SearchLites

Vol. 14 No. 1, Winter 2008

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

SearchLites, ISSN 1096-5599, is the Quarterly Newsletter of **The SETI League, Inc.**, a membership-supported, non-profit [501(c)(3)], educational and scientific corporation, dedicated to the electromagnetic Search for Extra-Terrestrial Intelligence. SETI League, Dr. SETI, and the above logo are all registered service marks of The SETI League, Inc.

Reflections on the 50th Anniversary of Sputnik

by Louis Friedman, Executive Director, The Planetary Society

The legacy of Sputnik lies above all in its social and cultural impact. Sure, it began the space age, was a technological triumph, and launched the entire new field of space science - but that was already foreseen in the early and mid-1950's. And, sure, it demonstrated that the Soviet Union was a powerful nation, but nuclear weapons and intercontinental ballistic missiles had done that already. It was Sputnik's sudden and startling impact on the American psyche and on global politics that came as a complete surprise and created its true legacy.

Sputnik and the space missions that followed it are striking anomalies in the political landscape. They have little economic returns (at least on any practical time scale), no military value, and are a minor part of national budgets and political discussion. And yet, the accomplishments of space missions are major world events, whose impact often dwarfs the other political events of the time. This was certainly the case with Sputnik, just as it was with the Apollo missions a decade later.

The cultural and political impact of space missions has been demonstrated many times since Sputnik: Yuri Gagarin's first human flight, the first spacecraft to the Moon, the first spacecraft to the planets, man walking on the Moon, the Viking landing on Mars, Voyager's journey to the end of the Solar system, the missions to Halley's comet, the Hubble Space Telescope, Mir, and the International Space Station. All of these resonated around the world, captured the imagination of millions of people, and raised the international prestige of the countries who launched them.

Sputnik and the missions that followed were, of course, the product of 'cold war' rivalry and nationalistic ambitions. Remarkably, however, they transcended these roots to stand as symbols of human greatness, bringing out the best in us and offering hope for the future. The legacy of Sputnik is not Soviet might; it is a new era of human evolution beyond Earth. The legacy of Apollo is not its rockets; it is 'we came in peace for all mankind'.

In the US, Sputnik launched an education revolution, from which I personally benefited. President Eisenhower, while publicly downplaying the significance of Sputnik, initiated the National Defense Education Act to close the presumed dangerous education gap between American students and their Russian counterparts. This piece of legislation paid for much of my university education. In 1957 I enrolled at the University of Wisconsin, and a month later Sputnik was launched. The University immediately created its first space science course, taught by Werner Suomi. It may have been the first such course anywhere, and I was hooked. Space was the new frontier.

The link between space achievements and education continues to this day. It is an integral part of both the politics of space exploration and the scientific content of the missions themselves. Today, India and China are following in the footsteps of the Soviet Union and the United States by joining the ranks of spacefaring nations engaging in a new Moon race. The only reason they are doing this is that space exploration is a source of inspiration, a stimulus for education, and a spur for economic and technological growth.

The most amazing aspect of Sputnik is that it launched a great battle of the long and frightening 'cold war' - and that that battle was a peaceful one. The space race was a rivalry that gave the nations involved confidence, and provided inspiration for their young people to pursue excellence and high achievement. The 'cold war' has since come to an end, and the world is now a very different place. And yet - the vision of the space age that humankind can use its technology for peace and a better future remains. It reminds us that we can go to Mars, we can stop the environmental destruction, and we can use technology to improve life, not to destroy it. Confidence and inspiration are the legacies of Sputnik.

❖

Event Horizon

SearchLites' readers are apprised of the following conferences and meetings at which SETI-related information will be presented. League members are invited to check our World Wide Web site (www.setileague.org) under *Event Horizon*, or email to us at info@setileague.org, to obtain further details. Members are also encouraged to send in information about upcoming events of which we may be unaware.

April 4 - 8, 2008: I-Con 27, Stony Brook University, NY.
April 15 - 17, 2008: *Astrobiology Science Conference*, Santa Clara CA.
April 19, 2008, 0000 UTC - 2359 UTC: Eighth annual SETI League *Ham Radio QSO Party*, 14.204, 21.306, and 28.408 MHz.
April 20, 2008, 1:00 PM Eastern Daylight Time: Fourteenth SETI League *Annual Membership Meeting*, Little Ferry NJ.
April 20, 2008, 2:00 PM Eastern Daylight Time: SETI League Annual *Board of Trustees Meeting*, Little Ferry NJ.
April 25 - 26, 2008: *Southeastern VHF Conference*, Orlando FL.
April 25 - 26, 2008: *Trenton Computer Festival*, The College of New Jersey, Trenton NJ.
May 16 - 18, 2008: *Hamvention 2008*, Dayton OH.
May 23 - 26, 2008: *Balticon 42*, Baltimore MD.
May 30 - June 1, 2008: *Rochester Hamfest*, Rochester NY.
June 29 – July 2, 2008: *Society of Amateur Radio Astronomers* Conference, NRAO Green Bank WV.
July 24 - 26, 2008: *Central States VHF Conference*, Wichita KS.
August 8 - 10, 2008: *EME 2008*, Florence Italy.
September 24 - 26, 2008 (proposed): *SETI 08 Conference*, Paris, France, under the sponsorship of the International Academy of Astronautics SETI Permanent Study Group.
September 29 - October 3, 2008: *59th International Astronautical Congress*, Glasgow, Scotland.
October 2008 (proposed - dates TBA): *AMSAT Space Symposium*, Orlando, FL.
April 18, 2009, 0000 UTC - 2359 UTC: Tenth annual SETI League *Ham Radio QSO Party*, 14.204, 21.306, and 28.408 MHz.
May 15 - 17, 2009: *Hamvention 2009*, Dayton OH.
May 29 - 31, 2009: *Rochester Hamfest*, Rochester NY.
June 2009 (dates TBA): *Society of Amateur Radio Astronomers* Conference, NRAO Green Bank WV.
July 23 - 25, 2009: *Central States VHF Conference*, St. Charles IL.
October 12 – 16, 2009: *60th International Astronautical Congress*, Daejon, Korea.
October 2009 (proposed - dates TBA): *AMSAT Space Symposium*, Atlanta, GA.
April 17, 2010, 0000 UTC - 2359 UTC: Eleventh annual SETI League *Ham Radio QSO Party*, 14.204, 21.306, and 28.408 MHz.
June 4 - 6, 2010: *Rochester Hamfest*, Rochester NY.
June 2010 (dates TBA): *Society of Amateur Radio Astronomers* Conference, NRAO Green Bank WV. ❖

Guest Editorial

Why Smaller is Better

by Prof. Robert A. Lodder, University of Kentucky

Editor's Note: *The online magazine Spiked recently conducted a major survey of thinkers, practitioners, educators and communicators in the fields of science, technology, medicine and beyond. The question posed in the survey was: "What is the greatest innovation in your field?" The following essay is Rob Lodder's response to that survey.*

The greatest innovation in my field is miniaturisation. It is a force that pervades science and engineering, resulting in many things being accomplished

- faster (the speed of light is constant, but allowing light to traverse a smaller distance speeds whatever process the light is accomplishing),
- cheaper (less material used), and
- better (the solution can be sized to fit the problem).

Miniaturisation is the ongoing movement in technology toward progressively smaller scales for first mechanical, then optical, electronic, and recently full circle back to mechanical devices.

Miniaturisation can be traced back hundreds of years as a theoretical science and a physical practice, commencing with atomic theories of matter and the use of the first microscopes, and leading to the contemporary sciences of nanotechnology and molecular nanotechnology. In electronics, miniaturisation leads to Moore's Law, which predicts that the number of transistors on an integrated circuit for minimum component cost doubles every 24 months. Moore's Law is responsible for the continuing information technology revolution.

Miniaturisation is making possible great strides in the Triple-A problems in science. During a career a scientist will typically work on all kinds of different problems. Some will have a broad impact and some will not. There are three general problems that promise to have such an impact on science as a whole that we call them the AAA problems.

1. Artificial Intelligence
2. Aging
3. Astrobiology

Briefly, Artificial Intelligence (AI) is important because we hope to some day soon build machines with human and superhuman intelligence. Once this happens, all problems that can be solved by intelligence will be solved, because we can build more and more machines that will work day and night on the problems until the answers are obtained.

Aging is an important problem to solve because eradication of aging and disease will allow humans to live forever. Once humans live forever, they will continue to learn more and more until all problems that can be solved by intelligence are solved. However, once humans live forever we will need more space to reproduce, and human life will have to expand beyond planet Earth.

Astrobiology is the study of life in the universe. The tools of astrobiology will eventually be used by the human species to understand and explore the universe, and to expand our existence beyond first our planet and then our solar system.

It has been said that technology, when sufficiently advanced, is indistinguishable from magic. When such technology advances even further through nanotechnology, it becomes indistinguishable from nature.

Disclaimer: *The opinions expressed in editorials are those of the individual authors, and do not necessarily reflect the position of The SETI League, Inc., its Trustees, officers, Advisory Board, members, donors, or commercial sponsors.* ❖

Featured Song:

Oh, Be A Fine Girl, Kiss Me

a musical mnemonic to help students remember
the Harvard stellar classification system
lyrics and melody © 2007 by Dr. H. Paul Shuch

The stars in the sky when you look up at night
Appear at first glance to be pinpoints of light.
But study them closely. They're not all alike.
Oh, be a fine girl, kiss me.

The hot stars are blue and the cool ones are red.
Yes, color tells temperature; that's what I said.
Some stars are still living, and some are long dead.
Oh, be a fine girl, kiss me.

The hottest blue stars we consider Type O.
The cool ones are M Class. Confusing, I know.
The system was standardized quite long ago.
Oh, be a fine girl, kiss me.

Look up in the daytime, and what do you see?
Our warm yellow Sun, which we know is Class G.
A star like the others, but special to me...
Oh, be a fine girl, kiss me.

As Hurtzprung and Russell said time after time,
The main sequence stars queue up in a straight line.
Their blackbody curves tell you every star's kind.
Oh, be a fine girl, kiss me.

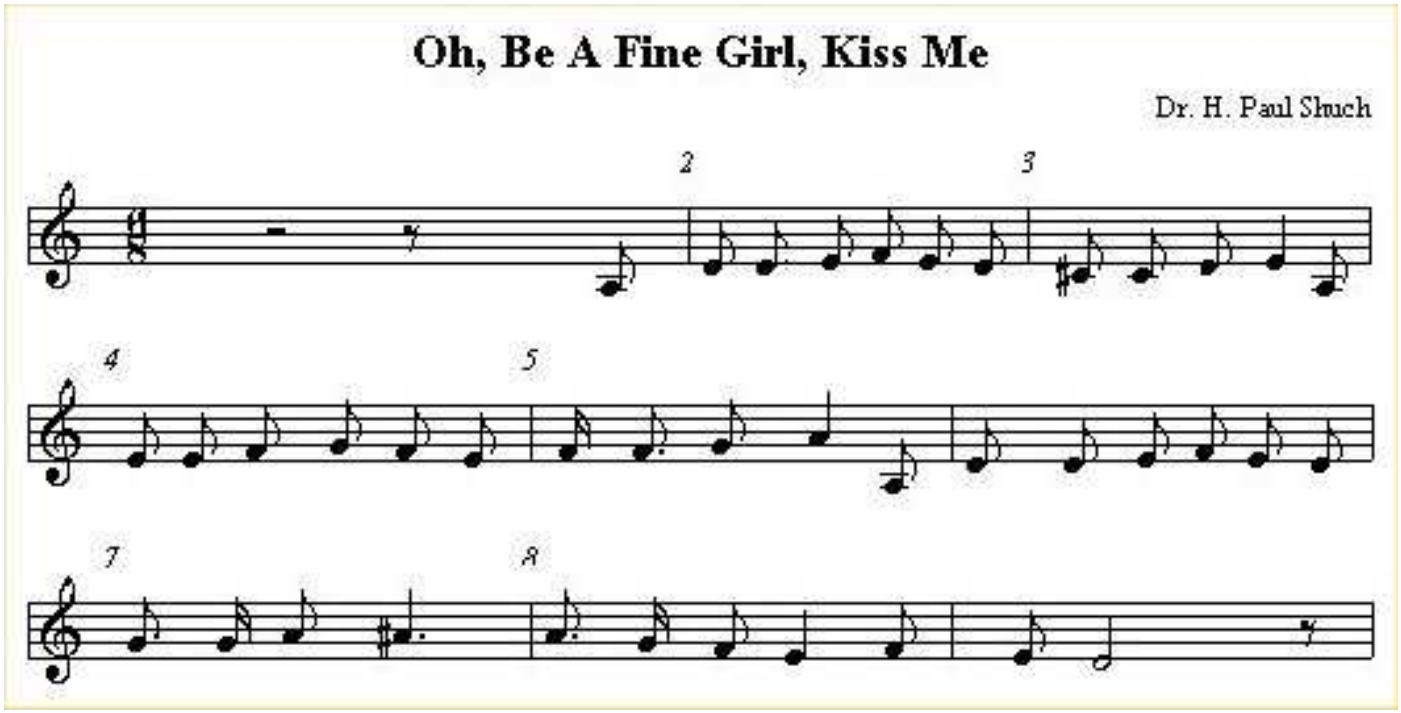
The stars clump together, not by twos or threes,
But hundreds of billions, to form galaxies,
And there are a good hundred billion of these.
Oh, be a fine girl, kiss me.

Today's population of stars we call I.
A nearby example would be our own Sun.
They're quite rich in metals, and tend to be young.
Oh, be a fine girl, kiss me.

The first population of stars we call II.
Just fusion reactors, and what did they do?
Produce heavy elements, planets, and you.
Oh, be a fine girl, kiss me.

In five billion years, our Sun's life will draw short;
We can't say exactly its ultimate course.
Expand to red giant, or shrink to white dwarf?
Oh, be a fine girl, kiss me.

I've studied the stars of each possible kind.
I'm happy to watch them for quite a long time.
And don't you just love how they twinkle and shine?
Oh, be a fine girl, kiss me.



Ask Dr. SETI

Bayesian Statistics

Dear Dr. SETI:

What are Bayesian statistics, and how can they be applied to SETI?

An amateur radio astronomer

The Doctor Responds:

Bayes' Theorem is an elegant tool, used extensively by psychologists, for analyzing conditional probabilities (by which we mean, occurrences which depend in some way upon one another). The relationship need not be causal, just correlated.

Let's say we have two events, A and B, which can occur individually, or in combination. Assume we know, or can compute, the probability that A will occur, given that B has. We indicate this conditional probability as P(A|B), pronounced "the probability of A, given B." We can use Bayes' Theorem to turn the problem around, and compute the converse, P(B|A), the probability of B, given A.

Trivial example: some people have blonde hair. Some have blue eyes. If we know the probability that a blue-eyed person will also be blonde, we can invoke Bayes' Theorem to compute the probability that a blonde will also be blue-eyed. So, set, theory is involved. The population of all people who are either blonde or blue-eyed is the union of two sets (the set of blondes, and the set of blue-eyed folks). The population of all people who are *both* blonde and blue-eyed is the (somewhat smaller) intersection of the two constituent sets.

Of course, we probably (oops-- wrong word to use here!) can't assemble all the blue-eyed people in the world, nor lay all the world's blondes end-to-end (though some might like to try). So, instead of dealing in populations, we often deal in samples: small, measurable subgroups which we hope are representative of the populations in question. The degree to which a sample truly reflects the characteristics of the underlying population is a science unto itself, called sampling theory, and involves such factors as the population size, the sample size, replacement, and how well we shook up the box when drawing the sample.

What has all this to do with radio astronomy? Consider two possibly interrelated sets, one which represents natural astrophysical phenomena, and the other which represents a particular class of received signals. One research question might be: "to what probability (and to what degree of certainty) is a specific received signal representative of a particular astrophysical phenomenon?" Bayesian statistics can help us to answer that question.

Assuming our sample (what we've observed) is truly representative of our population (what's actually out there), we can set up the problem in terms of conditional probabilities. Say we can compute the probability (on a scale of 0 to 1) that a given astronomical event is associated with a particular microwave signature. If so, we can invoke Bayes' Theorem to compute the probability that a given received signal is associated with that kind of astronomical event. Blonde hair, blue eyes.

(Note that I say "associated with" here, and not "caused by." Establishing causal relationships is another matter altogether, requiring far more research.)

This approach works well with things like pulsars, and pulse trains. We observe that a certain class of rapidly rotating neutron star produces radio pulses. If we can compute the probability that a given class of pulsar will produce a particular pulse train, then if we receive that kind of pulse train, Bayes' Theorem lets us compute the probability that it came from that kind of pulsar. (Note that we are allowing here for the possibility that some *other* kind of event, like RFI, could *also* produce those very kinds of pulses).

What Bayes' Theorem does *not* work particularly well for is fields of study in which at least one conditional probability is not known. A good example of this kind of problem science is SETI. If we receive a candidate SETI signal, we want to know the probability that it was produced by intelligent aliens. So, we invoke Bayes' Theorem, which derives this estimate from the probability that intelligent aliens generate these kinds of signals. But, since we have yet to detect a single clear, unambiguous alien RF artifact, we don't yet know the second conditional probability, so how are we going to use it to compute the first?

SETI: Science, or Religion?

Dear Dr. SETI:

SETI has been said by some (George Basalla, for example) to be unscientific. The simple version of this claim suggests that 40-some years of data having produced no hits, the maintenance of a belief in future hits is irrational. A slightly more complex version of the claim would suggest that SETI proponents tacitly hold a belief (in the existence of intelligent life elsewhere) which is immune to disconfirmation. Is that a valid accusation? At what point would it be rational to stop SETI, if ever? In a more positive way, SETI seems to share some of the emotional content of philosophies and religious systems, such as the idea that humanity may find companionship in the cosmos or that we will be found to "have a place" among a larger cosmic scheme. Are you comfortable with such shared resonances or not?

William (via email)

The Doctor Responds:

One does not gauge scientific credibility by short-term success in validating a particular hypothesis -- after

all, it took more than half a century to produce compelling evidence to support some of Einstein's theories. What marks a field of study as scientific (or not) is the testability (or, more properly, falsifiability) of its underlying hypotheses, and the level of rigor brought to the related experimental design. When we demand the highest possible standard of proof before accepting proffered evidence, we are applying the scientific method -- hence, are practicing science. This is, I believe, what differentiates SETI science from UFO pseudoscience.

The accusation that SETI is based upon a non-falsifiable hypothesis is valid only if one believes that the objective of SETI research is to prove the existence of extraterrestrial intelligence. Any experiment which adopts that goal is poorly designed, because it becomes open-ended. Better to establish a null hypothesis, which it takes only *one* counter-example to disprove. For example: I would hypothesize that there are no extraterrestrial civilizations that emit artificial electromagnetic radiation which can be detected on Earth, at our current level of technology. Presently (and for more than 40 years), our research supports this hypothesis. But a single confirmed detection would falsify the null hypothesis, thus lending credence to an alternative hypothesis (that we are not alone).

Because we are in our technological infancy, with the power of both our instrumentation and analysis techniques increasing exponentially with time, I would be hard-pressed to advocate termination of any experiment on the basis of null results alone. One can argue that would be equivalent to abandoning space exploration prior to 4 October 1957, on the basis of humanity's inability to achieve orbital velocity.

When Icarus fell into the sea, did humans give up their dream of flight? It took centuries for us to develop the technologies necessary to conquer the sky. SETI science today is probably still trying to soar on wax-and-feather wings. It may be centuries before our technology advances to the level of likely success. Or maybe next year -- we can't know. But, as Phil Morrison said in his seminal SETI article in 1959, if we don't try, the chances of success are zero.

Other, more poetic analogies have been suggested -- at The SETI Institute, Seth Shostak equates abandoning SETI research to Queen Isabella ordering Columbus to turn back, just three weeks out of port, on the grounds that he had not yet reached India. Which brings up an even more compelling reason for continuing SETI research: the prospect of positive, though altogether unintended, consequences. After all, Columbus never reached India, so his expeditions must be judged a failure!

Similarly, SETI research may never detect extraterrestrial intelligence. However, along the way to failure, these observations have already significantly expanded our knowledge of the Universe. From detection of supernova remnants to the discovery of countless organic molecules in space, SETI radio telescopes are constantly generating new knowledge. The technology we develop for the SETI endeavor has been applied with great success in the telecommunications and biomedical research arenas. Long-duration cosmic observations hold great potential for further serendipitous discoveries, even if we never reach India.

There is one good time to abandon the SETI enterprise -- when it is no longer producing unexpected results. If we understand everything we detect, and are not seeing anything that we cannot explain -- in short, if we are stagnating -- then the search no longer serves a useful purpose. That's not the case now. There's lots we don't understand, and can't begin to explain. This is a good place to be, if our intention is to learn more.

I have heard SETI called a religion. Although I don't see it as such, there are certainly parallels, with which I for one am entirely comfortable. Many people of religious faith see SETI science as compatible with their beliefs -- for example, Father Theodore Hesburgh (president emeritus of Notre Dame Univ.) has long said that a search for extraterrestrial intelligence is an attempt better to understand God and His creations.

What Should We Say to Aliens?

Dear Dr. SETI:

I have this project to do for school. I have to design a SETI poster that can be sent into space. I'm really stuck on a design. I was wondering if you could please give me some ideas about what to include in a SETI message. I'm thinking to include the solar system and a picture of a male and a female. I desperately need some ideas. Please help!!

Jennifer

The Doctor Responds:

Jennifer, because I was long a teacher, I make it a policy never to do a student's homework for her. There is an extensive literature on interstellar message construction, which you can access through even a cursory web search. If you know how to Google, you can find what's out there. Nevertheless, perhaps I can suggest a strategy whereby you can answer your own question, and focus your efforts.

The best way to design an interstellar message is to turn the question around. What would *you* most like to receive in a message *from* extraterrestrials? Answer that question, and you can imagine what they might wish to learn about us. Then, it's simply a matter of deciding how best to convey that information.

Good luck with your school project. I hope your teacher (and the extraterrestrials!) enjoy your message.

❖

Book Review:

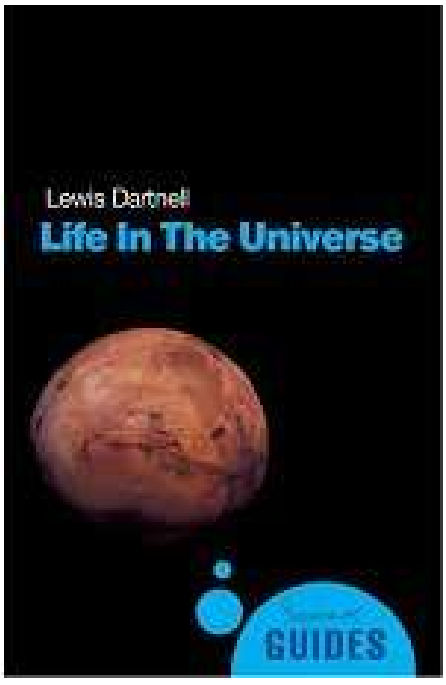
Life in the Universe - a beginner's guide
By Lewis Dartnell

ISBN 987-1-85168-505-9, paperback, $14.95 US

Life in the Universe is an easy-reading introduction to the field of astrobiology, the emerging interdisciplinary science concerned with the search for life beyond Earth. It starts from the very basics of what 'life' actually is before leading on to what might be special about our place in the cosmos and finishing with a discussion on what an alien visitor might actually look like. Dartnell wrote the book from the outset to serve as both an engaging account of recent advances in this exciting field for the non-specialist reader, as well as an entry-level primer for under- and post-graduate students on all the new courses in astrobiology now appearing around the world.

Astrobiology incorporates many disparate fields of research, and the author has treated them all as evenly as possible (whereas most previous books on the topic have had a distinct bias towards the 'home' discipline of the academic author). The book is well illustrated with carefully-chosen photographs and images, and for students there is also an extensive reading list and glossary. Lewis Dartnell is actively engaged in astrobiological research at University College London, and has received awards for both his academic research and his popular science writing. *Life in the Universe* has already been very warmly received by the academic community in astrobiology as well as the diverse audience for which it was written.

The author says, "I've been delighted to see it on the High Street bookshop shelves next to Darwin and Dawkins (a happy coincidence of my surname...) in both the UK and US." *Life in the Universe* should be on every SETIzen's bookshelf as well, filed next to Darwin and Dawkins.



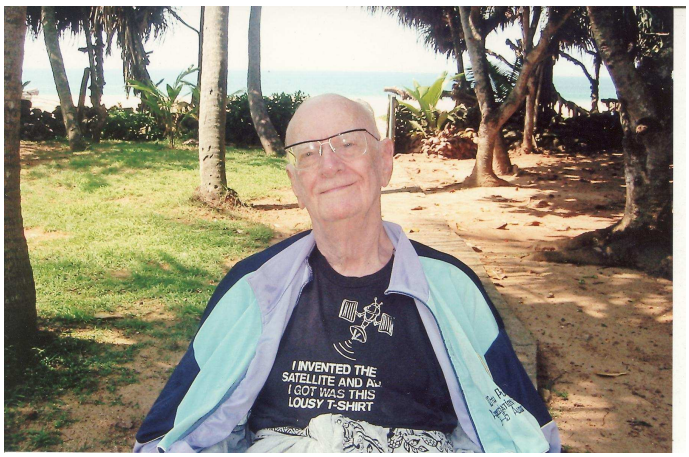
Flag of Earth to Fly Again

Delaware, OH.., October 2007 -- Since its introduction in 1970, the Flag of Earth, which flies at SETI League headquarters, has graced SETI locations around the world. It symbolizes the fact that SETI is carried out on behalf of humankind as a whole. The individual people, organizations, and nations involved are immaterial, since any signal received will belong to all of humanity, and represent Earth's entry into the Galactic community. This lovely symbol can be seen online, and is explained at www.setileague.org/general/whatflag.htm. The yellow part of the flag is the sun, the blue circle symbolizes the Earth, and the small white circle represents the Moon. Sadly, when James Cadle, creator of the Flag of Earth, passed away in 2004, his family elected not to continue manufacturing, distributing, and promoting the Flag. They have been unavailable since then. The Flag of Earth design had been placed in the public domain by James before he passed away. The web site flagofearth.com has for some time been dormant.

Now, a group of SETI researchers in Ohio has taken up the cause, and the Flag of Earth is once again available. The North American Astrophysical Observatory (NAAPO) has received the enthusiastic blessing and cooperation of the Cadle family to continue Jim's work. They have obtained the web sites flagofearth.com and .net, and will very soon also have .org. Eventually .org will become the official Flag of Earth website. The larger cloth Flags are now available on a non-profit basis, and smaller flags are also available free for download that you can print yourself on paper. Ordering information about the Flag of Earth may be found at www.flagofearth.net. ❖

Happy Birthday, Sir Arthur!

The SETI League, Inc. is pleased to celebrate the 90th birthday (on 16 December, 2007) of Sir Arthur C. Clarke, who generously serves on our Advisory Board. A noted author and pioneering communications engineer, Sir Arthur is the father of satellite communications. In this recent photo from his home in Sri Lanka, he is wearing a shirt proudly displaying the message, "I invented the satellite and all I got was this lousy t-shirt."



Hardware Corner:

Disabling AGC in the Icom PRC-1000

By Greger Gimseus, Argus station JO89sn, Sweden

I decided to do something about the AGC in the Icom PCR-1000 unit. The agc is always activated, the only selection being fast or slow agc - no way to disable it. I'm not going to debate the benefits of disabling the agc, that's another story.

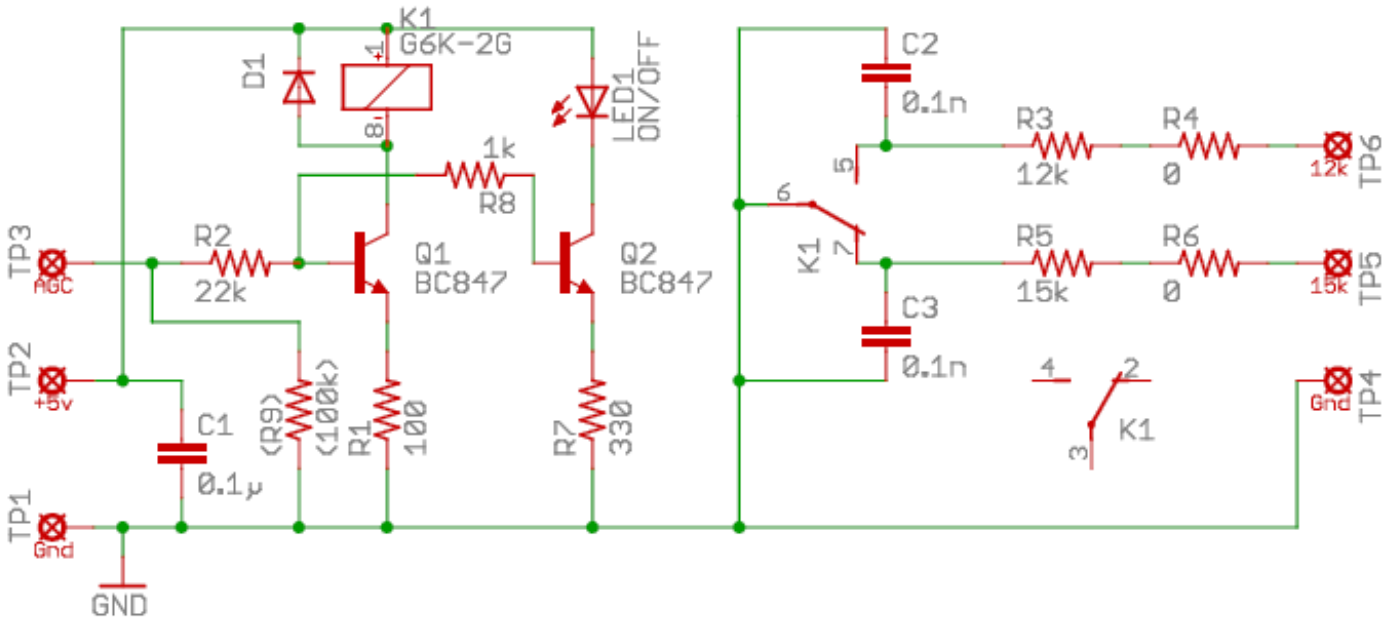
After some schematic studying and testing I found there are no way to easily disable it, won't work by cutting any tracks or injecting 2.5v as in the R8500 unit. I decided to go for another approach in which I shift the agc op voltage reference, this is done by replacing a resistor in the voltage divider prior to the op, this way the signal is just dc voltage and makes it able to switch using a relay and wires.

However I didn't want to permanently change the agc as I use the radio for other stuff as well, so I made a little cockroach to make this option available by software. This photo shows the mod (now the board is fixed and wires are trimmed). Click on the thumbnail for a high resolution image.

I just activate the AGC button (which normally switch to fast agc) to activate it, so it will work with any standard control software. A schematic can be found in this article. The led part is optional; it was only for testing purposes.

Any questions/ideas can be forwarded to me at greger_at_rfelektronik_dot_se.

I also replaced some capacitors in the voltage regulator circuit, the linear regulators get very very hot, as do the caps next to them, so I changed them before they dry up and also added some extra to reduce ripple created by cheap switching adaptors. You can see the pcb discoloring due to the heat, they really should have heatsinked the regulators.



The SETI League, Inc.
433 Liberty Street
PO Box 555
Little Ferry NJ
07643 USA

Non-Profit Org.
U.S. Postage
PAID
Williamsport, PA
Permit No. 38

ADDRESS SERIVCE REQUESTED

To:

Has your address changed?
Please correct your label and return it to us.

***SearchLites* Volume 14 No. 1, Winter 2008**
Printed in the USA

Annual Renewal: Is This Your Last *SearchLites?*

SETI League memberships are issued for the *Calendar Year*. Please check the expiration date indicated on your mailing label. If it reads December 2007 or earlier, you have already expired, and *must* renew your SETI League membership **now!** Please fill out and return this page along with your payment.

Please renew my membership in this category:

Full Member	$50 / yr
Supporting Member (elderly, retired, or disabled)	$35 / yr
Scholarship Member (full-time students only)	$25 / yr
Household Member (same address as a Full Member)	$15 / yr
Household Life Member (same address as a Life Member)	$300
Life Member (until we make contact)	$1,000
Sustaining Life Member – a generous *annual* pledge of:	$1,000 / yr
Patron (priority use of The SETI League's radio telescope)	$10,000
Director (Patron membership plus seat on advisory board)	$100,000
Benefactor (a major radio telescope named for you)	$1,000,000

Annual memberships are issued for the calendar year. Those processed in January through April expire on 31 December of that year. Those processed in September through December expire on 31 December of the *following* year. Those members joining in May through August should remit half the annual dues indicated, and will expire on 31 December of the same year.

Order Your Membership Premiums:

	(u *)	**(o *)**
Pocket protectors	$ 3	$ 4
Mouse pads	$ 5	$ 7
Tune In The Universe! (CD-ROM)	$25	$30
Proceedings of SETICon01	$20	$25
Proceedings of SETICon02	$20	$25
Proceedings of SETICon03 (CD)	$15	$20
Proceedings of EuroSETI04 (CD)	$15	$20
Proceedings of SETICon04(CD)	$15	$20
SARA 2006 Conference Proceedings	$20	$25
SARA 2007 Conference Proceedings	$20	$25
SETI League Technical Manual (CD)	$10	$13
Project Cyclops 2nd Edition	$20	$25
The Listeners by James Gunn	$15	$15
Sing a Song of SETI (Songbook)	$10	$13
Sing More Songs of SETI (Songbook)	$10	$13
T-shirts, specify M, L, or XL	$15	$18
SETI Nerd Gift Set (one each Mouse Pad, Pocket Protector, *Project Cyclops* and *Tech Manual*) at 20% Savings to Members Only:	$30	$40

*** Includes postage to (u) US, or (o) other addresses.**
Payments in US Dollars, check payable through a US bank

Pleased to Accept Credit Cards

The SETI League invites you to pay your membership dues and additional contributions via Visa or MasterCard. Please fill out the form below and return it with any order. We thank you for your ongoing support.

Circle One: Visa / MasterCard Exp.___/_____
Card Number:_____

Cardholder: _____
Address: _____
Phone: _____ email:_____

Ham call: _____ URL:_____
Total Contribution (US Dollars):_____
Signature:_____
Today's date:_____