THE NEW WANDERINGS

No. 14

01 May 2012

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Feature:

There are millions of children, around the globe, who enjoy playing with those little plastic bricks called LEGO.

But big kids, or Citizen Scientists, can also use LEGO. Not so much as a toy but, instead, as a quick prototyping medium. LEGO offers a great variety of components, other than just the coloured bricks. These include wheels, gears, shafts, motors, sensors, pneumatics, computers … and … for those who may be interested … little plastic people☺. LEGO offers an ideal system for prototyping your ideas as they can be used to quickly assemble, test and than modify as your vision evolves.

One of the LEGO systems that was developed for the older child or adult is the Mindstorm system. The Mindstorm, together with the RCX computer brick, enables a person to build and program a wide variety of devices.

Probably the majority of the LEGO work has been done with robots, but the possibilities are by no means limited to this area. In the examples, below, you will find links to a scanner, a plotter and a model spectrophotometer, which could be

expanded to become a full-fledged computer controlled scientific instrument made mostly out of LEGO bricks.

This week's Feature touches on the surface of the LEGO resources that can be found on the Web.

What is LEGO?

LEGO is a popular line of construction toys, consisting of interlocking plastic bricks, gears, wheels and various other parts.

LEGO

This is LEGO's Home Page

LEGO Education Catalogues

Download one of LEGO's online catalogues and see many of their exciting bits and pieces that you can't find at the local Toys-R-Us store.

The Peeron LEGO Inventories

The Peeron Inventory is a listing of many of the parts in the official LEGO sets.

LEGO MindStorm

The MindStorm System lets you design and program real robots.

LEGO MINDSTORMS: *The Master's Technique*

A book by Jin Sato

Extreme NXT: *Extending the LEGO MINDSTORMS NXT to the Next Level*

A book by Michael Gasperi and Philippe Hurbain

LEGO Robolab

LEGO Mindstorms sets that were designed for schools

The LEGO RCX Computer

Here is a description of the internals of the LEGO RCX computer brick.

The LEGO RCX, Inside And Out

Find out how to get up close and inside the LEGO RCX Microcontroller.

LEGO RCX Plotter

You can program this plotter to draw lines and print letters.

LEGO NXT Image Scanner

The NXT image scanner is a "stand alone" scanner that can scan and save images as a BMP-file in the NXT's flash memory.

LEGO NXT Segway with Rider

This robot simulates a **Segway PT**, a self-balancing vehicle, by using the NXT Color Sensor as a simple proximity sensor to detect the approximate tilt angle of the robot enabling it to actually balance itself.

NQC

"Not Quite C" or “NQC” is a simple “C like” language for the RCX.

LEGO Pneumatics?

Here’s something that you will NOT find at your local Toys-R-Us ☺

LEGO Gears Tutorial

“This is a complete tutorial on LEGO gears, their advantages and disadvantages as well as the basic laws of mechanics that apply to them.”

A LEGO Based Turing Machine & Much More

If you are “into” LEGO, than Denis Cousineau’s site is a must.

A PID Controller for Lego Mindstorms Robots

PID Control is a common technique used to control a wide range of processes. The complete mathematical description of PID control can be fairly complex but is not really required in order to use PID effectively.

PID Tutorial

What Is PID? A tutorial overview

An Interactive PID Demonstration

Play with PID control with a virtual liquid flow control system.

PID Control Information

This site contains some good links to PID pages.

Arduino to LEGO Mindstorms Shield

This shield allows your Arduino to control up to 4 LEGO NXT motors and read 4 NXT sensors.

Lego Mindstorm vs Arduino

Which is better?

LEGO + Arduino = A Mini Segway

Using an Arduino and a couple LEGO motors and sensors you could build your own self balancing robot.

Homebrew LEGO Sensors

Michael Gasperi's LEGO Mindstorms NXT/RCX Sensor Input Page

Philo's Home Page

Philo's page contains tips and information about LEGO Mindstorms and panoramic photography.

LEGO Robot Pages

The Dept. of Computer Science, Utrecht University, NL, used these in their investigation into whether they could use the LEGO Robots in their robotics courses.

Matthias Wandel's Lego Domino Row Building Machine

Have a look at some of Matthias' best LEGO creations.

Exploring the Nanoworld with LEGO Bricks

The purpose of this website to demonstrate, via 3 dimensional LEGO models, the various physical and chemical principles related to nanoscale science and technology.

LEGO Push-Pull Logic Gates

LEGO Logic Gates are along the line of Babbage's mechanical logic but with bricks.

Andrew Lipson's LEGO Page of Interesting creations

Here are a few of Andrew's creations for your delectation and delight.

The LEGO Chess Robot

This is a team project report by Stewart Gracie, Jonathan Matthey, David Rankin, and Konstantinos Topoglidis of the Engineering Dept. at the University of Glasgow.

There are many LEGO CAD programs, on the net. Do a Google search and find one that fits your needs and likes. The following are a few of the ones I found.

LDraw

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

LeoCAD

"LeoCAD is a CAD program that can be used to create virtual LEGO models. It has an easy to use interface and currently features over 4000 different pieces created by the LDraw community."

BlockCAD

BlockCAD is a simple freeware program that can be used to build virtual models with LEGO like bricks.

Lugnet: *The LEGO Users*

Lugnet is an international organization that caters to all levels of LEGO enthusiasts.

LEGO @ eBay

Lastly, don't forget eBay as a possible source for good deals on LEGO components. But be cautious! Factor in the sellers shipping costs before you order. And what is the price at your local store?

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Wanderings:

Citizen Science Enters a New Era

"From China to the Congo, a new wave of volunteer science projects aims to allow amateur participants to actively gather data for the benefit of their communities."

Views from Science

Take a step into Eli Silk's *World of Citizen Science*.

Charles Wenzel's Techlib Forum

If you have enjoyed the **Techlib site**, in the past, why not drop in on and take part in the discussions on the forum.

CD4069 Atomic Frequency Standard

While on his site, have a look at the little frequency standard, that Charles built, that runs off of the 60 (50) cycle power line --- "The line frequency is only fairly accurate at any given instant - perhaps within a few hundred PPM - but the long term error is kept very low by comparing the frequency with national time standards which are, of course, based on an array of atomic standards!"

Bruce's Wimshurst Machine

Bruce's machine is based on the plans at --- **Jake's Wimshurst Machine and How to Build It! (Part 1)**

Electrostatic Machines

While searching for information on Wimshurst machines, I came across this site which is a huge resource on static machines.

The Stirling Builder

Those who may be interested in Stirling Engines will enjoy Jim Larsen's excellent site.

Make Your Own Circular Slide Rule

Charles Kankelborg, a physics professor at Montana State University shows us how to build and use a circular slide rule.

International Slide Rule Museum

Step back into the old days when engineers worked it out with a stick ☺

The Open Beam Construction System

OpenBeam is a modern version of the **Erector** or **Meccano** sets that is planned to a low cost construction system aimed at the hobby and Maker market.

The Xtal Set Society

The Xtal Set Society is dedicated to building and experimenting with radio electronics, more specifically crystal radios.

Bryan's Analytical Instrumentation Page

"How to become an analytical chemist"

DIY Instrumentation

Hua-Zhong "Hogan" Yu and his colleagues, at Simon Fraser University, have turned to the laser-based optical read-write technology of DVD and CD players to create a biomedical diagnostics system that requires no hardware modifications.

Build a Scanning Probe Microscope

Here are free plans and instructions on how to build a Scanning Tunnelling Microscope (STM) for under $100 US.

How to Solder Aluminum

I posted something similar to this, years ago, on the old SAS site. It DOES work. I used "3 in 1" oil and a high wattage soldering gun to tin the aluminum than I used my regular Weller W-60 to solder the wire(s) to the tinned patch.

Laser Hacks

Here is a collection of laser hacks and modifications that were found on the **Hack N Mod** Web Site.

DIY ECG Machine on the Cheap

Scott Harden devised an incredibly simple ECG machine with a minimum of parts to view the electrical activity of his heart.

Homemade Flyback Secondary

In Radu Motisan's blog, Pocket Magic, we are shown how to rewind a flyback transformer for better high voltage operation.

Teslina's Experiment Page

Tealina's site is devoted to Tesla Coils and other high voltage projects.

The Globe at Night

"The *Globe at Night* program is an international citizen-science campaign to raise public awareness of the impact of light pollution by inviting citizen-scientists to measure their night sky brightness and submit their observations to a website from a computer or smart phone."

Space News

Space.com is a great source for news of astronomy, sky watching, space exploration, commercial spaceflight and related technologies.

Join the Hunt for Hubble's Hidden Treasures

Take part in NASA's contest to find hidden treasure in the Hubble image database. Hurry! as the contest will soon close.

The Cable Connector Tutorial Guide

This is a reference of the various types of cables that are used to hook up various pieces of equipment?

The Echochamber xkcd Forum

I came across this forum, with science and math topics, as I was searching for some freeware forum software.

phpBB

Oh, by the way, this is the forum software that I was looking at when I found *Echochamber* in their examples.

SMF

Here is another package that I was looking at: ---"*Simple Machines Forum* — SMF in short — is a free, professional grade software package that allows you to set up your own online community within minutes."

The Sudbury Neutrino Observatory

"The Sudbury Neutrino Observatory (**SNO**) results have provided revolutionary insight into the properties of neutrinos and the core of the sun."

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From Instructables, YouTube & Make:

Instructables: Intro to Arduino

This is a little tutorial designed to introduce you to the Arduino and its capabilities.

Instructables: Arduino Projects

Here is a collection of Arduino projects that may inspire you to roll up your sleeves and try one or to develop your own project.

Instructables: Weekly Challenge Archive

The folks at *Instructables*, constantly, run weekly contests covering various topics. Give one a try!

Instructables: How to Repair Ruined Vinyl Records

Bfk shows us how it may be possible to bring ruined vinyl records back to life.

Instructables: Oogoo a DIY Sugru Substitute

Oogoo is an inexpensive silicone clay that is easily made substitute for **Sugru**.

YouTube: Spark Detector for Alpha Particles

In this video, Carl Willis demonstrates his *Alpha Particle Spark Detector* that is based on a design by Tim Raney.

Make : John Iovine: Geiger Counter Sanity Check

MAKE's Paul Spinrad, from Make, interviewed John the recent run on Geiger counters. Also, see his **Spark Detector**.

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The Kids Room:

Taylor's Nuke Site

Taylor Wilson, a 17 year old student, is interested with all things nuclear and radioactive and conducts research in related fields.

Rock Around the World

"Mars Scientists are asking students from around the world to help them understand the red planet. Send in a rock collected by you or your classroom from your region of the world and we will use a special tool like the one on the Mars Exploration Rovers to tell you what it's made of."

Dr. Anne Marie Helmenstine's *About Chemistry*

Follow Dr. Helmenstine as she guides you through the wonderful world of chemistry.

Fun Science Project Idea's

A collection of various project ideas that include Tesla coils, static electricity, heat engines, pneumatic projectile devices and other neat stuff

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Random Samples:

The MIT IDEAS Global Challenge

"The MIT IDEAS Global Challenge connects students with the passion and talent to improve the world with the experience and resources of the MIT community worldwide. We support innovation and entrepreneurship as public service through an annual competition that awards up to $10,000 per team for the best ideas to tackle barriers to well being."

How To: Fly With Homemade Electronics

"Most makers who travel with homemade electronic devices and other prototypes have a fear that their innocuous project will catapult them to the front page as a threat to national security."

13 Things That Do Not Make Sense

Michael Brooks, at **The New Scientist**, presents thirteen perplexing natural mysteries.

13 More Things That Don't Make Sense

Michael Brooks brings us 13 more mysteries.

7 Inventors Killed By Their Inventions

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Suppliers and Stuff:

Scientific American's "The Amateur Scientist". [CD-ROM]

This CD contains the complete The Amateur Scientist columns from Ingalls to Carlson.

Pitsco Education

Pitsco is a great source of specialized LEGO components and kits and resources for classroom use.

Esduino

The Esduino is an Arduino-style board based on a 9S12C 16 bit microcontroller.

Images Scientific Instruments

Images SI is a source of Geiger counters, science, robotics and electronics kits and components.

Surplus Sales of Nebraska

They have over 20,000 individual items and hard to find RF components.

Gyroscope.com

Gyroscope.com is dedicated to all things gyroscopic plus they have a great selection of “high tech” toys.

Rubidium Atomic Frequency Standard

Have a look on eBay if you have a need for an atomic clock or any thing else that you can imagine.

NCH Tone Generator Software

The NCH Tone Generator generates sine, square, triangular, saw tooth, and impulse waveforms in the range of 1Hz to 22 kHz plus it is capable of generating white noise and pink noise.

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From The Far Side:

Perhaps They Are Right!

Are “the men in black” trying to stop experimentation in over unity devices?

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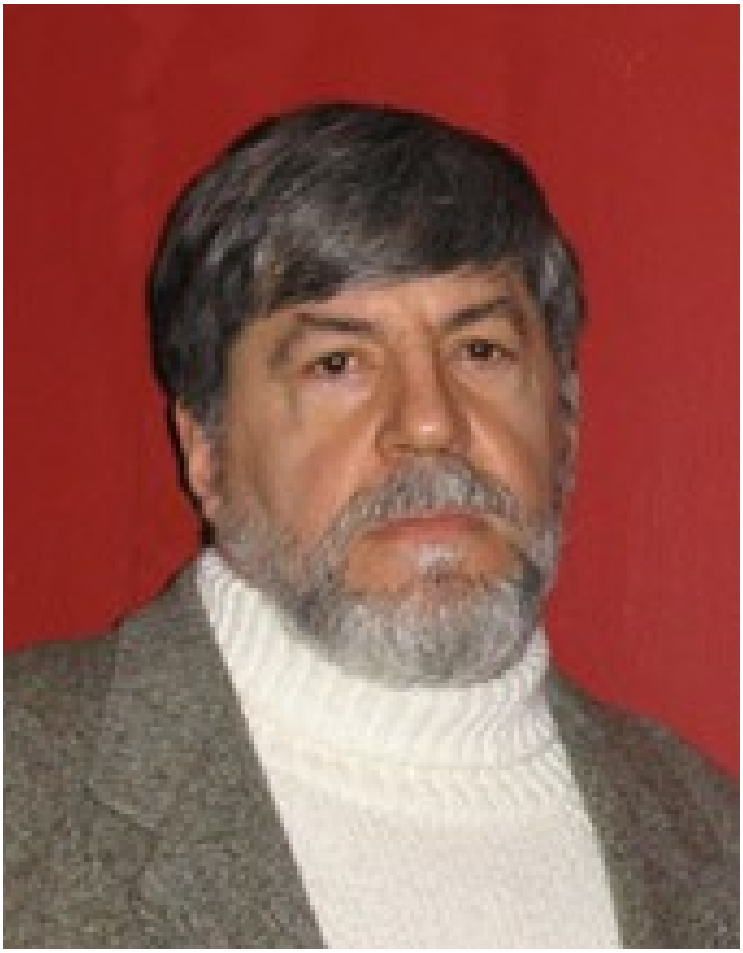

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