STEM Society Meeting, May 10, 2016

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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.

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 May 10, 2016 Meeting Announcement

The May meeting of the STEM Society will take place on the second Tuesday of the month, May 10, 2016, at the Trailside Center at 99th and Holmes in Kansas City, Missouri. The starting time is 6PM. Also look at our website for past meeting notes:
The web site is:

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

Topics and possible Discussions:

(a) Modular arithmetic and using Mod(9) to check calculations.

(b) Rich Kaufman may talk about "green" chemistry and other new developments in that field.

(c) We might do some elementary demonstrations in electricity and electronics.

(d) A brief look at the notes from last months meeting.

(e) We might try to install Python on the Trailside Center computer to show how easy it is to do.

(f) Perhaps some other elementary topics from mathematics and computing.

(g) A review of the new KC street cars.

(h) As always, attendees are free to bring, and should bring additional topics, things, ideas, and presentations. We need more presentations from our very diverse and experienced fellowship.

3 James Emery, Checking the Multiplication of Two Large Integers

See the document titled **Casting Out Nines**:

http://www.stem2.org/je/casting9.pdf

4 Rich Kaufman, Green Chemistry

I have run across a trend in organic chemistry called "Green Chemistry." There are 12 principles according to Wikipedia. Also, a chemical invention named "metathesis" involving the development of a special catalyst for double bond reactions, which has revolutionized industrial chemistry and is an example of one of the principles in action (fewer intermediate compounds, I think).

I looked up an example of a reaction involving this catalyst, the Grubbs catalyst which had Ruthenium in it, but couldn't follow the thing at first ... really complex.

The EPA seems to have some literature on Green Chemistry. I did get a small handle on metathesis. It involves what is called a double replacement reaction but involving double bonded molecules

$$A = B + C = D \rightarrow A = C + B = D.$$

Apparently this reaction is used to involve numerous intermediate steps without the Grubbs catalyst....a Ruthenium-carbon molecule. There was an earlier catalyst of this sort which was a Molybdenum-carbon molecule which was pretty unstable.

The twelve principles of green chemistry are:

1. It is better to prevent waste than to treat or clean up waste after it is formed.
2. Synthetic methods should be designed to maximize the incorporation of all materials used in the process into the final product.
3. Wherever practicable, synthetic methodologies should be designed to use and generate substances that possess little or no toxicity to human health and the environment.

4. Chemical products should be designed to preserve efficacy of function while reducing toxicity.

5. The use of auxiliary substances (e.g. solvents, separation agents, etc.) should be made unnecessary wherever possible and innocuous when used.

6. Energy requirements should be recognized for their environmental and economic impacts and should be minimized. Synthetic methods should be conducted at ambient temperature and pressure.

7. A raw material or feedstock should be renewable rather than depleting wherever technically and economically practicable.

8. Reduce derivatives Unnecessary derivatization (blocking group, protection/deprotection, temporary modification) should be avoided whenever possible.

9. Catalytic reagents (as selective as possible) are superior to stoichiometric reagents.

10. Chemical products should be designed so that at the end of their function they do not persist in the environment and break down into innocuous degradation products.

11. Analytical methodologies need to be further developed to allow for real-time, in-process monitoring and control prior to the formation of hazardous substances.

12. Substances and the form of a substance used in a chemical process should be chosen to minimize potential for chemical accidents, including releases, explosions, and fires.

5 Installing and Using Python

I had planned to install Python on the Trailside Center Computer; but installation was found to require an administrative password, which I did not know.

Some computers and operating systems have Python installed by default. Among these are Mac OS, and Linux systems, for example the Raspberry PI.

6 Shaun O'Kelley, Kansas City Waste Treatment Discussion

Shaun will talk about this in more detail at the June meeting.

7 James Emery, How to construct an Octagon in a Square

http://www.stem2.org/je/octagon.pdf

8 Mathematical Miscellany

See the document titled **Mathematical Miscellany**:

http://www.stem2.org/je/misc.pdf

9 The New Kansas City Missouri Street Cars