

SETI League Extends Charter Life Membership Conversion Period

The SETI League's charter members are truly pioneers, bold individuals who were willing to support our organization when it was little more than a dream. In recognition of their demonstrated confidence in our League, the Trustees of The SETI League, Inc. have voted to extend the previously announced Charter Life Membership conversion program through the end of 1996.

As is customary for non-profit organizations, life memberships were initially offered with dues set at twenty times the cost of a full membership. Currently, full member dues are \$50 US per year, which makes the cost of a life membership an even \$1000. We announced in *SearchLites* Volume 1 Number 3 (Autumn 1995) a decision to allow our charter members to convert to life membership for twenty times their *initial* dues, for a limited time. Since charter dues were offered at a reduced rate of \$35, this made charter life membership conversion available for an additional tax-deductible contribution of just \$700 US.

Unfortunately, many charter members who joined us late in 1995 were unaware of this conversion opportunity. In recognition of their early support, we have extended this offer through the end of 1996. Charter members wishing to avail themselves of this opportunity may send US dollar checks to SETI League headquarters. Be sure to mark your check "Charter Life Membership Conversion." A special charter life membership certificate will be issued to all participating in this program.

Those SETI League members who joined us after the end of our charter membership period are welcome to secure life memberships at the current rate of \$1000 US. Since The SETI League, Inc. is a non-profit [501(c)(3)] corporation, your contributions may be exempt from US federal and state income tax. Please consult your accountant or tax professional.



**433 Liberty Street
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SearchLites

the Quarterly Newsletter of The SETI League, Inc. Volume 2 Number 3 Summer 1996

Editorial

OK, What If We Hear Something?

by H. Paul Shuch, Executive Director

With the launch this Spring of Project Argus, we now have ourselves a real live SETI project underway. Soon we will have dozens of amateurs around the world scanning the skies for signs of life. And then hundreds, and some day thousands. But what happens if we actually hear something?

I'm reminded here of an old (and admittedly sexist) joke about a young man who repeatedly made what would today be deemed totally inappropriate overtures toward numerous young women. They all rebuffed him, until one day a certain young lady agreed to his suggestion. "Omigod!" he stammered. "Now what do I do?"

That's kind of the situation we find ourselves in. We're ready to do The Search. But are we ready for success? Have we even contemplated the implications of what we are attempting? I imagine not.

The international community of SETI professionals has already dealt with this question and has its protocols firmly in place. From signal verification techniques to resource sharing to decoding of message content to announcing this greatest of all discoveries to a waiting world, the procedures are codified, and subscribed to by governments and scientific organizing committees. (See elsewhere in this issue.) The SETI League, Inc. endorses these international protocols. But because of the nature of our mission, we may wish to establish even more stringent standards for ourselves.

Our very strength, that of involving perhaps thousands of amateurs in an all-sky survey, may well prove our greatest weakness. When SETI was done primarily by governments, it was easy to coordinate among them and arrive at acceptable protocols. But just as we don't attempt to tell our members what frequency is best to search, just as we are loathe to stifle the creative spirit, so we hesitate to dictate to our members how signals should be verified, or how a positive result should be announced.

And yet if we don't, chaos could reign. Just imagine what it would do to the credibility of our organization in particular, and the SETI enterprise in general, if our individual members started announcing unverified "hits" to their local media. We must present an organized, unified front. We must find ways to coordinate, to verify what we observe, to weed out false positives, and to announce our results in a credible, disciplined way. I look to you, the members, to help determine how we might accomplish this.

Declaration of Principles Concerning Activities Following the Detection of Extraterrestrial Intelligence

Adopted by the International Academy of Astronautics, 1989

We, the institutions and individuals participating in the search for extraterrestrial intelligence,

Recognizing that the search for extraterrestrial intelligence is an integral part of space exploration and is being undertaken for peaceful purposes and for the common interest of all mankind,

Inspired by the profound significance for mankind of detecting evidence of extraterrestrial intelligence, even though the probability of detection may be low,

Recalling the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, which commits States Parties to that Treaty "to inform the Secretary General of the United Nations as well as the public and the international scientific community, to the greatest extent feasible and practicable, of the nature, conduct, locations and results" of their space exploration activities (Article XI),

Recognizing that any initial detection may be incomplete or ambiguous and thus require careful examination as well as confirmation, and that it is essential to maintain the highest standards of scientific responsibility and credibility,

Agree to observe the following principles for disseminating information about the detection of extraterrestrial intelligence:

1. Any individual, public or private research institution, or governmental agency that believes it has detected a signal from or other evidence of extraterrestrial intelligence (the discoverer) should seek to verify that the most plausible explanation for the evidence is the existence of extraterrestrial intelligence rather than some other natural phenomenon or anthropogenic phenomenon before making any public announcement. If the evidence cannot be confirmed as indicating the existence of extraterrestrial intelligence, the discoverer may disseminate the information as appropriate to the discovery of any unknown phenomenon.

2. Prior to making a public announcement that evidence of extraterrestrial intelligence has been detected, the discoverer should promptly inform all other observers or research organizations that are parties to this declaration, so that those other parties may seek to confirm the discovery by independent observations at other sites and so that a network can be established to enable continuous monitoring of the signal or phenomenon. Parties to this declaration should not make any public announcement of this information until it is determined whether this information is or is not credible evidence of the existence of extraterrestrial intelligence. The discoverer should inform his/her or its relevant national authorities.

3. After concluding that the discovery appears to be credible evidence of extraterrestrial intelligence, and after informing other parties to this declaration, the discoverer should inform observers throughout the world through the Central Bureau for Astronomical Telegrams of the International Astronomical Union, and should inform the Secretary General of the United Nations in accordance with Article XI of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Bodies. Because of their demonstrated interest in and expertise concerning the question of the existence of extraterres-

trial intelligence, the discoverer should simultaneously inform the following international institutions of the discovery and should provide them with all pertinent data and recorded information concerning the evidence: the International Telecommunication Union, the Committee on Space Research, of the International Council of Scientific Unions, the International Astronautical Federation, the International Academy of Astronautics, the International Institute of Space Law, Commission 51 of the International Astronomical Union and Commission J of the International Radio Science Union.

4. A confirmed detection of extraterrestrial intelligence should be disseminated promptly, openly, and widely through scientific channels and public media, observing the procedures in this declaration. The discoverer should have the privilege of making the first public announcement.

5. All data necessary for confirmation of detection should be made available to the international scientific community through publications, meetings, conferences, and other appropriate means.

6. The discovery should be confirmed and monitored and any data bearing on the evidence of extraterrestrial intelligence should be recorded and stored permanently to the greatest extent feasible and practicable, in a form that will make it available for further analysis and interpretation. These recordings should be made available to the international institutions listed above and to members of the scientific community for further objective analysis and interpretation.

7. If the evidence of detection is in the form of electromagnetic signals, the parties to this declaration should seek international agreement to protect the appropriate frequencies by exercising procedures available through the International Telecommunication Union. Immediate notice should be sent to the Secretary General of the ITU in Geneva, who may include a request to minimize transmissions on the relevant frequencies in the Weekly Circular. The Secretariat, in conjunction with advice of the Union's Administrative Council, should explore the feasibility and utility of convening an Extraordinary Administrative Radio Conference to deal with the matter, subject to the opinions of the member Administrations of the ITU.

8. No response to a signal or other evidence of extraterrestrial intelligence should be sent until appropriate international consultations have taken place. The procedures for such consultations will be the subject of a separate agreement, declaration or arrangement.

9. The SETI Committee of the International Academy of Astronautics, in coordination with Commission 51 of the International Astronomical Union, will conduct a continuing review of procedures for the detection of extraterrestrial intelligence and the subsequent handling of the data. Should credible evidence of extraterrestrial intelligence be discovered, an international committee of scientists and other experts should be established to serve as a focal point for continuing analysis of all observational evidence collected in the aftermath of the discovery, and also to provide advice on the release of information to the public. This committee should be constituted from representatives of each of the international institutions listed above and such other members as the committee may deem necessary. To facilitate the convocation of such a committee at some unknown time in the future, the SETI Committee of the International Academy of Astronautics should initiate and maintain a current list of willing representatives from each of the international institutions listed above, as well as other individuals with relevant skills, and should make that list continuously available through the Secretariat of the International Academy of Astronautics. The International Academy of Astronautics will act as the Depository for this declaration and will annually provide a current list of parties to all the parties to this declaration.

Headquarters Flooded with Winning Limericks

We now have five winners in The SETI League's Isaac Asimov Memorial Limerick Contest! (For contest details, see "In Search of Alien Limericks," in *SearchLites* Volume 1 Number 3, Autumn 1995, or refer to our Web site.) These contributors have already received their coveted SETI League pocket protectors. Will you be our next winner?

Shaun Merrigan of Alberta Canada sends us:

*They came across trillions of miles
According to secret X-Files.
Now the good folks at SETI
Want us to get ready
And welcome them back with big smiles.*

From Ray Hogan of Lebanon, NJ we received:

*While repairing my new LNA
An alien had something to say.
I was not off long
And then he was gone
And he hasn't been heard to this day.*

SETI League member Francis Cartier of Pacific Grove, CA sends in:

*We cannot know where in the sky
A signal is lurking, or why.
We will search even though
The chances are low.
The payoff is well worth a try.*

Lissa McCollum of Grand Rapids, MI submitted:

*I gaze at the star sprinkled sky
and ask, 'Is there one such as I
in an alien place
staring off into space,
searching with strange wistful sigh?'*

whilst Neil Whyman from England gives us:

*Whilst scanning one night into space
I espied an echoey trace.
My microwave MMIC's
Thus silenced the cynics,
Who may yet see an alien race.*

Honorable mentions go to SETI League Charter Members Mike Leahan of Wisconsin, and Laurie Spiegel of New York City, as well as writer Gabby Hyman of Port Townsend, Washington, Tony Neilson of Melbourne, Australia, and Bill Cooke of Amarillo, Texas for their submissions. Since this is an open-ended competition, keep those cards and limericks coming, folks!

Director Introduces Project Argus at BioAstronomy Conference

SETI League executive director H. Paul Shuch introduced our Project Argus all-sky survey to the world SETI community, in a paper delivered at the Fifth International BioAstronomy Conference in Capri in early July. The Conference was a veritable Who's Who of SETI, with representatives of all major SETI organizations and searches in attendance. Keynote speaker was Philip Morrison, who co-authored the first modern SETI paper to appear in a scientific journal (the British "Nature") in 1959. Also presenting papers were two Nobel laureates, biochemist Christian DeDuve and Maser inventor Charles Townes.

With respect for the company in which he found himself, the following is an abstract of Dr. Shuch's somewhat more modest paper. The entire document is available on our Web site (www.setileague.org/) under Articles. Reprints of the full paper are available to SETI League members for the courtesy of an addressed envelope with three ounces of postage affixed.

Abstract

Thirty six years after implementation of the first modern SETI study, it is beginning to appear that the most interesting candidate signals are highly intermittent in nature, of just a few seconds to a few minutes in duration, and never repeating. If such signals are the norm, then even the most advanced temporally displaced signal verification scheme (such as the FUDD approach used by Project Phoenix) will be prone to a high incidence of false negatives. Further, as large radio telescopes scan only a tiny fraction of the cosmic sphere at any given time, we can expect that the overwhelming majority of interesting candidate signals will evade initial detection.

This paper introduces Project Argus, a global effort of the non-profit SETI League, Inc. to achieve continuous monitoring of all four pi steradians of space, in real time. Perhaps the most ambitious SETI project ever undertaken without benefit of Government equipment or funds, Project Argus will ultimately involve 5,000 small radiotelescopes worldwide, built, maintained and operated by private individuals (primarily radio amateurs and microwave experimenters), coordinated so as to miss no likely candidate signals, and providing independent verification of any interesting signals detected. The first prototype Argus stations went into operation in 1996; it is expected that full sky coverage will be achieved by 2001.

The sensitivity and range of Project Argus are assessed by comparison of current capabilities to those in place at the Ohio State Radio Observatory nineteen years ago, when the so-called "Wow!" signal was detected. The "Wow!" signal serves as a convenient benchmark, even though its exact nature remains unknown. It will be shown that, should a similar candidate signal appear during the fully deployed phase of Project Argus, it will not evade detection. In fact, each Argus station, though utilizing just a small satellite TV dish as its antenna, achieves range and sensitivity on a par with the Ohio State Big Ear radio telescope, circa 1977. The technological breakthroughs which have made this level of performance possible are explored in the following pages.

Technical Update

SETI Receivers: How Should We Scan? by H. Paul Shuch, Executive Director

Several of our members have asked (and doubtless others have wondered) about the time dimension of sweeping the SETI water hole. The underlying reason for recruiting as many as 5,000 amateur SETI observers worldwide is that it makes it easy to divide up the whole sky. But as more and more SETI League members gear up for our Project Argus sky survey, the question of how to divide up the frequency spectrum begs our attention. Let us assume for the sake of argument that we're attempting to scan the entire Water Hole (1420 to 1660 MHz), at a nominal resolution of 10 Hz. Let's further assume we're using the most popular amateur SETI receiver to date, the Icom model 7000 series scanning receiver. If we can establish a 12.5 kHz IF and audio bandwidth (this might require some receiver modifications), that receiver can be programmed to scan in 12.5 kHz steps. We know that a SoundBlaster type sound card in a PC, with appropriate software, can easily analyze a 12.5 kHz chunk of audio spectrum. Dividing the 240 MHz wide water hole by 12.5 kHz, we can see that our receiver needs to scan 19,200 channels.

OK, but where does the 10 Hz resolution come in? Our DSP software is performing, let us say, a 1024 point Fast Fourier Transform (FFT). That means it divides the audio band into 1024 individual bins. The width of each of these bins is: $(12.5 \text{ kHz}) / (1024) = 12.2 \text{ Hz}$, pretty close to our resolution goal. So our actual number of 12.2 Hz-wide bins surveyed is: $(19,200 \text{ channels}) \times (1024 \text{ bins} / \text{channel}) = \text{just under 20 million!}$

Now there is the problem of how long it should take to sweep thru all 19,200 channels. That is, what is the minimum dwell time required at each frequency step, in order to perform the required digital signal processing? Unfortunately, there's no simple answer. Signal processing time is a function of the computer used (CPU, clock speed, memory, hard disk access time, etc) as well as the DSP software chosen, and bin resolution selected. For PCs (as opposed to high-end dedicated DSP boxes) minimum processing time is likely to be in the seconds. But it doesn't necessarily pay to go with the minimum time. Since sensitivity improves by the square root of integration time, it makes sense to dwell in each channel for minutes.

A practical maximum dwell time per channel is the longest time a celestial object remains within the beamwidth of the antenna. If the antenna is fixed (operated in drift-scan mode) this value is likely to be ten minutes or so for a typical TVRO dish. Which means we really don't want to scan at all, but rather sweep out a 360 degree swath of sky at one channel one day, the next channel the following day. For 19,200 channels, each 12.5 kHz wide, this means one complete sweep takes 19,200 days. This approach makes the search of the entire water hole take 56.2 years.

At this rate, I doubt that many of our members will live long enough to make it all the way from the hydrogen to the hydroxyl line! But by the time we've gotten much past hydrogen, we can expect new technology (affordable dedicated DSP boxes, for example) and new search strategies to emerge.

Hardware cost keeps coming down, and computer power seems to be doubling every year. If we dare extrapolate this trend, it suggests that within a decade we'll have seen a 1,000-fold improvement in DSP technology. Such improvement would let us cover the entire water hole, for a given swath of sky, in just a matter of days.

So I guess the bottom line is, let's start out crude, and become more elegant with the passing years. But let's start now; we wouldn't want to miss The Call.

Conference Calendar

SearchLites' readers are apprised of the following conferences at which SETI-related information will be presented. League members are invited to check our Web site (www.setileague.org/), call headquarters at (201) 641-1770, or send email to info@setileague.org, to obtain further details. Members are also encouraged to send in information about upcoming events of which we may be unaware.

July 13 - 17, 1996: *Society of Amateur Radio Astronomers Annual Meeting, Green Bank WV.*

July 25 - 28: *Central States VHF Conference, Bloomington MN.*

August 5 - 10, 1996: *American Association of Physics Teachers, University of Maryland, College Park MD.*

August 15 - 18, 1996: *International EME Conference, Bowie MD.*

August 26 - 28, 1996: *22nd Eastern VHF/UHF Society Conference, Vernon CT.*

August 28, 1996: *SETI Lecture at Simi Settlers Amateur Radio Club, Simi Valley CA.*

August 29 - September 2, 1996: *L.A. Con III / 1996 Worldcon, Anaheim CA.*

September 13 - 15, 1996: *ARRL National Convention, Peoria IL.*

September 21, 1996: *Long Island Astronomy Forum, New York Institute of Technology, Greenvale NY.*

October 5, 1996: *Mid-Atlantic VHF Conference, Horsham PA, sponsored by Mt. Airy VHF Radio Club.*

October 18 - 20, 1996: *Grove Enterprise Expo, Atlanta GA.*

November 8 - 10, 1996: *1996 AMSAT Annual Meeting and Space Symposium, Tucson AZ.*

May 16 - 18, 1997: *Dayton Hamvention, Dayton OH.*

May 30 - June 1, 1997: *Rochester Hamfest and ARRL Atlantic Division Convention, Rochester NY.*

July 24 - 27, 1997: *Central States VHF Conference, Hot Springs AR.*

August 28 - September 1, 1997: *Lonestarcon 2 / 1997 Worldcon, San Antonio TX.*

May 15 - 17, 1998: *Dayton Hamvention, Dayton OH.*

May 29 - 31, 1998: *Rochester Hamfest and ARRL Atlantic Division Convention, Rochester NY.*

August 5 - 9, 1998: *BucCONeer / 1998 Worldcon, Baltimore MD.*

May 14 - 16, 1999: *Dayton Hamvention, Dayton OH.*

Deceased Rocket Scientist Breathes New Life Into Cosmic Search

ORLANDO, FL., June 21, 1996 -- In death Tony Wojtowicz may well be accomplishing what he never could achieve in life. The retired aerospace engineer, who had devoted the last 20 years of his life to a radio search of the heavens, has left his books, notes and equipment to the non-profit SETI League, Inc., leaders in a scientific Search for Extra-Terrestrial Intelligence. The bequest was announced by his widow Aline late last year at the couple's Central Florida home. SETI League executive director Dr. H. Paul Shuch met with Mrs. Wojtowicz yesterday to accept the gift on behalf of his organization.

Zdzislaw Anthony Gregory Wojtowicz was born in Poland in 1921, and fought with the Polish Resistance during the Second World War. Educated in England, he became a U.S. citizen in 1964 and worked for the National Radio Astronomy Observatory and several prominent aerospace corporations. He was a member of the Planetary Society, a space advocacy group founded by Carl Sagan. Wojtowicz died of natural causes on October 5, 1995. He leaves his wife, three sons and five grandchildren.

Equipment donated to the SETI League includes a complete microwave circuit development laboratory, plus receivers, antennas, and computers. The equipment will indeed be used by a younger generation of scientists, notes Shuch. But it is Wojtowicz' laboratory notebooks, two loose-leaf binders representing a lifetime of work, which may prove most valuable to future researchers. "I never had the honor of meeting Tony Wojtowicz," comments Shuch, "but I feel his presence when I read his lab notebooks. Here is a man who spent years pursuing a dream, and documented his every thought and effort thoroughly, methodically, as though he were writing for my personal benefit. I wonder if he knew the historical significance of his work."

Project Argus "Standard" Takes Shape

When pushing the state of the art there are no standard recipes, no cookbook, no map to guide the pioneer. This means that no two *Project Argus* stations will look or work exactly alike. Early participants in our sky survey have had to develop the required technology on the fly. Thus we have doubtless disappointed some of our members who had hoped we could tell them exactly what equipment to obtain, and how to hook it up. "If designing and building a network of amateur SETI stations were easy," notes executive director H. Paul Shuch, "someone would have done so long ago."

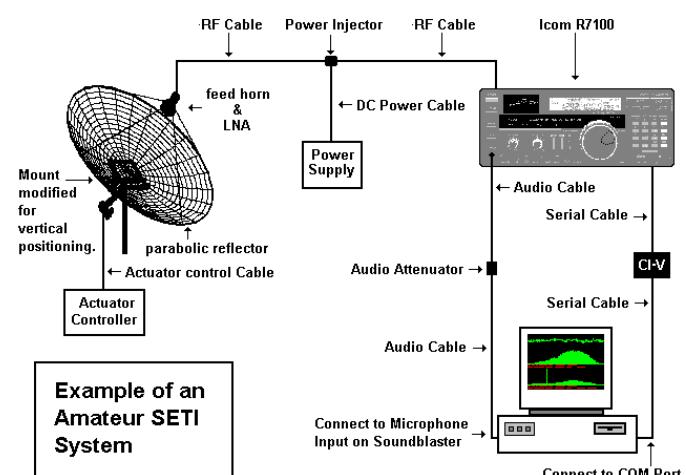
Now that the first few stations are on the air, that situation is beginning to change. A more or less "standard" configuration is evolving (see, for example, the block diagram at right). As the bugs get worked out of these first systems, they are being documented in The SETI League Technical Manual, which is available on the Web, as well as in hardcopy. See the last page of this Newsletter for ordering information. And if you come up with new designs or innovations of your own, please remember to share them with your fellow SETI League members. Electronic submission (to info@setileague.org) is always appreciated.

Cosmic Explorers Reprint Classic Text

LITTLE FERRY, NJ., June 11, 1996 -- In 1971 a team of radioastronomers and engineers headed by Hewlett Packard vice-president Dr. Bernard M. Oliver spent ten weeks designing the ultimate microwave system in the Search for Extra-Terrestrial Intelligence (SETI). The results of their effort became known as Project Cyclops, the most advanced interstellar receiving system never built. The published account of their summer study session, the Project Cyclops report, became a SETI classic, the foundation for much of the scientific work which followed. In the quarter-century since the Cyclops study group first convened, 10,000 copies of the Cyclops report were distributed by NASA. It is probably safe to say that every major player in SETI today cut his or her teeth on this document.

The Cyclops report had long been out of print. Last year two non-profit organizations, The SETI League and SETI Institute initiated a joint project to reprint this important historical document. Just weeks before his untimely death last November, Barney Oliver prepared an Introduction to the Second Edition. After much deliberation, the two organizations decided to go forward with their publishing plans in Barney's memory.

Project Cyclops, Second Printing (ISBN 0-9650707-0-0) went on sale in June, 1996, the 25th anniversary of the opening Project Cyclops meeting. Dr. John Billingham, who co-chaired the Cyclops team, has written a moving dedication to Barney Oliver, which appears in the new edition, along with introductory remarks by SETI League president Richard Factor and executive director H. Paul Shuch. Cover price of this facsimile edition is \$20.00 postpaid to US addresses, or \$24.00 elsewhere. Payment must be in US funds, checks payable on a US bank. We regret that we are unable to accept credit card orders at this time. Order from The SETI League, Inc., PO Box 555, Little Ferry NJ 07643 USA.



Typical System Block Diagram, courtesy of *Project Argus* pioneer and innovator Daniel Fox, KF9ET.

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Benefactor (a major radiotelescope named for you)	\$1,000,000

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Payment in US Dollars only, please
 Foreign checks must be payable through a US bank

Order Your SETI League Goodies:

	(u)	(o)
T-shirts, specify M, L, or XL	\$14	\$16
Coffee mugs	\$ 6	\$ 8
Pocket protectors	\$2.50	\$ 3
Buttons:		
"We're All Ears"	\$1.50	\$ 2
"We Know We're Not Alone"	\$1.50	\$ 2
"Project Argus Launch "	\$1.50	\$ 2
<i>Sing a Song of SETI</i> (Songbook)	\$10	\$12
<i>SETI League Technical Manual</i>	\$10	\$12
<i>Project Cyclops 2nd Printing</i>	\$20	\$24

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