THE NEW WANDERINGS

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Feature:

Sub Atomic Particles

You may have seen a few of the various methods of detecting sub atomic particles, especially those that are extraterrestrial in origin, scattered through some of the past issues of *Wanderings.* This month I'm offering a consolidated list with a few new ones thrown in.

Wanderings No. 126 and **Wanderings No. 170**

These two columns contain links to DIY Charged Particle Detectors, some of which are repeated here.

Cosmicopia

NASA's Cosmicopia contains an collection of information about cosmic rays, the Earth's magnetosphere, the Sun, space weather, and other exciting topics in space science.

Build a DIY Cloud Chamber

A cloud chamber is a simple device that will show the tracks that are produced by cosmic rays as they pace through the chamber.

Amateur Cosmic Ray (Muon) Detection

The aim of this project is to develop a DIY Cosmic Ray Detector which is easy to build, low cost and has some kind of usable output. Robert Hart's **Hardware Hacking** Site shows his work with different types of detectors together with some of his other interests.

Cosmic Ray Detection With Fluorescent Tubes

Here is a link to Robert Hart's fluorescent tube cosmic ray detector that is patterned after **CERN** researcher Sascha Schmeling's design.

An Interesting DIY Cosmic Tube

The **fusor.net** has a discussion thread concerning the use of fluorescent tubes as cosmic ray detectors.

Cosmic Ray Triggered Music

Sebastian Tomczak uses Robert Hart's cosmic ray detector and an **Arduino** to trigger music.

Counting Particles from Space

Check out ***The Amateur Scientist*** for Feb 2001.

Note: The above 2 items use a 0.01 inch or 250 µm bare copper sense wire. This wire is actually AWG 30 and is fairly easy to find but it will probably be enamel covered magnet wire. This covering makes it VERY difficult to solder the sense wires to the frame. But don't panic! Common lamp or zip cord is made up of two conductors of stranded wire --- and guess what? There is a very good chance that the individual strands are bare AWG 30 wire.

The Cosmic Connection

The Berkeley Lab Cosmic Ray Telescope is a simple but ***pricey,*** DIY cosmic ray detector.

The Muon Lifetime On-Line Experiment

This project is a real particle physics experiment, prepared for the student and/or general public that can be remotely operated with only a simple web browser.

Techlib Geiger Counter and Ion Chamber Site

Charles Wenzel's Techlib.com has always been an excellent source of information on DIY radiation detectors. Also, have a look at his **Blog**.

Building A DIY Geiger Counter

This is a fairly simple circuit using the SSBM-20 Russian GM tube. The article is continued in **Part 2**.

ATtiny26 Geiger Counter Schematic and Code

An **ATtiny26** microcontroller is used to display the counts from a LND7313 Geiger tube.

Sparkfun's Geiger Counter

Sparkfun has a small USB Geiger Counter for $150.00 US. They also have a tutorial showing how to use a Geiger counter as **a true random number generator.**

GS Tube.com

This Russian vacuum tube distributor is a source of exotic items such as photomultiplier, Geiger and electrometer tubes.

A Do It Yourself Neutron Detector

A Geiger counter, silver paint and paraffin wax are used to make a DIY neutron detector.

A Geiger Tube Mood Lamp

Even though this link is for a novelty mood lamp, Michal Zalewski gives us useful information on GM tubes and high voltage supplies.

The Sudbury Neutrino Observatory

The Sudbury Neutrino Observatory (**SNO**) is situated 6800 feet under ground, in INCO's **Creighton mine** near Sudbury, Ontario, Canada. The detector consists of 1000 tonnes of **heavy water.** The **neutrinos** react with the heavy water to produce flashes of light called **Cherenkov radiation.** This light is then detected by an array of 9600 photomultiplier tubes.

Magnetometers - Measuring the Magnetic Field of Earth

The Earth's magnetic field is another interesting phenomenon to observe.

CARISMA (Canadian Array for Realtime Investigations of Magnetic Activity)

The CARISMA Network is an array of **magnetometers** that are used to measure disturbances in the Earth's magnetic field, caused by activity occurring in a region of space near the Earth, known as the magnetosphere.

Wanderings No. 60

The Feature from the **02 April 2004 Wanderings** contains a number of DIY magnetometer links.

Wanderings:

Potassium Chlorate

Yes --- amateur science endeavours may contain elements of danger but use your head! Recently, I observed a science fair entry that investigated the efficiency of various amateur rocket propellant mixtures. I was very disturbed that one of the propellants was based on a mixture of potassium chlorate and a metal powder. Apparently, this student's mentor had no idea what potassium chlorate is!

Rocket Boys/October Sky

In the book / movie *Rocket Boys / October Sky* Homer Hickam and his buddies also used a potassium chlorate fuel for their rockets. See Section II Question #23.

Potassium Chlorate MSDS

The Material Safety Data Sheet (MSDS) for potassium chlorate states it reacts vigorously, and in some cases **spontaneously ignites or explodes**, when mixed with many combustible materials.

The Dangers of Using Potassium Chlorate

Jimmy Yawn warns about potassium chlorate as a rocket fuel component.

Introduction to Amplitude Modulation (AM)

This explanation of AM, by the *York County Amateur Radio Society,* departs from the simplified classic definition of detection by rectification.

DIY Scanning Electron Microscope

You may have seen Ben Krasnow's piece on his **DIY Scanning Electron Microscope** on the CSL Blog. Check out Ben's personal blog for further details and an insight to some of his other work.

Science Made Alive

Wilco Oelen wants to show, at the level of the amateur, that science can be fun and very rewarding.

Could You Build A Toaster From Scratch?

Thomas Thwaites talks about his **Toaster Project** on the **TED Site**.

A Wood-Gas Stove for Developing Countries

Simple DIY stoves that are based on the gasification of wood or other biomass provides a cleaner, better controlled and more efficient cooking media for developing countries. See, also, the **Biomass Energy Foundation's website.**

Cook Up Some Biodiesel In Your Kitchen

Here is a simple recipe that will allow you to demonstrate the conversion of vegetable oils into biodiesel, using common household chemicals

One Straw

This site contains information on one family's 'journey" towards self sustainability.

A Guide to Placing Wind Turbines

This "How To" guide recommends standards that will help to reduce the possible health risks occurring from the noise produced by wind turbines.

Red Rock Energy

Red Rock links to alternative energy systems for the home or small property owner who is interested in natural energy or solar power.

List Of Distributed Computing Projects

There are many distributed computing projects, on the Internet that could give you a chance to do real science. If interested, check the list and you might find a project that you like.

Have You Ever Seen a 300 mph Sock?

Visit **Joseph A. DiVerdi's High Speed Photography Page** and see how he was able to catch this fleeing sock.

Microscopy UK

"Microscopy & Astronomy are two areas of scientific study where a non-professional can make important discoveries!"

The Tesla Turbine

This group of *Instructables* covers the plans for building several different types of boundary layer effect Tesla Turbines. These devices are high RPM low torque motors that can be run from compressed air or even the water flow from your kitchen sink.

Sugar Donuts + Starbuck's Passion Tea = Solar Power

Yes, it's true. You can make a solar cell from a donut. Actually, it's the powder sugar from the donut that is used. You can't use regular icing sugar as it probably does not contain the required Titanium Dioxide (TiO_2) that commercial icing sugar has. But you may be able to find TiO_2 in the form of icing whitener at the local cake shop or from **Natures Flavors**.
Read the **Comments & Response** on the American Chemical Society's site.

Webcam Based DIY Laser Rangefinder

Todd Danko describes how a mini laser pointer can be configured along with a single webcam to provide mono-machine vision with range information.

Details of the Laser Range Finder

Here are some details of the University of Buffalo's laser range finder.

Möbius Strip

We have, all, heard about the Möbius Strip, a figure with only one side and one edge, but, what about a bottle with only an inside?

The Klein Bottle

Konrad Polthier will show us this amazing bottle that has an inside but no outside. Or you could look at it, the other way, and say that it has an outside but no inside.:-)

Make Your Own Klein Bottle

This Instructable will show you how to make your own simulation of a Klein Bottle.

Make a DIY Manual Vacuum Pump

This Instructable shows you how to convert a manual bicycle pump into a vacuum pump.

Convert A Tire Inflator-Into A Vacuum Pump

Are you a bit lazy and don't want to pump by hand? Then why not let a motor do your pumping and convert a tire inflator-type air compressor into a vacuum pump?

Guerrilla Guide To CNC Machining

Michal Zalewski has compiled his experiences in bench top manufacturing for robot builders, model makers, and other hobbyists

Hobby Servo XY Table at TeleToyland

You can remotely control this XY table at **TeleToyland**.

Low Cost Hobby Servo XY Table

Build your own XY Table

How To Make Springs

Do you need a hard to find special spring? Why not make one?

The Arduino @ Instructables

I found this listing of all of the Arduino Instructables too late to be included the Arduino Feature that was presented in **Wanderings #171**.

TEA Laser --- Only Three Inches Long

This YouTube video shows Nyle Steiner's small TEA Laser (Transverse Electrical Excitation at Atmospheric Pressure).

Simple Homemade T.E.A. Laser

If you liked Nyle's laser why not try building your own? This site is an excellent step by step hand holding guide through the construction and firing of a T.E.A. laser. In case you missed it, this laser operates at atmospheric pressure so no vacuum pump is required and the only exotic component is a simple high voltage power supply.

Cool Homemade Stuff

Take a look at Nyle's Web site to see what else he's been working on.

The TEA Nitrogen Gas Laser

More information on T.E.A. lasers can be found on Mark Csele's Homebuilt Lasers Page.

The Canadian Association of Rocketry

The Canadian Association of Rocketry (CARWeb) is the online voice and information repository for rocketry in Canada.

How to Design, Build and Test Small Liquid-Fuel Rocket Engines

This e-book provides the serious amateur builder with design information, fabrication procedures, test equipment requirements, and safe operating procedures for small liquid-fuel rocket engines.

A Beginner's Guide to Accelerometers

"An accelerometer is an electromechanical device that will measure acceleration forces. These forces may be static, like the constant force of gravity pulling at your feet, or they could be dynamic - caused by moving or vibrating the accelerometer"

The Accelerometer: Theory

Here is a tutorial on accelerometers from **Pyroelectro**.

Pyroelectro Tutorials

Pyroelectro has other tutorials and projects besides their accelerometer tutorial.

How to Make an Inexpensive DIY Analog Pressure Sensor

This Instructable shows you how to construct an analog pressure sensor from black anti-static dissipative foam.

The Lego RCX Input Multiplexer

This Color Sensor circuit shows how three resistive sensors can share a single **Lego Mindstorm's RCX** micro controller input.

Low Cost Water Flow Sensor

This YouTube video shows how to build Carnegie Mellon University's water flow or vibration sensor.

The Gauss Rifle: A Magnetic Linear Accelerator

This simple project is both educational and amusing. You can buy a version from **Think Geek**.

DIYbio

DIYbio is an organization dedicated to making biology an accessible pursuit for citizen scientists, amateur biologists, and DIY biological engineers who value openness and safety.

DIY Centrifuge Using Dremel Tool

If you need a small centrifuge and already have a Dremel tool this may be what you are looking for. The adapters are available from **Shapeways**.

Build A Net Gun

This Instructable shows you how to build a Net Gun capable of firing a 90 square foot net 15 to 25 feet.

Dry Ice Info and Applications

Here is a site that has everything you always wanted to know about dry ice.

The Dry Ice Directory

This site may help you in locating a local source of dry ice.

Start Seeing Magnetic Fields

The Evil Mad Scientist Laboratories introduces to some basic and inexpensive tools that will enable us to see magnetic fields.

Infrared Detectors

Boston Electronics offers a wide range of photodetectors spanning the spectrum from the ultraviolet to the infrared and their web page describes the characteristics of each type.

Amateur Science - Getting Started in Photometry

This Power Point Presentation details how the amateur astronomer can get started in **Photometry.**

The Make Club

"Inspired by such websites as **MAKE magazine**, **Instructables**, **hack-a-day**, and **ReadyMade**, MAKE Club is all about creativity. It's for the DIY'ers, the dreamers, and those who like to get their hands dirty."

Getting Started in Electronics

The ECE Lab wed site has a good selection of topics that cover the basics of electronics.

Micro Forge

Kip Kay, of Make Magazine, shows us how to make a *DIY Micro Forge* in his **Weekend Projects Series**.

KP4M4-001 Stepper Motor

A while ago, I came across a bunch of "OLD" floppy disk drives. Instead of throwing them into the dumper I decided to have a look inside and --- lo and behold! --- I found KP4M4-001's which are heavy duty unipolar stepper motors.

Stepper Motor Control

This page shows various ways that may be used to control a stepper motor.

Controlling Stepper Motor with a Parallel Port

This stepper motor driver allows you to control a unipolar stepper motor through your computer's parallel port.

About Rare-Earth Magnets

This is a short article on rare earth magnets from **Lee Valley Tools**.

Online Unit Converter

Here is a collection of utilities that will enable you to convert between different units of measurements.

My Daughter's Scythe

We are storing a lot of my daughter's belongings, while she is off working in New Zealand. Among her stuff is a scythe. It seems to me that a lawn mower would be a lot easier :-) Learn all about this ancient tool at **The Scythe Connection**.

Rough Science

Rough Science is a 10-part TV series produced by the BBC and can be seen, sometimes on the Discovery Channel and/or PBS. The plot involves five scientists who are placed on a remote island and are challenged to solve a series of scientific challenges using only their knowledge, ingenuity, and whatever is at hand. BTW --- this is my daughter's favourite TV show. See **Rough Science on YouTube.**

The Penobscot Bow

Scroll down to the posting by David W. and you will see a picture of the strange looking compound bow that I saw on the TV show, Pawn Stars. Several years ago, during my Internet wanderings, I came across a primitive version of this bow that is called the **Penobscot** or **MicMac** Bow. It would be interesting to build one to scientifically test its effectiveness.

Boston Dynamics' 4 Legged "Mule"

Boston Dynamics designed a robot "pack mule" for the Army.

Los Alamos National Laboratory Technical Reports Collection

Gregory Walker and **Science Madness** are making available a large on line collection of technical publications that are no longer available from the **Los Alamos National Laboratory**.

The Ivory Bangle Lady

Did Africans live in ancient York during the Roman occupation?

The Federation of American Scientists

The Federation of American Scientists was founded by scientists who had worked on the Manhattan Project. They believed that they had a unique responsibility to both warn the public and policy leaders of potential dangers from scientific and technical advances and to show how good policy could increase the benefits of new scientific knowledge.

Operational Sea Surface Temperature and Sea Ice Analysis

The OSTIA system produces a high resolution analysis of the current sea surface temperature (SST) for the global ocean

Met Office Hadley Centre Observations Datasets

Researchers at the Met Office Hadley Centre produce and maintain a range of gridded datasets of meteorological variables for use in climate monitoring and climate modelling. This site provides access to these datasets for *bona fide* scientific research and personal usage only.

The Art of Grantsmanship

Jacob Kraicer's guidelines will assist both new and veteran investigators to optimize their chances of successfully competing in a peer-reviewed grant application competition.

Farmers Are Trying To Cope With Roundup-Resistant Weeds

Repeated and intensive use of the herbicide **Roundup** has resulted in strains of Superweeds.

The Kids Room:

Bang Goes The Theory

BBC's *Bang Goes The Theory* site has a nice **Hands On Science** section. Note --- The videos may not work in North America.

The ASPIRE Project

The ASPIRE Lab claims to be one of the most innovative and interactive science education websites available on the Internet.

The Science House

The Science House's mission is to work in partnership with K-12 teachers and students to promote the use and impact of hands-on **inquiry based learning** in science and math.

Hands-on Student Inquiry Activities

Here is a collection of student activities from The Science House.

Let's Talk Science

Let's Talk Science's approach to science education engages children and youth with fun, exciting hands-on / minds-on activities that improve their understanding of physical and life science, mathematics and technology.

Science Answers

Actual answers from US science students.

Teachers' Resources: A Guide to Kitchen Chemistry

This **Instructables Guide** was compiled by **Matt.Nupen.**

Homemade Spectroscope

Dr. Shawn shows you how to build a DIY Spectroscope from common house hold "junk".

LEGO and LDraw

LDraw™ is an open standard for LEGO CAD programs that allow the user to create virtual LEGO models and scenes.

Women in Science:

Jeri Builds a Homebrew NMOS Transistor

This YouTube video features **Jeri Ellsworth** showing us the step by step process in constructing a DIY NMOS transistor.

Science Demonstrations, Experiments, and Projects

This collection was compiled by **Dr. Anne Marie Helmenstine**.

Random Samples:

Kiva --- Empowering People Around The World With A $25 Loan.

Kiva is a non-profit organization with a mission to connect people through lending to alleviate poverty.

Interactive Health Tutorials

The **U.S. National Library of Medicine** and **MedlinePlus** present a series of health tutorials that cover the symptoms, diagnosis and treatment for a variety of diseases and conditions.

Desert Camels at Sunset

If you look closely, at this picture, you will see little white lines. These ARE the camels and the black images are just their shadows!

Eric Whitacre's Virtual Choir

Britlin Losee inspires Eric Whitacre to form a Virtual Choir. The choir was composed of 185 singers from 12 countries who never sang together until, with the magic of the Internet, their voices were edited together.

Suppliers and Stuff:

Being listed here does not constitute an endorsement by SAS or me of any information, product or service.

Egg-Bot

The Egg Bot is **The Evil Mad Scientist's** open-source art robot that can draw on spherical or egg-shaped objects

Emovendo

Emovendo can supply rare earth magnets in a wide variety of shapes and sizes.

Manual Vacuum Pump

This $25 Brake Bleeder and Vacuum Pump Kit are designed for the automotive industry but are capable of providing a moderate vacuum for the amateur scientist or hobbyist.

GridChoice

GridChoice is a supplier of a wide selection of new, used, and obsolete items such as **stepper motors**.

Spectacular Chemical Experiments

"This book demonstrates over 80 enjoyable, impressive and sometimes almost unbelievable chemical experiments for the classroom, lecture hall or home."

HMS Beagle Online

HMS Beagle Online is dedicated to providing you with a wide array of products which help to engage young and old minds alike in the amazing world of science.

Benchmark Legacy Chemicals From H.M.S. Beagle

H.M.S. Beagle recreates their version of A.C. Gilbert's 1936 chemistry set.

The Amateur Scientist 3.0 CD-ROM

Bright Science is offering the complete collection of *Scientific American's* **"The Amateur Scientist"** column from 1928 to its final cancellation in 2001.

On The Lighter Side:

Try The Impossible Paper Trick

Instead of cutting nice neat lines, try using jagged cuts for a more puzzling effect.

The Impossible Puzzle

Here is another interesting paper puzzle.

Howjsay?

Do you need a free online talking dictionary of English pronunciation?

The Bubble Machine

Got some free time? Why not fill your life with bubbles from this DIY bubble machine?

From The Far Side:

The End of the World!

If Judgment Day will be held on 21 May 2011 with the End of the World to follow on 21October 2011 then I guess that all **the predictions for 2012** were a waste of time.

Time Travel

Explore John Bajak's Flux Capacitor and other devices that cause temporal distortions.

The Tesla Shield

The Tesla Shield was inspired by the work of Nikola Tesla, and was designed by **Life Technology** to heal, strengthen and protect the mind body and soul. Myself --- I like the aluminum foil cap :-)

Copper Magnetic Therapy Jesus Bracelet

If you don't believe in the Tesla Shield, perhaps you'd like a Jesus Bracelet. Magnetic Copper? It has to be a ***miracle***!

James Randi and the Jesus Bracelet

Read Randi's views on the bracelet.

QRay

And then there was the QRay bracelet.

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