SearchLites

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The Quarterly Newsletter of The SETI League, Inc.

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Schrödinger's Mom

by H. Paul Shuch
Executive Director Emeritus, The SETI League, Inc.

The SETI League is saddened to report the recent death of longtime supporting member Phyllis Shuch, early on the morning immediately after she had celebrated her 93rd birthday. Although not a scientist (but rather a reading teacher), her most significant contribution to SETI science was the early and enduring encouragement she gave to her son in pursuit of SETI success.

For the past few weeks, your loyal Executive Director (emeritus) has been occupied with settling his late mother's estate. And here is where we encounter a clash between quantum mechanics and legal semantics.

In the United States, no legal matters associated with arrangements for, or disposal of property belonging to, the deceased can be addressed without having an official death certificate in hand. Two weeks after my mother's demise, while I remained in California attempting to settle her affairs, no such death certificate had yet materialized. I called the County Department of Health, and inquired as to the status of the required paperwork.

"I can't discuss this with you," replied the sympathetic but unhelpful public servant at the other end of the telephone line, "as that would constitute a HIPAA violation."

HIPAA, the Health Insurance Portability and Accountability Act, is a US law passed in 1996 to ensure that the privacy of patients' medical history is respected. In order to coordinate my mother's care during the final years of her life, she had long since signed HIPAA release forms, assigning me Power of Attorney for all medical matters. I so informed the Health Department employee.

"Oh, HIPAA forms are only valid during the life of the patient," she replied.

"Wait - wait a minute," I stammered. "Are you telling me that my mother is dead? Why, that's a HIPAA violation!"

The humor was lost on the public servant (which probably goes without saying, given that she had doubtless undergone a humorectomy as a condition of employment). "You'll receive the death certificates in the post, in due time."

Remember the thought experiment articulated by Erwin Schrödinger, the father of quantum mechanics, in 1935? He described a sealed box, containing a cat. But, was the cat alive or dead? One couldn't know which until the box was opened. So, up until the reality was revealed, the cat was simultaneously alive and dead, with assignable probabilities p and q (which of course must sum to 1).

And that was the situation with Phyllis Shuch. She remained simultaneously alive and dead, until just yesterday, when I finally received, and opened, the envelope from the County Health Department.

Spoiler alert: Schrödinger's mom is dead. She will be greatly missed, and long remembered.

❖

Event Horizon

SearchLites readers are apprised of the following conferences and meetings at which SETI-related information will be presented. League members are invited to check our World Wide Web site (www.setileague.org) under *Event Horizon*, or email to us at info@setileague.org, to obtain further details. Members are also encouraged to send in information about upcoming events of which we may be unaware.

February 12 - 16, 2015:American Academy for the Advancement of Science *annual meeting*, San Jose, CA
March 21 - 22, 2015:*Society of Amateur Radio Astronomers Western Conference*, Stanford University, Palo Alto CA.
April 18, 2015, 0000 UTC - 2359 UTC:: Sixteenth annual SETI League *Ham Radio QSO Party*: 3.551, 7.0309, 7.2039, 14.084, 14.204, 21.306, and 28.408 MHz.
April 19, 2015: Twenty First SETI League *Annual Membership Meeting*, Little Ferry NJ.
April 24 - 25, 2015: *Southeastern VHF Conference*, Morehead, KY.
May 22 - 25, 2015: *Balticon 49*, Hunt Valley, MD.
June 21 - 24, 2015 (tentative): *Society of Amateur Radio Astronomers Conference*, National Radio Astronomy Observatory, Green Bank WV.
August 19 - 23, 2015: *Sasquan*, the 73rd World Science Fiction Convention, Spokane, WA.
October 2015 (dates to be announced) : *66th International Astronautical Congress*, Jerusalem, Israel.
April 16, 2016, 0000 UTC - 2359 UTC:: Sixteenth annual SETI League *Ham Radio QSO Party*: 3.551, 7.0309, 7.2039, 14.084, 14.204, 21.306, and 28.408 MHz.
April 17, 2016: Twenty Second SETI League *Annual Membership Meeting*, Little Ferry NJ.
21 August 17 - 21, 2016: *MidAmeriCon II*, the 74th World Science Fiction Convention. Kansas City, MO.
October 2016 (dates to be announced) : *67th International Astronautical Congress*, Guadalajara, Mexico.
October 2017 (dates to be announced) : *68th International Astronautical Congress*, Adelaide, Australia.❖

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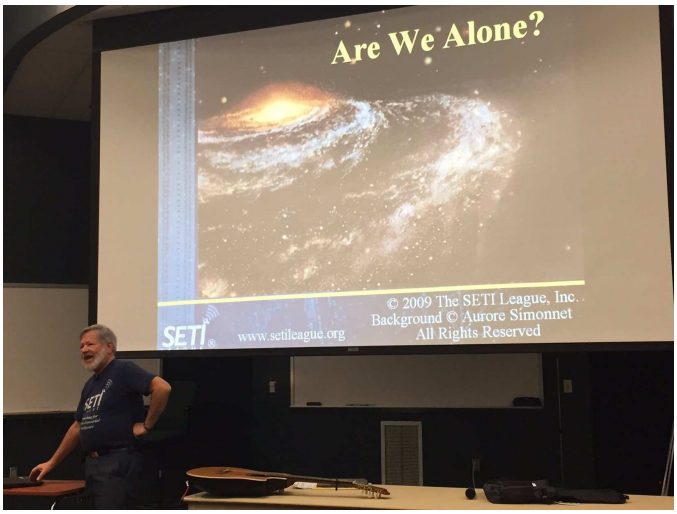


SETI League executive director emeritus Prof. H. Paul Shuch gave one of his popular 'Dr. SETI' lecture/concerts in November 2014, at Roane State College in Oak Ridge TN.

Several SETI League members paid a visit to the Oak Ridge National Laboratory in November, where they got to see the world's first continuously operating fission reactor. The X-10 went critical on 4 November 1943, and was decommissioned exactly twenty years later.

Guest Editorial:

Does Size Matter?

by Dan Duda

from the October, 2014 issue of Penn Central, the monthly newsletter of Central PA Mensa, used by permission

According to some particle physicists, the answer may be "no." Respected particle physicists are beginning to think a particle's mass and length are really emergent properties displayed only after its interaction with other particles. In fact, they're reworking the master equations which describe particles by eliminating the factors of mass and length to see what difference it makes.

This is a particularly interesting line of investigation considering recent breakthroughs with the Higgs Boson. You may recall that the Higgs is thought to act in just this way — transmitting mass to many of the particle types with which it comes into contact.

Now for a quick detour into the weeds of particle physics. A novel, math-like theory was developed to solve many of the problems encountered with the standard model. Supersymmetry suggests that for every elementary particle a "superpartner" exists. An electron, for example, would have a "selectron," which would be heavier. It was originally thought that the Large Hadron Collider would find these superparticles fairly easily, but that hasn't been the case. So many physicists are now jumping off the Supersymmetry bandwagon.

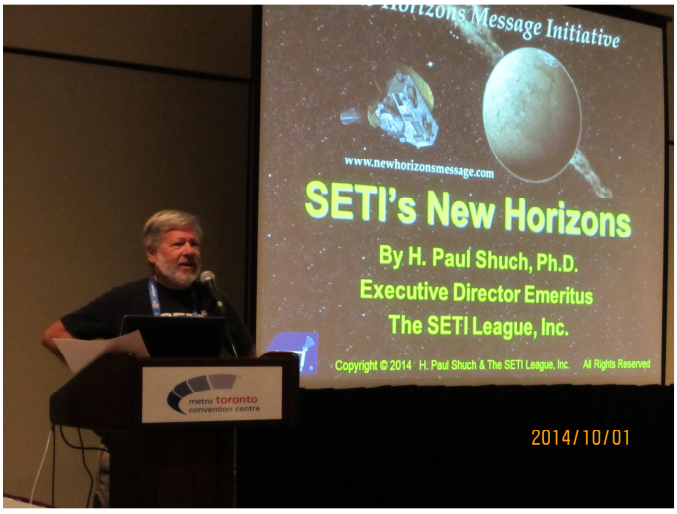
So what's replacing Supersymmetry among particle zoo theorists? On the macro level it's the multiverse. But most scientists find it unsatisfying to call out this deus ex machine, seeing it as a "magic" solution. And then, as you work through the formulas eliminating Supersymmetry, you end up with, of all things, ghosts. "The basic equations of particle physics need something extra to rein in the Higgs boson... " according to Manfred Lindner, director of the Max Planck Institute for Nuclear Physics.

And that "something extra" turns out to be ghost particles. Enter another new theory: agravity. "Agravity weaves the laws of physics at all scales into a single, cohesive picture in which the Higgs mass and the Planck mass both arise... [it also] offers an explanation for why the universe inflated into existence in the first place" [Natalie Wolchover]. This gets us back to the original premise regarding mass and length — these do not appear to be elementary features of the universe, but rather they arise only from particle interactions. So to answer the question in the title—size does seem to matter when particles interact. However, as with so many issues in particle physics, it's not certain just what size is — so the reality of it appears to be what we make of it rather than what the universe dictates.

I realize that we'll never really get out of the weeds on this one. Ironically, that comment might apply to particle physics itself. It takes a deep passion for finding answers to the ultimate questions to stick with the pursuit. It's like one of our famous cornfield mazes in Pennsylvania this time of year — each path seems so promising until we encounter a dead-end. And as long as we're on metaphors, it's also like the plight of Sisyphus pushing that bolder up the mountain. But in our case, it's not even certain there is a top to the mountain. Back in college I was drawn, like so many others, to the concepts of existentialism and nihilism. Jean Paul Sartre; Albert Camus — they seemed to set the stage for philosophy at that time. And, as more and more particle physics theories come and go, I'm constantly reminded of Sartre's premise in Being and Nothingness. Ironically, however, I'm now drawn more and more to the ideas of pantheism, which are much more optimistic.

In the immortal (and I hope inaccurate) words of Umberto Eco, "But now I have come to believe that the whole world is an enigma, a harmless enigma that is made terrible by our own mad attempt to interpret it as though it had an underlying truth."

IAC 2014 Photos
(Toronto ON Canada, Sep-Oct 2014)



Prof. Shuch gives a presentation on the One Earth Message, an initiative to upload a digital overview of Earth and its inhabitants into the solid-state memory onboard the New Horizons spacecraft now enroute to Pluto and the Kuiper Belt.

SETI League regional coordinator Lori Walton departing on her first orbital mission. (Actually, she was just trying on a Russian space suit for size.)

Several SETI League members gather for brunch before one of the SETI sessions at the 2014 International Astronautical Congress. From left: Stephane Dumas, Morris Jones, Lori Walton, H. Paul Shuch, Denise Herzing.

Two dozen SETI enthusiasts breaking bread together at the annual no-host IAA SETI dinner.

Attendees at one of the two annual IAA SETI sessions listen to technical presentations.

Mapping the Interstellar Medium

by Paul Gilster

reprinted from the *Centauri Dreams* blog by permission

The recent news that the Stardust probe returned particles that may prove to be interstellar in origin is exciting because it would represent our first chance to study such materials. But Stardust also reminds us how little we know about the interstellar medium, the space beyond our Solar System's heliosphere through which a true interstellar probe would one day travel. Another angle into the interstellar medium is being provided by new maps of what may prove to be large, complex molecules, maps that will help us understand their distribution in the galaxy.

The heart of the new work, reported by a team of 23 scientists in the August 15 issue of Science, is a dataset collected over ten years by the Radial Velocity Experiment (RAVE). Working with the light of up to 150 stars at a time, the project used the UK Schmidt Telescope in Australia to collect spectroscopic information about them. The resulting maps eventually drew on data from 500,000 stars, allowing researchers to determine the distances of the complex molecules flagged by the absorption of their light in the interstellar medium.

About 400 of the spectroscopic features referred to as 'diffuse interstellar bands' (DIBs) — these are absorption lines that show up in the visual and near-infrared spectra of stars — have been identified. They appear to be caused by unusually large, complex molecules, but no proof has existed as to their composition, and they've represented an ongoing problem in astronomical spectroscopy since 1922, when they were first observed by Mary Lea Heger. Because objects with widely different radial velocities showed absorption bands that were not affected by Doppler shifting, it became clear that the absorption was not associated with the objects themselves.

That pointed to an interstellar origin for features that are much broader than the absorption lines in stellar spectra. We need to learn more about their cause because the physical conditions and chemistry between the stars are clues to how stars and galaxies formed in the first place. Says Rosemary Wyse (Johns Hopkins), one of the researchers on the project:

"There's an old saying that 'We are all stardust,' since all chemical elements heavier than helium are produced in stars. But we still don't know why stars form where they do. This study is giving us new clues about the interstellar medium out of which the stars form."

But the paper makes clear how little we know about the origins of the diffuse interstellar bands:

Their origin and chemistry are thus unknown, a unique situation given the distinctive family of many absorption lines within a limited spectral range. Like most molecules in the ISM [interstellar medium] that have an interlaced chemistry, DIBs may play an important role in the life-cycle of the ISM species and are the last step to fully understanding the basic components of the ISM. The problem of their identity is more intriguing given the possibility that the DIB carriers are organic molecules. DIBs remain a puzzle for astronomers studying the ISM, physicists interested in molecular spectra, and chemists studying possible carriers in the laboratories.

The researchers have begun the mapping process by producing a map showing the strength of one diffuse interstellar band at 8620 Angstroms, covering the nearest 3 kiloparsecs from the Sun. Further maps assembled from the RAVE data should provide information on the distances of the material causing a wider range of DIBs, helping us understand how it is distributed in the galaxy. What stands out in the work so far is that the complex molecules assumed to be responsible for these dark bands are distributed differently from the dust particles that RAVE also maps. The paper notes two options for explaining this:

...either the DIB carriers migrate to their observed distances from the Galactic plane, or they are created at these large distances, from components of the ISM having a similar distribution. The latter is simpler to discuss, as it does not require knowledge of the chemistry of the DIB carrier or processes in which the carriers are involved. [Khoperskov and Shchekinov] showed that mechanisms responsible for dust migration to high altitudes above the Galactic plane segregate small dust particles from large ones, so the small ones form a thicker disk. This is also consistent with the observations of the extinction and reddening at high Galactic latitudes.

Working with just one DIB, we are only beginning the necessary study, but the current paper presents the techniques needed to map other diffuse bands that future surveys will assemble. ❖

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