

SETI Scientists Release Songbook

The non-profit SETI League, Inc., announces the release of a songbook honoring radioastronomy, its pioneers, and the scientific Search for Extra-Terrestrial Intelligence. *Sing a Song of SETI* contains the lyrics to 16 new songs by SETI League executive director Dr. H. Paul Shuch, sung to various popular and traditional melodies. The collection, which includes the award-winning *SETI League Anthem*, is being sold to raise funds for a recently privatized radio search of the heavens for signals of possible intelligent extra-terrestrial origin.

The *SETI League Anthem* received a second-place award in the songwriting competition at Philcon, the Philadelphia Science Fiction Society's annual convention. "I've long been striving to strike a balance in my life between art and science," notes Shuch, a radioastronomer and engineering professor. "Apparently, other technical people share this dilemma." He has been singing SETI songs at astronomy meetings, ham radio gatherings and science fiction conventions for the past year, and has received numerous requests for copies of his songs.

Sing a Song of SETI is available for a tax-deductible \$10 contribution to The SETI League, Inc., PO Box 555, Little Ferry NJ 07643. All songbook proceeds will go toward hardware development for Project Argus, an all-sky survey which will ultimately involve 5,000 amateur radiotelescopes deployed worldwide. SETI scientists seek to determine through microwave measurements whether humankind is alone in the universe. Since Congress terminated NASA's SETI funding two years ago, The SETI League and other scientific groups have been attempting to privatize the research. Experimenters interested in participating in the search for intelligent alien life, or citizens wishing to help support it, should contact The SETI League, Inc. membership hotline at 1(800) TAU-SETI.



**433 Liberty Street
PO Box 555
Little Ferry NJ 07643**

SearchLites

the Quarterly Newsletter of The SETI League, Inc. Volume 2 Number 1 Winter 1996

League Announces First Technical Conference

Plans are now being made for *SETICon I*, The SETI League's first annual technical conference, to be held at Trenton State College, NJ, on Saturday, June 29, 1996. This year's conference coincides with the 25th Anniversary of the Cyclops study, and will provide SETI enthusiasts with an opportunity to gauge our progress over the past quarter century. A full day of lectures, workshops and panels is planned, some conducted by alumni of the Cyclops study group, which spent the summer of 1971 designing the (then) ultimate SETI system.

Keynote speaker will be Cyclops signal processing group member Dr. Robert Dixon (W8ERD), now Deputy Director of the Ohio State University Radio Observatory and a technical advisor to The SETI League. 1996 Bruno Award recipient Dr. D. Kent Cullers (WA6TWX), mentioned elsewhere in this *SearchLites*, will speak on "How Cyclops Changed My Life." SETI League engineers will update you on our Project Argus all-sky survey. And those pre-registering will receive a complimentary copy of the Cyclops Report 25th Anniversary reprint. Mark your calendars now; details and registration forms will be sent out in March.

How-To Manual Introduced

Our World Wide Web site (www.setileague.org/) continues to provide our members with hundreds of pages of technical details about Project Argus, our upcoming all-sky survey. But not all of our members enjoy Web access. Responding to your requests, The SETI League is pleased to announce the availability of our Technical Manual in hardcopy, for the cost of printing and postage.

The SETI League Technical Manual consists of printouts of hardware and software articles from our Internet site, detailing the design, construction and operation of an amateur SETI station. Copies will be printed individually on request. Since the Web site is updated weekly, this manual represents a moving target, and it can be expected that no two copies will be exactly alike. SETI League members **only** may order copies using the form on page 6 of this *SearchLites*.

In Memoriam -- Barney Oliver

by H. Paul Shuch, Executive Director

It is with great sorrow that I must report to SETI League members the recent passing of a legend. Dr. Bernard M. Oliver, the father of Project Cyclops and former head of NASA SETI, died of a heart attack on Thanksgiving evening. He was an energetic 79, actively pursuing SETI interests up to the end. Although I only worked with Barney personally on perhaps half a dozen occasions, I considered him one of my three most important mentors, and am highly honored just to have known him. It was Barney who first introduced me to SETI, almost 23 years ago. I shall always be grateful.

The Barney Oliver anecdotes are legion. An EE Ph.D. degree from Caltech in hand, he had established himself as one of Bell Labs' most creative microwave receiver designers before I was even born. You may have heard how he dropped out of the sky in a single-engine Mooney to visit Frank Drake at Green Bank, WV in 1960, as Frank was preparing to launch Project Ozma, the very first SETI effort. Barney was one of the first to use the National Radio Astronomy Observatory's private airstrip. When I landed my Beechcraft at NRAO Green Bank some 35 years later, I was acutely aware of flying in Barney's shadow. Perhaps you recall the story of how, as Engineering VP at Hewlett-Packard, Barney spearheaded the development of the scientific pocket calculator. Every few days, it's said, he rushed into Bill Hewlett's office with a slightly smaller package. When the prototype finally fit in Hewlett's shirt pocket, the HP-35 was born.

Let me contribute to the Barney Oliver legend a personal remembrance. In mid-1977, Barney had just given one of his wonderful missionary presentations on Cyclops, at Lockheed/Sunnyvale. That was the year I left Lockheed and went into full-time college teaching, but Nick Marshall (now a most active SETI League member)* invited me to attend the presentation. I expected it to be the same talk I had heard Barney give at MIT some four years earlier, but was pleasantly surprised that he had updated his presentation to reflect the very newest technology: monolithic microprocessors. After the talk, Barney, Nick, my then-wife Suk, and I went out for dessert at Charley Brown's Steak House on Mathilda Avenue.

I've always felt you can tell a great deal about a person by how he or she chooses to unwind. Nick, though Hungarian, had been educated in Paris, and ordered something sweet and gooey from the French pastry cart. Suk, who was pregnant with our son Andrew, ordered ice cream, and joked about pickles on the side. My ethnic roots drove me to order New York style cheesecake. And then Barney blew us all away by ordering a double Scotch on the rocks. Suddenly, I felt I understood something of the source of his genius. I told him so; Barney tried to keep a straight face, then grinned that warm engaging smile of his, and sipped his Scotch.

* As this issue goes to press, I am saddened to learn that Nick Marshall has also recently passed away. The SETI community has thus suffered a double loss.

Much of what we in SETI do in the months and years ahead will be a tribute to Barney. All of it will be impacted by his influence, and our sense of loss. This issue of *Search-Lites* is dedicated to him. *SETICon I*, the Cyclops 25th anniversary conference, is being held in his memory. And the SETI League and SETI Institute are now collaborating to reprint the Project Cyclops report, which will be dedicated to Barney Oliver, father of the greatest SETI receiver never built.

None of this is an adequate tribute to a man who taught us all how to dream. It will be difficult ever dreaming at so grand a scale without him.

Merrimac Donates Lab Equipment

The SETI League is upgrading its research facility thanks to a generous donation of microwave test equipment from Merrimac Industries of West Caldwell, NJ. The equipment will enable The SETI League to establish a microwave circuit design laboratory, to be used in conjunction with its search for radio signals of possible intelligent extra-terrestrial origin.

Eugene W. Niemiec, K2KJI, Merrimac's president and chief executive officer, donated several hundred pounds of computers, signal generators, signal analyzers and accessories to SETI League president Richard Factor (WA2IKL) for use at The SETI League's Little Ferry, NJ headquarters. "It's Merrimac Industries' pleasure to help support this project," states Niemiec. "There's no doubt in my mind that there's someone out there. When SETI succeeds in finding other civilizations in the cosmos, it will change our world forever."

Blind Physicist Honored as SETI Visionary

Dr. D. Kent Cullers (WA6TWX), the NASA scientist who developed the computer software used by radio astronomers to identify alien microwave signals, has been presented the first annual Bruno Memorial Award by The SETI League, Inc. for his significant technical contributions to the Search for Extra-Terrestrial Intelligence. Cullers, who has been blind since birth, believes that no human eyes are any more sensitive than his, when it comes to detecting alien civilizations. But radio receivers and computers, he reasons, have advanced in recent years to a level which makes searching the cosmos for other civilizations finally practical.

The Bruno Award honors the memory of Giordano Bruno, an Italian monk who was burned at the stake in 1600 for contemplating the existence of other inhabited planets. Recent astronomical discoveries (including the detection of planets around at least three Sun-like stars) have given scientists new hope that the Universe is teeming with life. But Government support for this research has waned, leading Cullers and other former NASA scientists to seek private funding. Cullers, who currently heads the SETI Institute's Project Phoenix search of nearby Sun-like stars, has devoted most of his professional life to seeking evidence of extraterrestrial life.

FFTDSP Update

by Mike Cook, AF9Y

This is to inform SETI League members that a new beta version of the FFTDSP program is available for downloading from my webpage. Here are a few of the new features in FFTDSP41:

- Record and Playback WAV files for post spectral analysis
- Automatic Color Gradient for optimum visibility
- Integration mode for signal detection below the noise
- Mouse point and click for selective recording
- On screen Moon position and TOD tracking
- True S/N (in 100 Hz Ref) bar graph
- Selective area and mode for S/N display
- Display Smoothing Filters
- Zoom In/Out for wider frequency coverage
- Improved Graphics Interface and Setup Screens
- Find Call feature from partial information

I've noticed that some of the SETI League members are confused about the term "below the noise level." Weak signal detection of a carrier is limited by the effective channel bandwidth and frequency stability. Here are the key considerations:

- FFT Processing per time element.
Example: 4096 Pt FFT at 8192 Sample Rate
= 2 Hz Channel (0.5 Second update rate).
- Signal stability, including doppler, must be less than the channel bandwidth for best detection. For the above example, the signal should not drift more than 4 Hz per sec.
- Higher levels of FFT processing will reduce channel bandwidth but will demand greater signal stability.
- Integration increases signal detection because random noise will average down in all channels which do not contain a carrier. This has the effect of bringing the signal out of the noise.
- During integration, the signal must remain in the channel for best detection. If the 4096 Pt FFT is averaged over 100 time periods (50 seconds), the detection is improved by 10dB. The signal would have to stay in the 2 Hz channel for the entire 50 seconds. The drift rate should be no more than 0.04 Hz per sec.

It is apparent that equipment stability and doppler consideration are key factors in any SETI attempt. I believe that compensation could be made for doppler (if significant) during the integration process. This possibility and any other recommendations for program improvement are welcomed.

Webpage: <http://www.webcom.com/af9y>

Email: mwcook@cris.com

(Editor's Note: This shareware package looks like an ideal way to separate coherent signals of possible intelligent extra-terrestrial origin from the background noise. The SETI League thanks Mr. Cook for his continued efforts.)

Project Argus Participant Survey Enclosed

Toward the rear of this Newsletter, readers will find a Project Argus Participant Survey form. We still hope to launch our exhaustive all-sky survey on Earth Day, April 21, 1996, with the handful of stations which we expect to have operational at that time. It is expected that the Argus effort will be up to full strength (perhaps 5000 participants worldwide, providing full sky coverage) within about five years. Meanwhile, in order to provide meaningful coordination, we need to know your present and planned future station status.

All SETI League members planning to do active observing (whether now operational or not) are asked to please fill out and return the survey form. We recommend that you photocopy the form, and send us frequent updates as your station evolves. Remember that your station cannot be coordinated into our network unless we have your information on file. Preference in the assignment of aiming coordinates will be given to those members with the most restrictive aiming and physical constraints, but all else being equal, it's first come, first served. So please respond promptly!

Headquarters occasionally receives inquiries from amateur and professional radioastronomers, asking whether they need be SETI League members in order to participate in Project Argus. The realistic answer is: yes. Without a strong membership base, we will lack the resources necessary to properly coordinate this effort and it will ultimately fail. Remember that your membership dues provide you with far more than a newsletter. They finance hardware and software development, maintenance of our Web site, continuation of our toll-free SETI hotline, and the various publications which we use to disseminate technical details. Your continued support is appreciated.

SETI League Equipment Exchange

The SETI League has recently begun receiving calls, letters, and email from private citizens around the US wishing to donate their out-of-service satellite TV antennas to our cause. A number of SETI League members have similarly asked for assistance in locating an available dish. As a service to our members in good standing, the SETI League will try to act as an antenna clearinghouse by matching up those members in need of a dish with those citizens wishing to have one taken off their hands.

We also anticipate that various SETI League members may be interested in buying, selling or swapping other SETI-related equipment. We have therefore set up a members' Equipment Exchange via this Newsletter and our Web site. Think of us as your swapmeet on the Information Highway. To participate in this Equipment Exchange, SETI League members may call, write, or email to info@setileague.org. Please note that we are only in a position to support our membership at this time. If you wish to participate in this program and are not yet a SETI League member, we urge you to join us.

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 email info@setileague.org, to obtain further details. Members are also encouraged to send in information about upcoming events of which we may be unaware.

- February 16 - 18, 1996:** *Boskone 33*, Framingham MA.
March 13, 1996: SETI presentation at *North Jersey Astronomical Group*, Montclair State University, NJ.
March 15 - 17, 1996: *Lunacon '96*, Rye Brook NY.
April 5 - 7, 1996: *Balticon XXX*, Baltimore MD.
April 18, 1996: SETI presentation at Catonsville Community College, MD.
April 20 - 21, 1996: *Trenton Computer Festival*, Trenton NJ.
April 21, 1996: *Earth Day*, and Launch of *Project Argus*, SETI League headquarters, Little Ferry NJ.
April 27, 1996: Astronomy Day, Glenfield Planetarium, Montclair NJ.
May 1, 1996: SETI Symposium at *IEEE Electro*, Somerset NJ.
May 17 - 19, 1996: *Dayton Hamvention*, Dayton OH.
May 23 - 27, 1996: *International Space Development Conference*, New York NY.
May 31- June 2, 1996: *ARRL Atlantic Division Convention*, Rochester NY.
June 17 - 21, 1996: *IEEE International Microwave Symposium*, San Francisco CA.
June 29, 1996: *SETICon I*, honoring the 25th Anniversary of Project Cyclops, Trenton NJ.
July 1 - 5, 1996: *Fifth International Bioastronomy Symposium*, Capri Italy.
July 13 - 17, 1996: *Society of Amateur Radio Astronomers Annual Meeting*, NRAO, Green Bank WV.
July 25 - 28, 1996: *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 29 - September 2, 1996: *L.A. Con III / 1996 Worldcon*, Anaheim CA.
September 13 - 15, 1996: *ARRL National Convention*, Peoria IL.
October 5, 1996: *Mid-Atlantic VHF Conference*, Horsham PA, sponsored by Mt. Airy VHF Radio Club.
July 24 - 27, 1997: *Central States VHF Conference*, Hot Springs AR.
August 28 - September 1, 1997: *Lonestarcon 2 / 1997 Worldcon*, San Antonio TX.
August 5 - 9, 1998: *BucCONeer / 1998 Worldcon*, Baltimore MD.

Editorial

Planets, Planets Everywhere

by H. Paul Shuch, Executive Director

An assumption fundamental to all SETI research is an abundance of habitable extra-solar planets. Since the existence of communicative civilizations seems to require planets upon which they might build their homes, cities and antennas, the whole house of cards constructed out of the Drake Equation collapses if planetary formation is as rare as was once believed. Fortunately, every day seems to bring new evidence that planetary systems around Sun-like stars are commonplace.

Bear in mind that optical detection of planets orbiting distant stars is still beyond our capability. As has been pointed out previously, visually spotting such planets is a little like trying to see a firefly perched on the rim of a searchlight. Because suns saturate our photodetectors, other means of planetary detection must be devised. And they have been.

The first known planetary system other than our own was confirmed as recently as 1994. The next such discovery occurred a year and a half later. And just three months after that, two new solar systems were discovered. The near geometric progression suggests that soon we shall be discovering new solar systems on a daily basis. Then the existence of other worlds will cease to be news and become an accepted fact of SETI.

Most encouraging for our endeavor is that the three most recent planetary discoveries have all involved G class stars, very much like our own Sun. Although the sample size is still small, it's beginning to appear that planets circling stars such as our own might be commonplace. One of the latest planets appears to have a surface temperature consistent with the existence of liquid water. Though not necessarily essential to the development of life, the presence of oceans certainly simplifies the process.

None of this makes SETI success any more of a certainty than it was a few years ago. But it does seem to raise substantially the values which we might assign to the variables at the left of the Drake Equation. The numbers toward the right are just as speculative as they ever were. Still we should be encouraged by the recent surge of planetary discoveries. And we will keep searching. It remains obvious to me that if we do not, N will for all practical purposes continue to equal 1.

$$N = R_* n_p f_e f_l f_i f_c L$$

SETI League Members Note:

SearchLites is your newsletter. Letters, guest editorials and technical contributions from members are always welcome. Please share your thoughts and experiences.

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SearchLites Editor, c/o The SETI League, Inc.
 433 Liberty Street, PO Box 555, Little Ferry NJ 07643
 tel: (201) 641-1770; fax: (201) 641-1771
 memberships: 1(800) TAU-SETI
 email: info@setileague.org
 Web -- <http://www.setileague.org/>

Who's Who in The SETI League

Founder and President Richard C. Factor
Executive Director H. Paul Shuch, Ph.D.
Secretary Diana Davidson
Treasurer Martin Schreiber, CPA
Administrator A. Heather Wood
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Patron (priority use of The SETI League's radiotelescope)	\$10,000
Director (Patron membership plus seat on advisory board)	\$100,000
Benefactor (a major radiotelescope named for you)	\$1,000,000

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"We Know We're Not Alone"	\$1.50	\$ 2
<i>Sing a Song of SETI</i> (Songbook)	\$10	\$12
<i>SETI League Technical Manual</i>	\$10	\$12

All prices shown are postpaid to
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