

STEM Society Meeting, January 13, 2015

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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 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 January Meeting Announcement

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

Topics:

- (1) Tom Grant will give a talk on **Solar Panel Leasing**.
- (2) If there is time left after this talk, we can discuss any unannounced topic that anyone wishes to introduce, or possibly one of the following topics:
 - (a) The Linear Independence of Solutions to Differential Equations, and the Relation to the Wronskian,
 - (b) Computations involving the sextant, (I have a brass model of a sextant),
 - (c) Famous Experiments in Physics,
 - (d) Wave Motion in Physics,
 - (e) A continuation of our previous topic of the Quantum Mechanics of Semiconductors,
 - (f) The electronics of Operational Amplifiers.

But we shall strive to make the meeting not overly long, so as to leave time for evening activities such as eating, drinking, and sleeping.

The STEM Society Website:

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

3 Kaufman: DNA Learning Center

Rich Kaufman Jan 9 at 1:32 PM

To

jdemery@member.ams.org

I just googled DNA learning center.....really interesting.....too much to read right now. You might take a look.

Rich

P.S. How about a discussion of whether such a program should be established either in KC or another place outside of the East Coast. I know such programs will spring up....they're cutting edge and timely.

Rich Kaufman Jan 9 at 1:27 PM

To

jdemery@member.ams.org

Well said, about sleeping, Jim.

Which experiments in physics might be discussed?

I've been reading Jim Watson's 2003 book entitled "DNA" which is a redo of his earlier book "Double Helix". Also, read "DNA, annotated....", a very detailed discussion of some of the different people and strands of research he and Crick used, plus several false leads they followed before latching onto the helix version.

Since these are really detailed, it might be dull to discuss them.....need to really follow the subject to be that interested.

Cold Spring Harbor lab, which Watson ran for 20 plus years, has produced what they call the "DNA Learning Center", apparently a lesson plan for learning about DNA. If I find out more before Tuesday, at least that might be of interest to everybody.

Rich

4 Tom Grant: Solar Panel Leasing

Power Point slides of Tom's presentation:

<http://www.stem2.org/je/solarleasingtgrant2015.pptx>

Tom made a Power Point presentation and distributed a handout. The presentation and handout concerned a customer of Cromwell Solar. This handout contains pages by Cromwell solar describing the benefits that the customer would receive from the lease, and spreadsheet data created by Tom giving his own analysis. The customer is in Paola Kansas. Tom found some errors in the Cromwell supplied data. Also Tom estimated that the 7 percent escalation of energy costs used by Cromwell may very well be too high. And if a 3.5 percent escalation of energy costs were used, then the benefits of the lease would be considerably less than Cromwell estimates and may make the lease undesirable. A bank is supplying the capital for the purchase of the solar panel installation, and one of the major return the bank would receive is due to the bank obtaining the federal tax credit instead of the customer. It might take an effort to digest all the details of the presentation.

We may make Tom's presentation available on our stem2.org website.

I did take some raw notes during the presentation, but whether they are accurate or useful is an open question. So these scribbles follow:

Growth of Solar in the US.

Solar growth by state.

Third party financing.

Solar panel cost used to be 76 dollars per watt. This has decreased to a theoretical 36 cents per watt, and a practical 2.80 dollars per watt plus a one dollar per watt installation fee.

Average PV system price.

Net Metering.

Market Rate Net metering.

Federal tax credit is 30 percent of cost. This expires December 31, 2016. State incentives vary by state.

Typical Warranties: defects and workmanship 10 years. Panels supply typically supply 80 percent of their initial power after 10 years.

Solid State inverters are able to completely follow the utility waves, i.e., are in phase.

A lease is a contract to rent property.

A brief history of leasing: statute of Wales 1284, 497 of the fortune 500 companies now lease their automobiles.

Residential leasing of Solar Panels is prohibited in only 3 states.

Major Solar leasing companies: Clean Power Finance, NRG Sunlease, One Roof Energy, Sungevity, Sunpower.

Seventy five per cent of solar panels are now leased.

Leases run 15 to 25 years.

Complications if the house is sold.

Leased Solar Panels will probably decrease the value of the house.

The average installation is a 6 KW system.

The assumed seven percent escalation rate is probably higher than the inflation of utility rates.

Panels now supply about one half Kilowatt per square meter.

An old tiny solar panel, which I have from Harbor Freight, supplies 1.4 Watt. It measures 14.75 inches by 6.5 inches so the area is

$$A = (14.75)(6.5)2.54^2 = 618.5471cm^2 = 618.5471/(100)^2 = .0618m^2$$

So the panel puts out

$$1.4/.0618 = 22.6537 \text{ W/m}^2$$

So this is about 4 percent of the one half Kilowatt per square meter value of current panels.

5 Jim Emery: Using the Sextant to Determine Latitude and Longitude Using Celestial Navigation

I informally talked about this to a small group after the meeting. I showed briefly how one uses the brass sextant, which I brought to the meeting. We may go into this at the next meeting on February 10.