



# SearchLites

Vol. 17 No. 3, Summer 2011  
The Quarterly Newsletter of The SETI League, Inc.

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## In Search of SETI SuperStars

A dozen years ago, in an effort to encourage positive SETI coverage on the emerging Internet (as well as in the interest of promoting our own website), The SETI League instituted its monthly SETI SuperStar award. The initial rules for that Award, as posted to our website, included the following:

- Noncommercial websites devoted to the scientific Search for Extra-Terrestrial Intelligence (SETI) will be eligible for consideration for this award.
- SETI League members in good standing are eligible to nominate worthy websites for consideration for this award. Webmasters are invited to self-nominate their sites, whether or not they are SETI League members. All nominations should be made by filling out the Nominating Petition provided. Be sure to include the complete URL of the site to be evaluated.
- Sites so nominated will be evaluated by our Awards Committee for information content, scientific accuracy, positive portrayal of SETI subjects, service to the SETI community, ease of navigation, and overall presentation.
- Nominees need not be members of The SETI League, Inc. Membership status will not be a criterion in selection for this Award (although SETI League membership is of course encouraged).
- The Awards Committee may select not more than one website per month for receipt of the SETI SuperStar Award.
- The SETI SuperStar Award carries with it no cash honorarium or any other consideration. Appropriate recognition is the sole prize.
- Recipients of the SETI SuperStar Award will be notified by email of their selection.
- Recipients of the SETI SuperStar Award will be listed on, and their websites linked from, the website of The SETI League, Inc.
- Recipients of the SETI SuperStar Award are encouraged to download the graphic depicted below to their local servers, and to display it prominently on their winning websites:



145 SuperStar awards later, we seem to be scraping the bottom of the SuperStar barrel. It is becoming increasingly difficult for our Awards Committee to locate new websites that meet our high standards for SuperStar recognition. Of course, there are bound to be quality SETI sites out there of which we are unaware.

And that's where our fellow SETI League members can help. We're searching for noncommercial websites that portray SETI science in a positive light. Individual members' personal websites (especially those depicting your own amateur radio telescopes) are certainly appropriate candidates, and self-nomination is encouraged. You can find a nominating form on [www.setileague.org](http://www.setileague.org), linked from the above SuperStar graphic. Or, drop an email to [awards@setileague.org](mailto:awards@setileague.org), indicating the site you're nominating and the reason you feel it is a worthy recipient. Your site, or one you nominate, could well become SuperStar number 146.

Guest Editorial:

## Wolves Among the Stars

by Adam Frank

How naïve are we in our thinking about extraterrestrial intelligence and its inclinations? Here we sit, a newly high-tech species, unwittingly broadcasting our existence to anyone (anything?) with a radio receiver. Are we like baby birds chirping away announcing our presence to a galaxy full of predators? At what point do we reassess our assumptions, and our actions, and decide it would be wiser go radio quiet for the time being?

Last spring Steven Hawking made news when he used his Discovery Channel series to opine that getting on the down-low (interstellar communication wise) would be the right choice. In his view,

*If aliens ever visit us, I think the outcome would be much as when Christopher Columbus first landed in America, which didn't turn out very well for the Native Americans.*

This launched a fury of blog activity both supporting and contradicting Hawking's pessimism. What I did not see in all the hub-bub was much mention of Greg Bear's two tightly-written books - *The Forge of God* and *The Anvil of the Stars* - which deal directly with the issue. Recently I finished rereading the series and it reminded me of the vast assumptions we make in dealing with our place among other intelligences and how little collective thinking has been applied to the issue.

In Bear's story, the Earth is visited not by laser-wielding aliens but fully autonomous Von Neuman machines. These are self-replicating interstellar probes that spread out among star systems using the resources they find to generate more versions of themselves. The premise of Bear's fictional Universe is that with the laws of physics keeping interstellar travel slow (it takes a long time to travel among the stars even at near light speed) all intelligent technological species will, essentially, be in the dark about what is out there.

Thus for some cultures the best defense will be a good offense.

The Von Neumann machines of Bear's story are killer probes. Once our stray radio broadcasts are picked up, the probes arrive, try to build more versions of themselves and, essentially, disassemble our planet. No explanations. No monologue of evil intent. Just mindlessly

eliminating potential competition and potential threats. Then it's on to the next system.

I leave you to explore Bear's books on your own if you're interested, but what I always found compelling in his story was the relentless logic of Darwinian competition in a Universe governed by speed-of-light travel restriction.

We love to imagine warp drives and worm holes carrying us back and forth among the stars with an ease that looks a lot like intercontinental air travel (and hasn't that been fun these last few weeks!). But if we take the physics we know seriously and don't ask for techno-miracles, then light-speed will remain an upper limit on interstellar civilization building. The kind of psychology needed for interstellar relations in that case could very well tilt "reasonable" species into expecting the worst.

So who does speak for Earth on this issue? Who decides our strategy for dealing with such a large and potentially significant concern.

The answer is "no one."

As David Grinspoon described in a 2007 article for *Seed* magazine, high level discussions on the subject have occurred within the SETI community, but not much beyond. Even among those interested in SETI, the debate has been contentious. John Billingham, a member of the SETI Permanent Study Group (SPSG) of the International Academy of Astronautics, resigned in 2007 because the group refused to take a stand on the issue of so-called active SETI (beaming messages into space). As Billingham put it,

At the very least we ought to talk about it first, and not just SETI people. We have a responsibility to the future well-being and survival of humankind.

So are the stars a warren of wolves or angels? Who decides for us? How do we decide? And, most importantly, when is time to make a decision and act?

**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.



## The Friendly Candy Company By Richard Factor

When you're at a major trade show such as that of the National Association of Broadcasters (as was I, recently), and you have no specific agenda other than to take a look around and assess the state of the industry and the competition, there's the simplest of strategies. Start at one corner of the hall and wend your way through the aisles and past the stands until you find yourself without further room. At NAB, this would have been impossible due to size and geometry, but I at least was able to do it in one small section, the radio exhibit area. It was more eclectic than one might think. Radio stations use pop-up tents for promotions and beacons on their antenna towers, so it wasn't just broadcast equipment in the narrow sense. Shortly after beginning the trek I found myself face to poster with a stand run by the Federal Communications Commission.

When I was a teenager and new ham operator, the FCC was the source of all blessings and not just a little fear. They were the Government Agency that allowed me to commune with my conspecifics over the radio waves, a privilege accorded only a few and only then after months of arduous study of the Morse Code and radio theory and Law, and only *then* after appearing before the Examining Officer in a Government Building in the bowels of New York City. When we talked over the air, the FCC was the Friendly Candy Company, the Agency whose Sacred Name (not to mention Sacred Initials) might not be Uttered. (I've dropped most of the capital letters since then. The fear remains, but it is largely hypothetical.)

How things have changed! When I found myself at their stand, there was a bowl of chocolates front and center. I helped myself to one, made eye contact with an FCC representative, and indicated my astonishment that I was actually getting something from the government for free.

The FCC representative, by the way, had a name. She was Cecilia Sulhoff, and her business card attested to her dual portfolio: She was the booth manager and an "outreach specialist." She responded to my offhand comment about the free chocolate by saying that she had paid for the chocolate herself, while mentioning that some churl (my characterization, not hers) had come by earlier and actually complained that the taxpayers were paying for the chocolate. Of course I complimented her on her thoughtfulness in providing same, and punctuated the compliment by accepting a second piece. We chatted a bit about antenna towers, and I suddenly remembered that:

*I Had a Problem.*

I hold an FCC license for my ham radio activities. I am also the trustee of the "club" license for the SETI League, call letters W2ETI. Ham licenses are valid for ten years, and the W2ETI license had very recently expired. I was reminded of same by two organizations who take it upon themselves to keep the number of renewals close to that of (expirations minus deaths), and make a few bucks in the process, but their forms got buried on my desk and the date slipped by. When I say "form," I'm not talking about a single sheet where you check a "please renew" box and write your credit card number. You need to know your special numbers, which you last saw ten years ago, have obviously forgotten, and have hidden away under a decade of accumulated detritus. I lamented this state of affairs to Ms. Sulhoff and she sprung into action. (The convention hall had very high ceilings; if she had literally sprung it would have been OK.)

"We can renew that license right here and now" she told me. And, in an outreach-specialist minute, she hand-keyboarded me (and even cellphoned me) through the labyrinthine FCC computerized bureaucracy until I had my numbers, my password, and, finally, my printed acknowledgement of a renewed license in folder. The license itself was received a few days later in the post. (In my youth, this process would have required months!) So, right here and now, I would like to thank Cecilia Sulhoff of the Federal Communications Commission for going to the time and trouble of helping this wayward (and expired) mendicant solve his Problem, and also for putting the (literally) "Friendly Candy Company" in a good light with this and probably many more taxpayers. If I were a Congresscritter and asked to vote positively on a Special Appropriation to provide reimbursement to Ms. Sulhoff for the bags of Hershey's Miniatures, I would surely do so.

Which leaves us with just a few questions:

**Why** doesn't the FCC just send a form with a check box to "please renew my license" and a place to put in a credit card number?

**Why** does the license expire in the first place? Why not just send a post card whenever they can afford it asking you if you're alive or dead?

**Why**, when Google can afford to give you a gigabyte of free email storage, does the FCC need to charge to *keep* you in a database, the entirety of which (for half a million people!) requires less than that?

**Answer:** We're so used to doing things monthly, quarterly, annually, biennially, or even once per decade, that nobody seems to think that doing something once and forever is enough! Hence the desk full of accumulated detritus.



Ask Dr. SETI®

## Is My LNA Oscillating?

Dear Dr. SETI:

My system has been acting strangely for a while, so took the Head End electronics down, pulled out the LNA (Radio Astronomy Supplies, 28 dB gain), and set it up on my bench. When I have the LNA input terminated in a good 50 ohm terminator, I get -36 dBm out of the LNA as measured on my HP Power Meter and 8484 sensor. I don't see anything on my spectrum analyzer, but it only goes to 1.5 GHz so it may be oscillating at a higher frequency. The power supply is solid and quiet. Question - What should I see on a terminated LNA that is working right?

Jim, California

### The Doctor Responds:

The output of any properly terminated amplifier is simply broadband noise. The power level of that noise equals the input noise power, amplified by the amplifier's gain. The input noise power is in turn the thermal noise generated by the terminating resistor, added to the internal noise of the amplifier (that is, its Noise Figure or Noise Factor). So, let's calculate: As a first order approximation, let's consider the amplifier's noise figure to be near zero. That is, its internally generated noise is negligible -- it is a *Low Noise* amplifier, after all. So, all we have to do now is calculate the noise generated by your dummy load resistor. (Note that, in this context, dumb is appropriate...)

Let's consider that load resistor to be a thermal black body. Boltzmann's Law says its noise power (in watts) equals  $kTB$ . In this equation,  $k$  is Boltzmann's Constant ( $1.38 \times 10^{-23}$  Joules/Kelvin).  $T$  is the physical temperature of the black body, in Kelvins (for lab temperature, you can assume 300K). And  $B$  is the bandwidth in which the noise power is being measured, in Hz (that is, cycles per second).

Invoking unit analysis, we can prove that the Boltzmann equation is dimensionally consistent:

$$kTB = (\text{Joules/Kelvin}) \times (\text{Kelvins}) \times (\text{Cycles/Sec}) \\ = (\text{Joules/Sec}) = \text{Watts}$$

Now, since you're measuring noise with an HP 8484 power sensor, whose passband is 10 MHz to 18 GHz, you might assume the bandwidth  $B$  to use in this calculation to be about 18 GHz. But, remember that the power sensor is going to be placed at the *output* of an amplifier with a much more modest bandwidth. Thus, the only part of the load resistor's noise power that counts is that part within the LNA's passband. Let's say your LNA passes frequencies from 1.3 to 1.7 GHz. That's a 400 MHz bandwidth, which is what we'll use for  $B$  in Boltzmann's Equation.

OK, let's calculate. Noise power  $P_n$  (coming out of the load resistor, in the amplifier's passband) is  $kTB$

$$P_n = kTB$$

$$P_n = (1.38 \times 10^{-23} \text{ J/K}) \times (300 \text{ K}) \times (400 \times 10^6 \text{ Hz})$$

$$P_n = (1.66 \times 10^{-12}) \text{ watts} = 1.66 \times 10^{-9} \text{ mW}$$

Converting to logarithmic measure, that's a power level of -88 dBm.

This is the noise power that gets amplified by your LNA. Your LNA has 28 dB of gain, so the -88 dBm of noise, after being amplified, comes out of the amplifier at a level of -60 dBm.

OK, now the noise you're seeing on the power meter is -36 dBm, which is a whopping 24 dB stronger than the noise you should be seeing. That's a power level about 250 times higher than it should be. From this, I conclude that, yes, your amplifier is probably oscillating.

How's that for a long answer to a simple question? My main point is, the noise power coming out of a properly operating amplifier is entirely calculable (and, now, you know how to calculate it).

### Editor's Note:

Dr. SETI thanks Kevin Murphy, ZLIUJG, for pointing out a glaring mathematical error in an earlier version of this column.

## Did We Transmit on the Wrong Frequency?

Dear Dr. SETI:

My question concerns why the "Arecibo Message" was transmitted at 2380 MHz. Everything I've read indicates that the "water hole" for listening to potential messages is at 1420 MHz. If we decide messages would be at 1420, why would we purposefully transmit at 2380? Was there a specific reason why this frequency was selected?

David Ritchey, James S. McDonnell Planetarium, Saint Louis

### The Doctor Responds:

David, the short answer to your question is: that's the frequency on which the existing radar transmitter at Arecibo operated.

A longer answer would involve considering the true purpose of the Arecibo transmission. Let's put it in historical perspective. Think back to November 1974. The Apollo program had ended two years prior. US military involvement in Vietnam had just wound down a year ago, and the fall of Saigon was five months ahead. The OPEC oil embargo had ended eight months earlier, but the US economy was still reeling from soaring energy costs. Against this backdrop, the Arecibo Observatory had just undergone a massive renovation, its half-inch galvanized steel mesh replaced with a precision surface to allow higher frequency operation at greater efficiency, at a not insignificant cost. The funding agencies (National Science Foundation and Associated Universities) wanted to garner some favorable publicity to encourage continued public support, so they staged a dedication ceremony. Central to that ceremony was a symbolic transmission to the stars, using the existing 2380 MHz high power radar transmitter actually designed not for interstellar communications at all, but rather for surface studies of the Moon and Venus. The transmission's target was the cluster of stars that just happened to be overhead at the time of the ceremony. Those stars being some 25,000 light years away, there was really no expectation that anyone at the receiving end would actually receive or decode the message (in fact, there was no good reason to believe any-

body was home at the target stars at all). This was a publicity stunt, pure and simple.

If the Arecibo Message was transmitted on the wrong frequency, toward the wrong target too far away, exactly who was its intended audience? I believe the transmission was a powerful message to humans, about our place in the cosmos. And it's become a landmark in human history, widely portrayed in popular culture and much discussed by all, despite its limited scientific value.

So, to that extent, the Arecibo Message transmission has been received, and was a resounding success. ❖

## **Minutes of the Seventeenth Annual Membership Meeting 24 April 2011, SETI League Headquarters, Little Ferry, NJ**

### **• Call to Order**

The meeting was convened at 13:01 hours EDT, in the Library at SETI League Headquarters, Little Ferry NJ, by Executive Director Emeritus Dr. H. Paul Shuch. Three SETI League members in good standing present. Our By-laws requiring one percent of the current membership to be in attendance for the conduct of SETI League business, the above represents a quorum.

### **• Minutes of 2010 Membership Meeting**

The Minutes of the 2010 Membership Meeting having been previously posted to The SETI League's World Wide Web site, the following correction was requested by Richard Factor: under New Business, 1. Web Server, DSL should read Cable. par A motion was then passed to accept the minutes as amended.

### **• Treasurer's Report**

Presented jointly by the Executive Director and the Secretary/Treasurer, covering the calendar year 2010 (as e-filed).

1. Revenues: Dues and Contributions \$22,733, Interest Income \$8, Total \$22,741.
2. Expenses: Educational/Scientific Programs \$16,222, Management/General \$2,666, Fundraising \$1,050, Total \$19,939.
3. Revenues minus Expenses: \$2,803.
4. End of 2010, SETI League account balances equalled \$10,981. 2008 beginning net assets \$8,178.
5. 2010 Budget: Projected Revenues \$20,020, Program Expenses \$17,000, Management/General Expenses \$4,600, Fundraising Expenses \$1,400, Projected deficit (\$1,981), Projected Ending Balance \$9,000.
6. This report was accepted by those present.

### **• Executive Director's Report**

The Executive Director's annual report of Program Service Accomplishments having been previously posted to

The SETI League's World Wide Web site, a motion was passed to accept the report as published.

### **• Committee Reports**

#### **EME Committee**

Report by station trustee Richard Factor. The EME beacon remains off the air. The yagis are damaged beyond economic repair. It is hoped to replace them with a dish. The station license has been renewed.

#### **Awards Committee**

Awards Committee chairman David Ocame being absent, executive director H. Paul Shuch announced that this year's Giordano Bruno Award was made to Christian Monstein. This year's Orville N. Greene Award was made in memoriam to Dr Malcolm Raff. A phone call was made to his widow, Connie Woods, to advise her of the award. Twelve websites have been given the SETI SuperStar award this year. More nominations are requested from the members. Paul will note this in the next issue of *SearchLites*.

### **• Old Business**

#### **1. Very Small Array**

Executive Director Emeritus H. Paul Shuch reports that the project is on hold, due to lack of funding.

#### **2. Mid-Year Renewal Letter**

Secretary/Treasurer Heather Wood will mail out a mid-year appeal to lapsed members.

#### **3. Annual Report**

The SETI League's 2010 Annual Report is available to members via the website, in Portable Document Format (PDF).

#### **4. Web Server**

President Richard Factor reports that the website will migrate to a new server sometime soon. Richard will look into the archiving facilities offered by Google Groups.

### **• New Business**

1. The book "Searching for Extraterrestrial Intelligence," edited by H. Paul Shuch has just been published by Springer Verlag. All contributing authors have agreed that any resulting royalties will accrue to The SETI League, Inc. A motion was made and passed to allow the executive director to draw upon such royalties to offset SETI related travel expenses.
2. The meeting reaffirmed the commitment of the membership to searching for extraterrestrial intelligence.
3. **Next Meeting**

The next Annual Meeting will be held at the same venue. The date of Sunday 22 April 2012 has been tentatively approved. The meeting will be at 1300 hours EDT, to be followed immediately by the Board of Trustees meeting. The date and time will be announced to the membership via the website and newsletter.

- **Good and Welfare**
  - The membership was apprised of the Executive Director Emeritus' new venture, a Sport Aviation flight school.
- **Adjournment**

The Annual Membership Meeting was adjourned by the Executive Director Emeritus at 13:35 hours EDT on 24 April 2011. A Regular Board of Trustees meeting followed.

### Business Transacted by Board of Trustees:

#### 1. Quorum Call

Trustees and Officers present: A. Heather Wood, Richard Factor, H. Paul Shuch  
Trustees and Officers absent: Martin Schreiber  
A quorum is present.

#### 2. Election of Officers

The following slate of officers was retained for a one-year term:

President - Richard Factor, serving without compensation.  
Secretary/Treasurer - A. Heather Wood  
Executive Director Emeritus - H. Paul Shuch, serving on a volunteer basis.

#### 3. Registered Agent

The New Jersey Division of Revenue requires that we designate a Registered Agent to execute certain state documents. Richard Factor was previously appointed to this post, and has agreed to continue serving in this capacity for an additional year.

#### 4. Personnel matters

1. In executive session, the Secretary/Treasurer's annual performance review was completed.
2. In executive session, the Board of Trustees voted to continue cost-sharing of Executive Director Emeritus' health insurance premiums, as an administrative expense, pending availability of funds and subject to periodic review. Dr. Shuch abstaining.

#### 5. Advisory Board

Establishment of a secure email alias, to permit the Executive Director Emeritus to communicate with Advisory Board members on an occasional

basis, was previously authorized. Richard Factor will explore implement this function upon activation of the new Web server.

#### 6. Bank Fees

Fees charged for our various bank accounts were discussed. The Secretary/Treasurer will explore alternatives for reducing credit card fees.

#### 7. Adjournment

The Board of Trustees meeting was adjourned at 13:55 EDT.

Respectfully submitted, A. Heather Wood, Secretary ❖

## 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](http://www.setileague.org)) under *Event Horizon*, or email to us at [info@setileague.org](mailto:info@setileague.org), to obtain further details. Members are also encouraged to send in information about upcoming events of which we may be unaware.

**May 27 - 30, 2011:** Dr. SETI concert at *Balticon 45*, Hunt Valley, MD.

**June 17, 2011:** Dr. SETI presents *Sing a Song of SETI* at Delaware Valley Amateur Astronomers, Plymouth Meeting, PA.

**June 27 - 30, 2011:** Third IAA Symposium on Searching for Life Signatures, St. Petersburg, Russia.

**August 17 - 21, 2011:** Renovation 69th World Science Fiction Convention, Reno NV.

**October 3 - 7, 2011:** 62nd International Astronautical Congress, Cape Town, South Africa.

**April 21, 2012, 0000 UTC - 2359 UTC:** Thirteenth annual SETI League Ham Radio QSO Party: 3.551, 7.0309, 7.2039, 14.084, 14.204, 21.306, and 28.408 MHz.

**April 22, 2012:** Eighteenth SETI League Annual Membership Meeting, Little Ferry NJ.

**August 30 - September 3, 2012:** Chicon 7 70th World Science Fiction Convention, Chicago IL.

**September 2012 (dates TBA):** Sixth International Congress for Radio Astronomy, Medicina, Italy.

**October 1 - 5, 2012:** 63rd International Astronautical Congress, Naples, Italy.

**April 20, 2013, 0000 UTC - 2359 UTC:** Fourteenth annual SETI League Ham Radio QSO Party: 3.551, 7.0309, 7.2039, 14.084, 14.204, 21.306, and 28.408 MHz.

**April 21, 2013:** Nineteenth SETI League Annual Membership Meeting, Little Ferry NJ.

**October, 2013 (dates TBA):** 64th International Astronautical Congress, Beijing, China.

**April 19, 2014, 0000 UTC - 2359 UTC:** Fourteenth annual SETI League Ham Radio QSO Party: 3.551, 7.0309, 7.2039, 14.084, 14.204, 21.306, and 28.408 MHz.

**April 20, 2014:** Nineteenth SETI League Annual Membership Meeting, Little Ferry NJ. ❖

Book Review

## Searching for Extraterrestrial Intelligence: SETI Past, Present, and Future

Reviewed by Keith Cooper

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**Editor:** H Paul Shuch

**Publisher:** Springer-Praxis

**ISBN:**978-3-642-13195-0

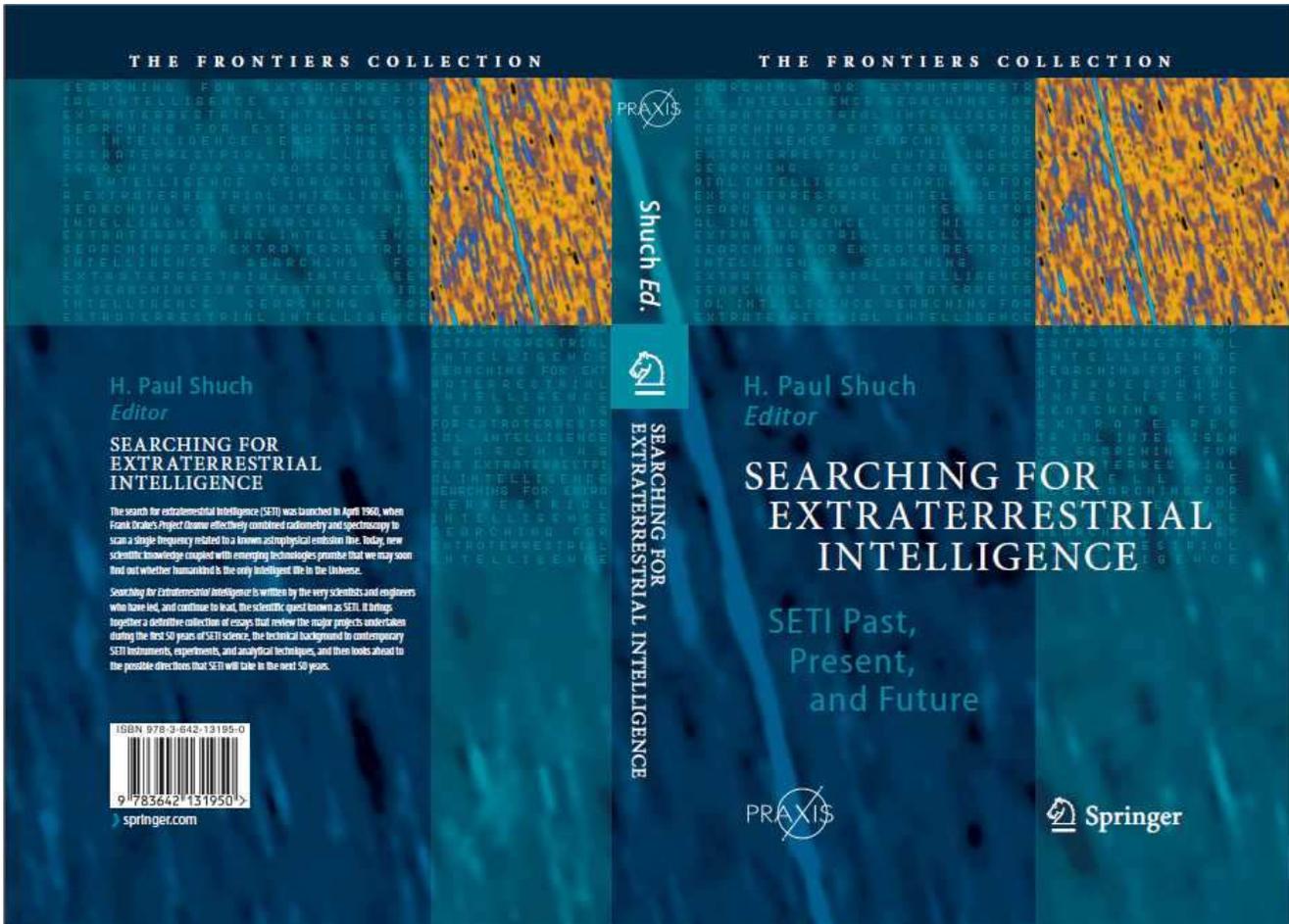
**Price:** £53.95 (Hb) 538pp

Among the books on my desk at home is a copy of Iosif Shklovskii and Carl Sagan's Intelligent Life in the Universe, which was the first ever popular science book published about SETI, in 1966. It is fascinating to see how much has changed, and how much hasn't changed, with the arrival of this hefty tome nearly half a century later. Edited by the SETI League's H Paul Shuch, SETI: Past Present and Future features essays, articles and technical treatises from 26 experts in the field, including the SETI Institute's Jill Tarter and Seth Shostak, former head of NASA's SETI programme John Billingham, astronomer Claudio Maccone, science fiction writers David Brin and Stephen Baxter, anthropologist Kathryn Denning, and many others.

The book is split into three sections: 'The Spirit of SETI Past', 'The Spirit of SETI Present' and 'The Spirit of SETI Future'. A few of the chapters are highly technical and mathematical, but the vast majority are accessible to the intelligent layman. As Shuch says in his preface, "We, the authors, invite you to seek your own level of comfort, and then to challenge yourself, to reach beyond it."

Some chapters have been published elsewhere, but most are new (to this reviewer). The best chapters include overviews of Project Cyclops and the mystery of the 'Wow!' signal by the man who discovered it; excellent pieces about the SETI League's Project Argus and how amateurs can create their own network of radio telescopes; a remarkable history of SETI at NASA by John Billingham; controversial (to some) passages by Alexander Zaitsev on messaging extraterrestrial civilisations; cultural aspects on SETI by Shostak, Denning and Brin; and a delightful surprise in the final pages with a lost letter by one of the founding fathers of the field, the late Philip Morrison.

It's pricey, but if you have a serious interest in SETI, this book provides the wide, eye-opening overview that other books lack. A must buy.





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SearchLites Volume 17 No. 3, Summer 2011  
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 2010 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 <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/c)* | (o)* |
|---|--------|------|
| Pocket protectors   | \$ 3   | \$ 4 |
| Mouse pads  | \$ 5   | \$ 7 |
| <i>Tune In The Universe! (CD-ROM)</i>   | \$25   | \$30 |
| <i>Proceedings of SETICon01</i>   | \$20   | \$27 |
| <i>Proceedings of SETICon02</i>   | \$20   | \$27 |
| <i>Proceedings of SETICon03 (CD)</i>  | \$15   | \$17 |
| <i>Proceedings of EuroSETI04 (CD)</i>   | \$15   | \$17 |
| <i>Proceedings of SETICon04(CD)</i>   | \$15   | \$17 |
| SARA Conference Proceedings:  |        |      |
| 2006, 2007, 2008, 2009 (specify)  | \$20   | \$27 |
| <i>SETI League Technical Manual (CD)</i>  | \$10   | \$13 |
| <i>Project Cyclops 2<sup>nd</sup> Edition</i>   | \$20   | \$30 |
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