



Welcome to the April 2105 issue of the Tennessee Valley Interstellar Workshop (TVIW) Newsletter. In this issue, you will read about the Fourth TVIW Symposium, TVIW design competition, technical note

on Dr. Robert E. Hampson about *TransLunar Lab*, and various TVIW news tidbits.

## 4<sup>th</sup> TVIW Symposium: February 28 to March 2, 2016

To hold our pattern of having the symposium every 18 months, it is our great pleasure to announce that the Fourth TVIW Symposium will take place on February 28 to March 2, 2016 at the historical Chattanooga Choo Choo Hotel and Convention Center, Chattanooga, Tennessee. With the historic Chattanooga Choo Choo as the backdrop, we are please to announce the theme of the Symposium, "*From Iron Horse to Worldship: Becoming an Interstellar Civilization.*"

We are now formally seeking proposals for working tracks, plenary talks, and any other content.

**Working Tracks** are collaborative, small-group discussions about a set of interdisciplinary questions on an interstellar subject. Proposals for Working Tracks are **due on June 15, 2015**. See the TVIW website for full details.

The proposer(s) will be the Working Track's technical lead and may need not act as facilitator or moderator. Each Track will comprise a few hours of structured discussion and work on Monday and Tuesday during the Symposium. It is desired that Track participants will prepare in advance to ensure productive dialogues during our short time together. We anticipate that Tracks will extend existing collaborations or become the start of new collaborations after the Symposium. Reports from the tracks will be submitted to *Journal of British Interplanetary Society (JBIS)* to appear in the Comments section.

**Plenary Talks** include traditional papers, lectures, and presentations. Proposals are **due on August 16, 2015**. Papers should be for original work that has not been previously published. The current schedule allocates 20 minutes for each talk followed by 5 minutes of Q&A. Talks will be recorded on video for later distribution. Certain papers may be selected for submission to professional publications, such as *JBIS*.

**Other Content** includes anything not explicitly mentioned above. This category may include posters, displays of art or models, demonstrations, seminars, panel discussions, interviews, or public outreach events. Proposals are **due on August 16, 2015**. Be creative!

For more information and to submit proposals, abstracts and ideas, please visit TVIW website at: [www.TVIW.us](http://www.TVIW.us)

## TVIW Design Competition

We will soon announcing the first design competition. Full-time students affiliated with colleges and universities in the American Southeast will be invited to form multidisciplinary teams to address a broad variety of problems facing humanity as we become an interplanetary and interstellar civilization. Teams may include members from universities outside of the American Southeast, but the lead organization must reside within this geographic region.

In accordance with TVIW's charter to engage all relevant aspects of study required in this endeavor, the Design Competition will seek projects in three fundamental areas: Engineering (including topics such as ship design, propulsion, power generation and recycling/repurposing), Fundamental and Applied Science (including astrobiology, planet detection, astronavigation, information technology, and space medicine), and Social Sciences (including cultural, political and social evolution). The specific details will be announced when the final Design Project Solicitation is released in May. With the support of Baen Books, the winning team will received a cash prize, and an opportunity for publication by Baen and in a professional technical journal.

## Upcoming Space Related Events of Interests



**May 21 – 24 (Toronto, Canada).** National Space Society's International Space Development Conference (ISDC) 2015. Member of the TVIW Board of Directors will be attending. Website: [www.nss.org](http://www.nss.org).

**May 28 – 29 (Pennsylvania State University, University Park, Pennsylvania).** First annual Emerging Researchers in Exoplanet Science Symposium. Website: [eres-symposium.org](http://eres-symposium.org).

**June 26 – 28 (Chattanooga, Tennessee).** LibertyCon 28. The entire TVIW Board of Directors will be attending. Website: [www.libertycon.org](http://www.libertycon.org)

**July 29 – August 3 (Prague, Czech Republic).** International Academy of Astronautics' 20th Humans in Space Symposium.

**August 19 – 23 (Spokane, Washington).** Sasquan 73rd World Science Fiction Convention or WorldCon. TVIW Board of Directors Ken Roy and Martha Knowles will be attending. [www.sasquan.org](http://www.sasquan.org).

**September 4 – 7 (Atlanta, Georgia).** DragonCon. The largest multimedia, popular culture convention focusing on science fiction & fantasy, with the usual amazing lineup of science panels. Members of the TVIW Board of Directors will be attending. Website: [www.dragoncon.org](http://www.dragoncon.org).

## Les Johnson to Speak at Topeka and Wichita, Kansas



Our very own Les Johnson will be giving three presentations in April in Kansas. Two of them will be at Wichita State University on April 22 on: *Propellantless propulsion: Propelling spacecraft using the natural environments of space, and Using space science and technology to help solve energy and environmental problems on Earth.* The third one, *How are we going to go to the stars?*, will be at the Ad Astra Day Celebration on April 25 in Topeka. Additional information at <http://adastra-ks.org>.

## I4IS Kickstarter: Project Dragonfly

Our friends from the [Initiative for Interstellar Studies \(I4IS\)](http://www.I4IS.org) have launched a Kickstarter crowd funding campaign in order to raise funds for their Project Dragonfly Design Competition. The competition has the ambition to develop



innovative concepts for a small, laser-propelled interstellar mission. Exciting rewards are waiting for all donors! More details under this link:

<https://www.kickstarter.com/projects/1465787600/944816578?to ken=cc0576df>

### Visit by Marc Millis of Tao Zero Foundation to TVIW

Marc Millis, co-founder of Tau Zero Foundation, met with four of five TVIW board members in Oak Ridge on March 29 to discuss mutual interests of our organizations. He wrote a check to support the 2016 TVIW Symposium at the Interstellar sponsorship level. The breakfast was an opportunity to discuss some good organizational practices and share contacts to help us in the future. We agreed that we have much to learn as we navigate the way ahead and Marc was extremely supportive of our efforts.



Left to Right: Martha Knowles, Ken Roy, John Preston, and Marc Millis and Robert Kennedy.

### TVIW Thanks Founder and Former Board Member David Field

A note of appreciation signed by TVIW President John Preston dated December 29, 2014 was presented to David Fields on January 9, 2015 to acknowledge his "...hard work and commitment to the educational purposes of the TVIW as a founder" and his "...tenure as a charter member of the Board for the past year." It further posits, "If the objectives of TVIW are to be met in encouraging others to see the possibilities before us beyond Earth, it will require such catalyzing efforts as those you have pursued in published papers and in teaching the next generation."



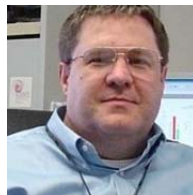
Left to Right: Martha Knowles, Ken Roy, John Preston, and David Field.

### TVIW Website Migration Update

As you may have noticed, our website has a new feel to it. We have migrated to a new content distribution platform, and we are in the process of re-stylizing the site, and adding new content

and capabilities. If you see any broken links or have content suggestions. If you have knowledge of HTML, CSS and/or Drupal, and want to help us, please drop us a line.

### Technical Note: TransLunar Lab by Dr. Robert E. Hampson



The outer space environment is hazardous to multicellular life. Planet-bound life evolves in an envelope of pressurized gases, with a constant force of gravity that always points in the same direction, and with protection from solar and cosmic radiation by virtue of a deep atmosphere and planetary magnetic field. Hence, two of

the biggest problems that face astronauts are microgravity and radiation. The problem with collecting experimental data on Earth is countering the constant 1g gravity field on Earth's surface and artificially producing the types of radiation encountered in space. In the International Space Station (ISS), we do collect plenty of data on physiological effects of microgravity, but at the same time, ISS space limitations rule-out generating an environment to determine whether spin- or acceleration-induced artificial gravity will counter those effects. At the same time, the ISS is in Low Earth Orbit (LEO) at just over 400 km altitude and just not exposed to the full extent of radiation that will be encountered on the Moon, on Mars, or anywhere else in or out of the Solar System.

Artificial gravity research cannot be conducted on Earth, and is limited on the ISS; therefore a laboratory is needed that expands on the limited research capabilities of space capsules, shuttles and ISS. It needs to be at the very least in High Earth Orbit (for radiation studies, as further described below), it needs to be "livable" in that both humans and lab animals spend all of their time within the habitat, and it needs to have a short enough radius to allow research at different gravity levels, but long enough radius that a standing human feels no differential gravity at any level. The laboratories will also have to be able to assess cognitive abilities (memory, decision-making, stimulus discrimination, sleep functions) in humans and lab animals, measure physiological changes, perform surgical procedures, provide controlled atmosphere and pressure, and perform biochemical, histological and microbiological tests. In comparison to current ISS experiments, which are limited to very small animals, this laboratory should be able to handle larger animals, up to and including nonhuman primates (rhesus monkeys). As a neuroscience researcher, I feel it is necessary to include primates as a stand-in for humans in certain experiments. Only primates spend as much time upright (bipedal) as humans, and only primates exhibit the full range of physiological and neurological responses to the environment as humans.

Why is it important to have a laboratory in a position to study the effects of space radiation? We know the obvious connections between radiation and alteration of mammalian cells: blood forming cells, immune system and cancer risk. However, solar and cosmic radiation are very hard to simulate on Earth. The only facility in the U.S. capable of delivering radiation, which comes close to the composition of the cosmic radiation, is the National Space Radiation Laboratory at the Brookhaven National Research Lab particle accelerator. The effects of radiation on the human body ranges from sunburn to catastrophic organ failure. The obvious connections between radiation and human health risk include chromosomal damage and alteration of the hematopoietic system leading to increased risk of cancer. The general public may be less aware that

radiation effects also include inflammation, degradation of muscle and cartilage and vision damage. The research field of "space radiation" is, however, quite well aware of these consequences after more than 55 years of studying high altitude and space radiation effects on animals and humans. Unfortunately, The radiation most frequently encountered on Earth, x-rays, consist of photons -- essentially light waves in the 0.1 nm wavelength, 1 exahertz (10<sup>18</sup> Hz) frequency. Solar radiation, in comparison, is photons, electrons (positrons), and a plasma comprised of atomic nuclei that have been stripped of those electrons. The high positive charge of such particles is one reason why the Earth's magnetosphere deflects or captures the energetic particles. The key difference between the solar wind and galactic cosmic radiation is in the proportion of heavy charged particles. Solar wind is about 85 percent protons, with the remainder as electrons and positrons. The heavier charged nuclei are rather rare, accounting for less than 1 percent of the total with nuclei larger than helium occurring with extremely rarity (less than 0.001 percent) and mainly released by flares. Cosmic radiation differs from solar wind only in the proportion of heavy ions, with slightly less helium, and comparatively more oxygen, silicon and iron. Even with this increase, cosmic rays still contain less than 0.1 percent heavy ions.

Effects of radiation vary by the type of radiation, with x-ray and gamma rays being the "simplest" to high-energy heavy nuclei that will produce physical as well as radiation damage in living tissue. Nevertheless, one of the less well-known consequences of radiation - whether from terrestrial, solar or extrasolar sources - is a gradual degradation of memory and cognitive performance following exposure of brain tissue to intense radiation. Whole brain irradiation totaling as little as 5 gray (5 Sieverts) in the course of cancer treatment can result in degradation of memory and cognitive decisions in humans and nonhuman primates. In rodents, the threshold for such decrements has shown to be as low as 25 centigrays (0.25 Sv or 25 rems in older measurements). It is this risk of radiation-induced cognitive decline that most concerns neuroscientists, and it is only recently begun to gain traction with the space radiation research community, yet has the potential to eclipse the risk of cancer on long duration space missions.

One would hope that the need for a space laboratory would be obvious based on the number and type of investigations that must be performed in the actual context of space missions. Neither artificial gravity nor effects of space radiation can be completely simulated on Earth or ISS. The greatest risk humanity faces in the exploration of space is for our astronauts to reach their destinations with failing bodies and minds. We must not risk our ability to "boldly go" ... because we failed to adequately research the conditions necessary to get there.

You can watch Dr. Robert E. Hampson's TVIW 2014 talk at our website: [www.TVIW.us](http://www.TVIW.us), under TVIW 2014/Presentation Videos.

Dr. Hampson's article on Translunar Lab for Baen Books can be found here: <http://www.baen.com/TranslunarLab.asp>, and Baen's weekly podcasts at:

Part one: <http://www.baen.com/podcast/mp3/Baen-Free-Radio-Hour-2015-02-20-Roberts-Magic-46.mp3>

Part two: <http://www.baen.com/podcast/mp3/Baen-Free-Radio-Hour-2015-02-27-Roberts-Magic-47.mp3>

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*What is the AmazonSmile Foundation?*



AmazonSmile Foundation is a 501(c)(3) private foundation created by Amazon to administer the AmazonSmile

program. All donation amounts generated by the AmazonSmile program are remitted to the AmazonSmile Foundation. In turn, the AmazonSmile Foundation donates those amounts to the charitable organizations selected by Amazon's customers. Amazon pays all expenses of the AmazonSmile Foundation; they are not deducted from the donation amounts generated by purchases on AmazonSmile.

**Please Consider Donating to TVIW, Inc.**

Since our founding with the first TVIW event in 2011, we have made some great connections with likeminded people, inspired others, run three successful symposiums and made small steps in contributing to the establishment of an interstellar capable society. We have a long road ahead of us, but together with you, our supporters, sponsors, and partners, we have laid the foundation for an exciting adventure.

Space exploration and colonization is not science fiction, it is happening now. It is in our DNA to wonder and explore. We have the technology now to enable us to become a spacefaring civilization. Exo-Solar System exploration, interstellar travel and colonization are the next logical evolution of human curiosity and migration.

Please join us in support of our mission. Please consider donating to TVIW. You can give cash donation by check or credit card. Checks can be mailed to our address:

TVIW, Inc.,  
PO Box 4171  
Oak Ridge, TN 37831

Donation can also be made by credit card via PayPal from our website at [www.TVIW.us](http://www.TVIW.us). TVIW, Inc. is a not-for-profit scientific-education public benefit corporation in the state of Tennessee. For U.S. tax purposes, TVIW is a tax-exempt, 501(c)(3) educational, non-profit corporation. All donations to TVIW are fully tax deductible (as allowed by your local laws).

**We Want Your Feedback**

What would you like to hear in the next newsletter? Suggestions? Comments? Do you have a technical note that you would like to share with the TVIW community? We want to know. Just drop us an email at [Info@tviw.us](mailto:Info@tviw.us)

*Until Next Time...  
Look Up at the Stars and Dare to Dream Big.  
Something Really Big!*