08, 2004 at 19:59:18 (PST)

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**walk around with a hand mirror held under your chin this gives the effect  
of walking on the celing! its a bit disorienting but effective.**

Speedyplstic <[willsr@hotmail.com](mailto:willsr@hotmail.com)>

Mankato, MN USA - Tuesday, December 07, 2004 at 15:41:04 (PST)

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**One thing about making a Super-Lighter by removing the shield and  
overadjusting it- DON'T hold the flame on too long- the little brass nozzle  
that the gas comes out of can overheat, melt the plastic, and blow out,  
resulting in a huge fireball, a scorched ceiling, and missing eyebrows.**

RatsOfFire <[CDH106@hotmail.com](mailto:CDH106@hotmail.com)>

Trafford, PA USA - Wednesday, November 24, 2004 at 06:03:26 (PST)

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**In the winter when static electricity abounds, go into your bathroom and turn on your sink so that only the tiniest trickle of water comes out. It must be a steady stream, not dripping---almost dripping---but not dripping---just a tiny little steadily trickling stream---got it? Now comb your hair with a plastic comb until it's crackling with electricity. Then place the comb near the stream of water. The static electricity will bend the stream of water into an arc. with a little practice you can actually make the water flow against gravity and up out of the sink!**

David E Jones

L'ville, GA USA - Monday, November 22, 2004 at 22:26:20 (PST)

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**To write backwards, use the hand you don't normally use. Relax, don't concentrate, and you will see that you can naturally write from right to left. It looks a bit spidery, but hold it up to a mirror to see how well it worked.**

Darren Longhorn

Leeds, UK - Saturday, October 30, 2004 at 14:20:16 (PDT)

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**You've probably seen "light saber" toys, consisting of a plastic rod fiber optic and a laser-pointer-like base that has a flashing LED instead of a laser. Two things you can do here:**

- 1. Attach the plastic optics to a laser pointer. Gives interesting sparkles, and may let you lens smeared laser onto your walls.**
- 2. Close your eyes and point the flashing LED right into your face. This works best if the LED is red, but green will sometimes get through enough as well. After a while, you will begin to see color dots and fringes similar to those you get poking at your eyes, but without the discomfort or risk. They will flash in time with the LED (not surprising). A rate of about 4 to 5 Hz and a short duty cycle seems to work quite nicely. I've seen some that blink once or twice a second, with a long duty cycle. That's not going to cut it.**

**Don't do this if you're epileptic, or even have had a seizure. It's probably best to do it laying down even if you aren't worried about having a seizure.**

**But it doesn't hurt to be baked or otherwise chemically enhanced.**

## **OTHER THINGS TO DO WITH TECHNOYS**

- 1. Shine a bright red LED into thin skin areas like the webbing between two fingers. You'll see a diffuse glow that is eerie itself, but you'll also see blood vessels and maybe even finger bones. Red lasers work too, but the sparkle effect tends to screw up seeing blood vessels.**
- 2. Shine a laser pointer into a translucent object. The sparkle effect can be quite mesmerizing.**
- 3. Shine a laser pointer through a transparent, half-filled bottle of water, then shake the bottle to jostle the water around. Watch the laser dance on the far wall.**
- 4. Cats generally love to chase laser dots, as do some dogs. Birds are likely to try to eat the dot, but that's not particularly entertaining for long. But if you can get your pet to chase it, it's a lot less effort than playing fetch, and there are no soggy tennis balls.**

**If there's a mirror in the room, lead the laser dot over to the mirror (slowly, you don't want your pet to crash into the mirror) and beyond (bounce it off the mirror). A typical cat will only track the real dot going into the mirror, but see both the real and reflected dots after it reaches the mirror, and will look at the two alternately, trying to decide which one is real.**

**Mal-2**

Mal-2 <[miaowara\\_tomokato@yahoo.com](mailto:miaowara_tomokato@yahoo.com)>

Los Angeles, CA USA - Saturday, November 20, 2004 at 03:16:26 (PST)

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**Ok, this one is only for people with braces. Get a standard, fully charged 9 volt battery and put 1 of the prongs on the top braces, and the other on the**



**bottom braces. You'll start to get a strange feeling/taste in your mouth, and then, all of the sudden your whole face will get a violent JOLT. Most of the time, you will see a blue flash of light, as the shock forces your eyes to close. Trick people with braces into doing this and you'll probably laugh you ass off! Now if noone minds, i'd like to shamelessly plug my own site, <http://www.boredom-induced.com> <--we make stupid movies.**

Boner Jones <[bonerjones@gmail.com](mailto:bonerjones@gmail.com)>

West Palm Beach, FL USA - Sunday, October 17, 2004 at 19:55:05 (PDT)

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**Ok, I haven't done this one since I was a kid, but it should work fine. First, lay down on the ground face down with your arms straight and relaxed over your head. Relax your whole body, then get a friend to grab your hands and pull them up, lifting your head off the ground. You must keep your head hanging loosely the whole time. After your friend holds you there for a good 2-3 minutes. (If it doesn't work after 2-3 minutes, try longer). After waiting with your head hanging, have your friend lower your arm slowly to the ground. When done right, your arms will feel like they're going through the ground. Your mind is tricked into thinking the ground is alot closer than you'd previously thought. PEACE!**

Boner Jones <[bonerjones@gmail.com](mailto:bonerjones@gmail.com)>

West Palm Beach, FL USA - Sunday, October 17, 2004 at 19:26:14 (PDT)

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**When you feel that you have to sneeze, take control of that involuntary action and let as much air out of your lungs as you can. This stops you from sneezing without causing pressure to be built up in your ears and possibly blow your eardrums.**

Joe

Canada - Sunday, October 17, 2004 at 11:28:22 (PDT)

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**Have u noticed how cats always lands on their feet, and the same when you accidently drop a slice of peanutbutter bread and it always lands on the peanutbutter side! So here's what you do. Take a cat and one slice of peanutbutter bread, and attach the slice to the cats back(any way you want) and drop the cat from the roof. Now notice how the cat stops about**

**half meter from the ground and rotates furiously. They have reached an invinite equalibrium of their inverted quantum energies. This is good. Now all you have to do is connect a dinamo and you have an infinite energy source. Legal Note: I am NOT responsible for any loss of animal life. I will also ingone any requests to clean up blood and peanutbuttered pavements. Tip: Use variations of bread.**

Dewald Steynfaard <[12922897@puknet.puk.ac.za](mailto:12922897@puknet.puk.ac.za)>

Kathu, RSA - Sunday, October 17, 2004 at 06:41:42 (PDT)

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**BE the record player. Put a record on the turntable and turn it on, but instead of putting the needle on the record, use your fingernail. It takes some practice to hold it steady enough and with the right amount of pressure to stay in the groove, but if you get it right you'll faintly hear the record playing out of your fingertip. DO NOT use your mint condition first pressing of Abbey Road, because doing this probably ruins the record.**

Ross <[rdwesterbur@yahoo.com](mailto:rdwesterbur@yahoo.com)>

Detroit, MI USA - Saturday, October 16, 2004 at 12:37:01 (PDT)

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**You're seated and have just finished your bottled water and slip the empty plastic bottle behind you between your back and the seat. Leave it there a while so no one's aware.**

**Out of nowhere you give your head a twist-like you're trying to pop your neck- and lean back on that bottle. It's loud. People cringe and often scream. Fun.**

jim <[friskylamar@hotmail.com](mailto:friskylamar@hotmail.com)>

memphis, TN USA - Thursday, October 14, 2004 at 20:06:04 (PDT)

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**This is a follow up to blowing up lighters.First- the lighter when it explodes can fly twenty feet or more in any direction so make sure you're not going to hit anybody or yourself. Second- if you throw the lighter down hard but it doesn't hit the ground at the bottom part, it will break but not explode.You know you've succeeded when you hear a fairly loud bang, see**

**some fire(more discernable at night), and their are no lighter pieces in sight.**

Oren Politi <[oren2001@yahoo.com](mailto:oren2001@yahoo.com)>

San Francisco, Ca USA - Thursday, October 14, 2004 at 03:04:17 (PDT)

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**Blow up cheap lighters. Get a cheap plastic lighter filled with lighter fluid, go outside and throw it as hard as you can on the ground. Make sure you throw it so only the bottom of the lighter hits the ground vertically. It takes some practice but if you do it hard and precise enough the lighter will explode and fly everywhere. The more lighter fluid inside the bigger the explosion.**

Oren Politi <[oren2001@yahoo.com](mailto:oren2001@yahoo.com)>

San Francisco, Ca USA - Thursday, October 14, 2004 at 02:20:33 (PDT)

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**Works best with three people. Two people stand on either side of a swivel chair. One person gets on their knees in the chair. The person in the chair kneels down and puts one side of their head on the top of the back of the chair (so they are facing a wall looking at it sideways). They should then close their eyes. The two people on either side should start spinning the other person. At a certain point the person will no longer feel like they are moving. At this point, the two spinners should stop the chair immediately. If done properly (It's hard to mess up) the person will be unable to stop himself from falling forwards (if the direction of spin is the direction they were facing) or backwards (if otherwise).**

John

Lakewood, CO USA - Monday, October 04, 2004 at 22:28:44 (PDT)

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**magic tilting soda can. I discovered this on my own while being bored on my lunchbreak at work a few years ago. (disclaimer; This trick only works once in front of witnesses before half of them figure it out and do it themselves later on in front of another set of witnesses - thereby creating a tilting soda can pyramid scheme) Drink about two thirds to three fifths of a can of soda - the kind with a bevelled bottom edge works best (most cans have this kind of bottom edge). Tilt it at a diagonal angle and place it by**

**the bottom edge on a flat surface and carefully let go. The can stands tilted there on its own! It may take a little adjusting by sipping a little bit more to get it balanced just right. If done perfectly, you can further entertain people by carefully nudging the side of the can to make it wobble around in circles. Another wonderful thing to do is set up a bunch of tilting cans all around an empty cafeteria or kitchen or wherever there's a lot of flat surfaces where people are bound to come in and be completely befuddled by the cans as though they're in the Twilight Zone! The trick is a simple act of evenly distributed liquid on the inside of the can to form a perfect V angle with the bottom bevelled edge; gravity does the rest.**

Mathyula <[rainingcats@netzero.com](mailto:rainingcats@netzero.com)>

Baldwinville, MA USA - Monday, October 04, 2004 at 12:54:30 (PDT)

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## **ANTIGRAVITY**

**next time you are going down in an elevator, jump! you get a cool feeling of no gravity. just make sure you are the only one in there or else everyone will think you're crazy**

james <[wizewonson@shaw.ca](mailto:wizewonson@shaw.ca)>

edmonton, ab canada - Saturday, October 02, 2004 at 15:52:34 (PDT)

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**where's my finger?????**

**(help if u can go cross eyed) sit on a chair in front of a table, now place your elbow on the table so that your palm is flat with your forehead. now look directly straight and bring the index finger of your other hand around and pass it behind the wrist of your fixed hand. your wrist should cover your finger. now do it with your eyes cross.... your wrist thickness becomes as thin as paper yet your finger is cut so short. mess with your head**

Elie <[mrpink@hush.com](mailto:mrpink@hush.com)>

sydney, nsw australia - Friday, October 01, 2004 at 19:05:38 (PDT)

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**Crossed Eyes...even better effect....look as far left as you can ...slowly cross your eyes and then look to the right....do it smoothly back and forth and your eyes will appear to independently "flip-flop" ...it will freak out your friends if they are watching**

Randy Jameson

Toronto, Canada - Thursday, September 30, 2004 at 14:38:14 (PDT)

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**Okay, i learned this when i was all blazed at my friends house. he has one of those electric zappy things, but it is elongated and twirly, but im pretty sure a "plasma globe?" would work. Take a penny and spit on it, then put it on the glass. The electricity will go through the glass and into the penny, now if you get near it (you have to get close) it will zap you pretty good. Do it to your friends while wasted, it inspires hilarity.**

charlie <[sevendaystogo@yahoo.com](mailto:sevendaystogo@yahoo.com)>

milwaukee, WI USA - Wednesday, September 29, 2004 at 22:01:13 (PDT)

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**Take a standard wire hanger and pull it in the middle by holding the top and pulling center out C=====?. Stick your index finger in the loop of the closed end so you can twirl it with your finger. Bend the top slightly so the point of the hanger is vertical when the hanger is hanging down from your finger. Now place a penny face up on the point. If you are carefull it will balance. Now slowly rock the hanger back and forth until there is enough force to allow you to start spinning the hanger 360 degrees with your finger. The centrifical force will keep the penny in place and trip everyone out.**

Choda Shortknob

USA - Tuesday, September 28, 2004 at 10:50:35 (PDT)

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**First you need an office chair or any other type of chair that can easily swivle 360 degrees. Second grab a standard bicycle wheel (the larger the wheel such as the front wheel of a beach cruiser the better this works). Spin the bike wheel as fast as you can while holding it by the axles. Sit in the swivle chair and left your feet. By tilting the spinning wheel left or right the gyroscopic effect will cause your body to spin around in the chair. Joy!**

greg pucci <[gregpucci@hotmail.com](mailto:gregpucci@hotmail.com)>

folsom, ca USA - Tuesday, September 28, 2004 at 10:33:32 (PDT)

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**Another two cool eye tricks I've discovered that Ive never heard mentioned**

## of ANYWHERE.

**1) open your eyes really wide. Now with your index fingers, gently press inward towards your nose on the outer corner of your eyes. Soon your vision will fade black around the corners, and continue until all you see is a small circle of vision, then complete blackness (sometimes with nifty swirley blue things). Release the pressure, and your vision fades back. Nifty trick involving pinching the optic nerve.**

**2) stare at any one of your eyes in the mirror... really closely, so that you can see the patterns and lines clearly. Now tilt your head as if your eye was the center of a wheel. Your eyeball will twist in its socket to maintain "upright" vision. You can notice that the lines and patterns in your eye dont move with your head. freaky!**

Kerrick <[Poncepimp84@aol.com](mailto:Poncepimp84@aol.com)>

Daytona Beach, fl USA - Tuesday, September 28, 2004 at 10:23:37 (PDT)

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**put an aluminum can tab between your forefinger and index so your fingers touch through the big hole, then fling it forward and the can tab will take flight. It will spin like a helicopter or frisbee through the air. They stall a bit so don't expect them to go where you aim. These fly very far and sometimes cannot be seen because of their low profile or speed. Try experimenting with different ways of launching them to make them fly farther.**

manion

plano, TX USA - Tuesday, September 14, 2004 at 15:51:38 (PDT)

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**the gum rapper thing below, it has to be spicy cinnamon gum.**

will <[expickwickmoose@aol.com](mailto:expickwickmoose@aol.com)>

USA - Thursday, August 26, 2004 at 22:59:03 (PDT)

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**If you take a gum wrapper, lick it then put it on your head for about a minute it will feel like it's burning you.**

Emil

chicago, IL USA - Saturday, August 21, 2004 at 16:36:13 (PDT)

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**Paralyze your hand. Grab the fingers of your left hand with your right hand and squeeze them as hard as you can. Hold them for as long as you can take the pain. Now reduce your grip very slightly and remove your left hand without moving the fingers on your right hand and wait for about 1 min. Finally VERY SLOWLY try open your hand you will find that some of your fingers will not move.**

Hotdog

Uk - Wednesday, August 04, 2004 at 14:03:57 (PDT)

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**From "Scientific American", in the age of dinosaurs. Use an flash equipped camera, take the film out, or set the flash to "test". Get in a totally dark room, with no light source whatsoever. Put a newspaper (remember those?) on the floor, with the headlines or a big bold ad showing. (this is really cool if you haven't read it yet) Let your eyes get accustomed to the dark. With your eyes wide open and staring at the newspaper (if you could see it). pop the flash. Close your eyes, and be careful not to move your head too much. You can still read the paper!. Try the same game without the newspaper and so you could see your legs, and then squat down. Your body will feel "squatting", but your eyes still see "standing". Be careful not to lose your balance.**

Tomr <[tomr\\_tas@hotmail.com](mailto:tomr_tas@hotmail.com)>

Chicagi, IL USA - Thursday, July 29, 2004 at 11:07:21 (PDT)

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**Domo rigato, Mr. Roboto.**

Jonathan <[dyingevolution@aol.com](mailto:dyingevolution@aol.com)>

Turnersville, New Jersey USA - Monday, July 26, 2004 at 20:36:36 (PDT)

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**Lift your right leg off of the ground in front of you. Then, make circles with your foot counter-clockwise. Then draw an imaginary '6' in the air with your hand. Your leg should switch directions! It will go clockwise. If not, you're probably doing it wrong. Try circling your foot clockwise**

**instead of counter-clockwise. It will go vice versa. If this scientific discovery doesn't work, do it again and again until you get it right. -Jon.**

Jonathan <[dyingevolution@aol.com](mailto:dyingevolution@aol.com)>

turnersville, nj USA - Monday, July 26, 2004 at 20:32:40 (PDT)

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**When you get up in the middle of the night and your eyes are adjusted to the darkness, keep one eye closed while you turn on the lights. the open eye will adjust, but the closed one will not, and when the lights go off all sight in the open eye will be black but you'll still have night vision in the one you closed. go into the dark and stick a penlight or keychain laser into your mouth. something with a momentary switch. when you turn it on, you can see a vague redness (or whatever color) light but it's not coming from anywhere in particular. it is like all of your peripheral vision glows a little bit. with the laser you can actually shine it on different parts of the roof of your mouth, and "see" the redness in some places but not in others.**

Rawr

USA - Sunday, July 25, 2004 at 23:58:37 (PDT)

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**this is very difficult to get, but once you do, its easy. stick the tip of your index finger in the webbing of your other index finger and middle finger. something like this: <- . now push your index finger (the one in the webbing, we'll call him finger 1) so that the joint closest to your nail bends up and the other joint bends down. \_^ like that. now put this under your chin in the fat, so it makes a air pocket, then bend the joint near your nail down, and if you get it right, it should make a popping noise.**

will <[expickwickmoose@aol.com](mailto:expickwickmoose@aol.com)>

woodlands, tx USA - Friday, July 16, 2004 at 17:12:03 (PDT)

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**Put a recordable CD (Used or not, it doesn't matter) into the microwave. Maybe add a cup of water to make it a little easier on the magnetron. Sparks explode over the whole surface of the recordable side. It only takes a second-- any longer and the disk melts and smells bad and your co-workers give you a hard time. Needless to say, this ruins the disk.**

Paul Rako <[winopaul@yahoo.com](mailto:winopaul@yahoo.com)>



Sunnyvale, CA USA - Thursday, July 01, 2004 at 19:03:35 (PDT)

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**Cross your fingers then touch a skinny object like a pencil or your nose with the groove formed in between your crossed fingertips. Since your fingers are crossed your brain thinks that the object is located "around" your fingers even though it is between your fingers. I discovered this when I was in first grade and everybody probably thought I was a freak since I was always touching my face with crossed fingers. Anyway, another thing that feels really weird is that you can make yourself "breathe" without actually using your diaphragm. If you take in a breath then hold it with your mouth open and twist your torso back and forth you will hear a weird sound that sounds like breathing. I'm not actually sure whether or not air is entering and leaving my mouth since I can't feel it but it sounds pretty odd. This was discovered much more recently, only about a couple of years ago in high school.**

Matt Ligon <[mafiew@ucla.edu](mailto:mafiew@ucla.edu)>

Los Angeles, CA USA - Monday, June 28, 2004 at 04:45:13 (PDT)

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**While sitting in front of a computer monitor, take a 30cm wooden ruler and clamp it tightly between your teeth with one end protruding. Twang the free end of the ruler while looking at the monitor. The image on the screen will wobble in a very odd manner.**

**I suspect this won't work with those newfangled flat LCD monitors. If you haven't got a wooden ruler, anything you can hold in your teeth and twang should do the job.**

Pont

NZ - Thursday, June 24, 2004 at 22:17:49 (PDT)

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**A great trick for parties: You and a friend both need to be drinking beer from long necked bottles ( Stella bottles are the only ones that I know work for certain). When your unsuspecting friend is distracted, beer in hand, lightly tap the base of your bottle squarely on the opening of theirs and it**

**should cause ALL of the beer in the bottle to instantly froth all over their hand and if they're not quick enough down their trousers too. Stella bottles work, because they have a conical base - don't know which other brands do, but if one brand doesn't try others until you get the desired result ;)**

Chris <[chri5chandler@msn.com](mailto:chri5chandler@msn.com)>

Manchester, United Kingdom - Thursday, June 24, 2004 at 16:56:09 (PDT)

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**Here is an interesting effect that can cause much amusement and pain.**

**When current flows into an inductor, energy is stored in the magnetic field. The larger the inductor (and therefore the larger the magnetic field) the more energy is stored. If the current is suddenly cut off, the energy can no longer stay in the magnetic field, and so transfers into the coil as voltage. This will cause a very large voltage spike across the inductor. So.....**

**Take two AA batteries, and alot of wire. Have enough wire, preferably magnet wire about 26, 28 gauge, to have about an ohm or two of resistance. This will allow several amps to flow. Wrap this around a iron core, or permalloy, or something else that focuses magnetic fields well. Get as many turns as possible. Hook this up to the battery. Holding both of the wires, disconnect suddenly.**

**I haven't tried this myself, however, from what I have heard, if done right the shock can hurt for days.**

**Rig it up with a relay so you can switch it off and shock your friends (or enemies to be, whatever you prefer).**

Chris The Great <[downnnessisgoingup@hotmail.com](mailto:downnnessisgoingup@hotmail.com)>

Fort Langley, BC Canada - Friday, June 11, 2004 at 23:38:40 (PDT)

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**First of all, just a simple physical trick; this works best with a small, weaker person and a big larger person. Have the smaller person put their hand on their head. Have the larger person try to pull the hand off. The**

**larger person will be able to whip the little person around, but never pull of the hand.**

**Secondly, just a warning. There is quite a bit of mention here about the "breathing ddeeply, stopping and temporarily losing conciousness" tricks. What you are actually doing with that is starving your brain of oxygen, so it shuts down your consiousness so as less of your brain is taking in available oxygen. What ends up happening at the moment you lose conciousness is that some of your brain cells die before your brain can protect them. If you do this to often, you can end up being extremely suseptable to headaches and migraines in later life.**

**Iruliiia**

**Calgary, AB Canada - Thursday, June 10, 2004 at 20:45:16 (PDT)**

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**1: Cup both your hands so when put together, they only have a hole between your index fingers.**

**2: Open your mouth in a tall O-like shape.**

**3: Clap your hands so the hole ends up almost right in front of your mouth.**

**Open your mouth with different sizes to make different noises.**

**Alex M <[holy\\_b@hotmail.com](mailto:holy_b@hotmail.com)>**

**Toronto, Ontario Canada - Tuesday, June 08, 2004 at 15:08:14 (PDT)**

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**Next time you are in a public toilet stall (alone) try making low humming noises with your lips closed through the musical scale. When you hit a frequency that matches the distance between the stall walls, you will achieve a "standing wave" and your head will start to vibrate with the stall walls.**

**Mark Schwendau <[MarkS@kishwaukeecollege.edu](mailto:MarkS@kishwaukeecollege.edu)>**

**Malta, IL USA - Wednesday, June 02, 2004 at 08:23:54 (PDT)**

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**Try and catch floating dust when theres a beam of light coming throug a window, its seems impossible because when you 'catch' it the shadow of your hand makes it dissapear, go to [www.funnysecrets.cjb.net](http://www.funnysecrets.cjb.net) and read peoples personal secrets!**

Liem <[nismogtr2@hotmail.com](mailto:nismogtr2@hotmail.com)>

Melbourne, Australia - Wednesday, June 02, 2004 at 04:51:52 (PDT)

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**when you and you friends goes camping and make a fire stand around it 6 or 7 feet away. each one should take a hand full of flour or sugar powder and throw it in the air abowe the fire. this will cause a flame 8 or 9 feet high. beware part of the flame wiil move towerds you and your friends.**

aner cohen

israel - Wednesday, May 26, 2004 at 03:10:02 (PDT)

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**put your tongue on a 9 volt battery. Or lick your upper lip and put it on there**

alex wagner <[alexwags@sio.midco.net](mailto:alexwags@sio.midco.net)>

sioux falls, south dakota USA - Monday, May 17, 2004 at 14:03:05 (PDT)

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**take a large amount of aluminium foil and press it to the front of a TV that is OFF. the remaining static should hold it there. then take one crocodile clip or wire and attach it to the foil and another wire and attach that to a water pipe or another electrical ground. basically you can do a lot of stuff with this, you can attach the wires to two separate metallic objects such as a drinks can and then with an insulator (plastic rod or other plastic or glass object) move them near each other. as you turn the tv on a spark will jump between the two cans. if not move them closer together. DO NOT TOUCH THE FOIL OR EITHER CAN you will get a total bitch of a shock, will hurt for bout 10 minutes. i've had sparks jump 2 or 3 inches to hit me as well so generally avoid going near it. when you are done touch the two cans together to drain the power and peel the foil of (preferably with gloves in case of remaining static charge)**

James

USA - Sunday, May 16, 2004 at 10:04:11 (PDT)

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**Fill a large bowl with cornstarch (the more the better) and keep adding water until it's a thick liquid.**

**When you get it right, you can blow on it and run your hands through it slowly and it looks and feels like milk. But if you punch it, your hand bounces off the surface. If you squeeze it, it feels like rock, but when you relax, it dribbles through your fingers like water.**

**Craziest thing ever. I'm a college student, and some friends and I made a big tray of this stuff and played with it for about three hours. It's simply amazing. Easy to make, too. Cornstarch is cheap.**

**(I think the reason this works has to do with the way long chains of organic molecules slip past each other, but I'm not certain.)**

xkcd

USA - Saturday, May 15, 2004 at 17:35:04 (PDT)

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### **Shamanic Dieting**

**Get a single raw almond, walnut meat, chunk of jerky, etc., put it in a baggie and carry it around with you. When you're hungry and have not yet eaten, go somewhere private, close your eyes, and eat it in small bites. The flavor is stunning. And usually this lets you skip lunch.**

Bill Beaty

USA - Thursday, May 06, 2004 at 12:07:16 (PDT)

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**this works best in the outfield of a baseball field)at night . spin around really fast for a loooooong time and let your arms float out beside you. after spinning for a very very long time, close your eyes, drop to the ground, and roll up into a ball. do not open your eyes. you will imeadiatly feel like the ground is tilting and you are just going to slide off. the longer/faster you spin the bigger the effect. oh yeah, when you open your eyes and look straight ahead you will think you are acually looking the other way. keep posting i love this stufff!**

Jojo <[arffyjo@netzero.com](mailto:arffyjo@netzero.com)>

yukon, OK USA - Tuesday, May 04, 2004 at 18:39:33 (PDT)

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**Here's a mini one:**

**Got a stainless steel sink? Turn the water on full cold, and listen to the wooshing noise. Pretty much white noise and fuzz. Now, turn the hot water on, and suddenly the pitch changes. Two neat things happening at once here: The metal sink is tightening and loosening like a drum and changing the pitch, but the weird thing is the water sound doesn't read as having any particular pitch at first- it sounds like static, all mixed up. But, when you change the general distribution of all the different pitches, you hear the change, and suddenly you can tease out a single pitch from all of the noise. Congratulations, you now have a heat controlled drum that wastes water.**

confuseatron <[rkscott@spamthlink.net](mailto:rkscott@spamthlink.net)>

agoura, ca USA - Monday, April 26, 2004 at 11:02:51 (PDT)

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**stand in a doorway and push your armes agained the sides, and wait for 1min. then walk forward and stand stil. your arms will then go up!!!**

zac <[zacmac2010@yahoo.com](mailto:zacmac2010@yahoo.com)>

gaylord, mi USA - Saturday, April 24, 2004 at 20:48:13 (PDT)

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**Stand in front of a window, almost touching it. Look at the house or building across the street. Take note of the size of the building - not estimating its height in feet, just looking at the size of the visual image. Now turn around and walk to the other end of the room. Turn back around and look at the building from your new position. It will appear several times larger and twice as close.**

tg

USA - Monday, April 12, 2004 at 15:44:26 (PDT)

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**The next time you're out for a run (or walk), try altering the natural swing of your arms while maintaining your usual foot pace: swing them twice as**

**fast (bizarre), twice as slow (cool upper body slo-mo effect), or keep them straight down at your sides (Ministry of Silly Walks?).**

Chris Nauyokas

Chicago, IL USA - Thursday, April 08, 2004 at 13:32:27 (PDT)

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**Keith Millard posted a trick here about making breath noises by altering the shape of your mouth and throat. There's actually a much weirder thing you can do by singing a constant note instead of just breathing. Look up throat singing, also known as overtone singing, on Google. With a little practice you can produce unnaturally deep rumbles like a big pipe organ, twanging sounds like a mouth harp, high-pitched whistles like an ocarina, or anything in between. It's even possible to sound more than one note at the same time. Throat singing is great for harmonizing with ambient sounds and resonances like other posts have described.**

**NOTE: A car is a good place to practice this. Anywhere people can hear you is generally a bad place to practice.**

JP

USA - Tuesday, April 06, 2004 at 00:02:23 (PDT)

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**Once I fell into weeks-long altered state while working on a big hardware project. I started working round the clock without sleep, only getting short catnaps. "Thomas Edison Sleep Mode." It turns out that others are exploring this:**

**Uber-sleep**

**<http://www.kuro5hin.org/story/2002/4/15/103358/720>**

**<http://circadiana.blogspot.com/>**

**Be warned: playing around with this stuff is very similar to getting into the "vision quest" mental state. It's similar to long term fasting and meditation: it MIGHT kill you or drive you insane, but usually is fairly**

**harmless. [Later Note: Hahahahahah! Spoke too soon! On April 7, two days after this entry, I was flung into vision-quest mode and remained there for almost two weeks! Collected lots of stuff for [mental derangement](#) page. Dipped in and out of mild delusions. ]**

William J. Beaty <[billb@amasci.com](mailto:billb@amasci.com)>

Seattle, WA USA - Monday, April 05, 2004 at 16:03:00 (PDT)

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**I used to do this, they called it a 'Gong-Bong' back in the headshop days -- you squat down, and vigourously breathe in and out about 6 or 7 times; then, stand up real quick, stretching your arms over your head while going up on your tiptoes -- you'd better be near something soft, because you will be falling over, almost unconscious!**

mechaboy <[BCoburnree@aol.com](mailto:BCoburnree@aol.com)>

Chicago, IL USA - Sunday, March 28, 2004 at 20:00:29 (PST)

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**This is a pretty cool one i heard this from a friend it is like how to make ice burn, what you do is you put about a teasnppon of salt on your hand and wait like 5 secondes then put some ice on the salt after a while it will bur nit leaves makrs for a couple weeks so do it!**

Garrett

Auburn, WA USA - Friday, March 26, 2004 at 22:40:02 (PST)

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**Try "two-stream simultaneous writing": practise writing two different sentences at the same time, one pen in each hand...**

David Golden

Ireland - Friday, March 26, 2004 at 17:48:56 (PST)

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**'Who turned the lights down?'**

**Hmmm, this could be neurologically damaging but hey, I'm still alive after many years of practising this: Take a 9v battery in one hand - moisten the 'groove under the nose' with tongue - now apply one terminal to your tongue tip and the other to the 'moistened groove' result? Your vision**



**temporarily darkens slightly! (remove battery and everything's fine again!) This must be affecting the iris somehow. or the brain. go on try it!**  
spotburst <[spotburst@hotmail.com](mailto:spotburst@hotmail.com)>

Southampton, UK - Thursday, March 25, 2004 at 07:56:41 (PST)

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**get one of those adjustable lighters where you can control how much gas is released when you turn the knob. it can get pretty big....but try this...take off the metallic covering on the lighter, and push the knob upwards, and you will see a white cog underneath. push the knob left, then down, and crank the cog to the right, repeat that, and everytime, the lighter will release more fluid at a time. WARNING: the flame will get HUGE! amaze your friends**

Mitch

Montreal, canada - Wednesday, March 10, 2004 at 19:54:49 (PST)

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**It takes practice, but clasp your hands, but dont let the bottom of your palm touch each other, while clasping find your middle finger of any hand . put your chin in the little crevices of where your middle finger is between the other 2 fingers of the other hand, while your chin is on top, push your middle finger with force through the 2 other fingers it was between, if done right you will hear a popping sound which sounds like you just cracked your finger, but all you did was make a vacume with your chin, with practice it can be very loud! (it takes awhile before u can do it on que but just practice)**

jonathan

toronto, canada - Sunday, March 07, 2004 at 08:59:26 (PST)

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**Get a 2 liter thing of club soda, and stick it in your fridge for months. The bottled up carbonation will pressurize the liquid so much, it'll turn to ice (in your refrigerator)!**

Lance <[kpkineticpenguins@yahoo.com](mailto:kpkineticpenguins@yahoo.com)>

Spokane, WA USA - Thursday, March 04, 2004 at 09:21:18 (PST)

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**hey, have you noticed that if you have a gameboy colour, played a game with a colourful screen at the time, then tilted or shook the screen repeatedly, the screen will have a lot of faint lines on it (like a spoilt tv chanel). why's that?**

**i tried the floating when your half asleep thing years ago. i can easilly do it when i'awake, sitting upright and opening my eyes. if you do it while looking down from a window (closed, with your face pressed against the glass so that you can't see any thing but ground bellow if you dont trust yourself) you can practically feel your self falling. shaking your head makes it easier to do.**

**speaking of shaking heads, sometimes, waaay passed curfew (im sixteen), around 3 or 4 at night, AND after i stayed up all night on the computer, i some times shake my head quickly while closing my eyes and i see my whole vision light up, like lighting surges without bolts,for verrry sort moments. can any one explain? ...oh yeah, and whats the deal with all that dejavu stuff, is creepy...**

noura <[crossbow\\_lili@hotmail.com](mailto:crossbow_lili@hotmail.com)>

cairo, egypt - Tuesday, March 02, 2004 at 01:30:46 (PST)

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**This is very easy get your index and thumb and make them together so that u make a little circle. say girl it will make your voice change and u might acctally say goey and if u move your thumb it will go higher or lower.[the voice] Aint that cool!!! =-)**

Vladymir

Gaithersburg, md USA - Sunday, February 29, 2004 at 17:49:27 (PST)

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**get another person. lie them on the floor. lift JUST their arms off the floor, about 2 feet. hold it there for about 45s.slowly put their arms back down.they will feel like thier arms are going through the floor!**

Snake <[drewskybrewsky@hotmail.com](mailto:drewskybrewsky@hotmail.com)>

surrey, BC Canada - Saturday, February 07, 2004 at 23:44:32 (PST)

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**Bite down on your index finger for 30 seconds. Then take them out and put them together and pull. It should feel like your bones are coming apart. Well if not you have real tough bones.**

McKala 10 <[kttm@earthlink.com](mailto:kttm@earthlink.com)>

Jackson, ms USA - Sunday, February 01, 2004 at 12:29:28 (PST)

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**Rapid fire leaf blower tennis ball shooter... ..thing. take your leaf blower, get some pvc pipe (about 4 ") cut one 1' 3" piece and one 2 foot piece. in the 1' 3" piece cut a 4" notch out about 2" from the end going toward the blower. now duct tape the 1' 3" piece to the blower (notch up)and duct tape the 2' piece sticking up out of the notch fill the 2' piece with tennis balls Sometimes you might have to drill vent holes behind the 4 " notch (Or just leave a leak in the duct tape)**

countspatula <[bootmoufyo@yahoo.com](mailto:bootmoufyo@yahoo.com)>

warren, pa USA - Sunday, January 25, 2004 at 16:15:06 (PST)

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**i'm a teenager but i love science and fire one night while bored in my room i took plyers and grasped a tic tac in the plyers then i took a lighter and moved the tic tac over the flame after a while you'll hear a sound like the tic tac is blowing out air remove the lighter and watch.**

david <[twoboarderman@yahoo.com](mailto:twoboarderman@yahoo.com)>

Reno, nv USA - Friday, January 02, 2004 at 13:31:14 (PST)

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**OK, here's another one. Create a 'gravity ball'. Hold your hands about 1 foot apart from each other (palms facing inwards). Get someone to do the same but put their hands 'outside'. Now try and force your hands outwards while the other person is trying to force their hands together. After a minute or so stop. you will now find that as you try to bring your hands together there is a gravity ball between them. You can even move your hands around as if you were holding a soccer ball and still feel the effect.**

Chris <[ctaylor@ct-design.freeserve.co.uk](mailto:ctaylor@ct-design.freeserve.co.uk)>

Margate, UK - Tuesday, December 30, 2003 at 18:46:59 (PST)

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**Ever wondered how to distort the fabric of space? Read on..... This page is**

**a good thing to try it on. Put your hand about 6 inches away from your face (palm towards you) and spread your fingers out. Now, focus on the text on the screen. If you move your hand slowly enough, you will notice that the writing on screen 'warps' slightly as you move your hand around. You have to move it fairly slowly otherwise you don't have a chance to catch the effect.**

Chris <[chris@somewhere.com](mailto:chris@somewhere.com)>

Margate, UK - Tuesday, December 30, 2003 at 18:11:47 (PST)

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**This takes a bit of practice, but it's a neat little trick. Make a fist with no holes except on the end with your index finger. With your dominant hand, put your thumb on the lighter like you're about to light it. Stick your thumb and the lighter into the hole in your fist, making sure the whole thing is more or less airtight. Then press down on the little button that makes the gas flow out (but don't light it yet) such that it's going into your fist. Hold this for a second or two, then simultaneously light it and open your fist. If you timed it right, you should get a small fireball that looks really cool in a dark room. It lasts for such a short period of time that you hardly feel any heat, let alone burn your hand. A few tips: You actually need to strike the lighter a fraction of a second before opening your hand in order to get it to work. Also, don't hold the gas button after you strike it, because you WILL burn yourself - all you need is a small spark to light it.**

ross <[ross\(at\)listentome.net](mailto:ross(at)listentome.net)>

USA - Monday, December 22, 2003 at 20:44:50 (PST)

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**okay, this really is a cool thing. ride your bike down a gravel road for a fairly long time, and stare at the gravel the whole time. (using peripheral vision to watch where your going.) you can look up once or twice if need be, but only for a short time. now, stop biking and look at the sky. it works best on a day with only a few clouds in the sky, but the sky and just about everything will look almost as if it its moving away from you. or maybe it looks like an overlaying negative of the gravel you were just looking at, only in reverse. i used to go bike riding as a kid for the sole purpose of experiencing this.**

abs again <[skypilot500@hotmail.com](mailto:skypilot500@hotmail.com)>

WI USA - Wednesday, December 17, 2003 at 11:08:01 (PST)

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**This one may have been submitted already: A cool trick with a grape is to cut it nearly in half, leaving just a small bit of its "skin" connecting the two halves. Now microwave it. If the conditions are right, you will see an electric current pass through the skin where the two halves are connected! It fries the skin and separates the two halves rather spectacularly. I really don't know how it works, perhaps it has something to do with how thin the grape skin is (a few hundred microns, so it is on the order of microwaves?) (Inhomogeneities in the microwaves?) Cool nonetheless**

Alex Kane

Tustin, CA USA - Saturday, December 06, 2003 at 03:30:44 (PST)

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**Spit Ball Cannon! First thing you need to do is get a bic pen. You need to get the cheapest kind they have, the clear ones with the little cap at the end. It's probably sitting on your desk. Remove all it's parts so all you have left is the long hollow tube. Next grab a hanger from your closet. Cut the top of the hanger off. Straighten 2/3rds of it as best you can. Next take the last 1/3rd and wind it in a coil. Now start making spit balls. You need two. The first one make just small enough so you can jam it down the pen about 2/3rds. Use your hanger to jam it down. Don't make it so big that it won't come out! Next make the second spit ball a little bigger. Put this one in the pen as well but near the end. It should be fitting just a snug as the first. The pen actually tapers slightly. You are now ready to fire. Hold the hanger so that the straight part is just inside the pen up against the second spit wad. Now hit the springy coil end of the hanger as hard as you can. The pressure from the second wad pushing down on the first blast the first one out of the pen like a cannon. At 15 feet you could serious injur someones eye, and at 30 feet they will still definately feel it.**

Rob <[rob@bestwebimage.com](mailto:rob@bestwebimage.com)>

San Jose, CA USA - Friday, December 05, 2003 at 22:16:34 (PST)

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**how to fix a phonline**

Jerimia <[Jwg1212@hotmail.com](mailto:Jwg1212@hotmail.com)>

Fontana, Ca USA - Sunday, November 30, 2003 at 19:53:29 (PST)

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**Make you fingers numb. take ur first two fingers on ur left hand and squeeze them with ur right hand for 30 seconds. let off a tinny bit of pressure of ur right hand take ur left two fingers out slowly. now rub the buttom of ur right rist with the same two left fingers.**

Jordan Earle <[talon777@yahoo.com](mailto:talon777@yahoo.com)>

Tampa, FL USA - Friday, November 14, 2003 at 07:07:38 (PST)

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**This one is quick and simple.**

- 1) hum for a second or three**
- 2) whistle for a second or three**
- 3) Now hum and whistle at the same time. Move Jerkily.**

**POOF! you're a robot!**

Vrai Bois <[None, right now](#)>

Somewhere, in Freakin Iraq - Thursday, November 13, 2003 at 08:11:06 (PST)

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**could some one please tell me how to gleek (gleeking or spitting under your tounge) i know its up at the top but i still cant do it. if someone could please give me a veary good in depth explanation i would be veary thankfull.**

**ooooooooooooo yeah now the trick part i dont think this has been posted yet. if you put bolagna on somebodys car it will peal paint, at least thats what one of my friends told me. i have never tried it,**

**and..... if you buy one of those big pack of ballones (50 pack of the regular and a 4 pack of those really big punching ballons is what i usally buy)you can entertain your self for hours in a pool with a watering hose . i like to fill up those really big ballons and go under water then you can smack it and it will wiggle like a big blob of jello or you can blow half air into the baloon and half water so it will float on the surface and you can hit**

**it and it will sound like a techno sound like ping.... me and my brother fill about 10 of them up and you can have a techno band (remeber about gleeking pleaseeeeeeeeeeeee) ('o')**

matthew

paducah, ky USA - Thursday, November 06, 2003 at 16:38:47 (PST)

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**make a sheild i got a fun 1 it will take a few years to do it did for me anyway first draw energy then swirl it around you picture what you want it 2 l@@k like it should work then if it starts to go away + more energy!!!!!!!!!!!!!!! p.s.:hope you like it and if it doesnt work keep on trying have fun**

ty

ellijay, ga USA - Friday, October 17, 2003 at 15:08:16 (PDT)

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**Ok youre in for the coolest thing ever..(SAW THIS AT A RAINBOW GATHERING) This is best done over the heads of a large crowd...nice with lots of drums too.. Ok get one of those plastic things that you can blow a really big soap bubble with and a few laser pen flash lights. you'll need a few accomplices...one person in the middle of the crowd and two on either side with the flashlight laser pens. Yup now you blow a big bubble in the middle and then keep blowing on it to keep it up while your pals point lights at it. It is a luminous orb just hanging there moving a bit. Totally alien people flip on this one! Enjoy**

Harmony <[pan97@hotmail.com](mailto:pan97@hotmail.com)>

USA - Thursday, October 09, 2003 at 19:59:47 (PDT)

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**Okay, this mostly works on a school bus or next to a school bus, and you have... I mean HAVE to be next to a school bus, and the other one has to have the nose about 5" in front of you, okay, now turn around and don't look at the bus or out the front window or the other side and wait for the other bus to start moving, now look out towards the bus, and you'll get the feeling that you're moving fowards, then you'll think you're moving backwards, fowards, back, it goes until you finally see the end of the bus. I**

**do this alot, but, you know, you have to be stupid like me, to actually be fooled by a bus.**

Evan B. <[Evilpinklettuce@hotmail.com](mailto:Evilpinklettuce@hotmail.com)>

Iowa City, IA USA - Saturday, October 04, 2003 at 20:54:01 (PDT)

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**Position yourself so that you can see a television screen in the next room. This effect is enhanced if the screen is relatively small, is black and white rather than color and shows a static or slowly moving scene. (Security system monitors are ideal.) Now get some crunchy food such as pretzels, hard candy or crushed ice and chew it. The image on the TV screen will dance and vibrate but everything around it will seem normal.**

RedDawg <[reddawg@speakeasy.net](mailto:reddawg@speakeasy.net)>

Baltimore, MD USA - Thursday, October 02, 2003 at 07:13:07 (PDT)

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**Go outside and find the biggest, thickest blade of grass you can (The weedy kind with the ridges works good). Fold it in half along the crease and place it between your palms (Your hands should be in the "pray" position). Blow. If you did it right, the blade will act like a reed and make a loud squeaking noise. When I was a kid, we'd smuggle blades of grass into the classrooms and annoy the teachers. Also: when you are lying in bed half asleep, imagine yourself tumbling through space. If you're good, you can convince yourself that you are really falling and you'll reflexively thrash around trying to break the fall.**

KingFlathead

Denver, CO USA - Sunday, September 28, 2003 at 01:21:34 (PDT)

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**Pull on your fingers until they "pop". It's something to do with the fluid surrounding the joints. You can make any joint in your body pop if you do it right. My favorite is swinging my arms down and making my elbows pop. It's really loud and the noise disturbs people :-)**

KingFlathead

Denver, CO USA - Sunday, September 28, 2003 at 01:10:13(PDT)

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**Take a really right LED penlight (white and red work best), go into a**



**totally dark bathroom, and wait 5 minutes or so for your eyes to adjust. Now, shine the light up your nose while looking in the mirror. You can see your sinuses glowing red! Looks really weird to see your face backlit.**

KingFlathead

Denver, CO USA - Sunday, September 28, 2003 at 01:03:17 (PDT)

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**Sit on your couch with your feet streight out infront of you on the coffee table. now smack yourself in the back of your head, not too hard, at the point where your head connects with you neck. Now feel your toes tingle... dont do it too much or too hard or you might cause some serious problems...(ahh, the wonderfull things I learned in college)**

dickie <[df3photo@hotmail.com](mailto:df3photo@hotmail.com)>

erie, pa USA - Thursday, September 18, 2003 at 23:54:20 (PDT)

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**Take a sheet of paper color one side. Of the paper and the other side a different color. Yhen stare at one side for 30 seconds. Now look at the other side quick.**

Tyriel <[ecarr1@cox.net](mailto:ecarr1@cox.net)>

Zachary, La USA - Friday, September 12, 2003 at 15:56:22 (PDT)

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**Breathe through your butthole: climb on your bed, get on your hands and knees with your head down, and stick your butt up into the air. Hold this position until you feel your sphincter "relax" and your colon fill with air. It may take 5 or 10 minutes. Now, when you breathe in, air gets pushed out of your colon, and when you breathe out, air rushes in your butthole to fill the vacuum. It's a euphoric feeling. Don't push too hard though, or your butthole will close and you'll have to start over again. Bouncing on your back: lie on top of the bed, on your back. Bend your knees above you, and raise your arms up into the air so only your back is touching the bed. Now, try to bounce just by rhythmically straightening and contracting your legs upward, creating resonant momentum. No cheating with elbows! With practice, you can clear the bed by a foot or more. It's also very very funny for anyone watching.**

Nick <[phaseblade@hotmail.com](mailto:phaseblade@hotmail.com)>

Toronto, ON Canada - Wednesday, September 03, 2003 at 13:23:06 (PDT)

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**Ok ok, I read most of this stuff, an i know lots of it already too. I cant think of much else like this, but i'd like to talk about some of my weird trips ive had whilst on ECSTACY. ooh scary. kids look away. right. well one time, i was 'up' on ecstasy, and my friend had this light that flashes really fast (i cant rememba what its called). Me and about six other people took it into this room with the light off, and turned the flashing one on. We all started dancing, and i looked at this little light on a plug socket, and slowly the light began to move across the floor! i showed my friends, and they ALL said they could see it too, apart from one person who was just drunk... weird... i have loads more weird stuff but its all mine! hehe**

THiNK <[vital\\_d@msn.com](mailto:vital_d@msn.com)>

Sussex, Brighton England - Friday, August 15, 2003 at 10:43:07 (PDT)

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**if yuo have spare 9 volt batterries and spare time tyr this: Put a 9 volt batt. on your tounge. Feels strange? now hold it there. then it hurts after a while. well try having contests with your friends to find out who can hold it there the longest.**

scott hadley <[frenchyfries@mr-potatohead.com](mailto:frenchyfries@mr-potatohead.com)>

Roswell, ga USA - Wednesday, August 06, 2003 at 12:47:36 (PDT)

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**This is the greatest and best site in the world. Trubite.**

**Couple of things... As a guitarist and general interested-in-stuff person, I wonder what the effect would be of running a video signal through a delay pedal, as opposed to audio. I don't have a delay pedal, nor access to one. But go and try it! Or how about a phaser pedal?**

**Secondly, a variation on a post below. With your eye open, press on the eyelid above, so that you can still see out but you're not poking yourself in the eye, because that would just be silly. (But rich in comedy value to onlookers.)**

**Soon (10 seconds ish) you will lose sight in that eye - don't worry, it often returns afterwards. Keep pressing. Strange patterns appear. Not organic, random patterns but symmetrical patterns of straight lines and circles.**

**Explain that! Eh? Probably far more entertaining when you're high. Do both eyes at once! To make sociology fun, try this while standing in a packed bus or train.**

**Once again, great site.**

Crazy Eddie <[fanged\\_eddie@yahoo.com](mailto:fanged_eddie@yahoo.com) -the m>

Swaffham, Norfolk UK - Thursday, July 24, 2003 at 05:27:41 (PDT)

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**This is fun to do to a kid. (Was done to me by my dad and older brother). They put me on a wooden plank about the size of my feet, then blindfolded me. Put my hands on their heads and slightly picked up the plank and sat down. I felt like they picked me up very high. They told me to jump off. I stepped off and fell, even though they lifted me not even an inch off the ground.**

Boris

Old Bridge, NJ USA - Tuesday, July 22, 2003 at 11:38:39 (PDT)

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**u know those cans of pressurised air u can get at hardware stores? well spray it upside down and get a cheap ice gun. shoots almost 5 ft also there is something very mean going on i got a email on it [www.bonzaikitten.com](http://www.bonzaikitten.com) it is so creul e mail me to help stop it**

dan B. <[k2cougar3334@netcape.net](mailto:k2cougar3334@netcape.net)>

hertland, wi USA - Friday, July 18, 2003 at 19:09:32 (PDT)

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**Someone said something about staring at someone with an emotionless expression can really freak the person out. the same thing works with cats and other animals. (And you wonder why people say Cats are similar in emotion to humans?)**

Whitney

Kansas City, MO USA - Saturday, July 12, 2003 at 23:15:44 (PDT)

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**My father was a musician for many years and the stories of bands doing drugs are on the money. He used to come in off the road and do this trick for us, much to my mother's dismay. Even though when he did this in hotel rooms on the road, I'm sure he was pretty stoned, we as children found it**

**fascinating! Take a wire coat hanger with no paper or plastic or cardboard on it and pull it down from the center to form a long diamond shape. Take one (or more) sheets of the plastic that comes over your clothes after you get them back from the dry cleaner and tie this in several knots forming a small rope of sorts. Take the hanger and in the part you bent on the bottom, tie the plastic sheeting to it. Get a 5 gallon bucket (my dad used a large trash can) and fill it about halfway with water. Hang the coat hanger in an open doorway with the bucket directly underneath it and light the bottom of the rope you made from the plastic with a match or lighter. Turn of the lights and sit back and watch. The plastic will drop off in colorful blobs and make a noise as they drop to the bucket. An awesome show! Thanks for the memories Dad :)**

Shells <[shellie@live4him.zzn.com](mailto:shellie@live4him.zzn.com)>

Nashville, TN USA - Wednesday, July 09, 2003 at 14:57:22 (PDT)

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**Take a penny. Any coin works, but pennies are cheaper and more mysterious. Walk around handing people the coins and telling them "circulate this coin" in a grim voice. I have seen people run in fear, and other strange reactions. It can provoke some weird responses!**

Ike <[ikefox@earthlink.net](mailto:ikefox@earthlink.net)>

Greenwood, SC USA - Tuesday, July 01, 2003 at 15:18:07 (PDT)

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**Mirror game from childhood: Get a largish mirror (10"x12"...a shaving mirror is too small), hold it horizontally, a little below your clavicle...and, looking only in the mirror, walk around your house on the ceiling. You'll be stepping high to get over doorways, ceiling fixtures, etc. This doesn't work too well outdoors.**

trudy <[trudiweaver@yahoo.com](mailto:trudiweaver@yahoo.com)>

Whitehaven, MT USA - Friday, June 27, 2003 at 15:21:31 (PDT)

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**okay, to everyone who gave the pushing on your eyes to see the color. i did that a lot in early elementary. i naow have massive astigmisism from permanetly deforming my eyes. of course, i have recently realized that i could undo the damage through occasional steady pressure. im working on**

**it.**  
alex <[the\\_leaking\\_pen@yahoo.com](mailto:the_leaking_pen@yahoo.com)>

kissmy, az USA - Wednesday, June 25, 2003 at 12:42:33 (PDT)

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**Im not sure if this has been posted but im sorry if it has. Get a Plasma Globe and an Floresant Bulb. Now touch the globe and the bulb. The bulb will light up as if you are full of electricy.**

Jesse <[foreveryawn@netscape.net](mailto:foreveryawn@netscape.net)>

Lilburn, GA USA - Wednesday, June 18, 2003 at 00:11:41 (PDT)

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**Take an average size candle and melt it onto your hand(it doesn't hurt,if it does hurt you,then dont be stupid,stop doing it,but for most people,it wont hurt) cover your whole hand,but make sure its in a fist.make a few layers of the wax on your hand,now,try to get your fist out of the encasing without breaking the wax shell. if you can,congrats you have a cast of your hand.If you cant,then either just break it and throw it out,or you can hold your hand a few inches over the flame and watch it gradually melt off,but dont get to close to the flame, it's hot.... duh. ok now try it again.but do it on your other hand. then you will have a pair of wax hands.**

Ricky <[rbedard@mindspring.com](mailto:rbedard@mindspring.com)>

Houston, Tx USA - Friday, June 13, 2003 at 21:48:26 (PDT)

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**Rubber Fingers (I don't know if this hase been posted, so forgive me if it has.) If you take a look at your fingers (not the thumb)you (should?)see that it has three segments. The first one with the nail, the second in the middle, and the third, attached to the palm. Now if you bend your pinky down, so it is bent at the palm and after the third segment, but not at the joint between the first and second, with the whole thing forming a 'u' shape with your palm and the third section being the base. You should now be able to tap at the nail and it will bounce like it's made of rubber! works with the other fingers too, but not as good. Note: Only bend one finger at a time, or it might slack down.**

Chua Yu Xiang <[lhatespam](mailto:lhatespam)>

Singapore - Friday, June 13, 2003 at 10:00:05 (PDT)

**More Fun With Plasma Globes** Take a store bought plasma globe and gently, **\*with an insulator\***, place a metallic wrapper from gum, candy, etc. I've noticed that Airhead wrappers are nearly the best. Using a knife with a sharp point, touch the wrapper gently. Wear gloves or hold the knife by a plastic area, because the metal can burn you almost instantly, and it **HURTS A LOT**.

Nickbo <[infiniter@excite.com](mailto:infiniter@excite.com)>

USA - Monday, June 09, 2003 at 17:22:08 (PDT)

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**Ha cool party thing...I'll try and explain it best I can... You need five people to do this. I would try it but I don't have any friends, and no money to pay people. Get someone to sit on a chair. Preferably someone heavyISH. Fat chuffers not allowed. The other four people stand at each corner of the chair and clasp their hands together, then extend their index fingers only (so you have a pensive pair of hands..). All four people can then try to lift the chair - with the person on - by putting their hand under the seat and lifting with their extended index fingers. It shouldn't work. If it does get someone heavier. When they've stopped trying to lift the chair, each lifting person hovers their hand over the head of the person sitting down - the first person places the hand over their head, the second person over the first person hands, the third over the second persons and so on. Then each person does the same with their right hand. So now you have the four lifters with their left and right hands hovering over the sitter. This does something spooky, I'm sure. The lifters take their hands away, then clasp them together and extend their index fingers again. Try to lift the person in the chair, and you should be able to lift them. Magic. If it doesn't work, your not magical enough. Kill a unicorn and pick your nose with it's horn to achieve the desired level.**

Raa Raa Touche <[bum@boobies.com](mailto:bum@boobies.com)>

Cheese, Fridge - Friday, June 06, 2003 at 07:17:52 (PDT)

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**Stand in a doorway (helps if the door's open) and bring your arms up until the outsides of your wrists touch the doorframe. Keep pressing your arms**

**HARD** against the frame (as if you are trying to raise your arms with the doorframe stopping you) and do this for about a minute. Then, walk into the middle of the room and let your arms completely relax. They will begin to rise of their own accord! Spooky...

Belch <[Belcheee@hotmail.com](mailto:Belcheee@hotmail.com)>

Lancaster, England - Friday, June 06, 2003 at 05:58:38 (PDT)

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**At nite, Hold a flashlight up to one eye. Keep both eyes open. Everything you can see with the unobstructed eye will look black and white. I have no explanation for this.**

bille

USA - Sunday, June 01, 2003 at 03:44:07 (PDT)

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**omg,, so GREAT! lay on your bed or your sofa face down , rub your tongue on the inside of your bottom lip until it TINGLES 9works better witha little spit in your mouth)wierd tinlgy sensasion, lasts for awhile!**

kelly <[asd@sweetdreamfire.nz](mailto:asd@sweetdreamfire.nz)>

USA - Sunday, June 01, 2003 at 03:39:48 (PDT)

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**buy a 2-liter bottle of soda. Drink in your spare time. When it's empty, suck out all the carbon dioxide for a MASSIVE HEAD RUSH!!! Works best if an inch or two of soda has been allowed to go flat. You will feel a burning in your lungs(though not at all painfull), shortness of breath, followed by a reddish-orange haze filling your entire field of vision. Wicked good stuff, we called it "schuffing", "orange haze", or "kaz"**

dude <[yo@yo.toy](mailto:yo@yo.toy)>

USA - Sunday, June 01, 2003 at 03:36:38 (PDT)

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**Wow.. I started out with a whole bunch of things to try, and then I started to see them one by one appearing on the list. So the ones I have left aren't the coolest, but... Look up a recipe for sterno online, or go to your local cook-it-at-your-table restaurant (the "embers" are usually sterno). It burns at a very low temperature. Set it on fire, dampen your hands with water, and juggle flaming snowballs. You'll need to re-dampen your hands**

**after a while. Make a longish mask for yourself (out of black construction paper, or something) that restricts your vision to a field of view a little smaller than your palm at arms length. Wear the mask while playing soccer, cooking dinner, whatever. After a few hours, take it off. You will have great appreciation for the amount of information your brain has to process as you suddenly realize how vast your real field of vision is, and how bright the world is. Acquire The Flying Circus of Physics, With Answers. Have fun replicating many of the items therein. (Like plunging your naked hand into a vat of molten lead. If you do it right, your sweat vaporizes and forms a protective gas "glove." But don't do it.)**

Nils

Seattle, WA USA - Thursday, May 29, 2003 at 22:28:57 (PDT)

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**Odd that nobody's mentioned this one. Find a wall with patterned wallpaper. Not just any old patterned wallpaper, but with a small repeat-distance -- about 3-4 inches is good. Now, move up close to the paper and focus on two different bits of the pattern, one with each eye. Get the two bits of pattern to sit directly over each other, so that you can't tell they're different. (A bit like those Magic Eye things, only there's no hidden image). Move away from the wall a couple of feet. Now, reach out and touch the wall where you're looking at it...**

Darksatanic

UK - Tuesday, May 27, 2003 at 13:22:37 (PDT)

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**bite ice-cream and feel the cool sensation**

terminator

- Monday, May 26, 2003 at 06:50:24 (PDT)

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**Weird Levitating Arms I didn't see this one listed, so if it is a duplicate, please forgive me. Place your hands at your sides with your palms facing inward (towards your legs). Find a door way and stand in the middle of it. Extend your arms away from you body so that the back of your hands contact the sides of the door jamb. Press your arms outward like you are trying to make the doorway wider. Do this until you can't do it any longer,**



**then quit. Walk away from the doorway and your arms will float up on their own with no effort at all. It is kinda wierd feeling. Have fun! Hacker Hacker <[blislamb@aol.com](mailto:blislamb@aol.com)>**

**Toledo, OH USA - Sunday, May 25, 2003 at 21:10:22 (PDT)**

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**This is a list of just plain fun things to do. I do these every once in a while and it attracts attention, whether it be wanted or not.**

**Here goes:**

- 1. If there is a large crowd of people looking at something which requires perfect silence from the crowd, make sure you're in the back, out of anyone's view. Make a very weird noise. For instance, push the back of your tongue against the back of your throat (near your uvula) and it will make a "ghe" noise. People will wonder about you...**
- 2. If you are on a manual, small form of transportation on a road for cars, wait for an extremely polite driver to give you extra space. If you're lucky enough, he'll have his window open, then you scream "WATCH WHERE YOU'RE DRIVING, (place random cussword here)!!!"**
- 3. If you really want to give someone a fright, be in a car with them at night. Whil the car is off, and it's just you two, hope and pray that they stay silent. Look at the back of a seat or the dashboard. DO NOT make eye contact with them. After a while, scream at the top of your lungs. For added effect, get out of the car and run away. The other person may have a heart attack.**
- 4. This is a cool way to take ANYBODY down. Get going at a good speed, a mix between a slow trot and a jog, then leap up and hook your arm around someone's neck, not pulling it. If they stay up, say, "You passed", and if they fall, you've got them in a headlock!!! This is really only meant for short people like me.**

**Please use these "tricks" and enjoy. Oh, email me of any experiences that you feel are worthy of sharing. Thanks!**

Starfish <[jule\\_theshow@hotmail.com](mailto:jule_theshow@hotmail.com)>

Cinci, Oh USA - Sunday, May 25, 2003 at 14:30:12 (PDT)

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**When you are stuck in the car on the highway do this. Look down at the road centered on the white lines. right before a line passes the car blink. It will look like the lines are moving away from you but everything else is coming towards you. This works best if the street is smooth. Don't try it while driving, just when you are with your grandparents or anyone else you don't want to talk to in the car.**

Dan <[Footlzrd120@msn.com](mailto:Footlzrd120@msn.com)>

warrenville, ill USA - Saturday, May 24, 2003 at 17:59:19 (PDT)

---

**Try sneezing with your mouth open, it turns into something else.**

Ellen

Bellevue, WA USA - Thursday, May 15, 2003 at 11:39:27 (PDT)

---

**O.K. Say you and a friend are at a fast food place. (Did you say it?) You ordered a diet cola, your friend ordered cola sans the diet. They guy behind the counter forgot to push down the little button on the lid that says diet, how can you tell the difference with out tasting them? Take the lids off and put the straws in making sure that the ice doesn't keep the straw from moving. Wait a few moments. The straw in the diet cola begins to collect lots of bubbles immediatly and starts to rise in the cup until it falls over, the straw in the sans cup pretty much stays put. Something to do with covalent bonds. They are weaker in the diet cola.**

Ron

Esperance, NY USA - Sunday, May 04, 2003 at 18:55:46 (PDT)

---

**Another strange idea inspired by Bill B's Caught in a Face Warp. And I just noticed it now so it behooves me to share!**

**Scroll back up to the fat necked/pointy headed geek. Take anything that's**

**flat with a straight edge like a 3"x 5" index card and hold it against the computer screen so that the face warp image is only half exposed.**

**Watch Bill B's face tilt back and forth like a drunk weeble-wobble.**

**I must say that I too am having way too much fun and I am very close to damaging my self!**

**Ron**

**Esperance, NY USA - Saturday, May 03, 2003 at 19:31:02 (PDT)**

---

**I can't claim credit for this idea but it's still fun so I wanted to pass it on.**

**This is actually the brainchild of the late famed ventriloquist Paul Winchell whose alter ego was Jerry Mahoney. As a matter of fact he actually marketed the idea for a while many decades ago.**

**Get a mirror about the size of a standard sheet of paper so that it's easier to see yourself. Using the medicine cabinet mirror, position the portable mirror in such a way so that you are looking at your face upside-down.**

**Now concentrate your view on your teeth and chin. Once you can do this fairly easily, draw upside-down eyes and a nose on your chin. Make sure you use a marker that washes off easily! Now back to the mirrors. Give your new character a voice and start talking! Pretty wierd, huh?**

**Now, in his kit Paul Winchell actually included a mask that represented the body of this rather strange puppet and a concave mirror in order to flip the image upside-down.**

**It must have been hard to entertain an audience with this style of puppet since you had to have the mirror directly in front of you to see the resulting image. I saw it demonstrated on TV so all the studio had to do was flip the image electronically.**

**Maybe it was intended primarily for the user's enjoyment. Paul Winchell did admit to being a shy, withdrawn young man with a stutter.**

**Once again, if somebody walks in on you while you are engaged in entertaining yourself, you are on your own! Maybe this time however you can put on a show for them but first you will have to master standing on your head so that they can see the full effect.**

**By the way. See how much practice it takes to make this little character stick out his/her tongue in the correct direction so that it doesn't look like he/she is licking it's nose.**

Ron

Esperance, NY USA - Wednesday, April 30, 2003 at 19:52:06 (PDT)

---

**Lick the white part of a Big red bubble gum wrapper and stick it to your forehead. ITf you leave it there it will burn but try it.**

Nokojono <[None](#)>

Antioch , Tn USA - Tuesday, April 29, 2003 at 18:59:57 (PDT)

---

**Walk or run on the back of your feet. Easy to master, just don't put too much pressure on you feet. Fun to do walking down steps.**

disco stew

norfolk, va USA - Monday, April 14, 2003 at 22:17:05 (PDT)

---

**Get a camera without film and go into a pitch dark room. (by yourself or with friends. ..freakier by yourself) Find a painting or picture of anything freaky or gothic like ..ex. skulls, ugly faces. Something that isn't pretty to look at. Now make sure your friends are all looking at it and flash the camera onto the image..it'll light up very bright and vivid-like.. you'll feel like you're in a dream. Right after the flash everything will fade to black but the image will still be floating in your mind.**

Jenny <[frolicsome\\_insomniac@hotmail.com](mailto:frolicsome_insomniac@hotmail.com)>

USA - Saturday, April 05, 2003 at 20:22:14 (PST)

---

- 1. Take a coathanger and cut the flat bottom of it in the middle.**
  - 2. Cut off the top hook thing.**
  - 3. Bend coathanger in to a half circle.**
  - 4. Bend the ends of the coat hanger in so it is sort of a loop.**
  - 5. Take 2 elastic bands and a washer tie one of the elastic bands to one side the other elastic band to the other side.**
  - 6. hook 1 elastic band to the loop of the coat hanger and the other elastic to the other loop.**
  - 7. wind the washer up till you cant.**
  - 8. stick machine in the middle if a thin magazine.**
  - 9. sit on the magazine and lift one leg should make a loud farting noise.**
- note: use thick elastic bands and small washers. do this in office or library people just stare at you and wonder. experiment with different washers and elastic bands.**

Nick <[nicnic40@hotmail.com](mailto:nicnic40@hotmail.com)>

pemberton, bc canada - Friday, April 04, 2003 at 19:33:10 (PST)

---

**Make color meaningless and irrelevant. Maybe even your entire existence!**

**I discovered this effect many years ago while waiting to get into my high school early one morning.**

**On a clear morning look up at the sky and stare into the sky until your brain only sees the blue of the sky and nothing else on the periphery.**

**This is the beginning of the eerie feeling that nothing else exists but you and the sky. Continue to stare into the sky until the blue becomes so overwhelming that you can't see it anymore.**

**Start to ask yourself wierd questions like: "If I can't see any other color, is it really blue?" or "If I can't see anything, am I really here?"**

**When you have sufficiently diminished your existence to a vacuum stop and look around you and breath a sigh of relief as you reassure yourself**

**that you were there all along!**

**So is the school building! No biggie! Friday afternoon is not that far off anyway!**

Ron <[rwconti@midtel.net](mailto:rwconti@midtel.net)>

Esperance, NY USA - Tuesday, April 01, 2003 at 20:01:14 (PST)

---

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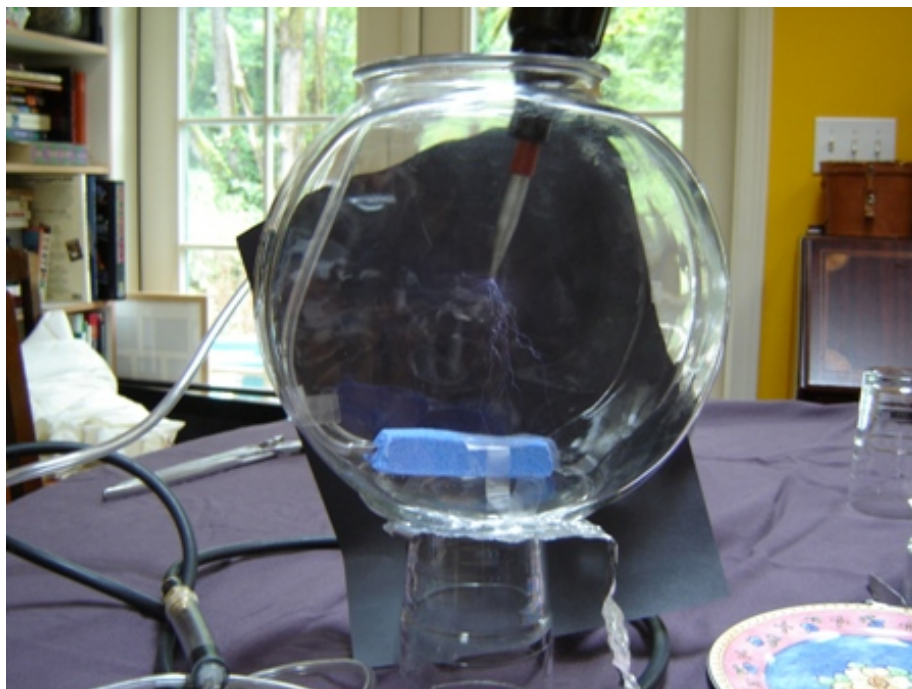
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<http://amasci.com/~billb/cgi-bin/instr/instr.html>

Maintained by [Bill Beaty](#). Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

# THE SECRET TO VACUUM-LESS PLASMA GLOBES

(Originally discovered by Ed Harris, 1995, 'usa-tesla' discussion group)



[scroll down](#)

Also see: [Building Plasma Globes](#)

\*\*\*\*\*

\*

\*

\* After hearing about a rumor that "Eye of the Storm" plasma

\*

\* spheres use high pressure helium, Ed Harris experimented

\*

\* with tesla coils and nobel gases. The rumor is true!

\*

\* A box or balloon full of pure helium acts like a "plasma

\*

\* sphere" but at ambient pressure. Or use pure welder's

\*

\* argon for immensely long snakelike discharges! - billb

\*

\*

\*

\*\*\*\*\*

VIDEO:



first test video  
MPEG 1.0M, bill b. 9/2005

VIDEO:



Side view  
MPEG 900K, bill b. 9/2005

VIDEO:



Explanation  
MPEG 4.3M, bill b. 9/2005

[ ONE MORE VIDEO TOO, SEE BELOW ]

I used a [Handheld Tesla Coil, \\$130](#), #HS-10 from Edu. Inno. catalog, SEE PAGE 42

FROM ED HARRIS, AUG 1995:

People in the past have used Tesla coils for powering plasma globes since they require a high-voltage high-frequency power supply.

Tesla himself experimented with these globes in the form of his carbon "button" bulbs.

If you can build an argon-filled discharge chamber, it allows you to get many times the arc length of a standard air-discharge tesla coil.

In some high pressure plasma experiments, people have in the past sometimes added helium gas to raise the working pressure of a plasma discharge -even up to and beyond 15psi.

I have tested this idea recently with a homemade plasma sphere run from a small 15kHz flyback supply. I can obtain 15psi discharges in helium with some small partial pressure of air(or other gas)



with rather  
small input from the flyback (est~5Kv).

So yes! You can run a plasma sphere at atmospheric  
pressure with  
helium + small dopant gas.

-Ed

Now if I can only find some reasonably non-toxic gas which  
produces nice  
colors!

-Ed Harris  
EDHARRIS@MPS.OHIO-STATE.EDU

---

Well- some guy remarked previously about using a plastic bag or  
the like  
as a atmospheric pressure plasma sphere. So I accepted the  
challenge :)

I was able to make a plasma sphere using a rubber balloon which  
was very well  
purged of air (air partial pressure approximately 1/1000  
atmospheric  
pressure) and filled with helium. Powered by a 10kV flyback  
circuit, the  
arcs inside the balloon could be seen to extend from the central  
electrode  
all the way out to the rubber (about 5 inches).

Hope some others try this  
It's rather neat!

-Ed Harris  
EDHARRIS@MPS.OHIO-STATE.EDU

---

Date: Sat, 12 Aug 1995 11:51:29 -0700 (PDT)  
From: William Beaty <[billb@amasci.com](mailto:billb@amasci.com)>  
To: list physics teaching

Subject: Rubber ballon plasma sphere

Wow, at one atmosphere!!! How about sealing a rubber glove to a largish balloon, stick a hand inside, and let plasma play on your fingers? Got a good camera? Should be good for an Omni magazine cover!

And how about an entire room with a Helium or Argon atmosphere? Such things must exist somewhere. If a \*glassless\* plasma globe unit was taken into one, wouldn't the plasma filaments extend right out into the air? And what would happen to colors and plasma-filament structure when small bags of various 1-atm gases were released in such a room? Or if a handheld unit was moved through various gas layers in a glovebox chamber?

Or hold your breath, go inside, touch a larger tesla coil terminal, and see if humans can serve as plasma globe electrodes.

If the leads to a neon-sign transformer were connected across a large volume of Helium, would a "beam" of red plasma leap between them? If so, what would happen if you poked at the plasma beam with a glass rod, or tried to cut it with a glass sheet? Could a plasma-globe power supply and a UV laser be used to create a \*real\* Star-Wars movie lightsaber effect inside a large He-filled chamber? Mind boggling.

The physics demonstrators sure are going to have fun with this one!

- Bill Beaty, [billb@amasci.com](mailto:billb@amasci.com)

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VIDEO:



Shoot arcs from fingertips!  
MPEG 1.5M bill b. 9/2005

MORE STUFF from billb

Ed Harris discovered that pure Argon works even better than Helium, giving bright white snakelike discharges like those seen in various Plasma Globes.

I experimented with this and found that Nitrogen contamination (air) wrecks the effect. Therefor, if you try an Argon-Balloon Plasma Globe, you need to flush all the air out first. Do this by squeezing out the balloon, filling it part way with Argon, allowing the argon to all 'squeal' out, then fill the balloon with Argon all the way. The argon in the balloon can generate long white discharges, but if you wait for a few hours, the nitrogen will get in through the rubber walls and spoil the effect.

If a metal rod or coathanger wire is pushed up into the balloon and the balloon neck is sealed with cable ties, you've got yourself a quick and dirty glassless plasma globe! It only lasts a few hours though, before air diffuses through the rubber and poisons the effect again.

I messed with the argon gas in a large plexiglas cube. Argon is a bit heavier than air. If you fill a box slowly with argon from the bottom, and provide an exit hole at the top, the box will fill up slowly, and

you can obtain long, snakelike discharges near the bottom of the box as the slightly-heavy argon drives the air upwards. The same tesla coil terminal that gives inch-long discharges in air will give foot-long discharges in Argon. Pretty cool to move the tesla coil terminal wire to different places in the box and watch the discharge grow from a dim, purple corona to blazing white snakes many inches long.

What would happen if we had a box with layers of helium, neon, argon, etc. inside? As the electrode was pushed through various layers, the plasma filaments would take on totally different color and length.

Trap a layer of argon between nitrogen above, and something heavy (maybe CO<sub>2</sub> or sulfur hexafluoride) below. Then a wire could connect to that argon layer, and a blazing disk of plasma would flow out into the narrow argon layer. (or does SF<sub>6</sub> gas make long plasma streamers too?)

If you build a plexiglas box, be aware that the fumes from plexiglas solvent or from silicone caulk will pollute your argon. Let your box dry for a couple of days before working with the argon, maybe attach a tiny fan to holes in the box to drive out the outgassing glue fumes.

Oh, the industrial grade argon obtainable in welding tanks (about 70\$ recharge) works just great. An Argon+CO<sub>2</sub> mix didn't work, CO<sub>2</sub> apparantly also poisons the long-sparks effect.

[Plasma Globe](#) links, magazine articles, etc.

I used a [Handheld Tesla Coil, \\$130](#), #HS-10 from Edu. Inno. catalog, SEE PAGE 42

=====  
Date: Tue, 16 Jun 1998 23:26:05  
From: mycroft42  
To: [billb@amasci.com](mailto:billb@amasci.com)  
Subject: Argon-based electoplasma effects.

Hi, found your website today, love the mad science hoaxes.  
I had a question about a common source of Argon that might produce  
some  
interesting facts.. There are thermally insulating windows  
available that  
contain an inner atmosphere of argon. Has anyone experimented  
with these  
windows to see what effects can be made? (has anyone thought of  
modifying  
these windows in a house to that each could be "turned on"?  
frankly it  
sounds like a neat form of environmental art just waiting to be  
tapped)

=====  

---

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(try "tesla coil" too)

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<http://amasci.com/tesla/heli1.html>

Created and maintained by [Bill Beaty](#). Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

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# TRAFFIC WAVES

**SOMETIMES ONE DRIVER CAN VASTLY IMPROVE TRAFFIC.**

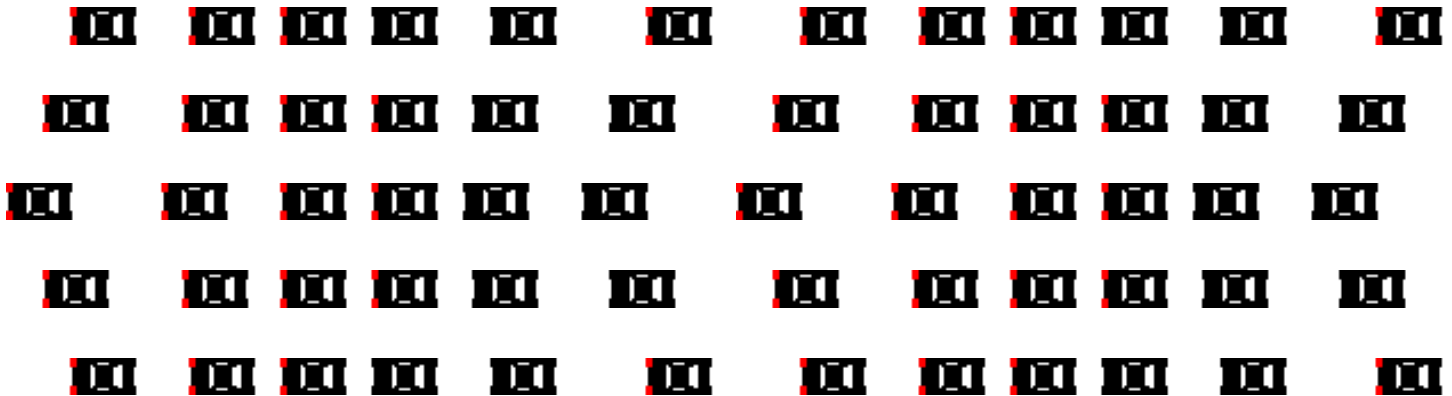
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# TRAFFIC WAVES

SOMETIMES ONE DRIVER CAN VASTLY IMPROVE TRAFFIC.

(note: wait for [animation](#) to load)



Jan 1998 [William Beaty](#), Electrical Engineer

[WAVES](#) [A CURE](#) [JAMS](#) [EMAIL](#) [LINKS](#) [FAQ](#) [COMMENTS](#)

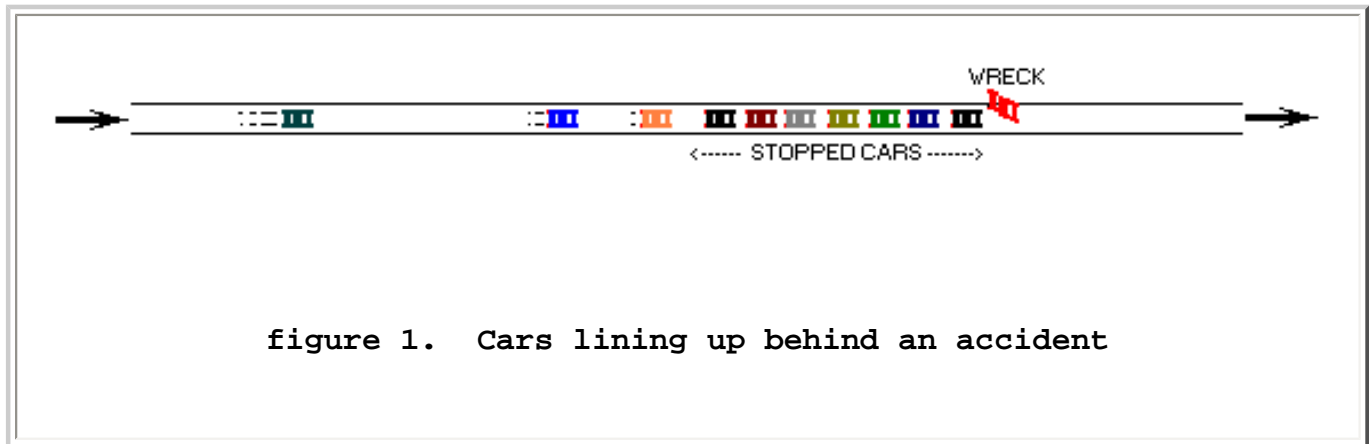
I live in Seattle and my two daily commutes last about 45 minutes. (That's when I'm lucky; sometimes it's more like two hours each.) This has given me an immense amount of time for watching the interesting patterns in the cars. Boredom led me to fantasize about the traffic being like a flowing liquid, with cars acting as giant water molecules. Over many months I slowly realized that this was not just a fantasy. Why had I never noticed all the "traffic fluid dynamics" out there? Once my brain became sensitized to it, I started seeing quite a variety of interesting things occurring. Eventually I started using my car to poke at the flowing traffic. Observation eventually leads to experimentation, no? There are [amazing things](#) you can do as an "amateur traffic dynamicist." You can drive like an "anti-rubbernecker" and erase slowdowns created by other drivers. But first, some basic phenomena.

## Invisible accidents

Have you ever been driving on an interstate highway when traffic suddenly slows to a crawl? You inch along for many minutes while waiting to see the accident which must have caused the jam. At the same time you also curse the "rubbernecker" who are causing the whole problem. But then all the cars ahead of

you take off at high speed. The jam is over, but no accident, no police cars, nothing. WHAT THE HECK WAS THAT?!! A traffic jam with no cause? In the rear-view mirror you see all the poor saps behind you still stuck in the jam. But why? If all those people could just speed up at the same time, the whole traffic jam would evaporate. Why don't they ever do that? What caused the mysterious slowdown in the first place?

After experiencing many of these "invisible accidents", I came up with the following explanation. To best understand this, imagine that you look down on traffic from an aerial view point. Pretend you're in a Traffic Reporter's helicopter looking downwards.



Above in fig. 1 I've drawn a one-lane road, an accident, and a row of cars stuck behind the wreck. Other cars are approaching from the left and stopping too. Suppose that the "wrecked" car (the red one above) has simply become temporarily stuck. Maybe it spun out on ice. What will happen when the red car moves and unplugs the flow?



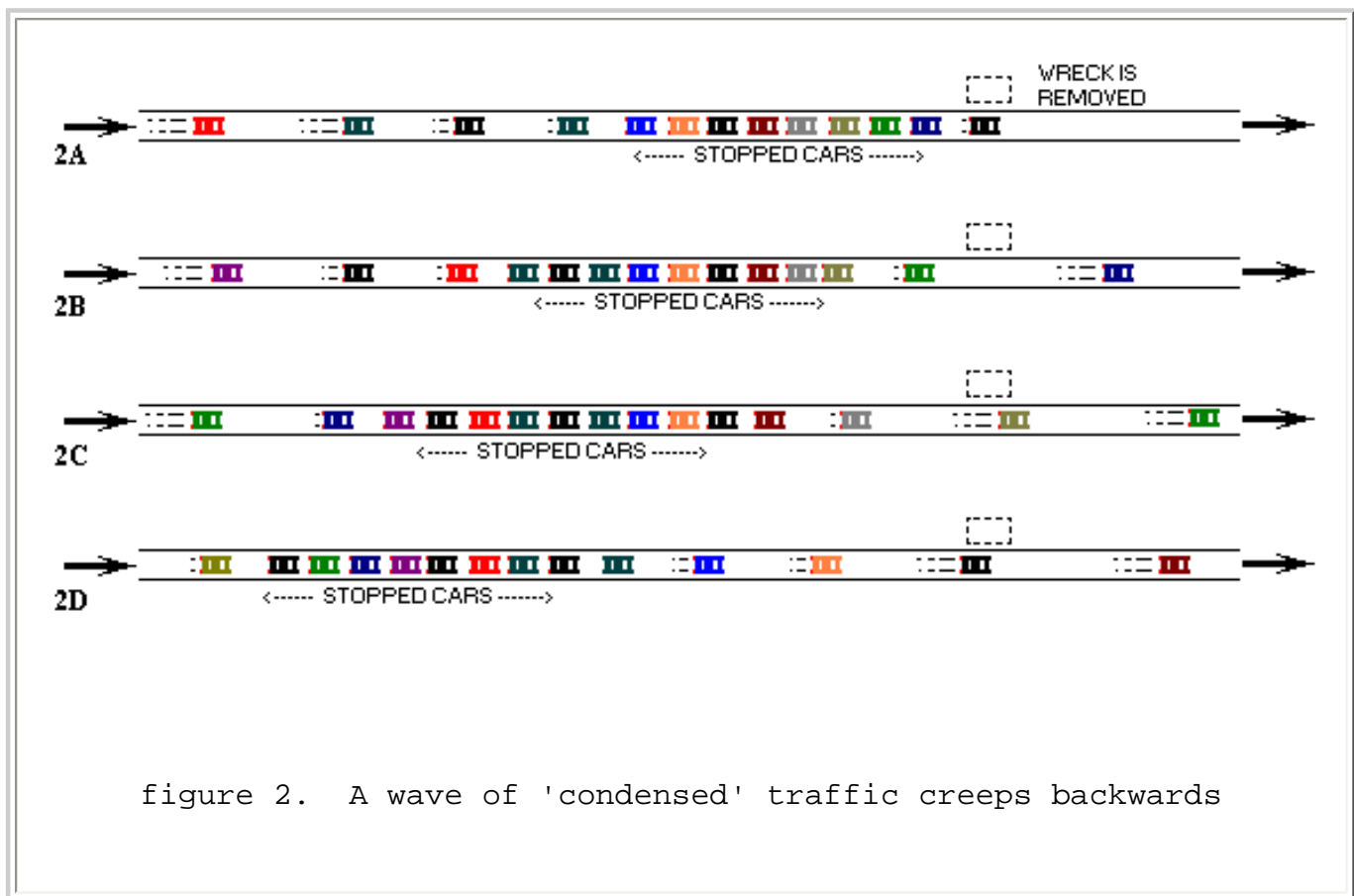


figure 2. A wave of 'condensed' traffic creeps backwards

Refer to fig. 2 above. In the top row (fig. 2A) the flow is suddenly unplugged. But not all the cars can move, since most cars are stuck behind drivers who are stopped. Figure 2B shows the traffic a few moments later, and figure 2C shows it a few moments after that. Notice the orange car in 2A, and see how it eventually becomes unjammed in 2D and begins moving. At the same time the red car in 2A approaches the jam and is swallowed up.

## A MOVING WAVE OF "JAM"

After the wreck is removed, there seems to be no reason for the traffic jam to persist. Yet it does. The reason for this is sensible: if I am stuck behind a car that is stopped, then I have to stop too, and so does the car behind me. All the cars in the jam are in this situation. Even though the wreck is gone, they remain locked at standstill because if they want to move, they ALL have to move at once. They never do, because each driver is waiting for the car ahead to move. If I am in the traffic jam, I'm not going to move forward because I have no room to do so. I'd bump the car ahead of me. We all think like this, so none of us can move.

When the car in front of me leaves, I still cannot accelerate instantly, so I will

remain stopped for a moment. I must delay leaving for a moment. If I started up instantly, I'd stay too close to the car ahead of me, and that would not be safe. Each departing car must delay in the same way, and this causes the jam to "evaporate" starting from the forward downstream end. It evaporates in a wave which begins at the forward end of the jam, (near the wreck). The wave eats into the jam from right to left, yet new cars are piling onto the back end of the jam.

Starting at figure 2A, the cars depart from the jam in sequence. In 2B the wave of "evaporation" has moved away from the wreck site, and in 2C and 2D it is far from the wreck. But notice an interesting thing: even though the CARS THEMSELVES are moving from left to right, the "wave of evaporation" moves in the opposite direction. It moves leftwards as it eats into the traffic jam.

There is a second important thing to notice. While some cars are still jammed, more cars are piling up behind them at the trailing end of the jam. Even after the wreck is removed, more cars are still "condensing" onto the back of the jam. The traffic jam is like a solid object whose front end is evaporating and whose back end is growing like a crystal. Cars move left to right, yet look at the the group of stopped cars. The stoppage is creeping slowly upstream, in the opposite direction to the moving cars. The accident is gone, but a "moving wave" of stopped cars remains behind. It's not a traffic jam, it's a shock wave which propagates through the "automotive material". It's a traffic-clot in the blood vessel. It's a [travelling wave](#) of traffic-condensation.

## NOT CAUSED BY ACCIDENTS

These sorts of travelling waves are common during heavy traffic conditions. An accident isn't needed to create them, sometimes they are caused by near-misses, by people cutting each other off, by [merging lanes](#) at a construction site, or simply by extra cars entering from an on-ramp. In traffic engineering lingo, they can be caused by "incidents" on the highway. A single "rubbernecker" could cause one by momentarily stopping to look at something interesting. Whenever you slow way down in order to merge across a lane to get to your upcoming exit, YOU could create one.

Sometimes the traffic waves have have [no real cause at all](#). They appear because tiny random motions can trigger large results. They are like sand ripples and sand dunes, and they just build up for no clear reason. They are like ocean waves caused by the steady breeze, or like the waves which move along a flapping flag. They just

"emerge" spontaneously from the writhing lines of traffic. In the science of Nonlinear Dynamics this is called an [EMERGENT PHENOMENON](#)."

How long will the "traffic wave" last after the accident is cleared? Its lifetime depends upon the amount of traffic, and on the number of cars trapped in the jam, but sometimes these things can persist for many hours. When traffic is slight, the traffic jam might shrink rapidly to nothing. But if traffic remains heavy, then there's no reason for the travelling wave to ever dissipate at all. Also, if the conditions are just right (if the "condensation" happens faster than the "evaporation",) then even a tiny wave could grow large and larger. Sort of like dropping a tiny seed crystal into a supersaturated solution. When traffic is heavy and unstable, slight braking by a single driver can cause the traffic to freeze into a gigantic crystal. Like Kurt Vonnegut's end of the world story [CAT'S CRADLE](#) it's the "Ice Nine" of the highways.

So, next time you are commuting and you approach a stoppage, don't think of it as a stupid f@#\$% traffic jam. Think of it as a pressure wave which has approached your car and engulfed it. Think of it as a simple living thing which is composed of cars rather than molecules. Stay hopeful that the Crystalline Amoeba poops your car out soon. Take an aerial viewpoint, and visualize the wave which is moving backwards as you move forwards.

## [PAGE 2: TRAFFIC EXPERIMENTS](#) and a possible cure for certain types of traffic congestion

Also see [Frequently asked questions](#) and [visitor comments](#)

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a great little program, \$25, try their free eval version.

[FYI SEE: [idleworm](#), [how to animate](#)]

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Created and maintained by [Bill Beaty](#). Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

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# Unwise Microwave Oven Experiments

[William J. Beaty](#)   [U. Washington](#)

This page is intended for an adult technical audience, and has a [RSACi](#) rating of V4. If your kids can see it, then you are not using an Internet Filter to block adult content.

**Are you a kid? Does your microwave oven belong to your parents? If so, then don't even THINK about trying any of these experiments. I'm serious. If I wreck my microwave oven, I can buy another. Also, I'm a professional electrical engineer. I know enough physics and RF effects to take correct safety precautions when I'm experimenting. But you don't know the precautions, so you should be smart: read and enjoy my writing, but don't duplicate my tests unless you grow up to become an electronics tech, engineer, etc., and buy your OWN microwave oven.**

Disclaimer: This information is presented for your information only. Anyone who tries to duplicate these demonstrations does so entirely at their own risk. There is a chance that you will damage your microwave oven. There is a chance that you will cause a fire. There is a chance that a heated object will explode. Heated water can unexpectedly burst into violent boiling. Messing with a microwave oven is stupid if you don't know what you're doing.

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  - [Candle spews "Ball Lightning"](#)
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- [Microwave oven myths](#)
  - Do Microwave Ovens cook from the inside out?
  - If I put a fork in the Microwave, will it destroy the oven?
  - What about the dangerous radiation?!!
  - Aren't these ovens tuned to a special frequency so they only heat water?
  - Don't you need distilled water to cause superheating and "explosions?"
  - Why no microwave space heaters?
  - Doesn't microwave energy lower the food's nutrition?
  - Corona discharges? High voltage? Balderdash!
  - How do microwave ovens work?

## AN UNWISE SCIENCE PRESENTATION

Organizations in Seattle can request the microwave oven presentation via the U. of Washington [Speakers Bureau](#). See some [comments](#) from a recent presentation.

- I nuked the fruit flies on the food, but they survived!
- "Microwave ball lightning" didn't work.
- Why does the turntable sometimes rotate backwards?
- [How do microwave ovens work?](#)

---

[main page](#)

### Microwave Magma: a lava flow of liquid Pyrex

A guy who repairs microwave ovens once told me that an oven burned a hole through a Pyrex measuring cup. The cup had boiled dry, and apparently the microwaves attacked the glass. Yet glass is mostly transparent to microwaves, so it shouldn't heat up. WTF?!!

Then I remembered a little trick that physics teachers perform. First they connect a glass rod to 120VAC cables. Then they heat the glass rod with a blow torch until it becomes red hot between the

electrical connections. Glass is full of sodium or boron ions (charged atoms,) and glass becomes a conductor when softened. The ion charges become unlocked and movable. As it's heated with the torch, the red hot glass suddenly draws significant current from the electric outlet, it turns yellow hot, then white, then incandescent blue-white. It burns in half (if your circuit breaker doesn't trip first!) For a moment it acts like a light-bulb, but with a glass as the glowing filament.

Hmmm. So... if something were to heat a tiny spot on the glass to nearly red hot... the glass would become a good absorber of microwaves? It then might quickly become white hot, heating the surrounding glass to red hot, which would also absorb microwaves and begin heating. An "outbreak" of melting would occur, like a microwave-powered forest fire slowly moving through the glass. It only needs a trigger. (Also the oven needs to be empty of every other object, otherwise most of the wattage will end up elsewhere, rather than in the glass we wish to melt.)



Torch a little hotspot...



...pop it in the ol' nuker



...sit back and enjoy.

It works great! Just use some method to heat a small spot on the rim of a pyrex custard dish to red hot, slam it instantly into the oven and hit "start." The tiny red glow will increase wildly. Just remember to shut it down before the advancing "lava flow" runs to the bottom of your oven and burns off the paint. Obviously this is somewhat dangerous as a demo. If you don't already know the hazards (such as trapped internal strains and high-velocity shrapnel), then messing with this procedure would be extremely Unwise.

**LAVA CHAMBER:** I got a hunk of porous red rock used as "decorative stone" under some shrubbery. I'm told that it's probably slag from the iron industry. Would the stuff turn conductive when hot? Lets find out! I put it on a small overturned flower pot in the oven, then heated a small spot to orange heat, then slammed the door and started it up. The orange heat died away. It seemingly went dead. But then my intuition kicked in: wouldn't the surface radiate away the energy, while deeper within, the material was still absorbing microwaves like crazy? The hot region... should MIGRATE! It should move into the center of the rock where plenty of RF is heating it, but where it's surrounded with nice insulating, non-microwave-absorbing rock. Let's let it cook and see what happens. Hmmm. Inside the pores in the rock I see something red. Now it's yellow. Now there's a crevice. The whole side of the small rock splits open, collapses, revealing the interior of a white hot miniature magma chamber. An orange river of magma pours forth! I stop the oven, and the flow halts before it gets to the bottom. Through the open door I can feel the radiating heat on my face. Hope it doesn't set the painted metal walls on fire!

**REAL MAGMA:** Next I triggered some heating in a small piece of obsidian. I hoped to re-liquify some actual lava, rather than melting the manmade materials above. But I didn't remember an important fact: Hawaiian volcanos slurp outwards, but magma from American volcanos is more like a white hot jet engine filled with powdered glass... because American lava is full of dissolved gas. Sure enough, the black obsidian melted in the microwave oven. Sure enough, it expanded into a large white puff of glass foam, sort of like a popped popcorn kernel.

**BEER BOTTLE:** Yes, with care you can heat a spot on a glass bottle to red heat but without shattering the bottle. And yes, the microwave output of your oven will then raise it to incandescent white hot, melting a hole right through. And yes, during cooling the bottle will shatter, launching hot fragments all over the kitchen.

Also see on Usenet:

[Molten lava in your microwave](#)

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## They're Heeeere!

Years ago I was living with roommates, and while working in the kitchen I noticed that the fluorescent light over the sink was about 8 inches long. A light went on in my brain ;) because I'd always wondered what would happen if a fluorescent tube was placed in a microwave oven. In theory the standing-wave RF energy should have enough voltage to ignite the mercury vapor into a plasma, and the lamp should light. But standard ovens put out at least 500 watts, so the tiny fluorescent tube should light quite brightly, to say the least. I'd never before encountered a fluorescent tube which was short enough to fit in an oven. So, I pulled out the tube, stuck it in the oven, said "THEY'RE HEEEEEEERE!" , and punched the ON switch. Sure enough, the kitchen was lit up by a blue-white blaze of light coming from the front of the microwave oven. I only let it run for about 1 second, but this was enough to heat the fluorescent tube so it was too hot to touch.

(Yeah yeah yeah, I know I'm reeeeeeally old, and most young whippersnappers never saw all those ads for the movie "Poltergeist," where the young daughter looks at the screen of the misbehaving TV set and says "they're here." )

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## Candle spews "Ball Lightnings"

In the late 1990s, someone on the [Cold Fusion research](#) forum mentioned a rumor: that if you [cook a lit candle](#) in your microwave oven, it will emit large buzzing goutts of plasma which will crawl around on



the upper surface inside the oven. Yowza! So a large number of people tried this... without success. Only one person saw it happen, but nobody else could duplicate it.

Finally someone on another forum discovered the secret: high oven power, and [carbon impurities](#)! If your microwave oven can put out significantly more than 500 watts, and if you stick a bunch of charred toothpick fragments in the top of a lit candle... then sure enough, the candle will intermittently spit out orange "flames" made of plasma. The plasma rises immediately to the top of the oven and crawls around. When it winks out, the candle will emit another one.

Over many months, several people discovered easier ways to trigger the production of these "microwave plasmoids," including using graphite rods from mechanical pencils, or even using a lit cigarette. Check out the various [links](#).

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## Cuppa burning plasma

Electric arcs can develop inside a microwave. The strength of the e-field inside the oven chamber can be described as "high voltage." Once a high-volt electric arc has been triggered, it will absorb energy from the microwave field. Sometimes it can break loose and fly around the oven like a "ball lightning." One way to trigger this effect is described above: place a lit candle inside the oven. Use a wide and stubby "votive candle" and stick some short pieces of charred toothpick into the top of the candle to supply some "seeds" of carbon (or ions?) for initial arc attachment.

A wandering electric arc can be captured in an upside-down container, J.L Naudin has some GIFs of this effect on [his site](#). I tried it with a Pyrex measuring cup and it works! The cup became quite hot after only a few seconds of contact with the "plasma", so perhaps you shouldn't run it for very long. Or, if you have an old oven that you don't mind destroying, find out what happens when you run it for many minutes. Maybe you can melt the cup into incandescent glass-lava. [NEW: after about 30 seconds the cup goes "snap" and falls apart into shards. Apparently the plasma is as hot as a blow torch, and it shatters the glass.]

I supported the inverted cup-measure on three small paper cups. My candle was about 1in tall and 1in wide. I stuck several pieces of charred toothpicks into the top, lit the candle, then placed it below the glass container and shut the door.

The oven ran for a short time before the candle flame began creating eruptions of plasma. (If yours doesn't work, move the candle to another spot in order to locate a "hotspot.") Some of the plasma flickers blew away because of the oven fan and were lost, but finally one rose into the glass mug. The "plasma pool" fills half the cup and makes a loud 120Hz buzzing noise. It initially is dull orange, but then it changes color to pinkish blue. This color resembles the color of a glassblower's torch when borosilicate glass is being heated. Perhaps it's boron emission lines, or perhaps the color is associated with nitrogen/oxygen emission.

**NEW EXPERIMENT:**

I used honey to adhere some salt (NaCl) to the inner surface of the pyrex cup in hopes that I'd see some yellow Sodium light. This works well. At first the captured plasma blob turned pinkish blue, but then a wave of brilliant yellow/orange light passed through it. This effect repeated several times, and I suspect that salt crystals are falling off the glass surface and passing through the plasma, releasing sodium ions as they go. Other salts to try: salt replacement (potassium chloride), copper sulfate, borax, epsom salts, perhaps even strontium chloride for red color. Search for info about fireworks colorants.

**IMPROVEMENT:**

See Matt Crowley's paper on [Bigger Better Balls](#)

**LESS WISE EXPERIMENT:**

Years ago there was a news story about a new kind of efficient light source: a quartz capsule of sulfur which was blasted with microwaves. What will happen if the above salt crystals are replaced with powdered sulfur? Blasts of intense white light? I haven't tried it yet. **[NOW I DID! No brilliant light. Instead, the plasma forms, then the sulfur reacts with air to create a cloud of acrid gas. Sulfuric acid?! Suddenly I find that I can't breathe the air in my kitchen. Hold nose, turn on the fans, and leave the house at a run!]**

To try next: put a tiny hole in the upside-down glass cup (or perhaps use a chemist's funnel.) Will the pool of plasma drain out upwards through the hole? Or will the oven keep making more plasma as bits leak out? If I had a ceramic tube, could I guide the plasma through a hole and outside the oven? Home-built plasma torch!!

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## Snifter of Neon

While working on a microwave article for an encyclopedia decades ago, it crossed my mind that it might be possible to map the pattern of RF energy in the oven by filling it with low pressure gas. The gas would glow in proportion to the RF electric field in various parts of the oven's volume. (There are better ways to do this, some below.) This would be an involved bit of construction to pull off, so I did the next best thing. I grabbed a big bag of NE-2 neon pilot lights and stuck them into a wineglass, hoping that this small volume would show some patterns when the glass was rotated by the oven's turntable. I filled the glass with water, to give the oven something to heat so it wouldn't be damaged by the small load presented by the bulbs. I ran the oven, and the bulbs glowed REALLY BRIGHT. As the turntable turned, various bulbs extinguished and others lit up. However, I could see no coherent patterns. When I emptied the glass, I discovered that several of the bulbs were stuck together. The short metal leads of some bulbs had melted into the glass of adjacent ones. Also, several of the bulbs had small holes melted through their glass, and were full of water. Apparently the plasma temperature was so high that it heated the glass to melting. Or, possibly some corona discharges developed between the inside and outside of the bulbs and burned through the glass. Hot glass is conductive, so the arc would continue once started.

## Foil-eating Plasma

I'd seen electrical flames produced by microwave ovens before. In the strong RF field, even the tiniest flame will absorb a large percent of the many-hundred-watts oven output and grow large. Thousand watt candle? So, I decided to try initiating an electrical flame-discharge intentionally. I tore aluminum foil into 2" squares, crumpled it lightly so it didn't lay flat, then placed it on the oven turntable with the two foil pieces adjacent to each other and in gentle contact. Sure enough, when the oven was turned on there was a loud buzz and a bright light, and a flame erupted from the contact point between the two pieces of foil. When I looked in on them, I found that the brief flame had eaten a bite about the size of a dime out of both pieces.

Note: on some ovens the air from the fan will blow the foil around. **DON'T SEAL UP THE FAN OUTLET!!!** Instead, tape the foil down to the glass turntable. The air from the fan is hot because that fan is being used to cool the magnetron tube. If you block up the fan, the microwave generator will have a meltdown!

## Miscellaneous Light Bulb in the Microwave

My 8" fluorescent tube isn't the only light producer. Another classic u-oven experiment is to cook a standard incandescent bulb briefly on "high". A 100W bulb will light up with more than normal brightness.

If you have a newer oven with rating over 800W, include a glass of water in the oven, otherwise the filament support wires will instantly melt and spoil your fun. Even with the water, don't run this for very long, since ALL the lightbulb wires glow white hot, not just the filament. This could shatter the bulb. For best results, buy a transparent bulb rather than a frosted bulb, then watch what happens inside. If you include a glass of water, the bulb makes purple discharges. If you DON'T include water, the bulb makes many colors as the metal wires melt or turn into incandescing vapor. I've had the glass of bulbs be melted and burst \*outwards.\* Apparently the pressure in the bulb rapidly becomes higher than atmospheric pressure.

There is an interesting bit of physics here: first the filament and its supporting wires glow white hot, but then they cool again. Bright blue beams leap from the tips of the filament supports and extend outwards to the glass, with bright "stars" of incandescence at the tips of the wires (many watts of Saint Elmo's Fire, like Nikola Tesla's 'carbon button' lamps!) This is a plasma discharge in the argon/nitrogen gas that is found inside all standard light bulbs. It's similar to [Plasma Globe](#) devices such as "eye of the storm", but 500 watts worth, which heats the glass red hot, and may melt the tips of the steel filament supports, or soften the glass so it is crushed by external air pressure! Another one: elgersmad suggests trying xenon flash tubes.

Note that most of these objects become intensely hot, so don't prop them up on a plastic object. And as usual, if this damages the microwave generator in your oven, don't come whining to ME! You know the risks, or you wouldn't be messing with this stuff. Go buy a huge old microwave oven for \$5 at a garage sale, experiment with THAT.) Better check for door-leaks first!

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## Mapping the Energy Nodes

Microwave ovens cook unevenly because a pattern of standing waves forms inside the oven chamber, and the pattern creates an array of hotspots throughout the oven's volume. An operating frequency of around 2000 MHZ will produce a wavelength of around 10cm, and the hotspots should be at halfwave points, or every 5cm, but in a complex 3D pattern. I'd always wondered how this could be visualized. Perhaps fill the entire oven with raw eggwhites, then let the oven cook them into an interesting, white, rubbery 3D sculpture? Or fill the oven with solid wax, and let the RF hotspots melt out a 3D structure of holes? Finally someone figured it out:

Alistair Steyn-Ross and Alister Riddell, STANDING WAVES IN A MICROWAVE OVEN, *The Physics Teacher*, October 1990, Vol. 28 No. 7 pp474-476

Steyn-Ross and Riddell were stimulated to investigate the pattern of melted cheese on a "mu-oven" cooked pizza. They hit on the use of Cobalt Chloride soaked paper. When wet,  $\text{CoCl}$  solution is pink, but turns sky-blue when dry. (It's sometimes sold as "weather indicator" paper.) They discovered that this worked beautifully, and a large square of the paper would give varying patterns of pink and blue when supported at different heights on a tile of cork within the oven. The pattern is temporary, and disappears as the paper dries entirely. Also, cobalt chloride is poisonous, and should not be used around young kids.

More recently, J. E. Slone of Virginia tells me that thermal FAX paper can be used for the same thing if it is slightly moistened. When placed on an insulating plate within the microwave oven, the hotspots heat the water to boiling which creates a permanent image of the standing wave pattern. Kool! Both of the above experiments will only work if your oven lacks a "stirrer," a fan which wiggles the hotspots and spreads them out. If your oven has a rotating turntable, it usually lacks a stirrer.

[main page](#)

## Danger: Coffee Explosion

You warm up a mug of water for a few minutes in the microwave oven. You take it out, then you dump in some powdered coffee, tea, sugar, etc...

DOOSH! The water explodes in roiling foam, spraying boiling water all over your bare skin, and sending you to the emergency ward. I hate it when that happens.

Heating up water or coffee in a microwave oven can be dangerous, especially if you use a ceramic mug or clean glassware. Water sometimes "explodes" because the oven heats it to a temperature that's far hotter than the normal boiling point. When this occurs, any tiny disturbance can trigger some violent boiling. The stored energy of the above-100C water is released as a steam explosion. This DOESN'T happen when water is boiled in a pot on the stove. The difference: a stove creates small hotspots on the bottom of the pot which are far above 100C degrees, and these hotspots continuously trigger a roiling boil which cools the rest of the water down to 100C.

Whenever there are bubbles of steam zipping up through the water, those bubbles provide some surfaces which allow the water to make more steam, and as steam is created, the water cools down to 100C. In fact, water can only "boil" at places where the water surface touches a gas. If there are no bubbles already formed, then "boiling" will only happen at the top surface of the water and not down within it. So, whenever you heat water on the stove, the extreme temperature at the bottom of the pot causes tiny bubbles to form. The boiling water fills those bubbles with steam. The roiling bubbles act to cool the water and keep its temperature at (or below) 100C/212F degrees.

Things are different in a microwave oven. The water gets hot but the container usually does not. There are no tiny "boiling-bubbles" triggered by a hot stove burner. Without those bubbles to cool it, the temperature of the water can rise far higher than 100C. We call this "superheated water."

Superheated water is just waiting for some sort of trigger which will let bubbles form and allow boiling to commence. If the water becomes hot enough, a few bubbles will appear near the top, but these quickly rise and burst, and the water isn't cooled much at all. Even if your mug of water is bubbling slightly, don't trust it, since its temperature has risen so high above 100C that bubbles are appearing spontaneously. If some unwitting victim should pour powder into the superheated water, this will carry thousands of tiny air bubbles into the water. Each of these micro-bubbles expands into a large steam bubble, and the result is a huge "explosion" of hot froth. It's just like dumping ice cream into rootbeer, but the froth can be so violent that the hot water sprays into the air.

Even more dangerous is to boil water TWICE in a microwave oven. Most containers have tiny scratches in their surfaces, and these crevices contain air. When you heat water, these tiny air pockets will provide a constant stream of "seed bubbles" which allow normal boiling to occur. However, the air in these tiny bubbles within the cracks quickly gets replaced by steam. The crevices still produce

seed-bubbles, but if you turn off the oven and let the water cool, the steam in the cracks will collapse and vanish, and the crevices fill with water. The seed bubbles are gone. If you now turn the oven on again, the water will superheat. Boiling your coffee twice can erase the bubble "nucleation centers." If your luck is bad, the water will superheat to a very high temperature, then explode violently when a single huge steam bubble spontaneously appears. If that bubble should start out at the bottom of the container, the explosion can fling the entire volume of hot water upwards. A few people have reported that sometimes the explosion is so violent that it makes a sharp noise, and can even crack a glass container.

**MOST DANGEROUS:**

- BOILING PLAIN WATER...
- IN A CLEAN SHINY CONTAINER (MUG OR PYREX)...
- BOILING IT MORE THAN ONCE (LET IT COOL BETWEEN BOILINGS)...
- COOKING IT EXTRA LONG (STORES LOTS OF ENERGY IN SUPERHEATING)...
- REMOVING IT IMMEDIATELY (NO CHANCE TO COOL DOWN)
- DUMPING IN SUGAR, CREAMER, A TEABAG, ETC. (SUDDENLY ADDS SEED BUBBLES)

If you avoid the items on this list, you'll probably never see a "coffee explosion." On the other hand, the above list is a "recipe for disaster." **DON'T BE TEMPTED TO FOLLOW IT.** Instead, here's a simple, **HAZARDOUS** experiment to try. Wear safety goggles, and don't heat the water for an excessive amount of time.

Fill a clean mug about 1/3 full of clean water (**DON'T FILL IT TO THE TOP!**), then heat it for about five minutes in the microwave oven. Now carefully take it out and immediately plunk it firmly onto the tabletop (whack it hard, but not so hard that it breaks.) The boiling water will burst into froth. **DON'T BURN YOURSELF!** The superheated water acts almost like warm carbonated cola: if you strike the container, it will foam up instantly.

Another trick: heat up the water to boiling again, remove it from the oven, then immediately insert a dry wooden coffee-stirrer, or a wooden popsicle stick into the water. Foosh! The water boils violently. The dry wood contributes a layer of air to the water, and the air fills with steam and expands into a mass of hot foam.

Another: heat up the water again, then pour a little bit of warm tap water into the superheated water. The water suddenly boils violently! It turns out that the tap water is full of tiny bubbles. If you let the tap water stand around for half an hour before pouring it into the superheated water, all the tiny bubbles in the tap water will have risen and popped, and the bubble-free water won't trigger any violent boiling. And if you then dissolve some salt into your "bubble-free" tap water, again that water **WILL** trigger boiling, since the salt contributes invisibly small bubbles.

Hmmmm. I wonder if de-ionized distilled water in a **REALLY CLEAN** container will superheat even

more than normal? (DANGER, SUPERHEATED WATER CAN BURST OUT OF THE MUG AND SCALD YOU!) I wonder what would happen if we used vacuum-degassed water, or if we put some dishwashing soap in the water...

**SAFETY WARNING:** Treat microwave-boiled water with respect. It can "explode" without warning. You can "defuse" it by CAREFULLY inserting a dry wooden stir-stick or toothpick in order to trigger boiling. Don't dump any sugar in a mug of superheated coffee, or the spewing foam \*really\* gets violent. Don't try to boil liquids more than once, since that removes the tiny bubbles on the container surfaces which act as boiling centers. If you're going to re-heat a previously heated mug of liquid, cook it with a wooden stir-stick or wood chopstick which allows it to boil normally. Always allow bubbling liquids to cool for several minutes before adding anything to them (or perhaps reach over and carefully drop in a dry toothpick or a wooden stir-stick to force them into normal boiling mode.)

PS

Certain types of foods have no bubbles inside, and these foods will superheat and "explode." For example, never cook a whole unbroken egg in a microwave oven. The explosion isn't just messy, sometimes it's violent enough to smash up the inside of your oven or tear off the door. Paste-like canned foods easily superheat since they're too thick to allow streams of tiny bubbles to form. Canned spaghetti sauce is famous for superheating and causing those "BOOMF" mini-explosions that spray the sauce all over the oven. (I wonder if there's any cure for the "Spaghetti-O explosions?" Maybe whip the stuff with a fork before cooking, so lots of air is added? Mix it with dry bread crumbs or other material that's full of air?)

- [Flash-boiling experiment](#)
- [How things work: exploding coffee](#)
- [FDA: Erupted hot water phenomenon](#)
- [Superheating](#)
- [Superheating and microwave ovens](#)
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## CLASSICS

There are many other excellent microwave demos on [other sites](#). Stand up a CD in your oven and nuke it for about five seconds. Or convert Marshmallow Peeps into monstrous mutants. Slice a grape almost in half and watch it emit a six inch blowtorch of flaming plasma. Make showers of sparks with steel wool. Swell a chunk of Ivory soap into a blob of crunchy snow. Gamble on racing grapes.

Google search on:

- [CDROM](#)
- [Peeps](#)

- [Grape](#)
  - [Steel wool](#)
  - [Soap](#)
  - [Grape racing](#)
- 

## Untried experiments

Generate a glob of soot from burning paint thinner. Replace the air within the soot ball with pure oxygen, or ozone, or nitrogen, or argon. Place it within an active microwave oven. Is a Ball Lightning plasmoid created?

Light a candle and place it in the oven. Does the RF energy make the candle flame grow huge? If you place various metal salts on the wick, will the colored candle flame absorb RF energy better? Or, try running a wire up through the candle so its tip is in the flame. Any effects? There are reports of "[ball lightning](#)" being generated from candles, burning toothpicks, and burning plastic in Microwave Ovens.

Partially inflate a balloon with argon. Release the argon to purge the bit of air that was in the balloon, then fill it with pure argon. Carefully insert a wire up into the balloon so the wire tip is near the center of the sphere. Tie off the balloon. Place it on a plate in a microwave oven and turn it on. This should create a 700 watt "plasma ball" effect. However, it might also pop the balloon instantly. The tip of the wire will probably be melted by the intense corona. Anyone for "Kirlian photography" which vaporizes the object being photographed? If the balloon pops instantly, try the same thing by using a plexiglas box. (note: glue fumes wreck the effect, so hold the plexiglas together with tape.)

Try the [infamous Microwave Powered Water-Fueled Lawn Mower](#). Do huge pulses of EM really extract energy from a mysterious source within water? [Dr. Graneau](#) says that high current discharge through liquid water produces numerous anomalies. Laugh if you wish, but only the real world can supply the real answer. "Let the experiment be Made!"

[More and weirder non-microwave experiments](#)

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Other microwave oven sites on the WWW:

## Microwave oven Ball Lightning

Ball Lightning triggers

- [Jon's tricks](#), plus earliest mention of candle in uW
- [Crowley: Bigger Better Balls](#)
- [C. Willis](#)
- [Neon HV transformer](#)
- [Naudin 1](#), and [2](#)



- [Microwave Phenomenon Page](#)
- [MW Oven Ball Lightning](#) messages
- [Ball Lightning](#) page
- [More Microwave BL](#)
- [Abstract: Golka1.html](#) from [Atmospheric Electricity Page](#)
- [Microwave oven BL](#), from [Keelynet](#)

## Misc sites

- [Microwaved Peeps!](#)
- [Make diamond powder](#) in your kitchen
- [One Hundred NE-2s in a microwave](#)
- [High voltage cooking](#)
- [Hochwald](#) safe/unsafe experiments
- [Microwave chemistry](#)
- [Hans H. Microwave Experiments](#)
- [Microwave oven as foundry furnace](#)
- [SVB x LABS](#)
- [Ask a scientist: microwave ovens](#)
- [Microwave oven safety](#) (fda.gov)
- CD + MW oven + [TESLA COIL!!](#)
- [Votnet](#)
- [Experiment: use MW oven to make gases](#)
- [CD Toasties](#)
- [Microwave oven lecture demo](#)
- [Funny things w/microwave](#)
- [Glubco](#), far more "unwise" than I!
- [Fun with Grapes - A Case Study](#)
- [Grape Racing!](#)
- [T.W.I.N.K.I.E.S. Radiation Test](#)
- [Jon's microwave games](#)
- [CD-ROM's in the Microwave](#)
- [Microwave Oven Q & A](#) at HOW THINGS WORK
- [Microwave Oven FAQ](#) at sci.electronics.repair
- [Microwave Acoustics](#), w/refs on microwave hearing
- [Microwave Oven info](#), FAQs, repair
- [Microwave Ovens and Safety](#)
- [Microwave Oven Reaction Enhanced Chemistry](#)
- [Microwave Oven](#)
- [Microwave Oven Radiation Leakage](#)

- [Microwave Furnace Development](#)
- [EEED Medical Technology](#)
- [SVBx Labs](#) (archive.org)

## Some Microwave Oven Myths

### Q: Do Microwave Ovens cook from the inside out?

A: Nope. Food is partially transparent to the radio waves, so the energy is able to shine through it. But at the same time the waves are partly absorbed by the food. Usually most of the heat is produced in an outer layer about an inch thick. So, large pieces of meat will be quickly cooked to a depth of about an inch, while the inside portions are cooked by heat conduction, just like in a conventional oven. This effect is different for different foods of course. If a food is mostly water, then only the outside inch cooks at all. If a food contains both air and water (like bread, cake, etc.,) then the radio energy penetrates all the way through, and the food gets heated everywhere, even deep inside.

### Q: If I put a fork in the Microwave, will it destroy the oven?

A: Nope, this is a myth, but it has some roots in reality.

In order to safely use metals inside a microwave oven, the cook has to learn numerous complex and mysterious rules in order to avoid fires and undercooked food. For example, thin metal will heat up fast in the oven, and may cause fires. The famous problem of the staple in the paper popcorn bag comes to mind, where the staple heats up and sets fire to the bag. And if a metal object in the oven is lightly touched to another one, or touched to the metal wall of the oven, an electric arc might ignite at the contact point. If not stopped it can set fire to the oven. In the higher power ovens when the amount of food is small, [sharp points](#) on metal objects can initiate a corona discharge, a "Saint Elmo's Fire," which behaves the same as a flame and can set fire to the food and the oven if allowed to continue for long.

So, it's much easier to totally ban the use of metals in microwave ovens. The alternative would be to send everyone to school to learn the complicated rules!

### Q: What about the dangerous radiation??!

A: Microwave ovens don't use "radiation." Instead they use radio waves.

Usually when we talk about radiation we mean radioactivity or "Ionizing Radiation," gamma rays and high energy subatomic particles. Microwaves aren't high energy, the microwave photons less energetic than visible light. Yes, if the source of microwaves is a very "bright" source, it can cook food. If normal light is very bright, light can also cook food (think of those solar ovens used by campers.)

Note that technicians and scientists talk about "microwave radiation" in the same way that they talk about "optical radiation." Optical radiation is just another word for VISIBLE LIGHT. They're using the word "radiation" to mean "waves." In this sense light is radiation, the warmth of an electric heater is radiation, even radio waves are radiation. And when you speak, some "acoustic radiation" comes out of your mouth. But radioactivity is an entirely different thing. Microwave radiation doesn't sterilize your reproductive organs like high-energy X-rays would. (An oven with a damaged door can only cook you!)

Speaking of that, how can you tell if your microwave oven is safe? There's one simple way to detect a major leak microwave. Get a fluorescent tube and hold it near the edges of the oven's door when the oven is on. Microwave leakage will make the bulb glow. (Do this in a darkened room so you'll see the slightest glow.) This works much better if there is nothing at all inside the oven. If you own an older oven (pre 1980s) you might want to include a glass of water. However, this method only shows the larger leaks. Your oven might be leaking too little, so it won't light a fluorescent tube. To catch even the smallest leakage, you need a "microwave leakage detector." Search the web for these. I've sometimes seen them [on eBay for \\$10.](#)

**Q: Aren't these ovens tuned to a special frequency so they only heat water?**

A: No. The usual operating frequency of a microwave oven is far below the resonant frequency of water vapor... and liquid water doesn't have a resonant frequency. Also, the radio energy in a microwave oven can heat many other substances besides H<sub>2</sub>O. Water isn't special. For example, drops of grease on a plastic microwave dish will be heated far hotter than 100C, and this causes the mysterious scarring which frequently occurs on plastic utensils. Any molecule which is "polar" and has positive and negative ends will be rotated back and forth to align with the changing e-field of the radio waves in the oven. The vibrating electric field of the radio waves vibrates the oil and water molecules and any other polar molecules within the food. Jostling molecules equals heat! Microwave ovens have difficulty melting ice, presumably because the water molecules are bound together and cannot be easily rotated by the e-fields.

If liquid water had a narrow resonant frequency, and if the oven was tuned to this frequency, then the water would be far more opaque to the wave energy. The water in the food's thin surface would absorb all the energy, and only the outside surface of foods would be heated. The thin outer surface of meat would become a blast of steam, and the inside would remain ice cold. [Perhaps the oven would act like a normal electric oven, charring the outside but only heating the inside very slowly.] But because water does not resonate with the microwave frequency, the waves can travel an inch or so into the meat before being absorbed. Microwave ovens heat a thick layer of meat, not a thin layer.

Another note: single H<sub>2</sub>O molecules have a sharp resonant frequency, but liquid water does not. In order to have a distinct resonance, a water molecule must be alone in space, not bound to billions of identical neighbors. The bonding to neighboring water molecules spoils

the sharp resonance and greatly widens the frequency band. Liquid water has a huge, wide absorption band, not a single resonant frequency. In other words, water absorbs all short radio waves. Typical microwave ovens don't even use the best frequency. They should be up around 10GHz frequency rather than the usual 2GHz, but that would make the microwave tube more expensive. Here's an article about it:

[Microwave absorption spectrum of liquid water](#)

[EM absorption and Molecular vibration of H2O](#)

**Q: Don't you need distilled water to cause superheating and "explosions?" Impure tap water only boils, it won't explode.**

Ummm. What?

*Of course* impure water can "explode." That's why people get scalded; they re-heat their coffee in microwave ovens and then quickly add sugar. Coffee is extremely impure water! To cause "coffee explosions," you don't need special pure water. All you need is water that lacks micro-bubbles.

It seems that some recent TV show tries to prove that only pure water can superheat and "explode." This is wrong. Probably the creators of that show did not know an important fact: while crystals will grow upon solid nucleation centers, the gas bubbles in cola and in boiling pots grow upon microscopic seed-bubbles. You can't grow crystals unless you have a solid microscopic seed. And you can't boil water unless you have seed-bubbles present. It doesn't matter how filthy your water is, or how many crystal nucleation centers it contains, if it lacks seed-bubbles then it will not boil normally, instead it will superheat.

Clearly this has nothing to do with distilled water. In fact it's very easy to boil distilled water normally, without explosions. First chill and shake up your bottle of distilled water thoroughly. And it's easy to make "impure" water explode. If tap water has had all the bubbles cleared out by earlier boiling or by simply sitting for days in an open container, then it will superheat, and when sugar is dumped in, it will go DOOSH and spray all over.

**Q: I want to buy a microwave space heater!**

Heh. Me too. Why aren't they available? One main reason springs to mind: in your eyes, the cornea and internal lens are very sensitive to heating. Unlike most other body parts, they have no blood vessels to keep them cool. Intense radio waves can give you instant cataracts, so a microwave heater would require that we use special goggles to prevent blindness.

Another problem: a normal heater heats only your skin surface, while a microwave heater heats a very thick layer of flesh. So, with a normal heater you can yank your hand away when you feel pain, and your thin skin cools down almost instantly as the surface heat migrates to fill a thicker layer. But with a microwave heater, you might receive internal burns at the same time that you feel pain on your skin. And when you yank your arm away, then the thick layer of heated flesh wouldn't cool instantly, causing even more tissue damage. And last, a microwave heater is an intense electrical source, and it would probably destroy any radio, cellphone, PDA, or laptop that came near. Lawsuit city!

But here's an interesting link found by Marcus:

Heating homes with microwaves

<http://www.personalmd.com/news/a1996122603.shtml>

### **Q: Doesn't microwave energy lower the food's nutrition?**

I don't know.

On the other hand, I've heard lots of crazy rumors along the lines of "microwave energy turns food into slow poison." Maybe it's true, or maybe all the rumors are just some BS made up by bored storytellers. However, because these crazy rumors exist, we must be on guard against believing them, and we should only trust information if we can get it from people who are up front about where the information came from in the first place. Anything else, and we'd end up believing the liars who have fun by starting rumors, hoping their rumors will catch fire and scare huge numbers of victims.

Just follow the same rule that you follow for crazy spam emails that give you all sorts of dire warnings about various topics. The rule: if the warnings were real, wouldn't it be dead easy for the original email author to *include several URLs* pointing to many articles about the danger? So, if an email doesn't link to real live websites, it's almost always a false rumor being spread by hoaxers. And with any health warning, if warnings about microwaves don't link to news articles or perhaps actual medical journals, almost certainly the author is passing on third-hand rumor rather than a story about a genuine hazard.

Below are a few of my own rumors! With no links to research or online news!

:)

I vaguely recall seeing something in the papers long ago about microwave ovens harming food vitamins. But I don't remember if they said that microwave-cooking is worse than REGULAR BOILING. I don't know if they said that the problem comes from simple overcooking rather than from any weird stuff with radio waves. I've always heard that eating

raw vegetables is best, and cooking destroys vitamins. What happens when you feed people on overcooked or canned food for months? If somebody says that microwave cooking is much MUCH worse than a canned food diet, I'd like to find out WHY they say that. Maybe they're really just warning us about boiled vegetables, but trying to make out like the problem is with the microwave ovens rather than with the boiling. Microwave ovens cook food deeply and quickly, so if you boil your vegetables for five minutes on a stove, they'll still be green and crunchy, but if you boil your veggies for five minutes in a microwave oven, they'll be way overcooked. With microwaves, it's hard to cook only the outside surface of the vegetables. (Now that I mention it, even boiling water doesn't do such a great job. It's better to stir-fry veggies so the inside is almost raw but the outer layer is cooked.

If we need to be warned about any cooking, the warnings must be precise. And fake warnings themselves aren't innocuous. Don't forget, it was a rumor-storm of fake warnings about poisoned candy and razor blades in apples that ruined Halloween trick-or-treating in the US for decades years.

Another issue: microwave cooking unsafe... COMPARED TO WHAT? Life is unsafe. People die from taking showers or stepping on toys, not from eating microwaved food. Think a minute. When you eat browned meat or even baked bread, the browned parts are full of heat- shredded biomolecules which form all kinds of NASTY CARCINOGENS. Yet they seem not to harm people very much (perhaps we've all gotten used to the stuff over the millenia because we've been eating charred food ever since humans discovered fire.) As I understand it, browned food is a dark secret of cancer studies, and if they applied the current FDA regulations to normal foods like bread or BBQ, the government would have to ban cooking. They've been "grandfathered in." Yet perhaps the carcinogens in browned food do occasionally cause things like colon cancer? If they do, then perhaps microwave cooking is much safer than normal ovens, since microwave cooking is akin to steaming, and it's almost impossible to force your microwave oven to shred the molecules on the outside of your steak into tasty brown carcinogens.

Does this mean that microwave ovens are *health-food devices*? Maybe stores should've been selling microwave ovens next to the carrot juicers and wheat-grass kits? I don't know. First I'd want to know if anyone did any microwave-cooking nutrition studies at all, even with lab animals. And as a control, compare the results against such common health dangers like going swimming or (gasp) DRIVING A CAR... or at least compare it against baked bread and fast food hamburgers.

- [Microwave heat ruins broccoli antioxidants](#)

**Q: Corona discharges? High voltage? Balderdash! The watts per cm<sup>2</sup> is too small!**

**A:** Wrong, melted pyrex breath! You're thinking about cooking huge roasts. What happens with EMPTY microwave ovens?

Yes, a typical oven's output might only be 1000 watts or so. And yes, 1000W spread over a few hundred square centimeter does not prouduce strong e-fields. The fields will only be a few hundred volts per cm. (For corona discharge we need around 30,000V/cm.) But you're forgetting something important: the voltage rise for resonant circuits. If there's a huge roast (a significant electrical load) then... 1000W leaves the magnetron, and 1000W is absorbed by the meat. There's a 1000W energy flow between magnetron and food, and the max. e-field inside the oven stays low.

On the other hand, if there's no food in the oven, then the 1000W bounces back and forth, yet the magnetron still puts out more energy. THis adds to the waves already there. It's like wiggling your hand in a full bathtub: energy is stored as standing waves, and the waves build up higher and higher until frictional losses finally halt their growth. Inside an empty microwave oven you might have 50,000 watts in one direction and 49,000W in the other (with the magnetron supplying the 1000W difference.) The interior of the oven is a resonator, and the peak wattage within that space can becom HUMONGOUS, since it only depends on the "Q" factor of the resonator; it depends on the "friction" of the system. Q is high, so huge wattage gives huge voltage. If there's no food and no glass of water in the oven, then the e-fields become intense, and the tiniest burr on a metal object can trigger the formation of a large "Saint Elmo's Fire" which consumes hundreds of watts of RF energy and resembles a blowtorch.

In fact, the empty chamber of a microwave oven is very much like the secondary coil of a Tesla Coil. The only major difference is the operating frequency. RF energy is injected into the resonator, and the output voltage rises and rises until finally the conductors get hot (or until finally an electric arc breaks out somewhere.) Tesla coil secondaries do this. Microwave ovens do this too. With nothing in the oven chamber, either the metal walls and glass parts get very hot, or an electric arc bursts forth from a sharp metal point somewhere inside the oven cavity.

### **Q: How do microwave ovens work?**

**A:** OK, this question doesn't involve microwave oven myths, so I guess this section is becoming a FAQ. Microwave ovens are weird, they were born in a military "black project" dealing with exotic physics. The microwave vacuum tube had its birth in England during World War II, and was the central part of a new secret weapon: radar. Eventually the secret military technology was declassified, and it ended up in appliance stores everywhere. One is led to wonder how many other incredible military discoveries are still sitting unused in that

(perhaps) non-mythical government warehouse seen briefly at the end of the first Indiana Jones movie!

The Klystron and Magnetron microwave tubes both rely on nonlinear effects of density waves in particle streams interacting with solid surfaces and tuned cavities. That's right, they are identical to that bizarre resonant-cavity standing wave generator known as the **EMPTY BEER BOTTLE**.

A microwave vacuum tube is like a whistle. Blow across a glass bottle's orifice, and tiny sound waves within the bottle will cause the air jet from your lips to move slightly. Motions of the air jet create pressure waves in the bottle. Pressure waves wiggle the jet even more. Runaway feedback takes place, and a loud sound is created. If we replace the air with an electron stream in a vacuum, and use a hollow metal bottle, then radio waves will build up in the bottle, and they will deflect the electron stream back and forth. A microwave tube is an electron-whistle which creates a loud "sound" in the form of radio waves. Intense sounds can heat objects, and intense radio waves do the same.

If we start our electron-whistle operating, and then if we try to extract energy, the resonance is ruined and only a little wave-energy comes out. This problem was solved by using multiple "bottles" and a magnet to direct the electron stream across their "mouths". A magnetron tube consists of a central electron-emitter, one or two disk-magnets which cause the electrons to swirl in a whirlpool motion, several tuned cavities with their open mouths pointed into the whirlpool of charges, and a high voltage power supply which moves the electrons along at high velocity. Energy is extracted from just one of the tuned cavities, and this has only a small effect on the resonance of the others.

If you wanted to create an acoustic model of a microwave oven, you could attach a vacuum cleaner to the center of a heavy cylindrical box. Put slots around the edge of the box. The resulting tornado acts to supply the jet of high-speed air that will "play" the bottles. Several glass bottles could then be poked through the sides of the box, inserted into the tornado, and adjusted to give a loud sound. With luck, you might even be able to connect an "exit tube" to one of the bottles, connect the tube to a sealed metal cabinet, then actually heat any objects which are placed in the cabinet. Use really thick, heavy construction materials, otherwise the intense sound would not stay trapped inside your beer-bottle-tron device. It would sound like an air-raid siren.

The speed of light is about one million times faster than the speed of sound. However, audible sound is about a million times lower in pitch than microwaves. The effects cancel out, so the wavelength of the sound waves in glass bottles would be very similar to microwave wavelength. So instead of giving out 1,000 MHz microwave radiation, your device would give out sound radiation that's a few inches in wavelength (just like microwaves,) but a million times lower in frequency, or about 1000 Hz.



**Q: I nuked the fruit flies on the food, but they survived!**

I noticed the same thing. There are several possibilities. First, the pattern of heating inside the oven is NOT uniform: there are hot spots and cold spots, and the hot spots don't touch the metal walls. If a bug crawls on the oven surface, it's fairly safe. Also, if you're cooking a large hunk of food at the time, then this food absorbs the RF energy like mad, and insects won't get as hot as when the oven is totally empty. Also, insects have built-in behavior to avoid being cooked by sunlight... if they feel hot, they crawl faster, and if the heat stops, they stop too. Perhaps when you turn on the oven, all the bugs move until they hit a cold spot in the radio wave pattern, then they stay in that spot. (If a bug was on the rotating glass platter, then it's out of luck.)

**Q: I tried making "microwave ball lightning." It didn't work.**

For better results, try it with carbon fiber: [carbon "veil"](#) from a plastics supplier or fiberglass supplies store. JL Naudin finds that the sharp carbon stick from a mechanical pencil also works well.

The demo with the burning candle requires a microwave oven with a turntable inside. The turntable carries the candle into a "hotspot" in the oven, then plasma bursts forth. Without a turntable you might have to spend twenty minutes moving the candle to different spots. Also, I find that my 1000 watt oven makes plasma flares very easily, but an older 500-watt version might not have the gusto. Try using a newer, "hotter" high wattage oven. Also, sometimes all the hotspots are a certain distance above the glass plate. If your stubby candle won't make BL, try propping it up on a wood block or an overturned bowl. Try different heights.

I suspect that the "ball lightning" needs both a Saint Elmo's fire and a source of chemicals in order to get going. Sharp pieces of metal sometimes produce microwave arcing, but it's unreliable. A charred toothpick is a conductor, and also it has incredibly sharp points (the carbonized wood fibers.) This might be why a normal candle doesn't make fireballs, but a candle with charred toothpicks near the flame DOES. Or perhaps the charred toothpicks contribute ions? Maybe instead use uncharred toothpicks which are wetted with salt water?

Here's a question of my own: if you try to catch a fireball in an upside-down glass chemist's funnel, does the plasma pour up through the funnel's thin tube? Could it even escape from the oven if you drilled a hole in the oven top to pass the glass tube? PLASMA TORCH! I haven't tried this one myself.

**Q: The turntable rotates randomly? Why?**

A great mystery within microwave ovens: WHY DOES THE TURNTABLE SOMETIMES ROTATE BACKWARDS? I always wondered about this. The obvious explanation is that

the turntable motor is a 60Hz synchronous induction motor. But why? Synchronous motors aren't as good as the normal kind. One thing might make sense: it forces your turntable to end up in the same position as it started. That way your coffee mug will be at the front, or the handles on the cassarole dish will be positioned correctly. But my microwave oven doesn't do this. Most of the time the mug ends up in a crazy position.

Testing is required. I heated a mug of tea at work for a minute, and for the first time I actually watched the clock as the turntable rotated. AHA! IT ROTATES ONCE EVERY TEN SECONDS!!!! I verified the effect and it does work: as long as you punch in multiples of 10 seconds, your food will come back to its original position. But something's screwy. My oven at home doesn't do this, yet its turntable randomly starts off clockwise or CCW, so it must contain a synchro motor. So I timed the oven at home. Bingo: it rotates every 20 seconds. That explains everything. At home, if I punch in 30 seconds, or 10 seconds, then the turntable rotates an extra half turn, putting the soup bowl on the opposite side. Not to smart. How many people cook things for 20 seconds, or 40 seconds? A 3RPM turntable speed only works if you cook something for one minute. But now that I know about the problem, I can start only using multiples of 20 seconds.

Try [Dr. L. Bloomfield's Microwave Oven FAQ](#)

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<http://amasci.com/weird/microexp.html>

Created and maintained by [Bill Beaty](#). Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

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- [Yahoo group: Mad Scientist](#) (amateur)
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- [The Straight Dope](#) forum
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- [Techlib Hobby Forum](#)
- [Forums at electronics-lab.com](#)
- [Otherpower](#) wind/solar hobbyists
- [Sciforums.com](#)
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- [Physics forums](#)
- [Yahoo groups: home electronics](#)
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- [The RF Cafe](#)
- [Electro-tech forums](#)
- [Pease columns](#) , also [more](#)
- [Sparknotes: electrical physics](#)
- [NPR Science Friday forum](#)
- ['Powerlabs' message boards](#)
- [Circuit Cellar Online](#)
- [Amateur Science Forum \(SAS\)](#)
- [Online Forum](#) at the [Xtal Set Society](#)
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- [.HV Community](#)
- [Tesla-fy](#)
- [All Things Tesla](#)
- [ALT.ENERGY.HIGH-VOLTAGE](#) news
- [Tesla-2](#) for beginners
- [HV Association wwwboard](#)

## Science News

- [NPR Radio: Science Friday](#)
- [Science News](#)
- [SCIENCE \(AAAS journal\)](#)
- [Scitech Daily Review](#)
- [This Week In Science](#)
- [Sky & Telescope](#)
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- [High Voltage List](#) at [pupman.com](#)
- [High Voltage Community](#)
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- [High Voltage Assc.](#) forum
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- [Backwash.com: Sci](#)
- [Science Babble](#)
- [ELECTRONICS NOW forum](#)

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- [Phreaky](#) (grrl.com)
- [The Halfbakery](#)
- [Daily Grail](#)
- [Segfault](#)
- [Hitchhikers Guide t/Galaxy](#)
- [Everything2](#) vast hypertext project

- [ePanorama](#), main hobby electronics resource
  - [Alex's Tutorials](#) links
  - [EPE Magazines A-Z link index](#)
  - [Don Lancaster's Hotlinks](#)
  - [Sam Goldwasser's bookmarks](#)
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- [Popular Electronics](#), some old cover stories, jpeg, 1955-1975
- [CRT pocket watch, 1" tube](#)
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- [Fun with ion chambers](#) (geiger counters)
- [Piezo-acoustic Gyroscope](#) with piezo-beepers
- Sense radar pulses with a [dual op-amp](#)
- [Plasma Tweeter](#)
- [Poor Man's Spectrum Analyzer](#) (kit)
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- [Induction motor as generator!](#) cool!
- [Proton Precession Magnetometer](#)

- [Homebrew X-ray](#)
- 

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## Various Other Hobbyist Sites

- [Don Lancaster's](#) Guru's Lair
- [ePanorama](#), main hobby electronics resource
- Big Clive's [Things to make and do](#)
- [Magic Eye Tube Gallery](#)
- [Seiichi Inoue: Hobby Electronics](#)
- [Museum of Obsolete Technology](#)
- [Wind/Solar homebrew](#)
- [Phil Hobbs'](#) electro optics
- Crystal radios? How 'bout crystal TRANSMITTERS:
  - [Galvanized tunnel diodeosc](#), and [more](#)
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- [Halloween Projects](#)
- [LED Museum](#)
- [Mechanical television \(NBTV\)](#) , see [gallery](#) , & [build your own](#)
- [Baird Mechanical Television](#) , w/wax recordings
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- SCRATCHBUILT COMPUTERS (TTL chips, etc.)
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  - [homebrewcpu.com](#)
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  - [Dave B's SIMPLEX-III](#)
  - [FPGA-CPU News](#) build your own CPU
  - [M. Sokos'](#) scratchbuilt computers
  - [Mechanical computation w/LEGOs](#)
- [Vacuum Tube Page](#)
- [T. Boyd's page](#), simple projects w/PC
- [A. Horden's page](#)
- [Experimenters Corner](#), Ham & science
- [X-tal radios](#)
- [Induction motor as generator!](#) cool!
- [CyberWorkshop](#) (Japan)
- [Mike's Electric Stuff](#)
- [Don Klipstein's](#) hobbyist site (LED stuff!)
- [Engdahl's Electronics Info Page](#)
- [Jerry Russell's circuits archive](#)
- [RSW's](#) Faq Collection , see [INDEX](#) too
- [Electronics Onramp](#)
- [Altair.org](#), microwave and VLF radio projects, tesla coils
- [Microwave Oven Experiments](#)
- [Xtal-set Society](#)
- [Weather circuits](#)

- [FAQ: Unusual Diodes](#)
- [Hobbyist LASER info](#) (excellent!)
- [Raymond's ELECTRONICS 2000](#)
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- [Electronics for Beginners](#)
- [Tesla Page](#), coil project info
- [Circuit Cellar](#) (Home controls)
- [Low-Cost Electronic Projects](#)
- [Fluxgate Magnetometer](#)
- [Halloween Hobbyists](#)

- [PEASE PORRIDGE](#) (Bob Pease' columns)
- Malvino's [Intuitive Edge](#)
- [Electronics Repair FAQ](#)
- [Repair your VCR](#)
- [FAQ](#) for ALT.COMP.HARDWARE.HOMEBUILT
- [Jerry Russell's circuits archive](#)
- [Darden's Car battery FAQ](#)
- [P. Mathews' LED FAQ](#)
- [Steve's Workbench](#)(Radio Shack)
- [Wenzel Inc.'s](#) PDF circuit library
- [IR Comm](#) resources
- [sci.electronics](#) news FAQ (huge, don't miss it!)

## Circuits Archives, Schematics Archives

- [FC CirKIT](#)
- [Web-EE archive](#), GIF & PDF
- [delabs PDF/PNG archive](#)
- [Electronics-lab](#) (Greece)
- [Circuit Exchange Intl](#)
- [Bob Blick's projects](#)
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- [pdf Hobby Circuits](#) from Imagineering Online
- [Techlib Archive](#)
- [Electronics Zone](#)
- [Crystal circuits & tutorials](#) (Wenzel Assc.)

## Other circuits linkfarms

- [DMOZ list of circuit archives](#)
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- [Discover Circuits](#)
- [Schematic Links](#) (commlinx)
- [Arik's list](#)
- [Educyclopedia circuits](#)



- [Arron C's circuits](#)
  - [RSWs circuit archive](#) (FTP site)
  - [4QD's Schematics & Lectures](#)
  - [eklektix Circuits](#)
  - [Wenzel Hobby Page](#)
  - [Wenzel Inc.'s PDF circuit library](#)
  - [Hardware Book](#) connector pinout ref, circuits
- 

- 
- [Protel](#) free trial
- [Merlin PCB](#)
- [Orcad PSPICE Student vers](#)
- [Eagle Lite](#) (PCB)
- [Digital Works](#) simulator (shareware)
- [Designworks Lite](#) (schematics)
- [Cadint PCB](#)
- [FPGA devel.](#) webpak ISE (Xilinx)
- [Free Student Version](#) of the [Quickfield](#) magnetic/electrostatic/thermal simulator
- [Scilab](#) math/sci, FFT etc.
- [XMDS](#) math simulator
- [FEMM](#) finite element magnetics
- [Sonnet Lite](#) for PCB rf reflections
- [Other free EM code](#), and [more](#)
- [Finite Element Resources](#)
- [Terry P. Schem/PCB sw list](#)
- [Atmel AVR programming sw](#)
- [3D e-fields](#)

## FPGA, VHDL stuff

- [VHDL FAQ](#)
  - [COMP.LANG.VHDL](#)
  - [VHDL cookbook](#) (pdf, via FTP)
- 

- [Bill B's Electricity Articles](#)
- [NCSU electronics tutorials](#)
- [101 Science: Electronics](#)
- [All About Circuits](#) online textbook series
- [LED Museum](#)
- [Satcure Hobbyist Tutorials](#)
- [Column: electronics thermal Q & A](#)
- [Electronics for Beginners](#) , and [Intermediate](#)
- [Choosing Capacitors](#)
- [I-FX Electronics](#) (good beginner's site)
- [Electronics-tutorials.com](#)
- [Piezo tutorials](#)

- [Electricity physics](#)
  - [Alexs Tutorials](#) links
  - [Engdahl's Electronics Basics](#)
  - [Mark Sokos' Electronics Tutorials](#)
  - [RSWs ftp site: Electronics Tutorials](#)
  - [Iquanalabs Tutorials: Beginner/Intermed/Adv](#)
  - [Electronics Workshop](#) Encyclopedia, Tutorials
  - [Basic Electronics tutorial \(download\)](#)
  - [Electronics for Beginners](#)
  - [ELECTRONICS 2000](#), see "Basic Electronics I/II/III"
  - [Electricity/electronics training software](#)
  - [Doctron example circuits](#)
  - [Electricity/Electronics Teaching Resources](#)
  - [Electronics Tutorials](#) from [Iguana Labs](#)
  - [embeddedsystems tutorials](#)
- OP AMP TUTORIALS
- [Op-amps for audio](#)
  - [NCSU ECE480 class: op-amps](#)
  - [Basic Electr. III](#)
  - [Mark S. Tutorials: op amp](#)
  - [Intermed. Electr.](#)

- 
- [Nuts & Volts Magazine](#) (excellent for beginners)
  - [Circuit Cellar Ink Magazine](#) (Adv. projects, home automation)
  - [Popular Electronics](#), some old cover stories 1955-1975
  - [Poptronics](#) (beginner projects)
  - [Elektor Magazine](#) (UK)
  - [Imagineering Magazine Online](#), from [D.A. Johnson](#)
  - Hobby Electronics [gone, became a porn site]
  - [ROBOT Science and Tech](#)
  - [EDTN](#) network
  - [EOTW](#), Electronics on the Web, [Issue1](#) and [Issue2](#)
  - [Circuit Surgery](#) (EPE Magazine)

## Int'l Magazines

- [Saber Eletrônica](#) (Brazil)
- [Everyday Practical Electronics](#) (UK)
- [Silicon Chip](#) (Aust.)
- [Electronics Australia](#)

## Professional Mags

- [Circuit Cellar Ink Magazine](#)
- [EDN](#)
- [Electronic Design](#)
- [Portable Design](#)

- [Hardware interface to Flash](#)
  - [CMU](#) a.i. ccd camera
  - [Scrapheap Challenge](#)
  - [Personal Robotics](#) Newsletter
  - [Robot Books](#)
  - [Battlebots](#)
  - [Robotics Discussions](#) (Onelist)
  - [Robot Constructors Page](#)
  - [MIT Ants](#)
  - [Solarbotics](#)
  - [Amateur robotics at U. MN](#)
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  - [Hobbyist Robots Webpages](#)
  - [ROBOT Science and Tech](#) (magazine)
  - [BEAM Webring](#)
  - [Robots-R4U BBS](#)
  - [Dallas Personal Robotics](#)
  - [SRS, Seattle Robotics Soc.](#)
  - [Portland Area Robotics Soc.](#)
  - [Thunder Bay Amateur Robotics Soc.](#)
  - [Mondo-tronics](#) Robot Store
  - [RobotBooks](#)
  - [Links Page](#) from ROBOT WARS
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- [BILLB NEAT JUNK](#) & Surplus mail-order catalogs for sci/electronics hobbyists.
  - [SURPLUS SUPPLIERS](#) electronics parts
  - [LEDS, high power & UV](#)
  - [Surplus Sales](#), HV connectors, also [MHV](#)
  - [Ebay auctions: Electronic Parts](#)
  - [Phil's large MAIL ORDER list](#)
  - [Commercial & surplus](#) links from Experimenter's Corner
  - [Ultraviolet Flashlights](#)
  - [Hyper-sensitive magnetometer chips](#), Speake & co.
  - [EIO](#) Surplus items, online hobbyist forums
  - [Electronics Workbench](#) design/sim SW
  - [Am. Science & Surplus](#) (formerly Jerryco)
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  - [Electronics equipment swap site](#)
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- [Allegro](#) (hall effect)
- [Altera](#) (FPGA)
- [Agilent/HP](#)
- [Analog Devices](#)
- [Atmel](#) (CPUs)
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- [Fairchild](#)
- [Infineon/Siemens](#)
- [International Rect.](#)
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- [Linear Tech](#)
- [Maxim/Dallas](#)
- [Microchip PIC](#)
- [Motorola](#)
- [National](#)
- [NEC](#)
- [NTE](#) (replacement semis)
- [Philips](#)
- [Sharp](#)
- [ST/SGS-Thompson](#)
- [Texas Inst.](#)
- [Toshiba](#)
- [Xilinx](#) (FPGAs)

## Printed Circuit Suppliers

- [Quick-turn PCBs](#), free CAD sw
- [Quick-turn PCBs by mail](#)
- [More quick-turn PCBs by mail](#)
- [PNP-BLUE](#) transfer film (make PCBs at home)
- [Dyna Art TTS](#) (make PCBs, the white decal stuff)
- [Toner Transfer tutorial](#)
- [The PCB FAQ](#)

## Kits

- [Geiger Counter Kit \(w/alpha window!\)](#) or just the [GM Tube](#) alone.
- [Electronikit.com](#)
- [Electronic Goldmine](#)
- [Hobbytron](#) science kits, electronics, rob, RC
- [Fascinating Elect. Inc.](#)
- [Ramsey Electronics](#)
- [DIY](#) Electronics, 110 Kits
- [Solarbotics](#) kits & plans

- [Electronix Express](#) components, kits, [online parts catalog](#)
  - [Kitz \(Aus.\)](#)
  - [LNS Kits](#) (weird stuff!)
  - [Lucid Technologies](#) (68705 uP kits)
- 
- [Electronic Circuits for the Evil Genius](#) a beginners' electronics course (new 2005) see [animations](#) , also [forum](#)
- 
- [Hardware Hacking Projects for Geeks](#), new 2004
  - [Analog circuit Design: art, science, and personalities](#)
  - [Op Amps For Everyone](#) (entire free book, 2 meg .pdf)
  - [Practical Electronics for Inventors](#)
  - [The Art of Assembly Lang. Programming](#) (online book , also see [Webster](#))
  - [There Are No Electrons](#)
  - [Bebop to the Boolean Boogie](#)
  - [The Art of Electronics](#), also see [Horowitz&Hill site](#) (ICs, intermediate electronics)
  - [Trinkaus TESLA COIL](#) (beginners)
  - [The Art of Unix](#)
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  - Don't miss [Lindsay Publications](#)
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  - FORREST MIMS:
    - [Getting Started in Electronics](#) (used only)
    - [Engineer's Notebook](#)
    - [Circuit Scrapbook](#)
    - [Engineer's Notebooks](#) (several, Radio Shack)
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  - GORDON MCCOMB
    - [Gageteer's Goldmine](#)
    - [Robot Builder's Bonanza](#)
    - [The Laser Cookbook](#)
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  - WALTER JUNG:
    - [IC Timer Cookbook](#)
    - [Op Amp Cookbook](#)
  - DON LANCASTER:
    - [CMOS Cookbook](#)
    - [TTL Cookbook](#)
    - [Active Filter Cookbook](#)
  - AMAZON: lists
    - [Self-taught electronics](#)
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    - [Combat robotics](#)
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- [Sparkfun \\$30](#) PIC starter kits, cameras, accelerom, cellphone
  - [Rabbit Semi, \\$39](#) (more advanced than Stamp)
  - [Handy Cricket \\$59](#)
  - [PIC vs. Stamp vs. OOPIC](#)
  - [Embeddedsystems.org](#)
  - [OOPIC](#) \$25
  - [Teleo](#), controlled from Flash

- [PIC Library](#) (Don Lancaster)
- [Parallax](#) (Basic Stamp \$29)
- [Olimex](#) bare PCBs, PIC, AVR, ARM, etc.
- [Atmel AVR home page](#)
- [Micromint](#) (Pic stic)
- [Gumstix](#) Linux boards, bluetooth \$110
- [Microchip Inc.](#) (PIC ICs)
- [D. Tait's PIC resources](#)
- [Iguana Labs](#)
- [The EE Shop](#)
- [Eric's PIC page](#)
- [Circuit World](#)
- [EMBEDDED Webring](#)
- [COMP.ARCH.EMBEDDED](#)

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Created and maintained by [Bill Beaty](#). Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

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## Electricity/electronics articles here:

- [How Transistors REALLY Work](#)
- [Electrostatic Speakers](#)
- [Right Angle Circuitry](#)
- [Interesting Toys](#)
- [Electricity Article List](#)
- ["Energy-sucking" antennas \(new 7/99\)](#)
- [Electrostatics projects & links](#)
- [The Nature of Sparks](#)
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The WEIRD SCIENCE database of  
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- [THE "HUM"](#)
- [EXPERIMENT REPORTS](#)
- [Electrostatic "force field wall"](#)
- [About this project \(site faq\)](#)



- [BOOKS](#)

## Other sites:

- Get help at [Spiritual Emergence Network](#) (closed since 9/03, seeking funding)
- [Article: Help for victims of unusual experiences](#), at the [C. Tart](#) site
- [Book: Spiritual Emergency](#)
- [Book: Saints and Madmen](#)
- [Book: Kundalini experience: Psychosis or Transcendence](#)
- [Book: Psychoses and Spirituality](#)
- [More books](#) at SEN
- Book search: [Kundalini Process](#)
- [Paranormal Help](#)
- [T.A.S.T.E project](#), weird things happen to scientists too!
- Get help at [Spiritual Emergence Network](#)

- [Lets be spooked](#) paranormal network
- [PSIPOG](#) students needing guidance
- [Reality Shifters](#) stories
- [Ulterior Writings](#) (stories)
- [About.com: readers' paranormal stories](#)
- [GHOSTS.ORG](#), report your

## DISCUSSIONS

- [Delphi forum: paranormal tales anomalies.net: phenomena](#)
- [Fortean Times wbbs](#)
- [Psychic Testing](#)
- [Unsolved Mysteries](#) (very large site)
- [Ghosts/hauntings](#) (suite101.com)
- [Yahoo Groups](#) (paranormal)
- [ALT.FOLKLORE.GHOST-STORIES](#)
- [ALT.MISC.FORTEANA](#)
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- [SCIENCE FRONTIERS](#)
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scary phenomena!

- [Paranormal Confessions](#)
- [Archive X](#) (paranormal stories)
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- [UFO Reporting Center](#) (usa)
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- [Archive: News of the Weird](#)
- [Fork you](#), melt a spoon
- [Northern lights](#) make noise?
- [Ghostwatcher](#) haunted house webcams
- [The REAL x-files](#) at FBI.GOV site
- [Meteor fireball report form](#) from [NAMN](#)
- [Report your precognition experiences](#)
- [Precognitive dream registry](#)
- [Fortean Times Magazine](#) reader reports
- [Tornado Oddities](#)
- Don't miss Corliss' [Science](#)

[Frontiers](#) online archive, and  
[Sourcebook Project](#)

- Some [Fortean](#) (unusual phenom) links

Please [add your own](#) report

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## RECENTLY-ADDED REPORTS

**Regarding the internal human clock post. I have the ability of going to sleep and wake up at the time I decide to, with a error margin of 5-15 minutes. I noticed this usefull skill when, everytime I had to set my watch to wake me at a particular time, I always woke up 5 to 15 minutes BEFORE it beeps. It took a while to trust this internal clock, but nowadays I don't use alarm clocks anymore. All I need to do is to memorize the time I'm going bed and concentrate on how many hours I'll have to sleep. I know a bunch of people who can do the same, many in a lesser degree.**

[Neto](mailto:Neto@homelink.com.br) <[Neto@homelink.com.br](mailto:Neto@homelink.com.br)>

Recife, PE Brazil - Saturday, November 24, 2001 at 11:03:26 (PST)

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**I have tested the Infinite Energy report on adding lithium to gasolene. Yes it works. i have a 100k mile turbo madza. I add gunk lithium spray at every fueling. seat of the pants improvement. my g-tek meter ran 178hp (engine rated 155) the only problem is exhaust temp high. my cooling hoses on turbo water jacket melted. strangely, the gunk brand works best. this extra hp and mileage cannot be chemical. the effect takes about a week to peak out. next i will measure gamma on new spark plugs, install and run for a few months, then measure gamma again. i'm also trying to find a better way to inject the lithium.**

[bruce vicknair](mailto:bruce.vicknair@mail.com) <[vicknair@mail.com](mailto:bruce.vicknair@mail.com)>

Woodlands, Tx USA - Tuesday, September 25, 2001 at 16:17:26 (PDT)

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**"Tumbling snowballs" 01/11/02-We had a snow flurries this morning. I went to my mothers house and noticed snowballs spread throughout the yard. My first thought was that these snowballs came from my brothers snowblower. His snowblower mounts on a fa rm tractor and can throw snow quite far. After further inspection we noticed the snowballs were not packed, but balls of powder snow. Whenever I attempted to pick one up it fell apart. It appears that the winds were such that they started blowing snow and the snow formed snowballs. Sort of like tumbleweeds. There were even little tracks in the snow left by the snowballs.**

[Jeff Miller](mailto:miller.j.j@worldnet.attnet) <[miller.j.j@worldnet.attnet](mailto:miller.j.j@worldnet.attnet)>

Oshkosh, WI USA - Saturday, January 12, 2002 at 22:45:09 (PST)

**This is a short one, but a definite "event". I woke up from a deep sleep as I dreamed someone had raised a large knife and plunged the knife into my heart. This was 25 years ago and is still extremely vivid. What jolted me awake was the extreme pain I felt as I was stabbed. I instantly bolted upright (in my bed, not my dream) and took a while to calm down, as the pain was so real and severe. Later that night I received a call that my grandfather died of a heart attack.**

[Steve](mailto:commonblue@att.net) <[commonblue@att.net](mailto:commonblue@att.net)>

Evansville, IN USA - Sunday, October 21, 2001 at 19:24:20 (PDT)

**It was over the summer and I was lying in bed. It was late, around 2 or 3 AM. I looked out my window and saw the sky was a dark shade of redish brown. I thought this was very unusual, even though there was a thunderstorm off in the distance. There was no rain or thunder, just a lot of lightning. Most of this was sheet lightning, and I could swear I saw many colors in the sheet lightning. It contained yellow, white and some orangish red.**

[sara](mailto:saraakashawa@aol.com) <[saraakashawa@aol.com](mailto:saraakashawa@aol.com)>

meriden, ct USA - Saturday, February 23, 2002 at 10:52:46 (PST)

**since i am a twin, its always been ruled out that my ability to read and predict peoples minds/or what theyre going to do or say is because of that twin thing. i hate having 2 know what my friends are going to say, but also i always have dreams where later the things happen and for some reason, i was just lookin up monsters and came across the electic human. it sounds weird but lately for the past month or two, every person i touch even if for a second-we both get shocked. even if i lay my hand on a metal surface its sparked. do these things ever happen to you?**

[n/a <kimmiewimmie189@hotmail.com>](mailto:n/a%20%3Ckimmiewimmie189@hotmail.com%3E)

USA - Monday, February 18, 2002 at 13:41:37 (PST)

**I talk to dead people in my dreams. Just last Night i talked to my friend Chrissie who died Commiting Suicide. What does this mean?**

[Katie <Librachick003@aol.com>](mailto:Katie%20%3CLibrachick003@aol.com%3E)

MD USA - Sunday, February 17, 2002 at 14:26:30 (PST)

**I enterd my place of employment as I do every day, whilst makeing the coffe before anybody else had arrived in the building at around 8.45 am. I noticed a grey object floating down the stairs and dissapearing through a wall,this object had no form or fisical apperance and was more of a haze than anything else about 5 feet high. I do not take drugs or any sort of substances and would regard my self as quite level headed. I have told my boss but he thinks that I am just trying to get a day off. If anybody could shed some light on this I would be very interested as I have never in my 48 years experienced anything like this.**

[Martin Thackwell <firstchoice.mobiles@btinternet.com>](mailto:Martin%20Thackwell%20%3Cfirstchoice.mobiles@btinternet.com%3E)

cardiff, uk - Friday, February 15, 2002 at 02:00:50 (PST)

**When I was about 3 my Grandma died, and I had used to spend every day with her. After her funeral, I was playing, and I remember her playing with me, but only i could see her. I'm 13 now and about 2 years ago i was in a car accident. I went on home school after that, and spent a long time in the hospital. Doctors thought I was going crazy, and they had to give me shots to calm me down. They had realized that I was epeleptic. I had been shaking and jumping in the air, they had me pinned down... but what ever took over my body... was stronger. Now I'm still having these strange incounters... and i went into deep deprestion, and I turned to a goth, and I obsess over death!!!!!!!!!!**

[Heather <Qutie\\_Pie\\_420@yahoo.com>](mailto:Heather_Qutie_Pie_420@yahoo.com)

Redding, CA USA - Wednesday, February 13, 2002 at 21:54:17 (PST)

**I was hiking in the woods (a dark, dense pine forest)when suddenly I saw several white translucent 'people' simultaneously duck behind trees. They had appeared to be floating and wearing sheets. I thought at first I had run into a kkk meeting but I could hear no running or see no legs and they were several feet above the ground. I watched for a few minutes and it happened again, with them moving (gliding) behind different trees. After watching for awhile nothing else happened. For the life of me I can't figure out scientifically what I saw!**

[Dave <guerradj@yahoo.com>](mailto:Dave_guerradj@yahoo.com)

Putnam, Ct USA - Monday, February 11, 2002 at 08:50:55 (PST)

**This happened alot when i was younger... in my late teens especially. On numerous occasions things would disappear (or I'd lose them) but somehow they came back to me extremely quickly through bizarre sets of co-incidences, which could just be that but judge for yourself(a few of many): 1)My house keys fell out of my pocket when i was in a taxi in my hometown (a big place). The next fare was a girl who worked at the same place as me and recognised the keys, and told the taxi driver to go to my house. i had them back within 5 minutes of getting out of the cab. 2)I left my school id card in a library book. The next person to take out the book was a friend of my sister's. i got my card back the day after returning the book to the library. 3)I left my mobile phone on a table in a cafe at lunch time. The cafe owner who picked it up happened to be my classmates sister, and recognised her sisters'(my classmates') name and number when going through the phone numbers. I got the phone back before dinner! etc etc these three incidents i remember most clearly because they happened within two weeks of each other.**

[twinkletwinkle <twinklex2@hotmail.com>](mailto:twinkletwinkle_twinklex2@hotmail.com)

Barcelona, Spain - Saturday, February 09, 2002 at 11:40:42 (PST)

**As far back as I can remember, I controled the weather. I could do it so easily I used to think I was dreaming it until I got older and saw how real it was, and realized that perhaps I should not be doing this and stopped. I could look at any animal and send them emotional energy which they would return..ex; a huge tiger that never came near anyone but when I came and looked at him he would run as fast as he could over to me and lay on his back with tongue out almost purring, trying to get as close as he could to me..the trainer said he'd never seen anything like it. I can tell you where and how much and when, ANY electric energy, radiation etc. is happening and stops. This has been tested on me with thousands of dollars worth of gauss meters by an engineer who doused for the government. I can tell you within one inch where it starts and stops, every time. I cannot sleep in a house that has not been corrected with certain devices to mis-direct electrostatic energy away from me etc. re; underground streams etc. I have devices all over my house so that I can sit in front of my computer, talk on the phone, drive my car. I can tell you what your thinking at the moment your thinking it. I can see atoms in the air. I can see the atoms that make up light and sound. I am not into psychic phen. and I am not 'weird'. I am exactly like every one of you except for some reason I was born this lifetime having more usage of our natural abilities, or perhaps just more 'attuned' to them. Thanks for reading. Interesting stuff here. 'Stumbled' onto this site.**

[Asia](#)

- Thursday, February 07, 2002 at 20:32:46 (PST)

**I have been reading all these reports and have to add my own: About 2 years ago I did some training in a special martial art after a special training lesson to open up my energy I have noticed that after resting for a while i get these partialy visible fields flowing through my eyes this is great at night seems as i can see almost everything! my family is very skeptical. I can light up flourecent gloves while doing the meditation and move materials closer to my hand. When I do the breathing exercises i can increase my strenght by 50 % and fell a cold wind coming out of my hand s I do not put out light but i distort the radio heavily. I often see small ball lightning in intense electrical storms and some the size of peas come close to my body nd then disappear. Please write to me if you have similar experiances! Wilyarti howard**

[wilyarti howard](#) <[wilyarti\\_howard@yahoo.co.uk](mailto:wilyarti_howard@yahoo.co.uk)>

Australia - Thursday, February 07, 2002 at 19:31:23 (PST)

**On June 27, 2001 at 7:16 P.M. it was very cloudy and we could hear thunder very far. I saw I very bright light in my home and it went through the hallway and then disappeared. My husband was outside and then suddenly I heard a very loud explosion. I checked to see if my children were all right and then I looked through my living room window and saw my husband lying face down on the ground. I ran outside and turned him over to see that he wasn't breathing anymore. I lowered his arms on the side of his body and replaced his head straight to help him breath. I then ran back inside and tried to dial 911 but my phone was dead. Luckily we had an old dial phone in my daughter's room that was still working. The peramedics were at home within 10 minutes and they gave my husband oxygen. His eyes were bloodshot and his breathing was extremely slow. His face was swollen, his nose was broken with all the skin torn off. There was a burnt hold in his chin. Today he has many medical problems such as a large tumor to his pancreas and many other tumors to his gall bladder. The doctors don't know what to do because they have never seen such a case and I would like to know if anyone has ever experienced this or knows someone who has and who has survived. Please write and let me know.**

[Jean-Claude Labelle <ladouceur.l@videotron.ca>](mailto:ladouceur.l@videotron.ca)

blainville, Canada - Thursday, February 07, 2002 at 14:47:31 (PST)

**MYSTERIOUS MAN IT ALL STARTED ON HALLOWEEN NIGHT IN 1984.I WAS LIVING IN GREER S.C.EVERY HALLOWEEN 2 WOULD COME ON AT 8PM AND GO OFF AT 10 PM.I CAME HOME AT 9:30PM AND MY MOM CHECKED MY CANDY AND SENT ME TO BED.THAT WAS 9:55 PM.ABOUT 9:58 MY BODY LOCKED AND I COULDN'T MOVE.BEHIND MY HEAD WAS A WALL AND BEHIND THAT WALL REST THE REFRIGERATOR.I CAN SEE THROUGH THE WALL AND THE REFRIGERATOR EVEN THOUGH I WASN'T FACING IT.WHAT EVER THIS WAS WANTED ME TO SEE IT COMING.EVERYBODY KNOW THE NORMAL WIDTH OF A REGULAR DOOR.THIS THING WAS LIKE A BIG BLACK CLOUDIT WAS BIGGER THAN THE KITCHEN DOORBY MORE THAN 6IN ON BOTH SIDES.IT CAME THROUGH THE KITCHEN AND THROUGH THE REFRIDGERATOR.I WAS SCREAMING SO MY MOM CAN HEAR ME BUT NO SCREAMS LEFT MY MOUTH BUT I CAN HEAR THEM.THATS WHEN THE THE BIG "SHADHOA:LAYED ON MY BODY MY SOUL LEAPED IN THE AIR AND I WAS LOOKING AT MY BODY FROM ABOVE.THEN A WHITE SHADOW CAME AND LAYED ON TOP OF THE BLACK SHADOW.IT WASN'T THE SAME SIZE.MY BODY HAD THE WHITE SHADOW IN IT BUT THE BLACK SHADOW WAS STILL PRESENT CAUSE THE WHITE SHADOW HAD A BLACK OUT LINE.I RETURNED TO MY BODY AND IT WAS 10:38 AND HALLOWEEN 2 WAS ON BUT ONLY ON MY TV I WAS FORCED TO WATCH IT THEN IT WENT OFF AT 12 MIDNIGHT.I WAS 9 YRS.OLD OVER THE YEARS I CHANGED.I HAD A WARM HEART BUT I WOULD COMMIT EVIL ACTS AND I LOVE TO SEE BLOOD.I WAS A GOOD KID BUT I WAS OBSESSED WITH MURDER. 1990 I CAME TO MY MOTHER'S HOUSE,I WAS STAYING WITH MY**



GRANDMOTHER AT THE TIME,AND HALLOWEEN 2 CAME ON T.V.MY MOM WENT INTO A TRANCE AND SAID:OCT.31 1984 SHE WAS LAYING ON THE COUCH WAITING FOR HALLOWEEN 2 TO COME ON WHEN HER BODY LOCKED.WHEN IT DID SHE COULD SEE THROUGH THE WALLS OF THE 2 ROOMS BEHIND HER HEAD.THE SHADHADOWS OF BLACK AND WHITE CAME AND LAYED ON HER BODY. IT DOESN'T END HERE. THE BLACK SHADHAWA SEEMED TO EMERGE FROM MY BODY.1ST WAS A MYSTERIOUS VOICE TELLING ME YOU GOING TO DIE REPEATEDLY.THEN ONE NIGHT IN 92 I SAW SHADHAWA FOR THE 1ST TIME.I FELL ASLEEP ONE NIGHT WHEN SOMETHING PULLED ME OUT OF BED. I HIT THE FLOOR TURNED THE LIGHT ON, NOTHING.I CUT THE LIGHT OFF AND A HOUR LATER I SEE A FIGURE WITH NO FEATURES STANDING IN THE LIVING ROOM.IT LOOK LIKE ME AT THE TIME BUT IT WAS ALL BLACK.I SLOWELY MOVED BACK TO MY ROOM SOMEHOW WENT TO SLEEP.EVIL ACTS CONTINUED AND STUFF I LOVED WOULD DISAPPEAR.THAT CONTINUED FOR THE NEXT 2 YEARS.DURING THEN I THOUGHT ABOUT SUICIDE TO STOP THIS MADNESS. IN 95 I WAS LIVING WITH MY COUSIN IN GREENVILLE. I CAME HOME WITH MY GUN IN MY HAND.I SITTING ON THE COUCH DRINKING A BEER IN THE DARK LOOKING AT MY NEW GUN,WHEN I LOOKED UP HE WAS STANDING 2 ROOMS UP IN THE KITCHEN.I KNEW HE WAS THERE CAUSE THROUGH THE THIN CURTAINS I CAN SEE THE STEET LIGHT OUT BACK BUT HE WAS BLOCKING THAT WINDOW.TO MY SURPRIZE IT WAS STILL BLACK BUT IT STOOD LIKE ME AND IT HAD MY PHYSIQUE.AGAIN I FELL ASLEEP WITH MY GUN. WHEN I WOKE UP IT WAS GONE BUT IN MY HIDING SPOT. I THOUGHT I DID SOMETHING HORRIBLE THANK GOD I DIDN'T. I CAME HOME TO GREER IN 96. IN BETWEEN 96 AND 97 I TOLD MY BEST FRIEND AND MY YOUNGER BROTHER ABOUT SHADHAWA MAN AND HIS PROCESS.THEY WERE SKEPTIC.ONE DAY IN 97 I TURNED THE CORNER OF MY STREET COMING FROM WHEN MY LITTLE BROTHER MY BEST FRIEND AND 2 GUYS WHO JUST MOVED IN THE NEIGHBORHOOD RAN BY ME CRYING AND SCREAMING.I CAUGHT UP TOO THEM AND I ASKED WHAT HAPPENED.THEY SAID:DON'T GO HOME SHADHAWA MAN BEEN THERE LOOKING FOR YOU SEEN HIM IN THE ROOM WHEN WE CAME BACK FROM SHOOTING BALL.NOW I REALLY KNOW I'M NOT CRAZY CAUSE THEY SEEN SHADHAWA TOO. IN 98 IN THE MORNING I LEFT AND GOT ME A BEER AND MY COUSIN THINK I'M THE COOLEST SO HE COPY MY HAIRSTYLE AND THE WAY I DRESS.HE WAS SICK SO HE STAYED HOME.AT THIS TIME MY MOM MOVED INTO MY GRANDMOTHERS HOUSE WHEN MY GRANDMOTHER WAS PUT IN A HOME.I CAME HOME AND MY MOM SAID:DAMN THAT WAS FAST! I SAID:I BEEN GONE FOR AN HOUR I WAS HELPING AFRIEND MOVED HER FURNITURE.MY MOM TOLD ME SHE SAW SOMEBODY LIKE ME LOOKING AT MY COUSIN WHILE HE WAS SLEEP.SHE THOUGHT I WAS ME SO SAID NEVER MINE.IN 2002 TODAY I STILL FEEL HIS PRESENCE BUT I DESENSITIZED SHADHAWA MAN BY TAKING ON HIS NAME AS MY OWN.STUFF STILL DISAPPEAR AND HE MADE ONE LAST APPEARANCE JUS ABOUT 2 MONTHS AGO.I WAS TAKING A SHOWER WHEN I LOOKED OUTSIDE AND A BIG BLACK

**FIGURE WAS IN A TREE.IT WAS SHADHOA MAN.I LIVE ALONE NOW SO IT SCARED ME PRETTY GOOD ESPECIALLY SINCE MY FRONT DOOR WAS OPEN TOO. IF ANYBODY HAD AN EXPERIENCE LIKE THIS OR WANT TO ASK ANY QUESTION ABOUT ME OR SHADHOA MAN.FEEL FREE TO E MAIL ME. I KNOW THIS SOUND LIKE A MOVIE BUT TRUST ME AND THIS SIGHT THIS IS A TERRIBLE REALITY I LIVE EVERY SINGLE DAY IT STILL GIVE ME CHILLS TO TALK ABOUT THIS**

[maurice dillard <shadhoa26@yahoo.com>](mailto:maurice.dillard@shadhoa26@yahoo.com)

greenville, sc USA - Wednesday, February 06, 2002 at 05:45:18 (PST)

**I can't believe I found this. I thought (and worried) that I was the only one in the world who got electrical shcks on an almost hourly basis. Cars, store shelves, doorknobs. Once I got shocked so badly from touching a water faucet that for a few hours after I couldn't even use my arm. I have also noticed the "streetlight going out when I drive under it" curse.**

[Paula Collins <p\\_collins@juno.com>](mailto:p_collins@juno.com)

USA - Monday, February 04, 2002 at 20:48:12 (PST)

**I teach a 4th grade class with 20 students and 10 computers. One child in my class turns off any computer in class just by using it or even being too close to it. The same thing happened to her in a similar class last year. Her parents thought it was just the school computers so they bought her one for Christmas so that she could do her WebQuests at home. She can't use that computer either because it always shuts off. Any suggestions?**

[Karen Martin <kmartin@willard.k12.mo.us>](mailto:kmartin@willard.k12.mo.us)

Willard, MO USA - Monday, February 04, 2002 at 12:46:09 (PST)

**While working at Wyong Station I and several Cab drivers observed 'Dangling' Orange lights to the west which seemed to bob,bounce,drift, and fade about the general same westerly area. For half an hour or more we observed them. We had time to move about and judge for ourselves that these lights would have been over the Yarramalong area. I even tried to call the local radio station. One cabbie related a story of miniscule 'light' buzzing his side window the night before - I asked 'fireflies'? he shrugged a no-idea. As i was working I moved on with a customer towards Berkely Vale. Several cars ahead were pulled over, I leaned forward asking myself and passenger what was going on here and then 3 Orange Lights in the sky grabbed my attention. I stopped, got out andobserved them for a minute with the passenger. A formation of 3 lights moved silently directly obove the road at approx 2-600', It was impossible to tell, but they moved uncannily like a delta formation of helicopters! Next, the rear right Light left formation and slowed first, then the others stopped together. The passenger wanted to go home.....i drove on at his request, looking back at the next lights to see only a single Orange light. Here my account ends, I have no idea what they were. I can only suggest Ball Lightning or some sort of Plasma Energy Release. Exact year of sighting I'm not sure of. Sighted 31-12-99 or 98 yes New Years Eve.**

Mark Steele <[docwho@ozemail.com.au](mailto:docwho@ozemail.com.au)>

Wyong, NSW AUSTRALIA - Monday, February 04, 2002 at 02:47:31 (PST)

**Here is a real story many of you may find interesting: When I was 16 years old (I'm 29 now) my girlfriend and I were standing outside of her house talking. This guy that liked my girlfriend kept driving by her house while I was there... On the fourth or fifth time he drove by (I was really mad) I looked at my girlfriend and said "I wish he would wreck his car" - no sooner than I said it - it happened - he ran his car off the road into the ditch and flipped it!(the guy was shaken up but his car was totaled) You should have seen the look on my girlfriends face! I have never forgotten that day. Needless to say my girlfriend broke up with me soon after this incident... Is that strange or what? Is it possible to MAKE things like this happen? Be careful what you wish for - it just might come true! Nate**

[Nate](mailto:Nate@KNN10@bellsouth.net) <[KNN10@bellsouth.net](mailto:Nate@KNN10@bellsouth.net)>

GA USA - Sunday, February 03, 2002 at 19:37:16 (PST)

**I have tested this experiment many times in front of my friends. You take a small DC motor 9-12V, glue a ring magnet to the top of the housing. Then I take a large speaker ring magnet (the whole back section, steel and all) and balance it on top of the motor shaft (easy as there is an indent in the speaker magnet) in attraction to the glued magnet. After applying power (the motor is not fixed to anything, just sitting on the bench) and watching it accelerate for a while, after about 1-2 minutes there seems to be a few kickback forces which makes the motor spin the opposite way of rotation about a half turn. After the epileptic behaviour of the motor, it smooths and accelerates about 10 times the speed before the kicks. When I put my hands near spinning magnet the field feels cold. What would cause this ? (also it seems to only work in 1 direction)**

[Anthony B <infinity75@ozemail.com.au>](mailto:infinity75@ozemail.com.au)

Melbourne, VIC AU - Friday, February 01, 2002 at 19:07:22 (PST)

**since the age of 4, i must of shut down about 1,000 street lights right over my head. I am not exegerating... 1,000 time , i know 500 or even 100 times is to exectionnal to forget. 1,000 times minimum . every week of my life and never the same streetlight or place.I have a memory like gold : very gifted for that and great artisitic talents.when you are a searcher , you seek and find wath's inhibiting you.i'm 26 gotta god job and still wanna know whats this phenomena.**

[Dan <Dandruff20@hotmail.com>](mailto:Dandruff20@hotmail.com)

Montreal, Que Canada - Thursday, January 31, 2002 at 22:58:00 (PST)

**I have only recently been aware of my, shall we say abilty, I don't do anything nearly as wild as some here, But you people say you'll kill a watch in a month, I can kill a Brand new lithium battery that should last years in about 2 days. Been doing it since i was old enough to wear a watch. I even bent the hands of a watch till they touched the face of the watch and they wouldn't move anymore. My parents hate it when i talk on the cordless phone for more than 5 minutes cause it'll go dead. I also disrupt lotza electrical equipment such as Alarm clocks and computers. I'm only 17 and really interested in this, i've heard that my case is sometimes related to near-death experiences. apperently when i was born i was dead for a matter of minutes and they eventually revived me. Has anyone else had a near-death of any kind with my kinda qualities?**

["Lewvan" <atomic\\_jesus@hotmail.com>](mailto:atomic_jesus@hotmail.com)

Saltcoats, Sask, Canada - Thursday, January 31, 2002 at 19:05:53 (PST)

**My very sweet great Aunt Mimi (real name Mildred) just died on January 25th 2002. She was 91. She would have been 92 on April 1st 2002. She was very crippled with arthritis and she was very distorted and she could not even hold up her head. It made me very sad to see my Aunt in this sad condition. Regardless of her condition she still never lost her wonderful sense of humor. I used to visit her every Friday and she would tell me funny stories and always be upbeat no matter how bad she was feeling. I admired her so much for her overcoming all aversities that I never missed our Friday visits. A lot of the time I would be feeling down and she would bring me up. I always brought her an angel every time I came to sit in her window sill. She had 91 angels in her little tiny nursing home room. I really started to go see her again in August of 1995 when I heard she was getting sicker and I remember her vividly as a child how kind she was and how she always told me to come over after school for hot chocolate and cookies. This became a ritual I very much looked foward too. I did not have a lot of positive family members when I was growing up. She was always there with open arms and a big hug. So I decided to make it up to her. I made sure to buy enough angels to cover her window sill her dresser and her night stand by her bed. I just brought her two angels on January 23rd two days before her death. This made a total of 91 which was her age. I knew she was close to death but she opened her eyes and sad may God bless you forever. She died two days later. Now we come to the strange part. On the evening of January 25th after I had went to her very short and sweet veiwing. Which was fine for me because I do not like furnerals I came home feeling very exhausted. Sitting on my night stand by my bed was a very small angel with a bowed head and hands together in prayer. I told my husband that was very sweet for him to do this for me because it did make me feel much better. He said he did not get the angel. I asked all of my frinds and family members if they had brought me this very thoughtful gift. Today is January 31th and still I have not found out where the angel came from. I truly think my beautiful Anut Mimi sent me this angel to express her appreciation for my great love for her. I keep the angel on my bedside table and say a prayer every night and tell Aunt Mimi thanks and to watch over me. I truly feel she is around me. I feel her presence everyday. No doubt in my mind this angel is from her to watch over me and express her thankfulness for all of the love we shared.**

**Sincerely Dianne Leonard**

[Dianne Leonard <Angeljustis@aol.com>](mailto:Angeljustis@aol.com)

Springfield, Oh. USA - Thursday, January 31, 2002 at 17:47:25 (PST)

**I'm glad I found some people who have the same problem I do. When I was 16, I got absolutely fried by the electric lines that run into the house, from the pole outside. I'm no electrician, but it was a hell of a lot of amps, enough to send me flying onto the ground near unconsciousness, and make me kinda stupid for a couple days. I can't say for any certainty if that was the cause, but since then I have pursued a career in IT. A while back, I worked as a technician, assembling and configuring computers. Every tech who works at these facilities is forced to wear at least 2 peices of ESD equipment, to prevent from shocking the computer parts. I wore a wrist strap, and an ankle strap at all times, however, they NEVER worked. The alarm went off every time I plugged it into the grounding port. I tried different shoes, clothes, everything. I am perplexed as to why I cannot be grounded. Also, I have the uncanny ability to disrupt television or radio signal by simply waving my arm in front of the device. This is a real pain in the ass if you're trying to watch tv, because I have to find the one spot in the room where I am not affecting the signal. If anybody has a mailing list, or any other reference materials explaining this, I'd love to read them. Or, if you can help me use my powers for evil, I would be interested in getting 4 or 5 of us together to take over the world. haha :-)**

Nick Rowlett <[grapesoda97@yahoo.com](mailto:grapesoda97@yahoo.com)>

Indianapolis, IN USA - Wednesday, January 30, 2002 at 08:40:33 (PST)

**I've never realized this until I read these people. Lately all the computers I work with, all have time delay. Even I've adjusted it every week. I was sick of adjusting, I don't do adjusting anymore. Constantly my girlfriend pass me electric shock. Maybe she is a electric person too! :) Here's the interesting part, last year when our relationship was new, we had sex often in her room.. In the same year she had changed 3 alarms clocks that always slowed down an hour or so in a day. Coincident? Nowadays , we have sex less often, so her alarm clock is stil okay. I really miss "blowing some clocks". :)**

[Sean](#)

SD USA - Wednesday, January 30, 2002 at 00:33:00 (PST)

As a child, our family was visiting my older brothers home near Amsterdam MO. He was married and working as a band director around there. I was 12 or so. Mom, Dad, my younger brother and myself were together in one car, my brother and his wife in their car, driving around the country roads this Sunday afternoon in the summertime, (1973). It was sunny and warm Then, during this Sunday drive, in a 5 minute time span, black clouds rose up to one side of us, moving very quickly. These clouds were absolutely pitch black. We thought they were smoke from a fire. As soon as they were overhead, it started to rain harder than I have ever experienced in my entire life. It also became so cold Dad had to turn on the heater and eventually the defroster. With the rain came thunder, but the spooky part about it was that there was no light flash. It became pitch black, and very cold. The windshield iced up, hail and sleet came down, we had to use headlights at first, and as the wind and and hail worsened, we had to pull over. The whole episode lasted barely 30 to 45 minutes. As quickly as it came on, it left. The sun came back out and the country road was so white with hail it looked like winter. As the dark cloud swiftly moved on, we were rewarded with a double rainbow that crossed above us. It was so astonishing that we got out and took pictures of it. Could it have been produced by a reflection off of a lake. LaCygnes power plant, with its resevoir, is near Amsterdam MO. I have told this story on other occaisions and have been ridiculed about the double rainbow. I believe this was a natural phenomenum, but dont understand how we saw a double rainbow, crossed overhead in the wake of this terrific storm.

[N. Sherman <nrsherman@hotmail.com>](mailto:nrsherman@hotmail.com)

KC, MO USA - Tuesday, January 29, 2002 at 15:09:49 (PST)

While I have no effect on streetlights, every watch I have ever owned never kept perfect time, while I wore it, and I am usually better at telling time that the watch I wear is. I have always felt a connection with electricity, and while I do not seem to be on as grand a scale as some of the people here, I have noticed several 'abilities' One of which is that I have 'healed' several electrical appliances, for example, my MP3 player. It stopped working for some time, and one day I just held it for about 5 minutes, I think I was doing something and just had it in my hand, perhaps I was packing up for a move. The next time I messed with it, it worked fine, as if nothing had ever happended to it. I seem to be very static-y, quite often shocking people. Of all things, for my science project I chose an experiment with static electricity (which is how i found this site)! While I do not damage electrical devices, computers often act odd around me, and most often I can 'heal' the computer that misbehaves.

I also hear very high-pitched sounds that nobody I personally know is able to hear, but I just assumed it was perhaps some dog-like ability, because I also have a very good sense of smell, and my eyesight is terrible. This does not seem to be related, but I also have some telepathic ability and, too often to be coincidence, yet not 100% accurate, some prophetic(predict future events) abilities.

[DoC](#)

Bowie, MD USA - Monday, January 28, 2002 at 16:57:24 (PST)

**I'm not sure if this is the correct place for me as I have a strange, mild aversion to electricity which tends to be physiological. My day to day life is not affected by this, but it does worry me as it seems to be getting more pronounced. For example: -I can immediately sense when i am close to a large electrical current as I get a strange reverbaration in my head which causes a mild headache, which gets worse if I am unable to get away from the source. - In rooms full of electrical equipment I get quite manic and suffer from mood swings,hot and cold flushes and as soon as i leave I feel perfectly normal again. -The Electrical hum from working electronic objects sounds a lot louder and disturbing to me than to others. i.e. if there is a light on in an other room while I'm sleeping there is a distinct low level sound or 'hum' which wakes me up. (Not the light itself, which I can't see)other appliances, which are noisier, are insufferable. - Microwaved food often makes me feel uncomfortable, though I wouldn't say nauseous. I can often tell when something in a restaurant has been heated up this way. -Being on this computer for more than an hour means I need to sleep a lot more the following day. - I feel very uncomfortable in office buildings (actually I'm convinced 'sick building syndrome' is the result of too much electrical wiring and/or negative energy surrounding the workers..but that's open to debate!) There may be other explanations for these symptoms, i would consider any alternative or sceptical diagnosis, but was wondering if anyone else has felt like this? please reply to twinklex2@hotmail.com Time to get off this damn thing!**

[twinkletwinkle](mailto:twinkletwinkle) <[twinklex2@hotmail.com](mailto:twinklex2@hotmail.com)>

barcelona, spain - Monday, January 28, 2002 at 15:21:07 (PST)

**Hello: I don't know just how "weird" this is, but I had never seen it before. On September 7th, 2001, in Miami, Fl., just after 7:00 in the morning, I noticed an extremely high (app. 65 degrees, in the West) Rainbow. After calling a friend to witness, I saw that the Moon was centered below it, making this a Rainbow over the Moon. I am a Land Surveyor, and as such outside most of the time, and had not observed anything to match this. My question: Was this just an unusual combination of events, or the sight of a lifetime? I didn't have a camera. (Darn!)**

[Al Banyai](mailto:AlBanyai) <[Singerfirst@aol.com](mailto:Singerfirst@aol.com)>

Miami, Fl USA - Sunday, January 27, 2002 at 18:55:27 (PST)



I was at my home town in San Luis Obispo California, one night. It was an unusually warm night when I decided to hike up mnt bishop just outside of the town, on a range of extinct volcanic peaks extending from twelve miles inland in a row towards the ocean where there is Morro Rock supposedly part of the same chain of volcanos. I've been told that there is another mountain under the ocean just of the coast of morro bay. Any way back to the story. It is about an hour and a half walk to the stoney peek of this mountain. As i reached towards the top, I noticed lightning in the distance toward the coast, I was'nt shoure if it was lightning at first, all i saw were flashes untill I reeched a beter vantage point. It was crazyest amount of lightning Ive ever seen untill I moved to the colorado rockies. We get storms in that part of cali, but the lighting is more spread out and less frequent than what I saw that night. It was consentrated in one area which from what I could see was right on top of Diablo Canyon Nuklear Power plant, I got a little nervouse. The strange thing about this lightning was that I could not here any thunder, I was only about ten to twelve miles away from it, I talked to another witness who was even closer to the action, on a beach, an area called Montana De Orro, only two mile north of the power plant, She said there was no thunder either, My dad told me that there were construction crew at diablo canyon that evening who packed up an left cause the lightning was so bad. When I reached the top, I started out looking for my favorite cave made for boulders. You would have to climb down into it then through to where the edge of part of the peek, It had a nice flat floor and a triangle shaped roof like it was a loft, at the edge was a 100ft cliff with a phat view, I never found it that night, apparently the huge boulder that formed most of the roof of this cave had been split ,I gues by lightning, this boulder is about the size of a two story house. The fishure in the rock is visible from the road below, The lightning that struck the mountain was not from that night though. Anyways my theory from this is that the earths crust is formed sort of like a crystal not unlike a piazo guitar pickup, Diablo canyon is a known fault line, funny they still built the facility, After living in Colorado, the formation of the earths crust is crystal clear, Although california has many earth quakes, it doesnt have the most briliant lightning like many other parts of the U.S.. Maby something about the Nuke plant that caused a charge build up.

[benjamin bradley](mailto:benjaminbradley@rutontheroad@hotmail.com) <[rutontheroad@hotmail.com](mailto:benjaminbradley@rutontheroad@hotmail.com)>

Fraser , Co USA - Sunday, January 27, 2002 at 00:46:15 (PST)

**I would like to start out by saying that though I did worship a demon, I don't do it anymore. And this is why. Deep in the recesses of my basement I began to participate in the dark arts (Satanic witchcraft). I won't go into detail about the rituals**

**I performed but in know it brought Lucifer into my house. Lights wpould off and on. I would see visions of people be torn apart and mutilated beyond recognition. This went on for two or three weak before IT happened. I was sitting in my rrom praying\_not to Jesus, amd I heard something down stairs. I was home alone. Something or someone walked around downstairs. Terrified i sat on my bed doing nothing but listening. I heard the footsteps coming up the stairs. My door swung open, abruptly stopping before hitting the wall. Although I knew what this was, I saw nothing. Finally I saw two hollow-looking eye flash in front of me in thin air. At that moment an extreme flash of cold flashed thru my body. That night I burned all my spells and books and was never tempted to try something like that again.**

[Anonomous](#) <[Anonomous](#)>

USA - Saturday, January 26, 2002 at 22:41:08 (PST)

**i've noticed in alot of cases like this, even the ones ive experianced things will often wind up were they are strted where they were supposed to be or right in a hand or pocket. This is one of my theories on dissapearence and reappearance. I read some where that every so often the brain flickers like a website refreshing, this causes us to lose a little short term memory (i cant speak on whether this is actual science or speculation but ive had personal experiences that prove this to me). So is it posible that these objects are put into place by us but our brain "refreshes" causing us to forget it happening?**

[Nick](#) <[nick@archland.com](mailto:nick@archland.com)>

KY USA - Friday, January 25, 2002 at 21:35:10 (PST)

**This involves three unconnected incidents that happened to me over the past couple of years i apologize for the length but i had to get this off my chest. Once i was looking out my window at a bout 9:00 on a summer night. I saw what i thought to be a hooting star. but upon recalling it it was much larger than a shooting star, the tail was wider and the thing burnt out very fast, and it was a very vibrant green almost like a firwork but it was oviosly high in the atmosphere. Then the next night at nearly the same time riding home in the car i saw the exact same phenomena in the sky above the car, but ive never saw or heard of such a thing since. The second odd event happened to me and a friend and his mother we all three experieced and later recollected this event. We were wlaing down a road on a suny day, the other boys mom said to us look at that jet is there somthing on it. When we looked carefully there were 3 to four mettalic tear drop shaped objects circling the plane, i would liken them to liquid mercury. The lane was medium sized passenger jet. They were circling close to the plane from the front of the right wing diagonally across the fuselage to back of the left wing. I at first thought this was some sort of illusioncaused ny the reflection on the plan but you could see this happening very plainly, the plane was closer to the ground then usually. And third. i was at my house in mid-eastern KY wich apperentl lies under a major air highway because many jets fly across these skies. One day i walked out it was very sunny at the sky was completely clear with no clouds. i examned some of the exhaust trails, and over in the sky right above my house all by itself was a exhaust trail that shows the distinct pattern of a pulsationg engine. this "donut on rope" exhaust trail, was obviosly not skewed by the wind as none of the other trails in the sky were at all. It was not rough either it looked as though he plane that had created it had just flown over, the pattern was very clear i know that it was definatly the "donut on a rope" exhaust pattern. if anyone has experieced similar, or just wants to tel me im imagining it please feel free to do so.**

**[Nick <nick@archland.com>](mailto:nick@archland.com)**

**KY USA - Friday, January 25, 2002 at 21:09:54 (PST)**

**I found this sight while searching for an answer as to why I seem to have problems concerning electricity. It is a running joke in my family when a street light goes out as I pass. My children are 20, 18 and 10 now, and they all remember this as they grew up. My wife looks for sales and stocks up on light bulbs because we go through so many of them. They usually pop when i turn the switch on, but often they will blow when just sitting at dinner or watching television. I also have a terrible time with any sort of credit card. I refuse to use them unless I absolutely have to. I have a company gas card for work and cant remember how many times I have had to wait while the clerk had to call in the number or use a hand imprinter. Phones themselves are a large problem also. We have bought countless telephones and answering machines over the years. Ironically, I work for a phone company, and while I dont do much technical work, the technichians just shake their heads when I tell them of some of the problems that I have had with phones, wiring and connections. I do have to use a transmitter at times and i have had 3 of them in the shop at once. A lot of people have mentioned static electricity, and while it has not been a problem for the last several years, at one time it was to the point that it was worrisome.**

The kids were afraid to touch me and I was to the point where I was afraid to touch metal or get out of the car. In fact, there was a story on the cover of one of those supermarket tabloids about a man being killed by static electricity from his dryer, and my wife bought a copy for me as a joke. While I laughed along with her, I have to say that it did make me a bit paranoid, because I had already begun to refuse to take the clothes out of the dryer. I also have the same problem that many people have described with watches. I haven't worn one since high school because they just would always quit working. My wife bought me several wind up pocket watches and I had no luck with them either.

Another thing that I have noticed while reading other people's experiences is that many of them seem to have some sort of psychic occurrences. I was never big on this sort of thing, but have had some things happen recently that have made me wonder. When I was in college, I took a bus home and the woman next to me asked if she could read my palm. What the heck. She told me things about my family that she couldn't have possibly have known, and while I was curious I put it out of my mind until this summer. At my wife's 25th high school reunion, I ran into a friend that I hadn't seen in years. He introduced me to his wife and we hit it off at once. Everyone drifted away and she asked me if she could tell me something she had never told anyone before. What the heck. To make a long story short, she told almost the exact same fortune teller story with the exception that hers was on a recent flight from Salt Lake City. Then she said that when they got off the plane this woman told her that she would "believe," when she met someone like her again. That was the strangest part, because this is the exact same thing that my mystery woman had told me. I was in shock and asked her why she told me this, and she said she didn't know. We were interrupted before I could tell her my story and I never did get to tell her. Since then, I have had intermittent short periods where unrelated events seem to come together. It only lasts for a few hours, but becomes very intense. Sometimes it will be just silly little things, but once in a while, it becomes a little disturbing. Anyway, I found this site and the posts on the street lamp interference seem to have cut off about a year ago. I'm wondering if I'm not navigating the site right or they were discontinued. If anyone has any comments on any of this, I would appreciate hearing them.

[tom <flyqc@aol.com>](mailto:tom@flyqc@aol.com)

davenport, ia USA - Wednesday, January 23, 2002 at 09:29:00 (PST)

**3 facts and a theory: 1- There are ferromagnetic crystals in the brain of normal people; 2- There are ferromagnetic crystals elsewhere in the body of normal people; 3- ferromagnetic crystals are aligned for maximum efficiency, and look like - of all things - pyramids! (well, almost like pyramids) so it seems the body expects this magnetism and probably uses it. I can't wait for the human genome project to identify the genes for it... The theory: biological processes controlling and creating those crystals can be influenced by biochemistry, and SOME humans can connect this magnetic field to their brain as input, output, or both. Read about scalar electronics to find out more... (people with negative effects should try training it) I'm suspecting heavy metal poisoning and fluorosis! But this is just a guess. We need to check a few things: -IS IT GENETIC, ENVIRONMENTAL, OR BOTH? -DOES IT SLOWLY REDUCES OVER TIME(decades), LIKE THE UNDOING OF A HEAVY METAL POISONING? -DOES IT RELATE TO BOTULISM OR OTHER INFECTION(as per the many-inmates case)? -DOES A RADICAL CHANGE OF DIET FOR A WEEK ALTERS IT? -IS THERE A SINGLE PHENOMENA, OR MANY DIFFERENT PHENOMENAS? I'm leaving you with those questions! -Simon, watch-zapper recently trying to train himself to control it. No success yet.**

[Simon](#)

Montreal, QC Canada - Tuesday, January 22, 2002 at 03:55:13 (PST)

**In the Christmas season of 1974 my two year old daughter, my ex-wife and I were at Ford City Mall in south suburban Chicago. We were watching a school group singing songs for the holidays. The mall had several rows of chairs set up for the shoppers to enjoy the show. I noticed my daughter not looking at the show, but she was staring at a little girl sitting about 5 (empty) chairs away. She seemed to be "locked" in a stare with the other girl. I looked at the girl and she was staring at my daughter in the same "locked" way. I noticed the other girl's eyes, they were not round but oval, like a cat or a reptile. I then looked at her father. He turned his head slowly and looked me in the eye and his eyes were just like hers! I was shocked at what I just saw and turned away for a few seconds. When I looked back, the two of them were gone. They were both dressed like everyone else there, nothing to make them stand out. I looked around the area to try to find them again, with no luck. I walked around the mall looking for them and have never seen anything like that again. I have talked to several eye doctors about these eyes. They have all told me that no one has eyes like that. I know what I saw and can't find an answer. Hopefully one of your readers has seen the same thing.**

[Jim](#) <[luckyjrc@aol.com](mailto:luckyjrc@aol.com)>

Orland Park, IL USA - Monday, January 21, 2002 at 06:11:47 (PST)

**Does anyone remember a dream from their childhood in which a big tree is encountered that seems to be full of inflated plastic owls? I have this memory, associated ( I think ) with a familiar tree that was located in a place where I would play with friends. It seems to be a single, isolated experience and not some reoccurring dream. I have had those, and this is distinctly different.**

**[Chris Taylor](mailto:cht@imipolex-g.com) <cht@imipolex-g.com>**

**Los Angeles, CA USA - Sunday, January 20, 2002 at 23:23:28 (PST)**

**I'd like to report a phenomenon that used to happen to me regularly in the hopes that someone out there can explain what was happening. It happened several times between the ages of 12 and 20, and only at my parent's house. It has not happened to me since I've moved out. In the middle of the night, I would wake up and see various colored lights, like a few strands of a dew-covered spider web that glow blue, red or green floating above me. Sometimes they were spherical (but not solid), and seemed to be very fragile. The lights were SO pretty, like looking at a Christmas tree with your eyes blurred. Generally, I would wake up and the instant I saw them, I reflexively threw my blanket over them and hopped out of bed before I barely knew what happened. Most times, I would quickly turn on the light and stand there with that adrenaline feeling for a few moments before I would pick up my blanket and inspect it, but no physical evidence ever remained. Because of this fact, I'm inclined to think that it was all in my head, but it just seemed so real. So if you know of anyone experiencing this (whether you believe it is a physical or mental phenomenon), please let me know.**

**Peter B. <[pbarney@yahoo.com](mailto:pbarney@yahoo.com)>**

**Ohio USA - Saturday, January 19, 2002 at 12:44:41 (PST)**

**Kind Readers, As previously posted, I have the knack for dreaming about a location before I actually visit it, albeit surrepticiously. This has occured numerous times. The latest occurance is totally unlike the rest. A brief background... My family and I were confronted with a dire medical prognosis regarding our dear father. He was, and remains to be, a great man who will live in our hearts forever. Dad passed on Dec. 28, 2001. During that troublesome time, as would be expected, emotions were stretched to the limit. We prayed, cajoled, wept and slept fitfully. Dad and his recovery was our sole focus. During that time I had a dream of hopelessness, repition and an unhealthy obsession with confined spaces. August last, my wife and I relieved the suffering of our K-9 buddy, Spike. He was a good dog and yes, the tears did flow. During the preceding weeks of Spike's demise, (vacation) I anticipated my return to work and instead of watching the tube or reading, I purchased a PlayStationOne gaming platform. (It's that kind of Job). After playing-out several games, I returned to a local retailer and purchased "Metal Gear Solid" maybe a week or so after Dad's funeral. "MGS" is a paramilitary game that relies**

**on stealth and sneakiness for success. One scenario in the game is crawling through virtual air-conditioning ducts to infiltrate the "enemy base". As one would imagine, it is dark, confining and an unhealthy atmosphere. Exactly matching the dream I've had weeks before. This is the first time that excludes the physical realm and delves into the concept of realizing, in a dream state, virtual reality. I am truly astounded.**

[Dave Hicks](mailto:escarpment@webtv.net) <[escarpment@webtv.net](mailto:escarpment@webtv.net)>

Milwaukee, WI USA - Thursday, January 17, 2002 at 22:31:28 (PST)

**I have constant static shocks when I touch people or anything metal. Some days it is worse than others. At work I cannot touch the photocopier for fear of a shock. I have only today got a shock when I touched the microwave and also the draining board of all things! Even if my leg brushes against the metal table leg I get a shock through my jeans. Nothing I seem to do combats this problem.**

[Clair](mailto:clairabbey@hotmail.com) <[clairabbey@hotmail.com](mailto:clairabbey@hotmail.com)>

England, UK - Monday, January 14, 2002 at 06:31:53 (PST)

**I am so glad I found this site. When I was little, I had two electrical experiences. I am not sure exactly how old I was during each incident, but I know I was less than 5 years old. The first one, I was visiting my grandparents house, and the lights all over the house kept dimming and brightening. My parents went to investigate, and when they had come into the bedroom where I was playing, discovered me with a lamp that had the plug cut off (don't know if I cut it or if I found it that way) and I had the cord partially split and was inserting the bare wire ends into the two holes of the electrical socket. Didn't harm me a bit, but every time I stuck it in, it dimmed the lights. Then the other incident, I had a little record player. While I was listening to one of my little records, I had taken a pair of nail clippers and cut into the cord. It shot the clippers out of my hand clear across the room, and smoked like you would not believe. I felt a mildly warm wave pass over me, but that was it. Now as a 30 year old adult, I pass lights that turn on or off, but I just thought it was coincidence. I tend to build up static electricity frequently, but nothing that seemed overly abnormal. But I have an affinity for knowing when a power outage is going to occur. And I can just sense what is wrong with my computer. People at work call on me to fix computers, cash registers and our handheld inventory computers. They will be trying to do something and it won't work. I pick it up and do exactly what they did, and it works just fine. I can feel electricity. Like from electronics mildly, but much stronger from street lamps and large equipment. One time, we had stopped at this vista point along a scenic highway, and we got out of the car to look. There was these huge power cables running over head. The sensation was wonderful! I could feel the electricity humming, and I felt so vibrant. I can't describe how it felt adequately! Then two years ago, at the county fair, there was this**

machine that showed how much electricity you produced by placing your hands on the sensors. My sisters put their hands on it, and the meter went to about the same point gradually. When I did it, the needle jumped to a very high level. I can sense other people's moods and emotions really well just by feeling their radiations. I don't know how else to describe what I sense. I can sense who is on the phone when it rings. And more than once have picked up the phone to call someone and they are already on the phone calling me. But in reading many of the people's posts here, they site exceptionally warm hands. I am the opposite. I am terribly cold all the time. My body temperature (when I take my temperature with a thermometer) is a little bit lower than the average 98.6 degrees. My normal temp is 97.4.

[Kristi Thomas <TheCelt99@hotmail.com>](mailto:TheCelt99@hotmail.com)

Modesto, CA USA - Sunday, January 13, 2002 at 02:11:07 (PST)

As strange as this may sound,to answer this question because I know it will be asked,As long as I can remeber(age ???one?) The phenom as it can only be called is either a PSYCOTIC episode which has lasted since age one or it is something I cannot explain.I can /will only admit at this time that it has to do with audio,my hearing and television,radio,other peoples thoghts and thats as far as I dare give.

[steven ebner <shovel8mo@yahoo.com>](mailto:shovel8mo@yahoo.com)

oakland but movingtolexinton, Ca. USA - Thursday, January 10, 2002 at 08:04:44 (PST)

My boyfriend found this article in Gear Magazine tonight. It's just one of many we subscribe to. Although we read other articles we are not ones to go to other sites unless it's commical. But the topic of streetlights going out, well I had to add my thoughts in about it. My partner and I have been together for 3 1/2 years. In this period he has pointed out to me about the reaccuring street lights going off and on as we drive under, around, walk by, etc. I thought maybe that this was a new phoenomena, although I remember as a teenager looking out my bedroom window and as soon as I did, the light pole across the way turned off. I didn't remember the odd feelings of this until he brought it up. I never connected it. So the first year I turned off a few lights at night time on and off while out in the car. Now we turn out anywhere from 3-5 or more depending on how long we drive, and where we go. It seems to be the same places, although sometimes it's anywhere. I used to think that it had to do with alien ubduction or maybe that we as human beings have electric currents running through out bodies using our own psychic abilities, etc etc... I was scared at first, and now I have justified as it as my "angels" looking after me. Wlshful thinking? Maybe? But look at it this way...it's better to think positive and think they are saying hi. At this point, you might be thinking..."you're in denial, or you're a freak..." Could be. I never said I wasn't weird. In fact both my boyfriend and I (I am female) have always been called such things growing up. We have even experienced odd dreams, maybe



ever physical abductions, ghostly phenomena and whatever else I have forgotten to mention. My guess would still have to be that most electric people are abductees as well. I've read many posts and can see that some of these people display symptoms of this. I am no doctor, but I have seen, heard, and been through a lot thus far. I liked the theory one gentleman had on this posting board about the fact that the light posts have light sensors and that we are somehow be tricking them through whatever ability we might have. Just thought I would share...I guess that's what's cool about the internet. I keep finding out there are others who are going through similar things.

[Carrie <seductive\\_btrfly@hotmail.com>](mailto:seductive_btrfly@hotmail.com)

Nothern Cali, ca USA - Sunday, January 06, 2002 at 20:12:18 (PST)

I am a retired professor of electrical engineering at Kansas State University, and am interested in SLI. It seems to me that the two first places to look are the photosensor that turns power off to the bulb and the bulb itself for components that some people can affect. I bought a mercury vapor yard light with photosensor to test. The photosensor seems to have a microswitch for the actual on/off control rather than some solid state component like a triac. It takes from 30 to 60 seconds to turn off after light is applied and another 30 seconds to turn back on after light is removed. Is this time delay consistent with what people observe? If turn-off and turn-on are much faster than this, then this type of photosensor is probably not the key element in the puzzle. I have the light set up inside a large building near I-70. I can control the light intensity to the photosensor so it is just at the threshold of turning off. If a SLider is driving through Kansas (or lives in eastern Kansas) I would be interested in seeing if that person could turn this light off by standing or walking underneath it. Gary Johnson

[Gary Johnson <gjohnson@ksu.edu>](mailto:gjohnson@ksu.edu)

Manhattan, KS USA - Sunday, January 06, 2002 at 14:59:14 (PST)

**I realize that any story involving weirdness - especially suspected memory lapses - becomes suspect when marijuana use is involved, but this true story was simply too clearly experienced to be the result of "stoner" absent-mindedness. Anyway, my friend and I had walked to a nearby beach to enjoy the sunset. We took along a large and heavy bong which, when not being used, we placed on a half-embedded log between us. The beach was flat and there were no hiding places or objects behind which anything could have been placed so as to be hidden from our field of vision. A distant street lamp and the illumination from nearby high-rise condos provided ample light even after the sun had started to set. After having set the bong down, one of us stooped to pick it up for another hit. But it wasn't there where we had left it, less than twelve inches from our feet. We were both clad in shorts and t-shirts, and it would have been impossible to conceal this very unwieldy bong on either of our persons. The water was too far away for it to have been flung into. After each of us accused each other of somehow hiding it as a prank, it dawned on us that clearly neither of us knew where it had gone. We grew increasingly puzzled and started as scientific a physical search and methodical thought process as we could to determine its whereabouts. I could tell from my friend's alarmed attitude that he wasn't playing any joke. Also, no-one was anywhere near us. We walked back and forth, dug and squinted along the beach surface for twenty minutes. Suddenly, we both saw the bong sitting there in precisely the location I had left it - but where we had looked fifty times in the last twenty minutes and had not seen it. In fact, I was on my hands and knees inches away from it when it "re-appeared". We were stunned. It is possible that some world-class magician has somehow decided to play a pointless elaborate joke on us - it couldn't have been my friend because the whole episode badly unnerved him, and he couldn't have faked such a plausible adverse emotional reaction ( he was my closest friend, and I had never seen him freaked like this). Also, the bong couldn't have been buried in sand because it was completely clean and leafy material was still in the bowl- and water was still in it. Again, the whole thing resembled a classic magic trick and if it had taken place under controlled conditions I wouldn't have been remotely impressed. We spent hours afterwards re-constructing the event in minute detail and could see no way this could have happened without the involvement of another skilled trickster - but we checked for prints in the sand, and there was only the two sets of our tracks. The advantage of a sand surface is that it clearly shows if it has been recently disturbed - so we were satisfied it had not been buried. Nor had the log been moved. The bong itself was clay and about 15" x 4", which a very wide base sculpted into a "sitting deity" form and very heavy -as I said, no way it could have been concealed under any clothing. A small mystery, of perhaps no lingering interest. All I can say that made it particularly noteworthy was that after it occurred we took the care to spend two hours at the scene where it happened looking for physical clues and finding nothing - so it was much more "evidential" in nature than so many fleeting incidents that are caused by simple confusion, mistaken interpretation or hallucination.**

[Tony Danis <wdmc\\_77@yahoo.com>](mailto:wdmc_77@yahoo.com)

Mountain View, CA USA - Thursday, January 03, 2002 at 20:14:44 (PST)

**Hi I'm the one who told the story of my OBE with braces. A new forum for more frequent discussion of our collective paranormal experiences has been started. Join in and help us find answers that mundane science ignores. If you have questions, ask and you shall receive...an answer! If you have answers, dig in, we need all the help we can attract. You can find fellow psyientists at :<http://pub49.ezboard.com/fnexianpsyienzfrm8> The answers are forthcoming, the gateway is open for truthseekers and harmonic problem solvers. By the way, DO TRY TO GIVE A WORKING EMAIL. THERE ARE SOME ANSWERS FOR SOME OF YOU BUT I CAN'T GIVE THEM TO YOU BECAUSE WHEN THE EMAIL GOES OUT I KEEP GETTING "RETURNED MAIL: USER UNKNOWN" MESSAGES IN MY OUTLOOK. No more ghost email addresses. Thanks**

[d'truthsayer](mailto:d'truthsayer@worldserviceworld.net) <[nexuspoyntz@worldserviceworld.net](mailto:nexuspoyntz@worldserviceworld.net)>

USA - Wednesday, January 02, 2002 at 15:41:06 (PST)

**Well here is my story , it is the strangest thing I have ever seen . It is about my 1993 GMC safari van. Lets start with the day I bought it . It was at my Local dealer , in excelent shape , Black with a gold stripe , with 56000 miles on it . After I got it home I noticed there was little bamboo crosses in it . They were all over the place , glove box , under the sun visors and all the compartments . And there was a Brown poppy [ for a dead Vet]hanging on the mirror And a baby picture in the over head compartmet .**

**Well Nothing bad happned the first year I owned it , and it ran fine , but 1 and a half years later [it had only 74000 miles on it] I stopped at my Local hardware store . And an Old man came up to me , and with a slightly forien accent ask me " Do you own the van ?" I said yes . he ask me kind of pausing as he went , had Anything strange happened while I was driving it ? I said No . He said him and his wife had problems with it as soon as it had 2800 mioles on it . he said they would be driving along , and it would just stop , then later it would run fine . So we went out to where it was parked , he acted like he did`nt want to touch it . I said " I have a baby picture in here " So I looked for it and found it and he opened the door, I gave it to him along with the crosses . And he went to his car . Now remember , this van ran fine , I used it every month to go on 400 mile round trips to see My Mom . I drove away from the hard ware store , I got 1 mile from there and the van jerked a few times and stopped dead ! I had it towed in . It would not start . So to try to make this short , They tried to fix it , The had it running sevrall times and The service manager would drive it up the road with me in it , and I would tell the story of the old man , and the van would stop dead ! I spent \$2000.00 on repair , and they could not fix it . So I had it towed home and it sat in the driveway . Well I met a guy who wanted it and would trade me a car for it , cause it looked new . So he came over to get it and pull it home with his Big truck . Just before he came over , I tried to start the van , It WOULD NOT RUN . So he arrived and started to hook it up to pull it , He said " well I am going to try to start it " I said ok . He started it , it started right up , like new ! , it ran fine ,They drove it home and Him and his family went on vacation with it that week About 150 miles away . So Whatever it was ,**

**that Van would not run for me , But as soon as he got it, and I signed the title over , whatever "spell " that was on it was broken . I sware this story is true , I have a couple friends who can sware it . And you would really have to be there to believe it , and see just how strange this all was . The Man who got the van is still driving it , his wife loves it , And they think I am crazy for getting rid of it . I don`t ever want that van around me again , there is something evil about it !**

[Jim <pine\\_forest\\_trail@yahoo.com>](mailto:pine_forest_trail@yahoo.com)

Roscommon, Mi USA - Sunday, December 30, 2001 at 09:07:59 (PST)

**I have found rocks that contain images of people and events. Some of the images look like photographs. These rocks are all around us, you just have to look. The pictures on the [blackdogartifacts.com](http://blackdogartifacts.com) web page were shot with a simple usb video camera. I need to know if anyone else has seen this. Museums and Acadamia seem to blow me off. I find it strange that they aren't even slightly curious. These pictures are so easy to see, I can't believe I'm the only one who has seen it. I was told by an anthropologist that I was forming abstract images in my mind out of an otherwise random pattern. These images are not random patterns formed by natural means, erosion etc. Take a look for yourself.....**

[Tony <imagesinstone@nyc.rr.com>](mailto:imagesinstone@nyc.rr.com)

New York, N.Y. USA - Sunday, December 30, 2001 at 00:10:21 (PST)

**Tonight (12/27/01) I was stargazing with my telescope when some clouds began to roll in. I was rather annoyed at them but I began to notice that they were forming a rather large circle (A perfect circle in fact) and it seemed to be centered around the moon. That was around 9:58 or 10:02 PM. About an hour later the same exact thing happened again and I got it on video tape as best I could. It was a very unsettling experience. If anyone has any explanation it would be greatly appreciated.**

Veronica

RSM, CA USA - Friday, December 28, 2001 at 00:05:36 (PST)

**I just ran across this page and figured that my stories would be easily acceptable. I vow that none of what I say is a lie, and that if you would like to e-mail me, I'd appreciate it. Uhm, I don't know where to start except to say that I've experienced almost every sort of the most common phenomena. When I was a kid, camping out in my yard, I seen two UFO's fly above a factory where I was living and shortly after, I seen a fleet of helicopters surround one of them, the other was gone. Since then I have had numerous UFO sightings(in fact I can recall having witnesses to ALMOST everyone of them, which is weird, because I seen them all, with different witnesses). During my sophomore year in high school, I awoke on a July night to find myself the victim of an alien abduction ( I wont' go into details because this sight isn't about abductions). I have lived in a house where I could hear voices talking, and I seen shadows and heard people moving around(noone was there but me). I remember one time, me and my friends were hanging out and driving , and I looked up and it was a near perfect figure of clouds with the moon behind that set off a picture of JESUS(four witnesses-no denial to this day). Another time, me and two of my friends were about to go to a party, and we was standing in my friends bedroom when-and I sh\*t you not-the equivalent of a cup of water poured down my friends jacket out of mid air(two witnesses-no denial, I was the only one who actually seen it materialize). I have a random sense of high power ESP. This is especially prevalent when playing cards and dice(but it's random), when it happens, I can foretell what everything is going to be. I also get this itch. It sounds crazy, but, I get an itch and sometimes I recognize it and sometimes I don't, but when I get an itch, I know something's going to happen to that part of my body. Like I'll feel a pinpoint itch on my kneecap a minute before I bang it on the coffee table. It can foretell anywhere from a few seconds to a few minutes. I also can tell what people will say before they say it, in movies and real life. It pisses me off sometimes cause it will happen in a conversation and someone will say something funny that I was going to say, and I realize that it was me stealing the idea from them. I also get dejavu ALOT. It doesn't bother except when I try to describe it to people and they just don't understand. I've also had a vision of hell and JESUS. That and the ufo abduction tie with the most horrible scary moments of my life(except the JESUS part). That was crazy cuz I seen Jesus and I looked into his eye(I know it sounds stupid that I didn't look into both of them) and I seen a thousand miles deep and seen the sadness he harbored for the lost souls that burn in hell(which is a reminder for all people that Jesus loves you and you should never forget). And I've also had some crazy as dreams. I dream alot about war and military fighting and shit. But the most recent crazy dream that I can remember was that, I had robbed a federal bank, and laid all the money out in the street and I detonated a bunch of nuclear bombs in the street, and I came and looked down the street and the money was burning up( I distinctly remember seeing a 100 dollar bill burning) and I found that I had killed 200 million people, and everyone was happy, but I sat down and prayed and said oh GOD what have I done, how will I ever be saved, I felt lost and hopeless and that's all I remember. I hope that noone ever has to be abducted by aliens(or whatever the fuck they are, I think they're bad angels) or see hell first hand(it's not pretty, and if you want me to tell you what it's like, then you're crazier than I am). May GOD bless you all and if anyone ever has fear of phenomenon, remember HE is with you!!!!!!!!!!!!!!**

[confidential <minor4life@hotmail.com>](mailto:minor4life@hotmail.com)

Iuka, IL USA - Thursday, December 27, 2001 at 20:41:13 (PST)

**I predicted in 1998 public radio broadcast 911 events in exact detail (no date) The evil in this is why? as important this is as if i have not ever existed..... The US government has used PK energy to create a program of total population control (stargate) the use of this energy will result in the destruction of US and the world... a nuclear war will erupt in India VS Pakistan conflict ,NY,WDC,SF and many other american Citys will be destroyed ...in Europe .London ,Paris .Frankfurt will also be vaporized in nuclear holocaust ,US government has tried to plug a wire into the mind of GOD ...the result will be a war they will never win ... anyway the evil is done the wall is near... a paradox no seer can peer into ,extending from 2003 to 2010 Welcome back to the stone age ! man rage will go uncontrolled unbound by the same GODS US government has atempted to tame and control for the sake of money and power forgetting the nesesity of the poor and underpriviledge .... (END)**

[Clasified Info <arkresearch@hotmail.com>](mailto:arkresearch@hotmail.com)

mayaguez, P.R. USA - Monday, December 24, 2001 at 08:45:30 (PST)

**I remember when I was in first grade, when I was sitting at someone else's table. I left my pencil underneath the papers as I went to talk to a fellow calssmate. When I came back, I found that it was not there. When I returned to my desk, I found it, in the pencil slot provided at the edge of the table. I have also experienced evil before. As a christian, I belive that aliens are fallen angels, demons. One night while having a dream, everything turned green. My hand clumped into a fist, and held in place as if it was plugged into the wall. I was struggling to breath, but somehow I got knocked-out. Now this is exaactly the same thing happening to other abductees. Ever since, strange things have been happening. I was eating dinner once, when I lifted my head to see a stretched out figure leaning against the wall by the hallway. It had no face. Just black. In a blink of an eye, I saw it disappear. I was taking a shower once when I turned around, to find Jesus' face along with 12 others, screaming in horror and sanity as the picture slid down the tiling. The sound of a thousand men screaming arose from the picture as well. I belive Jesus was taking the fallen angels down to where they belong. Remember, I AM A CHRISTIAN.**

[Jason Hsin <whsin@gte.net>](mailto:whsin@gte.net)

Arcadia, CA USA - Saturday, December 15, 2001 at 18:14:24 (PST)

**It was probably oh so , Eight oclock in the afternoon. It was pitch black outside , and chilly. Nothing shone in the sky but a few stars and a three quater moon to my right . The sky was covered by a few clouds. Well , quite aways from the glow of the moon , in one of the darker areas of the sky , shone rainbow streaming brilliant colors out of a cloud. Mind you it being very dark , and no light to actualy reflect through the raindrops , this is quite unusual. It had not rained once all day.**

[michelle <angel\\_on\\_lsd@yahoo.com>](mailto:angel_on_lsd@yahoo.com)

eaton, oh USA - Friday, December 14, 2001 at 22:37:43 (PST)

**Tues,10:00 pm A couple days ago me and my freinds were walking in the alley at night I saw electricity flowing threwh the cans on the floor . A large bright light appeared for a second. I saw the terminator ,who took my freinds clothes and said ILL BE BACK.**

[irven martinez <nice\\_and\\_chocolatee.aol.com>](mailto:nice_and_chocolatee.aol.com)

cathedral, ca USA - Wednesday, December 12, 2001 at 09:49:08 (PST)

**Here is really what happened! Back in September of 1955 while in the army stationed at Fort Knox Kentucky I was send for by Headquarters. This was located about two miles from where my company was stationed. It was a nice day, and I walked to Headquarters in the "main post" area. I was feeling fine. On the way there my mind drifted,(maybe?)what I saw was sort of a picture: it was a large cross inside a some buliding, and in the center was a military tank. I was in an armord division at the time, so this was not such a strange thought. The other thing I saw, and this did seem strange: there were these big comfortable red leather chairs, in the army every thing is some sort of brown. The chairs did not fit in a military picture. But what the heck a full size tank should be inside a building either. The thought was a flash, and I soon forgot it, and kept up my pace. When I arrived at Headquarters, the thought rush back like deja vu. In the center of this bulding at a cross corridor, there was an actual tank. What kind of a thought did I have? When I enter the office I was to go to, there were these big red leather seats in the waiting room. I sat in one of these big red leather seats and fell into a deep sleep. This was unusual because this happened the first thing in the morning. When my meeting was finished, I left the building, and instanly I was hit with a very bad fever, Across from the building I had exited I saw a church, the wooden door to the cellar was open and I went downstairs. I spotted a cot in a small room, and could just about make it to it, I fell asleep, and woke up at eight the next morning, I was confused about everything, but pulled myself together, and made my way back to the company. My company commander listen to my story, and I think he believed me, however he informed me that he would have to carry me as absent without leave, as I had missed "row call". When I was discharged, my original discharge papers said: one day missing under A.W.O.L. Now years back I lost my original discharge papers and have sent for them on**

several occassion, but they never say anything about "One Day Missing" anymore.

[Harry D <pax33@optonline.net>](mailto:pax33@optonline.net)

Rosedale, NY USA - Tuesday, December 11, 2001 at 17:16:56 (PST)

**one night i was sleeping and suddenly heard a noise, it sounded like a dog whining so i got out of bed and down the staires and went outside to find what i belive to half human or somthing like a dog mix maby a were wolf feeding on the dogy. you could see the blood glisten on the snowy ground. and then they saw me loking at them so i started runing in the house and called 911 but they thought it was a prank, so i had the nerve to look out side the window and they were gone.**

[robert porttaer](mailto:robert.porttaer@fontana.ca)

fontana, ca USA - Tuesday, December 11, 2001 at 11:08:39 (PST)

**Im highly charged. I get static shocks from cars, polystyrene(why does that happen?),metal chairs and one which I hadn't thought could happen but I'd warn people about is putting their hand into the washing machine after it's turned off, to get the clothes out. I got an electric shock from the metal circle of the door. i didn't even touch it, it just "jumped" at me. as expected, it was painful.(and there definitely wasn't any electrical fault with the machine) it's a novelty at first but it's getting worse and i find my head gets really itchy/creepy afterwards. also, I'm very sensitive to summer storms. I can tell when a storm is brewing and it gives me headaches and can make me giddy. I presume this has something to do with it also. this isn't really reporting a phenomena is it? i guess it's just nice to have someone not think im exaggerating :) thanks.**

[Auburn Franks <munchkin@redbrick.dcu.ie>](mailto:munchkin@redbrick.dcu.ie)

dublin, ireland - Tuesday, December 04, 2001 at 06:35:51 (PST)



**When I was in college, each time I would attempt to leave the undergraduate library, I would set the alarms off. Inevitably, I would be loudly called to the main desk to have my backpack searched. I was mortified(!) and this happened nearly every time I entered the library and subsequently tried to leave. I was never found to have any library books on me or materials that would otherwise cause the alarms to go off. It seemed that the more I fretted about the alarms going off, the greater the likelihood that this would happen. My best guess as to why this was happening is that initially something electrical about me would cause the alarm to sound. Then, on subsequent visits to the library, I would become so panicked, so certain that the alarm was going to go off, that I believe I was setting the alarm off myself somehow with my mind. Why didn't the alarm go off when I entered the library? Odd, I know. Needless to say, I did not find any humor in this (being a shy person), and I completely quit going to this library. The interesting thing about it is that I never experienced this problem at the graduate library across the campus.**

[Mystery <Mysterydate@aol.com>](mailto:Mysterydate@aol.com)

NC USA - Monday, December 03, 2001 at 13:26:29 (PST)

**When I'm upset and talking on my cell phone it will get real hot, too hot to hold to my face, and the battery will lose it's charge and even when charged up again, it will not hold the charge. Later it will act just fine. Other times, even when not upset, if I touch light bulbs they will burn out and even the replacement will burn out as soon as i put it in the socket. All of my cars eventually develop starter problems and the radio/cassette players quit working.**

[la <jpoth68425@aol.com>](mailto:jpoth68425@aol.com)

seattle, wa USA - Monday, December 03, 2001 at 11:32:20 (PST)

**I would not ordinarily admit to this but some people close to me have heard the stories or have been there when they occurred. On many occasions, I wake up in the middle of the night as if in a nightmare. I hear and "feel" strange sounds as though surrounded by a hundreds of people. When I try to move - I can't. The sounds intensify and I feel like I'm dying. The entire ordeal lasts several minutes as I try to regain sensation (and control) of bodily movement. It's as though I am completely paralyzed and struggling to come back to life. This phenomenon is often accompanied by unusual visions, usually numbers that flash repeatedly. The last time this happened, I bought a lottery ticket (scratch type) based on the numbers I saw because I wrote them down- and won \$200. In another experience (this is really wierd), I was in a dream, or so I thought, in which I came face to face with my deceased father, who knocked at the door of an apartment or house that I had never been in before. He did not speak, but his facial expressions were sad and I felt compelled to embrace him. At first it felt warm and comforting as I had not seen him alive in several years. I could feel and smell him; but within minutes, I felt as though**

he was drawing me in (to where I don't know), and all I could see was a tangled mass of what appeared to be stringy muscle or flesh. This scared the hell out of me and I struggled to get away, again, with the same sense of helplessness described earlier. When I finally regained control, my heart was racing and I was gasping for breath. It took weeks to shake off that experience. I experience this sort of waking dream often. I have concluded that it may be nothing more than being half asleep (or half awake) depending on your point of view. The episodes are random and without any common denominator to determine the cause. I don't have any history of sleep walking, and I am not a drug user or alcoholic. There are too many such episodes to talk about here, but I can say this - the feelings of fear, numbness, a presence unknown, and a sense of dying are present in all of them. I'm 41 years old and in good physical and emotional health. If anyone out there has experienced something similar, feel free to share your experiences - you are not alone.

I just seem to have too much electricity on my body. Everything seems to malfunction when I have it. I've had watches, computers, stereos, power amps, cars (batteries), video cassettes, and anything else electric, malfunction. Sparks fly out of me a lot more often than the rest of the people that I know. I went to grab my cell phone and a spark went of from my hand and I shorted the cell phone! Anybody out there knows anything about this, or how to help me? contact me at [puertorico22@yahoo.com](mailto:puertorico22@yahoo.com)

[jose <puertorico22@yahoo.com>](mailto:jose@puertorico22@yahoo.com)

ponce, pr USA - Sunday, November 25, 2001 at 11:15:17 (PST)

Some friends and I were all at an old barn on halloween. Normally I don't believe in all the wierd stuff but this really happened to me. As we all walked up to the house we thought that we heard someone call out. Well looked around and saw no one. Then in the window of an old house by the barn the was a white figure. It had no facial features. It seemed to have had a head that appeared to look at us as we all were staring. The a friend of mine threw a rock at the figure, but it went right through it. The figure then walked away. The car that had been left on seemed to have a figure in the drivers seat. The strange thing was that we were all outside of the car. My friend had just bought a new light for the car and all the sudden it went out. We were left in the dark. No one wanted to get into the car to leave bacause we were all afraid that there was something in there, so we just stood there. Later we all got inside the car anyway, we had to leave. As we were driving the car went off the road without the control of the driver. We were zig zagging. Then the car just shut off and we call someone to tow it. We left and we will never go back to that barn again because its haunted.

[Frankie Fish <Frankiefishy@yahoo.com>](mailto:Frankie Fish <Frankiefishy@yahoo.com>)

Chicago, NE Bangladesh - Monday, November 05, 2001 at 09:50:27 (PST)

**I would like to know if anyone has tried to attach a small shunt feild generator. To a Bajak Flux Capacitator. With a Glass rod in between the two, and an armature coil of a 1:2 turn ratio? Do to the fact that from what I've been reading of this Bajak Flux Capacitator. It seems that you people are creating very powerfull EM waves. If I'm wrong and a generator or amplifier of some sort wouldn't bend matter to match the temporal frequency of the time line you're trying to reach. Post and tell me in theory how you would get to quantum disslocate your obj. to move forward and backwards in time.**

[adam reese](mailto:adamreese2000@yahoo.com) <[adamreese2000@yahoo.com](mailto:adamreese2000@yahoo.com)>

Franklin, PA USA - Monday, November 05, 2001 at 06:54:00 (PST)

**So I'm not insane, possessed, cursed, or tapping into other dimensions! What a relief to know others have the same weird happenings. I first noticed the streetlight phenomena when I went for a walk with my wife-to-be. It was our first night together and as we walked under a streetlight, it went out. Later another one went out and when she arrived home, the light above her driveway went out. Since then we can count on streetlights going out on a regular basis. Since neither of us experienced this before meeting, we have to wonder if we needed each other to bring this ability out? I also affect other electrical equipment. I am a musician(I notice an artistic bent among many others here - a coincidence?) and am known as the feedback king because my amp feeds back and hums when I play through it.(It behaves for others of course.) I was working recently for a company constructing offices and because I didn't have a drill I borrowed other peoples'. The first drill was only a few weeks old and worked fine, but when I started to use it, it slowed down and wouldn't start again. It had to be sent out for repairs. The second drill I used was a few years old and again worked fine until I started to use it. Same thing happened - it died. Radios that are working fine start to give out a static sound if I get to close, and I kill watches on a regular basis. If anyone would like to discuss this with me, feel free to email me. Thanks**

[Curtis Ballendine](mailto:otisdeez@hotmail.com) <[otisdeez@hotmail.com](mailto:otisdeez@hotmail.com)>

Calgary, Ab Canada - Sunday, November 04, 2001 at 21:43:50 (PST)

**There are not too many weird things that happen to me. I have been reading this site and its pretty great. I mostly related to one other person who dimmed street lamps and was a hot bodied person. I have noticed that street lamps go out or dim above my self for sure and my brother as well. I also am always quite warm and wear considerably less clothing then anyone around me. I just think its cool that there are lots of people who's electrical charge change the electricity around them. Keep up the good work. ~Andre**

[Andre Reid](mailto:amreid@mybc.com) <[amreid@mybc.com](mailto:amreid@mybc.com)>

Boston, MA USA - Sunday, November 04, 2001 at 20:26:29 (PST)

**I humbly salute all: How is posible after I predicted 911 events in a radio talk show there is a total press gag as to (NO one forswaw it)? why?if I can predict the furture By if by looking at it in a TV there is this press "gag" goin on,whats the game ? how many lives lost because of this PRESS GAG ,the funny thing about it(It WAS NOT BIN LADEN that did it) and the other funny thing is after biological warfare comes NUCLEAR holocaust. All planed by the enemy "within" not from outside ,but internal enemys of GOD,RELIGION and LIVERTY. I am also part of the spiritual protectors of the world and as result of this "GAG" I am not able to notify the world the spiritual PROTECTION by us have CEASED as 9/01/01, contact has being atempted by means of the armed forces ,FBI ,police to no avail (I am not the only one) asking the Goverment to open a communication channel to Eliminate KARMA by means of WORLD SOCIAL changes and the use of technology in a war agaist poverty and Ignorance (much better than genocidal wars )and eye for eye retribution,without knowing the real ENEMY. Its the end of the milenium,my words are a sword of judgment asking for a change toward stopping world Holocaust ,or push the "mule" off the abbis to certain death if it becomes stubborn ... Total Spiritual protection shut down ,satan loose on earth ,hurricanes,tornados,Tidal waves,earthquakes,Nuclear holocaust ,hell on earth and a 800 mile wide asteroid as the "frosting" of the cake END. All this averted by Wisdom ,Knoledge,PEACE only if the small guy "the people" ASK its political LEADERS for it. My true Spirit name: Iman Emmanuel (OMEGA)**

[Hector Perez](mailto:arkresearch@hotmail.com) <[arkresearch@hotmail.com](mailto:arkresearch@hotmail.com)>

mayaguez, pr USA - Sunday, November 04, 2001 at 16:49:36 (PST)

**I found this site while searching for scientific phenomenon but after reading a few of the unexplainable personal encounters I am compelled to share the one that followed me for the greater part of my life. I spent the first six years of my life in a trailer park with my single mother, older brother and live in baby sitter. I had my first experience when I was three. After my mom would put me to bed I would wake up sometime in the middle of the night and walk to her room and crawl into bed with her. I did this every night and still have memories of it. One night I woke up as usual but when I turned to go out of my bedroom I saw standing in the doorway a very tall figure that blocked the opening almost entirely. I do not remember seeing any detail so to the best of my recollection it was a shadow. It frightened me so horribly that after that night it took me almost ten years to get up enough nerve to leave my bed after everyone was asleep, even if I had to urinate badly I would just hold it till morning.**

**My mom remarried when I was six. We moved into a house across town. I became extremely ill around the age of eight and mom would check on me periodically through the night. One night while I was sleeping on the living room couch she came to check on me and saw a very tall thin "shadow" standing over the back of the couch looking down at me. When she addressed the "person?" she could see that it turned its head towards her then slowly walked through the kitchen. As she followed, it went into the dining room and out of sight. When she went into the dining room it was gone. There is a back door in the dining room which would be the only way out without passing her but the door was shut and still locked. My mom and my live in baby sitter have both seen this Shadow near me or my room while I sleep. And I have seen it twice. The full account of encounters and experiences associated with this phenomenon spans a period of 24 years and I personally believe that this shadow is the motivation to some of my more bizarre dreams. As of today nobody has even tried to come up with a possible explanation. And I usually don't give it much thought myself. I do wake up from hearing voices calling my name from time to time but I haven't seen anything in over 12 years. If any one has any thoughts as to the nature of these events or a possible meaning please feel free to email me.**

**[Jason Church Blackwell](mailto:church12759@cs.com) <[church12759@cs.com](mailto:church12759@cs.com)>**

**Johnson City, Tn USA - Saturday, November 03, 2001 at 09:02:34 (PST)**

**One night my girlfriend and I were awakened by a loud crashing noise which appeared to have come from the kitchen of our one bedroom apartment. Knowing that our cat was more than a little clumsy, we were ready to dismiss it and go back to sleep, when I realized that the cat was lying at the foot of the bed and the door of our bedroom was closed. We thought we had intruders. My heart was pounding as I turned on the light and looked around the room in a desperate attempt to find a heavy object that could double as a weapon. The cat was still at the foot of the bed, his ears were back and his eyes were bulging out of his head... basically he looked terrified. I opened the bedroom door and cautiously stepped out into the hallway. I peered around the corner into the kitchen area which was partially illuminated by the streetlight outside. I didn't see anyone so I crept into the living room. There was no-one there either, and upon checking, I found the front door to be locked. I turned on the light and went back into the kitchen. Apparently the loud bang had come from two sources. An empty coffee mug which had been left on the kitchen table was now right side up on the kitchen floor, about 2 feet from the table. There had also been a small silver dish on the table that housed a collection of rings. This dish sat in the same spot as before, only now it was upside down with all the rings splayed out neatly around the dish's perimeter. Except for one. When I lifted the dish I found one ring underneath it, right in the centre of the circle of rings. I really wish I could find some sort of logical explanation for this event, but I'm stumped.**

**JAMES** <[jamtart@powersurfr.com](mailto:jamtart@powersurfr.com)>

edmonton, alberta canada - Thursday, November 01, 2001 at 19:48:39 (PST)

**Alright, i was looking at this site thinking back to the past 2 years. There have been a few strange things before then, but these are the most vivid. Now i know most of the stories here i have so far read seem like things bored or paranoid ppl decided to write, but some things i have had similar experience in. Anything about lights dimming (such as the simultaneous dimming of vanity lights in one of these stories) is most likely the powercompany's fault. when they switch the power flow, as they often do, they sometimes screw up the timing and cause power failures and dips/surges. There are some things here that do hold merit in my mind though. about a year or so ago i decided it would be fun to see what happens to a paperclip if i stuck it into an outlet. I used the insulated type and had it on the end of a long wooden dowel to reduce my risk. unfortunately it completely melted, insulation and all in a massive shower of sparks. I felt a warm tingle in the hand holding the dowel and noticed a path that had burned its way to my hand. well a few months later i was competing in a robot design challenge and on my last run one of my reverse switches shorted out while i was not even touching it. well i was very nervous at the time so i think that might be part of the problem. when i checked on the wires, everything was perfect, nothing touching where it should not touch. after the run was declared incomplete i checked the battery that i had just installed and found that it still was working and so was the motor, but the switch polarities had reversed (it suddenly started to respond after the match.) that is only one of my experiences. on a trip biotrip last year, shortly after that incident, we went on a marsh walk in the morning and it was very cold +wind chill. Eventually i got annoyed**

at the cold and forced my body to heat up. it was very strange, i visualized a wave of heat (as if viewed w/an infared sensor) fill my body and it did. after about ten minutes it weakened and i had tor do it again. by the third time it was down to a minute between the heat waves. i mannaged to concentrate on it (it was very dificult to keep the consentration) and could maintain it, but different parts of my body started to get cold so i started to direct it there. I noticed that a friend of mine was cold so i tried to warm her instead of my self. well i succeeded im pretty much creating a heat pocket around her and between us, which she notice b/c i saw her stop shivering and comenting on how it had suddenly warmed up (no one else was warmed up until someone else passed through the weakening pocket and broke my consentration. i realize that this sounds very far fetched but it is actually true. lately i have not had any real oppertunities to test this ability and train/strenthen it, but ive been doing all i can, and i know i still have it. this winter should (hopefully) help me out in that respect. other electrical experiences ive had are a number of lightbulbs have simply blown out on me. not like the normal way where it just refuses to turn on or when you go to turn it on it makes a small pop sound though. with me it is an extremely bright blue flash, a loud snap/mini-explosion and black powder all over the inside of the bulb. one time i put a brand new bulb in and when i turned it on the thing exploded so much that the glass cracked all over and when i went to remove it, several glass fragments fell into my hand. it was strange having to explain to my parents how i blew out 2 bulbs in 10 minutes, one of which was new, plus how the glass of the bulb had broken without me dropping it or anything. to sum it all up, strange electrical experiences and the ability (currently a weak one) to control and project heat in and around my body. "Firestorm"

["Firestorm"](#) <[cloudhopper22](#)>

cranford, nj USA - Wednesday, October 31, 2001 at 15:22:32 (PST)

On 4 occasions, fire alarms have gone off in hotels where I was staying, and no, I didn't start fires, and I don't travel all that much. I have caused medical monitors to go blank just by pointing at them. I have been in department stores on three occasions when the power just went down.

[Crobey](#) <[cfannon@us.ibm.com](mailto:cfannon@us.ibm.com)>

boulder, co USA - Wednesday, October 31, 2001 at 12:53:40 (PST)

ok, this isnt all "paranormal" or anything, but it is odd and has bugged me for years. Once, when i was about 8, back in the day when pogs(milk caps) were big, i was at my grandmothers house sitting in her den on her sweet recliner chair whlie i was counting my "pogs" (god those were stupid now that i think about it)and slammers. I counted all of my pogs and slammers and found they were all there. i picked up my sweet metal slammer with a reflective red back and i dropped it. I looked every till is in my own home. i couldn't and still cant locate the damn things for my life! argh!

[Chad <BigBossChad@aol.com>](mailto:BigBossChad@aol.com)

Grand Blanc, mi USA - Saturday, October 27, 2001 at 19:29:30 (PDT)

well I was 8 years old and we lived in this big blue house in ilinois and me and my sisters were all sleeping in the bedroom down stairs and I kept hearing this noise scratch at the window and my mom came in and checked it out and it would stop, well I was so tired that I decided to ignore it and I threw my foot over the side of the bed and something grabbed my foot and I was so scared that I could not move and I started screaming and whatever it was just let go and mom came to the room and nothing was there and till this day I still can not hang my foot off the bed and then when I was 12yrs old we had moved to where my grandparents lived and they helped us get a house and it only had 2 bedrooms so my mom bought a hide away bed and put it in the living room and me and my sister slept there and I woke up one night and turned over to see these black figures playing cards at the kitchen table and there was like a, I guess u would call it a banaster that divided the kitchen and the livingroom and I woke up to see these figures hanging another figure from them and when I would look at them I would just get so freaked out that all I would do was shake. then my grandparents bought a house that used to be a old motel and it was really nice but old and it was said to have been built over a semetary and strange things would happen all the time there, when I would stay the night you could hear foot steps on the stairway and when i would walk through the house I always felt like someone was watching me and following me and then one time me and my cousin were playing in a room upstairs and the door shut all by itself and we could not get it open and we started screaming and my papa broke the door trying to get it open and he is a big guy and it took all he had to get it open and we then learned from some people in the town that when the place was a motel the people that owned it had locked a woman in the room we were in and she died there and every since then these occurances are happening. It seems everything I do and everywhere I go I feel something watching me and something around me. I ONCE HAD A DREAM ABOUT MY GRANDFATHER DYING AND I ACTUALLY SAW HIM IN a casket and 3months later he died and i just always think to myself if i would of just told him he might still b alive today so i want to tell all you people out there who are havin g dreams like this of your loved ones TELL THEM JUST DONT KEEP IT TO YOURSELF!!!!!!!!!!!!!!!

[bre](#)

USA - Saturday, October 27, 2001 at 10:46:41 (PDT)



**Has anybody in the suburban Detroit are noticed any small triangular configuration of three dots placed on the lower half of street signs? like a small triangle. not on every one, but on enough to make you wonder why, and who is doing this? Usually painted on with white paint or dark paint. not only on street signs but on some mail drop boxes also.**

[Michael Nader](mailto:doonoak@yahoo.com) <[doonoak@yahoo.com](mailto:doonoak@yahoo.com)>

Garden City, MI USA - Friday, October 19, 2001 at 12:37:44 (PDT)

**This was long ago - 14 years or so - I was between 8 to 12 years old at and just a little kid. I liked baking cookies at that time, and someday, I was in the kitchen making the dough for it. My mom was sitting at the kitchen table working. Nobody else was home, my sister was at school and my dad at work in town. My mother and I started hearing a sound, which we very quickly identified as the toilet flushing (which was about 15 feet distant from us). When standing in the kitchen, I had a direct view at the door of the toilet and no-one got in or out. We were quite shocked - but for some reason I wasn't too afraid to check it out, so we went there and opened the door. There was no-one, but the lights were on - something that totally freaked us out. Someone of my family would forget to switch off the light there only about every half year or so. The toilet automatically flushing never happened since this incident (nor before it). Sometimes I think back at this and still wonder what this might have been - to me the coincidence of the toilet flushing seemingly by itself, only one time in my life, together with the lights still being on (happens about two times per year) seems to me too "odd". I just don't understand.**

[Harald E.](mailto:heedens@yahoo.com) <[heedens@yahoo.com](mailto:heedens@yahoo.com)>

Wijdenes, NH Netherlands - Friday, October 19, 2001 at 11:44:13 (PDT)

**I have always had a problem with wrist watches of the battery operated kind....I can't keep them running, they reset or die completely. SO, the suggested alternative that has worked for me is wind up pocket watches.....and yes, I shock people and myself a lot...I used to notice the putting out street lights thing more, but haven't paid attention in a while. Another problem I have is when I sing I sometimes have HUGE trouble getting on the mic with out shocking the sense RIGHT OUT OF MY LIPS, that is uncomfortable....could be a problem with how I rig my gear. I didn't know there we so many people with problems like this...how fascinating. A friend once thought (she was a foot reflexologist and could FEEL more electricity in my right body side then the left), that it was related to my heart surgery, which I had at age 7. Perhaps having wire in my sternum, so close to the charge of the heart, has created this phenomenon? I'd be curious to know if any of you other people also have metal in your body anywhere.....we should start a club (electric people of America).**

[Tacy Traverso <tacy@tacytraverso.com>](mailto:tacy@tacytraverso.com)

Reno, NV USA - Tuesday, October 16, 2001 at 16:50:11 (PDT)

**I had a really weird experience when I was about 9 years old. I woke up in the middle of the night and I thought I was being watched. I peeped over the covers and there were two large green eyes looking at me next to the open door. There was no face - just eyes. I slept at the back of the house and there were no streetlights. I thought I was dreaming so I hid under the clothes and I was frightened. I peeped over again and they were still there looking at me. I was a normal evening, not suffering any illness and no one had died. I have never had anything before or since.**

[Janet <janet2802@aol.com>](mailto:janet2802@aol.com)

Northampton, UK - Saturday, October 13, 2001 at 12:29:04 (PDT)

**ABOUT 2 YEARS AGO, I WAS LIVING ALONE IN A TINY APARTMENT WITH MY 3 YEAR OLD SON. I WAS GOING THROUGH A HARD POINT IN MY LIFE. EVERYNIGHT I WOULD CRY MY SELF TO SLEEP. MY PARENTS HAD JUST MOVED OUT OF THE COUNTRY, MY SONS FATHER WAS IN AND OUT OF THE PICTURE, I WAS WORKING TWO JOBS AND I WAS VERY CONFUSED ABOUT LIFE IN GENERAL. ONE NIGHT, MY SON AND I WERE SLEEPING. (WE SLEPT IN THE SAME BED) ALL OF A SUDDEN, MY EYES OPENED AND I SAW A SOULOETTE OF A MAN IN THE BEDROOM DOORWAY. I QUICKLY SAT UP. THE SOULOETTE HAD A BRIGHT WHITE SHIMMER. I KNEW THE SOULOETTE WAS A MAN BECAUSE IT RESEMBLED MY DAD. AS MY EYES FOCUSED MORE AND MORE ON IT, IT SLOWLY DISAPPEARED. I WAS VERY STARTLED. I HELD MY SON TIGHT THAT NIGHT AND DID NOT EVEN ATTEMPT TO GET OUT OF BED. THE NEXT MORNING WHEN I**

**WOKE UP SOMETHING HAPPENED. AS I WALKED THROUGH THE DOORWAY INTO THE DINING ROOM, THERE WAS A SINGLE WHITE FEATHER SITTING ALONE ON THE KITCHEN TABLE. I HAD NOTHING IN MY APARTMENT WITH FEATHERS. I PICKED UP THE FEATHER AND PRAYED. I QUICKLY CALLED MY PARENTS AND SPOKE WITH MY DAD. HE SAID THAT THE NIGHT BEFORE, HE FELL ASLEEP THINKING ABOUT MY SON AND I AND THAT HE PRAYED VERY HARD FOR US BECAUSE HE FELT SOMETHING WAS WRONG. I STILL HAVE THAT FEATHER TILL THIS DAY. I BELIEVE THAT MY DADS PRAYERS SENT AN ANGEL TO ME TO ASSURE ME THAT I WAS NOT ALONE.**

[Dina Gutierrez <dguajar@pisd.edu>](mailto:dguajar@pisd.edu)

plano, tx USA - Friday, October 12, 2001 at 18:39:22 (PDT)

**Back in 1996 and 1997, I was living in southern California. Having a really rough time making it and ended up on the streets for a short time. During that time, I had a series of dreams and night terrors which I chronicled into poetic verses. I named them; "The Prophecy Parable" and they can be found registered and copywritten at the U.S. Library Of Congress. The Copyright was obtained in late 1997. What is important is, I named Bush as president during the time that the attack in New York took place.(which I clearly foretell in my poem). Also, it tells of several other things; some have happened, some not yet but, the signs are here. You have my permission to investigate. Do it, before it's too late.**

[Michael Walker <michael.walker@iflyata.com>](mailto:michael.walker@iflyata.com)

Chicago, Il. USA - Friday, October 12, 2001 at 15:31:26 (PDT)

**This happened to me twice in my life time. It would occur right when I'm going to fall asleep. My body freezes and I can't verbalize. I try to move and scream because I'm scared. The first time this happened to me, I told my father about it and he told me to never try and turn around to see what was causing this, because he said it was a spirit. He told me to start praying right away. The second time this happened to me was recently in my home. I tried to move and tried to hollor for my husband but I couldn't even move. I was wondering if this has ever happened to any one out there. If so, what did you do at the time of the occurence? Did anyone ever try to give you an explanation of the incidence? Shields-verahonesty@hotmail.com Valentine,NE USA**

[Shields <verahonesty@hotmail.com>](mailto:verahonesty@hotmail.com)

valentine, ne USA - Tuesday, October 09, 2001 at 13:28:57 (PDT)

**One day I was walking back from the library when something I call "The Big C" appeared in my field of vision. It was about 2/4 of a circle, somewhat irregular and filled my field of vision about like my hand held 8 inches from my face. It looked as though it was composed of transparent straight bars of glass broken into short lengths and arranged in a Big C shape, so that they refracted the light. I could see within the C and around it. It was attached to my field of vision--that is, wherever I looked it seemed to be at the same place in front of my right eye.**

**I went to my office and sat down, becoming alarmed. I thought I was having a detached retina (though I've never had that). I turned off the light (my office is windoless) and I could not see the shape in the dark. I turned the light back on and was about to phone a Doctor when the Big C began to move. In the course of perhaps 5 minutes it drifted from right to left, out of the field of vision of my right eye and into the that of my left eye. It contined to drift to the left, and dissappeared entirely. I've never had anything like this before or since. It seemed to be something in or attached to my right eye, yet it moved to my left. I have never worn contact lenses. I have a mild astigmatism and wear glasses, but I took my glasses off as soon as the " Big C" appeared, without effect. I'm puzzled, to say the least.**

[Robert <rallen@utm.edu>](mailto:rallen@utm.edu)

Martin, TN USA - Thursday, October 04, 2001 at 19:11:56 (PDT)

**Also remember I said you are only creating resonance or link with time once with this circiut. If you hook a psionic helmet to the ground or negative side of the battery of this device and have variable caps in series with the helmet and radionically tune the helmet then you will have resonance times resonance = time also look up "steven L. Gibbs" he sells time travel units and reports on how to make them, he has a report called zero point energy, it includes the bajak device.**

[Ryan Neibaur <icecream972001@yahoo.com>](mailto:icecream972001@yahoo.com)

Id USA - Wednesday, October 03, 2001 at 10:03:25 (PDT)

well with the flux capacitor you are only creating resonance once, in my experiement I used a rubing plate and witness well in series with the variable capacitors that are in paralell with the peizo transducer, and i use green wire to make a cadeus coil around a round long shiny magnet. I put this coil in series with everything. I put a news paper in the witness well of the time i wanted to go back to. Then I turned the variable resistor until i got a stick on the rubing plate. Then I set the clock on top of the piezo transducer, then i pushed the button up and down like mad for about an hour getting about 2hz per second. I thought i saw the clock go back a few seconds but was not sure, then i went to bed and woke up and the clock was two and a half hours back. This clock had a digital read out and was a regular alarm clock that beeps ehhhh ehhhh ehhhh when it goes off, and its digital read out light is red.... Supposedly this ciruciuat uses zero point energy, if you make the wires on the variable resistors yellow, and the wires hooked to the piezo transducer green and the wires on the capacitor blue it will enhance its performance, if you read you read about zero point energy and its vectors in relation to color and light you will know why. At <http://www.tec-time.org/> you will find the flux capacitor that has more information about this device... more later

[Ryan Neibaur <icecream972001@yahoo.com>](mailto:icecream972001@yahoo.com)

Id USA - Wednesday, October 03, 2001 at 09:59:39 (PDT)

I am very excited to find this website!! I thought I was just very weird or crazy! For as long as I can remember, I have constantly had to replace lite bulbs, especially when I have been in an emotional state of mind. I also have noticed while walking or driving at night, street lights turn off as I pass them and then go back on after I have gone by. I cannot wear a watch, they quit within a few days. I would be interested in finding out how or why these kind of things happen to us??

[cheryl evans <cheryl.evans@state.or.us>](mailto:cheryl.evans@state.or.us)

newport, or USA - Tuesday, October 02, 2001 at 14:21:37 (PDT)

ok look its really wierd to me,and im hoping to findout what this thing is. I wish could get a replie on this but im just here to tell you my wierd phenomena that happens to me often.....very often!!! i usaully have an image that only last a half a second. It always apear to be a clown!I could only see its face and its smile is so evil and big that its all the way to the back of his jaw!His teeth are as yellow as butter and it has dirt on his teeth yu could see its gums and their all bloody! His skin is light brown but its skin is dead and peeling and blood all over his skin is dripping! His eyes have that evil lookso evil its shapelike a lemon with the sharp tips at the corner of the lemon and its eyes look like hes on crack and he has one pupil thats black. his ears are like the elfs ears except bloody!He has a hat that is the same one that uncle sam has but dirty really dirty!and the backround is the sky with rain pooring down hard!!!!and lightning!I have this image in my head often !!! I have no fear of clowns i think their funny and cool i was also a evil clown for halloween.!I just need a anwser of wha does it symbol orwhat does it mean?!?!?!? im getting tired of this imag that oonly last a half a sec!!!

[erik maynez <defiant 187@aol.com>](mailto:erik_mayne@defiant187@aol.com)

north hollywood, ca USA - Tuesday, October 02, 2001 at 11:06:18 (PDT)

This is a report of a mass UFO sighting in around 12/74. I was out at a local golf course snow sledding with a friend and his family. It was around 8:00,8:30pm on a clear night and there were probably around 20-30 more people sliding at this same spot, when looking N/W we all witnessed this light formation move across the night sky! There was no sound,it just seemed to move up and sideways for about 20 seconds and then vanished. No one really talked that much about it, other than "That was weird." I have witnessed nothing since,almost 20 years on.

[Mike Hachey <mike\\_hachey@hotmail.com>](mailto:mike_hachey@hotmail.com)

quispamsis, nb canada - Sunday, September 30, 2001 at 00:42:01 (PDT)

WHEN I WAS TEN YEARS OLD, I WAS LIVING IN MEMPHIS, TN WITH MY GRANDPARENTS. MY MOTHER LIVED IN DURHAM , NORTH CAROLINA AND I VISITED HER REGULARLY. AND ONE VISIT I MET A BOY WHO BECAMED MY BEST FRIEND. ONE SUMMER, RETURNING FROM A VISIT I WAS SLEEP AND HAD A DREAM ABOUT A DEVIL STANDING NEXT TO MY DRESSER AND HE WAS TELLING ME TO GET OUT OF BED AND GO WITH HIM, BEING YOUNG I DID. SO WE WENT IN AN ELEVATOR DOWN TO HELL THERE MY BEST FRIEND WAS WAITING ON US. HE SHOWED US THOUSANDS OF TORMENTED SOULS JUST FLYING IN AN AREA. AND THEN I WOKE UP. LATER ON THAT YEAR I SPOKE WITH HIM ON THE PHONE HE TOLD ME THAT HE HAD A DREAM ABOUT ME, I REPLIED SO DID I. WE DESCRIBE THE DREAM FOR AN HOUR, FINISHING EACH OTHERS WORDS THE WHOLE TIME. IT WAS SOMETHING THAT WE NEVER TOLD PEOPLE. ALSO ONE DAY IN HIGH

**SCHOOL WE WERE IN CLASS TOGETHER I HAD FELL A SLEEP AND WOKE UP DRAWING A PICTURE OF WHAT HAPPEN FIVE YEARS PRIOR. HE LOOKED AT THE PICTURE AND HIS FACE WENT BLANK AND SAID " THAT'S A FAMILIAR FACE " HE SAID " THOSE EYES" I COULD TELL THE FEAR WAS COMING BACK. SO I TORE THE PICTURE AND THREW IT AWAY.FROM THEN ON I NEVER WANTED TO SEE THAT FACE AGAIN.**

[DRE <ELDRAGON60@HOTMAIL.COM>](mailto:ELDRAGON60@HOTMAIL.COM)

DURHAM, NC USA - Friday, September 28, 2001 at 10:02:56 (PDT)

**ok, the streetlight thing used to happen to me on a regular basis but i have had only very few instances then something else "electrical" would happen to me--i think it is interesting and would be very cool if it really were some strange ability or power, but i dont think so. and, yes, i had the shit shocked out of me when i was about 3 by grabbing a couple exposed wires hanging out of an electrical outlet at a gas station--i think you would find that if you asked 1000 people whether or not they we re shocked at a young age that you would find that the majority of them were. i think there is a possibility it could have something to do with a built in mechanism in streetlights to periodically shut off to cool down so that they last longer or even to shut off if they sway too much in the wind as a safety precaution--has anyone bothered asking someone from a company that manufactures streetlights? i do know that if you get a light pole shaking, the light will go out temporarily. anyway, i dont mean to piss on anyones big "i-have-electrical-powers" parade but i really think the streetlight thing is BS. the other things...i would have to see them for myself.**

[doug sims <douglasesims@aol.com>](mailto:douglasesims@aol.com)

wilmington, nc USA - Friday, September 28, 2001 at 07:55:00 (PDT)

**My experiences are for real. I can't do the electrictricity from the fingers thing, but I have had some times that had to do with electric currents or waves. I believe that I can sense electrical waves. I can sense a T.V being turned on from an other room. Just today, I was in the kitchen fixing dinner for the wife and kids. Well, in the kitchen I had the stove fan going and the family playing around me. I got alittle hotheaded and told them to go into the livingroom where I had the stereo going. A few seconds after they left I sensed the T.V being turned on. I went into the livingroom and turned the stereo off and said to my wife "You know I don't like the T.V and the stereo on at the same time!". She just looked at me and said, "How did you know I turned the T.V on?" Considering that I evidently couldn't hear it over the stove fan in the kitchen and the stereo in the livingroom, I just turned and smiled. It's hard to explain the feeling I get whenever another power current interupts the previous one but it feels great. I have also had to reboot my computer a few times this week. Once a few minutes ago because the computer**

wouldn't let me do anything. I have had to replace many light bulbs very frequently within the house because when entering a room after awhile and flicking the switch immediatly, I'd blow them. Needless to say, I've learned to enter a room and hold off on the switch until at least a few seconds after entering. It seems to work. As for the tingling sensation, I get that too on a regular basis. It feels pretty cool, but nothing ever happens from it. Also the static shock when I touch my vehicle and or another person also throws me for a loop. Especially when I'm walking on concrete or gravel. Well, that's about it. If anyone has got any comments to help me better understand this please feel free to contact me.

[Erik Klein <spaceman102@yahoo.com>](mailto:spaceman102@yahoo.com)

Fort Campbell, KY USA - Thursday, September 27, 2001 at 20:00:20 (PDT)

This concerns my 11 year old daughter. She has an uncanny knack of being able to render things inoperable. When she gets on the computer, it freezes up 3 or 4 times before she get's to do anything. No one else in the family has this problem. No watch has lasted more than 10 days on her arm before it stops. Different remote controls don't work in her hands yet they work in other family members hands. Light bulbs in her room burn out 3 times faster than the rest of the house. There has been at least 5 times where she has bought a new CD and buy the time she got it home, it was blank. There are other things that have happened with her that just gets plain annoying for her. People have told us she seems to have a deep soul and she is able to use her left and right hand interchangably, is she special or just a freak? Or is this all just coincidence?

[Tom Jalass <tbjal@yahoo.com>](mailto:tbjal@yahoo.com)

Omaha, NE USA - Monday, September 24, 2001 at 21:10:21 (PDT)

Is it an unusual phenomena to have incredible luck? I mean, I have never won the lottery or anything grandiose like that (haven't tried either) but, for example, one day when I was going to work I realized I was 15 cents short to buy a Metro card to take the subway. The first coin return slot that I checked contained fifteen cents. another incident involved the terrorist attacks the week before last and is only indirectly related to me (or my luck). My dad was supposed to be on the plane that slammed into the Pentagon but his itinerary got changed at the last minute from the second (hijacked) flight out of Dulles to the first flight out of Dulles to California. (my apologies and sympathy to anyone reading this who lost friends or family during the attacks). When I was a kid I rode my bike down a steep hill in our neighborhood one day and didn't apply brakes at the bottom of the hill. I blindly, wildly, stupidly went rolling out into a busy intersection and several cars all slammed on their brakes as they saw this idiot kid wheel out in front of them. When I was very young, my mother gave me a bath one evening. There was a terrible thunderstorm and lightning crackled every few moments. A bolt of lightning in fact



**struck our house and a blue tendril of electricity entered the bathroom window but did not strike my mother, the tub water or myself. And last but not least, I turn out at least one streetlight when I walk down the street at night.**

[Kevin Huff](#)

Arlington, VA USA - Monday, September 24, 2001 at 12:17:51 (PDT)

**As a child, I would go to the church festivals and play the numbers games. I could predict the numbers that were spun on the numbers wheel and win. In 1979, I visited a college friend at his apartment. As we chatted, I had the urge to call out the number and suit of the top card sitting in the deck on the counter we were at. I can't recall the card , but went something like this: "M\*\*\* , look at this, 8 of diamonds." I picked the top card and flipped it over to reveal an 8 of diamonds. M\*\*\* looked at me kind of weird like. Then, I said, "The next one is a 5 of clubs." I flipped the next card and sure enough it was as I called it. He asked how I did that. "I don't know how; I just knew." In 1999, My wife and son were walking across the Wal-Mart parking lot when I saw a playing card sitting face down on the blacktop. My son ran to pick it up, but before he could even touch it I yelled out, "six of clubs". I picked it up and showed it to my wife. Her eyes opened widely with a weird look. I just knew what number and suite it would be. I also have dreams that come true the next day. I am never visited by officials, never in 15 yrs of teaching. One night, I had a dream that my kindergarten kids were misbehaving as a TEA monitor was visiting my class. Well, in the 16yrs. of teaching, never has anyone from TEA ever visited me, except for that day. Yes, it was my kindergarten music class and the kids were atypically misbehaving. Rod**

[Rod <elreyrod@yahoo.com>](mailto:elreyrod@yahoo.com)

Rio Grande Valley, Texas USA - Sunday, September 23, 2001 at 19:56:10 (PDT)

**On two occasions I have noticed a rotating helix of light on florescent light tubes. I have noticed this phenomenon in two widely separated locations. The most dramatic was at an airport where at least six tubes were doing it. I have also encountered it on one tube at work. My colleagues also saw it, so I did not imagine it. When the lamp was switched off and on it operated normally. The rotating helix did not return. If you have any idea what causes this, please email me.**

[Robert Hunt <rob@teralab.org>](mailto:rob@teralab.org)

UK - Saturday, September 22, 2001 at 08:54:10 (PDT)

**UFO landing:** In the early '70's, as a student at Iowa State U., I worked part time as a broadcast engineer at the WOI radio/TV studio on campus. It was the ABC affiliate station for central Iowa and it had a full-time news department. One morning the entire news department emptied out to investigate a UFO landing report 35 miles north of the studio. When they returned I asked a lot of questions. I learned that they saw a burned patch in a soybean field. The patch was surrounded by three, deep, symmetrically-placed indentations in the soil. A soil specialist from the University was at the site and reported that each of the three depressions compacted the soil with a force of 45 tons! If the specialist was correct, the "saucer" weighed 135 tons if it was completely at rest! The reporters indicated there was no evidence of vehicle tracks anywhere close to the site.

[Rick Shindley <ricks@techcomsvcs.com>](mailto:ricks@techcomsvcs.com)

Big Lake, MN USA - Thursday, September 20, 2001 at 21:42:39 (PDT)

**i will try to be as brief as possible while attempting to maintain continuity....as impossible as it may be... first: i was/am a recovering addict...and i have been "on my own since i was 14...my last grade completed was 6th..and i was raised to believe in God more than most (my name is christian).after 12 years of intense "church" my dad started drinking AGAIN and my mother went over the deep end...she divorced him left me and my sister and started a "wife swapping" club...so the meat and taters of my story begin: i spent years in a downward spiral of drugs and homelessness and wound up in a treatment center at the age of 20.i was released about a weeks and a half before my 21st b-day...assuming i wasnt going to be able to stay sober for my b-day(21 is the legal drinking age)i self destructed a week before this.i wound up in jail on my 21st b-day and the 3 days on either side of it..(the law says that 72 hours is the max hold without a charge)i was in for 6 days due to transfers between 3 different counties...the las county i was in i went to an AA meeting and i sat through an amazing story told by a \*PLUMBER\* (i will tie these \*xxxxx\* together later)it was a one of a kind story which included robbing a social security office....---end of part one**

**next:i was doing ok in mpls mn but needed a break so my dad (who had quit drinking by this time) came to get me to goto wisconsin...the age of 23 or so i went with him planning on getting a job and saving some money...the last thing i did before i left the apartment i was in was, for some reason, look on top of the shelf in the closet...there was a 14 year medallion!i had only been sober for 6 months at this time but i thought i would grab it since it would prolly get thrown out by the new tenents...i put it in my pocket and on the trip to wisconsin i got very warm...well since i had my bag in the back seat i changed into shorts and threw my jeans in a tightly wrapped ball in the back window....several months passed. one day my dad started screaming at me...something about "what are you gonna do with your life" ...so in a fit of new resolve i determined that i would join the madison area tech college....he said you cant do that in one day i said i can to so i began to look for my "nice"jeans...after an hour or so i recalled they were in the car...put them on and off we went to goto school....at the school we met a native**

american counselor whom we will call sandy. after a long drawn out session reviewing my interests and determining i was smart enough to be there we were ready to go....my dad ever the chatter box was making blabber with the nice lady...as i stood there severely bored i decided i was going to get a soda and reached into my pocket to get out some change... as i was doing this sandy interrupted my dad and said "hey christian,i just wanted you to know i am in recovery as well...in fact (my hand was now coming out of my pocket full of coins) she said ,yesterday was my 14th annaversery,but i have been so busy i havent had a chance to get my medallion" i looked down at the handful of coins and started to laff,she asked what was so funny and i handed her the medallion i found on the shelf in my apt. in mpls.....i said this must be yours...\*and told her the story\*. ..

next:i was having an increasingly difficult time (age 26 or so)and had one at a time, given up all of my vices including cigarettes and caffiene...it was driving me nuts but i sat there in my one room apt.alone and ....well wrote and analyed my "nutsness" until that too drove me nuts...now when your "nuts" drive you nuts its time to get some air...so i did this: i prayed...it was a simple request..."show me you are real".. and i got up and decided to goto an aa meeting...i lived 100 yards from a place where they had them so as i walked out the door i checked the mail and had it sorted by the time i got to the meeting...i opened a letter from \*sandy\*...she just dropped a line to say how "she was amazed at how God works sometimes"....as i quietly wrote this off in my mind as simple coincidence i enter the meeting where the \*plumber\* was telling his story about the social secutity office....later as i went home i looked back through my jorunals and discovered that these events had all taken place at specif intervals in time 1year 2years 3yearsetc....and the culmination of them all on one day just blew any doubt that God is real out of my mind...now i dont claim to know him well but i know he is there....i still hate church...but i love God

[christian <christiancleaner@cfl.rr.com>](mailto:christiancleaner@cfl.rr.com)

ocee, fl USA - Tuesday, September 18, 2001 at 11:56:39 (PDT)

Okay I got a weird one to tell you guys, and its all true; I can swear on that. I don't know how to exactly explain this but here it goes, about 2 weeks ago from today I was lain down on my couch around mid day and I suddenly fell asleep. Know this part coming up makes my hair stand up on end. I had my eyes literally open and they moved from left to right at a pretty fast speed and I realized that later when I awoke, but the weird thing was that when this was happening I had my eyes open I felt like I was physically back in time for a couple min, like out of my body or something, because when I was awake on the couch about one hour before I fell asleep I heard my mom cooking and laughing, and then before that my sister was asking me what to do in this computer game I have. So as my eyes moved back and forth I could vividly see my surroundings like my body and my clothes but I could also experience what I had heard before and all in sequence but really fast, and really clearly and really loud but I felt like I was physically there, like I was living it again. It was so weird; it felt like I was out of my body or

**something. Then as I keep on experiencing this sensation I felt scared for some reason and out of no where I imaged a scenario in my mind in witch I left my body and some lost soul took it over. Really weird correct, since that day I have tried to do that over and over but I can't do. If anyone has experienced this before please contact me, I want to hear your story.**

[juan a <quantumtrance@hotmail.com>](mailto:juan_a@quantumtrance@hotmail.com)

lancaster, CA USA - Sunday, September 16, 2001 at 23:42:30 (PDT)

**This might seem minor, but I always notice that when I randomly open an encyclopedia, already with a certain subject in mind, it ALWAYS *seems* to flip open at the right page. This is no exaggeration, although it is with 70-80% accuracy. Any explanations?**

[John](#)

Perth, WA Aus - Sunday, September 16, 2001 at 02:38:28 (PDT)

**I have watched 3 movies from Sept 10-15. Starting with AI(artificial Intelligence) The movie's end left me sobbing. Looking back on it, I watched it evening of Sept 10. The movie had a seen where the robot boy plunges himself off a tower in Manhatten. I sobbed uncontrollably and just put it off to being overtired. The next movie I watched was Down to Earth. Chris Rock is looking for a new body in Manhatten. there is a seen where someone plunges from a tower. Tonight I watch Shrek, again anot her scene of a massive fireball invading the top of a tower. These are the only movies that I have watched this last few days. I hear that other movies scheduled for release are not release because of scenes, relating to the terrorist attack. I also believe that many of us knew this would happen. Many people have highten awareness, though almost all refuse to believe, such a thing could happen.**

[D. Kuipers <deswin@telus.net>](mailto:deswin@telus.net)

Kamloops, BC Canada - Sunday, September 16, 2001 at 00:17:48 (PDT)

**One day I was hanging out with my friends, just chilling, like I always do at my house. I was outside my front yard and then I felt someone put their hand on my back. As soon as I turned around they took it off. I asked my friends if anyone was behind me and they said no. So then I was like, "O.K. whatever!" and I started touching my back where I felt it. That spot was warm and the rest of my back was cold. I asked my friends if they could touch my back to see if it was just me or if I was just imagining things. They felt the warm spot too. Then I was officially freaked out! I just hope that this doesn't happen to you because it is very freaky. Have a nice day!**

[Shika Hernandez <skika421@hotmail.com>](mailto:shika421@hotmail.com)

santa ana, ca USA - Friday, September 14, 2001 at 16:07:14 (PDT)

**A few nights ago, I went to sleep and all of the clocks in the house were synchronized. When I woke up, the microwave and my computer clock were 7 hours and 51 minutes behind my watch, and the oven clock was 32 minutes slow. The date on my computer was also reading as 1/1/1904. My computer clock goes to 12/31/2019, and was reading 8/24/01 that night. I unplugged my microwave to see if a power out would only stall it, but it reset it completely. Power outs do not affect my computer's clock. Powerouts would stall my oven's clock for the duration of the event. My wristwatch was COMPLETELY UNAFFECTED. I know because I checked it against my favorite radio program. This was not a powerout stalling the clocks. The clocks were out for the approximate time I was asleep. Nothing like this has ever happened before. The next night I reset my computer clock to 8/24/01 before going to sleep. It did not happen again. I need to hear from anyone else this has happened to. I am scared shitless.**

[Aaron Smith <ttoocs@gte.net>](mailto:ttoocs@gte.net)

Kamuela, HI USA - Tuesday, September 04, 2001 at 17:56:09 (PDT)

**when ever a tv is on i can sense it, like a computer monitor.....i can stand in a room next to a room w/ a tv in it and tell u if it is on or not just by using the tingling feeling in my head.....i can also tell when little gajets are on, like cameras.....it feels like i am hearing a high pitch sound, but i feel it instead of hear it, like it goes through my temples instead of my ear.....older tvs seem to be "louder" or create a stronger tingling than newer tvs ..... like i could sense them from farther away and easier.....some people i have met can do this too, i always thought i was weird, i talked to my best fiend and he can do it too, an we talked to sum people and they said they don't know wut we are talking about..... ..**

[dustin <asoulskater@hotmail.com>](mailto:asoulskater@hotmail.com)

IN USA - Tuesday, September 04, 2001 at 08:45:30 (PDT)

**Me, my brother and a friend were exploring a disused (...abandoned, partially flooded, very dangerous and closed to the public...) WWII fortress on the coast of the Thames river to the East of London. It had a ring shape, and on the lowest floor, below groundlevel, there was a tunnel that went around the outside of the ring, which met another tunnel, that went around the inside, in a small room at the end of the main arc. We got there, and seeing as it was a simple tunnel (a few hundred metres long, no windows, 1 floor underground, about 3 feet wide and 6ft high) decided to feel our way back to the entrance without torches. Torches off, pitch black...\*no\* light whatsoever. Even after about 10 minutes standing around getting used to it, utter darkness. Couldn't tell the difference between open/closed eyes, or see our hands or anything waving in front of us. So we set off, and then, about 80% of the way back to the entrance, the weird bit happened. Despite it being pitch black, I suddenly noticed it get \*much\* darker, in an instant. I said 'wow it seemed to get darker!' and my bro and his friend both kinda laughed and said they noticed it too. We've discussed this loads of times, but have no idea what it was. I'd love to know what anyone thinks this was due to...pls email me if you've got any thoughts!**

[Wido <widosm@mac.com>](mailto:widosm@mac.com)

dorset, UK - Monday, September 03, 2001 at 08:58:52 (PDT)

**about a year ago now, a friend and I were looking at a house to rent. From all appearances, it was a nice place, relatively modern (maybe 20 years old), light and sunny. However, after touring the rest of the house, I entered one of the bedrooms at the end of the hall and was immediately overcome with a most disturbing sensation, like an electric tingling that spread out from the base of my skull and back of my neck. It was like I could feel a malignant energy in that room and an otherwise pleasant space was filled with a dark, claustrophobic presence. So I thought I might perform a simple test and walked back down the hall to the living area, where the sensation vanished. I then returned to this room and as I travelled towards it this sensation again grew. Of course, there was no way I was going to sleep in a room like this, and subsequently we did not rent the house. As we were leaving in the car I said to my friend "did you feel that in there?", not describing what I had felt, but his response was "sh\*t yeah!" and he went on to describe the same sensation. We couldn't figure what it was, and both being somewhat practical, grounded types, were not keen to ascribe any fanciful, ghost story type explanations. Weird though.**

[Jup MacTydee <azureabaddon@angelfire.com>](mailto:azureabaddon@angelfire.com)

wellington, new zealand - Saturday, September 01, 2001 at 01:56:44 (PDT)

**While driving home at around 3:15 am going north on Hwy 13 towards Adams Co. about 5 or so yrs ago, I commenced to start saying my prayers because what I saw made me believe I would be dead in a few more seconds! The whole sky in front of me at first slow like a rising sun then like a huge blast turned blood red like a nuclear explosion and everything in front of me dissapeared with it so I said to myself, this is it, thought how I wished at least I could have made it home to die with my kids, and waited for whatever blast it was that I had seen humbly consume myself and my vehicle, but nothing happened! I just kind of freaked out and thought maybe it was some test from the base up north here but it was too close to Adams... I read one story here tonight that sounded a little similar but nothing on the magnitude of how huge this glare or whatever it was was. If an experiment, I wish the gov. would kindly give out notices! Anyone else can e-mail me on anything as large or if you just happened to see it too. Marre P.S. Can anyone explain a star that moves extremely fast around in all directions kind of like its broke and then just streaks off with a tail of light? My whole family saw this while driving home in the 70's. Thanks**

[Marre Carpenter](mailto:MarreCarpenter@Webtv.Net) <[Balinora@Webtv.Net](mailto:Balinora@Webtv.Net)>

Springville, WI USA - Sunday, August 26, 2001 at 19:37:53 (PDT)

**I have been intuitive all my life. I don't remember ever being shocked by anything as a kid. I have always loved thunder and lightening storms, not that we get much in California. I turn off street lights, I blow out light bulbs, nothing dramatic like in the movies they just don't work. I can never use anything that is plugged in because I zap it, and then it doesn't work for me or most of the time it doesn't work for anyone else. Anything electrical, my computer, vcr, the burner on my computer won't ever work right. The copy and fax machine all of these go on the blink. Once at work I wondered if I had zapped the computer at the spa because it blew about the time I was standing by it. The whole system was down for about 3 hours while they had someone try to fix it. Once at COCO's restraunt when I was the hostess with the mostest, I was getting frustrated and when I was trying to ring up someones meal on the cash register it froze up. The manager tried to get it to work and nothing. I finally had to step away for awhile and when I came back the machine was working. I do have good luck in picking out the machines in Vegas, I feel its energy and know if it is going to pay off. I shock everyone, even my pets. My kids have learned to ground before I give them a hug. When I kissed my honey on the head he got a shock so bad that he felt it for the rest of the evening. Once when I was angry at my teenage daughter the lights started to flicker. My daughter said that she felt as if her head were going to blow up. Then I looked away and my glance fell on the gallon of koolaid and it just blew up I wasn't even holding it my son was. My then boyfriend was a witness to that event. He still remembers it to this day and that was seven years ago. I now do massage for a living and my clients love my warm and vibrating hands. I seem to just know where the sore spots are without asking. I feel the muscles melt. The most unusual shock I recieved was when I was training someone to do a body treatment. I was setting up the table and had placed a plastic sheet on the table, then for no reason at all the floor wasn't even wet. I felt a charge of energy**

**hit me in the forehead and felt it travel down my right arm and it exited out of my big toe on the left foot. It literally blew off the rubber sandal that I had on. Then my foot went into cramps. MY forehead had a mark on it. Like a scrape that was the size of an erasure on a pencil. I have photographs that I have taken that have other pictures in them. My silverware is not safe around me any more especially my spoons. I bend them. I just hold the spoon between two fingers and when I sense the softening in the spoon I use other hand to spin the handle of the spoon over and over I can get 4 turns before the spoon handle is too short or when I lose focus and the spoon turns hard again. Boy! can you feel the heat radiate from that! Forks are more difficult because of the prongs but I bend them too. Mostly I find that I have more problems with this when I am scattered (not focused) tired, stressed, or when my energy level is very high. Sometimes running water over my hands and feet help. Also if I take a bath in salt water that helps. Mostly, tho I just live with this. Being intuitive is a mixed bag of blessings and this is just one aspect of myself that I have had to deal with. This is just a part of me and I have accepted that. Thank you so much for having this site. I truly didn't realize others had this ability too.**

[Susan Wadleigh <susanpsychic@hotmail.com>](mailto:susanpsychic@hotmail.com)

Big Bear , Ca. USA - Friday, August 24, 2001 at 00:35:34 (PDT)

**Sensitive to electricity at 10 Hz or lower, called Low Frequency Vibration Disease. Vibrations are felt through the feet, legs, and back. Terrible pressure on head. Usually caused by someone in the vicinity playing a stereo or TV at very low volume.**

[Ruth J. Toliver <rujoto3@aol.com>](mailto:rujoto3@aol.com)

Arvada, CO USA - Tuesday, August 21, 2001 at 10:05:44 (PDT)

**I am not sure if this was a dream or not, but one night i was asleep when i woke up. I sat up in my bed. I looked around just for the heck of it. Then i heard a fiddle. it got louder and louder, then it was screeching. I covered my ears, then when i uncovered them, i listened, and i heard a very low screeching. I got up and scaled the house, but nothing. the only instruments we had in the house are a trumpet and a keyboard. So i layed back down. then i heard it again. Pretty soon, my bed started shaking(no it wasn't an earthquake). Then the sky lit up. the next thought that ran through my head was (ALIENS!!!!) i ran outside, and as i had thought, a big ship was near my house, then it vanished into(hyperspace). I went back to bed and it happened again. This time i woke my mom and dad up, and they ran out, and we shot the weird UFO. then as weird as it was, it just turned to green smoke. so we went to bed. I think this was all a dream. one more time i heard a screech. but it was the low and loud screech. but it weirdly put me to sleep. ....**

[Kevin <ChristianChild11@aol.com>](mailto:ChristianChild11@aol.com)



Science Hill, KY USA - Monday, August 20, 2001 at 18:28:10 (PDT)

**I am a clairvoyant and intuitive councillor by profession and only recently had found the name SLI for something I have had as long as I could remember. I have, on average, 4-5 streetlights go out (or turn on if they are off) per week. My biggest event was when I was 18. Two friends and I were walking across a large deserted civic center parking lot at night and as we moved blocks of 6-12 sodium-vapor lamps would go out as we moved, until there was a 20-yard wide path from the street to my car. We all got so freaked out that we hopped in the car and left in a hurry. In addition to "straight up" SLI, I spent 10 years in theatrical lighting and was shocked more than anyone I knew. Also, I interrupt wireless services (pager and cell phone), get alot of static shocks, my watches, weither digital or analog, can never keep accurate time(usually runs slow), and finally, I drain anything with a battery faster than I should. That is about all of my electrical stuff. I have a question for all of you SLIders: Much of my work is with spirits, and I am wondering if there is a correlation between SLI and seeing, hearing, or feeling ghost activity? If we hypothesize that spooks are some form of energy, and that SLI is also a manipulation of energy, it stands to reason that SLIders could sense it as well as dish it out.**

[Steven D'Antoni](mailto:dantoni25@yahoo.com) <[dantoni25@yahoo.com](mailto:dantoni25@yahoo.com)>

Pasadena, CA USA - Monday, August 20, 2001 at 16:23:02 (PDT)

**Same here folks weird isn't it. I've got the street light problem. The fqct that every computer I've ever worked on in the office has broken down loads more times than everybody else. Lights flicker sometimes when I'm around. My TV broke last week, and there's been long periods in my life when anything electrical that I touched broke. There's no point in me owning a watch because of this. I did get electrocuted by mains electric 2 or 3 times when I was young and my mother's been hit by lightning. The problems have never stopped Fun heh? but who actually wants to fix it**

[Brian](mailto:elsobri@aol.com) <[elsobri@aol.com](mailto:elsobri@aol.com)>

London, UK - Monday, August 20, 2001 at 12:21:44 (PDT)

**I have been living in my apartment for close to 2 years. Recently I have been experiencing weird phenomenal things. My microwave is never plugged in, so in order to use it ,we have to get an extension cord and plug it in a totally different room in order for it to work. Well, it seems that very late at night, someone is touching the controls and it beeps. When we go to see what is going on, the cord is wrapped up as always!!! When I get up in the morning to make my husbands lunch, I can hear a man talking to children. Ikeep thinking te TV is on and go and check it. Of course it's not on, so I go back to making the lunch and hear the man again. This is very nerve racking. My daughter hears someone knocking on her walls in the middle of the night.....the family dog just sits in the parlor and looks out towards the dining room and moves her ears as if someone is talking to her.....sometimes the dog just sits and barks at nothing...does any one have any suggestions.....My daughter and cousin play cards on the dining room table which is situated across from my bedroom and they say they see something black pass by my walls in my room when they are in the dining room.....My neighb ors upstairs from me also hear strange noises when things are quiet at night Please e-mail me with any suggestions or help!!!!**

[CATHY CORDEIRO <CATHY\\_02724@YAHOO.COM>](mailto:CATHY_CORDEIRO_CATHY_02724@YAHOO.COM)

FALL RIVER, MA USA - Friday, August 17, 2001 at 10:51:20 (PDT)

**I do not have this "affliction", but I cannot help but wonder if these so-called faith healers do. They are making a lot of money out of the vulnerability of a great number of people who believe their "power" is God-given. What a sad state of affairs if any one of these healers is using this phenomenon to increase their fame and wealth.**

[Maggie Cross <Lilysgrand@aol.com>](mailto:Lilysgrand@aol.com)

Loveland, CIO USA - Wednesday, August 15, 2001 at 08:58:27 (PDT)

**About 6 months ago I was in bed with my boyfriend, it was late and we were just about asleep when I suddenly woke up and looked at my roof. A split second later, the entire roof went completely bright white, like my roof was made of a neon light or something similar - and it only lasted for about one tenth of a second. I assumed it could have been a power surge of short circuit making my light bulbs flash, and we went to sleep. Then about 1 one month later, it happened again, except this time the wall next to me lit up in the same way. This time i was freaked out, and couldn't sleep. I had forgotten about it until about 3 weeks ago when I rolled over to face my boyfriend and there was a shingin ball of light, about 4" wide, in front of my face. This time in stead of lasting for a split second it stayed a littel longer. Neither me or my boyfriend can think of an explanation, as our bedroom window is not near any source of light such as cars, neighbours house lights, outdoor lighting, anything. Now I can't sleep properly, sometimes I can't even handle having the light off... I feel like a kid! Could someone explain**

**this?**

[Jemma Cantell <weirdo\\_gerl@punkmail.com>](mailto:weirdo_gerl@punkmail.com)

Sunshine Coast, QLD Australia - Wednesday, August 15, 2001 at 00:04:45 (PDT)

**I was sitting in class one day. My teacher was in the front of the room giving a lecture. I wasn't doing anything much other than listening and taking some notes. There was one kid behind me and a little to the right, no one else. All of a sudden I felt like I got shocked or something. It was VERY intense. At first I thought maybe I got struck by lightning, but that, I realized, was ridiculous. It happened to my right shoulder area. My whole desk was lifted about five inches into the air when my shoulder jerked. It scared the heck out of me, I didn't know what to think. The person sitting behind me saw it, but didn't see what could have caused it. About a minute after the event the whole right side of my body swelled up, became hot, and turned a little red. I haven't had it happen since, but I'm afraid that it will. I mean what would have happened if the thing happened in my heart instead of my shoulder! I'm still afraid to this day that it will happen again. Is there any way I can stop it?**

[Justin X <just4wheeler@hotmail.com>](mailto:just4wheeler@hotmail.com)

Penrose, NC USA - Monday, August 13, 2001 at 10:31:54 (PDT)

**Last week in my home town of Dallas, I was on duty as a parking cop and there was this old cadillac parked in a handicap spot without a handicap card. I saw that the car was empty and started walking towards it. When I was about seven feet away I saw a women in the car that appeared to be in her mid 50's. I thought she must have been bent over when I looked so I proceeded towards the car. When I got to the window and lightly tapped on it she looked at me and I felt a cold chill come oven me. It was hot weather, so I thought it was pretty weird. She dissapeared and I never saw her again. I decided I wouldn't tell anyone because they would think I was crazy, until now.**

Bill Walligar Jr. <[BillWalligarjr@aol.com](mailto:BillWalligarjr@aol.com)>

Dallas, TX USA - Thursday, August 09, 2001 at 16:32:47 (PDT)

**this is another thing yes people think im weird but i've always had that . Can anyone eles see the energy in the sky? It's very difficult to explain but its blue-white and darts around everywhere like commas, , , , , , , , , , Anyone?**

[cat <ghostdog@iprimus.com.au>](mailto:ghostdog@iprimus.com.au)

wa Australia - Wednesday, August 08, 2001 at 22:11:35 (PDT)

**I can feel when I going to blow something up (quite handy if u don't have any spare light blubs). Blown up light blubs quite often, the flouro ones more than often, we've stopped buying them. Also the street lights. I also can hear ( accute hearing ) electrical devices - they are very annoying - when this happens I have to unplugg things. I can hear radio conversations this only in the country where its quieter. With the combination of both I get headaches and ringing in my ears.**

**[cat <ghostdog@iprimus.com.au>](mailto:ghostdog@iprimus.com.au)**

**wa Australia - Wednesday, August 08, 2001 at 21:48:12 (PDT)**

**When I was a young kid (about 6-11 years old), I was scared of the dark. There were a lot of things that spooked me, and some that didn't, due to a lot of phenomenon in my life at that time. What would happen is that shortly after I turned off the lights, a few feet below the ceiling and just above my closet door, something would appear -- basically a small area of light that I would estimate slightly bigger than a man's fist. It is usually taller than it is wide, and it was transitional; not only would its shape blur into slightly different positions, but it would often move to different points along the same horizontal path, all in all about a three foot span from one point to another where it could appear. There was no predicting its movements, nor what nights it would appear, and which nights it would not. When I was at this early age, I viewed it as a benevolent spirit, and felt a sense of relaxed peace to its existance. I had no problem looking at it, indeed I looked at it often for reassurance that my sleep would be peaceful and free of nightmares (nothing it ensured, but it helped me relax enough to sleep at night). Within the past few months, this same light has appeared. Please note, it was NOT present for many years (I am now 19). Until I came to a conclusion as to what it was (see below), it scared me like I hadn't been scared since I was a child. I had become paranoid to see it, hiding in my bed against the wall. I went crazy, and drove myself to determine it's REAL cause (after all, not all we view as mysterious is supernatural). Shaking, I went to the window, the assumed cause of this light disturbance. Logically, this should make sense, except that this spot of light, while it could come from the window between the panes of glass and the blinds, is not the length of my window, and the length of the window is not being blocked by any object -- ie, if it was the window, it would be a strip the length of the window, not 6-10". Regardless, I adjusted the window several ways. I put down the curtains, pulled the curtains to the side which the light WOULD come from, blocked the light with my hands and arms, seeing if I could even produce a shadow in this odd light (which has a slight fuzzy glow to it, not a definitiveness). Absolutely nothing changed the light spot. Terrified, back to my bed. My next thought was that it was perhaps some sort of glow in the dark paint, some abnormality with the closets above my closet (where it remains), and so in the light, I investigated. There was nothing wrong with the texture, paint, or otherwise on that spot of wall. Finally, I told myself to have the courage to just**

walk up and touch it, PROVE to yourself that it isn't anything, it can't harm you, and it's not alive and/or sentient. However, even with the deepest courage and faith I could muster, within two to three feet of this light, I completely panicked, and ran to flip on the light. I repeated this several times, never able to confront this light within even two feet. I've finally concluded that this light is actually some sort of "mirror wisp" -- some form of sentient energy that feeds off the emotions of a person and likewise mirrors them back. Notably, the first night I deal with the wisp in this new light, I felt anxious in looking at it -- and my anxiousness was amplified. The second night I felt slightly kind toward it, and had that kindness amplified. I could be wrong, but history and my notion gives me a hunch that this is some form of sentient energy...

[Jaime Brownyard](#) <[howlingpen@hotmail.com](mailto:howlingpen@hotmail.com)>

Whittier, CA USA - Wednesday, August 08, 2001 at 13:13:40 (PDT)

Although I am a skeptic when it comes to the recent explosion of orb photography (dusty cellars and flying insects in graveyards), I do strongly believe in the presence of spirits. My personal experiences cannot be a better defense of the existence of supernatural things. The house that I grew up in was a two story salt-box built before the victorian era prior to the developement of the small town which grew around it. The actual date unknown. I remember three experiences. In all experiences I was awoken from a deep sleep and upon awakening felt wide awake and unable to fall asleep again and had a feeling that something was about to happen. The first occurance happened as I had describe and the room was totally black as the window shades were drawn down. Laying in the darkness and right next to my bed I herd the sound of a glass sliding, tipping over as to make a klink and rolling across a counter top -then quiet. This at the time seemed unusual only for the fact that this happened shortly after I was aroused from sleep. Justifying the sounds that I herd I figured that maybe a mouse had knocked over a glass on the nightstand. The thing that puzzled me was that there was not the sound of the glass hitting the wood floor as it rolled off the stand. The next morning I searched for an over turned glass and could find no glass in the room. I just chalked this up as mystery not worth pondering. The second occurance however was terrifying. I awoke and lay in my bed for several minutes motionless. The room was barely lit by moonlight. Suddenly through the open bedroom door came a white wispy figure, not very well difined in shape, which startled me but thought it could be my mother. But why was my mother coming into my room in the middle of the night. The figure moved around my brothers bed and as it approached the side of my bed the figure remained fuzzy and mistlike and as it got closer facial features were barely recognizable. I was petrified to the point that I didnt want to move or speak then I noticed the figure looked as though it was speaking to me as it leaned closer to me but I didnt hear a sound. Then the figure moved away around my brothers bed and back out of the door. The next morning without any major attention brought to the question I asked my mother if she had come into my bedroom overnight. She said no and that was that, confirming in my mind that I had seen a ghost. I never told her what had happened. The third and last occurance I can remember wasnt as terrifying but very unusual. I woke up the same way as the other times and almost knew something would

happen so looking around as I lay there quickly discovered a soldier standing at attention with a bayonete at his side standing at the foot of my bed. This figure was as realistic as anyone could be but the fact the image resembled a small flat "soldier" shoe rack on our closet made this occurance seem less terrifying. The soldier stood motionless and after a minute I pulled the covers over my head and that was that. Possibly the ghost(s) realized they were scaring an otherwise interested audience. No other occurances that I have remembered but on an interesting note. My parent sold the house and the new owners made several modern additions to the house and instaled a pool. That same year the new owners child had drowned in the pool. An unfortunate accident but I find it just a bit creepy after my experiences there!

[Jbretz <jrbretz@tre.state.pa.us>](mailto:jrbretz@tre.state.pa.us)

Harrisburg, PA USA - Monday, August 06, 2001 at 13:20:39 (PDT)

I was 19 years old and drinking heavily with my buddies (Im 27 now). I decided to visit my girlfriend, so I borrowed a car and promptly wrecked it in a terrible crash at over 100 mph. I survived with a some large road rash scars and damaged pride. The next few months I spent in isolation. I faced criminal and character prosecution. Drunk drivers dont get much forgiveness these days. I tried lots of things to occupy my time, but I had fallen into a deep depression. I slept very little and was doing a lot of soul searching. My parents suggested I begin attending church. I scoffed.

I began having very vivid dreams. Two stand out very clearly. The one I would like to tell about is surreal. It was like an image or very short movie clip, no people or situations. It was pure emotion, a feeling of floating, combined with wonderfull color and motion. The best way I can describe it is a blend of colors forming a spiral-like tube that surrounded me. I had a calm, awe sweep over me and it was the most intense feeling of curiosity I have ever had. There seemed to be a white point, very far away as I floated through this wonderfull array of feeling and color. I wanted to study the things around me and the light in the distance. I didnt want it to end, then I awoke. I have never mentioned the dream to anyone, but it has been a constant image in my head.

Slowly, my life came back. I had new friends, I graduated, I found a good job, I met a girl. I fell in love with her and was convinced we should get married. We tried attending churches to find a place to get married, but I was extremely uncomfortable with that notion. I hadnt been to any religous function since I was a kid. One Sunday we went to a local church. I liked it immediately but couldnt explain why. We agreed this was the church we should get married in and continued to attend the church as often as we could. As I sat in a pew one sunday, I noticed a decoration hanging near the front of the church. It was as close as anyone could ever have come to re-creating the image I had seen 8 years earlier in my dream. I felt stunned and frightened, but most of all curious. I didnt feel comfortable discussing this with anyone. I dismissed it as coincidence for over a year. One day the curiosity overwhelmed me and I called

**the pastor to ask him about the wall-hanging. He told me it was a piece conceived by a member of the church meant to represent the creation of the universe. The white light in the center was the day of creation of the universe and the spiral colors reaching out from the center was the continued expansion of God's work. The pastor gave me the artist's phone number, but I have been apprehensive to call since I don't want to be forced to explain the reason I'm calling is b/c of an 8 year old dream. Any similar experiences with this image I have described?**

Anonymous < [spiralcolordream@yahoo.com](mailto:spiralcolordream@yahoo.com) >

Midwest, Mi USA - Friday, July 27, 2001 at 18:04:07 (PDT)

**One day my brother's friend came over and we have this box of letters from a long time ago. Well we were reading them and then we took a break and went out of the room for a sec. and when we came back the letters were spread out around the box!!!! So then I was scared, and I was very curious and so, me, my brother, and his friend did the ghost call and didn't hear anything, but an hour later my brother's friend started hearing voices. So we asked a few questions and most of them he didn't give us an answer. So then, after I wasn't scared anymore I went into my room (by myself because the others were still scared) and I went to get the letters and they were all put back in the box nicely and we didn't touch them. And then as I stood there speechless the door closed and locked and I tried to unlock it and get out but it didn't move and so I banged on the door and screamed as loud as I could (which wasn't very loud because I was scared to death) and then my brother and his friend ran to the top of the stairs and asked what was wrong and I told them so they called my mom and came running to help me and it just wouldn't open and then finally my mom said quit messing around up there, and the door flew open and hit my brother right in the head. And from that day on, my house was said to be haunted!!!!!!!!!!!!!!!!!!!!!!**

[Ashley](mailto:ashreneeomah) < [ashreneeomah](mailto:ashreneeomah) >

Omaha, NE USA - Tuesday, July 24, 2001 at 18:54:35 (PDT)

**I was at a birthday party for my great niece and taking pictures. I took a picture of her blowing out the candles. When I downloaded the pictures I noticed that the flame from one of the 2 candles was about 3 or 4 inches above the candle. No one saw anything unusual at the time. Do you think that she may have blown the still burning gases up.**

[Clyde Lewis](mailto:colewis@adelphia.net) < [colewis@adelphia.net](mailto:colewis@adelphia.net) >

Emporium, Pa USA - Monday, July 23, 2001 at 03:58:59 (PDT)

**IN 1966 WHEN I WAS WAS VIET NAM. AS I HID IN THE BUSH WITH MY EYES ON A CONG COMEING MY WAY AND WHEN THEY GOT WITH IN 40FT.I COULD READ THERE MINDS I KNEW WHAT THEY WERE THINKING. WHY?**

[VERNON TROKEY](#) <[KCHEYENNE8](#)>

TAMPA, FL USA - Sunday, July 22, 2001 at 16:18:19 (PDT)

**Working on theories of Moray B. King, dealing with coherence of ZPE. I used seven neon tubes wound with series bifilar coils, in series with the tubes. One tube had a search coil (series bifilar) that I connected to an old tube oscilloscope. When I power this experiment I get a spike with a resonant signature. Photos of this experiment show that this spike occurs when the ion accoustic waves pass through the center of the tubes. I have a possible gravitational event associated with this spike. I have one wierd photo in which one shutter stopped and the other passed it. I had the camera checked and this malfunction cannot happen according to the camera tech. This may be a manifestation of twins paradox. I modified this experiment further and am now getting photos that are much brighter when shot under the same camera settings, and same power levels. Mr. King's thoeries may be right. Also, a wierd coincidence happened at about the time the first experiments. Guess What! UFOs. I am about to try to build a new tube that should create a ion accoustic standing wave within the coils.**

[David E. Weiss](#)

Oshkosh, WI USA - Sunday, July 08, 2001 at 17:44:12 (PDT)

**Coming home from a whitewater river trip one afternoon with my sister and step-mother, I was riding in the back of the car just looking up into the sky and thinking about the trip we had just taken. All of a sudden I saw something that looked like handwriting in the clouds. I looked closer and saw that it was one perfect word, and that word was Jesus. I couldn't believe it so I sat there silently just examining it. When it started to disipate I asked both my sister and step-mother if they saw it but it was already starting to break up. My step-mother said she could barley make it out and my sister said it looked like some word. I know, without a doubt, for a brief moment in the clouds, in cursive writing, it said "Jesus". I'm wondering if this has ever happened to anyone else?**

[Lindee Robinson](#) <[dbltbl@hotmail.com](#)>

Twin Falls , ID USA - Tuesday, June 26, 2001 at 09:26:49 (PDT)



**10:00p.m, give or take a few minutes. I was 15 and by myself in my semidark room. No appliances were on, save for my desklight near my bed for reading. On the opposite side of the room, near the door, I heard a "whoosh" sound. Looking to the ceiling corner by the door, I watched as a triangle of light, pointing down appeared. A pair of eyes, with slits for the iris looked around my room. They weren't real eyes, more like shadows. It looked around, then at me for a few seconds. The eyes disappeared as did the triangle followed by a "whoosh". No one was in the house with me, and the TV had been off for a few hours. If anyone has any clue what this "abnormality" is, please contact me at [Hal\\_Jordan\\_GL@yahoo.com](mailto:Hal_Jordan_GL@yahoo.com)**

[Robert Taylor](mailto:Robert_Taylor@Hal_Jordan_GL@yahoo.com) <[Hal\\_Jordan\\_GL@yahoo.com](mailto:Hal_Jordan_GL@yahoo.com)>

Terrytown, LA USA - Wednesday, June 20, 2001 at 12:45:58 (PDT)

**somtimes when i look in the corner of my eye, i see a quick dark figure and sometime a human shaped but when i examine the spot where i saw it, thers nothin there. also i when certain events happen, somtimes nothing in particular it almost like i remember it happenig before it really happens. but i never remember thinking about it please tell me what this is**

[ricky](mailto:ricky@mgnty200@yahoo.com) <[mgnty200@yahoo.com](mailto:mgnty200@yahoo.com)>

USA - Tuesday, June 19, 2001 at 06:55:56 (PDT)

**It was a dark night, darker than most and a strang earie felling hung over me. I was on my way to the all-night store just a few blocks away.It was a journey i knew well and walked many a time before, but never agean. I heard foot steps behind me and a cold wind blew at my back. I was shivering with feer too scared to turn and face my fate. I froze to the spot, cold rough hands cluched the back of my neck. I turned quickley but no one was there, I gasped in disbelieve.**

**I turned back and stood directaly infrount of me at just about arms reach away was a tall dark shadowie figure. He was dersed in a long black overall and pointy black rimmed hat, he was sorporting a long gray bierd and black framed specticals. He looked strangely saddend bye my expresion of absolute terror. I gasped for breath then he disapierd. I dont know what he was maby a gohst maby a apprition who knows but ill never forget all the emortions running through my head and body in the few short seconds he visited my life for ever.**

[Nadine](mailto:Nadine@Nadine_or_Nads@aol.com) <[Nadine or Nads@aol.com](mailto:Nadine_or_Nads@aol.com)>

USA - Sunday, June 17, 2001 at 13:36:28 (PDT)

**If anyone out there knows about any holes in the ground of unknown origin E-MAIL ME!!**

**If you find a hole in the ground of any width, don't know where it came from, and especially if you drop things in and never hear them hit the bottom, send me a message.**

**If there are any holes out there that you've known about for a long time but never given much thought to, e-mail me.**

**DO NOT try to go into the hole to see what's down there or where it goes. Try shining a light in and see if you can see the bottom. If you can't see the bottom, DO NOT try to explore the hole yourself. DO NOT call the government or the USGS or even Art Bell. Don't call anyone but DO e-mail me.**

[Jack Richards](mailto:s2i@post.com) <[s2i@post.com](mailto:s2i@post.com)>

Seattle, WA USA - Saturday, June 09, 2001 at 18:01:59 (PDT)

**For years Ive thought about this ancient egyptian wierd science invention that I discovered in a museum book of ancient egyptian tomb pictures. This 'machine' really jumped out at me. It took me ages to 'fathom' what it actually did and was used for - but there is very little doubt to me that there is something very technological and amazing about the image. Elements in it seem like ,an iron magnetic coil, antenna, schematic energy image, waveforms, banks of metal plates and people interacting with this machine holding metal implements. Well thats what it looks like to me!!! After years Ive sort of settled into the conclusion that the device is electrical in nature and it is designed to seat humans on a very high powered, but very well balanced electrical energy source, and for that electical enegry to be modulated by and thru the human being. In effect the human is the unstable link in a power transmitter designed to transmit power in a human modulated form. Ie as you feel - so you project. Honestly this is my conclusion. Im pretty clued about physics/ capacitors/ leyden jars/ radiation gamma alpha beta, atomic theory - tuned tank circuits etc. So the point is that my conclusion isnt based completely on wishful thinking. After reading the entries on this site - I am sure, if such a machine was designed, then it could be used somehow by some of these people. Now I can see that there are electical to biological channels. They seem very odd to me but I would be foolish to dismiss them.**

**I would like to point out that our bodies are made of molecules which are bundles of atoms. 99.9999999% of chemical/ physical reactions involve the outer orbiting electrons of these atoms. These electrons are electrical. When you look outside you are looking right at electrical fields because everything that happens to that tree can be broken down to the electron flows around its atoms. Light itself is electro- magnetic radiation - when it hits atoms electrons dance electrically. The earth is a polarized emitter of static electic and magnetic energy. Finally the**

stars beam us with energy that is super powerful beams of electro-magnetic energy. Do you notice a common theme ?? Physics says that - We -( electron fields) are walking about on the earth which is itself a bunch of atoms and hence also a dense electron field. The earth (an electron field) is getting blasted by the electromagnetic energy of the sun and meanwhile massive intersecting beams of electromagnetic energy pierce us from all directions from the stars. That being said - it would be rather odd if there wasnt a whole cacophony of energy - electrical interactions between the various elements of this electrical mega field of which we are only a part!! Anyway, thats my bit for now. I wish I had some electrical experiences of my own - Im jealous of you guys - Im in love with energy!!! Umm if anyone want to know about this eqytian stuff, drop me a line and Ill pass it on. Its in the library at the local library for sure - I can tell you where to look - which tombs etc. I can also pass on an image of the 'energy balance schematic' which looks pretty good to most people, but technically minded or trained people will be very perplexed to think that this image really is at this very moment painted on the wall of a tomb in egypt and is thousands of years old. I call the actual painting of this 'thing' The Thrones of The God Kings. That way it sounds important even if its not!!

[David Miller](mailto:daveymilla@yahoo.com) <[daveymilla@yahoo.com](mailto:daveymilla@yahoo.com)>

Australia - Friday, June 01, 2001 at 23:55:09 (PDT)

I experienced levitation above my physical body, leaving through the window of my bedroom on a curved light beam & travelling at the speed of light into the future, witnessing an event & then returning to my body on the same light beam, then meeting my body was a sparkling ball of living lightning. I phoned 2 people to tell them about my experience & within 3 days one of the people reported to me what I saw in the future...I've been tested & told I'm a prodigy & was invited to brain storm with other prodigies & technologists with the Tesla Group...can anyone help me get in touch with them? I see advanced technologies WAY before they come into creation.....Terry.

[Terry Andersen](mailto:icpinc@hotmail.com) <[icpinc@hotmail.com](mailto:icpinc@hotmail.com)>

Victoria, BC Canada - Thursday, May 31, 2001 at 20:07:16 (PDT)

**Hello everyone , I am Nikhil Sharan from India .I am studying in class ninth .I am also my research with ufo's and other science projects.I've had a great experiences in my life and I think the thing which I'm going to tell you will make your hearts pound.**

**There's a place called Mehandipur in one of our states called Rajasthan where there is a Balaji temple( One of the most worshipped forms of God in India )where people come to free themselves of spirits.Their guardians claim that these people were caught by unknown spirits.So to free these people from the evil spirits they come to visit this place.These people are chained together and tied to teh walls of the temple.They sit reciting stupid things and their voices become heavy.They keep hitting their heads to the walls .Ant there's another temple at the top of a small hill where you can see these people carrying heavy stones weighing in tonnes and going up and down the hill .Now **THE ADVENTURE BEGINS** ,you can even find these people putting their faces into the fire and if you don't believe you can feel the fire by yourself .Do you think this is possible for a normal human being to do ? Not at all.**

**I hope this article interests you.**

**See you soon**

**Your reporter from India**

**Nikhil sharan**

[Nikhil Sharan < nikhilsharan@rediffmail.com >](mailto:nikhilsharan@rediffmail.com)

Motihari, bihar India - Saturday, May 26, 2001 at 22:11:35 (PDT)

**The air temp was about 10 F. The wind was blowing about 40 mph. My home is bermed into a hill side and has stone walls. All conducive to generating a electrical imbalance between the ground and the wind. I layed down and closed my eyes to sleep and immediately I was aware that I was in full dream mode. I opened my eyes and all was normal. Closed my eyes again, and full dream mode again. Horned beasts were rising up out of a lake and vaporizing into smoke. They were wriggling like they were being electocuted. They did not appear to be happy about being forced from their residence.**

**Then I heard a loud pop as a cookie cutter jumped off the niche in the dining room. (I thing the lightning charge entered my home where the electrical supply comes into the house and jumped throught the wall) Then a second later my computer screen discharged and then a milisecond later, I felt a electrical charge enter my feet and pass through my body up to my brain where it set all my circuitry to one modulation or frequency. It was traveling about 12 feet a second. I closed my eye and saw a script scrolling by. I opened my eyes and all was normal. I closed my eyes and I was greeted by three energy beings with another crowd of by-standing energy beings behind them.**

**The crowd was singing praise and joy and good tidings and welcomes, I remember they kept saying we are so glad you are here and all that kind of stuff. The energy being's were waving their energy arms which trailed off like streamers in some olympic floor exercise. I realized or thought that they (the energy beings') must be intentionally taking on a sort of human shape for my benefit. I further sumised that all the joy and happiness seemed to be iminating from them and was not something that I was personally experiencing, although I can understand how others may have confused similar experiences during a near death experience like I was experiencing. I also realized that we must be communicating via mental telepathy. I heard their thoughts in a part of my brain that was separate from where I hear my own thoughts. After some further confirmation tests, I asked how this place works. The energy beings disappeared and I was left in a landscape of linear flow columns stretching as far as I could see to the left and a very ominous looking vortex or tornado (perhaps a magnetic vortex) slowing spinning on my right.**

**Since then the fog in my brain (primary visual) responds to some verbal commands. Rotates left and right, (truth is clockwise and false is counterclockwise) visual confirmation of my body parts in my field of vision with my eyes closed. I've seen a tensor field and a type of attractor which had random activity in a non local area. A microtubial attractor arising from a quantum sea. I lost the ability to recall images. I can project the light in my head out into a dark room. I form receding donuts of light that recede into infinity. (Just as ball lighting decays into infinity rather than towards one of the poles.) I think the ball lightning must have left me magnitized towards infinity. I have traveled down into the worm hole of the donut and when I hold the donut of light from receding and then enter my consciousness into that hole, baby, I am in touch with something other than just me.**

[Clifford White](#) < [equilibrium@gtec.com](mailto:equilibrium@gtec.com) >

Grafton, Il USA - Saturday, May 26, 2001 at 13:22:08 (PDT)

**I can make chills run up and down my spine any time I want, and I can feel other people's energy, like if someone is coming up my road, or if something bad is about to occur. I also have a hightened sense of hearing/smelling to an uncanny point, but only at random times. Ever since I can remember I have had a sort of ESP. I sometimes jokingly say ting and they happen moments later, or I am playing basketball with friends and I can predict every shot missing or going in. It just happens randomly without me attempting. I dunno. I just felt like adding this...**

[Anonymous](#) < [N/A](#) >

York, PA USA - Thursday, May 24, 2001 at 16:31:53 (PDT)

**You have to be very careful with desinformation here, there are people trying to take advantage out of this and the Bajak device is problematical because it's too easy to build, besides the danger of roasting your nervous system on a big jump, so take a few breaks if you want to go see the first 4th of july or something. And by the way, no one can change history, only contributes to it (there are infinite parallel universes but the device only works the time of a given universe), everything that can happen has already happened.**

[someone](#)

USA - Monday, May 14, 2001 at 17:40:16 (PDT)

**Man Proves that parrots can talk and think like they do.**

**A Brampton, Ontario researcher claims to have irrefutable proof that parrots can understand and use context when they speak. One of his budgerigars has a remarkable vocabulary of several hundred words and is able to converse on just about anything.**

**"I don't think science and people in general are ready to accept the fact that any animal can be as intelligent as this. Currently they are grappling with the idea of whether monkeys are cognizant or not. The truth is budgies are sentient beings and my audio and video files prove it. They are so amazing people have a hard time believing they are real. Well I think it's about time the truth is out. I welcome any media or scientific organization to authentic my claims. Heck, I'll even set up a recording session if they want!" says Ryan.**

**Ryan Reynolds is the director of <http://www.talkingbudgie.homestead.com/index.html> and <http://www.budgieresearch.homestead.com/index.html> and is also the founder of the Budgie Research Group. He is well known among the budgie enthusiasts on the Internet as being a world leader in training parrots to talk. His main research was devoted to the late "Victor the Wonder Budgie" who he appointed as the "World's Most Intelligent Talking Bird." He is currently working with Victor's mate Betty who is proving to have the same abilities as Victor for understanding, talking and using context.**

**Ryan has a multitude of audio and video recordings that will change the way the world thinks about talking birds forever. His future plans are to do audio and video presentations to universities and scientific organizations about these amazing creatures.**

[Ryan Reynolds](#) <[RyanReynolds@home.com](mailto:RyanReynolds@home.com)>

Canada - Friday, May 04, 2001 at 17:04:36 (PDT)

**When I use to get upset, I would get Hives and now I dont itch anylonger.... OH I still brake out but now... The persons who make me mad brakes also...They have no sign of hives except the itch...**

[Ranger](mailto:foxxfire123@earthlink.net) <[foxxfire123@earthlink.net](mailto:foxxfire123@earthlink.net)>

Upper Little River, NC USA - Thursday, April 19, 2001 at 11:49:48 (PDT)

**When I Was nine years old Iwas struck by lightning .I left a fan in my window during a storm and lightning struck the pole across the street and hit the fan .I awoke when I saw the light and sat up in bed ,the lightning grazed my shoulder.I was'nt sure what happened but,when I became hysterical my parents rushed in and saw the mark on the fan and yhe burn on my shoulder.I have since become very psychic aswellas having the unpleasent sid effect of blowing out bulbs whenever I turn on a light when I am upset or angry.anyone else with the same problem?**

[Laurie J. Bourgeois](mailto:natrlblonde01@aol.com) <[natrlblonde01@aol.com](mailto:natrlblonde01@aol.com)>

Quincy, MA United States of America - Friday, April 13, 2001 at 12:10:19 (PDT)

**Time Travel This is a useful link for time travel circuits email me if you get any good results.  
[http://comunidad.ciudad.com.ar/argentina/capital\\_federal/nandoherrera/main.htm](http://comunidad.ciudad.com.ar/argentina/capital_federal/nandoherrera/main.htm)**

[Bill](mailto:backasswardz@yahoo.com) <[backasswardz@yahoo.com](mailto:backasswardz@yahoo.com)>

Chi-town, IL USA - Friday, April 06, 2001 at 22:18:39 (PDT)

**I HAVE AN UNUSUAL STORY.I HAVE A PHENOMENA THAT IS CAUSING ABSOLUTE HAVOC.IT STARTED AT AN EARLY AGE WITNESSING LIGHTS AND FLASHES,OBVIOUSLY HAVING SOME FORM OF E.S.P BUT OVER THE LAST FIVE YEARS THIS HAS GONE TO THE EXTREMES THERE HAS BEEN SIGHTINGS OF THESE UNUSUAL FLASHES BY OTHER PEOPLE AND EVEN SOME SAY THEY HAVE WITNESSED UFO'S.THERE IS ALSO FORMS OF TELEPATHY THAT IS BEING FELT BY A LARGE AMOUNT OF PEOPLE EVEN AFTER I HAVE LEFT AN AREA WHERE I HAVE BEEN. THE LIGHTS ARE VARYING DIFFERENT COLOURS RED WHITE AND BLUE!! AND SOMETIMES FORM TRIANGULAR PATTERNS.THE INCIDENTS VARY AND I HAVE RESEARCHED BUT NONE THE WISER. KIM HOLME LOND ON ENGLAND U.K.**

[KIM HOLME](mailto:kim.holme@onmail.co.uk) <[kim.holme@onmail.co.uk](mailto:kim.holme@onmail.co.uk)>

LONDON, UNITED KINGDOM - Saturday, March 10, 2001 at 12:24:56 (PST)

Ok I have 2 stories that id like to she with all of you after reading some of thes freaky stories. The first takes place in Long Island NY I must have been in the seventh or eight grade with one of my best friends Scott at his grandmothers house witch is located right on the beach I mean the wate is about 100 ft from the back door. Well we were sleeping in the bedroom facing the water in thiss old beachhouse that is very oldand has been in his family for quite some time. Well anyway were up late like 2 in the morning and its a perfectly clear night looking out over the water i think conneticut or something is across the water. Were up like looking at the stars and were like yo imagin we seen like a ufo or something. Then after a while we noticed that these stars in the sky were slowly moving twords the water and we se this police boat with a blue light driving all around the area its pretty far out there. When the stars finally seemed to reach the water we saw what seemed to be a fire and saw the police boat driving around the area. By this time it was real late and we decided to go to bed. WHen we wake up we have our usal full breakfas his grandmother would make us we'd have like every food group she's like a gourmet cook and while were eating we explain what we saw and I cant remember her reation but we imeadiatly went to the backyard THE BEECH like we did every morning and we saw all this crap that was washed up on the shore alot of it apeard burnt I think Scott had spotted some dingy he stole from the neighbors he stole last 4th of july so we grabbed it and as I was walking along the shore with scott I picked up some piece of staind wood that looked burnt and I looked at it closer and it had the name Franco burned into it witch is his grandmother's last name she took one quick look at it and explaind to us that the wood had once been part of some good wooden chairs that had been stolen from the back of the house some time before that prob like 18 19 years before that. I dont know that that might not be the strangest story but think about it I dont know. The next one is real weird though, check this out

I was a good friend of mine his name is chris and we used to go to chinatown in ny and buy large quantaties of fireworks. And alot of times we would mess around and take apart m-80's and make explosives with the powder from them and shotgunshells and we had made a couple. And like usual we put like 3 rolls of electrical tape around each onefor a louder boom. It was a really rainy I mean pouring you couldnt see 100 feet in front of you were in the back of a local base ball field medows and a perfect view of ny well back there the is a small concrete train tressel about 30 40 ft long and like 20 30 ft high and were tryin to light thes things under the tressel but i think the fuses got wet or they didnt burn all the way soo we hidem real good i mean we put them under heavy rocks soo we could get them the next day. We go back the next day just about as sh--ty as the day before to light the bombs and we look on the ground and here ar these things we made unravelled laying on the ground like i mean like a couple hunded feet of tape lying aroud and the shotgun shell laying there not lit or anthing i considered that the tape may have come off because of moistur but these things were unde rocks that hadent been unturned somebody had to touch them but no one could have possibly kew where they were let alone be out in that weather i mean youd have to be insane to goout that day or the next maby that explains it but i guess ill never know. Oh sh-- sorry one more crazy story before i go to bed.



**Theres like some truckyard by a semitary that has a small stream surrounding it with dense weeds and shrubbary over it in the back of the semitary theres a bike track and one day me and scott are riding bikes by the bike track and the truckyard when scott looks over in the weeds and finds a jar by the stream this kid always finds the weirdest sh-t its like an amber colored plastic jar and he's like open it and im like no you so after arguing for a while i gave in and opened it i immediatly thew it cause a friggin horribly dead stench came from it he went over and picked it up and we held our noses and looked in ad saw something that resembled a humanheart or something with brass pins in it we closed it and put it back we went back a couple days later it was still there then we went back to show someone else and it was gone I read about some weird thing going around where this cult preforms rituals by the cemetary or something like its a religion or something where that in one of there practices they put like dead stuff in a jar by a stram and in nature with like iron and its supposed to do some kinda magic or something i dont know it early in the morning now sorry about hte grammar im just to lazy lol well if anyone has any intesting answers to my stories E -mail me at [KNOXROCKS@aol.com](mailto:KNOXROCKS@aol.com) OH YEH THE WEST CHAZY STORIE I KNOW THE SKIPPER YOUR TALKING ABOUT I PROB KNOW YOU**

[Steve Zanetakos <KNOXROCKS@aol.com>](mailto:Steve.Zanetakos@KNOXROCKS@aol.com)

Kearny, Nj USA - Saturday, March 10, 2001 at 04:52:28 (PST)

**i have had many strange things happen to me in my life, but most other experiences fall lunder catagories such as alien encounters, ghosts, and psychic phenonoma....but this even really is a doozy.....i lived in Hollywood at the time and this happened about 12 years ago...i lived in a 4 story apartment building and was visiting with a friend out in the courtyard....i was sitting on an iron fence...feet not touching the ground cause i am short....a "friend" of my room mate was visiting him inside....he apparently was crazed form drink and drugs, found my pitchfork in the apartment and came out into the courtyard....i looked up to see him running full speed at me with the pitchfork aimed right at my chest....when the pitchfork reached me, and was about 4 inches away, i felt something, unseen, push me off the wall backwards...so the pitchfork didn't touch me.....**

[barbara <windancer@theriver.com>](mailto:barbara@windancer@theriver.com)

claypool, az USA - Sunday, February 25, 2001 at 11:20:04 (PST)

**I wonder if anyone can tell me why infomercials seem to put you into a daze. I have noticed that when i am looking for something interesting to watch and i come across one of these commercials i am hooked. I must have seen that damned ab roller commercial a hundred time. At first i thought i was crazy, and the only one who did this, but i have noticed that several of my friends and family memebers do this as well. If you want to see something really freaky..... try staring exactly into yours eyes in the mirror.**

**[zack <prozack2001@aol.com>](mailto:prozack2001@aol.com)**

**S, tn USA - Saturday, February 17, 2001 at 00:01:48 (PST)**

**Actually, I'll submit a second weird one, although this one may be more amusing - it's certainly strange. Many places I have lived, there have been spiders. I don't like spiders, most people don't. Superstition or not, I end up informing the spiders vocally when I move in that if I see them, I will kill them, and usually I don't see many after that. One spider, however, seemed determined to eliminate me as a threat. It was a wolf spider, which are brown hairy hunting spiders with decent speed. I was on my hands and knees working on my computer under my desk when I noticed it crossing the floor towards me. Too busy to deal with it, I told the spider "Out of my sight, or you're dead!" It turned around and ran behind something, out of sight. At this point**

**I went back to work, crawling behind the computer to work with the cables. I looked up, and the same (I suspect) spider was crawling towards me over the cables now - it had gone the long way around the desk! Frustrated now, I told the spider it was finished, and went upstairs to get the RAID. I came back down, and the spider appeared to be gone. So, back to the front of the machine, and I was finishing it off when the spider came towards me again, in the front again. At that point I finished the evil creature.**

**(In retrospect, it occurs to me that perhaps the spider was simply trying to avoid me by going around the desk where it thought I wasn't, and it was all bad luck and not malicious intent, but that's giving a spider a lot of credit, too!) ;)**

**Tursi <[tursi@orcas.net](mailto:tursi@orcas.net)>**

**Hayward, CA USA - Thursday, February 15, 2001 at 13:35:33 (PST)**

**Interesting site. I'll add my two bits. I have, in the past, seen the stars that move, then abruptly change course and zip away. I've had the deja vue and in some cases have realized at the time of the dream that it was going to be deja vue. (Usually I dismiss it at the time, often in the dream itself, until it happens.) I've lived in houses that gave me nightmares and feelings of dread about certain places. I even had a plush rabbit that, if I slept with it, I was guaranteed to get nightmares (seemingly unrelated.)**

**But, to provide a specific circumstance, this was an odd one. I was about 14 or so and working alone in an office of the apartment buildings my parents managed, up in British Columbia. All the doors and windows were closed, and the heat was off at the time. The door to the rest of the apartment was open, however, and kept swinging a short distance back and forth, creaking as it did.**

**Anyway, a few minutes of this was driving me nuts. I was about to go over and close the door, but first, mostly out of annoyance (and not any belief it would work), I called out "Just make up your mind, already!!"**

**The door promptly closed fully, latching.**

**That's the only instance I've seen of 'weirdities' that was that blatant.**

[Tursi <tursi@orcas.net>](mailto:tursi@orcas.net)

Hayward, CA USA - Thursday, February 15, 2001 at 13:15:10 (PST)

**I once was lying in bed at night. I was looking at the sky through the window. The sky was not cloudy. Suddenly one star started moving to another. It moved quite fast. When it moved it left a glowing trail behind. As it moved towards another star it's trail faded. Maybe those stars were spaceships? But the speed was quite big. I'm a specialist in astronomy, astrophysics & physics. But I can't explain this phenomena.**

**Sergey Bayutin Ñãõããé**

**Áàpòèí.**

[Sergey Bayutin <sergeevo@livas.lv>](mailto:sergeevo@livas.lv)

Riga, Latvia - Saturday, January 13, 2001 at 04:34:12 (PST)

Some times I will be opening up my school binder and I will notice that a peace of string on it will start to raise, and whenever I want to, if I can concentrate, I can control the peace of string. Everything strange always seems to happen to me. In fact, one night I was sitting in bed and playing Playstation, what I was about to see would frighten, because I had already seen other things like this.

In my closet I saw to eyes looking directly at me. Quickly, I turned of the TV and went to bed. I was shivering in a deep sweat. I was panicking and I didn't know what to do, and then I opened up my eyes again and I still saw it in my closet. Then I tried to convince myself that it was coming from a light behind the TV, the VCR, or a light from outside, because it couldn't have been the Playstation because it was off. So I looked at the window and there where no lights shining on it, and then I stared at the VCR, and the lights from the VCR where on shining in my direction, and I light couldn't have been shining from the TV because the TV was faced back towards the wall. That went on for a few seconds, and I closed my eyes thinking what to do. I thought about running to my sister who was out in the living room, but I was to scared. For the third time I opened my eyes and the eyes where gone. It took a few minute but, eventually, I fell asleep. The next morning I woke up at 5:00, and the room was still dark. I felt like there was a reason for me to be up. Suddenly, I saw a figure made of light deformed on the wall. It looked like it didn't have a shape, and that it could take any form. This also frightened me. I saw the figure moving across the wall and I heard footsteps walking along the ground at the same point the figure was marked on the floor, but there was nothing in between both of them. The figure moved from my brothers bed to the playstation, which I was to scared to turn off, and from there it moved from the Playstation to the closet door, which I had been to scared to close, and finally it walked be me to get to the room curtain, which I had also been to scared to close, and while it was walking by I could feel it brush my foot. After it walked to all of those places it then walked walked back to were it came from, my brothers bed. Right after that my brother got up out of bed and mimicked the same movements, but instead he turned of the playstation, closed the closet door, and closed the curtains. One time I touched the computer monitor and it went off for a few seconds and came back on, and when I am typing, even right now I can fell an electricle current running throgh my arms, but it doesn't hurt. Sometimes when I am out of energy and about to faint and lying on the ground I can see. Tiny light circles of electricity rushing towards my body, and I gain enegy to last quicly. I can see the circles in some places like my room. Sometimes when I am out in my living room alone at night I get scared because I can sense invisable electricle organisms, and it feels like they are stalking me. I have also had others experiences, but it would take to long to explain.

[O.J Onimole <Job901686539@AOL.com>](mailto:O.J.Onimole@Job901686539@AOL.com)

Mesquite, Tx USA - Sunday, January 28, 2001 at 23:05:17 (PST)

**my roommate in college used to scare me to death regularly (about 25 yrs ago), but it was so interesting to me that i stayed and watched, and tried to take notes. Shed go into a trance i guess..her arm would keep coming up so her hand touched her shoulder..she tried to fight it off with the other hand,because she didnt want to do it, but it was too strong. When her hand finally touched her shoulder her arm made a rough looking circle. She would call it "the circle" and kept saying that there was an electrical current running all through it..then shed start talking things, and languages that didnt make sense. I urged her to go to Duke and have it studied, but she was afraid of it. I watched this for 2 years on and off and never told anyone except my future husband..I still wonder what "the circle with the electrical current" running through it was.**

[Adele <Gruffypaw@aol.com>](mailto:Gruffypaw@aol.com)

Greensboro, nc USA - Saturday, January 06, 2001 at 22:17:49 (PST)

**A air craft in the air i was shaped like a arow head it was realy big and there where three big light circle shapes. I called it in they sead it was meader right but i think it was au ufo.no sight of landing it dissaperd like nothingt**

[Joey Kane <jena719>](mailto:jena719)

newyork, ny USA - Wednesday, December 06, 2000 at 09:37:21 (PST)

**I don't know what this will classify as. Often when something happens I recall a hazy memory as if the same thing happened long ago or in a dream. It's like a really odd form of deja vous. An example is one time I was shopping at Wal Mart with my family. I was looking for shoes. My sister looked at a pair of high heels. Of course my sister was too young for shoes that high. My mom told her no because she was too young for heels that high. I don't remember the exact wording, but I remember at the time that I was shocked because the whole situation seemed familiar and I've heard my mom say the exact same words just maybe a week before.Something to consider is that in my family we never buy shoes that often, and neither I or my sister have ever owned a pair of black high-heeled shoes before this, so this couldn't have happened before. The next odd thing that happened was the shoes. when my sister mentioned them, I was at a distance and had bad vision and no glasses at the time, but they seemed to be what I was looking for. I went over and looked at them closely. Again I was shocked because I recalled a hazy memory of wearing shoes like that before, but I never have wore heels that high, or black shoes. I don't know if this is some form of telling the future, since I got those shoes. I have never told anyone, especially my mom since she doesn't believe in the paranormal. I believe in these types of phenomena and I know I am not imagining these occurences. I have had other encounters with odd things, but they are less substancial.**

[Daisy <AngelLove22587@aol.com>](mailto:AngelLove22587@aol.com)

Madison, al USA - Saturday, January 06, 2001 at 15:03:21 (PST)

**I have several strange abilities. One is I can smell death. I have 4 cats that frequently bring dead animals in. I am the only one who knows they are there. My mother can't smell it nor my stepdad nor anyone else who comes in the home. I can smell almost anything though. If someone hands me pills and they ate an orange earlier in that day I smell it.**

**Another thing I have so much electric in my body my hair will stand up and sometimes with my mind I can move it in one direction.**

**I am also able to create sparks of light. While petting a cat or moving a blanket. I shock almost everything I touch.**

**I can also sense supernatural "things".**

**Oh and one more thing sometimes I get physic ability.**

**I feel like some sort of mutant. Can anyone explain?**

[Emily Dunay <LAVITIKA@aol.com>](mailto:LAVITIKA@aol.com)

Uniontown, OH USA - Monday, January 01, 2001 at 01:51:41 (PST)

**Try not to laugh at this, even tho i know its gonna be hard not too: OK, call me crazy and crap, but im a psychic. Kinda. Well, see, it started maybe, 3-4 years ago. I know this is a minor part but I began to predict movies. I'd say something and it would actually happen. The best prediction was this weekend, at the movie vertical limit. Near the end, he helps his sis outta hole, and he uses a rope for it. The thing holding the rope was coming out, and they could not reach it. I told my mom, " watch the old guy come and step on the metal thing and save them. Exactly what happened. I predicted it word for word. This happens to me all the time. This is not my only report of this " phenomea". On Saturday night, I was thinking about this psychoch stuff, and i wanted to prove it. So i said, "whatch ,my little sis wear her blue pj's and my best friend wear his typhoon lagoon shirt. Exactly as I predicted. I predicted clothes for the next day, and I was right again. then , i have these wierd desavoo feelings. Like ill see something and then get this flashback of it happening, like i dreamed it before or something. Its happened around 50 times, which leads me to convince myself. It feels like ive lived my life before. Its just wierd, like I have done this already. Like ill see something on the wall or something, then ill**

like just stop what im doing andget this flashback of it, like ive seen it before. then, a few days ago, i had the most wierdest thing ever. I was walking toward the house, just hoem from school, and I hear something like a hooting traoin except in shorter lengths, about two at once, lasting about 1 second. As i got closer to my backyard, it got softer, like a reassuance, come closer until u find me. I was thourly creeped. I started to walk away, but as i did the noise got louder, as in alot louder. needless to say, I had to piss real bad, so i couldnt decide wether to ude the b-room or go and check out what it was(and no it wasnt a owl)I went to use the bathroom, but my mom occupied it, so iran back out. The sound was gone. I tried to immatate it, but nothing. I ended up jus closing my eyes. But as i did, i feltlike i was leaning/ being attracted to something, so i let it take me. I ended up near a pile of wierd rocks. I couldnt find out what they were. I say something white like run by the corner of my eye and i ran. Befoire that happened, I had saw some snow hit pur winsheild while we were driving home. It hit and left no mark of snow. nothing. So, I asked my mom if she had seen , it, she hadnt. I just forgot about it, until my mom stopped to pick up some stuff, a thump was heard on my roof. There was no mark of anything hitting. This probably sounds really weird to you, but I am a psychic. Also, there is something I heard of that looks like a bubble expanding form the horizon, like a green bubble, and then it dissapears. If you have any info email me. Also, if ther are any psychics on this board contant me. PS, dont listent to those psychic hotlibne things, you can only predict naturally, not when u want too

[Justin <popo452@yahoo.com>](mailto:popo452@yahoo.com)

USA - Sunday, December 10, 2000 at 15:58:07 (PST)

I live in an old house in the suburbs, surrounded by trees. If I listen very carefully i can hear the muffled, continuous screaming of a young woman. It sounds like its coming from below the basement. 2 weeks ago I was in my car with my friends and saw a dark man. I shined the flashlight andit was gone... The minute i turned off the flashlight he was there, walking across the yard... I nearly pee'd myself.... Scary stuff

[StarDuzt <starduzt121@hotmail.com>](mailto:starduzt121@hotmail.com)

Franklin, WI USA - Monday, October 30, 2000 at 19:48:07 (PST)

**This is just an odd thing that happens to me occasionally. I have absolutely no explanation for it. I have trouble reading digital displays. For example, one night, going home from a friend's place I was wondering how far away we lived from each other. I peeked over husband's shoulder to read the odo on the motorbike. When we were about half way home I looked again and the reading was the same as the first one I had read. The odo was not broken. It was ticking over quite nicely. I have had similar experiences with digital clocks, where I want to know an elapsed time, but I find that my second time I look I see the same time as when I first looked, and no, it wasn't 12 hours later...**

[amanda <feathers@cyberspace.net.au>](mailto:amanda@cyberspace.net.au)

melbourne, Victoria Australia - Monday, October 30, 2000 at 15:22:22 (PST)

**Well no this isnt an urban legend, it is true and happened to me recently. I dont think this is that wierd of a story but I thought it was pretty interesting and wanted an explanation. Well I was at a Pizzeria in Kansas City, MO called Pizza Street.(which has very delicious pizza.) Anyways my mom and dad were at one table, and my sister, her boyfriend and I were at another. We were just sitting there talking and my sister put her glass down and it kind of slid, then oddly it came back to her. I said "Cool!" And I experimented with it some more. I concluded that if you kind of spun the glass and pushed it at the same time it worked the best. Obviously, it had to do something with the condensation that had came off the glass and had formed a little puddle of water underneath it. But I couldnt figure out how it was doing it. Finally my parents said it was time to go. But I wanted to stay longer to experiment with it. One time,(this was the coolest one) I did the pushing and spinning of the glass and got it to go like 10inches which from there it stood still for like just a second then came back to me again. Sweet!! I still couldnt figure it out though. Then i left the restaurant. When I got home I tried it but couldnt get it to work. Mysterious huh!? Well if this has happened to anybody or has an explanation for this please e-mail me at [mtncoolman@aol.com](mailto:mtncoolman@aol.com)**

[Mark Nelson <mtncoolman@aol.com>](mailto:Mark.Nelson@mtncoolman.aol.com)

St. Peters, MO USA - Monday, October 30, 2000 at 15:05:42 (PST)



**5 years ago I was staying in a house which I believe was haunted!The reason for believing this is that I was 'feeling' strange things.I don't exactly know how to explain it but I know that spirits were visiting me almost every night.The unhappy thing was that they weren't good ones.And I know that because they were not friendly to me.They used to scare me by appearing or walking infront of me just for 2 seconds and disappear again!Or by coming in my dreams with a very scary appearence.That period I used to see unknown figures and hear footsteps even when I was home alone. Know that I have moved from that house and 5 year have passed I don't really know how to explain what was happening back then.The only thing I know is that that experience caused me a lot of pain and left me with many psychological problems.After all it's not easy for a 14 years old girl to go through all these inexplicable activities!**

[Athina <askondra@coventry.ac.uk>](mailto:askondra@coventry.ac.uk)

UK - Friday, October 20, 2000 at 10:04:55 (PDT)

**I've been living in my current apartment for the last two years. About nine months ago, I had my laptop leaning against the wall at a 75 degree angle. I went to bed, but couldn't sleep, so I listened to Art Bell's Coast-to-Coast show. I heard a loud bang against the wall, from the other side of the wall. I got up and looked around the living room. I looked and my laptop was on the floor. There was paint all across the backside, which was closest to the wall. Now, it could have been that it fell, however, at the angle that it was at, it was very unlikely. It is as if someone had slammed the laptop against the wall.**

**A few weeks ago I was sleeping on futon sofa right near where the Powerbook was. I slept in a few times and was half-asleep when each time I slept it, I felt as though someone was trying to sit on my legs, and each time I moved my legs and when I stopped, the pressure returned. I could have been a dream, however, the feeling continued, and I was nearly snoozing when it happened, not fully asleep. My feet were right where the laptop had been.**

**Last week, I went into the bathroom and notice that I had left the cap to my shaving cream off. There was shaving cream all over the bottom of the toilet seat, the mirror, and in a corner of the bathroom. I have ablsolutely no idea how the shaving cream got all over the place.**

**All of these experiences have me thinking...**

[patrick fisher <kundangi@eskimo.com>](mailto:kundangi@eskimo.com)

Seattle, WA USA - Wednesday, October 18, 2000 at 23:34:40 (PDT)

**I can only remember that it was the year of Harmonic Convergence. I was in a remote part of Montana where the nearest town was 20 miles away and the nearest neighbor was 2 miles. It was a completely clear night, millions of stars not obscured by any lights. There was also an arc of light from horizon to horizon. It was not the Milky Way or northern lights. You could not see the stars behind the arc of light. It looked like it could have circled the Earth. It lasted about another hour and just faded away. I asked an astronomy professor about it and he could'nt explain it.**

[John McKenney <chmck@earthlink.net>](mailto:chmck@earthlink.net)

smewhere, Mt USA - Monday, October 16, 2000 at 11:51:46 (PDT)

**When I bite down and my teeth connect I see a distinct distortion in computer monitors. I have asked others if they see this same disturbance but the answer has always been no. There is nothing wrong with my eyes or my vision and I have never worn braces.**

[D.T. <zedzedbeta5@hotmail.com>](mailto:zedzedbeta5@hotmail.com)

Sarasota , FL USA - Saturday, October 14, 2000 at 21:23:47 (PDT)

**The night before the US Navy ship was bombed in Yemen. I couldn't sleep well. I kept waking up. In one vivid dream I stood beside a huge tree that had been cut down. It lay on it side across a road. The tree was gray. A strange color for a large tree, at least from where I'm from in the northeast. The tree was also the size of a battleship. The next morning as I traveled to work I heard the news about the bomb attack on the news. IS there something toi my dream. I few years a go, I had a similar restless night. I dreamed that all of Europ was on fire. The next day, I woke to hear that Chernoble nuclear disaster. Strange isn't it.**

[jerome holst <jholst@manor.edu>](mailto:jholst@manor.edu)

Jenkintown, PA USA - Friday, October 13, 2000 at 10:17:36 (PDT)

**In August of 1992, a cousin and I conducted an experiment to actually track a brainstorm IN PROGRESS on an EEG. She helped me get wired up and then I lied down in a darkened room as my cousin took over the controls. When the EEG was started, everything was normal and running at 100 uV/cm. The odd part was hoping to induce a brainstorm, since most of these are spontaneous. Well, I was able to successfully induce one (no drugs or hypnosis used), and it was about how I would create the sounds of monster pipe organs in my computer room. During the brainstorm, I was able to "hear" these pipe organs, and I was able to "see" myself standing back and looking at my keyboards and computers in awe, as if "What have I created?". While this was going on, I narrated my thoughts onto a tape recorder as my EEG was being recorded also. After the brainstorm was over, I allowed my mind to just go blank.**

**Here are the results using a simple EEG connection. First of all, I had the ground electrode on the left frontal region. The positive electrode was on the right frontal region. The negative electrode was in the occipital region. When the EEG was started, its amplitude was about 3-5 cm (or about 300-500 p-p). When the brainstorm intensified, the reading went off the graph BIG-TIME. However, my cousin forgot to turn down the sensitivity. Probably about 1 mV/cm would have been about right. When examining the readouts myself after the experiment, the amplitude was so large that it appeared more like a square wave going clear from the top to the bottom of the screen. After the brainstorm was over, the amplitude and waveform nature returned much closer to normal. Later when I was in a "blank" state, my EEG was even smaller than normal. It was probably around 200 uV p-p.**

[John Nozum](mailto:JNozum@worldnet.att.net) <[JNozum@worldnet.att.net](mailto:JNozum@worldnet.att.net)>

Moundsville, WV USA - Tuesday, October 10, 2000 at 03:55:47 (PDT)

**about fiveteen years ago i saw a object, two dimond shaped objects one on top of the other rotating opposite of each other,it was about three feet tall and ten feet off the ground , it floted ,no noise, then traveled off**

[how](#)

covina, ca USA - Friday, September 15, 2000 at 17:51:59 (PDT)

**I am a 30 year old male active duty military. I have always felt a strangeness about my bodies internal workings. I do not remember when it all started. But when I first enlisted 10 years ago I had to have an EKG for a physical screening to enter the military. At that same time I had the feeling of some one running there finger nails down a chalk board in my spine. I do not remember why I was thinking about the chalk board but it happened. Thr EKG machine shut itself off. The corpman at the time dismissed it as a bad machine. Well he restarted it and I thought no way is this happening. So I intentionally had the chalk board thought after a 30 second interival of the machine up and running. POW!!! I shut it down, but before that he noticed that my heart rate was almost at 200 on the EKG. He asked what are you all excited about whats wrong why is your heart rate so high? I told him nothing was wrong. So he decided to manually check my heart rate and B.P. it was 98 BPM. Wholly crapp did I manipulate this damn thing? It is my opinion that yes I did and continue to do so. I have to get EKG's on a regular basis for job reasons and I consistantly screw with the corpman just to see if I can control this energy. It is funny but I feel like I can teach poeple to bring this on at anytime. I tried to see if an O-scope would measure this energy but It wont. But that was from fingertip to fingertip. All of the energy I harness is definetly from the central nervous system outward. I can make it happen any time anywhere, so if any one wants to test me I am all for it.**

[A. Cochran <littlestpup@hotmail.com>](mailto:littlestpup@hotmail.com)

Anacortes, WA USA - Wednesday, August 16, 2000 at 09:53:46 (PDT)

**During the winter of '94 I was working a night job, I would get off at 4:00 am. Being interested in auto mechanics, and performance, I often tweaked the settings on the engine to try to get better performance. The best way to test my changes was on the way home from work because there was a long hill to climb. I would get out on the road and open the throttle, and check my speed at a certain point along the road. Well one morning, I was doing just this, I got past the point, and just for fun was still accelerating. I was probably around 85 mph (this is in a rural setting, so speeding wasn't as much of an issue), when suddenly the car struck something. Whatever it hit, the car slowed down 5 mph on impact. Strangely enough, I never saw what it was I hit, and my headlights were well aimed. I saw nothing at the time, I continued home and went to bed. The next day, I inspected the car under full daylight, there was no damage done, and no evidence whatsoever of anything striking the car. I drove along the same section, much slower this time, and still saw nothing in the daylight. I inspected everything mechanical on the car, and nothing was at fault, there was nothing that could have caused such a sensation. I still don't know what it was I hit and probably never will. Judging by the feeling of the impact, it would have been something the size of a large dog.**

[Damon Johnson <alaska@xmission.com>](mailto:alaska@xmission.com)

USA - Tuesday, August 15, 2000 at 20:41:53 (PDT)

may i suggest to whoever runs this page or whoever posts stories, they add something at the top of the page that encourages posters to submit physiological info, like height, weight, gender, race, hair color, complexion, health conditions.... that way we might be able to see if there are any similar patterns in physiology of the people that display this phenomena....

[kramer <zoaraster\(nospam\)@mailcity.com>](mailto:zoaraster(nospam)@mailcity.com)

USA - Saturday, August 05, 2000 at 04:38:31 (PDT)

**When I was about 14 several of us (4 total) were camping at my friends house. We had a fairly nice sized camp fire going and we were playing team hide and seek in the woods. It was around 11:00pm and there was a nice layer of fog hovering about 3 feet off the ground. This is a pretty typical summer night in Florida. Two of my friends were hiding and the other person and I were looking for them. In order to keep it fun, we only have 15 minutes to find the other team, and at the end of the 15 minutes, everyone is suppose to meet back at the camp fire. The 15 minutes were up and we had found one person about 7 minutes prior. My friend and I had just made it back to the camp fire when we saw something human shaped run across the path. Thinking it was the remaining person, we called out to him, but to our surprise, he came out of the bushes right behind us. We asked him if he saw it too and he had. We then assumed that it was the person we had caught a few minutes ago, so all 3 of us called out to him. To our surprise again, he came down the trail from the house which is not close to where we saw this humanoid thing move across the trail. Also, he is a bit too large to have run from where we saw this thing to where we saw him come up the trail. At this point we were all a bit confused about what we saw, and at 14 years of age, it freaked us all out a bit. A few minutes later, my friends dog yelped and came running to the camp fire. When the dog got there we realized that she was trembling and appeared to be very scared. She also refused to leave the camp fire.**

**I do not believe in ghosts and while I believe in extra terrestrial life, I do not believe it has visited Earth. If I had seen this thing by myself, I would have simply dismissed it as my imagination, but since two other people saw it also, I have a harder time dismissing it.**

**Several years later, I was over at my girlfriend's (at the time) house. We were sitting outside watching the meteor showers on 15 July 1995. She believed in ghosts, alien visitors, and all kinds of other supernatural phenomenon. I still didn't believe in any of that sort of thing. Suddenly, her dogs started barking like crazy. She yelled at them to be quiet, but they would not be quiet. This is the first time I had ever seen her dogs not be quiet when she yelled at them. They barked for a few more minutes when they both yelped and started hunkering down by the back door. I looked over at the dogs when they yelped and noticed something move out of the corner of my eye. When I turned to look straight at it, I knew it was exactly the same thing I had seen several years later at my friends house. As soon as I looked at it directly, it ran into the orange grove several feet away. I didn't say anything to my girlfriend knowing that it would seriously freak**

her out. I left her house about 1:00am. About 3:00am, she called me completely terrified. She said that something (she later described it as a demon) came after her in her sleep and attacked her. The next day she had fairly deep scratch marks on her back and chest. While she might have been able to inflict the scratch marks on her chest, she could not have inflicted the marks on her back. The cuts were just too neat and too intentional to have been done without help.

After seeing this thing for the second time, it has changed my outlook on unexplained events/creatures. If you have seen anything like this before or know anything about what I saw, could you please email me.

**Thanks Brad**

[Brad <bradley\\_@hotmail.com>](mailto:bradley_@hotmail.com)

FL USA - Sunday, June 04, 2000 at 18:47:33 (PDT)

**ONE NIGHT ABOUT A YEAR AND A HALF AGO, I WAS LAYING ON MY BED WITH MY BLACK LIGHT ON. MY BOYFRIEND WAS AWAY VISITING RELATIVES, AND I WAS THINKING ABOUT HIM. ALL OF A SUDDEN. THE BLACK LIGHT SHATTERS INTO A MILLION PIECES HITTING EVERYTHING IN THE ROOM EXCEPT FOR ME. THERE WAS GLASS STICKING OUT OF MY WOODEN DRESSER, THE WALLS, THE BED(WHICH I WAS LAYING ON), THE WINDOW FRAME...EVERYTHING.....EXCEPT ME. IT SCARED THE CRAP OUT OF ME...BUT I WAS THANKFUL I DIDN'T GET HURT. CAN ANYONE EXPLAIN TO ME WHAT HAPPENED?**

**WHY DID GLASS HIT EVERYTHING EXCEPT ME???**

[TINA <KRAZIDAME7@AOL.COM>](mailto:KRAZIDAME7@AOL.COM)

WENONAH, NJ USA - Tuesday, May 30, 2000 at 16:52:42 (PDT)

**This is a visual phenomena, I think it's an interpretation of the brain or it may be the blood circulating in the eyes..**

**When I'm tired and I look at a the sky or at a white or blue wall, I see a motion like an Inverted star field.. What I see are kind of non-regular bubbles that flows to the center point of my eyes. They flow at a medium-fast regular rate, but the length of the bubbles is random.**

**Is this a kind of refresh of the image that the brain does!?**

**Also, I remarked that many phenomenas relied on solenoid electro-magnetism .. Is there someone that can explain me the fonctionnality of this component ?**

**P.S.: Excuse my english, Im french.**

[Loster McLeod](mailto:loster_mcleod@hotmail.com) <[loster\\_mcleod@hotmail.com](mailto:loster_mcleod@hotmail.com)>

Rosemere, QC CANADA - Tuesday, May 23, 2000 at 17:27:05 (PDT)

**Im a guitar player and was playing with a normal "bad horsie" Wah-Wah. Well, when i muted my strings and and pressed all the way down on the wah, i heard people talking out of my amp. Like at a restaurant or party. It was definiatly no one around me in any of the other rooms, because when i changed the volume, the voices changed. At times i could make out words. It was very erie.**

**But i've figured out what it was. For some reason, my amp was picking up a radio station, when i used the wah. And the people must have been from a radioshow.**

**Just kinda interesting.**

[Phil](mailto:sasquatchs@aol.com) <[sasquatchs@aol.com](mailto:sasquatchs@aol.com)>

Massachusetts, MA USA - Sunday, May 21, 2000 at 19:40:12 (PDT)

**i seen one of thee type during the lonely night when walking past the graveyard to my grandmother house when i notice a couple of purple flames. i ask my seniors & they say it was common in these typr of areas when they sometimes appear...**

[???](mailto:gun_blade@hotmail.com) <[gun\\_blade@hotmail.com](mailto:gun_blade@hotmail.com)>

Singapore - Wednesday, April 12, 2000 at 01:49:26 (PDT)

**Ok. Last year I reported conjuring up a tornado with a simple electrical device, which removed the roof of my small trailer, leaving other trailers in the park undamaged. Since then, unusually heavy rains all but prevented the repair / replacement of said roof until the tragic fire came along, which destroyed my 1956 kit trailer once and for all. The fire was caused by a faulty oil line. The 3/8" copper line (only 6 months old) had begun to de-materialize...Now there is nothing left at my old address at 202 N. Klevin, Space #9, Anchorage, Alaska, 99508. Do not send mail there. It will come back. I have since had to rebuild my business from scratch, salvaging only one hard drive from the network. The trailer was not insured. But don't feel bad for me because I consider it a beneficial learning experience. I now have a 512K connection to the internet at my new location and I am working on safer pursuits than destructive thought amplification, warping space-time, etc. I am afraid my mind will never be the same. With all my worldly possessions gone, including my computer. I found I had much more free time in the evenings so I decided to develop my mechanical ability, building several stirling engines from the trash that was left; tin cans and stuff I could buy at the local hobby shop for a couple of bucks. I cut the pieces with tin snips and soldered them together with an ordinary soldering iron. At first I didn't believe these engines would work, having only read about them on the internet, but I built first the one, and then three working models that utilize heat as fuel. That's right, heat is fuel, not gas or oil, just heat. That's what I found out from building these engines. Heat is fuel, ok, so is cold. Cold is fuel too. I took my engines down to the Imaginarium <http://www.imaginarium.org/> and we ran them on liquid nitrogen. Ok, so heat and cooling are not fuel, exactly, but the \*flow of heat\* is fuel for this engine. Anywhere you have a heat difference, you can insert this engine and it will generate power. I am working on a larger engine, built from an oil drum, that will power a generator from ordinary ice. Surprise surprise! This is not new technology at all. Believe it or not, the stirling engine has been around in rudimentary form since the 1600's and has actually changed very little since. In the 1800's, Robert Stirling, a clergyman, by trade, was credited with the invention of an improvement in the engine, specifically, the regenerator, and that's what gave the Stirling engine its name. A regenerator is basically anything that can absorb heat and store it temporarily for the next cycle. My engines use ordinary steel wool to accomplish this. The regenerator effectively recycles heat inside the engine so its cylinders can pump over and over with the same energy. The engine will run for several minutes after you shut it off due to the heat exchanging in and out of the regenerators. It isn't overunity, but at close to 50% efficiency, it is \*still the world's most efficient engine\* In comparison, your automobile engine is roughly 16% efficient. Even at the cruddy 35% efficiency I can get from tin cans, I am over-double the efficiency of my car. The stirling engine is even a superior alternative to expensive (and less efficient) solar panels. Think a solar reflector is hard to build? These can be easily made by stretching some reflective plastic or aluminized foil over a large circular frame and then sucking out some of the air with your lips. You can make a large circular frame by bending thin plywood, cardboard, or just about anything. The resultant concave surface won't be an exact parabolic dish, but it will be**



close enough to concentrate sunlight. If you would like to see pictures of my engines, I have posted them at <http://home.gci.net/~bce/tincan.htm> and you can also find my new address where you can order plans to the models on the page. In addition, you can find links to free plans published on the web, including the simplest design I have ever seen; an engine made from a pepsi can, a balloon, some pieces of wood and a paper clip. Another thing that I forgot to mention is that when you turn the crank on one of these engines you have yourself a heat pump. They are heat-flow engines and heat-flow pumps. These are great fun to build and experiment with, and make an excellent science fair project so I suggest you try them. Never was there an easier engine to build. There are no valves. None! No spark plugs, carburetors, etc. to mess with, just a piston, an empty can, a piece of junk cardboard or ceiling tile, a flywheel and a simple crankshaft. I can build one in an afternoon. They work. Now naturally, you will have to build larger engines to get more power... However, I am surprised that considering how simple these engines are to build, that everyone isn't building them and getting free power! Is this what the oil companies don't want us to know?

[Henry Kroll <kardz@hotmail.com>](mailto:kardz@hotmail.com)

Anchorage, AK USA - Sunday, March 05, 2000 at 02:04:38 (PST)

Ok, my friend and I have been pretending alot. We were pretending we were Sailor Moon characters. That was yesterday. Well a month ago, we were looking for this thing called a Moon Crystal. Alot of weird stuff was happening when we were looking. Now we are in to magic and stuff and all this weird stuff is happening. I am getting sick, and so is she. We are both having huge fights with our parents. We are really scared. Please tell us what is happening. Our email address is listed

[Anonymous <winnie1698@gurlmail.com>](mailto:winnie1698@gurlmail.com)

USA - Monday, February 28, 2000 at 17:27:07 (PST)

Well this may seem weird or it may just seem to you like we were influenced together by something but this is really weird. My friend and I were really close then and we used to try to analyze each others dreams. Help each other out ya know? Well i used to get dreams were I'd have to find my way out of this freaky town. There were energy vampire/dead people in my dreams and I had to go South to gather people up for something. The dreams always gave me the impression that it was to gather people (the reason for trying to get south bound) But the people in my dreams were really real. Trust me > I had to kill some of the people in my dreams and I feel like a murderer now still. I told noone of these except my mother who I used to wake up in the night to come spend company with me due to the dreams. Then one day my friend started telling me of these dreams she was having. I asked her to describe the town and when she did it matched the memories of the town in my dreams perfectly. So perfect was the match that we discussed the colors of the houses and the different regions of the town. This town seems real even as i write about it. She started having the dreams and I started to get scared now. I

**thought i was going nuts. But when in one of my dreams I got out of the town and headed south the dreams stopped . My friends dreams stopped.This town's main street is two and a half blocks long with a main enterance and when the street ends the roads fork up(right) and down(left).Its brick with a bridge by the end of it. There's a river through the town the goes under the Main Street bridge , at the end of the road to the left ,there's a warehouse in use on the right... and the driveway dip to the warehouse. NE info . Email me**

[McQ <MstyLadyMc.aol.com>](mailto:McQ@MstyLadyMc.aol.com)

Concord, NH USA - Thursday, February 24, 2000 at 16:28:13 (PST)

**Hi , I have lived in my house for 19 yrs , and as far as i can remember strange things have happened, Strange smells, shadows,ect. The things in my house are so bad I have had to go see a doc for help because I thought I was going crazy,There are alot of strange things like when we watch tv it will turn off and then turn on same with our A.c ,The doors constantly open anded close ,Our house has this strong strange smell, and if you go in this one room, It is very cold, and you get this feeling that someone is there, All I know is that we bought this house from some older people and they might have passed on by now,**

[Bullock. Laura <Blushed76@aol.com>](mailto:Bullock.Laura@Blushed76.aol.com)

Houston, Tx USA - Monday, February 21, 2000 at 13:37:46 (PST)

**This is a very real, true story. It happened to me and a group of my friends. We were staying over my friend Sara's house. We had rented a very stupid "supposed-to-be-scary" movie. It turned out to be really stupid. Anyway, about halfway threw the movie, we heard foot steps. (My friends mother was on the same floor, and was asleep). We turned off the tv the light.We all went upstairs and check it out. We checked both rooms to find nothing weird or out of place. We decided to stay upstairs. After a while, we heard voices down stairs. It sounded like a couple of men talking. My friend Katy and I decided to go down stairs and check it out. We got as far as the top of the stairs. At the bottom, there was a shadowy figure. It started coming up the stairs so Katy and I leaped into the room, screaming. All of us were huddled on the floor, all whispering our last words. The door opened!! We all shrieked! I looked up. Sara's mom walked into the doorway. She said she heard us scream and ran up here. The odd thing was, we screamed after we saw the figure at the bottom of the stairs. Soon, she went to bed. Later on, at about 3:00 am, we heard footsteps open the door and walk outside. We didnt hear any more that night. But, the next week, well, thats another story!**

[Rachel <Railie@USA.net>](mailto:Rachel@Railie@USA.net)

Waterford, ct USA - Monday, February 14, 2000 at 16:06:29 (PST)

Ever since I was little girl, my house has been a focused site of hauntings. My family has even had a poltergeist named Speedly who brought wonderful experiences such as our piano playing with noone sitting at it, a black hand which reached and clicked my light off in my room as I played dolls, and a continous stopping of our old clock at the same time for weeks. We didn't have anything too big happen to us until about a year ago when I formed a great need to study and learn how to use our Ouija Board. Since then I've had my touch lamp flicked on and off continuously, a dark figure and a face wake me up in the middle of the night, a bright light in the shape of a figure shining in my room when no light is on and my blinds are closed, a demonstration of the person's ability to levitate objects, the appearance of my dead grandfather when my brother found out he had cancer again, floating black "blobs", footsteps heard in our unfinished spare room, the sound of my other grandfather's footsteps down our hall, a dark figure walking down our hall(we really only have one hall), missing objects that show up later on, the sound of music coming from nowhere, a beam of green light that my mom saw in her bedroom, etc. Plus, everything that has happened to the people who have been a part of my sessions, which includes seeing a small person smiling and sitting in my livingroom when there was none, a cold hand on their back, dark figures with cat eyes visiting them in their house, etc. My mom recently put up our collection of Christmas Village Houses on top of our cubbards in the kitchen and at a certain time everyday they turn on. There is one house inparticular that acts very stangely. No matter what my mom does to it, it turns on and off. She's changed bulbs, rewired it, etc. One night about two weeks ago, we were contemplating the reason for its behavior over dinner. I started talking about little people and it started going on and off. Then, four nights ago, my friend David and I decided to talk to it. We asked it yes or no questions and it turned on and off as it answered. It was amazing! I think things are only gonna get more interesting!

[Meghan <Evilbob8@northernway.net>](mailto:Evilbob8@northernway.net)

MI USA - Monday, January 31, 2000 at 11:57:06 (PST)

**I'm 22 year old student from the Netherlands and i have experienced some weird stuff.**

**I sometimes dream(i used to dream more often in the past), and most of the times my dreams feel odd, but that seems to be normal for me.**

**But i have 2 dreams that really puzzle me.**

**This dream i dreamt about 3 or 4 months ago. (1): I was dreaming that i was riding in a bus, sitting next to a girl and being very sleeping. I doze off in that dream, dreaming i was with some other girl being intimate. I wake up, realizing that i'm all over that girl i'm sitting next to in my dream, panic a bit and wake up for real. Talk me weird!**

**Now to the second dream, which i dreamt 5 years ago. (2): I was dreaming that i was riding on my bike to someones house. When i get there, there's this party and i walk around until i see the stairs and decide to go upstairs. Once there, i see several rooms open, but i take the one with the most light shining through the opening. I open the door and go inside, i look around and see many cardboard boxes(some closed some open with stuff inside, as if someone had moved or was planning to move), after a while i look outside a window. Then i see some sort of phenomenon appearing above two skyscrapers(the only 2 there, other buildings are just normal houses and many trees) about 1 to 1.5 kilometers away. The phenomenon looks like some tear formed inside clouds and there is light coming out of it, it looks like rays. Then i feel a tremor. I turn around, look at one open box and pick up an embroidery. It is brownreddish in coulor with the phenomenon i just experienced embroidered on it. I turn to the window and see the phenomenon happening 2 or 3 more times with the subsequent tremors and i wake up.**

**This is my #1 weird dream, i never experienced such a strange dream before or after until this day. And it gets even stranger, in real life, i sometimes encounter a situation, which i never encountered before, but while i encounter it, it feels as if it happened before. And that feels weird, it's some kind of recognition i can't really place, it seems like deja vu. It began 5 and half years ago and it was more frequent than it now is.**

**If anybody has experienced similar things and/or has a reasonable explanations for these phenomena, you can contact me by e-mail: [n1002953@cpedu.rug.nl](mailto:n1002953@cpedu.rug.nl)**

**Greetings, Jan.**

**[Jan Derk Kotlarski <n1002953@cpedu.rug.nl>](mailto:n1002953@cpedu.rug.nl)**

**Emmen, NL - Thursday, January 27, 2000 at 05:19:00 (PST)**

**Yes I'm nuts. Let's get this strait right off the bat.**

**It started back in 1985. A intelligent friend of mine were discussing a term we called the "Constant variable" for several hours we clicked like a synchronous transmission. We detailed several mathematical graphs and offered our thoughts on how the universal pattern of nature followed this same scheme. Everywhere we tested the example, it fit. That was the end of our last year at high school. We went our own way for several years and slowly grew apart. He secured a well paying job and I pursued the hard road of questioning the way of human society.**

**It seemed that every question I directed at the illogical way something was done,(as everyone agreed it was just the way you did it?) all I got was resentment at any number of more logical solutions that I offered. I continued this throughout my working career. The more I thought about it the harder I thought for a better solution to mankinds ills or at least to my ills. There is always a simple solution to every gripe I hear from every kind of person. The most important one is the gripe of consumption! I'm not making enough money to consume what I want to consume. When you talk money , what are we talking about? A means of barter to sustain life. What do humans need to live? No, to live in comfort? It all boils down to energy. Everything we use all ties to energy or work. If we had our own power company we wouldn't need to work for anyone? Most people would do their own thing and become independant of the restriction of the group. That would make the human world real dynamic. The art and science would come at exponential speed.**

**This is the fairy tale I lived for 15 years as I tried to promote it. That didn't make it long as I found all types of resistance around every corner! Before it was said and done, I was labeled a paranoid and the laughing stock of all my peers. I isolated and during this isolation I found the clues from a very close family member that worked electronics in the Air Force in the early 60's. He's never answered any of my questions about what he did and he never won't. He's got a priority greater than me his oldest son, it's his country! I can say I'm initially disappointed but very proud of him in his oath and upholding it. I'm going to tell the story that changed my life forever.**

**It was a hot Texas day around 11:00 a.m. on a day when you had to walk or at least move around if you were outside, just to keep wind flowing over your skin to evaporate sweat. It was too hott to be outside! Pops was in the gameroom after I started working on the Holley spreadbore on my hotrod. I had been having trouble constantly on this heap of iron I'd sunk all of my money into not to mention the blood i'd lost. Don't even mention my weekends alone due to this money black hole I suffered. I was isolated out there in Fairview,Tx. WE had recently moved from all my friends and I was without wheels and now money. This encompassed several years. I grew moody and introverted squared. This summer day I learned the most profound thing in my life.**

**Here I am leaning over this Pontiac peering down the throat of this mechanical secondary gas**

bazooka opening the throttle plate it looked like a cow pi\*\*ing down both rear manholes. It was getting gasoline! The damn thing would barely turn over, with 2 batteries in parallel and a starter I had wound at Hammond bros. It weighed almost as much as the transmission! I set the charger to work on the batteries, and peered at the carb. sweat and frustration was rolling through my eyes into the carb. I had almost reached my limit on the troubleshooting of everything else. My dad came out as I thought I figured out the problem and it was part of the carb. Leaning over the heap I proceeded to investigate, now was not the time for Pops to go on one of his tales. He proceeded to watch me as he guzzled his cold Coors. after I got real close and had to get in one of those contortion stances one gets into working on internal combustion machines. He says "HEY you know that distributor works sun?" YEA I KNOW how it works dad! ITS a real weird thing that distributor and how it works and all. I know dad. He kept it up for at least 30 minutes, even though the hints I was dropping weren't subtle. I got so hot and frustrated at every little thing that was bothering me I was about to have a Family Grantham fit! Being one hisself he knew this and proceeded to throw fuel on the fire.

One major mistake I made was assuming he was drunk or lit. I blurted out okay g\*ddam\*it I can see I'm not going to get anything done until I listen to this stuff your haarping on me! We went inside the game room and each on the opposite side of the long laminate bar, I,m glad he did that because otherwise I think he would have killed my smartas\*! We looked at each other as he exposed my misconception of how the coil worked, the whole time letting me think I had it right. I figured it worked like a transformer a step up one giving out h.v. on demand? If anyone of you know my dad you can imagine how he approached this! I couldnt get the conception oout of my head and my brain locked on not accepting any other way. I already knew. After he let me do this for an hour or 2 , he cut the game in two. A look no man on this earth would have stayed after he saw it,came over my dads face? What did I do ? OH no !! I panicked and locked up in total confusion. bad move hoss! He had the No.2 pencil in a compression death grip with 2 fingers. I could see the energy upon it . SHUT UP AND LISTEN THIS TIME SUN AND LOOK AT WHAT IM DRAWING!

It took another two hours or so of his frustration and my bewilderment, before I could even put 2 pieces together! He was foaming at the mouth and I was trying to really pay attention. If I don't learn what he's trying to tell my ignorant self he's gonna kill me and everyone else too. THEN LIKE A LIGHTNING BOLT ON A CLEAR SUMMER DAY WITH NO CLOUDS IN THE SKY STRUCK CLOSE ENOUGH TO HEAR BEFORE YOUR BRAIN REGISTERED THE FLASH YOU SAW SPLIT MY WORLD IN TWO. I saw how it really worked in my mind. he saw this and walked away, leaving me. HE SAID "SON THERE'S SOMETHING YOU CAN KNOW TOO MUCH ABOUT... MAGNETICS . i COULD ALMOST SEE THE TEAR IN HIS EYE, JUST LIKE THE ONE ROLLING DOWN MY CHEEK RIGHT NOW. THat set me on the disaster course I'm on today. IT was oer 11 years ago i learned that and Im still paying for it and still reasearching it when they let me.

**BALL LIGHTNING!** LET me say the first time I saw it , I was saying to the system in the rain walking to the store to get cigarettes, If all this isn't coincidence (and coincidences like this are

equal to hitting the lottery every time you played) then show me a corona ball because Ive never seen one and I know theyre rare sites. **NOW I'M GONNA SHUT UP BECAUSE i SAW BALL LIGHTNING 65 YARDS AWAY TO THE LIKES i NEVER IMAGINED EXISTED, AND IT LASTED FOR AT LEAST 25 SECONDS. i NEVER FELT ANYTHING MORE STRANGER UP TO THAT TIME BECAUSE MY BODY WAS IN HARMONICS TO THAT WHITE BLUE HAIRY PLASMA PORTAL OF "NRG" I WAS ANKLE DEEP IN WATER RUSHING DOWN THE ALLEY IN GARLAND FROM THIS FREAKY OUTBURST THE WEATHER CONDITIONS WERENT RIGHT FOR A STORM AND THE NEWS DIDNT SAY ANYTHING ABOUT IT.**

**So yea I'm crazy and a paranoid schezophrenic but don't let it happen to you cause I still live it and its keeping me from learning anything about it! Everyone that knows me knows you can't keep me from doing something I set my mind to. I'm scared but I'm still trying to find out I'm close too! If some doofus would like to respond to me just e-mail me [tqgrantham@juno.com](mailto:tqgrantham@juno.com) THEY SAY PRESSURE WILL BUST A PIPE .... i'M GONNA SEE! IF IM A NUT I AM A BLACK WALNUT HUSK ME, CAUSE I'M AN ABBERATION! "THE MIGHTY QUINN"**  
[Thomas Grantham <tqgrantham@juno.com>](mailto:tqgrantham@juno.com)

Garland, Tx. USA - Friday, September 24, 1999 at 19:23:32 (PDT)

**Strange, I just submitted a message to your site yesterday about a childhood experience involving HAARP. I would like to insert a paragraph here, but this window won't permit it. Today, on the anniversary of my testing of my working 'operator influence amplifier' my office/trailer was struck by a tornado which blew out all the windows and removed the front section of roof along with my entire woodpile and some cinder blocks. It also lifted the front end of my brother's car off the ground. The roof went up over the power lines which were arcing and landed across the alley by the dumpster, where most of the stuff was deposited right in the dumpster. I was fixing a computer at the time at a customer's house. Coincidentally, I was talking about the hurricane in Florida to this customer. I was telling him how I thought tornados and hurricanes were strong updrafts caused by electrostatic attraction of air molecules and ions--very much like the whirling streamers you see in plasma globes, only invisible. I imagined briefly what it would be like if a tornado struck my trailer while I was gone. I immediately heard a gust of wind when the lights flickered, interrupting my download of Netscape to his computer. I shrugged this off as imagination. I heard fire trucks race by. Little did I know that the flickering lights were the power lines shorting out on my roof! What's even stranger--I'm in Alaska!!! Tornados are very (extremely) rare. So rare that we don't get them. So how come a tornado hit my trailer only when I was thinking about it and only in the spot where the machine was and not a single trailer in the park other than mine was even touched? So how did we get a tornado? I think my operator influence amplifier may still be working in my mind. A little background information: The operator influence amplifier is something I came up with and tested last year at this time. It turns thoughts into reality. I**

dismantled it because it has some alarming side effects...it worked way way too well. So well, in fact that every thought, even unwanted ones would instantly pop into reality, accompanied by high voltage discharges and explosions. I thought lightening would strike the trailer and I could hear the walls crackle and hiss. The trailer walls are aluminum and they are grounded so I suspect ionized air was making them hiss. I could smell the ozone. I looked at the computer screen and it was typing what I was thinking. I panicked. I ran to shut off the machine, but before I did so I deliberately imagined \$4500 in cash. The next day, I received a check for \$4500 and the trailer was struck by lightening. I had nightmares all night about lightening seeking me out. This was strange because I have never dreamed of lightening before or since. The next few days my feet barely touched the ground. Every time I thought of something my hair would stand on end and I felt as though I would be struck by a powerful bolt of electricity if I thought of it too long, so I would have to immediately force myself to think of nothing. I am an ex-Scientologist, but if I didn't have that Scientology training, I would have never been able to control my mind and keep the phenomenon under control. A week passed and the effect gradually wore off. When I finally had the courage to dismantle the machine, it exploded as I approached it, even though it was unplugged. (This was just as I had expected it to do--and probably why it did [reciprocal action]) The capacitors must have held a charge which was ionized by my presence. From all this I have learned a few startling facts: 1) The only difference between reality and imagination is potential. 2) That potential happens to be in the millions of volts and it is purely an electrostatic potential. This device has the ability to create a volume of electrostatic potential that resonates at the frequency of matter by creating physical stress on a flat capacitor plate and an inductionless resonant coil. The observer sees the machine and in doing so creates a copy in his or her mind. The area between the real and imagined capacitors forms a 4th dimensional pocket in space-time in which you can insert whatever you desire. Watch that your head doesn't explode from a sudden bolt of lightening, however. (An identical machine exists in the imagination of the observer.) Feedback starts to occur between the real machine and the machine you think you see which is only in your mind. The frequency of the feedback is around 20KHz (the limit of human hearing). This is one of the many frequencies where matter starts to interact with imagination... (What we think we see is actually our imagination piecing together data gathered by sensory information. This imagined picture of reality is what we call reality when actual reality is assumed to exist but is never contacted directly.) I used an arbitrary feedback of roughly 20 KHz because I was using an old VGA monitor to generate the pulsed DC. Computer monitors have slightly higher refresh rates than standard TV sets. What is really neat about this is that there is an operator influence amplifier on almost every desktop. Computer monitors by their design are crude operator influence amplifiers. Isn't it interesting how computers help us turn our thoughts into reality. Though not as powerful as the machine I built to test the effect, they do work. That is why they are the idols of our age. We certainly spend enough time in front of them! This tornado occurred while I was in front of a 19" monitor and thinking about a tornado hitting my trailer. The tornado was simply feedback to the place where I was working on the machine, amplified by the interaction of the monitor with the energies that constitute perception and imagination, charging them up. Don't believe me? My 'imagined' tornado was just on the 6:00 news. The Fire Department helped us recover sections of our roof. If you have a big monitor, you may want to exercise a



little caution about what you think. It just might come true! Needless to say, I am making tons of money. Even stranger, I have never held down a job. All my life I was called 'stupid,' 'dumb' and 'weird'. I flunked all my classes and dropped out of school and was contemplating suicide, but when I saw the magic on the screen of my first computer, reality began to shift. I seemed to 'know what to do' to make it work, even though I had no training. I just imagined I knew what to do and it worked. My fingers 'seemed to know what to type'. Within minutes I was writing complex programs with nobody to tell me what to do and no books. I spelled my name out on the screen in large colored letters. I imagined myself a genius and it came true (at least for me). The computer is a sort of catalyst. I went back to school and graduated. I taught myself Scientology (Scientology is the study of knowledge--not to be confused with the cult of wierdos who promote it. I overcame my ignorance and became fluent in many subjects. People never question my credentials. They assume I have some sort of degree. I still study whatever interests me. That's how I became the 'Computer Doctor' and the proud owner of my own business. Over the years I have gained a lot of skill, but I still have a hard time diagnosing computer problems over the phone. I have to be in front of the computer in order to 'know what to do'. Now you know the 'rest of the story'. Just don't ask for my qualifications. It's all 'magic'.

[Henry Kroll <on.line@i.am>](mailto:on.line@i.am)

Anchorage, AK USA - Saturday, September 18, 1999 at 04:51:49 (PDT)

### Maybe you can save a life

TUVPO is starting a research project about UFOlogy. Any information forwarded to us will be added to our data bank and kept as an important source in determining the connection between ALP's and earthquakes. TUVPO would be very happy to work with organizations and institutions who could contribute to this project. TUVPO believes that even the smallest amount of information might be beneficial to save peoples' lives. At the moment, the research project consists of finding out if a relationship exists between ALP reports and seismic movements, and filing a report. For a report to be valid, it must contain seismic movement reports in the region where the ALP's have been seen. Seismic movements must be recorded no later than 30 days after observation.

The observation of ALP's must be documented by photos, eyewitness report or the media. Reports which do not carry the above features will not be taken into consideration. Any person or institution who would like to participate in this project may send the ir reports from their own region or from regions (all over the world) they are able to reach by Internet. The participants will be published in our web page. All you need to do is write your name, surname, e-mail address (hotmail or any other similar free e-mail addresses will not be accepted) to [kayyt@tuvpoorg.cjb.net](mailto:kayyt@tuvpoorg.cjb.net) <http://members.tripod.com/~ufolojist/alp.html>

[erol erkmen <andromeda1@turk.net>](mailto:erol erkmen <andromeda1@turk.net>)

istanbul, tr - Wednesday, August 25, 1999 at 15:17:04 (PDT)

[Back to WEIRD SCIENCE](#)

The original Script and Guestbook software created by Matt Wright and can be found at [Matt's Script Archive](#)

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<http://amasci.com/weird/unusual/unusual.html>

Created and maintained by [Bill Beaty](#) .

Mail me at: [billb@amasci.com](mailto:billb@amasci.com)

# THE ANTIGRAVITY "UNDERGROUND"

- RECOMMENDED SITES: [Lifters \\*don't\\* fly in vacuum](#), also [1964 Ionocraft](#)
- [Antigravity Files](#)
- [Links to other sites](#)
- [Keelynet antigrav files](#)
- [The Wallace Patents](#)
- [Torsion Fields](#)
- [Podkletnov "Tampere/Finnish" Gravity articles](#)

Mainstream scientists regard Electrogravity research with distaste, class it as a disreputable field of study, and group it with research into UFOs, bigfoot, unexplained phenomena, etc.

So-called "Antigravity" is the target of skeptical debunkers, and any physicists who venture into the subject put their reputation and career at risk. Einstein's General Relativity implies that hobbyist devices cannot produce strong gravity effects; that no strong links can exist between gravity (spacetime distortions) and electromagnetism (photon exchange). Gravity engines? "It's impossible," therefore it's open to ridicule.

This page is an unabashed collection of both mainstream and far-fringe Antigravity files and links. Where professionals fear to tread, the lead is taken by amateurs, maverik researchers, and crackpot inventors. This is not necessarily a bad thing. After all, mainstream scientists once regarded the [crazy inventors](#) of "flying machines" with smug amusement if not outright disgust.

As a result, modern aviation came not from conventional science, but from the arena of "crackpot" flying-machine inventors. Those who smugly dismiss the crazy antigravity inventors of today would have fit right in with those who ridiculed all the amateur aerodynamicists at the turn of the century.

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*"We may learn to deprive large masses of their gravity, and give them absolute levity, for the sake of easy transport." -Ben Franklin, 1780*

## Tampere Gravity-shielding claim

### The Podkletnov discovery (Links)

- [Gravity Society](#)
- [Podkletnov/Modanese Gravity Pulse Paper, .pdf](#)(uses VandeGraaff & superconductor)  
New, Aug 2001
- [NASA's Ning Le: stealing Podkletnov's discovery?](#) (Pop Mechanics)
- [Replicating Schnurer's SC Gravity exp.](#)
- [NASA funds sc gravity shield experiment](#) (9/2000)

- [Wired Magazine: Podkletnov Antigravity](#)
- [Podkletnov meets w/NASA](#)
- Pop. Mechanics: [Non-public NASA Antigravity Meeting](#)
- [CSPAAR Gravity Research](#), U. Alabama
- [P. Skeggs'](#) page
- [Podkletnov/Tampere article](#) from Parascope
- [Another collection of Tampere papers, but with diagrams](#)
- [The Journal of Ideas](#) Issue 4
- Hyper-D physics, [w/Tampere Physica-C 1992 paper](#)
- [INE article](#)
- [U. Alabama](#)
- [Skeptical response](#) from CSICOP
- [the OTHER 'Tampere' experiment](#) :)

### **Podkletnov's Discovery (Files here)**

- [1/12/97 Podkletnov paper \(latex\)](#)
- [1/97 Schnurer/Modanese paper \(latex\)](#)
- [Another Tampere Replication](#), 1/23/97
- [Tampere Replication](#), 1/16/97
- [Matthews/Sample](#) article
- [Modanese '96 supercond. gravity effect paper \(LaTeX\)](#)
- [Earlier Modanese](#) gravity effect paper, 5/95 (LaTeX)
- [References](#) from T. Thompson
- [More references](#)
- [Business Week](#) 9/25/96 article
- [The expected emotional response](#)

## Antigravity files here:

- Build this [Antigravity Chamber](#)
- [Electric Spacecraft Journal](#) ESJ, semi-pro anti-g research
- '[Gotchas](#)', experimenter errors which can mimic antigravity
- [Space-warp Capacitor](#)
- [Morton Device](#) apparent "gravity" pulse
- [Magnets-disk device](#)
- [Poliakov's Gravitonics Book](#) , also see [Frolov's Photos](#)
- [Electrogravity resources](#), from Robert Stirniman (440K)
- [Ideas for testing Podkletnov/Tampere effect](#)
- [Map gravity distortion fields](#)
- [Wallace info from freenrg-L](#)
- [Wallace patents](#)
- [Zdnarsik](#) antigravity experiments
- [ELECTROGRAVITY](#) patents, etc. from B. Paddock
- [Electrogravity Res.](#), Another copy on INE site
- [USAF Gravity Doc, 1956](#) from Robert Stirniman
- [USAF Gravity Doc Contents Page, 1990](#) from Robert Stirniman
- [Magnetic Levitation fun](#)

## Yahoo forums: antigrav

- [JLN "lifter"](#)
- [Greenglow \(antigrav\)](#)
- [Amer. AntigraV \(lifters\)](#)
- [Hamel Tech](#)

- [Electric Rocket](#) (TT Brown Capacitor)
- [Force Field Propulsion](#)
- [Antigravity](#)
- [UFO Propulsion](#)
- [Alternative Propulsion](#) (warp, ion, etc.)
- [Alcubierre warp drive](#)
- [Skyzone](#) (in Russian)

## Other Websites: Best Ones

- [Tim Ventura: Podkletnov's SC/Vandegraaff device](#)
- [Vasant corp.](#)
- [NASA breakthrough propulsion: skeptic](#)
- [Laithwait's heresy](#)
- [Gravity Society](#)
- [Roschin/Godin Device](#) replication of Searle's disk
- [Electrostatic "lifters"](#) (T. Ventura)
- [deSeversky's Ionocraft](#) (1964 Popular Mechanics)
- [Lifters](#) (J. L. Naudin)
- P. Skeggs' [QUANTUM CAVORITE](#) page , and [archive copy](#)
- [Replicating Schnurer's SC Gravity exp.](#)
- [The Gravity Engine](#) (fiction)
- [CIPA papers](#), see [Origin of Inertia](#)
- NASA's [Breakthrough Propulsion Physics](#)
- [Antigravity Forum \(Egroups\)](#)
- J. Bayles' [Electrogravity site](#) and online book
- [Yost's Electric Spacecraft Journal](#)
- [Cox's Antigravity News](#), \$24/yr
  - [Videos, device patents](#)
- [K. Brown's "Gravitational Engineering"](#) (Wallace's physics)
- [S. Dufresne's](#) various experiments
- [Spacedrives Archive](#)
- [Woodward Drive](#) on P. Skeggs page
- [Dr. Woodward's Site](#)
- [Sarfatti's stardrive.org](#)

- [Keelynet Gravity page](#)
- [C. Brush](#), Kinetic Theory of Grav., from [R. Muha's page](#)
- [Jean-Louis Naudin page](#)
- [Nils Rognerud page](#)
- [T.T. Brown page](#)
- [Hovertech](#), about "hoverboards"
- [Fourmilab Gravity Detector](#)
- [Antigravity](#) list (discussion group)

## Some Papers

- [Podkletnov/Modanese Gravity Pulse Paper, .pdf](#)(uses VandeGraaff & superconductor)  
New, Aug 2001
- [Fields as multi-dimension entities](#)

## Many Other Antigrav Websites:

- [deSeversky's Ionocraft](#) (1964 Popular Mechanics)
- [Vasant corp.](#)
- [How lifters \\*don't\\* fly in vacuum](#)
- [Nick Reiter articles](#)
- [Lifter Theory](#), E. Barsoukov
- [DeAquino's VLF electrogravity](#)
- [Gravity waves research project](#)
- [Various sensors](#)
- [Gravity sensor, electroluminescent](#)Galletti/Aluigi
- [BAE Systems Greenglow](#)
- [Russian Gravity Experiments](#) (A. Frolov page)
- [Alex Frolov's site](#)
- [Vacuum Propellors](#) (Walker's fourmilab)
- [Distinti's](#) electrograv page
- [Tolchin device](#) generates translation, not thrust?
- [Modern Relativity](#), FTL math
- [Antigravidad](#)
- [Gravity Gate](#)



- [Gyroscopic Inertial Thruster](#) (GIT)
- [SUPERSYMMETRY](#), linear mechanical thrusters
- [P. B. Fred](#)
- [Artificial Inertia](#)
- [Gyroscopic Propulsion](#)
- [J.L. Naudin's Gyroscope exp't.](#)
- [The X Prize](#), last one into LEO is a rotten egg!
- [Dr Aspden's pages](#)
  - [Flywheels and Gravity](#)
  - [Supergravitons & Cold Fusion](#)
  - [Gravity, an Introduction](#) (Aspden)
- [Elektromagnum: Physics](#) (mostly antigravity)
- [Elektromagnum's](#) old Keelynet archive: Gravity
- [INE Antigravity Articles](#)
- [JERK, 3rd derivative of position](#), from [Physics FAQ](#)
- [Searle Page](#), famous antigravity device
- [Stellar Drive](#) based on pulsed EM
- [Euejin Jeong](#) & dipole gravity
- [ISPEGFT](#), gravi-fugal flight
- [Hartman](#) propulsion
- [Levitron& a stolen invention?](#)
- [Lorrey Drive](#)
- [Gravity Wave Research Project](#) (Hodowanec sensor)
- [Hoverboard Resources](#)
- [Levitating Frog](#)
- [Colorado Superconductor](#), HTSC disks for do-it-yourself
- [Roswell](#) bismuth/mag layered fragment, [Keelynet](#) file
- [Keelynet's](#) files on [Gravity](#) (mirror on [Elektromagnum](#))
- [Project Magnet](#) Hamel flying disks
- [Center for Gravitational Physics and Geometry](#)
- [Inst. for New Energy](#) Antigravity
- [US Antigravity Squadron](#)
- [UFO engine](#)
- [LIGO Quantum Gravity telescope](#)
- [Project Omicron](#) Amateur Gravity Research

- [Real flying saucers](#)
- 

## Some "Dean Drive" type patents

- [Dobos](#)
  - [Cuff](#)
  - [Benson](#)
- 

# KEELYNET FILES

- [New Keelynet Gravity page](#)

## Searle gravity/energy device

- [searle1.asc](#)
- [searle2.asc](#)

## T.T. Brown Electrogravity

- [more Keelynet TT Brown .gifs](#)
- [even more Keelynet TT Brown .gifs](#)
- [BRN2A.GIF](#)
- [BRN2A.GIF](#)
- [BROWN1.PCX](#)
- [BROWN2.PCX](#)

## Floyd Sweet's VTA device

- [Sweet VTA article](#)
- [Other articles in: Space Energy Jnl Back issues index](#)
- [bearesp.asc](#)
- [sweet1.asc](#)
- [sweet2.asc](#)

- [sweet3.asc](#)
  - [sweet4a.asc](#)
  - [sweet4b.asc](#)
  - [sweet4c.asc](#)
  - [sweet4d.asc](#)
- 

"It is not uncommon for engineers to accept the reality of phenomena that are not yet understood, as it is very common for physicists to disbelieve the reality of phenomena that seem to contradict contemporary beliefs of physics" - H. Bauer

<http://amasci.com/freenrg/antigrav.html>

Created and maintained by [Bill Beaty](#).

Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

[WEIRD SCIENCE](#) | [GOOD STUFF](#) | [NEW STUFF](#) | [SEARCH](#)

Google:

Weird Research, Anomalous Physics

## Other Websites: Interesting "weird" pages

- ALSO SEE: [weird art links](#) and [cool science links](#)
- [Sci-art bloggers](#)
- [Octopus video archive](#)
- [Quirky Japan](#)
- [Triology of Terror](#), Zuni warrior doll
- [Bunny Suicide](#)
- [Tainted ink: Reiko](#)
- [Underground gardens, Fresno CA](#)
- [Goofus, Gallant, Rashomon](#), and [more](#)
- [Strindberg](#), and [HELIUM](#) (flash cartoon)
- [Fortean Times: gallery](#)
- [Scratch-built machines, radar, o-scopes!](#)
- [FBI unusual phenom page](#)
- [Goth ebay](#)
- [Paintball](#), the other kind
- [Dogpile searchspy](#)
- [Backscatter xray](#)
- [News items from next decade](#)
- [Holiday turkey!](#)
- [Ananova Quirkies](#) weird news items



- [Love potions](#), funeral oils, etc.
- [Ideas Archives](#), loads of 'em
- [Goth Barbies](#)
- [Sodium blast](#)
- [Truth Greeting cards](#)
  
- [Top 10 Censored News Stories](#), also see [Cryptome](#) censored info
- [Brain donors needed](#)
- [Half-silvered public toilet](#)
- [Musarium](#)
- [Diesel Dreams](#)
- [Theatrical contact lens](#), and [more](#)
- [Trepanation society](#)
- [The 1950s future](#)
- [Pickover's](#) weird links
- [Movie Trailer Archive](#)
  
- [Thomas Edison Sleep Mode](#)
- [Daily Negative Affirmations](#)
- The horror that is [Gas-e-pop](#)
- [L. Carlson flash art](#)
- [But I don't LIKE black licorice](#)
- [Bio](#), [Chem](#), and [Math](#) with [Tom Lehrer](#)
- or try [Flanders/Swann First & Second Thermo](#) song (mp3)
- They had fun naming the [The Johnson Solids](#)
- [Python Holy Grail, Lego Flash version](#)
- [Orisinal](#) online games. Childhood Pastel Nightmare.
  
- [Forced Housefly Cooperation](#)
- [Optical Illusions](#), and [more](#)
- [SteamEngineChaos](#)

- [Geoffrey Pyke](#), demented genius
  - [Improbable articles](#)
  - [Weight-Watchers Recipe Cards](#)
  - [Hair Club For Scientists](#)
  - [Robert Anton Wilson's favorite sites](#)
  - [backwash.com: science: fun, weird, gross](#)
  - [Transhuman World Culture](#)
- 

"If, after hearing my songs, just one human being is inspired to say something nasty to a friend, or perhaps to strike a loved one, it will all have been worth the while." [Tom Lehrer](#)

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- [Bomb #20 encounters Phenomenology](#)
- [Band Name Generator](#)
- [CrashBonsai Gallery](#)
- [The Memory Hole](#), suppressed news stories, etc.
- [Convert your car to tank treads](#)
- [Absinthe recipes](#), go crazy!
- [YaTTA!](#)
- [Babel-izer](#)
  
- [Miskatonic U.](#) bumper stickers, etc.
- [Techno Occult](#)
- [Thought Crime](#), from [doxy.org](#)
- [Project Kill BO](#) (stink is an infection?)
- [Strange Objects found in dog poop](#)
- [Kooks Museum](#)
- [SatireWire](#)

- [The Bizarre Abyss](#)
- [CAR TALK: rants page](#)
- [plagiarist.com](#), mischief, mayhem, poetry.
  
- [The Pseudodictionary](#) (amazing!)
- [How to cook an alien](#)
- [mmmmmm, Donuts...](#)
- [Rectal Foreign Bodies](#)
- [Landover Baptist Church](#) are you UNSAVED?!!
- [Weird news, London](#)
- [Ideas futures, science "stock market"](#)
- [The Plastic Jesus Song](#)
- [Urban adventure](#), ride elevator tops, scale buildings.
- [Freakisly Awful](#)
  
- [Bonsai houspets](#)
- [Electric Sheep Comix](#)
- [Bad Science Projects](#)
- JIM's [Whimgrinder](#) animation (worth the download time!)
- [CIA Kids Page](#)
- [Product Warning Labels](#), eg. for fridge: "NOT AN EXIT"
- [DARK HOTEL](#), comix w/Mavrides, Spain, Justin Green, Joe Sacco!
- [the CURSE of a THOUSAND CHAINLETTERS](#)
- [Exploding Lineman](#)
- [WeirdPages](#)
  
- [Vanishing Tattoo](#)
- [Brainflower](#) submit your ideas
- [Disturbing Auctions](#)
- [Make your own weiners](#)
- [ComicCon.com](#)

- [AAARG, strange of the net](#) (& francais)
- [PILLS, phreaky linx](#) (huge archive fm [grrl.com](http://grrl.com))
- [Event Horizon: strange devices](#)
- [cat-scan.com](#), send in a scan of your cat
- [The Onion](#), funnier than the old "National Lampoon"
  
- [Links Collection](#) at [The Weird Site](#) e-zine
- [Absurd Patents](#)
- [Edible Brain](#)
- [Haunted Places](#)
- [Kooks Museum](#)
- [Snake Oil](#), Kristian Kulture
- [Jack Chick Archive](#) (coming soon)
- [Magicians' Devices](#) (Spain)
- [Slowglass club](#) videocam psychwar
- [Sightings](#)
  
- [The Reality Club](#)
- [Antique Electrotherapy](#) photo archive
- [Goth Gardening](#)
- [Gift Shop](#) at the L.A. Coroner's Office
- [Interstellar LACTOLIPIDS!!](#)
- **BEWARE:** [The New World Odor!](#)
- [Weird and strange Museum](#)
- Fringeware's [Hot Site List](#)
- [Stupid Page](#)
- [Event Horizon](#), SF zine by former OMNI staff

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**HIGHLY** recommended by BillB:





Me, \*I\* get to shop in the actual store, since I live in Seattle. And... they are moving to a bigger storefront, which puts them within walking distance!

- [Deoxyribonucleic Hyperdimension](#)
- [Morbid Fact of the Day](#)
- [The New Hacker Dictionary](#) (as in Geek, not Cracker)
- [Archie McPhee Store](#), essential accoutrements!
- Amargiland Egyptan Mysteries [site gone]
- [Girls' Guide to Geek Guys](#) (a classic)
- [Holes](#) in your head (excellent!)
- [The infamous \(and musical\) Mr. Pujol](#)
- [The REAL X-files](#), FBI FOIA files on weird stuff
- [Towey's](#) weird-links collection
- [The Straight Dope](#) (ALL your questions answered)
- [The Glass Armonica](#) (Franklin's wineglass/wetfinger instrument)
- [News of the Weird](#)
- [Mind control products](#)
- [THE OFFICIAL TRUTH](#) (excellent!)
- [Zen and the Art of Debunkery](#) (excellent!!)
- [Amazing Prehistoric dogs](#)
- [Church of Subgenius!](#) Braise Pob!
- [Subgenius WEIRD LINKS 2](#)
- [Cosmic Ray Deflection Society](#)
- [Heresy Hall](#)
- [Feiereis](#) "Magic" auto devices
- [UFOs!](#)
- [Fringe Watcher's Guide to High WWWeirdness](#)
- [MIT Online Hack Archive](#)

- [MIT 'borgs \(now at Toronto\)](#)
- [The T.W.I.N.K.I.E.S. Project](#)
- [Fun with Grapes - A Case Study](#)
- [Starting a grill with 10gal of Liquid O2](#)
- [The OTHER Flaming Poptart Blowtorch site](#)
- [Paper Airplane of the month](#)
- [Science Jokes](#)
- [Science made Stupid](#)
- [Mysterious & Unexplained](#)
- [Johan's Guide To Aphrodisiacs](#)
- [Twisted Theories](#)
- [Edge of cyberspace](#)
- [Extreme Hobbies](#)
- [Weird Places On The Net](#)
- [Chuck's Weird World](#)
- [Sex in space](#)
- [Zer0 News](#)
- [Zer0 Zone](#)
- [Fringeware site \(excellent\)](#)
- [Fortean Times](#) magazine, amazing anomaly reports!
- [FT's weird links collection](#)
- [Chaos at U. Maryland](#)
- [Geek site of the day](#)
- [FINDHORN Community](#)
- [Ancient sparkplug inside rock](#)
- [Strange Magazine](#) (recommended!)
- [INTEC sound camera](#)
- [Scott's Weird Web World of Science](#)
- [Cool Science](#) (mostly non-weird)
- [Errors in K-6 Sci. Texts](#) (everything you think you know, is wrong!)
- [Belljar](#) amateur vacuum-physics project newsletter

<http://amasci.com/weird/wpage.html>

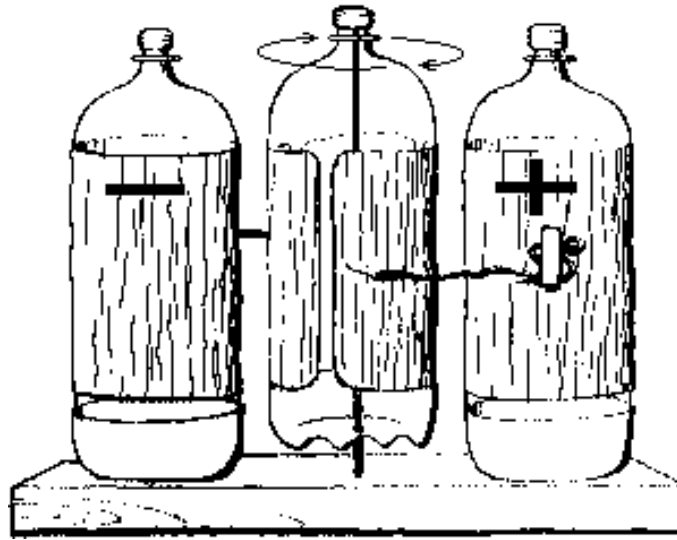
Updated: Mar 31 2005

Created and maintained by [Bill Beaty](#). Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

# Simple Electrostatic Motor

Build this high voltage motor from plastic pop bottles

by [William J. Beaty](#)



- [Electrostatic Bottle Motor](#) plans & instructions
- [Bottle Motor debugging](#), getting it to work
- [Bottle Motor experiments and demonstrations](#)
- [Popbottle motor photo](#) (80K GIF)
- [Photo](#) of operating bottle-motor (30K GIF)
- [What's it good for?](#)

## Powering your bottle motor

- M. Foster's [Cheap High Voltage](#)
- Lenny R's [PVC Pipe](#) generator
- [TV set as electrostatic generator](#)
- [Negative Ion Generator](#) as power-supply
- [Van de Graaff](#) electrostatic Generator
- [General debugging notes for electrostatics](#)
- [Solving humidity problems for VDG machines](#)
- [Electrostatic Generator](#), a simple one (electrophorus)

- [Kite-lifted Antennas](#)
- [Electrostatic Generator](#), Kelvin's waterdropper

## Misc.

- [Hints](#) for electrostatic device builders
- [Electrostatic Motors](#), C.L.Stong, Scientific American
- Other motors:
  - [The Amateur Scientist: electrostatic motors](#)
  - [Bob L's bottle motor](#)
  - Jefimenko-style [Corona Motor](#) and [Poggendorf](#) (in Deutch)
  - [Elektrostatische Motoren](#) (in Deutch)
  - Naudin's [Brushless](#) e-motor
- [Sky-voltage antenna](#)
- [Electricity Explanation Articles](#), a large collection
- [What is Electricity?](#) The real answer! Finally!
- ['Static' Electricity](#) page
- [Van de Graaff](#) page
- ["Frictional" electrification](#)
- [Electrostatics Books](#)
- [Bob's motor](#)
- [JL Naudin's Motor](#)
- [R. DeFeo's super-simple motor](#)
- [Wimshurst machine](#)
- [Frictional Generator](#) on lenyr's page

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See: [Science Projects & Experiment books](#)

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(We make a few \$\$ on any books ordered via these links.)

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[ELECTROSTATIC MOTORS](#), by Dr. Oleg Jefimenko

Order from: Electret Scientific Co.  
PO Box 4132  
Star City, W. VA 26505

Article: ELECTROSTATIC MOTORS YOU CAN BUILD (by Dr. Jefimenko)  
Popular Science magazine, April 1971, May 1971  
Dr. Jefimenko gives plans for various plexiglas and foil motors.  
He runs them from the clear-weather sky voltage, using a long wire and a balloon!  
Order these magazine backissues through the interlibrary loan program at your public library.

[ELECTROSTATICS](#), by A.D. Moore

By the grand old man of electrostatics. Great book, has the Di-Rod generator construction project. Find it in libraries.

Other [ELECTROSTATICS BOOKS](#)

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<http://amasci.com/emotor/emotor.html>

Created and maintained by [Bill Beaty](#). Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

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[GOOD](#)  
[STUFF](#)

[NEW](#)  
[STUFF](#)

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# ARTICLES ABOUT "ELECTRICITY"

## New Explanations, Alternate Mental Toolkit

[William J. Beaty](#)

Electrical Engineer, U. of Washington

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Jump down to [Build-it Projects](#).

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### [What Is "Electricity?"](#)

There is a simple answer to this question. Really. Not the one you expect, though.

### [Electricity FAQ \(Frequently-asked Questions\)](#)

Browse these Frequently Asked Questions, or submit a new one.

### [Explaining "electricity" visually](#)

A simple classroom activity using red and green plastic sheets. Here's a way to visualize Electric Current, "Static", and the electric charge which creates both.

[How Scientists Define "Electricity"](#) Quotes from J.C. Maxwell's "Treatise" and others. Maxwell says that electricity is not energy. So does Faraday. Also Millikan, Einstein, and JJ. Thompson. The CRC Handbook agrees!

## [Barriers to Understanding Electricity](#)

Twenty misconceptions which prevented me from understanding simple electrical science as a student. Maybe they cause trouble for you as well?

## [Electricity mistakes and 'nitpicking' also How SHOULD we teach Electricity?](#)

My encounters with elementary-school electricity, and how I started my "electricity debunking" articles.

## ["Static" sparks](#)

Doorknob sparks and zapping yourself on the car door... and people who suffer from an "electric shock" disease.

## [What is the relation between Watts, Ohms, Amps, and Volts?](#)

Trying to tie it all together. Ohm's law and electrical energy.

## [What is Voltage?](#)

What the heck is VOLTAGE? What the \*HECK\* is voltage? Charles Fort said that when investigating a circle you can start at any point.

## [The "Electricity" Map](#)

How are batteries different than static cling? Perhaps this diagram will "generate" some insights.

## [Which way does 'electricity' flow?](#)

The direction of the current. Charge really flows from negative to positive, right? RIGHT???

## [Speed of "Electricity"?](#)

Everyone is sure that charges flow in wires at nearly the speed of light. All the books say so, and that many books can't be wrong, can they? Ah, but science is not settled by voting.

## [Where does EM energy flow in a circuit?](#)

The schematic of a flashlight looks simple, but only because the



electromagnetic energy flow is invisible.

### [Sparks and Lighting](#)

What would lightning look like if we could slow it down?

### [How is "static" different from "current?"](#)

Not the usual answer found in most textbooks!

### [How is "current" different from "net charge?"](#)

This one goes with the article above.

### [Electricity is not a form of energy](#)

How can so many textbooks and encyclopedias make a major mistake?

### ["Static Electric" misconceptions](#)

A list of things which gave me a warped view of Electrostatics. Once I recognized their existence, I was able to fight free of them.

### [Sticky Electrostatics](#)

Use sticky tape to demonstrate the behavior of electric charge.

### [Right Angle Circuitry](#)

Do Lenz' Law and the Right Hand rule still work... after you've been turned INSIDE OUT by that Evil Grey Fog?

### [Tesla's Big Mistake](#)

Why did physicists deride Nikola Tesla? What was really going on in Tesla's mind? Some insights...

### ["Acoustimagnetolectricism"](#)

A long rant about sound, work and electrical energy

### [Capacitor complaints](#)

Why I never really understood capacitors...

## [How transistors REALLY work](#)

Problems with traditional transistor explanations...

## [Why three prongs?](#)

Why do wall outlets have three holes? "Grounding" and safety.

## [When currents DON'T shock](#)

High current versus low current. The oomph of the zapph.

## [LED explanation](#)

How are Light Emitting Diodes like thermocouples and solar cells?

## [Are Amperes "Fundamental?"](#)

Everyone learns about "Amps" but never remembers what a "Coulomb" is. This is totally backwards.

## [Flowing "static electricity."](#)

If "static electricity" could flow along, would the world end? Maybe not...

## [Discussing Electrical Energy](#)

I'm always getting into flamewars about this stuff...

## [How \*should\* we teach "electricity?"](#)

Doing something, rather than just whining. ;)

## [Why "Electricity" is Impossible to Understand](#)

Gigantic collection of thoughts on learning-barriers in electrical education.

## [Triboelectric Series](#)

If a cat gets trapped in a clothes dryer full of nylon pantyhose, which way do the electrons flow?

## [Electricity educational links collection](#)

Part of my Electronics Hobbyist page.

## [ELECTRONICS HOBBYIST](#)

A whole large pageful of links for the electronics freak. Online discussion groups, schematic and project archives, etc.

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(try "science fair" too)

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## **Build These Electrical Devices**

[Plasma Globes](#), make an "eye of the storm" using a tiny Tesla coil and a plastic bag of Argon gas.

### [VandeGraaff Generators](#)

Instructions for having fun with 500,000 volts, including [plans sources](#), [FAQ](#), [debug](#)...

### [MAGLEV CRADLE](#)

Lifts a bar magnet from below. Use this to perpetrate a Room Temperature Superconductor hoax?

### [Ball Lightning](#) in your microwave oven

Demonstrate the 'Maser Theory' of Ball Lightning formation

### [Electrostatic Loudspeakers](#)

by Mark Rehorst. No magnets, no magnetism, they use voltage-force. Almost like wiggling the air itself.

### [Ultra-simple Electric Generator](#)

Spin the magnet, light a bulb. The complement to the "Beakman Motor".  
Challenge: make the one run the other.

### [Ridiculously sensitive charge detector](#)

Build this simple circuit and detect miniscule levels of electric charge at large distances. Befuddle onlookers with the the "mysterious voice commands" trick by holding it and scuffing your shoes on a rug.

### [The Duluc Drypile](#)

A "battery" with so many cells that Electrostatic effects appear.

### [3D E-field viewing bottle](#)

Actually SEE invisible electrostatic fields and magnetic fields by harnessing the amazing powers of Baby Oil.

### [Dangerous experiments with a big capacitor bank](#)

Nobody died from simply reading this. But stay away from actually performing any of these demos.

### [Acid/Base Goldenrod secret](#)

Use a battery to draw red lines on wet yellow paper

[High Powered Ultrasound](#) Shatters water into a fine mist. Collect some in a bowl. Probe it with high voltage, see what happens. [ELECTROSTATIC GENERATOR](#), Kelvin's Thunderstorm"

An electrostatic generator based on dribbling water. Also see the [INLINE VERSION](#)

[ELECTROSTATIC MOTOR made from plastic pop bottles.](#)

Who says "static electricity" must remain static, or that it's useless and feeble?

## [ELECTROSTATIC GENERATOR](#), a simple one

A simple device which can be used to power the pop-bottle motor.

## [Hints for electrostatic device construction](#)

Building 500,000 volt devices in your basement? Avoid these pitfalls.

## [Solving Humidity Problems](#)

Egor! Activate the Dehumidifier Array!

## [ARRAY ELECTROMETER](#)

Build this and SEE electrostatic fields!

## [VISIBLE CURRENT](#)

Build this moving-LEDs device which makes the flowing charges visible in wires. Wouldn't "electricity" be easier to understand if you could SEE it moving?

[Plasma Globe with no vacuum pump](#) The Radio Shack "Eye of the Storm" device would be REALLY impressive if it didn't need that glass globe...

[Incredibly easy way to make a 100-amp cable](#). Around the world, the physics teachers look at this and say "Doh!"

## [Rotating disk device makes e-fields visible](#)

Idea for dangerous whirling mechanisms which reveal invisible field patterns.

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# [ARTICLES LISTED BY POPULARITY](#)

# [ALL ARTICLES ON WEBSITE](#)

# [SITE MAP](#)

**LIKE THIS ARTICLE? WHY NOT  
[SUPPORT AMASCI.COM](http://amasci.com)**

<http://amasci.com/ele-edu.html>

Created and maintained by [Bill Beaty](#). Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

# "Science Myths" in K-6 Textbooks and Popular culture

The complex and abstract nature of Science makes the subject difficult to understand. But complexity is not the only barrier to our understanding Science. The subject is made much more difficult by the presence of numerous misleading "Science Myths" which circulate in the popular culture, which are handed down from parents to children, and which have become so common and widespread that they appear widely in science textbooks and are taught as facts in grade school. ([MORE](#))

- [BAD PHYSICS](#)                      Textbook errors in the news:
- [BAD](#)
- [ELECTRICITY](#)                      • [Textbooks Flunk Out](#) 5/17/99 Boston Globe article
- [Articles here:](#)                      • Dr. Hubisz, [textbook errors](#) Also see [forum](#) and [Reviews of textbooks](#)
- [electrical miscon.](#)                      • AP story: [Study finds errors rife in U.S. science textbooks](#) (see [research](#))
- [Articles here:](#)                      • [In The Bad Books](#) (Beyond 2000)
- [various miscon.](#)                      • [CNN: Sci texts not always by the book](#) (11/2002)
- [Articles elsewhere](#)                      • [Errant Texts](#) Science News 3/2001
- [Quotes](#)                                      • [Forbes: The Great American Textbook Scandal](#) 10/2000
- [Comment book](#)                      • [Textbook Troubles](#), J. Am. School Bd.
- [Links](#)                                         • [Sci textbooks reviewed by AAAS](#)
- [REPORT A TEXTBOOK ERROR TO AAP](#), Assn. of Amer. Publishers

[2004 Dr. Matrix award](#) [SCROLL DOWN](#)

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[Am I just a pedantic science-nitpicker?](#)

## Some Physical Science Misconceptions ( [K-6](#) Grade)

- [BAD PHYSICS](#): Misconceptions spread by [K-6](#) Textbooks
- ["ELECTRICITY" misconceptions](#) [All Electricity Articles](#)
- [Comment Book](#)
- [A Germ Theory of Education](#)
- [A Lens Misconception](#)
- [Wings and Lift](#) page
- [Lens versus Pinhole](#)
- [Science Answers](#) page
- [Naïve conceptions list](#) from Operation Physics.
- [Some resources](#)
- [Some links](#) to other Miscon sites

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*Ignorance is not the problem in the world. It's the things people "know" that aren't so. - Will Rogers*

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## Some Electrical Misconception Articles:

- ["Electricity" misconceptions](#) in [K-6](#) textbooks
- [How SHOULD we teach electricity????](#)
- [The "Electricity" Map](#) (GIF)
- [Capacitor Misconceptions](#)
- ["Static" versus "Current"](#)



- [Explaining "electricity"](#) with red/green plastic sheets.
- [Which way does the "electricity" REALLY flow?](#)
- [Static Electric misconceptions](#)
- [What Is Electricity?](#)
- [Speed of "Electricity?"](#)
- [Are Amperes "Fundamental?"](#)
- ["Static electricity..." that flows!](#)
- [Sparks and Lighting](#)
- [Acoustomagnetoelectricism!](#)
- [Understanding Electrical Energy Flow](#)
- [Why "Electricity" is Impossible to Understand](#) (long)
- [All the "Electricity" articles here](#)
- [Some resources on Elect. misconceptions](#)

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*"I know that most men, including those at ease with problems of the greatest complexity, can seldom accept even the simplest and most obvious truth if it be such as would oblige them to admit the falsity of conclusions which they have delighted in explaining to colleagues, which they have proudly taught to others, and which they have woven, thread by thread, into the fabric of their lives." -Tolstoy*

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## Teaching Articles Elsewhere

- [Misconceptions as barriers to understanding science](#) (NAP)
- [Bob J's Chemistry Philosophy](#)
- [Enhancing Learning Through Conceptual Change Teaching](#)
- [Authentic Science: What Do Students Believe?](#)
- [Constructivism as a Referent for Science Teaching](#)
- [A Guide to Assessing, Selecting, and Using Science Textbook Visuals](#)
- [Students' Conceptions and Problem Solving in Mechanics](#), L.C. McDermott

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## Links to other Websites: Electricity

- [Electricity Preprint](#) from Chabay and Sherwood (.pdf)
- [Bill Drennon's Christmas Lights](#)
- [The CASTLE Electrical curriculum](#)
- [CASTLE](#) capacitor kits and downloadable manuals

## Links to other Websites:

- [BAD ASTRONOMY](#), and [Forum](#)
- [BAD ARCHEOLOGY](#)
- [BAD CHEMISTRY](#)
- [Physics Myths](#)
- [Plant misconceptions](#)
- [REPORT A TEXTBOOK ERROR](#), AAP's "e-line"

- [Textbooks reviewed](#) (Textbook League)
- [FORUM: errors in middle school science texts](#)
- [Review of Middle School Physical Science Texts](#)
- A. B. Fraser's [BAD SCIENCE/BAD METEOROLOGY](#) (excellent!)
- [Forbes: The Great American Textbook Scandal](#)
- [The Guardian: BAD SCIENCE](#)
- [Getting Science Wrong](#), BOZ magazine
- [Feynman on education research](#)
- [List of Common Physics Misconceptions](#) (from [PHYS-L](#))
- [Myths taught as science](#)
  
- ["Judging Books by their Covers"](#) Dr. R. Feynman on K-6 Textbooks
- [Deep in the Heart of Folly](#) (Textbook League)
- [AAAS misconceptions bib.](#)
- [Biochem Howlers](#), errors in several texts
- [Why School Reform is Impossible](#) (Papert)
- [Texas: publishers fined for each textbook error](#)
- [Optics Demos](#) to fight misconceptions
- [Math books reviewed](#)
- [Misconceptions as Barriers](#) (Ch4 of "[Science Teaching Reconsidered](#)")
- [Ten Science Myths](#)
- [Theories DON'T become Laws](#)
- [Marilyn Vos Savant is Wrong](#)
- [Chemguide](#)
- [STATS.ORG](#), spotlighting misuse of statistics
- [The Straight Dope](#), fighting ignorance since 1973
- [Ancients DIDN'T think the Earth was flat](#)
- [Frequently Misused Physics Terms](#)
- [Centrifugal "Force"](#)
- [Bibliography: biology misconceptions](#)
- [Chemistry Misconceptions References](#)
- [Naive Conceptions in Life Science](#)
- [Nat. Assoc. for Research in Sci. Teaching](#) (NARST)
- [Dispelling Science Myths](#)
- [Technological Dis-empowerment](#)
- [Student naive electricity concepts](#)
- [P. Brna's Misconceptions Bibliography](#)
- [Kid's Humerous Misstatements](#)
- [The Textbook League](#) (w/scathing reviews of K-12 texts)
- [Physics Textbook Errors Database](#)
- [The Challenge of teaching/learning intro physics](#) (excellent!)
- [Meaningful Learning Research Group:](#)
  - [1st International Seminar on Sci/Math Misconceptions](#)
  - [2nd Int'l Seminar on Sci/Math Miscons.](#)
  - [3rd Int'l Seminar on Sci/Math Miscons.](#)
  - [4th Int'l Seminar on Sci/Math Miscons.](#)
  - [Ordering info \(CDROM available\)](#)
- [Top ten mistakes in Education](#) from [Engines for Education](#) project
- [Student's Alternate Concepts in Physics](#) from C3P Project.
- [Teaching physics](#) so people understand

- [Chemistry Common Misconceptions](#)
- [Earth Science Myths](#)
- [A PHILOSOPHICAL TOY \(RICHARD FRAZIER\)](#)
- [Thought Contagion \(memetics\)](#)
- [Kids' Science Books](#) page
- [Urban Legends: Science](#)
- [Yahoo: urban legends](#)
  - [Physics FAQ:](#)
  - [Does hot water freeze faster?](#)
  - [Clockwise bathtub drain?](#)
- [Computer Virus Myths](#)

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*"The Truth shall set you free... But first it will piss you off!" - Anon*

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## [K-6](#) TEXTBOOK PUBLISHERS

- [Addison Wesley](#)
- [Harcourt Brace](#)
- [Holt, Rinehard, & Winston](#)
- [Houghton Mifflin](#)
- [Kendall-Hunt](#)
- [McGraw-Hill](#)
- [Merrill](#)
- [Prentice-Hall](#)
- [Steck-Vaughn](#)
- [MCP Science](#)
- [Scott Foresman](#)
- [Wiley \(JWS\)](#)
- [WH Freeman](#)
- [textbookpublisher.com](#) (longer list)

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## OTHER SECTIONS HERE

- [Science Hobbyist](#), top page
  - [Amateur Science](#)
  - [Cool Science](#)
  - [Physics Demos](#)
  - [Science Ed. Links Index](#)
  - [Tesla Coils](#)
  - [Weird Science](#)
  - [The Problem with Skepticism](#)
  - [Static Electricity](#)
  - [Electronics Hobbyist](#)
-

## Some Quotes:

*Errors, like straws, upon the surface flow; He who would search for pearls must dive below.*

-John Dryden

*Truth comes out of error more readily than out of confusion.*

- Francis Bacon

*It is one Thing, to show a Man that he is in an Error, and another, to put him in possession of Truth.*

- John Locke

*Common sense is the collection of prejudices acquired by age 18.*

- Albert Einstein

*The ill and unfit choice of words wonderfully obstructs the understanding.*

- Francis Bacon

*You do not really understand something unless you can explain it to your grandmother.*

- Albert Einstein

*Education is what you have left when you have forgotten everything you learned in school.*

- Albert Einstein, 1936

*It is as fatal as it is cowardly to blink facts because they are not to our taste.*

- Tyndall

*Many errors, of a truth, consist merely in the application of the wrong names of things.*

- Spinoza

*When even the brightest mind in our world has been trained up from childhood in a superstition of any kind, it will never be possible for that mind, in its maturity, to examine sincerely, dispassionately, and conscientiously any evidence or any circumstance which shall seem to cast a doubt upon the validity of that superstition. I doubt if I could do it myself.*

- Mark Twain

*I can live with doubt and uncertainty and not knowing. I think it is much more interesting to live not knowing than to have answers that might be wrong.*

- Richard Feynman

*Things should be made as simple as possible, but not any simpler.*

- Albert Einstein

*The most erroneous stories are those we think we know best--and therefore never scrutinize or question.*

-Stephen Jay Gould

*There are many hypotheses in science which are wrong. That's perfectly all right; they're the aperture to finding out what's right.*

- Carl Sagan

*An easily understood, workable falsehood is more useful than a complex incomprehensible truth. - Thumb's Postulates*

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If you have comments to make or great URLs to add here, you can post to the [COMMENT BOOK](#), or send [private comments](#) (I see both).

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<http://amasci.com/miscon/miscon.html>

Created and maintained by [Bill Beaty](#). Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

# "Free Energy" Devices

[JUMP DOWN](#) to links and articles.

Also see [F.E. Frequently Asked Questions](#)

## **WARNING WARNING WARNING!**

### **DO NOT GIVE MONEY TO PEOPLE INVOLVED IN "FREE ENERGY"!!!!**

Several legit researchers do exist, but they don't spend huge amounts on advertising like the scammers do. The people who pursue wide publicity are almost all scam artists. If someone is selling plans for "real" free-energy devices, [they are a ripoff](#). Don't waste your money. Or if someone is selling "Dealerships" or investment opportunities for a free energy company, hold tight to your wallet and RUN! Or, if you've already let them get their hands on your money, ask to see proof of the FE device, and see what excuse you're given. (It will be a very convincing excuse. Scam artists don't act sneaky. Scam artists survive because they seem far MORE honest and honorable than a normal person. Remember that the "con" in "con game" means "confidence." They win your confidence first, then they go after your money.) How to tell the difference between a con game and a real product? Easy: if you give them money before receiving a working FE device, , then it's a scam, always.

How can we tell a free energy scam from an honest FE company? Here are some symptoms of a scam:

1. The company wants your money. It wants investors to buy stock, it wants to sell "Dealerships", it wants individuals to make large "donations." Or sometimes it wants to sell you extremely expensive plans which do not work... or sell books and videos about devices which don't do anything real. In any scam, the WHOLE POINT is to separate the victims from their wallets. (If absolutely no money is involved, then the researcher might be legit... or the scam might be less obvious.) Some scammers say that they want to improve the world (etc.), but then they somehow avoid doing this; they keep secrets, they run complex business deals... they do all sorts of things except getting working FE devices out into the public.
2. How can we tell? Just ask the F/E hobbyists. While you can't trust most "skeptics", since they will dishonestly say that ALL free-energy inventors are scammers, you can still ask the [online F/E community](#). They'll quickly set you straight about who is a ripoff artist and who is a legit experimenter.

## **FE hobby sites**

- [Greaterthings](#)
- [Adsitt's Scam Watch](#)
- [NuScam \(Perreault\)](#)

3. The invention violates current laws of science. Well, that's OK, since historical inventions often violate the physics theories of their time. But if many other listed symptoms are present as well, then it's a scam.
4. The invention is unproven. It has not yet splashed itself across news headlines worldwide. "NEW SOURCE OF ENERGY DISCOVERED IN USA!" Nope. Scams always involve unproven inventions. Unproven inventions might or might not be real. But scammers often hide behind this fuzzy status.
5. The inventor either keeps the device secret, or their patent lacks some critical information and nobody can build a working copy based on the patent. (A small critical piece of info remains secret.)
6. It's NOT the company's number one goal to prove that the invention is real. Scamsters have all sorts of really sensible excuses for not proving that their discovery is real. But honest companies just sit down and prove their claims beyond any doubt BEFORE gathering investors. After all, its unethical to take investors in questionable unproven devices as if they were reliable companies.
7. The company performs public demonstrations... but something always goes wrong. If it's a scam, then the "failure" was planned all along. When the inventor starts a demonstration, watch for the "failure" which excuses the inventor from having to actually prove the device.
8. The inventor doesn't publish successful scientific research papers (i.e. he doesn't publish detailed instructions, or if he does, other researchers can't get them to work. Something vital wasn't included.)
9. The inventor uses conspiracies/suppression as an excuse. Yes, actual suppression and small conspiracies really do exist. Some inventors have genuine horror stories about this. But if it's ALWAYS "the conspiracy's fault" and the inventor cannot test the device or even show good evidence that it works, or can't make progress despite years of investments or "donations," can't reveal history of the work, can't reveal device details... if The Conspiracy is to blame, then it's a scam.
10. The inventor doesn't give out working copies of the invention to independent labs for testing (the hardware stays secret and untested.)
11. The inventor makes one statement, then contradicts himself later. This string of lies is revealed by comparing various statements. A classic version is "The idea was given to me by god" ...followed by "I must keep the invention a secret so idea-theives can't steal it." (Hmmm. If god has gifted mankind with the secret of free energy, why is this guy keeping it hidden, and worse, trying to make money off it?! Gifts from god are supposed to CONTROLLED and SOLD?)
12. The inventor hasn't tried winning any of the [FE device prizes](#) Back in the days of flying machines, the genuine inventors were all questing after the several major prizes. They didn't

distain the prizes and make excuses. But scammers sure do!

13. SEE: [another list](#)

## Articles by Billb

- [Rules for FE inventors](#)
- [The Prometheus Game](#)
- [Inventors and Secrecy](#)
- [Why am I involved in Fringe Sci?](#)
- [Weird science \*is\* perception](#)
- [Physics Sermon #49](#)
  - [Free Energy](#) Frequently-asked Questions
    - [What's a FE device?](#)
    - [It's just Perpetual Motion!](#)
    - [Are they suppressed?](#)
    - [Are they a ripoff?](#)
    - [Where can I buy one?](#)
    - [But PLANS exist!!!](#)
- [MORE ARTICLES...](#)
- [Link collection to other F/E sites](#)
- [Link collections to ALL Weird Science](#)

## Unusual Patents, via [IBM Patent Server](#), thanks to Greg Watson

- [OU PATENT LIST](#) at Solaris , and [older copy](#)
- [Kawai Motor](#) and [Bearden article](#)
- [Puharich's OU electrolyzer](#)
- [4,151,431](#) Johnson Permanent magnet motor. (No graphics)
- [4,215,330](#) Hartman Permanent magnet propulsion system (Tomi like).
- [4,877,983](#) Johnson Magnetic force generation method & apparatus.
- [5,191,258](#) German Electric current generator including torque reducing countermagnetic field.
- [5,402,021](#) Johnson Magnetic propulsion system.
- [5,436,518](#) Kawai Motive power generating device
- [Minato Motor](#)

## Link. Shortcuts to files below

- [INE list of devices](#)
- [Museum of Unworkable Devices](#)
- [NERL tests of devices](#)
- [Books on Free Energy](#)
- [Bedini Device](#)
- [T.T. Brown Electrogravity](#)
- [Chernetski self-acting o/u arc](#)
- [Johnson Motor](#)
- [Hans Coler device](#)
- [Dennis Lee Thermal O/U](#)
- [The Farnsworth Tube](#)
- [Finsrud O/U Sculpture](#)
- [The Gray magnetic motor](#)
- [Hendershot Device](#)
- [The Hubbard Coil](#)
- [Hyde electrostatic device](#)
- [Moray's space energy receiver](#)
- [S. Meyer's hi-volt, hi-freq hydrogen cell](#)
- ['N-Machine' Homopolar Generator](#)
- [Joe Newman's giant coil overunity motor](#)
- [Searle gravity/energy device](#)
- [Floyd Sweet's VTA device](#)
- [Methernita TESTATIKA device](#)
- [Water-vortex devices](#)
- [Greg Watson SMOT, etc.](#)
- [Some articles on Vacuum Energy \(ZPE\)](#)
- [ATMOS](#) self-powered clock, [ATMOS Sales](#)
- [Others](#)



The following Keelynet files are mirrored from David Johnsson's excellent [ELEKTROMAGNUM](#) site

## Free Energy Files

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### Researchers who distain secrecy

- [Jerry Decker](#)
  - [George Wiseman](#)
  - [Bill Beaty](#)
  - [Brian Martin](#)
- 

### Floyd Sweet's VTA device

- [Forum: Sweet VTA](#) , and [others](#)
- [Sweet VTA article](#)
- [Other articles in: Space Energy Jnl](#) (buy back issues)
- [WJE's VTA page](#)
- [bearesp.asc](#), via [Wayback Machn.](#)
- [sweet1.asc](#), via [Wayback Machn.](#)
- [sweet2.asc](#), via [Wayback Machn.](#)
- [sweet3.asc](#), via [Wayback Machn.](#)
- [sweet4a.asc](#), via [Wayback Machn.](#)
- [sweet4b.asc](#), via [Wayback Machn.](#)
- [sweet4c.asc](#), via [Wayback Machn.](#)
- [sweet4d.asc](#), via [Wayback Machn.](#)

### Bedini Device

- [John Bedini page](#)
- [Forum: bedini motor](#) , and [others](#)

### Hendershot's Self-Acting Oscillator

- [hender.txt](#)
- [How did it work?](#) (Naudin)
- [Hendershot Fuelless motor](#) (Rex Research)

### Dennis Lee Thermal O/U (warning: probable scam!)

- [Questions about Dennis Lee](#)
- [Dennis Lee Site](#)
- [Dennis Lee site](#)
- [Pro-Dennis-Lee article](#)
- [Testing](#) reveals errors in Dennis Lee's measurements

### **Methernita TESTATIKA device**

- [Methernitha](#)
- [Testatika photos, mpeg movies](#) ([S. Hartmann's page](#))
- [Keelynet](#) Testatika file
- [Keelynet](#) Testatika .gif
- [More Keelynet](#) Testatika .gifs
- [Space Energy Jnl Back issues index](#)

### **Searle gravity/energy device**

- [searle1.asc](#)
- [searle2.asc](#)
- [Antigrav Page](#)

### **Hyde electrostatic device**

- [hydehath.asc](#)
- [hydeoffr.asc](#)
- [hydeptnt.asc](#)
- [Keelynet](#) Hyde .gifs

### **'N-Machine' Homopolar Generator**

- [Untried N-machine experiments](#)
- [DePalma Page \(new 11/98\)](#)
- [Tesla's Fueless Generator](#)
- [nmachine.html](#) on [MUFOR](#)
- [N\\_MACH1.GIF](#)
- [N\\_MACH2.GIF](#)
- [N\\_MACH3.GIF](#)
- [N\\_MACH4.GIF](#)
- [N\\_MACH5.GIF](#)
- [dpalma1.asc](#)
- [dpalma2.asc](#)
- [dpalma3.asc](#)
- [dpalma4.asc](#)
- [dpalma5.asc](#)

- [dpalma6.asc](#)

## Hans Coler Device

- [Coler Invention](#), on [C. Ohstrom](#) Page

## The Gray magnetic motor

- [evgray.asc](#)
- [evgray2.asc](#)

## Howard Johnson Motor

- [Sci & Mechanics article](#)

## S. Meyer's hi-volt, hi-freq hydrogen cell

- [meyer1.asc](#)
- [meyer2.asc](#)
- [Meyer](#) GIFs

## Moray's space energy receiver

- [moray1.asc](#)
- [moray2.asc](#)
- [moray3.asc](#)
- [moray4.asc](#)

## Joe Newman's giant coil overunity motor

- [Newman's website](#)
- [Skepticism & problems with Newman](#)
- [Newman Energy Machine](#)
- [newman1.asc](#)
- [newman2.asc](#)
- [newman3.asc](#)

## The Hubbard Coil

- [hubbard1.txt](#)
- [Hubbard Coil](#) (Rex Research)

## Finsrud's Overunity Artwork

- [Finsrud page](#)
- [Finsrud.htm](#) ([S. Hartmann's page](#))

## Farnsworth Fusor (Multipactor) Tube

- [Fusor Page](#)
- [Multipactor](#) at [Borderlands Archive](#)

## Watson's SMOT, RMOG, etc.

- [SMOT message archive](#)
- [PMOD](#)
- [JLNlabs SMOT page](#)

## Water-vortex devices

- [The Schaeffer device](#), predecessor of Hydrosonic Pump
- [Schauberger's work](#)
- [Viktor Shaugerger, water wizard](#)
- [Walter Shaugerger's PKS](#)
- [Dr. A Evert](#) fluid perpetuum mobile
- [Water Vortex World](#)
- [Schauberger gallery](#)
- [Steam anomalies](#)
- [Potapov's "YUSMAR"](#)
- [The Clem motor](#)

## T.T. Brown Electrogravity

- [T.T. Brown website](#)
- [more Keelynet TT Brown .gifs](#)
- [even more Keelynet TT Brown .gifs](#)
- [BRN2A.GIF](#)
- [BRN2A.GIF](#)
- [BROWN1.PCX](#)
- [BROWN2.PCX](#)
- [Antigrav Page](#)

## Chernetski self-acting arc discharge

- [PLASMAFE.TXT](#)

## Some articles on Vacuum Energy (ZPE)

- [zpe1.asc](#)
- [zpe2pt2.asc](#)
- [zpe2pt3.asc](#)
- [zpe2pt1.asc](#)
- [zpe3.asc](#)
- [zpe4.asc](#)
- [zpe5.asc](#)
- [zpe6.asc](#)
- [zpe7.asc](#)
- [zpetest.asc](#)

## Others

- [Edwards: neat solarcell effect](#)

Created and maintained by [Bill Beaty](#).

Mail me at: [billb@amasci.com](mailto:billb@amasci.com)

[Weird Science](#) | [COMMENTS](#) | [NEW STUFF](#) | [SEARCH](#)

Google:

## Weird Research, Anomalous Physics

# Not your average construction project

NOTE: ARE YOU BUILDING ANY OF THESE DEVICES BELOW? OR EVEN CONSIDERING IT? Beware of "ego improvements": don't modify the devices until you've built an exact copy and made it work. And don't try building these without first asking the members of [FREENRG-L](#) about their experiences. Most of these projects are untried, but some have been attempted. Don't repeat another's failures, and don't reinvent the wheel, first talk to others to get the real story. Join [freenrg-L](#), the Weird Science Projects and Unconventional Physics discussion group. (This is a 'listserv.' To start it up, see the [instructions](#).)

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Also see: [Free energy](#) and [Antigravity](#) pages.

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"Though I have no power to quote from authors as they have, I rely on a far bigger and more worthy thing: on experience... if they despise me who am an inventor, how much more should they be blamed who are not inventors, but trumpeters and reciters of the works of others?" - *Leonardo Da Vinci, Codex Atlanticus*

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- [Kinetobaric effect](#)
- [Magnetized water, ormus, little men?!! from ORMUS site](#)
- [Experiment: body weight during sleepwalking from S. Krepelka](#)
- [Transcranial Magnetic Stimulator, experiment on BRAAINS!](#)
- [Graphing human 'life fields,' w/a pulsed EM sensor](#)
- [Borderlands: remote sensing of "bio" radiation](#)
- ['Seth' and Vortex Points](#)
- [Simple anomaly in electrolysis \(Wiseman\)](#)
- [Impossible pulses from a simple transformer primary](#)
- ['Epsilon', broadcasting scents using pyramid power](#)
- [Xenon/magnet experiments](#)
- [Bakers' yeast ALTERS Uranium half-life?!! , by S. P. Faile](#)
- [Human body circuits move chemicals around](#)
- [Sky-current battery charger \(if overload, try cached version\)](#)
- [Grow plants in the dark \(Hieronymus, "Odylle"\), also Borderlands version](#)
- [Underground antenna experiments , also Robert Felix experiments , also Roger's Radio at Rex Research](#)
- [Reported: a vanishing paperclip](#)
- [Grebennikov's Insect-antigrav & shape forces](#)
- [Cook Device, FE from 1871](#)

**Bill B's stuff:**

- [Rules for maverick inventors](#)
- [Faraday-disk devices](#)
- [Energy-sucking antennas](#)
- [Threads of 'electric wind'](#)
- [UFO-detector binoculars](#)
- [Listen to ears](#)
- [Coupled-oscillator atoms](#)
- [Acoustic 'brain suck'](#)
- [Time distortion detector](#)
- [Charged air](#)
- [Aerogel critters](#)
- [Electric Rocket \(TT Brown\)](#)
- [Screwy Ideas](#)
- [Evil Genius Pranks](#)
- [Projects for "Normals"](#)



- [Morton Device](#), VandeGraaff sparks
  - [Inert Gas Devices](#) (subtle energy)
  - Instruments for gravity experiments:
    - [Gravity sensor, electroluminescent Galletti/Aluigi](#)
    - [Various sensors](#)
    - [Gravity wave detector](#), Hodowanec's capacitor device
    - [Mechanical Sensor](#) detects gravity waves? UFOs?
    - [Gravity-emitting capacitor!?](#)
    - [Podkletnov antigravity generator](#)
    - [Method for mapping strong gravitational anomalies](#)
    - [Electrogravity device](#)
    - [Gravity Resonance Coil](#)
- 

"I haven't failed. I've found 10,000 ways that don't work." -  
*Thomas Edison*

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- [DIY Psionic Devices](#) (Cosimano)
- [Benveniste's chemical audio signals](#)
- [HERF gun plans, mythical?!](#)
- [Chandra Bose](#), microwave devices from 1897
- [Shoulder's "Charge Clusters" cause holes in foil](#)
- Ed Leedskalnin's [Magnetic Current I](#), also [II](#) and [III](#) (Keelnet)
- [Orgone Accumulators](#) from PORE
- ["Scalar beam"](#) experiments

- [Scalar device](#) from **J. Bedini**
- **Cold Fusion** for hobbyists: [Transmute carbon to iron](#) (simple demo!)
- [Crossed-field Antennas \(CFAs\)](#) and build-it [project](#)
- [Listen to ears, hear 'mental voice?'](#)
- [Ranque-Hilsch "Vortex Tube" Refrigerator](#)
- [Tesla force-bubble](#) build-it project?!!!
- [Faile Effect](#): anomalous transparency
- [Uncle's Perpetual Motion Toy](#)
- [Ghost Detector](#)
- [Lex Luthor's Large Death-Ray Projector](#)
- [Spirit communicator](#)
- [Vortex point / pyramid experiments](#)
- [Gallimore's exp't with capacitors and crystals](#) (fm [keelynet](#))
- [Binding-force Anomaly Detector](#)
- [Recipe for a "storm glass"](#)
- [Acoustic anomaly](#), audio illusion
- [Time distortion sensor](#)
- [TSD Time Shift Detector](#), JL Naudin's version
- ["TENS" nerve stimulator](#), and [Schematics](#)
- [Spin-field Generator](#)
- [Cold Fusion](#) for the brave
- [Element 115](#), modified Keller-style alchemy recipe
- [Orgone Accumulator](#) from [artasylum](#)
- [Electrostatic tornado, invisible "air threads"](#)
- [Charged Air](#), untried experiments
- ['Magnetized' water changes resistance](#)
- [Marinov's Ball-bearing Motor](#)
- [Potato-eye energy sensor](#)
- [Collection of projects](#) at "solaris" page
- [Gold transmutation recipe](#) (from [J. Champion](#)) (Joe Champion in jail, website gone?)

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"If a cluttered desk signs a cluttered mind, of what then is an empty desk a sign?" - *Albert Einstein*

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- [Chick's brains affect random robot path?! \(from JSE\)](#)
  - [PSI "Field" Detector](#)
  - [Electrostatic force-field wall](#)
  - [Clem device, and Update \(keelynet\)](#)
  - [Sonoluminescence plans at UCLA](#)
  - [Scalar Regen Receiver, Bob S.](#)
  - [Scalar transmitter, from JL Naudin's Scalar page](#)
  - [Radionic Transmitters, on C. Cosimano Page \[site gone\]](#)
  - [SMOT overunity magnetic ramp from J.L. Naudin's page](#)
  - [Oil-drop experiment detects monopoles](#)
  - [Hamel's magnetic spinner demo](#)
- 

"If you want to have a great idea, have lots of ideas" - *Linus Pauling*

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- [UFO-sensing binoculars](#)
- [Beck's viral cure device from Explore](#)
- [Beck Bioelectrifier Schematic, etc.](#)
- [Fogal Transistor](#)
- [Ehrenhaft magnetic chemistry, from SPVril \(search down to 'Magic with Magnetism'\)](#)
- [Ultrasonic triggered water explosion](#)
- [Ionized nickels fall slower](#)
- [Loudspeaker thrust](#)
- [Minto's Wonder Wheel \(solar motor\)](#)

- [Aerogel organisms](#)
- [Homopolar Generator Experiments](#)
- [Sonoluminescence explosion](#)
- [Self-accelerating Plasma Tube](#)
- [Water Thread](#) phenomenon
- TVQ: [Scalar detector](#) based on Barkenhausen Effect
- [RIFE](#) frequency generator using soundblaster
- [Test](#) of Barker's method for altering radioactive half-life
- ["Cold Fission"](#) energy tube REMOVED AT [AUTHOR'S](#) REQUEST
- TVQ: [Scalar Electrostatic Gradiometer](#)
- [Microwave O/U Lawnmower Engine](#) and [Discussion](#)
- TVQ: [Strange Scalar](#) noise circuit
- [Drawing holograms by hand!!!](#)
- [Ball lightning](#) plasma tube
- [Gravity-emitting capacitor!?](#)
- [Scalar xmitter](#)
- TVQ: [Scalar detector](#), neon bulb and [gif diagram](#)
- TVQ: [Gravity Resonance Coil](#)
- [Caduceus coil](#)
- [Caduceus coil GIF](#)
- [TVQ group's scalar suggestions](#)
- [Aura Camera](#) by Chuck Shramek (Chuck passed away, his wife says all his stuff was mean-spirited hoaxes)
- [Some weird but conventional devices](#)
- [Conventional electronics projects](#)

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"To invent, you need a good imagination and a pile of junk." -  
*Edison*

Very unfortunately this also seems true: *"there is no pleasure in having nothing to do; the fun is having lots to do and not doing it."* - John W. Raper.

Even so, we should get off our butts and actually test some of the above ideas.

<http://amasci.com/weird/const.html>

Created and maintained by [Bill Beaty](#).

Mail me at: [billb@amasci.com](mailto:billb@amasci.com)

# CAPACITOR-BANK DISCHARGE EXPERIMENTS

6/15/94 William Beaty

This page is intended for an adult technical audience, and has a [RSACi](#) rating of V4. If your kids can see it, then you are not using an Internet Filter to block violent content.

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DISCLAIMER: the experiments described below are fantastically dangerous, and they are described without reference to the many precautions needed to guarantee the experimenter's safety. Accidentally discharging these capacitor banks through your body can not only kill, but can explode flesh and bone. The "exploding water" effect can launch electrode fragments at high velocities. The "watergun" is a full-fledged cannon, and must be treated as such. And these are not the only hazards. I describe these experiments for your information only. Anyone who attempts to duplicate them does so at their own risk. And the risk is considerable unless you know EXACTLY what you are doing. If you don't have lots of experience with lethal high voltage and the effects of explosions, stay safe and steer clear of this stuff.

PARENTS: I supply no detailed plans for reproducing these experiments. Also, these experiments require large and expensive lab equipment which is not obtainable by children. (And the plans for an atomic bomb are safe for children too, because kids can't afford to buy kilograms of Plutonium!) If your kids have access to 5,000 volt high-current power supplies, then they are already in great danger, whether or not they read about my capacitor discharge experiments below.

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## Other Cap-Discharge sites

- [Hickman Quartershrinker](#)

- [History of quarter shrinking](#)
- [T. Stewart](#) can crusher, railgun
- [Sam Barros'](#) Powerlabs
- [EM pulse Can Crusher](#) at RPI Plasma Dyn. Lab
- [Railgun Page](#)
- [Sterilization by cap discharge?!](#)

## THE "WATERGUN"

by Bill Beaty, experiment by Chris P., Dan Y. and Dale T. in ?1991?  
Water cannon built by Chris P.

The capacitor discharge gun was a 6" cylinder of mild steel, 2" diameter with a 1/2" hole bored most of the way through axially. At the base, two holes were bored in from the sides and threaded to take standard sparkplugs. The gun was fired at potentials ranging up to 40,000 Volts supplied by a bank of six 3uF, 150,000-volt capacitors (about 1/2 cubic yard in size!) using 1-1/2" x 1/2" copper busbar as conductors. The switching gap was a pair of metal spheres between which a short length of metal rod was inserted using air pressure. The charging supply was a DC HV unit from an old X-ray machine. Later versions used a 50,000V neon sign transformer and strings of the [high voltage diodes](#) sold as replacement parts for microwave oven repair. About one cm<sup>3</sup> of water was placed in the gun, and a steel ballbearing was initially used as the projectile.



### **ABOVE: THE CAPACITOR BANK**

(gun not present, set up for 'shrinking' coins)

In the initial tries, the sparkplugs blew out violently from the gun, and the ballbearing was gently lofted from the barrel. We assume

that the force originates in the discharge gap, and so we need to position the gap closer to the base of the barrel.

The sparkplugs were replaced with turned teflon rods and copper wire conductors, with the single discharge gap centered in the barrel. The ball bearing was replaced with a black polyethelene cylinder with flat ends, which gave a slip-fit into the bore. A clay cube of about 10" to 12" thick (water based modeling clay) was used as a target. When fired, the teflon rods and the copper conductors were still blown out of the holes. But this time the slug went through the entire clay block, leaving a large entrance hole and a tiny exit hole. The entrance hole was conical, with ripples and spirals on the walls. Amazingly, the projectile had not the slightest bit of damage, and the edges of the beveled end were even still sharp and polished. Even more amazing, after going through the entire block of clay, the slug was stopped by the thin poly bag that covered the back of the clay block.

5/95 - In the spring issue of ELECTRIC SPACECRAFT JOURNAL, the Richmond Virginia Tesla Coil Builders Assn. have an article on their own watergun experiments. They manage to perforate a 1/4" aluminum plate with nothing but the water fired from the end of the gun. They attempt to look for anomalous energy production, but their results are inconclusive.

For info on subscribing to ESJ, see FREE ENERGY NEWSLETTERS AND JOURNALS in WWW Weird Science at <http://amasci.com/weird.html>

Some references recommended by Tom Coradeschi

IEEE Transactions on Magnetics:

Vol. MAG-18, No. 1, January 1982  
1980 Conference on Electromagnetic Guns and Launchers

Vol. MAG-20, No. 2, March 1984  
2nd Symposium on Electromagnetic Launch Technology

Vol. MAG-22, No. 6, November 1986  
3rd Symposium on Electromagnetic Launch Technology

Vol. 25, No. 1, January 1989  
4th Symposium on Electromagnetic Launch Technology

Vol. 27, No. 1, January 1991  
5th Symposium on Electromagnetic Launch Technology



Vol. 29, No. 1, January 1993

6th Symposium on Electromagnetic Launch Technology

Vol. 31, No. 1, January 1995

7th Symposium on Electromagnetic Launch Technology

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SOME CAPACITOR EXPERIMENT RESULTS,  
or, Blowing Stuff Up: a "guy thing"

7/10/94

We tried discharging the capacitor bank through small pieces of agar gel with various electrode lengths and spacing. Capacitors: three 100uF, 30,000-volt units in parallel. Switching gap: two 1-1/2" brass spheres moved by an AC solenoid, with flexible contact made via several flat 1" ground braids. 8" lengths of heavy solid copper wire (#12?) were run from the capacitor terminals and were bent to form a gap, into which small blocks of agar were placed. A styrene cottage cheese bowl was placed below the gap to shield the capacitor conductors from agar splatter. A 12" Tupperware bowl was placed over the gap to shield the rest of the room from flying agar.

At lower voltages (under 2,000V) there was no explosion. Instead, the agar glowed yellow, sputtered, and melted adjacent to one electrode wire. This is similar to the "glowing 120V pickel" demo, where an arc burns pickel flesh from around an electrode with a crawling arc which sequentially attacks the material closest to the electrode.

With electrodes inserted 1/2" into the agar at 1" spacing and 2,500V, there was an extremely loud blast which shattered the styrene cottage cheese bowl we had placed below the wires in an attempt to shield the conductors from agar splatter. But even with a blast like a shotgun discharge, the agar simply broke into several pieces and fell from the electrodes. The explosion was all sound, but with very little mechanical force.

With 1/2" electrodes at 1/4" spacing, the blast was extremely loud, the agar was thrown out from the discharge as a liquid spray, the cottage cheese bowl was again shattered and blown downwards, and the 10" tupperware bowl that covered the assembly was shattered! Bill thinks it happened not only from overpressure, but from fast risetime of force which shattered the plastic like sillyputty with a hammer. Because the agar was liquified rather than gently fractured as before, we suspect that the voltage and spacing in the previous run must have been just at the explosion-producing threshold. Also note that the explosion energy seems to be nonlinear with respect to e-field, and with respect to total input energy, since reducing the gap while keeping capacitor voltage and capacitance constant seems to have enormously raised the energy output.

Perhaps energy is proportional to peak current? Or perhaps there is a threshold in the voltage or current below which explosion energy falls rapidly.

Since the discharge is intensely loud, Bill suspects that the extremely loud noise from the quartershrinker<sup>\*</sup> setup may be coming from the switching gap, and not from the exploding coil. After all, covering the quarter with the iron pipe did not reduce the noise all that much. Dr. [P. Graneau](#) has written about anomalies with high current air arcs, pointing out in particular that the sound from lightning may not simply be from thermal transient air expansion, but from unexplored plasma dynamics which produce shock waves via motor effects. Perhaps this is the source of the intense sound from the discharge.

\*

Quartershrinker: device which electrically compresses a coin into a small, shrivled, spherical lump. See EXTRAORDINARY SCIENCE, Vol 5 No.3, Summer 1993, p10 (pub of the Intl. Tesla Society, Colorado Springs, CO, 719-475-0918. Email the author at [ghawk@eskimo.com](mailto:ghawk@eskimo.com), or <http://www.eskimo.com/~ghawk>

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IDEAS FOR THE FUTURE:

Place a glob of jello against a solid sheet (metal, plastic, etc.) Stick capacitor wires in the jello. Fire the capacitor bank. Will the exploding jello shatter or dent the plate? Place it against a coin. Will it cause dents? Can exploding jello drive a quarter into a block of wood?

Obtain a satellite TV dish. Suspend a jello-glob blaster (as above) a little farther away than the dish focus. Find the distant secondary focus optically, and place objects there. Fire off the capacitor bank, and see if the refocussed blast wave can do damage at a distance. Blow out a candle at fifty paces? Shred a roll of toilet paper? Atmospheric lithotripter!

Measure the output energy of the capacitor bank's discharge. "Free energy" test: fast, high current impulses tend to do weird things. Are they a F/E source? Discharge the capacitor many times in a container of water. Measure the temperature increase, and calculate energy input. Calculate electrical energy use. Is it anywhere near unity? Is it over unity? Fire a supergun upwards with a heavy bullet, measure the height. Fire it into a ballistic pendulum, measure the height.

Coil-crush a quarter inside a heavy pipe full of oil. Is coil still

destroyed? (Put it in a big baggie to limit the mess)

Blow a bare coil inside a cup of water. Anything interesting happen? Is explosion symmetrical, or do water jets form? Is there a difference between fresh water and electrolyte?

Drill a 1/2" depression in a metal block. Fill it with water. suspend a wire that touches the center of the water. Discharge the capacitor between block and wire. Is safety shield needed? Maybe not, and the plasma jet will be easily observed. Try different sizes of holes. Try a deep hole with a drop of water in the bottom and a long conductor making contact. Direct the jet against various materials.

Run the capacitor leads to a baggie of water. Fire it off, and make a mess. Do it with paint in a parking lot, maybe several colors and various objects to make blast shadows. A big blast with mannikins against a wall makes "Hiroshima" effects.

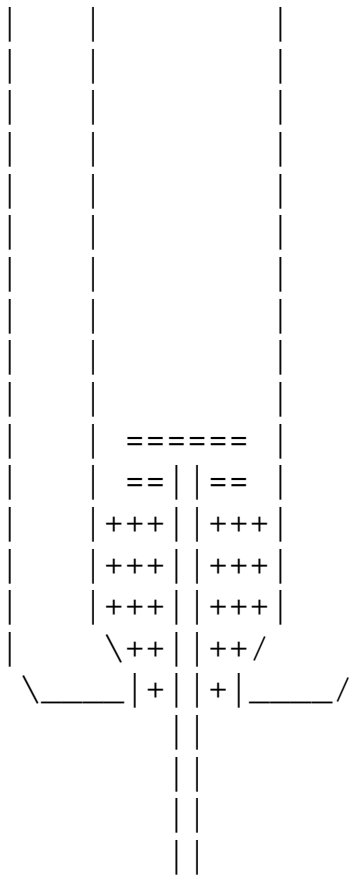
Fill a flexible (rubber?) container with water, insert capacitor leads. Try firing it with low voltages, see how high a voltage is needed for explosions. Try firing it with various electrode separations. What exactly is needed to make water explode?

Install a heavy polycarbonate window on the above rubber bucket, and observe small water explosions underwater.

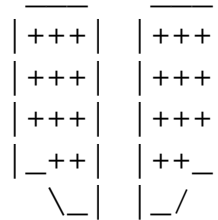
Discharge a capacitor bank through the ground, while using geophones to listen at great distance. How far can the sound be detected? Instead, use electrodes and an audio amp to listen at a distance. How far away can the EMF effects be detected?

Can "machinable ceramic" stand up to water blasts? If so, make a reusable cannon: Bore a large hole most of the way through a 2" metal bar. Bore a much smaller hole the rest of the way. Carve a thick disk of ceramic that slip-fits into the large bored hole. Drill a hole through the center of the ceramic disk. Machine another electrode in the shape of a giant nailhead. Stick this through the ceramic disk, so the shaft of the "nail" extends out the back of the cannon, and the ceramic separates the center electrode from the metal cannon. Put a little water in the cannon, and discharge the capacitor between the cannon and the center electrode. If the ceramic can take the shock, the device is reusable. If a small-bore cannon with lots of water is used, the slug of water itself will become the projectile. P. Graneau claims that such a waterslug can penetrate a 1/4" aluminum plate. But how big a capacitor bank did HE use?

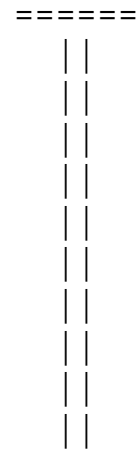
ASSEMBLED  
CANNON



CERAMIC



CENTER  
ELECTRODE



=====

MORE STUFF:

F/E testing: discharge in a calorimeter repeatedly, maybe use sorbothane packing around sphere electrodes, see if T(rise) is anomolous. Underwater discharges are probably too destructive to containers

Discharge underwater with plastic or wax lenses to refocus the shockwave and destroy objects at the lens focus.

Place a small water drop on a metal block, touch the drop with a metal wire, connect the block and wire to the discharge capacitor. Is the block surface damaged?

Try inducing long discharge paths using wet thread, the thinner the better. Will curved thread cause shockwave focusing effects?

Wrap wet string around a thin plastic tube, place a quarter inside. Perhaps the discharge will form a spiral arc with good conductivity which will warp the coin without requiring the destruction of a copper coil?

Try graphing sound peak amplitude versus capacitor voltage for a constant length short arc. Force an arc initiation at all voltages by using wet

filaments or #40 wire across electrodes. Is sound proportional to voltage, energy, or what? If more than proportional to energy, F/E is revealed?

Are water-arcs different from other arcs? Run some very thin wire to a tiny block of jello and fire it off. Does the exploding jello give a different explosion pattern than the exploding wire?

=====

<http://amasci.com/amateur/capexpt.html>

Created and maintained by [Bill Beaty](#). Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

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# EVIL GENIUS'

## LIST OF PRANKS AND

# HI-TECH PRACTICAL JOKE IDEAS

WILLIAM J. BEATY

(convenient proof that everything in [WEIRD SCIENCE](#) must ALSO be a hoax, right?!)

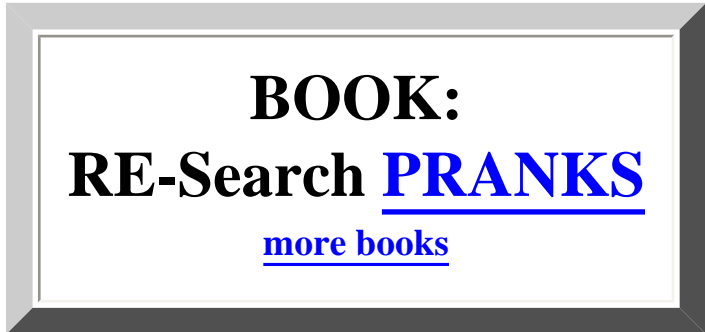
I've neither built nor prototyped any of the following devices. Some are hazardous and should not be built or operated. Others can be misused. This list is for your information only. If you choose to build any of these, you do so entirely at your own risk.

Hey, wanna help bring these into reality? I'm looking for funding. Give me a buzz if you can help.

Also see: [MORE SCREWY IDEAS](#) , and [DO THIS NOW](#)

## Megavoltage Body-charger

What if you could be charged up all the time, as if you had your hands on a large VandeGraaf generator? Your hair would stand out straight. Anyone you touched would receive a huge zap (so wear chainmail gloves.) You could crash laptops for miles around! Fortunately there's a way to build a VDG machine without



using any moving conveyor belt. If you have a very small hi-volt power supply and some sharp needles, then you can inject charges into the air. If you have a small powerful fan, then you can transport those charges against a (rapidly increasing) high voltage. Wear some thick insulator-shoes, strap the device to your leg so its air jet aims at the floor, and away you go. Create a buzz when you walk into the room (or maybe more like a crackling hiss.) Creep people out by pointing at them (via 'sticky ions' effect.) Perform hands-on "anti-healing" ceremonies for cellphones and PDAs!

---

## Road Music

Carve computer-generated ripples in the surface of a main highway, and when vehicles pass over the surface, mysterious voices whisper, and distant music plays. Two ripple-tracks, one for each tire, should give stereo sound. Two tires on each side will make it all echo-y. Is this already being done? Little sub-threshold voices which say "Buy popcorn." "I will vote for Bush" "All your base are belong to us!" Also see [the Halfbakery](#) Also see slashdot-J, [Musical roads in Hokkaido](#)

(J. Dujardin says to look at number thirteen on [hiddenmickeys.org](#))

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## Broken UFO parts

Embed numerous ["repulsor" coils](#) and a power supply in a small, fake UFO crash remenant, so that small independent segments of the object hang unsupported in the air nearby, via the battery-powered "Meissner effect" generator. (independent segments must be magnets, of course) Take it to a mainstream researcher, but don't let them look at it in detail. Visions of alien room-temp superconductors should haunt the person forever after!

## Radioactive nightmare

If a radioactive object is surrounded by the blue glow of Cerenkov light, then the level of emission is absolutely lethal. You'd better be viewing such a glow through many inches of lead-glass. If not, then you're already dead. Here's a way to surround a real-world object with a 3D blue glow. Scare the crap out of your scientist friends (maybe literally.) First cover one wall of a room with retroreflective screen. The glass-bead tape used for car warning signs would work. Don't make it obvious, so hang pictures on that wall, etc. Now hold up a small blue light bulb with the retro-screen in the background. See? The screen sends the blue light back to the bulb, but its aim isn't perfect, and the bulb is apparently surrounded with a glowing, three-dimensional nimbus. Now place an opaque object in front of the bulb. The glowing blue nimbus remains! Any object with a light bulb behind it will develop an "aura" when held before the retroreflector screen. Walk around, and the nimbus stays around the object as long as the retro-screen is in the visual background. Now hoax up a paint can as a lead-shielded "transport container," and rig up a metal bar with battery-powered blue lights on one side. If your fake Geiger counter is roaring, and you don heavy gloves and use tongs to remove the bar from the "shielded enclosure" while keeping the blue lights aimed AWAY from your victims, they'll see an apparent radiation source surrounded with a blue glow, and suddenly realize that it's far too late to do anything about it, **THEY'RE ALREADY DEAD.**

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## "Stink Beam" projector

A large, hollow-ended cylinder is attached to a bass loudspeaker. The open end of the cylinder is covered with a flat plate, and a 3in. hole is put in this plate. This forms a [vortex launcher](#), and when a pulse is applied to the speaker, an invisible ring-vortex or "smoke ring" of air will be launched. Pulses can be



repetitive, so a continuous beam of vortices is projected. Pulse waveform can be tailored to produce robust, fast, silent vortices. Each vortex incorporates air from within the cylinder, and carries this air along as it travels. If a scent is placed in the cylinder, you have a "stink gun" which can target a distant nose without being intercepted by others, or can surround a distant object with any desired scent. If specific gases are added, then when the "stink beam" encounters a distant source of ignition, such as a cigarette, the vortices (and maybe the launcher device!) will explode. A computer, video grabber, IR camera, and some stepper motors could be assembled into an IR-seeking cigarette-targeting acetylene gasball launcher. No Smoking!

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## Yucky ions

If a sharp point is attached to the dome of a VandeGraaff generator, the point will spew charged wind. If you stand in this air stream, it will charge your clothing and hair, which will start clinging to your body. Ewwww!, feels like you've been dipped in vegetable oil. So, bolt a [VDG](#) upside-down within the ceiling, with ion-needles pointing downwards, and a "stand here" sign on the floor below. (only works in fairly low humidity, the lower the better.)

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## "Free energy" hoax

Fake device is composed of complex structures and materials, a tiny battery-powered spark generator, and in the distance, a hidden, "stink beam projector device" rigged for acetylene. The projector shoots gas pulses which cause occasional loud and unexplained explosions within the device. If both an ion projector and an acetylene launcher are used, it may even be possible to create sparks and explosions in a distant device which contains no power supply at all!

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## Even better "Free energy" hoax

Use the ['Energy sucking receiver'](#) effect to gather power from a special transmitter. The receiver has an array of tuned circuits with the coils acting as loop antennas. The transmitter has an identical array. The tuned frequencies are scattered all over the band, and will seem like low-level white noise. However, since the transmitter and receiver are coherent, each tuned circuit provides significant energy, and if all of them are passed through rectifier diodes, the total energy might be enough to run a small motor. At the same time, the EM field of the transmitter would be almost immeasurably small.

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## Elvis Miracle

Use my whitelight abrasion [hologram](#) method to encode an image of Elvis or other religious icon holographically into an everyday surface, (car hood?) Announce the miracle, charge admission, and even befuddle the experts who come to debunk it. Impossible!, a real hologram, but encoded into a crude painted surface!

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## Roadside Kilovoltage Source.

Build a sturdy [VandeGraaff generator](#) into a metal and plastic column, with a handcrank on the top metal terminal and a large label saying "TURN." When the crank and stepup gearing is turned, the generator operates. Place it outdoors, and surround it with a thick plastic insulating plate. Anyone who cranks it will feel a prickling sensation, their hair will stand up, and the next person they touch will get a huge "static zap." Better still: win the lottery and have thousands of them built and distributed around the country unannounced. Permanent Infamy!

## 4-Lane dot matrix printer

A truck-mounted device spits a row of paint dots under computer control. Drive along the Interstate while printing out political diatribes. Make our highways look like Usenet rants. Use high-pressure water sprays instead of paint for temporary, less illegal road gibberish. Can you be arrested for CLEANING little spots on the highway? Colored dyes would work well on packed snowy roads (a little carbon copier toner or fluoroceine dye goes a long way.) Rent out ad space in fields near airports, then do your printing in water/seed slurry for variously colored crops. Hang a stretched-out version of one of these devices as a long cable between widely-separated power boats to make an ocean graffiti printer (On water surfaces on windy days, tiny bits of oil make enormous blotches!) Also: lunar dust is supposedly dark grey, so electrostatically shoot charged magnesium oxide (white) downwards from lunar orbit for a more noticable and long-lasting advertising sign on the moon. "CHAIRFACE!"

These guys independently invented the [GraffitiWriter!](#)

Also a bike-carried chalk-spray [road printer](#)

Look at: [BikeWriter](#)

And now here's a [Graffiti machine](#) using winches and a single spray can. That reminds me. I first visualized the spray-can dot matrix printer around 1978 while looking at the frat-boy graffiti along the top edge of the huge brick chimney at the power plant for the University of Rochester campus/hospital complex. The frat symbols were 6ft tall, yet they appeared tiny and barely visible on the giant chimney. I realized that the vandals were doing it wrong. Put a hundred spray cans on a horizontal metal rod, then rapidly lower the rod with ropes. Keep it horizontal as a computer pushes on the paint can tips with solenoids. Make chimney-graffiti that's thirty feet across and several hundred feet tall!

## Kindergarten Solar-powered Death Squad

Take a large crowd of children out into the sunshine and give each one a 20cm square mirror. Show them how to aim all of their little spots of sunlight at the [same distant object](#), then stand back and see what they do. Better yet, run away.

FAST!

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## Ball-lightning incident

[Ed Harris](#) on usa-tesla has discovered that argon gas lets you make a large 'plasma globe' effect at ambient pressure. Build a battery-powered Tesla Coil, clip it to your belt, and run a wire out to an argon-filled mylar sphere. When turned on, the tip of the wire will grow a large blazing white ball of lightning filaments. Run screaming through the night, chased by a ball-lightning in a hardly-noticable clear bag. Charred, smoking clothes would be good too. Ahhhhhhg! It's biting me!

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## Build a Borg

The Yale psychologist [Stanley Milgram](#) discovered what he called the "Cyrano Effect", and experimented with strange group-organism he dubbed "Cyranooids." Build one as follows: provide the "brain person" with a radio transmitter. Give a radio receiver and earphone to a second or "body person," then have the 'body' agree to [carry out all orders](#) spoken by the distant 'brain.' Even better would be a video RF link so the 'brain' can see and hear through the 'body's' eyes, and maybe add a radio channel which controls vibrating transducers on the 'body'

person, so that the 'brain' can silently command their movements with a joystick rather than verbally. If one 'brain' runs several 'bodies,' you've got the start of a small Borg civilization! If you could rent the equipment for cocktail parties, would you pay more to be an amoral central controller, or a brainless puppet who might do ANYTHING?

The same psychologist discovered the power of this closed causality loop common in World War II:

- NOT MY FAULT, ONLY FOLLOWING ORDERS.
- ONLY GAVE ORDERS, DID NOTHING MYSELF.

This can be used to convert a pair of people into a psychopath. Responsibility for actions becomes a closed loop and evaporates. Ordinary "good" people can be convinced to give [lethal shocks](#) if a superior authority figure gives the orders and SEEMS to take responsibility. If anything bad happens, both people are certain it was the OTHER person's fault. As a consequence, the radio-controlled 'Cyranoïd' pair is very dangerous. So David Letterman has built himself one? Just wait until Dave gives an unwise order to his puppet and finds that the person ACTUALLY CARRIES IT OUT! The 'slave' trusts the 'master' to give only benign orders and stops thinking, but the 'master' may order something terrible, just to see how far the 'slave' will go. When Letterman's slave commits a crime, whose fault will it be, the one who only followed orders, or the one who did nothing himself?

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## Phaser Weapon

If pure argon is injected into a laminar stream of air, the argon stream will support sparks of enormous length. If connected to a fair-sized Tesla coil, the argon stream should produce linear arcs many feet long. This would be easily disrupted by wind or by a small fan. Indoors use only? Reach out zap someone! A similar effect can be had by running an argon stream through a [hose](#)

[connected](#) to a distant tesla coil. Hot dangerous arc-plasma will pour from the hose end. "Don't unplug that rubber hose, its not full of water!" Fill a bowl with cold argon, place a tesla coil underneath, then stick your hand in the bowl. Lightning shoots out of your fingertips. Fill an entire small room with Argon or even Neon. Hook yourself to a small tesla coil and enter the room, and you'll look like something inside an "Eye of the Storm" plasma globe. (Hold your breath, of course!)

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## Longrange Defacement Ray

CO2 lasers of hundreds of watts rating are very small and not that expensive. With a large-diameter beam and the proper collimator you could create a "woodburner" which leaves a charred black mark several hundred feet away. Mount it in an old rusty van along with computer and XY scan mirrors (might have to install pneumatic jacks to keep the van steady.) Drive to a spot with a clear view, use your joystick to set the anamorphed position of your artwork on yon billboard, then hit the return key and sloooooowly the original propaganda is modified or replaced by that of your own design.

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## Duck-plunge Mechanical Fountain

When a large rock is flung into a pond, the waves spread into a series of ripples of descending wavelength, as if the water has "Fourier Transformed" the splash signal. It has! The water surface is not a linear medium, therefore any signal becomes "chirped" in a similar way to the "whistlers" produced in ELF radio sets by distant lightning pulses. If you could wiggle an underwater object and produce an "antichirp" series of ripples, (a temporally-reversed version of the ripples from a big splash,) then as the ripples moved, they would slowly compress together and finally create a line or circle with a little explosion of spray.

Ripples also take the form of an expanding circle. Rather than just reversing the "chirp", we could also reverse their direction. If water ripples could be created as inwards-curving rings, so that they focussed themselves to a point, so much the better.

Therefore build a bicycle-powered wave generator which can be placed at the shore of a pond. It would slowly vibrate a long, curved wall which floats half-immersed in the water. When aimed at a distant unwary duck, a series of ripples is created. The duck sees the distant ripples approaching, and contracting, and concentrating, then... DOOOSH! WAAAK-Aaak quaaak quackquack...

Or build the device onto a large fountain pool. Design the wave-generator to produce several superimposed "antichirp" patterns per revolution of the flywheel. Then, if you pedal at the right speed, a mysterious zone of violent splashing would appear out in the middle of the pool. Do this in a lake by using a very long, very weak wave generator. The waves would remain invisible except at the focus which was hundreds of feet away from the wiggling boards.

Suppose the wave-generator was adjusted to produce a \*line\* of splashing, and every so often the antichirp waves would contract and produce a long burst of "chop". This line might act to reflect other water waves, especially if the event was repeating at the same frequency as the waves. Perhaps we could trap a standing wave in the space between the shore and a nonlinear barrier made from "chop." Or design the wave generator to create a square \*hole\* in the water temporarily. Make a really big one, so all the small 3rd-world countries can tickle the ocean for awhile and have it swallow approaching aircraft carriers.

Soliton waves can exist on the surface of water. The "tidal bore" is one such soliton wave. Perhaps a soliton can be assembled from many smaller waves. (This probably occurs in nature, where freak waves sink large ships.) If freak waves can exist, then cranking a bicycle-powered wave generator for a couple of minutes could create the smaller waves which contract together, then sum nonlinearly to build a gigantic travelling soliton. Very cool museum exhibit!

## Hidden images on videotape

This one isn't so useful. A cool trick for techies? If you view a television signal on an oscilloscope, you see a froth of squiggly shapes. Also, as objects move around on the TV screen, the squiggly shapes on the oscilloscope move and flow. Suppose you write software that changes the TV signal so the reverse happens? Then the television picture will be a mass of wavy moving shapes. But if you observe that video signal using an oscilloscope, the signal will contain a perfectly clear television picture.

DOH! The musician Aphex Twin figured out a use for this. But don't apply it to TV signals and scopes. Instead apply it to sound and spectrum analyzers! That way you'll get weird swervy noise, but when the noise is viewed with a spectrum analyzer, you'll see some clear images. The results were recently posted on memepool, see [usefulcontent](#) and [cleth](#) pages.

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## LINKS:

- [MORE SCREWY IDEAS HERE](#)
- [Childhood brain-modification techniques](#)
- [Culture Jammers](#) encyclopedia
- [Museum of Hoaxes](#)
- Book: RE-Search [PRANKS](#), big compendium of famous hoaxes and practical jokes, interviews, inspiration.
- Book: [Happy Mutant Handbook](#)
- [Hoaxer links](#) at Cacophony Society
- [DILBERT: ideas from the lazy entrepreneur](#)
- [Applied Autonomy](#)'s streetwriter performance art
- [Project Paradise](#) telepresence cyborgs



- [BURNING MAN](#) gigantic artist/prankster convention
- [Rotteneggs.com: pranks](#)
- [Building Fake UFOs](#)
- Science Jokes Page: [Pranks Section](#)
- [Yahoo: Practical Jokes](#)
- [Bizarre childhood brain-modification techniques](#)

If we freeze a can of shaving cream and then saw away the metal can, will the "brick" of ice expand into foam as it thaws?

<http://amasci.com/hoax.html>

Created and maintained by [Bill Beaty](#). Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

# MISCELLANEOUS SCREWY IDEAS . . .

## 1997

W. Beaty

...that I've never found time to actually test!

Every so often I'm messing around with a mildly interesting device, when some implications occur to me like so:

"wait a minute... is this feasible? OH MY GOD!!!"

But then after the idea has popped out of my head and I'm breathing normally again, I rapidly lose interest. I know it can be done, so actually *\*doing\** it doesn't seem as much fun as originating the idea. It's too bad the ideas don't have lives of their own. If they must depend on *\*me\** to build actual working hardware, they'll be waiting a long time. Hey, I know, I'll put them on a website, and maybe it'll only be a matter of time before the ideas attract interested people, and therefor cause versions of themselves to see the light of day.

- [MECHANICAL SMOKE RING](#)
- [HUMONGOUS SMOKE RINGS](#)
- [LEX LUTHOR'S DEATH RAY](#)
- [GHOST DETECTOR](#)
- [SOUND CAMERA](#)
- [PROVING PSYCHIC POWERS](#)
- [REALITY-DETECTOR GOGGLES](#)
- [ORB-SORTING CAMERA](#)

- . **Archive:** [Suggestions from others](#)
- . **Archive:** [Strange build-it projects](#)

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## HUMONGOUS SMOKE-RINGS

It's easy to make a small [smoke-ring launcher](#). But I want to launch smoke rings that are 200ft across! Make vortices which are bigger than the [volcano smoke rings](#)! I'd have to build a building-sized chamber the size of a football field. But perhaps there is another, less expensive way.

It is possible to construct semi-rigid structures made from inflated cloth tubes. Solid walls of

this sort will resemble an air mattress. My "smoke ring chamber" could be built using a sewing machine and some old parachutes. A tiny fan would supply the inflation pressure. I would build a 100ft "igloo"-shaped structure, with a 50ft hole in the center of the roof. It launches the smoke-rings upwards.

To launch a smoke-ring, I'd pressurized my chamber like so: have a "venetian blinds" valve over the smoke-ring launcher's hole. Start with the valve initially closed. Use another fan to pressurize the air in the chamber slightly. Maybe add a collapsible "plenum chamber" to the side of the main chamber, and wrap it with rubber cords so that it can be inflated like a balloon.

When the "venetian blinds" valve is suddenly opened, the air in the chamber would rush outwards and a ring-vortex would be formed. To make the vortex visible, I would have heated the air in the chamber and provided some water-mist sprayers to fill the air with fog. Upon meeting the outside air, the drop in temperature would form extra fog.

I expect that a 50ft smoke ring would have a very long lifetime. If launched upwards, the warm air would carry it much higher than the launcher would otherwise throw it. The ring-shaped cloud would be seen for miles. Maybe it would reach the stratosphere and form a genuine cloud. It'd look very strange on a cloudless day.

If the launcher was operated over and over again, then a string of 50ft smoke rings would rise into the sky. A vertical dotted-line miles tall against the blue sky. Lots like those searchlights they use for advertising at night. But this would be visible for miles in the daytime!

If a row of 10 huge launchers were built side by side, then perhaps we could generate enormous dot-matrix letters rising skywards...

If I were rich (or if somebody gave me a few \$K) I would build one of these for next year's [BURNING MAN](#) festival. At the end of the celebration, we'd have to swap the water-mist sprayers with kerosene foggers... then shoot flaming arrows or incendiary Estes rockets at the resulting flammable white smoke rings. Oh, but that constitutes a fuel/air explosive. The shock wave might be *\*too\** impressive... impressing the onlookers right into the rocky dirt. Sell bumper stickers to any survivors "I was almost killed at BURNING MAN 1999"

**NEW IDEA:** Make a big smoke-ring launcher, but lay it on its side, and cut in in half so only the upper half is there. It will create "smoke-arches" which fly horizontally. Sort of like a pair of dust-devils which connect together at the top. People could duck into the center as they go by.

## GHOST DETECTOR

For Children's Discovery Room at Boston Museum of Science, we built a "liquid crystal wall." Liquid crystal postcard material can indicate temperature to within a couple of degrees, and it responds fast when not against a surface.

So, build a "ghost detector" which visually reveals the shape of those unexplained cold spots in your haunted house. Obtain a large sheet of the material, stretch it on a frame, and mount the frame adjacent to an electrical heating sheet of equal size. Connect the heater to an AC dimmer, and set the heat level so that it "biases" the liquid crystal material to its most sensitive color-changing temperature. Any tiny changes in air temperature or IR radiation will create patterns upon the sheet. Mysterious "cold spots" would instantly become visible on this thermal panel.

Maybe a ghost will write you a message with an icy fingertip on your "thermal blackboard." Maybe a person with PK powers can create colored patterns without touching the surface. Or for some non-paranormal fun, just use a bright flashlight with IR filter and draw pictures with an "invisible heat-beam."

Link to [Source of LC material](#)

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## "ORB" SORTING CAMERA

Idea for "Orbs" hunters. "Orbs" are bright sphere-shaped or disk-shaped objects which show up when photographing cemeteries, haunted houses, etc. But many of these are simply the photoflash-illuminated dust motes or mist droplets hanging in front of the camera lens. The circular "orb shape" is a blurred image of a bright dot, and the shape is determined by the camera iris edge. If your camera iris is circular, the "orb" will appear as a disk, but if the iris is octagonal, the orb will look like a little octagon.

Ooo, idea! To settle the matter, place an opaque object on your camera lens! E.g. stick a thin slice of black electric tape across the lens. Or even make an "X shape" from thin tape slices. Now whenever you photograph a bright, small, blurred object such as a dust mote, then the dark strips of tape will show up as part of the bright circular "orb image." The false orb will

have a big black X drawn across it. On the other hand, if the "orb" is real, if it is large and distant from the camera, you'll see no shadow-image of the opaque tape cutting across the "orb." Presto: any possible "orbs" can be instantly separated from the dust-mote images; the real orbs won't have a big fuzzy "X" across them.

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## REALITY-DETECTOR GOGGLES!

Remember the "special sunglasses" in the 1988 movie "[They Live?](#)" I wonder if TV cameras will see exactly the same things that human eyes see. The Carlos Castaneda books claim that our everyday lives are full of alien entities, but we see them as normal people and never think twice. And some UFO researchers claim that space-alien entities are visible by eye, but don't show up when the videotape is played back again. If hypnosis-disguised entities were among us, then perhaps our eyes and our cameras see two different things when looking at certain people. We'd never notice this unless we could watch the video camera's output and look for differences between the viewfinder-view and the direct-eye view. So... wear some liquid crystal goggles with flipper-mirrors which can switch between a direct view of the world and a TV monitor, then switch the two views back and forth slowly. This would be a "blink comparator," similar to the technique for finding comets and planets by sequentially comparing two nearly-identical telescope photos. When the two views are aligned, any similarities would line up and not be noticed. But any differences between the camera-view and the real-world view would display obvious jumps as the two views were switched back and forth.

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## SOUND CAMERA

A balloon full of carbon dioxide acts as a "sound lens". If you fill a fairly large balloon with CO<sub>2</sub> and place a microphone at the right spot, it will act as a long-range listening device. But being a lens, the balloon actually creates a "sound image" at the focal plane. So, why not build a camera to detect this image? Place a row of closely-spaced microphones on the surface of a rotating drum. Give the drum some circuitry to amplify the sound from each mike and have the received sound signal drive an LED. If you place each LED on the opposite side of the drum from each microphone, then any sound that "shines" upon one side of the drum will

become patterns of light on the other side. Maybe give each channel a low-cut filter, so it will only "see" the sharply-focused high frequencies. Now "illuminate" the room with a high-pitched white noise. This mimics white light and eliminates diffraction fringes and "laser speckle" effects. Spin the drum, aim the lens, and see what "acoustic scene" appears on the raster of moving LEDs.

Now if you built an UNDERWATER version of this, then you'd have a camera that could [see through muddy water](#) (maybe even see through mud and sand.) Water-filled human flesh would look almost invisible, and people would look like living skeletons covered with clear-jelly muscles, except for their silvery air-filled lungs and tracheas. And don't forget blobs of silver-reflective gas in their intestines.

## GIGANTIC DEATH-RAY PROJECTOR

Big Tesla coils produce arcs many feet in length. These arcs take on a sort of crawling fractal shape. What if they could be shaped into perfectly straight lines? Then we would have a "death ray" generator which resembles those found in hundreds of SF movies. Here's a possible way for tesla coil hobbyists to accomplish just this feat in the real world.

Build yourself a squirt gun. Power it with a couple hundred PSI air compressor. An old CO2 fire extinguisher would make a good water reservoir. Drive the tilt/pan motion remotely with cables and pulleys. Give it a mechanical valve, controlled by another cable.

Install the entire thing in the main terminal of a large Tesla Coil. Use nonconductive materials for the control cables and air hose, of course. When the TC runs and the squirt gun squirts, the arc discharge will follow the row of conductive water droplets! Looks just like a Phaser weapon from Trek! (maybe put some metal salt copper chloride in the water to give the arc's plasma a green color.)

If you REALLY wanted to get ridiculous, you could install the squirt gun with its aim fixed axially upwards, then TILT AND PAN THE ENTIRE TESLA COIL SECONDARY! Here's where a "magnifier" Tesla Coil might work better than a standard TC.

Remember those truck-mounted beam weapons used in the first Godzilla movie? Go for it!

The above is totally a thought experiment. Perhaps the arc won't even follow the water jet for

very long distances. Perhaps the steam will cool things down and quench the arc. Perhaps you'll have to use WD-40 and magnesium powder instead of water.

Prototyping test: poke a hole in a can bottom, suspend it from insulators, hook it to a neon sign transformer, fill it with various liquids, let it dribble into a grounded sink. Turn it on and see what kind of arcing effects are obtained.

Other ideas: put various salts in the water to color the arc. Sodium gives yellow/orange, strontium red, copper blue/green, etc. Use several water tanks with various salts, and switch between them with a high-speed valve to get a multicolored tracer-bullet effect. Also, I've heard that there are particular salts which one can inject into flames in order to cause conductivity. If these materials were placed into the water jet, perhaps much longer "death beams" could be attained.

Obtain a 100hp gasoline generator, mount the whole affair on a flatbed truck, shave your head, wear a white lab coat, put some copper sulphate in the water to get a nice green effect, then go hold up a bank while screaming:

**I HAVE NO USE FOR YOUR PITIFUL CURRENCY, I SIMPLY WISH TO  
ATTRACT THE ATTENTION OF...**

**\*\*\*SUPERMAN\*\*\*!!!**

**YOUR PUNY MENTAL-WARDS AND EXCESSIVELY SMALL PROJECTILE  
WEAPONS ARE USELESS AGAINST THE POWER OF MY PLASMA BEAM  
GENERATOR!**

**SUPERMAN! WHERE ARE YOU! LEX LUTHOR SAYS COME TASTE  
KRYPTONITE DEATH!!!!!**

(If you forget to wear a flak jacket under your lab coat, don't come whining to me!)

See also: [100KV, 100 kilojoule DC taser cannon](#)

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## PSYCHIC POWERS

If humans are sensitive to the "vibes" of others, can one person "feel" which box contains another person and which boxes are empty? Can a wife "feel" which box contains the

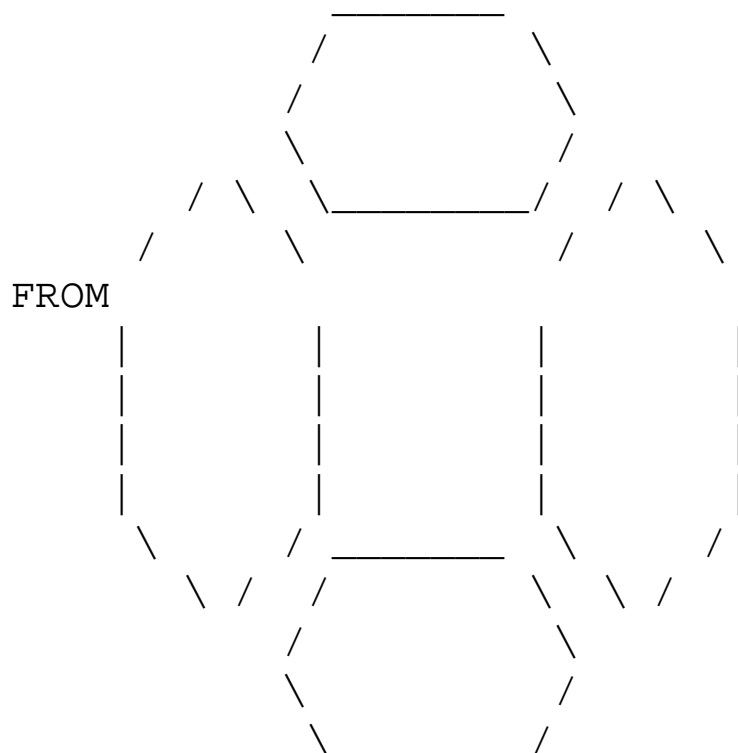


husband, and which boxes contain strangers? If the human "vibes" sense is fairly strong, then this would be an easy way to demonstrate the existence of PSI.

## MECHANICAL SMOKE RING

While discussing a friend's small prop-driven helium blimp, I had an interesting insight: could we build a blimp which flew like a ring-vortex does? Suppose we made a big stack of disk-shaped helium balloons and threaded them onto a big thin steel rod. Bend the rod into a hoop. When this "donut" of balloons was forcibly flung broadside through the air, all of the balloons would rotate, and the air friction would be very low. If such a device could be motorized, so that the disk-balloons would be forced to rotate on axis, then the whole affair would travel forwards. (And if selected sectors of the balloon-stack were run backwards, then the entire device would turn, sort of like steering an army tank.)

Rather than a circular stack of disks, perhaps it could take the form of several large football-shaped blimps, where the tips of the blimps are connected together. Six blimps? Or even four or two. Like this:



"SQUARE DONUT" AIRCRAFT MADE  
ROTATING BLIMPS

The above "square smoke-ring" craft could go tearing horizontally across the sky like some sort of big silver water-weenie! If the blimps were rigid, turbulence wouldn't tear them up. To steer, run one of the blimp-motors a bit faster than the others.

Heeyyyyyyy! Maybe they wouldn't need helium! If the "smoke ring" was oriented horizontally like a donut on the ground, and if the gasbags were spinning, maybe it would act like a helicopter and drive itself upwards. It would be VERY quiet, since the air flow would be almost laminar. It would look like a flying saucer. With the large surface area it would need, it may as well be a helium balloon. But with enough power, maybe helium wouldn't be necessary.

How would it behave? If it was hovering, and if the blimp-motors were suddenly cranked up, it would eject a "starting vortex" and be strongly accelerated. Being neutrally bouyant, it would only experience parasitic drag and not "induced drag," and because the surfaces are rotating WITH the air and perhaps maintaining laminar-flow conditions, the parasitic drag would be minimal. The craft would coast along like a big flywheel, just as smoke-rings do. If the spinning of the blimps was suddenly halted (use electromagnetic braking and recover the energy!), maybe it would create another starting-vortex in the air, and would stop on a dime? Maybe not.

Hmmmm. EM braking. What if the whole thing was powered by electric motors, so that the kinetic energy of the spinning blimps could be stored in big internal capacitors? This might give a high-G acceleration capability.

The whole idea is SO STUPID!! Just think of a 50ft silver donut hovering erect above the air force runway. Turn the balloons one way and it moves forwards. Turn them a different way, and the whole thing rotates. Everyone laughs really hard. But then the pilot kicks in the ultracapacitors... and the whole aircraft blinks out of sight. Huh? It accelerates at 30G and unexpectedly goes tearing across the sky, but because it is a laminar-flow propulsion system, it is SILENT. Just don't aim the "exhaust" side at a building when you punch the accelerator, because it launches a huge "starting vortex" which has enough overpressure to do some serious damage.

Imagine getting into a dogfight with such a beast. It might not need weapons. During sudden accelerations it would launch "clear air turbulences" which would have enough wind-shear to tear wings off of conventional craft. It would be like battling a UFO that's equipped with a titanic Wham-O air-puff gun!

## Get Instantly Arrested

No, don't read this! You'll be tempted to try it and end up in jail. Back in 1982 I was using some adhesive "window burglar alarm tape", the metal stuff you burnish onto glass to detect breakage, and realized that it's made of lead. With just this lead foil and a razor blade, I could make some lead-on-paper messages, put them in my carry-on luggage, and send a secret message which is visible only to the X-ray operator at the airport security station! Are those x-ray systems live-video or freeze-frame? Maybe I could even make a motorized animated sign, a little lead-foil creature who waves at the x-ray operator. And some modern x-ray units detect absorption spectra, displaying it in various colors, so materials such as silver-leaf from art supply stores will show up on their video display. Hey, rather than using lead foil, I could use lead oxide white pigment or "litharge", the old fashioned lead paint. Make some silver chloride paint that shows up in color on the x-ray display. Use white paint on white paper and it would show up on x-ray, but to the eye be visible only as white paper. Print a litharge-ink silk-screen image of the x-ray photo of a human hand or head and stick it in your luggage. Will you be arrested for smuggling invisible body parts?

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Also try:

[EVIL GENIUS PRANKS](#)

[CHILDHOOD MIND-WARPS ARCHIVE](#)

Created and maintained by [Bill Beaty](#). Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

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**NOTICE: New Book**

[Ball Lightning: an unsolved problem in atmos. physics](#)

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# Ball Lightning Page

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BALL LIGHTNING does not look like "lightning." Instead, it usually appears as a mysterious glowing sphere which drifts horizontally through the air. It is typically the size of a grapefruit, but sometimes appears as small as a pea, or as large as a bus. It sometime hovers at a few feet or tens of feet altitude, but can also bounce along the ground. It usually lasts only a few seconds, but sometimes persists much longer. Various colors of "BL" have been seen, sometimes it changes colors, and sometimes it has internal structures such as glowing layers or moving sparks. Sometimes it disappears silently, other times it explodes with extreme violence.

At one time BL was thought to be extremely rare, but this was because most BL eyewitnesses feared ridicule and wouldn't come forward. In reality, five percent of the population has seen BL close up. Today most researchers agree that it is real, yet its nature is still highly controversial, and no sensible theories yet exist to explain it. (For example, BL cannot be hot plasma, since plasma

would be much lighter than air and would immediately rise like fire, or like a balloon.) See Scientific American's [Ask the Experts](#) under [BALL LIGHTNING](#), also [SAINT ELMO'S FIRE](#)

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## Make Your Own Ball Lightning?!

("Maser theory" plasmoids in kitchen microwave oven)

- [Bigger better balls](#), and [more](#), M. Crowley's carbon fiber
- [Microwave Oven](#) Ball Lightning (msg from usa-tesla listserv)
- [Candle in microwave](#) (msg from usa-tesla listserv)
- [Jean-Louis Naudin's MW plasmoids](#)
- [Microwave Oven Recipe: Ball Lightning](#)
- [More Microwave BL](#)
- [Even more microwave BL](#)
- [C. Sanders'](#) attempted replication of Corum/Corum reports
- [Some possible experiments](#)
- [Extremely stable ion streams](#), any relation?
- [Abstract: Golka1.html](#) from [Atmospheric Electricity Page](#)
- [Microwave oven BL](#), from [Keelynet](#)

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(try "atmospheric electricity" too)

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## Ball Lightning Research

- [GOOGLE SCHOLAR: Ball Lightning](#)
- [Sanduloviciu](#)
  - [Nonlinear self-organized plasma phenomena](#) (.pdf)
  - [...anomalous transport in plasma devices](#) (.pdf)
  - [...behavior of a hi-freq plasmoid](#) (.pdf)
  -
- [Vortex Fireball theory](#)
- [Chen/Pakter](#) plasma-torus paper (2001)
- [Corum Ball Lightning paper fm/TCBA](#)

- [Call for papers](#), ISBL 2001 (july 26-29 St. Louis)
- [Symposium Abstracts](#) ISBL St. Louis 2001
- [Electron power systems](#) plans toroid exper.
- [Ball lightning and metastable substance](#)
- [Royal Society BL report Dec 2001](#)
- [Tornado experiment forms sphere of burning fuel](#)
- [Sandia ICOPS99: Ball Lightning](#)
- [ALP project](#) (anom. lum. phenomena)
- [Prof. Yoshi-Hiko Ohtsuki](#), Dept of Physics, Waseda U, Jp
- [Masashi Kamogawa](#) Waseda U., Jp
- [ISBL-99 Report](#) Int'l Seminar on Ball Lightning
- [New E. Lewis page](#) (BL/plasmoid/gorgon articles)
- [Planetophysical Function of Vacuum Domains](#), A.N. Dmitriev, V.L. Dyatlov, A.V. Teteno
- [Nocturnal Lights, Norway](#)
- [Thunderstorm gamma rays](#)
- [Some Ball Lightning Books](#)
- [Some Ball Lightning Papers](#)
- [Ball Lightning Papers, Literature Search](#)

## **Journals with Ball Lightning on the WWW**

- [Anatomy of a Lightning Ball](#) (Science News)
- [Abstracts](#) of the Journal for Scientific Exploration:
  - [Ball Lightning and St. Elmo's Fire as Forms of Thunderstorm Activity](#)
  - [BL Penetration into Closed Rooms: 43 Eyewitness Accounts](#)
- Ball Lightning papers on the [INE web page](#):
  - [Tornadoes and Ball Lightning](#)
  - [Gorgons, Tornadoes, and Plasmoid Phenomena](#)
  - [Concerning Production of Elements and Plasmoids](#)
  - [Plasmoid Phenomena](#)
  - [Considerations about Plasmoid Phenomena and Superconductivity Phenomena](#)
- [Atmospheric Electricity HomePage](#)
  - [Abstract: Handel talk](#)
  - [Abstract: Golka1.html](#)
- [TORRO J. of Meteorology, Ball Lightning](#)
  - [Report: 18th Torro conference \(BL\)](#)
  - [1994 Index](#)
  - [1995 Index](#)

- [1996 Index](#)
  - [4th Torro Conference: Ball Lightning](#)
- 

## Links to Other Websites:

- [Oct 2002 article](#) in Fortean Times
  - [Znidarsic's BL chapter](#)
  - [Electron power systems](#) plans toroid exper.
  - [Ball lightning photo](#)
  - [Spectres in the Storm](#)
  - [Boules de Feu](#) (about.com UFO section)
  - [Two eyewitness BL accounts](#)
  - [NRP](#), Kolok's "plasmak"
  - [Mysterylights](#) page
  - [Geophysical "Meteors"](#)
  - [Hubler/Abrahamson: BL is silicon aerogel](#)
  - [Newsgroup: alt.sci.natural.phenomena.unusual](#)
  - [Ball Lightning Articles](#) from Corliss' [Science Frontiers](#) newsletter
  - [S. Goodfellow](#) page
  - [A.D. Johnson](#)
  - [BL Article](#) at New Scientist magazine
  - [Computer animation of Ball Lightning](#)
  - [Ball Lightning radio show](#), and [more BL](#)
  - [What is Ball Lightning?](#)
  - [SciAm "Ask Experts" page](#)
  - [NY Times Article](#)
  - [Mysteries of Ball Lightning, X-tagger page](#)
  - [Koloc](#) Ball Lightning article
  - [Ball Lightning](#) email discussion
  - ["Tiny ball lightning"](#) article, BL and Cold Fusion
  - [Ball Lightning Stories](#) from sci.geo.meteorology
  - [Kugelblitz Page](#) (German)
  - [J. Logajan's CF page](#), Plasmak artificial BL by Paul Koloc
  - [Message from Jonathan Woithe](#)
  - [Plasma Sci and Tech](#), and [archive](#) of sci.physics.plasma newsgroup
  - Use [Dejanews](#) to search newsgroups for "ball lightning" keyword
-

**"It is not uncommon for engineers to accept the reality of phenomena that are not yet understood, as it is very common for physicists to disbelieve the reality of phenomena that seem to contradict contemporary beliefs of physics" - *H. Bauer***

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**"Round about the accredited and orderly facts of every science there ever floats a sort of dust-cloud of exceptional observations, of occurrences minute and irregular and seldom met with, which it always proves more easy to ignore than to attend to... Anyone will renovate his science who will steadily look after the irregular phenomena, and when science is renewed, its new formulas often have more of the voice of the exceptions in them than of what were supposed to be the rules." - *William James***

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**OLD LINKS GONE BAD?** Try <http://archive.org>, "The Wayback Machine"  
It offers billions of old websites and even some of the graphics.  
But  
it's not searchable. You have to know the URL of the old site.

<http://amasci.com/tesla/ballgtn.html>

Created and maintained by [Bill Beaty](#). Mail me at: [billb@amasci.com](mailto:billb@amasci.com).



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# CLOSEMINDED SCIENCE

**Examining the negative aspects of the social dynamics of science.**

Skepticism is a primary tool of science. We'd be hypocrites if we never directed a skeptical eye towards [Scientific Skepticism](#) itself. Denied imperfections and errors are free to grow without limit, and Skepticism is not immune to this problem. Unbridled gullibility can destroy science, but unbridled disbelief is no less a threat because it brings both a tolerance for bias and ridicule as well as the supression of untested new ideas. Better to take a middle road between total closed-mindedness and total gullibility. Practice pragmatism, pursue humility, and maintain a clear, honest, and continuing view of ourselves and the less noble of our *own* behaviors.

## ARTICLES HERE

- [New Ideas in Science](#), Dr. T. Gold, from the [JSE](#) (excellent!)
- [Ridiculed, vindicated geniuses, a list](#)
- [Keep your Bead on the Wire](#) (fm Encyc. of Ignorance)
- [The Blind Eye of Science](#), more BL skepticism
- [AGAINST EXCESSIVE SKEPTICISM:](#)  
collected quotes

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- [Sprites, Jets, Skepticism](#) from [ISUNY](#) Journal
- [Pyrrhonian Skepticism](#)
- [Complaints of suppression are not Conspiracy Theories](#)
- [Recommended Books](#), Heretic's Bibliography
- [Why become involved in fringe science?](#)
- [Crackpot science: forums and newsgroups](#)
- [The Symptoms of Pathological Skepticism](#) (Bill B.)
- [Pure Horganism!](#)
- [Cognitive Processes and the Suppression of Valid Scientific Ideas](#)
- [Contemporary Evolution Heresy](#)(Bill B.)
- [Fringe-sci and Crackpots and Breakthroughs, Oh My!](#) (Bill B.)
- [They Laughed at the Wright Brothers!](#) (Bill B.)
- [Zen and the Art of Debunkery](#) (D. Drasin)
- [That which is not so](#) ( Bill B.)
- [The End of Science](#) (Bill B.)
- [Maverick Scientists Facing Barriers](#) (fm Boston Globe)
- [STM Microscope draws hostility, laughter](#) (fm Sci News)
- [PARASCIENCE vs. PSEUDOSCIENCE](#) (Bill B.)
- [List, Abhorrent Ideas in Science](#) (Bill B.)
- [PHILOSOPHIZIN'](#) by billb (dejanews archive)
- [New theories, scorn, & derision](#) (Bill B)
- ["THE OFFICIAL TRUTH"](#)
- [Ball Lightning and Skepticism](#)

- [Never Criticize Science!](#) (Bill B.)
- [Two Sad Stories](#) -- 1996 J. M. Bokris.
- [Scientific Censorship and Evolution](#) by Richard Milton
- [Maverick Science vs Conventional Science](#) (Bill B.)
- [Rules of the Research Game](#)
- [WEIRD SCIENCE](#) section
- [FORTEAN](#) section

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Please leave [COMMENTS!](#)

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"The most erroneous stories are those we think we know best -- and therefore never scrutinize or question." -Stephen Jay Gould

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## RECOMMENDED LINKS:

- [Skeptics talking to Believers](#) (McLaren)
- [Pathological Disbelief](#) (B. [Josephson](#)) (pdf)
- [Evidence, Experiments, and Bigots](#) (K. Pedler)
- [Radin: A Field Guide to Skepticism](#)
- [The Plight of the Obscure Innovator](#) (Nissani)
- [Zeteticism](#) (the old zeteticism.org)
- [Unconventional claims in science](#) (Truzzi)
- [Reporting Scientific Anomalies](#), R. Westrum
- [Skeptical Investigations](#)

- [Scientific belief as obedience to authority](#), R.A. McConnell
- [Strategies for Dissenting Scientists](#), B. Martin
- [Parapsychology, blind faith, and "pseudo-skeptics"](#), C. Tart
- [A Letter to a Dissident Scientist](#), by [B. Martin](#)
- [Stamping Out Dissent](#), B. Martin
- [THE ANOMALIST](#). Don't miss ["Moving the Goalposts"](#), and ["Pseudoskeptics"](#)
- [On Scientists and progress: "Hello Stupid"](#)
- [Scientists' treatment of "Heretics"](#), by Dr. [Brian Josephson](#)
- [Pseudoscience or Protoscience?](#)
- [The Myths of Skepticism](#), M. Sofka

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"Advances are made by answering questions. Discoveries are made by questioning answers." - Bernhard Haisch, astrophysicist



[What is this?](#)

**Journey around  
the Skeptic Ring**

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"We do not believe any group of men adequate enough or wise enough to operate without scrutiny or without criticism. We know that the only way to avoid error is to detect it, that the only way to detect it is to be free to inquire." - J. Robert Oppenheimer

# Dishonest Argument

If you've ever conversed with a closeminded person, you are aware how difficult it is to get your point across and to maintain your cool. You might not realize it, but there is are good reasons for this. While some people are like scientists and genuinely want to know the truth, others are like bad politicians and lawyers: dishonest truth-hiders whose only goal is to defend and persuade. Below are some of their tactics. Once you're familiar with these ploys, you can fight against them (or at the very least not let them drive you crazy!)

- [Conversational Terrorism](#)
- [Table of Slick Manuvers](#)
- [the Fallacy Files](#)
- [Handbook of Logical Fallacies](#)
- [Fallacies I, II, III](#)
- [Rhetorical Strategems](#)
- [Links: fallacies](#)
- [Fallacious Arguments](#)
- [Propaganda Analysis](#)
- [The fallacy of one-sidedness](#)
- [Clinical Attitude toward Arguments](#)
- [What is "Skepticism?"](#)
- [Intellectuals vs. Pseudointellectuals](#)
- [Sham reasoning, pseudo-inquiry](#)
- [Beavis/Butthead logical fallacies](#)
- [Art of Debunkery](#)
- [Wingnut debate dictionary](#)
- [The Spin Dictionary](#)
- [Typical Flamer Types](#)
- [Accidental flamewars](#)
- [Flamer personality disorder](#)
- [Flamers and Bullies](#)
- [The Lying disease](#)
- [People of the Lie](#) (also see the [book](#))
- [How to be PERSUASIVE](#)
- ['Flame' and 'Troll'](#)

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## Related Websites:

- [Peer Review: an iron law of disciplines](#)
- [Why I'm Not a Skeptic](#) M. Prescott

- [Beliefs, skepticism, possibility](#) H. Flynt
- [Precog dreamer vs. Dr. Wiseman](#) (another 'starbaby' scandal?)
- [T. Gold Plagiarism?](#) Russian deep hot biosphere research
- [Bridging the Chasm](#), a TB turns skeptic
- [Abuses of Skepticism](#) (CSICOP)
- [Anomalistics](#), a skeptic turns TB
- [Pseudo-critical thinkers](#)
- [The Objectivity of Science](#)
- [Notes from a Parallel Universe](#), UC Berkeley vs. crackpots
- [What You Can't Say](#) 1/2004
- [M. Truzzi on investigation of anomalies](#) 11/2003
- Physics Today: [the discovery of rapid climate change](#)
- [The Plight of the Obscure Innovator](#)
- [Stent: Prematurity in Scientific Discovery](#) (now also a [book](#).)
- [Radin: A Field Guide to Skepticism](#)
- The Mega Society: [Genius, Creativity, and the Mainstream](#)
- Velocity press: [Forbidden Knowledge](#)
- [Prof. Tangent](#), nutrition for the mind
- [Zeteticism.org](#), EXCELLENT (articles, links, quote)
- [MENSA column: alternative science](#)
- [R. Milton & Neodarwinism](#)
- [Sham reasoning, pseudo-inquiry \(1997 CSICOP\)](#)
- [Skeptical look at Astrology](#) (skeptic, not cynical materialist)
- [Love of the Marvellous and the Disbelief of the True](#)
- [The Burden of Skepticism](#) (Sagan)
- [On Skepticism](#) (symptoms of pseudoskepticism) , from [Boerner's](#) page
- [Disciplined Minds \(book\)](#) Scientists are trapped in Dilbert-land too!
- [The New Thought Police Suppressing Dissent in Science](#) (from [ISIS News](#))
- [Ethics in Science](#) (Bauer)
- [anti-CSICOP forum](#)

- [Delphi forums: debunking debunkers](#)
- [A Habit of Lies: how scientists cheat](#)
- [The Logical Trickery of the UFO Skeptic](#)
- [Could Gambling Save Science?](#)
- [Meteor Noises](#)
- [Magicians endorse PSI?](#)
- Truth-seeker's mindset:
  - [Cargo Cult Science](#), (R. Feynman)
  - [The Clinical Attitude toward Arguments](#) (Suber)
  - [Fallacy of one-sidedness](#) (Suber)
  - [Pseudo-inquiry](#) (Haack, CSICOP)
  - [Pseudointellectuals](#) (Harris)
- [Skeptic Satires](#)
- [How NOT to argue with Creationists](#) (Lippard) , and [reply](#)
- [The rise of moderation in skept. orgs](#) (S. Hall)
- [Debunking Common Skeptical Arguments](#) (W. Wu) , and a [rebuttal](#)
- [Some Failures of Organized Skepticism](#) (Lippard)
- [Dishonest science](#)
- CSICOP sTarbaby scandal
  - [sTARBABY](#) Rawlins vs. CSICOP
  - [Crybaby](#) (response to Rawlins)
  - [True Disbelievers](#) (response to Crybaby)
  - [Mars Effect Controversy: timeline](#)
- [Does psi exist?](#) (Bem & Honorton)
- [Links](#) at SKEPTIC mag: critiques of skept.
- [CSICOP and the Skeptics: An Overview](#)
- [Morphostasis](#): immune-system heresy (excellent!)
- [Archeological Outliers](#)
- [Skeptics: what they do and why](#)
- [Pseudo-critical thinkers](#)
- Kit Pedler's MIND OVER MATTER: a scientist looks at the paranormal

- [Evidence, Experiments, and Bigots](#)
- [Spoon benders and others](#)
- [Conceptual Conservatism](#)
- [The Plight of the Obscure Innovator](#)
- [Creationism: You asked for it](#) (fm New Scientist mag)
- [Scientific belief as obedience to authority](#)
- [Freethinker page](#)
- [Keynote Address](#) at 6th Int'l Symp. on Ball Lightning
- [Getting 'heresies' published](#)
- "Your Endangered Mind", [Lecture](#) and [online book](#), R. Herrman, USNA mathematics
- [Journals and organizations](#) for "dissident" science research.
- [Refreshingly humble scientific view of evolution/creationism](#)
- [Dr. Arp's](#) heretical discoveries
- [Arp: What Science has Come To](#)
- [More on Arp vs. Academia](#)
- [About Arp](#) (from [Arp Peculiar Galaxy Club](#))
- [Laser Stars](#)
- [Critical Thinking \(links\)](#)
- [Remote Viewing vs. Its Skeptics](#)
- [Suprise!](#) results always require interpretation. hilarious!
- [Evolutionary Heresy: altruism](#)
- [Sturrock-Rockefeller UFO Panel vs. the "skeptics"](#)
- [Deep Hot Biosphere](#), more T. Gold heresies!
- [The Anti-Closed-Mind Site](#)
- [Dr. B. Pollok's SAFESCIENCE](#)
- [Scientific Integrity?](#) whistleblowers beware!
- [Stamping Out Dissent](#), Dr. B. Martin
- [Open Questions in Physics](#) from [Physics FAQ](#)
- [Scientific Misconduct Page](#)
- [Arrogance vs. Stupidity](#)



- [The Mythical "Scientific Method"](#)
- [Pseudoscience or Protoscience?](#)
- [A Science Ethics Bibliography](#)
- [M. Cremona's Forbidden Archeology](#)
- [Cargo Cult Science](#), R. Feynman
- [Parapsychology, blind faith, and "pseudo-skeptics"](#), C. Tart
- [Theories and ethical practice in science](#), course syllabus links
- [Characterization of Quack Theories](#)
- [Psy-Zone](#)
- [Maccabee on Science vs. UFOs](#)
- [Science against science](#)
- [The "Fusor" and Scientific Knowledge](#)
- [Critiques of Organized Skepticism](#)
- [The Anti-physics Review](#)
- [Stupid Skeptic Tricks](#) (Lippard)
- [Bias in peer review](#)
- [Peer Review: reform or revolution?](#)
- [Weird but true](#) (recommended!) (170K)
- [Psi, Grof, Jung, and the Quantum Vacuum](#)
- [Peer review as scholarly conformity](#), from [Suppression Stories](#)
- [A Letter to a Dissident Scientist](#), by [B. Martin](#)
- [The real reason behind suppression of inventions](#)
- [Anomalous Meteor Phenomena](#)
- ["The Golem"](#), Collins and Pinch debunk scientist's myths
- [H. Bauer - Ethics in Science](#) (recommended!)
- [Dissident Physics at '95 AAAS meeting](#)
- [Myths of Skepticism](#)
- [Defending Darwinism: How Far is Too Far?](#) from [Origins Research](#)
- [Retardation of Science](#), from [Alternate View](#)
- [sci.skeptic FAQ: Aren't all skeptics just closed-minded bigots?](#)
- [Science and Consensus](#), from [EMF-L](#)

- Discover 5/97, [Science vs. Its Own Popularizers](#): Carl Sagan
- [THE ANOMALIST](#). Don't miss "[Moving the Goalposts](#)", and "[Pseudoskeptics](#)"
- [Ambiguity in research](#), Science On-Line
- [Scientists' treatment of "Heretics"](#), by Dr. [Brian Josephson](#)
- [L. Frank vindicated](#), new mini-comet evidence (see "[Moving the Goalposts](#)" and [CNN article](#))
- [Fund for UFO Research](#)
- [Brainmind Bulletin](#)
- [Earth mantel heresies](#)
- [Debunking the debunkers](#)
- [Science Frontiers](#) articles:
  - [Arp and redshift](#)
  - [Temperature affects half-life?](#)
  - [T. Gold's deep oil](#)
  - [Directed mutation](#)
- [Post-relativist Physics](#) from '[Sumeria](#)'
- "[Three Galileos](#)", article from [Duesberg](#) page
- [Aquatic Ape Theory](#)
- [Psi phenomena](#) papers, Frasca page
- [The Sourcebook Project](#), archive of unexplained observations
- [B. Haisch UFO essay](#) from the [J. Sci. Exploration](#)
- [Farce of Physics](#), Dr. B.G. Wallace
- [Panspermia](#): life evolved elsewhere
- Ways of knowing: [Science vs. Religion](#)
- [J. Talbot's "Skeptics" quotations](#)
- [The Experts Speak](#)
- [Psychology of Invention](#)
- [Psychology of Science](#) List
- [Forbidden Archeology](#)
- Scientists want to censor a [Controversial show](#). See [producer's response](#).

## Dr. Margulis' heresies:

- [Gaia](#) and evolutionary cooperation-not-competition
- [Endosymbiosis](#)
- McClintock's [Jumping Genes](#)
- [Heretical catastrophism](#)
- [Descaling water magnetically](#)

Collected quotes moved to <http://amasci.com/weird/skepquot.html>

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# Van de Graaff Generators Frequently Asked Questions

1998 William J. Beaty

Also see: [Main VDG Generator Page](#)

- [Q: WHERE CAN I GET VAN DE GRAAFF GENERATORS, OR PLANS?](#)
- [Q: MY VAN DE GRAAFF GENERATOR DOESN'T WORK!](#)
- [Q: WHAT IS A "VAN DE GRAAFF MACHINE"?](#)
- [Q: HOW IS A VDG DIFFERENT THAN OTHER ELECTRIC GENERATORS?](#)
- [Q: HOW DO THEY WORK?](#)
- [Q: WHERE DID VDG MACHINES COME FROM?](#)
- [Q: WHAT'S A VDG MACHINE GOOD FOR?](#)
- [Q: DON'T THEY GENERATE STATIC ELECTRICITY?](#)
- [Q: IS AN ELECTRIC MOTOR ABSOLUTELY REQUIRED?](#)
- [Q: DO THE COMBS HAVE TO DRAG AGAINST THE BELT?](#)
- [Q: WHY USE A BELT AT ALL?](#)
- [Q: CAN WE STEP DOWN THE OUTPUT VOLTAGE?](#)
- [Q: WHY DID THE ON/OFF SWITCH ZAP ME?](#)

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Q: MY VAN DE GRAAFF MACHINE DOESN'T WORK!

A: First, is it humid out? Above 40%? Test humidity with an

inflated

balloon rubbed on your arm. If the balloon won't charge up and cause your arm hair to rise when held near the balloon, then the humidity is way too high. For some info about solving humidity problems, see [THIS FILE](#).

If humidity is not the problem, see my article about [VDG DEBUGGING](#) and also about [building electrostatic devices](#).

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Q: WHERE CAN I GET VAN DE GRAAFF GENERATOR PLANS?

A:

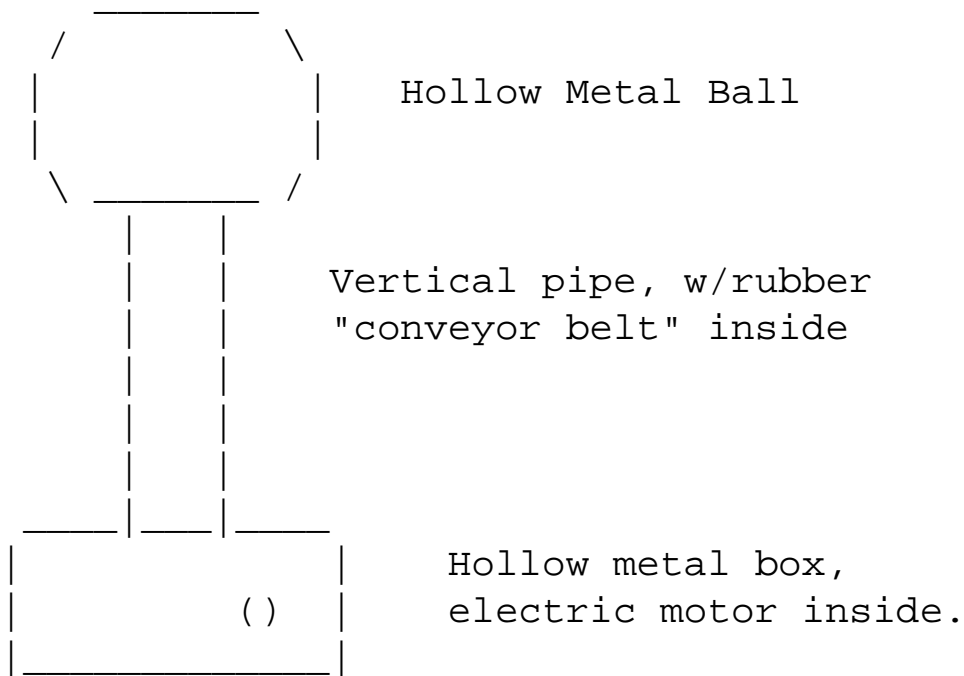
PLANS: There now are several DIY build-it websites for VDG machines, see the [links to plans](#) on my main VDG generator page. Or, you can check out my [plans](#) page for a list of books and magazine backissues. Also, [Science First](#) sells a set of plans for a few bucks.

KITS AND PRE-BUILT: Several sources will sell you VDG kits or complete devices, see the [commercial suppliers page](#).

Q: WHAT IS A "VAN DE GRAAFF MACHINE"?

A:

A Van de Graaff machine is a mechanical-electric device which produces extremely high voltage at low, safe levels of electric current. It also goes by the name "Van de Graaff Electrostatic Generator." We usually encounter these devices in high school, where our physics teachers use them to raise the hair of some lucky student. :)



Tabletop versions of the VDG generator range in size from several feet tall producing half a million volts, down to tiny 2-inch versions which produce only five thousand volts. Physics researchers use larger ones, some of which are several stories tall and produce many megavolts output voltage.

Q: HOW DO THEY WORK?

Short Answer: A VDG is a charge pump. One or both rollers become charged through contact with the belt. One roller sucks electric charges from its adjacent metal comb and onto the belt. The other roller pushes electric charges from the belt and onto the adjacent comb. When the belt is cranked along, the device sucks charges in at one end and spits them out at the other.

Longer Answer:

Everyday objects are made up of equal amounts of positive electric charge and negative electric charge in almost perfect balance. We might say that ordinary matter is made up of "cancelled-out electricity." A VDG machine takes the mixed-up positive and negative charges of matter, sorts them out, then pulls them far apart from each other. A VDG is a "charge uncanceller" or "charge separator." The machine moves charge continuously, so it also acts as a mechanical charge pump.

A VDG machine contains a flat circular belt running on a pair of rollers, conveyor-belt style. The belt material must be an insulator; rubber or plastic for example. A metal "comb" is placed adjacent to each roller,

with "teeth" pointing toward the belt surface. At each end of the belt, each roller and comb is enclosed inside a hollow metal box or hollow sphere. Each hollow box or sphere must be electrically connected to the metal comb inside. One of the rollers is spun by an electric motor so that the belt moves, and the other roller spins too.

To create a buildup of separated charge, the machine pulls one type of charge ( either pos. or neg. ) out of one comb and places it onto the belt's surface. The belt transports it to the far end of the machine.

The electric charge is then pushed off the belt surface and onto the other metal comb, where it is sucked to the outside of the metal sphere. As the charge-transport process continues, the voltage (electric potential) between the two ends of the generator grows and grows.

More stuff:

- [THE SPHERE](#)
- [BELT AND ROLLERS](#)

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Q: HOW IS A VDG DIFFERENT THAN OTHER ELECTRIC GENERATORS?

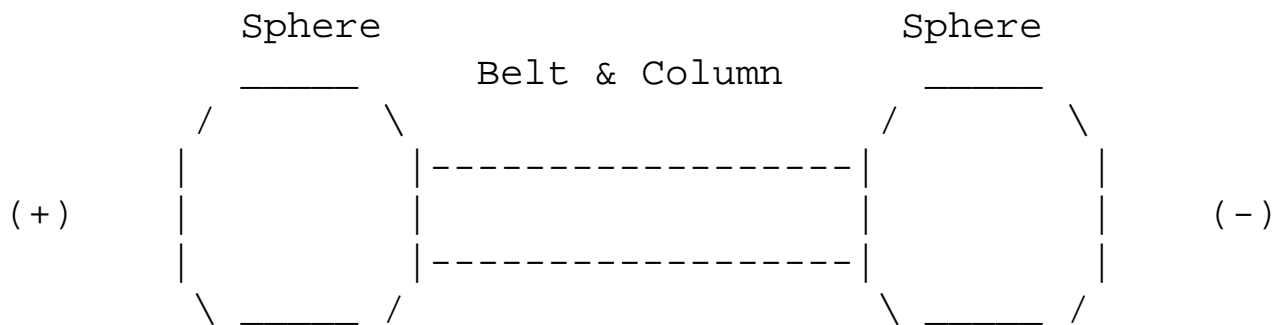
A:



Like all other electric generators, a Van de Graaff machine is basically

a charge pump. It drives negative charge from one end to the other, and/or drives positive charge the other way. The hollow metal ball acts as one output terminal, while its metal base acts as the other. On some VDG machines the upper sphere becomes negatively imbalanced, while the base becomes positive. On other machines the polarity is reversed.

To drive home the idea that a VDG is like a battery or a standard power supply, it helps to imagine the generator like this:



A VDG machine is a bit like battery. All VDGs actually have a positive terminal and a negative terminal as shown above. However, most tabletop models lack the second ball. Instead of a sphere, they have a wire which connects the base of the generator to ground. Even the grounded-base type of generator actually has two spheres. One is small and metal, while the other one is 8000 miles across. If one end of the generator is connected to ground, then the whole earth becomes the generator's second terminal.

Batteries and VDG machines both act as charge pumps. However, a VDG is different from a battery in one important way. Batteries produce constant voltage with variable current, while VDGs produce constant current with variable voltage. A VDG is similar to a battery, but the behavior of its voltage and current are swapped, and everything works backwards. If we short out a battery, we get an electrical overload. When short circuited, a large current appears in the battery's connecting wires, while the battery voltage remains the same. A VDG is the opposite: to overload a VDG you don't short it out, instead you run it open-circuited with no electrical load attached. When you overload a VDG you get a very large voltage, but the VDG current stays the same. A VDG likes to be shorted, but labors mightly when open-circuited. A battery is opposite: it likes to be open-circuited, but labors mightly when shorted out.

Batteries can produce large currents, while VDG machines can produce large voltages. A car battery is rated at 12 volts, and when a load is connected to it, the battery can create any value of current between zero and 500 amperes or so. A small VDG machine might be rated at 50 microAmperes current, and, depending on electrical load, can produce any voltage between zero and 100,000 volts.

VDG machines are also different from common coil/magnet electric generators. A coil/magnet generator pumps charge by sweeping a magnetic field across a charge-filled conductor wire. This might seem magical, with invisible magnetic fields causing an electrical pumping

action which creates invisible electric currents. A VDG machine is much more down-to-earth. It uses a mechanical belt to grab the charge and physically drag it along. A coil/magnet generator uses complicated Maxwell/Einstein physics to pump charge, while a VDG machine is more like a 16th-century waterwheel.

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Q: WHERE DID VDG MACHINES COME FROM?

A:

The VDG machine was invented in the 1920s by Robert Van de Graaff, an MIT physics student who was inspired by large, unexplained sparks produced by an industrial printing press. As paper in the press passed over high speed rollers, both the paper and the metal printing press itself became electrified. Robert's first machine was a few feet tall and made from metal cans. In later years his large "professional" version was ?????? feet tall, with spheres which were ??? feet across.

The Museum of Science has a [short history page](#).

Q: WHAT'S A VDG MACHINE GOOD FOR?

A: Yes, you can use a VDG to raise your hair, or to jump a large spark to the knuckle of an overly-trusting science student. However, VDG devices do have many professional applications. They were originally used as power supplies for the early particle accelerators used in research into radioactivity. This was in the days before the invention of the Cyclotron and Linear Accelerator Ring. The [early "atom smashers"](#) consisted of a VDG machine connected to a long vacuum tube. VDG machines still find use in particle physics research, and many universities own large VDG machines encased in huge pressure chambers filled with insulating gas. More recently these have been replaced with "Pelletron" VDG machines which use a metal/plastic chain travelling in a vacuum chamber. Big VDGs are also used to power high energy X-ray machines. If you want to treat cancer with radiation, make X-ray photos of locomotive engines, or sterilize food with gamma rays, you'll want to buy a Van de Graaff-powered X-ray generator.

Closer to home are its educational uses. The Van de Graaff machine is an excellent device for studying Electrostatics, the science of voltage and electric charge. Yes, flashlight batteries are fine for studying electric current and circuitry. But if you want to investigate voltage alone, then get yourself a VDG electrostatic generator.

Q: DON'T THEY GENERATE STATIC ELECTRICITY?

A: Yes and no. A VDG machine is a "constant current source." It generates a small, nearly-unstoppable electric current, and if this current is blocked, extremely high levels of "electrical pressure" or potential will build up.

"Static electricity" is not electricity which is static and unmoving.

Instead, "static" appears when opposite electric charges are widely

separated from each other. But even this is not quite right, since

batteries and coil-type generators create separated charges as well.

Here's a better definition: "static electricity" is high voltage. For

example, when you rub your head on a balloon, you create up to 50,000

volts between the balloon and your hair. More specifically, "static" is

high voltage at low (or zero) current. So, since a VDG machine generates

high voltage at low current, we COULD say that it generates "static."

Myself, I prefer to avoid the term "static electricity" as much as possible because it is misleading. If we really mean "high voltage"

then we should just say "high voltage," and eliminate the misleading talk

of "unmoving charges."

---

Q: IS AN ELECTRIC MOTOR ABSOLUTELY REQUIRED?

A:

No, it's just as easy to build a hand-cranked Van de Graaff generator.

I've always suspected that the electric motor caused misconceptions.

Since a motorized VDG machine is a closed electrically powered box, it

SEEMS to be doing something mysterious. In order to combat this misconception, I bought several commercial VDG kits in 1988 for the

exhibit at the Museum of Science and had them modified for hand cranking.

With no motor and with nothing hidden, the workings become far more

obvious. Since then the idea has become popular, and several science

catalogs now sell hand-cranked VDG machines to the science education community.

---

Q: DO THE COMBS HAVE TO DRAG AGAINST THE BELT?

A:

No. It's true that the combs act like motor brushes. However, the combs operate by using high voltage to turn the air into a conductive corona. It's this invisible, conductive air which actually touches the moving belt. For best results, adjust the combs so their sharp points are close to, but not touching, the belt. Or better yet don't guess about it. Instead, measure the generator's output current with a microamp meter connected between the upper comb and the lower one. Then just manually adjust the comb spacing so the current is as large as possible.

---

Q: WHY USE A BELT AT ALL?

A: I always wondered what the belt was for. After all, if we want to put 20,000 volts on a metal sphere, why not just buy a 20KV power supply and connect one wire to a sphere? In fact this would work fine. It would lift your hair, make sparks, etc. (You might need a billion-ohm resistor in series with the wire to prevent electrocution!) VDG machines are charge pumps, but so are high-voltage DC power supplies. Voltage is voltage.

The VDG belt performs an interesting task. It amplifies voltage by physically stretching the e-field which exists between opposite charges. The belt/rollers mechanism takes in opposite charges which are

close together, and spits out charges which are far apart. A VDG machine is a field-line stretching device.

To produce a high voltage we must take the opposite electric charges out of matter and separate them. Doing this takes work. When a VDG is operating, a bit of charge is placed on the belt, and a bit of opposite charge is placed into the adjacent comb at the same time. As the belt is cranked along, these opposite charges fight the belt's motion. They attract each other, they "want" to leap together and rejoin. But the belt draws them apart, it forces them to separate farther and farther, then deposits the charge on the distant sphere and leaves the opposite charge in the earth. If you've ever tried turning a hand-crank VDG machine, you can feel the crank becoming harder and harder to turn as the machine charges up. Mechanical work is being converted into stored electrostatic energy as the positive and negative charges are being pulled far apart.

It is true that a VDG machine is equivalent to a DC HV power supply that plugs into a wall outlet. However, small VDG machines can easily attain a half-million volts, while a half-million-volt DC power supply would be big, heavy, and VERY expensive. And without a large-value series resistor for protection, a half-megavolt DC power supply would be a lethal safety hazard. The low current and low energy-storage of tabletop Van de Graaff machines make them safe for student use, yet at the



same  
time they act as inexpensive sources of extreme high voltage.

---

Q: CAN WE STEP DOWN THE OUTPUT TO RUN LIGHT BULBS?

A: This is probably possible, but I haven't tried it myself. A tabletop Van de Graaff machine supplies a watt or two of electrical energy. For example, a small VDG machine which produces 250,000 volts at 10 microamps would act as a 2.5 watt DC power supply. If we could keep the wattage the same, but step the voltage down and step the current up, in theory it could run a flashlight bulb or some DC motors.

One possibility: we could repeatedly jump sparks to a large grounded sphere or a mixing bowl (so the voltage is very high before the spark,) then we'd break the ground wire and place a high-frequency high-voltage stepdown transformer in the discharge path. A flyback transformer from a TV monitor might work: route the discharge current through the high voltage side and back to ground, then wind a few turns of wire around the ferrite core, and rectify this low voltage output with some high speed diodes.

You might first have to use an oscilloscope to measure the AC voltage coming out of the low voltage winding; to verify that its putting out a few volts and can turn on the 1.4V of a diode bridge. (If it's

too low,  
 wind more turns of wire on the flyback's ferrite core.) If you  
 adjust the  
 two spheres to give a few sparks per second, the AC coming out of  
 the  
 transformer could charge up a capacitor and light some LEDs.  
 Since a  
 superbright red LED runs at  $0.02\text{A} \times 1.5\text{V} = .03$  watts, you might be  
 able to  
 flash a big wad of LEDs quite brightly, or even light a small  
 incandescent  
 pilot light.

As a science project, this shows that "static electricity"  
 generators are  
 no different than any other power supplies; they're just putting  
 out their  
 electrical energy with low current at high voltage. "Watts is  
 watts,"  
 and it really doesn't matter whether the voltage/current is low or  
 high.  
 Also, there really is no such thing as "Static electricity."  
 After all, a  
 conventional DC circuit is operated by surface charges on the  
 conductors  
 which produce an e-field which cause currents in the conductors.  
 You hear  
 me right: all circuits everywhere are run by surface charges. The  
 "Static  
 electricity" we know and love is a misnomer, we should use it's  
 more  
 accurate name: "high voltage." Rub a balloon on hair, and you  
 produce  
 HIGH VOLTAGE charge-separation.

---

Q: WHY DID THE ON/OFF SWITCH ZAP ME?

A: Ah, you get that too? I wondered about this for quite awhile,  
 but  
 then I eventually discovered a little-known feature of Van de

Graaff

machines: they spew electric current into the air. The charge that travels along the rubber belt doesn't just stop at the sphere. Instead, the blocked charge causes the voltage on the sphere to rise until the charge-flow is able to blow right across the barrier and into the air.

(Or in other words, the potential rises until corona discharge ignites, providing a leakage path from metal to plasma to air.)

When you operate a VDG machine inside a draft-free room, the VDG sphere spews a few microamps of current into the surrounding air. This charge-flow follows the direction of e-field lines and tries to find a pathway back to the earth. If it is intercepted by insulating or ungrounded objects in the room, those objects become electrified. If you stand next to an operating VDG machine, and if the humidity is low enough that your shoe soles don't conduct, then your body will become electrified. When you touch the grounded metal switch, zap!

The solution: hold a small metal object in your hand, then touch it against ground, then turn off the switch with your other hand.

Either that, or grab a grounded wire when you turn your VDG machine on, and never let go of that wire until after you've turn the machine off.

<http://amasci.com/emotor/vdgdesc.html>

Created and maintained by [Bill Beaty](#). Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

# "Static Electricity" Page

2003 W. Beaty

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## Articles here:

- [Doorknobs, Car-door sparks, electric people](#)
- [Explaining "static electricity" with colored plastic sheets.](#)
- [Electrostatics books](#)
- [What Is Electricity?](#)
- ["STATIC ELECTRIC" MISCONCEPTIONS](#)
- [Other electricity misconceptions](#)
- [The Electricity Map, static vs. current](#)
- [What A Shocking Career](#)
- ["Static electricity" really means "High Voltage"](#)
- [Determining Charge Polarity](#)
- [Frequently-asked Electricity questions](#)
- [Static Electricity versus Current Electricity](#)
- [A Bit About Wimshurst Machines](#)
- [Triboelectric Series, rubbing fur on plastic](#)
- ["Zerostat" record-cleaner gun](#)
- [Sparks and lightning](#)
- [Flowing "static"](#)
- [Crackpot musings:](#)

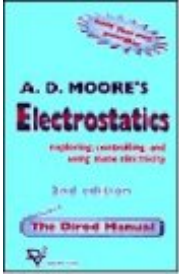
## **Billb's HV Build-it Projects:**

- [Van de Graaff Generator Page](#)
- [Commercial Suppliers](#) for electrostatic generators (kit or assembled)
- [Ridiculously Sensitive Charge Detector](#)
- [Sticky Electrostatics](#): adhesive tape experiments
- [Threadlike streams of "electric wind"](#)
- [Nanoamp current meter](#)
- [Negative Ion Generator](#) as HV power supply
- [The Duluc Drypile](#) where batteries meet "static"
- [ELECTROSTATIC MOTOR](#) made from plastic pop bottles.
- [ELECTROSTATIC GENERATOR](#), electrophorus, a simple one
- [ELECTROSTATIC GENERATOR](#), "Kelvin's Thunderstorm"
- [ELECTROSTATIC GENERATOR](#), In-line waterdropper
- [SEE electric and magnetic fields](#) with this simple viewing bottle
- [ARRAY ELECTROMETER](#) makes e-fields visible
- [Solving Humidity Problems](#)
- [Hints for electrostatic device construction](#)
  
- [All electricity projects here](#)
- [Links to projects elsewhere](#)

[SCROLL DOWN](#) FOR LOTS MORE LINKS

[charged air phenomena](#)

- [Tesla Coils](#), more high voltage
  - [Hi-volt Plasma Globes](#)
  - [Electronics Hobbyist](#)
- Page



**Highly recommended:**  
**[ELECTROSTATICS](#) by A. D. Moore**  
(lots of projects), also [others](#)

[SCROLL DOWN](#)

[High Voltage Ring](#)  
[ [Previous](#) | [Previous 5 Sites](#) | [Next 5 Sites](#) | [Next](#) ]  
[ [Random Site](#) | [List Sites](#) ] | [ [High Voltage Ring](#) ]

## Projects elsewhere:

- [R. A. Morse Experiments: Ben Franklin as my lab partner](#) (w/videos!)
- [RA Morse: Electrostatics Activities for Students](#)
- [Electrostatic controlled crawling slime](#)
- [The Amateur Scientist: electrostatic motors](#)
- M. Foster's [Cheap High Voltage](#)
- [Teralab Electrostatics](#)
- [Bob's High Voltage site](#)
- [Marx Generators](#) from Mike's Electric Stuff
- [La construction de la machine de Wimshurst](#) (en français)
- [Les generateurs tres hautes tensions](#) (en français)
- [CURIOUS KIDS](#) Static Electric activity
- [Nova: indoor lightning](#)
- [Op-amp electrometer](#), R. Hull
- [Nat's](#) homebuilt electrostatic generators
- [Storm Detector](#)
- [Electrostatics projects](#) at "solaris"
- [Rubbing Teflon](#), story from [Pease Porridge](#)
- [Electrostatic Loudspeaker Project](#)
- [Exploratorium](#) demos
- [U. Rochester Demos](#)
- [Simple Generator from Leny R's SPARK, BANG, BUZZ](#)
- [Generators](#) by G. Shannon
- [Highway to Science](#) activities
- [Demos links](#) at J. of Electrostatics

- [Boston MOS](#) static activities

## Forums

- [4HV high volt forum](#)
- [pupman: Tesla Coils](#)
- [alt.energy.high-voltage](#)
- [Electrostatics Soc. of America](#)
- [Sam's Powerlabs](#)
- [High Voltage list](#) (archive 1996-pres)
- [HV Assn forum](#)
- [VDG vorum](#)

## Websites elsewhere:

### Resources

- [DMOZ: High Voltage](#)
- [Electrostatic Machines](#)
- [Sparkmuseum](#) electrostatic machines
- [Electrostatics Glossary](#) from ([ESD Journal](#))
- [High-voltage Handbook](#)
- [Matweb](#) (capacitor dielectric search!)
- [Dielectric Constants \(list\)](#)
- [Mr. Static](#) FAQ
- [FAQ Page: Problems caused by "Static"](#)
- [Static elim. companies](#)
- [Book Catalog](#) fm/EAI

### Organizations

- [Electrostatics Society of America](#)
- [Journal of Electrostatics](#) and [index](#)
- [ESD Journal](#)
- [Electrostatics Webring](#)

### LINKS

- [Steam-jet electrostatic generator](#)
- [Electro-magnetic Miscellany](#)
- [Spark ignition of solvent](#), CE mag
- [Dave Swenson's Hair-raising Tales](#)
- [Priestly's Physics Project](#), activities from [Franklin Inst.](#)
- [Carbon fiber tape](#) (good for discharge brushes)

- [Electrostatic Cooling](#)
- [ZeroStat\(r\) gun](#) , also [here](#)
- Scams and "health claims"
  - [Cordless grounding straps](#)
  - [Mr. Static: Static Hocus-Pocus](#)
  - [Ground yourself during sleep](#) for \$330?
- [VDG & electrostatics forum](#)
- [Video: aircraft lightning strike](#)
- [Electric Snowflakes](#)
- [Lightning Webring](#)
- Gas Station Static Fires
  - [Articles](#) from ESD journal
  - [Chevron warning](#)
  - [PEI Letter](#)
  - [Fire report summary](#)
  - [Gas can fires](#)
- [Clarendon Dry Pile](#), "perpetual motion" that works
- [The Bakken Museum & Library](#), historical electrical devices
- [ELECTROSTATICS by A. D. Moore](#) now in reprint
- [Car door sparks: The Control of Body Voltage Getting Out of a Car](#)
- [The Control of Static Electricity](#)
- [Electrostatics Applications Inc.](#) (electrostatics books)
  - [Links Collection](#) fm/EAI
  - [Book Catalog](#) fm/EAI
- [PIRA's](#) list of [Electrostatic Physics Demonstrations](#)
- [Historical Electrostatic Machines](#), Polytechnique, France
- ["Power fence" wind power](#)
- [NCSSM Electrostatics Lab Activity](#)
- [TSU Maryland](#) VDG demos
- [Electrostatic machines list](#) from NCSU
- [Electrostatic](#), U. Virginia
- [Lorente's generator](#)
- [Condensation causes electrification??!](#)
- [Negatively charged air](#)
- [Giant VDG](#) in Boston
- [Giant VDG](#) in Boston, History
- [A VDG project](#)

## Some Companies

- [Sensitive Research](#), electrostatic voltmeters (passive, moving-plate electrometer)

- [High Voltage Association](#) company & products links
  - [Professional voltmeters, power supplies, etc.](#)
  - [Surplus Sales](#), HV connectors, also [MHV](#)
  - [PV Instruments](#): electrostatic machines
  - [Resonance Research](#), VDG machines & tesla coils
  - [Monroe Electrostatics](#)
  - [Simco](#)
  - [Trek Electrostatic Voltmeters](#)
  - [Novx Corp](#)
  - [J Chubb Inst.](#) (UK)
  - [Kinderprint fingerprint kits](#)
  - [Ion Systems](#)
- 

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## Weird Research, Anomalous Physics

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- [CLOSEMINDED SCIENCE](#), errors of skepticism
- [BUILD-IT PROJECTS](#) (weird stuff)

### Hairbrained Theories and Inventions

- [2nd crackpot theory: Photons don't exist?!!](#)
- [Fingernails on Blackboard](#)
- [Human eyes 'see' thermal IR?](#)
- [Are molecules ATTRACTED to distant receptors?](#)
- [Tesla's Big Mistake](#)
- [Photon absorption based on radio physics](#)
- [Energy-sucking radio antennas, and MORE](#)
- [Ion Experiments](#) (untried, suggested experiments.)
- [High-voltage ion threads](#) (w/photos)
- [Why am I involved in "fringe sci?"](#)
- [Right-angle Circuitry](#)
- [The Prometheus Game](#)

### Misc. billb articles

- [Large collection of quotes](#) (Against Skepticism)
- [CLOSEMINDED SCIENCE](#), errors of skepticism
- [Ridiculed/Vindicated discoverers](#)
- [The Ice Which Does Not Melt](#)
- [Cognitive Processes and Science-suppression](#)
- [Benveniste's "water memory" send over wires](#)
- [Evolution Heresy](#)
- [Physics Sermon](#)
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- [Rules for Inventors](#)
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- [UPDATE: grav-capacitor report](#)
- [My first crackpot theory: vector-potential energy source](#)
- [UPDATE: Vector-potential free-energy device idea!](#)
- [Crackpot Theory the 2nd: Energy-sucking Quantum Electrodynamics](#)
- [Crackpot Theory the 3rd: "Invisible Wall" acoustic effect](#)
- [Exploding Coffee Water](#) added to Microwave oven page
- [Unexplained vanishing screw](#)
- [Pool Devils/Demons](#) (dust devils)
- [Torsion fields, vacuum spin waves](#)
- ['Gotchas', antigravity experimental artifacts](#)
- [Bions, Leukocytes, and Floaters](#)
- [The Morton Effect](#)
- [WEIRD STUFF: anti-chirp scalar wave for Star Trek 'force field'](#)
- [The End of Science?](#)
- [David Hudson](#) lecture
- [O/U microwave lawnmower messages](#)
- bajak.doc (just some old Cserve msgs, now removed)
- [Hovertec stuff](#)
- [ELECTROGRAVITY](#) patents, etc. from B. Paddock
- [Electrogravity resources](#), from Robert Stirniman
- [P. Graneau's](#) electromagnetic anomalies, from Robert Stirniman
- [USAF Gravity Doc, 1956](#) from Robert Stirniman
- [USAF Gravity Doc Contents Page, 1990](#) from Robert Stirniman
- [FAQ Free Energy Devices](#) (under constr.)
- [New theories,scorn, & derision](#)
- [Dangerous experiments](#) with a big capacitor bank (New 2/95)
- [Unwise Microwave Oven Experiments](#)
- [Sparks](#) and Lightning
- [THE OFFICIAL TRUTH](#) (excellent!)
- [Zen and the Art of Debunkery](#) (excellent!!)
- [A small CF explosion?](#)

- [Ammunition](#) for defeating the Skeptic (quotes)
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  - [Invalidation of Lightclock Gedanken](#)
  - [ERG "Electrogravitics Systems" paper](#)
  - [Znidarsic ZPE paper](#)
  - [2nd Znidarsic paper](#)
  - [Hyperspatial](#) theory, J. S. Tomei
- [Holes](#) in your head (excellent!)
  - [UNIVERSE SONG](#), from Monty Python's 'Meaning of Life'
  - [Bill B.'s hoax ideas list](#)

- [Aura Camera](#)
- 

*"The best way to  
have a good idea is  
to have lots of  
ideas."* - Linus  
Pauling

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"I am not very skeptical... a good deal of skepticism in a scientific man is advisable to avoid much loss of time, but I have met not a few men, who... have often thus been deterred from experiments or observations which would have proven servicable." - Charles Darwin

"Round about the accredited and orderly facts of every science there ever floats a sort of dust-cloud of exceptional observations, of occurrences minute and irregular and seldom met with, which it always proves more easy to ignore than to attend to... Anyone will renovate his science who will steadily look after the irregular phenomena, and when science is renewed, its new formulas often have more of the voice of the exceptions in them than of what were supposed to be the rules." - William James

"I know that most men, including those at ease with problems of the greatest complexity, can seldom accept even the simplest and most obvious truth if it be such as would oblige them to admit the falsity of conclusions which they have delighted in explaining to colleagues, which they have proudly taught to others, and which they have woven, thread by thread, into the fabric of their lives." -Tolstoy

"It is really quite amazing by what margins competent but conservative scientists and engineers can miss the mark, when they start with the preconceived idea that what they are investigating is impossible. When this happens, the most well-informed men become blinded by their prejudices and are unable to see what lies directly ahead of them."

- Arthur C. Clarke, 1963

"When even the brightest mind in our world has been trained up from childhood in a superstition of any kind, it will never be possible for that mind, in its maturity, to examine sincerely, dispassionately, and conscientiously any evidence or any circumstance which shall seem to cast a doubt upon the validity of that superstition. I doubt if I could do it myself." - Mark Twain

"Doubt everything or believe everything: these are two equally convenient strategies. With either we dispense with the need for reflection." - Henri Poincare

"It is not uncommon for engineers to accept the reality of phenomena that are not yet understood, as it is very common for physicists to disbelieve the reality of phenomena that seem to contradict contemporary beliefs of physics" - H. Bauer

"There is a principle which is a bar against all information, which cannot fail to keep a man in everlasting ignorance-- that principle is contempt prior to investigation." - Herbert Spencer, British philosopher

"If a man is in too big a hurry to give up an error he is liable to give up some truth with it." - Wilbur Wright, 1902

"It's like religion. Heresy [in science] is thought of as a bad thing, whereas it should be just the opposite." - Dr. Thomas Gold

"You can get into a habit of thought in which you enjoy making fun of all those other people who don't see things as clearly as you do. We have to guard carefully against it." - Carl Sagan, 1987 CSICOP meeting

"New and stirring things are belittled because if they are not belittled, the humiliating question arises, 'Why then are you not taking part in them?' " - H. G. Wells

"The easy confidence with which I know another man's religion is folly teaches me to suspect that my own is also." - Mark Twain

"I believe there is no source of deception in the investigation of nature which can compare with a fixed belief that certain kinds of phenomena are IMPOSSIBLE." -William James

"Modern science should indeed arouse in all of us a humility before the immensity of the unexplored and a tolerance for crazy hypotheses."  
-Martin Gardner

"Almost all really new ideas have a certain aspect of foolishness when they are first produced." - Alfred North Whitehead

"The mind likes a strange idea as little as the body likes a strange protein and resists it with similar energy. It would not perhaps be too fanciful to say that a new idea is the most quickly acting antigen known to science." - Wilfred Trotter, 1941

"When a distinguished but elderly scientist states that something is possible, he is almost certainly right. When he states that something is impossible, he is very probably wrong." - Arthur C. Clarke's First Law

"There are some people that if they don't know, you can't tell 'em." - Louis Armstrong

"The security provided by a long-held belief system, even when poorly founded, is a strong impediment to progress. General acceptance of a practice becomes the proof of its validity, though it lacks all other merit." - Dr. B. Lown, invented defibrillator

"The fact that an opinion has been widely held is no evidence whatever that it is not utterly absurd; indeed in view of the silliness of the majority of mankind, a widespread belief is more likely to be foolish than sensible." - Bertrand Russell

"New opinions are always suspected, and usually opposed, without any other reason but because they are not already common." - John Locke



"All great truths begin as blasphemies." - George Bernard Shaw

"Be not astonished at new ideas; for it is well known to you that a thing does not therefore cease to be true because it is not accepted by many." - Spinoza

"If we watch ourselves honestly we shall often find that we have begun to argue against a new idea even before it has been completely stated."  
- Wilfred Trotter

"When a man finds a conclusion agreeable, he accepts it without argument, but when he finds it disagreeable, he will bring against it all the forces of logic and reason." -Thucydides

"It is difficult to say what is impossible, for the dream of yesterday is the hope of today and the reality of tomorrow." - Robert Goddard

"Science might be better served when some scientists generate novel ideas while others carp at everything new, than if all scientists could somehow become disinterestedly skeptical." Dr. Henry H. Bauer

"'Type one' error is thinking that something special is happening when nothing special really is happening. 'Type two' error is thinking that nothing special is happening, when in fact something rare or infrequent is happening.'" -M. Truzzi

"I ask you, which is the greater threat to science and mankind, accepting a claim that can have no possible benefit, or rejecting a

claim that can have great benefit?" -Dr. Edmund Storms

"There is nothing particularly scientific about excessive caution.

Science thrives on daring generalizations." - L. Hogben

"What we need is not the will to believe but the will to find out."

- Bertrand Russell

"If you haven't found something strange during the day, it hasn't been

much of a day." - J. A. Wheeler

"Only those who attempt the absurd will achieve the impossible."

- M. C. Escher

"What is there that confers the noblest delight? What is that which

swells a man's breast with pride above that which any other experience

can bring to him? Discovery! To know that you are walking where none

others have walked..." - Mark Twain

"Man's greatest asset is the unsettled mind." - Isaac Asimov

"It would seem to me... an offense against nature, for us to come on the

same scene endowed as we are with the curiosity, filled to overbrimming

as we are with questions, and naturally talented as we are for the

asking of clear questions, and then for us to do nothing about, or

worse, to try to suppress the questions..." -Lewis Thomas

"Only a fool of a scientist would dismiss the evidence and reports

in front of him and substitute his own beliefs in their place."

- Paul Kurtz

"The creative person pays close attention to what appears discordant and contradictory... and is challenged by such irregularities." - F. Barron

"Genius in truth means little more than the faculty of perceiving in an unhabitual way" - William James, 1896

"The voyage of discovery lies not in seeking new horizons, but in seeing with new eyes." - Marcel Proust

"Research is to see what everybody else has seen, and to think what nobody else has thought." - Albert Szent-Gyorgyi

"A man receives only what he is ready to receive... The phenomenon or fact that cannot in any wise be linked with the rest of what he has observed, he does not observe. - H. D. Thoreau

"You cannot depend on your eyes when your imagination is out of focus." - Mark Twain

"The man who cannot occasionally imagine events and conditions of existence that are contrary to the causal principle as he knows it will never enrich his science by the addition of a new idea." - Max Planck

"We not only believe what we see, to some extent we see what we believe ...The implications of our beliefs are frightening." - Richard Gregory

"If what we regard as real depends on our theory, how can we make reality the basis of our philosophy? ...But we cannot distinguish what is real about the universe without a theory...it makes no sense to ask if it corresponds to reality, because we do not know what reality is independent of a theory." - Stephen Hawking

"If we knew what it was we were doing, it would not be called research, would it?" --Albert Einstein

"Exploratory research is really like working in a fog. You don't know where you're going. You're just groping. Then people learn about it afterwards and think how straightforward it was." - Francis Crick

"Reality is that which, when you stop believing in it, doesn't go away."  
- Phillip K. Dick

"There are children playing in the street who could solve some of my top problems in physics, because they have modes of sensory perception that I lost long ago." - Robert Oppenheimer

"The discovery of truth is prevented more effectively not by the false appearance of things present and which mislead into error, not directly by weakness of the reasoning powers, but by preconceived opinion, by prejudice." - Schopenhauer

"It is a puzzling thing. The truth knocks on the door and you say, 'Go away, I'm looking for the truth.' and so it goes away. Puzzling."

- R. Pirsig

"They are ill discoverers that think there is no land when they see nothing but sea." - Francis Bacon

"The universe is wider than our views of it." - Henry David Thoreau

"Everyone takes the limits of his own vision for the limits of the world." - Arthur Schopenhauer

"Who never walks save where he sees men's tracks makes no discoveries."  
- J.G. Holland

"In questions of science, the authority of a thousand is not worth the humble reasoning of a single individual." - Galileo Galilei

"It is as fatal as it is cowardly to blink facts because they are not to our taste." - John Tyndall

"Many discoveries must have been stillborn or smothered at birth. We know only those which survived."  
- W. I. Beveridge, THE ART OF SCI.

INVESTIGATION

"A foolish consistency is the hobgoblin of small minds." - Emerson

"Absence of evidence is not evidence of absence."  
- Sir Martin Rees (astronomer)

"I can't see any farther. Giants are standing on my shoulders!"  
- unknown

"In science it often happens that scientists say, "You know that's a really good argument; my position is mistaken," and then they would actually change their minds and you never hear that old view from them again. They really do it. It doesn't happen as often as it should, because scientists are human and change is sometimes painful. But it happens every day. I cannot recall the last time something like that happened in politics or religion." -Carl Sagan

"When I examined myself and my methods of thought, I came to the conclusion that the gift of fantasy has meant more to me than my talent for absorbing positive knowledge." - A. Einstein

"All truths are easy to understand once they are discovered; the point is to discover them." - Galileo Galilei

"Advances are made by answering questions. Discoveries are made by questioning answers." - Bernhard Haisch, astrophysicist

"The most erroneous stories are those we think we know best -- and therefore never scrutinize or question." -Stephen Jay Gould

"It is a good morning exercise for a research scientist to discard a pet hypothesis every day before breakfast. It keeps him young."  
- Konrad Lorenz

"Inquiry is fatal to certainty." - William J. Durant

"In every work of genius we recognize our own rejected thoughts."

- Ralph Waldo Emerson

"There is no better soporific and sedative than skepticism." -  
Nietzsche

"...By far the most usual way of handling phenomena so novel that  
they  
would make for a serious rearrangement of our preconceptions is  
to  
ignore them altogether, or to abuse those who bear witness for  
them."

- William James

"Science today is locked into paradigms. Every avenue is blocked  
by  
beliefs that are wrong, and if you try to get anything published  
by a  
journal today, you will run against a paradigm and the editors  
will  
turn it down" - Sir Fred Hoyle

"If we will only allow that, as we progress, we remain unsure, we  
will  
leave opportunities for alternatives. We will not become  
enthusiastic  
for the fact, the knowledge, the absolute truth of the day, but  
remain  
always uncertain... In order to make progress, one must leave  
the door  
to the unknown ajar." - Richard Feynman

"The pressure for conformity is enormous. I have experienced it  
in  
editors rejection of submitted papers, based on venomous  
criticism of  
anonymous referees. The replacement of impartial reviewing by  
censorship will be the death of science." -Julian Schwinger,  
physicist

"When adults first become conscious of something new, they  
usually

either attack or try to escape from it... Attack includes such mild

forms as ridicule, and escape includes merely putting out of mind."

- W. I. B Beveridge, The Art of Sci. Investigation, 1950

"New ideas are always criticized - not because an idea lacks merit, but

because it might turn out to be workable, which would threaten the

reputations of many people whose opinions conflict with it.

Some people

may even lose their jobs." - physicist, requested anonymity

"Too much openness and you accept every notion, idea, and hypothesis -

which is tantamount to knowing nothing. Too much skepticism - especially

rejection of new ideas before they are adequately tested - and you're

not only unpleasantly grumpy, but also closed to the advance of science.

A judicious mix is what we need." - Carl Sagan

"All truth passes through three stages: First, it is ridiculed; Second,

it is violently opposed; and Third, it is accepted as self-evident."

- Arthur Schopenhauer

"Theories have four stages of acceptance: i) this is worthless nonsense;

ii) this is an interesting, but perverse, point of view; iii) this is

true, but quite unimportant; iv) I always said so.

-J.B.S. Haldane, 1963

"When a thing is new, people say: 'It is not true.' Later, when its

truth becomes obvious, they say: 'It is not important.' Finally, when



its importance cannot be denied, they say: 'Anyway, it is not new.' "

- William James, 1896

"The radical invents the views. When he has worn them out the conservative adopts them." - Mark Twain

"To imagine that turmoil is in the past and somehow we are now in a more stable time seems to be a psychological need." - geologist E. Moores

"The soft-minded man always fears change. He feels security in the status quo, and he has an almost morbid fear of the new. For him, the greatest pain is the pain of a new idea." - Dr. Martin Luther King Jr.

"Loyalty to a petrified opinion never yet broke a chain or freed a human soul." - Mark Twain

"No Pessimist ever discovered the secrets of the stars, or sailed to an uncharted land, or opened a new heaven to the human spirit" - Helen Keller

"A danger sign of the lapse from true skepticism in to dogmatism is an inability to respect those who disagree" - Dr. Leonard George

"We should be eternally vigilant against attempts to check the expression of opinions that we loathe." - Oliver Wendell Holmes

"If I want to stop a research program I can always do it by getting a few experts to sit in on the subject, because they know right away that it

was a fool thing to try in the first place." - Charles  
Kettering, GM

"If you are only skeptical, then no new ideas make it through to  
you.

You become a crotchety old person convinced that nonsense is  
ruling the

world. (There is, of course, much data to support you.) But  
every now

and then, a new idea turns out to be on the mark, valid and  
wonderful.

If you are too much in the habit of being skeptical about  
everything,

you are going to miss or resent it, and either way you will be  
standing

in the way of understanding and progress. " - Carl Sagan

"There is a very important distinction between a critical  
attitude of

mind (or critical "faculty") and a sceptical attitude." - W.  
Beveridge

"In philosophical discussion, the merest hint of dogmatic  
certainty

as to finality of statement is an exhibition of folly." -  
Whitehead

"There is a principle which is a bar against all information,  
which

cannot fail to keep a man in everlasting ignorance--that  
principle is

contempt prior to investigation." - Herbert Spencer, British  
philosopher

"It is a capital mistake to theorize before one has data.  
Insensibly one

begins to twist facts to suit theories, instead of theories to  
suit

facts." - Sherlock Holmes (Sir Arthur Conan Doyle)

"Now, my suspicion is that the universe is not only queerer than

we

suppose, but queerer than we can suppose... I suspect that there are

more things in heaven and earth than are dreamed of, in any philosophy"

- J.B.S. Haldane

"The farther the experiment is from theory, the closer it is to the Nobel

Prize." - Joliet-Curie

"There are two possible outcomes: If the result confirms the hypothesis,

then you've made a measurement. If the result is contrary to the hypothesis, then you've made a discovery." -Enrico Fermi

"Daring ideas are like chessmen moved forward; they may be defeated, but

they start a winning game." - Goethe

"Everything we know is only some kind of approximation, because we know

that we do not know all the laws yet. Therefore, things must be learned

only to be unlearned again or, more likely, to be corrected."

- Richard Feynman

"As long as we do science, some things will always remain unexplained."

- Fritjof Capra

"The philosophies of one age have become the absurdities of the next,

and the foolishness of yesterday has become the wisdom of tomorrow."

- Sir William Osler

"The altar cloth of one aeon is the doormat of the next."

-Mark Twain

"Perhaps the only thing that saves science from invalid conventional wisdom that becomes effectively permanent is the presence of mavericks in every generation - people who keep challenging convention and thinking up new ideas for the sheer hell of it or from an innate contrariness." - Dr. D. M. Raup, Paleontologist, U. Chicago.

"One thing I have learned in a long life: that all our science, measured against reality, is primitive and childlike - and yet it is the most precious thing we have." - Einstein

"We do not understand much of anything, from... the "big bang" , all the way down to the particles in the atoms of a bacterial cell. We have a wilderness of mystery to make our way through in the centuries ahead."  
-Lewis Thomas

"There is no natural phenomenon that is comparable with the sudden and apparently accidentally timed development of science, except perhaps the condensation of a super-saturated gas or the explosion of some unpredictable explosives." - Eugene P. Wigner

"Beware when the great God lets loose a thinker on this planet. Then all things are at risk. It is as when a conflagration has broken out in a great city, and no man knows what is safe, or where it will end."  
- Ralph Waldo Emerson

"Fiction is obliged to stick to possibilities. Truth isn't." - Mark Twain

"Nothing is too wonderful to be true if it be consistent with the

laws of  
nature." - Michael Faraday

"The love of the marvellous is the most dangerous enemy of  
natural  
science." - minerologist Eugene de Patrin, said in 1802 while  
dismissing  
reports of meteorites.

"The skeptic will say, 'It may well be true that this system of  
equations is reasonable from a logical standpoint, but this does  
not  
prove that it corresponds to nature.' You are right, dear  
skeptic.  
Experience alone can decide on truth. - Albert Einstein

Unnamed Law: If it happens, it must be possible.

"I have steadily endeavored to keep my mind free so as to give up  
any  
hypothesis, however much beloved (and I cannot resist forming  
one on  
every subject), as soon as the facts are shown to be opposed to  
it."  
- Charles Darwin

"I love fools' experiments, I am always making them." - Darwin

"It is a fool's prerogative to utter truths that no one else will  
speak."  
- Shakespeare

"The whole of science consists of data that, at one time or  
another, were  
inexplicable." - B. O'Regan

"Name the greatest of all the inventors. Accident." -Mark Twain

"May every young scientist remember... and not fail to keep his

eyes

open for the possibility, that an irritating failure of his apparatus

to give consistent results may once or twice in a lifetime conceal an

important discovery." - P. Blackett

"My advice to those who wish to learn the art of scientific prophesy

is not to rely on abstract reason, but to decipher the secret language

of Nature from Nature's documents: the facts of experience." - Max Born

"The beginning of knowledge is the discovery of something we do not

understand." - Frank Herbert

"In any field, find the strangest thing and then explore it."

- John A. Wheeler

"The most exciting phrase to hear in science, the one that heralds new

discoveries, is not 'Eureka!' (I found it!) but 'That's funny...'"

- Isaac Asimov

"The only solid piece of scientific truth about which I feel totally

confident is that we are profoundly ignorant about nature... It is this

sudden confrontation with the depth and scope of ignorance that represents the most significant contribution of twentieth-century

science to the human intellect." - Lewis Thomas

"The end of our exploring will be to arrive at where we started, and to

know the place for the first time." - T.S. Eliot

"Sit down before facts like a child, and be prepared to give up

every  
preconceived notion, follow humbly wherever and to whatever  
abysses  
Nature leads, or you shall learn nothing." - T.H. Huxley

"Truth is stranger than fiction, but it is because Fiction is  
obliged  
to stick to possibilities; Truth isn't." - Mark Twain

"Let the mind be enlarged... to the grandeur of the mysteries,  
and not  
the mysteries contracted to the narrowness of the mind" -  
Francis Bacon

"Man's mind stretched to a new idea never goes back to its  
original  
dimension." - Oliver Wendell Holmes

"The test of a first-rate intelligence is the ability to hold two  
opposed ideas in mind at the same time and still retain the  
ability to  
function." - F. Scott Fitzgerald

"It is the mark of an educated mind to be able to entertain a  
thought  
without accepting it." -Aristotle

"I can live with doubt and uncertainty and not knowing. I think  
it is  
much more interesting to live not knowing than to have answers  
that  
might be wrong." - Richard Feynman

"You cannot teach a man anything, you can only help him find it  
within  
himself." - Galileo

"The high-minded man must care more for the truth than for what  
people  
think." - Aristotle

"In real life, every field of science is incomplete, and most of them

- whatever the record of accomplishment during the last 200 years  
- are  
still in their very earliest stages." - Lewis Thomas

"There are many hypotheses in science which are wrong. That's perfectly

all right; they're the aperture to finding out what's right.  
- Carl Sagan

"I personally feel it is presumptuous to believe that man can determine

the whole temporal structure of the universe, its evolution, development and ultimate fate from the first nanosecond of creation to the last  $10^{10}$  years, on the basis of three or four facts which are not very accurately known and are disputed among the experts."

- J. Bahcall, senior astrophysicist, Institute for Advanced Study

"On any Tuesday morning, if asked, a good working scientist will tell

you with some self-satisfaction that the affairs of his field are nicely in order, that things are finally looking clear and making sense, and all is well. But come back again on another Tuesday, and the roof may have just fallen in on his life's work." -Lewis Thomas

"Science for me is very close to art. Scientific discovery is an irrational act. It's an intuition which turns out to be reality at the

end of it --and I see no difference between a scientist developing a marvellous discovery and an artist making a painting." - C. Rubbia,  
Nobelist and director of CERN



"It is through science that we prove, but through intuition that we discover." - H. Poincare

"Science... is part and parcel of our knowledge and obscures our insight only when it holds that the understanding given by it is the only kind there is." - C.G. Jung

"The person who thinks there can be any real conflict between science and religion must be either very young in science or very ignorant of religion." - Joseph Henry, early American physicist

"Science is not only compatible with spirituality; it is a profound source of spirituality." - Carl Sagan

"Science without religion is lame. Religion without science is blind."  
-Albert Einstein

"The intuitive mind is a sacred gift and the rational mind is a faithful servant. We have created a society that honors the servant and has forgotten the gift." - Albert Einstein

"If you restrict the journal to publishing only what pleases the referees, you end up publishing what is popular, and while it does make everyone feel more comfortable, you are guaranteed to miss the occasional breakthrough." - A. Dessler, Editor, Geophysical Research Letters, (regarding small-comet bombardment of Earth.)

"No matter how we may single out a complex from nature...its theoretical treatment will never prove to be ultimately

conclusive... I

believe that this process of deepening of theory has no limits."

- Albert Einstein, 1917

"Biologists can be just as sensitive to heresy as theologians."

- H.G. Wells

"A new scientific truth does not triumph by convincing its  
opponents and

making them see the light, but rather because its opponents  
eventually

die and a new generation grows up that is familiar with it." -  
M. Planck

"Science advances funeral by funeral." (Planck?)

"When the human race has once acquired a supersitition, nothing  
short of

death is ever likely to remove it." - Mark Twain

"You can recognize a pioneer by the arrows in his back." -  
Beverly Rubik

"If the man doesn't believe as we do, we say he is a crank, and  
that

settles it. I mean, it does nowadays, because now we can't burn  
him."

- Mark Twain

"Scientists are not the paragons of rationality, objectivity,  
openmindedness and humility that many of them might like others  
to

believe." - Marcello Truzzi, CSICOP

"The common idea that scientists reject a theory as soon as it  
leads to a

contradiction is just not so. When they get something that  
works at

all they plunge ahead with it and ignore its weak spots...  
scientists

are just as bad as the rest of the public in following fads and being

influenced by mass enthusiasm." - Vannevar Bush

"Once a new paradigm takes hold, its acceptance is extraordinarily rapid

and one finds few who claim to have adhered to a discarded method."

- Dr. B. Lown, inventor of the modern defibrillator

"For every expert, there is an equal and opposite expert." - anon

"One could not be a successful scientist without realizing that, in

contrast to the popular conception supported by newspapers and mothers

of scientists, a goodly number of scientists are not only narrow-minded

and dull, but also just stupid."

-- J. D. Watson "The Double Helix"

As a whole, parapsychologists are nice, honest people, while the critics

are cynical, nasty people" - Ray Hyman, skeptical scientist, 1985

"Desire for approval and recognition is a healthy motive, but the desire

to be acknowledged as better, stronger, or more intelligent than a

fellow being or fellow scholar easily leads to an excessively egoistic

psychological adjustment, which may become injurious for the individual

and for the community." - Albert Einstein

"Science is the search for truth - it is not a game in which one tries to

beat his opponent, to do harm to others." - Linus Pauling

"The need to be right all the time is the biggest bar to new ideas. It

is better to have enough ideas for some of them to be wrong, than to be

always right by having no ideas at all." - Edward de Bono

"To swear off making mistakes is very easy. All you have to do is

swear off having ideas." - Leo Burnett

"A man with a new idea is a crank until he succeeds." - M. Twain

"Don't worry about people stealing your ideas. If your ideas are that

good, you'll have to ram them down people's throats." - Howard Aiken

"Physical concepts are the free creations of the human mind and are not,

however it may seem, uniquely determined by the external world."

- Einstein/Infeld in "The Evolution of Physics" 1938

"A new idea is delicate. It can be killed by a sneer or a yawn; it can

be stabbed to death by a joke, or worried to death by a frown on the

right person's brow." - Charles Brower

"A great many people think they are thinking when they are merely rearranging their prejudices." - William James

"If you make people think they're thinking, they'll love you; but if you

really make them think they'll hate you." - Don Marquis

"We must care to think about the unthinkable things, because when things

become unthinkable, thinking stops and action becomes mindless."

- James W. Fulbright

"Wisest is she who knows she does not know." -anon

"The only means of strengthening one's intellect is to make up one's mind about nothing -- to let the mind be a thoroughfare for all thoughts. Not a select party." - John Keats

"There is nothing so absurd that it cannot be believed as truth if repeated often enough." -William James

"A lie repeated often enough becomes the truth." - G. Goebbels

"Never attribute to conspiracy that which is adequately explained by stupidity." - paraphrase of "Hanlon's Razor" (fm R. Heinlein)

What I don't understand I despise, what I despise I reject.  
- THE REFEREE'S CREED

"Without deviation from the norm, progress is not possible."  
- Frank Zappa

"My friends they were dancing here in the streets of Huntsville when our first satellite orbited the Earth. They were dancing again when the first Americans landed on the moon. I'd like to ask you, don't hang up your dancing slippers." - Wernher von Braun

AND FINALLY...

"A witty saying proves nothing." - Voltaire

of three years a  
machine] problem  
- Thomas Edis

"Such startling  
unworthy of scie  
- Sir William  
sucessful l

"We are probably

reaction and th  
which to react.  
in high schools  
Goddard's revol

"This foolish i  
lengths to whic  
-A.W. Bickert

"Space travel is

to have a good  
from Linus Pauli

Sufficiently and  
pseudoscience.

Progress in scie  
mountaineers don  
out and attack a

To be the next E



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...and the .sig  
both science and

<http://amasci.com/weird/skepquot.html>

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# BILL B's SCIENCE ANSWERS

(& 2 questions!), at:

## Madsci Network "[ASK A SCIENTIST](#)"

### 2000

- 88. **Physics:** [Re: What properties make some materials gain e- by contact](#)
- 89. **Physics:** [Re: magnetism and arc welding](#)
- 90. **Chemistry:** [Re: How does the dye and phosphor coating create the black light effect?](#)
- 91. **Physics:** [Re: How do watts, volts, ohms, and amperes compare to one another?](#)
- 92. **Physics:** [Re: Any information on kinetic gas theory - as relevant to spark plugs??](#)
- 93. **Physics:** [Re: How does the filament dimensions of a black light affect its working?](#)
- 94. **Physics:** [Re: How do you stop static electric charge in humans, zapping each other](#)
- 95. **Physics:** [Re: info on magnetics moving.](#)
- 96. **Engineering:** [Re: How to make a Lie Detector need further help](#)
- 97. **Engineering:** [Re: Why doesn't my touchlamp work when I touch it slowly?](#)
- 98. **Zoology:** [Re: How can someone raise worms to the surface using electricity?](#)
- 99. **Other:** [Re: how much energy can static produce ??\( Ex: a car, etc....\)](#)
- 100. **Engineering:** [Re: How do you get rid of static charges](#)

101. **Physics:** [Re: Why does ripping a BAND-AID \(or similar bandage\) wrapper produce light?](#)
102. **Physics:** [Re: Is cotton positive or negative on the triboelectric series?](#)
103. **Chemistry:** [Re: Why does only one half of the electric pickle light up?](#)
104. **Other:** [Re: What would cause curved stalactites in my icecubes in the freezer?](#)
105. **Engineering:** [Re: Why are prongs of electrical plugs different sizes \(polarized\)?](#)
106. **Physics:** [Re: Does a caduceus coil generate peculiar 'scalar waves'?](#)
107. **Physics:** [Re: How exactly does resistance cause heat increase?](#)
108. **Computer Science:** [Re: How can I build a computer from scratch? No industry made parts.](#)
109. **Physics:** [Re: hologram effect with water waves](#)
110. **Engineering:** [Re: Is there a high-voltage powerstorage system, and how it is handled?](#)
111. **Engineering:** [Re: Can two transformers be wired together?](#)
112. **Chemistry:** [Re: Can water be electrolyzed by using AC current?](#)
113. **Earth Sciences:** [Re: How do cats eyes in the road, reflectors on a bike and optic fibres work?](#)

## 1999

64. **Physics:** [How does a Kelvin waterdrop generator work?](#)
65. **Earth Sciences:** [Why do some people have severe problems with static electricity?](#)
66. **Engineering:** [How exactly does a Mercury Vacuum pump operate?](#)
67. **Engineering:** [How will neon react to a low powered laser in a vacume tube](#)
68. **Engineering:** [How do I calculate the magnetic field produced by a 33 Kv power line?](#)
69. **Physics:** [It's AC, so why is "hot" different than "neutral?"](#)
70. **Physics:** [Why does the scotch tape glows in the dark when we take a piece](#)

of it?

71. **Earth Sciences:** Can a lightening strike cause nail pops on your roof and dry wall screws pop

72. **Physics:** Why do scratches in glass always seem to form circles around light-sources?

73. **Chemistry:** On reduction potentials of cells

74. **Engineering:** Can a video tape show induce a TV screen current?

75. **Engineering:** Van de Graaff generators

76. **Physics:** Why does microwave-cooked popcorn have an electric charge?

77. **Engineering:** Effect of cold on incandescent light bulbs

78. **Earth Sciences:** What Is Ball Lightnig?

79. **Physics:** I am doing a 3-d magnetic field viewing project but I need a variable.

80. **Engineering:** Can the touch lamp theory be applied to D.C. powered appliance

80. **Biophysics:** Static Electricity and why does it have to be me?

82. **General Biology:** What is the easiest way to change light intensity?

83. **Earth Sciences:** Lightning cone of safety

84. **Engineering:** will there ever be holographic televisions.

85. **Physics:** How can you demonstrate a homemade lightbulb?

86. **Engineering:** Experiment to test piezoelectric crystals?

87. **Physics:** How does alternating current move forward?

## 1996

1. **Physics :** How do generators make Electricity?

2. **Physics :** descaling water magnetically

3. **Physics :** Thermodynamic scale movil

4. **Physics :** How can I build a generator at home?

5. **Chemistry :** Electric current passing thru chocolate syrup

6. **Physics :** The best miniature tornado

7. **Physics** : [Car Rearview Mirror](#)
8. **Physics** : [How does sound travel down phone lines](#)
9. **Engineering** : [Magnetic field of parallel wires stack](#)
10. **Computer Science** : [html- how to flash GIFs?](#)
11. **Physics** : [AC is symmetrical, so why are 3 special prongs needed?](#)
12. **Physics** : [What is Electricity?](#)
13. **Physics** : [What makes electricity work?](#)

## 1997

14. **Earth Sciences** : [What is the official name of the 'skin effect'?](#)
15. **Chemistry** : [why does static electricity build up](#)
16. **Chemistry** : [How does one form silica spherules of specific dimensions](#)  
Adrian Popa, Staff Optical/Microwave Physics, Thu Feb 6 13:17:13 1997
17. **Chemistry** : [What gases are in a black light bulb and how does it work?](#)
18. **Medicine** : [Are NMR machines noisy?](#)
19. **Cell Biology** : [Does rusting of iron commonly involve bacteria?](#)  
Josef Berger, Faculty General Biology, School of Biology South Bohemian U.
20. **Physics** : [How does light work in a photostating machine?](#)
21. **Earth Sciences** : [Effects of Lightning on Electronic Equipment](#)  
Dwayne Rosenburgh, Physics/Electrical Engineering, Tue Nov 11 20:23:10 1997
22. **Engineering** : [How large a value \(Farads\) can a capacitor POSSIBLY get?](#)
23. **Engineering** : [How can an ariplane fly upside down?](#)
24. **Physics** : [Why does the paint in the join between two walls fade less?](#)
25. **Physics** : [how the volt tracer or detector works thanks](#)
26. **Chemistry** : [Why does storing an automotive battery on a cement floor damage it?](#)
27. **Physics** : [electrocution in a bathtub](#)
28. **Physics** : [Newton's third law](#)

# 1998

29. **Physics:** [What causes a sonic boom.?](#)
30. **Physics:** [what are the properties of a conductor that affect the electric resistance?](#)
31. **Earth Sciences:** [Can you project static electricity?](#)
32. **Chemistry:** [9-volt batt. sets fire to steel wool?](#)
33. **Physics:** [Magnetize plates so they repel?](#)
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35. **Physics:** [Electrical device that can heat and cool depending on the current](#)
36. **Physics:** [Biefeld/Brown antigravity experiment](#)
37. **General Bio.:** [Can trees be used to generate electricity?](#)
38. **Engineering:** [How does a touch lamp work?](#)
39. **Biophys:** [Airport Landing Light 'Illusion...'](#)
40. **Earth Sci.:** [Does a tornado \(not TStorm\) create electricity/lightning?](#)
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44. **Engineering:** [Speed of electricity?](#)
45. **Physics:** [Electricity Produced in a Bottle of Orange Juice](#)
46. **Physics:** [Inertial Propulsion](#)
47. **Biophys:** [Can ELF/EMR cause low frequency vibrations in common objects?](#)
48. **Physics:** [Does whitewater produce ions?](#)
49. **Engineering:** [Perpetual Electric Generator](#)
50. **Physics:** [Static electricity: length of 1mm spark](#)
51. **Engineering:** [How to make a Lie Detector?](#)
52. **Physics:** [Why can't reentering spaceships use parachutes?](#)
53. **General Biology:** [Why does a wad of hair make a jar of water evaporate faster?](#)

54. **Physics:** [Volts and amps to explode a drop of water?](#)
  55. **Physics:** [Pressure of water at X depth?](#)
  56. **Engineering:** [How to build a 'shock box'?](#)
  57. **Engineering:** [Magnetically aligning LCD?](#)
  58. **Engineering:** [Human as circuit in "energy orb" toy?](#)
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  60. **Biophysics:** [Why dappled light makes circles?](#)
  61. **Environment:** [Electric power substation harms animals?](#)
  62. **Engineering:** [How does the sparker to light your grille work, in detail.](#)
  63. **Physics:** [Skin effect](#)
- 

## OTHER SITES

- Bill B's messages on [newsgroups](#) (sci.electronics, etc.)
- Bill B's messages at [The Straight Dope](#) (click on 'search for all posts by this user')
- [Skip Down to Bill B's old Madsci answers](#)
- Bill B's [Electricity FAQ](#)
- All the [Archived Answers](#) at Madsci
- [Bill B's USENET postings](#) (hundreds and hundreds)
- [Ask Yahoo: Science](#)
- [Newton Archive](#), ten years of "Ask A Scientist"
- [Dr. L. Bloomfield's answers](#) at "How Things Work"
- [HOW STUFF WORKS](#) Archive
- [The Straight Dope](#), large archive
- [Ask Physics Questions](#) (physlink)
- [New Scientist Magazine: Last Word](#) ( hilarious science Q & A )
- [SSC: ScienceNet](#) (large archive)
- [BBC Sci Shack Q&A](#)
- [Physics Explanations](#), J. Denker
- [Google Answers: science](#) (costs \$)
- [The Skinny On...](#)
- [Frequently Asked Physics Questions](#) (page down to INDEX OF SUBJECTS)
- [Scientific American, Ask the](#)

## Experts

- Science Net UK
- Aircraft/Aerospace questions

<http://amasci.com/amateur/answers1.html>

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**MadSci Network is located at**  
**<http://www.madsci.org>**

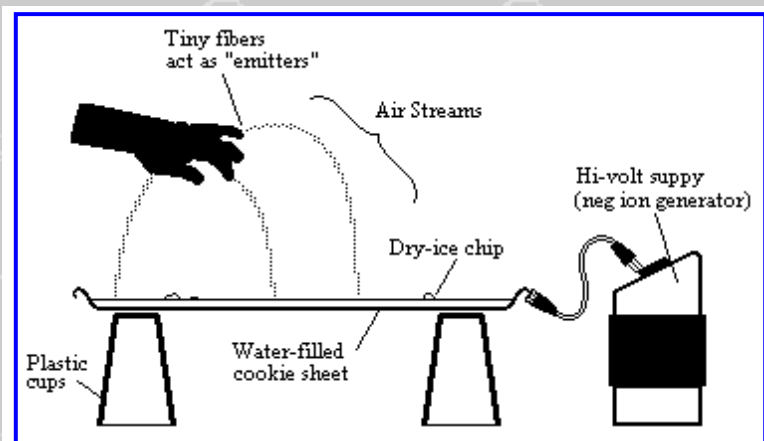
**Please update all links and bookmarks to  
point to this address.**



# Threadlike streams of "Electric wind"

## THINGS TO TRY:

- Alternate sensor-surface: soap film. (Try alcohol in threads)
- Do streams PASS THROUGH thin soap films?
- Does water vapor play any role? H<sub>2</sub>O aerogel? Electret polymer? Try dry nitrogen.
- send threads through grounded window screen, how far will they continue?
- electrodes behind grounded screen; charge the electrodes? FET op amp to detect it. LED as variable resistor to ground the electroe?
- burned a hole through a light bulb?!!!
- bundle of sharpened tungsten wires: many parallel beams, high average current. (Or use nano-rough, wetted surface.)
- Pulsar-electrodes at either end. One-way travelling waves, or 2-way?



**Fig. 1 (Left)** A rotating chip of dry ice leaves a spiral trail of mist on the water. Several "air threads" from my thumbnail are writing identical squiggles in the mist. (The "threads" are about 12 inches long here.) The metal tray is charged at approx. -5,000 Vdc

[Up to SCIENCE HOBBYIST](#) | [Up to ELECTROSTATICS](#) | [Up to WEIRD SCIENCE](#)

- [The Phenomenon](#)
- [Hardware details](#)
- [Experiments to date](#)
- [Implications, musings, ideas to try](#)
- [References, received email](#)
- [Bizarre "force-field wall" reported](#)

- [Untested Ion Experiments](#)

While playing with dry ice during tonight's (6/98) [Seattle Weird Science](#) meeting, I stumbled across a VERY strange electrostatic effect.

If several chips of dry ice are placed in a dark-bottomed tray with 1cm of hot water, a layer of moving white mist covers the water. This is fascinating to watch, especially if several dry ice chips are scattered around the pan. Complicated radial gas flows! The white fog creates images which look like comet gas flows, or the bow-shocks of solar wind between neighboring stars. This isn't the interesting part though.

On a whim I grabbed a high voltage DC power supply (about 10KV), clamped a needle on the negative lead, and was directing ion wind at the fog and blowing it around. Here's the weird part. The thick high-voltage wire swung across the tray for a moment, and there appeared in the mist layer a collection of parallel lines, as if the wire had been spewing a number of narrow "rays" which swept across the mist and cut furrows in it. I found that I could wiggle the wire around and draw an array of identical looping patterns as the tips of some sort of invisible "rays" all made identical motions across the mist layer. I pulled the wire back several inches, and still the furrows would appear. These are Charles Yost's "coherent threadlike streams" mentioned in [ELECTRIC SPACECRAFT JOURNAL](#) in 1996, I finally found an easy way to create and observe them!

### **LIKE LONG, INVISIBLE HAIRS**

Brief experimentation showed that the entire wire was sending out these "rays" in all directions, maybe one or two of them per cm of wire. They reach out about 10cm to 15cm and terminate abruptly, and seem to be less than 1mm across. If my wire was a like high-pressure hydraulic hose, then any tiny oil leaks would behave in the same way as these "rays". They would shoot out like invisible needles, and would carve furrows in the surface of the fog layer.

I had used the negative power lead, while the positive lead was grounded to the pan. The wire is heavy test-probe leads which are fairly old, and not designed for 10KV (maybe has a bit of insulation leakage.) No obvious cracks though. Some of the "air-stream rays" appeared to originate at the tips of tiny pieces of lint which were clinging to the wire.



**Fig. 2 Not the surface of Jupiter, but the slot made in the flowing CO2 fog by a single "air-thread." The emitter is a human hair 1/4" long, held two feet away. Two other marks are also visible, no doubt made by tiny bits of lint on the cliplead which held the hair. The part of the stripe visible here is about 4 inches in length.**

NEXT: [Hardware details](#)

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# DR. RICHARD P. FEYNMAN

## (1918-1988)

**Nobelist Physicist, teacher, storyteller, bongo player**

the hero of physics geeks everywhere!

Photo © MALCOLM KIRK. For further information contact:  
malcolmkirk@mac.com

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"An honest man, the outstanding intuitionist of our age, and a prime example of what may lie in store for anyone who dares to follow the beat of a different drum" - Dr. Julian Schwinger

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### Feynman Articles

### [Feynman Books](#)

- [R. Feynman postage stamp](#) finally exists!
- [The Guardian: 'This is how science is done'](#), Feynman's letters
- New Book (2005): [Perfectly Reasonable Deviations from the Beaten Track](#), Feynman's Letters
- Online video: ["Remembering R. Feynman"](#), Michelle Feynman, S.Ellis, N.Myhrvold, G.Dyson, (video [seattlechannel.org](#)) , [new book](#)
- [RF's Nobel Prize Lecture](#)
- [LA Times: the cult of Richard Feynman](#)
- [Feynman on K-6 Textbooks](#)
- [Feynman on grade-school science](#)
- [R.F. Anecdotes](#) at [Feynman Online](#)
- [Cargo Cult Science](#), R. Feynman
- [video clips from "Best mind since Einstein"](#)
- [R. Feynman](#) on Papf (Papp!) perpetual motion engine , also [MORE](#)
- ["The Dignified Professor"](#), on teaching vs. research
- [Plenty of Room at the Bottom](#), R.F. on nanotechnology ...in 1959!
- [My mother, the scientist](#)
- [Ideas don't come from committees](#)
- [Friends of Tuva: R. Feynman](#)

**Other books  
on SCIENCE  
ANECDOTES**  
quirky stories!

billb recommends:

[The Lost Art of  
Healing](#), by B.

Lown

[Best Science  
Writing 2003](#),

- [Tuva, Feynman, Zappa, & Beefheart](#)
- [Nobel e-museum: Feynman](#)
- [Tricks](#), Feynmanesque and otherwise

---

**"Physics is like sex. Sure, it may give some practical results, but that's not why we do it." - R. Feynman**

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Oliver Sacks

[Best Science Writing 2004](#) D. Sobel

[The Man who Mistook his Wife for a Hat](#), Oliver Sacks.

## Highly Recommended Feynman Books

(help support [THE SCIENCE CLUB](#), order these via amazon.com)

- [Safecracker Suite](#) original audio of RF's A-bomb stories (audio CD)
- [Surely You're Joking, Mr. Feynman!](#), by Leighton, Feynman, Hutchings(ed.) (R.F. Anecdotes. An excellent basic introduction to R. Feynman's world)
- [What Do YOU Care What Other People Think?!](#), by Leighton, Feynman
- [The Feynman Lectures on Physics](#), Dr. Richard P. Feynman (3 volumes, expensive but WORTH IT)
- [The Feynman Lectures on Physics : Commemorative Issue](#) by R P..Feynman, R Leighton (hardcover)
- [The Feynman Lectures 1-2](#) CD audio, also [3-4](#) ,[5-6](#)
- [Genius : The Life and Science of Richard Feynman](#), by James Gleick

## More Feynman Books

- NEW IN 2005: The Feynman Letters: [Perfectly Reasonable Deviations from the Norm](#)
- [Feynman's Rainbow: a search for beauty in physics and life](#)
- [QED: The Strange Theory of Light and Matter](#), by R. P. Feynman
- [The Pleasure of Finding Things Out](#), by Feynman, Robbins, Dyson
- [The Beat of a Different Drum : The Life and Science of Richard Feynman](#) by J. Mehra
- [The Character of Physical Law](#), by R. Feynman
- [Six Easy Pieces : Essentials of Physics Explained by Its Most Brilliant Teacher](#), by P. Davies et al
- [Six Not-So-Easy Pieces : Einstein's Relativity, Symmetry, and Space-Time](#), by R. Leighton et al
- [Tuva or Bust!; Richard Feynman's Last Journey](#), by R. Leighton
- [Feynman's Lost Lecture : The Motion of Planets Around the Sun](#) by R. Feynman, D. Goodstein, J. Goodstein
- [The Meaning of It All : Thoughts of a Citizen Scientist](#), by R. Feynman
- [Elementary Particles and the Laws of Physics : The 1986 Dirac Memorial Lectures](#) by R. P.Feynman, S. Weinberg

- ["Most of the Good Stuff" : Memories of Richard Feynman](#), by L. M. Brown (ed.), J. S. Rigden (ed.), R. Feynman
  - [The Art of Richard P. Feynman : Images by a Curious Character](#) by Michelle Feynman, A. Hibbs
  - [Richard Feynman : A Life in Science](#) by J. Gribbin, M. Gribbin
  - [Feynman Lectures on Computation](#) by A. Hey (ed.), R. Allen (ed.), R. Feynman
  - [Feynman Lectures on Gravitation](#) by F. Morinigo, W. Wagner, R. Feynman
  - [Amazon list: Fun Feynman](#)
- 

"There are two kinds of geniuses: the 'ordinary' and the 'magicians'. An ordinary genius is a fellow whom you and I would be just as good as, if we were only many times better. There is no mystery as to how his mind works. Once we understand what they've done, we feel certain that we, too, could have done it. It is different with the magicians. Even after we understand what they have done it is completely dark. Richard Feynman is a magician of the highest calibre." - Mark Kac

---

## Feynman Videos

- Online video: [Sir Douglas Robb mem. lectures](#), 1979
- THE MOVIE: [Infinity](#): Richard, Arlene, & the Bomb (VHS 1996)
- [The Pleasure of Finding Things Out](#) (50 min, VHS or PAL)
- [NOVA: The Best Mind Since Einstein](#)
- [Genghis Blues](#), (1999) Tuvan throat-singing
- MORE VIDEOS, see: [Caltech Bookstore](#) and [Sound Photosynthesis](#)

## Books on tape/CD

- [Safecracker Suite](#) original audio of RF's A-bomb stories and bongos!
- [The Pleasure of Finding Things Out](#) (books on tape)
- [The Character of Physical Law](#) (books on tape)
- [More tapes](#) (Tuva Trader)

### The Feynman Lectures (audio cassette):

- [Volume 1](#) Quantum Mechanics
- [Volume 2](#) Advanced QM (6hrs)

- [Volume 3](#) Crystals to Magnetism (6hrs)
- [Volume 4](#) E & M
- [Volume 5](#) Energy & Motion (6hrs)
- [Volume 6](#) Kinetics & Heat (6hrs)
- [Volume 7](#) Mechanics, Statistics (6hrs)
- [Volume 8](#) Optics (6hrs)
- [Volume 9](#) Classical Mech. (6hrs)
- [Volume 10](#) Basic QM (6hrs)
- (other tapes avail. at [Tuva Trader](#))
- Also see: [Amazon list: Feynman audio](#)

## Other Feynman Websites

- [Feynman Online](#) (It's back again!)
- [Feynman in Chinese](#)
- [Video: "Pleasure of Finding Things Out"](#)
- [Tuva Trader](#) (LOADS of R. Feynman stuff for sale!)
- [Feynman Videos & cassettes](#) from [Sound Photosynthesis](#)
- [Feynman Photos Archive](#) (Caltech)
- [CNN Feynman Page](#)
- [Feynman Page](#) at Caltech
- [Feynman Page](#) geocities
- [The Feynman Lectures](#) (Sarfatti)
- [Friends of Tuva](#)
- [R. Feynman Index](#) at Yahoo
- [Tuva Newsgroup](#) (via Dejanews)

## Other Feynman Quotes

Physicists always have a habit of taking the simplest example of any phenomenon and calling it "physics," leaving the more complicated examples to become the concern of other fields...

"Science is the belief in the ignorance of experts. "

"I can live with doubt and uncertainty and not knowing. I think it is much more interesting to live not knowing than to have answers that might be wrong."

"The first principle is that you must not fool yourself - and you are the easiest person to fool."

"If we will only allow that, as we progress, we remain unsure, we will leave opportunities for alternatives. We will not become enthusiastic for the fact, the knowledge, the absolute truth of the day, but remain always uncertain... In order to make progress, one must leave the door to the unknown ajar."

You can know the name of a bird in all the languages of the world, but when you're finished, you'll know absolutely nothing whatever about the bird... So let's look at the bird and see what it's doing -- that's what counts. I learned very early the difference between knowing the name of something and knowing something.

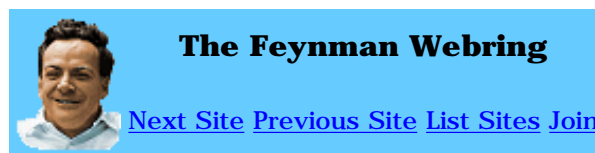
"We cannot define anything precisely! If we attempt to, we get into that paralysis of thought that comes to philosophers, who sit opposite each other, one saying to the other, 'You don't know what you are talking about!' The second one says 'What do you mean by know? What do you mean by talking? What do you mean by you?', and so on."

"...far more marvelous is the truth than any artists of the past imagined it. Why do the poets of the present not speak of it? What men are poets who can speak of Jupiter if he were a man, but if he is an immense spinning sphere of methane and ammonia must be silent?"

(On pseudoscience) "...there is one feature I notice that is generally missing in 'cargo cult science'... It's a kind of scientific integrity, a principle of scientific thought that corresponds to a kind of utter honesty -- a kind of leaning over backwards... For example, if you're doing an experiment, you should report everything that you think might make it invalid--not only what you think is right about it... Details that could throw doubt on your interpretation must be given, if you know them."

"I'd hate to die twice. It's so boring." (last words)

**UP TO MAIN SITE: [SCIENCE HOBBYIST](#)**





<http://amasci.com/feynman.html>

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[Up to SCIENCE HOBBYIST](#) | [Up to WEIRD SCIENCE](#)

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- [Got PSI?](#) online test (9/2003)
- [SCI.FRONTIERS newsletter archive](#), a great read (8/2003)
- [LENR/CANR](#), current and past research papers on Cold Fusion (2/2003)
- [Are nanobacteria real?](#) (1/2003)
- [Fusionanomaly nodes](#) (6/2002)
- [Scathing review of book VOODOO SCIENCE](#) (4/2002)
- [Fork-you.com](#) bend cutlery w/your mind (3/2002)
- [New Energy Tech.](#), Russian Magazine (11/2001)
- [Young Investigators Forum](#) (9/2001)
- [Replicating Schnurer's SC Gravity exp.](#) (8/2001)
- [Saucer Smear](#) (7/2001)
- [KeelyNet conference, Dallas June 16/17](#) (5/2001)
- [UFO Skeptic](#) (4/2001)
- [Rex Research Infolios](#) (2/2001)
- [The Museum of Jurassic Technology](#) (12/2000)
- [Lunascan Project](#) (11/2000)
- [Mad Scientists](#) at [Burning Man](#) festival (9/2000)
- [Boundary Institute](#), serious PSI research (6/2000)
- [John Hutchison \(antigrav experimenter\) arrested](#)
- George Wiseman's [Eagle Research](#) (1/13/2000)
- [ARCHIVE OF SCIENTISTS' TRANSCENDENT EXPERIENCES](#)  
(10/25/99)
- [Alex Frolov's](#) site, also [Journal on CD](#) (8/10/99)
- ["Exotic Research" Conference, Arizona July 22-25 1999](#)
- [Boston: MIT Cold Fusion Movie Nite](#) May 26, 1999

- [March to End Secrecy](#), 10/24/99
- [Bill B. on Laura Lee show](#)
- [John Hutchinson](#) (Hutchinson Effect) (11/22/98)
- [Boundaries of Science Webring](#) (10/4/98)
- [How skeptics behave?](#) 8/13/98
- [ISSSEEM](#) Journal, Society for Study of Energy Medicine (7/27)
- [Farnsworth's Fusor](#), inertial confinement desktop fusion ( 5/15 )
- [Fortean](#) and "[Fortnite '98](#)" (3/28)
- [PEAR Labs](#), growing evidence that minds affect matter (3/3/98)
- [Weird Propulsion](#) at NASA (2/6/98)
- [FAS fights government secrecy](#)
- [Natural Philo. Alliance](#), openminded/dissident sci. 11/3/97
- [Greg Watson's stand-alone o/u generators](#) (10/10/97)
- [Physics/consciousness Research](#) page
- Jerry Decker's [Keelynet](#)
- [Levitron was a stolen invention!](#)
- [SMOT overunity magnetic ramp](#) from [J.L. Naudin's page](#) (5/28)
- [The Sourcebook Project](#) (4/26)
- [Letter to a Dissident Scientist](#), by [Brian Martin](#) 3/25
- [Zenergy Inc. Challenge](#) \$100,000
- [Lindsay Publications](#)
- [Robert Cathey Research Source](#)
- Beware of [Dennis Lee](#) (11/23)
- [Psychic Page](#), and [Practical Psychic](#) web book (10/19)
- [CSICOP versus Orgone](#) from the [OBRL](#) page
- [John Bedini page](#) w/plans for o/u devices
- [Society for Scientific Exploration](#)
- [INE](#), Institute for New Energy
- [Muller Magnetic Dynamo](#)
- [Enigma Project](#)
- [Stefan Hartmann's](#) excellent new site

- [Barkhausen Scalar Detector](#)
- [Laura Lee](#) Unconventional Sci using [Realaudio](#)
- [The Newman Motor](#)
- [David Hudson](#) ORMES lecture
- [Symposium on New Science](#), in St. Petersburg
- [Joe Champion](#) transmutations
- [Stirniman's](#) Electrogravity Resources (300k)
- Bruce Perrault cracks the secret to the Moray device (removed by Author)
- [Virtual Times: T. Bearden Column](#) (Heavily illustrated!)

<http://amasci.com/weird/wsotw.html>

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I'm trying to improve this article below. It's aimed at total electronics newbies and at the general public: How transistors REALLY work. ...

[sci.engr.semiconductors](#) - Sep 12, 3:37 pm by b...@eskimo.com - 1 message - 1 author

[How energy transfered to light in bulb](#)

In a resistive wire, the e-field accelerates an electron, and as the kinetic energy of that electron increases, the e-field becomes weaker (energy flows from ...

[sci.physics.electromag](#) - Aug 14, 7:54 am by b...@eskimo.com - 3 messages - 3 authors

[All Electronics is selling ...used vibrators.](#)

Personal Massager (used) <http://www.allelectronics.com/cgi-bin/category.cgi?category=search&item=VB-2&type=store>

[sci.electronics.design](#) - Jul 11, 5:54 pm by b...@eskimo.com - 3 messages - 3 authors

[Spectra physics 2018-RM ultraviolet laser, fixed!](#)

Interesting explosion inside 2018-RM Laser power supply: The UV Laser in our mass-spectrometer department had a strange failure: blown supply fuses, and a huge ...

[sci.electronics.repair](#) - Jun 23, 2:12 pm by b...@eskimo.com - 1 message - 1 author

[Will bar magets suck more radio stations than ferrite ...](#)

Have you seen the pretty MIT pictures? No need to make assumptions about what the fields look like. First mpeg is 2.1megs. TEAL ...

[sci.physics.relativity](#) - Jun 20, 4:49 pm by b...@eskimo.com - 162 messages - 8 authors

[Newbie on Electricity](#)

Textbooks get the equations right, but many of them contain all sorts of errors and misconceptions in their verbal descriptions. ...

[sci.electronics.basics](#) - Jun 20, 4:25 pm by b...@eskimo.com - 8 messages - 8 authors

[Why do flying helicopters get charged up electrically?](#)

When helicopters fly, they get charged electrically. This is such a strong effect, that the shock can kill a man, especially if it has heart problems. ...

[sci.physics.electromag](#) - Jun 18, 1:37 am by b...@eskimo.com - 6 messages - 5 authors

[Rimless steel hemispheres, 14" dia, \\$12](#)

Amazing! Mark W. tipped me off that Ikea is currently selling bowls in the form of near perfect rimless steel hemispheres, 5", 8", 11", and 14" diameter. ...

[sci.electronics.basics](#) - Jun 18, 1:28 am by b...@eskimo.com - 2 messages - 2 authors

[Rimless steel hemispheres, 14" dia, \\$12](#)

Amazing! Ikea is currently selling bowls in the form of near perfect rimless hemispheres, stainless steel, 5", 8", 11", and 14" diameter. \$3 for the 5" ones. ...

[alt.energy.high-voltage](#) - Jun 18, 1:25 am by b...@eskimo.com - 1 message - 1 author

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[how does AC current flow through capacitors \(opens\) ?](#)

You only described HV devices as I had pointed out. Not at all. Perhaps you aren't aware that "Electrometer" doesn't mean "HV voltmeter ...

[sci.physics.electromag](#) - Jun 15, 1:40 am by b...@eskimo.com - 18 messages - 7 authors

*The ordering of results sorted by date is approximate.*

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## Science Hobbyist FAQ

- [WHY DON'T YOU ANSWER MY EMAIL?](#)
- [WHO ARE YOU?](#)
- [THIS SITE LOOKS LIKE SOMETHING FROM 1994!](#)
- [WHY ARE YOU INVOLVED IN FRINGE SCIENCE?](#)
- [THAT STUFF ABOUT MISCONCEPTIONS... YOU'RE JUST NITPICKING!](#)
- [PHYSICS IS SUPPOSED TO BE COMPLEX, WHY CAN I UNDERSTAND YOU?](#)
- [WHAT IS YOUR COMPANY, WHAT ARE YOU SELLING?](#)
- [CAN I PUT YOUR LINK ON MY SITE?](#)
- [SEND ME SCIENCE FAIR IDEAS! NOW!](#)
- [PLEASE SEND ME ALL YOUR INFO ABOUT xxxxxx.](#)
- [HOW DID YOU GET LIKE THIS?](#)
- [WHERE ARE ALL THE KEWUL GRAPHICS?](#)
- [WHAT DO YOU HAVE AGAINST 'FRAMES'?](#)
- [HOW'D YOU GET SO MANY HITS?](#)
- [HOW'D YOU MANAGE TO CREATE SO MUCH STUFF?](#)
- [WHERE DID YOU \\*GET\\* THIS JUNK?!](#)

---

*People that are really very weird can get into sensitive positions and have a tremendous impact on history. - Dan Quayle*

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### Other FAQs Here

- [FAQ: EXPLAINING "ELECTRICITY"](#)
- [FAQ: VANDEGRAAFF ELECTROSTATIC GENERATORS](#)
- [FAQ: WHAT IS THIS "FREE ENERGY" STUFF?](#)
- [FAQ: MICROWAVE OVEN MYTHS](#)

## **Q: THIS SITE LOOKS LIKE SOMETHING FROM 1994!**

(Also see [WHERE'S YOUR KEWUL GRAPHICS?](#))

A: Um. This site was created in 1994.

The whole thing is written by hand directly in HTML. Why? It's compatible with all modern browsers, and with nearly all of the early ones. It works fine with text-only terminals and loads instantly even with a 2400b modem. It's [friendly to vision-disabled internet users](#). But those are just excuses. Really I'm a techno-luddite who runs out and buys an [8080 home computer](#) and then looks suspiciously at these newfangled "PC" things with "operating systems"... someone who leaps onto the internet and then just uses a text-only browser (Lynx) forever after. But that's only what set me on this path.

Why write websites in html?

Most important: totally cheap editing. From any computer with a modem I can run a Telnet text-terminal and then improve my pages or start adding more content to the site. amasci.com is a one-man show, a little "personal website." It's like having a file cabinet in my house which automatically appears on the internet, no work required. If I had to use website-builder software, then I couldn't create this huge site without hiring a staff of employees. And I'd have to carry that software with me in order to change my site. Text terminals would be useless for editing, and I wouldn't be able to treat this site as my personal C: drive. And in that case, this site wouldn't exist.

When internet users say that content is more important than the "look," they actually mean it. The majority of website developers don't believe this for an instant. But what happens when someone takes this idea seriously, then spends 100% of time on site content and 0% on design?



You get something that's all depth! But then the "surface" looks simplistic and primitive.

I figure that my website might offend the kind of people who look only at surfaces, while it rewards those who pursue depth. Don't just appeal to a particular audience... also make sure to drive away everyone else! It's an old trick well known to shamen and alchemists.

**NEVER TRY TO PLEASE EVERYONE! YOUR GOAL SHOULD BE TO BECOME THE HATED ENEMY OF CERTAIN KINDS OF PEOPLE. :)**

### **Q: WHY DIDN'T YOU ANSWER MY EMAIL?**

A: I'm sorry about this, but the website is just my hobby. I have a family and an engineering career, and lately I only have time to answer a few messages per week. But sometimes I receive over 50 per week! Site traffic here is up to 50 thousand hits/week. To help people out, I've set up lots of pointers to discussion groups and other help pages at various places on my site. Try these:

- [Guestbook](#) for comments (or contact other users)
- [Science fair help](#)
- [Comments about MISCONCEPTIONS](#)
- [Comments about ELECTRICITY MISCONCEPTIONS](#)

- [Answers to Science Questions](#)
- [Science teacher discussions](#)
- Tesla coil questions, try [usa-tesla](#) or [Tesla Group](#)
- [Reporting your Unusual Phenomena](#)

### **Q: CAN I PUT YOUR LINK ON MY SITE?**

A: Sure! Excess traffic on Sci. Hobbyist is not a problem. If your ISP charges you for hits per month or bandwidth usage, you might consider checking out [ESKIMO.COM](#) as a new provider. Single-user remote accounts (accessed by telnet) are amazingly low priced if you buy a whole year at a time, and they come with 10megs for webpage use (and only \$1/month per extra ten megs!).

**Q: SEND ME SCIENCE FAIR IDEAS!**

A: Sorry, too many requests and not enough time. Try the [Science Fair](#) Ideas List, or go to ASK A SCIENTIST at [MADSCI](#).

**Q: SEND ME ALL YOUR INFO ON xxxxx.**

A: Sorry, all my information is already on my webpages. To find more, try searching at [ALTAVISTA](#), [LYCOS](#), and [YAHOO](#). If you have a science question, try the ASK A SCIENTIST project at [MADSCI](#).

If you can't find any information about your subject, it probably is not on the internet at all, and you'll have to go to the public library.

Note: if you cannot find any info about a very important topic, this means that nobody has created a webpage for that topic yet. It means that YOU YOURSELF could start that webpage and become the internet's central clearinghouse for that subject. Then all the other people who are right now getting frustrated from finding no information, could instead find you.

## Q: HOW DID YOU GET LIKE THIS?

A: By growing up abnormal: I was one of those weirdos who hated school, sports, and popularity, knew better than to worship straight-As, and spent all my time reading in libraries, building science demonstrations and electronic devices, messing with computers, etc. My father died when I was nine, which seriously messed with my head, to say the least. (That sort of learning experience is the most valuable thing any human can ever encounter. Vast wealth pales in comparison.) An early attraction for paranormal gave me a critical eye regarding the belief-system of conventional science. Encounters with certain [books](#) seriously warped my mind! (Reading a book is the ultimate subversive act.) My work in designing science exhibits for museums showed me how to do physics in visual/intuitive mode, without using any math. Long years attempting to [see](#) interesting scientific phenomena outside myself, as well as fascinating/disgusting psychological phenomena INSIDE myself, made my eyes open a bit wider than the usual. I developed the habit of telling the truth. No, I mean really telling the truth. No, I mean **\*\*REALLY\*\*** telling the truth, not like shining a flashlight but like using a blowtorch. I grew up overseas, on Guam, which pretty much broke the "American male" mold for me. I also try to watch less than 1hr of TV per week. Dump your TV set for a couple of years, it will make you... "different."

;) )

"On a certain shelf in the bookcase are collected a number of volumes which look somewhat the worse for wear. Those of them which originally possessed gilding have had it fingered off, each of them has leaves turned down, and they open of themselves at places wherein I have been happy. Each of them has remarks relevant and irrelevant scribbled on their margins. These favorite volumes cannot be called peculiar glories of literature, but out of the world of books I have singled them, as I have singled my intimates out of the world of men." - Alexander Smith

Read the following books, they will warp YOUR mind too:



["Surely You're Joking, Mr. Feynman"](#) - R. Feynman

["Zen and the Art of Motorcycle Maintenance"](#)

["Antinomy"](#) - Spider Robinson

["The Nature of Personal Reality"](#) - J. Roberts

["The Fire from Within"](#) - Carlos Castaneda

["Stranger in a Strange Land"](#) - R. Heinlein

["The Cartoon History of the Universe"](#) - Larry Gonick (also [vol](#)

[II](#))

["Why Children Fail"](#) - J. Holt (and others by [Holt!](#))

["The Divided Self"](#) R. D. Laing

["Sympathetic Vibrations"](#) - K. C. Cole

"Jim" and "Frank" comics - [Jim Woodring](#)

["Chaos"](#) - James Gleick

["Alternative Science"](#) - R. Milton

["Kooks"](#) - D. Kossy

"Cat's Cradle" - K. Vonnegut

In libraries, everything under [Dewey Decimal 507](#) (science experiments!)

Hundreds of SCIENTIFIC AMERICAN mag backissues buried in libraries,

especially concentrating on ["The Amateur Scientist"](#)

Many feet thick of [underground comics](#), concentrating on the Greats

such as Crumb, Shelton, Spain, Mavrides, etc.

Hundreds of pounds of Science Fiction paperbacks, particularly anthologies of short stories, and everything by Robert Heinlien, Spider Robinson, and Larry Niven

**Also see:** [BILL BEATY'S BOOKSTORE](#)  
and [Science Heretic's Bookshelf](#)

## **Q: WHAT IS YOUR COMPANY, WHAT ARE YOU SELLING?**

A: This website is a "personal page," although the contributions from the folks on VORTEX-L help much in offsetting expenses. OK, OK. Time to sell out, go strictly commercial as Zappa says. I'll sell you something. But then I'll give away the profits, nyaaa! Check out [SCIENCE HOBBYIST BOOKSTORE](#), also [FEYNMAN BOOKS](#).

Also, I hire myself out for occasional lectures on topics like:

- WHAT \*IS\* ELECTRICITY, ANYHOW?
- PHYSICS PROJECTS AND TOYS YOU CAN BUILD
- DEMOS AND EDU. TECHNIQUES FOR TEACHING ELECTRICITY
- EVERYTHING WE KNOW IS WRONG: ERRORS IN SCIENCE TEACHING

(Old Answer: I'm a hobbyist on a \$10/month account. The internet lets me get this info out to

people without having to \*pay\* anyone! Maybe someday browsers will have micro-cash features, and I'll be able to charge everyone a penny per hit and make the site pay for itself. If you like the site, please consider making a [donation](#) to help me keep it alive.

Speaking of selling, there are cassette tapes available of me talking about "[scientific suppression](#)" and about the "[Taos Hum](#)", see the Laura Lee [radio show](#). No, I don't make any money off of cassette sales. You can find my talk "The Darker Side of Amateur Science" on the [Keelynet Conference videos](#) Jerry Decker sells. I also have an "Electricity Misconceptions" talk on Steve Ellswick's Exotic Research [conference videos](#).

The [REPORT UNUSUAL PHENOMENA](#) page is part of the WEIRD SCIENCE section of my SCIENCE HOBBYIST website. It's not associated with any academic institution, etc. I started it for several reasons: there was nothing else like it on internet, I myself wanted to read these types of reports, and finally, I realize that these types of stories, if kept secret, can wreck your life. The cure is to realize that such things happen to other people too, and to get your experiences out (even anonymously) so others can benefit.

## **Q: WHERE ARE ALL THE KEWUL GRAPHICS?**

A: Many who use this page are on VT-100s at libraries, or are using older PCs at school, so I intentionally try to see the world through their non- Netscape eyes by developing and using these pages with a [Lynx](#) text-only browser. I'm starting to become a bit of a 'techno-luddite' and text-only activist. I can't SEE the bleeding edge hype-factor stuff, so my pages end up having a bit

more content than most sites. Also, my pages don't have that "Please download Netscape" notice which excludes so many users: if the people have no bread, why, let them eat cake! Also, things aimed at the text-only users will end up being useful for the growing population of visually-impaired internet users.

Another point: reading is subversive. Reading makes you weird. If I put lots of good science stuff on the www in the form of text, then any kids who read will be rewarded. The web is an immensely powerful force for convincing kids to take up reading. It may be even stronger than, (gasp!) comic books. (I learned to read via comics. If not for comics during childhood I probably never would have become a voracious reader.)

BTW, if you use a modem link and have a Unix "shell" account on your ISP, try typing "lynx" as a Unix command. Or, if you are on a freenet, search your menus for the "Lynx" browser. If Lynx is available, try using it for web surfing. On a modem, it is MUCH, MUCH faster than Netscape (and others), since it is actually running on your ISP's machine with a direct hardline to the internet. Unlike with Netscape, your PC is then being used only as a terminal, and your actual browser is on an extremely high-speed mega system. I use Lynx to race through my web site explorations while bookmarking the good ones, then later go explore them with Netscape. This is a huge time-saver.



## **Q: WHAT DO YOU HAVE AGAINST 'FRAMES'?**

My main beef: Frames make a site useless for visually-impaired people. My site attempts to be handicapped-friendly, so my policy is to avoid linking to frames-only sites. It's not just Frames that causes problems. If a site is entirely based on ISMAPS and has no text links or ALT tags in its GIF graphics, or if a site is useless when viewed with the Lynx browser, then I will avoid linking it to my site. For more info on creating good, browser-compatible web pages, see my collection of links to [webpage design flaws](#).

## **Q: WHY DID YOU INVOLVE YOURSELF IN ALL THIS DISGUSTING "FRINGE" STUFF? YOU SHOULD BE ASHAMED!** A: Many reasons.

- [1. New discoveries come from the "fringe."](#)
- [2. Seek unexplored areas in science.](#)
- [3. Flee self-congratulatory arrogance, hubris, concensual mob-rule.](#)
- [4. Excess rationality poisons creativity](#)
- [5. Be skeptical about so-called 'Scientific' hyper-skepticism](#)
- [6. The world is still 99% unknown.](#)

- [7. The REAL reason! :\)](#)

## **Q: HOW DID YOU GET SO MANY HITS ON YOUR PAGE?**

A: Ah, the webmaster's secrets, eh? The number one way to get lots of hits on your webiste is this:

1. When first starting out, don't be tempted to concentrate on impressive layout or exotic HTML and Java features, they will only use up your precious time and interfere with search engine ranking. Carefully avoid elevating image over substance. Instead, offer some kind of useful service to internet users. As they say, CONTENT, CONTENT, CONTENT.

Don't copy other sites; find something that ISN'T on internet already, then become the worldwide supplier for that thing. If your site just shows what a clever Java programmer you are, no one will care. Or if you spend your energy on "image" and trying to impress people, then you'll trigger the sensitive BS detectors of the audience, and they'll distrust you (if not avoid you entirely!) But if your site is useful, everyone will bookmark it.

I looked around the internet and found that there were no webpages at all for Amateur Science or Tesla coil building. (this was 1994) I complained about this for awhile, but then I realized something. There must be hundreds of other people out there looking for the same sorts of webpage I wanted to find. If I was writing webpages instead of complaining, other people would even now be hitting my pages while searching, and I could develop an audience.

Therefore, I decided to nominate myself as the central internet clearing- house for Amateur Science and for Tesla coils. I was subscribed at the time to the USA-TESLA discussion group, and also regularly read sci.physics newsgroup. I started saving the really interesting messages and putting them on my pages for the rest of the world to find.

2. While surfing, stay aware of your own desires, and write them down. Get inside the heads of other people: assume that there are lots of others just like you on internet, and if you are wishing that there was a good website for XXXXXX, then you've probably just discovered an idea for a popular website.

For example, while on newsgroups I was pissed about the constant flamewars between all the gigantic, fragile egos. I wished there were some interesting discussion groups where flaming was prohibited. And I wished that people on alt.sci.physics.new-theories actually did experiments, rather than arguing endlessly about untested theories. My internet- provider offers an email list service, so it was possible for me to START a discussion list. I became the provider for discussion groups for Weird Science ([FREENRG-L](#)), science museum staff ([WEBHEAD-L](#)), and others. I also slowly typed in all sorts of useful files for other people to find. I'm a frustrated writer. In the non-web world I had never managed to get an article so cleaned up that I would want to offer it to a magazine. On internet things were different. I could type the first draft of many articles onto my website, then go back later and clean them up. I could even put MAILTO buttons on the articles, get comments from passersby, then fix what other people pointed out! This got to be a habit, and sucked me into writing huge amounts of stuff. This draws people to my site. Therefore, my third secret to generating content and attracting high hit-count is:

3. Make your website be your filing cabinet. If you have little projects underway, put them on your website while working on them. Reject the paper-publishing traditions of polishing an article to perfection before publication. **DO NOT ELEVATE IMAGE OVER CONTENT.** (Perhaps even keep yourself honest by cultivating a deep revulsion for "image.") Instead, let all your flaws hang out, and type things directly into your site in rough draft form (label them UNDER CONSTRUCTION if you really must).

Expunge the fear of embarrassment from your life, and instead practice making foolish mistakes in front of thousands of strangers. Stop using your PC to store files, instead use your website as your main storage. Let people poke through your filing cabinet. It will contain far more than a perfectly polished website does.

You'll always be adding more stuff, which will make your audience come back again and again to see what's new. It will also give you "external ambition," because you'll start getting mail from people who say things like "when are you going to finish your article about smoke rings." ;)

Once you have some content, there are other things you can do to "spread a net" and catch more hits. There are conventional tricks like submitting your page to various search engines. But once you are "out there" you should constantly test how searches are finding you.

4. Maintain a "link farm" of other pages similar to your own. Whenever you find another page to add, email the owner of that page to tell them about it. Don't add cool websites to your browser's "favorites" menu, instead add them to your webpage.

This one is critical for creating a huge web-presence. First, if the other page-owners know you've linked them, they might add your site to their own links. If they haven't seen your pages before, at least you've attracted a new user. Secondly, after a number of sites all link to each other, they form a "community", and when one page catches a new user, that user can easily find all the other pages too. Third, if any pages in the "community" become high in the search engine rankings, your ranking will also increase. And even if you're the only one who maintains a links collection, and even if nobody else links to you, this still will attract lots of people to your "portal" site. Don't forget: if you find your "favorites menu" useful, then others will too, so put it on the web. Web users would rather browse a list of links than to run web searches, so your site will become popular with everyone interested in your subject. Think: would you rather have a librarian on call who can deliver any book you ask for, or would you rather wander in a library? Most prefer wandering the library, because neither you nor your super-searcher- librarian knows which keywords will find the best stuff!

5. Every time you add a separate webpage, submit it to Google's [ADD URL](#) page. Other good places are [Altavista's](#) add-URL page. Another is the Mozilla Open Directory Project, [dmoz.org](#) and [Yahoo](#). These sites share their data with other link archives, so once you get into one of them, your links end up in many others.

6. NEVER EVER move one single html file or change an URL. Don't you hate it when you click on a link and it says "404 file not found"? Well, I've been here since 1994, and all the links to my site still work!

Hitcount grows slowly as others link to you, and as search engine spiders gradually catalog your whole site. Don't start over from square one by doing something stupid. I've seen people move their entire site to a new provider, yet only leave a forwarding link on their former top page. VERY stupid. Even big companies do this! Are they trying to hide, so users cannot find them? As far as search engines are concerned, their site has disappeared without a trace. All the search engine links will say "404 not found." It will take months for all the different spiders to index their new site's location. During those months, people will think that the site has met it's demise, and will stop clicking on any links that the search engine turns up, even if those links go to the new location. PS, if your site is maintained by another person and you catch them changing the URLs without maintaining the old URLs for many years, then they are completely incompetent and you should ditch them ASAP.

Another problem: people like to link to your "subpages", not to your top page. If you move your site, you'd better replace every single html file on your old site with a small page linking to the

new location of that page, and then maintain that skeletal site for a year or three. If you don't, then people with links to the "good stuff" inside your site will see those links go bad, and they will delete them. You could lose the majority of your site's users. You'll only be left with the non-serious people who link to the "splash page" at the top of your old site. Very often I'll browse somebody's "amateur science" links and will find that all the links on the page are bad. All except the ones that point to MY pages. :)

Wait a second. Forget everything that I just said. Keep moving your site a few times per year, and only leave a forwarding address at the top page of your old site. As long as you make all the links to your site become "404 not found", then everyone will delete the links to you, and they'll only be left with links... to ME!

## OTHER HINTS:

7. Use "meta" tags. Do it like this. Search Altavista and Google for pages like yours. Think of lots of keywords, and see what's out there. Did you get lots of hits on your own pages? If not, then there's something wrong. Your own pages don't contain the keywords YOU YOURSELF would use while looking for your type of page. Fix this by adding a "keywords" tag to the head section of your various webpages:

```
< meta http-equiv="keywords" content="amateur,science,physics">
```

8. Always add a link to the top of all of your pages which links back to your main site.

If someone uses a search-engine and hits a deep subpage on your site, they will have no clue that the rest of your site exists unless you provide links! Also, other site-owners may link to subpages on your site. If one of your files gets lots of business from some other site, that file had better have clear links to your site. If it does not, then those users may entirely miss the fact that they are reading just one file on your much larger site.

9. View your site using a 28K modem and with graphics turned off, then redesign it so it's still useful.

If you drive away modem-users who have graphics turned off for speed, or people who are using LYNX, or if you drive away blind people who are using text-to-speech screen readers, then your priorities are crazy. Use "alt" tags on images, and "summary" to tables, and provide text links that duplicate all your Image Maps, etc. I say more about this on my [WEBPAGE MISTAKES](#) page. Stay compatible with minimal browsers like Opera, don't become a "Flash bigot." You're trying to get MORE users.

## 10. Maintain a "WHAT'S NEW" page.

This will let your repeat users immediately find the stuff they haven't seen before. Without a "what's new" page, your site may seem exactly the same to everyone who visits, even though you're adding huge amounts to some far corner of your site.

## 11. Avoid javascript menus, frames, flash navigation, or any other navigation method other than dead-simple HTML.

Pure HTML navigation links make your page extremely friendly to vision-disabled internet users. But far more important: fancy menu techniques are unreadable by google and any other search-engine spiders. Search engines are basically the same as the vision disabled. Google is a blind user. They can only "see" html, and many cannot even handle Frames well. So, if your site navigation links are all part of a Flash program, then all the sub-pages in your site will never appear on any Google search results! (Remember rule number one above: resist the temptation to use fancy stuff. The fancy stuff will hurt you. Fancy stuff is a newbie mistake. )

## 12. Use absolute links.

E.g., on your own pages, don't link to "sci.html", link to "http://www.yoursite.com/~user/sci.html". Why? Because people like to copy good webpages, and if all the links on their stolen copy of your pages actually point back to your original site, then the stolen copies of your pages will send people back to your REAL pages and not to other parts of the copy. I've been doing webpages since 1994, and I've seen LOTS of copied fragments of my pages in other places. But I always smile, because all of the links to my original pages remain in the copy, so these copies just route traffic back to me, and serve as advertisements for my original site!

## 13. KEEP CONTENT KING! And keep ease-of-use near the top of the list. Look at rule #1 again. Don't let a pursuit of "image" slowly destroy your site.

I constantly notice good sites that have slowly gone to hell because someone is being paid to make them look polished, as if they were an expensive magazine... and the designerly features interfere terribly with navigation. Those page owners have it backwards: image is nothing, ease of navigation is everything, and the need for useful content outranks both. Those page owners also have little respect for their audience; thinking that nobody notices attempts to manipulate them with shallow facades. In your organization, can the author of an article say "this aesthetic feature slows people down slightly, get rid of it" and the art department jumps to make changes? If not, then the wrong people are in charge, and the way is open for creeping corruption of facade over function.

14. Provide a guestbook. Let people read it. This isn't just for your ego. It provides another interesting file for your audience to read, and you didn't have to write it yourself.

15. Mutate your guestbook! Look at my "report unusual phenomena" page, and "science fair archives". These are simple guestbooks, but altered so that passersby can type in interesting things, and others can read them. Even if there were no other things on my site, just these pages alone would be worth an occasional visit. It's like a no-cost mini-newsgroup.

16. Troll the "awards" sites, submit your own page for consideration. If you see a page which has multiple awards, use it as a reference for where to find awards sites! [My AWARDS page](#), for example.

17. Become a heavy user of your own website. Try constantly to see your site as an outsider; try to get into the heads of strangers. Note how you cruise the WWW yourself, then modify your site so it is easy for YOU to cruise.

For example, most people (including me) rarely use the scroll-bar. Therefore, if they don't see good stuff on the screen instantly, then they will go elsewhere. If the good stuff on your website is not right up at the top of the screen, most people will never see it. See my own top page. I put the big four subsections right in your face, using huge font size. Yes, most of my other pages are these great huge things which absolutely require lots of scrolling. However, nearly all of them have a "shortcuts" list which acts like a top page, letting people jump down to all the sections, and this "shortcuts" list is right in your face, right at the top of the page. I suck you in first, and only THEN force you to get off of your butt and use the darned scroll bar.

Another example: stop maintaining a "favorites" menu on your browser, and instead always put interesting URLs on your website. Make your website become your only "favorite links" menu. Others will find this useful... and also you'll learn to see your mistakes because you'll constantly be looking at your own site and comparing it to others. Keep tweeking a page site to make it easier for you and your friends. And once you've learned the tricks, keep updating all the other pages in your site.

18. Start early. If you had started a few weeks ago, you might be getting lots of hits by now. If you had started last year, your site might now be a major player on the web. WWW is still growing fast, don't put it off, jump in quick. Don't polish your site before publishing. The time it takes to perfect your site could be better used for hooking in more users and getting an early start on the geometrical growth of hitcount. If you create a site a month early, several years down the road that month could mean an increase of hundreds of thousands of hits per year. If you are a big

company that moves slow, a year of delay can move you from the top-ten websites and place you with the hundreds of late-comer wannabes.

DOES THIS STUFF WORK? Well, here are some google keywords which, when last I checked, give me top rank or almost-top in the search results:

- [Amateur](#)
- [microwave](#)
- [Cool Science](#)
- [Flamer](#)
- [Antigrav](#)
- [VandeGraaff](#)
- [Tesla coil](#)
- [Static Electricity](#)

Pretty cool, eh?

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### **Q: HOW'D YOU MANAGE TO CREATE SO MUCH STUFF?**

A: First answer: I have a very understanding wife! :)

[UPDATE 9/2000: Not any more. Now divorced.]

Second answer is, I started early, in 1994. Them squirrels, how they do accumulate detrius. Or maybe its crows. They like shiny objects.

Third answer: whenever somebody asks me for something and I have time to supply it, I make a strange assumption. I assume that hundreds of other people are wanting that thing too, but didn't have the ambition to email me and ask. Therefor I copy it onto my website, rather than hiding it uselessly away.

Fourth answer: I don't live in Windows 95. Not win3.1 either. Not msdos. I live on the internet, in a unix shell account which is aliased to look like msdos. If I should type a little textfile during other activities on the computer, it only takes me ten seconds to put it on my webpage. Unlike most people, for me the barriers against publishing on internet have entirely evaporated.

Fifth answer: I took a typing course in high school. Best investment I ever made, almost as important as learning to read. Now after years of programming, I can type REALLY FAST. If



ever I think of something interesting, I can jot down a couple of pages about it and link it to my website.

Sixth answer: I have no shame. Would you let the entire internet have read-rights to your hard drive? And then make some menus, so they could look at all your private stuff? That's what SCI HOBBYIST is, it's my c: drive. I'm sure that many people have all sorts of fascinating junk on their systems as well, or in their filing cabinets. Difference is, only they themselves can access it. Most people prefer to hide their flaws, I suspect. I want to flaunt mine! The withering spotlight of honesty keeps the evil insanity of the self-lie at bay.

Seventh answer: I don't necessarily create it. Much of it I simply notice and write down. If you adopt a religion which requires that you look at yourself without blinders on, then you'll discover that it's a monumental task to take your habitual blinders off. Once you succeed, you'll find that the entire world looks very different. Interesting things will spring out at you which only you can see. Anyone could see them, but the vast majority of humans are so afraid of looking at the rotten crap that they've done throughout their lives, that they desperately maintain the blinders. The blinders are like painkillers which eliminate any negative viewpoints and let people feel good about themselves regardless of their past actions. Unfortunately these same blinders make most of the real world become invisible to them. In any scientist this is a real shame. It ruins our powers of observation and cuts us off from our fundamental creative source. So, gather your stamina and gaze unblinking into your own personal hell, and on the other side you might perceive the outer world as it really is. Then stop talking philosophy, and just tell others what you see.

Last: if you never have to wait for a Windows application to load, writing a quick note will become a positive experience, and also you will have some extra free time for other things. :)

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Q: WHERE DID YOU *GET* THIS JUNK?

A: It's a secret. Here it is. Always tell the truth, and, more importantly, never lie. Even to yourself. What the heck does this have to do with anything? Well, once I realized that I was defending my ego by constantly telling myself a thousand subtle lies, I was able to stop. When I did, all this stuff started boiling up out of my unconscious and out onto my website. It must have been in there all along. It just wouldn't come out and play. Maybe it was embarrassed about all the lying.

PS I strongly suspect that [Richard Feynman](#) accidentally stumbled across this same technique. It's a source of creativity like you wouldn't believe! It's a wellspring of amazing ideas which seem to arise fully formed, without you doing the work to assemble them.

This sort of extreme creativity seems to be an inbuilt human feature, but unfortunately a "normal

life" is filled with millions of tiny dishonesties which acts as a "plug" that halts the creative flow almost entirely. If you stop lying to yourself totally; stop distorting reality in your efforts to have a positive self image, then you damage your own psychological defenses. Those defenses block the Monsters from the ID. They keep your personal horrors at bay. But they do far more than that: they also cut you off from the prime creative source, your subconscious, and block your flow of ideas almost entirely. If you choose the path of safety and never look deep within, then you may retain the ability to do really well on exams, and to be an expert puzzle-solver. But you'll never come up with major new ideas.

Shatter your mental plug and you're on your way to an amazing life. However, if you do remove your psychological defenses, you force yourself onto a path that leads to both genius or insanity. Do you REALLY want to see yourself as you really are? No fuzzy lens at all? Some people would rather not go there. And that's one reason why insanity is so close to genius. Removing your defense mechanisms is far more serious than taking a powerful drug that gives you honest vision. The effects of drugs eventually wear off!

<http://amasci.com/faq.html>

Created and maintained by [Bill Beaty](#). Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

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<http://amasci.com/sitemap.html>

Created and maintained by [Bill Beaty](#). Mail me at: [billb@amasci.com](mailto:billb@amasci.com).



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# Science Hobbyist

## COMMENT BOOK

Thank you for visiting SCIENCE HOBBYIST. We would love it if you would add [your comments](#) to our comment book.

And don't miss the [WEB FORUM \(BBS\)](#) for ongoing hobbyist discussions.

---

**Hi Bill;**

I seldom look at websites as I have done with yours. The information on transistors <http://amasci.com/amateur/transis.html> was excellent. More often than not, teachers and students really do not understand the concepts just the results, and I have seen this on several occasions. Perhaps the Babylonians were right all along. Lets convey the concepts first and then link them to the mathematical solutions, What an IDEA!!. An article on an inductor and rectifier would be nice. Anyway, keep the great work.

[Christopher Hanson](#)

Montpelier, VT USA - Sunday, October 02, 2005 at 07:10:47 (PDT)

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<http://amasci.com/traf/> I came to some of the same conclusions (though without trying to figure out why!), simply because my car gets MUCH better gas mileage when I drive a steady pace. Also, less wear & tear on the car, and reduced mental stress on me.

Ever since I was kid (in the early 70's), I have been riding a track bicycle (long before the bike messengers made it cool); with only 1 gear, no coasting, and most importantly -- no brake -- I became quite obvious that

**maintaining a steady pace was most efficient.**

**Thanks for creating a great website!**

[J.Lee](#)

bratenahl, oh USA - Friday, September 30, 2005 at 09:42:44 (PDT)

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**I just wanted to thank you on your comments regarding FPD, Flaming Personality Disorder. I stumbled accross this web sight, while doing a search for pathological lying. The information was excellent, very informative, and gave me the tools deal.**

**My ex-boyfriend has FPD. I broke up with him this past Monday. I broke the promise to myself to not get into any heated discussion, and to just break it off.**

**In the beginning, I did just that, and just said, "this relationship is just too intense" but as he calmy made accusations as to why, (its another man, isn't it, blah blah) I told him the truth.**

**"No, its not another man, its your lying" He started to breath really really hard, and he said he had to go, and hung up. Typical. Also typical, is that he denies reacting this way.**

**I call him back, left a message, explaining, "case in point, here we go, this is what you do. And regarding the lying, you dont have to defend yourself. I beleive that you beleive you words.**

**With this, he calls back. I guess he got ready for his telling his side. And here is how you deal with a Flamer. You just dont respond.**

**He called me back with all sorts of projections, of my lying, when I did this and when I did that, blah blah blah, but I just ignored it and said.**

**I beleive you. I believe that you beleive everything you say. And since you**

**are unaware of your own contradictions, and you are not even conscious of your own actions, well then, there is nothing left to talk about. We are at an impasse. Which is good, again, he got distracted, and rushed off the phone, saying he had a client. He didn't.**

**I now, block all his emails, and reprogrammed my phones, for when his calls come in, or a blocked call, it gets routed to the fax machine.**

**So that is how you shut down a flamer. let them disappear, when they run out of arguments. Thats a good sign, that means you've won. And then ignore them at all costs going forward.**

**Our history is this. He usually admits I am right, after some time has passed. Then, the same type of behavior will erupt over something else. But this time, when he comes around, I will not be here. I am glad I saw the argument through to the end, and did not let him tell me, his fabricated reasons for the break up. If I let that happen, then, in his mind, he still has an in.**

**NEVER Again.**

tania wilson

[Hi Tania! Rather than Pathological Lying, this sounds more like the mental stuff called "Borderline Personality Disorder" or BPD. Did you also feel like you were going crazy, or that YOU were the crazy one? BPD people subtly devalue and marginalize any honest information and insights in order to conceal their problem, and to impose their world view on loved ones. Marriage counsellors call this the "crazy making" technique, also "[gaslighting](#)." Some BPD people may constantly lie and distort, but also they seem totally unaware that they're doing this. For more info on BPD, see other [BPD symptoms](#). There are also many [online support groups](#) for spouses of BPD people, and [stories](#) from their loved ones. Good books are [Stop Walking on Eggshells](#) and [I Hate You, Don't Leave Me](#). -billb] USA - Friday, September 30, 2005 at 06:13:46 (PDT)

**Muito bom o site! Tem me ajudado muito!**

**Abraço!**

[cleber](#)

SP BRA - Thursday, September 29, 2005 at 12:56:25 (PDT)

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**Hi I'm a healer:**

**I call the paranormal event miracle healing. I have been practicing and researching the healing for the past 12 years and still can't figure it out. The healing has been successful for 9 out of 10 people with chronic pain, nerve damage. Some say you have the power, the gift, Md say feel the heat, energy healing and so on, I just don't know the answer.**

[Joseph D. Krovich](#)

Camp Hill, PA USA - Thursday, September 29, 2005 at 12:50:43 (PDT)

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**I wrote to AMASCI several months ago and tonite haven't seen my comments. Perhaps my experiment is TOO dangerous to tell others? I'm an older person who ain't crazy for rap music, but notice not me, but others who get a migraine headache from the very low THUD sound those automobile "BOOMERS" make. Now, i'm a sound engineer & i been doing some personal experimentation with that low thud sound with some speakers moving golf balls and objects. I rig the wires to a makeshift radar antenna and directed the soundwaves to the leaves on a tree and the leaves fell to the ground. I tryed it on a bird and the bird fell to the ground DEAD. I aimed it at a stray cat and the cat took off like lightning. Cat never came back. I tryed amplifying it but not too much for fear of burning the transitors and the finals in the circuit board and pointed it at a grocery bag. The bag started to move a few inches and went up in FLAMES. Freak the bejesus out of me. What in Gods name did i create here??? Please post this comment for others to read. I think i stumbled onto something but don't know exactly what i created. I'm using the frequencies in the same range of the LOW thud sound one hears from the "rap music" coming from teenagers boom box in their cars.. Robt**

[Robert Szymanski](#)

Hydesville, CA USA - Monday, September 26, 2005 at 22:03:40 (PDT)

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**It's about time the uk got it's own maglev system.**

**Considering Eric Laithwaite was early pioneer.**

**Greta website**

[Mike](#)

london, uk uk - Monday, September 26, 2005 at 03:09:11 (PDT)

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**I am making a science project for school and I stumbled across the "ULTRA-SIMPLE HOVERCRAFT can lift several adults!" project. I believe this will work, but I'm only 12 and need help from my dad. He says he won't do it unless someone says that this is actually possible, so if anyone had made this, please write!!! my email is [gamer070893\\*\\*\\*\\*@aol.com](mailto:gamer070893****@aol.com) (take away the \*'s), you can send something there and I'll be saved.**

**[ There are many links to photos of hovercrafts that people have built and websites about their projects, some with videos. I've just added [more links](#). This project originally came from The Physics Teacher magazine 1989, see [Human Hockey Puck -billb](#)]**

[John O'Sullivan](#)

Miami, FL USA - Thursday, September 22, 2005 at 17:45:36 (PDT)

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**How are you? I'm studying Human Anatomy at the University today. I saw your sites on the link list at the Girl Genius Yahoo group. Have a nice day.**

[Michael William Andersen](#)

SLC, UT USA - Sunday, September 18, 2005 at 14:46:24 (PDT)

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**The Gravity Capicitor does work! Check out this link with video!**

<http://jlnlabs.imars.com/lifters/act/html/sfptv1.htm>

[Nick](#)

**[Eh, that's a poor test. High voltage applied to sharp-edged foil will create**

electric wind thrust, just like those "lifter" devices. For a fair test, the sharp foil edges must be embedded in solid wax or plastic. Or perhaps just enclose the whole thing in a metallized plastic shield-bag. If the thrust then decreases greatly, this shows how much of it was caused by ion wind thrust. -billb]  
VA BEACH, VA USA - Friday, September 16, 2005 at 14:50:47 (PDT)

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**I thought you might like to see this recently granted patent I stumbled over in my weekly trawl for daft patents . . .**

**<http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO1&Sect2=HITOFF&OS=PN/6920032&RS=PN/6920032>**

**I e-mailed a few science mags at the time, but no-one seemed interested in the fact that the patent office has effectively granted a patent on a perpetual motion machine ( or at least the energy source for one )**

**What do you think ?**

**Best regards,**

**Martin G**

**www.ohpurleese.com**

**specifically :**

**[http://www.ohpurleese.com/month\\_archive\\_21.htm#20JULY05](http://www.ohpurleese.com/month_archive_21.htm#20JULY05)**

**[martin g](#)**

**london, UK - Friday, September 16, 2005 at 07:28:38 (PDT)**

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**The present scientific world is based upon order or at least the ability to verify experiments but if idiot savants exist and I believe (not proved)they**

**do, then our world cannot exist as we feel, believe, assume. etc does exist. This body seems to be the nothing from which everything springs and yet it is nothing.**

[Allen](#)

Prince Rupert, BC Canada - Thursday, September 15, 2005 at 16:44:39 (PDT)

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**Bill, you have been a tremendous influence in my development. It's been a pleasure reading your work over the years. Thank you!**

[Thomas Amabisca](#)

Miami Beach, FL USA - Sunday, September 11, 2005 at 19:55:30 (PDT)

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**Unfortunately, Katarina, it's all wrong.**

**Very wrong. Bill doesn't know what he is talking about.**

**[Prove your assertion, don't just use meaningless bad-mouthing. You don't point out even a single error in my article? Also, why do you remain anonymous, rather than using your real name? And why do you also sent me private email full of personal insults, and containing threats, rather than just posting it here? These are NOT the actions of a person of integrity. -billb]**

[Philippe](#)

Brussels, Belgium - Saturday, September 10, 2005 at 13:47:17 (PDT)

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**Nice site. But your 'how a bipolar transistor works' is wrong from the the beginning till the end. Better not read it. [Why should anyone believe anything that comes from anonymous people? If my article is so bad, you could construct a devastating argument by simply listing the worst errors. It's very telling that you don't do this, but you instead use derogatory emotional language. And you claim privately to be an electrical engineer. I certainly doubt that! Let's see some proof. School and year of degree. (As expected, I received no response to my email messages.) -billb]**

[Philippe](#)

Brussels, Belgium - Saturday, September 10, 2005 at 13:16:10 (PDT)

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**Sir,I visited ur site a few days ago and I must say its very different from**

**other information sites. You really make concepts easier to understand. I really appreciate ur gesture. I had a silly question to ask.**

**I never really understood the motion of electrons in an ac wave. now in a dc wave (well not wave exactly) charges flow in one direction, but what happens in ac wave? moreover a capacitor provides very high resistance to dc, but acts like a short in case of ac.**

**Also why direction of current in any circuit is always towards ground. (the ground is generally the negative terminal of the battery, but if there are more than one power supplies, than the most negative one is considered as ground, is it???)**

**I would really appreciate if u could clarify these doubts.**

**thank you.**

**my email ID is manali\_bhutiyani hotmail com**

**Manali Bhutiyani**

**Pune, Maharashtra India - Thursday, September 08, 2005 at 22:07:45 (PDT)**

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**Any Idea where I can order some science project materials. I stay outside USA. Also, I am making Flash games/movies - and like to have ideas from you on science (especially those in your weird pages) related Flash games. [Lists of science project suppliers are linked on my projects page, or go to <http://amasci.com/supliers.html> -billb]**

**[Sarah](#)**

**Msia - Saturday, September 03, 2005 at 23:37:32 (PDT)**

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**re:- <http://www.eskimo.com/~billb/weird/microexp.html>**

**I have just finished reading the above page and found it fascinating as well as destroying some of the warnings of doom that abound, in particular the**



**superheating of water.**

**I had noticed that the superheating rarely occurred when I was using older mugs, eg with a few worn spots to heat my instant coffee. I have found that by tapping lightly on the base of the mug with the spoon will bit by bit "exhaust" the superheating effect. Also, none of the warnings say how fierce this effect can be - I would lose over half the contents of the mug if I ws not careful. It was only chance I was not holding it at the time.**

**Next**

**This may not be th appropriate place for my next question which is a "Why is this so" type.**

**About 25 years ago, in a large department store which had a very large display of microwaves for sale, I noticed that all the doors were hinged on the left side (as you face it) with the control panel down the right hand side. Out of curiosity, I have been looking ever since for a door opening the other way. So far, I have seen ONE(1) with a lift up door and even that had the controls on the right hand side.**

**Is this a limitation or restriction cause by the construction and/or operation of the micro-wave generator?**

**I have put this question to several science type forums but had not yet had a serious reply. I realise it is not very important but I am a curious sod and keep hoping**

**[ I bet they're designed for right-handers. Most people would carry a bowl or plate in their left hand, then use their right hand to punch in the numbers. If the door opened the other way, it would block the keyboard. If correct, then a left-handers' microwave oven would have the door opening the other way, and have the keyboard on the other side. -billb]**

**Greg**

**Darwin, Australia - Friday, September 02, 2005 at 21:29:52 (PDT)**

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**Hi,**

**Great resource, I arrived from google after searching for anti-gravity**

**resources, and spent some time surfing!**

**Have you seen a Magazine in the states called New Scientist? I don't know if it is out in the states, but it's big over here...as big as you get being a science magazine ;)**

**That have a great section called "the last word" I won't put the URL in case you think I'm a spammer... but it's:**

**[http://www DOT newscientist DOT com/lastword.ns](http://www.DOTnewscientist.DOTcom/lastword.ns)**

**Keep up the good work!**

**Richard. (web designer)**

**[Richard Ells](#)**

**Maidstone, Kent UK - Thursday, September 01, 2005 at 05:51:16 (PDT)**

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**Greatest site! :o)**

**What I liked the most: Weird Research, Anomalous Physics!**

**In germany we have very few info on stuff like this and only one tv-channel that gives a programm once in a while...**

**So, thanks again and keep the cool site alive! :o)**

**Yours,**

**Norbert ([www.uni-bremen.de](http://www.uni-bremen.de))**

**University of Bremen/Germany**

**Bremen, BE Germany - Thursday, September 01, 2005 at 04:50:50 (PDT)**

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**What an unbelievably fascinating, well-written site! I stumbled on this when a friend asked me if the shock she received from a 120V wire could've killed her, and I got totally sucked into the [FAQ](#). Great work.**

**[Mitch](#)**

**Needham, ma USA - Thursday, August 25, 2005 at 22:26:17 (PDT)**

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**I want to sent a remarkable example of modern quote! .T....**

**One Salad diet For Me, Dr.Atkins For Mankind.(10w.) .T....**

**(Greenback(one dollar) means diet and money) .T.... (Tribute to Neil Armstrong).T....(US-Pilot) .T.... by Ralf Ratenberg(respectfully quoted) .T.... (Comment for Reality: Say Saladdiet read Dr.Atkins)**

[Ralf Ratenberg](#)

New York, New York USA - Tuesday, August 23, 2005 at 04:37:00 (PDT)

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**Check out this web site.**

[don Briddell](#)

USA - Saturday, August 13, 2005 at 12:17:35 (PDT)

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**Sir or Madam,**

**I would like to draw your attention to a recently published web page, <http://www.geocities.com/joeiii63> which shows that varying the inertial mass (read as the apparent mass) in a closed system will produce the exact same result that would occur if the strength of the gravitational field affecting it was alternated between weak and strong.**

[H. Joseph Schiess III](#)

Orlando, FL USA - Wednesday, August 03, 2005 at 11:05:55 (PDT)

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**I saw your "bogglers" explanation of why ariplane wings generate lift in Discover magazine, and hope you never design an airplane to carry you. Your explanation of lift goes against 100 years of flight experience and airfoil design. [ LOL. Should we trust you, or should we trust [NASA](#) who agrees with me, and an increasing number of aerodynamicists who see the light. See the several news articles about the controversy at [Airfoil Misconception: links](#) Also check out links to Drs. Anderson and Eberhardt's page, J. Denker's page SEE HOW IT FLYS, Jeff Raskin's page on Coanda effect, and Dr. Klaus Weltner's papers that lit the fire. - billb] An airfoil flies upside down by flying at a greatly increased angle of attack, thereby making the air on top follow an even longer path than the air going underneath the wing. [Ah, you believe in the "longer path**

fallacy," an error which is [specifically debunked at NASA's flight education page](#). Wings fly because the air moving over the top is faster, NOT because the air moving over the top takes a longer path. Is this confusing? Yes, but only if you've bought into the incorrect explanations found in most grade-school textbooks and pilot training manuals. Wrong explanations are like a disease. The size of this infestation is stunning. Be careful: science is not determined by voting, and if one small voice points out "and yet it moves," that voice can defeat the combined voices of thousands of known authorities if those authorities are wrong. -billb] The downward deflection of air only provides lift within a few feet of the ground, hence it's aviation name of "ground effect". [You've got it backwards. A wing in ground effect DOESN'T deflect air downwards, instead the upwash and downwash are equal, and only tiny wake effects are produced. Most textbooks wrongly describe a two-dimensional airfoil in a 2D wind tunnel where the wing is always in ground effect no matter the altitude. Only during higher flight of three-dimensional wings does the wing begin to produce a significant vortex wake which entrains descending air, where the upwash before the wing is small compared to the downwash behind. In ground-effect the wing interacts directly with the Earth, behaving somewhat as a half-venturi. In high level flight the wing doesn't interact with the earth, but instead interacts with the air. It deflects huge masses of air downwards. -billb] The vast majority of lift is caused by the air going over the top of wing creating a vacuum on the top. [ True. That effect is part of both the Bernoulli and the Newton explanations. Those explanations are correct, it's the "[longer path explanation](#)" which is wrong. -billb] If you don't believe this come fly with me and watch the upper skin deflect upward between it's fasteners to the ribs on the top of the wing in flight. You might want to do a little more "research in airfoils and flight before answering such questions.

[Earl Jantzi](#)

Zion, IL USA - Monday, August 01, 2005 at 18:25:21 (PDT)

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Hey there...thanks alot for the help we got...i got to learn how elkectricity

**and current definitions are bad!....whoo hoo...go sicence....go my favorite physics teacher...Paul Bartkovsky!...aka Mrs. B!!..Riverside High School**  
[CJ Martini](#)

Moosic(Scranton), PA USA - Wednesday, May 25, 2005 at 09:01:01 (PDT)

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**love your thoughts. I found my own solution to the puzzel. I moved to the mtns**

[pat](#)

Creston, nc USA - Monday, May 23, 2005 at 19:04:18 (PDT)

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**Hi, Very interesting discussion on your website. I see from the pictures that the air does not meet back at the trailing edge of an airfoil. The upper curved part of the air, in fact, obtains greater speed and "beats" the underneath air. So, I am confused how this "disproves Bernoulli." [ **Who says that this disproves Bernoulli? Seriously. Where on my website do I say that Bernoulli is wrong or needs "disproving?" Have you been reading some other website? As I clearly state on the grade-school misconception page, the Newton explanation and the Bernoulli explanation are equivalent. They are two ways to describe a complicated phenomenon. You need to say which article you're talking about. Perhaps you're reading articles on some other website rather than mine? -billb**] He says faster air has less pressure, right? And the curved, upper air iss faster...**

[Nicole Evans](#)

Jacksonville, FL USA - Thursday, May 19, 2005 at 11:25:36 (PDT)

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**My husband's presence around certain types of equipment causes many problems. Computers and cell phones "act up" or crash whenever he is near them. Strange things happen to these types of equipment, like LCD screens being upside down or backwards or blanked out completely. Cell phones dial incorrectly and computers don't follow the commands correctly. Computers crash and lose saved information. Too many other strange things to mention but you get the idea! Any suggestions on how to harness or block whatever his body is emitting??!! [All my info is on the page about [Doorknob sparks and electric humans](#) -billb]**

[Yvonne Lauer](#)

Waterford, WI USA - Thursday, July 28, 2005 at 11:36:35 (PDT)

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**Here's an oldie but a goodie:**

**<http://www.personalmd.com/news/a1996122603.shtml>**

**This is right up there with the "non-tox" Malathion chugging demonstration which I've heard has been done by some of our more "progressive" professors.**

**We need more mainstream science like this . . .**

**marcus \*-at-\* colisp \*-dot-\* commercial**

Marcus

Area, 51 USA - Wednesday, July 27, 2005 at 08:57:07 (PDT)

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**Hi- I am in the SF Bay area and have recently been diagnosed with high electrolytes. I am a practising psychic and have often had "issues" with electrical equipment, esp. recording equipment and computers. Have you ever heard of any correlation between high electrolytes and psychic ability.?? I understand that you need to replenish electrolytes after psychic work which I have never done (probably never needed to). I have the sense I shouldn't mess with trying to lower electrolytes as it may be "normal" for me.**

**Any info is appreciated. There's very little out there on this.**

**@ @ @ @ andrea@pleiadianvisions@com @ @ @ @**

[Andrea Morese](#)

San Jose, CA USA - Friday, July 22, 2005 at 09:41:41 (PDT)

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**Love the site.**

**Just one thing, the bit about leaving coins at a level where children can find is a cute idea. But aren't coins a real choking hazard for little kids?**

**[ GOOD POINT! The coins are only worth something to kids above a certain age: kids who know what coins are, and who won't stick them in their mouths. Obviously we should only put them in non-babyproof areas where other swallow-able objects are already present, and where bored 6yr olds would explore. Never leave coins in a babyproofed home, or where lots of toddlers are around. -billb]**

[Ed H](#)

Sloatsburg, NY USA - Thursday, July 21, 2005 at 13:26:59 (PDT)

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**Why with all of the experimenting being done by many extremely competent individuals that no useful power that can run motors or power lights been have been produced.**

**It would be wonderful to be able to build some of the marvelous equipment and it be a source of useable power. I**

**would like to power a set of pumps and lights for a greenhouse complex but how do you get power from a Tesla Coil or one of the other power Induction devices. I would like to build it myself. The Tesla Turbine would seem to be one of the most usable for power generation and pumping. [See my FAQ about free energy devices -billb]**

[Ernest Fields](#)

Judsonia, AR USA - Wednesday, July 20, 2005 at 16:34:53 (PDT)

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**This just might prove to be the long awaited true "Unification Theory!" The paper titled "The Three Elements" is published on the following site: nuphysics4u.com CHECK IT OUT!**

[R. Roberts](#)

Eastanollee, Ga USA - Friday, July 15, 2005 at 17:43:14 (PDT)

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**I just wanted to say 'thanks for existing'. Here I am, in Novi Sad, Serbia, amased by your generosity to give others your knowlidge. Actually, i've just enrolled in electronics faculty and i must admit not understanding tranzistors, well that is until I've read this article.**

**(if you like you can send me an email on yahoo - my name's in the data base there)**

[Katarina Zvejin](#)

Novi Sad, Serbia & Montenegro - Wednesday, July 13, 2005 at 13:22:00 (PDT)

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**Add ball-bearings to the axle assembly of the wonder wheel!**

**Good luck in your work.**

[Denis](#)

NY, NY USA - Tuesday, July 12, 2005 at 04:39:58 (PDT)

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**Hola Bill soy Raul desde Argentina. Soy un coiler desde hace mucho tiempo ya. Te quiero felicitar por tu pagina web ya que gracias a ella logre contruir mi primera bobina de tesla, en esta pagina tienes mucha informacion util. Muchas gracias.**

**raulcb400f hotmail com:::**

[Raul Ordoñez](#)

Cosquin, cordoba Argetina - Monday, July 11, 2005 at 10:23:17 (PDT)

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**Can anyone help? I have a very enthusiastic 9 year old son who is mad keen on science, engineering and technology. He has no interest in most things his classmates like but instead devours books on how things work from morning to night. I am hopeless on the subject and have to refer him to his grandfather for any intelligent conversation on the subject!**

**However, I am having difficulty trying to find any kind of science club in the UK for kids / teenagers that he can get involved in - does anyone know of anything suitable in the UK or even any other websites I can try?**

**Many thanks**

**Philip**

**philipmg.humphreys virgin net**

[Philip Humphreys](#)

Marlborough, Wiltshire England - Sunday, July 10, 2005 at 03:29:51 (PDT)

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**For science projects related to Solar Energy your visitors may be interested**



in <http://www.makeitsolar.com/>

**Thanks for the wealth of information you provide!**

[Edward](#)

Southborough, MA USA - Monday, July 04, 2005 at 07:15:33 (PDT)

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**I was curious if anybody has tried to conduct the Edward Leedskalnin magnetic experiments. Do the experiments he wrote about actually work?**

[Serg](#)

VA, LA USA - Wednesday, June 29, 2005 at 16:26:34 (PDT)

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**Hello Great site, I would like to invite All You TESLA fans to view my Nikola Tesla Tribute Video/song.**

**here is the link for those interested:**

**<http://www.paulhone.com/song25.html>**

**thanks wonderfull site.**

**Paul Hone**

[Paul Hone](#)

Reseda, CA USA - Tuesday, June 28, 2005 at 12:08:36 (PDT)

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**I like this site, thanks!**

Devil

USA - Tuesday, June 28, 2005 at 10:29:09 (PDT)

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**Great website!!**

Matthew Turnbaugh

Newmarket, UK - Saturday, June 25, 2005 at 08:30:16 (PDT)

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**Really appreciate your content, yes; the presenation is retro-cool - Ive always valued content over gloss/spin.**

**(I apologise for being a citizen of a country with a spinmeister for presi. sorry prime minister/crap slinger.)**

[Joe Anderson](#)

UK - Tuesday, June 21, 2005 at 13:30:59 (PDT)

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**Brilliant Bill! Glad to know that you are there!! Keep it up!**

[Darryl Burnside](#)

Perth , WA Australia - Sunday, June 19, 2005 at 03:49:28 (PDT)

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**i've been trying to explain traffic wave theory to my boyfriend for years but was unable to articulate it properly. now i'm just going to take bits of this and show it to him. thanks**

[Deborah Kelly](#)

USA - Thursday, June 16, 2005 at 05:27:42 (PDT)

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**I need help! I am trying to find materials that, if worn, will minimize the effects of static/imbalanced electricity. I am doing some research about the relationship of static electricity and animals. Your comments/direction is greatly appreciated. Thanks!**

[Justine Blair](#)

saratoga springs, ny USA - Wednesday, June 15, 2005 at 19:46:44 (PDT)

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**Are there any highschool or college students or anyone who is just smart in physics, engineering, and science in general who would be interested in helping me design and build an antrigravity starship? I would require that you agree not to discuss the research of design with anyone outside our design and build group however. I can be reached at surf\_lightning hotmail com**

Stealthminer

USA - Wednesday, June 15, 2005 at 07:36:05 (PDT)

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**stuff.html is freaking brilliant. Or perhaps feeping brilliant, but that's beside the point- my engineering knowledge is essentially limited to such a point that I am unable to follow the crackpot theories.**

**On the other hand, if you haven't already, I might reccomend picking up "Science and Health" by Mary Baker Eddy. It's the fundamental text for Christian Science, and it's nuts and wrong- but true nonetheless. Like many religions, it presents good material and then proceeds to draw**

**exactly the opposite conclusion introspective sanity or healthy madness might suggest. It's also probably safe to skip the first few chapters. Few deliberately left undefined.**

**Ever checked out the Principia ( <http://principiadiscordia.com/> ), the Jargon File ( ) or Organelle ( [http://www.organelle.org/](http://www.catb.org/~esr/jargon/http://www.organelle.org/) )? I offer these deliberately without commentary, as they are all things which are simultaneously full of crap and beauty.**

**Although I guess I'm a tad out of place here. What else is new?**

[Joshua Arafelis](#)

PA USA - Wednesday, June 15, 2005 at 00:53:02 (PDT)

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Bill,

I really appreciate the numerous science articles you've written, as well as the links! Question, though: I can't find your fascinating article about UV, IR, & X-Ray waves and their differences, which I saw only the other day -- help, would like to use it to teach kids about light.

Thanks in advance,

Larry W.

[Larry W.](#)

Washington, D.C. USA - Tuesday, June 14, 2005 at 17:25:34 (PDT)

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**Thank you! this is just what I need for my electronics GCSE - the pieces on how Transistors and Capacitors REALLY work are brilliantly written and explain things perfectly! thank you so much!**

Paul

Cambridge, UK - Saturday, June 11, 2005 at 15:10:46 (PDT)

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**for those of you interested in magLEV trains, i suspect that Halbach arrays will also be of interest:**

**[http://www.magnetricity.com/Articles/Halbach\\_Array.php](http://www.magnetricity.com/Articles/Halbach_Array.php)**

<http://www.skytran.net/press/sciam02.htm>

**and to Bill i have only gratitude, for helping me better understand electricity, and for the hours of edutainment i had in the process :-)**

[Nicolai Sanders](#)

Copenhagen, Denmark - Friday, June 10, 2005 at 07:06:54 (PDT)

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**Bill you have a Nice Website with many Links.**

[Anantha Narayan](#)

Bangalore, Kar India - Thursday, June 09, 2005 at 14:01:30 (PDT)

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**Add ball-bearings to the axle assembly of the wonder wheel.**

[Barry](#)

NH USA - Monday, June 06, 2005 at 10:09:19 (PDT)

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**My house has been humming since august 04 when the kinder-morgan gas company added two new compressors to the trans-colorado pipeline. It can easily be heard 40 miles to the north and 20 miles to the south of my house(thats millions of acres).Local officials won't help, probably because our county makes about 13 million dollars from pipeline leases.State legislators,EPA, no one will help.If they can get away with this in my county, how many other countys across the country are they preying upon. With so many billions of dollars at stake, how many government agencys have been bought out? Officials from kinder-morgan with all there expertice,experience,monitering equipment,and money have only this to say" I don't hear nuthin". Are we suposed to believe they aren't bold face liars and that they are really that incompetent? We are being sold out. Thousands of people are effected in my county alone, all so one company can make more money. What's next?**

[tom](#)

cortez, colo USA - Monday, June 06, 2005 at 07:29:03 (PDT)

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**I have an e- buddy who says it is possable to bend space with a toroidal**

**coil.**

**Who has a large toroidal coil and a laser?**

**Will you run an experiment for me and post the results?**

**respond to johntaylor at hotmail dot com**

[PlayTOE-](#)

Canada - Sunday, June 05, 2005 at 18:46:44 (PDT)

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**Hi! We have a almost a dozen free articles on making handmade paper, including helpful instruction on getting started and more advanced topics for older children. The web site was started by me and my Mom, Mary Reimer, who used papermaking as part of her language arts curriculum as an elementary teacher. Making homemade paper is fun for all ages, from 5 years old and up. So we invite you to check out the web site and download as many articles as you'd like! Sincerely, Heidi Reimer-Epp**

[Heidi](#)

Winnipeg, MB Canada - Thursday, June 02, 2005 at 11:21:47 (PDT)

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**This would seem to be a simple question but there of course are a lot of very particular details that would have to be worked out. Using a relatively new technology, let us say bluetooth for now, couldn't a chip be installed in a car that lets cars surrounding each other communicate so that these so that traffic jams are almost eliminated. Of course, besides the technical aspects of this, what do you think the major social problems be. I vote for control.**

[Mark Adam](#)

Annapolis, MD USA - Thursday, June 02, 2005 at 10:59:42 (PDT)

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**I like the "old school"-design! In my favorites!**

[Mark \(Rechtsanwalt Offenbach\)](#)

Offenbach, Germany - Wednesday, June 01, 2005 at 16:58:42 (PDT)

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**Hey there...thanks alot for the help we got...i got to learn how elkectricity and current definitions are bad!....whoo hoo...go sicence....go my favorite physics teacher...Paul Bartkovsky!...aka Mrs. B!..Riverside High School**

[CJ Martini](#)

Moosic(Scranton), PA USA - Wednesday, May 25, 2005 at 09:01:01 (PDT)

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**love your thoughts. I found my own solution to the puzzel. I moved to the mtns**

[pat](#)

Creston, nc USA - Monday, May 23, 2005 at 19:04:18 (PDT)

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**Hi, Very interesting discussion on your website. I see from the pictures that the air does not meet back at the trailing edge of an airfoil. The upper curved part of the air, in fact, obtains greater speed and "beats" the underneath air. So, I am confused how this "disproves Bernoulli." [No, it's me who's confused... Where did I say that this disproves Bernoulli? If I said such a thing anywhere on my website, please point it out. When I read my article, I notice that in several different places I clearly state that Bernoulli explains flight (and so does Newton, of course.) The only thing that's disproved is the "wing shape explanation." But this was disproved long ago. Aerodynamics experts have been complaining about the grade-school wing-shape misconception for many decades. Lifting force is created by circulation; by the air deflected by the trailing edge. Go see the [NASA GRC website](#) for a thorough debunking of "wing shape explanation." Unfortunately the misconception was taught to many pilots, and now those pilots would rather die than admit to not understanding their own aircraft. -billb] He says faster air has less pressure, right? And the curved, upper air isss faster...**

[Nicole Evans](#)

Jacksonville, FL USA - Thursday, May 19, 2005 at 11:25:36 (PDT)

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**I am a 4th grader in Milwaukee Wisconsin and wuld like to thank you for helping me with my science project. sincerely yours, Brendafaye Guster**  
[Brendafaye Guster](#)

milw, wi USA - Wednesday, May 18, 2005 at 10:29:34 (PDT)

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**I've heard that triangular antigravity flyers don't work in a vacuum. A**

**doctor of physics put a 'flyer' in a vacuum chamber which was at normal atmospheric pressure and the flyer worked but when the air pressure was reduced to that of the same level as 100km above the earth the flyer didn't work. The physicist said therefore they must be generating a ion wind. Have you heard of such research? What do you think about it? [ Yes, I've been saying this all along. Lifters are an obvious ripoff of deSeversky's Ionocraft from 1964, and they're only weird if you have no knowledge of that old device. See the first link on my [antigrav webpage](#)! See my comments on Naudin's 2001 [Lifter's page](#). They obviously produce a huge amount of ion-wind thrust. But do they also create antigrav effects? Well, only if they can produce thrust under high-vacuum conditions, only then are they interesting. Now we have evidence that they can't. Therefore, they're just ion wind devices. -billb]**

[Chris Anderson](#)

London, N/A UK - Monday, May 16, 2005 at 15:40:50 (PDT)

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**This website is not as cool as your title suggests! More bright colours!!!!**

[Alice](#)

Boston, NY USA - Wednesday, May 11, 2005 at 06:18:29 (PDT)

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**Great site! I made the IR goggles, and they are possibly the coolest thing I have ever seen. I'm making them for all my friends. I do have a question I hope someone can answer for me though: I want to build a tesla coil, but the prospect of winding all the wire for the interruptor/spark gap assembly is daunting. Is there a commercially-produced part I can buy instead, or does anyone have any extra ones lying around that they'd be willing to barter/sell me? Thanks! [Heh. Tesla coils are dangerous... and the way to promote safety is to prevent kids from building them. Most kids don't have the patience to wind the main coil. This is a psychological safety feature! Kids who do wind it are probably obsessive nerds like me, and they're too smart to electrocute themselves. -billb]**

**krawczak\*at\*gmail\*dot\*com**

[Alexander](#)

San Diego, CA USA - Tuesday, May 10, 2005 at 16:38:23 (PDT)

**This is a note to see if you are interested in some free equipment. My husband was planning to build a tesla coil and accumulated power supplies, wire, shelves of god-knows-what. He died recently. Anyone who is interested in the stuff can call me 360-668-0723. [it's all sold now, but she has a tour bus and a trailer for sale]**

[Kay Van Dyke](#)

Snohomish, WA USA - Monday, May 09, 2005 at 20:10:28 (PDT)

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**Hey, I want to make a huge electro-magnet, I'm sure there are questions of why, but you'll have to ask later. I want to make a HUGE amount of amps. I'm talking 10,000 if possible. What I need to know is, where could I get high-amp wires, can't just go down to wal-mart and get them. Also, I need to know about what kind of power I'll need to be running through this thing, I am willing to pay a load for this, so don't leave the monetary value out of the answer, thanks. You can reach me at**

**HJ\*ones\*873@\*hot\*mail.com --- remove the \* I hate spammers**

Houston Jones

Dickson, Tennessee USA - Friday, May 06, 2005 at 21:09:12 (PDT)

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**Hi - My son recently received a Digiscope DS-150 with Motic software as a B-day gift. The quality of the picture to the monitor screen is excellent and it also works very well strictly as a microscope. I am a trustee of our school district board and am trying to find a place to purchase more of these for our schools (we have 3 K-8 schools in our district). Currently I have been having little to no luck searching the internet. I can find info on them, but no sources as to where I can purchase more of them. Do you have any ideas? Thank you so much for your help. shuelsen at yahoo dot com**

**[ I found them by searching google:**

**<http://www.google.com/search?&q=%2Bdigiscope+%2Bprice+%2Bmotic-billb>]**

[Sherry](#)

Silver Peak, NV USA - Wednesday, May 04, 2005 at 13:34:52 (PDT)

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**Why a plug on an electrical device has two prongs. (Of course, some plugs have three prongs, but all plugs have at least two.) [Go check out my [Electricity FAQ](#), under the parts about two wires and one wire. -billb]**  
[Aysha](#)

Islamabad, Pakistan - Tuesday, May 03, 2005 at 15:17:31 (PDT)

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**I was curious if anybody has tried to conduct the Edward Leedskalnin magnetic experiments. Do the experiments he wrote about actually work? If so, where may I find literature on the experiments? My e-mail for this topic is [science.experiments@gmail.com](mailto:science.experiments@gmail.com)**

[w](#)

rock hill, holland, holopaw, many USA - Friday, April 29, 2005 at 22:40:20 (PDT)

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**Hi Scientists!**

**Here's a short Hello from Germany.**

**We stop by the Hobbyist forum every once in a while.**

**Keep up working!**

**Thanks and Cheers,**

**Hans**

[Hans](#)

berlin, de germany - Monday, April 25, 2005 at 17:00:34 (PDT)

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**hello im looking for a power supply for a five by one inch laser hene tube im looking for one with all the parts exposed thank you willi19047 verizon net**

[wil;liam j grayeski](#)

penndel, pa USA - Monday, April 25, 2005 at 04:48:13 (PDT)

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**I to drive like this,so as to not have to accelerate and brake constantly.I find it much more relaxing to leave a distance from the car infront and just drive at a nice even pace,which also saves petrol and i arrive no later than**

**the people who have been stopping and starting for the last 30 miles. But my comment is that even if you drive like this i have noticed that the cars behind me will not keep this constant speed and will just accelerate up behind me and then brake thus starting the whole traffic jam again. The only difference being that it's a few hundred metres behind the one in front. [Why would the cars behind you do that? They'd have to intentionally drive slow, opening up a huge space, then speed way up again to consume that space. Drivers don't do this, since they're terrified that other drivers will zoom into any space ahead of them. Therefore they tailgate. But we use this to [fix traffic](#), because whenever you drive at a constant speed, everyone behind you tailgates you, and they end up going at a constant speed too. -billb]**

[roy](#)

dublin, Ireland - Sunday, April 24, 2005 at 13:25:09 (PDT)

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**Hi! I am doing a project on hovercrafts for my 6th grade science fair, and I found the "LARGE SIMPLE HOVERCRAFT" article very useful! We built it, and it really works! It is SO neat! Thanx!!!**

Lizzie

Richmond, VA USA - Monday, April 18, 2005 at 17:50:54 (PDT)

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**my uncle and I have made a home made van da graff and are having problems. first is there easy way to replace the belt. second when we run the motor for very long connected to the axle that is spinning the spool the belt will twist over and mix the protons and electrions. can some one help me**

Carl

Mi USA - Monday, April 18, 2005 at 07:59:28 (PDT)

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**i am a fan of this site, a comment on the tv tube electrostatic generator method: if you spray the tv tube with a thin layer of water you can get a much closer and secure connection. no tape needed. ie wipe your screen with a wetish rag and while it is still damp burnich the foil on the face.**

Dainichi

Edgewood, WA USA - Saturday, April 16, 2005 at 23:44:12 (PDT)

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**I am looking for a safe electronic electrostatic generator. I have found the negative ion generators on your page (electronic's goldmine, etc) but need something that is both safe and battery operated.**

**What would be a good way to limit the current to safe levels on the 12V battery operated [Ion generator](#) from Electronic's Goldmine? Or, is there another option? ['Safe' current is ~1mA, so to limit the 10KV negative ion generator's nasty pulses to one milliamp, you need to install a resistor in series with the HV output, with the value being  $10,000/.001 = 10$  megohms. But standard 1/4watt resistors are only good for a kilovolt or two. So rather than one ten-meg resistor, use five 2.2meg resistors in series. And heavily insulate the solder joints! I'd use RTV silicone (the vinegar-smelling kind of caulk.) First cover the resistor-chain with a piece of aquarium air-hose slit down the side, then inject the goo through the slit to cover the solder joints. -billb]**

Aldus

USA - Friday, April 15, 2005 at 12:32:16 (PDT)

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**Hello I need to build a kelvin design challenge hovercraft. I have no clue how to make the plans. I chose to do wiring option A so if you could possibly send me plans on what to do that would save my life asap please help me.**

Ashley

Bowie, md USA - Thursday, April 14, 2005 at 09:00:36 (PDT)

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**Bill Beatty's 1995 article on Kelvin's Thunderstorm, aka Kelvin's Water Drop Electrostatic Generator, contained a beginning note to the effect of not mounting the metal parts on wood supports. Why is that??? [If you read the [Kelvin waterdrop article](#), you'll find a whole section about not using wood. The beginning note about wood is explained in the main text. -billb] Cheers, Bill Bryant**

William R. Bryant, Jr.

Ft. Pierce, FL USA - Sunday, April 03, 2005 at 21:51:52 (PDT)

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<http://amasci.com/miscon/energ1.html> says electricity flows inside wires. I have heard that electricity actually flows on the surface of the wires. (I'm no authority, but I work for BellSouth and another technician told me this. It has also been my observation that ranks of BellSouth technicians are full of geniuses and near-geniuses.) **[Electric current is not on the surface. That's a myth, but it's a [widespread myth](#) , and even some experts believe it. If they thought for a moment, they'd realize that if the current was only on the surface, then all that expensive copper would be unnecessary, and we could replace all the power cables with cheap plastic ropes with a microscopically thin copper film on their surfaces. In fact, electric current for DC and for 50/60Hz AC is all through the whole cross-section of the cable. -billb]**

My e-mail address is claypool at bellsouth.net4. (Remove the 4 at the end.)  
**[See [Electricity FAQ #10](#) -billb]**

Marc Claypool

Nashville, TN USA - Saturday, April 02, 2005 at 08:37:43 (PST)

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William, thank you for your article [HOW DO TRANSISTORS WORK?](#) It did help me enormously to get now at least a feeling of what I have been trying to understand for years! (and I am glad to know more people feel confused about it ;-) ) And I have always suspected there is something wrong with saying transistors are amplifiers... Thanks a lot, keep going like this :- ) jarmen at hashcom.plremoveafterpl

jarko

Brzeszcze, Poland - Friday, April 01, 2005 at 00:33:20 (PST)

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Hi there, I enjoyed having a look around your site. Good luck with your lab experiments! Have you cloned a sheep yet? Dr Sheep

Dr Sheep

Fife, UK UK - Monday, March 28, 2005 at 03:06:46 (PST)

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Does anyone know of a physicist or retired physicist that would be

**interested in writing a white paper on coulomb force law relative to cold cathode emission? Or maybe someone knows a group that specializes in this activity. The paper will be used for the writing of a patent application. The pay is negotiable. Thanks for any help, Larry.**

Larry Canada

Asheboro, NC USA - Saturday, March 26, 2005 at 12:27:19 (PST)

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**Connected, supportive unity of many brilliant, lit minds is creations current way. We share more than all w/ each other for the whole, to come about beautifully! My spirits are: Martial/ meditative\dance\health, electro-mag.(natural and mech.), total equality/mercy, something out of nothing alchemy; conjer, construct, co-op... Please feel me easily; matter underminde, that mine are the intent of the higher source we both superconscieounsnurse from?? Send me !feedback!**

e~9

T-town, Ks USA - Wednesday, March 23, 2005 at 07:40:08 (PST)

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**Hi, my name is Danielle. I have ONE query...what is a free-nrg blaster? I really need to know how one can be built to help my mom with her chronic back pains. she has a friend who has one of these machines. It has electric currents that when put around your wrists send strong current/zapping pulse like currents through your body giving u pins/needles like feeling, and dramatically helps my mom's back pain. Its from Rife Blaster or Royal Life. PLEASE HELP. Send any answers to my email at danii\_bujo at yahoom.com.au. Thank you. [That doesn't sound like a "Royal Rife" device, instead it sounds like a [TENS machine](#). -billb]**

Danielle

Corrimal, NSW AUSTRALIA - Sunday, March 20, 2005 at 14:24:48 (PST)

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**I too discovered how a single individual can meter freeway traffic, exactly in the way you describe, sometime between '96 and '98. The thing is, sortly afterwards I quit the city and moved to the hills and been poor and happy ever since, METERING CULTURE these days. Hope it works as well.**

Mark

Pike, CA USA - Saturday, March 19, 2005 at 21:39:49 (PST)

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**Hi I came across your site while looking for science information and found it interesting. I am 17 and from vancouver B.C and actually i rap lol kinda a unlikely place for me to be but schools school. I understand science very well and enjoyed reading your site and passed it along to my teacher to check out. Just thought id let you know i enjoyed your site and have a good day**

**Rob Johnson**

**Vancouver, B.C. Canada - Thursday, March 17, 2005 at 15:15:16 (PST)**

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**i think u lot need to get a life, we all know that at the center of every black hole is klingon life, around the black holes ionic decompression zone is the gwaoul federation. this is just common knowledge, u wheezing fools  
sup3r g33k**

**USA - Tuesday, March 15, 2005 at 00:02:34 (PST)**

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**I ran into your page on smoke rings after a discussion with my friends. Nice page, but I think it's misleading when you say, "NO AIR IS MOVING on average." Yes, on average, but that's also true when I walk across the room -- the air I displace in front of me fills the void I leave behind me.**

**My friends and I were talking about those "air cannons" which we concluded were the same phenomenon as smoke rings, but one of the points of contention was whether they actually sent a jet of air, or whether they simply sent an impulse transmitted through the air. As your page makes clear, there is in fact a mass of air traveling through the surrounding air -- which there would have to be, since the smoke itself is not moving.**

**What I really want to know is how the ring maintains its shape and doesn't simply dissipate. I think that would be a valuable bit of information to add to the page.**

**Adam**

Seattle, WA USA - Monday, March 14, 2005 at 13:02:36 (PST)

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**i get shocked alot mainly when i make beds,sometimes when i put a key in the door i can see the electicity a little blue light. sometimes when i bump into things i get the shock of my life and it really hurts how can i stop htis or at lease calm it down?**

teme

albany, ny USA - Thursday, March 10, 2005 at 19:23:59 (PST)

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**I just wanted to comment on the point that was made about truckers and their driving habits through traffic jams. I admit I am an aggressive driver and have always noticed that truckers had an unusual large space of open road ahead of them.....I always believed it was harder for them to brake...I wonder if they become upset when I pull in front of them or if they have the same point of view as you in trying to ease traffic. I don't think I would attempt your driving suggestion, because in the end I would still be ahead of you! [Let's see if I have this right. You can get ahead of me by probably twenty cars during a half-hour morning commute, arriving thirty seconds earlier. But me, I know how to singlehandedly shatter huge traffic jams, or at the very least, how to wipe out miles of stop-and-go traffic. If you can use your skills to cut your commute time in half, then I'd sit up and take notice. But aggressive drivers cannot do this, instead they reduce their commute time by 1% or so, while triggering traffic jams all throughout the system. They can't go faster, so instead they pretend that they're in a race, a race where nobody else matters and teamwork is ridiculed; a race where a tiny gain will put them over a finish line. But they do this through frustration and through ignorance, and so it's perfectly forgivable. But you, you're smart, and you've read my article, so you're not doing it through ignorance anymore, eh? -billb]**

**There is a similar situation on my freeway route (merging lanes) to work that causes a jam every morning. The highway is a constant 4 lanes, but when we get near downtown, only 2 shift northbound to the city. The right 2 lanes going to downtown back up and completely stop for quite a**

**distance. The left 2 lanes are slow but they still flow at a decent pace. I know some think I may be a jerk, but why would I sit in stopped traffic when I can pull all the way up to the split and merge over at the last second. If I can not just pull over, I will just slow down (even stop) and wait for my moment...hehe...causing my own traffic jam in the 3rd lane; however, people behind me are usually doing the same thing. Oh...by the way ...I am moving to Seattle this summer 2005, so look out! [Lol! About half the commuters here are EXACTLY like you. Adding one more aggressive driver to the tens of thousands on the road; that's like adding one more bacteria to the culture in the petri dish. If you want to be different than everyone else, don't try to be a "winner" like all the other bacteria. Instead, just be different. Note that only very few drivers have the courage to try the traffic-busting techniques, or the brainpower to discover new "switch points" which allow individuals to remove traffic jams. On the other hand, aggressive driving takes no courage at all and certainly no brainpower, it just takes a bit of hatred of ones fellows and a serious lack of caring of the troubles caused by one's behavior. On the other hand, Seattle police aggressively ticket people like you. They even set up 'stings' and pull over all of em, while onlookers cheer. Moving violations are very expensive tickets. If you're coming to Seattle... maybe it is you who should look out. -billb]**

Dan W. D.

Cleveland, Ohio USA - Wednesday, March 09, 2005 at 14:57:53 (PST)

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**A new book will be available on April 5th called PERFECTLY REASONABLE DEVIATIONS FROM THE BEATEN TRACK: THE LETTERS OF RICHARD FEYNMAN from Basic Books - For more info, please visit our website: <http://www.basicfeynman.com> - We would appreciate it if amasci.com were to add this title to the recommended books portion of the [Feynman section](#) on your website - Many thanks!**

Peter Costanzo

New York, NY USA - Wednesday, March 09, 2005 at 14:45:01 (PST)

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**I NEED MAJOR HELP AM LOOKING FOR A SMALL VORTEX**



**MACHINE LIKE WE HAD IN SCHOOL BUT NEED IT TO BE ABLE TO MAKE GO SLOWER OR FASTER, THE KIND THAT MADE TORNADO'S IN THE JAR TYPE** cmarie3157 at hotmailcom

tina

cedar rapids, ia USA - Wednesday, March 09, 2005 at 04:47:27 (PST)

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**Hi Bill, I stumbled upon your web site while looking for kid-friendly info about kinetic energy. How wonderful it is to know that there are people like you out there in cyberspace who are concerned enough to get accurate science information out to all. As a teacher I am always trying to pass on the most accurate and up to date info I can get. Unfortunately we don't always have access to stuff that is right, so thanks a lot. Don't worry about putting it into lesson format, any teacher worth their salt can do that. JUST KEEP GIVING US THE FACTS... PLEASE!!!!**

Sydney John Candler

johnscandler at yahoo.com, ny USA - Saturday, March 05, 2005 at 01:35:32 (PST)

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**Loved the traffic experiments, excellent. The real question is... Does doing the gregarious act of attempting to remove traffic waves actually decrease, or increase your journey time? I suspect it is the latter. In other words, only generous people will increase their own journey time, to decrease that of others... If only there were a few more people like this on the roads! Gav**

**Gav**

**[When busting traffic-waves, how can it affect your journey time at all? Seriously. If you think it *significantly* changes your journey time, please explain why. Ideally, all you're doing is to first determine the average speed of stop-and-go traffic, then second, driving at the average speed. In the ideal case, whether you participate in the stop-waves or not, you'll still go at the average speed.**

**But for more complicated moves, we can look to the truckers for philosophy. Truckers are a small community. They all want to go fast through congested cities. So they execute a move known as "reciprocal**

**altruism" where one member of the group clears the way for others who follow, and over many years the members take turns clearing the way. It's not pure altruism, instead it's selfish! But it's not pure selfishness either, because if truckers were selfish, none would volunteer to speed up traffic by taking the trouble to bust up the clogs of commuters. In reciprocal altruism you would try to bust up all traffic jams you encounter. But you'd also find that traffic was already flowing much more smoothly than normal, because some other reciprocal altruist had taken their turn being the jam-buster before you even arrived on the scene. On the other hand, if you want to be a cheater, and benefit from the work of others but without taking your turn... then maybe we should ALL become cheaters who sit and wait to reap the free benefits. You'll wait a long time in a society where True Altruists are almost nonexistent, and where reciprocal altruists have all decided that it's better to "avoid paying dues" and just put up with huge traffic jams. -billb]**

Manchester, UK - Friday, March 04, 2005 at 05:48:57 (PST)

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**Phew... Bill lots of mail. My site seeks to help students learn Thermodynamics. Please take a look.**

**[http://www.thermomcom/item/stone\\_boiling/stone\\_boiling.html](http://www.thermomcom/item/stone_boiling/stone_boiling.html) Thanks, J Pohl**

Jim Pohl

Brevard, NC USA - Thursday, March 03, 2005 at 08:56:27 (PST)

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**Your list of Children's Misconceptions about Science from Operation Physics Project indicates 3 figures under Electricity (#8-10) but there are no diagrams. Where can they be found? MspollockTAKEOUT at earthlinkTAKEOUT.net Thanks,**

Michael Pollock

Campbell, CA USA - Sunday, February 27, 2005 at 21:39:10 (PST)

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**Hey Bill! Fascinating website ("of course it is!" he thinks), of particular interest is your article on traffic waves, a subject i have studied for over 25 years as a professional driver. I drove "b-train" fuel tankers for many**

**years, and with a gross weight of 140,000 lbs they present an excellent opportunity to gain empirical data on these observations. I was curious about "standing waves" in traffic flows for many years. As you correctly state, drivers who take a competitive attitude to driving cause many problems and delays in traffic flows. I wrote our minister of transport many years ago with some ideas, he replied with a booklet of traffic stats and a terse note stating the obvious : that most accidents are caused by poor driver attitude and not necessarily lack of skill. Notwithstanding that, driving is a learned skill and my many years handling large heavy vehicles has given me appreciation for the subtleties of road management, subtleties that completely escape the average motorist. What particularly interested me were your strategies for minimising the impact of these traffic anomilies. As you said, truck drivers have been doing some of these things for years, such as reducing speed when approaching a standing wave. It actually does save fuel, time and aggravation. I, too, am a fan of Seth (since 1980) and many other things that could be considered out in left field.**

michael hill

Barrie, Ontario Canada - Sunday, February 27, 2005 at 17:43:22 (PST)

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**New science and engineering calculator, completely free with conversions, calculations, descriptions and material data.**

Charlie Hawkins

UK - Sunday, February 27, 2005 at 12:40:22 (PST)

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**Thanks! My son and I just built the emotor - It works really well. By the way, we found a way to use the plastic cap as a bearing socket - Just drill a slight depression in it and use it with the pencil-tip bearing you discussed.**

Al

USA - Friday, February 25, 2005 at 13:46:10 (PST)

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**How can you increase the amps, and current in static electricity to let's say!?! Fire magnets!?! I understand a Van De Graff generator can produce up to 400,000 volts at like 10 milliamps! But that is not going to make electromagnets work huh!?! I need more current, and more amps!**

Gabe  
Glen Burnie, MD USA - Thursday, February 24, 2005 at 21:52:31 (PST)

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**I am "CHARGED" I need some advise on what to do to keep from getting ZAPED every time I touch something metal, or even kiss my wife. Thanx.**  
[See [Doorknob Sparks-billb](#)] Jim at pacericu at yahoo.com  
Puyallup, Wa USA - Thursday, February 24, 2005 at 16:45:00 (PST)

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**blew up tree in yard using sea salt and pig fat that i collected from a local butcher KABOOM!!!!!!!!!!!!**  
harrison  
bannerelk, nc USA - Thursday, February 24, 2005 at 10:14:04 (PST)

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**Good work,keep it up ! I will be back.**  
Tamocha  
Imphal, M India - Thursday, February 24, 2005 at 02:52:47 (PST)

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**I really enjoyed your web site, but didn't find anything on tesla field ozone, built by Nikla Tesla? Can you find out anything on this subject? Thank You KD at kdkitty3cat at aolcom**  
KD  
Apache Junction, AZ USA - Wednesday, February 23, 2005 at 22:23:05 (PST)

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**I found your site in a reference listing.I would like to coment on what a terrific informative site that it is.Great job,well done!**  
Wade Whittaker  
Sutherlin, Or. USA - Wednesday, February 23, 2005 at 20:37:19 (PST)

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**Great site. I have linked yours from my site. Will you please consider a link back to my site? My site Electronics Infoline is all about circuits and schematics. In fact, it is a Schematics search engine and directory for electronics and computer enthusiasts. Schematics spread over from more than 445 neatly organized hierarchical categories.**  
Aniruddha Sarkar  
India - Tuesday, February 22, 2005 at 08:32:49 (PST)

**Hey, I've been a fan of your site for years. So, I was quite intrigued when I came across this article today:**

**<http://www.jalopnik.com/cars/novelties/japans-musical-roadways-033465.php> Sounds familiar, huh?**

Jesse Jones

Stockton, CA USA - Sunday, February 20, 2005 at 19:18:37 (PST)

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**Thanks for your tesla coil page. It helped me understand the G-line technolgy used by corridor systems for Broadband over Powerline (BPL). I'm doing a paper on that for my Systems Analysis certificate at UC Berkeley Extension.**

david bruce

san francisco, ca USA - Sunday, February 20, 2005 at 14:33:03 (PST)

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**wow...last comment from russia...ia tozhe rysku u teper tu tozhe znaesh....i was searching for packaging mashine and got your website...next time try targeted marketing/promotion ;) .....ur in my favorites as of 1:24pm central time on Feb19 2005....**

oleg

chicago, il USA - Saturday, February 19, 2005 at 11:23:17 (PST)

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**re: your suggestion about spraying titanium dust on the moon to paint a large graffiti -- such a project was written about by Robert Heinlein in his story "The Man Who Sold the Moon". A company contracted to launch charcoal dust in specific patterns to paint their corporate logo on the face of the moon. No laws against it! (At least not then.)**

dennis murphy

morgantown, wv USA - Thursday, February 17, 2005 at 13:16:49 (PST)

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**Your page is really interesting. But I colnd't find what I'm looking for. I need to know how NOT to get zapped by static electricity. It's driving me nuts!!!! I live in a very low humid state and anything metal I touch shocks me. Please help! Anybo dy there.....**

Yahi Hahi

Sara Kuza, Ja U - Tuesday, February 15, 2005 at 20:42:02 (PST)

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**See ya have a section on Feynman! Found a wonderful video clip of Murray Gell-Mann talking about working with him!**

**[http://www.edge.org/edge\\_video.html](http://www.edge.org/edge_video.html)**

Rob Storms

Rochester, ny USA - Tuesday, February 15, 2005 at 19:54:58 (PST)

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**I once had a piezoelectric natural gas lighter and a Binatone clock radio. I made lots of sparks on the shiny clock settings buttons, until the minutes ran forward at several Hertz. Then I made more sparks, and the clock didn't work at all. But the radio still did, so I gave it to a friend.**

Pico

UK - Monday, February 07, 2005 at 14:09:03 (PST)

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**Great site! I dey hereooooooooo**

ken

salt lake, ut USA - Tuesday, February 01, 2005 at 08:53:08 (PST)

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**You have a very nice web-site! Best regards, Nika!**

Nika

USA - Sunday, January 30, 2005 at 18:46:27 (PST)

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**Hey, I didn't exactly find what I wanted but oh well. You have a cool sight. Today, I pranked my sister when she was at a skating rink, I got some tampons and drenched them in sauce to look like they had blood. That way, when her friend came over, she would see it in her room. Bye!**

Olivia

Evansville, IN USA - Saturday, January 29, 2005 at 20:01:51 (PST)

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**Great resources! Tons of valuable information! How long it will take to sift through all these sites! Keep up the good work.**

Jennifer

Malden, Ma USA - Wednesday, January 26, 2005 at 05:56:07 (PST)

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**absolutely awesome, i intend to build the massive solar furnace using about 500 1cm mirror chips r.e.schneider at gmail. com**

rutger mccoool

burke, va USA - Monday, January 24, 2005 at 13:17:04 (PST)

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**You need to have a section on where does the flavor go from your gum go when you leave it on the bedpost over night.**

Terry

Indianapolis, In USA - Sunday, January 23, 2005 at 19:24:11 (PST)

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**Hi, I'm writing from an independent publisher where we are preparing a middle-school text on the history of science. We have a section on Bernoulli and airflow, etc, which includes the same picture of the Cessna coming out of the clouds that you have at /wing/rotbal.html. I thought you should know that this is not a "live" photo; it was produced for a Cessna ad by overlaying a stock photo of the plane on top of the cloud photo. So although the Bernoulli effect apparent in the clouds is really cool, it's not quite legit. Anyway, I'm adjusting our text in light of your helpful explanations here. Thanks very much.**

Matthew Ashford

New York, NY USA - Friday, January 21, 2005 at 14:21:20 (PST)

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**PLEASE EMAIL ME RE: "LISTEN TO EARS"! Has anyone tried this experiment yet? It is VERY important to me and on a separate issue to my mother. Please let me know. c.d.2004 at earthlink.net**

CYNDI

SAN PEDRO, CA USA - Friday, January 21, 2005 at 08:49:00 (PST)

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**Physics and chemistry are killer courses! But biology is fun~~~~~**  
dee

Canada - Tuesday, January 18, 2005 at 20:47:48 (PST)

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**well hey i'm from japen i love this site you help me out a lot thank**  
Kenshin

USA - Tuesday, January 18, 2005 at 14:33:16 (PST)

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**Great explanations on how to describe the basics in electrical science. I will compliment you futher and actually use the suggestions with my classes. PS I teach special education in a behaviorial setting. They love this stuff and show no signs of difficult behaviors when they are using the hands-on materials.**

Jalil

Troutdale, OR USA - Tuesday, January 18, 2005 at 12:39:27 (PST)

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**YOU PEOPLE ROCK,.. YOU SHOULD KNOW THAT,.. WE ARE NOT WORTHEEEEEEEEEEEEEEEEEEE!!**

YUGOLAND

USA - Tuesday, January 18, 2005 at 05:13:11 (PST)

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**We crossed paths briefly over the past couple years. I'm the guy with Tesla's double cone secondary coil. As a result of my research, I have now published, "Secrets of the Aether," a book about the new Aether Physics Model.**

**I wish you continued success in your experiments and research and hope you have time to review mine. [www.16pi2.com](http://www.16pi2.com)**

David Thomson

Alma, IL USA - Tuesday, January 11, 2005 at 08:31:09 (PST)

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**If this is guestbook for amasci.com, as beginner web designer, but experienced surfer, I am delighted with choice of colours on your front page. English is not my first language, so that it for now. God bless you!**

Johan

Wien, AU - Saturday, January 08, 2005 at 20:37:33 (PST)

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**Wish you a very happy new year 2005. Great website with lot of information. I would like to grab some content to my site at <http://www.electronicinfo.com> , of course with full credit to you and your site. [You can visit my site here.](#) This site contains about 14000 link to**



**electronics projects and resources spread across 445 categories at this moment.**

Aniruddha Sarkar

Krishnanagar City, WB India - Friday, January 07, 2005 at 12:48:49 (PST)

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**This is a cool site y'all**

Dallas

queen creek, az USA - Friday, January 07, 2005 at 10:01:38 (PST)

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**Let me tell you how much I'm enjoying you site, it is something I've been looking for for a long time. Thanks for the magnificent effort.**

Fabian Savovic

Montenegro, Yugoslavia - Wednesday, January 05, 2005 at 13:58:53 (PST)

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**I got your email address off a web page...thought you may be able to help me.**

**I am looking for a light box, original built by both sharper image and Radio Shack in Mid to Late 80s.**

**Heck, I would even be interested in trying to build one. Maybe by my description you could either comment on how difficult it would be to build, or if you have ever seen the item I am asking about. Or possibly direct me to where I could find the schematics and parts.**

**description:**

**approx 16" square box, 3-4" deep**

**front of the box is clear plexi or glass**

**inside the box is a led panel approx 2" x 14" long**

**LED panel contains atleast 100 individual LED lights of different colors**

**the LED panel rotates at constant speed when plugged in**

**a cord also connected this box to a stereo system**

**The result, when plugged in was that each song played thru this box emitted a unique and interesting light signature, also looking like kind of a wandering raster image when connected to sound source.**

**any thing you can think of? Maybe a suggestion where I could post this similar email for feedback elsewhere?**

dean  
san diego, ca USA - Monday, January 03, 2005 at 13:02:13 (PST)

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**Just a thought about your traffic model. I thought about the phenomena too, but it seems that you've left out one of the rules I considered key: When the cars/road ratio increases -- even for very small lengths of road -- cars tend to slow to adjust back to "safe" following distance. There's more than one idea in that, but it's similar to a "virtual" accident at the point of increased car density -- which takes on a life of its own. By the way: Neat site!**

stephen nagy  
Wyncote, PA USA - Monday, January 03, 2005 at 11:07:59 (PST)

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**I was reading up on your homeade hovercraft and I had an idea, why not use a mounted fan on the back as a propeller? Nothing fancy just a simple box fan. Then, maybe you could add plastic rudders on the fan and control them with strings or something, if anyone has any suggestions please IM me on my AOL screen name: YaNkEeSrOsM009 with your first IM saying you have a hovercraft suggestion. THANKS A TON!**

Colton A.  
Lubbock, Texas USA - Sunday, January 02, 2005 at 20:01:28 (PST)

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**"In an AC circuit, charge does not flow forwards at all, instead it sits in one place and wiggles forwards and back." How can a charge sit in one**

**place and wiggle forwards and back, and sit in one place at the same time?**  
rick

USA - Sunday, January 02, 2005 at 04:35:38 (PST)

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**LAST YEAR'S COMMENTS** (Jan 2004 to Dec 2004) |

**OLD COMMENTS** (Jan 2003 to Dec 2003) |

**OLD OLD COMMENTS** (Jan 2001 to Dec 2002) |

**OLD OLD OLLLD COMMENTS** (Jan 2000 to Dec 2000) |

**OLDER COMMENTS** (Nov98 to Dec 99) |

**EVEN OLDER COMMENTS** (May97 to Oct98) |

**MUCH OLDER COMMENTS** (Oct96 to May97)

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[Up to Closeminded Sci.](#)

# Closeminded Science

## Comments, Mini-forum

Thank you for visiting SCIENCE HOBBYIST. We would love it if you would [Add](#) your comments to our comment book.

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**Dear Sirs! Please send me Phase diagram for alloys of Fe<sub>2</sub>O<sub>3</sub> and Y<sub>2</sub>O<sub>3</sub>.**

**Thank you! [hfilipenk@rambler.ru](mailto:hfilipenk@rambler.ru)**

Henadzi Filipenka <[hfilipenk@rambler.ru](mailto:hfilipenk@rambler.ru)>

Grodno, Belarus - Sunday, April 03, 2005 at 05:34:33 (PDT)

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**Closed minded is one thing, dishonest is another and I am collecting and publishing on my site evidence of dishonest psi testing. [www.dream-detective.com](http://www.dream-detective.com) I am just begining but have plenty of evidence about CSICOP and Dr Wiseman that shows either down right dishonesty or stupidity? You decide which it is.**

Chris Robinson <[psychiccr@aol.com](mailto:psychiccr@aol.com)>

London, LON UK - Saturday, November 13, 2004 at 03:55:59 (PST)

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**Enjoyed that, being a maverick myself. Some mevericks become that despite themselves. It's simple, they access their intuition, which is holistic, and as "the unconscious" maintains and updates their understanding and "world-model" by which they find 'anomalies' from elementary consistency among the parts and the way the senses work too. What is curious is that one lot suppresses it and another chases it. For which I suppose one may blame that herd instinct and mob psychology, though I fancy it's a shade more complex. The noises made by empathy and the senses is louder than that of the "con-science" So, do the mavericks have better "hearing"?**

adrian van der Meijden <[adrf@paradise.net.nz](mailto:adrf@paradise.net.nz)>

meremere nZ, New Zealand - Sunday, October 17, 2004 at 07:48:23 (PDT)

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**I am SO glad you created this guestbook! Thanks! As a skeptic, inquisitive person in awe of Nature, a holistic therapist, a natural psychic healer, and a member of the family with ten medical doctors in three generations (my uncle, a surgeon, introduced me some 30 years ago to the field of parapsychology as it was called then), I am writing a PhD thesis on my telepathic and/or psychic 'reading' and healing of my patients' energy patterns as software of all human aspects - mental, emotional, physical, soul etc. Therefore I thought a lot about science and psychic phenomena.**

**I find the psychic healing crucial in effective, lasting healing of all 'stubborn' cases, which resisted medical and alternative treatments, healthy life style changes, spiritual practices etc.**

**I think that the reductionist 'science' CAN NOT comprehend fully the holistic healing, nor psy phenomena, irrespective of any innovative methods or rigor, simply because that 'science' is born out of the tendency to monopoly of the intellect over the whole, authentic human being. Acknowledging even the possibility of that whole Self would annihilate the very foundation of the reductionist 'science'. No imposter can survive as such if it accepts that it might be an imposter!**

**So I wandered -**

- 1. What would it take to get to the holistic science, which would do justice to the whole Human, and to the whole Reality of the natural world, including psychic phenomena, and thus to holistic healing too?**
- 2. What would change the reductionist scientists into whole human beings, and open up their minds to exploring and comprehending human wholeness rather than exploring its broken pieces by their broken selves?**

**On the basis of my action research since 1986, my answers are:**

**1. Since science is supposed to enhance the quality of human life, and since holistic healing is enhancing it more than anything else, by healing all individuals' aspects concomitantly, plus spontaneously healing their social environment, HOLISTIC HEALING IS THE HOLISTIC SCIENCE itself.**

**Since by definition holistic science HAS to be applied to be holistic, the proof/validity of such holistic science is in the direct, natural human experience of its healing effect/application at all levels. It does NOT need any other reductionist 'proof', and thus makes the reductionist science redundant.**

**2. The reductionist tunnel vision is, from holistic healing point of view, a symptom of the deep human woundedness, of being broken by conditioning into intellect separate from the rest of one's own whole Self, an intellect suffering an lonely, terminal self-inflicted pedestatitis. Such alienated intellect, created by denial of its own true place in its natural context, HAS to fight to maintain denial of human wholeness as the very condition for its own existence and self-validation. It HAS to try to scale the whole Life down to its own crippled level, so it tries to 'prove' the 'truth' by non-living, mechanistic, dry measurements as something 'objectively' more valuable than experiencing Life itself. Such mind HAS to battle desperately for all related alienated 'power', in order to convince itself that it can win its futile battle to control the 'chaotic' Nature in general, and human nature in particular. Such mind HAS to negate the validity of emotional intelligence by labeling it 'irrational', HAS to manipulate the body by prescribed drugs in its delusional attempt to control its life and death, HAS to deny the Soul, too free to keep such intellect company in its voluntary mental prison, and HAS to deny the psychic human aspect, which is the vehicle of direct natural/intuitive/guided/soul knowing, that would rule out the alienated, reductionist imposter intellect as the would be slave driver of human beings. Such mind HAS to see things black and white and to attack viciously whoever and whatever is not obedient enough to its self-imposed rules (a pathetic modern version of Inquisition).**

**Such self-madening woundedness can get healed though, and IS getting healed willy nilly, due to the ripples of holistic healing that incorporates the psychic healing. I witness it daily, as a paradigm shift in my holistically healed patients, and also in people close to them, who were against holistic healing as not scientifically proven. Such is the bonus of true holistic healing. Due to its psychic aspect, it spreads even better than any illness at all levels of existence, to the true benefit of all 'infected'. Hence - watch out for the 100th scientist phenomenon!**

**Cheers, Tiyana [tiyanamb@iprimus.com.au](mailto:tiyanamb@iprimus.com.au)**

Tiyana Maksimovich-Binno <[tiyanamb@iprimus.com.au](mailto:tiyanamb@iprimus.com.au)>

Sydney, NSW Australia - Friday, September 17, 2004 at 09:42:02 (PDT)

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**Great collection!!! But how it is possibly to download?**

Leo <[Leo@gurnam.com](mailto:Leo@gurnam.com)>

London, UK, NY USA - Sunday, August 01, 2004 at 01:37:57 (PDT)

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**Dear Sirs! Please see the papers.**

**SciTecLibrary - Articles and Publication [2] The literature generally describes a metallic bond as the one formed by means of mutual bonds between...**

**<http://sciteclibrary.ru/eng/catalog/pages/4564.html> , 77354 bytes**

**SciTecLibrary - Articles and Publication [2] Every subsequent element of the table of elements differs from the previous one in the amount of pro...**

**<http://sciteclibrary.ru/eng/catalog/pages/6815.html> , 36049 bytes**

**Sincerely, Henadzi Filipenka, teacher of materials**

hfilipenk <[hfil@aport2000.ru](mailto:hfil@aport2000.ru)>

Grodno, Russia - Wednesday, July 14, 2004 at 09:33:25 (PDT)

**Your Disgusto-Scope makes me for once rather glad I only see out of one eye! Keep up the good work!**

Alex

Sunnyvale, CA USA - Sunday, May 02, 2004 at 01:25:28 (PDT)

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**Where are my posts???**

**[Read the warnings to spammers. No direct postings, unfortunately. I only move the new posts to public view once a week or once a month. I can't allow direct postings, since thousands of spammers try to fill guestbooks with their URLs about ringtones and casinos and fake diet pills. I have to delete about thirty of these each month, and it would be a much larger number if I didn't keep changing things so their automatic software can't find the guestbooks. -billb]**

cove <[ceive@mail.com](mailto:ceive@mail.com)>

- Friday, March 05, 2004 at 13:16:17 (PST)

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**What the religion of the fine folk at NASA won't allow them to say is that while Mars probably does have water locked-up in its poles as ice, and perhaps traces amounts of water vapor in the atmosphere, the atmospheric pressure may never have been high enough to permit water to exist as a liquid for more than the most transitory periods of time. This would be a disaster to the NASA acolytes, and its future missions.**

**The NASA religion is that life is ubiquitous in the universe—evidence of which is that even our next door neighbor (i.e., Mars) had it. Therefore, let's go out and find it. They don't tout the Drake Equation, but it runs as a basso continuo in their thinking. That's why you've never heard them even utter the opposite possibility—that Mars never made it, life-wise, and has always been a barren desert. See <http://www.spacedaily.com/news/mars-water-science-00k1.html> to get the full scoop.**

Tom Holzel <[thosholzel@aol.com](mailto:thosholzel@aol.com)>

Boston, MA USA - Friday, February 06, 2004 at 13:06:43 (PST)

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**Hello! Your site looks interesting. I am not a totally new to web development. I have some skills, but anyway I need to learn something new, could you please give me some advice.**

[see <http://amasci.com/faq.html#hits> and <http://amasci.com/mistake.html> -billb]  
al <[asd@msn.com](mailto:asd@msn.com)>

Kiev, NY Ukraine - Wednesday, October 15, 2003 at 12:30:43 (PDT)

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**I an from Russia and have been studying English . Textbook are bored and I try to read the sites. Your sites is very pleasant. I glad that I can understand it :)**

Tersaakova <[tersaakova@mail.ru](mailto:tersaakova@mail.ru)>

Philapelpia, PA USA - Sunday, September 28, 2003 at 07:26:00 (PDT)

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**Hi. Have you known what happens with two tea bags? Hackers etc... It's horroble, isn't it? Are you afraid the same? May it happens on this site?**

cnn news <[gerda@coxicc.com](mailto:gerda@coxicc.com)>

Vishaite, KZ USA - Saturday, September 13, 2003 at 00:23:41 (PDT)

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**I think you mean "closedminded science," not "closeminded science." The latter sounds like the mind is not far away. Compare to brokenhearted. You wouldn't say breakhearted.**

**[ Close the door, have a close-door meeting versus a closed-door meeting? You're right, the second one is better. But what about closed minds? Check a dictionary. Both are listed, so both are right. Which one is more common? Search google on closeminded versus closedminded, or close-minded versus closed-minded. Results are approximately equal (although closeminded definitely beats closedminded, closed-minded edges out close-minded.) So I guess it doesn't much matter. On the other hand, Roget's Thesaurus II at bartleby.com doesn't list closed-minded at all. It lists close-minded. Does this mean I "win?" Nah. -billb]**

Jim  
NJ USA - Thursday, July 17, 2003 at 11:24:40 (PDT)

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**Good website. You sound a lot like my father who always talks about the**

**never ending increase in pseudo science. He likes to say "Never before have we had more knowledge, and yet we have more wackos than ever before". Or some thing like that :\_)**

**[Brian <kellyjacks2001@yahoo.com>](mailto:kellyjacks2001@yahoo.com)**

**Chicago, IL USA - Wednesday, April 09, 2003 at 17:23:15 (PDT)**

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**The question of which human brain evolves is the fundamental question of mankind evolves, and is the most thorny problem, too. If we can't avoid it because this question is thorny, otherwise, we can't touch the core of mankind evolves. So long as we solve this key problem, all of problems about the fact of mankind evolves will be easily solved.**

**The theory of "human brain software" can completely solve the question of human evolution. It is no longer a theory with misty nihilism, but one kind of theory which can be touched with our esthesia. We can check the theory with a kind of simple and easy experiment method. We can control soccer talents and world soccer markets with the theory, and can early earn over 100 million \$. The details please see:**

**Sundays too my father got up early, and put his clothes on in the blueblack cold, then with cracked hands that ached from labor in the weekday weather made banked fires blaze. No one ever thanked him. But thanks for this site! Steve S. from [www.saroff.com](http://www.saroff.com) --**

**Steve Saroff <[ssaroff@hotmail.com](mailto:ssaroff@hotmail.com)>**

**Missoula, MT - Saturday, February 22, 2003 at 19:10:04 (PST)**

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**Nice site. Cheers from Canada.**

**eddie**

**Ear Falls, Ontario Canada - Friday, February 21, 2003 at 12:06:00 (PST)**

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**A thought-provoking site. In the context of this site, to see a current and concrete example of scientific controversy, please visit my website:**

**<http://www.geocities.com/bibhasde>**

**[Bibhas De](#)**

USA - Wednesday, December 18, 2002 at 14:13:11 (PST)

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**Just surfing. A wise man will always change his mind . . a fool never will**  
[Ronny from FCK, Hobbykicker Verein](#)

Germany - Thursday, October 03, 2002 at 08:49:29 (PDT)

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**new revolutions. Psi-powers and ghosts, for instance, would certainly turn science on its ear, but they have been under investigation for centuries, and I tend to the view that if something consistent and repeatable were going to turn up, it would have by now. But with fusion, say, or quantum phenomena, or even things associated with technology that we have**  
[Ibiza](#)

USA - Sunday, September 22, 2002 at 12:44:20 (PDT)

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**Mr. Bill Beaty. Thank you for maintaining this website. I had personal experiences of the arrogance of "the organised sceptics" against "dissident viewpoints" and got frustrated reading about their blind and almost religious misuse of "the accepted scientific method" to determine what is truth or not. I am convinced that organised science itself is the greatest obstacle towards the exploration of reality, in much the same way as organised religion obstructs pure spiritual development. I am very much interested in the psychology of this phenomenon that could be coined as "collective conservatism". Thomas Kuhn gave us some insight in the phenomenon, but it seems as if the scientific sceptics, the religious leaders and maybe also the classic company managers act as the members of some "clan" and follow an unwritten collective credo (a mental attractor?): "to safeguard the existence of the clan and our position in the clan, we must at all cost keep the power (control) within the clan". So we see that the classic scientist (the blind sceptic) wants to maintain the boundaries of the actual scientific paradigm and protect those boundaries in an almost fundamentalistic religious manner and only tolerates the discoveries and methods that can be explained within the paradigm. I hoped to find studies of this phenomenon in the philosophy of science but could not find any. Years back had a dutch book about the struggle Semmelweis and others**

**had to go through. I lent it out and it got lost. Later I realised how difficult it was to find literature that is critical towards the the scientific approach in the classic circuits. Since long I was seeking books and the web for critical and open-minded views on the myths of scientific truth. I am overjoyed to find your website. I have printed all your info and will go through it and will certainly feed back to you. Great job. If our knowledge of reality is deepening despite of organised science, we have to be thankful and pay homage to the real geniuses that combined their insights with a great deal of courage and a great stubbornness to keep fighting the institution in the persuit of the knowlegde of reality. Your website is an true homage to those geniusses.**

[johan de cocker](mailto:johan.decocker@yucom.be) <[johan.decocker@yucom.be](mailto:johan.decocker@yucom.be)>

gent, Belgium - Monday, April 01, 2002 at 01:20:39 (PST)

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**VERY interesting site. It seems that there is more moderation in science than I previously thought. Thank you for sharing all of those wonderful sites and articles.**

[Jeremy](#)

USA - Tuesday, November 20, 2001 at 17:57:47 (PST)

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**I have been researching how to intergrate the electromagnetic effects of the varriations of the solar wind into the standard weather forecast model, since 1982... Have put together a web site, with no commerical content, as an alternative to attempting to publish into a Science Journal, the results of my findings, among other things A natural analog period of ~6554 days, due to the interactions of the planetary passive magnetic conductivity, shaping the disstortion of the solar wind field from spherica ly perfect... To present examples of this repeating pattern I have compiled from NOAA daily records, of daily highs and lows, and range of precipitation to expect based on the summation of the past three cycles... I find that the resultant pattern repeat s again, in the present with better accuracy than the 10 day forecast but not as good as the 48 hour forecasts NOAA generates, But the pattern will hold that accuracy for several years out into the furture... I have not met with much acceptance from the N WS powers that be, but**

**have found several mentors....I found most of your advice helpfull and also most of your discription of the resistance to dissention, to be true in my own case as well... Just starting to look into earthquake production cycles by th e same method of investigation and am finding patterns that will be usefull in forecasting them, data is partly processed so as yet not posted to web pages...**

**[Richard Holle <aerology@dustdevil.com>](mailto:aerology@dustdevil.com)**

**Concordia, Ks USA - Thursday, January 18, 2001 at 23:23:16 (PST)**

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**Excellent site. I am a skeptic and have noticed that many of these so-called "skeptical" groups are not really skeptical. They attack new ideas and discoveries and reject them on an a priori basis. That is not science and these groups are stifling creativity and discovery. True skeptics such as myself will suffer because of the actions of these statist, close-minded "experts."**

**[Paul LaMont <pclamont1@aol.com>](mailto:pclamont1@aol.com)**

**TX USA - Sunday, January 07, 2001 at 22:06:45 (PST)**

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**Your site contains some interesting information. I'm shocked that K-6 science textbooks contain so much erroneous information. I am not surprised, since I recently learned that often, texts are written by professional writers and not reviewed by professional scientists.**

**However, I am puzzled about your "evolution" comments. I am not aware that evolution, or "survival of the fittest" is taught as a principle of human interaction. Whenever social scientists attempt to make scientific theories translate into conclusions on human behavior, trouble results. Witness eugenics and social Darwinism. Evolutionary theory isn't to blame; fallible humans are. Evolution is merely an observed process in nature.**

**Concluding from observations of the natural world anything about human behavior is wrong-headed and misleading.**

**[Liz <lizard6849@yahoo.com>](mailto:lizard6849@yahoo.com)**

**Roeland Park, KS USA - Monday, November 20, 2000 at 13:54:01 (PST)**

**I like your raw approach to internet but I disagree with the "word only" theory, to go faster, to get more infos ? maybe-- but if the eye can grasp over 80 000 informations at the time it is more than speed reading -- why couldn't we tell complete story only with images and sound ? a concise language is very unattractive and words tend to need more and more words and are often a fastidious waste of time to read -- that is why images are needed on the web --to cut the bs -- is that weird science?**

**[Pierre-Alain TOUGE](mailto:webmaster@bearmount.com) <[webmaster@bearmount.com](mailto:webmaster@bearmount.com)>**

**Sain-Germain de la Coudre, Le Perche FRANCE - Monday, August 28, 2000 at 18:15:25 (PDT)**

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**I just LOVE your website. You did a tremendous job here. Kudos.**

**Also, I did follow the link to <http://www.geocities.com/newastronomy/> mentioned above below it's definitely worth a look!**

**[Heretic](mailto:heretic@forbidden-science.com) <[heretic@forbidden-science.com](mailto:heretic@forbidden-science.com)>**

**USA - Saturday, May 20, 2000 at 00:42:12 (PDT)**

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**From billb: On Mary Messall (below) re. scientists being "overly skeptical"... Mary seems to be displaying the right amount of skepticism, and using the word "skepticism" as it should be used. We should *never* be willing to believe something without evidence, and this swings both ways: we should neither accept *nor reject* a proposition without examining all the evidence. Dr. M. Truzzi labels this practice "[zeteticism](#)", and complains that the word "skepticism" has become corrupted by constant misuse by sneering smug "disbelievers". Today the word Skepticism is typically used to label scoffers rather than critical thinkers. I can say it more clearly: scientists should avoid being overly scoffing or disbelieving, but they should be *very* Zetetical, they should base their knowledge on evidence and not on emotional reactions or beloved preconceptions.**

**Yet I would caution her to be wary of rejecting PSI (etc.) on the grounds that decades or centuries of investigation haven't found supporting**

**evicence. The history of science contains numerous discoveries which were resisted for decades, (go [here](#)) yet they were perfectly valid, and in hindsight the resistance was caused by human nature; by scientists who confront the fact that a piece of their worldview was faulty, and they reject the discovery in order to preserve their worldview (e.g black hole theory suppressed by ridicule from 1930 to 1960, transposon theory suppressed by ridicule from 1940 to 1970 regeneration of brain neurons suppressed by ridicule from 1950 to 1990, etc.) In other words, yes, sometimes the passage of decades can indicate that a discovery is wrong and cannot be replicated... but it also can indicate that the scientific community is dead set against accepting a discovery that makes them all look bad. In that case Max Planck's rule holds, and at least ten or twenty years must pass before the resistant generation of scientists dies off and is replaced by youngsters who grew up familiar with the idea. "Science only progresses funeral by funeral (Planck.)"**

**Unfortunately, DIS-belief is just as prejudiced a stance as belief. Neither one is true skepticism. There is an infinite difference between "not proved" and "disproved," since things not proved may be valid or invalid. There is an infinite difference between remaining undecided about a proposition and refusing to accept or reject it, versus becoming a disbeliever. When we decide to disbelieve without basing our decision on good evidence, we release our hold on rational thinking.**

**My complaints are mostly directed against those who adopt a prior stance of disbelief; those who discard evidence on the grounds that the evidence contradicts contemporary theories and worldviews. This stance is the very opposite of science where evidence supposedly determines theory and not vice versa. Negative beliefs are just as prejudiced as positive beliefs, and prior disbelief can lead to a form of Pathological Science where real evidence is ignored, and where self-fulfilling prophecies dominate a scientific field. If we believe that a genuine phenomenon does not exist, this can cause us to reject evidence (or even become unconsciously blind to evidence) in support of the disbelieved phenomenon.**

**Human beings tend to see what we want to see, and this is a real problem for scientists. But don't forget that we also tend to become blind to things we disbelieve, and this is an equally large problem in science (although it's discussed only rarely.) If we unconsciously close our eyes, and then because we see nothing, we therefore conclude that no visible evidence exists, that's circular thinking with no basis in reality. Smug disbelief is just as distorting as wide-eyed gullible belief.**

## **"EXTRAORDINARY CLAIMS REQUIRE EXTRAORDINARY EVIDENCE"**

**The above statement is wrong. It's a prime example of the problem. Members of Skeptic groups take the above statement as a given. Yet if they examine it critically, they'll discover an interesting concept: extraordinary claims should require good, solid evidence, JUST THE SAME AS NON-EXTRAORDINARY CLAIMS. Anything else would create prejudice, it would create a prior emotional bias against anything considered "extraordinary." And in science, it is of paramount importance to eliminate any prejudice before examining evidence. If extraordinary claims require EXTRAORDINARY evidence, then we can reject enormous amounts of good, solid evidence on the grounds that it is not "extraordinary" enough. This is called "adopting a prejudice, then becoming selective of the evidence." Selecting evidence to support a disbelief has little to do with skepticism or science, and everything to do with defending a belief system against any evidence that contradicts it. Science is not based on defensiveness and rationalization.**

**The best stance for a scientist is one of humble openmindedness, as well as a [refusal to accept or reject](#) any proposition entirely. All scientific knowledge is tentative. If we avoid falling into beliefs or disbeliefs, but instead think exclusively in terms of "likelihood", we can avoid all the battles which, at their root, are conflicts between opposing "religious" positions, i.e. between opposing belief systems. So, does PSI exist? First we**



**must distrust the warring factions that say "No it doesn't!!!" or "Yes it does!!!" First we must eliminate our existing prejudice, and only then take a clear look at the best evidence for and against.**

**But remember: true critical thinking puts us in danger of deciding that PSI is real, and then a large portion of the scientific community will turn against us. But shouldn't this have no bearing on our analysis of PSI? Yet for most professionals it's a very big issue.**

**[Bill Beaty](mailto:billb@amasci.com) <[billb@amasci.com](mailto:billb@amasci.com)>**

**Seattle, WA USA - Monday, February 28, 2000 at 10:53:13 (PST)**

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**Further thought- I lend different amounts of credulity (and require different standards of evidence) to old revolutions and new revolutions. Psi-powers and ghosts, for instance, would certainly turn science on its ear, but they have been under investigation for centuries, and I tend to the view that if something consistent and repeatable were going to turn up, it would have by now. But with fusion, say, or quantum phenomena, or even things associated with technology that we didn't have under recently ( like large voltages over long terms) I'll lend a more sympathetic ear. In these cases, it's more likely that there simply hasn't been enough time to accumulate evidence. It's a valuable distinction to make, if one wishes to narrow the list of "unusual phenomena" to the best candidates.**

**[Mary Messall](mailto:mmessall@ups.edu) <[mmessall@ups.edu](mailto:mmessall@ups.edu)>**

**Tacoma, WA USA - Thursday, February 24, 2000 at 13:21:26 (PST)**

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**I've said this elsewhere, but this seems a fairly appropriate place to repeat it. I think there's a problem with saying that scientists are "overly skeptical." It suggests that we should be willing to believe without requiring so much strict evidence. This is, I think, exactly the opposite of what you're trying to suggest- that we should require \*more\* strict evidence for those aspects of scientific orthodoxy we do believe. What we need is more skepticism, the strength to doubt the principles that certain phenomenon contradict. Skepticism, the relentless doubting of everything,**

**\*is\* science. You experiment, you test, you come up with alternate explanations, you argue even with god. It's the only means we have to progress. Accepting things without evidence leads to gullible stagnation. (Mind you, some things have to be provisionally accepted in order to function, but these can always be called into question later.)**

[Mary Messall](mailto:mmessall@ups.edu) <[mmessall@ups.edu](mailto:mmessall@ups.edu)>

Tacoma, WA USA - Thursday, February 24, 2000 at 13:11:41 (PST)

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**Great site. What a wonderful collection of quotes.**

**[<http://amasci.com/weird/skepquote.html>] I could not believe how many diverse quality quotes you found. I guess I have grown ever more critical of scientists without ever losing the tiniest bit of love for science. Perhaps losing my naivety has fueled me onward. I didn't get through all the quotes yet but I thought this one would fit in, if its not there already: In questions of science, the authority of a thousand is not worth the humble reasoning of a single individual. Galileo Galilei So, Sci-American put a link to my site last April. I model aggregate state space. Interesting stuff. I wrote three books opposing the big crunch and endless heat death scenarios with my theory that the universe is expanding to flatness and absolute zero, all written years before NASA discovered accelerating expansion. A Ph.D is offering to help me write a book but I need all the help I can get. Come visit: [everythingforever.com](http://everythingforever.com) -send me a line. Thanks, Devin Harris**

[Devin Harris](mailto:dharris@everythingforever.com) <[dharris@everythingforever.com](mailto:dharris@everythingforever.com)>

USA - Sunday, February 20, 2000 at 17:03:17 (PST)

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**Okease have a look at my new site: skeptic, but I hope open-minded. There are articles on belief systems, homeopathy and parapsychology, and various aspects of alternative medicine from a critical (inside) angle. Also book reviews of books on science, philosophy, parapsychology etc. This is (I hope!) a rapidly developing site. Feedback very welcome.**

[Anthony Campbell](mailto:a.campbell@freethinker.uklinux.net) <[a.campbell@freethinker.uklinux.net](mailto:a.campbell@freethinker.uklinux.net)>

London, UK - Saturday, February 19, 2000 at 05:57:50 (PST)

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**For a discussion of how the Shapiro effect is the cause of the redshift of**

**distant galaxies, and not the Doppler effect, see my web page at:**

**<http://www.geocities.com/newastronomy>**

**[Jerrold Thacker <JThacker@msn.com>](mailto:JThacker@msn.com)**

USA - Sunday, February 06, 2000 at 12:45:34 (PST)

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**Need a section on Velikovsky; his concepts, predictions, and validations, also on Harlow Shapley the Liar, et al. Some of Velikovsky's thoughts [and possible results of what he thought happened], may shed light on things we are now finding out about our Solar system. Examples: Venus now quite hot [due to in part to friction of close approach to Earth 2700 years ago] ; Mars now nearly devoid of water but once may have had flowing streams [loss of much of Mars' atmosphere when in close approach (Phobos & Deimos visible to eye-- Homer) to much more massive Earth (pickup of Martian water could be cause of our Flood)].**

**[fatjack](#)**

lancaster, PA USA - Saturday, January 22, 2000 at 12:54:57 (PST)

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**NEW FEATURE, NO ENTRIES YET. BE THE FIRST!**

**[Bill Beaty](#)**

USA - Thursday, January 21, 1999 at 10:07:35 (PST)

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**[Back to CLOSEMINDED SCIENCE](#)**

Guestbook script from [Matt's Script Archive](#)

# Electricity Questions

Also see: [ELECTRICITY ANSWERS](#)

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**Why is a 6 volt battery bigger than a 9 volt battery?**

[Mitch Devriendt](#) <[mailmoogle11@yahoo.com](mailto:mailmoogle11@yahoo.com)>

Madison, WI USA - Tuesday, May 17, 2005 at 17:21:51 (PDT)

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**Does hair stick up when it feels electricity?**

Mariah

monroe, MI USA - Tuesday, May 17, 2005 at 15:30:15 (PDT)

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**how does electricity and magnets help a mini electric motor work?**

[nike](#)

sacramento, Ca USA - Tuesday, May 10, 2005 at 17:16:32 (PDT)

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**Is it possible for a person to get electric shock or even electrocuted by using a stand up tanning booth. There seems to be extreme amounts of voltage being used in confined space that has alot of metal close to the person standing in it.**

[Bruce babiar](#) <[bruce\\_babiar@cushwake.com](mailto:bruce_babiar@cushwake.com)>

Dallas, TX USA - Monday, May 09, 2005 at 09:28:15 (PDT)

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**how is electricity related to lightning?**

[megan](#)

missouri, tx USA - Wednesday, May 04, 2005 at 10:42:57 (PDT)

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**Does electricity really make stuff work? how come when things breaks smoke comes out? my theory is the smoke makes things work and when it leaks out, the stuff stops working. Can someone help me with this theory?**

[Mark](#) <[ab0st0nian@yahoo.com](mailto:ab0st0nian@yahoo.com)>

Winthrop, ma USA - Tuesday, May 03, 2005 at 13:56:01 (PDT)

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**Is there one pole transformer for each home, or can multiple homes be served by a single transformer?**

[Ted Hermann](#) <[ted.hermann2@verizon.net](mailto:ted.hermann2@verizon.net)>

North Wales, PA USA - Tuesday, May 03, 2005 at 05:50:14 (PDT)

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**The Site did a better job then the school book... So if i understood it correctly it's possibel to discribe electricity as "Movement of charged partcils along e-field created by charge inbalance what brings energy with it"**

**And some more questions...**

**Can e-field around one wire produce current in nearby wire inside fields range?**

**Are field produced by a coil electric ore magnetic, and is the iron core of the coil megnetic or charged.**

**Are there some sites which discribe cunstruction of Ac and Dc motors in the way allowing me to build them under home condicions???**

[A. Eitminovic <alekseitmin@yahoo.com>](mailto:alekseitmin@yahoo.com)

Castricum, Netherlands - Sunday, May 01, 2005 at 07:25:41 (PDT)

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[Old comments: 2004](#)

[Old comments: 2003](#)

[Old comments: 2002](#)

[Old comments: 2001](#)

[Old comments: 2000](#)

[Old comments: 1999](#)

<http://amasci.com/~billb/elect/guestbook.html>

Created and maintained by [Bill Beaty](#).

Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

(Original scripts and Guestbook software created by Matt's script archive and can be found at [Matt's Script Archive](#))



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Also see older entries: [2004](#), [2003](#), [2002](#), [2001](#), [2000](#), [1999-1998](#)

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**Seven colours in the rainbow. What seems to have happened was this. Isaac Newton saw that white light could be made into a rainbow, and the human eye could readily distinguish 6 colours: Red Orange Yellow Green Blue Violet Unfortunately 6 is the devil's number (666 is worse) whereas 7 is God's number (7 stars in the sky (=planets) days of the week, orifices in the head etc. It was therefore necessary to invent Indigo as an imagined colour between Blue and Violet, or his optical work would have been criticized on religious grounds!**

[mex <carpet@mail333.com>](mailto:mex@carpet@mail333.com)

USA - Thursday, July 28, 2005 at 15:32:18 (PDT)

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**A simple observation.**

**In the article GRAVITY IN SPACE IS ZERO? you state that, "You'd only weigh about fifteen percent less than you do on the ground. While 300 miles out in space, a 115lb person would weigh about 100lb."**

**The only problem I see in this statement is that fifteen percent less than 115lb is not 100lb, but 97.75lb.**

**[ You removed one word from that sentence. Fifteen percent less than 115 lbs is *ABOUT* 100 lbs. It's unfair to change my words and then criticize the altered version. -billb ]**

**Thank you for your page.**

Jonas

Guadalajara, JAL MEXICO - Wednesday, July 06, 2005 at 11:57:34 (PDT)

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**I am writing a science workbook in which I am encouraging students to think critically about scientific theories. I would like to use some of your information, but do not want to break any copyright laws. I would very much like to use two or three of your writings in their entirety and give you credit. May I have your permission to do so?**

Elaine <[erelt@sbcglobal.net](mailto:erelt@sbcglobal.net)>

San Antonio, TX USA - Saturday, July 02, 2005 at 13:22:43 (PDT)

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**The analysis of air being blue is completely incorrect. Air is not blue. The "color" of a gas is determined by absorbed and transmitted light, which are processes completely different than Rayleigh scattering.**

**[Nope. Color is a property perceived by humans and created by human retinas and minds. If I look at a gas and see blue, then the color of the gas is blue. That's what the word "color" means. The light striking the retina is important, but the details of the physics which produced the light are irrelevant, because if it looks blue, it really is blue. Your reasoning is also wrong because, in order to be consistent, we'd have to say that blue-jays are and Morpho butterflys are NOT blue, After all, butterfly wings and bluejay feathers are entirely made of transparent materials, and their perceived colors are created by wave interference rather than by dyes. Bluejays are blue, yet there is no blue in their feathers at all. Air is analogous: when air is lit from the side, the air is colored blue, even though the color is created by wave mechanics rather than by selective absorption. -billb ]**

**Your statement that "air is blue" is a gross oversimplification. If the scientific explanation for something is too complicated, I see no reason why you can't simply say that instead of offering a completely incorrect explanation.**

**[ Completely incorrect now? I thought it was just grossly oversimplified. Can't be both. :) Whenever someone says that a concept is too complicated to be explained without math, I become extremely skeptical. Usually they mean this: "I've not bothered to spend the time and the careful thinking necessary to come up with a simple explanation." Either that, or they assume that a simple explanation is trivial to create, and they could produce a good one if they bothered. In reality, math can be a crutch which prevents understanding of physics, and simple explanations are "simple" only in hindsight. Einstein said "*You do not really understand something unless you can explain it to your grandmother*" Give it a try yourself. Try to explain advanced concepts to the general public. If you can do a good job, then post your efforts on a website and I'll link to them. - billb ]**

Rob Cook <[robtpt@yahoo.com](mailto:robtpt@yahoo.com)>

Stanford, CA USA - Monday, June 20, 2005 at 13:24:48 (PDT)

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**Under the misconceptions about heat, I am unsure if heat does actually rise or not? Could you please send me some information on this topic to clear up my misconceptions? I plan to be an elementary teacher and would like to know the correct answer to provide students when asked? [Actually, warmer air is less dense than cooler air, so warmer air rises and cooler air falls. - billb]**

Christa Tandle <[CTandle@mail.keuka.edu](mailto:CTandle@mail.keuka.edu)>

Waterloo, NY USA - Monday, June 13, 2005 at 10:52:58 (PDT)

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**Here's a simple demonstration of an airfoil. Turn on a faucet so that the water forms a steady hard stream (this is our 'airflow'). Now loosely hold the handle end of a spoon between your thumb and index finger letting the other end dangle downwards (the back of the spoon is our 'wing'). Now gently move the spoon towards the water flow until the back of the spoon makes contact with water. At this point, you will feel a definite and surprisingly strong pull on the spoon. The force will pull the spoon into the stream and part way through it -- a good portion of the spoon will end up completely on the other side of the initial water flow. You can see how the direction of the water flow follows the shape of the spoon and leaves the spoon in the same direction as the trailing edge. I definitely recommend that you try this.**

Glenn C. Rhoads <[rhoads at paul dot rutgers dot edu](mailto:rhoads@paul.rutgers.edu)>

Highland Park, NJ USA - Thursday, May 26, 2005 at 13:40:06 (PDT)

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**Thanks, great informative site. I particularly liked your explanation of [transistors](#), I have felt the same way you did, that no one ever clearly explains how they work and we are meant to just accept their mathematical descriptions. In fact I feel that way about alot of subjects in that same area, having to do with quantum physics or electronics.**

Brian

Urbana-Champaign, IL USA - Tuesday, May 17, 2005 at 19:53:12 (PDT)

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**I am a science teacher in the UK, and you have made it very clear that I need to go back to school! My understanding of Physics is clearly not up to the job.**

Matt

UK - Sunday, May 01, 2005 at 06:31:42 (PDT)

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**If the air is tinted blue as you claim  
then distant clouds should appear bluer  
than nearby clouds.**

**[Sunlit clouds are too bright, so I doubt you can see the dim blue light added by the air in front of them. On the other hand, a distant dark object should look far more blue than a nearby dark object ...such as distant forested hills in shadow. - billb]**

[cyber\\_rigger](mailto:cyber_rigger@yahoo.com) <[cyber\\_riggerAT yahoo DOT com](mailto:cyber_riggerAT yahoo DOT com)>

USA - Monday, April 25, 2005 at 07:15:16 (PDT)

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**very intresting reading, as for those seeking the circuits for the herf guns ive collected them before and they can be found in the electronics lab site , in the forums and as for the electromagnetic levitation, stuff theres circuits for that to there,**

steven <[stc1@bigpond.com](mailto:stc1@bigpond.com)>

perth, w.a australia - Saturday, April 23, 2005 at 08:30:38 (PDT)

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**Are these misconceptions general? Or did you conduct some kind of survey to find out these misconceptions. I'm just wondering. If you could send me an e-mail that would be nice.**

**Thank you.**

**[ I found these misconceptions in grade-school textbooks and in children's science reference books. Because I was looking for widespread misconceptions, I only recorded the ones which appeared in several different books. - billb]**

Matt <[burn\\_baby\\_burn241@yahoo.com](mailto:burn_baby_burn241@yahoo.com)>

Glen Rock, NJ USA - Monday, April 18, 2005 at 04:58:08 (PDT)

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**My comment has to do more with scientific philosophy than science. I recently had a little debate with the editors of Discover magazine over the concept of infinity. I was responding to a quote in the magazine over the difference between science and the unfathomable. I put infinity in the unfathomable category. They responded that infinity was an accepted mathematical concept and that it was used in science. My contention is that just because infinity is accepted in mathematics and "used" in science does not make it a verifiable concept. No one has ever verified an infinite value of any scientific parameter. A simple equation like  $f=ma$  allows for an infinite mass and infinite acceleration, but have infinite masses and infinite accelerations ever been measured? When Riemann spaces came on the scene, the door was opened for spaces that do not naturally extend to infinity in nature. Hence, verifying infinity may not be either necessary or possible. I suggest that we leave infinity in the unfathomable category. Any thoughts?**

**[ How about Xeno's paradox and continuous space: I can divide the space between my fingers into an infinite number of slices. Or I can move my fingers to an infinite number of different positions. Unless space itself is discontinuous, that is. Infinity is not just connected with "no upper limit." It's also connected with smoothly continuous values and the number of tickmarks you can put on a ruler. - billb]**

Scott Jackson <[jackessone@cox.net.xxx](mailto:jackessone@cox.net.xxx)>

Irvine, CA USA - Saturday, April 02, 2005 at 14:25:09 (PST)

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**my thoughts of causes of flight....as an airfoil moves through the air, the air hitting the leading edge of the wing is thrust/ramped up into the airstream above, creating a zone of high pressure. This high pressure zone rides over the now "low pressure" zone right above the wing, created by the absence of the air that got pushed up at the leading edge in the first place.(The airflow beneath the leading edge is largely undisturbed and parallel,per smoke stream photos) As shown by the various wing gradient pressure charts seen at (and ignored) other sections of this site, a substantial difference in pressure is created, attracting the air below the wing and the wing itself upward. The high pressure zone above the low pressure also flows to the low pressure area, but by the time it arrives, the wing(and the plane) has allready flown past, so this air continues....in the downward direction that is frequently discussed.This is the downward airflow that occurs, having little to do with direct deflection from air contacting bottom of wing.**

**There is, however, a net deflection of air from the total body of the aircraft passing through the air, similar to the waves of water thrust aside when a boat travels through the water, or an 18 wheeler throwing about vast amounts of air as it tunnels through the air, at "super hi-way" speeds. This outward blast can be easier seen during a light mist or drizzle, and on dry days can be seen by the violent disruption of the grass on the side of the road just as the front of the truck passes.**

**The causes of trailing wake vortices? Well, the normal pressured air below wing, in trying to get to the highly low pressure air above, has only one direction it can go, and that's up and around the end of the wingtip. It can't go up and around the front, blocked by the oncoming airstream. It can't come from up behind the wing, that way is blocked from the air stream from the hi pressure area present on top of the wing. So that leaves the wingtips. And, as the lo pressure (and the wing, and the plane) has flown by before this incoming airstream gets there, this stream flows in, from outside to inside, thereby creating the circular wake vortice streaming back from the wingtips. Of course, there is also the "surfing" /planeing of the wings through through the aerial medium that also contributes to lift, but the vast majority of the work is done by this "magic" that occurs above the wing.**

**Any other flow of air other than that at the leading edge is a waste product (like the water exiting out the bottom of a hydroelectric dam, after the turbines have been turned by the incoming water, the outgoing water flow is now something to get rid of, as its usefulness is done), as the majority of the work has been done.**

**Wing shaping is critical to successful wing design and performance, as shown by the research performed by the early architects of flight, and hundreds of variations of wing shapes and lift performance tabulated by NACA. As promised, this link...**

**<http://www.f-16.net/modules.php?op=modload&name=Downloads&file=index&req=viewdownload&cid=3>**

**has a section (AERIAL DEMONSTRATIONS) where a USAF manual depicting pilot operations during air show demos, answering the question of how planes fly upside down (by addition of either rudder or elevator input, depending on attitude of the aircraft at the time.**

**I don't believe the assertion that wings, propellers, and helicopter blades operate the same. It seems that they operate in two separate modes. Props and especially helicopter blades are oriented at 10-30 degrees in order to fling air backwards, creating thrust. No airplane wing has an angle on incidence that would support deflection as the main source of lift. In fact, most aircraft wings stall at this angle of attack.**

steven

raleigh, nc USA - Thursday, March 31, 2005 at 14:27:52 (PST)

**If water seeks it's own level, then why would the water level increase world wide as the polar ice cap melts? An ice cube in a glass of water, doesn't raise the level inside the glass as the ice melts.**

Ron Seto <[ronaldseto@bellsouth.net](mailto:ronaldseto@bellsouth.net)>

Vancleave, Ms USA - Sunday, March 27, 2005 at 12:03:50 (PST)

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**This is GREAT!!! I'm going to give this site to everyone i know. It'll make 'em flip out.... hehehe.....**

Yo Momma <[kingflute31@gmail.com](mailto:kingflute31@gmail.com).....>

nowheresville, arbitrary cambodia - Thursday, March 24, 2005 at 20:10:44 (PST)

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**I only just found this site but it looks pretty good. It is pretty in depth and I will consider using a link on my own web site once I spend some more time on your site. I look forward to that. Mike Stahl (www.respectfulempiricist.com)**

Mike Stahl <[respectfulempiricist@yahoo.com4591](mailto:respectfulempiricist@yahoo.com4591)>

Towson, MD USA - Wednesday, March 23, 2005 at 07:56:50 (PST)

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**What sets some people apart from others in understanding science questions is often that the details have been "mulled over" for some time, that is, they have been allowed to be digested or to sink into the ol' noggin. Youngsters frequently are put under pressure to perform in the classroom or in public and even an adult would find the process of learning under these circumstances to be difficult. Thinking about puzzling concepts in the quiet of one's own thoughts is how science is learned. I sometimes want to shout this from the rooftops. AVC**

Anthony Chessick

Tehachapi, CA USA - Tuesday, March 22, 2005 at 14:45:30 (PST)

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**Your article about why the sky is blue is intriguing, but nevertheless erroneous. In the article you state, "Each molecule of air behaves like a bluish-looking mote of dust." Molecules of "air" do not exist. Air is a mixture. A container of air will have molecules of oxygen, nitrogen, carbon dioxide, etc. So which molecule exactly are you saying is blue [ **Yes, that's right: a molecule of nitrogen gas scatters blue light and appears bluish, and so does a lone oxygen molecule. The skies of Mars, heavy in CO<sub>2</sub>, are also blue. In other words, "air molecules" look blue regardless of which type they are. Only a molecule with a resonance frequency near the visible band will appear otherwise. - billb**] or is blue some magical property of the mixture of different molecules. If your argument is correct why don't astronauts in space see a bright blue halo effect around the earth. When they look past the earth, but near the edge of it's disk, they are actually looking through twice the thickness of atmosphere that we normally look through. So why don't they see blue?**

**[They don't?!? Perhaps you aren't familiar with all those photos taken by shuttle astronauts. Try these: [Astronomy Picture of the Day: Moonrise - Spacewalk](#), [Spacewalk 2 - billb](#)]**

Marvin Champion <[mchampatmemberdotafadotorg](mailto:mchampatmemberdotafadotorg)>

Warner Robins, GA USA - Tuesday, March 22, 2005 at 13:49:24 (PST)

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**With regards to sound traveling better in liquids/solid than air: This is more of a question than an argument (ok it is both realy). I know (or at least I am fairly confident) that explosions (sound/shockwaves) are more intense underwater. For example, unless my Naval training was wrong, the relative power of an underwater explosion can be as much as 4-10 times stronger than the same explosion above water. I have witnessed such examples but do not rule out that there could be any number of influential variables that I do not recognize or fully understand. My gutt says that the reasoning is in the density of the propogating material providing much more contact with the surface of the material receiving the damage than there would be contact between air and receiving object. I look forward to any comments as I am simply a curious person and not a scientist. Note on my background: I was an ETRO in the Navy (Electronics Tech/Reactor Operator) however, having been Enlisted rather than an Officer I recognize that most of my Heat Tranfer/Fluid Flow, Electronics, and Nuclear Chemistry training are strongly skewed toward usefulness to my job rather than deep scientific understanding at the mathematical level. Cheers, Scot**

Scot <[scot \(at\) scot gabriel . com](mailto:scot(at)scotgabriel.com)>

Joplin, mo USA - Tuesday, March 22, 2005 at 09:01:57 (PST)

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**A line from one of Shakespeare's sonnets (#66) may well sum up most of the difficulty: "And simple truth miscalled simplicity". The simple truth is that both the laws of conservation of mass and momentum must be observed. Air does not magically appear or disappear above or below the wing to result in a difference in airflow in the real world outside of the artificial constraints imposed within wind tunnels and forces created in the airfoil must be balanced by equal and opposite motion generated in the air. Any Bernoulli Effect that occurs results in slowing down as well as the more generally recognized speeding up of flow over curvatures in the airfoil surfaces and it generates a twisting force on it rather than lift. The reaction to this in the air is some creation of vortices at the trailing edge and this is normally not a good thing. More important than these unending controversies and all but unknown universally is the tremendous mass weight of air in quantity, adding up to many hundreds of tons in hardly any space at all. Aircraft are flying through a thick soup that is no less weighty for its invisibility. The same applies to the creation of energy from wind turbines, which must be built strong to accept the forces imposed on them from even light winds. It is a good exercise for homework to calculate just how heavy air is ( despite its buoyancy ) in ordinary spaces from its density of about one and a quarter ounces per cubic foot. Thanks for providing this forum for everyone's benefit in learning about some of these realities of creation as it exists.**

Anthony Chessick <[see www.integener.com](http://www.integener.com)>

Tehachapi, CA USA - Tuesday, March 22, 2005 at 07:01:11 (PST)

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**People who have not "mulled over" Science questions should be disqualified from making any comments about them. I am thinking about the Bernoulli principle as it relates to aerodynamic lift. Many don't even know how the Bernoulli principle works in the first place. It takes some mulling over, you know. The other thing that needs mulling over is the weight**

of ordinary air as it helps create lift. One million cubic feet of air has a mass weight of 38 tons!!!!!! This is the air contained in a box only 100 feet on a side or just an envelope surrounding a medium sized aircraft. 38 tons!!!! Just ordinary air!!!!!! It takes lots of mulling to come to the realization that air is very, very heavy in large quantities and it doesn't fall because it is buoyant!!!!!! No wonder that aircraft can find support in this medium, whether or not any of the various lift theories are correct!!!!!!

Anthony Chessick <[integener at inreach.com](mailto:integener@inreach.com)>

Tehachapi, CA USA - Monday, March 21, 2005 at 21:07:06 (PST)

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$n/0$  is undefined. Defining it as infinity leads to paradoxes. See this page in the wikipedia for enough paradoxes to float your boat. [http://en.wikipedia.org/wiki/Division\\_by\\_zero](http://en.wikipedia.org/wiki/Division_by_zero)

[Thanks for that link! But if you read "Limits and division by zero" in that entry, you'll find no paradox. They say that  $0/0$  is undefined, not that, say  $2/0$  is undefined. -billb]

I certainly enjoy your site, and I find your attitude towards authority a healthy and useful one, but oversimplification will often produce faulty logic. Your problem with the definition of science and the scientific method, the latter of which applies to natural science only, undermines your approach. Your attitude towards grammar and spelling are not particularly useful either, not because those are essential to understanding, but because too much license is usually taken in the process. On the best day, it is difficult to express scientific information with precision, outside of mathematical equations, as you have noted in your personal reformulation of your understanding of electricity. Using imprecise language and spelling and grammar just contribute to the confusion. They may not be intrinsic to the meaning, but ignoring and perpetuating such errors when you are aware of them is not laziness, but deliberate contribution to the sea of confusion that already threatens to drown us. Everything I read here tells me that is not your intention, but we all know how that contributes to the paving business.

Now, let us discuss your odd attitude toward the scientific method. You casually toss off several "examples" that purport to defeat the basic definition of the scientific method as you state it. Those casual thoughts do not hold up to close examination.

[Applying negative labels such as "casually toss off" is a dishonest tactic. Another dishonest tactic is to pretend that nobody except me has a problem with The Scientific Method (when my article clearly links to several physics professors' websites who say the same things I do.) Your tactics are common in politics and law, but they have no place in science, since they're not intended to promote clear understanding, but instead used to "win" a fight or emotionally sway an audience, but with little regard to which side of the argument is actually correct.

Note well: "methods of science" certainly exist, and they separate science from non-science. I (and others, of course) are complaining about something far more specific: a list of steps which are taught in grade school, a list called "The Scientific Method" which all scientists are said to follow. That list is incorrect because it requires that all scientists perform



**experiments. The list applies to physics but not to observational sciences, or to science in general. Many versions of The Scientific Method don't even mention observation. And I've heard that some school science fair judges reject entries if they don't contain an experiment. Now if those authors told students up front that the list was simplified and imperfect, and was only supposed to give a rough idea of the nature of parts of science, that would be fine. But they don't. Instead they use the list to rigidly define the nature of all sciences. At the very least, the list wrongly implies that physics is a real science while astronomy is not. (Heh. We should have some astronomers rewrite "The Scientific Method" and see how it differs from the version written by physicists.) -billb ]** If science is conflated with knowledge or the search for knowledge, then almost any field or form of study will fit under that rubric, but natural science is a more specific topic, and it requires the scientific method. By whatever means, observation must be obtained or matched with hypothesis, not necessarily created before the observation. Invention is not science, but it may, almost must contain science. Invention, by definition is an instance of an idea, not the idea itself. That is an important distinction, as is the distinction between  $n/0$  being infinity or undefined. Details do matter. They are the heart of "nitpicking".

Having read your main misconceptions page, I'd say that you may have created as many confusions as you have resolved. [ **But you don't say what they are -billb** ] Only a few of your points are clear winners. The rest would probably do as well unsaid, as they appear to be alternate simplifications as lacking in rigor as the original.

[ **I don't care about the "winners." I want to hear useful criticism. If my article is full of faults, just list a few, and everyone here will know what you're talking about. The lack of such a list turns a critique into rhetoric. - billb** ]

Everett Williams <[@#@junk@cebridge.net](mailto:@#@junk@cebridge.net)>

Ingram, TX USA - Monday, March 14, 2005 at 13:39:26 (PST)

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recent news said that a star was cast out of the center of the milkyway and that it was going faster than light speed now from what they said it the star was traveling at 1.5 million mph. now did the star leave the center of milkyway the other day or did it happen years ago also why did it not get larger as too speed and time there is a problim in the math.

monte robinson <[ser4now2004@yahoo.com](mailto:ser4now2004@yahoo.com)>

santee, ca USA - Tuesday, March 08, 2005 at 17:42:52 (PST)

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Mr. Beatty,

First,your website(s) are awesome. For me they take the place of Scientific American's Amateur Scientist column, which I grew up with but which no longer exists. I have a few comments to this page:

1. Regarding the burning of a candle to show that CO<sub>2</sub> is consumed: I've done this with my kids, and I'm reasonably sure air didn't leak out the bottom. My theory was that, since CO<sub>2</sub>

is highly soluble in water, it is rapidly removed through the water, and therefore the experiment might have a smidgen of validity.

**2. An experiment I saw in FIRST GRADE (35 years ago...) didn't make sense then, and it still doesn't: two balloons of equal size were suspended from opposite ends of a stick, balanced. If you pop one, the system is unbalanced, and the deflated balloon goes up. This was supposed to demonstrate that air does have "weight." The problem is that as long as you're in the atmosphere, the balloons are isobuoyant, and it shouldn't make any difference whether or not one is inflated. The only reason it seems to work is that the weight of the popped balloon is redistributed across the lever.**

**3. The peanut butter jar barometer: A balloon stretched across a jar, with a straw sticking out sideways, is often used as a basic barometer for kids learning about weather. Most of my kids had to make one. The problem is that temperature changes also cause the air inside to expand and contract (my kids actually had explicit instructions to place them outside). The end of the straw moves a couple of centimeters, and the kids think the pressure has changed. I kept one at (approx.) constant temperature, and it did work, when compared to reported barometric pressure, but the change was TINY - about 2mm at the end of a 9 inch straw. Any comments?**

David E. Hunt <[talidavid@TTTTTTTearthlink.net](mailto:talidavid@TTTTTTTearthlink.net)>

Lexington, KY USA - Wednesday, February 16, 2005 at 13:28:31 (PST)

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**Quote "Because the flowing air adheres to the TOP of the wing, the tilt of the wing also causes the upper surface of the wing to pull downwards upon the air above it. The air ABOVE the wing moves down and the wing is forced upwards."**

**I want you to explain a general approach illustrating air being "pulled". I can not imagine air being pulled; like a sickly ball of cotton candy tugged by a child from a parent. I can imagine air being pushed (entrained) by other surrounding air.**

**David Anderson has no idea how wings work, and my review on Amazon attempts to explain why.**

Ug its Me <[todesvogel@warmmail.com](mailto:todesvogel@warmmail.com)>

MA USA - Wednesday, February 02, 2005 at 19:17:49 (PST)

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**Hi**

**A comment on your explanation of why lakes and seas appear blue. Basically I disagree with your explanation.**

**It is true to say that water absorbs longer wavelengths better than short and hence white light transmitted through water appears blue ( ask a SCUBA dver what colour every thing looks at 30 metres ) but the overwhelming majority of light visible from the surface of the sea is reflected.**

**[ Incorrect. Very little light is reflected from water unless the light strikes at a glancing angle (like 10deg or less.) If you go down to the shore and gaze out to the horizon, you see only the reflected sky on the water, but if you look down over the edge of a boat, you see the color of the water. -billb]** Highlights are due to the myriad of reflecting directions provided by an uneven water surface catching sunlight and other bright sources of light.I support this with the following thoughts:-

**1) There are no light sources below the water The only light source is the sky ( and surrounding scenery ).**

**[Good point! If nothing in the water scattered the light upwards, then deep water would look completely black. But water does scatter a little light back up. In some situations there is plenty of light coming up from beneath the water. [White sandy beaches](#) and white sand ocean bottom for example, and these show unmistakably that water is a blue substance: a thin layer of water over white sand is light blue, and the thicker the water, the [deeper the blue](#). -billb]**

**2) The sea does NOT look blue on a cloudy grey day it looks GREY. Go out and look if you don't believe me.**

**[ I grew up on Guam next to the Pacific ocean. On cloudy days the water looks steel blue (that it, unless you go down the hill and stand on the beach and look outwards toward the horizon, where you can see nothing but reflections.) Let's see if I can find a photo. Here's one that shows the [blue AND the grey](#). If you're up on a hill on a cloudy day, you can see down into the water and see it's color. Or if you're on a boat or pier and look downwards, you see the blue. But if you look out to the horizon, all you can see is the reflection of the sky. -billb]**

**3) A significant amount of light is absorbed by the ocean - water is transparent after all ( even allowing for surface reflections )- so the water appears to be the same colour as the sky but darker.**

**[ I thought we agreed that water absorbs different frequencies differently, so if the sky is dim white (grey), then water should look dark blue. -billb]**

**4)( The clincher ) If you are lucky enough to find a perfectly calm lake then you will observe a perfect reflection in it of the sky and surrounding scenery WHICH INCLUDES ALL OF THE COLOURS PRESENT PERFECTLY REPRODUCED.**

**[ I stand on a pier and look down into perfectly still water. My face and clothing look very dark blue. The water isn't like a mirror, it's more like dark blue glass. Now if I look out**

**towards the horizon, where the light bounces off the water at 10deg or so, then yes, the water acts like a mirror, and I can only see the sky reflections but not the water's color. -billb]**

**There are minor points involving the polarisation of light which produces uneven darkening in places but this is not relevant.**

**In conclusion water "is" blue but this is NOT the reason why lakes and oceans appear blue. THEY PREDOMINANTLY REFLECT THE SKY.**

**David Matkin.**

David Matkin <[davidmatkin\\_removethis@tinyworld.co.uk](mailto:davidmatkin_removethis@tinyworld.co.uk)>

USA - Tuesday, January 25, 2005 at 09:26:56 (PST)

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**My work is related to a particular science curriculum, which is based on students "doing science." While a lot of it follows the scientific method which you comment on, I think very importantly it begins with "observation," which you seem to support. Students observe...something, whether it's a flame, a piece of ice, a field of grass...and they try to notice something that they want to explore further. Then, they go from there to ask a question, develop a hypothesis or an idea, and test that through an experiment. It seems to work very well, and allows the kids to learn a lot of information as well as science process. So, I agree with you, methods of science do go beyond what traditionally has been taught, but you have to start somewhere, and don't a lot of innovations come through trying things out: experimentation of a sort?**

**[ If books explained the "methods of science," the scientists linked on my site wouldn't be complaining. Or if the books listed the simple series of steps always performed by physics researchers (and to a lesser extent Chemists and Biologists,) then there would be little confusion. Instead the books try to turn these methods into a requirement for all scientists, turning it into a definition of Science, a short list of unquestionable rules written in gothic capital letters, *The Scientific Method*, where Thou Shalt Perform Experiments, (and if you don't perform experiments, then you're not doing science.) But that's just wrong, because science is not physics, and there is no simple list, no Scientific Method which applies to all sciences. The various "methods of science" exist. But if there is no Scientific Method, doesn't this make it very hard to define what Science is? Yes. That's the actual situation: Science is *very* hard to define, whole books have been written about the problem. Grade school teachers are put in a bad situation if they're expected to explain what science is. Top minds in science and philosophy have failed, and the topic is controversial. Ah, I see an analogy: telling kids that all scientists always follow *The Scientific Method* is much like telling them that electrons in an atom orbit the nucleus just like planets orbit a sun. This isn't a misconception as long as we make clear that REAL electrons behave quite differently (just as real scientists often do things very differently than the list of steps in *The Scientific Method*.) -billb]**

Mark J. Smith, MA <[map4jc@yahoo.com](mailto:map4jc@yahoo.com)>

Albuquerque, NM USA - Wednesday, January 19, 2005 at 09:53:56 (PST)

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**Can you tell me why Einsein's equation is  $mc^2$  and not  $(mc^2)/2$ . I understand that  $(mv^2)/2$  is the normal relation for kinetic energhy of motion. and it would appear that the particles emitted in nuclear reacion leave at the volocity of light.**

Leonard Greiner <[uoblg@aol.com](mailto:uoblg@aol.com)>

Santa Ana, CA USA - Monday, January 10, 2005 at 08:54:35 (PST)

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**Despite what your physics teacher would tell you, weight and mass \*are\* one and the same. The confusion lies with the extraordinarily poor choice of term chosen by scientists/physicists to describe the pull of the earth or other body on an object. They chose "weight", and they shouldn't have since that term was already in use.**

**One thousand years ago and earlier, merchants and laypeople would use balance scales to 'weigh' objects by comparing the 'weight' of the object against the 'weight' of other objects. Since they were using balance scales it is an undeniable fact that our millennial ancestors were measuring what is now referred to as mass, except they called it "weight" (the word "mass" didn't exist yet in English). If you were to send an ancient merchant to the moon with his scales he would conclude that objects weighed the same on the moon as on Earth (although he would of course notice that the pull of the moon on the object was substantially less than that of the Earth). Then along came Science. Somewhere along the way 'weight' became known as 'mass'. Then the definition of weight, according to physics, along with the units that measure it, became a force, something it had theretofore never been. And how could it have? The tools to measure forces were created by science itself - force-based spring scales simply did not exist one thousand years ago! So, weight according to its "scientific" definition was not even measurable despite the fact that the term had been in use for centuries.**

**Conclusion: weight = mass and physics needs to come up with a term for the pull of a large body on an object that doesn't contradict over a millennium of common usage. I suggest 'pull' - the pull of the Earth on an object is X newtons or Y poundals (not pounds since those are a unit of mass).**

David P James <[davidpjames@yahoo.com](mailto:davidpjames@yahoo.com)>

Ottawa, ON Canada - Saturday, January 01, 2005 at 18:00:53 (PST)

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Also see older entries: [2004](#), [2003](#), [2002](#), [2001](#), [2000](#), [1999-1998](#),

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<http://amasci.com/~billb/cgi-bin/miscon/guestbook.html>

[Back to MISCONS](#)

Guestbook script from [Matt's Script Archive](#)

# Traffic Waves

## COMMENT BOOK

Your question may have already been answered! Don't miss the [Frequently Asked Questions](#) section. We would love it if you would [Add](#) your comments to our comment book. Also see the [TRAFFIC WAVES LINKS COLLECTION](#) and the [comment Book](#) for the main SCIENCE HOBBYIST site.

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**Honestly, I have actually thought the same thoughts as you are explaining on your web site. It is very interesting to me. I drive one hour each way to work five days a week, and I have plenty of time to analyze traffic behavior. It really does act like one being rather than thousands of people. What really makes me wonder is why do people insist on filling the gaps I try to leave between me and the car in front of me. It is comical. We, my family, observe this all the time and it does become entertaining to us. Thanks for your scientific analysis of the behavior of traffic. This is the coolest website ever**  
cflukens <[cflukens@aol.com](mailto:cflukens@aol.com)>

Fremont, NC USA - Monday, July 05, 2004 at 08:25:27 (PDT)

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**just a small remark on your writings about traffic jams, You might be interested to know that the technique you call 'rolling barrier of state troopers' is used in Belgium for already a very long time (I think about 6-8 years already). We have one three lane highway that brings all the traffic to the coast, and on sunny days, we have what we call 'blokrijden' or 'driving in blocks'. Basically what happens is the following... One motorcycle cop goes on the highway and drives in front of some people, they are obliged to stay behind him. The speedlimit is 120 kph here... so the cop typically drives about 90-100 kph (slower if needed). They allow for a large 'block' of moving cars to form, but little enough not to have the wave effect. Then, when the block has a sufficient size, another motorcycle cop goes in again and forms another block... Like that over and over... so we have big blocks of cars driving on the highway... I have to say it is very effective...**

Geert V

Belgium - Monday, July 05, 2004 07:21:48 (PDT)

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**I've modified my driving over the last year since I first read your site. I can't really say if it has helped the traffic behind me but it sure has made driving I5 less stressful. I have also noticed many other drivers leaving anti-traffic space during drive-times.**

**I have though found the best solution: taking the Sounder train to work. I am so much more relaxed when I get home after taking the train.**

Joe Hamelin <[joe@hamelin.us](mailto:joe@hamelin.us)>

Edmonds, WA USA - Saturday, July 03, 2004 at 23:45:40 (PDT)

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**Hi! That's a great site! I have made exactly the same observations myself. I guess it is a professional hazard of physicists. I'm one too (astrophysicist). I usually move at three seconds behind the previous**

**driver, but when it comes to synchronous flows, a situation that can easily jam up, I often increase that to five seconds (just count slowly). I have too found that I can make a big difference.**

**Now for a comment I just posted in a Slashdot discussion:**

**There's a funny Traffic Wave Generator in Drammen, Norway. Unintended of course, but nonetheless. It's a longish bridge going from northeast to south in this picture[1], and at the northwestern end, there's a lot of traffic coming in, and at a relatively high pace. The speed limit is something like 90 km/h, which means the average speed is probably well in excess of 100 km/h. Then the limit on the bridge goes down to 70 km/h, and at the same time, it merges to a single lane in either direction. Bound to be trouble as it is... But to make matters worse, shortly after the 70 sign (perhaps 50 meters), there is a photo box, that, if it has film it in, will shoot pictures of anybody speeding. You'd get the fine in the mail.**

**But the true sign that nobody in authority has the faintest idea why this is the most hated persistent traffic jam in the country is a big, official sign saying "In case of a jam, follow along!" Right.**

**What they officially seem to be advocating is the fast acceleration. But not everybody can. For example with my mother's little engine, I can't... There is very little you can do to assist evaporation, as you very well argue.**

**So they created the worst, high amplitude traffic wave in the country by putting a traffic control camera in exactly the worst thinkable spot. There would necessarily be a traffic wave there anyway, but it is making matters so much worse.**

**I admit that there is a thing I do not quite understand. The jam often extends the whole bridge, and does not dissolve before a km afterwards. It would be interesting to study this from the air, but I'd love to hear your thoughts on this.**

**[1] [http://map.finn.no/Ortofoto\\_FINNKART22400124811593.jpg](http://map.finn.no/Ortofoto_FINNKART22400124811593.jpg)**

**Kjetil Kjernsmo <[kk@kjernsmo.net](mailto:kk@kjernsmo.net)>**

**Oslo, Oslo Norway - Saturday, July 03, 2004 at 12:22:54 (PDT)**

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**Hi i just wanted to tell you in Germany there is a system on some HighWays which is rhoughly translated called 'automatic traffic leading'. Instead of normal speed limits there are electronically changeable speed signs and sensors which count the cars on the highway. if a traffic jam is reported by the sensors a computer changes the speed limits ahead of it to smaller value so the jam can dissolve. this system uses just the tecnique you described and you hardly ever see a jam on these 'computer-managed' highways. If you want more information on this, the german name is ' automatische Verkehrskontrolle' .**

**Lorx <[achzumteufel@yahoo.de](mailto:achzumteufel@yahoo.de)>**

**Germany - Friday, June 04, 2004 at 04:56:08 (PDT)**

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**Great site, and great concept. I'm looking forward to getting my license soon to try and test this theory. However, drivers in Israel are notoriously raged, so I'm not sure slowing down will work without retaliation. one other problem I encountered while reading the site is this: what all these methods do is**



only make the 'traffic jam' more bearable, mentally. They won't let you get to your destination any faster, though...

**[Not so. "Unplugging" a merge-lanes traffic jam is not theory, I've done it myself a number of times. It's unmistakable when it happens. The whole jam vanishes, and your speed goes from 5mph to 40mph. It's like flipping a switch. -billb]** for instance, when you show two variants of the traffic jam, where in one, everyone's pushing forward and condensing, and in the other, people let spaces build and drive faster. in that case, a car that is in the 50th place behind the first would get to point 'x' (point 'x' being after the traffic jam, where traffic is normal in both variants) the same time in both variants.,

**[What?!! I think you didn't look at those animations. In the unjammed version on the right, the total flow is doubled: two cars per second go past the blinking arrow, and also the speed of the cars is 5x faster. In real life it could be more than this because it takes a very long time to "take turns" at the head of the jam. The benefits of unjammed merge zones are very large. But there is a big problem: once the jam is removed, WILL it rapidly reappear again? When traffic is even more dense, then I suspect it's impossible to maintain the "unjammed" condition. -billb]**

it would only seem more fluid for the car that's driving by your theory... am I mistaken?

Twinpraetor <[Twinpraetor@yahoo.com](mailto:Twinpraetor@yahoo.com)>

Tel Aviv, N/A Israel - Thursday, May 20, 2004 at 01:54:45 (PDT)

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I was quite impressed with what you have done here. I, myself am an antitraffic supporter, and have been utilizing the technique on the North Dallas Tollway for months now. I was excited to find your site and its in-depth approach to the subject. Here is my main comment....how can we organize? How can we easily and effectively get this information out to all of the commuters I see everyday. Most drivers are so anxious to get to their destination, they punch their cars forward, riding up on the cars in front, not letting others merge...stop and go, stop and go. If there were a way to get the message across that EVERYONE would get home quicker and less stressfully if they follow a few simple rules. I would love to be involved in a re-education effort to change our rushhour habits....any ideas?

LeeDon <[leedonmoore@earthlink.net](mailto:leedonmoore@earthlink.net)>

Dallas, TX USA - Wednesday, May 19, 2004 at 12:21:31 (PDT)

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I read through this, and I must say I find it quite interesting. I never thought to look at traffic patterns like this before. I'll try to put this into practice whenever I get into a traffic jam and see how it works out :)

Ashwin Vaidyanathan <[ashwin@anidlemind.com](mailto:ashwin@anidlemind.com)>

Chapel Hill, NC USA - Friday, May 14, 2004 at 17:44:37 (PDT)

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This was a very interesting site, it defined Newtons First and Third laws of physics, as well as incorporated the law of inertia. Also clearly defined the geometric pathagorin theroem in which cars move at a steady rate. We're planning on commuting to Seattle to try this experimentation using several trials, to see for ourselves if you are truly full of shit!

Darwin Fish and Natalie Shrek <[weluvphysics@aol.com](mailto:weluvphysics@aol.com)>

USA - Thursday, May 06, 2004 at 09:25:19 (PDT)

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Neat site, and certainly brings back memories of a lecture our applied math professor gave in grad school yeeeeeeears ago. He modeled traffic as fluid flow in a pipe, and when the density and speed were great enough, the flow goes "supercritical". Once it is supercritical, any random fluctuation (a driver gawking at a sign) will cause shock waves. Depending on the density or speed, the shock wave will

**either propagate forward through the traffic or back. I sure wish I remembered the math . . .**

Jessie <[carman\\_jessie@hotmail.com](mailto:carman_jessie@hotmail.com)>

Manama, Bahrain - Tuesday, May 04, 2004 at 01:39:48 (PDT)

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**Here's another idea I had that might actually have some real effect on traffic patterns: The New York State Thruway Authority Tarp Company. Rubbernecking on the opposite side of a highway from where an accident is, is the cause of needless traffic. There is no physics capacity problem. This is a social engineering problem. So I propose, the Tarp Company. At the site of an accident or ANYTHING 'interesting', the tarp company shows up and puts up a huge sail (there are some wind problems, I realize) but something to make the drivers quickly lose interest in what's going on, on the other side of the roadway so they don't slow down to take a look.**

Stu <[spamme@deadpelican.com](mailto:spamme@deadpelican.com)>

White Plains, ny USA - Tuesday, April 27, 2004 at 10:46:31 (PDT)

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**I don't know if somebody mentioned this, but let me explain something I figured out about traffic. Actually some are here: <http://nyti.dyn.ee:81/learnedcat> items 30, 31 and 32. As you are, I'm an amateur traffic dynamicist and the merging problem can be explained this way. Fill up a two liter soda bottle with water, turn it upside down and watch the water pour out. There are about 5 lanes of water in the bottle, and only one that goes out the bottle (at the cap) In order for traffic in five lanes to flow at the same speed in one lane, that one lane would have to be going 5 times as fast, but do people speed up at merges? no, they slow down making the backup worse. All that crap about "if people would just not bunch up and let people in, there wouldn't be any merge problems" is all bull. Physics doesn't allow for it. Period.**

**[Heh. Think first, THEN talk physics! In the real world, when two lanes merge smoothly into one, the two lanes slow down and no traffic jam forms. (The two incoming lanes might move 2x slower, but that is not a "traffic jam.") On the other hand, if a traffic jam appears, then the flow in the two lanes approaching the merge zone IS NOT 2x lower than the flow in the single lane. Instead the flow drops almost to zero, and that is the problem. If traffic behaved like water which pours through a bottle neck, then traffic jams would not exist. Instead, traffic often behaves like stones pouring into a funnel: they grind together and stop, while the tube below the funnel empties out, while still more stones pile on behind the funnel. And within the funnel, only a few stones can grind past each other per minute. If instead we poured oil on the stones, so that the gravel in the funnel could easily flow into the smaller tube... that is called "having no traffic jam!" Back to the cars: if there is no traffic jam, then the flow in the two incoming lanes must be twice as low as the flow in the single outgoing lane. But when a traffic jam develops, the flow is much much lower than 2x. A single driver can sometimes remove a traffic jam. But of course a single driver can do nothing about the 2x slowdown. -billb]**

Stu <[spamme@deadpelican.com](mailto:spamme@deadpelican.com)>

White Plains, ny USA - Tuesday, April 27, 2004 at 10:38:27 (PDT)

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**I thought there might have been a chance to encounter the term "correlation length of the system". It's inversely proportional to "stress in the system" brought in by stressed drivers.**

Jan Storms <[jan@storms.org](mailto:jan@storms.org)>

Haarlem, Nederland - Saturday, April 10, 2004 at 13:49:15 (PDT)

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**YES, YES, YES !!! Someone GETS it...greetings and kudos Bill, for taking the time to inform others by posting all this. This is a wonderful site. Chock full of interesting and informative information on**

**traffic and flow. Especially the 'cures'. As an airborne traffic-reporter in Los Angeles (who also drives 75 - 100 a day on those same roads), i can second your thoughts on most of these dilemmas. Our roadways are - for the most part - constant, yet the number of vehicles using them is ever-expanding. Thus, creating quite a problem. It takes a bit of thinking, planning and COOPERATION from others on the road to make this all work. Will definitely create a link to your site for others to explore and learn from. Keep up the great work! ...taylor (non-expert...just an observer)**

M taylor baez <[EyeintheLAsky at ya-hoo dot com](mailto:EyeintheLAsky@ya-hoo.com)>

Ca USA - Saturday, April 10, 2004 at 12:03:29 (PDT)

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**I have just found the perfect site for car mad science students in Oman. Thank you**

KathyS <[kathys@squ.edu.om](mailto:kathys@squ.edu.om)>

Muscat, Oman - Wednesday, March 24, 2004 at 23:30:47 (PST)

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**For many years I have suspected the traffic wave phenomena. Your articles make it very clear. They should be required reading in any driving education program. I have pointed out your articles to my local newspaper (Doctor Gridlock at the Washington Post).**

Tim Brown <[tbrown59@verizon.net](mailto:tbrown59@verizon.net)>

Wash, DC USA - Monday, March 22, 2004 at 10:46:59 (PST)

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**Great theory! Now I will not feel so helpless when I get lost in the maze of traffic.**

**It seems to me after reading your theory that two things could be done to improve traffic slow downs.**

**1. The speed limit of traffic could be lowered during the crush hours. If it were a stanard to lower the speed limit to say 45 mph during the moring and evening hours traffic could maintain itself better. It's either that or go 2 mph all the way home.**

**2. There could be acutal traffic monitor cars that cover all lanes and purposely slow traffic down. They would form one line across all lanes and back down on the gas to 45 mph.**

Mark Rankin <[m.rankin5@verizon.net](mailto:m.rankin5@verizon.net)>

Hemet, Ca USA - Friday, March 05, 2004 at 03:55:29 (PST)

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**What a fantastic site. It really is what the Internet was intended for. I have a question which I am fairly sure ws not answered, though must admit I did not read every line of the other comments.**

**I believe what you say is true. However, only a few of us are sensible, mature and professional enough to understand and adopt this way of driving. I'm not even sure I'm one of us myself! The fact that your web site's been around for a long time but I don't seem to meet many people like you on the roads tends to confirm that this sort of behavior will not rise up spontaneously from the driving population in my lifetime. And I wish it would. Do you, therefore, have any suggestions as to how to coerce or enforce the population to behave in this way? I was wondering about some kind of "good driver reward", where some cameras and image recognition stuff picked out such people and rewarded them in some way?**

Andrew B

USA - Tuesday, December 30, 2003 at 14:55:48 (PST)

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**Hey I just wanted to say your website is dead on, I realized the traffic wave idea about a year ago and Its the best thing ever. I can go a smooth 20-30MPH in solid rush hour traffic and never have to stop once not to mention its sooo much easier and stress free! I dont think you covered this but have you noticed the middle lane is usually the fastest? The left (fast) lane is filled with people who dont want to wait and think they can zip past everyone. The right lane is filled with people who slow down to exit the freeway and leave the freeway system so thats -1 car and frees up space, so it might look faster BUT its also got people who enter the freeway system, so thats +1 car PLUS most of them havent reached the same speed as everyone else which causes cars behind to slow down. Plus the middle lane has the added bonus that if something were to happen ahead of you, you have more options on what to do. you can get into the left OR the right lane.**

Asa

USA - Friday, December 19, 2003 at 18:06:12 (PST)

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**Great site! The more you get the word out, the better the driving experience will be for more people right? Driving a manual trans., I have been doing this for a while myself. Saves wear and tear on the brakes. Keep up the great work. We sure do like to amuse ourselves while in traffic don't we? ;) You might like a site that keeps my mind ticking in traffic, it's [www.AboveAverageDriver.com](http://www.AboveAverageDriver.com) My handle is "gowiththeflow" Catchy eh?**

Kimberly Demyanovich <[kimberly@aboveaveragedriver.com](mailto:kimberly@aboveaveragedriver.com)>

Woodhaven, MI USA - Friday, December 12, 2003 at 18:29:38 (PST)

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**ANTITRAFFIC DESTROYS TRAFFIC ... I think your observations are "spot on". I thought I was the only "lunatic" who observed and practiced this on the highway. With the amount of miles (25-30k) I put on the car every year, I have plenty of time to observe. I routinely leave the gaps you describe, and often play a "game" while driving and see how many miles I can drive w/o having to apply my brakes; leaving large gaps of "anti-traffic" between. Without qualifying it, as you have, I have thought that I was contributing to "anti-traffic" by driving in this fashion. It's hard to do in densely-populated NJ, but I do it anyway. It's also less stressful -- not competing. Keep up the good work! How can we get others to follow?**

Larry G <[gruberz@aol.com](mailto:gruberz@aol.com)>

NJ USA - Tuesday, December 09, 2003 at 04:26:14 (PST)

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**Thanks so much for your website. My students (many new drivers) and I are investigating waves in my trigonometry class, and I have put up a link to your site from the school assignments webpage. Thanks again!**

J. Euchler <[jeuchler@mccanntech.org](mailto:jeuchler@mccanntech.org)>

North Adams, MA USA - Sunday, December 07, 2003 at 14:02:38 (PST)

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**Thanks so much for your website. My students (many new drivers) and I are investigating waves in my trigonometry class, and I have put up a link to your site from the school assignments webpage at <http://www.mccanntech.org/showPersonal.asp?ID=JE&area=MAT>**

J. Euchler <[jeuchler@mccanntech.org](mailto:jeuchler@mccanntech.org)>

North Adams, MA USA - Sunday, December 07, 2003 at 14:01:46 (PST)

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**I really love your web site. Keep it up.**

asaba owerri <[homeboy\\_owerri\\_asaba@aba.us](mailto:homeboy_owerri_asaba@aba.us)>

miami, florida USA - Monday, November 24, 2003 at 03:22:03 (PST)

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Since it is all about waves what you've done is create a wave 180 degrees out of phase with the original wave ( a big space as large as the wave.)

Dan <[d-desloovnosspam@nospam.monroe.lib.mi.us](mailto:d-desloovnosspam@nospam.monroe.lib.mi.us)>

Monroe, MI USA - Thursday, November 06, 2003 at 09:07:04 (PST)

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Nice theory, but I don't think it can work, [**What theory? I'm describing what I do personally during commutes. Please go and try using a large empty space, and try it at least ten times before you declare that it can't be done. -billb**] even with the rolling blockade. Too many impatient people to screw it up. And even if there weren't, there is usually just too much traffic, especially with people entering the freeway. I have found in trying to leave a 2 second gap in front of me, it constantly gets filled by cars passing from either side. If I want to maintain a gap, I have to keep slowing down more and more, as the gap keeps filling. It has been impossible for me to do what is described in the link, because the gap never develops, I just keep slowing down. I have been able to do it when coming to a closed lane, by being in the closed lane and matching speed with another vehicle (usually a long truck) in the open lane beside me. The closed lane invariably moves faster (in any city I've driven), because too many people are too courteous in the open lane, letting multiple selfish ones in the closed lane get ahead of them. I have been successful many times in making the flow fair, and kept the closed lane at the same speed as the open lane, which I'm sure made the open lane go faster. I start matching speed after I have passed at least one, some times two notifications that my lane will end. I stay aware of the possibility that the closure is no longer in effect. This results in a lot of pissed off impatient people in the closing lane behind me. Some times they pass on the shoulder. Even the people in the open lane don't always appreciate the fairness, and don't want to let me in, even though I could have gone 20 car lengths ahead of them, and had a lot of other drivers pass to get in front of them. Unlike the other authors, I have usually been able to speed out of a jam, and make a point of jumping into a newly opened lane as soon as possible, to show the drivers behind me that they can speed up too, (the end is near). Alas, I always see rubberneckers or trucks going slowly in all lanes behind me as I leave them behind.

mark <[comercial@ev1.net](mailto:comercial@ev1.net)>

Houston, TX USA - Monday, November 03, 2003 at 12:06:03 (PST)

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Sounds good, but is it not true that all of your ideas simply move the "wave" further behind you? [**No. When I smooth out a series of traffic waves, I'm actually taking the dense parts of traffic and putting them into the sparse parts, so no waves exist after I pass. And with merging-lane jams, I'm destroying the traffic-jam effect by pulling the dense part of traffic backwards away from the merge zone. Yes, when unplugging a merge-lanes jam, you do move the dense wave backwards. But then it STOPS GROWING, since the "plug effect" is gone and free-flow merging can occur. The remaining wave then drifts backwards into the distance. If I did nothing, then that wave would remain pinned in place at the merge zone, and as more cars pile in behind, it would grow larger, and larger, and larger. And finally, while you're right about the "standing wave" in that animation, the genuine "rubbernecker waves" instead grow larger and larger because the front of the wave remains pinned in place while the back of the wave still moves backwards as more cars pile in behind. In that case, if I pull the standing wave backwards away from the accident, then the front end starts evaporating normally again, so it starts moving backwards at the same rate as the rear end, and the whole wave moves backwards but no longer grows rapidly larger. - billb**] Just because you slow down into a "standing rubbernecker wave" does not mean it will erase the wave, it just means that the wave will move further behind you. In

**essence, it moves spots. It doesn't disappear. If you are the only driver on the road that is taking part in these "anti-traffic" methods, then you cannot control the other drivers on the road who are still speeding into rubbernecker waves.**

Jonathan <[weeple81@yahoo.com](mailto:weeple81@yahoo.com)>

Portland, OR USA - Sunday, November 02, 2003 at 23:50:06 (PST)

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**Thanks for this great site. I'm confident that traffic will be the scourge of the 21st Century. I've been referring my family, friends, and co-workers here to see what they think. Of course, they are all skeptical. I've found the "large space" has done wonders in the morning commute on I-84 westbound in Portland, Oregon at the I-205 junction and again at I-5, where it is basically merge-zone jams and stop-go waves. But I'd like to say something about the role of expectations when driving in heavy traffic. Drivers behind me clearly expect me to go as far forward as I possibly can. I've seen several drivers gesturing angrily behind me because I have refused to close the gap in front of me... it is as though tailgating has become a basic requirement for highway survival. The underlying psychological principle seems to be, "We're all resigned to the same fate of being stuck in this jam, so why bother trying to make it better?" So the question I have is whether there is any hope for dissipating the common belief that once a jam has started that it cannot be changed?**

Peter

Portland, OR USA - Thursday, October 30, 2003 at 01:05:54 (PST)

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**It is incredibly awesome that this site is still around. I found it years ago and have been following the philosophy implied here ever since. I have gone from a 35-mile commute back then to a 50-mile today and everyday I see the proof of the things talked about here. Love the site! Keep it up!**

Timothy Michael <[tmichael@igwebgarden.com](mailto:tmichael@igwebgarden.com)>

Dallas, TX USA - Friday, October 17, 2003 at 21:02:06 (PDT)

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**An impressive site on a subject that has intrigued me for a number of years. I have a number of observations from driving the I10 to and from Louisiana where there is continual construction. 1. Traffic jams where a two lanes merge in to one are perpetuated by selfish drivers that want to get to the front of the closing lane and merge. What causes the initial jam is hard to say since I've never been there to witness it.**

**2. A State Trooper with flashing lights on the shoulder next to the closing lane will encourage all drivers to merge early and avoids the worst symptoms of the jam. This suggests that the selfish drivers know they're doing something wrong.**

**3. In lieu of a State Trooper to remind people to merge early perhaps some kind other incentive to get out of the closing lane would work. "Rumble strips" across the lane that make driving in it noisy perhaps? I have considered throwing glass bottles into the closing lane, but that's just me ;-)**

**4. Trucks will often sit in the closing lane and match the speed of the merge lane. This stop drivers rushing to the front and perpetuating the jam. Of course everyone behind is still screwed, but at least part of the problem is solved, and it pushes the jam further back away from the merge.**

**5. In Houston we have on-ramp stop lights for rush hour traffic. They control the amount and frequency of cars entering the freeway. These appear to have helped, but they aren't linked to actual traffic flow. I've seen them off when traffic is backed up, and on during a holdiay when the freeway is empty. Good science, bogus implementation.**

**I'd be interested in studying what driving habits cause the initial jam at merging lanes. The 59/I610**

**intersection in Houston is notoriously bad. Perhaps I could ask one of the high rise buildings there to let me set up a video camera before rush hour and record what goes on.**

Bob E <[bentwhistle.AT.hotmail.DOT.com](mailto:bentwhistle.AT.hotmail.DOT.com)>

Houston, TX USA - Tuesday, October 07, 2003 at 13:23:31 (PDT)

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**This isn't a question, rather a comment. I just wanted to say I enjoyed reading your page. I never thought about this principle as technically as you have but discovered it in 1993 while stationed in Norfolk VA. In Norfolk construction was always going on somewhere and I started slowing down slightly ahead of the construction zone and end up moving steadily through the construction zone. I heay traffic I have noticed when I come to a place where traffic has stopped when it starts to move I can move steadily even if it is only at 10 mph and then steadily increase back up to the speed limit. Even on a four lane highway (two lanes in each direction) this process has shown sucessful for the idiots who wait until the last minute to merge, because unlike the majority I am not trying to punish them for their stupidity. I large metropolitan areas through traffic can help by staying away from the outside lanes. These lanes should be reserved for commuters to and from that area. If you will notice when you enter a large metropolitan area there are usually two lanes designated for through traffic. This principle also seems to work on controlled highways (highways with traffic lights) because in many larger cities the light cyles are synchronized. If I don't treat each stop light as a drag racing start I can usually negate a light cycle delay. I saw a comment about truck drivers knowing this principle. Though truck drivers may be courteous to other trucks they seem to be rude to cars. I know and have ridden with friends who are truck drivers and they will talk junk about the cars on the road. I have learned for every impatient idiot in a car there is and impatient idiot in a truck somewhere. For example I'll hear truckers talk about cars tailgating them, but there have been sveral times I have had a truck tail gate me. Later, Erik Fruits**

Erik Fruits <[stiurf@yahoo.com](mailto:stiurf@yahoo.com)>

Wilson , NC USA - Monday, October 06, 2003 at 23:32:08 (PDT)

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**3 more points. The first one can also be handled by leaving space as you've already covered: I've noticed most car drivers stop when they should slow down. This has to do with lack of foresight and delayed human reaction time. Looking at least 2-3 cars ahead for slow-downs ahead can help eliminate this problem because you'll know to slow down earlier. Also, when stopped (in stop-and-go traffic) looking ahead and starting slowly and obviously when the car that is 2-3 spaces in front of you starts to move can help you. Your movement (attentive inching) can sometimes give the stopped motorist in front the "hint", and they start moving earlier. This works for traffic lights too. I heard that in France some traffic lights blink yellow (or green) before changing to green. This gets most drivers' attention and they start moving almost synchronously. I'd like to see this done in the U.S.A.**

John C

Rockville, MD USA - Thursday, September 11, 2003 at 20:56:59 (PDT)

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**Thank you so much for these insights. I have wondered about the same concepts in passing, but this site's full discussion adds a new understanding. I will be taking Driver's Ed in October, and getting my learner's permit in April 2004. I now plan to use these techniques in my everyday life eventually.**

**Thanks again!**

Tyler

NC USA - Monday, September 08, 2003 at 21:45:20 (PDT)

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**I blundered onto your site from Slashdot. Very good analysis of the traffic problem. I have a daily commute of about 30 miles to Manchester some of which is on road, some on motorway. I observe the behaviour you describe daily and have found that similar behaviour to what you describe really works. I started doing this as I hate stop start lines and think the chances of accidents are much higher in these events. I find that to make a difference, If I can slow down very gradually the cars behind me go into a pacified mood and evenly space taking my example. If I forget and speed up, closing a gap, then the traffic behind does likewise and all three lanes get more busy as people hunt for the faster lane. I find that in general about 3-5 cars will carry on following me in the morning even if the next lane is 10 mph faster. Possibly a confidence thing going on in their mind and would rather follow than weave between Lanes. Will be interested to hear if any police forces in the US start applying any of the methods you have tried. I did some mind experiments a while ago and figured that rolling regulation of dense traffic should be possible. It would be interesting to do an estimated financial analysis in terms of cost vs savings if police did employ this technique.**

Richard Price <[richardprice@lineone.net](mailto:richardprice@lineone.net)>

Halifax, UK - Wednesday, August 27, 2003 at 02:34:23 (PDT)

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**Okay...but how do you create a space in front of you, when as soon as you leave enough space for one car, someone in a hurry cuts you off and fills it? Then you back off and leave space and someone else cuts you off and fills it? It seems that all you would really accomplish is allowing many people to cut you off, thereby impeding your own progress... How's this. One day while returning to New London, CT from Hartford, I turned the cruise control on at 65mph as soon as I left Glastonbury on Route 2 (where the traffic finally opens up.) Two vehicles immediately zinged past me to rush forward-a white hyundai and a red toyota pick-up truck. Half an hour later, in Waterford, CT (nearing home), I was stopped at a traffic light just after exiting the highway. One of the vehicles, the Hyundai that had sped past me 30 miles away in Hartford, was in the lane to my left, and only one car ahead. I looked behind. There was the other vehicle, the Toyota truck that had sped past me upon exiting heavy traffic in Hartford. So, their excessive speed had gotten them nowhere, fast...**

tony <[baldwinets@lycos.com](mailto:baldwinets@lycos.com)>

New London, CT USA - Tuesday, August 26, 2003 at 17:53:14 (PDT)

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**Your ideas about traffic are very similar to my own, but I came to the same conclusions through a different route. Mine are based on manufacturing simulation, in which a statistical model is built of some process. A good model includes the variation of the process, not just average numbers. What you've observed about traffic, stated in terms of a statistical model, is that variation in speed (velocity, really) is the cause of traffic jams. This is particularly clear when driving along a stretch of freeway that has a number of small hills. Traffic builds up going up the hill but completely clears coming down. After the first hill it seems like the traffic should be clear the rest of the way, but it's not - it just collects at the next hill. The problem is not that \*everybody\* goes slower up the hills; it's that \*some\* people go slower, which causes others to step on their brakes, change lanes, and so on. All of this compounds the variation in speed and makes the problem worse. Traffic is a system which includes the behavior of the people involved in it. As you've noted, if we change people's behavior, we'll change the traffic patterns. You may be interested to know that your idea of slowing traffic by using a highway patrol car is being used in southern California near Knott's Berry Farm (probably other places as well). I've been through that stretch of freeway several times; a patrol car drives back and forth across the lanes, slowing traffic down. I've never been stuck in a jam there (always with normal traffic conditions), I've just gone**



**slower. I read through some of the other comments and have to say that increasing capacity will not always solve traffic problems; it's certainly not the cheapest way to do it. In particular, adding one lane to a jammed freeway at a hill may not help. It would be cheaper and perhaps more effective to slow the traffic down or maybe to hand out tickets for driving outside a certain rather tight speed range. Of course, you'd have to hand out the tickets well after the point of the problem :=) For anybody interested in a rather common sense discussion of problems introduced by variation, try reading "The Goal" by Eliyahu Goldratt (a physicist turned manufacturing engineer). It's more of a novel than a text book.**

Bob <[bob.kannon@excite.com](mailto:bob.kannon@excite.com)>

Encinitas, CA USA - Monday, August 25, 2003 at 18:30:03 (PDT)

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**Let me first start off by commending your site. Your site is one of the most insightful sites that I have read. Keep up the good work. I am originally from New York and just moved to the Seattle area recently. In the two weeks that I've been here however, I have noticed two things about Seattle roads that seem to cause the traffic plugs more often than when I was in New York: (1) The numerous number of left lane exits and merges, especially on I-5. Cars are continually jockeying from one side of the road to the other in order to make their exits, as a result slowing down the cars behind them. (2) The excessive use of braking on the expressways (or freeways as you call them here). I don't mean to complain about Seattle drivers in general, though I've seen many occurrences where cars will brake to slow down even when there are 10 car lengths in front of them to the next car. This is especially true during slight bends in the road where just releasing the accelerator is sufficient. I've noticed that cars that brake will cause cars behind them to brake even more since they see the brake lights, with the result being the traffic plugs you describe. The suggestions on your site are especially helpful in relieving this particular situation. Thanks for the great site!**

Clyde Law

Redmond, WA USA - Wednesday, August 20, 2003 at 13:32:14 (PDT)

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**Very interesting to come across your web page on traffic dynamics. Up until Aug 2002 I lived some 15 miles North of London, UK. For 3.5 years I had to commute to my office South of London, a 150 mile daily round trip. My daily drive usually took between 3 and 4 hours total (incl to and from). I observed many of the wave effects mentioned. The M25 motorway encircles London, and my journey took me on almost exactly half of it. I used the East half despite having to spend £1 each way at the Thames toll crossing, because the traffic is much worse on the West side (around Heathrow airport etc). Along much of the busy Heathrow section they have variable speed limits displayed prominently on overhead bridges every few hundred yards. The idea is precisely to smooth flow, preventing waves and congestion and junctions. Not sure if anyone pays any attention though. I am ashamed to make an admission, in fact should not be saying this here... there's another benefit to driving at the average speed and leaving nice gaps in front of you, other than the social benefit of deleting waves. If you take a book or magazine with you, and drive slowly and smoothly with a nice big gap, you can read while you drive in the traffic jam! NOT RECOMMENDED... One eye on the road and one on the magazine works Ok at low speeds. Many drivers seem to think the fast lane is still faster than the slow truck lane even when the whole thing is barely crawling along. The fast lane is usually more congested because of all the desparate drivers blind to the reality and because of this it's usually quicker to fit comfortably in between two huge trucks than stress with the rest in the fast lane. The acceleration and braking of your typical freight vehicle are also so slow that they automatically create a wave deleting effect of their own. Plus there's the added advantage that if you're reading a magazine, the looming truck in front of**

you is a lot easier to spot out of the corner of your eye. In 120,000 miles I never had an accident while crawling along with my magazine/book - I read almost the whole of the Lord of the rings like this... but I know it's wrong and I shouldn't have done it. Fortunately now I live a mere 2 miles from my office and if my journey takes more than 7 or 8 minutes it's a bad day.

Hans Summers <[Hans.Summers@Tudor.Com](mailto:Hans.Summers@Tudor.Com)>

London, UK - Tuesday, August 19, 2003 at 05:44:39 (PDT)

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**a comment to your state trooper idea: They do that sometimes here in California, A highway patrol will swerve back and forth between all lanes with his lights on keeping traffic slow. I had no idea why the hell he was making me go less than the speed limit so I called my step dad who was a cop and he told me it was to fix traffic conditions. They do not do this too often, and I am not sure why they do it sometimes while most times they dont, or what the criteria to do it is, or if maybe its only in a certain location. What I do know is they figured it out too. Figured you might like to know that. -Jeff**

**krzee <[krzee@ircpimps.org](mailto:krzee@ircpimps.org)>**

Petaluma, CA USA - Wednesday, August 06, 2003 at 02:35:44 (PDT)

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**Great site and a lot of food for thought, especially for a daily commuter who hits 2 of the worst 18 bottlenecks in the US (I-95/495 and I-95/Rte 1). I definitely agree with your observations and conclusions, especially having practiced some of the 'traffic-eating' solutions myself!**

**A parallel occurrence you might find interesting that exists in military marches, aka the accordion effect. My credentials are I am currently in the military and have hiked hundreds of miles in large formations. The military 'solution' to hiking traffic (usually occurring with an injury or when approaching steep terrain, bottlenecking bridges, etc.) is to have each man (or woman) 'keep it tight'. Anyone who has humped (military term for hiking with a pack) knows the worst place to be in the formation is at the end, because keeping up with the tail end of the accordion means going from a complete standstill to an all out sprint to catch up with the traffic 'wave' that is travelling all the way back from the front. Why is this a problem? Drivers coming out of a traffic wave just push on the gas a little harder to resume normal speed, but when you're on foot, it means you must do an all out sprint to catch up with the rest of the formation. Recruits are ordered by their drill instructors in basic training (at least in the Marine Corps) to always keep an arm's length of distance between yourself and the person in front of you (simulating the tight spacing of vehicles in traffic). Any large gaps would instantly arouse the ire of a drill instructor, who would order the recruit to 'tighten it up' in a full out sprint. That would cause the recruit behind THEM to sprint as well, and so on, and by the time the gap 'wave' passed to the end, some recruits were running several dozen yards to 'keep it tight'. When an injury/bottleneck/slowdown occurs in the front, it makes nearly the ENTIRE formation come to a stop in a huge accordion-like fashion. When I was in basic training and was paired up with an experienced infantry marine, when gaps occurred we would hasten the pace a bit but not break out into a run. By doing so we slowly closed the gap and sometimes 'ate' the traffic waves coming backwards as a result of recruits in front of us crashing into each other as they went from an all out sprint to slowing suddenly to a walk (again, simulating stop and go traffic in a tight flow). The slow closing of the gap allowed the formation behind us to stay together but it didn't screw over the guys at the end who would have had to 'eat' the biggest part of the gap 'wave'. Some units have caught on to this and normally will leave large gaps (several hundred feet or even meters) between units on the move to accommodate for this if the hump involves large numbers of people.**

**It took some courage to maintain a hump gap (especially with DIs yelling in your ear ordering you to do otherwise) just like it does when you leave large gaps in front of you in highway traffic, but through trial and observation I know it WORKS. Keep up the good work!**

Nick  
washington, dc USA - Monday, August 04, 2003 at 00:58:51 (PDT)

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**Peace be unto you**

maga <[mugu@maga.com](mailto:mugu@maga.com)>  
NY, USA - Saturday, August 02, 2003 at 12:04:35 (PDT)

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**The techniques seem to mainly pertain to highway congestion. Is there anything that individual congestion busters can safely do in city traffic with all manner of stoplights, cross streets, driveways, and parked cars?**

**[ I've seen articles pointing out that in inner-city driving, cultures with extremely aggressive drivers have fewer traffic jams! So apparently the best philosophy for city-grid driving is opposite of the best philosophy for driving during rush hour on highways. - billb]**

**You mention that stoplights are better than 4-way stop signs. An idea that is catching on now in the US is the modern roundabout. The relevant feature of roundabouts is that cars spend less time stopped. (They have yield signs, not stop signs and no stoplights.)**

**You mention signs with light displays, where the speed limit can be changed at any time. Ramp meters and variable speed limits controlled in response to traffic conditions are among the techniques advocated by physicists to prevent or disperse congestion. As you point out in a couple of places, it is hard for an individual to know whether their efforts to improve traffic are optimal or even whether they are doing more good than harm. What helps in one place may make things worse elsewhere. Theoretically, with sufficient information about area-wide traffic conditions, these decisions could be automated. (I'm not sure how a few speed limit signs could maintain the desired space between cars though.)**

**Your discussion comparing people in traffic and molecules in a fluid, says that molecules are all alike and that maybe people tend to act alike in heavy traffic. Well, molecules aren't really alike: They vary in energy level. Then again, there are astronomically more molecules in a fluid than people on a highway. And I would suppose that the percentage of a fluid that is molecule (versus empty space) is tiny. (The molecules are all congestion busters). In short, I think the fluid analogy could use some work. (Don't look at me!- I'm no physicist.)**

**Thanks for such a good site. This is what makes the internet so great!**

Jerry Bridgman <[jerrydenise@juno.com](mailto:jerrydenise@juno.com)>  
Madison, WI USA - Wednesday, July 30, 2003 at 00:19:36 (PDT)

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**Leaving space and letting people merge is good advice. It surely would help if people here in LA would take this stuff to heart. Unfortunately the first thing you learn here is to NOT use your indicator before changing lanes, as this will cause the gap you have been aiming for to close immediately. I'm originally**

from Germany and German drivers are famous for being aggressive but here many people are more than rude they are psycho. Took me months to get used to it (as far as one ever can).

Another factor you should point out is that stop-and-go traffic is a major source of air pollution (another thing that LA in abundance besides traffic jams). Smooth traffic wastes far less gas and greatly reduces vehicle emissions compared to repeated acceleration and deceleration, especially if everybody is driving ridiculously heavy trucks and SUVs. Additionally, leaving plenty of room and not shoving your air intake into somebody else's exhaust pipe will make breathing in your own car so much easier.

So, regardless of whether it actually does improve traffic flow (of which I'm quite convinced), leaving space will save you nerves and gas ( $\Leftrightarrow$  money), reduce your risk of accident, help the environment, keep you out of other people's exhaust cloud and generally make the road a less nasty place to spend time on for everybody. I guess that's good enough to give it a try.

Thank's Matt, have a good drive.

Franz <[trax\\_s@hotmail.com](mailto:trax_s@hotmail.com)>

Los Angeles, CA USA - Saturday, July 19, 2003 at 03:21:46 (PDT)

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The only way to alleviate traffic through a change in driving philosophy is for all drivers to go **FASTER**. **[But everyone in the jam already wants to go faster. Why don't they? Simple: there's someone ahead of them who also wants to go faster but cannot. All of us are in the same situation. OK, so go look at the very the start of the jam. What's the big hold-up? Often it's caused by turns-taking at congested merge zones. Or perhaps it's caused by a "traffic standing wave" which has become pinned in place at a hill or at a turn. Drivers *can't* go faster, there's various sorts of "traffic plugs" blocking them. This website is about these plugs, and about ways that individual drivers can unplug them. Driving faster (or just *trying* to drive faster) seems to trigger the Three-Stooges doorway effect; it seems to be the *cause* of traffic jams. It makes drivers close up spaces, which triggers traffic waves and prevents merges. Ease off, give space, and see if you can unplug a major stoppage singlehandedly. (It's certainly possible, I've done it myself.) - billb]** If each car travelled twice as fast there would be half as many cars on the road at any given time. It's a matter of velocity and pressure, greater speeds and greater distances between cars. Your proposed solution would make it impossible to get to your destination any faster, the rate determining step is the driver in front of you, who has not changed behavior. Plus you are being kind enough to let a mile of merging cars in front of you, so you can only expect to get to your destination slower. The drivers behind likewise can only expect to arrive later unless they pass you. The simulation you cite is flawed since it is only simulates a half mile highway, what about the endless miles of congestion that exist in real life? **[But what if the simulated road was much longer than you're visualizing? In that case something amazing happens: it still acts the same! Doubling the length of the road does not make the traffic waves behave differently. And unplugging the stoppages always causes traffic to speed up, regardless of how long the road might be. - billb]** The only relief is getting the clog off the road, in other words, getting the cars to their destination faster. The simulation only needs to get a half mile of clog off the road, which is not difficult. The only solution is to lower the pressure of the system, which means drive as fast as you can. The faster you get your car in the garage, the faster there will be one less particle in the pipes.

Keith <[kclemens@hotmail.com](mailto:kclemens@hotmail.com)>

LA, CA USA - Friday, July 18, 2003 at 18:19:07 (PDT)

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**hey there...loved the spot on traffic jams. can you preach the gospel to LA drivers? pretty please.**

**i've actually been practicing the "lubricant particle" driving for years, and it works like a charm...plus i won't get tendinitis in my wrist from having to shift gears so often. cheers.**

jonnie5 <[jonatmudd@yahoo.com](mailto:jonatmudd@yahoo.com)>

pasadena, CA USA - Thursday, July 17, 2003 at 13:30:24 (PDT)

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**A colleague of mine who used to commute some 30 miles each way to work along the oft-clogged 128 highway in Metro Boston used to refer to this as the "water hammer" effect, which is pretty much the same analogy you are using, only in a different vernacular.**

**On a related note, I am curious your opinion on a (perhaps?) related phenomenon. I commute home on a different highway, Rte. 3, which at one stretch is heading pretty much due west. There is often a "solar slowdown" in this stretch, as people slowdown presumably because they are momentarily blinded by the sun directly in front of them. The thing is, this slowdown occurs even on overcast days. Is this just a force of habit among the regular commuters?**

Mark Timmins

- Thursday, July 17, 2003 at 13:05:04 (PDT)

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**The equivalent of a rolling barrier of state troopers is the system that is applied in the Netherlands on major highways with lots of traffic. There are overhead panels that can show varying information, including actual speed limits. When it is crowded, the panels will show a lower speed limit, which decreases even more when a traffic jam is near. Since these limits are strictly enforced (radar), people stick to these limits. Complete jams are avoided, there are just long lines of slow-moving traffic.**

Renate <[renatew@xs4all.be](mailto:renatew@xs4all.be)>

Belgium - Thursday, July 17, 2003 at 01:37:18 (PDT)

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**I was delighted when my husband sent me the link to your page about traffic waves. I grew up in a rural area in Virginia and never had to deal with traffic problems simply because everyone was relaxed in their driving habits. Having recently moved to the Washington DC Metro area, I am astounded at the idiocy displayed on a daily basis by the drivers in this area. The first time I drove on the Capital Beltway, it took years off my life- people rushing to fill the gaps in front of them and then slamming on their brakes and causing traffic to squeal to a halt. I drive a manual transmission car, so needless to say I can't drive like that and expect my transmission to last. I have observed the same types of behavior when I let large gaps open up in front of me. Yes, there are the people that immediately rush to fill in the gap, but they usually don't stay very long, seeing another gap in a different lane that they can rush into. I just back off and let more space accumulate. It saves wear and tear on my car as well as my mental wellbeing!**

**Thanks for your site- it was refreshing to know that there are people out there who are aware of the problem and know how to solve it. I wonder if there is any way to educate the public of the DC metro area... hmm.**

Jessica C

Purcellville, VA USA - Wednesday, July 16, 2003 at 11:04:40 (PDT)

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**These are very interesting observations and I'm anxious to try them in my own commutes. Atlanta's traffic is awful to what is becoming legendary degrees and I'm intrigued by the possibility that a very small percentage of cars on a busy interstate might be able to "lubricate" the whole road with this technique.**

**I'm also thinking of how nice it would be to leave my gearbox more or less in one gear (2nd?) in order to maintain a constant speed.**

Jeff

Atlanta, GA USA - Wednesday, July 16, 2003 at 10:38:24 (PDT)

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**Great site.**

**Here in the Netherlands they have done experiments with state troopers that slow down traffic. They just start to ride on the middle of the road, keeping all other traffic behind them. This effectively enforces a lower speed limit on that road. This increased the throughput of the roads in question by a noticable margin by reducing the traffic jams greatly. It works.**

**Martijn Lievaart**

Martijn Lievaart <[m@rtij.nl.removefromhere.invalid](mailto:m@rtij.nl.removefromhere.invalid)>

De Bilt, Netherlands - Wednesday, July 02, 2003 at 08:05:37 (PDT)

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**It's nice to see such a comprehensive treatment of this, but it really is nothing new. The "fluid dynamics" of traffic flow has been around at least as long as the National Traffic Laboratory, and anyone who drives on motorways with any frequency knows how to keep things moving.**

**[Actually, this stuff is cutting-edge research, only discovered in the late 1990s: chaotic dynamics of particle flows applied to auto traffic. In fact, many traffic engineers apparently *hate* the new ideas because they're brought in by outsiders (by physicists rather than by traffic experts.) Much older research treated traffic like plumbing. It's not. Many nonlinear phenomena were noticed, but not explained until very recently. See the article on the links page, especially in 1999 [Science News](#) for more about the new science, and especially the part about the politics and the resistance to the new traffic concepts. And as for drivers already knowing how to keep things moving... I don't believe you. I've been driving for decades, and I never heard ANYTHING about any of this. A few truckers know about it, but drivers in general do not. If drivers knew how to keep things going on congested highways, *then we wouldn't all participate in creating traffic jams!* If you think it's well known, then just point out some older articles about traffic smoothing and un-triggering of traffic jams. (I suspect they don't exist, but I'm happy to change my mind, and I'll add any articles you find to the ones already listed on my [links page](#).) -billb ]**

**I noticed your suggestion of a barrier of State Troopers to maintain an average speed rather than stop-go. While I doubt many places have the police resources to do this every day, the principle is used on much of the M25 (Britain's most famously overcrowded motorway). They have cameras to monitor the traffic, and variable speed-limit signs (large dot-matrix displays) that are set at the right speed for the conditions. Exceeding the limits on motorways is the norm here, so I didn't expect this scheme to work when I heard about it, but they put up large boards explaining how the variable limits would speed up**

**everybody's journey, and asking people not to change lanes unnecessarily, and by and large the regular drivers seem to have got the message.**

**As someone who only drives there from time to time, it's tempting to zoom ahead into the space that's empty as far as we can see, but when most people are obeying the variable limits (in a way they'd never obey the ordinary ones) and we know that it's preventing a huge jam just round the corner, it all seems to work.**

Pete

UK - Wednesday, June 25, 2003 at 17:12:55 (PDT)

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**inspired. i've had similar thoughts as to teh wave nature of traffic, but have never been able to put it in these terms. is there any way to connect with traffic choopers to get video of this perhaps? as well as an experiment with a car creating a gap? maybe set it up with a local tv station?**

alex <[the\\_leaking\\_pen@yahoo.com](mailto:the_leaking_pen@yahoo.com)>

mesa, az USA - Wednesday, June 25, 2003 at 09:17:19 (PDT)

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**Some information I've come across over the years. The "wave" effect you are talking about has been known about, by the military, for a long time; probably as long as there have been marching armies. It is called the "accordion effect." It occurs in columns or convoys. the military's only solution was to tell every soldier/driver to pay attention to the gap between himself and the next soldier/vehicle. Didn't work. If you were at teh end of a column of 125 marching soldiers or 15 vehicles, you would sometimes have enough time to take a smoke break, then you would have to run/put the pedal to the metal to catch up.**

**The "accordion effect" is caused by slight differences in slowing down/speeding up, multiplied by each person/vehicle in the column/convoy.**

**The was recently an article by some German traffic engineers who studied the psychological phenomenon that causes traffic jams even when there is plenty of room and no distrctions.**

**There is also another phenomenon that was described by California Highway Patrol officers, called "wolf packs." Drivers seemed to speed up when the freeway was clear until they encountered another car. They then slow down slightly and follow the traffic ahead until a "wolf pack" forms with long stretches of clear freeway in between.**

**None of these articles had any good solutions except to suggest that drivers try to maintain a steady pace and the standard one car length gap for each 10MPH, which, we know nobody ever does.**

**since the "accordion effect" hasn't been solved by the military in thousands of years, I don't see much hope for a solution short of automated vehicle control which is probably a good many years off.**

WD

Irvine, CA USA - Wednesday, June 25, 2003 at 08:06:02 (PDT)

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**Great Site! - I have been practicing your techniques on London's Orbital M25 for some time (but from next week I may never have to again). Yes it has Variable Speed Limit signs and Yes they are enforced**

**with Speed Cameras but what tends to happen is rather than imitating the 'rolling roadblock' effect they imitate the 'frequently spaced car wreck' effect. What I mean is people drive faster than the current limit until the moment they drive under the sign and associated speed camera whereupon they slow down and then (once they are out of the trap zone) they speed up again. This exaggerates the stop start. If only people would realise that the speed limit applies to all the road and not just the bit under the sign!**

P. Smith <[karnuvap@netscape.net](mailto:karnuvap@netscape.net)>

London, UK - Wednesday, June 25, 2003 at 05:43:28 (PDT)

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**Hey, I discovered another one! In my neighborhood there's a common situation where a single driver can double the traffic flow by flipping an "invisible switch."**

**During morning rush hour there's a 4-way stop sign which becomes severely clogged. Frequently the people each take turns in clockwise or counterclockwise order. While sitting in line I realized that TWO cars should always go at once, yet politeness demands that nobody steal a turn and proceed early. Ah, but we can always go backwards: slow down and give away one turn. So... when people at the 4-way stop are each going one at a time in CCW or CW order, when it's my turn I refuse to budge, and I wave the person through in the cross street. Then I take my turn, and so does the person facing me. Then both people in the cross street take their turns at the same time, etc. By becoming a "big loser" and giving away my turn, I've just converted the 1,2,3,4, pattern into a 1,2 pattern and doubled the traffic flow! (But will the pattern persist? Yes, I think it will last for awhile until those turning right/left mess it up, or until a large gap arrives in one of the lanes and politeness forces everyone to start up the 1,2,3,4 pattern again.)**

Bill Beaty <[billb@amasci.com](mailto:billb@amasci.com)>

Seattle, WA USA - Wednesday, June 18, 2003 at 16:34:59 (PDT)

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**I've been playing with some of these methods for the last 3 years or so in Minneapolis, and it's nice to find that I'm not the only person (or the first) to think like this. The sad part is, whenever I talk to anyone here about leaving space in front of you, they just say "But then someone will just change lanes into that space and you'll have to slow down." So far I haven't been able to get the fluid idea across to people (maybe now I'll just point them to your site). Best of luck!**

Steve Gigl <[traffic@gigl0002.mailshell.com](mailto:traffic@gigl0002.mailshell.com)>

Minneapolis, MN USA - Thursday, May 29, 2003 at 13:27:52 (PDT)

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**The zipper method works! For many years I commuted 62 miles (one way) from the Baltimore area to downtown Washington D.C. My route took me thru Rock Creek Park, a two lane (no shoulder) winding road with only two intersections (limited additional cars). This is the perfect lab for your experiment and I say it works. The trick is a single line of cars entering the park at the north end and exiting at the south end. Also, the southbound line of cars has a good line of sight to the upcoming merge. It is accepted practice by the locals to zipper merge and this behavior is transferred to the unknowing by example. The long line of sight approaching the merge area demonstrates the zipper method to those approaching. Traffic moves at a steady slow pace. This works because access to the park is limited.**

Roy Eisenstadt <[royezz@aol.com](mailto:royezz@aol.com)>

Owings Mills, MD USA - Tuesday, May 27, 2003 at 06:20:42 (PDT)

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**I am 55 and have been driving for fourty years. In the early days many vehicles with dodgy or no**



**brakes. In those days of course Australia had not developed a large system of freeways or motorways so I suppose our driving developed in parallel with the quality of roads. Not that bad roads did not teach skills but it was necessary to develop skills to match conditions. At an early age I joined the Navy and had experience of driving all over Australia. It is true to say that the conditions and styles of driving in our States varies greatly and it takes some time to gain experience and confidence when travelling from one State or City to another. It is always a good idea to see that the people around you who may be driving differently have a foreign plate so you can make allowances for them and give them room to think.**

**As a new driver we often allow a large gap behind the car we are following until we find everybody pulling in front you seem to go backwards and the gap always stays too small. Worse still these drivers that pull in have a tendency to brake hard. The problem with this is if you have maintained a large gap and these cars keep pulling in front you must look as far ahead as possible in your lane and react to the cars way up ahead. If you wait for the car in front of you to see the car in front of him stopping in a hurry, it will be too late as he will jam on his brakes and you will be at fault. Also the damage can be quit substantial. On the other hand if your bumper is touching the car in front and you brake on his lights there is less chance of contact being made and is so it will only be minor.**

**A few years ago I was in England travelling through Birmingham on the "spagetti" junction where a large amount of traffic merged in a major set of intersections.I was amazed that both at a.m peak and p.m. peak the traffick did not stop but rolled along at a steady 10 to 20 MPH. This may be in part to the drivers courtesy, and you must always give praise in the area when due as it creates a pride and need to improve. But also that the off and on ramps were all in the outside lane and that the law states that it is an offence to overtake on the inside. The law is the same in Australia with the rider that all vehicles must travel in the left lane. Which is stupid when three lanes are provided so this lane is ignored by law enforcers as well as the undertaking law. If however you get into the "inside" lane and plant your foot you are unlikely to be held up by those squabbling in the inner lanes. The other thing to do is get in your off lane as soon as you can and stay there.**

**I used to live twenty miles from work and start time was 8 am. Usually because of traffic I was an hour late so after a number of years I left home an hour later and got to work at the same time. I left an hour gap in front and working the extra hour after work had the same result. Anyway twenty years ago I decided that I did not want to spend my life like this so found an alternative, with less money but I was just as well off. Anyway you made the analogy with water I would like to make a comparison with a column of marching troops. The romans did it and until recently modern armies have done it. Squads of about 50 to 100 troops marching at about 50 or more paces were kept on the move by using this space in between as a buffer. The reason being that exhausted troops on the march upon reaching a jam would stop and lay down or generally become totally disorganised, but when allowed to put one foot in front of the other they would march forever. I had a experience in the Navy at a march past when strangely enough the right hand marker of one group was hypnotised to stop when ordered eyes right. There was a huge pile up and at least one serious injury. It would have been much worse if there had not been a reasonable gap between groups. My query if not comment is have you considered the case of marching soldiers. And if it was possible that in theory no car on the freeway could overtake another and remained parallel and that at stoppages or lane blockages alternative access should be provided with the right side car having first priority.**

**Apart from this I agree with you in every respect and anyone who disagrees lacks true road sense. I**

**know it works or at least it used to for me as in the end I gave up the constant struggle of fighting everybody on the road. I now gesture for people to pull in front and leave a huge gap in front whilst maintaining a reasonable speed. Which is deliberately below the speed limit. One problem with this is the tendency to day dream which is just as dangerous as speeding. When deliberately speeding you are living on the edge and tend to be more aware of external circumstances but if you speed all the time you tend to become far too casual. The biggest bogey in the pack is road ragers and as they are becoming more and more persistent I would suggest let them pass or turn off out of their way as soon as possible. No doubt with your analytical mind you could arrange for them to self destruct without taking us with them. Best wishes with your work I wish governments were able to undertake such research.....Guy**  
guy jennings <[randall6662000@yahoo.com.au](mailto:randall6662000@yahoo.com.au)>

PERTH, WA Australia - Thursday, May 22, 2003 at 08:18:40 (PDT)

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**I noticed something similar to this, although less rigorously and for different reasons. While sitting on 520-West on a Friday night I noticed that it was quite mentally taxing (from a repetition/boredom point of view) to keep accelerating / stopping. Very frustrating. So instead, when the car in front of me accelerated I just let the car idle forward, maybe lightly touching the brake to keep the movement slow. In doing so I was able to let a few car-length space develop, and I was able to idle my way all the way to the bridge. The cars behind me were able to crawl as well. This is a great theory!**

Jason Martin <[jhmartin@toger.us](mailto:jhmartin@toger.us)>

Bellevue, WA USA - Friday, May 16, 2003 at 16:10:02 (PDT)

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**Interestingly, I noticed this phenomenon before I heard you on KIRO radio several months ago. Your article explains exactly what I was seeing. When traffic begins to build,I simply begin driving with lots of space on the freeway and trying never to step on the brakes. All of a sudden, it was like I was driving in my own traffic "bubble" and I was able to go faster than the lanes around me. The hard part is to keep the space in front and let other cars merge and change lanes as they wish. Often, it seems that a car or two behind me will take the que and we end up with a couple of cars doing the same thing. One time I was with my nine year old son and explained to him what seemed to be happening and he grasped the concept immediately commenting that it would make the "backup" longer and slower but keep moving without stopping. Great stuff, thanks for your observations and articles. By the way, we're about to do one of your electricity science experiments, building a simple generator. I'm not sure I'm ready to take on the "elementary school scientific establishment" with your thoughts on all of the misconceptions taught to the youngest kids.**

Dave Russell <[davidar1@attbi.com](mailto:davidar1@attbi.com)>

Seattle, WA USA - Tuesday, April 01, 2003 at 19:09:37 (PST)

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**Here is a case where the theory is flawed: A multilane freeway connects to another similar freeway, but only with one connecting lane. Depending on time of day, up to 3 lanes of traffic try to exit through one lane (which includes a 35mph curve). The backup can be 4-5miles long. People who play fair enter the back of the line and spend 30+ minutes to go through it. I can run up to the last half mile and only spend 3-4 minutes in line (thanks to people opening spots as you suggest). Some fpeople merge in the last 100 feet.**

**It turns out to be a "priority queue" where your degree of selfishness is directly related to a wait ranging from seconds to fractions of an hour. It's unfortunately skewed to reward the selfish behavior**

**that causes traffic jams.**

[Jeremy](#)

MN USA - Saturday, February 01, 2003 at 03:01:12 (PST)

**[Not flawed. In fact this is exactly the situation where a single driver can bust up the entire jam, at least temporarily. We have one of these in Seattle, on northbound I-5 just south of the city at the exit into the northbound express lanes. The jam is only at the exit, and the exit ramp itself doesn't limit the flow. I personally have caused this jam to evaporate about once for every four attempts. Many hundreds of cars in the jam, lined up for miles! Ask yourself why the huge lineup exists. It's because people in the two jammed lanes at the very head of the line are slowly taking turns going out the exit.**

**Also, ask yourself *how can you tell who is a cheater?* If that jam has already formed, then any driver who cannot change lanes fast enough to get in the line will be blocked out of the exit lane. It's not like a bank-teller queue, since drivers cannot go backwards to get to the back of the line once they realize that the lineup exists. The people **IN THE LINE** are selfish, they're packing together and refusing to let anyone in adjacent lanes use that exit. Incoming drivers who need to exit have no choice but to drive to the **FRONT** of the line, that's the only place that empty spaces exist. (Did you ever try to merge early; merging into the **SIDE** of such a wall of cars? People behind you will get violent! It takes many minutes for a space to open, so most drivers won't chance it.) In fact, incoming drivers are often punishing the selfish idiots in the solid wall of cars. *"If they won't let me in, screw them and their 'I'VE GOT MINE' attitude, I'll just go to the front of the line!"* See how the psychology works? Both parties think the **OTHER** one is selfish, yet they never examine their own selfish behavior. It's called **HSelf-serving Attributions.**" It's a hypocrisy standoff.**

**But by letting twenty or fifty cars go in ahead of me, those cars no longer have to block traffic at the very front of the jam. The so-called "cheaters" are now merging early because I've given them a hole in the solid wall. Hence the entire line drains out at high speed. Once the speeds are high, the entire "cheaters" issue is gone, and everyone can merge easily. This is the way that one car can often "flip the switch" to produce high speed zipper-merge dynamics. This really works, I've succeeded many times. And it shows that the whole situation is unnecessary. When people give up the right to punish others, the jam vanishes like magic! Sometimes it only takes a single non-punisher to burst the jam.**

**Of course this only works if the jam is causing itself, and the road is clear after the exit-jam. If something far downstream is making the exit itself go very slow, then the jam isn't caused by turns-taking at the exit. In that case it does no good to let extra drivers merge early. I've seen this happen too, but more often it is the turns-taking itself which is responsible for the jam. -billb]**

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**I've had this exact discussion with colleagues at work. My contention has been that traffic must follow simple rules of fluid dynamics. if people were to consciously try to facilitate a laminar flow pattern we would all move more efficiently. Of course i still break for tailgaters. ;-)-**

roy <[th\\_royd@yahoo.com](mailto:th_royd@yahoo.com)>

fresno, ca USA - Tuesday, March 18, 2003 at 20:20:58 (PST)

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**Thanks for the excellent explanation of traffic phenomena that we've all witnessed. I used to live in Toronto, and made the same "experiments" during my daily 1 hour commute. I came to the same**

conclusions as you. It's amazing the effect (both plus and minus) that a single car can have, even on a 8 lane highway.

A couple of other thoughts.... I agree completely that the truckers have long had this figured out. I don't know about Seattle, but in Toronto the truckers will often use their size to intimidate "jerk drivers" into not trying to jump to the front of the line by screwing everyone else. I always smile when I see this because I know exactly what they're doing. Have you wondered why truckers universally behave this way? As you discovered, it's not really to help themselves. They can have a large impact, but it really benefits those behind them the most. So why do they do it? It's easy to say that they're helping other truckers who they know are stuck behind them, but I think that's the easy answer. Human nature doesn't seem to support that conclusion. (unfortunately).

**[In fact, human nature does support this. It's called "cooperation" or "reciprocal altruism" where I rub your back and later you rub mine. I get no benefit from rubbing your back, but if a network of "reciprocation" develops, then everyone benefits, therefore evolution reinforces the development of such networks. Truckers essentially take turns smoothing traffic for fellow truckers. This sort of thing tends to develop within small tight communities where members trust other members to take turns contributing some effort which gains no immediate reward (but is rewarded eventually.) Truckers are one group. People who read this website are another! -billb ]**

My conclusion is that they are helping themselves. How? Because if you were driving a rig that was severely underpowered (compared to our cars) and had to manually shift more than 10 gears to get up to highway speed, you (like I) would be much more inclined to just stick it in 3rd and roll along at the average speed (or a bit less) of traffic. So, this result is selfishly helping the truck driver be a bit lazier, but it has the great side effect of helping to smooth traffic out. What does all this mean? That more than anything else (except that human nature part...), I think the automatic transmission is to blame for the bunching up of cars that occurs.

Our cars are, relatively speaking, so overpowered, and the brakes are so effective, that we can just "stand on the gas, then stand on the brakes". This requires very little effort from us, and makes us feel like we're going to get there sooner by doing it. Try driving a stick in traffic (I do) and watch how your driving behaviour just naturally changes as a result (it's in your own interest, since otherwise you'll blow out your clutch knee). Plus, in a standard, we get the benefit of more "engine braking" which allows us to slow down somewhat without using the brakes. This has a secondary "psychological" benefit as well. If the driver behind you sees brakes lights, what's the most likely response going to be? He's going to brake as well, but with just a bit more vigor that you did. And the driver behind him will do the same thing. Ten cars back, we're at a dead stop again. Anyway, thanks again for putting this writeup together. We can only hope that enough people will read it that we will start to have a mutually beneficial effect.

**Greg Holloway Vancouver, BC**

Greg Holloway

Vancouver, BC Canada - Thursday, March 13, 2003 at 21:30:48 (PST)

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**Mr. Beaty, you are a god. What a wonderful site. Please take care of yourself and get out for some**

**exercise. If you're in SB sometime, I'll buy you lunch.**

goedon <[suntaog@yahoo.com](mailto:suntaog@yahoo.com)>

santa barbara, ca USA - Wednesday, March 05, 2003 at 22:08:14 (PST)

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**In traffic up to moderate levels, it seems that the most throughput will occur if drivers allow faster cars to pass on their left. As traffic increases, there's probably a point where the theories described in this site apply to all lanes. I encourage you to expand your study to address the "passing lane effect".**

Private Krankenversicherung Vergleich

Houston, USA - Tuesday, March 04, 2003 at 08:56:54 (PST)

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**nice site!**

**Like other folks have said- been doing this on my own initiative for years. Despite your affirmations, I do not believe it saves me time. In one case, it loses time. [Mostly it only saves time for the people behind you. If people won't help each other, then traffic jams get worse for all. - billb]**

**Coming into Boston on I90 new traffic merges in from the right, as on most highways. I90 ends in a three-way split with right and left bottlenecked getting onto 93N and 93S. The left lane is slowed worst. Downtown traffic is center lane, and should move freely but instead acts as a "cheater lane". Mean traffic velocity of less than 20 MPH.**

**Staying right or left yields no personal gain except fuel economy. Acting as a speed regulator in the ceter equalizes flow behind, but is too inviting for bordeline cheeters on right and left.**

**Gains for the innies and outies behind convert to losses for myself and my traffic tail.**

**I do it anyway because I enjoy being contrarian.**

Kevin MacKay <[kevin\\_mackay\\_12345@yahoo.com](mailto:kevin_mackay_12345@yahoo.com)>

Boston, MA USA - Thursday, February 27, 2003 at 11:30:39 (PST)

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**Fascinating stuff! I haven't had chance to read in detail but does all this deliberate modification of traffic flows actually get you to your destination sooner? I suspect it may but I think that this is where the benefits of flow ideas (which I think are actually well known in some statistical and maybe other circles) will show their real value! I notice here in the UK where three lane motorways are the norm, the the nearside (slow) lane frequently has becomes an "eddy" i.e. the traffic moves faster in that lane when you would think it oughtn't to! I also believe that people cruising in the middle lane are the triggers for many of the "volume congestion" caused slowdowns. INteresting stuff!**

Max Blinkhorn <[maxblinkhorn@hotmail.com](mailto:maxblinkhorn@hotmail.com)>

Edinburgh, Scotland - Thursday, February 27, 2003 at 06:09:08 (PST)

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**I'm very impressed, your theory is well thought out and makes a lot of sence. Doing the same thing on major sydney highways has some very impressive results, thankyou.**

[Frogbert](mailto:frogbert@NOSPAM.host.sk) <[frogbert@NOSPAM.host.sk](mailto:frogbert@NOSPAM.host.sk)>

Frogbert Land, FL Australia - Saturday, February 15, 2003 at 02:51:06 (PST)

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**I have independently come to the same conclusions regarding traffic waves and always try to drive without using brakes. Most drivers stay too close to the car in front of them and as a result have to slam**

**on their brakes when they see brake lights in front of them. Also, I think the wave theory applies to interstates between cities. I have noticed on highway driving that I am more often passed by "waves" of vehicles rather than random single vehicles. ]**

[Mike <mkillian@swbwell.net>](mailto:mkillian@swbwell.net)

St. Louis, USA - Friday, February 14, 2003 at 19:37:44 (PST)

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**How do these techniques affect actual travel time? i.e. if I travel 1hr at a constant 40 mph (polite/no waves) vs. 45min at 50 mph and then 15min at 10mph (with waves) I still travel 40 miles.**

**Sure, less wear and tear on the car and better fuel consumption and less headaches (so therefore worth it regardless), but is there also a time savings, and what parameters affect that? Cool site!**

[A <mojoandy@yahoo.com>](mailto:mojoandy@yahoo.com)

CANADA - Friday, February 14, 2003 at 08:51:33 (PST)

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**[ 20% to 30% speed gain in the simulations. It's answered in the [FAQ Section](#). - billb ]**

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**I can't begin to count the number of times I've had to "go around" over the years in my mission to help stranded motorists because the vehicle behind me was following too close for me to be able to stop safely w-out ramming the vehicle I'm stopping to help!**

**When this happens, I abort the attempt and "go around" to reapproch, and THEN, knowing in advance where the disabled vehicle is, I activate my strobes and beacons on approaching the spot.**

**You wouldn't BELIEVE the number of inattentive or just plain STUPID drivers who don't back off even THEN!!**

**Anyway that's my two cents worth. I LOVE what I do and won't stop doing it until I don't feel confident in my ability to do it intelligently. [ means NOT getting KILLED doing it! ]**

[The Highwayman <SNOWtraction@aol.com>](mailto:SNOWtraction@aol.com)

San Diego, Ca USA - Wednesday, February 12, 2003 at 11:59:11 (PST)

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**Great site. I've been noticing the same thing for years as well. And driving that way, much to the chagrin of the people behind me who look to be thinking "I can't believe this a###hole isn't rushing to fill up that 10 carlengths in front of him. He's making me late!!"**

**Most drivers are too self-absorbed.**

**I look at traffic as a flow, akin to a river. Others seem to see it as some kind of race. Ironically, its a race that can't be won. This coming from an owner of fast cars that loves to race. On the track that is.**

**I find that keeping my speed to the average is far less stressful on me and my car. It is funny to watch the 'jockey-ers' jump into my space thinking they're gaining something. The jump onto the the bumper in front of them. Why is it usually SUV's doing that?**

**Good site man.-**

[Roy S. <badcam@hotmail.com>](mailto:badcam@hotmail.com)

Baton Rouge, LA USA - Monday, February 10, 2003 at 11:56:29 (PST)

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I saw a TV program about 'ghost jams' a few years ago. They interviewed the traffic cops responsible for policing the M25 (big freeway that orbits London). They said that these ghost jams could develop for a number of reasons. They could be the after-effects of an accident or a real traffic jam from hours before. The ghost jams do move like waves. At any time they could see several of these on their instruments at the control center. Their advice was pretty much as you stated - to stay cool. When you hit heavy traffic & it seems to clear up, accelerate gradually. Most of these jams could be cleared up if everyone just drove at a steadier pace. Its the stop-start response of people that causes repercussions for miles behind. They showed an example of someone changing lanes to gain a few feet causing dozens of cars to brake. It was an interesting show that seemed to correspond with my experiences.

[Dave <west.d@attbi.com>](mailto:west.d@attbi.com)

Portland, OR USA - Saturday, February 01, 2003 at 13:50:18 (PST)

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Your cause is futile. Most people are too stupid to live, let alone drive.

[LA <landea@qwest.net>](mailto:landea@qwest.net)

Chandler, AZ USA - Friday, January 31, 2003 at 21:42:04 (PST)

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**[Read the article. In certain situations ONE SINGLE DRIVER can fix the problems caused by hundreds of others. If you don't want to make the world a better place, well, there are a few others out there who'll take on the task. -billb]**

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"Q: Traffic is not like air in a tube, because drivers have widely varying behavior, and air molecules do not." This is not true. Air molecules DO have widely varying behavior. Study Boyle's Law and fluid dynamics. It's similar in many ways to the physics of traffic. Solitons can be created in air and water just as easily as in traffic. These are all examples of chaotic systems. Traffic has less degrees of freedom than air, actually, so it would be more correct to say "air molecules have widely varying behavior, and drivers do not". That pretty much refutes the entire point of whoever originally asked that.

supruzr

Chicago, IL USA - Friday, January 31, 2003 at 19:46:35 (PST)

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I havent noticed any comments on the financial benefits of traffic- wave erasing. My (limited) knowledge of acceleration is that cars use mush more gas to move from 0 MPH to 10 MPH, than equal accelerations at higher speeds, due to the need to create inertia. Is this assumption correct? If not, what is the relative distance needed to drive at a lower but constant average-flow-of-traffic speed, than to drive at a higher speed and sit for five to ten minutes at 0 MPH? If an average sample car is used as a baseline, can this even be measured accurately? With gas running at .74/Liter (Canadian) I think the math may be worth the trouble.

[Felix Wilcox](#)

Calgary, AB Canada - Friday, January 31, 2003 at 12:22:09 (PST)

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It's funny, I've noticed this too about traffic waves, but for a different reason. I ride a motorcycle pretty much everywhere I go, and I sometimes like to play a game to improve my traffic judgement

**skills. It's a simple game:**

**Never put your feet down (except at stops signs where required by law).**

**The trick is to look ahead at traffic (stop lights, traffic jams, merges, rubberneckers, etc...) and choose a road speed which will prevent me from ever having to come to a complete stop. So if I know a light ahead will take 10 seconds, I'll slow down so it will take 10 more seconds to get there. The same with an evaporating traffic wave.**

**I have been doing this for years, essentially for the hell of it, and until I read this site, I'd never bothered to notice that I was also keeping those traffic waves from propigating back behind me =:-) - lars**

**[Lars Friend <larsfrnd@light/\\*nospam\\*/link.com>](mailto:larsfrnd@light/*nospam*/link.com)**

**Ithaca, NY USA - Thursday, January 30, 2003 at 11:57:46 (PST)**

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**Very interesting and entertaining web site. Every time I have to drive south through all that Everett/Seattle/Tacoma I-5 mess, I'm reminded agian why I live out here in the sticks instead of in the middle of that urban sprawl. Hey, an easy way to avoid most of that nasty traffic mess is to only drive the Everett/Seattle/Tacoma I-5 corridor between 2:30 am and 3:30 am. At that hour, with the drunks coming home, gang-bangers, drive-by shootings, street racers, and car jackers, snarled traffic is the least of your problems. Happy motoring, Seattle!**

**[Bill W. <Firemarshal.Bill@verizon.net>](mailto:Firemarshal.Bill@verizon.net)**

**Oak Harbor, WA USA - Tuesday, January 28, 2003 at 16:39:51 (PST)**

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**Very interesting insights but the goal should be to get rid of the imbalanced volumes that occur during rush hours. Volumes at or near the capacity of the highway will usually result in severely slowed or stopped traffic. If you avoid commuting during the average peak times of 7:00 to 9:00 and 16:00 to 18:00 then you can avoid the slowed traffic. More companies need to adopt staggered start times as volumes progressively increase. Either that or DOT's will have to start embracing more mass-transit solutions.**

**[JJ <jimmyjay86@hotmail.com>](mailto:jimmyjay86@hotmail.com)**

**Detroit, MI USA - Tuesday, January 28, 2003 at 13:10:32 (PST)**

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**I agree with the theory you have putting state troopers moving at 55mph to give the jam time to clear. However I have a similar theory. Here in Long Island one thing you experience is the huge fear people have of getting speeding tickets. Of course there are police speed traps sitting on the side of the road everywhere here. Even when there is really heavy traffic they are sitting there putting their time in. Meanwhile everyone is doing 25mph. I say put these police cars on the road all the time. Make them drive up and down the highways doing the speed limit. This will force everyone to do the speed limit and regulate the traffic density. This would prevent speeders grinding to a halt when their radar detector goes off and causing a build up behind them. Of course the counties would rather collect the ticket revenue (despite the court costs). But I'm totally convinced it would be beneficial (unless I'm running late) to everyone and reduce the number of accidents on the highways.**

**[dermot <dermotfixgerald@yahoo.com>](mailto:dermotfixgerald@yahoo.com)**

**hicksvile, ny USA - Tuesday, January 28, 2003 at 07:42:05 (PST)**

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The best kind of traffic theory, personal observation. It'll beat math and formulas any day. My anecdote is about in-town traffic and merging. The engineers who designed a major intersection here in town were coming under fire for designing a two to one lane merge immediately following a stop light. One of the letters printed in the paper was, "Who was the idiot that designed a merge after a dead stop?" My only reply to that was, "the same idiot who knows that you have to be moving to merge." I go through that light every morning and I see self-centered idiots race their way up into the front instead of taking the gap that I provide and subsequently we all end up stopping. My new answer to the question is, "a person who obviously didn't learn to drive here." And even when I give a person the gap, the person behind him tries to force his way up. Sheesh, no curtesy whatsoever. Thanks for the good read.

[Rob <robo451@gci.net>](mailto:robo451@gci.net)

Anchorage, AK USA - Monday, January 27, 2003 at 18:43:58 (PST)

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Great piece of work! I have an adjunct theory that supports your notion of that traffic is better modeled by nonlinear dynamics.

The thing I find fascinating is "turbelence"- especially in the early morning. The early morning think 4-6 AM is filled with cocaine addicts up from the previous night, and people that are slowly waking up after 4 cups of coffee. What I find is that there are several cars looking to break speed records, going for 90 to 100 mph, and others dispersed throughout the lanes (keep right doesn't really exist in the US, does it?) going closer to the speed limit. The fast cars careen throughout the "obstacle course", forcing the net speed to be lower than an hour later, when the lanes are full, and just flowing- the behavior is non linear, and the effect is an increased sense of risk.

[George <georoad@yahoo.com>](mailto:georoad@yahoo.com)

san francisco, ca USA - Monday, January 27, 2003 at 17:47:04 (PST)

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the politeness factor differs city to city. I've heard more than one commentator vote Miami as the "rudest" traffic in the nation. (and i know everyone thinks thier city is especially rude) When 95% of the people in traffic are not just punishers of insane lane changers, but guilty themselves of the same act, the formula seems to break down. The crowd behind me constantly shuffles to make a break for the gap ahead. the "polite" people you talk about never seem to build up behind me. ALSO: when I'm in traffic, i think about traffic waves we'll have in the future with "flying cars" in three dimensions.

[todd <nospamlight\\_speed@hotmail.com>](mailto:nospamlight_speed@hotmail.com)

miami, fl USA - Monday, January 27, 2003 at 15:11:19 (PST)

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Think about this. What is the best way to alleviate a traffic jam? How about by diverting traffic to non-clogged roads? A national traffic sensor system installed on all freeways and linked to a display in your car or to a billboard display system like the one used to track flights at airports could give real-time updates as to traffic conditions so the jams could be avoided altogether. The traffic jam is alleviated because less traffic is feeding into it as the clog itself dissipates. The only issue with this is in creating a clog somewhere else in a mad dash to avoid the clog in the first place.

[James D. Marchant <marchantj505@hotmail.com>](mailto:marchantj505@hotmail.com)

Pearl Harbor, HI USA - Monday, January 20, 2003 at 03:59:58 (PST)

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I found your site very interesting. Have you thought about how your ideas grok with Nash's game

**theory? This seems like a perfect example of it.**

**You need to go around to DOTs and do seminars. I'd like to see patrol cars used to mitigate traffic jams as you describe.**

**[John](mailto:john@mciann.com) <[john@mciann.com](mailto:john@mciann.com)>**

**Birmingham, AL USA - Thursday, January 16, 2003 at 12:58:08 (PST)**

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**Your page provides a number of good arguments for something I've been practicing for a long time. I completely agree from practical experience that it's easy to maintain a large gap without driving slowly!**

**I'm surprised you didn't mention the following two things:**

**A large space in front of you is really good for safety!**

**Avoiding constant breaking and acceleration is really good for your car!**

**Also, this is another possible explanation of the drive-slower question:**

**Q. How can I drove slower, yet somehow cause traffic to move faster?**

**A. Imagine you are driving by yourself on a street with traffic lights. Let's look at the two extremes of behavior. With one, you slam on the gas as hard as you can when the light turns green, then race to the next red light, and screech to a halt right before it (and then wait). With the other, you move at such a speed that you reach the next light right as it is turning green. While your car certainly goes faster in the first stragety (at least some of the time), the second strategy will probably get you to your destination faster because you don't need to spend the time accelerating from 0mph at the last light. (It's also much easier and safer to drive this way.)**

**[Tom 7](mailto:no@spam.com) <[no@spam.com](mailto:no@spam.com)>**

**Pittsburgh, PA USA - Thursday, January 16, 2003 at 11:36:42 (PST)**

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**Very interesting. When I drove a truck I left big gaps in front of me as I approached slow traffic because my truck was glacial in its acceleration. If I had to stop it would take a loooooong time to get back to 50mph and all the traffic behind me would be held up. Boy, was I annoyed when a car in front slowed me down instead of speeding off at the same rate as the guy in front of him.**

**[zack mollusc](mailto:zack@mollusc.com)**

**USA - Thursday, January 16, 2003 at 03:32:18 (PST)**

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**I think this article should be mandatory reading for every driver's education course.**

**Andrew Berg <[andyberg@u.washington.edu](mailto:andyberg@u.washington.edu)>**

**Seattle, WA USA - Wednesday, January 15, 2003 at 15:04:38 (PST)**

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**Driving in Seattle I also have noticed traffic waves and I have also tried (before reading this article) to alleviate them by driving the average speed. I think, however, that you are leaving out a major benefit to this responsible driving. Not only is driving at the average speed more relaxing than stop and go, but it is much more fuel efficient. There is nothing worse than stomping on the gas to speed up between**

waves only to waste all that energy by slamming on the brakes a few seconds later.

Andrew Berg <[andyberg@u.washington.edu](mailto:andyberg@u.washington.edu)>

Seattle, WA USA - Wednesday, January 15, 2003 at 15:01:27 (PST)

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I agree with most of your points but not once do you ever mention keeping right except to pass. I regularly see drivers creating bottlenecks by riding alongside other drivers when they could ease the burden by keeping right and let other drivers past.

[Don Lawrence](#)

Denver, Co USA - Wednesday, January 15, 2003 at 12:54:16 (PST)

[Are you sure? Read the article again. Maybe those drivers are preventing TRUE bottlenecks from forming. I don't mention anything about "keep right" because I do the very opposite! To wipe out traffic waves in my own lane, I drive at the average speed. To wipe out waves in two lanes, I team up with another driver doing the same. This keeps anyone from rushing madly forward only to come to a complete stop up ahead. During congested conditions, trying to drive fast is what causes stop-and-go traffic! But I do agree with you that during UN-congested conditions drivers shouldn't create rolling barriers. People should remain free to drive fast unless the conditions are such that this would trigger waves or trigger a full-blown traffic jam. The thing that we all miss is that our fast-driving behavior during low traffic is OK, but if we try to use the same behavior during heavy traffic then we end up going SLOWER, not faster. Hey everyone, when traffic becomes thick, start driving differently! -billb]

---

I agree with most of your points but not once do you ever mention keeping right except to pass. I regularly see drivers creating bottlenecks by riding alongside other drivers when they could ease the burden and let other drivers past.

[Don Lawrence](#)

Denver, Co USA - Wednesday, January 15, 2003 at 12:53:28 (PST)

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Great site. Nice to have words put to the concepts I've also seen. One point to note is about handling bottlenecks. You suggest that if everyone maintained a decent gap so that traffic can merge at high speed then waves should not occur. I wonder if this will work cause surely when a person merges into the gap the drivers who maintained that gap will slow down so as not to be very close to the person in front. This could create the wave. I also like the comments by Jeff Martin and the idea that leaving at different times to everyone else could also come under the concept of maintaining a gap.

[Dean](#) <[dean@nospam.com](mailto:dean@nospam.com)>

Reading, UK - Wednesday, January 15, 2003 at 07:21:18 (PST)

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The M25 motorway (freeway) around Heathrow Airport in London has been suffering this for years, until variable speed limits were introduced. Intelligent speed cameras were also introduced which kept drivers observant. As traffic builds the limits are dropped either side of the airport exits until the flow stabilises, and can then be gently raised or lowered as requested at a central control point. This creates the standing waves required to clear jams when they start. If you ever come to the UK, hire a car and take a trip around the M25. It's surprising how well the phased limits area works, and how badly the sections just before and after flow!

[Hugh](#)

UK - Wednesday, January 15, 2003 at 01:26:01 (PST)

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**Nice theory and I use it all the time. Not that it helps traffic as a whole, it takes more than 1 person to do that. But it's just a whole lot EASIER than driving gas-brakes-gas-brakes-gas-brakes for an hour! Haven't these people ever heard of COASTING? No, they don't have a clue and use the "horse parade" method - keep your nose in the arse in front of you. Most people are so far away from comprehending your ideas it's unbelievable. Witness them tailgating each other at 80 mph in the driving rain and fog. And they're allowed to reproduce.**

**[Al Bergo <yes\\_I\\_would\\_like\\_more\\_spam@getlost.com>](mailto:yes_I_would_like_more_spam@getlost.com)**

**Vallejo, CA USA - Thursday, January 09, 2003 at 23:26:42 (PST)**

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**[OLDER GUESTBOOK ENTRIES](#) (back to 2/98)**

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[Older Email Messages](#)

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[Back to SCIENCE HOBBYIST](#)

[Back to TRAFFIC WAVES](#)

Guestbook script from [Matt's Script Archive](#)

## Science Club

# COMMENT BOOK

Thank you for visiting SCIENCE CLUB. We would love it if you would [Add](#) your comments to our comment book.

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**Hi I'm 13 and I like science my science teacher is Connie TemBerge and she is the coolest well BYE!!**

Kandice Marie Burgess <[none](#)>

Huntsville, Ar. USA - Friday, April 21, 2000 at 10:26:39 (PDT)

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**Hey. This webpage really helped lots! Keep doing whatever your doing to make this page so great!**

Jessica <[jessica\\_1523@hotmail.com](#)>

Washington, WV USA - Saturday, April 08, 2000 at 09:03:35 (PDT)

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**I like this page and think you should have more projects . I have some ideas : some projects/ diagrams on the ear .or about the eye or something to that effect.because my younger sister has to do a project on the ear and include a diagram or a model.**

jessica <[sk8erp00@aol.com](#)>

ga USA - Friday, April 07, 2000 at 16:38:55 (PDT)

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**make your site better**

[thissitesucks](#) <[blah blah blah](#)>

atlantis, fu atlantic ocean - Friday, April 07, 2000 at 13:05:03 (PDT)

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**Thanx for all your help!!**

Lindsey/ Mandy <[kkatrina\\_15@hotmail.com](#)>

Warsaw , Ill USA - Thursday, April 06, 2000 at 07:42:54 (PDT)

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**I'm greatfull because I found "The Science Club" something I was looking for. I was looking for ideas for my science projects, and now I found them, tank's to the Club and their Organizers. It is the best to help students like me. Thank you, EITava**

Elly Tavares <[seravat\\_ca@yahoo.ca](#)>

Toronto, Ont Canada - Monday, April 03, 2000 at 21:30:05 (PDT)

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**Nice web page! :P**

Kari <[DaNcEgRl187@aol.com](#)>

Mt. Arlington, NJ USA - Sunday, April 02, 2000 at 17:56:56 (PDT)

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**I really liked how you could get advice and exchange advice on good science projects. I wrote in some stuff and it feels good to help other people and be helped with your projects.**

Audrey Carlsen

Seattle, WA USA - Saturday, April 01, 2000 at 15:36:42 (PST)

---

**I really liked how you could get advice and exchange advice on good science projects. I wrote in some stuff and it feels good to help other peoplr and be helped with your projects.**

Audrey Carlsen

Seattle, WA USA - Saturday, April 01, 2000 at 15:36:23 (PST)

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**Radcliff and I look forward to using this site to help him with his first grade science project. How much salt does it take to float an egg.**

Radcliff Humphrey <[jeana@netpci.com](#)>

GU USA - Monday, March 27, 2000 at 01:12:58 (PST)

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**I would just like to say thanks this will help my grandson with his project in school by the way he is in the 5th grade.**

FRED <[WFISHING2@AOL.COM](#)>

COLUMBIA, TN USA - Sunday, March 26, 2000 at 09:49:12 (PST)

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**This is really cool i'll tell all my modeling as well as school friends ciao**

Jesse ocher <[host67@hotmail.com](#)>

New York City, NY USA - Friday, March 24, 2000 at 13:50:53 (PST)

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**this website really helped me out. I was frustrated looking for a project for my sister, but after i visted this website i felt so muc better**

Nickecia <[niktomcat@cs.com](#)>

NJ USA - Thursday, March 16, 2000 at 16:02:34 (PST)

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**this site is pretty cool. i learned a lot! i better get an A+ on my science project now! thanks! charlotte:)**

Charlotte <[buttercup337@hotmail.com](#)>

USA - Thursday, March 16, 2000 at 08:16:28 (PST)

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**I am interested in hearing from school science club sponsors. I am trying to start a club at our junior high school and am looking for input. Thanks!**

Gayle May <[gaylemay@hotmail.com](#)>

Middleburg, Fl USA - Friday, March 03, 2000 at 09:02:20 (PST)

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**I THINK THIS IS A GREAT SITE FOR SICENCE!!!!SO STAY COOL AND NEVER DO HOMEWORK!!!!**

Jessica <[hottie789@hotmail.com](#)>

barrie, Canada - Wednesday, March 01, 2000 at 12:03:49 (PST)

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**Check out this cool page about Water with a free project outline**

[Robert](#) <[jolt421@geocities.com](#)>

USA - Wednesday, February 23, 2000 at 16:38:26 (PST)

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**What about computer game cheats**

What about something

USA - Tuesday, February 22, 2000 at 23:54:29 (PST)

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**hey, i really could use some more ideas if anyone would like to give me them. i mean all of the ideas were good but a lot of them are already being used!! Thanks g love jen**

Daiziestar <[jenrawding32@hotmail.com](#)>

beaver falls, pa USA - Wednesday, February 16, 2000 at 16:51:49 (PST)

**I really enjoyed doing the project about the eggs and seeing which beverage is worst on your teeth. It was award winning and a lot of fun. I got the idea from this sit so keep sending ideas, it helps a lot of people.**

Kara Johnson <[kara2003@yahoo.com](mailto:kara2003@yahoo.com)>

NC USA - Sunday, February 13, 2000 at 11:37:24 (PST)

**I would like to be one of the members. I am a young scientist because I belong to Unhs- Special Science class. Let's help together to save mother earth.**

[Karla Sison Morden <barbiegirl\\_km@yahoo.com>](mailto:Karla Sison Morden <barbiegirl_km@yahoo.com>)

Urdaneta city, pa Philippines - Friday, February 11, 2000 at 02:08:38 (PST)

**I think you are really cool bill and I think the site is wick but I am really stupid and I need good and easy ideas for my project so you should come up with some easier project idea well thanx for listening ~\*Tracey\*~**

~\*Tracey Flynn\*~ <[Hot\\_Skank@hotmail.com](mailto:Hot_Skank@hotmail.com)>

Charlottetown, PE Canada - Wednesday, February 09, 2000 at 12:52:00 (PST)

**hello..ur site is pretty amazing.. can somebody help me find some interesting project that i can do for my science project.. thanks!!**

[karma <Karmayangzom@hotmail.com>](mailto:karma <Karmayangzom@hotmail.com>)

cambridge, ma USA - Monday, February 07, 2000 at 06:03:04 (PST)

**Just a retired Chemist/grandfather trying to eliminate the panic calls at 11:00PM on Sunday nights. This is a great way to get "urchins" to research.**

Frank Toomey <[toomey@worldnet.att.net](mailto:toomey@worldnet.att.net)>

Bethpage, NY USA - Friday, February 04, 2000 at 13:20:43 (PST)

**i really hate this stupid website the end**

BROOKE

port hueneme, ca USA - Thursday, February 03, 2000 at 14:19:06 (PST)

**I am a elementary school teacher and I desperately need some Science fair experiments within the next two weeks.**

Zamika James <[zbaby@hotmail.com](mailto:zbaby@hotmail.com)>

Dallas, Tx. USA - Thursday, February 03, 2000 at 13:49:45 (PST)

**Cool Site!! I learned a lot!**

Kelsey <[soccDragon@hotmail.com](mailto:soccDragon@hotmail.com)>

USA - Wednesday, January 26, 2000 at 18:50:21 (PST)

**Cool**

[Holly](mailto:Holly)

Canada - Wednesday, January 26, 2000 at 13:00:56 (PST)

**IT SITE IS A GREAT FOR SCINCE FAIR IDEAS IT SAVED ME AND I GOT AN A+ FOR MY SCIENCE FAIR PROJECT. TAKE CARE**

sam <[!!!!!!](mailto:!!!!!!)>

SAN FRANSICO, cA USA - Tuesday, January 25, 2000 at 18:49:28 (PST)

**The science club is a very good site to visit.My granddaughter told me about it and its address.I visited the site and I found out she was right.So I come to my conclusion that science club is the best science web site there is. Sincerly, Sandra L. Dunn**

[Sandy Dunn <isdone@prairieweb.com>](mailto:Sandy Dunn <isdone@prairieweb.com>)

Torrington, WY USA - Tuesday, January 25, 2000 at 09:04:47 (PST)

**science sucks !!!!!!!**

Jesyka Leean Flores <[ctiger08@aol.ocm](mailto:ctiger08@aol.ocm)>

corpus christi, tx USA - Tuesday, January 18, 2000 at 15:39:12 (PST)

**I Love your website**

Lyndsey <[littlebit2\\_11](mailto:littlebit2_11)>

Smithion, IL. USA - Tuesday, January 18, 2000 at 08:27:04 (PST)

**This is a really cool site. I picked up a topic from here for my science fair. I recommend this site for people in need of science fair projects. I'll visit this site next year again for my science fair, and hope to find new stuff!!**

[Siddharth Vyas <coolsids@yahoo.com ; coolsids@rediffmail.com>](mailto:Siddharth Vyas <coolsids@yahoo.com ; coolsids@rediffmail.com>)

India - Monday, January 17, 2000 at 01:54:30 (PST)

**you guys need to put science fair ideas. cause im am having a lot of trouble on mine.**

Rose Geluse <[wackygrl15@hotmail.com](mailto:wackygrl15@hotmail.com)>

San Diego, CA USA - Wednesday, January 12, 2000 at 13:01:14 (PST)

**you have great info. thanks a million!!!**

Emily Love <[plancak@yahoo.ca](mailto:plancak@yahoo.ca)>

Camrose, Alberta Canada - Wednesday, January 12, 2000 at 11:22:47 (PST)

**I like it!**

Chance Barkley <[chancebarkley@hotmail.com](mailto:chancebarkley@hotmail.com)>

Groom, Tx USA - Wednesday, January 12, 2000 at 09:18:55 (PST)

**This site really informs us young ones about science.**

[Logan Smith <bigman42081@hotmail.com>](mailto:Logan Smith <bigman42081@hotmail.com>)

Smithland, ky USA - Wednesday, January 12, 2000 at 06:34:24 (PST)

**I love your archives of suggested projects it helped me pick out an idea for a project.**

Jordan Schager <[schagme@aol.com](mailto:schagme@aol.com)>

Bainbridge Island, WA USA - Tuesday, January 11, 2000 at 12:33:56 (PST)

**yo sup p diddy. word up homes!!!**

[timmy <snowbusta@aol.com>](mailto:timmy <snowbusta@aol.com>)

bainbridge island, wa USA - Tuesday, January 11, 2000 at 10:50:43 (PST)

**I know most of you are probably pretty young, but I am in 8th grade and i enjoy biotech so much that my scince prjct, which got me to state, was on it... If you understand electrophoresis and like bacteria, the check out my site becasse i uploaded my sicnmce project... Itsa a good place to get an idea for a REALLY good project!**

[Rob <rob222@mytalk.com>](mailto:Rob <rob222@mytalk.com>)

IL USA - Sunday, January 09, 2000 at 18:35:12 (PST)

**Despite all the rude comments people submit, I think that this is a great website. I found a great science project to do! Thanks!**

AMS

Tucson, AZ USA - Sunday, January 09, 2000 at 13:31:11 (PST)

**I think your club is cool but it needs to be more exciting so kids will like it.**

Kaila Tremblay

USA - Tuesday, December 14, 1999 at 21:06:27 (PST)

**I will Like to U for your help for my project, Thanx**

Travis Brown <[teddylove90@hotmail.com](mailto:teddylove90@hotmail.com)>

Frisco City, AL USA - Friday, December 10, 1999 at 08:37:41 (PST)

**Ireally like the idea of spiders geting drunk.**

Malcom <[hi@excite.com](mailto:hi@excite.com)>

Plentywood, MT USA - Wednesday, December 08, 1999 at 08:09:15 (PST)

**Thanks alot for coming to our school. We enjoyed your speech East Side school**

Megan Roberts

Gouverneur, ny USA - Friday, December 03, 1999 at 10:14:06 (PST)

**HEY! I THOUGHT THAT THIS WEB-SITE WAS REALLY NEAT. IT HELPED ME PICK OUT A GREAT TOPIC FOR MY SCIENCE FAIR. BY THE WAY: DOGIES RULE!!!!!! #1**

Heather Biard <[hettab@hotmail.com](mailto:hettab@hotmail.com)>

USA - Monday, November 29, 1999 at 20:27:48 (PST)

**Nice experiments age 9 fourth grade**

Megan Roberts <[hhilts@gcs.neric.org](mailto:hhilts@gcs.neric.org)>

Gouverneur, NY USA - Monday, November 22, 1999 at 10:35:57 (PST)

**Your site is pretty cool. It is good. Peace.**

[Alex <blink356@hotmail.com](mailto:Alex<blink356@hotmail.com)>

Baltimore, MD USA - Friday, November 19, 1999 at 08:06:01 (PST)

**thanks aloth this page helped me out with my project for the science fair thanks again**

micheal hovde <[M\\_C\\_Hovde@juno.com](mailto:M_C_Hovde@juno.com)>

germentown, MD USA - Thursday, November 18, 1999 at 06:24:07 (PST)

**Well, I attend Romeoville High School and we just added the science club to our school this year. I am the Vice President of my club, and I was wondering are there any project that we could do that would be fun? I would really enjoy what kind of things you have in mind. THANKS, CAROLINE :)**

[Caroline Cornick <ccornick@earthlink.net](mailto:Caroline_Cornick<ccornick@earthlink.net)>

Bolingbrook, IL USA - Sunday, November 14, 1999 at 18:07:05 (PST)

**science is the bomb science is my favorite subject in school**

melissa <[mindy0527@webtv.net](mailto:mindy0527@webtv.net)>

jax, fl USA - Sunday, November 14, 1999 at 08:26:39 (PST)

**hi.... i'm thinking about doing a project i found on your site, under medium chemistry. the person that submitted it is someone named Doug Warren. i need some help concerning this project, i.e. more information on how to do it and where can i get some background information. id really appreciate any help on this. thank you.**

Halley Caryntha <[night\\_jade@hotmail.com](mailto:night_jade@hotmail.com)>

St. Louis, MMo USA - Saturday, November 13, 1999 at 15:10:19 (PST)

**I really like this site. I am lucky I found it.**

Edward <[Pud\\_15@hotmail.com](mailto:Pud_15@hotmail.com)>

Canada - Friday, November 12, 1999 at 12:55:01 (PST)

**This is a great website im getting all teh onfo I need. Plus I am getting my Scince fair project here.**

Rbert Bergstom <[05\\_rbergstrom\\_99](mailto:05_rbergstrom_99)>

Fairfeild, MT USA - Friday, November 12, 1999 at 09:48:10 (PST)

**HELPPPPPP!!!!I'm doing a science project and i'm going 2 do it on plants.(does plant food affect the growth of plants,does magnetism affect the growth of plants,how does heat affect the growth of plants)Pleace send info.**

Katie Davis <[loki00@msn.com](mailto:loki00@msn.com)>

Powder Springs, Ga USA - Thursday, November 11, 1999 at 16:57:25 (PST)

**Hi my name is mike and i love science. late at night when my parents go to i enjoy locking my door and conducting scientific experiments. Sometimes i LIKE to give rats lombatamies. I cant wait to try my little sister. he he he**

michael mattiello <[obi1knobi@aol.com](mailto:obi1knobi@aol.com)>

poughkeepsie, ny USA - Wednesday, November 10, 1999 at 07:25:12 (PST)

**CLOUD POWER PLANT (CPP) nov 20, 1999. TO THEvisitors Dear sir, I have a new idea to generate power from a new source. Would you please review it to send a comment to me? Thanking you DR. MOHAMMAD JAINUL ABEDIN ROOM NO.101 , MORIYAMA IDAI HEIGHTS 1724-4 IKENOBE,MIKI-CHO,KITA-GUN ,KAGAWA 761-0701 , JAPAN jabedin@kms.ac.jp** Cloud power plant (C P P ) IDEA: now a days electrical power is generated from gas / water turbines ,nuclear plants, solar pannels etc.Here main idea (hypothesis) is to generate power from a new source,cloud. So it can can be called as cloud power plant(CPP). PRINCIPLE: A huge electrical charges(positive / negative) are deposited on the cloud in a rainy and stormy day.A device is hereby made to make artificial thundering and charges are allowed to pass through a big condenser / capacitor placed in the earth hollow.This capacitor is separated from the earth by insulators ( example plastic , porcelin etc.). But the capacitor / condenser is connected to the earth by some fine filaments / wires only.When high power thunderbolt charges try to pass through these fine wire / filaments----they are automatically fused and charges are trapped in the capacitor.These charges can be used now. METHODS: A metallic electrode is placed in a very high place ( example hills, building tops etc.) in a cloudy day. It is connected by a thick wire to a big capacitor placed in the earth ( but separated from the earth by insulators). Only a few filaments /fine wires are connected between the earth and the capacitor.So now the pathway of charges from the cloud to the earth is as follows: CLOUDS to THE ELECTRODE placed in a high place to THICK WIRES to THE CAPACITOR to FINE WIRES to THE EARTH finally. ADVANTAGES: A)stored charges can be used in household or factory jobs. B) A store of charges in a microcapacitor can be used in the cars as a fuel instead of oils. C)This type of power will be very cheap but this collection method is season depended.

[MOHAMMAD JAINUL ABEDIN <jabedin@kms.ac.jp](mailto:MOHAMMAD JAINUL ABEDIN <jabedin@kms.ac.jp)>

miki-cho, kagawa japan - Wednesday, November 10, 1999 at 04:06:01 (PST)

**we have a great deal of supplies and project ideas for the students and homeschoolers. visit our page and check out the project the duval county students did in 1999. enjoyed visiting yor site!**

[mary rowland <rowlab@fair.net](mailto:mary_rowland<rowlab@fair.net)>

jacksonville , fl USA - Monday, November 08, 1999 at 11:57:52 (PST)

hi

deshae <[bigdred@gurl.com](mailto:bigdred@gurl.com)>

little rock, AR USA - Friday, November 05, 1999 at 12:45:23 (PST)

**How can I test for chemical pollutants in water? I want to check to see what kind of water is cleaner, tap, bottled, etc. I would really appreciate your help. Thanks.**

Emily <[QTGIRL1122@aol.com](mailto:QTGIRL1122@aol.com)>

NY, NY USA - Friday, November 05, 1999 at 12:06:24 (PST)

**I really like this site, please add more info, please. Thanks, JOHN DOE**

John Doe <[JohnDoe@yahoo.com](mailto:JohnDoe@yahoo.com)>

miami, fl USA - Thursday, November 04, 1999 at 19:06:14 (PST)

**Hi! Your page is really cool, and i learned a lot from it!**

Paulie Shemitz <[Gena@home.com](mailto:Gena@home.com)>

Canada - Wednesday, November 03, 1999 at 18:42:44 (PST)

**My teacher told us to go here to get a ? for our science project.**

Raye Cerenity <[tallsweetchick@yahoo.com](mailto:tallsweetchick@yahoo.com)>

Grand Haven, MI USA - Sunday, October 31, 1999 at 14:19:53 (PST)

**please e-mail me! i need an idea for my science project! thank!**

Allison <[al\\_girl3@hotmail.com](mailto:al_girl3@hotmail.com)>

nashville, TN USA - Thursday, October 28, 1999 at 14:55:44 (PDT)

**this site is the bomb. I got an A on my project with your projects**

Ian Shih <[FireMage59@aol.com](mailto:FireMage59@aol.com)>

Falls Church, VA USA - Tuesday, October 19, 1999 at 16:40:46 (PDT)

**Pls I would like to be a member of the world science club**

adela <[dally@yahoo.com](mailto:dally@yahoo.com)>

kuwait, kw kuwait - Sunday, October 17, 1999 at 07:05:08 (PDT)

**I think there should be a chat net work where people who are rude that come and harrassed other people would be kicked out or better yet you could put ignore and have it where people could make private chat rooms and they could have questions that people would have to answer before they could get in the chat room most likly math problems and such so they could prove themself to be smart enough for the private chat room manly and such there would be also be activities depending on the chat room museum would have pre historic stuff and youd have figures and walk around to different places and click action button takes you to that activity and such also teachers chat lounge where they could talk to other teachers (remeber you have to answer problems to get in)but that would be a good idea.**

Kyle Swinnea <[SnS-TERLTON@worldnet.att.net](mailto:SnS-TERLTON@worldnet.att.net)>

USA - Friday, October 15, 1999 at 08:48:32 (PDT)

**I love this site rock on!**

[Bobby Jones](mailto:BobbyJones@Twinkle113@hotmail.com) <[Twinkle113@hotmail.com](mailto:Twinkle113@hotmail.com)>

marietta, GA USA - Tuesday, October 12, 1999 at 09:53:42 (PDT)

**HELP!! i need information on "which mouse can run through a maze faster??? a fat one or a skinny one????" i need info for my science fair project. PLEASE E-MAIL ME AND TELL ME INFO!!! thanx, Zack**

Zack <[ultimatekornfan@yahoo.com](mailto:ultimatekornfan@yahoo.com)>

lafayette, la USA - Tuesday, October 12, 1999 at 06:21:58 (PDT)

**I just love your web page**

Shameka

Killeen, tx USA - Monday, October 11, 1999 at 14:30:31 (PDT)

**i'm having trouble with deciding on a science fair project and this site really helped! Û But there is one thing... it needs to be updated!!! let's see this is '99 most o fthe projects were put there in what was it... '96???? UPDATE!!!**

Cari Hofmann <[SeaEyesC@aol.com](mailto:SeaEyesC@aol.com)>

Lancaster, Pennsylvania USA - Wednesday, October 06, 1999 at 14:20:49 (PDT)

**Help! I have a student spending several months in South America. Does anyone out there have any good ideas for a science project that would compare S.A. life to US?**

carole <[cwojo13@hotmail.com](mailto:cwojo13@hotmail.com)>

USA - Sunday, October 03, 1999 at 18:02:18 (PDT)

**Thank you.This website really helped me with my science fair project.I am going to tell all my friends!**

Heather <[hlt11@hotmail.com](mailto:hlt11@hotmail.com)>

Passadena, Tx USA - Tuesday, September 28, 1999 at 17:05:26 (PDT)

**Up date this web page, please teacher**

marie <[herisan@aol.com](mailto:herisan@aol.com)>

USA - Friday, September 17, 1999 at 12:25:20 (PDT)

**this is a really trippy site it helped a lot! thanks!**

super chick 2000

san deigo, ca USA - Sunday, September 12, 1999 at 20:28:59 (PDT)

**Mahalo for your efforts in putting together this site! Keep up the great work. I have found some things to integrate in my classroom. Aloha from Hawaii!**

Rhesa <[tahina2@yahoo.com](mailto:tahina2@yahoo.com)>

Honolulu, HI USA - Saturday, September 11, 1999 at 18:38:49 (PDT)

**This page is great, keep up the good work! Say hi to Mrs. carolyn Hayes at Center Grove High School if you see her, she is cool!**

Alex Frew <[Shadow7166@aol.com](mailto:Shadow7166@aol.com)>

greenwood, IN USA - Wednesday, September 01, 1999 at 13:32:41 (PDT)

**Found your site under 'teacher talk acid/base' as a link. what is the home page site address?**

Kaylin Ratner <[ratner@bestnetpc.com](mailto:ratner@bestnetpc.com)>

Palm Coast, Fl. USA - Saturday, August 21, 1999 at 06:04:07 (PDT)

**I love your site! I dont think people need to write rude things!**

[Mary](mailto:Mary@mlbwmgse@yahoo.com) <[mlbwmgse@yahoo.com](mailto:mlbwmgse@yahoo.com)>

lawrence, KS USA - Tuesday, August 10, 1999 at 10:54:58 (PDT)

**hi! i want to ask you something. do you think of starting a club for the science club if you think you are please e-mail me at brandon boswell@excite.com i would like to be the president of the club.**

[brandon boswell](mailto:brandonboswell@brandonboswell@excite.com) <[brandonboswell@excite.com](mailto:brandonboswell@excite.com)>

allenhurst, ga USA - Saturday, July 24, 1999 at 09:22:02 (PDT)





Disser <[disser#\\$\\$%@.fu](mailto:disser#$$%@.fu)>

- Tuesday, April 06, 1999 at 16:49:49 (PDT)

**u people have a stupid site and it needs 2 actually help people find a science fair topic not bs them. i am never telling anybody about this stupid site cuz it has nothin ok.peace out losres!**

[unknown u dork <myob>](#)

myob, nca USA - Friday, April 02, 1999 at 11:14:08 (PST)

**Just looking for some pictures for a project. THANK YOU!**

[The Rongos <rongo@tardis.svsu.edu>](#)

essexville, mi USA - Tuesday, March 30, 1999 at 14:41:54 (PST)

**this is so exciting! you've got to love it. All my friends say it turns them on!**

Jordan

MB, CA USA - Monday, March 29, 1999 at 15:50:18 (PST)

**I love science and i think that the science club is the best way to learn it and school**

[cybernet3 <cybernet39@hotmail.com>](#)

cleveland, TN USA - Thursday, March 25, 1999 at 17:52:27 (PST)

**Jim and Kathy, Nice to find your website you both came Montesano about 4 years ago and were at Beacon School we loved you both. keep up the good work. Science is a way that you can reach kids Keep up the great work. If you are around Montesano give me a ring.Would love to see you again. Thanks for caring of all the kids out there. Mike McKinney**

Mike McKinney <[sailors@techline.com](mailto:sailors@techline.com)>

Montesano , WA USA - Thursday, March 25, 1999 at 16:09:51 (PST)

**I love this site!I found some really cool things I could use.Keep up the good work and I hope I get first place.I am sure I will with this site.I am in 4th grade.**

Auriel Schuler <[ksschuler@mindspring.com](mailto:ksschuler@mindspring.com)>

Coral Springs, FL USA - Wednesday, March 24, 1999 at 17:46:46 (PST)

**This site is awesome. It's got everything you need!!**

Meaghan A. Davis <[kendav@netquik.com](mailto:kendav@netquik.com)>

OrangeVale, ca USA - Tuesday, March 23, 1999 at 16:07:30 (PST)

**Great page!!! GAVE me many options and ideas for my science project!! Keep it up!**

Jenny <[bsbfreak67@geocities.com](mailto:bsbfreak67@geocities.com)>

USA - Saturday, March 20, 1999 at 15:07:07 (PST)

**Do You Like COrndogs?? I Do Please e-mail me!! Bye Love Ya**

Jour Dane <[viperman\\_72@hotmail.com](mailto:viperman_72@hotmail.com)>

magna, ut USA - Friday, March 12, 1999 at 10:12:24 (PST)

**Help! I've waited till the last minute to think of a science project! Anybody out there have an idea? Please tell me. I'm in 8th grade so need a fairly difficult project and need it by tomorrow! thanks later!**

darcie <[norton1@cyberhighway.net](mailto:norton1@cyberhighway.net)>

ID USA - Tuesday, March 09, 1999 at 17:43:08 (PST)

**WELL I WOULD LIKE TO SAY THAT I NEEDED A PROJECT FOR MY SCHOOL AND I FOUND IT HERE AND ANYONE WHO WANTS TALK IM ME**

DANIELLE <[SAGEGKA@AOL.COM](mailto:SAGEGKA@AOL.COM)>

MA USA - Saturday, March 06, 1999 at 08:00:45 (PST)

**It's a nice page but... there is not really anything that fits my science project...so...would you guys add more experients???**

Amy <[seastar\\_love@hotmail.com](mailto:seastar_love@hotmail.com)>

Taipei, Taiwan - Friday, March 05, 1999 at 18:50:16 (PST)

**Despite all the rude and ignorant comments I found here I was able, through your links to find exactly waht I was looking for. PLUS!! It is great to have one site from which I can find so many highly informative articles. Thank you.**

WM. M. CLARKE <[wmc@pathcom.com](mailto:wmc@pathcom.com)>

Mississauga, ON CANADA - Thursday, November 05, 1998 at 06:35:25 (PST)

**WELL I WOULD LIKE TO SAY THAT I NEEDED A PROJECT FOR MY SCHOOL AND I FOUND IT HERE AND ANYONE WHO WANTS TALK IM ME**

DANIELLE <[SAGEGKA@AOL.COM](mailto:SAGEGKA@AOL.COM)>

MA USA - Saturday, March 06, 1999 at 08:00:45 (PST)

**It's a nice page but... there is not really anything that fits my science project...so...would you guys add more experients???**

Amy <[seastar\\_love@hotmail.com](mailto:seastar_love@hotmail.com)>

Taipei, Taiwan - Friday, March 05, 1999 at 18:50:16 (PST)

**This page is excellent!!!!**

Sunshine

St. John's, Canada - Wednesday, March 03, 1999 at 16:06:45 (PST)

**This is an awesome sight! I was tipped off by a friend and so I skipped on over to see. It was neat to see all of the science projects that I could do...I even added some of my own ideas!**

"sarah"

Prince Rupert, BC Canada - Tuesday, March 02, 1999 at 16:29:51 (PST)

**BOOOOOOOOOOOORHING! You suck**

Duh <[Duh](#)>

Duh, Du Zimbabwe - Sunday, February 28, 1999 at 12:36:23 (PST)

**Man this site sucks and it's ideas are pathetic. What were you smoking when you came up with some of those ideas? You Suck.**

Frank <[\\*\\*\\*\\*\\*](#)>

????, DDU USA - Sunday, February 28, 1999 at 12:33:45 (PST)

**I like your page. I'm going to use it for my homeworkk. Suggestion..... Put science news article on your page....(planets, chemicals, ect.)**

[Tyler Reed <tyr86@hotmail.com>](#)

Lancaster, OH USA - Thursday, February 25, 1999 at 16:13:19 (PST)

**Thanks for the ideals!!!**

powe82 <[powe82@hotmail.com](mailto:powe82@hotmail.com)>

n/a, n/a USA - Thursday, February 25, 1999 at 12:06:56 (PST)

**I don't LOVE science, but this is a great site for it.**

[Aminda N. Tiberend](mailto:Aminda.N.Tiberend@midwest.net) <[mtiber@midwest.net](mailto:mtiber@midwest.net)>

Nashville, IL USA - Saturday, February 20, 1999 at 09:29:27 (PST)

**You bite because you have no information only comments!!!!**

Staret Powey <[Bikerboy83@aol.com](mailto:Bikerboy83@aol.com)>

Townsend, Ma USA - Saturday, February 20, 1999 at 07:47:09 (PST)

**I think your site is great I found a great prject just right for my teacher so I can get a good grade thank you so much!!**

Danielle Brekke <[twostang@uni.com](mailto:twostang@uni.com)>

Ramsey, MN USA - Friday, February 19, 1999 at 15:22:15 (PST)

**This is a GREAT place to find a science project so keep up the great work!!!! Your friend Amanda**

[Aminda N. Tiberend](mailto:Aminda.N.Tiberend@midwest.net) <[mtiber@midwest.net](mailto:mtiber@midwest.net)>

Nashville, IL USA - Thursday, February 18, 1999 at 08:54:23 (PST)

**I like your webpage.I have a science club (but in Turkey).Can you help me.Do you have advyce for me**

HellMasTer87 <[hellmaster87@hotmail.com](mailto:hellmaster87@hotmail.com)>

Ýstanbul, Turkey - Tuesday, February 16, 1999 at 10:21:20 (PST)

**I think that your science club is nice but it could be a little more interesting, thank you**

[guest\\_cun\\_knowned](mailto:guest_cun_knowned)>

un knowed, unknowed - Tuesday, February 09, 1999 at 05:30:49 (PST)

**I think this website is the most intresting website of all. I think my school would like to see the website too!! I think the projects and others should be more fun and simple to do.**

[siti\\_nurfara\\_bte\\_mohd\\_noor](mailto:siti_nurfara_bte_mohd_noor@faranoor@hotmail.com) <[faranoor@hotmail.com](mailto:faranoor@hotmail.com)>

singapore, singapore - Monday, February 08, 1999 at 03:47:26 (PST)

**this is the most intresting science website of all.I think my school would like to surf your website too!!**

[siti\\_nurfara\\_bte\\_mohd\\_noor](mailto:siti_nurfara_bte_mohd_noor@franoor@hotmail.com) <[franoor@hotmail.com](mailto:franoor@hotmail.com)>

singapore, singapore - Monday, February 08, 1999 at 03:43:35 (PST)

**your site is greatI will book mark it**

Renesha and keshia <[ushers\\_babe\\_gul](mailto:ushers_babe_gul)>

memphis, tn USA - Tuesday, February 02, 1999 at 11:27:30 (PST)

**I really hate science!**

Alea

Salem, Oregon USA - Tuesday, February 02, 1999 at 09:55:07 (PST)

**This is a great site. Visit my homepage. [http://www.geocities.com/CapeCanaveral/Lab/4059/Aristotles\\_Lyceum\\_in\\_Cyberspace.html](http://www.geocities.com/CapeCanaveral/Lab/4059/Aristotles_Lyceum_in_Cyberspace.html)**

[Jeffery Winkler](mailto:Jeffery.Winkler@Aristotle2@goplav.com) <[Aristotle2@goplav.com](mailto:Aristotle2@goplav.com)>

Hanford, CA USA - Monday, February 01, 1999 at 17:01:47 (PST)

**This page has been helpful to me, because I am trying to come up with a science project that can be about anything.**

Joe Cool <[uswq86a@prodigy.com](mailto:uswq86a@prodigy.com)>

Mantoloking, NJ USA - Saturday, January 30, 1999 at 08:14:08 (PST)

**I like your page, but Canada doesn't have States, and I live in a town not a city. Cool science Ideas, though.**

laura palmer <[lrlpalmer@hotmail.com](mailto:lrlpalmer@hotmail.com)>

Roberts Arm , N.F. Canada - Wednesday, January 27, 1999 at 15:42:04 (PST)

**This page really sucks!**

Paco and Vic

USA - Wednesday, January 27, 1999 at 07:51:22 (PST)

**VDG question- what would be a safe distance to keep the vdg machine from a computer? dont want to zap my puter with my man made lightning! i plan to start construction this weekend. this site is so cool, keep up the good work art!!!**

[art\\_@jgnatz@datasync.com](mailto:art_@jgnatz@datasync.com)>

lucedale, ms USA - Tuesday, January 26, 1999 at 18:54:48 (PST)

**This site is very well made. I think that you should send e-mail to all the schools in district 81. and to all the people who disagree with me, reconsider your thinking, and to those who "hate" science: Don't give in to hate, that leads to the dark side. " anger, fear, and aggression lead to the dark side." and to all those wrestling**

**fans out there, especially the ignorant oaf who posted his name as steve austin, " Wars do not make one great". Violence is not good, it don't help, jus' hurts. Everyone should give up wars and focus on peace and restoring the environment. THIS SITE IS THE BEST SCIENCE SITE OUT THERE.**

Obi-Wan Kenobi <[the\\_duke47@hotmail.com](mailto:the_duke47@hotmail.com)>

mos eisleys, tat outer rim terr. - Monday, January 25, 1999 at 20:42:55 (PST)

**You have a great site for kids. They should all visit it. [http://www.geocities.com/CapeCanaveral/Lab/4059/Aristotles\\_Lyceum\\_in\\_Cyberspace.html](http://www.geocities.com/CapeCanaveral/Lab/4059/Aristotles_Lyceum_in_Cyberspace.html)**

[Jeffery Winkler](mailto:Jeffery.Winkler@Aristotle2@goplav.com) <[Aristotle2@goplav.com](mailto:Aristotle2@goplav.com)>

Hanford, CA USA - Monday, January 25, 1999 at 16:35:38 (PST)

**I was wondering if someone could e-mail me ideas for a science project. I really need help. I am in grade 8. Thanks!!! My e-mail is shouston1@home.com**

Sheena <[shouston1@home.com](mailto:shouston1@home.com)>

Vancouver, BBC Canada - Sunday, January 24, 1999 at 13:43:09 (PST)

**hi mr. mr. my name is kristopher how bout u he double hockey sticks o we all love u me loves u more then my friend**

[kristopher\\_&\\_steav](mailto:kristopher_&_steav@splash1133@aol.com) <[splash1133@aol.com](mailto:splash1133@aol.com)>

france, CALI OHIO - Thursday, January 21, 1999 at 10:09:20 (PST)

**The site offers comprehensive information which can be used to help people doing homework. In other words THIZ RULEZ!!**

Ashley Earl <[ashley.earl@cliftoncomp.rotherham.sch.uk](mailto:ashley.earl@cliftoncomp.rotherham.sch.uk)>

Rotherham, England - Thursday, January 21, 1999 at 02:10:29 (PST)

**My friend and I came across this site looking for a science fair project we could do on acids and alkalines. We already have an experiment but would like to get another to add to our project so if you could E-Mail us at the address above with an experiment than I would be very thankful. Thanx again**



JBI, me antarctica - Friday, December 18, 1998 at 08:27:21 (PST)

**This Sucks**

[bobby](#) <[housearrest](mailto:housearrest)>

pearl, wa USA - Friday, December 18, 1998 at 08:25:34 (PST)

**This site is cool. We are looking for science fair project. I will try to come back to this site again.**

Terra Dailey <[tdailey@manhts.autoelect.com](mailto:tdailey@manhts.autoelect.com)>

casper, WY USA - Thursday, December 17, 1998 at 08:29:14 (PST)

**This site is cool. It has good ideas.I hope to come back to this place again.I'm looking forward to using one of this projects.**

Ramona Garcia <[rgarcia@manhts.autoelect.com](mailto:rgarcia@manhts.autoelect.com)>

casper, wy USA - Thursday, December 17, 1998 at 08:28:33 (PST)

**Science is cool sometimes when the teacher takes time to explain what we are working on, instead of just giving it to us. My teacher Mr.D or Mr.Dauenhaueris cool because he does this and he doesn't give us homework either. I am glad he is my teacher!!!!!! I also have a science project coming up which plant transpires them most? Answer at my E-mail adress and for a title say Science Amswer**

Amber Sullivan <[Tigger4548@AOL.com](mailto:Tigger4548@AOL.com)>

Portland, OR USA - Monday, December 14, 1998 at 11:26:25 (PST)

**Enjoyed your site. Robert Ray 214-275-8293 Email. rray@wowmail.com**

Robert Ray <[rray@wowmail.com](mailto:rray@wowmail.com)>

Dallas, Tx USA - Monday, December 14, 1998 at 07:02:34 (PST)

**IT SUCKS**

MainFrame <[ivan595@aol.com](mailto:ivan595@aol.com)>

gloversville, ny USA - Friday, December 11, 1998 at 11:48:56 (PST)

**hi people how are you I like this site**

vickie

CANADA - Thursday, December 10, 1998 at 19:04:22 (PST)

**Hi! We just wanted to let you know that we rule!**

None of your buisness

USA - Thursday, December 10, 1998 at 10:11:54 (PST)

**Very nice site**

jeff

USA - Monday, December 07, 1998 at 20:39:28 (PST)

**per your request in the seattle times, i have a compaq lte computer for you guys if interested. please contact me so we can make arrangements for the transfer.**

Michael dixon <[mdixon@premier1.net](mailto:mdixon@premier1.net)>

arlington, wa USA - Wednesday, December 02, 1998 at 09:39:34 (PST)

**I WILL PAY YOU IF YOU HELP ME OUT. IT DEPENDS ON THE QUALITY OF WHAT YOU SUGGEST. TOP REWARD:\$10,000. I NEED AN EXPERIMENT FOR THE SCIENCE FAIR WITH ALL THE DETAILS AND EVERYTHING. I NEED TO BE ABLE TO FIND A LOT OF RESEARCH ON IT. A SUPERB, CREATIVE IDEA!!!**

CHRISTIE BAHNA <[JKIM859827](mailto:JKIM859827)>

LOS ANGELES, CA USA - Saturday, November 28, 1998 at 10:40:31 (PST)

**I thought people were just joking about this web site being baad in the guest book. But it really does.It is the worst web site. You guys really need to make a better web sight**

[joe bob jim](#) <[kujasfdoije@hotmail.com](mailto:kujasfdoije@hotmail.com)>

:kk, l:k k;k:kUSA - Tuesday, November 24, 1998 at 19:17:27 (PST)

**thanks for the help. this was just what I was looking for my 6th grader.**

Robinson <[Fride98@aol.com](mailto:Fride98@aol.com)>

Ny, Ny USA - Tuesday, November 17, 1998 at 07:06:27 (PST)

**cool**

Whitney C. <[Cleo610@aol.com](mailto:Cleo610@aol.com)>

Tx USA - Sunday, November 15, 1998 at 11:09:51 (PST)

**This is the best site ever!!!!!!!!!!!!!!!!!!!!!!**

Rangan <[vilorea@aol.com](mailto:vilorea@aol.com)>

Rochester Hills, MI USA - Tuesday, November 03, 1998 at 19:21:38 (PST)

**I THINK THIS WEB SITE IS PRETTY COOL BECUACE I AM JUST GETING IN TO SCINCE IT IS GIVING ME A LOT OF INFORMAION. THANK YOU**

SHANNON

REED CITY, MI USA - Tuesday, November 03, 1998 at 16:24:05 (PST)

**I think that this is the best site that I have ever been on in my entire life. I've been alive for a long time now. Keep up the GOOD WORK Science Club**

David <[davpeder@sendit.nodak.edu](mailto:davpeder@sendit.nodak.edu)>

Tioga, ND USA - Monday, November 02, 1998 at 11:13:01 (PST)

**kool**

jim

USA - Friday, October 30, 1998 at 20:48:59 (PST)

**This site rocks! I did the hologram thing but on a 4ft piece of plastic. The teacher thinks I invented it.**

LL

USA - Friday, October 30, 1998 at 14:02:36 (PST)

**Thank you very much for the plans. I will endeavor to do my best work. You are very kind to assist me.**

Mohammad

- Friday, October 30, 1998 at 13:59:35 (PST)

**Thanks for your heelp on my project.**

Glenda  
USA - Friday, October 30, 1998 at 13:57:14 (PST)

**Thanks for a great site!**  
Bobby  
USA - Friday, October 30, 1998 at 13:56:08 (PST)

**This PaGe ReaLLy HelPeD mE fInD mY SCienCe Pr0jEcT... ~ThAnX- !LiSa!**  
LiSa <[lisaMarie](mailto:lisaMarie)>  
-, NY USA - Friday, October 30, 1998 at 13:18:53 (PST)

**I like this site. I saw a presentation at school today. I was looking for the hover craft model, but I couldn't find it. Please send it to Lewis & Clark High School in Spokane Washington area code 99204,the school is in district #81, and is a public school, request it be sent to the MASA Program PLEASE PLEASE PLEASE respond soon!!!!!!!!!!!!!!**  
[scih <ananamou>](mailto:scih<ananamou>)  
Spokane, WA USA - Tuesday, October 27, 1998 at 20:18:20 (PST)

**to all of you that are dissing this site you are all losers, I mean you waste you time on dissing a site which you couldn't care less about. HINT: GET A LIFE!!!!!!!!!!**  
[mark](mailto:mark)  
boston, USA - Monday, October 26, 1998 at 14:52:47 (PST)

**I like this site alot, it gave me a great idea for my science fair!!!! I was on the net for three sraight hours, until I found this site! thanks agine mate! jenny**  
[jenny smith](mailto:jenny smith)  
sydney, australia - Monday, October 26, 1998 at 14:46:33 (PST)

**give me some stuff about ergenomics!!!!**  
[stu harris <golgo13@aol.com>](mailto:stu harris <golgo13@aol.com>)  
walker, la USA - Monday, October 26, 1998 at 11:27:05 (PST)

**This plase sux... sux... sux...bad..**  
Cierra <[ryler@bellsouth.net](mailto:ryler@bellsouth.net)>  
Jaskson, mi USA - Thursday, October 22, 1998 at 16:26:03 (PDT)

**I LOVE SCIENCE IT IS THE BEST THING THAT EVER HAPPENED TO ME**  
[Daniel <danielferrell@hotmail.com>](mailto:Daniel <danielferrell@hotmail.com>)  
Santa Fe, NM USA - Wednesday, October 21, 1998 at 11:01:03 (PDT)

**You cant find anything on this website over projects dealing with how long does it take gum to get hard.**  
Model 214  
Dallas, Tx USA - Tuesday, October 20, 1998 at 16:31:04 (PDT)

**Dear Bill,**  
**Indeed your page helped me build a VDG capable of 5 micro amps. Now, our School has this VDG, which can provide years & years of fun with static electricity. I wish to convey on behalf of our students and staff our THANKS for hosting on the web your knowledge and experience. We wish you great success.**  
**R. Ramesh**  
[R. Ramesh <lilly@eiasbg01.vsnl.net.in>](mailto:R. Ramesh <lilly@eiasbg01.vsnl.net.in>)  
Bangalore, KA India - Tuesday, October 20, 1998 at 05:34:14 (PDT)

**Any chance of linking to our simple little site as above. I await your link hopefully. Our email has not been satisfactorily installed yet so there may be problems with it.**  
[Downshire school <downshire-carrick.antrim.sch.uk>](mailto:Downshire school <downshire-carrick.antrim.sch.uk>)  
co Antrim, uk - Monday, October 12, 1998 at 09:11:48 (PDT)

**I think this site was very interesting. It had lots of good info that i can use for future sci. projects. I like everything about the site except for the fact that most of your comments are either explicit or moronic. Other than that, keep up the good work!**  
Jonathan Goodnight  
Vienna, VA USA - Monday, October 12, 1998 at 07:35:20 (PDT)

**Hey i really think this site is cool yeah man :-)**  
OVerkill <[bartholomew@cyberdude.com](mailto:bartholomew@cyberdude.com)>  
USA - Tuesday, October 06, 1998 at 15:32:52 (PDT)

**This site is stupid. It has no darn science stuff. Oh yeah will all dem freaks out there cut some for da D-Low?**  
Supafly  
Atlanta, Ga USA - Tuesday, October 06, 1998 at 10:59:48 (PDT)

**Grrretings from mad scientist**  
[Luiqi Vittorio Basso <luigibasso@ntt.it>](mailto:Luiqi Vittorio Basso <luigibasso@ntt.it>)  
Treviso, Italy - Thursday, October 01, 1998 at 11:24:23 (PDT)

**YO YO YO I think that dis page suxs!!!! this isn't the page to ge award winning projects. You Should edit dis page yo. Also WAZZUP ALL MAH KOREAN HOMIES OUT ON DA WEB!!!**  
hANgoOk KiMchl Lover  
Skokie, IL USA - Tuesday, September 29, 1998 at 13:30:46 (PDT)

**U Sux!!!!!!!!!!!!!!!!!!!!**  
Anita Bath  
New York, Ill USA - Tuesday, September 29, 1998 at 08:11:50 (PDT)

**JEEZ, This site could turn kids of of science. My son was looking at this site and started laughing out loud. I was so horrified I took the internet away so he wouldn't take science like a joke. Ill be expecting a letter of apology in my email. I should Report you ALL!!!**  
[Planet-Dexter <fairviews@yahoo.com>](mailto:Planet-Dexter <fairviews@yahoo.com>)  
chicago, IL USA - Tuesday, September 29, 1998 at 08:01:19 (PDT)

**THis is the worst paGE ON the net. Who would waste their time to make some stupid science page. U guys are losers check out our schools page http://www.fairview.cjb.net**  
[MrPsychotic <MrPsychotic@netscape.net>](mailto:MrPsychotic <MrPsychotic@netscape.net>)  
asdf, l;kj lUSA - Tuesday, September 29, 1998 at 07:59:45 (PDT)

**SCIENCE NET WHAT ABOUT LIFE SCIENCE?????????????????????????????**  
life girlz

USA - Sunday, September 27, 1998 at 06:22:57 (PDT)

**Nice Site!**

Gary  
USA - Saturday, September 26, 1998 at 05:51:38 (PDT)

**Your website sucks!!!!!!!!!!!!!!**

John Liver <[shutup@hotmail.com](mailto:shutup@hotmail.com)>  
Cleveland, NY Bermuda Triangle - Tuesday, September 22, 1998 at 05:53:34 (PDT)

**we think you're web page is great and we are glad to know people are into science on your side os the atlantic**

euan macdonald  
kilmarnock, east ayrshire scotland - Sunday, September 20, 1998 at 13:06:11 (PDT)

**PLEASE SEND SOME INFO ON HOW TO GET A A PLUS PROJECT. PEACE PS:BYE THE END OF TODAY**

Skilz <[Radine@webtv.net](mailto:Radine@webtv.net)>  
FAYETTEVILLE, GA USA - Sunday, September 20, 1998 at 12:14:23 (PDT)

**This is one of the dumbest spots cause it doesn't have 1/2 of the sites, you shouldn't put it on there if you can't find it. That's my opinion on this matter anyway. Thanxs =)**

Daisy Go-lucky <[You don't really care anyways!](#)>  
Akron, IA USA - Friday, September 18, 1998 at 16:41:31 (PDT)

**hey, this websites gay! theres nothin bout science, its completely unoriginal, i warn the poeple who made this NOT to make a sister-site**

SD  
USA - Friday, September 18, 1998 at 16:33:33 (PDT)

**Science is evil and i don't know why you are promoting it on such a poor site. I truly feel sorry for you guys. You could have at least made a site on something cool.**

Jv[adman <[yourmom@mybed.com](mailto:yourmom@mybed.com)>  
USA - Wednesday, September 16, 1998 at 10:26:18 (PDT)

**So do we have any ladies in the audience tonight?**

THor Johnson <[itsprobably@hotmail.com](mailto:itsprobably@hotmail.com)>  
USA - Wednesday, September 16, 1998 at 08:00:19 (PDT)

**we apologise for the e-mail from the grange science club but he does have a point**

euan macdonald <[euanmacdonald@hotmail.com](mailto:euanmacdonald@hotmail.com)>  
kilmarnock, east ayrshire scotland - Wednesday, September 16, 1998 at 05:33:00 (PDT)

**You sad people**

Grange Academy <[scienceclub97@hotmail.com](mailto:scienceclub97@hotmail.com)>  
Kilmarnock, scotland scotland - Wednesday, September 16, 1998 at 05:30:15 (PDT)

**sam t wuz here sept 98 whatever**

[sam t](#) <[not yet but soon i hope](#)>  
clinton, tn USA - Tuesday, September 15, 1998 at 13:38:27 (PDT)

**I love this page, it is totally the bimb, you can find everything and anything really easy. This is my fav. thing to look at on the internet**

Miranda foreman <[abbyf1](#)>  
piedmont, ca USA - Monday, September 14, 1998 at 18:08:01 (PDT)

**I love this page its cool visit mine <http://expage.com/page/science>**

Ferguson <[JSmith@gateway.net](mailto:JSmith@gateway.net)>  
doster, pa USA - Wednesday, September 09, 1998 at 18:36:38 (PDT)

**Natural Disasters: Destructive Forces of Nature <http://library.advanced.org/16132> Check out this site to get information on seven different natural disasters. A must see!**

[David Gunther](mailto:David.Gunther@worldnet.att.net) <[GUMPD@worldnet.att.net](mailto:GUMPD@worldnet.att.net)>  
Yorktown , NY USA - Friday, September 04, 1998 at 07:56:27 (PDT)

**This site was so educational. But you should really have some science chat!!**

Clinton High School  
Clinton, AR USA - Wednesday, September 02, 1998 at 08:22:25 (PDT)

**Hey if you want to you can sign my guestbook. I trying to tell as much people as I can. But you dont have to do anythang for me.**

[Jerome](mailto:Jerome) <[Hernman@webtv.net](mailto:Hernman@webtv.net)>  
Brooker, FL USA - Friday, August 28, 1998 at 20:22:22 (PDT)

**This posting is for all of your members. The Projekt Box is a new science/discovery forum where people of all ages are allowed to participate in teams tackling the design of virtual projects that members submit. Teams move through the various design and R&D stages involved in bringing a project to life. Membership is free and provided for by Yahoo, Inc. If you like building things and learning new sciences beyond your current level of understanding, The Projekt Box is for you. Visit the site, and click on "Join". You will be emailed within seconds instructions on how to join the group. Once there, leave information under your member profile about your skills and interests so other know what strengths you have that they might borrow from. When enough members are present to form a team, you will be asked to vote on the project you would like to virtual build. Have fun!**

[Projekt Box Host](mailto:Projekt.Box.Host@vulzan@aol.com) <[vulzan@aol.com](mailto:vulzan@aol.com)>  
N/A, NA USA - Wednesday, August 26, 1998 at 01:07:59 (PDT)

**You really should put more pictures**

Alan Liao  
Paramus, nj USA - Thursday, August 13, 1998 at 18:12:18 (PDT)

**I was missing yous guys & foolin with the net. Your site needs your pictures.**

Sunshine <[SitComStar@netscape.net](mailto:SitComStar@netscape.net)>  
Seattle, WA USA - Saturday, August 08, 1998 at 21:10:42 (PDT)

**I like your site!!!**

[San-cycle](#)  
FL USA - Thursday, July 30, 1998 at 11:33:23 (PDT)

ilovethiswiveste







**I am in the 6th grade. Projects such as your's which made all this possible really makes learning so much more fun and interesting. Keep up the great job at bringing technology right to my fingertips. Words cannot express how much I really appreciate a ll the time, effort and dedication you'd put forth into The Science Club. Thank you so much!**

Jason <[BKANO70@AOL.COM](mailto:BKANO70@AOL.COM)>

Suisun City, CA USA - Monday, February 02, 1998 at 21:54:50 (PST)

**HI I AM IN 4th GRADE I LOVE SCI. I AM GOING TO BE IN ONE FOR MY CLASS TO I WANT TO BE IN THIS CLUB BUT I DON'T KNOW HOW TO SIGN UP CAN SOMEONE TELL ME!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!**

spy10 <[wpv0@webnet](mailto:wpv0@webnet)>

STERLINGTON=, LA USA - Thursday, January 29, 1998 at 16:25:15 (PST)

**I hate Science! I think there shouldn't be a rule saying that everyone has to do a Science Fair Project!**

Esther Kraus <[4322798850451980](mailto:4322798850451980)>

Omaha, NE USA - Wednesday, January 28, 1998 at 06:57:07 (PST)

**This site was great for me! This is my first time doing a science project and I'm going to use one of your ideas. the one I liked best was the one about the dog's mouth (Which is cleaner: a dog's mouth or a human?) but the e-mail address for the student who submitted it was incomplete. It only said URL: rickz @ And then the rest was blank! CAN ANYONE HELP ME FIND OUT WHO THIS IS OR SEND ME AN E-MAIL WITH INFORMATION FOR MY PROJECT? PLEEEEEEEASE HELP ME!**

Brandon <[graccs@power-online.net](mailto:graccs@power-online.net)>

Evergreen, CO USA - Tuesday, January 27, 1998 at 18:26:32 (PST)

**Why do you need to put comments?**

Ryan Longair <[ryanl@ibm.net](mailto:ryanl@ibm.net)>

Surrey, BC Canada - Tuesday, January 27, 1998 at 07:00:02 (PST)

Ryan Longair <[ryanl@ibm.net](mailto:ryanl@ibm.net)>

Surrey, BC Canada - Tuesday, January 27, 1998 at 06:59:28 (PST)

**I love the design of your website.**

[Leia Ingram](mailto:Leia_Ingram) <[User186354@aol.com](mailto:User186354@aol.com)>

Hyattsville, MD USA - Saturday, January 24, 1998 at 14:52:18 (PST)

**I would like to find a project that would guarantee me an award. Could someone help me out? You could e-mail me as soon as you fin one. Thanks a lot.**

Steven Hynes <[hyness@panthers.presjh.k12.nf.ca](mailto:hyness@panthers.presjh.k12.nf.ca)>

Corner Brook, Nf Canada - Tuesday, January 20, 1998 at 10:18:46 (PST)

**This is a great site!I got all the information I needed for a project!At school,I got an A+I want to thank anyone who made this site!!!!!!!**

Kathy <[mhk33536@csun.edu](mailto:mhk33536@csun.edu)>

North Hills, CA USA - Friday, January 16, 1998 at 18:48:53 (PST)

**I thought this site was great it helped me find a good science project to do. And an interesting one.**

Jesse Haber <[habers@uniserve.com](mailto:habers@uniserve.com)>

Quesnel, BC Canada - Thursday, January 15, 1998 at 07:27:09 (PST)

**It is sites like this that make surfing the web a pleasure, informative, witty and full of exciting things to learn. Both my children (13 and 10) are searching for ideas for their science fairs, I think the search is over. Huge KUDO's to all the peopl e that have made this site what it is, keep up the great work!!**

George Giusti <[ggiusti@ccinet.ab.ca](mailto:ggiusti@ccinet.ab.ca)>

Edmonton, AB Canada - Thursday, January 08, 1998 at 21:29:09 (PST)

**The Science Club, what a very outstanding page. I have two grandchildren who are working on projects for a Science fair at their respective schools. The information which we were able to obtain from the Science Club helped these two 10 and 13 year of d girls really become interested in their project and instead of it being a boring must do experiment, it became something that was a fun learning experience. They suddenly became excited about science after reading about what other kids their own ages had done. Thank you so much for helping to turn these two around so that science became fun.**

[Peter B. Calhoun](mailto:Peter_B_Calhoun) <[C239422962@aol.com](mailto:C239422962@aol.com)>

Jacksonville, FL USA - Wednesday, January 07, 1998 at 05:29:24 (PST)

**looking for viscosity prokect , couldnt find it , but i found something about eggs and teeth and sodas and stuff.pretty cool**

anonymous

USA - Sunday, January 04, 1998 at 10:46:48 (PST)

**you must add a chat room so we can chat and scines is the Bom**

Matt <[Emaryp@msn.com](mailto:Emaryp@msn.com)>

Rochester, ny USA - Friday, January 02, 1998 at 07:53:18 (PST)

**you must add a chat room so we can chat and scines is the bame**

Matt <[Emaryp@msn.com](mailto:Emaryp@msn.com)>

Rochester, ny USA - Friday, January 02, 1998 at 07:52:32 (PST)

**Awww C'mon!!!!!!!!!!!!!!!!!!!!!!**

[Josh](mailto:Josh) <[Skanker112@aol.com](mailto:Skanker112@aol.com)>

Glen Dale, WV USA - Monday, December 29, 1997 at 17:16:02 (PST)

**This page is fun to me. The page is cool to me. I like the page.**

Angela

USA - Monday, December 29, 1997 at 10:53:53 (PST)

**i am very good with science and i want to do science tests. sincerley, david hamilton**

[david hamilton](mailto:david.hamilton) <[dhass](mailto:dhass)>

salt lake city, utah USA - Friday, December 26, 1997 at 09:41:13 (PST)

**I like this site.**

Frank

Lima, PE South America - Wednesday, December 24, 1997 at 14:08:16 (PST)

**none**

Patty Ippolito <[meippolito@aol.com](mailto:meippolito@aol.com)>

altus, ok - Monday, December 22, 1997 at 07:35:15 (PST)

Give it more information about inventing things.

Paul Livsey & Wayne Johns <[MLMP.LIVSEY@BIGPOND.COM](mailto:MLMP.LIVSEY@BIGPOND.COM)>

Katanning, WA Australia - Wednesday, December 17, 1997 at 03:21:23 (PST)

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**This site is horrible i searched it for 2 hours and couldnt find a good project**

[Anonymus <rfghja@hdgkap>](mailto:Anonymus<rfghja@hdgkap>)

ohio, oh USA - Sunday, December 14, 1997 at 11:14:33 (PST)

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**Your city is good enough for me and for my chýlds. Thanks for people that prepared thýs web cýty.**

[Gökhan Aldemir <ikk2@tr-net.net.tr>](mailto:Gökhan Aldemir <ikk2@tr-net.net.tr>)

Ankara, TR TURKEY - Friday, December 12, 1997 at 02:17:45 (PST)

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**Hi! Well done...**

[Chungsoo Kim <mc68302@chollian.net>](mailto:Chungsoo Kim <mc68302@chollian.net>)

Taejon, Korea - Thursday, November 27, 1997 at 02:40:25 (PST)

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**I recently dropped of an old computer at one of the science club members houses and got you web address from a bag of glow in the dark powder I got when I dropped it off and I must say, this is a great site**

Chris Ducharme <[DUCH@prodigy.net](mailto:DUCH@prodigy.net)>

Issaquah, WA USA - Tuesday, November 11, 1997 at 21:12:51 (PST)

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**hi,i really like your site! i'm planning on using the ear plug experiment! it sounds really cool and my science teacher said that it should get a place in the fair. thanks for having all these great ideas!! i love them!!!**

skittles marie <[tobyg@iamerica.net](mailto:tobyg@iamerica.net)>

USA - Sunday, November 02, 1997 at 16:05:46 (PST)

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**This is a really cool site! Thanks for the info**

Jimmy Lee Moore II <[jkmoore@kymtnnet.org](mailto:jkmoore@kymtnnet.org)>

Elkhorn City, KY USA - Friday, October 31, 1997 at 15:15:38 (PST)

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**THANKS FOR THE SCIENCE PROJECT INFORMATION. ENJOYED VISITING YOUR SITE.**

Richard D. Thornton <[RICHARDDTHORNTON@HOTMAIL.COM](mailto:RICHARDDTHORNTON@HOTMAIL.COM)>

Pasadena, TX USA - Friday, October 24, 1997 at 08:40:36 (PDT)

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**You have a very INTERSING SITE !!!!!!!!!!!!!!!!!!!!!!!**

Merredith Guzman <[guzman@express-news.net](mailto:guzman@express-news.net)>

San Antonio , TX USA - Thursday, October 23, 1997 at 14:54:52 (PDT)

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**My grandchildren often call for help with homework and special school projects. It is so hard to find appropriate and grade level sites on web browsers. your site is bbookmarked for them. Grades 3 and 1, Jasmine and her brother Robert are in a Math & Science Magnet School. Sent Jasmine's query via E-Mail. Thanks so much for being there. We need more sites like yours. An appreciative Grandmother**

[Louise Hutchinson for Granddaughter Jasmine <>](mailto:Louise Hutchinson for Granddaughter Jasmine <>)

Washington, DC USA - Tuesday, October 21, 1997 at 12:31:33 (PDT)

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**YOU WEB SIT IS COOL**

JOEY MAZER <[DetroitRod@aol.com](mailto:DetroitRod@aol.com)>

Mesa, AZ USA - Wednesday, October 15, 1997 at 19:40:52 (PDT)

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**I LOVE SCIENCE AND PLAN TO DO MARIEN BIOLOGY ONCE I LEAVE SCHOOL. I AM MOST CERTAIN THAT I WILL VISIT YOUR PAGE ONCE I GET ON-LINE. CATCHA LATER.**

COURTNEY RAMSDALE <[NOT\\_ANY\\_YET](mailto:NOT_ANY_YET)>

LAKE CATHIE, NSW AUSTRALIA - Sunday, October 12, 1997 at 19:25:21 (PDT)

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**keep up the good work! :)**

Kim DeWit <[kdewit@aol.com](mailto:kdewit@aol.com)>

Carmel, Ca USA - Saturday, October 11, 1997 at 22:52:37 (PDT)

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**Jim & Cathy, It is good to see that "The Science Club" is still going. Thanks for the opportunity of working with the both of you, you guys taught me a lot. Take care. Rodney Conway**

Rodney Conway <[rconway@wacpm.ang.af.mil](mailto:rconway@wacpm.ang.af.mil)>

Issaquah, WWWAWW USA - Friday, October 10, 1997 at 08:24:32 (PDT)

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**Hi! I wish I could have got 1st place, I got last from this page!!!**

Kelly <[something](mailto:something)>

Quitman, Tx. USA - Thursday, October 09, 1997 at 16:00:31 (PDT)

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**SCIENCE IS SO GOOD!! I LOVE IT !!**

LORETTA LEUNG <[calvados@netvigator.com](mailto:calvados@netvigator.com)>

HONG KONG, HONG KONG CHINA - Sunday, October 05, 1997 at 09:16:13 (PDT)

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**I LOVE THIS CLUB I WANT TO JOIN**

Benj <[tschenk@cglaw.com](mailto:tschenk@cglaw.com)>

San Diego, Ca USA - Saturday, September 27, 1997 at 06:50:21 (PDT)

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**Science rules, right now I'm looking for ideas for science fair. No ideas so far**

Sherie

Orlando, FL USA - Thursday, September 25, 1997 at 06:01:17 (PDT)

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**I HATE SCIENCE!!!!**

[Joe Mama <Joebitch@cyberlude.com>](mailto:Joe Mama <Joebitch@cyberlude.com>)

USA - Monday, September 22, 1997 at 10:53:59 (PDT)

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**Thanks Every year I struggle with ideas... This page helped me alot... I am in the 7th grade.**

Kevin <[cruiser497](mailto:cruiser497)>

erie, pa USA - Sunday, September 21, 1997 at 17:15:03 (PDT)

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**Dear Mr. Burrows I just wanted to wosh you a happy 50th Birthday. Talk to you later**

Coco <[colann@ih.net](mailto:colann@ih.net)>

Woodhaven, MI USA - Saturday, September 20, 1997 at 17:21:18 (PDT)

<http://scienceclub.org/~sciclub/cgi-bin/guestbook.html>

**i am trying to find how to make a model car out of recycled materials but this email doesnt have any info . if you do can you please email me on dowling@ozemail.com.au . thanks alot**

[draggermate](#) <[i\\_dont\\_know](#)>

toowoomba, qld australia - Saturday, September 20, 1997 at 15:31:49 (PDT)

**Hi! I am in 6th grade and am looking for a Scientific Job to do a report on. I was wondering if you could add a section on Science Jobs and Scientists. Thank for your time!**

" Alisha " <[BOOMBA12@webtv](mailto:BOOMBA12@webtv)>

USA - Tuesday, September 16, 1997 at 12:51:52 (PDT)

**This page helped me get ideas for my biology science project. Thanks! I hope you keep this page.**

Stephanie

Southbury, CT USA - Saturday, September 13, 1997 at 07:40:33 (PDT)

**This page helped me get ideas for my biology science project. Thanks! I hope you keep this page.**

Stephanie

Southbury, CT USA - Saturday, September 13, 1997 at 07:38:51 (PDT)

**I think this is a neat mosquito site. Keep up the good work!**

Shanon Spencer <[BayHorse14](mailto:BayHorse14)>

Tucson, AZ USA - Tuesday, September 09, 1997 at 21:42:35 (PDT)

**Like the site.**

Gretchen Henry

Springfield, Mo USA - Friday, September 05, 1997 at 22:53:15 (PDT)

**We just found this site and really enjoyed it. We're planning on using one of the ideas. We will keep you informed of the results.**

Nicole <[mrocket](#)>

USA - Friday, September 05, 1997 at 17:46:59 (PDT)

**We just found this site and really enjoyed it. We're planning on using one of the ideas. We will keep you informed of the results.**

Nicole <[mrocket](#)>

USA - Friday, September 05, 1997 at 17:42:39 (PDT)

**Great resourse. Thanks, I appreciate it.**

M ball <[Mball@Zebra.net](mailto:Mball@Zebra.net)>

USA - Wednesday, September 03, 1997 at 14:52:41 (PDT)

**Great site even with out the pictures!(text only at my library) Check out my site, it is pretty cool!!!**

[Pyro](#) <[dan@modex.com](mailto:dan@modex.com)>

Oh USA - Sunday, August 24, 1997 at 14:34:52 (PDT)

**JUST FOUND THIS SIGHT AND LOVE IT!!! I WANT TO START A SCIENCE CLUB AT MY MIDDLE SCHOOL AND WOULD LOVE FEEDBACK. THANKS!!**

MICHELE BEAVERS <[MESHAWN.BEAVERS@WORLDNET.ATT.NET](mailto:MESHAWN.BEAVERS@WORLDNET.ATT.NET)>

JACKSON, MS USA - Sunday, August 17, 1997 at 13:59:44 (PDT)

**test**

test <[test](#)>

USA - Saturday, July 05, 1997 at 12:50:31 (PDT)

**No comments**

George <[zverushka@hotmail.com](mailto:zverushka@hotmail.com)>

RESTON, VA USA - Monday, May 26, 1997 at 17:37:07 (PDT)

**Student and teachers wishing design and management assistance with science fair projects may contact me. I have experience at the local, regional and international levels and have mentored ISEF Grand Awards and First Places, as well as numerous region al Grand Awards.**

[Steven Branting](#) <[sbranting@lewiston.k12.id.us](mailto:sbranting@lewiston.k12.id.us)>

Lewiston, ID USA - Thursday, May 22, 1997 at 11:20:57 (PDT)

**Great site helped me heaps in school btw we dot "giddy mate" as much as you think here in australia**

Andrew Nye

Brisbane, qld Australia - Monday, April 21, 1997 at 16:54:28 (PDT)

**I was wondering if you have nany web site on consumerisum. I am in the sixth grade**

Tricia slack

milwaukee, wi USA - Monday, April 14, 1997 at 17:56:26 (PDT)

**Thanks \*\* I won first place the science fair with an idea off this site\*\***

Revetta <[avannoy@swbell.net](mailto:avannoy@swbell.net)>

ft worth, tx USA - Thursday, April 10, 1997 at 18:00:13 (PDT)

**cool**

007

USA - Tuesday, April 08, 1997 at 10:42:50 (PDT)

**Great site. It realy helped me get a project for my upcoming science fair**

[Ben Pearson](#) <[bpearson@mail.holton.k12.ks.us](mailto:bpearson@mail.holton.k12.ks.us)>

holton, KS USA - Sunday, April 06, 1997 at 16:58:29 (PDT)

**Great site. So glad I found it. I'll be coming back alot more. Lots of help. It makes science more fun, not a drag**

Mike <[DDolan8702@AOL.com](mailto:DDolan8702@AOL.com)>

Worthington, OH USA - Saturday, April 05, 1997 at 09:04:30 (PST)

**Great site. So glad I found it. I'll be coming back alot more. Lots of help. It makes science more fun, not a drag**

Mike <[DDolan8702@AOL.com](mailto:DDolan8702@AOL.com)>

Worthington, OH USA - Saturday, April 05, 1997 at 09:02:29 (PST)

**THIS WAS REALLY FUN!!!!!!!!!!!!**



It's an astonishing "site"! I'm a teacher at the University of Porto (Portugal) in the are of "Cosmology" and I will be back again and again!! Thank You!

Levi Ant3nio Malho <[cassandra@esoterica.pt](mailto:cassandra@esoterica.pt)>

Porto, Portugal - Saturday, January 18, 1997 at 17:17:33 (PST)

**Keep up the good work! This is a good idea and I hope you encounter more success.**

Pierce Barnard <[pbarnard@ultranet.com](mailto:pbarnard@ultranet.com)>

Westford, MA USA - Wednesday, January 15, 1997 at 19:58:04 (PST)

**This science club is for very big losers!**

[queebles goldfish](#) <[slkf](#)>

rapid city, mb canada - Monday, January 13, 1997 at 09:03:46 (PST)

**This has been a great place for me to get ideas for science projects. Thanks!**

Aaron Marcum <[MMarcum@Infoave.net](mailto:MMarcum@Infoave.net)>

Oneida, TN USA - Saturday, January 04, 1997 at 11:06:59 (PST)

**Inexpensive Lightning Sensors and also Lightning Data Logging Software is available from [www.stormwise.com](http://www.stormwise.com). Thanks!**

[Lightning Sensors and Software](#)

Greenville, TX USA - Tuesday, December 10, 1996 at 19:26:59 (PST)

**None**

Nicholas <[mwinter2@iv.netcom.com](mailto:mwinter2@iv.netcom.com)>

El drodo hills, ca USA - Sunday, December 08, 1996 at 19:28:09 (PST)

**What an awsome page this is. I am glad to have internet access. Especially to here!!!**

Nicole <[cunningham@mail.interconnect.net](mailto:cunningham@mail.interconnect.net)>

Corpus Christi, TX USA - Saturday, December 07, 1996 at 09:27:57 (PST)

**Found a great Science Fair Project for 4th grader (Bird in a Cage). Won Blue Ribbon at School and then again at out local County Fair. Thanks, will check back often.**

Mary Jo Williams <[williams.116@osu.edu](mailto:williams.116@osu.edu)>

Wooster, OH USA - Wednesday, December 04, 1996 at 08:32:05 (PST)

**whazzup!The joint is da' beast!!!**

robin <[www.davisrt.com](http://www.davisrt.com)>

ft.washington, md USA - Monday, December 02, 1996 at 13:52:01 (PST)

**THIS SCIENCE CLUB THING IS GOOD FOR TEACHING KIDS. IF I WAS A TEACHER I WOULD HAVE A CLASSROOM COMPUTER FOR MY CLASSMATES TO USE. THIS SCIENCE CLUB IS COOL FOR YOUNG KIDS,IS'S GREAT!!!!!!!!!!!!!! !!!**

[RANDALL BUCKNER](#) <[DWHIGHAM@ZEBRA.NET](mailto:DWHIGHAM@ZEBRA.NET)>

MOBILE, AAL USA - Saturday, November 23, 1996 at 17:43:50 (PST)

**Jamieson Eagles RULE!!!!!! Thanks to Mr.Toledo**

Tony Kostov <[www.something something .com](http://www.something something .com)>

Chicago, IL USA - Saturday, November 16, 1996 at 14:18:13 (PST)

**Thanks for the help! I was looking for science fair ideas, and I found one after I looked at this site! Keep up the good work, and I think I'll look here more often!**

Leslie

Tulsa, OK USA - Thursday, November 07, 1996 at 17:26:29 (PST)

**THIS IS A NICE WEB SITE.**

Ashley

Spencer, IOWA USA - Thursday, November 07, 1996 at 07:21:28 (PST)

**NONE**

Scott Clark <[sclar@tunbridge.k12.vt.us](mailto:sclar@tunbridge.k12.vt.us)>

Tunbridge, VT USA - Saturday, November 02, 1996 at 15:19:43 (PST)

**This is great! I am part of a "science committee," put together by my kis' PTA to assist teachers get more science in the classroom. More than a few have been afraid of some areas, particularly physical sciences, electricity, etc. Thanks for the goo d stuff. Will coordinate with the PTA hired science specialist to use this with her goodie bag, so we can get up to speed, even if we aren't part of the National Science Foundation Grant yet.-We're in line!**

Amy HAlc <[104343.2045@compuserve.com](mailto:104343.2045@compuserve.com)>

Seattle, wa USA - Wednesday, October 23, 1996 at 21:38:06 (PDT)

**I LIKE IT A LOT.**

joseph m smith <[macsgirl@ix.netcom.com](mailto:macsgirl@ix.netcom.com)>

vestavia hills, aL USA - Sunday, October 20, 1996 at 11:26:25 (PDT)

**This my first time that I have ever been to this site. Could you send some thing about this site. I belong to a science club in school. I go to Long Cane Middle School. Thanks!**

[Trevor Myers](#) <[LMyers5344@aol.com](mailto:LMyers5344@aol.com)>

LaGrange, GA USA - Sunday, October 20, 1996 at 06:58:34 (PDT)

[Back to SCIENCE CLUB](#)

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# SCIENCE MUSEUMS

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## Indexes, etc.

- [Science exhibits discussion](#)(webhead-L)
- [ASTC](#), Assn. of Sci. and Tech. Centers
- [AAM](#), Amer. Assn. of Museums
- [AZA](#) Amer. Zoo & Aquarium Assn.
- [DAFE](#) DarkRide/Funhouse Enthusiasts
  
- [Unusual Museums of the Internet](#)
- [Big museum index](#)
- [Science Learning Network](#)
- [Yahoo science museum index](#)
- [Hands on Science Centers Worldwide](#)
- [Index of Sci. Museums in Israel](#)

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## Museums

- [Edgerton Explorit](#) (Nebraska)
- [Inventors Museum](#)
- [Computer History](#)
- [Chicago Academy of Sciences](#)
- [Computer Museum](#)
- [Exploratorium Museum](#)
- [Franklin Institute](#)
- [Museum of Holography](#)
- [Israel Science Museum](#)
- [Museum of Jurassic Technology](#)
- [Liberty Science Center](#)
- [London Natural History Museum](#)
- [Miami Museum of Science](#)
- [Montshire VT Museum of Science](#)
- [The MIT Museum](#)
- [Museum of Science, "Bahston" MA](#)

- [OMSI, Portland, OR](#)
  - [Ontario Science Center](#)
  - [Pacific Science Center](#) our local Seattle science musuem!
  - [The Science Museum, London](#)
  - [The Science Museum of Minnesota](#)
  - [Smithsonian](#)
  - [S. African Assn. of Sci and Tech. Centers](#)
  - [Tech Museum of Innovation](#)
  - [University of California Museum of Paleontology](#)
  - [Museum of UNNATURAL MYSTERY](#)
  - [The World of Benjamin Franklin](#)
- 

## WEBHEAD-L

### SCIENCE MUSEUMS ONLINE DISCUSSION GROUP

Webhead-L is an online forum for the discussion of interactive science museum exhibits and exhibits issues. This is a public, lightly-moderated "[list](#)". Membership currently hovers around 200. Interested parties are welcome to subscribe (see [instructions](#) below.) Please see the [rules](#) below. There is no charge, but donations towards expenses are accepted (see rules below for suggested donation.)

Admin addr: [webhead-L-request@eskimo.com](mailto:webhead-L-request@eskimo.com)

Mail addr: [webhead-L@eskimo.com](mailto:webhead-L@eskimo.com)

WWW archive: [via ESCRIBE](#)

Moderator: [billb@amasci.com](mailto:billb@amasci.com)

William J. Beaty  
7540 20th Ave NW  
Seattle, WA 98117  
206-789-0775 USA

Subscribers: 209 as of 6/98

### ARCHIVES OF PAST MESSAGES:

- [New threaded archive service!](#)
- [July 2004 - present](#)
- [Jul 03 - Jun 04 \(200K\) \(.zip\)](#)
- [Jul 02 - Jun 03 \(290K\) \(.zip\)](#)
- [Jul 01 - Jun 02 \(270K\) \(.zip\)](#)



- [Jul 99 - Jun 01 \(340K\) \(.zip\)](#)
- [Dec 98 - Jun 99 \(200K\) \(.zip\)](#)
- [Apr 98 - Nov 98 \(200K\) \(.zip\)](#)
- [Feb 98 - Mar 98 \(130K\) \(.zip\)](#)
- [Oct 97 - Feb 98 \(131K\) \(.zip\)](#)
- [Jan 97 - Oct 97 \(300K\) \(.zip\)](#)
- [Dec 96 \(70K\)](#)
- [Oct/Nov 96 \(60K\) \(.zip\)](#)

## Various pages here:

- [Discussion groups for Physics teachers](#)
- [Classroom science exhibits](#), from [Exploratorium](#)
- [Books on physics demos](#)
- [Books on kids' sci. exp.](#)
- [SURPLUS](#) mail-order supply catalogs for sci/electronics hobbyists.

## Other Museum discussions online:

- [MUSEUM-L](#)
- [ISEN-ASTC-L@HOME.EASE.LSOFT.COM](#), also [ISEN-ASTC-L Archive](#)
- [CHILDMUS@LISTSERV.RICE.EDU](#) Childrens' Museum Discussion
- [MUSEUM-ED@MTN.ORG](#) Museum Education
- [MUSWEB-L@FREESIDE.NRM.SE](#) Museum Web Development
- [SIG-ILER@MAIL.SESP.NWU.EDU](#) Informal Learning
- [PCST-L](#) Public Communication of Sci. and Technology

## Exhibitory, contractors, misc.

- [ASTC](#), Assn. of Sci. and Tech. Centers
- [Wico Inc.](#) and [Happ controls](#), ultra heavy-duty pushbuttons, trackballs
- [Museum computer kiosk w/Linux](#)
- [George Rhoads](#) large kinetic sculptures
- [Mongrel Media](#) (UK)
- [Videosonic](#)
- [TEXhibits](#)
- [TechnoFrolics](#) "Dancing Trees", displays, toys
- [New Curiosity Shop](#), cool physics exhibits
- [Strattman Design](#), Luminglas plasma sculptures
- [Resonance Research](#), VDG machines & tesla coils
- [Review of museums by visitors](#)
- [Informal Science Inc.](#)

- [Online discussion: Informal Learning Environments](#)
- [Museum Services Int'l](#)
- [Informal Learning Environments](#) Research Group
- [Visitor Studies Assn.](#)
- [PV Instruments](#): historical electrostatic machines
- [Interactive Sciences Ltd.](#)
- [Ed Tannenbaum](#) video wall
- [Taylor Studios Inc., Museum Exhibit Fabricators](#)
- [ITEC Productions](#)
- [Maltbie](#)
- [Exhibitor Magazine](#)

\*\*\*\*\*  
Webhead-L subscription instructions:

Send a blank email message to [webhead-L-request@eskimo.com](mailto:webhead-L-request@eskimo.com), with the word "subscribe" in the subject line. (No quotes around subscribe.)

You will get an automatic greeting message in response. Once subscribed you will receive a few messages per day from the other members. To converse, simply reply to these messages. Or send your new messages to [webhead-L@eskimo.com](mailto:webhead-L@eskimo.com).

To unsubscribe, send a blank message to [webhead-L-request@eskimo.com](mailto:webhead-L-request@eskimo.com) with the word "unsubscribe" in the subject line.

\*\*\*\*\*  
Webhead-L Rules:

1. WEBHEAD-L is funded by Bill B. (labor, mostly.) If WEBHEAD-L proves very useful or interesting to you, please consider making a \$10US/yr donation to help cover operating expenses. If you cannot afford this, please feel free to participate anyway. If you would like to give more, please do! Direct your check to the moderator, address above.

2. "Flaming" is banned here, and will not be tolerated. If you should

feel the need to insult another subscriber, please do it via private

email, keep it off webhead-L. Also, always be aware of the low-bandwidth nature of email, and if you feel you have been insulted,

verify this fact first before responding in kind. In other words,

don't take insult where none was intended.

3. Small email files please. The limit is set to 40K right now, those

exceeding the limit will be forwarded to Bill Beaty. If you wish to

start extremely off-topic discussions, please feel free to exchange

initial messages on webhead-L, but MOVE THE DISCUSSION TO PRIVATE MAIL

IMMEDIATELY. Some members are on limited service, or have to pay for

received email. Diagrams and graphics can be mailed to me or John

Logajan and posted on our webpages for viewing.

4. PLEASE PLEASE PLEASE: when you reply to a message DON'T include the

ENTIRE message in your reply. Always edit it a bit and delete something. The more you delete, the less traffic overload.

The entire

message should really only be included if: (A) you are replying to a

message that is many days old, or (B) you are doing a point-by-point

reply to many parts of a message. Many webhead users must pay by the

kilobyte for receiving message traffic, and a large amount of redundant

messages are irritating and expensive. So, when including a quoted

message in your reply, ALWAYS DELETE SOMETHING, the more the better.

5. "Junkmail" email advertising will not be tolerated. While not illegal

yet, widecasting of junk-email ads to listservers is against

the

Unwritten Rules of the Internet. Anyone who spams webhead-L  
with

junkmail will be referred to the Internet Vigilante Justice  
team. ;)

Occasional on-topic advertising by long-time webhead-L users is  
acceptable.

- Bill B. [billb@amasci.com](mailto:billb@amasci.com)

<http://amasci.com/museum.html>

Created and maintained by [Bill Beaty](#). Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

[Up to WEIRD SCIENCE](#)

# Freenrg-L Discussion Group

**freenrg-L@eskimo.com**

---

FREENRG-L is for the discussion of experiments and devices which exhibit anomalous energy production (or consumption!), or which violate currently-accepted physics theory. This includes:

- \* "Overunity"
- \* Electrogravity & inertia violation
- \* Scalar Electromagnetism
- \* Psi phenomena and Paranormal
- \* Relativity violation

...and any similar topics which the regular users consider interesting (ask us!) The discussion is limited to experimentalism. Or theory-led experiments. Or theoretical implications of experiments. This is not a forum for all those controversial physics theories being ignored by mainstream science. Try NEOTECH for those. But if your theory leads directly to interesting, testable, real-world phenomena, then by all means discuss the experimental possibilities. If your experiments reveal anomalies not predicted by ANY theory, definitely jump right in and discuss your findings. Also it's very acceptable to publish theoretical work on a web page and announce its presence here.

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## • [HOW TO SUBSCRIBE](#)

- [CURRENT MONTH](#) (escribe www archive)
- [Current month](#) (large text file)

### **2000**

- [current month](#)
- [MSG ARCH](#) Nov 2000 (.zip)
- [MSG ARCH](#) Oct 2000 (.zip)
- [MSG ARCH](#) Sep 2000 (.zip)
- [MSG ARCH](#) Aug 2000 (.zip)
- [MSG ARCH](#) Jul 2000 (.zip)
- [MSG ARCH](#) Jun 2000 (.zip)
- [MSG ARCH](#) May 2000 (.zip)
- [MSG ARCH](#) Apr 2000 (.zip)
- [MSG ARCH](#) Mar 2000 (.zip)
- [MSG ARCH](#) Feb 2000 (.zip)
- [MSG ARCH](#) Jan 2000 (.zip)

## 1999

- [MSG ARCH](#) Dec 1999 (.zip)
- [MSG ARCH](#) Nov 1999 (.zip)
- [MSG ARCH](#) Oct 1999 (.zip)
- [MSG ARCH](#) Sep 1999 (.zip)
- [MSG ARCH](#) Aug 1999 (.zip)
- [MSG ARCH](#) Jul 1999 (.zip)
- [MSG ARCH](#) Jun 1999 (.zip)
- [MSG ARCH](#) May 1999 (.zip)
- [MSG ARCH](#) Apr 1999 (.zip)
- [MSG ARCH](#) Mar 1999 (.zip)
- [MSG ARCH](#) Feb 1999 (.zip)
- [MSG ARCH](#) Jan 1999 (.zip)

## 1998

- [MSG ARCH](#) Dec 1998 (.zip)
- [MSG ARCH](#) Nov 1998 (.zip)
- [MSG ARCH](#) Oct 1998 (.zip)
- [MSG ARCH](#) Sept 1998 (.zip)
- [MSG ARCH](#) Aug 1998 (.zip)
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- [MSG ARCH](#) June 1998 (.zip)
- [MSG ARCH](#) May 1998 (.zip)
- [MSG ARCH](#) Apr 1998 (.zip)
- [MSG ARCH](#) Mar 1998 (.zip)
- [MSG ARCH](#) Feb 1998 (.zip)
- [MSG ARCH](#) Jan 1998 (.zip)

## 1997

- [MSG ARCH](#) Dec 1997 (.zip)
- [MSG ARCH](#) Nov 1997 (.zip)
- [MSG ARCH](#) Oct 1997 (.zip)
- [MSG ARCH](#) September 1997 (.zip)
- [MSG ARCH](#) August 1997 (.zip)
- [MSG ARCH](#) July 1997 (.zip) (missing)
- [MSG ARCH](#) June 1997 (.zip)
- [MSG ARCH](#) May 1997 (.zip)
- [MSG ARCH](#) Apr 1997 (.zip)
- [MSG ARCH](#) Mar 1997 (.zip)

- [MSG ARCH](#) Feb 1997 (.zip)
- [MSG ARCH](#) Jan 1997 (.zip)

## 1996

- [MSG ARCH](#) Dec 1996 (.zip)
- [MSG ARCH](#) Nov 1996 (.zip)
- [MSG ARCH](#) Oct 1996 (.zip)
- [MSG ARCH](#) Sept. 1996 (.zip)
- [MSG ARCH](#) Aug. 1996 (.zip)
- [MSG ARCH](#) Jul. 1996 (.zip)
- [MSG ARCH](#) June. 1996 (.zip)
- [MSG ARCH](#) May. 1996 (.zip)
- [MSG ARCH](#) Apr. 1996 (.zip)
- [MSG ARCH](#) Mar. 1996 (.zip)
- [MSG ARCH](#) Feb. 1996 (.zip)
- [MSG ARCH](#) Jan. 1996 (.zip)
- [USERS LIST](#)

## 1995

- [MESSAGE ARCHIVE](#) for Dec. 1995 (.zip)
- [MESSAGE ARCHIVE](#) for Nov. 1995 (.zip)
- [MESSAGE ARCHIVE](#) for Oct. 1995 (.zip)
- [MESSAGE ARCHIVE](#) for Sept. 1995 (.zip)

## Some Files

- [freenrg-L users](#)
- [Plans & project articles](#)
- [O/U microwave lawnmower messages](#)
- [Hastings Report](#) on the Newman Motor
- [bajak.doc](#) (Word 6.0)
- [Hovertec stuff](#)
- [ELECTROGRAVITY](#) patents, etc. from B. Paddock
- [Electrogravity resources](#), from Robert Stirniman
- [P. Graneau's](#) electromagnetic anomalies, from Robert Stirniman
- [USAF Gravity Doc, 1956](#) from Robert Stirniman
- [USAF Gravity Doc Contents Page, 1990](#) from Robert Stirniman
- [FAQ Free Energy Devices](#)
- [Weird Science](#) page
- [Antigrav](#) page
- [Taoshum-L](#)

This list is for the discussion of experiments and devices which exhibit anomalous energy production (or consumption!), or which violate currently-accepted physics theory. This includes:

- "Overunity"
- Electrogravity & inertia violation
- Scalar Electromagnetism
- Psi phenomena and Paranormal
- Relativity violation
- Unusual scientific instruments

...and any similar topics which the regular users consider interesting (ask us!)

Webpage & archive - - - - -

<http://www.eskimo.com/~bilb/freenrgl/flist.html>

Send subscribe/unsubscribe commands to - - - freenrg-L-request@eskimo.com

Send messages to - - - - - freenrg-L@eskimo.com

List owner - - - - - billb@eskimo.com

Inspired by - - - - - Jerry Decker's

[Keelynet](#) BBS,

214-324-3501 (TX,

usa)

\*\*\*\*\*

AUTOMATIC UN-SUBSCRIBE

If your email account bounces mail for several days continuously, you will be automatically unsubscribed from freenrg-L. This is done to prevent mail loops and excessive bounced-mail error messages. When the Unsubscriber takes you out, it sends a message notifying you that this has happened. Unfortunately, this warning message usually bounces too, so you won't know why Freenrg-L has suddenly gone dead. If you suspect that you've been automatically unsubscribed, simply re-subscribe yourself. Any missing messages can be found at the freenrg-L webpage, in the archive. And complain to your internet provider that their system was bouncing mail back to the sender!



\*\*\*\*\*

## FREENRG-L DIGEST MODE

A "digest" mode now exists for freenrg-L. The digest is actually a separate email list called `freenrg-digest@eskimo.com`. To use it, subscribe to the digest, then when you start receiving digest messages, unsubscribe yourself from the normal list. To converse with list users, send your messages to `freenrg-L@eskimo.com`, and *\*not\** to `freenrg-digest`. The subscribe/unsubscribe commands are the same as for `freenrg-l`, but the address for commands is:

`freenrg-digest-request@eskimo.com`

The digest will be sent out every two days, or when the collected messages pass a size threshold of 40K, whichever comes first.

\*\*\*\*\*

## FREENRG-L RULES ( WARNING! PLEASE READ! )

1. Heavy on experimentalism. Or theory-led experiments. Or theoretical implications of experiments. This is not a forum for all those controversial physics theories being ignored by mainstream science. Try NEOTECH for those. But if your theory leads directly to interesting, testable, real-world phenomena, then by all means discuss the experimental possibilites. If your experiments reveal anomalies not predicted by ANY theory, definitely jump right in and discuss your findings. Also it's very acceptable to publish theoretical work on a web page and announce its presence here.

2. Flamewars are banned. No namecalling or intentional insults on this list. Use private email if you want to be nasty. To prevent spontaneous

flamewars, be ever aware of the psychology of email, since it is easy

to misinterpret a message, hear unintentional insults, and respond in

kind. If you respond in kind to a nonexistent insult, then \*you\* threw

the first punch. So, if you feel offended, first ask the author if a

particular statement is intended to be insulting. You might get an

explanation or apology. If you respond in kind to a genuine insult,

you lower yourself to their level, participate in a flamewar, and

jeopardize your subscription to the list. And if you give a cool-

headed response to an obvious attack, you make your attacker look

like a flamer. If you absolutely must respond to insults, do it via private email, keep it OFF freenrg-L.

3. Ridicule, debunkery and believer/skeptic flamewars are banned. Let's just say that freenrg-list is a big nasty nest of "true believers" (having maybe a bit of rational skepticism,) and let the

skeptics leave in disgust. The tone should be one of legitimate

disagreements and respectful debate.

4. Small email files please. The limit is set to 40K right now, those

exceeding the limit will be bounced back to you. Some members are on limited service, or have to pay for received email.

Larger diagrams and graphics can be mailed directly to interested

parties. Or, contact me and we can place them on the FREENRG-L webpage for viewing.

5. PLEASE PLEASE PLEASE: when you reply to a message DON'T include the

ENTIRE message in your reply. Always edit it and delete as much as

possible. The entire message should only be included if: (A) you are

replying to a message that is several days old, or (B) you are

doing

a point-by-point reply to many parts of a message. Several users must pay by the kilobyte for receiving message traffic, and large amounts of redundant messages slow down eskimo.com and cause the freenrg-L traffic to be delayed. For those of us keeping logs of freenrg-L messages, the redundant messages unnecessarily double or triple the file size! So, when including a quoted message in your reply, ALWAYS DELETE SOMETHING.

6. "Junkmail" email advertizing will not be tolerated. While not illegal, widecasting of junk email ads to listserv sites is against the Unwritten Rules of the Internet. Anyone who spams freenrg-list with off-topic advertizing will be referred to the Internet Vigilante Justice team. ;) Occasional on-topic advertizing by regular freenrg-list users is acceptable. Used equipment ads yes, get rich quick schemes no. Note: WEIRD SCIENCE now has a free for-sale area.

#### GROWTH OF LIST SUBSCRIBERS

# of users	Date
1	09/03/95
28	10/07/95
97	10/22/95
114	11/18/95
133	12/03/95
153	12/27/95
285	11/27/96
310	12/06/97
316	09/13/98
337	01/10/99

Created and maintained by [Bill Beaty](#). Mail me at: [billb@eskimo.com](mailto:billb@eskimo.com).  
If you are using Lynx, type "c" to email.

# Science Teaching Discussion Groups

[SCIENCE EDU. EMAIL FORUMS \(lists\)](#)

[SCIENCE EDU. NEWSGROUPS](#)

[WEB FORUMS](#)

[AMATEUR SCI. DISCUSSIONS PAGE](#)

[ELECTRONICS HOBBY NEWSGROUPS PAGE](#)

[OTHER SIMILAR SITES](#)

---

## SCIENCE EDUCATION DISCUSSIONS ON EMAIL

[WHAT ARE EMAIL "LISTS?"](#)

[PHYS-L](#) Discussion list for physics teachers. Great fun! Here are some examples of message threads: [newton vs bernoulli](#), [balloon demos](#)

NEW 11/98: phys-L now has an [archive](#)

Also a [members directory](#)

To subscribe, send this one-line message to  
listserv@lists.nau.edu

subscribe phys-l [your full name here, no brackets]

[TAP-L](#) Discussion list about physics teaching apparatus. To

subscribe,

send this one-line message to

listserv@listserv.appstate.edu:

subscribe tap-1 [your full name here, no brackets]

There are [archives](#) available, and a [FAQ](#) as well

[PHYSHARE](#)

[ELECTRON](#) Discussion list for electronics teachers. To subscribe, use the www-form to submit your email address

[ARMCHAIR-SCIENCE](#) Forum for "Armchair Scientist" web magazine.

Subscribe

by sending this one-line message to

listserver@areacom.it

subscribe armchair-science

SCHOOLSCIENCE Science teaching news. (moderated) Subscribe by sending

this one-line message to

listserv@vollans.demon.co.uk:

subscribe Schoolscience

EXPLORATORIUM Archive at

<http://www.exo.net/snaktalk/hypermail/index.html>

SNACK-TALK

PHYSHARE Sharing resources for high school physics. Subscribe by sending this one-line message to listserv@psuvm.psu.edu  
sub PHYSHARE [your full name here, no brackets]

NTWFORUM New Technologies in Physics Education. Subscribe by sending

this one-line message to listserv@listserv.iupui.edu

sub NTWFORUM [your full name here, no brackets]

PHYSLRNR PHYSICS LEARNING RESEARCH LIST. Subscribe by sending this

one-line message to listserv@idbsu.idbsu.edu:

sub PHYSLRNR [your full name here, no brackets]

VORTCOR-L Discussion forum for members of the MAD SCI. NETWORK, experts

who answer science questions. See the [website](#) for more info.

WEBHEAD-L Discussion forum for interactive science exhibits (includes both

phys teachers and sci museum staff. See the [website](#) for more info.

info-holo The holograpy list for the [SPIE](#). To subscribe, send this

one-line message to [info-request@spie.org](mailto:info-request@spie.org):  
subscribe info-holo [your full name here, wo/brackets]

MINI-AIR Annals of Improbable Research distribution list. (They run

the "Ig-nobel" prize awards) To subscribe, send this one-line

message to [listproc@air.harvard.edu](mailto:listproc@air.harvard.edu):  
subscribe mini-air [your full name here, wo/brackets]

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To keyword-search the entire (huge) list of bitnet listserves, send this

one-line message to [listserv@listserv.net](mailto:listserv@listserv.net):

lists global /physics

You will get an email message in response which lists all the listserves

containing "physics" in their descriptions. Of course you can also use

some other keyword in place of "physics"

And be aware that you usually can get full instructions from any listserv

by sending the word "help" (no quotes) or "info" to any of the above

list addresses.

# SCIENCE EDUCATION FORUMS ON THE WEB

[SAS FORUM](#) Society for Amateur Science WebX BBS forum,  
a huge site to browse.

[PHYSICS FORUMS](#) On line forums at PHYSLINK

[PHYSICS FORUMS.COM](#)

[DR FRED](#) Dr. Fred's Science Project Forum for Kids

[SCIENCEHELP](#) forum, phys/chem/bio w/NASA consultants,  
(a Yahoo ["group"](#))

[SCIENCE DEMONSTRATORS](#)  
(a Yahoo ["club"](#))

[WONDERMAGNET](#) hobbyist magnetics

[HVA Board](#) High Voltage Forum run by the [HV Assoc.](#)

[HV Community](#) High Voltage Forum, hobbyist

[KIDS BOOKS](#) Children's Science Books: WWW discussion area  
Run by "Dr. Fred", kids' science book author

[STRAIGHT DOPE](#) Message boards at "The Straight Dope" newspaper  
column  
for questions/answers on all sorts of stuff, including  
science.

[SCIENCE TALK](#) For kids, parents, teachers, provided by  
NPR Science Friday KidsConnection.

[SCIENCE CONNECTION](#), a meeting place for  
science teachers. (Yahoo.com 'club')

[SCI. MENTORS](#) Q and A Discussion area for NPR "SOUNDS LIKE  
SCIENCE" radio show.



[AAAS](#) Science teaching forum on the AAAS Netlinks site

[NETLINKS](#)

BBS

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## Usenet Newsgroups: SCIENCE EDU

- [Browse All Newsgroups](#)
  - [Directory of Sci. Newsgroups](#) (at dejanews)
  - [Directory of K-12 Newsgroups](#) (at dejanews)
  - [Reviews](#) of newsgroups
  - [Newsgroup FAQs](#) (freq. asked questions)
  - [What are "Newsgroups?"](#) (from Hotwired [WEB 101](#))
  - [What are "Newsgroups?"](#) (from Dejanews)
    - [K12.ED.SCIENCE](#)
    - [SCHOOL.SUBJECTS.SCIENCE](#)
    - [MISC.EDUCATION.SCIENCE](#)
    - [SCI.EDU](#)
    - [MISC.EDUCATION.HOME-SCHOOL.MISC](#)
    - [ALT.TV.BEAKMANS-WORLD](#)
    - [SCI.MISC](#)
    - [ALT.SCI.AMATEUR](#)
    - [SCI.PHYSICS](#)
    - [ALT.ENERGY.HIGH-VOLTAGE](#)
    - [SCIELECTRONICS.BASICS](#)
    - [SCI.ANSWERS](#)
- 

## Other sites w/info on sci. lists:

- [DMOZ: physics forums](#)
- [DMOZ: physics lists](#)
- [AAPT Online Communities and Listservs](#)
- [Yahoo groups: EDUCATION](#)
- [Yahoo groups: SCIENCE](#)
- [Virt Library, physics edu. listservs](#)

- [Directory of Scholarly E-Lists](#)
- [EDWEB list of email lists](#)
- [Pitsco Sci. Listserve List](#)
- [Edu. Listservers](#)
- [WedNet Lists](#)

**Non-sci lists:**

- [PAML, Big index of listserves](#)
- [LSOFT catalog of Listserv lists](#)
- [Topica free listservers](#)
- [Escribe free list-archive service](#)
- [Onelist free listservers](#)
- [Egroups free listservers](#)
- [ListBot free listservers \(LinkExchange\)](#)
- [Insidetheweb free WWW Bboards](#)
- [Findmail free list-archive service](#)
- [TILE.NET, A website for listservs](#)
- [Liszt Directory of Email Discussion Groups](#)
- [List of Lists](#)
- [E-Mail Zines](#)

Created and maintained by [Bill Beaty](#). Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

# Amateur Science Discussion Groups

## [AMATEUR SCIENCE EMAIL LISTS](#)

## [WHAT ARE EMAIL "LISTS?"](#)

## [AMATEUR SCIENCE NEWSGROUPS](#)

## [SCIENCE CHAT](#)

## [SCI. TEACHING DISCUSSIONS PAGE](#)

## [ELECTRONICS HOBBYIST PAGE](#)

## [OTHER SIMILAR SITES](#)

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## SCIENCE DISCUSSIONS VIA EMAIL

### [SCICLUB-LIST](#)

New group (6/99) for discussions of amateur science, amateur issues, home-build lab equipment, etc.

### [SAS FORUM](#) Society for Amateur

Science forum is now a WWW forum, and it is no longer available via email. This is a large discussion area filled with all sorts of people, I highly recommend it!

### [Sci-tech](#)

Science-Technology discussion list (formerly tesla@ssz.com)

An amateur/pro science experimentation forum run by Jim Choate.

To subscribe, send a message to majordomo@ssz.com with

this

command in the body of the message:  
subscribe sci-tech

[PHYS-L](#) Discussion list

for physics teachers. Great fun! Here are some  
examples of message threads: [newton vs bernoulli](#), [balloon](#)  
[demos](#)

NEW 11/98: phys-L now has an [archive](#)

Also a [members](#)

[directory](#)

To subscribe, send this one-line message to  
listserv@lists.nau.edu

subscribe phys-l [your full name here, no brackets]

[TAP-L](#) Discussion list

about physics teaching apparatus. To subscribe,  
send this one-line message to

listserv@listserv.appstate.edu:

subscribe tap-l [your full name here, no brackets]

There are [archives](#) available, and a [FAQ](#) as

well

[HALLOWEEN-L](#)

Discussion of high-tech scary effects & decorating

[SCIENCE](#)

[TALK](#) For kids, parents, teachers, provided by

NPR Science Friday KidsConnection.

[ARMCHAIR-SCIENCE](#)

Forum for "Armchair Scientist" web magazine. Subscribe  
by sending this one-line message to  
listserver@areacom.it:

subscribe armchair-science

MINI-AIR Annals of Improbable Research distribution list. (They  
run

the "Ig-nobel" prize awards) To subscribe, send this

## one-line

```
message to listproc@air.harvard.edu:  
subscribe mini-air [your full name here, wo/brackets]
```

---

To keyword-search the entire (huge) list of bitnet listserves,  
send this

```
one-line message to listserv@listserv.net:  
lists global /physics
```

You will get an email message in response which lists all the  
listserves  
containing "physics" in their descriptions. Of course you can  
also use  
some other keyword in place of "physics"

And be aware that you usually can get full instructions from any  
listserv  
by sending the word "help" (no quotes) or "info" to any of the  
above  
list addresses.

---

## Science Chat & Misc.

- [WWWBBS](#) at WorldofScience
- 

## WEB FORUMS

[SAS FORUM](#) Society for Amateur  
Science forum. This is a large discussion  
area filled with all sorts of people, I highly  
recommend it!

### [WONDERMAGNET](#)

Hobbyist magnetics

### [STRAIGHT](#)

[DOPE](#) Message boards at "The Straight Dope" newspaper column with questions/answers on all sorts of stuff, including science.

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## Usenet Newsgroups: SCIENCE

- [Electronics Hobbyist: Forums list](#)
- [Directory of Sci. Newsgroups](#) (at dejanews)
- [Reviews](#) of newsgroups
- [Newsgroup FAQs](#) (freq. asked questions)
- [What are "Newsgroups?"](#) (from Hotwired [WEB 101](#))
- [What are "Newsgroups?"](#) (from Dejanews)
  
- [ALT.SCI.AMATEUR](#)
- [SCI.PHYSICS](#)
- [SCI.PHYSICS.ELECTROMAG](#)
- [ALT.ENERGY.HIGH-VOLTAGE](#)
- [SCI.ASTRO.AMATEUR](#)
- [SCI.OPTICS](#)
- [REC.CRAFTS.METALWORKING](#)
- [SCI.PHYSICS.RELATIVITY](#)
- [ALT.INVENTORS](#)
- [REC.RADIO.AMATEUR.HOMEBREW](#)
- [ALT.SOLAR.PHOTOVOLTAIC](#)
- [ALT.SOLAR.THERMAL](#)
- [ALT.ENERGY.HOMEPOWER](#)
- [ALT.AMATEUR-COMP](#)
- [SCI.ELECTRONICS.BASICS](#)
- [SCI.ELECTRONICS.DESIGN](#)
- [SCI.ELECTRONICS.MISC](#)
- [SCI.RESEARCH](#)
- [SCI.ANSWERS](#)

## Other sites w/info on sci. lists:

- [Lists at Experimenter](#)

- [SCIED: Physics Teaching Lists](#)
- [Onelist: SCIENCE](#)
- [Directory of Scholarly E-Lists](#)
- [EDWEB list of email lists](#)
- [Pitsco Sci. Listserve List](#)

## List Directories:

- [PAML, Big index of listserves](#)
- [LSOFT catalog of Listserv lists](#)
- [Topica free listservers](#)
- [Escribe free list-archive service](#)
- [Onelist free listservers](#)
- [Egroups free listservers](#)
- [ListBot free listservers \(LinkExchange\)](#)
- [Insidetheweb free WWW Bboards](#)
- [Findmail free list-archive service](#)
- [TILE.NET, A website for listservs](#)
- [Liszt Directory of Email Discussion Groups](#)
- [List of Lists](#)
- [E-Mail Zines](#)

Created and maintained by [Bill Beaty](#). Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

[GUESTBOOK](#)   [SCIENCE HOBBYIST](#)   [GOOD STUFF](#)   [NEW STUFF](#)   [SEARCH](#)

# AMATEUR SCIENCE

SITE OF THE MONTH:

[Comments](#), questions, add URLs?

[Lateral Science](#), humor articles and amateur science experiments from 1850

Past Picks: [AMASOTM](#)

## Shortcut links:

- [Amateur Science Links](#)
- [Kids' Science Projects Here](#)
- [Kids' Science Projects Elsewhere](#)
- [Ask Science Questions!](#)
- [Cool Science Sites](#)
  
- [SCIENCE HOBBYIST forum](#)
- [Amateur Science Links](#)
- [Society for Amateur Scientists](#)

## [THE AMATEUR SCIENTIST](#)

Now on  
CDROM, all the  
Scientific  
American  
magazine  
columns.  
~1000 projects by



C.L. Stong,  
Jearle Walker, and Shawn  
Carlson.  
pp2100, \$24.99



- [Screw with your head](#)
- [Interesting Toys](#)
- [Am. Sci. Discussion Groups](#)
- [Other Links](#)
- [Useful Data](#)
- [Sci. Am. Links:](#) **THE AMATEUR SCIENTIST**
- [Magazines and Newsletters](#)
- [Science Fair Stuff](#)
- [Am. Sci. Books](#)
- [Science Ed. Forums](#)
- [Science education stores](#)
- [Science & surplus suppliers](#)
- [Static Electricity](#) project page
- [Electronic Hobbyist Page](#)
- [Patents](#)
- [BILL B's HOBBY PROJECTS](#)
- [Other BILL B. Articles](#)

Highly Recommended:



[AMERICAN SCIENCE  
& SURPLUS](#)



## Other pages here:

- [Weird Science Page](#)
- [Science Education links](#)
- [Physics Demo Page](#)
- [Tesla Coils Page](#)

Advertisement:



**THE SCIENCE CLUB**  
A NON-PROFIT EDUCATIONAL CORPORATION  
*Science, Inquiry, and Laughter*  
Assemblies for children   Workshops for parents   Courses for teachers

The [Ultimate Site for Kids' Science](#) (.txt)

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# Amateur Science Misc.

- [Amateur Sites](#), big link collection
- [SAS](#), links to Society for Amateur Science
- [Magazines](#)
- [Science suppliers](#)
- [Other](#) interesting links
- [Amateur Science](#) article from [The Scientist](#), 6/96
- [Would YOU be a 'Carl Sagan?](#)
- [Interesting projects list](#)
- [Newsgroup: alt.sci.amateur](#)
- [MORE](#) (scroll down)
- [Astronomy](#)
- [Biology](#)
- [Chemistry](#)
- [Geology](#)
- [Nuclear](#)
- [Robotics](#)
- [Rocketry/Space](#)
- [VLF Radio](#)

## Amateur Science Organizations

- [Society for Amateur Science](#)
  - [SAS Discussion Group](#)  
(recommended!)
  - [SAS local chapters](#)
  - [Denver Mad Scientists Club](#)
  - [Altair \(Atlanta\)](#)
  - [Memphis HV group](#)
  - [GeekGroup](#) Michigan
  - [Alchemy](#), chem in UK
  - [Amateur Laser Constructors](#)
  - [Mad Scientist](#) science forum
  - [White coat labs](#)
  - [Cafe Scientifique](#) (UK)
  - [Cockeyed.com](#)
  - [Powerlabs](#)
  - [Austin Robot Group](#)
  - [Soc. de Científicos Aficionados de Venezuela](#)
  - ["OMNISCIENCE"](#) hobby group
  - [Santa Rosa](#) Soc. of Model & Exp. Engineers
  - [Keelynet Roundtable](#) (Dallas, TX)
  - [Transylvania Polygnostic University](#)
- [scroll down](#)

- [Seattle Weird Science](#)
  - [Seattle Science On Tap](#)
  - [Dangerous Laboratories](#)
  - ["Steamboat Ed's" group](#) , and [meetings](#)
  - [Retired Scientists Club](#) Olympic Peninsula
- 

"In the matter of physics the first lessons should contain nothing but what is experimental and interesting to see. A pretty experiment is in itself often more valuable than twenty formulae extracted from our minds." - Albert Einstein

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## Amateur Science WWW Sites

updated April 2005

- [Yahoo Index](#) for Amateur Sci.
- [DMOZ index](#) for science experiments
- [Add an Url here](#)
  
- [Gizmologist's Lair](#)
- [Fun with Ion chambers](#) (geiger-counter-like)
- [Tinkerhack](#) vacuum pump
- [Teralabs](#): garage physics, x-ray, vacuum, etc.
- [C. Johnson inventions](#) and thoughts
- [Scan in your 3D objects](#)
- [Dave Williamson](#) projects (amazing!!)
- Teach yourself [Lab Glassblowing](#)
- [Dave Boll](#), fun with sci, math, amateur astron.

- J. Walker's [Fourmilab](#) site
- [STM \(scanning tunneling microscope\) construction project](#) and [others](#)
- [J Alexander STM](#) using \$2 piezo beeper!
- [Jim Rice Homebrew Scanning Tunneling Microscope STM Page](#), also [here](#)
- [Mike's Electric Stuff](#) , don't miss [Marinov's Motor](#)
- Proton magnetometer hobby projects (NMR/MRI)
  - ["New" proton magnetometer plans](#) (UK magazine 1968)
  - [Proton precession magnetometer](#)
  - [Teachspin](#), flourine precession samples
  - [Phil's Magnetometer and Prospecting page](#)
  - [Proton Magnetometer Forum](#)
  - [PPM files](#)
  - [Home built proton mag](#)
  - [Non-PPM magnetometer kits](#)
  - [Hall-effect chips](#)
- [Bizarre Stuff You Can Make in Your Kitchen](#)
- [Jochen's Hi-volt, x-ray, nuke](#)
- [The Last Amateur Scientist](#)
- [Home-built turbojet](#)
- [Electronics & Spelunking](#)
- [Plans, Ranque-Hilsch vortex tube cooler](#)
- [UV pulse laser](#), more info [here](#)
- [Amateur pulse jets](#), also a [forum](#)
- [Steam & Stirling engines](#)
- [Microscope Scienceart](#)
- [Pulse Jets](#)
- [Laser Freak](#) (english/deutch)
- [Andy's X inventions](#)
- [Chandra Bose](#), microwaves in 1897
- [Sonoluminescence](#) (non amateur)
- [Sam Barros' "Powerlabs"](#)

- [Scrapheap Challenge](#)
- [Seismometer via diamagnetic levitation](#)
- [Diamagnetic levitator](#)
- [Experimental Musical Instruments](#)
- [NCEMO, earth magnetism observatory](#)
- [L. Berg Homebuilt Turbine Engines](#)
- [Farnsworth/Hirsch Fusor](#), desktop fusion?!!
- [Chris S. Radiation Detectors](#)
- [Bob D's AmSciTech web-zine](#)
- [Mark K's edu. projects: how things work](#)
- [Fred's World o' Sci](#), homebuilt linac & cyclotron
- [Ed Haas' page](#), steam & machines
- [Don Lancaster's Guru's Lair](#)
- [Fun Science Gallery](#)
- [Experimenter's Corner](#), K3PGP's Ham & Science stuff
- [P. Carroll's Life Sci.](#)
- [R. Fergus](#), storm/tornado EM
- [J. Hannon](#), cosmic ray det.
- [Homebuilt Lasers](#)
- [Jim Lux' page](#), H.V. & lightning
- [CyberWorkshop](#) (Japan)
- [Ultraviolet Lamps](#)
- CellAutomata, Physics, Bio, Math [Simulations](#) , and free [starLOGO](#) language (Macintosh)
- [Pulse Jets](#)
- [The Belljar](#) vacuum experimenters journal
- [Andrew's Science Page](#)
- [Amateurs setting kite altitude records](#)
- [J. Zikovski amsci page](#)
- [X-ray project](#)
- [Public Siesmic Net](#)





- [Sci. Adventure](#)
- [Brian Rich](#) Santa Barbara Science
- [NSRC](#), National Student Research Center, see their [student articles](#)
- [Kite Aerial Photography](#)
- [The X Prize](#) race to orbit
- [Leny R's](#) SPARK, BANG, BUZZ
- [VLF Radio Home Page](#)
- [Micscape](#) Microscopy page
- [Mac Science](#) and Ham S/W
- [W. U. Young Scientist Program](#)
- [Electronics Hobbyist](#)
- [Tesla Page](#), coil project info
- [Weird research, anomalous physics](#)



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*"Direct experience is best. The man who carries a cat home by the tail gains information that will be useful all his life and will not grow dim in his memory."* - Mark Twain

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## Society for Amateur Scientists (SAS)

-  Society for Amateur Science Website
-  SAS Weekly Newsletters
-  SCIENCE PROJECTS: Articles from latest THE AMATEUR SCIENTIST
-  SAS Online Forum

-  SAS Swap Meet
-  SAS Physics Demos page

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## Astronomy

- [DMOZ:science:astronomy:amateur](#)
- [TASS amateur sky survey](#)
- [Weird Telescopes](#)
- [Amateur Telescope Maker's Workshop](#)
- [Star Hustler](#)
- [Radio Astronomy](#)
- [The Meteoritical Society](#)
- [The Meteorite Exchange](#)
- [BCC Meteorites](#)
- [Natural lasers](#)
- [Ed Neuzil](#) Astronomy/microscopy
- [Amateur Telescope Makers](#) Journal
- [The Society of Amateur Radio Astronomers](#)
- [Radio-Sky](#) page
- [Dan's Astronomy Home Page](#)
- [Todd Gross' Weather/Astronomy Page](#)
- [Amateur Groups](#)

## Biology

- [Drake and Zeke collection](#)
- [Solar cell kit uses photosynthesis](#)
- [Views From Science](#) (microscope activities)
- [J. Ekstrom's page](#)
- [VRML Biology](#) (vrmf plugin required)



- [P. Carroll's Life Sci.](#)
- [Plants in Motion](#) (IR Photography)
- [Biotech Hobbyist](#) online zine
- [Biological Simulations](#) , and free [starLOGO](#) language (Macintosh)
- [Experimental Gardening](#)
- [Build this Leeuwenhoek microscope](#)
- [Micscape's](#) bio hotlinks
- [Amateur Bioscience](#)
- [Dennis Kunkel's](#) SEM photos

## Chemistry

- B. Merriman's [Chemical Suppliers list](#)
- [About.com: chem for kids](#)
- [Chemistry hobby articles](#) from [CR Scientific](#)
- [Silly molecule names](#)
- [Chemguide](#)
- [Chem take-home challenges](#)
- Teach yourself [Lab Glassblowing](#)
- [sci.chem Chemistry FAQ](#) , [demos](#)
- [Home Experiments](#) from 1888
- [Leeds: Delights of Chemistry](#) (demos)
- [Sci. is Fun, Chemistry Demos](#)
- [DMOZ: chemistry demos](#)
- [DMOZ: chemistry links](#)
- [Ask a Chemist](#) archive
- [Chemweb](#) chem club site
- [1940's Hobbyist Demos](#)(search down to "kitchen chemicals") (warning, dangerous, no safety instructions)
- [Wondernet: chem activities](#)
- [chem demos](#)

- Supplier: [Fotochem](#)
- Supplier: [A&K](#) (bulk chems)
- Supplier: [Springfield Sci. Supl.](#)

## Geology

- [The Dry Dredgers](#)
- [Amateur Paleontology Certification](#)
- [Caltech/USGS Seismocam](#) (needs Java)

## Nuclear

- [Scintillator plastic](#)
- [C. Thompson](#) Scint schematics online
- [Jochen's Hi-volt, x-ray, nuke](#)
- [X-ray project](#)
- [J. Hannon](#), cosmic ray det.
- [GM counter](#) (teralab.org)
- [Centronic UK](#) Geiger tubes

## Robotics

- [The Robot Directory](#)
- [Snake Robots](#)
- [LoganBot](#)
- [Scrapheap Challenge](#)
- [Robot Projects \(OOpic\)](#)
- [Robot Books](#)
- [Servo City](#)
- [Robotics Resources](#) at Umass
- [Robofest 7](#) (Don't miss it!)
- [Amateur robotics at U. MN](#)

- [Amateur Robotics Resources](#)
- [Hobbyist Robots Webpages](#)
- [Mondo-tronics](#) Robot Store

## Rocketry/Space

- [Hobby Space](#) (large & excellent)
- [SETI at home](#): participate in the search
- [Colonize the Galaxy!](#)
- [Visual Satellite Observers](#)
- [exoSCIENCE](#) online magazine
- [Students for the Expl. and Dev. of Space](#)
- [Space Frontier Foundation](#)
- [BlueSky Rocket Science](#)
- [Tinkertech Rotons](#)
- [The Planetary Society](#)
- [Rocketry.org](#)
- [Rocketeers](#) at Cal Poly

## VLF Radio

- [McGreevy's VLFRADIO](#)
- [NASA INSPIRE](#)
- [BBB4 Rcvr](#) (mirrored page)
- [ELFRAD Rcvr](#)

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# Magazines and Newsletters

- [Bottom Quark](#) news site
- [This Week In Science](#)

- [NPR Science Friday](#)
- [Sci Magazine Index](#) at naturalScience
- [SciTech Daily Review](#) web-zine
- [naturalSCIENCE](#) online magazine
- [exoSCIENCE](#) online magazine
- [Biotech Hobbyist](#)
- [Yes Science Mag](#) for kids
- [Armchair Scientist](#)
- Internet Science Journal [BOUGHT BY PORNO SITE!]
- [Amateur Ast. and Earth Sci Mag.](#)
- [the BELL JAR](#) web page
- [the BELL JAR](#) files here
  - [Belljar #1](#)
  - [Belljar #2](#)
  - [Belljar #3](#)
  - [Belljar #4](#)6/95

## SCIENCE MAGAZINES

- [Discover Magazine](#)
- [Quantum](#) (NSTA)
- [Science](#) (AAAS)
- [Science News](#)
- [Scientific American](#)
- [Yahoo: Science Magazines](#)

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# Other websites for Science Fair stuff

Moved to [Science Club Sci Fair Idea Archive](#)

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# KIDS' SCIENCE PROJECTS by Bill B.

Moved to [Science Club Kid's Projects](#)

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Moved to [Science Club, Other Kid's Projects Sites](#)

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## Ask Science Questions

Moved to [Science Club, Ask Science Questions](#)

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## BILL B's HOBBY PROJECTS

- [Ultra-simple Electric Generator](#)
  - [Dangerous experiments](#) with a big capacitor bank (New 2/95)
  - [WING SHOCK WAVE PHOTO \(30K\)](#)
  - [ARRAY ELECTROMETER](#) Build this and SEE electrostatic fields!
  - [VISIBLE CURRENT](#) Makes electricity visible in wires.
  - [NON-CRYO MEISSNER MAGLEV CRADLE](#) levitates a bar magnet from below.
  - [SCIENCE EXHIBIT IDEAS](#)
  - [ELECTROSTATIC MOTOR](#) made from plastic pop bottles.
  - [NEODYMIUM](#) magnet demonstration ideas
  - [3D E-field](#) viewing bottle
  - [Jacob's Ladders](#)
  - [Science Projects for Kids](#)
  - [more stuff...](#)
  - [ALL the articles](#) (website history)
-

# OTHER ARTICLES BY BILL B.

- [VandeGraaff machines](#)
  - [Sparks and Lightning](#)
  - [Which way does "Electricity" really flow?](#)
  - [What Is Electricity?](#)
  - [Electricity Misconceptions](#)
  - [Misconceptions in K-6 Textbooks](#)
  - [How do Capacitors REALLY work](#)
  - [Speed of Electricity](#)
  - [Why three prongs?](#)
  - [BALL LIGHTNING](#)
  - [Electrostatics projects](#)
  - [All my "electricity" articles](#)
- 

## Science Edu. Suppliers/stores

- [Edmund Scientific](#)
- [Nat. Academy Press](#), online books in GIF
- [Arbor Scientific](#)'s catalog of cool science demos, toys, etc.
  - Mechanical:
  - [Stock Drive Products](#)
  - [Small Parts Inc.](#)
- [Discover This](#) science kits
- [Explore 4 fun, science toys](#)
- [Robodyssey](#), six-leg walkers, servos, CPUs, etc.
- [Hardin](#), Amateur Telescope Making
- [Fuel Cell](#) classroom demonstration
- [INSIGHTS Science Videos](#), also [Microscopes](#)

- [Science City](#) kits and toys
- [Greatscopes](#) Microscopes & [Activities](#)
- [Sci. and Tech for Amateurs](#)
- [Indigo Instruments](#) science supplies
- [Cambridge Physics Outlet](#)
- [OMSI](#) Science Museum Store
- [Project Star](#) (telescope kits, etc.)
- [VPW: Free Videos, etc.](#), K-12 teachers only
- [Radio Astronomy](#)
- ["The Science Fair"](#) science edu. equipment & supplies
- [Inexpensive optics kit](#)
- [Excellent student microscope](#) (Bill B. recommended)
- [See magnetic patterns](#) on disks, videotape
- [Amateur Sci Videos \(French\)](#)
- [Pitsco](#) science edu. catalog (cool devices!)
- [Fisher Scientific Catalog](#)
- [Hands-on](#) science edu. products
- [Sycamore Tree catalog, science](#)
- [Lynxmotion](#) Robot Kit
- [NADA](#) Scientific, cool edu. devices!
- [PASCO](#) science ed. supplies
- [Rockville Creative Learning](#)
- [Carolina Bio Supply](#), huge edu. equipment supplier
- [Mondo-tronics](#) Robot Store
- [Sargent-Welch](#) catalog site
- [SCITECH](#) science store
- [Science Television](#)

## Surplus & parts suppliers

- [NEAT JUNK](#) & Surplus mail-order catalogs for sci/electronics hobbyists.

- [Wondermagnet](#) surplus supermagnets
- [eBay:Collectibles:science](#)
- B. Merriman's [Chemical Suppliers list](#)
- [American Science & Surplus](#) (DON'T MISS THIS ONE!)
- [MWK](#) Surplus Lasers & optics
- [Fil's giant supplier list](#) from SCI.ELECTRONICS FAQ
- [Directed Energy](#), pulse generators, etc.
- [Hyper-sensitive magnetometer chips](#), Speake & co.
- [LABX](#) used sci. equipment trading
- [Resource Guide](#) from [Exploratorium Snackbook](#)
- [Electronix Express](#)
- [PhysicsNet](#) physics equipment archive & search
- [Lasermotion Catalog](#)
- [W.J. Ford Enterprises](#) Surplus
- [MD SCIENCE](#)
- [Scientific Equipment Liquidators](#)
- [Scientific Equip. Exchange.](#)
- [Surplus equpt., vac, lasers](#)
- [Electronics equipment swap site](#)
- [Suppliers](#) list from The BellJar

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## Other WWW sites of Amateur interest

- [Materials A to Z](#) (look up chemicals)
- [19th century SCIENTIFIC AMERICAN](#)
- [Twenty Science Attitudes](#)
- [Halloween Hobbyists](#)
- [Extreme Hobbies](#)
- [Vacuum Technology](#) page



- [Hilsch Vortex Tube](#)
  - [MIT Online Hack Archive](#)
  - [MIT 'borgs](#)
  - [EM pulse Can Crusher](#) at RPI Plasma Dyn. Lab
  - [New Scientist magazine's PLANET SCIENCE](#) (excellent!)
  - [Geek Chic](#)
  - [INTEC sound camera](#)
  - [Science & Math Edu. Resources](#) page. RECOMMENDED! (in Bellevue, WA)
  - [The Scientist Newsletter](#)
  - [Physics market place](#)
  - [Journal of Scientific Exploration](#)
  - [SRL](#) dangerous robot performances
  - [National Science Foundation](#) (look at peoples grants!)
  - [Vacuum systems](#)
  - [X-Ray WWW Server](#)
  - [KSU. PIRA Physics demo stuff](#)
  - [NCSU Physics Demos](#)
  - [MIT's Annals of Improbable Research](#)
  - [Monty Python UNIVERSE SONG](#)
  - [Bill B's Science Ed Resources](#)
  - [Science Museum](#) links
  - [Physics around the world](#)
  - Interactive internet [MACHINES](#), live cameras, etc.
  - [Gary Hawkins'](#) web page
- 

## Some useful data

Other WWW sites of Amateur interest

- [Metal alloy recipes \(wood's metal, etc.\)](#)
  - [Capacitor dielectric constants](#)
  -
- 

## Patents

- [espacenet](#) (US/euro patent archive)
  - [Patent SEARCH](#)w/images of documents
  - [US Patent/Trademark Office](#) searcher
  - [Patent FAQs and info](#) at Oppedahl & Larson
  - [Absurd Patents](#)
  - [Inventor's Handbook](#)
  - [The Case Against Patents](#), Don Lancaster
  - [Wacky Patent of the Month](#)
  - [Micropat](#), order patents thru internet
  - [Patent Search](#), a real one
  - [USPTO](#), Patent and Trademark office
  - [Shadow Patent Office, real search, \\$\\$\\$](#)
  - [Yahoo: Patents](#)
- 

## Other Sections Here

- [AMATEUR SCIENCE](#)
- [SCIENCE DEMOS](#) ARTICLES, EXPERIMENTS, EXHIBITS
- [WEIRD SCIENCE](#) - MRA, ENERGY, GRAVITY, "CRAZY" INVENTIONS
- [SCIENCE EDUCATION](#) RESOURCE WWW LINKS

- [SCIENCE MUSEUMS](#)
- [HOME SCHOOLING RESOURCES](#)
- [TESLA COILS](#)
- [BALL LIGHTNING](#)
- [CLOSEMINDED SCIENCE](#)

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<http://amasci.com/amasci.html>

Updated: Mar 31 2005

Created and maintained by [Bill Beaty](#). Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

[Up to SCI.](#)  
[HOBBYIST](#) | [GUESTBOOK](#) | [GOOD](#) [NEW](#)  
[STUFF](#) | [STUFF](#) | [SEARCH](#)

# \*\*\* INSANELY GREAT \*\*\*

## Science Websites

Now sponsored by [The Science Club](#)



- [COOL SCIENCE](#) (Link Collections Elsewhere)
- [MY COOL SCIENCE SITE LIST](#)
- [SCIENCE PROJECTS FOR KIDS](#)
- [MY OWN COOLER STUFF](#)

Try some tricks and demos with [Rare Earth Magnet Spheres](#)

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NOTICE: now on CDROM, [The Amateur Scientist](#), all 810 of the columns from Scientific American magazine (C.L.

Stong, Jearle Walker, Shawn Carlson.) Approx 1000  
amateur projects, pp2100 \$24.99. See a [Sample](#).

# Explore these Massive, time-sucking indexes of CoolSci:

## [This Week In Science](#)

Audio archives of the weekly radio show, from U. of Cal. Davis

## [SLASHDOT: Science](#)

One of the best science-blogs. Updated by thousands of compulsive science geeks!

## [Griffith Observatory: best astro sites](#)

Archive of their weekly "Star Awards"

## [Hubble Space Telescope's Greatest Hits](#)

Lots and lots of pictures, great for desktop wallpaper. Also try [NASA picture of the day](#) and [Astronomy picture of the day](#)

## [Cool Robot of the Week](#)

A large collection maintained by [NASA telerobotics](#). With archives going back to 1996.

## [The Memepool: Science Archive](#)

The [Memepool](#) is an excellent, eclectic "cool sites of the week" page with all links to all sorts of somewhat warped websites. Browse their collection [by subject](#).

## [Exploratorium's "Cool Sites" archive](#)

The Exploratorium's Learning Studio maintains a monthly

"Top Ten" page for science sites. They've ferreted out the cream of webscience cool sites. Don't miss their past months' archive.

## [Dr. Matrix' Weird Web World of Science - Awards Page](#)

Dr. Matrix cruises the www and collects the coolsci sites for his Awards page. Seventeen catagories, hundreds and hundreds of science sites. Cruise the rest of his site for fascinating, thoughtful commentary

## [The Last Word](#)

Science questions answered, from [New Scientist](#) magazine.

## [AstronomyPicture of the Day](#) NASA archive

Ten years of collected photos and links from the famous APOD site.

## [The Editors Selections](#)

Science hotlist from [Scientific American](#) Magazine.

## [Science Friday: HOTLINKS](#)

NPR Radio's TALK OF THE NATION: [SCIENCE FRIDAY](#) is not to be missed. They've also built a nice collection of eclectic science links.

## [ZOOLAND Artificial Life Resource](#)

The famous/infamous (delete one) Santa Fe Institute brings us this brainmeltingly-extensive collection of links to sites involving Artificial Life; a-life. Zerosum breakage and titfortat dealings. Simulations, animations and applet-based growings.

Fractals and fishtanks and emergentboid wings ...these are a few of my favorite things!

## [Cool Science Archive](#) from the [Nat. Academy Press](#)

Also check out the NAP [reading room](#) for all sorts of science books online. Yes, complete actual illustrated books on the internet for free. Also try some non-science at [Litrix reading room](#).

## [The Virtual Laboratory](#) at Pilot to Physics

An excellent (and large) collection of hands-on Java applets, shockwave, and VRML programs for the visual learning of physics concepts. Also check out [online textbooks](#)

## [ENC Digital Dozen Archive](#)

Eisenhower Nat. Clearinghouse picks a monthly top-12 science education sites. No dry textbook sites, this archive of past picks is the really cool stuff.

## [Hands on Science Centers Worldwide](#)

Science Museums have the coolest websites. Here they all are, all at once. Take it slow, don't get brainburn.

## [PITSCO COLLAB. PROJECTS](#)

From the Pitsco Science Catalog site, a collection of "collaborative projects," a cool-science link collection by any other name.

## [Interesting Devices](#) on the Net

From Yahoo, this is an immense and venerable collection of



sites with live stillcams, interactive robots, and all manner of instrumentation connected to the net. Spy on people's offices all over the world. See the coffee pot that started it all. Watch 24hr timelapses at the UW. Talk to the cat. See if the pop machine at MIT has any warm Jolt cola left.

## [Franklin Institute's hotlist of online exhibits](#)

A list of highly interactive Cool Science sites. Also see their [monthly hotlist](#).

## [Yahoo's SCIENCE index](#)

Hours of surfing pleasure. If you find something in Yahoo that should be linked in Cool Science, drop me a note!

## [SCIENCE MUSEUMS](#), Yahoo

More and more museum sites.

## [SCROLL DOWN](#)

See my own collection of Cool Science links

•

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## Great Big List of Various Cool Places

(in no particular order)

- [NPR Science Friday](#) radio show's audio archive
- [Annals of Improbable Research](#)

For dead links try [Wayback Machine](#)

Just add this prefix before any defunct URL:  
[http://web.archive.org/web/\\*/](http://web.archive.org/web/*/)

- [What is it?](#)
- [Mathematical Thinking in Physics](#), from NASA Glenn
- [Synthetic ringtones](#)
- [Scotchtape Polyhedra](#)
- The [How Stuff Works](#) big list of topics
- [Manta rays](#)
  
- Octopus Videos
  - [Vanishing octopus](#) from the [Cephbase archive](#)

- Seattle Aquarium: [shark eating octopus](#) (play the video)
- The Mimic octopus as [walking coconut](#) and [drifting seaweed](#).
- Octopus with [video skin](#)
- [Pulpo fiction](#)
- [Science for People](#), essays
- [Essays at Naturalscience: Nanobacteria](#)
- [BBC Science Radio Archive](#) from [Lateral Science](#)
- [HOW2 Column](#) at Popular Science Mag
- [Mercury "infects" aluminum](#), and [LME video](#) (12 megs)
- [Atomic Pockmarks](#) at Nevada Test Site (the white lake bed is "Area 51")
- [Short video physicist interviews](#)
  
- [MIT desktop fab labs](#)
- [Lab Notes](#) Berkely Eng.
- [Quicksand effect](#) wo/water
- [Backscatter x-ray cam](#)
- [Psych experiments](#) (psycho!)
- [Flickr sort: "Science"](#)
- [Earth's b-field over time](#)
- [Make a CRT from scratch](#)
- [Animations](#) on Mathworld.com
- [Human walks](#)
  
- [100 things to do in life](#)
- [Silly Molecule Names](#)
- [Escher solid modling](#)
- [McMurdo Station News](#), and [jello](#)
- [Victorian Robots](#)
- [Kevan.org](#) simulations, games, psycho!
- [Science Meetup service](#)
- [Sci/Eng Visualization Challenge](#)

- [Sodium blast](#)
- [McCulloch illusion](#)
  
- [Sidney Harris cartoons](#)
- [Conway's "Life" simulator](#)
- [Things to Make and Do](#)
- [Kids & Science](#) (Tech. U. of Vienna)
- [Circular holes in clouds](#)
- [EPOD](#) Earth Science Picture of the Day, and [archive](#)
- [Anthrax neckties](#), Staphylococcus boxer shorts, etc.
- [UK television show: Rough Science](#)
- [Stupid movie physics](#)
- [Nuke explosions](#), weird shapes in the first instant
  
- ["Eye tubes"](#), green electron glows, some w/[animation](#),
- [Bio](#), [Chem](#), and [Math](#) with [Tom Lehrer](#)
- or try [Flanders/Swann First & Second Thermo](#) song (mp3)
- They had fun naming the [The Johnson Solids](#)
- [Optical Illusions](#), and [more](#)
- [Geoffrey Pyke](#), demented genius
- [Improbable articles](#)
- [Hair Club For Scientists](#)
- [backwash.com: science: fun, weird, gross](#)
- [Heddy Lamar](#), actress, military designer, invented Spread Spectrum radio
  
- Webby awards: [Science & Edu](#)
- [Getty Museum: Devices of Wonder](#)
- [Becoming Human](#)
- [NASA Earth Observatory](#)
- [e-Nature](#)
- [PLUS magazine](#)

- [Molecular Expressions: optics/microscopy](#)
- [Cave of Lascaux](#)
- [The Exploratorium](#)
- [Monterey Bay Aquarium](#)
  
- [NASA Space Science](#)
- [NASA Starchild](#)
- [Russian sci. anecdotes](#) from [M. Perakh](#)
- [To Ride a Trebuchet](#), man-hurling catapult!
- [Calresco, complexity & a-life](#)
- [matchrockets.com](#), science experiments
- [Atom Flowers](#), electron orbitals
- [Scientists' wagers](#)
- [John Bently, the Snowflake man](#)
- [My mother, the scientist](#)
  
- UW's [realtime sonar camera](#), and [images](#)
- [Hidden Images](#) inserted in music spectra
- [Ripple-tank applet](#), also [others](#)
- [History of hobbyist computing](#)
- [Moon wiggles](#), as viewed from Earth
- [Liquid Nitrogen Icecream Recipe](#)
- [Stupid Movie Physics](#)
- [ONLINE VIRTUAL REALITY WORLDS](#) (free Adobe plugin)
- [BBC Science Shack](#)
  
- [Experimental Musical Instruments](#)
- [Sodaplay Constructor](#) (amazing animated ball/spring JAVA sim)
- [Lavalamp-generated haiku](#)
- [Become a Brain Donor](#)
- [Heavens-above: look for IST, shuttle, satellites, etc.](#)

- [SciFaiku!](#)
- [ZORB!](#) zorb, zorb, [zorb](#).
- [Fly powered model airplanes](#)
- ["Hummingbird" flying platform](#)
- [SoloTrek](#) personal flying machine
  
- [Huge man-made tornadoes](#) from [Reelefx](#) Inc.
- [PhysicsLimericks](#)
- [Fractal video feedback](#)
- [Science-a-Go-Go](#) (excellent online forum, strange news items)
- [Studmuffins of Skepticism](#) 1999 calander
- [Institute of Druidic Technology](#) :)
- [Lasers made from White Paint!](#)
- [Bionic Design](#) at NAIR (.jp)
- [Inventor of the Week Archive](#) at the [Invention Dimension](#)
- [The Scientific Method](#) (from the founder of EDMUND SCIENTIFIC)
  
- [Virtual Physics Demos](#) (in Java, etc.)
- [Fractal Art Webring](#)
- [Lifesmith's Fractals Hotlinks](#)
- [The Meteorite Exchange](#)
- [Delightful Machines](#)
- [Why Files: Oddball Research](#)
- [PHYSLINK physics fun](#)
- Searching for the [1997 Greenland meteorite](#)
- [J. Walker's FOURMILAB](#)
- [MIT Ants](#)
  
- [Smart-Tech Demos](#): Alife, CAs, fuzzy, neural, genetic-alg, brains, etc.
- [J. Cramer's Alternate View](#) articles from Analog SF
- [Fantastic Forest](#) at Nat. Geographic

- [The "Notochords" science music?](#)
- [Submarine Races](#)
- [Infinite Fractal Loop](#) (fractal gallery webring)
- [Gallery](#) of atomic microscope (STM) art
- [Telson Spur](#), Phil Hughe's gigantic science links collection
- [Cliff Pickover page](#)
- [Visible Human](#) project
  
- [Mushroom clouds](#)
- [Aerogel Photo Gallery](#) from [MMG Berkeley](#)
- [Innocent Inanimate Objects](#) (shot by large caliber guns)
- [New Scientist Magazine: "Last Word" Q&A](#)
- [BioMedNet HMSbeagle newsletter](#)
- [Turtle Trax](#)
- [aLife Garden](#), design your own Artificial Life creature
- ["Complexity"](#) at Exploratorium
- [Animated Human Anatomy](#)
- [Flying Contraptions](#)
  
- [How Things Work](#):The physics of everyday life
- [Illusions and Perception](#) online exhibit
- [The Live Articial Life Page](#)
- [Leeches](#)
- [Chindogu](#), the art of useless inventions
- [Earth and Sky](#) radio show
- [Characterization of Organic Illumination Systems](#) (pickles!)
- [Wheelchairs with Legs](#)
- ["OMNISCIENCE FUTURENEERING"](#)
- [Weather Reports](#) for USA locations
  
- [Weather Satellites](#) GIFs & Movies

- [Bee Eye view of the world](#)
- [AGD Science Antics/Mayhem](#)
- [Cells Alive!](#)
- [Flapping Wings! The Ornithopter Home Page](#)
- [Particle Adventure!](#)
- [Tele-Garden Robot](#)
- [Waseda Univ. Humanoid Project Home Page](#)
- [Just For Middle School Kids](#)
- [Electronic Zoo](#)
  
- [Southwestern Archaeology](#)
- [Mars Multi-Scale Map](#)
- [Survival Research Labs](#) Dangerous robotic sculpture
- [The T.W.I.N.K.I.E.S. Project](#)
- [Starting a grill with 10gal of Liquid O2](#)
- [Exploratorium](#) Museum
- [Bad Science](#)
- [Paper Airplane](#) of the month
- [Micscape](#) Microscopy page
- [Internet Museum of Holography](#)
  
- [Science Jokes](#)
- [Preview The Heart](#)
- [The Nerdity Test!](#)
- [MIT Online Hack Archive](#) (student shennanigans)
- [Science Factoids](#)
- [The Nine Planets](#)
- [Society for Amateur Scientists](#)
- [Helping Your Child Learn Science](#)
- [Science on Da Web](#)
- [Marilyn Vos Savant](#) is WRONG



- [MIT 'borgs](#)
- [Cold Fusion Page](#)
- [Sarfatti's Physics Page](#)
- [The Science Club](#)
- [A Gallery of Interactive On-Line Geometry](#)
- [Space Movie Archive](#)
- [Amethyst Galleries' Mineral Gallery](#)
- [VolcanoWorld](#)
- [John Conway's Game of Life](#)
- [Virtual Frog Dissection Kit](#)
  
- [NetFrog](#)
- [The Face of Venus](#)
- [EM pulse Can Crusher](#) at RPI Plasma Dyn. Lab
- [THE OFFICIAL TRUTH](#)
- [Zen and the Art of Debunkery](#)
- [Forteana Page](#)
- [Swamp Thing](#)
- [Mad Scientist Page](#)
- [Forbidden Circuitry \(wiretap.spies\)](#)
- [The Fractal Microscope](#)
  
- [The Belljar](#)
- [YOU CAN with Beakman & Jax"](#)
- [Bill Nye T.S.G.](#)
- [Ask Dr. Neutrino](#)
- [MAD SCIENTIST NETWORK](#) Recommended! Large group of scientists!
- [Arbor Scientific's catalog](#)
- [Journal of Scientific Exploration](#)
- [SETI Institute](#)

- [PEAR](#), Princeton Engineering Anomalies Research
- [Frankel's Page](#), biological anomalies
  
- [Fortean Times](#) magazine
- [WARNING: dihydrogenmonoxide!!!](#)
- [Chaos](#) at U. Maryland
- [Ancient sparkplug inside rock](#)
- [Strange Magazine](#)
- [Ideas futures, science "stock market"](#)
- [INTEC sound camera](#)
- [Scott's Weird Web World of Science](#)
- [Earth Viewer](#)
- [Virtual FlyLab](#)
  
- [Fractal Explorer](#)
- [Introduction to Fractals.](#)
- [Primordial Soup Kitchen](#)
- [The world through the eyes of a bee](#)
- [Current and Past Satellite Images](#)
- [NrrdGrrl!](#)
- [Sprott's Fractal Gallery](#)
- [Comet Hale-Bopp](#)
- [Stanford University Tour](#)
- [The Henrietta Leavitt Flat Screen Space Theater](#)
- [Backyard Ballistics!](#)
- [Fun with Grapes - A Case Study](#)
- [Unwise Microwave Oven Experiments](#)
- [Flaming Poptart Blowtorches](#)
- [The OTHER Flaming Poptart Blowtorch site](#)
- [The Outrageous On-Line Uncle Al](#)

# My own NEAT STUFF

- [SURPLUS JUNK SUPPLIERS](#) and other cool catalog companies
- [NEW STUFF](#) list
- [COOL STUFF](#) list
- [Supermagnet Tricks & Demos](#)
- [Evil genius hi-tech practical joke ideas](#), also [MORE](#).
- [Soda-bottle voltage-motor](#)
- [My "electricity" articles](#)
- [Draw Holograms By Hand](#)
- [New and different build-it projects](#)
- [Strange and twisted build-it projects](#)
- [Dangerous Capacitor-bank Experiments](#)
- [Magnetic Levitation](#)
- [Screwy Ideas](#)
- [Ball Lightning Page](#)
- [Widespread mistakes in science textbooks.](#)
- [Science taboos, ridiculed geniuses](#)
- [My Answers](#) to science questions
- ["Static Electric" Stuff](#)
- [VandeGraaff Generator Page](#)
- [Free Energy](#) "perpetual motion" machines
- [Mysterious electrostatic air-threads](#)
- [Weird Science](#) section
- [Amateur Science](#) section
- [Sci. Education Resources](#)
- [Tesla coil](#) section

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**Updated 10/1/2005**

**<http://amasci.com/amateur/coolsci.html>**

**Created and maintained by [Bill Beaty](#).**

**Mail me at: [billb@amasci.com](mailto:billb@amasci.com).**

[PREV](#) [GUESTBOOK](#) [GOOD STUFF](#) [NEW STUFF](#) [SEARCH](#) [LINKS](#)

# Weird Research, Anomalous Physics

- [SEATTLE WEIRD SCIENCE 'SALON'](#) (monthly meetings)
- [DISCUSSION GROUP freenrg-L: Unconventional projects, physics](#)

## WEIRD SCIENCE OF THE WEEK

- [GOT PSI?](#) online test (12/2003)
- [Past picks](#) (recommended!)

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*"I love fools' experiments; I am always making them"* - Charles Darwin

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## WEIRD SCIENCE pages here:

- [ANTIGRAVITY](#)
- [FREE ENERGY](#) files, organized by device
- [TORSION FIELDS](#)
- [NOT YOUR AVERAGE CONSTRUCTION PROJECT](#)
- [REPORT YOUR UNUSUAL PHENOMENA](#)
- [AGAINST EXCESSIVE SKEPTICISM \(QUOTES\)](#)
- [CLOSEMINDED SCIENCE](#)

- [WEIRD SCI. BOOKSTORE](#)
  - [WEIRD-SCI NEWSGROUPS](#)
  - [UNCONVENTIONAL SCI. DISCUSSIONS \(email lists\)](#)
  - [LOCAL FILES: THEORIES, INVENTIONS, ETC.](#)
  - [CHEMISTRY, WATER, AND MAGNETISM](#)
  - [KEELYNET Library](#), huge alternative-sci file collection!!!!
  - [TESLA COILS](#), also [BALL LIGHTNING](#)
  - [Unconventional Science Journals and Newsletters](#)
  - [Non-conventional books, bookstores, catalogs](#)
  - [LINKS](#) (below)
- 

*"I have to disregard everybody else, and then I can do my own work."*

- R. P. Feynman

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## LINKS COLLECTIONS: WEBSITES ELSEWHERE:

- [Skeptical](#): truthseeking vs. scoffing
- [Free Energy](#)
- [Various "Weird Science" pages](#)
- [Fortean](#) (anomaly hunters)
- [Cold Fusion](#) (LENR)
- [Parapsychology](#)
- [Science/Spiritual](#)
  
- [Other Large Index Sites](#)
- ["Weird Science" Professionals & Institutions](#)
- ["Weird Science" Organizations & Journals](#)
- [Interesting Weird pages](#)

*We have the right to believe at our own risk any hypothesis that is live enough to tempt our will.*

- WILLIAM JAMES

*"Theories have four stages of acceptance:*

*i) this is worthless nonsense;*

*ii) this is an interesting, but perverse, point of view;*

*iii) this is true, but quite unimportant;*

*iv) I always said so.*

- J.B.S. Haldane, 1963

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**[WEIRD ART PAGE MOVED TO /weird/wart.html](/weird/wart.html)**

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## Other things here

- **[Taos Hum page](#)**
- **[Cool Science](#)**
- **[Weird Newsgroups](#)**
- **[TESLA COIL](#) page**
- **[SURPLUS](#) mail-order supply catalogs for sci/electronics hobbyists.**
- My **[AMATEUR SCIENCE](#) page**
- My **[SCIENCE EDUCATION](#) page**
- My **[SCIENCE UN-TEACHING](#)**

Please leave **[COMMENTS!](#)**

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**[BILL B's HOBBYPROJECTS](#), plans, unnatural hologram, electrostatics projects, science museum devices, neat stuff.**

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**<http://amasci.com/weird.html>**

Created and maintained by **[Bill Beaty](#)**.

Mail me at: **[billb@amasci.com](mailto:billb@amasci.com)**



# Nikola Tesla Page, tesla coils

Hey, congratulations, you found some [Tesla](#) stuff on WWW! I highly recommend Chip A's coil-building discussion list at ['Pupman.'](#) Also check out [nic.funet.fi](#) (TESLA GROUP below) for more files on coils.

**T-SHIRTS!** Hey, some people (not me) are selling Tesla t-shirts: [Color photo on white](#) (Bust The Smithsonian) [Tesla company](#) [Tesla w/bulb](#) (Purple Plates) [World wireless Classroom Tesla Coil \\$200](#), also a [Micro Tesla Coil \\$1.19](#)

## Shortcuts

- [Tesla Discussion Groups](#)
- [Coil plans, instructions, etc.](#)
- [Plasma Spheres](#)
- [Tesla WWW links](#)
- [Coilers' pages](#)
- [Coil Photos](#)
- [Some Tesla Books](#)
- [Homebrew Capacitors](#)
- [Text files & other info](#)
- [Suppliers/stores](#)
- [SOFTWARE](#)
- [Keelynet Tesla files](#)

OR JUST SCROLL DOWN



## SOME TESLA BOOKS (via AMAZON)

- Videos:
  - [Tesla, Master of Lightning](#) , VHS from [PBS](#)
  - [Secret of Nikola Tesla](#) VHS & [DVD](#)
  - [The Genius who Lit the World](#) VHS , also [DVD](#)
- [Harnessing the Wheelwork of Nature](#)
- [Prodigal Genius](#) J. O'Neill
- [Tesla: man out of time](#) M. Cheney
- [Master of Lightning](#) M. Cheney
- [Tesla: a spark of genius](#) (young adult)
- Trinkaus' [Tesla Coil](#) and [#2](#)
- [Tesla: the Modern Sorcerer](#)
- [Wizard: life and times of N. Tesla](#)

- [Earthquake Machine](#)
- [Tesla: Europe trip & scheme to split the Earth](#)
- [The Man Who Harnessed Niagra](#)
- [Little Egypt](#) (fiction: 1920 hackers & Tesla)
- [Inventions, Research, & Writings](#)
- [Tesla Said](#)
- [1984 Tesla Symposium](#)
- [1986 Tesla Symposium](#)
- [1988 Tesla Symposium](#)
- Books by Tesla himself:
  - [My Inventions](#), autobiography
  - [The Problem of Increasing Human Energy](#)
  - [Colorado Springs Notes](#)
  - [Lecture: NY Acad. of Sci.](#)

## Tesla Discussion Groups

- [TESLA GROUP](#) listserv for advanced hobbyists "pupman"
- [Nerdtoy tesla discussion](#)
- [usa-tesla](#) (old Intl Tesla Soc. list)
- [HV Community](#)
- [groups: Tesla](#)
- [groups: Tesla-fy](#)
- [groups: Tesla Wardencllyffe project](#)
- [groups: Tesla Turbine](#)
- [groups: TeslaTurbineList](#)

- [All Things Tesla](#)
- [ALT.ENERGY.HIGH-VOLTAGE](#) newsgroup
- [Tesla-2](#) group for beginners HV Association wwwboard
- [HV Association](#)

## Coilers' Pages

- [Tesla Coil Webring](#)
- [Bert Hickman Teslamania](#)
- [Mr. Michael](#), Bangkok Thailand
- [Richie's MOSFET coil](#)
- [Cincinnati Coiling Club](#)
- [Alto Voltaje](#)
- [Bart's classictesla](#)
- [hot-streamer.com](#)
- [HVFX, in UK](#)
- [Terry F.](#)
- [KVA Effects, zap-proof suit](#)
- [Dr. Megavolt](#)
- [The Great Voltini](#)
- [Marco's coil & thesis paper](#)
- [B. McCann's page](#)
- [Stefan's page](#), also coiler's discussion en Deutch
- [Stan's TC Info Depot](#)
- [D.C. Cox, Resonance Research](#)
- Greg Leyh's [Lightning On Demand](#)
- [Achims High-Energie-Page](#) TC,HV,Laser (Deutsch)
- [Coil at Vortexia](#)
- [Adam's TC](#)
- [Electric Stuff](#) from Mike H.
- [Kevin N.'s page](#)
- [C. Brush's coil](#)
- [R. S. Coppersmith](#) page (TC design software)
- [dstevick's page](#)
- [C. Baumann](#)
- [John Clement](#)
- [Steve Cole and others](#)

- [Doug Hall](#)
- [TeeCee's](#)
- [Tesla Technology Research](#) (Bill Wysock)
- ["Tesla Group" FTP file archive](#) (loads of pictures!)
- [jgore's "Tesla Coil Madness"](#)
- [Chip A's coil](#)
- [T. Bastian Tesla papers](#)
- [TCBOR](#), Tesla Coil Builders of Richmond
- [Brent Turner](#) Tesla Page

## Tesla Coil Explanations

- [Tesla coil animation](#)
- [How TCs work](#)

## Tesla WWW links

- [Tesla Coil Safety Sheet](#) from [Chip Atkinson](#)
- [Talking to Tesla](#)
- [Tiny \\$2.00 Tesla Coil](#)
- [Film: THE VISIONARY](#)
- [GOOGLE IMAGES: Tesla coil](#), and [Nikola Tesla](#)
- [Tesla FAQ](#) at the [Wardenclyffe Project](#)
- [Tesla Timeline](#)
- [Tesla chronology](#)
- [Tesla: the opera](#)
- [Tesla, FBI foia files](#)
- [PBS: Tesla, Master of Lightning](#), also the [VHS tape](#), \$14
  - [PBS: Tesla's life](#)
  - [PBS: Inventions](#)
  - [PBS: Teacher resources](#)
  - [PBS: Interviews](#)
  - [PBS: Patents & articles](#)
- Article at Chipcenter: Tesla, Inventor of the Century (via archive.org)
  - [I - Genius](#)
  - [II - Electrical Wizard](#)

- [III - Mad Scientist](#)
- [IV - Science Fiction](#)
- ["The Problem of Increasing Human Energy", N. Tesla](#)
- [Reasons for Tesla's obscurity](#)
- [H2G2: Tesla; why marginalized](#)
- [A bit about Tesla's "Death Ray"](#)
- [Tesla and Tunguska explosion machine](#)
- [WIRED: I.T.S. conference \(1998\)](#)
- [Tesla mechanical osc.](#) (earthquake machine)
- [Tesla Lost Manuscript](#) (real or hoax?)
- [Tesla coil plasma tweeter loudspeaker](#)
- [21st Century Books](#), Tesla books
- [Tesla History](#), but another "tesla" altogether!
- [Tesla Info Source](#)
- [Phil Hamilton](#) page (Tesla FBI FOIA papers)
- [Wardenclyff Project](#)
- [The Tesla Museum](#) (Beograd)
- [EE Times Tesla Article](#)
- [International Tesla Inst.](#) JW McGinnis
- [Nicola Tesla - Erased at the Smithsonian](#)
- [Parascope/Enigma: Tesla](#)
- [TCBA News Page](#) on [Steve Cole's HV page](#)
- [TESLA NEWSLETTERS, GROUPS, MAIL ORDER BOOKS, ETC.](#)
- [TCBA](#), the Tesla Coil Builder's Association
- [Prodigal Genius](#), Tesla biog., the entire book! From [BOL Books](#)
- [Dave Archer](#) TC paintings
- [Bogdan K.](#) Tesla Page
- [Tesla Museum](#) in Belgrade
- [TESLA ENGINE BUILDERS ASSOCIATION \(TEBA\)](#)
- [Tesla Memorial Society Inc.](#)
- [Lost Inv.](#) Zer0 Tesla Page
- [Keelynet](#) files on WWW/SPIRIT, tesla stuff in ENERGY section.

## **Tesla Group**

- ["Tesla Group" FTP file archive](#)
- [Tesla coil photo archive](#) (large)

- [Tesla Group, file descriptions](#)

## Other related pages

- [Ball Lightning](#) page
- [Electronics Hobbyist](#)
- [DMOZ: High Voltage](#)
- [Jim Lux High Voltage Handbook](#)
- [Snock's HV page](#)
- [PV Geissler tube catalog](#)
- [Laser-triggered Lightning](#)
- [Luminglas](#), flat "plasma globe" sculptures
- [Geissler tubes](#) (India) (WARNING, FRAUD)
- [plasma-art.com](#)
- [Plasma Sphere](#) page
- [Lightning Page](#) (w/christianity-hawking ads)
- [Lightning FAQ](#)
  - [Can. Forest Serv.](#)
  - [NOAA](#)
  - [NCAR](#)
  - [Lightning Tech](#)
  - [Thompson Lightning prot.](#)
  - [Lightningstorm Inc](#)
- [Sprites & Jets](#)
- [Striking Images](#) archive
- [NEON-L](#) discussion group
- [Space SHuttle Lightning obs](#)
- [Lightning photograpy](#)
- [Internet Schematic Archives](#)
- [sci.electronics FAQ](#)
- [Halloween Hobbyists](#)
- [Unconventional Sci. Books](#)
- [Unconventional Sci. Journals](#)

## Coil Photos

- [4hv photo archive](#)

- [GOOGLE IMAGES: tesla coil](#)
- [Oven-zapped CDs](#) atop a large TC
- G. Leyh's [Big coil](#) at Seattle [SRL](#) performance
- [Giant VandeGraaff](#) at Boston's Museum of Science
- [Tesla Coil](#) at Boston's Museum of Science
- [Another Coil](#) at MOS

Links to [Photos](#) at [nic.funet.fi](http://nic.funet.fi), from Richard Quick:

- [Streamers, 2.8KW, 10" dia coil, R. Quick](#)
- [StreamersII, 2.8KW, 10" coil, R. Quick](#)
- [Streamers, Magnifier coil, R.Quick](#)
- [12 ft arc, 'Nemesis' coil, R. Hull](#)
- [Magnifier, running at 2KW, R. Hull](#)
- [Coil w/small sphere, corona, R. Quick](#)
- [BW GIF, streamers. Coil, J. Mullins & G. Legel](#)
- [10' arc, 5KW, B. Svangren](#)
- [Coil detail, B. Svangren](#)
- [12" streamers, 'Bargain Basement' coil, J. Hartwick](#)
- [Setting up 10" dia coil, R. Quick](#)
- [rq\\_m800.gif](#)
- [bigcoil.gif](#)
- [bipole2.gif](#)
- [chip\\_a1.jpg](#)
- [chip\\_a2.jpg](#)
- [chip\\_a3.jpg](#)
- [chip\\_a4.jpg](#)
- [chip\\_a5.jpg](#)
- [hartwck1.gif](#)
- [hartwck2.gif](#)
- [niagara1.gif](#)
- [rodney.gif](#)
- [run\\_tesla.gif](#)
- [sparkgp1.gif](#)
- [sparkgp2.gif](#)
- [tesla.gif](#)
- [tesla1.gif](#)
- [tesla32.gif](#)

- [tesla50.jpg](#)
  - [teslania.gif](#)
  - [Doc files for above pics](#)
- 

**LOOKING FOR BOOKS? Try searching [amazon.com](#):**

(try "tesla coil" too)

Help Support [Science Hobbyist / Science Club Inc.](#), use the above form to buy your books.

(We make a few \$\$ on any books ordered via these links.)

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## Coil plans, instructions, etc.

- [Links to TC plans](#) (scroll down)
- [Where is the good info?](#)
- [PLASMA BALL](#) info, sources of plans
- [Magazines](#) with tesla coil plans
- [Lex Luthor's Kryptonite Death Beam Machine](#) and other screwy ideas
- [teslabld.exe](#) (pc dos required)
- [Some TC Builders Hints](#)
- [Coil winding Hints](#)
- [Sources of wire, HV diodes](#)
- [Toroid](#) hints
- [More Toroid](#) hints, theory
- [Large coil with FET drive](#)
- [TC Primaries](#)
- [Power Resistor](#) trick
- [Wire Gauge](#)
- [Tesla Group's FTP file directory](#)
- [Tesla Group, file descriptions](#)

**Links to actual TC plans elsewhere**

- [Beware of "Amazing Devices", "Info. Unlimited"](#)
- [TC Plans from "Bizarre Stuff"](#)



- [Tube-type TC](#), 1967 plans from SCI. EXPERIMENTER
- [La Bobina de Tesla](#)
- [Tesla Coil Webring](#) (lots of plans!)
- Electrotherapy museum:
  - [Handheld 120Vac TC](#), 'Violet Ray'
  - [Online Book: High Frequency Apparatus](#)
- [Coil building instructions fm/sci.electromag newsgroup.](#)
- [Plans at altair.org](#)
- [One-transistor mini-teslacoil](#)
- [Don Klipstein's TC plans](#)
- [Flyback Xfrmr Type](#) (just leave off the HV diode)
- [TC-PLANS.ZIP](#) from [dstevik's page](#)
- [dstevick's coil and schematic](#)
- [Tesla Group, mini coil schematic](#) (can be used for Plasma Sphere)
- [Tesla Group, another coil schematic](#)

## Homebrew Capacitors

- [R. Quick's Capacitor](#)
- [B. Pool's Capacitor](#)
- [TBCOR Capacitor](#)
- [D. Lima's capacitor](#)
- [E. Schwartz' capacitor](#)

## Text files & other info

- [Tesla Coil Plans](#)
- [Tesla was a CRACKPOT! \(Really?\)](#)
- [Resonant "energy sucking" antennas](#)
- [Tesla's big 'mistake'](#)
- [Tesla invented radio](#)
- [Sparks](#) and Lightning
- [Metals won't shield?](#) bizarre experiment (GIF)
- [Tesla Autobiography \(.txt\)](#)
- [Tesla Autobiography in \(Adobe .pdf\)](#)
- [CDROM effect](#)
- [Tricks](#) with a Tesla Coil

- [Unwise Microwave Oven Experiments](#)
  - [Science First](#), aluminum toroids
  - [Plasma Sphere](#) without vacuum pump!
  - [dlima's Plasma Sphere hints](#)
  - Cursed with [hearing plasma spheres](#)
  - [Nitrogen Pulse Lasers](#)
  - [TCs in particle accelerators](#)
  - [Electricity Misconceptions!](#)
  - [The Belljar](#), vacuum hobbyist newsletter
  - [Jacob's Ladders](#)
  - [Repairfaq: Jacob's ladders](#)
- 

## Suppliers/stores

### Books

- [PBS VIDEO: Tesla, master of lightning](#)
- [SCIENCE HOBBYIST: Tesla Bookstore](#)
- [21st Century Books](#), Tesla books
- [Surefire Tesla Coil Cookbook](#)
- [Tesla Project](#) 23 volume biog.
- [B.O.L. Books](#)
- [TCBOR](#), TC videotapes
- [Tesla Book Company](#)
- [Tesla Books](#) from BSRF catalog

### Hardware, misc.

- [Electronic Dimensions](#) custom-wound TC secondaries
- [Science First](#), aluminum toroids
- [High Voltage Association](#) company & products links
- [MG Electronics](#) Tesla Stuff
- [T-R](#) pole-pig transformers
- [S.D. Meyers](#) more pole-pigs
- [Geissler tubes](#) (India) (WARNING, FRAUD)
- [Maxwell Labs](#) HV capacitors

- [Tesla Technology Research](#) (Large coils, special effects)
- [B. Turner's High Voltage Demonstrations](#)
- [SURPLUS SOURCES](#) & neat junk mail-order catalogs for sci/electronics hobbyists.
- Amasci [Stores and Surplus list](#)
- B. Merriman's [Chemical Suppliers list](#)
- [Transformer](#) resources from R. Quick
- [Suppliers](#) list from The BellJar

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## SOFTWARE

- [R. S. Coppersmith](#) page (TC design software)
- [TC Field calc program](#)
- [Decompressing .Z files](#)

The files in the list below are available from this Keelynet mirror site, or from the Keelynet BBS itself, phone 214-324-3501. Any disabled files below are only on Keelynet itself, and have not been uploaded to ELEKTROMAGNUM as yet.

[Keelynet mirror at ELEKTROMAGNUM, with excellent indexing system](#)

Try [Elektromagnum](#) itself, with lots of interesting stuff!

[TESLAC.ZIP](#) U/L on 01/19/94 Desc | Tesla Coil Design Program  
Sz = 36864 DL = 50 Last = 08/26/94 |

[TESLACII.EXE](#) U/L on 07/28/94 Desc | A NEW VERSION OF TESLAC, THE  
TESLA COIL |  
Sz = 59904 DL = 32 Last = 09/15/94 | DESIGN PROGRAM.

[hardy1.asc](#) U/L on 08/01/92 Desc | double helix energy emission  
from a |  
Sz = 11150 DL = 19 Last = 06/15/94 | Tesla coil excited pyramid  
(see.GIF)

[TESLA2.ASC](#) U/L on 08/29/90 Desc | basic Tesla coil theory  
Sz = 4943 DL = 16 Last = 07/30/94 |

<a href="#">TESLA3.ASC</a> U/L on 08/29/90 Desc on Tesla's Sz = 39407 DL = 9 Last = 07/30/94 Ä	influence of Vedic philosophy work
<a href="#">tesla4.asc</a> U/L on 11/05/90 Desc good descript Sz = 50644 DL = 12 Last = 07/30/94	the Scalar Howitzer and a of the Tesla wave principles
<a href="#">tesla5.asc</a> U/L on 01/13/91 Desc includes SDI info Sz = 26058 DL = 12 Last = 07/30/94	The Greatest Hacker - and Tesla Anecdotes
<a href="#">tesla6.asc</a> U/L on 02/24/92 Desc probably caused Sz = 32610 DL = 10 Last = 06/30/94 info.....	Death Rays and how Tesla the Tunguska crater, good
<a href="#">teslafel1.asc</a> U/L on 02/01/93 Desc as used Sz = 28599 DL = 10 Last = 05/19/94	Article on the Tesla Power Box in a 1931 Packard to drive 80hp AC motor
<a href="#">teslafe2.asc</a> U/L on 02/01/93 Desc Box with Sz = 15867 DL = 6 Last = 05/19/94	sysop comments on Tesla Power Moray comparisons
<a href="#">zap.asc</a> U/L on 08/02/92 Desc with some Sz = 10072 DL = 12 Last = 05/20/94 .GIF's)	2.3 MV Tesla coil experiments anomalous observations (see
<a href="#">TESLAFE1.GIF</a> U/L on 02/01/93 Desc parallel version of Tesla Power Sz = 9801 DL = 24 Last = 04/23/94	shows Box...conceptual of course
<a href="#">TESLAFE2.GIF</a> U/L on 02/01/93 Desc Sz = 7746 DL = 22 Last = 10/28/93	shows SERIES version of Tesla Power Box...
<a href="#">teslapic</a>	

U/L on 03/18/91 Desc | Graphics of Tesla Howitzer. From T.E.  
Sz = 133371 DL = 52 Last = 08/26/94 | Beardens book. IBM's only.  
Read me file

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Here are three more files from Keelynet which are NOT yet on the two mirror sites. They run on PC compatibles:

[TESLABLD.EXE](#) U/L on 06/10/93 Desc | How to build your own Tesla coil with  
Sz = 57435 DL = 77 Last = 08/28/94 | diagrams and parts list...very good

[TESLAC.ZIP](#) U/L on 01/19/94 Desc | Tesla Coil Design Program  
Sz = 36864 DL = 50 Last = 08/26/94 |

[TESLACOL.ZIP](#) U/L on 11/29/92 Desc | program to design your own coil..  
Sz = 110638 DL = 70 Last = 09/12/94 | excellent program!

### Other things here

- [WEIRD SCIENCE](#)
- [AMATEUR SCIENCE](#)
- [Electronics Hobbyist](#)
- [SCIENCE DEMOS](#) ARTICLES, EXPERIMENTS, EXHIBITS - MRA, ENERGY, GRAVITY, "CRAZY" INVENTIONS
- [SCIENCE EDUCATION](#) RESOURCE WWW LINKS
- [SCIENCE MUSEUMS](#)
- [HOME SCHOOLING LINKS](#)

OLD LINKS GONE BAD? Try <http://archive.org>, "The Wayback Machine"

It offers billions of old websites and even some of the graphics.  
But  
it's not searchable. You have to know the URL of the old site.

<http://amasci.com/tesla/tesla.html>

Created and maintained by [Bill Beaty](#). Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

[UP TO SCI.  
HOBBYIST](#)

[AWARDS](#)

[GOOD  
STUFF](#)

[NEW  
STUFF](#)

[SEARCH](#)

# Physics Demos & Science Exhibit Designs



**Society for  
Amateur Science**

William J. Beaty, Seattle, WA



This [PIRA Webring](#) site owned by [Bill Beaty](#).  
[Join the PIRA Webring](#)  
[Previous](#) | [Next](#) | [List Sites](#)

- [Bill B. Edu Articles](#)
- [Bill B. Physics Demos](#)
- [Links to other Physics Demonstration Sites](#)
- [Suppliers](#)
- [Listsers, books, misc.](#)

## BILL B'S SCIENCE EDUCATION ARTICLES

- [BAD K-6 PHYSICS Page](#)
- [Explaining electricity](#) with colored plastic sheets.
- [Collected Electricity Articles](#)
- ["Static" Electric](#)
- [Bill B's Answers to Science Questions](#) at 'Madsci'

## BILL B's Physics Demos

- [Science Projects](#) for kids, also see [mail order parts sources](#)
- [NEODYMIUM](#) magnet demonstration ideas, and [more](#)
- [MAGLEV](#), a non-cryo Meissner-like device
- [Ultra-simple Electric Generator](#)

Help [support](#)  
scienceclub.org

- [Van de Graaff Generator FAQ](#), and [VDG Page](#)
- [Large Electrostatic Loudspeakers](#)
- [Van de Graaff Generator Demonstrations](#)
- [Adjustable voltage](#) VandeGraaff
- [Dangerous microwave experiments](#)
- [Plasma Globes](#), and [Argon globes](#) in open air
- [Electrostatics projects](#)
- [Tornado Generator Box](#)
- [Quick and simple telescope](#)
- [Seeing Sound](#) (an untested idea)
- [How airfoils REALLY work](#)
- ['Squealing wall'](#) laser demo
- [Antibubbles](#)



- [Ultra-simple Hovercraft](#)
- [Human infrared vision \\$10 goggles](#)
- [Traffic wave physics for Bored Commuters](#)
- [Drawing holograms by hand!!!](#)
- [Evil Genius hi-tech practical jokes](#)
- [Dangerous experiments](#) with a big capacitor bank
- [PIRA balloon demonstration suggestions](#)
- [Giant Rainbow Prism](#)
- [Smoke ring launchers](#) (Vortex Cannons)
- [Antigravity Chamber](#)
  
- [Ridiculously sensitive charge detector](#)
- [Gigantic low-cost solar furnace](#)
- [Acid/Base Goldenrod secret](#)
- [SEE magnetic fields](#) with this simple viewing bottle
- [TOUCH THE CLOUDS device](#)
- [BOOKS ON ELECTROSTATICS](#)
- [ELECTROSTATIC MOTOR](#) made from plastic pop bottles.
- [ELECTROSTATIC GENERATOR](#), Kelvin's waterdropper
- [ELECTROSTATIC GENERATOR](#), inline waterdropper
- [AMATEUR SCIENCE BOOKS](#)
  
- [WING SHOCK WAVE PHOTO \(30K\)](#)
- [ARRAY ELECTROMETER](#) Build this and SEE electrostatic fields!
- [VISIBLE CURRENT](#) Makes electricity visible in wires.
- [Incredibly easy way to make a 100-amp cable](#)
- [Rotating disk device makes e-fields visible](#)
- [SCIENCE MUSEUM EXHIBIT IDEAS](#)

- [Acoustic Illusion](#)
- [Tesla Page](#), plans, files, newsletters, etc.
- [Thermal radiation demos](#)

## BOOKS

- [Art & Science of Lecture Demos](#)
- [Dick & Rae](#) Physics Notebook
- [Invitations to Science Inquiry](#)

## LINKS TO OTHER PHYSICS DEMO SITES

- [Java Applets links](#) Sebastopol
- [U. Montana](#) demo videos
- [Darylsci Demos](#)
- [Physics Question of the Week](#)
- [Physics Demonstration Laserdisk Archive](#) (Huge, needs realplayer)
- [Sciclub links](#) (kids sites)
- Educators! [Join](#) the Physics Instruction Resource Assn. [PIRA](#)
- [PIRA news](#)
- [The PIRA 200](#), listing of most popular demos
- [AAPT resource center](#)
- [Phys. Demonstrations](#) (online book) by J. C. Sprott
- [Mark K's edu. projects: how things work](#)
- [Metrologic: 101 ways to use a laser](#)
- [American Journal of Physics](#)
- [UBC Outreach](#)
- [U. Florida](#) demos
- [NCSU Physics Demo Resources](#)
- [KSU](#)
- [U. of Maryland](#)

- [U. Texas](#)
- [Physics Computer Simulations](#)
- [Berkely Phys Dept Demos](#)
- [ncl Demos](#)
- [Brown Univ.](#)
- [BU: fractal experiments](#)
- [Scientific American Issue 1](#)
- [The Fractal Microscope](#)
- [Amazing Science at the Roxy](#)
- [Fractals](#)
- [The Belljar, physics projects newsletter \(.txt\)](#)
- [Tesla Page](#), coil project info
- [PHYSOC](#), U. of Sydney Physics Society
- [PIRA Balloon Demos!!!!](#)

## SUPPLIERS

- [E-beam](#) tubes from [Tel-atomic](#)
- [Big List of Mail Order Sci. Surplus](#)

## Useful Info

- [Discussion groups for Physics teachers](#)
- [Newsgroups](#)
- [Books on physics demos](#)
- [Books on kids' sci. exp.](#)
- [SURPLUS](#) mail-order supply catalogs for sci/electronics hobbyists.
- [Webpage flaws](#) to avoid!

# Other Websites: Kid's Science Projects

- [Bill B's Kids' Science Projects](#)
- [Links to Kids Science Projects](#)

# Science suppliers/stores

Moved to [here](#)

## Other sections here

- [AMATEUR SCIENCE](#)
- [SCIENCE DEMOS](#) ARTICLES, EXPERIMENTS, EXHIBITS
- [WEIRD SCIENCE](#) - FREE ENERGY, ANTIGRAVITY, MRA, "CRAZY" INVENTIONS
- [SCIENCE EDUCATION](#) RESOURCE WWW LINKS
- [SCIENCE MUSEUMS](#)
- [HOME SCHOOLING LINKS](#)
- [COOL SCIENCE](#)
- [TESLA COIL](#)

<http://amasci.com/scied.html>

Created and maintained by [Bill Beaty](#). Mail me at: [billb@amasci.com](mailto:billb@amasci.com).



## Society for Amateur Scientists

5600 Post Rd. Suite 114-341, East Greenwich, RI 02818

401-823-7800 Internet: [info@sas.org](mailto:info@sas.org)



[SCIENCE](#)  
[HOBBYIST](#) | [GUESTBOOK](#) | [GOOD](#) | [NEW](#)  
[STUFF](#) | [STUFF](#) | [SEARCH](#)

Google:

# K-12 Science Ed. Resources

<http://amasci.com>, William J. Beaty Seattle, WA

## SHORTCUTS to sections below



- [Discussion groups \(lists\) on Science Teaching](#)
- [Newsgroups: Science Education](#)
- [Discussion groups and newsgroups: General science](#)
- [K-6 Textbook Errors](#)
- ["Science Answers"](#)

## Link Collections:

- [Science Lesson Plans Websites](#)
- [Cheap or Free Kits & Matls.](#)
- ["Science Answers" archives](#)
- [Asking Science Questions](#)
- [Homework Help sites](#)
- [Free Online Science Courses](#)
- [Commercial Distance Edu. Courses \(\\$\\$\)](#)
- [Science Education Link Index Sites](#)
- [Science Education Websites](#)
- [Science Kits Websites](#)

## Other Things Here:

- [Kid's Science Build-it Projects Here](#)
- [Kid's Science Build-it Projects Elsewhere \(links collection\)](#)
- [Bill B's edu. articles](#)
- [Bill B's Electricity Articles](#)
- [Bill B's Physics Demos](#)
- ["Ask a Scientist" sites](#)
- [Stores & suppliers](#)
- [Richard Feynman](#)
- [Misc. Useful Info](#)
- [COOL SCIENCE page](#)
- [AMATEUR SCIENCE page](#)

- [Science Toys](#)
  - [Science Outreach Websites](#)
  - [Science Organizations](#)
  - [Physics Education Link Index Sites](#)
  - [Physics Edu. Software](#)
  - [Physics Education Websites](#)
- 

OLD LINKS GONE BAD? Try <http://archive.org>, "The Wayback Machine"

It offers billions of old websites and even some of the graphics.

But it's not searchable. You have to know the URL of the old site.

Hint: put this in front of any URL you want to search:

[http://web.archive.org/web/\\*/](http://web.archive.org/web/*/)

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## **BILL B'S SCIENCE EDUCATION ARTICLES**

- [Collected articles on "Electricity"](#)
- [TRAFFIC WAVES](#), commuter physics
- [Bill B's Answers](#) from "[ask a scientist](#)" project
- [K-6 PHYSICS MISCONCEPTIONS Page](#)
- [NEODYMIUM](#) magnet demonstration ideas
- [3D E-field](#) viewing bottle
- [Explaining electricity](#) with colored plastic sheets.
- ["Static Electricity"](#)
- [Physics Demos, etc.](#)
- [Kid's sci. projects](#)

## **Science organizations**

- [UTexas Emissary](#) (online mentors)
- [American Assoc. of Physics Teachers](#)
- [American Journal of Physics](#)
- [NSTA Science Line](#). Curriculum information
- [Assn. for Science Education](#) (UK)
- [Optical Engineering Page \(SPIE\)](#)
- [Electric Power Research Institute](#)
- [National Science Foundation](#) (look at peoples grants!)



- [Fermilab Education Office](#) K-12 Science Resources
- [Brookhaven National Laboratories](#)
- [SSE Young Investigators](#)

## Free for Teachers (or cheap at least!)

- [NIH curric supplements](#)
- [TAMU Bio & Envir modules](#)
- [Lawrence Berkely Lab](#) teacher pack
- [NIH Curric Supplements](#) Medical Sci. CDROMs, also [online](#)
- [AGG Geographers](#) free CD
- [Howstuffworks](#) free magazine
- [VPW free videos](#)
- [Flinn Chem](#)
- [Nat. Energy Foundation](#) free videos, posters, etc.
- [About.com: teacher freebies](#)
- [NAP, Online sci/tech books](#) (entire books for free)
- [Microsoft Kids: free edu software](#)
- [Edu World freebies list](#) , and [More](#)
- [Kit: Journey Inside the Computer](#) (Intel Corp)
- [Free Science Posters](#) (Wright Center, Tufts U.)
- [US Geological Survey, free activity packets](#)
- [Teachnology freebies links](#)
- NASA:
  - [NASA JPL](#) posters, CDs, board games
  - [Visit to an Ocean Planet](#) NASA cdrom
  - [Space Educator Handbook CD](#)
  - [NASA Earth Observe. Sys \(EOS\) matls](#)
  - [NASA Edu. Resources](#), \$5 CDroms
  - Online picture books: [online book: geomorphology from space](#) , and [Oceanography from the Shuttle](#)

- [PCs in Space](#) free software (download or CDROM)
- [US Dept of Energy mail-order freebies list](#)
- [US Dept of Education mail-order freebies list](#)
- [US Enviro. Prot. Agency curric and videos](#)
- [Free science videos](#)
- [SciAm "Science Frontiers" guides](#)
- [NASA Starchild, free CDROM](#)
- [The Chalkboard](#) corporate resources
- [Free edu. software](#)
- [Free stuff: posters](#) (some sci/tech)
- [Fermilab](#), Topics in Modern Physics
- [Freebiezone: educational](#)
- Try [Google: free for teachers](#) , also [free to educators](#) and [free to teachers](#)

## **HOMEWORK HELP SITES**

- [MadSci](#), answers to thousands of science questions
- [Help Resource: science](#)
- [Pinchbeck's Homework Help](#)
- [Refdesk](#)
- [Excite](#): school/homework
- [KoolKidsStuff](#)

## **Online courses and Tutorials**

- [blackboard.com](#), create online courses
- [Mark D's Virtual Courses Collection](#) (recommended!)
- [Physics 2000](#)
- [Math Tutorial sites](#)
- [Electronics Tutorials Links](#)
- [Aerodynamics, grades K-8](#)
- [World Lecture Hall](#) (collection of courses)

- [Highschool Chemistry](#), ChemTeam Proj.
- [Physics Tutorials](#)
- [NetFrog Title Page \(interactive dissection!\)](#)
- [Electronic Textbook for PFP 94](#)
- [THE FACE OF VENUS: AN INTERACTIVE ATLAS DATABASE AND DOCUMENT](#)
- [Electronic books \(Minnesota\)](#)
- [C Programming Tutorial](#)
- [On-line course on programming language concepts](#)
- [GNA Course: Introduction to Object Oriented Programming Using C++](#)
- [A WWW page relating to an Invention and Design Course](#)

## Commercial Online Courses (costs \$\$)

- Tutornet homework help (temporarily removed, see below)
- [Complaints](#) against Tutornet, also [forum](#)
- [U. Phoenix Distance Ed.](#)
- [Physics courses](#), Ivy Tech State College
- [Adult Ed. and Distance Learning Resource Center](#)
- [Introductory Mechanics \(Mac Interactive Physics\)](#)
- [Chemistry Course](#)
- [The Electronic University: A Guide to Distance Learning](#)
- [U Wisconsin Distance Education Clearinghouse](#)
- [The Internet University](#)
- [Globewide Network Academy](#)

## Science Lesson Plans

- [PBS sci. lesson plans](#)
- [NPR "Science Friday" kids](#)
- [Reach Out Michigan](#) plans, [activities](#)

- [Lesson & Lab Exchange](#), "Terrific Sci."
- [K-6 physical sci. lesson plans](#) Rutgers
- [Core Knowledge" conference](#) (PDF lesson plans archive)
- [Discovery Channel mats](#)
- [Microsoft Encarta: Sci. Lessons](#)
- [Lessonplanspage: Science](#)
- [Teachers helping teachers](#) Science lesson plans
- [TEACHNET Science Lesson Ideas](#)
- [AskERIC: Lesson Plans Archive](#)
- [Sci. Activities Manual K-8](#)
- [Purdue ESSC Sci. Activities](#)
- [Volcanoworld Lessons Page](#)
- [Solar System Lesson Plans](#) from [Views of the Solar System](#) (LANL)
- [Lesson Plans Exchange](#) at [Engaging Science](#)
- [Sci. Classroom Activities, Franklin Inst.](#)
- [K-3 Rainforest Curric](#) fm Cal-Poly
- [GC EduNET Lesson Plans](#)
- [U. Kans. EXPLORER Curric.](#)
- [Web-quest Lessons '98](#), see also [Lessons '97](#)
- [KODAK Inc.](#) Science/photography lessons

### **Lesson plans, Libraries of Links:**

- [Yahoo index: science lesson plans](#)
- [Teachers' Resource: lesson links](#)
- [Awesome Library: Lesson Plans](#)
- [Science Lessons Links](#) (U. Mich)
- [McREL's](#) Science lesson links
- [SCSSI Lesson Plans](#)
- [NSTA SS&C Site](#), Science "Micro" lessons

## Sci. Classroom Kits & Curric. Packages (\$\$)

- [SEPUP](#) (Lawrence Hall of Science)
- [TOPS Science Activities](#) (huge collection, w/repro rights)
- [NASA identifying minerals via color spectrum](#)
- [PROOPS](#) science project kits
- [The Teaching Tank](#)
- [Kit: 18th Century Electricity](#)
- [Education Modules](#) from GASEF
- [REVIEWS](#) of Science Curric Packages from:
  - [Guidebook to Examine School Curricula](#) at ENC
- [Great Explorations in Math/Sci](#) (Lawrence Hall of Science GEMS)
- [Full Option Science System](#) (Lawrence Hall of Science FOSS)
- [INSIGHTS](#) K-6 and 7-8 Inquiry-based Science Curric.
- [Hands-On Elementary Science](#)
- [The Private Eye](#)

## Science Outreach Companies

- [The Science Club](#) (WA)
- [Sciencetelling](#) (NJ)
- [EarthBalloon](#)
- [Science Bob](#)
- [Needham Science Center](#) (MA)
- [Let's Talk Science](#) (CA)
- [Magnet Man](#) (WI)
- [Sandia Labs](#)
- [UIUC Physics Outreach Van](#)

## Useful Info

- [SURPLUS](#) mail-order supply catalogs for sci/electronics hobbyists.
  - [Science Stores](#) and Edu. suppliers
  - My [Newsgroups'](#) newsrc
  - [Webpage Flaws](#) links & articles
  - [Shareware Archive](#)
- 

## Science Ed. Resources

### Indexes (large link collections):

- [Project FREE index: science](#)
- [ENC: Science](#) lessons/activities links
- [Frank Potter's Science Gems](#), giant link-archive, lots of Java applets
- [Newhoo:Education:Science](#) (New smaller alternative to giant Yahoo)
- [BBC Edu. Webguide](#)
- [Pinchbeck's Homework Helper: Science](#)
- [Yahoo - Education:Math and Science Education](#)
- [Infoseek Kids Science Activities](#)
- [SBG Best of the Net](#)
- [SciCentral K-12 Page](#)
- [Homeschool list: activities links](#)
- [Fed. Resources for Edu. Excellence \(F.R.E.E.\)](#)
- [Magellan Sci. Edu. Top Picks](#)
- [Sci Curric Links](#) at [SAMI](#) (Annenberg/CPB)
- [General Sci.](#) at Edu. Index
- [Computer Currents Magazine: Science](#)
- [Edu Gateway](#) at DOD
- [GEMS Hotlinks](#), Lawrence Hall of Science
- [Science Edu. Hot Links](#) from [TOPS](#)
- [Site of the Month](#) from [ENC](#)

- [WEBSEEKERS](#):Sci. and Technology
- [STANet](#) teaching resources, ask expert
- [PITSCO Collab. Projects](#) (large collection of sci. edu. links)
- [ONLINE EDUCATOR's](#) link collection (click "science")
- [ICONnect: Curriculum Sites for Science](#) (was Askeric index)
- [NSTA's Link Collection](#)
- [Hotlist](#) of K-8 Sci Teacher Networking Proj.
- [BlueWeb'n](#) for Librarians and Educators
- [Explorer Home Page](#)
- [School Science List](#), sites archive
- [Berit's Best Children's Sites](#)
- [EIN Galaxy](#)
- [CVSP Resources list](#)
- [Science & Math Resources for Education](#)
- [Biology & edu. resources](#)
- [The World-Wide Web Virtual Library: Education](#)
- [Explorer K-12 Education Links](#)
- [K-12 Gopher collection](#)
- [Schoolsci](#)
- [Infolist for Teachers](#)
- [Index of The Science Teacher \(NSTA\)](#)

#### **Links to Science Edu. Sites**

- [The Biology Binder](#)
- [Kids & Science](#) (Tech. U. of Vienna)
- [PBS: Nova](#)
- [International Space Station: games](#) NASA/Wju
- [Sci. clip art](#)
- [Discovery Channel: Exploration Network](#)
- [Science Teaching Discussion Groups](#)

- [Microbiology Portal](#)
- [Action Bioscience](#)
- [Infra-red Zoo](#) and [online video](#)
- [GE curric module on saving energy](#)
- [Green Frog News](#) (Enviro Student Newsletters)
- [NASA student competition: drop tower](#)
- [Ocean Discoveries](#)
- [Hands-on microbe activities](#)
- [Spacekids page](#)
- [Design Your Future:Math/Sci/Tech for Girls](#)
- [Mark K's edu. projects: how things work](#)
- [Science Analogies](#)
- [RESOURCE WORLD](#), natural resources used in everyday objects
- [Cavalcade o' Chemistry](#)
- [The Big Guy's Science Page](#)
- [Assn. for Science Education](#) (UK)
- [Fisher Scientific: teaching tips](#)
- [New Newsgroup: ALT.SCI.AMATEUR](#)
- [Chem-4-Kids](#) (also Bio and Physics sections)
- [KIDSWEB:Science](#)
- [K-3 Rainforest Curric](#) fm Cal-Poly
- [SSE Young Investigators](#), unusual sci. carrers
- [Event-based Science](#), NSF project
- [CERES](#), NASA astronomy classroom activities
- [Cool Sci. for Curious Kids](#)
- [NPR Science Friday Kids Connection](#)
- [Mentors Page](#) at NPR "Sounds Like Science" show
- [How Stuff Works](#)
- [Teacher Help Service](#) (Annenberg/CPB)
- [Microsoft Encarta Encyclopedia](#)
- [Mr. Warner's Cool Science](#)



- [Origins in the Universe](#)
- [B. Jacobs's Chemistry Resource Links](#)
- [PBS/NOVA educator's page](#)
- [Inventor Resources for Kids](#)
- [Creativity & invention](#) in spite of Science
- [AAAS Children's Science Book Reviews](#)
- [UW COURSES](#) for Science Educators in the NW
- [HOLOWORLD](#) (holograms)
- [Natural History of Genes](#)
- [Moonlink](#) virtual trip to the moon
- [Nat. Academy Press](#), online books in GIF/PDF
- [Science Teachers' Lounge](#)
- [The Why Files](#)
- [HP email science mentors](#)
- [Access Excellence](#) (bio teaching)
- [Jason Project](#)
- [W. U. Young Scientist Program](#)
- [U. Tenn. Science Bytes](#)
- [Weather Reports](#) for USA locations
- [Weather Satellites](#) GIFs & Movies
- [Latitude & Longitude](#) for cities
- [K-4 weather unit](#)
- [Bee Eye](#) view of the world
- [Newton's Apple](#) Lesson Plans
- Interactive internet [MACHINES](#), live cameras, etc.
- [Ask ERIC](#) large resource site, lesson plans
- [K-4 Science sites](#)
- [Microsoft/NSF Global Schoolhouse Project](#)
- [Elementary Science This Month](#) Electronic Magazine
- [Eisenhower National Clearinghouse](#) K-12 Math/Sci curric. matls.
- [BBC Science Ed.](#)

- [Schreber's Fantastic Beasts](#)
- [Bill Nye](#)
- [Kidopedia project](#)
- [Newton Ask A Scientist](#)
- [Cornell Theory Center Math and Science Gateway](#), curric., software.
- [Cornell Theory Center](#) Impressive scientific video archives
- [SAS Index pages](#)
- [The Scientist Newsletter](#) \*many\* issues online
- [Science/Math lesson plans](#)
- [NASA JPL](#) teacher site
- [The Fractal Microscope](#)
- [JASON Project](#) classroom remote underwater robot
- [Some online science mags.](#)
- [Visible Human](#) project
- [Students For Exploration and Development of Space](#)
- [S.E.D.S ftp](#)
- [Amazing Science at the Roxy](#)
- [Internet Resources for the K-12 Classroom](#)
- [NCSA Education Program Home Page](#)
- [Edu. weathersat project](#)
- [The WELL \(Whole Earth 'Lectronic Link\)](#)
- [Education \(K-12\) Worldwide](#)
- [Engines for Education](#) online book
- [Scholastic Home Page](#)
- [Eight Things That Can Be Done](#)
- [Educational Supercomputer Science Center](#)
- [The Text Project \(MIT\)](#)
- [Electronic journals and newsletters](#)
- [University of Washington Libraries \(UWIN\)](#)
- [Learning Innovations](#)

- [The Internet Bookshop](#)
  - [Young Scientist Network \(archive\)](#)
  - [Young Scientist Network](#)
  - [Scientific American Issue 1](#)
  - [NASA StarChild](#)
  - [NASA Hi-energy Astrophysics Learning Center](#)
  - [Science Teacher Program](#)
- 

## Physics Resources

### Indexes (link collections)

- [Alan Cairn's physics index](#)
- [Yahoo: Physics](#)
- [Yahoo: Physics Edu.](#)
- [Physics around the world](#)
- [Cambridge Physics Outlet's collection](#)
- [Phys. teaching discussion groups](#)
- [AIP physical sci. resources](#)
- [Physics gopher collection](#)

### Physics Software

- [Cool applets!](#)
- [Physics Sim in Education](#)
- [Frank Potter's Science Gems](#), lots of Java applets
- [Physlets](#)
- [Simulations](#) for Interactive Physics(tm)
- Educational Shareware Library (gone)
- [Educational Software Cooperative](#)
- [TIPTOP: Virtual Physics Demos](#) (in Java, etc.)

- [Daresoft shockwave sims](#)
- [Physics Applets](#) at Davidson
- [Online Simulations](#) in Shockwave
- [Free Educational Software](#)
- [CELLAB](#) Cellular Automata Laboratory
- [KSU SharePhys](#)
- [Physics SW fm Ed Schweber](#)
- [Free physics software](#) from AAPT
- Simtel archive science shareware for [win-95](#), [win-3.1](#), [msdos](#)

### **Physics Edu. Sites**

- [AAPT resource center](#)
- [Balloons as molecules](#)
- [Free physics textbooks reviewed](#)
- [Shade Tree Physics](#)
- [Amusement Park Physics](#)
- [NSF Fellowships](#): grad students assist K-12 teachers
- [Back of the Envelope](#)
- [Creating Physics Understanding](#)
- ["New way to learn,"](#) from [NSF Frontiers](#)
- [Comp. Conceptual Curric. for Phys. Project](#) (check this out!)
- [ncl physics demos](#)
- [Brown U. phys demos](#)
- [U. Texas phys demos](#)
- [MAC Physics Demo Handbook generator](#)
- [American Journal of Physics \(AJP\)](#)
- [Sarfatti's Internet Science Education](#) site
- [The Well's](#) archive via gopher
- [PHYSlab](#), a physics BBS
- [Physics page](#)

- [NCSU Project Viewgraph](#)
- [NCSU Physics Education Research](#)
- [U Idaho science](#)
- [a physics home page](#)
- [Center for Astrophys, Sci Ed Dept \(Roy!\)](#)
- [Fractals](#)
- [ZEBU: UO Physics WEB Server](#)
- [Applied Physics Lab, Univ. of Wash. Welcome Page](#)
- [Comet Shoemaker-Levy Home Page \(JPL\)](#)
- [The ElectroScience Laboratory Home Page](#)
- [Space Activism Home Page](#)
- [Vacuum systems](#)
- [X-Ray WWW Server](#)
- [NCSU Physics Demos](#)
- [The Belljar, physics projects newsletter \(.txt\)](#)
- [Tesla Page, coil project info](#)
- [Amateur robotics at U. MN](#)
- [PHYSOC, U. of Sydney Physics Society](#)
- [MIT's Annals of Improbable Research](#)
- [Physics market place](#)
- [KSU. PIRA Physics demo stuff](#)

## Other sections here

- [AMATEUR SCIENCE](#)
- [KIDS' PROJECTS](#)
- [SCIENCE DEMOS](#) ARTICLES, EXPERIMENTS, EXHIBITS
- [WEIRD SCIENCE](#) - ENERGY, GRAVITY, "CRAZY"  
INVENTIONS
- [SCIENCE EDUCATION RESOURCE WWW LINKS](#)

- [\*\*SCIENCE MUSEUMS\*\*](#)
  - [\*\*HOME SCHOOLING LINKS\*\*](#)
- 

<http://amasci.com/edu.html>

Created and maintained by [Bill Beaty](#). Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

[UP TO SCI. HOBBYIST AWARDS GOOD STUFF NEW STUFF](#)

# HOME SCHOOLING RESOURCES

## (SCIENCE, MOSTLY)

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This page is part of [SCIENCE HOBBYIST](#). Don't miss the [kid's science projects!](#) Lots of other stuff too, at [THE SCIENCE CLUB](#) section.

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[Some info](#) about the HOME-ED Listserv. Home-ed is an e-mail discussion group with lots of traffic and lots of homeschoolers.

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On "[Newsgroups](#)", check out these groups:

- [ALT.EDUCATION.HOME-SCHOOL](#)
  - [MISC.EDUCATION.HOME-SCHOOL.MISC](#)
  - [MISC.EDUCATION.HOME-SCHOOL.CHRISTIAN](#)
  - [ALT.EDUCATION.ALTERNATIVE](#)
  - [ALT.EDUCATION](#)
  - [ALT.EDUCATION.HOME-SCHOOL.DISABILITIES](#)
  - [Other chats and forums](#)
- 

Best darn book catalog I've ever seen: [GENIUS TRIBE](#). (No longer available, customers all defected to amazon.com)

Worthwhile [microscope](#) hidden in a tool catalog.

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## Some Links to Homeschool and Alternative Ed WWW sites.

- [A to Z Homes Cool](#)
- [Jon's homeschooling page](#)
- [Homeschooling discussion groups](#)
- ["Newhoo" index: homeschooling](#) (alternative to Yahoo!)
- [Yahoo Homeschooling directory](#)

- [School is dead, learn in freedom](#)
- [Science for families](#)
- [Creating a high-powered home learning environment](#)
- [Gifted kids, myths & facts](#)
- [Homeschoolzone Science](#)
- [The Homeschooler](#)
- [Homeschool World](#)
- [Home Ed Press](#)
- [Sudbury School](#) alt school
- [Yahoo Homeschool business directory](#)
- [Jon's Link Collection](#)
- [Homeschooling Best of the Net](#)
- [HomeTaught](#)
- [Gifted/Talented](#) Resources
- [Heather's Homeschooling Page](#)
- [Inst. for Achievement of Human Potential](#)
- [Home-Ed Kids](#)
- [Homeschooling Homepage](#), Bellevue, WA (has WHA and HSA stuff!)
- [The Teel Family Homeschool page](#)
- [The Eclectic Homeschool](#)
- [Joe Spataro](#) page

## Homeschool magazines and journals

- [Growing Without Schooling \(GWS\)](#) and John Holt bookstore
- [Home Education](#)
- [Homeschool Dad Magazine](#)
- [Practical Homeschooling](#)
- [The Teaching Home](#)
- [Homeschool Digest](#)
- [I Love Homeschool](#) monthly email newsletter

## "Curriculum Swap" Sites

- [Homeschooler's Curriculum Swap](#)
- [Books Galore](#)
- [Classified Ads](#) at The Homeschooler



## Some Commercial Sites

- [BrainPop: science movies](#) (Flash)
- [The Home School](#)
- [John Holt bookstore](#)
- [Pat's Preserved Specimines](#)

## Links to Homeschooling Articles

- [What is unschooling?](#), and here's a [links collection](#)
- [Progressive writings](#) from Netizen Activist's Resources
- [Edu. Ideas Archive](#)
- [Six-Lesson Schoolteacher](#), by John Gatto (and a [Seven-Lesson](#) version)
- [Ten Reasons](#) to Homeschool

## Some Links to Education Resource Directories

- [Bill B's Science Ed resources \(links collection\)](#)
- [Science Lesson Plans](#)
- [Online Courses](#)
- Educational Shareware Library (gone)
- [Educational Software Cooperative](#)
- [Science & Math Edu. Resources](#) page. RECOMMENDED! (in Bellevue, WA)
- [Yahoo master Education Index](#)
- [Biology & edu. resources](#)
- [ASK ERIC: Homeschooling](#)

## Kids' Science Projects

- Moved to [here](#)
- [Links to other "Science Projects" sites](#)

## Kids Asking Scientists...

- Moved to [here](#)

## Some Science Ed. Resources

- [The Science Hobbyist](#)
- [Bill B's Amateur Science page](#)
- Beware of [School Textbooks!](#)
- [Science Ed. Links Collection](#)

## Curriculum and Lesson Plans

- [here](#)

## Science Education suppliers/stores

Moved now to [here](#)

## Other sections here

- [AMATEUR SCIENCE](#)
- [SCIENCE DEMOS](#)
- [SCIENCE MISCONCEPTIONS](#)
- [SCIENCE MUSEUMS](#)
- [WEIRD SCIENCE](#)

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<http://amasci.com/amateur/home.html>

Created and maintained by [Bill Beaty](#). Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

# Webpage design flaws

## Mistakes to avoid

- [Top Ten Mistakes in Web Design](#), J. Nielsen, Sun Computer ([and other columns](#))
- [Top 15 newbie mistakes](#)
- [Art and the Zen of Web Sites](#) (I recommend this one highly!)
- [Dear Webby](#) (page design advice)
- [Resources on Web Style](#) (bad pages)
- [Webpages That Suck](#)
- [Making a webpage flop](#)
- [Bad Style Page](#)

## Other resources

- [Bill B's web secrets](#), increasing your hit count
- ["Best viewed with NxxxxPExx ANY browser"](#)
- [BOBBY](#) online accessibility validator (excellent!)
- [Website Repair](#): widening your audience
- [Yahoo: Handicapped Accessible Websites](#)
- [Basic Webpage Design](#)
- [Hints for Web Authors](#)
- [Designing an Accessible Webpage](#)
- [Lynx page](#)
- [Web Handicapped Accessibility Guidelines](#)
- Take the [Web Interoperability Pledge](#)
- [HTML validation service](#)
- [Yahoo: HTML checkers & validators](#)

## Some J. Neilson Columns:

- Top ten [mistakes of Web management](#) (June 15, 1997)
- Be succinct: how to [write for the Web](#) (March 15, 1997)
- Why [frames suck](#) most of the time (December 1996)

- Web access for [disabled users](#) (October 1996)

## Bill B's Advice

Always test-view your web designs with a text-only browser like LYNX. If your webpage is not usable by this most basic of all browsers, you will also drive away or offend such users as:

- People with graphics turned off for speed (large number of users)
- The community of vision-impaired net users (using text/speech sw)
- People using VT-100 terminals in libraries
- People on inexpensive "freenet" accounts
- Low-income school kids using 286 machines and 2400b modems
- People who use LYNX for ultra-high speed Web exploration
- Users on UNIX shell accounts using Lynx for convenience (me!)

Actually, it's a very good idea to develop all your pages with a text-based browser, then add necessary graphics later. This will force you to view your page as a provider of content, as is only right. It forces you into a top-down design for browser compatibility. First you create the content, then add graphics, then add layout, then fancy features. This gives your page "graceful degradation" when browser incompatibility issues arise: some browsers can't see the fancy features but everything else works. Others screw up the layout, but at least the graphics and text content comes through. Some users won't see the graphics, but all the text is still there. This is good design, and even at worst it is still usable by nearly all browser software. Always include a webmaster's "mailto:" link at the bottom of every page. (or, to avoid spam, include a form which forwards email, or instead use a GIF or JPG graphic of your email address which spammer software can't read.) That way if you accidentally screw something up on your page, some nice person MAY tell you about it eventually. If there's no obvious way to contact the page owner, your embarrassing mistake might remain there for ages.

Always include a link to previous pages or to the top of your site. Large numbers of users come to your site through deep pages found by web-search programs. If some tiny fourth-level submenu on your site attracts lots of users, yet it doesn't point directly to the rest of your vast and wonderful website, those users who find the subpage will have no clue that the rest of your site even exists.

On the top page of your site, never use frames, image maps, animations, or gigantic gif/jpegs/audio files. You want to welcome ALL browser types, at least initially. If your top page contains specialized techniques which aren't compatible with all browsers everywhere, then anyone who uses some slightly-incompatible software will immediately leave in disgust. If you have to offend certain users with a frames-heavy, graphics-heavy site, at least hook them in with a good, fast-loading top page. Save the slow or incompatible stuff for deeper menu levels. Your top page should be intentionally text-only (with maybe a few small, fast graphics), and with a link to GRAPHICS VERSION and FRAMES VERSION. Not the other way around!

<http://amasci.com/mistake.html>

Created and maintained by [Bill Beaty](#). Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

[Up to MAIN SITE](#)

[NW JOB LINKS](#)

# William J. Beaty [BIO](#)



Office webcam, UW campus

Age 45, divorced. [Electrical engineer, exhibit designer, consultant](#)

Main sports: crackpot physics. Sitting and thinking.

[This one](#) is non-smoking, but it occasionally tries odd beers.

Not very American. Grew up on [Guam](#). Still doesn't know the rules for football. And USA girls are [too skinny!](#)

Daughter in grade school. Day job = [U. of Washington](#)

[Reads](#) far too much, (how long before entire brain am FULL?!)

Messy but knows EXACTLY where everything is.

Trying to make the world a better place. Who's the real fool?

Makes [art](#), runs a [salon](#), attends [dorkbots](#).

Enjoys [twisted](#) childlike music: [Bobs](#), [TMBGiants](#), [Lehrer](#), Yankovic.

[Threepenny opera](#), Vincent. The Ventures and Un Bel Di.

Eats: mostly veg, Indian, Thai, Japanese, & [anything weird](#).

Hangs out on [Usenet](#), also on [The Straight Dope](#)

Me brane 'urts from Python & Red Dwarf, [The Onion](#), David Lynch,

[Gahan Wilson](#), [Crumb](#), Paul Bartel, Bob, [John Waters](#).

Great fan of unusual [phenomena](#) & research, Castenada, Seth, utter self-honesty, [awareness](#), excessive [introspection](#), rapid spiritual growth.

Talks to animals; cats, dogs, conures, budgies, amazons, rats, spiders.

Movies: The Man whwdbe King, Real Genius, Little Big Man, Young Frnkstn

Heroes: the usual (Tesla, Feynman, etc.) plus [A. Jarry](#) and [G. N. Pyke](#)

Member: [LFHCS](#), [AAPT](#), [ESA](#), [SSE](#)

Yes, I do give talks on [Electricity, k-6 misconceptions](#)

William J. Beaty  
7540 20th Ave NW  
Seattle, WA 98117  
H: 206-789-0775  
W: 206-543-6195  
[Resume'](#) [BIO](#)

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*People that are really very weird can get into sensitive positions and have a tremendous impact on history. - Dan Quayle*

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email: [billb@amasci.com](mailto:billb@amasci.com)

URL: <http://amasci.com>

FTP: <ftp://ftp.eskimo.com/u/b/billb>

[All of the Good Stuff](#)

[Manually induced brain damage](#)

[Frequently Asked Questions](#)

[What A Shocking Career](#)

[Me and Misconceptions](#)

[Why fringe science?](#)

[SERMON #49: math & honesty](#)

[Science is perception.](#)

[Answered science questions](#)

[Anti-skepticism articles](#)

[Resume'](#)

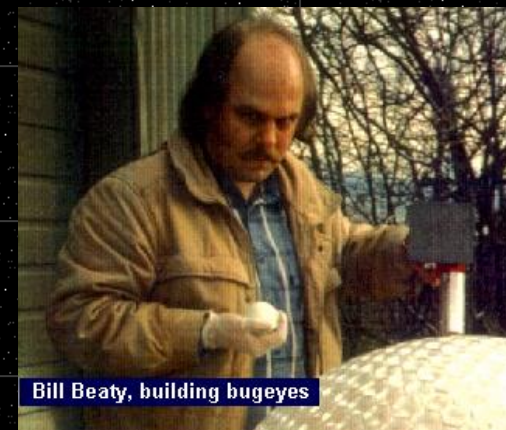
---

*"Physics is like sex. Sure, it may give some practical results,  
but that's not why we do it." - Richard [Feynman](#)*

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## FAQ:

- [WHY DON'T YOU ANSWER MY EMAIL?](#)
- [THIS SITE LOOKS LIKE SOMETHING FROM 1994!](#)
- [WHAT IS YOUR COMPANY, WHAT ARE YOU SELLING?](#)
- [WHY ARE YOU INVOLVED IN FRINGE SCIENCE?](#)
- [BUT PHYSICS IS SUPPOSED TO BE COMPLEX!](#)
- [CAN I PUT YOUR LINK ON MY SITE?](#)
- [SEND ME SCIENCE FAIR IDEAS! NOW!](#)
- [PLEASE SEND ME ALL YOUR INFO ABOUT ~~XXXXXX~~.](#)
- [WHAT IS THIS "FREE ENERGY" STUFF?](#)
- [HOW DID YOU GET LIKE THIS?](#)
- [WHERE ARE ALL THE KEWUL GRAPHICS?](#)
- [WHAT DO YOU HAVE AGAINST 'FRAMES'](#)
- [HOW'D YOU GET SO MANY HITS?](#)
- [HOW'D YOU MANAGE TO CREATE SO MUCH STUFF?](#)
- [WHERE DID YOU \\*GET\\* THIS JUNK?!](#)



*"The weirder you are going to behave, the more normal you should look. . . When I see a kid with three or four rings in his nose, I know there is absolutely nothing extraordinary about that person. "* -- P.J. O'Rourke

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LARGE SITE ICON



SCIENCE  
HOBBYIST

SMALL SITE ICON



SCIENCE  
HOBBYIST



Photos positioned wrong? So drag 'em around. Try it!

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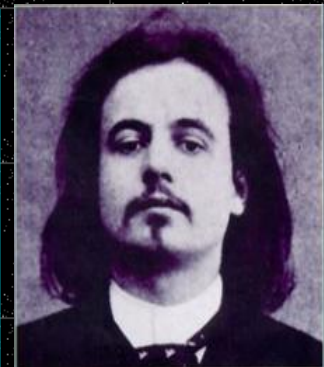
## Technophobe

- [Earthwalk Northwest](#), Issaquah, Primitive living skills
- [paleodiet](#)
- [Society of Primitive Technology](#)
- [primitiveways.com](#)
- [Inner Caveman](#) book list
- [Tom Brown \(Tracker\)](#)



[9/13/2003 Article](#)

(C)The Seattle Times, Mark Harrison





## HTML & WEBSITE STUFF

- [HTML Tutorial](#)
- [DDRIVE](#) moving sprites, javascript
- [Webmonkey](#) (large tutorial site)
- [Webmonkey javascript archive](#)
- [Netscape's HTML Extensions](#)
- [Netscape's HTML Tables](#)
- [HTML Tags](#)
- [Icons for Web pages](#)
- [Yahoo, HTML help](#)



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It is amazing what you can accomplish if you do not care who gets the credit.  
--Harry Truman

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## TOYS!

- [My toys page](#)
- [Gobler parody](#)
- [BLO](#) Barbie Liberation Org.
- [J. Pound](#) Garbage Pail Kids, Meanie Babies, etc.
- [House of Toys](#)
- [Toys of the '60s](#)

## Weird ebay sections

- [Sci. Instruments; medical](#)
- [Night Vision](#)
- [Electrostatics](#)
- [x-ray tubes](#)
- [Rocks; radioactive](#)
- [Rocks; meteor](#)
- [misc high voltage](#)
- [Weird](#)
- [Weird:Bizarre](#)
- [Quack Medical Devices](#)

## BBW

- [Les Toit BBW art](#)
- [1890 'porn'](#), or [more recent](#) types
- [Hilda calender](#), and [another](#)
- [BBWnorthwest](#)
- [BBW Goth forum](#)
- [List; no-charges personals](#)
- [Octopus steam](#), [Tentacle fun](#), and just plain [Weirdo](#)

## Local Seattle stuff

- [House of Science](#) (electronic surplus, ballard)
- [Earthwalk Northwest](#), Issaquah, Primitive living skills
- [Hokum Hall \(vaudeville!\)](#)
- [Ballard: live music](#), and [pubs](#)
- [The Stranger: movie times](#)
- [Ferry Schedules](#)
- [Zip code map tool](#)
- [Subterranean Cinema](#)
- [Pleaseeasaur](#) twisted performance
- [Jobs Page](#)
- [Seattle "Weird Science" Salon](#) monthly meetings
- [NEWSGROUPS: Seattle.\\*](#)
- [JAVA Bus Viewer](#)
- [Confounded Books](#)
- [Zanadu Comics](#)
- LOCAL GOVT
  - [License renewal](#)
  - [Emission Test locations](#)
  - [Pay a parking ticket](#)
  - [Police](#)
- [Fremont outdoor cinema](#)
- [Electronic Dimensions](#) (surplus, Tacoma)
- [Seattle Movies](#)
- [SF Northwest](#)
- [Seattle Comics History](#) at [MiscMedia](#)
- Personals
  - [Craigslisat Seattle](#)
  - [Stranger Personals](#)
  - [Seattle Personals](#)
  - [Kiss](#)

- [Sea. Singles](#)
- [match.com](#)
- [Matchdoctor](#) (free!)
- [PS Mycological Society](#)
- [COHO School](#)
- [Speakeasy Cafe in Belltown \(has a T1!\)](#)
- [Eskimo Seattle WWW sites](#)
- [Seanet Seattle page](#)
- [City of Seattle](#)
- [Metro Riderlink Bus Sched.](#)
- [Washington DOT Traffic Map](#)
- [Index of Seattle WWW pages](#)
- [Pacific NW Earthquake monitor net](#) and [Schoolnet stripcharts](#)
- [Web pages of Seattle internet providers](#)
- [WA Real Estate Network](#)

### Libraries

- [Seattle Public Library](#)
- [King Co. Library](#)
- [BOOK SALE: Friends of SPL](#)
- [Friends of Seattle Pub Lib](#)
- TELNET: [Seattle public library](#) login:library
- TELNET: [King County Library](#) login:kcls
- TELNET: [University of Washington Information Navigator \(UWIN\)](#)
- TELNET: [ESKIMO.COM](#), (not a library!)
- [vortex-1](#)
- [Internet Public Library](#)

### WWW Index Sites

- [Google](#) (they keep copies of webpages!)
- [Wayback Machine](#) (old sites archived)
- [SCIRUS science websearch](#)
- [DMOZILLA OPEN DIRECTORY PROJ](#) like Yahoo, run by volunteers, no ads!
- [PDF-only Search \(Adobe\)](#)
- [DirectHit](#) (fast)

- [AllTheWeb](#)
- [ASK JEEVES](#); ask questions using English
- [BestOfTheWeb](#)
- [WhereTheHell](#)
- [NORTHERN LIGHT](#)
- [DOGPILE](#), like metacrawler (searches other engines)
- [ALTAVISTA](#), good for excluding particular phrases & sites
- [METACRAWLER](#), uses Altavista, Lycos, Yahoo, etc. to search
- [HOTBOT](#), newer one
- [LYCOS](#), older one
- [EXCITE](#)
- [WEBCRAWLER](#)
- [GOTO](#), simple one
- [W3 VIRTUAL LIBRARY](#)
- [ALTAVISTA LOOKSMART](#), like Yahoo
- [EBLAST](#), (Britannica) (fairly slow to load)
- [MICROSOFT](#)
- [MORE...](#)
- [MORE...](#)(Uncle Al's)

## Patent Search

- [IBM patent server](#)
- [US Patent/Trademark Office](#) searcher (Very new! 11/95)
- [Micropat](#), order patents thru internet
- [YAHOO: Patents](#)

## Newsgroups

- [Newsgroup searcher!](#)
- [Newsgroups readership stats](#)
- [Usenet Newsgroups: Resources](#)
- [List of Newsgroup FAQs](#)
- [My Newsgroups'](#) newsrc

## Useful Info

- [Multiple Mentality training](#)
- [DDRIVE](#), learn javascript
- [Domain Name Index](#)
- [justlinux.com](#): applications
- [PIX.COM](#) website T-shirts, mugs
- [Antispam Stuff](#)
- [Webmonkey](#) web design tutorials
- [Booming Sand](#)
- [Spam filters](#)
- [Spider Robinson](#)
- [Anti-spam resources](#) unsolicited email
- **EMAIL HOAXES:**
  - [Purportal hoax/UL searcher](#)
  - [Norton antivirus: virus hoaxes](#)
  - [LANL/CIAC virus archive: the hoaxes](#)
  - [Urban Legends: email as a virus](#)
  - [Virus myths: hoax warnings](#)
  - [Datafellows hoax warnings](#)
  - [Thought-virus email](#)
  - [Hoax news](#)
- [More Castenada](#)
- [Castaneda, shaman or sham?](#)
- [Castaneda WWWboard](#)
- [Casteneda site](#)
- [Cool Science Sites](#)
- [SURPLUS](#) mail-order supply catalogs for sci/electronics hobbyists.
- [Roy Gould's page](#) at Harvard CFA's [SED](#) Dept.
- [Telescope](#)
- [Webster's Dictionary](#)
- [SimTel Shareware Archive](#)
- [Shareware searcher](#), cnet's VSL
- [Publicly Accessible Internet Mailing Lists](#)

- [Hot Java Homepage](#)
- [How to charge for your Internet services!!](#)
- [Add advanced web page features to your server!](#)
- [HOTWIRED](#) (Recommended)
- [NETSCAPE FRAMES](#)
- Interactive internet [MACHINES](#), live cameras, etc.
- [Politics!](#)

## New WWW pages worth checking out

- [Yahoo: Practical Jokes](#)
- [Society for Amateur Science](#)
- [GEEKGIRL](#) zine
- [Arbor Scientific](#)'s catalog of cool science demos, toys, etc.
- [Gary Hawkins'](#) web page
- [UML ftp](#) shareware PC games

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[SocialGrid ID Code](#)



<http://amasci.com/billb.html>

Created and maintained by [Bill Beaty](#). Mail me at: [billb@amasci.com](mailto:billb@amasci.com)

# SIGNIFICANTLY WORTHWHILE - BOOKS -

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[SCIENCE EDU.](#)

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FEYNMAN](#)

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# Amateur Science: Kids

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<b>THE AMATEUR SCIENTIST: complete 20th century collection</b> <b>by Shawn Carlson, Sheldon Greaves</b>	<b>\$24.99</b>	<a href="#">Author's Site</a>	<a href="#">BUY or READ REVIEWS</a>
<p>All science amateurs need this CD. It takes hundreds of pounds of Scientific American magazine and concentrates the good stuff onto a single CD with 2,100 pages of illustrated science projects. Carbon dioxide lasers, satellite receivers, and all the rest, see <a href="#">index</a>. (It was a great deal at \$89, but now the price down to \$26!)</p> <p>2000 Tinkers Guild, pp2100 on CD</p>			

<b>ZAP SCIENCE: A Scientific Playground in a Book</b> <b>by John Cassidy, Paul Doherty, &amp; Pat Murphy</b>	<b>\$17.96</b>	<a href="#">Author's Site</a>	<a href="#">BUY or READ REVIEWS</a>
<p>This is the book I wanted when *I* was 10 (if it had been published back in those ancient times.) All sorts of cool stuff to do, includes a "zap tube", 3D glasses, moire disks, polaroid plastic, stink patch, &amp; more.</p> <p>1997 Klutz press, sturdy spiral-bound, w/experiment mats, pp100</p>			



**THE KLUTZ BOOK OF MAGNETIC MAGIC, by Paul Doherty, John Cassidy & Martin Gardner****\$9.56**

An excellent "magnets experiments" book for kids, and it comes with its own set of magnets. By Paul Doherty of the [EXPLORATORIUM](#) science museum.

1994 sturdy spiral-bound, magnets pouch, pp68

[Author's Site](#)

[BUY or READ REVIEWS](#)

**200 Illustrated Science Experiments for Children by Robert J. Brown, Bob Brown****\$10.36**

1988 ppbk, 186pp

Author's Site

[BUY or READ REVIEWS](#)

**333 Science Tricks and Experiments by Robert J. Brown, Bob Brown****\$11.95**

1986 ppbk, 199pp

Author's Site

[BUY or READ REVIEWS](#)

**333 More Science Tricks and Experiments by Robert J. Brown, Bob Brown****\$10.95**

1988 ppbk, 228pp

Author's Site

[BUY or READ REVIEWS](#)

Find more **Kids' Science Books:**

# Amateur Science: Adults

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<p><b>THE ART OF SCIENCE: A Practical Guide to Experiments, Observations, and Handling Data</b> by Joseph Carr</p>	<p><b>\$15.96</b></p>	<p>Author's Site</p>	<p><a href="#">BUY or READ REVIEWS</a></p>
<p>Newly ordered, not yet reviewed</p> <p>1993 Hightext Pubns, ppbk, pp365</p>			
<p><b>ELECTROSTATICS, by A. D. Moore</b></p>	<p><b>\$11.96</b></p>	<p><a href="#">Publisher's site</a></p>	<p><a href="#">AMAZON BUY REVIEWS</a></p>
<p>The ultimate "static" electricity experiments book, by the Grand Old Man of electrostatics. Dr. Moore gives away all his teaching and demonstration ideas! Includes plans for numerous generators and devices, including the Dirod, the high-speed Wimshurst-like generator. ELECTROSTATICS has long been out of print. Get one at any cost and see what you've been missing. If you already know about Moore's book, then here finally is the solution to all those library fines and the guilt that builds up when you keep borrowing the same library book over and over. In low-cost paperback form, even!</p> <p>1997 paperback pp243</p>			
<p><b>PROCEDURES IN EXPERIMENTAL PHYSICS, by John Strong</b></p>	<p><b>\$25.95</b></p>	<p>Author's site</p>	<p><a href="#">AMAZON BUY REVIEWS</a></p>
<p>The classic book for the advanced amateur. Vacuum technique, glassblowing, optics, etc.</p> <p>1986 paperback</p>			

**HOMEMADE LIGHTNING, by R. A. Ford****\$17.95**

Plans for a high-speed sectorless Wimshurst Electrostatic Generator. This is a must-have book for all electrical experimenters, since Mr. Ford gives loads info about interesting and little-studied areas of electrostatics where amateurs stand to make genuine discoveries.  
pp223 1995 paperback

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## General Science

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**Figments of Reality: the Evolution of the Curious Mind**by **Ian Stewart, Jack Cohen****\$13.56**

I can't top this review: "At long last, a worthy successor to [Gödel, Escher, Bach](#), updated, twisted, and put through a Monty Python filter." *Figments* intertwines philosophy, humor, nonlinear dynamics, humor, psychology, and fluffy yellow aliens who are deciding whether Humankind is a threat worthy of vaporization.

1999, ppbk, 339pp

Author's  
site[AMAZON  
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REVIEWS](#)**The Meme Machines**by **Dr. Susan Blackmore****\$17.50**

If you've encountered "memes" before, you'll definitely enjoy this one. Memes are information infections; ideas with a life of their own. The Self as a mental virus, human consciousness as a meme infection!?

1999, hdcvr, 272pp

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REVIEWS](#)**Passionate Minds: The Inner Life of Scientists**by **Alison Richards, Lewis Wolpert****\$17.50**

What is Science? Check out this large, excellent collection of interviews with contemporary scientists. A must-read book for students, future scientists, and anyone wanting good insights into what science is really all about.

1998, hardcover, 240pp

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**SEEING THE LIGHT : Optics in Nature,  
Photography, Color Vision and Holography  
by Deiter R. Brill, David G. Stork, David Falk**

**\$80.90**

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An amazing compendium. All of optical science. Heavy on the non-math conceptual/qualitative side. It's a college textbook, but with occasional stories and bits of twisted humor. Pricey, but worth it. If you want to teach yourself optics from scratch, this is the book for you.  
1985 hardcover, 480pp

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site

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## Science Education:

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**INVITATIONS TO SCIENCE INQUIRY, by Tik L. Liem****\$45.00**

A big fat book of hundreds and hundreds of classroom science demonstrations in chem, physics, etc. Also the author's detailed introduction on philosophy of Enthusiasm and attitude in science teaching. Every science teacher should have one of these!  
1981 paperback pp450

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**SCIENCE, DISCOVERY, & LAUGHTER (videotape)****\$25.49**

Produced by The Science Club, this video was made **for parents** who've always wanted to get their kids involved with science experiments at home. It's a collection of fun activities, but it's also full of tips for making science enjoyable both for kids and adults. It supplies lots of ideas for children's further research and teaches some science principles, but even more important, it's filled with an attitude of the joyful curiosity which is the real reason that people take up science in the first place. ...a good cure for Science Project Anxiety. "Stop dreading science questions and start enjoying the discovery of answers."

(Help others find out about this tape: buy a copy for your local library)

1 hour, 1997, Spanish version too (call 1-800-391-6939)

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**DICK & RAE PHYSICS NOTEBOOK, by Dick Minnix & Rae****\$40.00**

Hundreds of physics lecture demonstrations and setups. Highly recommended by Physics Instructional Research Assoc. (PIRA)  
1993

Author's  
Site

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## MISCELLANEOUS BOOKS I RECOMMEND:

- [The Art of Scientific Investigation](#)  
WIB Beveridge , 1960 ppbk pp178 \$used
- [The Boy Mechanic](#)
- [Science and its Ways of Knowing](#)  
J. Hatton , 1996 hcvr pp150 \$30.90
- [Alexander's Science Projects](#)  
[T. Stasiuk](#) 1999 pp52 ppbk/spiral \$11.00
- [Music, Physics and Engineering](#)  
H.F. Olsen, 1966 ppbk \$9.56
- [Lust for Life](#)

Ellis/Robertson

Graphic-novel compendium of "Transmetropolitan" series. Intellectual, savagely critical, hilarious, intense. Spider Jerusalem is a 'newspaper' reporter fifty years in the future. SF and social commentary and blistering truth-telling.

- [PRANKS](#) A big compendium of famous hoaxes and practical jokes, interviews, inspiration.  
V. Vale (ed.) RE-Search volume #11, pp240 1996 \$19.99
- [Slanted Truths: Essays on Gaia, Symbiosis, and Evolution](#)  
by Lynn Margulis, Dorion Sagan, Philip Morrison, pp368 1997 \$19.60
- [Figments of Reality : The Evolution of the Curious Mind](#)  
by Ian Stewart, Jack Cohen, 344pp 1997
- [Great Mambo Chicken and the Transhuman Condition: Science Slightly over the Edge](#)  
by Ed Regis, ppbk 1991 \$11.20
- [The Evolution of Cooperation](#), Robert Axelrod, ppbk 256p 1985 \$18.00
- [The Man Who Planted Trees](#)  
Frederic Back, VHS, 1987 (Oscar Award, '87) [\(the text\)](#)
- [Advice to a Young Scientist](#)  
P.B. Medawar, 1979 ppbk, \$12
- [Cat's Cradle](#)  
Kurt Vonnegut, 1998 ppbk
- [Shadow Syndromes: The Mild Forms of Major Mental Disorders That Sabotage Us](#)



J. Ratey, C. Johnson, 1998 ppbk, 400p

- [Radical Honesty: How to transform your life by telling the truth](#)  
B. Blanton, 1996 ppbk, 276pp
- [Punished by Rewards](#)  
A. Kohn, 1993 ppbk, 397pp
- [MORE...](#)

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## OTHER GOOD SITES:

(not part of this bookstore)

- [Powell's Used Books](#) in Portland, OR (huge store, used/rare)
- [Shifted Librarian](#)
- [Addall](#), search online bookstores
- [Amazon.com](#), here in Seattle, 2.5M books
- at Amazon.com
- [Bookstore](#) at the Museum of Jurassic Technology
- [Gemmary antique sci. books](#)
- [Science Books of Yesteryear](#)
- [noamazon.com](#)
- [Lindsay Publications](#) (highly recommended!)
- [Book Hell](#) forum
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- [Bibliofind \(used books search\)](#)
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- [PHYSICS BOOKLIST](#) from [Physics FAQ](#)
- [Don Lancaster's](#) Tech Bookstore
- [NPR Science Friday](#) Bookstore
- [CHURCH OF ELVIS](#) T-shirts
- [Advanced Book Exchange](#) (search used books)

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Created and maintained by [Bill Beaty](#). Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

# "TIP JAR"

(Vote with your wallet!)



Amasci.com/scienceclub.org is currently paying its own costs! It's because of all our friends who make direct contributions, who buy [toys](#), [Feynman](#), [Tesla](#), or science books via [Amazon links](#), and more recently, who occasionally find worthwhile products on the Google ads. And the [Vortexians](#) have contributed a considerable sum over the ten years.

HEY, EVERYONE...

# THANK YOU!

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- Buy some link-checking software and fix all that dead stuff
- Add a stats service (\$30/month)
- Transfer the entire site to CDROM for those wanting local archive copies
- Transfer "Science Discovery & Laughter" on to DVD
- Perhaps start an amateur science organization

-Bill Beaty

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Want books? Try searching [amazon.com](http://amazon.com):

(try "science projects" too)

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(We make a few \$\$ on any books ordered via these links.)

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<http://amasci.com/tipjar.html>

Created and maintained by [Bill Beaty](mailto:billb@amasci.com). Mail me at: [billb@amasci.com](mailto:billb@amasci.com).

## IS THERE A CHARGE FOR ALL THIS?

Nope. Just a suggested donation. There's no overhead; I'm an individual on a cheap unix account, and this is my hobby. I'm also a closet physics teacher (Electronics designer by day) and now I FINALLY have an outlet for all my cool teaching ideas which would otherwise go unused.

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<== (NOTE: requires setting up a [paypal](#) account)

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If you're interested in donating serious money, time, or expertise to this sort of

internet project, then check out THE SCIENCE CLUB, <http://scienceclub.org> I'm involved with these folks. They're intending to spread their outreach project to the entire nation via the internet. Science clubs in every school in the country? YES! They're just scraping by at the moment, and it sure would be nice if some random benefactor suddenly started throwing real money at them.

Bill Beaty  
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## SCIENCE HOBBYIST: SUGGEST AN URL, OR LEAVE A COMMENT

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### ATTENTION! : **I CAN'T ANSWER!**

I'm currently swamped by email, my backlog is over 8 weeks and growing! If you have science questions, try the experts listed [here](#).

---

To send me a quick note, use the [GUESTBOOK](#). I'll receive it as an email message, and others will be able to see (and answer?) any questions you've entered in the book. To send me a private email message, use the form below.

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