STEM Society Meeting, October 13, 2015

James Emery

Last Edit: 11/5/2015

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 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.

These meeting notes contain links to many other documents, which may be viewed or downloaded by clicking the link. A partial list of documents can be reached by clicking the heading **Documents**. The meeting notes may also be viewed in an archive file (archive.pdf), which is in the list of documents. Many of the documents are PDF files. They may be viewed or downloaded to the computer by clicking, provided Adobe Reader, or another program capable of reading PDF files, is present. There are many more documents available at the site than are listed under **Documents** because the documents.htm file is not at all up to date. The last time I checked, about March 2014, there were about 350 document files on the site. We are in the process of creating better techniques for finding documents and authors. The first meeting of the STEM Society was in November of 2006. For several years we used the content management program called Joomla. It had a fancy looking interface, but was hard to use. It overran the space somehow at our internet provider Bluehost. So we now have a very simple HTML site. It is not so slick looking as Joomla, but is very easy to maintain and modify.

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 October Meeting Announcement

The October meeting of the STEM Society will take place on the second Tuesday of the month, October 13, 2015, at the Trailside Center at 99th and Holmes in Kansas City, Missouri. The starting time is 6PM.
Questions, Topics and possible Discussions:

(a) Who was Kenneth Spencer? Who was Elmer Verner McCollum? What are the connections with Kansas University, and what related big event will occur this November in Lawrence? What does this all have to do with Chemistry and Art?

(b) How can one design a Geometric Modeling System using the principles of Projective Geometry, and how is this related to one of the major Renaissance innovations?

(c) Why did Kent Smith's laser ranging device quit working when he connected an LED to the circuit to monitor it's operation? Could an opamp or transistor help?

(d) What ingenious electrical device is present in nearly every room of houses, and who invented this gadget?

(e) What does wax have to do with the operating temperature of a gasoline engine?

(f) What is DDT, who invented it, and why, when as a small child I was told by my mother that it kills insects but won't hurt people, I was skeptical?

(g) Do plants have feelings, a sex drive (is this why they leave stickers on your leg), or consciousness. And if they do have consciousness, how do they have this without a brain? Or do they have a brain, after all flowers turn toward the sun, and vines seem to have clinging and navigational intelligence?

(h) As always, I hope attendees choose to bring additional things, ideas, or presentations.

3 Review of the Previous Meeting Notes for the September Meeting

These notes are available at the Website stem2.org.

4 Spencer and McCollum

Kenneth Spencer was the owner of a large chemical company. After his death his wife gave away large amounts of the Spencer wealth to fund many educational, scientific, and art projects in the Kansas City area.

Elmer Verner McCollum is credited with discovering vitamin A, and with the coining of the term vitamin. A large residence hall named for him in Lawrence Kansas is scheduled to be exploded November 25, 2015. He received the Spencer award in 1958.

For more details see:

`stem2.org/spencermccollum.pdf`

There are also Wikipedia articles on both Spencer and McCollum.

5 Cécile Lagandré: Plants Found at Feaster

C'ecile displayed poster pictures with commentary of plants found on the Feaster estate of Cécile and Dave located near Warsaw, Missouri. Among other topics, Cécile presented some information on plant sex.

6 James Emery: Explaining an Engine Thermostat, and an Electrical Switch

The thermostat controls the engine temperature by opening and closing a valve mounted on the engine that allows hot water to pass from the hot

engine to the cooling radiator. This valve is closed by a spring, and opened when wax inside a cylinder melts, increases its volume and thereby increases pressure on a rod, acting as a piston, which counteracts the spring force to open the valve, which then directs the hot engine water to the radiator. The wax melts at a specified temperature to control the engine temperature at a nearly constant value. The defective thermostat was presented at the meeting as well as a sketch of its operation. I shall make that sketch available here in the future.

A common push switch on a table lamp is a quite ingenious and clever mechanism, no doubt a quite old invention, which has two stable points, switching on and off with a spring. A disassembled switch was presented at the meeting.

7 Kent Smith Ranging Device

Kent purchased a device for a radar like device and decided to modify the electrical circuit. He wished to monitor when the device was sending a signal. He connected an LED to a point in the circuit, which indicated when a signal was attempted, however the circuit ceased to work. I speculated that the voltage point was being loaded by the LED thus altering the voltage and making the circuit itself quit working. So perhaps a little transistor circuit could be devised so that this loading is avoided. An opamp would work also, but would require a more elaborate power supply.

8 James Emery, A Geometric Modeling System Using Quadric Surfaces and Projective Geometry

I did not have time to present any details on this, but I did show an image of a generated solid and an intersection curve which is called "the twisted cubic." Perhaps more on this later.

9 James Emery: The 2015 Spencer Award

I attended the award ceremony at UMKC and the dinner. And had some interesting conversations. A large number of Chemists compete nationally for this award. The award this year went to a chemist from DOW who develops pesticides and also has worked on the HIV Protease inhibitors that have tamed AIDS.

10 James Emery: DDT

I introduced the topic of DDT at this Spencer Award banquet to a group of chemists at my dinner table. They didn't know much about who discovered it. I looked up some information later on DDT and talked about it a bit at the STEM meeting. I found that there is little information on DDT in modern Chemistry or Organic Chemistry books.

DDT stands for dichloro-diphenyl-trichloroethane. The molecule consists of two phenyl rings, each bonding to a single chlorine atom at one of the carbons of the ring. The two rings are joined together at a carbon atom site of an ethane molecule, where three other normal hydrogen atom sites of ethane have been replaced by chlorine atoms. So DDT is a rather simple organic molecule.

Rachel Carson's book **Silent Spring** resulted in DDT being banned in the US, but the ban is not absolute. DDT was allowed in recent years to combat an outbreak of Bubonic Plague in California. Also India still uses it widely to combat the mosquitos and malaria. Some argue that millions of people die from malaria annually in the world because of the ban.

I did find one mention of DDT in a chemistry book titled **Chemistry and Chemical Reactivity**, by John C. Kotz, Paul M. Treichel, and John R. Townsend, Thomson Brooks/Cole, 7th edition, 2009, page 7. A small section talks about moral and ethical issues in science. DDT was developed during the second world war, although the molecule had been discovered in the 19th century. It effectively controlled pests but was harmless to people, but had unintended consequences. In Borneo thatched roofs fell down because the DDT killed wasps, which had eaten caterpillars, but which now allowed the caterpillars to eat the thatch. Small lizards ate the caterpillars also, and cats ate the lizards, passing the DDT to the cats, who began to die, this caused large growth in the rat population.

The DDT killed birds and had other bad environmental consequences. But widespread use of DDT during that time did kill the mosquitos and controlled malaria. In 2006 the World Health Organization approved the indoor spraying of DDT in parts of Africa. Indoor spraying limits the effect on the external birds and such.

I might later present a diagram of the DDT molecule. A while back I created a program to draw electronic diagrams. I suppose I could modify that program a bit to draw chemical diagrams. Many drawing programs exist, but I don't have one, and also many such programs produce bitmap images which I don't like at all because of the large filesize and inability to scale. I very much prefer vector graphics, specifically Postscript graphics, which have small file size and are nicely imported to LaTex.