



SearchLites

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The Quarterly Newsletter of The SETI League, Inc.

Offices:

433 Liberty Street
PO Box 555
Little Ferry NJ
07643 USA

Phone:

(201) 641-1770

Facsimile:

(201) 641-1771

Email:

info@setileague.org

Web:

www.setileague.org

President:

Richard Factor

Registered Agent:

Marc Arnold, Esq.

Secretary:

A. Heather Wood

Treasurer:

Martin Schreiber, CPA

Executive Director:

H. Paul Shuch, Ph.D.

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Frank D. Drake, Ph.D.

Malcolm I. Raff, Ph.D.

Clifford Stoll, Ph.D.

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Guest Editorial:

The Tennessee Valley Authority and SETI

by David Madison (email Maddad@Maddad.org)

Last year, on June 18, 2001, the Scripps Howard News Service ran a story entitled "TVA workers scolded for joining ET hunt." I have been a SETI@home volunteer for three years because I passionately believe in the potential value of the SETI mission. The following is my open letter to the Inspector General of the Tennessee Valley Authority (TVA):

Tennessee Valley Authority
Office of Inspector General

Please rethink your decision to fire seventeen employees who used your computers to run the SETI@home program. Consider the following:

You may compare our world today to the then known world of September 20, 1519, when the greatest explorer the world has ever known, Ferdinand Magellan, sailed west in five leaky ships and 265 men from Lisbon, Portugal. Three years later one lone ship with 18 men returned from the east, sans Magellan himself who had died in the Philippines. However, he had already crossed between the 123rd and 124th line of East longitude where the Portuguese nine years earlier had arrived from the west. In doing so, he completely re-defined our entire known world. Together with Columbus, Magellan found and made available to the Old World all of North and South America as well as parts of the Far East.

What is the value of all the bank accounts, of all the property of every country in the Western Hemisphere, of all the people there and all their contributions to Mankind? It is incalculable. The scope of SETI is a hundred times greater. We are not going there in person, not yet, but we have found a way to see if there is someone else standing on a distant shore sending a message back to us. We do not have to risk our lives to make this discovery. We only have to donate our unused computer time. That minor cost vanishes in the glare of the potential discovery of a new planet around a new star that Man may take his children to. Where we find one such new world, we will find another, and yet another beyond it. Man will live in more than one location, so that no longer will one catastrophic event have the capacity to silence him forever. The sentient beings we find there will challenge our beliefs in ways the Scopes Monkey Trial never thought possible. Race relations takes on new meaning, as would the inalienable rights spoken of in our constitution. Almost by definition, those we meet will have found a solution to a world at arms against itself. The common man chooses from an array of self actualized occupations never before thought of. Humanity gains entrance into an alliance of races where we contribute our creativity and ingenuity to a bigger "everyone" than we ever knew possible.

This is what SETI is about.

You stand as a guardian against mankind, preventing him from entering into these wondrous new worlds. Do not just stand aside. Verify to your own satisfaction, but quickly, the safety of the SETI@home system of distributed computing. Contact The SETI League, or one of the other SETI organizations, and ask them how you can help. Encourage participation in SETI@home by the employees of your organization. You have seventeen teachers; learn from them. At least some of them are visionaries like Magellan, and they will inspire the rest to contribute to the most significant project that the human race has ever attempted.

Be a part of the solution.



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.

- May 4 - 5, 2002:** *Trenton Computer Festival*, Edison NJ.
May 17 - 19, 2002: *Dayton Hamvention*, Dayton OH.
May 18, 2002, 0700 hours: *SETI Breakfast*, Marriott Hotel, Dayton OH.
May 24 - 27, 2002: *Balticon 36*, Baltimore MD.
July 7 - 10, 2002: *SARA Conference*, NRAO Green Bank WV.
July 8 - 12, 2002: *Bioastronomy '02*, Hamilton Island (Great Barrier Reef) Australia.
July 25 - 28, 2002: *Central States VHF Conference*, Milwaukee WI.
July 31 - August 3, 2002: *ALCon 2002*, Salt Lake City UT.
August 16 - 18, 2002: *10th International Amateur Radio Moonbounce Conference*, Prague Czech Republic.
August 29 - September 2, 2002: *ConJose World Science Fiction Convention*, San Jose CA.
September 7 - 8, 2002: *UKW-Tagung 47th VHF Convention*, Weinheim Germany.
October 10 - 19, 2002: *World Space Congress*, Houston TX.
October 24 - 26, 2002: *Microwave Update*, Enfield CT.
November 7 - 10, 2002: *AMSAT Space Symposium*, Ft. Worth TX.
April 19, 2003: *Fifth Annual SETI League Ham Radio QSO Party*; 14.204, 21.306, and 28.408 MHz.
April 25 - 27, 2003: *SETICon03 Technical Symposium and Annual Membership Meeting*, Ewing NJ.
May 16 - 18, 2003: *Dayton Hamvention*, Dayton OH.
May 17, 2003, 0700 hours: *SETI Breakfast*, Marriott Hotel, Dayton OH.
May 23 - 26, 2003: *Balticon 37*, Baltimore MD.
July 13 - 16, 2003: *SARA Conference*, NRAO Green Bank WV.
July 24 - 27, 2003: *Central States VHF Conference*, Tulsa OK.
August 28 - September 1, 2003: *Torcon 3 World Science Fiction Convention*, Toronto ON Canada.
September 5 - 7, 2003: *Third European Radio Astronomy Congress*, Heppenheim Germany.
September, 2003 (dates TBA): *UKW-Tagung 48th VHF Convention*, Weinheim Germany.
September 29 - October 3, 2003: *54th International Astronautical Congress*, Bremen, Germany.
October, 2003 (date TBA): *Microwave Update*, Seattle WA.
October 9 - 12, 2003 (tentative): *AMSAT Space Symposium*, Toronto Canada.
April 17, 2004: *Sixth Annual SETI League Ham Radio QSO Party*; 14.204, 21.306, and 28.408 MHz.
April 23 - 25, 2004: *SETICon04 Technical Symposium and Annual Membership Meeting* (location TBA).
September 2 - 6, 2004: *Noreascon Four World Science Fiction Convention*, Boston MA. ❖

Book Review:

Tune In The Universe!

reviewed by Bob Grove, W8JHD



Tune In The Universe!
by Dr. H. Paul Shuch, N6TX
Newington CT, ARRL, 2001
[ISBN 0-87259-854-3, CD-ROM,
\$24.95]

Subtitled "A Radio Amateur's Guide to the Search for Extraterrestrial Intelligence," this delightful CD is packed with easy-to-read and informative history, hints, and how-tos on building and operating a microwave earth receiving station in the quest for signals from aliens in the cosmos. Each page includes a table of contents for immediate point-and-click access.

Author Paul Shuch, N6TX, is perhaps the best-known proponent of this search, with his legions of followers in the growing SETI League, a global band of listening enthusiasts now more than 1300 strong.

Navigating the CD is quite intuitive: hypertext-linked sections concentrate on the evolution of the SETI program with credit to its founders and supporters; a technical section which guides the beginner and the advanced amateur through the phases of system design and implementation; and the author's own "memoir" department which includes songs he has written ("...music is my second love").

But of immediate interest to the reader is, of course, the technical area, and in this the CD excels. Following the enjoyable introductory articles is the real meat of the work, with major chapters entitled: *Are we Alone?*, *Ask Dr. SETI*, *Searching for Life*, and finally, *Your SETI Station*.

Are we Alone? is a collection of the author's well-considered reflections about the stars, planets, extraterrestrial life, intelligence, and communications, while *Ask Dr. SETI* is an FAQ assemblage about astrophysics, biochemistry, philosophy, sociology, technology, and related articles.

The approach is cookbook, but not intended for board-level assembly; rather, lists of sources for component equipment and accessories are provided. Extensive tutorial sections - including spreadsheets - allow the appropriate selection of antenna, receiver, cables (RF, DC, audio, and control), computer, and software.

Tune in the Universe on CD-ROM is available for \$24.95 from the American Radio Relay League (ARRL); see their web site at www.arrl.org, or call 860-594-0200 for ordering.

Editor's Note: Tune In The Universe is also available through The SETI League, Inc. Please see the back page of this issue of *SearchLites* for ordering details. ❖

My Seven Years Before the Mast

by H. Paul Shuch, Ph.D.

Executive Director, The SETI League, Inc.

Richard Factor is the kind of friend I always spoke to by telephone, usually about once a year, usually around the Holidays. Our annual chats fit something of a formula: How've you been? What are you doing? What do you want to be when you grow up? Any new toys? Any new wives? (This latter question directed toward me, as Richard has never made the same mistake once.)

Our mutual interests in ham radio and aviation held us together, though we first met when I was a grad student at Berkeley, and his electronics company was considering licensing my patent for BiDCAS, an airborne anti-collision radar system that never got off the ground. Orville Greene, Richard's patent attorney, terminated those negotiations, and because it was a logical business decision, it never intruded on our friendship.

Seven and a half years ago, during the week of Christmas, 1994, Richard and I had one of our formula phone calls. Only, this time, there was a new wrinkle. "Say," asked Richard after the usual pleasantries had been exchanged, "what do you know about SETI?"

We had never discussed it before, but here was a topic close to my heart, and just one more interest that Richard and I apparently held in common. I had been infected with the SETI virus back at Berkeley (if you check the historical record, you will find that nearly every major player in the field had some connection with the University of California over the years, either as a faculty member, student, or researcher). One of my thesis professors had been Jack Welch, who also taught (and, much later, married) Jill Tarter, the prominent SETI scientist. Kent Cullers was a ham radio buddy. I had met, dined with and studied under Barney Oliver, heard Frank Drake lecture, and corresponded with John Kraus, prominent SETIzens all. And I had read from cover to cover everything I could devour on the subject, including the *Cyclops* report and NASA's SP-419, *The Search for Extraterrestrial Intelligence*.

So, apparently, had Richard. We chatted about SETI history for over an hour, lamenting Congress having cancelled the NASA SETI program, expressing optimism about the job the SETI Institute was doing in privatizing the search, and sharing our excitement over the Project Phoenix observing run, just about to commence in Australia. Richard asked if I had ever considered it possible for radio amateurs to do credible SETI, and I told him about the five-meter dish I had built in my back yard in the late 'seventies, and how, with it, I had dabbled in just that.

As we talked animatedly about our common interest, I had no idea whatever that I was participating in a job interview. Eventually, Richard dropped the bombshell. "Orville and I have started a SETI nonprofit," he finally got around to stating. "How'd you like to run it?"

My heart raced, and my mind reeled. This seemed like the opportunity of a lifetime! But, I had other obligations. I was an engineering professor then. The new semester was just about to begin, and I was under contract to my college. I agreed to lend a hand in my spare time, until the semester ended in May, but Richard pressed me to commit to a longer

tenure. As it happens, I was about to become eligible for a one-year's sabbatical leave, and my college was supportive. So it is that in May of 1995, I became The SETI League's first and only fulltime employee.

By the end of my sabbatical, Richard and I had an organizational structure, and a handful of members, and the basic blueprint for Project Argus. But much work remained. He and Orville pressed me to stay on for another year. I asked the President of the college for an extension to my sabbatical. Predictably, he refused. Since The SETI League now had enough funding on hand to match my teaching salary, I then requested a one-year personal leave of absence, without pay. With the support and encouragement of my colleagues, that was granted.

Next thing I knew, I had blinked, and another year had passed. Now we had several hundred members, and a dozen stations on the air! It was beginning to look as though, just maybe, meaningful amateur SETI science was indeed possible. But I was at a critical crossroads. I was wanted back in the classroom. The college was not about to extend my leave. At 51, I was too young (and, with five sons still at home, too impoverished) to retire. And nobody in his right mind gives up a tenured Full Professorship (a cushy job for life, backed by the taxing authority of the State) to pursue fringe science on soft money. The party, it began to appear, was over.

Richard and Orville put their heads (and their purses) together, and came up with a tempting package. Although they could not offer me tenure, they guaranteed my teaching salary and fringe benefits for another five years. I agonized over the decision, and talked it over with my wife. Muriel understood my reluctance to burn the bridge back to academia; I had been teaching for three decades, and dreaded giving it up.

"But you're not really giving up teaching," she reassured me. "You're just getting a much larger classroom – and much better students. Besides, why are you asking me? You've already made up your mind."

Muriel was right, of course, on both counts. She always is.

That was nearly five years ago. The SETI League's seed money lasted quite a while, but now we must seek further funding. Meanwhile, I'm still here. And, I expect, I will be, until they drag me away kicking and screaming. For I have finally decided just what it is I want to be when I grow up. ❖

Announcing:



The SETI League's Third Annual Technical Symposium, Awards Banquet and Membership Meeting

Mark your calendar now for the best SETICon ever, scheduled for the weekend of 25 – 27 April 2003. Help us celebrate the tenth anniversary of Congress canceling the NASA SETI program, by showcasing a decade of progress in privatized SETI. Further details may be found online, at www.setileague.org/seticon.

All Alone? (Or Not?)

By Prof. Philip Morrison

Our hunt for other worlds will find them – or exclude their existence – only after continued growth in our hunting skills, bigger telescopes, better precision spectrography, more exact study of wobbly images, and maybe new ideas. But it is worthwhile recounting the steps we could and did take to arrive here.

How do we know there are other suns among the stars?

The sun is our star, and the old understanding that life depends upon the sun has to be the bottom rung in the ladder of search.

We all see only one sun, the hot disc of every clear daytime. It was not until the seventeenth century that there was good reason to believe that the stars in the night sky are really suns, although they look so different. (The Buddhist scholars always thought so, for they used simple analogy with real talent.) But how can you reconcile the sun's hot and incomparable glare to the cool flicker of starlight?

Naked-eye observers held that bright stars were bigger across than the faint ones are. They do look that way. But from the first telescopic view we saw that all the magnified stars are still just bright points, if some show glary haloes to the eye. Even Kepler did not believe that the stars were suns, for by eye they were much too big. Galileo's telescope made sense of the facts. Take the sun, figure out how far to move it to make it look as faint as a bright star, and its size in the sky will dwindle to a luminous bright point. It is the optics of the eye that surround a bright point with the dazzling artifact of those glaring rays.

Let me speak of my friend Carl Sagan, outstanding public figure among all astronomers, who died in December 1996 at the untimely age of 62. It was he who arranged – and it took some doing – that the distant camera of a Voyager space probe would point back toward the sun from beyond Neptune to take a picture of Earth. Out there you do not get a blue disc with a smear of details; you see only the color, a pale blue glowing dot. The whole Earth is seen as a planet among planets, just as a sun from afar is only a star among stars. Distance alone makes planet and sun dwindle.

The more we knew of stars the more we understood that the sun is only a star along the “main sequence” of stars, a common long-lasting type labeled G2 V. Indeed the Galaxy has a couple of hundred million stars of that very class!

OK, plenty of suns, but are there any other planetary systems?

When I was a graduate student, it was fashionable to believe that our solar system might be unique in the Galaxy. I believed that then, too, because the picture of planet formation was one of near-colliding stars. The theory was that one star orbited fast and close past the sun to escape to space, but it pulled out a lot of gas from its collision partner. That gas over a long time condensed into the planets, comets, etc. But you could calculate that such a star collision was very rare, maybe very few over all the age of all the stars. So we were likely to be alone.

I vividly recall reading the paper of 1939 by Lyman Spitzer that disproved the conclusion. He showed that a star collision could not make planets; solar gas was so hot that it would dissipate long before it would condense. Planets had to be made some other way; maybe they were as plentiful as suns!

How do planets begin?

The root idea is as old as Washington, DC. A star and its planets—if any—are made at one time by the slow gravitational collapse of a dilute extended cloud of interstellar gas, a nebula. This proposal is called the nebular theory (Pierre de Laplace). It was only some fifteen or twenty years ago that we saw by infrared light the first such “nebular disc” of gas and dust around a young star. (Even bright Vega has one.) That was the first confirmation beyond the many plausible fits of the nebular theory to the single solar system we know, the one and only family of the sun. There are plenty of nebular discs, even if no sure planets are yet seen in the discs. Planets take time to form, maybe 1 or 2 hundred million years; perhaps some will form around Vega too.

Are there signs of life far beyond earth?

Only hints, but plenty of those! Gas clouds in space often show specific radio emission lines that mean the presence of molecules that would be at home here in the bio lab, like formaldehyde or ether, not to mention much more abundant ones like molecular hydrogen, carbon monoxide and carbon dioxide. This proves that carbon compounds (and others) thought basic to life can form under the natural processes of deep space. But there is no life in those very dilute, expanded gas clouds. They span light years and are as dilute as the very best lab vacuum. Their formation is very slow, and nothing like a cell could grow, only widely spaced molecules. There is a huge gap between gas molecules or dust grains and life, even though the molecules are essentially those of life. A test tube full of blackish stuff is not life; see your neighborhood snowbank.

The chemistry in and near the stars is the same as it is here. But life is very special, very dense, very complex, very full of change. Molecules are implied by life, but atoms and molecules do not of themselves imply life. They are necessary but not sufficient, as the logician would say. Life is far more than its components.

Sun-like stars do not imply life, nor do atoms, nor planets, nor molecules—not even those molecules essential for the life we know, like water, carbon dioxide, and nitrogen compounds. They are only the precursors of life; they might abound, and life would still be absent.

What would disclose life for sure?

To find life for sure, we need a signal from living things. Jump to the top of the time scale, and seek radio signals made “artificially” by creatures as accomplished as we are, or more. Long ago my partner Giuseppe Cocconi and I put forward the notion that we might look for special narrow-band radio emission from the stars. If we found anything like the signals we ourselves could make, we would probably have found life. Complex details of the signal might make the case irrefutable. So we have been trying this route—a jump to the very recent features of life, its technical skills—for some 35 years, though

never systematically. We are now beginning a systematic radio search of the Galaxy that will take many decades.

If this gamble should win, it pays off with disclosing our counterparts. That is unlike finding organic molecules, or even microorganisms. They are complex, but they are not what we are, they are more our ancestors than our partners. The radio search, dubbed SETI, seeks a grander answer, and is correspondingly less likely to succeed, but it is the cheapest search.

What is the present state of the "hunt for aliens"?

Planets of normal stars went unknown or only hinted at until the fall of 1995. Out of a few hundred stars examined with the best new Doppler techniques or by direct orbit-wobble viewing, we now have evidence that eight normal stars have planetary mass companions. That astonishing new sample suggests that between ten and a hundred million solar systems are to be found in the Galaxy around sun-like stars.

If that sample poll holds up, we will come to believe what Carl Sagan conjectured in his television series *Cosmos* in 1980. He foresaw an *Encyclopedia Galactica* listing of all the planetary systems and their details in a huge many-volumed data base.

Our one and only solar system does have many counterparts, but we do not yet know how varied they may be. Do they all have big Jupiters—the only class of planet we can now find? Do they have earths too? Or moons like Europa that might hold life under ice crusts? We do not know, and we will be decades finding out.

Long shots might pay off sooner, if we try from the Earth by staring with computer at millions of stars to see dark planets causing a rare drop in the starlight, or maybe millimeter radio waves that show cool planets. Otherwise we will need big space-borne instruments to see planet atmospheres.

What about the chances of life similar to our own in its awareness of the world around?

Our true counterparts are akin in awareness of the universe, no matter how the creatures may or may not differ in looks or limb count or size or speech. What they are like is still mostly imaginative fiction. We simply do not know enough to say. Some day we will. We need both to hunt and to think. For me the most striking lesson of the NOVA television program Hunt for Alien Worlds was the wide recognition that merely wishing it true doesn't get at truth.

There is a big difference between an earth wobble and the wobble of a star out there, even if they look the same at first. Science requires that we find what is the case, not just what we expect, hope for, or even seek devotedly and long. That is its purest charm, and its most profound risk. There is a sharp but subtle distinction between tested fact and fiction, a distinction by no means obvious, simple, or even final.

Let the search go on. Hope for new means, new ideas, new people, but with the old resolution not to fool ourselves. We can progress, but we cannot in advance be certain of progress. We can try.

This is a golden age for sky viewers, one not matched since the time of Galileo, who around 1610 was professor at Padua near Venice. He first showed stars unseen by any eye, and showed that the moon was a rocky and mountainous place. Maybe, maybe some day -- with lots of luck, by 2100! -- we

will find life, even fellow astronomers, well beyond earth. I envy those who witness it!

Dr. Philip Morrison, Institute Professor and Professor of Physics at the Massachusetts Institute of Technology, is a distinguished theoretical astrophysicist and a pioneer in the search for extraterrestrial intelligence through radio communication. This essay is reproduced from the NOVA website, with the kind permission of Prof. Morrison and WGBH Boston. ❖

Editorial:

QST Award Bodes Well for SETI

by Dr. H. Paul Shuch, Executive Director

I learned a few months ago that my article *2001: A Moon-bounce Odyssey*, which appeared in the November issue of QST magazine, has been awarded that journal's Cover Plaque award as the most popular article of the month. The Cover Plaque award is voted by members of the American Radio Relay League, as a way of honoring the best article in each issue of QST, the ARRL's monthly journal. Although I am gratified by the favorable response to my article, this honor says far more about public acceptance of SETI than it does about my literary talents.

Up until the formation of The SETI League in 1994, SETI was generally believed to be too costly, too complex, and too challenging for amateurs. In the past seven years, we have showed the world that this is no longer the case. In fact, most amateur SETIers contend, the search is just too important to be left to the professionals!

But acceptance of our mission by the world's radio amateurs has been slow in coming. My 1995 QST article, "SETI Made Simple," was met with healthy skepticism. Just a year ago, we saw a letter in QST titled "SETI is not Amateur Radio." (We SETI league members are indebted to Richard W. Wilson, W5ETI, for his eloquent editorial rebuttal, "SETI *Is* Amateur Radio.") And, to this day, I receive letters from radio amateurs and professional astronomers alike, belittling our "toy" telescopes and calling our search a "waste of time and money."

For most of us in The SETI League, our SETI activities are a hobby. Isn't "waste of time and money" the very definition of a hobby? I am proud to call myself an amateur, because the root of the word is the Latin for *love*. Does the fact we do something for love, rather than for financial gain, mean we do it any less professionally than the professionals? I think not.

And, apparently, other amateurs agree with me. In November 2001, the readers of QST (amateurs all) voted a SETI article the best of the month. Now, even if all 1300 SETI League members worldwide were ARRL members (they certainly are not), and even if they all voted for my article in the Cover Plaque competition (they certainly did not), there would not have been enough votes to confer the present honor upon us. Thus, I conclude that a sizeable number of radio amateurs, most of whom are not SETI League members, consider our efforts credible, laudable, and worthwhile. That is the message which this honor conveys, and one of which all SETI League members can be justifiably proud. ❖

Moonbounce Beacon Returned to Service, Stronger than Ever

Kinnelon, NJ., March 2002 - Seven months after being shut down for upgrading, and just in time for its next tests in conjunction with the Arecibo (Puerto Rico) Radio Observatory, The SETI League's "moonbounce" beacon for radio astronomy and SETI has been returned to service, at more than ten times its initial power.

The SETI League Moonbounce Beacon reflects microwave signals off the surface of the Moon. The resulting radio echoes may be received by amateur radio operators (radio "hams") on Earth, and are used for testing Earth-based radio telescopes. Operating under the callsign W2ETI at an allocated amateur radio frequency of 1296.000 MHz, the EME (for Earth-Moon-Earth) beacon enables amateur and professional radio astronomers alike to calibrate their receiving systems by providing a stable reference signal emanating constantly from a known point in the sky.

First activated in March 2001, this unique research facility, built by radio amateurs and funded in part by a NASA grant administered by the American Astronomical Society, was used by astronomers at the Arecibo Observatory in Puerto Rico to help calibrate their equipment. It operated for four and a half months at a modest 15-watt transmit level, before being temporarily shut down in late July for the addition of a 200-watt amplifier assembly. The facility has remained intermittently operational at the lower power level during the upgrade. The next Arecibo tests have been scheduled for March 21 - 24, 2002. In its initial low-power configuration, the calibration beacon's weak echoes, reflected off the lunar surface and returned to Earth after a half-million mile journey, were detected by the 1000-foot diameter Arecibo radio telescope, by the 250-foot Sir Bernard Lovell telescope at Jodrell Bank in England, and by a homebuilt 30-foot dish built by Piedmont OK radio amateur Jay Liebmann, K5JL. At its current 200-watt level, the beacon should be accessible to the more modest amateur radio telescopes being built and operated by hundreds of SETI League members in 62 countries around the world. Full technical details are available online, at www.setileague.org/eme. ❖

SETI League Awards Highest Honors

Trenton, NJ., 27 April 2002 -- An Italian space scientist and an American patent attorney were tonight awarded The SETI League's two highest honors, at the grassroots science group's annual Awards Banquet on The College of New Jersey campus.

The 2002 Giordano Bruno Memorial Award, presented annually to a person or persons making significant technical contributions to the art, science, or practice of amateur SETI, was presented to Claudio Maccone of the Centre for Astrodynamics in Turin, in recognition of his technical leadership within the International Academy of Astronautics, and specifically for his efforts to establish a radio observatory on the far side of the Moon. Dr. Maccone is, significantly, the first Italian to win the Bruno award, which was established in 1995, and is dedicated to the memory of Giordano Bruno, the Italian

monk burned at the stake in 1600 for postulating the multiplicity of inhabited worlds.

The first Orville N. Greene Service Award went to Stephen D. Carver, Esq., a patent attorney from Little Rock AR who serves as The SETI League's volunteer patent and trademark counsel, for his diligence in protecting The SETI League's intellectual property interests. This award was established at last year's SETI League annual meeting, in the memory of The SETI League's co-founder, himself a patent attorney. It is presented annually to a person or persons making unusual volunteer contributions, or providing extraordinary service, to The SETI League, Inc.

SETI League members are invited to nominate worthy candidates for next year's Bruno and Greene awards, using the forms available on our website, at www.setileague.org/awards. ❖

Thanks to our SETICon02 Prize Donors

The SETI League, Inc. is indebted to the following individuals and organizations, for their generous donations to the SETI-Con02 Prize Table. Once again, nobody went home empty-handed from our Annual Awards Banquet. We urge SETI League members to favor our commercial prize donors with their business.

- WinRADiO 1550e Receiver (Grand Prize):
Milan Hudecek, Rosetta Labs (Australia)
- Dual-band Feedhorn, 1.4 + 1.6 GHz (First Prize):
Jeffrey Lichtman, Radio Astronomy Supplies
- Helical Feed, 1.4 GHz (Second Prize):
Dave Clingerman, W6OAL, Olde Antenna Labs
- 1420 MHz Weak Signal Source kit:
Down East Microwave Inc.
- NOVA software:
Mike Owen, W9IP, Northern Lights Software
- SETIFox software:
Daniel B. Fox, KF9ET
- SETIStar Deluxe software suite:
Neil Boucher, MathStar (Australia)
- Ham University software:
Michael Crick
- Low Noise Amplifiers and Field Effect Transistors:
Al Ward, W5LUA, Agilent Technology
- Various SETI and microwave books, donated by:
American Radio Relay League, Athena Andreadis, Adrian Berry, David Darling, Steven J. Dick, Foundation for the Future, Al Harrison, Cliff Pickover, SETI Institute, The SETI League, Inc., H. Paul Shuch, Wooden Books, Walker & Co.
- One-year memberships:
Team SETI, Radio Amateur Satellite Corporation
- Team SETI t-shirts:
SETI Institute
- SETI League pens:
The SETI League, Inc. ❖

Searching for Ourselves

by James F. Brown, W6KYP

After looking at the software and hardware requirements for my Project Argus station, and mulling over such technical questions as integration time constant and Doppler shift correction, I have come to the following epiphany:

I must look for the most obvious signal – and that is the signal that I would choose to send myself, if I had the money to do so.

What that means (and it seems obvious once put on paper) is that *I must look for myself*. This is necessary to make the signal recognizable to us when finally detected.

Any ETI that I might hope to detect must be more like than unlike me, in most basic ways. Not to put too fine a point on it, but, for example, I think this ET would think in the same time frame as we do. Not at the speed of a glacier or at the speed of a bullet, but somewhere near our 'thinking speed'. ET's physical makeup would have to be about the same as ours. Not as small as a bacterium or as large as one of the rolling hills I can see from my window, but somewhere in-between. This would give him the same type of control over his environment, and the same capability as I have to construct the needed transmitter, which could produce a signal which I can recognize. Not all ETI need be like me; only those whom I have a realistic chance of detecting.

ETI's transmitter must be an RF signal generator. Some other, more exotic form of communication may well be in use, but since I can't construct a receiver to detect exotica, it's not worth considering. This leaves optical SETI open - but not for me. I know nothing about the optics required on that scale. As a microwaver, I'll stick to the area where I have a shot at SETI success.

The signal must be a deliberate beacon. That's the only type I, and most other Argus stations, would have a ghost of a chance of hearing. Leakage detection seems less likely, if only because of the transmit power requirements needed to show up on my system. Detecting planetary radar also seems unlikely, because it seems that it would only be sent for short periods. Once a radar echo was recovered, the transmitter would most likely be turned off or pointed somewhere else. The modulation scheme needed for an effective planetary radar might also make it difficult to recognize on this end.

I would set my beacon up in the waterhole to maximize its chances of discovery. I would want to be heard, and that is the most obvious place to start. The hydrogen line is at 1420 MHz and the hydroxyl line at 1662 MHz. I would transmit at exactly halfway between the two, at 1541 MHz. (One could also make a case for the geometric mean of the hydrogen and hydroxyl lines, which is 1536 MHz. But we're splitting hairs here.) I would expect ETI to similarly transmit somewhere near the middle of the waterhole, if he wants me to detect him.

Unfortunately, my Project Argus system (receiver and filter) can't tune this frequency, but if I were to make changes to my system, that is where I would choose to monitor.

An ideal interstellar beacon should be narrow band to concentrate the transmit power, and to make it distinguishable from natural sources. It must be directed at our star. This is necessary to conserve power, and to make possible reception

over huge distances. So a directed beacon is what I am looking for. I can see ETI pointing such a beacon at each candidate star, one at a time, sending the beacon for some length of time, and then moving to the next star.

The above targeted beacon strategy implies that Earth rotation Doppler compensation is a minimum requirement of our Project Argus receiving stations, if only to exclude local signals. Correcting for the Doppler shift due to our travel around the Sun is also a requirement. I have the Earth rotation Doppler chirp running now - the other compensation is an unknown quantity to me at this point, but something which Project Argus participants should be working on.

My hypothetical interstellar beacon would be locked onto each star for about a year at a time. We may have missed ETI's signal already, and may have to wait another 300 million years for it to show up again. Or, it may be starting tomorrow. Since we just don't know, we may as well assume that it starts tomorrow.

If I were sending a beacon, its transmitter frequency would be Doppler-adjusted to the Galactic center of rest. Since the purpose of a beacon is to be seen against a background of other signals, this would make it clear to anyone receiving it that it was an intentional signal. Again, I have no idea how to design this correction into my receiver chirp. If it's small (less than about 0.01 Hz/sec), no matter where I point my antenna I can't use it anyway, because my 10Hz/Bin resolution and planned 30-minute integration time constant make such small Doppler rates moot. If the compensation for the Galactic center of rest is a sizeable fraction of a Hz per second, I'd better figure out how to implement it!

My beacon would be a CW signal on/off modulated in a regular way. I might send Morse code in a repetitive pattern, and I would send it at a speed slow enough to allow integration of each character, but not so slow as to allow the signal to drift across many bins during a given key-down period.

If I concentrate on looking for myself, I may well miss signals sent by those not like me. But I know that creatures who think like me exist (if only by Earth's own example.) Designing our search around those *not* like us involves pure speculation, and may reduce our chances for SETI success. ❖

2001 SETI League Financial Report

The following table represents the current unaudited financial statement of The SETI League, Inc., as reflected in its most recent Exempt Organization (IRS Form 990) filing, and presented to The SETI League Annual Meeting on 28 April 2002.

990 Line	REVENUES:	2001 (prelim)
1d	Dues, Grants & Contributions	180,412
4	Interest & Investments	6,821
12	Total Revenues	187,233
	EXPENSES:	
13	Educ. and Scientific Programs	195,888
14	Management & General	31,924
17	Total Expenses	227,812
18	Excess (Deficit) for year	(40,579)
	BALANCE SHEET:	
19	Beginning Net Assets	128,003
21	Ending Net Assets	87,424



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