



SearchLites

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The Quarterly Newsletter of The SETI League, Inc.

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Three Questions to Ponder

by Ed Trice

I watch the first 3 minutes of the movie "Contact" at least once a week. It makes me ponder the following:

1. We're like a merry-go-round on a merry-go-round. The earth spins on its axis, rotates around the sun, the sun via its unseen gravitational partner(s), the spiral arm of the Milky Way, which is itself in motion with respect to the Cosmic Microwave Background and (more locally) the Andromeda Galaxy which is blue-shifted right at us. How the heck can anyone find their way back to a planet orbiting a small star when it's never in the same place?
2. It seems like the Universe has a fractal nature. First we thought our galaxy was it, then came Edwin Hubble. We knew the universe was big, then came the Hubble Deep Field, with 10000 galaxies found in the same cross sectional area as a drinking straw. Now the thinking is the unobservable universe is 10^{43} times the size of the observable universe! And we might only be one such "bubble universe" in a froth of near-infinite or infinite universes??? Whoah!
3. We can't be alone! But... are we time-separated from other intelligent life? Does everyone falter at the Uranium Barrier? Did we make it past our own "Great Filter" or is it still ahead of us??

How does one deal with such consternation? Please enlighten me!!

Our Executive Director replies:

These are all very valid questions, Ed, for which there is no simple answer. The only way to ever know is to do the experiment.

We will probably never enjoy the opportunity to dialog with our assumed cosmic companions. Fortunately, listening is relatively cheap, and easy. We start with the null hypothesis: there are no detectable extraterrestrial civilizations. This can never be proven, of course, but it takes only one counter-example to falsify it. And, if nothing artificial is ever detected, think about all of the serendipitous discoveries that still await us!

Yours for SETI Success,

Paul

Guest Editorial:

Freelancing an Interstellar Message

by Paul Gilster

[Centauri Dreams](#)

The problem in sending intentional signals to the stars isn't technology. It's our lack of consensus. Having widespread buy-in on whether, why and how to add an 'active' component to SETI is deeply polarizing, at least on the surface. But dig deeper: While there are those who think we should send signals about ourselves to other stars, the opposition doesn't necessarily disagree provided appropriate discussion and consultation be achieved first.

I'm with the latter camp and always have been. To me, this is as sensible as coming up with an environmental impact statement and debating it. We need to be thinking about the issues involved here because as technologies get more powerful, individual actors will be able to send messages that would formerly have been in the province of governments.

Such issues are not new to science, as witness the debate over recombinant DNA research that eventually led to multidisciplinary agreement — for more on this, see Asilomar Conference on Recombinant DNA — (and see David Brin's *SETI, METI and the Paradox of Extraterrestrial Life* for more). The point is, thorny questions involving research and the limits on action need to be resolved through wide-ranging discussion.

These reflections were triggered by re-reading Michael Chorost's essay *How a Couple of Guys Built the Most Ambitious Alien Outreach Project Ever*. The topic is the Cosmic Call messaging project that sent two signals, in 1999 and 2003, from the Evpatoria dish in the Ukraine. What's interesting here is that Cosmic Call didn't come out of a space agency or a government decision. It came out of a series of interactions between private players.

Chorost is a canny writer, the author of the deeply insightful *World Wide Mind* (Free Press, 2011) and an active commentator on technology. He followed the Cosmic Call story to its origins in Team Encounter, a Texas-based firm intent on launching a true interstellar solar sail — i.e., a sail dedicated to making a 100,000 year crossing to Alpha Centauri while bearing messages, photographs and even DNA samples from supporters. The sail morphed into a message which would involve drawings, texts and songs from the people of Earth.

This is where Yvan Dutil, a Canadian astrophysicist, came into the picture, contacting Team Encounter with his own ideas about how to put together a message. Dutil teamed up with the late physicist Stéphane Dumas, who began to ponder message ideas based on the work of Hans Freudenthal, who had studied symbolic media of communication. Remember, we have nothing in common with the species we are hoping to contact — we assume a basic sense of logic which Dutil and Dumas explored in the form of a message primer.

I won't get into the details of the primer itself, sending you to the Chorost essay, but it's worth noting that Douglas Vakoch (formerly of the SETI Institute, and now a METI advocate and president of METI International) saw in the Dutil/Dumas primer "...a complexity and depth that's unparalleled in interstellar messages." Of which there haven't been many, but you see the point. This two man team had come up with a symbolic system that would allow, so they believed, an alien civilization to receive information, ask questions and respond.

In one way or another (and memories differ on exactly what happened), Dutil and Dumas became aware of the Evpatoria dish in the Ukraine, which led them to Alexander Zaitsev, an astronomer at the Russian Academy of Science whose work with the Evpatoria dish had largely involved planets and near-Earth asteroids. Already passionate about SETI, Zaitsev agreed to a proposal to oversee sending the Cosmic Call messages from the Ukraine.

Chorost likes to call this a 'crowdsourced' effort growing out of the dedication of the two scientists who had conceived the message and energized by their dealings with the Cosmic Call group. The effort would grow into a message sent to four stars in 1999 and then five more in 2003, using a transmitter powerful enough to be detectable as far as 70 light years out. But METI was controversial from the beginning, as Chorost relates:

...the National Space Agency of Ukraine, as it was called at the time, was alarmed enough to stop the transmission in 1999 after the message had been sent to the first star on the target list. According to Zaitsev, the agency was rattled by the attention the message was getting from the press. "Such energetic reaction of Western mass media also was an alarming news for Kiev's officers," he says. In addition, they had been told that the transmissions were "very dangerous for terrestrials and that USA's deep space stations refused to make Cosmic Call transmission." They pulled the

plug. Zaitsev rushed to Kiev to reassure the brass, and the transmissions resumed on June 30, 1999.

The point that emerges is that this SETI project, conceived and funded by private organizations, wound up costing something on the order of \$100,000, much of it from small donations. Although perhaps 20 people were involved in getting the message sent, the message itself was the work of two people. We can only assume that the costs involved are going to continue dropping, which means that other messages like this one surely lie ahead.

That gets me back to the original issue. The scientific process is all about a common forum of ideas, discussions of peer-reviewed papers, conference proceedings and meetings between experts in the field, with public debate affecting subsequent policy on matters of global import. With METI we are beginning to see significant decisions being taken by individuals without consensus among researchers and without the time for serious public reflection.

Can we find any agreement between the two camps on METI? Douglas Vakoch, a strong defender of METI, asks in a recent letter in *Nature Physics* whether there are ways of submitting transmission proposals to the scientific process. Let me quote him on this:

Scientists already have a process for judging the merit of METI projects: peer review. Decisions about allocating time for METI at publicly funded observatories should rely on the same procedure used for competing experiments. If proponents can make a convincing case, when compared with other proposals, for effectively using a transmitter for a specific METI experiment, then time should be granted.

There may well be a place for METI in our future, but we need to define and choose it. My own belief is that this needs to go beyond a small peer-review group for a specific project and extend to the entire idea of METI. How this could be done in the era of a global Internet is something that should spur the imaginations of everyone from social scientists to network programmers. However we formalize and codify the discussion, though, technological change forces the issue, making the question of who speaks for **Earth more timely than ever.**

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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.

April 15, 2017, 0000 UTC - 2359 UTC:: Seventeenth annual SETI League Ham Radio *QSO Party*: 3.551, 7.0309, 7.2039, 14.084, 14.204, 21.306, and 28.408 MHz.

April 23, 2017, 1300 EDT: Twenty-Third SETI League *Annual Membership Meeting*, Little Ferry, NJ.

April 24 - 28, 2017: *AbSciCon 2017* Astrobiology Science Conference, Mesa, AZ.

July 23 - 26, 2017: *Society of Amateur Radio Astronomers Conference*, NRAO Green Bank, WV.

July 27 - 30, 2017: *Central States VHF Conference*, Albuquerque, NM.

August 9 - 13, 2017: *75th World Science Fiction Convention*, Helsinki, Finland.

September 25 - 29, 2017: *68th International Astronautical Congress*, Adelaide, Australia

November 17 - 19, 2017: *Philcon*, Cherry Hill, NJ.

August 16 - 20, 2018: *76th World Science Fiction Convention*, San Jose CA.

October 1 - 5, 2018: *69th International Astronautical Congress*, Bremen, Germany

October 21 - 25, 2019: *70th International Astronautical Congress*, Washington DC



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Member Activities



In Eastern Canada, new member Scott, VE3CGN, has acquired this much-used 3 meter diameter C-band satellite TV dish, and is now repurposing it for use in his Project Argus radio telescope.



As a first step in building his Project Argus radio telescope, Scott has refurbished the frame of his 3 meter dish.



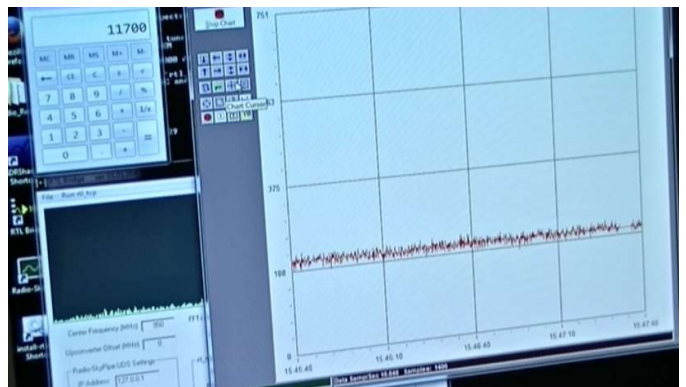
As he continues assembling his Project Argus radio telescope, Scott is cleaning, straightening, and painting the mesh petals for his 3 meter dish.



As he continues to assemble his Project Argus radio telescope, VE3CGN is learning about radio astronomy with this Ku-band dish.



Here is the Software Defined Radio dongle that Scott is using as a receiver in his Project Argus station.



Like many Project Argus participants, Scott uses Radio Sky Pipe software for signal analysis and data logging.

Ask Dr. SETI ®

How Long Do We Have?

Dear Dr. SETI:

How long do you think a civilization's radio communication phase will last? My question is based on the fact that the universe is 13,800 million years old, and it is impossible for any two civilizations to be at exactly the same level of development. This means that other civilizations may now use more advanced media (possibly even exceeding the speed of light). By this might we conclude it would be impossible to communicate with other ET intelligence?

Ruben, Portugal

The Doctor Responds:

You raise an important point about the temporal challenges of SETI, Ruben. It's not enough for another technological civilization to exist - they must exist at a level of technological development which we can recognize, and which will enable them to recognize ours, if dialog is to ensue.

Working to our advantage (as well as disadvantage) is the fact that radio telescopes are time machines. Because photons travel at a fixed velocity (300 Million meters per second -- the speed of light), any electromagnetic evidence we receive from Beyond (as well of any of OUR messages that THEY may receive) may have been traveling hundreds, thousands, or millions of years. That means any SETI evidence we receive on Earth may have originated from a civilization now long dead (and any of our messages received by our neighbors may not get there until our civilization is long dead). So, I consider the likelihood of establishing any sort of dialog to be negligible -- SETI is a one-way enterprise.

Can we receive any meaningful communication from other civilizations that do not share our time-frame? I believe we can. I can walk into a library any day of my (admittedly short) life-span, and read messages from artists, philosophers, and scientists long dead. That doesn't mean their words don't reach me, or that I can't benefit from them. Presumably, my writings may still enrich and inform lives of those who will live long after I am gone. At least, that is every author's hope.

More problematical is the question of whether we can even recognize the technology used by others, and vice-versa, when messages are received. Here, we rely upon the likelihood that civilizations evolve at different rates, and started at different points in time. We must assume that any civilization developing technology will go through a radio-polluting phase at some point along its path to something better (as, in fact, have we). So, at some point in the broad expanse of time, at least some of our cosmic companions may have generated (or may yet generate) recognizable signals. It's just a question of which ones we detect, and when. Given enough life-sites, maybe SOMEBODY's signals will reach us at a time in which we can share their technology -- even though, by the time we get the Signal, they may have advanced far beyond their technological infancy.

My point is, each civilization will follow its own technological trajectory. And, since radio telescopes are time ma-

chines, no alien civilization need be exactly at our level of development for SETI to succeed. It need merely be at the right distance from us for its primitive emissions to reach us at the right time.

Hydrogen times Pi

Dear Dr. SETI:

*In the film "Contact", SETI scientists refer to a frequency of "hydrogen times PI". Now if the atomic weight of Hydrogen is $1.00794 \text{ u} \pm 0.00001 \text{ u}$, then wouldn't hydrogen * PI = 3.16672? And what would that 3.16672 GHz mean, anyway?*

Fentro, Danbury CT USA

The Doctor Responds:

That frequency wouldn't mean anything, Fentro -- because GHz (billions of cycles per *second*) is related to the arbitrary way we reckon time on this planet. The real answer to your question has to do with how you define "hydrogen."

Since we're trying to establish a communications *frequency*, we should look for a frequency which is related to a natural constant, in this case one associated somehow with hydrogen. This means what we seek is not an atomic weight, but rather a resonance. Whenever a hydrogen atom undergoes a spin-flip transition (which it naturally does), it emits a single photon at a known frequency (which is, in turn, related to a specific energy level, according to Planck's Law).

It doesn't matter what language you use, or what units you choose, for defining that frequency -- it is a natural constant. Now, if you multiply that frequency by another known natural constant (such as pi, which is a unitless ratio), you get one of many possible "magic frequencies" for interstellar communications. Other civilizations may call that frequency 2.345 UrmaPlatz, or whatever -- doesn't matter, as it's based upon natural constants, which are physically the same for us as for them, regardless of how we count, or what we call them.

Of course, we don't know which of these possible frequencies an alien technological society might choose, so we have to monitor them all. Let's seek ones in the quietest part of the electromagnetic spectrum, the microwave window that extends from what we call 1 to about 10 GHz, and we have any number of likely SETI target frequencies. (Quiet spectrum is in the same place everywhere in the cosmos, no matter what numbering system we use to define it.)

Of those many possibilities, Carl Sagan chose the product of pi times the hydrogen spin-flip transition frequency, for use in his novel Contact. In fact, several SETI scientists in Australia had independently arrived at that same target frequency when Carl was writing his novel in 1985, and were already monitoring there. So, great minds think alike (let us hope on other planets, as well as our own!)



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