

# STEM Society Meeting, May 8, 2012

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## 1 About the STEM Society and the STEM Society Website

STEM is an abbreviation for Science, Technology, Engineering and Mathematics. 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 sometimes have scientific demonstrations. The topics range from General Relativity to scientific experiments for kids.

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 often more documents available at the site than are listed under "Documents" because they may not have been added to the documents.htm file yet.

**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 Meeting Announcement**

The May meeting of the STEM Society will take place on the second Tuesday of the month, May 8, 2012, at the Trailside Center at 99th and Holmes in Kansas City, Missouri. The starting time is 6PM.

Possible Topics are:

(1) Steve Cummins will bring various scientific devices that he will demonstrate in a show and tell.

(2) A discussion of Beryllium, and PCBs. A history of the Nuclear Weapons Complex and a discussion of accidents and toxic exposures that have occurred throughout this history. Biographical material on the scientists who worked in the Manhattan Project. We ask for any information that people

have on these matters.

(3) A possible discussion of CCDs by Bob Williams.

(4) A discussion and demonstration of microcontrollers.

### 3 Bob Williams: The CCD (Charge Coupled Device)

Here is Bob's Power Point slides converted to pdf:

<http://stem2.org/je/ccd.pdf>

For more information see the Wikipedia article on the CCD. Boyle and Smith invented the CCD at Bell Labs in 1970. They received the 2009 Nobel Prize in Physics for this work. Here is their original paper, which is available on the internet:

[1] Willard Boyle, George E. Smith **Charge coupled semiconductor devices**. Bell System Technical Journal, 49(4): 587-93, April 1970.

At Fairchild, a team led by ex-Bell researcher Gil Amelio, developed the first commercial devices, and by 1974 had a linear 500-element device and a 2-D 100 x 100 pixel device.

Steven Sasson, an electrical engineer working for Kodak, invented the first digital still camera using a Fairchild CCD in 1975. Steven J. Sasson (born July 4, 1950 in Brooklyn, New York), is an American electrical engineer and the inventor of the digital camera. Sasson is a 1972 (BS) and 1973 (MS) graduate of Rensselaer Polytechnic Institute in electrical engineering.

Sasson's invention began in 1975 with a broad assignment from his supervisor at Eastman Kodak Company, Gareth A. Lloyd: to attempt to build an electronic camera using a charge coupled device (CCD). The resulting camera invention was awarded U.S. Patent 4,131,919. Leica Camera AG honored Steve Sasson by giving him the 4th million Leica camera, a limited edition 18 megapixel Leica M9 Titanium at Photokina 2009.

On November 17, 2009, US President Barack Obama awarded Sasson the National Medal of Technology and Innovation at a ceremony in the East

Room of the White House. This is the highest honor awarded by the US government to scientists, engineers, and inventors.

Sasson recently gave a talk at Linda Hall library in the fall of 2011. I talked to him a bit there. Being quite familiar with Kodak, I asked him if he worked at the old giant brick building in Rochester. He told me no that even back then, he worked at a research facility in a different location. I may have been there also. Kodak was a giant place back then. Someone told me that they had recently filed for bankruptcy. Sasson said that he still works there though.

## 4 **Cris Sanderson: Internet demo, *Scale of the Universe 2*, Book Review *The Road to Reality*, by Roger Penrose.**

Cary and Michael Huang: The scale of the universe 2. This very interesting and beautiful internet application gives smooth zooming views of the universe, from the smallest objects to the largest.

<http://htwins.net/scale2/>

[1] Penrose, Roger **The Road to reality : A Complete Guide to the Laws of the Universe**, QC20 .P46 2005, 2005 .

## 5 **Steve Cummins: A Demonstration of Various Scientific Instruments**

This book is out of copywrite, and is available at Google Books as a pdf.

[1] Ervin Sidney Ferry, Oscar William, **A Handbook of Physics Measurements**, 1917.

[http://books.google.com/books?id=HXhCAAATIAAJ&pg=PA18&dq=cathetometer&as\\_brr=1#v=onepage&q=cathetometer&f=false](http://books.google.com/books?id=HXhCAAATIAAJ&pg=PA18&dq=cathetometer&as_brr=1#v=onepage&q=cathetometer&f=false)

*"I ran across the reference **A Handbook of Physics Measurements** while researching how to properly set up and use a measurement tool that I have. I thought it was some kind of "transit level" measurement tool. When I*

finally took the time to figure out the instruments maximum resolution capabilities, I was astounded to realize the vertical vernier display is individuated with 0.1 mm increments spread over a span of 0 to 1 mm full scale. I believe this calibration provides for a total instrument resolution of 100 microns per fine-scale division!

I called Gaertner Scientific Instruments today to obtain whatever information they have available for this piece of equipment they produced in 1967. The guy in Customer Service was not willing to "look up" my particular instrument in their archive of instrument manuals. I was finally able to "drag enough information out of him" so as to be able to properly identify the true name of this device. I have attached the above link to show to you (and any others you may wish to share this reference with) what it is that I have (it is called a vertical cathetometer, or "optical ruler" in layman's terms).

I think many others in our group might be interested in the overall scope and content of the many types of physical measurements instrumentation also described in "A Handbook of Physics Measurements".

I hope to be able to come to the next STEM Society meeting. I plan on bringing several "smaller and very much less heavy to carry" mechanical and electro-mechanical devices for show and tell.

1) An example of "Maxwell's Demon", also called a "Vortex Cooler" manufactured by the Exair Corporation.

2) A small hand-held "Tesla Coil", that can be used to look for very small and even "virtual leaks" often present in dielectric components assembled into the construction of a high vacuum pumping system. I have forgotten exactly where I stashed this device, but hopefully I can find it once again!

I have many other interesting scientific curiosity pieces that I would also like to share with the group members sometime. I have a "McCloud Gage" (without the mercury inside) that I am particularly fond of, as it is constructed out of all hand-blown glass components. I have only "used" this device perhaps once or twice. These devices were already "extinct" or at least a "rare and endangered" laboratory measurement "species" by the time I entered the field of high vacuum laboratory technology.

Steve Cummins.

## **6 Jim Emery and Kent Smith: Microcontrollers**

I showed a couple of physical circuits relating to the Arduino. Then rapidly went over a document on the Arduino, which can be found on the Stem Society web site:

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

Kent Smith talked briefly about his project using the ATTINY (made by Atmel) microcontroller.

## **7 Jim Emery: A Discussion on Beryllium**

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

## **8 Jim Emery: A Discussion on the Atomic Scientists**

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