



SearchLites

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When Will We Achieve Contact?

by H. Paul Shuch, Ph.D.

At the International Astronautical Congress in Bremen last October, and now in a bold new article in *Acta Astronautica*, SETI Institute astronomer Seth Shostak has gone on record, predicting SETI success within the next couple of decades. My respected colleague should know better than to make predictions, the outcome of which depends upon events completely beyond human control.

It is altogether reasonable to project the development of human technology, based upon past trends and planned investments. To say that we will have achieved a given number of simultaneous observational channels in a given time is merely an extrapolation of Moore's Law, which has thus far proven unassailable. Similarly, to state the number of candidate stars that we will have surveyed in a given timeframe is an altogether reasonable estimate based upon the experience the SETI Institute gained in ten years of Project Phoenix observations. But predicting the date (or decade, or even century) of contact is another matter altogether, because the 'other end' of the communications link is completely out of our hands.

It would be nice to think we know something about the existence, distribution, technology and motivation of our potential communications partners in space, but in fact, we don't. SETI seeks to detect not life (now believed to be abundant), but rather the communications technology such life might employ (and that's still a matter of pure speculation, the Drake Equation notwithstanding).

I, for one, do not subscribe to the Rare Earth Hypothesis widely articulated by Ward and Brownlee. That is, unlike those two scholars, I still picture a Universe teeming with life, much of it intelligent, some of it technological. Only I refuse to predict the direction which exo-technology might take. I subscribe instead to a Rare Photon Hypothesis: electromagnetic communication, appealing as it is to us, may well be the exception rather than the rule, as intelligent, technological and communicative civilizations develop signalling means the likes of which we cannot even begin to imagine.

I understand completely *why* Dr. Shostak has found it desirable to predict the date of contact. His SETI Institute is embarking upon an ambitious and costly venture, the construction of the World's Greatest SETI Telescope. The Allen Telescope Array is going to take a good deal of outside funding, and I certainly encourage the SETI Institute's fundraising efforts. Potential investors are going to want to know when they can expect a return on investment. The traditional SETI answer (maybe today, maybe tomorrow, hopefully in my lifetime, maybe never) just won't wash. So, Seth and his colleagues build optimistic mathematical models, in hopes of attracting funding. It may be fun, it's certainly intriguing, but is it scientific? I say it's no more nor less scientific than all the schemes out there to predict the direction of the stock market.

Dr. Shostak's prediction is reminiscent of similarly optimistic forecasts made by those brave pioneers who sold shares in high-tech startups, back before the internet bubble burst. If I make business decisions based upon his prediction, I will likely end up in the same position as those unwary investors who bought stock in those very startups: if not devastated, then surely disappointed. To his credit, Shostak does specify what his prediction does *not* take into account. He writes, "We have not considered the luminosity function or duty cycle of extraterrestrial transmitters, but have instead assumed that the N transmitters estimated by the Drake Equation are all detectable... We have not speculated on the possibility that the frequency coverage of our telescopes is inadequate..." But these are the very considerations that must go into rational predictions of SETI return on investment.

Rather than responding to promises of contact, I am much more likely to buy shares in the concept of advancing our own technology, and through that, advancing human knowledge in ways that we cannot begin to predict. Construction of the Allen Telescope Array is an important step in that direction. In making such an investment, there is no way that I will be disappointed. ❖

Book Reviews:

**SETI 2020: A Roadmap for the
Search for Extraterrestrial Intelligence**

Produced for the SETI Institute

by the SETI Science and Technology Working Group

Edited by: Ronald D. Ekers, D. Kent Cullers,

John Billingham, and Louis K. Scheffer

Reviewed by David Ocame,

email: David.Ocame@Yale.edu

I first obtained this book as a door prize at the SETI League's recent SETICon'04 Technical Symposium. I thought this might be an excellent opportunity to write a review, which could be helpful to other researchers interested in building their SETI research reading lists. As it was first published in 2002, I felt it might also be well overdue.

The volume's thickness may seem daunting, at first. But, I would urge the reader not to let size be a cause for hesitation. From the start, the depth of vision and, to a lesser extent, the technical detail, drew me in. I was, however, overwhelmed by the, perhaps, extreme ambitiousness of the enormous projects suggested and planned for.

SETI 2020 is written as a directive for the future research of the SETI Institute. However, it may also serve as an excellent guide for researchers who are not attached to the Institute itself. Contained within its pages are outlines for very specific strategies that will, hopefully, lead to first contact. The so-called Allen Telescope Array (an important research instrument in its own right), meant as a proof of concept for the much larger, and international in scope, Square Kilometer Array, is only one part of the overall plan. Other research directions discussed include plans for Optical SETI, an Omni directional SETI System (OSS), and the possibility for funding seed money to fund small, original startup projects outside the Institute.

At this point, I think some clarification is needed. It is not that the book is lacking in technical detail overall. In fact, it is detail rich in many respects. It does seem to me to be unbalanced in favor of the many rigorous mathematical treatments of SETI search concepts. Not that this is bad thing, but I would have liked to see more detail on the actual hardware components themselves (which are described as annual costs), and further depth on the subject of digital signal processing routines used in software (which are described as capital expenses). This is perhaps understandable for three reasons:

First, detailed analysis of each of the physical hardware components would turn a book, already fairly sizeable, into a library of many such volumes. This is beyond the scope and intention described at the outset in the first chapter. Second, it would seem counterintuitive to provide exact details of components before the Institute itself has the chance to deploy them. The last reason, stated in the book, is many of the technologies described have yet to be developed! Heavy reliance on the continued trend of Moore's law in computer processing power (which is that computer processors will double in speed and power about every 18 months) is stressed throughout. The caution here is that Moore's law has a limit that is quickly being approached unless a technological breakthrough occurs that will allow that barrier to be overcome.

Finally, I need to touch upon one last item before this review comes to an end. That is the SETI Institute's seeming over-ambitious, perhaps over-optimistic plans for the future. Throughout, attempts are made to estimate the costs that will be incurred in bringing these projects to fruition. The amounts are, needless to say, staggering! However, it is well known that the SETI Institute has access to an enormous amount of funding. I thought, too, that if commercial applications can be realized for many of the technologies under development, that this might serve to offset the initial outlay in capital expense. But, it seems to me that the Institute could possibly fall victim to the same sort of government over-spending that helped to doom NASA's SETI program. Rather the reverse of what the SETILeague, Inc has been trying to accomplish!

My final opinion is that due to the intellectual concepts involved, as well as the mathematical treatments used throughout, I would place this book in the intermediate to advanced range of reader. It is not for the casual reader, nor the beginning SETI enthusiast. Although this is not an exhaustive review, to be sure, the volume is important for its insight into the future direction of research activities at the SETI Institute. I would say that it is a must read for any serious SETI researcher, whether professional or amateur. The ideas presented within make it an important addition to any SETI library. ❖

Biocosm: The New Science of Evolution

How Intelligent Life is the Architect of the Universe

By James N. Gardner

Reviewed by David Ocame, NIYVV

email: David.Ocame@Yale.edu

Every so often, you hear someone speak, or read someone's book, or listen to some piece of music and it makes you stop and think about what you thought you knew about the world. Then you rethink it again, because although it is hard to write down, or speak about, in words, you know it makes sense on some level. You need time to digest your experience and have it gel with everyday life. But it never really does gel because life is no longer plain nor ordinary, nor everyday.

Rachel Carson's *Silent Spring* was one that opened my eyes and filled me with sadness at what we do to our world. The chemicals we pollute it with. Then James Lovelock published *Gaia: A New Look at Life on Earth*. I realized that no matter what nasty little chemical man produces on Earth, the universe already makes it in far greater quantities. Earth would recover and life would go on. Perhaps not for Homo sapiens or many other types of multi-cellular life. For Gaia theory looks at life not as a thin veneer on our world, but as a major contributor to it: a molder and shaper of it. It was through James Lovelock that I learned a new respect for the intricate, subtle, and mostly unknown interplay between the world of the living and the world of the seemingly not.

Now comes James Gardner with *Biocosm* with which he takes Gaia theory to whole new and infinite level. A Universe that holds infinite hope for finding life, intelligent life, in places other than our own Solar system. For not only must there be intelligent life out there in the Cosmos, it must expand and someday in the far future become "co-terminus" with it. Life, in all its forms, must permeate every nook, cranny and corner of

the creation left in the wake of the Big Bang. It must, because the Universe is endeavoring to become alive and we are its heartbeat!

Gardner goes on to say that one of the purposes of all living organisms is to reproduce. And so it is with our Universe. It wants to make baby Universes. It wants to pass on its knowledge, as we pass on our DNA, to the next generation of Universes. Information is necessary to making babies. In fact, it was information encoded in the known physical constants that makes this Universe so friendly and nurturing to life. Information coded by intelligent life to create a Universe that would have just the right gravitational constant, just the right charge and spin on the electron, speed of light and so forth. All deliberately set so that life and the physical world we see would be the result.

If this all sounds as though it smacks of religion and belief systems, the reader would be correct in my opinion. In fact, Gardner states that Intelligent Design proponents - IDers -and scientists must sooner or later reconcile. Not give in, but understand that each has a contribution to the whole to be made. He also takes on Peter Ward and Donald Brownlee's *Rare Earth* point by point concluding that whether or not correct, "...discussion does not settle such arguments. Only experimentation can."

Lee Smolin, Christian De Duve, Edward O. Wilson and his *Consilience*, Complexity Theory, Chaos Theory, all these and more are ingeniously threaded together to give a cogent and logical theory of why the Universe is the way it is and, moreover, why it will be the way it will be. This is a book that whether you agree with all its content, you will have a lot to think about. It is a work to read and reread, come back and read it again. I daresay it will be one of the most important additions to any astrobiology collection. Each time I read *Biocosm*, it continues to give anew. ❖

Journalistic Exuberance

by H. Paul Shuch, Ph.D.

Upon my arrival at the World Science Fiction Convention in Boston this past autumn, I encountered a SETI fiction far stranger than truth. It caused us all a momentary flurry of excitement, before fading into the noise level of SETI science. I refer to claims appearing in the 1 September 2004 issue of the reputable journal *New Scientist*, of a promising detection from the SETI@home experiment. Unfortunately, these claims proved to be a classic case of journalistic exuberance.

The story in question was actually rather cautiously penned. It made no claims, beyond the assertion that at least one candidate SETI@home signal had reappeared upon follow-up examination, when SETI@home chief scientist Dan Werthimer and his team headed to Arecibo to re-examine the coordinates of a couple of hundred promising hits last Spring. The real excitement stemmed from an apparent disconnect between a responsible journalist and a headline writer who may not actually have read the story in question. The headline screamed, "Mysterious Signals from 1000 Light Years Away!"

Would that it were true! Unfortunately, the story itself reported something far more prosaic: "This radio signal, now seen on three separate occasions, is an enigma. It could be gen-

erated by a previously unknown astronomical phenomenon. Or it could be something much more mundane, maybe an artefact of the telescope itself." This is, of course, the nature of most unconfirmed SETI candidates, and a familiar occurrence to those of us engaged in the ongoing Search for Extra-Terrestrial Intelligence.

So, from whence comes the "1000 Light Years Away" pronouncement of the headline? Back to the article itself: "SHGb02+14a seems to be coming from a point between the constellations Pisces and Aries, where there is no obvious star or planetary system within 1000 light years." It's not hard to see how this statement, carelessly read, was transmogrified into a claim far more concrete.

The late physicist and science fiction author Dr. Robert Forward espoused a philosophy which, over the years, has become codified as Forward's Law: "Never let the facts get in the way of a good story." I respectfully suggest that what we're seeing here is an example of this corollary: "Never let the story get in the way of a good headline."

But back to Boston. Upon arrival in my hotel room on 2 September, I was greeted by an avalanche of incoming emails. (Does 100 constitute an avalanche? I guess it all depends upon your perspective.) Many of our members, and not a few journalists, wanted to know more about this claim of SETI success. So, I went directly to the source, my friend and colleague (and former grad school classmate) Dan Werthimer himself. "What about your candidate signals?" I asked. Dan replied thus, from Arecibo, where he was at that very moment preparing to put a new multi-feed receiver system on the air:

None of our candidates are very interesting - they are all consistent with noise. We will continue to observe many of the candidates over the next few years, but there's nothing on the candidate lists we are particularly excited about.

A reporter from *New Scientist* read the SETI@home web pages. In particular there's a section on "candidate signals" where we discuss how we score signals and we show the data from the 220 candidates we re-observed at Arecibo 1.5 years ago. These web pages are old, but the reporter made an exciting story about them, by exaggerating their content and mis-quoting us and quoting us out of context, and making a press release about one of the candidates that has a bit higher score than the others.

I talked to a couple of reporters today, explaining we've seen stuff like this for the last 30 years, and it's always turned out to be RFI or noise, and that there's nothing to get excited about, and that when you look at 50 trillion bytes of data, occasionally you'll find patterns that look unusual just from noise...

I wish we had something in our data to get excited about.

Well, we SETIzens can't control the press, but we can be very careful not to disseminate misinformation without first checking in with the source. I only hope that, when we do finally have a *real* SETI detection to announce, the press and public don't turn a deaf ear. Nobody listens to the boy who cried alien. ❖

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.

February 24, 2005: *Seeking our Companions in the Cosmos*, featuring Drs. Allen Tough and H. Paul Shuch, University of Toronto, Toronto ON CA.

March 18 – 20, 2005: *Contact 2005*, Mountain View CA.

April 17, 2005, 0000 UTC - 2359 UTC: Seventh annual SETI League Ham Radio QSO Party, 14.204, 21.306, and 28.408 MHz.

April 17, 2005: SETI League Annual Meeting, held in conjunction with the *Trenton Computer Festival*, College of New Jersey, Ewing Township NJ.

June 19 - 21, 2005: *Society of Amateur Radio Astronomers Conference*, NRAO Green Bank WV.

July 2005 (dates TBA): *Central States VHF Conference*, Colorado Springs CO.

August 4 - 8, 2005: *Interaction World Science Fiction Convention*, Glasgow, Scotland UK.

October, 2005 (dates TBA): *AMSAT Space Symposium* Lafayette LA.

October 17 - 21, 2005: *56th International Astronautical Congress*, Fukuoka, Japan.

October 37 - 30, 2005: *Microwave Update 2005*, Cerritos, CA.

April 22, 2006, 0000 UTC - 2359 UTC: Eighth annual SETI League Ham Radio QSO Party, 14.204, 21.306, and 28.408 MHz.

June 2006 (dates TBA): *Society of Amateur Radio Astronomers Conference*, NRAO Green Bank WV.

July 2006 (dates TBA): *Central States VHF Conference*, Minneapolis MN.

August 23 - 27, 2006: *L.A.Con IV World Science Fiction Convention*, Los Angeles, CA.

September 8 - 10, 2006: SETICon06, in conjunction with the Fourth International Congress for Radio Astronomy, Heppenheim Germany.

September, 2006 (dates TBA): *57th International Astronautical Congress*, Valencia Spain.

April 21, 2007, 0000 UTC - 2359 UTC: Eighth annual SETI League Ham Radio QSO Party, 14.204, 21.306, and 28.408 MHz.

June 2007 (dates TBA): *Society of Amateur Radio Astronomers Conference*, NRAO Green Bank WV.

July 2007 (dates TBA): *Central States VHF Conference*, San Antonio TX.

August 30 - September 3, 2007: *65th World Science Fiction Convention*, Yokohama Japan.

October, 2007 (dates TBA): *58th International Astronautical Congress*, New Delhi, India. ❖

Saving an Endangered Telescope

by Dr. Bob Lash, President

Friends of the Bracewell Observatory Association

The imminent demolition of a historic radio telescope at Stanford University, consisting of five 60-foot dish antennas built by Professor Ronald Bracewell, has been delayed by the quick action of the Friends of the Bracewell Observatory Association, a group of astronomy enthusiasts who want to rescue and operate the observatory for both academic and public use.

It would be a tragedy for this large scale radio astronomy observatory to be completely demolished simply because dry brush and plant overgrowth at the site was deemed a fire hazard. The brush and debris can be cleared, and our restoration work can bring the observatory back into operation for the benefit of both Stanford University and the public.

The "Stanford Five-Element Radio Telescope" is at the site where radio telescopes first achieved the angular resolution of the human eye (one arcminute), and produced 11 years of daily high resolution maps of the sun in the microwave spectrum.

Friends of the Bracewell Observatory Association is a non-profit organization that includes members of the Society of Amateur Radio Astronomers (SARA), the Society for Amateur Scientists (SAS), and the SETI League. Their goal is to provide the first hands-on radio telescope system for public use, establish educational programs in amateur radio astronomy, support access to the dishes for special projects by Stanford faculty and students, as well as schools, individuals and amateur groups, and present the history of scientific contributions made at the site.

Stanford's School of Engineering agreed to delay the demolition until after June 30th, 2005 to give the group time to mount a rescue effort, to submit a final plan to Stanford, and to put enough volunteer and financial support in place to make its plan go.

To this end, Friends of the Bracewell Observatory Association is developing a collaborative proposal in conjunction with the Director of Stanford's Space, Telecommunications, and Radio Science Laboratory (STAR Lab) to synergistically combine Stanford academic and research use with its own planned activities. They will support STAR Lab's use of one or more of the dishes to track scientific satellites carrying Stanford-built instrumentation. The proposed public access will conform to any limits that Stanford may deem appropriate.

Thanks to fast responding supporters, the group raised the \$20,000 as required by the School of Engineering to stop the imminent demolition, and defer it. In the event the final plan is not accepted by Stanford, the funds would cover the added cost of completing the demolition work at this later date. Should the final proposal be approved, these funds will be available through STAR Lab in support of the site.

For those interested in helping with this rescue effort (examples include publicity, fundraising, contributions, dish mechanical restoration, feeds, receivers, building restoration, historical document preservation, scanning, and mentoring) please contact Bob Lash at bob@bambi.net. ❖

Guest Editorial:

A Bold Step into the Bank Vault

by H. Paul Shuch, Ph.D. (speaking as a private SETIzen)

Because what I am about to say is controversial, and likely to be highly unpopular, let me make one thing clear at the outset: these thoughts are *mine alone*. I am *not* speaking for The SETI League, its Trustees, members, sponsors, donors, or supporters. Wait a minute while I take off my Executive Director's hat...

There, now I'm just an ordinary SETIzen, like the rest of you, and free to speak my mind - like the rest of you.

I've read something mildly disturbing on the first page of Volume 13, Number 1 of *SETI Institute News*. Perhaps you read it too. Perhaps you were also disturbed. In an article titled "A Bold Step into the Future," our friends in Mountain View stated:

"To carry forth its mission over the next five years, the SETI Institute is seeking to raise, from a variety of public and private sources, a total of \$62 million dollars in support."

Now, I'm normally delighted to encourage, support, and contribute to the fundraising efforts of our professional colleagues in California. After all, they have been doing the most ambitious and definitive search for ETI to be carried out since NASA's SETI funding was terminated a dozen years ago. And when they announced their Team SETI membership branch, I was one of the first to sign up. But... \$62 million? It gives one pause. That's over \$12 million a year - on a par with the NASA SETI budget that Congress terminated in 1993. And that, to this Team SETI member, is a cause for concern.

The whole argument for privatized SETI hinges on the proposition that individuals can do science better, and cheaper, than governments -- that by dispensing with bureaucracy, we can apply more of our limited resources to science, and less to overhead. That philosophy served the SETI Institute (and, dare I say, The SETI League?) rather well for the past decade. But now, privatized SETI has finally exceeded the budget of our Government-funded forebears. And we started off so well! Where, exactly, did we go wrong?

Perhaps it's that we're trying to do too much. After all, when NASA SETI was cancelled, the SETI Institute chose one specific prong -- the targeted search - to resurrect under the Project Phoenix banner. And they were doing so on a fraction of what NASA was spending. So, logically, The SETI League chose to resurrect the other half of NASA SETI, the all-sky survey, on an even smaller fraction. Privatized SETI seemed to make sense then.

It still does, if we don't let ourselves be drawn too far afield. But now the very SETI scientists whose talents and dedication have long inspired us are branching out. They are, as mentioned in that same article, "probing the chemical pathways critical to life on early Earth and Mars, exploring the molecular traces microbial life might leave on the icy surface of Europa, and seeking novel biosignatures... measuring the 92-cm line of deuterium... measuring dark matter in dwarf galaxies... transitions of heavy molecules in the interstellar gas." And, they are now hard at work building The World's Greatest Radio Telescope. No wonder they need \$62 million!

And what *aren't* they doing? At the moment, they aren't doing any microwave SETI observations. What a waste, diverting their amazing talents away from this vital mission.

Sacrilege! There's long been an unwritten rule that no SETI organization should ever criticize the efforts of another, lest we cast a public pall over all of us. And I've just broken that rule (but as an individual, remember?) Am I not afraid that, as a result, the public will think less of (and be less likely to support) *all* SETI efforts, including our own?

Actually, that's already happening, and not because the SETI Institute's programs are not worthy. The problem stems from a persistent public perception that SETI is some single monolithic organization. That's not particularly the fault of the SETI Institute, but it is a reality with which they too have to contend. So, what *they* choose to do, to raise, and to spend reflects on us all. I hear it whenever I try to raise funds for a SETI League project: "why are you asking me for money, when Paul Allen just gave you millions?" I hear it whenever I encourage individuals to get personally involved in our research: "I'm already letting you use my computer - *you* should be paying *me*!" And I hear it whenever I urge our elected officials to consider renewing public support of SETI: "Why would you want that? You guys are doing so well on your own..."

Well, frankly, we're not. And if you should happen to feel my motives are suspect, my viewpoint less than totally objective, let me wholeheartedly agree. Yes, I'm jealous of the funding apparently available to others but denied to us. Yes, it frustrates me that, while tens of millions of dollars are being poured into the Allen Telescope Array, we can't seem to raise the piddling twenty thousand needed to finish the Very Small Array prototype, which many of you so generously helped us to start four years ago. And yes, sour grapes do indeed go best with a grain of salt. But aren't you frustrated too, just a little?

So, what would I urge our colleagues in California to do? Redouble their true SETI efforts, even if at the expense of some other worthy projects. Let others do the continuum radio astronomy, or the life-in-the-universe studies, or the school curricula, or the searches for organic molecules, or the studies of fossilized bacteria. Maybe even let others build The World's Greatest Radio Telescope, and then go to them and rent time on it. In other words, become a lean and efficient SETI Institute once again, not an Astrobiology Institute. NASA already has one of those, and it costs - millions. I would be the first Team SETI member to raise a glass in salute of a refocused effort, once more emphasizing observational SETI.

Or, maybe I'm looking at this all wrong. Perhaps we should see the desire of the SETI Institute to broaden its scope as a golden opportunity for The SETI League. After all they, for whatever reason, aren't doing observational microwave SETI at the moment. We, with our 125 operational Project Argus stations, are. So The SETI League has, for now, a chance to differentiate itself, as a major observational arm of the SETI community. What we should be striving for, through our demonstrated dedication and professionalism, is to be recognized as worthy partners in a bold adventure.

There - now that I've gotten that off my chest, I can put my SETI League director's hat back on, and...

Say, who is this guy who dares to speak out against another SETI enterprise?



Guest Editorial:

Active SETI Is Not Scientific Research

by Michael Michaud

**Member of the SETI Permanent Study Group,
International Academy of Astronautics**

Recent discussions within the SETI community have thoroughly explored the issue of whether people with access to radio telescopes should send powerful signals to alien civilizations without some process of prior international consultation. In particular, those exchanges have focused on the question of "Active SETI."

Some people who oppose prior consultation have framed their arguments in terms of our right to free speech. Few have addressed the other side of this coin, which is our responsibility to the human species.

Let's be clear about this. Active SETI is not scientific research. It is a deliberate attempt to provoke a response by an alien civilization whose capabilities, intentions, and distance are not known to us. That makes it a policy issue.

We can not assume that we already have been detected or that detection is inevitable. Extraterrestrial civilizations might not be looking for the kinds of signals we normally radiate. More importantly from a policy perspective, our leakage signals may be below their detection threshold. An Active SETI signal much more powerful than the normal background emitted by the Earth might call us to the attention of a technological civilization that had not known of our existence. We can not assume that such a civilization would be benign, nor can we assume that interstellar flight is impossible for a species more technologically advanced than our own.

This is not just the concern of a few paranoids. Many significant people have argued against our actively seeking contact. Pulitzer Prize-winning author and scientist Jared Diamond, calling astronomers' visions of friendly relations "the best-case scenario," warned that "those astronomers now preparing again to beam radio signals out to hoped-for extraterrestrials are naive, even dangerous" (he was even harsher about the Pioneer plaques, which provided any species that found them with a kind of map to our location in the galaxy). Nobel Prize-winning biologist George Wald declared that he could think of no nightmare so terrifying as establishing communication with a superior technology in outer space. Even the New York Times questioned the view that the effect of signals from extraterrestrials would be beneficial, stating that the astronomers were "boyishly defiant" of our inherited wisdom.

Astronomer Robert Jastrow, addressing the consequences of possible future contact with an alien civilization, wrote that he saw no reason for optimism. Astronomer Ronald Bracewell warned that other species too would place a premium on cunning and weaponry; an alien ship headed our way is likely to be armed. Astronomer Eric Chaisson thought that physical contact could lead to a neo-Darwinian subjugation of our culture by theirs. Astronomer Zdenek Kopal was more specific: should we ever hear the space-phone ringing, for God's sake let us not answer, but rather make ourselves as inconspicuous as possible to avoid attracting attention!

Other scientists who are less widely known have warned of potential dangers. Biologist Michael Archer said that any crea-

ture we contact will also have had to claw its way up the evolutionary ladder and will be every bit as nasty as we are. It will likely be an extremely adaptable, extremely aggressive super-predator. Physicist George Baldwin predicted that any effort to communicate with extraterrestrials is fraught with grave danger, as they will show innate contempt for human beings. Robert Rood warned that the civilization that blurts out its existence on interstellar beacons at the first opportunity might be like some early hominid descending from the trees and calling "here kitty" to a saber-toothed tiger.

Consider the cautionary views of SETI Institute astronomers. Seth Shostak wrote in one of his books that we can no better guess the motivations of alien intelligence than goldfish can guess ours. Jill Tarter asked rhetorically: who knows what values might drive an alien culture? Aliens might not have the same motives we do. Doug Vakoch wrote that we should not assume that the ethics of extraterrestrials will be like our own. Physicist Freeman Dyson has written eloquently on this subject. He issued a warning that should be heeded by SETI researchers: "Our business as scientists is to search the universe and find out what is there. What is there may conform to our moral sense or it may not...It is just as unscientific to impute to remote intelligences wisdom and serenity as it is to impute to them irrational and murderous impulses. We must be prepared for either possibility and conduct our searches accordingly."

Dyson posed two alternatives. Intelligence may be a benign influence creating isolated groups of philosopher-kings far apart in the heavens, sharing at leisure their accumulated wisdom. Or intelligence may be a cancer of purposeless technological exploitation sweeping across the galaxy.

None of us knows which alternative prevails. The best-case scenario that underlies Active SETI is based on belief or preference, not on proven facts.

In modern times, the public, their representatives, and the media have increasingly demanded accountability when powerful technologies are used for controversial purposes, especially when those technologies are built and operated with the taxpayer's money. Given the fact that there may be risks involved, using radio telescopes to attract the attention of other technological civilizations is controversial. We owe our fellow citizens some respect for their opinions.

More than a year ago, I proposed a standard that recognizes the fact that signals already sent can not be called back: do not transmit a signal more powerful than the Earth's radio leakage (including radars) without international consultation. Canadian scientist Yvan Dutil, who has designed three interstellar messages for transmission from the Eupatoria Radar Telescope, has endorsed a similar approach.

If the advocates of Active SETI are not comfortable with the United Nations, I suggest an alternative. Take an Active SETI proposal to the International Astronomical Union and seek that organization's endorsement. If the IAU will not endorse Active SETI, there will be even more doubt as to whether it is legitimate science.

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.* ❖

Seeking Alien Dialog through an Accessible Web Presence

Toronto, ON, Canada., November 2004 -- *Invitation to ETI*, a group of 90 scientists and artists engaged in an online Search for Extra-Terrestrial Intelligence (SETI) experiment, has overhauled and expanded its World Wide Web presence, in hopes of stimulating a dialog with other intelligent civilizations in the Universe.

"Because their capacities are probably highly advanced," states Prof. Allen Tough of Toronto, the group's founder, "some extraterrestrial species may be using unobtrusive methods of observing humankind and other fledgling civilizations in this Galaxy. As its name indicates, the *Invitation to ETI* invites these visitors to dialogue with all of humanity. Sooner or later, advanced extraterrestrials will have an enormous impact on humankind."

The group's website, www.ieti.org, has recently been overhauled by Dr. H. Paul Shuch, executive director of the non-affiliated SETI League, Inc., and Web Design Consultant for *Invitation to ETI*, to maximize accessibility. "Throughout the Web community," Shuch explains, "there is a growing awareness that this enabling technology must not be restricted to the able-bodied alone. Websites are striving to be accessible to persons with a variety of disabilities, and standards are emerging to aid in this process. What greater accessibility challenge is there than making the *Invitation to ETI* accessible to our cosmic companions, creatures with whom we may have nothing biological in common?"

In addition to a graphical overhaul (which he admits is purely for the benefit of the website's sighted human visitors), Shuch has embraced Bobby standards in an attempt to make the site accessible to alien web surfers. Bobby is an organization that validates websites for ease of access by humans (and, Shuch hopes, extraterrestrials) with a wide range of physical abilities and differences. Every page of the new website is tested for Bobby AAA compliance, as well as conformance to standards established by the World Wide Web Consortium (W3C). "Like all websites," emphasizes Shuch, "this is a work in progress. However, our new accessible design is intended to set the direction for future enhancements."

Dr. Shuch has been assisted in the website overhaul by Dr. Scarlett Wang, the project's Webmaster. Dr. Wang is responsible for the day-to-day maintenance of the [ieti.org](http://www.ieti.org) website. She became the project manager 16 months ago.

Although several of the 90 members of the *Invitation to ETI* team happen also to be active members of the nonprofit SETI League, the latter organization concentrates primarily on conventional radio telescope-based SETI. The focus of the *Invitation*, on the other hand, is to attract the attention of extraterrestrial civilizations that have invented technologies for monitoring our terrestrial Internet. This could be done through physical presence, robotic exploration of our Solar System, or long-range telecommunications. ❖

Ask Dr. SETI

How Much Sky Noise?

Dear Dr. SETI:

Is it true that the background noise level seen by the antenna is approximately 290 degrees Kelvin? For the purpose of determining the minimum detectable signal, I am using the following formula:

$$P_{\text{sens}} \text{ (in dBm)} = -174 \text{ dBm} - 10 \log B \text{ (in Hz)} \\ + \text{Total Receive System Noise Figure (dBm)}$$

The above -174 dBm is $10 \log K$ (Boltzman's Constant) less $10 \log (T)$, all converted to dBm,

T being the temperature of the antenna in Kelvins and B being the bandwidth of the receiver.

This from Page 7.6 of the ARRL UHF/Microwave Experimenter's Manual.

Roy (via the ARGUS list)

The Doctor Responds:

That equation is entirely correct, Roy, and the 290 Kelvin limit is true for *terrestrial* communications. It does not hold for radio astronomy! It would only be true if your antenna were pointing at the Earth (which is a 290 Kelvin thermal black body). That figure is used for terrestrial communications because antennas pointed on the horizon 'see' Earth noise. With radio telescopes, our antennas are pointed generally 'up' at the sky, and the sky is RF-cold. So, your antenna sees less noise to limit system sensitivity.

The actual sky temperature varies, of course, with where you're pointing, with the minimum being 2.7 Kelvin (the cosmic background radiation), and the hot spots in the sky emitting some tens of Kelvin at microwave frequencies. The actual thermal temperature seen by your antenna will be higher, because sidelobes and over-illumination spillover mean that some Earth noise is in the pattern, and this adds to total noise. I figure a 50 Kelvin antenna temperature for my system when it's in birdbath mode, slightly more when it's pointed lower. ❖

SETI League 2005 Budget (Proposed):

Revenues projected include expected membership dues only. They do not include any future grants, pledges, or new revenue sources, which we can in no way anticipate.

990 Line	REVENUES:	2005 (preliminary budget)
1d	Dues, Grants & Contributions	17,600
4	Interest & Investments	20
12	Total Revenues:	17,620
	EXPENSES:	
13	Educ. and Scientific Programs	6,800
14	Management & General	8,652
15	Fundraising	1,890
17	Total Expenses:	17,142
18	Excess or (Deficit) for the year	478
	BALANCE SHEET:	
19	Beginning Net Assets	3,000
21	Ending Net Assets	3,478



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SearchLites Volume 11 No. 1, Winter 2005
Printed in the USA

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SETI League memberships are issued for the *Calendar Year*. Please check the expiration date indicated on your mailing label. If it reads December 2004 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:

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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 <i>annual</i> 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 *)
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