STEM Society Meeting, January 8, 2013

James Emery

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Contents

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 not restricted to this meaning. There are nearly 100 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`

2 The January Meeting Announcement

The January meeting of the STEM Society will take place on the second Tuesday of the month, January 8, 2013, at the Trailside Center at 99th and Holmes in Kansas City, Missouri. The starting time is 6PM.
A List of Possible Topics:

(1) Bob Williams will continue our presentation on transistors.

(2) Cecilé may talk about: (a) Her current studies on grasses that she has recently collected. (b) A new expensive thermocouple that she received for Christmas, which interfaces to a computer, with supplied software to collect data. (c) Experiments she plans for the thermocouple.

(3) An introduction to a project to mount instruments on a falcon to measure temperature variation with height, as well as other related measurements, by Kent Smith.

(4) An introduction to bacterial communication and Quorum Sensing. Bill Reid plans next month to introduce a speculation that he has concerning Parkinson's disease and its relation to bacteria and quorum sensing and the work of Bonnie Bassler of Princeton university, as well as some work done at John Hopkins.

(5) Problems and Solutions. Possibilities: a problem relating to spirals, an alternating current problem in electrical engineering, complex numbers, and phasers, elementary calculus problems, et cetera.

(6) Book Reports. Perhaps reports on the new Kurzweil book, called **How to Create a Mind**, and the classic autobiography of physicist Richard Feynman called **Surely You're Joking Mr. Feynman**

(7) Impromptu topics from the masses who gather for this meeting.

The STEM Society web site:

`http://www.stem2.org/`

3 Google Fiber Gigabit Network Installation in Kansas City

This short presentation lasted about 30 minutes. Jessica Divine and Austin Watson from the Google Fiber marketing team attended the STEM meeting at the Trailside Center to discuss Google's upcoming plans in the community. This was mostly a question and answer session. Information along these lines is available at the Google-Fiber office at Westport Road and State Line Road

in KCMO. Some had expected a more technical and engineering discussion, and expressed some disappointment. There were some questions about the Fiber-Hut being installed next to the fire station and the Trailside center. Fiber will come in the fall, and the Trailside center is scheduled to be hooked-up.

I visited Google-Fiber later in the month and obtained the following additional information. There happened to be a person there who is involved in the actual installation of the fiber. According to him most of houses in the neighborhood on the Kansas side of State Line Road near the Google office have now been installed with essentially no problems. There is a small device that hooks to the fiber optic cable inside the house to convert the fiber signal to an ethernet electrical signal. For one Gigabit operation a computer needs a one Gigabit ethernet card, which most computers have had for the past 2 or 3 years. There are upgrade cards for older computers. All wiring in the house will be done by Google to various rooms. Most of the Google Gigabit network was strung on telephone poles in Kansas City before the Google announcement was made. Connecting fiber together is now trouble free and done by a sophisticated machine. Also there are several sophisticated instruments that can catch any network transmission problems such as unwanted signal reflections. There are two alternate boxes that may be part of the installation. The higher end box will be installed for customers buying the one Gigabit service, which includes a recording hard drive for television and such. The lower end box will be installed for those selecting the slower, free-for-seven-years-service (after a 300 dollar installation fee). There is no installation fee for the higher end service, for which there is a monthly fee.

4 A Computer Controlled Thermocouple: Cécile Lagandré

Cécile Lagandré is a contributor to the publication **Missouri Prarie Journal**. See **Missouri Prarie Journal**, Vol. 33 Nos 3 and 4, fall_winter 2012, p29.

`http://www.moprairie.org/documents/Fall_Winter2012Vol33No3_4.pdf`

This device is a thermocouple data logger manufactured by Lascar Electronics. Purchased from

MicroDAQ.com, Ltd.
PO Box 439
Contoocook, NH 03229
U.S.A.

The device mates to a laptop computer through the USB connection. The software controls and stores samples; it does analysis, and makes graphs. Feaster Glade is on Cécile's and Dave's estate near Warsaw Missouri.
Cécile's image:

http://www.stem2.org/je/stempictures010813.zip

Cécile's words:
Feaster Glade was feverish on Sunday morning, January 6, 2013. Protected from the wind and exposing its steep slope to a cloudless southern sky, its temperature reached a balmy 89F at 11:56am when nearby weather stations all recorded temperatures around freezing. Well, I have to admit that soil color may have played a role; the thermometer, a thermocouple linked to a data logger, was placed at the surface of the soil somewhere within the white ash layer left by the previous afternoon red cedar brush fire and in the middle of a collection of dark boulders.

The temperature chart revealed another worrisome pattern: some stress-related indigestion maybe. A couple of hours after sunset and, again twice during predawn hours, significant burps came to disturb glade peace. A little later, after sunrise, glade peace warm-up talks stalled, twice. It is only after all these political affairs were resolved that the fever really took off.

Fever and indigestion are much easier to swallow than thermodynamic conclusions reinventing what nature has been performing so proficiently all along. I would be ill equipped to elaborate on sunrays incidence, specific heat values, or soil surface climate. One finding I will mention though is that fire burns hot, very hot: a black-tailed jackrabbit proved it in a hurry.

5 Designing a Transistor Amplifier and Memories of the Education of a Physicist: Bob Williams

Bob talked about a 500 mile bicycle trip in the south, pulse amplifier design as an undergraduate student, hunting monopoles in graduate school at LSU

and Georgia.

Bob's main topic was analyzing a transistor amplifier to determine the current and voltage amplification, following a problem in the book **Principles of Electrical Engineering,** by D'Azzo and Houpis, Merrill, 1968, pages 145-147.

6 Review of the classic Richard Feynman book *Surely You're Joking Mr. Feynman*: Kent Smith

This is a terrific book that everyone with an interest in: repairing radios, Brooklyn in the 40's, marrying a wife with tuberculosis, theoretical physics, the Nobel Prize, having tea at a fancy Princeton reception, the Manhattan Project, safecracking at Los Alamos, viewing strippers while solving equations, learning to draw, discussing art with an artist friend, and the general exciting life and education of a famous physicist. Kent gave an interesting review. He said that Feynman seemed at root to be shy and insecure. Feynman said things like, to paraphrase, "So that is what I think, that is my opinion, but I don't really know much about the world." But I think this was a bit of a pose to mask a loud and exuberant personality.

7 Bonnie Bassler and Quorum Sensing

Bonnie Lynn Bassler (born 1962) is an American molecular biologist. She has been a professor at Princeton University since 1994. Born in Chicago and raised in Danville, California, Bassler received a Bachelor of Science in biochemistry from the University of California, Davis and a Ph.D. in biochemistry from Johns Hopkins University. She made key insights into the mechanism by which bacteria communicate, known as quorum sensing.

Bacteria communicate, as do we, using tactile and chemical signals. First observed by Anton van Leeuwenhoek in 1676, bacteria are the Earth's oldest and most abundant beings. They seem to be little more than rigid vessels filled with DNA and an amorphous cytoplasm. Bacteria are, however, highly sophisticated creatures. They not only communicate between themselves, they also communicate directly with higher plants and animals.

From the Wikipedia article on Quorum Sensing:

Quorum sensing is a system of stimulus and response correlated to population density. Many species of bacteria use quorum sensing to coordinate gene expression according to the density of their local population. In similar fashion, some social insects use quorum sensing to determine where to nest. In addition to its function in biological systems, quorum sensing has several useful applications for computing and robotics.

8 Transistors Document, Emery

The latest but incomplete version of my document called **Diodes and Transistors** is available as

`http://www.stem2.org/je/diodetran.pdf`