STEM Society Meeting, March 10, 2015

James Emery

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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 March Meeting Announcement

The March meeting of the STEM Society will take place on the second Tuesday of the month, March 10, 2015, at the Trailside Center at 99th and Holmes in Kansas City, Missouri. The starting time is 6PM.
Topics:

(a) Periodic functions and wave motion. Representations of two dimensional waves and higher dimensional waves in Mathematics and Physics. Wave equations, Electromagnetic waves, and sound waves.

(b) Book reports: Such as "How the Hippies Saved Physics," and others.

(c) Kent Smith has created a DVD of the documents on our web site, which I will bring, in case anyone wants to copy something.

(d) Other talks and projects are encouraged and welcome.

3 Nothing

On π day 3/14/15, at 9 hours 26 minutes and .5358979... seconds in the morning, nothing of any unusual significance appears to have happened here.

4 Cécile Lagandré: Comments on Asparagus and Related Words in Botony

Cécile, as I recall, talked about content similar to the following article from Wikipedia:

"Asparagus is a genus in the plant family Asparagaceae, subfamily Asparagoideae. It comprises up to 300 species. Most are evergreen long-lived perennial plants growing from the understory as lianas, bushes or climbing

plants. The best-known species is the edible Asparagus officinalis, commonly referred to as just asparagus. Other members of the genus are grown as ornamental plants ...".

Cécile wondered what property is common to all of these classifications. Biological groupings include: Kingdom, Phylum, Class, Order, Family, Genus, and Species. There are some modern additions on top: Life, and Domain.

Editorial Comment: Recall that Richard Feynman in the NOVA program of the 70's about him called **Best Mind Since Einstein**, talked about what his father had taught him, that names are not knowledge, and not important as compared to real understanding. Education in some sciences is too much about memorizing names rather than about real investigation and science. Of course giving names to people and things, does have some use, both positive and negative. Mathematicians could not do without both x and $-x$.

5 Rich Kaufman: Anatomy 101

Rich went over features of the human anatomy. We used online pictures from Wikipedia articles including: Human Body, Heart, Lungs, Brain, and Spinal Cord. Bringing up one of these articles, then by clicking on an image, a series of related images can be scrolled through using the arrow keys.

6 Review: How the Hippies Saved Physics

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Kaiser, David
How the Hippies Saved Physics
Science, Counterculture, and the Quantum Revival  (Book - 2011 )
W. W. Norton 2011
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Kaiser is an Associate Physics Professor at MIT, and perhaps teaches courses on the History of Science.

The book fails to document any "saving" of Physics, or any significant contribution that these "wacky nuts" made to Physics. However, it is an entertaining social history of the times, and informs us that those "quantum consciousness nuts and authors" mostly came from the same tree.

Kaiser was on Science Friday last Friday, 3/6/2015, talking about the 100th aniversary of Einstein's publication on General Relativity. He made

a silly statement about Einstein not studying Geometry in school because he cut classes, and so had to rely on others for his geometry. Advanced Differential Geometry, Differential Manifold Theory, and Tensor Analysis used in General Relativity, would not have been taught in any school at that time. This was current university research in mathematics then. This makes me wonder if Kaiser knows much about Relativity, and Physics in general.

Apropos of nothing, actress and singer Olivia Newton-John of "Grease" fame, is a granddaughter of Max Born, one of the founders of Quantum Mechanics and of the interpretation of the quantum wave function as representing a kind of probability.

New York Times Book Review:
"HOW THE HIPPIES SAVED PHYSICS Science, Counterculture, and the Quantum Revival"
By David Kaiser, Illustrated. 372 pp. W. W. Norton and Company. $26.95.

What Physics Owes the Counterculture

By GEORGE JOHNSON
Published: June 17, 2011 TWITTER

"What the Bleep Do We Know!?," a spaced-out concoction of quasi physics and neuroscience that appeared several years ago, promised moviegoers that they could hop between parallel universes and leap back and forth in time – if only they cast off their mental filters and experienced reality full blast. Interviews of scientists were crosscut with those of self-proclaimed mystics, and swooping in to explain the physics was Dr. Quantum, a cartoon superhero who joyfully demonstrated concepts like wave-particle duality, extra dimensions and quantum entanglement. Wiggling his eyebrows, the good doctor ominously asked, "Are we far enough down the rabbit hole yet?" All that was missing was Grace Slick wailing in the background with Jorma Kaukonen on guitar.

Dr. Quantum was a cartoon rendition of Fred Alan Wolf, who resigned from the physics faculty at San Diego State College in the mid-1970s to become a New Age vaudevillian, combining motivational speaking, quantum weirdness and magic tricks in an act that opened several times for Timothy Leary. By then Wolf was running with the Fundamental Fysiks Group, a Bay Area collective driven by the notion that quantum mechanics, maybe

with the help of a little LSD, could be harnessed to convey psychic powers. Concentrate hard enough and perhaps you really could levitate the Pentagon. In "How the Hippies Saved Physics: Science, Counterculture, and the Quantum Revival," David Kaiser, an associate professor at the Massachusetts Institute of Technology, turns to those wild days in the waning years of the Vietnam War when anything seemed possible: communal marriage, living off the land, bringing down the military with flower power. Why not faster-than-light communication, in which a message arrives before it is sent, overthrowing the tyranny of that pig, Father Time? That was the obsession of Jack Sarfatti, another member of the group. Sarfatti was Wolf's colleague and roommate in San Diego, and in a pivotal moment in Kaiser's tale they find themselves in the lobby of the Ritz Hotel in Related Paris talking to Werner Erhard, the creepy human Excerpt: 'How the Hippies Saved potential movement guru, who decided to invest in their Physics' (wwnorton.com) quantum ventures. Sarfatti was at least as good a salesman as he was a physicist, wooing wealthy eccentrics from his den at Caffe Tries in the North Beach section of San Francisco. Other, overlapping efforts like the Consciousness Theory Group and the Physics/Consciousness Research Group were part of the scene, and before long Sarfatti, Wolf and their cohort were conducting annual physics and consciousness workshops at the Esalen Institute in Big Sur. Fritjof Capra, who made his fortune with the countercultural classic "The Tao of Physics" (1975) was part of the Fundamental Fysiks Group, as was Nick Herbert, another dropout from the establishment who dabbled in superluminal communication and wrote his own popular book, "Quantum Reality: Beyond the New Physics" (1985). Gary Zukav, a roommate of Sarfatti's, cashed in with "The Dancing Wu Li Masters" (1979). I'd known about the quantum zeitgeist and read some of the books, but I was surprised to learn from Kaiser how closely all these people were entangled in the same web. Kaiser says his title was inspired by Thomas Cahill's "How the Irish Saved Civilization," and he has a similar aim: to show, with a healthy dose of irony, how another "unlikely group of underdogs and castaways kept the torch of learning aflame." He reminds us that the pioneers of quantum mechanics – Werner Heisenberg, Albert Einstein, Wolfgang Pauli, Niels Bohr, Erwin Schrdinger – argued endlessly about the implications of their equations: particles that were somehow waves of probability, that hovered in superposition between two states, that made quantum jumps without traversing the space in between. These thinkers were often as engaged with

the philosophy as they were with the mathematics. Ultimately the interpretations were only words: futile attempts to grasp something beyond language and maybe beyond mind. By the time the hippies were in school, physics textbooks had all but abandoned the messiness of meaning. Quantum physics worked. The message was "Shut up and calculate." I remember the letdown. I thought for a while that I wanted to be a physicist. I was glad to read here that philosophizing about physics has made a comeback in university classrooms. Without the enthusiasms of the Fundamental Fysiks Group, Kaiser speculates, the inquisitive spirit might never have been revived. More specifically, Kaiser argues that the hippies, with their noble failures, contributed to a cutting-edge technology called quantum cryptography. A member of the collective, John Clauser, conducted the first experiment that confirmed Bell's theorem, suggesting that two subatomic particles, once they have been in contact, will remain subtly entangled no matter how far they are separated in space. This "nonlocality," the fysicists felt in their bones, would allow for instantaneous signaling. Herbert was devising what appeared to be a particularly ingenious scheme, and in the course of debunking it, Kaiser ventures, mainstream physicists came to appreciate that entanglement does allow for something else: encrypting messages so that they are impossible, in theory, to surreptitiously intercept. Maybe the hippies' unrestrained enthusiasm nudged other minds to think up quantum cryptography. But as much as I enjoyed this book, I didn't leave the party persuaded that their influence was all that great. Some of the most imaginative ideas in those days were coming from physicists like John Wheeler, who saw the universe as a "self-excited system" bootstrapped into being by conscious observers. Wheeler, as close to an antimatter hippie as can be imagined, diplomatically rebuffed the San Francisco cabal. So did his student Richard Feynman, who indulged in Esalen's hot tubs as much for hedonistic reasons as for intellectual ones. His many-paths interpretation of quantum theory, in which a particle could be thought of as simultaneously taking every conceivable avenue from A to B, including those that looped back in time, was as mind-blowing as anything hallucinated by the Fundamental Fysiks Group. While the hippies shared the wonderment of their more successful colleagues, they lacked their skepticism. Just because an equation can be parsed to show a time-traveling particle doesn't mean that We of Many Particles can pull off such a stunt. Maybe the Bay Area mavericks did serve physics in a smaller way: by helping to bring its fascination to the masses. Some good books came out of San Francisco.

Capra's "Tao of Physics," read metaphorically, provides a stimulating flyover of both physics and Eastern religion. Herbert's "Quantum Reality," Kaiser tells us, is assigned in undergraduate physics courses. But a lot of what was inspired by that era was just physics porn – titillating but with no follow-through. Who the bleep needs that? George Johnson is the author of eight books, including "Strange Beauty: Murray Gell-Mann and the Revolution in Twentieth-Century Physics."

A version of this review appeared in print on June 19, 2011, on page BR14 of the Sunday NY Times Book Review with the headline: Psychedelic Universe.

7 Matthew R. Francis Comments on Quantum Nonsense on Slate

"Quantum and Consciousness Often Mean Nonsense," Slate May 29 2014 9:36 AM

http://www.slate.com/articles/health_and_science/science/2014/05/quantum_consciousness_physics_and_neuroscience_do_not_explain_one_another.html

Matthew R. Francis is a physicist, science writer, public speaker, educator, and frequent wearer of jaunty hats. He blogs at Galileo's Pendulum

8 Johnson on Economics

Lyndon B. Johnson: "Did you ever think that making a speech on economics is a lot like pissing down your leg? It seems hot to you, but it never does to anyone else."

9 Jim Emery: Waves and Wave Motion and a Derivation of the Electromagnetic Wave Equation

/stem2.org/je/waves.pdf