

STEM Society Meeting, May 14, 2013

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1 About the STEM Society and the STEM Society Website

STEM is an abbreviation for Science, Technology, Engineering and Mathematics. The acronym STEM is commonly associated with K-12 education, but our use of the term is only slightly bound to this meaning. There are over one hundred people on the mailing list, although a much smaller group attends any one meeting. We meet on the second Tuesday of each month at the Trailside Center at 99th and Holmes in Kansas City, Missouri. The meetings are open to all. The start time is 6PM. We make presentations, have discussions, and have demonstration experiments. These relate to Science,

the History of Science, Mathematics, Engineering, Philosophy and Technology at all levels. The topics have ranged from a technical discussion of the mathematics of General Relativity to scientific experiments for young students.

The set of meeting notes may be viewed by going down the list of notes appearing on the front page of the site. These notes contains links to documents, which may be viewed or downloaded by clicking the link. Other documents can be reached by clicking the heading "Documents and Downloads" that appears on the left side of the front page. Then click on "documents." The meeting notes may also be viewed in an archive file in the list of documents. Most of the documents are PDF files. They may be viewed or downloaded to the computer by clicking, provided Adobe Reader is present, or another program capable of reading PDF files. There are usually more documents available at the site than are listed under "Documents" because they are not in the documents.htm file.

The web site is:

<http://www.stem2.org/>

Direct to the documents list:

<http://www.stem2.org/je/documents.htm>

Direct to the archive file:

<http://www.stem2.org/je/archive.pdf>

Last Months Notes:

<http://www.stem2.org/je/stemsoc040913.pdf>

2 The May Meeting Announcement

The May meeting of the STEM Society will take place on the second Tuesday of the month, May 14, 2013, at the Trailside Center at 99th and Holmes in Kansas City, Missouri. The starting time is 6PM.

A List of Possible Topics, and suggestions for preparatory homework before the meeting:

(1) Questions: What is the relation between: (a) The philosopher Immanuel Kant, and Euclidean Geometry, (b) The philosopher Hegel, and the economics of Karl Marx.

(2) What is the difference between the theories of evolution put forth by (a) Charles Darwin, (February 12, 1809 to 19 April 19, 1882), (b) Lamarck, *Jean-Baptiste Jean-Baptiste Pierre Antoine de Monet, Chevalier de Lamarck*, (August 1, 1744 – December 18, 1829), and (c) Alfred Russel Wallace, (January 8, 1823 – 7 November 7, 1913).

(3) We may finish our discussion of the use of complex numbers and complex analysis in electrical engineering and electronics. We shall look at the idea of impedance, and examples including the idea of series and parallel resonance, experimental methods of measuring inductance, Amplitude Modulation of an RF electromagnetic wave, the magnetron generator of microwaves, and perhaps some experts can describe the use of magnetrons in sputtering.

(4) How can leaks in vacuum equipment such as a mass spectrometer be detected with a tesla coil?

(5) An update by Bob Kessler on Kansas City environmental issues.

(7) Mapping equipotential lines in two dimensional current flow. The analogy between electrical potential (voltage) and terrain contour lines in civil engineering and geological mapping. Using cubic spline and Bezier curves and software.

(8) Apparatus and equipment display.

(9) As always the following is welcomed: impromptu topics, projects, show and tell, book reports, problems and solutions in mathematics, physics, engineering, biology, scientific biographies, et cetera.

Backup and Future Topics:

(1) Optimization Theory, Lagrange Multipliers, and the Golden Section Search.

(2) More about Electronics and Circuits.

- (3) Experimental Apparatus and Machine Building.
- (4) The Calculation of Energy Levels in Semiconductors.
- (5) Number Theory.
- (6) The Postulates of Quantum Mechanics.

The STEM Society Website:

<http://www.stem2.org/>

3 Bob Kessler: Maurice Smith visit, Ed Welch death, Books, Environmental Assessment, National Academy of Sciences

...PEOPLE...

Maurice...he will try to make the next STEM2 meeting. I saw him at Timberlake Care Center yesterday, took his picture and he seems fine, probably be back home in a couple of days.

Ed Welsh died this last month, "oldest STEM2 guy", 85 years old.

...BANNISTER FEDERAL COMPLEX...

Final Environmental Assessment for the Transfer of the Kansas City Plant and FONSI released May 1, NO SIGNIFICANT IMPACT, actions to be taken by GSA and NNSA not completely clear, Also NNSA management team moved to Botts Road facility, "NNSA Security Campus", Monday, May 13, yesterday.

SCIENCE and EDUCATION APRIL SIGNIFICANT...

NGSS, Next Generation Science Standards, released April 9, OECD/PISA, Organization for Economic Co-operation and Development-Program for International Student Assessment, announced it will be accepting schools into the assessment program beginning in September, not just science.

Science Journal, April 19, 2013 special issue, **Grand Challenges in Science Education**.

National Academy of Sciences (NAS) 150th anniversary April 22, President Lincoln signed in 1863,

fyi, NAP, (National Academy Press), publishes all NAS reports free on-line, normally 200-300 reports per year

...RECOMMENDED READING...

The New Digital Age: Reshaping the Future of People, Nations and Business by Eric Schmidt and Jared Cohen.

Eric is Google's CEO, Jared is Director of Ideas, and of course you remember that Ray Kurzweil is the Director of Engineering.

Raspberry Pi: Readers Guide, by Eben Upton and Gareth Halfacree.

4 Raspberry Pi

The Raspberry Pi is a tiny complete computer that runs a version of Linux. It was created by a group in England. The Raspberry Pi can be purchased for under 50 dollars. Bob Kessler presented me with one of these a few months ago, but I have not had time to investigate it.

5 Jim Emery: Complex Variables in Electrical Engineering

Derivation of the impedance concept, solving steady state AC networks, series and parallel resonance, application to tuning a simple AM radio, measuring inductance example. See topics in **Electrical Circuits** by Jim Emery:

<http://www.stem2.org/je/ee.pdf>

Basic Electricity

<http://www.stem2.org/je/basicelectricity.pdf>

Electric Potential Lines for Planar Current Flow Through a Rectangular Tank of Water.

<http://www.stem2.org/je/epotentials.pdf>

6 Steve Cummins: Demonstration of Scientific Equipment

(1) Photo Ionization Detector HNU Corporation Newton Mass. PID

PID Analyzers, LLC was formed in April 2003 to acquire the assets of HNU Systems. Inc. (developer of the first commercial photoionization instrumentation).

www.dem.ri.gov/pubs/sops/wmsr2114.pdf

(2) Tesla Coil vacuum leak detector. Certain gases will emit radiation and cause a glow when stimulated by the high frequency electric field produced by a Tesla coil. This can be used to detect leaks of such gases from say a mass spectrometer. Steve demonstrated this with various apparatus. In air the Tesla Coil just produces electrical sparks. I will look into the theory of operation of the excitement of gases by Tesla coils. The two tesla coils he brought look like an old fashioned electric soldering Iron, with a metal probe sticking out from which electrical discharges and ionizations originate. A Tesla coil will excite florescent lights. Demonstrators make florescent tubes glow, but seldom explain why they glow.

(3) Tesla Coil driven Spherical globe showing discharges.

(4) Steve showed a device that is to be used for security purposes for detecting dangerous substances.