

**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

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Martin Schreiber, CPA

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## SETI League is Served Up Dozens of Dishes

Six years ago The SETI League, Inc., grassroots leader in the privatized Search for Extra-Terrestrial Intelligence, pioneered the conversion of satellite TV antennas into re-search-grade radio telescopes. A surprise gift of 47 dish antennas, feed assemblies, and antenna mounts has now brought us one step closer to realizing our long-planned phased array telescope design. The donation, from father-and-son computer dealers Lionel and Jason Lumaghini of Rockland, MA, and their respective companies (JCM Computers LLC and Micro Technology), gives SETI League engineers enough commercial-grade antennas and support hardware to test design concepts and eventually to assemble their *Array2k* antenna project announced in 1999.

"I'm glad to hear that the dishes will work well for your project," donor Jason Lumaghini told SETI League executive director Dr. H. Paul Shuch. "They look a lot nicer set up than they did sitting in my warehouse."

"These dishes are somewhat smaller than the ones initially envisioned for this project," replied Shuch, "but the price is certainly right! What we're saving in antenna costs can be applied to developing superior electronic circuitry." The younger Lumaghini had previously donated hardware to the University of California's SETI@home distributed-computing experiment.

The *Array2k* design combines a large number of standard satellite TV antennas into a single, powerful radio telescope. The SETI League, Inc. demonstrated collaborative use of multiple backyard satellite TV dishes for SETI research with the launch in 1996 of its *Project Argus* all-sky survey. The concept has been embraced by other scientific organizations, including the prestigious SETI Institute in California, which last year announced its considerably more ambitious Allen Telescope Array, to combine 600 such dishes into a grand SETI instrument.

The SETI League's more modest design will support the individual efforts of its 1,280 members worldwide as a follow-up detection device to help confirm their observations. It will also be used for direct astronomical research, and serve as a test-bed for SETI League engineers to develop the technologies which will someday allow them to unite thousands of members' small, backyard telescopes into a huge, planetary array.



**Announcing:**

**The Orville N. Greene Service Award**

The SETI League, Inc. has established a Service Award honoring the memory of SETI League supporter and co-founder, Orville N. Greene. The Orville N. Greene Service Award will be presented annually to a person or persons making unusual volunteer contributions or providing extraordinary service to The SETI League, Inc. The award shall consist of an appropriately crafted plaque or trophy, to be known as an OG.

SETI League members in good standing are invited to nominate deserving individuals for receipt of an OG. Nominees must be members in good standing of The SETI League, Inc. Employees, officers, and trustees of The SETI League, Inc. shall be deemed ineligible for receipt of an OG during their terms of such service to The SETI League, Inc.

Nominating petitions should detail the extraordinary contributions or significant volunteer service of the nominee. For consideration, petitions must be received by January 1st of each year. They may be addressed to Orville N. Greene Memorial Service Award, SETI League, PO Box 555, Little Ferry NJ 07643 USA, or submitted electronically using the Nominating Petition provided on our Website.

Nominating petitions will be evaluated by a committee of judges appointed by the Trustees of The SETI League, Inc. In selecting among nominees for the Orville N. Greene Service Award, the judges will give preferential consideration to the efforts and accomplishments of dedicated amateurs.

Nominating petitions not resulting in awards will be held for future consideration. Decision of the judges is final. The Trustees reserve the right to present no award in any given year. The Trustees reserve the right to present more than one award in any given year.

Awards shall be presented at The SETI League's annual membership meeting or such other SETI forum as the Trustees may dictate.

All decisions of the Board of Trustees of The SETI League, Inc., with respect to interpretation of the rules presented herein or subsequently amended, shall be final.

These rules and regulations shall have the force and effect of Bylaws of The SETI League, Inc. They may be amended as necessary from time to time by the Board of Trustees. Amendments or revisions shall become effective as of the date of their posting to the World Wide Web site of The SETI League, Inc.



**Orville N. Greene, circa 1974**

**Remembering The SETI League's Co-Founder**

If Orville N. Greene were alive today, he'd have just three words for you: plastics, computers, SETI.

Orville Greene was born to one of the last romantics who sought gold in California, in the city of gold, Oroville (from which birthplace Orville's first name was derived). When Orville first went to Washington, D.C., to work as a patent examiner in the US Patent Office, after receiving a degree in Chemistry at Lehigh University, computers were nonexistent, and the only plastics that existed were hard bakelite and soft celluloid. Today we all accept the existence of the computer and the various useful and beautiful plastics that are ever present in our lives.

During Orville's tenure as a patent examiner, there was a vast explosion of new plastic concepts, and the world suddenly had vinyls (Nugahyde), clear acrylics (Lucite), and butyral (the present transparent windshield safety-glass sandwich). In his role as a patent examiner Orville, impressed by the potential use and value of these new plastic concepts, passed many of these applications to issue as patents. Also during this time, Orville earned a law degree, attending George Washington Law School at night.

From his position as a patent examiner, Orville gained experience in patent, trademark and copyright law, and then entered private practice as a patent attorney in New York, where he started his own patent law firm.

Orville developed patents on certain inventions of a gifted, ceramic scientist rushed out of East Germany, just in front of the Russians' advance. These inventions resulted in a brand-new product: the ferrite memory cores which made the first (and consequently all modern-day) computers possible. The computer, of course, is largely responsible for the massive wave of scientific advances in recent years.

In 1979, together with his law partner, Frank L. Durr, Orville co-authored with John Bereseth The Practical Inventor's Handbook, the first work of its kind to discuss frankly the opportunities and pitfalls in developing an invention.

In the early 1970s, Orville entered the music business, when he and a partner acquired a recording studio in New York City, and a rhythm and blues recording company. Along with another partner (highly skilled audio and electronics expert Richard Factor) this music business led, in turn, to the formation of a new company for the manufacture of professional audio equipment. Their company achieved worldwide recognition and fame as the manufacturer of digital sound special effects equipment. Today, Eventide Inc. is a leading manufacturer of audio and broadcast products, as well as logging recorders and avionics. It was Factor (who now serves as SETI League President) with whom Orville co-founded The SETI League, Inc. in 1994.

In 1955, Orville was appointed by New York Governor Nelson Rockefeller to the Board of Visitors of the Otisville State Training School for Boys (a New York State reformatory). He served as a member, and later president, of that Board until 1970. From 1974 until his death in 1997, Orville served as a member, and then vice president, of the Board of Visitors of the Manhattan Psychiatric Center (New York Department of Mental Hygiene), having been appointed by New York Governor Malcolm Wilson.

As an enthusiast in the search for extraterrestrial intelligence and to fulfill his dream of the time when we will achieve contact, it was Orville, with his extremely generous donations to The SETI League, who helped give it its start. To ensure its future, he has also generously and substantially provided ongoing support to meet its financial needs. Through the time, energy, and efforts of SETI League members around the world, we are coming ever closer to confirming Orville's dream that "We are not alone."

*Editor's Note: This biographical data gathered and edited by Vicki Navarra, Orville N. Greene's associate of 46 years.* ❖

### **In Memoriam:**

#### **SETI League Advisor Poul Anderson**

Science fiction Grand Master Poul Anderson, one of the most prolific and highly honored writers in the genre's history, died at his home in Orinda, California, on July 31, 2001. He was 74 years old. Poul (pronounced "pole") had served on The SETI League's Advisory Board since its inception in 1995. Most SETI League members remember him for his guest editorial From SETI to CETI, which appeared in the Autumn 2000 issue of *SearchLites*.

Anderson's career as a science fiction author began with the story "Tomorrow's Children" (with F.N. Waldrop) in *As-tounding* in 1947, and took off in 1953 with the first appearances of two of his most famous novels, Three Hearts and Three Lions and Brain Wave. Soon he began writing his *Technic History* series, about a galaxy dominated by the Polestehnic League of traders, and featuring merchant prince Nicholas van Rijn. This series led into a second sequence involving the successor Terran Empire, served by agent Dominic Flandry.

Other well-known series included the *Time Patrol* tales of agents preventing the corruption of history, the History of Rustum sequence, and the Hoka stories written with Gordon R. Dickson (also recently deceased), involving furry aliens who take romanticized human fiction literally, with outrageous results. *The Last Viking* and *King of Ys* novel series were fantasies, the latter co-written with wife Karen Anderson.

Notable stand-alone novels included Tau Zero, about a relativistic spaceship gone out of control, racing ahead in time to the end of the Universe and beyond, and The Boat of a Million Years, regarding immortals increasingly estranged from Earth. His latest novel, Genesis, won the 2000 John W. Campbell Memorial Award for best novel. Other awards during his career include seven Hugos and three Nebulas (all for short work), the Gandalf Grand Master award for his fantasy, and the Science Fiction and Fantasy Writers of America's Grand Master award for his science fiction. He was inducted into the Science Fiction and Fantasy Hall of Fame in 2000. He was also SFWA's President from 1972-1973.

Poul Anderson is survived by his wife, author and filker Karen Anderson, and was the father-in-law of noted SF author Greg Bear, who married his daughter Astrid. All three are SETI League members. Also surviving him are a brother, John, and two grandchildren, Erik and Alexandra. To all of them, The SETI League sends heartfelt condolences. ❖

### **Event Horizon**

**January 18 – 20, 2002:** *Arisia '02*, Boston MA.

**February 14 - 19, 2002:** *AAAS Annual Meeting*, Boston MA.

**March 1 - 3, 2002:** *Contact Conference*, Santa Clara CA.

**April 5 - 7, 2002:** Dr. SETI ® is Science Guest of Honor at *JerseyDevilCon 2*, Edison NJ.

**April 11 - 13, 2002 (tentative):** *EuroSETI 1Congress*, Republic of San Marino.

**April 19 - 21, 2002:** *Southeastern VHF Conference*, Oak Ridge TN.

**April 21, 2002:** *Fourth Annual SETI League Ham Radio QSO Party*; 14.204, 21.306, and 28.408 MHz.

**April 26 - 28, 2002:** *SETICon02 Technical Symposium and Annual Membership Meeting*, Ewing (Trenton area) NJ.

**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.

**October, 2002 (date TBA):** *Microwave Update*, Washington DC.

**October 10 - 19, 2002:** *World Space Congress*, Houston TX.

**November 7 - 10, 2002:** *AMSAT Space Symposium*, Ft. Worth TX.

**April 21, 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* (location TBA).

**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, 2003 (date TBA):** *Third European Radio Astronomy Congress*, Heppenheim Germany.

**September 29 - October 3, 2003:** *54th International Astronautical Congress*, Bremen, Germany.

**October, 2003 (date TBA):** *Microwave Update*, Seattle WA.

**April 21, 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. ❖

## Science, Technology and Mind in Future Communication

by Prof. Alex Antonites (email [marie@netactive.co.za](mailto:marie@netactive.co.za))  
SETI League Regional Coordinator for South Africa

So far, no signal from an extraterrestrial civilization has been received that can be regarded as finally confirmed. This has led some to argue that the search is not worth the while, since the evolutionary biological paths of possible intelligent life must and would be so different from ours that, even if they exist, communication would be impossible. We would, in fact, never be able to confirm their existence, let alone search for communication.

The argument mainly runs as follows: On Earth there are currently many divergent cultures, and this complicates communication. What one human understands, with and under certain concepts, even though these may seem analogous, is in fact so different from what another human understands that we humans can never fully understand each other. This is the ethnocentric and anthropocentric argument. Human cultures are living in worlds of their own. All human knowledge is humanly interpreted. Communication does take place, but our concepts are so laden with cultural frames of reference that these communications cannot be considered meaningful. It is even argued that science and technology are not excluded from this: Chinese, Japanese, Western, and American sciences differ vastly from each other because they are culturally conditioned.

There is even a school of thought within mathematics which argues that French and British mathematics are dissimilar because of the British and French cultural mindsets. If this is the case amongst beings of the same biological evolutionary stock, how much more impossible would it be for communication to take place between civilizations of divergent biological evolutionary origins?

With such different roots, we can only begin to imagine how different language and science (including mathematics) might be. It would be like someone trying to explain the theory of relativity to a Stoic academic of the Roman Empire in 110 AD. This academic would not follow our thinking and argument and would not understand them, not because s/he is less intelligent, but because relativity would simply not make sense to them.

For primarily biological historical reasons, brains and minds of alien civilizations would be so vastly different that even scientific radio telescope and optical laser searches are futile from the start. Alien brains and minds would function so differently that, apart from some very small and minute similarities, the gap between them and us would be so large that communication would be impossible. Their evolutionary biological makeup will probably not be carbon-based like us, but something different. Their mathematical constructs need not even be geometry, trigonometry, or algebra as we know them. If their brains and minds were so divergent from ours, so would be their laws of logic. If divergent cultures have divergent logics on Earth, how much more totally divergent would be the logics of alien, extraterrestrial civilizations?

This anthropocentric argument may seem appealing to explain the fact that no confirmed contact with extraterrestrial

civilizations has been made to date. I have, however, very strong reservations against this anthropocentric and ethnocentric argument, because I do not think it is valid. It cannot be denied that cultures and societal environments do play a role in the shaping of thinking and that in some cases misunderstandings do arise in communication on Earth. It could also be accepted that cultural reasons do play a role in the generating of knowledge and new areas of research. Many things are indeed local in origin. It could even be granted, in fact I think it is certain, that alien civilizations' biological makeup would, evolutionarily speaking, be divergent from ours. Instead of a life-form that is carbon-based, it may be silicon or something different. Their reproduction/replication processes may be different, the way their brains and minds function may be different -- for example, the firing of neurons may be absent and this function be performed by some other process.

However, I do not think that this is the complete or total picture. The anthropocentric and ethnocentric argument does not follow. In fact, I think the anthropocentric and ethnocentric argument is one-sided. On Earth, in spite of many divergences, there are many universals as well, which are as much a part of humanity as are the divergences. The best example is science and technology. Sciences differ from each other in detail, object of study, and technical methodologies, but all of them are played according to basic general rules of what it is to be scientific. For one reason or another, humans in all cultures worldwide accept this as meaningful and play the game of science according the same basic rules of rationality, objectivity, methodology, and critical discussion, as well as being open-minded.

Cultural influences may steer research into new or other areas, but mathematics, whether in France, Britain, America, Japan, or Tahiti is the same mathematics. For cultural reasons and superstition, some societies do not regard logic and causal thinking as important. From this, however, it does not follow that they do not have the same logic and rationality in principle. This is why I cannot accept the psychologistic argument (psychologism is not the same as psychology) that laws of logic and mathematics, apart from others, are in a one-to-one correspondence relationship connected to brain states and brain events.

Of course, all thinking is connected in some way to brain functions, but, in my view, consciousness emerged from neuronal brain activities, not as something totally independent from the brain. In a quite definite sense it has a "life of its own," i.e., a relative independence of function. This means that the laws of logic or mathematical deduction and argument are not in a one-to-one way determined by biological brain states. For example, the law of noncontradiction holds whatever your emotional state may be during your arguing adherence to this law, or whatever the exact chemical combination in the brain may be, or whatever the speed or frequency of neuronal firings may be at the stage of logical deduction.  $X$  multiplied by  $X$  remains validly  $X$  squared, whatever the relevant brain states may be at the time of this mathematical deduction. Of course, emotional and chemical states may influence a human into not thinking clearly for a moment, concentration may actually be reduced or enhanced, but the validity of logical and mathematical laws is unaffected by these contingent and changing circumstances.

This very same argument can be extended to SETI. The laws of logic, for example, are not only universally human, but also universally universal. Mental states (thoughts, deductions, even the experiencing of pleasure or pain) are not congruent with contemporaneous brain states. Mentality is not a matter of the brain's biological/chemical composition, but of the structure of the internal activities that the brain sustains. As I argued awhile ago, this internal structure has in a definite sense a life of its own, where thoughts can causally interact with other thoughts and mental states, whatever the sustaining physiological material base may be.

Because mental states are not identical with certain material brain states, it follows that any possible alien civilizations whose brains are constructed from different stuff than ours could and may well have the same logic, mathematics, and mental states such as joy or pain. Therefore, an alien being constituted with a different physiology, with a chemistry and physical structure systemically different from ours, could even so sustain a functional economy of internal states whose mutual relationships parallel perfectly the mutual relationships that define our human mental states. Their understanding of mathematics, logic, and physics could match ours, even though it might be much more advanced. The alien may have an internal state that meets all the conditions for being a law of contradiction, X squared, or a pleasure or pain state.

This state, considered from an evolutionary biological perspective, may have a very different, even vastly different, makeup from that of a human, but from a functional point of view it may nevertheless be identical to a human adherence to the law of noncontradiction or pleasure state. These logical positions or mental states are not identical to the physical state, because what mental states have in common is not their status as physical states, but their causal role. For example, to be a turbine or radiator engine is to have a certain functional role and not primarily a certain physical structure. Logic, mathematics, etc. do not rely for their existence on any particular physical or physiological state.

Evolution is not only divergent, but also quite often convergent. As far as we have observed, not only does the universe have the same basic chemistry and the same laws of nature throughout, but also successful adaptations are repeated several times. It is reasonable to expect the same as we widen our fields of observation. The spontaneous emergence of life on the edge of nonlinear chaos and linear order implies that the abundant emergence of life in the universe is even more probable.

SETI is thus not a search in the void or in vain. ❖

### **Tutorial:**

## **What Is the Water-Hole?**

**By H. Paul Shuch, Ph.D. ('Dr. SETI' ®)**

The electromagnetic spectrum, as viewed from Earth, is a noisy place. Low frequencies are plagued by galactic noise, primarily due to synchrotron radiation (charged particles spiraling through our Sun's and our planet's magnetic fields). High frequencies are subject to quantum-effect emissions, and the whole continuum experiences a 3 Kelvin background radiation

level from the residual radiation of the Big Bang. These natural radiation sources limit our ability to detect artificial emissions. In addition, the Earth's own ocean of air generates spectral absorption and emission lines which draw a further curtain across our sky.

Fortunately, there are a few relatively clear windows on the cosmos. Our eyes evolved to operate in one such window, the optical spectrum. It is this window which first allowed us to observe the stars and planets. Another clear spot is in the microwave region, between about 1 and 10 GHz.

Within this so-called Microwave Window, photons (the substance of electromagnetic communication) travel relatively unimpeded through the interstellar medium, at the speed of light. This is, as far as we know, the fastest possible speed, making photons the fastest spaceships known to man. Thus, the Microwave Window, where natural noise is at a minimum, is a favored region for conducting radio astronomy research, including SETI.

Toward the bottom of the microwave window, radiation from the precession of interstellar hydrogen is clearly heard in our receivers at a frequency of 1420.40575 MHz (corresponding to a wavelength around 21 cm). The Hydrogen Line, first detected by Ewen and Purcell at Harvard University in 1951, provided us with our first direct evidence that space is anything but an empty void -- it is a veritable chemistry set. We hypothesize that any civilization in the cosmos which possesses radio astronomy knows about the Hydrogen Line. Since there is roughly one hydrogen atom per cubic centimeter of space, the combined voices of countless hydrogen atoms produce a raucous chorus. The very first SETI studies were conducted near the Hydrogen Line, and today it still looks like a logical place to seek deliberate beacons from beyond.

Just a little way up the spectrum, near 1660 MHz (a wavelength of 18 cm), a team of scientists at MIT Lincoln Labs detected in the 1960s a cluster of radiation lines from interstellar hydroxyl ions (OH). Like the Hydrogen Line, the Hydroxyl Lines occur near the very quietest part of the radio spectrum. They too should be known to other civilizations which have studied the cosmos at radio frequencies.

The chemist looks at H and OH and recognizes them as the disassociation products of water, the solvent essential to the very existence of life as we know it. During the landmark G-clops study of 1971, Dr. Bernard M. Oliver, then vice president of engineering for Hewlett-Packard Company (and later the chief of the NASA SETI program) hypothesized that the Hydrogen and Hydroxyl lines constituted obvious signposts to a natural interstellar communications band, one which would likely occur to other water-based lifeforms who had some knowledge of the radio sky. Since the H and OH lines are visible from anywhere in the cosmos, in the quietest part of the spectrum, they are markers which are by no means geocentric.

It was Barney Oliver who dubbed the spectral region between H and OH the Cosmic Water-Hole. "Where shall we meet our neighbors?" he asked. "At the Water-Hole, where species have always gathered."

Although other regions of the spectrum hold much promise, The SETI League and other organizations concentrate a part of their resources on the Water-Hole, in hopes that there we might detect signs of other life. ❖

*Guest Editorial*

## Are We Ready for Contact?

by Prof. Peter Schenkel (schenkel@ecnet.ec)  
SETI League Regional Coordinator for Ecuador

This is a question few SETI enthusiasts are asking. And yet, it is justified. Thousands and maybe millions of people point their telescopes, or just their eyes, every night to the stars, hoping to receive a signal or some indication that we are not alone in this vast universe. They share my belief that out there, somewhere, intelligent beings have evolved as we have, against all odds, and that many are probably our peers scientifically and organizationally. That is the tantalizing crux.

Once we establish Contact, how will they view our civilization, beset by so much violence and crisis? What will they say about our chronic incapacity to rid our world of the many isms, which divide instead of unite and which make irrationality and hate triumph over reason? Would they consider us capable and worthy of a mutually beneficial relationship?

I wonder, and sometimes ask myself whether it isn't just as well that Contact has eluded us so far. Maybe their reaction to our political and psychological primitivity would be a terrible shock to us. Maybe it would be much better if Contact occurred when our civilization is ripe for it, when we can be proud of all of man's accomplishments, his ethical behavior and peaceful order.

Of course, we may hope that superior extraterrestrials, upon learning our predicaments, might want to extend their help to us. Their scientific and technical wizardry could become the cure to many of our pressing ills. Their wisdom and political experience might help open the eyes of our political elite. But will our statesmen, mediocre as most are and embroiled in political, economic, ethnic and religious quarrels and rivalries, be able to agree to a common and meaningful response, a common friendly welcome and a mutually beneficial relationship? Will they have the humility to listen to and learn from them, to accept their opinions and advice?

So far, the national and international establishments have been more than lukewarm, at times -- as in the US -- even hostile to SETI. The declaration of principles of the IAA [the International Academy of Astronautics -- ed.], presented to COPUOS [the UN's Committee for the Peaceful Uses of Outer Space -- ed.] in June 2000 with the aim of getting states to agree to a binding post-Contact code of conduct, was filed away and languishes in its archive, where it is likely to rot.

Maybe the time has arrived to enlist a much broader support for SETI from the humanities, religious organizations, the arts, and thinkers of all creeds, to make sure that SETI gets adequately broad international attention and backing representative of mankind, and that mandatory and safe Contact and Communications procedures are agreed upon prior to, not after, Contact is achieved.

If we fail to address this endeavor, I am afraid the scenario I envisioned in my science-fiction novel *Contact: Are We Ready For It*, might come true. A visiting spaceship with aliens that have declared their peaceful intentions stays patiently behind the Moon, waiting for an invitation to land on Earth. But in seven days mankind, gripped by all kinds of taboos and ri-

valries, is unable to agree to a common and rational response. So, the frustrated aliens depart. Humanity goofs the historic chance to meet its brothers from space.

This might also happen with Contact via radio or optical astronomy, if we keep our arms crossed. Let's join ranks and open our vision to the task ahead before it is too late! ❖

## Cyclops Errata Updated

In the summer of 1971, a team of top engineers and radio astronomers designed Project Cylops, the greatest radio telescope never built. More than 30 years later, readers are still discovering minor errors and omissions in their NASA report, which The SETI League republished in 1996. Now member Dr. Larry Lesyna, who prepared the Errata sheet for Project Cylops, Second Edition, has graciously volunteered to continue coordinating the compilation of corrections to this landmark manuscript. A new Cyclops Errata page is available online at <<http://www.setileague.org/articles/cycerrat.htm>>. You may receive a printed copy by sending a stamped, self-addressed #10 (business-sized) envelope, or an addressed envelope with two International Reply Coupons, to SETI League headquarters. Members are encouraged to email any additional corrections to Larry at <[cyclops\\_errata@setileague.org](mailto:cyclops_errata@setileague.org)>. ❖

## Big Dish, Test Equipment Offered for Sale

Over the past several years, SETI League Hawaii regional coordinator Dr. Rachel Tortolini has accumulated an extensive laboratory of microwave test equipment, plus a most impressive 30-foot dish. Because of a recent job change and a move to a different island, she now finds it necessary to part with her entire SETI station. Rachel prefers that this gear find a good home with another SETI League member, and especially hopes that her antenna (which is disassembled and can be shipped by standard container) will eventually be back on the air.

Much of this equipment can be seen online, at this URL: <<http://www.setileague.org/photos/bioastr99.htm#rachel>>. If you are a member interested in receiving a full listing of Rachel's equipment, drop her an email at <[rachel@ilhawaii.net](mailto:rachel@ilhawaii.net)>, or write to her at her address as listed in your latest SETI League membership roster. ❖



## Tech Symposium Plans Take Shape

The great success of last year's SETICon01 Technical Symposium has encouraged us to expand the event to three days: April 26 - 28, 2002. Once again we will be hosted by The College of New Jersey in Trenton, NJ, for a keynote speaker, technical presentations, social events, an awards banquet, The SETI League Annual Meeting, and our annual Board of Trustees Meeting (which all members in good standing are welcome to attend). Details may be found on our website (from the main page, click on the SETICon02 banner, seen above), and registration forms will be mailed to all past and current SETI League members in late January. The pre-registration deadline is 31 March 2002. See you in April! ❖

# Array2k

## Project Update

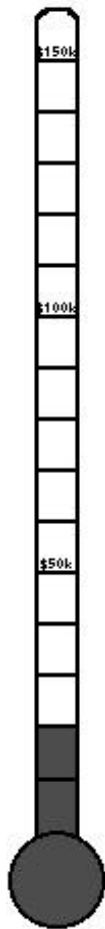
For the past two years, the SETI community has marveled at the development of the ambitious Paul Allen Telescope, a mini-Cyclops consisting of up to a thousand phased satellite TV-type dishes. While saluting the efforts of our California colleagues, The SETI League, Inc., pioneers in the use of backyard satellite TV dishes for SETI research, has been hard at work on its own phased array design, more modest in scope but quite as technologically audacious.

Our plans call for a new kind of radio telescope, dubbed *Array2k*, which will combine 16 or more standard satellite TV antennas into a single powerful radio telescope, at a fraction of the cost of a single giant dish such as those at Green Bank and Jodrell Bank. When completed, *Array2k* will employ a unique mix of analog and digital techniques to operate in five distinct modes simultaneously. Optimized as a drift-scan sky survey instrument in the proud tradition of Ohio State's *Big Ear*, it will serve as its own Follow-Up Detection Device, verifying its own findings in real time.

*Array2k* will be used to support the individual efforts of The SETI League's 1,280+ members worldwide as a follow-up detection device to help confirm their observations. It will also be used for direct astronomical research, and serve as a test-bed for SETI League engineers to develop the technologies which will someday allow them to unite thousands of members' small, backyard telescopes into a huge, planetary array.

The SETI League's patent-pending design builds upon the pioneering work of Prof. Ron Bracewell and Govind Swarup at Stanford University some forty years ago. To date, we have received donations of a site (in northern New Jersey) and 47 six-foot dishes and mounts (which, while smaller than our original design calls for, will be invaluable for proof-of-concept).

To get *Array2k* up and running, we need to raise \$160,000 US for hardware alone, plus an as-yet undetermined amount for operation, salaries, maintenance and infrastructure. Although this is a minute fraction of what has been spent in the past on research-grade radio telescopes, it is still a nontrivial sum, and the support of SETI enthusiasts everywhere is encouraged. One generous donor has already pledged to match contributions totaling up to \$50,000 US. Watch our website or future issues of *SearchLites* for progress reports on both the fund-raising and the engineering aspects of *Array2k*.



## SETI League Wins Two Technology Achievement Awards

**Williamsport, PA.,** 19 October 2001 – The SETI League, Inc. today received two Technology Achievement Awards from the Central PA Chambers of Commerce, for its two current engineering projects. The nonprofit organization's *Lunar Reflective Calibration Beacon for Radio Astronomy* was awarded Second Place in the category "Best Application of Technology," and *Array2k: Phasing Multiple Antennas for a Next-Generation Radio Telescope* received Second Place for "New Technology Project," at today's Technology Awards Showcase luncheon in Williamsport. The two awards were accepted on behalf of The SETI League by its Executive Director, Dr. H. Paul Shuch. The former Pennsylvania College of Technology engineering professor heads up both projects.

The SETI League Moonbounce Beacon reflects microwave signals off the surface of the Moon. The resulting radio echoes are received by amateur radio operators (radio "hams") on Earth, and are used for testing Earth-based radio telescopes. Funded in part by a NASA Small Equipment Grant administered by the American Astronomical Society, 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.

The *Array2k* design, which combines sixteen or more standard satellite TV antennas into a single, powerful radio telescope, represents the next generation of astrophysical research tools. A prototype of the design is currently under construction on a residential hilltop in Cogan Station, PA.

"Central Pennsylvania is an ideal setting for radio astronomy," notes Shuch. "Our region is blessed with a low cost of living, good infrastructure, a sizeable pool of skilled workers, and one of the country's lowest levels of radio pollution. I moved here from Silicon Valley eleven years ago, so I could turn this place into the Valley of the Dishes," he quips.

It was in Northern California that Shuch developed the world's first commercial home satellite TV receiver in 1978. Eighteen years later, under Shuch's leadership, The SETI League, Inc. pioneered the use of backyard satellite TV dishes for radio astronomy, with the launch of its *Project Argus* all-sky survey. His design concepts have been embraced by other scientific organizations, including the prestigious SETI Institute in California.



**At Right: First *Array2k* feedhorn assembly undergoing testing at SETI League headquarters in New Jersey**

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