STEM Society Meeting, October 11, 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 October 11, 2016 Meeting Announcement

The October meeting of the STEM Society will take place on the second Tuesday of the month, October 11, 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 Discussions:

(a) Ken Schmitz: **A Tale of Two Energies: Thermodynamics and the Fate of Mankind**

(b) As always, attendees are free to bring additional topics, objects, or ideas, which, subject to time constraints, can be presented. You can let me know at the meeting if you have such material to present.

3 Ken Schmitz: A Tale of Two Energies: Thermodynamics and the Fate of Mankind

Ken Schmitz gave a Power Point Presentation where he talked about several threats to the continued existence of mankind. Among these are the continued existence of the huge stockpile of armed nuclear weapons, of nuclear reactor accidents, and the threat of global warming. Other threats include asteroid collision with the earth, the worldwide spread of disease and viruses, and the disappearance of our atmospheric protection against extraterrestrial radiation by several possible means.

Most of the remarks presented here are those of Jim Emery. I welcome any corrections.

The universe is estimated to be about 16 billion years old and the earth about 4 billion years old. Humans have been around for a few hundred thousand years. Considering the continuing ignorance of human beings, including the continuing opposition to scientific knowledge, and the undiminished perseverance of human ignorance caused by culture and religion, and the continuing love of violence and war, one finds it quite difficult to believe that humans will continue to exist for thousands of years more. The disappearance of humanity seems almost certain. Although most of us now living will not likely experience this end. What we do now of course, may be able to

extend this period of human existence on earth somewhat.

From Wikipedia:

"In 1867, the Mallinckrodt brothers, Gustav, Otto and Edward, founded G. Mallinckrodt and Co. in St. Louis, Missouri. The Mallinckrodt family had immigrated from Germany, and Otto and Edward both returned to Germany, the leading chemical powerhouse of the time, for advanced training.

Mallinckrodt Chemical Works was incorporated 15 years later. By 1898, the company had established itself as a pharmaceuticals supplier and in 1913 became the first to introduce barium sulfate as a contrast media for x-rays.

Nuclear Waste in St. Louis, Missouri: Henry Farr and John Ruhoff, technical managers for Mallinckrodt, Inc. were directed by Edward Mallinckrodt, Jr. to develop a chemical process for purifying large quantities of uranium. Uranium purified by Mallinckrodt was used at the University of Chicago to build the first nuclear reactor known as ChicagoPile-1, which produced the first nuclear chain reaction. Mallinckrodt also contributed uranium to the Manhattan Project, producing fissionables used in the atomic weapons detonated over Hiroshima and Nagasaki. From 1942 to 1957 Mallinckrodt purified 50,000 short tons (45,000,000 kg) of uranium products at various locations in and around the city of St. Louis. The waste was secretly dumped on Coldwater Creek and in various St. Louis suburbs, including Berkeley, Hazelwood, Bridgeton, and Weldon Spring with the approval of the federal government, which is now taking financial responsibility for the cleanup. The dumping substantially contaminated Coldwater Creek. Cleanup efforts are now underway by the Army Corps of Engineers. Cleanup sites include the St. Louis Downtown Site (SLDS), where uranium was refined; the St. Louis Airport Site (SLAPS), where waste produced at SLDS was stored; the Hazelwood Interim Storage Site (HISS), where waste from SLAPS was improperly relocated; and the St. Louis Airport Site Vicinity Properties (SLAPS VPs), areas where contamination was caused by relocation of waste. Additional nuclear waste was also illegally deposited at the West Lake Landfill, which has now been designated a Superfund site. Various buildings have been decontaminated and demolished and nuclear material has been excavated and shipped out of St. Louis by covered rail as part of the cleanup process, yet more nuclear waste remains in and around St. Louis."

The Uranium in Uranium ore decays slowly by emitting an alpha parti-

cle, which is not very penetrating so from an external source it is not very dangerous to living tissue. However, when ingested into the body it is very close to tissue and the radiation is constant so it is very dangerous. Miners and workers would definitely ingest Uranium and the radiation would very probably induce cancers.

The first reactor called the ChicagoPile-1 or CP-1 consisted of blocks of graphite with drilled holes containing either Uranium Dioxide from Malinkrodt in St Louis, or Uranium metal that was reduced from the oxide by some newly invented process at Iowa State University. I have not searched for information on where ISU obtained their Uranium Oxide.

4 Bibliography

There are many books on these subjects, both popular and technical, and many people have campaigned against nuclear weapons over the years. Some of the notable people include Linus Pauling and Bertrand Russell. The campaign for Green Energy has also a very long history extending back to the nineteenth century. Many old attempts have failed in the past due to technical problems. I personally counted about 40 books in my own personal library on the threats of nuclear weapons. Here are a few books directly relating to Ken's presentation. I may expand this list later.

By the way, many non-technical people don't seem to realize that most scientists and engineers don't join militaristic R and D organizations because they are lovers of the military, rather it is almost impossible to avoid because of the way R and D is funded. Also most work that is engaged does not necessarily have a really direct connection to military ends, but to science and technology in general. For example a good part of advanced mathematical research after the second world was funded through the Office of Navel Research, although essentially none of it had any real connection to military ends.

Knowledge of Nuclear Physics could never have been hidden and never could have been avoided while humans continue to strive to understand their world because it is at the heart of physics and basic to the very existence of the universe.

[1] Boughton Deyon D., **Yellowcake Road: Cotter Corporation's unfortunate journey from Nuclear Production to Nuclear Waste Re-**

cycle, 2009.

[2] Naomi Klein, **This Changes Everything: Capitalism vs The Climate**.

[3] West Tony, **Safe Side of the Fence**, *A video Documentary on the Mallinkrodt corporation plant in St Louis, which purified "Yellow Cake", which is made from uranium ore, by first crushing it, then leaching away impurities with sulphuric acid.*

[4] Rhodes Richard, **The Making of the Atomic Bomb**.

Yellow cake is the mined Urainium ore, containing Uranium Oxide and impurities. It contains Uranium U238 mostly, with a small amount of uranium U235. This ore is not very radioactive, containing only a very small amount of the very radioactive isotope U235. However, there is evidence that mining and processing this ore leads to abnormally high rates of cancer among the workers. Presumably, the final product of the refined and purified yellowcake after reduction to the pure metal in Iowa, was sent to the Y12 plant at Oak Ridge where the U235 was separated.

The material used in the first reactor constructed at the University of Chicago used the oxide material directly, as well as pure Uranium metal produced by Iowa State University. The Mallinkrodt plant supplied the uranium dioxide for the first nuclear pile at the University of Chicago without the separation of U235. By reading the Wikipedia document called **ChicagoPile-1**, we see that not much of any protection from radiation was observed or employed at Chicago, I suppose partly out of ignorance. See the Wikipedia **ChicagoPile-1.pdf** article below.

Ore processing sites near St Louis include: Cold Water Creek, SLAPS (St Louise Airport Processing Site), Westlake Landfill, Weldon Quarry Superfund Site. See also Denese Brock. In 2003, the grass-roots organization, United Nuclear Weapons Workers, was born in Brocks mobile home. Brock's father was a Mallinkrodt worker, who suffered many incidents of cancer.

5 The Wikipedia Article, *ChicagoPile-1*, Retrieved 10/20/2016

This is a very interesting and informative article on the construction of the first nuclear reactor.

http://www.stem2.org/je/ChicagoPile-1.pdf

6 There Was No STEM Society Meeting in November

Our next meeting would normally be the second Tuesday in November, which is November 8, 2016. However, this day was election day, and the Trailside Center was used as a voting place. So we did not have a November meeting.