



SearchLites

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The Quarterly Newsletter of The SETI League, Inc.

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SETI League Member Elected to International Leadership Post

Space scientist Dr. Claudio Maccone of Italy was recently elected Chair of the International Academy of Astronautics (IAA) SETI Permanent Committee. Maccone, a longtime member of The SETI League, Inc., nonprofit leaders in a global Search for Extra-Terrestrial Intelligence, has served as a Co-Vice-Chair this committee for the past decade. A highly respected member of the international scientific community, Maccone also serves as Technical Director of the IAA.

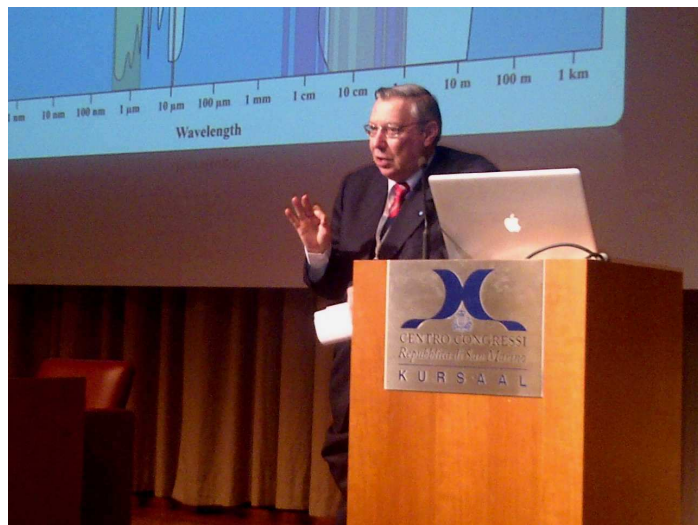
Founded in 1960 and recognized by the United Nations in 1996, the IAA is an independent international community of leading experts committed to expanding the frontiers of space. Its 1200 members worldwide are devoted to fostering the development of astronautics for peaceful purposes, recognizing individuals who have distinguished themselves in a branch of science or technology related to astronautics, and providing a program through which the membership can contribute to international endeavors in the advancement of aerospace science.

SETI is an acronym for the Search for Extraterrestrial Intelligence. The primary goal of the IAA Permanent SETI Committee is to examine all aspects of possible future contact with extraterrestrial civilizations, with special reference to international issues and activities. These aspects include technical efforts to find evidence for extraterrestrial intelligence, as well as the social consequences of such a discovery. In addition, the Committee promotes the interest and eventual involvement of students in its work, primarily through education initiatives, the Internet, and the mass media.

"I have known Claudio for many years," notes SETI League executive director emeritus H. Paul Shuch, "and have always been impressed by his energy, enthusiasm, and dedication to the scientific Search for Extraterrestrial Intelligence. He has honed his skills in his years of service both to the Academy, and to the grass-roots SETI League. His fluency in many languages (including English, French, Italian, and Mathematics) is a definite asset. His leadership abilities will be crucial in moving our Committee forward." Shuch, who resides in the USA, was also elected to serve as Maccone's Vice-Chair, and volunteers as Webmaster for the Committee's public website, <http://iaaseti.org>. Both Maccone and Shuch are full members of the IAA.

In support of the Academy's advisory role to the United Nations, the Committee has for decades developed international protocols for activities to be undertaken in the event of verified extraterrestrial contact. One of Maccone's challenges will be to promote adoption by the IAA, and eventually the UN, of the Committee's most recent update to these post-detection protocols.

Dr. Maccone lecturing at the IAA Searching for Life Signatures conference in the Republic of San Marino, September 2012.



Guest Editorial:

Rummaging in the Data

by Paul Gilster

from his *Centauri Dreams* blog, used by permission

Astronomy is moving at a clip that sees more data accumulated than can possibly be examined at the time they're collected. We're creating vast storehouses of information that can be approached from various angles of study. Now ponder how we might use these data for purposes beyond what they were collected for. In a new paper submitted to the *Astronomical Journal*, Ermanno Borra (Université Laval, Québec) looks at how standard astronomical spectra -- including those already taken -- can be used as part of SETI, the Search for Extraterrestrial Intelligence.

Here's the idea: Suppose somewhere out there a civilization decides to reveal its existence to the rest of the galaxy. These extraterrestrials reason from their own experience of science that an advanced civilization will study the sky and take spectra of astronomical objects. These spectra become the medium upon which the senders impose their signal. At our end, spectroscopic surveys of vast numbers of stars allow us to accumulate data that may contain evidence of an unusual signal, a spectrum deliberately crafted to be so striking that it calls attention to itself.

How to create the signal? Through modulating the spectrum by sending short bursts of laser light, an idea Borra addressed in a 2010 paper, as discussed again in this one:

Borra (2010) shows that periodic time variations of the intensity signal originating from a pulsating source modulate its frequency spectrum with periodic structures. Periodic time variations of the intensity signal originating from a pulsating source with periods between 10^{-10} and 10^{-15} seconds would modulate its spectrum with periodic structures detectable in standard astronomical spectra. Periods shorter than 10^{-10} seconds could be detected in high-resolution spectra. Note that the modulation is rigorously periodic in the frequency units spectrum but not in the wavelength units spectrum.

You can see the beauty of this proposition. We already have mountains of spectroscopic data acquired for other studies, data that can be analyzed visually or through Fourier transform software. Borra wants to make astronomers aware of this potential use for such data as a complement to existing optical SETI work carried out at sites like the Wyeth Telescope (Harvard/Smithsonian Oak Ridge Observatory) and the SERENDIP instrument at UC-Berkeley. The latter are cutting-edge projects, but with some limitations, the biggest being that they can observe only one object at a time. They also require either dedicated instruments or telescope time on standard telescopes, a limitation that a database hunt of earlier work surmounts.

Borra finds that the energy needed to generate the needed signals is feasible even for a civilization like ours --

he analyzes it in terms of current equipment by referencing diode-pumped laser technology similar to the Helios laser designed at Lawrence Livermore National Laboratory for inertial confinement fusion studies. The result: An isolated signal transmitted at 1000 light years (a sphere within which there are roughly a million stars) would be detectable with today's instruments. A spectroscopic survey like the Sloan Digital Sky Survey could find it.

By 'isolated' signal, Borra means a signal sent from a place distant enough from the home star so that the signal would not be directly superimposed on the spectrum of the star itself. The other case is a signal sent from the home planet, one that would therefore mix with the stellar spectrum. Now the signal becomes harder to detect because it is considerably weaker than the total energy of the stellar spectrum, requiring the extraterrestrial senders to resort to more powerful sources. Here Borra references the 2004 paper from which he drew the Helios comparisons:

...we can assume that, considering the Moore's law of laser technology, a more advanced civilization should have no trouble increasing the laser power by 2 to 3 orders magnitude making the signal readily detectable. For a solar-type star at 1000 ly the signal would then be comparable to the stellar background and thus easily detectable... The Moore law suggestion is intuitively justified by simply imagining how Howard et al. (2004) and the present article would have been received before the invention of the laser 60 years ago, when the signal would have had to be generated with light bulbs!

A Kardashev Type I civilization should be able to manage the power output to make its superimposed signal observable at nearby stars, but a Type II would be capable of harnessing all the energies available from its home star, making the production of such signals feasible for vast numbers of potential recipients. Because, as Jill Tarter has often commented, civilizations trying to contact us are likely to be more advanced technologically than we are, the possibility of finding such Type II civilization signals in astronomical spectra becomes an intriguing issue.

What's appealing about Borra's approach is its sheer simplicity. The database-mining idea for SETI has a history in the literature going back to papers in 1977 (Zbigniew Paprotny) and 1980 (Daniel Whitmire and David Wright), who suggested searching for anomalous spectral lines originating from radioactive fissile waste material. Geoff Marcy and Amy Reines have carried out a search of 577 nearby stars looking for emission lines too narrow to be natural. Signal-finding algorithms incorporated into existing software can be used with present and future spectroscopic data to continue this hunt, all achieved, as Borra says, with a few lines of code.

Is a SETI signal to be found in our databases? The paper is Borra, "Searching for extraterrestrial intelligence signals in astronomical spectra, including existing data," accepted for publication by the *Astronomical Journal*.



SETI League Announces Annual Bruno Award

Rome, Italy., 29 September 2012 -- The SETI League, Inc., nonprofit leaders in a global Search for Extra-Terrestrial Intelligence, has awarded its highest technical honor to physicist Dr. Gerry Harp, who serves as Director of SETI Research at the SETI Institute in Mountain View, California. Harp was today presented with the SETI League's annual Giordano Bruno Memorial Award during a brief ceremony in front of the Giordano Bruno statue at Campo de' Fiori, Rome, Italy.

Harp is a late-comer to astronomy, having started his career in surface physics and thin film magnetism. He has expertise in semiconductors, magnetic materials, and low dimensional systems. In this part of his career, he learned a great deal about quantum mechanics, diffraction and holography, and his thesis topic was on the development of a new kind of electron holography to obtain 3D pictures of atoms. Nowadays, making pictures of atoms is relatively easy thanks to the Scanning Tunneling Microscope.

Trained as a quantum mechanic, Harp has been exploiting the possibilities of using the multiple antennas of the SETI Institute's Allen Telescope Array (ATA) to generate beams on the sky - beams that could be far smaller than any single antenna could produce. He has undertaken many studies on beam formation, including the Array's ability to produce "negative" beams - useful for cancelling out, or rejecting, signals from such man-made noise makers as telecommunications satellites and the on-site, observatory computers.

The Bruno Award honors the memory of Giordano Bruno, the Italian monk burned at the stake in 1600 for postulating a multitude of inhabited worlds. It is presented annually by the grassroots SETI League, to a person or persons making significant technical contributions to the art and science of SETI. Harp is the nineteenth recipient of the Bruno award since it was established at a 1995 meeting of the American Association for the Advancement of Science. The statue in front of which this year's presentation was made stands on the site of Bruno's execution more than four centuries ago.

While detection of a signal from an extraterrestrial society is a dramatic prospect, Harp points out that the ATA is pushing the envelope for radio astronomy. It's not just a new instrument for cosmic research; it's revolutionary. Lately, he has turned to the problem of making images with radio data, and he's very interested in "imaging SETI," which can extract thousands of times as much information from radio telescopes as more conventional SETI processing.

Largely using radio telescopes and optical telescopes, SETI scientists seek to determine whether humankind is alone in the universe. Since Congress terminated NASA's SETI funding in 1993, The SETI League and other scientific groups have privatized the research. Amateur and professional scientists interested in participating in the search for intelligent alien life, and citizens wishing to help support it, should email join_at_setileague_dot_org, check the SETI League Web site at <http://www.setileague.org/>, send a fax to +1 (201) 641-1771, or contact The SETI League, Inc. membership hotline at +1 (800) TAU-SETI. Be sure to provide us with a postal address to which we will mail further information. The SETI League, Inc. is a membership-supported, non-profit [501(c)(3)], educational and scientific corporation dedicated to the scientific Search for Extra-Terrestrial Intelligence.



Dr. Jerry Harp receiving his Giordano Bruno Memorial Award from SETI League executive director emeritus H. Paul Shuch, in Campo di Fiori, Rome, Italy, at the foot of the Bruno monument.



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 15 - 17, 2013: Boskone 50, Boston MA.

March 15 - 17, 2013: Lunacon 2013, Rye Brook NY.

March 16, 2013: 38th annual Trenton Computer Festival, The College of New Jersey, Ewing NJ.

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.

May 21 - 23, 2013: *Spacecraft Technology Expo*, Long Beach CA.

May 24 - 27, 2013: *Balticon 47*, Hunt Valley, MD.

August 29 - September 2, 2013: *Lonestarcon 3*, 71st World Science Fiction Convention, San Antonio TX.

September 23 - 27, 2013: *64th International Astronautical Congress*, Beijing, China.

November 8 - 10, 2013: *Philcon 2013*, Cherry Hill, NJ.

April 19, 2014, 0000 UTC - 2359 UTC: Fifteenth 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: Twentieth SETI League *Annual Membership Meeting*, Little Ferry NJ.

August 14 - 18 August, 2014: *Loncon3*, 72nd World Science Fiction Convention, London, England.

September 29 - October 3, 2014: *65th International Astronautical Congress*, Toronto, Canada.

April 18, 2015, 0000 UTC - 2359 UTC:: Sixteenth annual SETI League *Ham Radio QSO Party*: 3.551, 7.0309, 7.2039, 14.084, 14.204, 21.306, and 28.408 MHz.

April 19, 2015: Twenty First SETI League *Annual Membership Meeting*, Little Ferry NJ.

October 2015 (dates to be announced): *66th International Astronautical Congress*, Jerusalem, Israel.



^ In Central Italy this past October, SETI League regional coordinator Stephane Dumas studies the geological evidence that first supported the currently accepted theory for the extinction of the dinosaurs (and most other life on Earth). The abrupt change in coloration of the striations at the K-T boundary is compelling evidence of global climate change, resulting from a massive meteor impact some 65 million years ago.



^ Geologist and SETI League member Lori Walton displays rocks from just before (light colored sample) and just after (dark colored sample) the meteor impact that changed Earth's global climate some 65 million years ago. These samples were collected during a recent visit by SETI scientists to the discovery site in Italy. Coincidentally, the ring she is wearing in this picture contains a meteorite fragment.

<< In October at the K-T discovery site in Italy, Claudio Maccone lectures a group of 17 SETI scientists about the geological evidence of a meteor impact, supporting the prevailing theory surrounding the mass extinctions 65 million years ago.



Book Review:

Mathematical SETI:

Statistics, Signal Processing, Space Missions
by Claudio Maccone

Springer Praxis Books, 2012 [Hardcover]

ISBN: 978-3642274367

724 p. 109 illus., 60 in color.

\$169 US

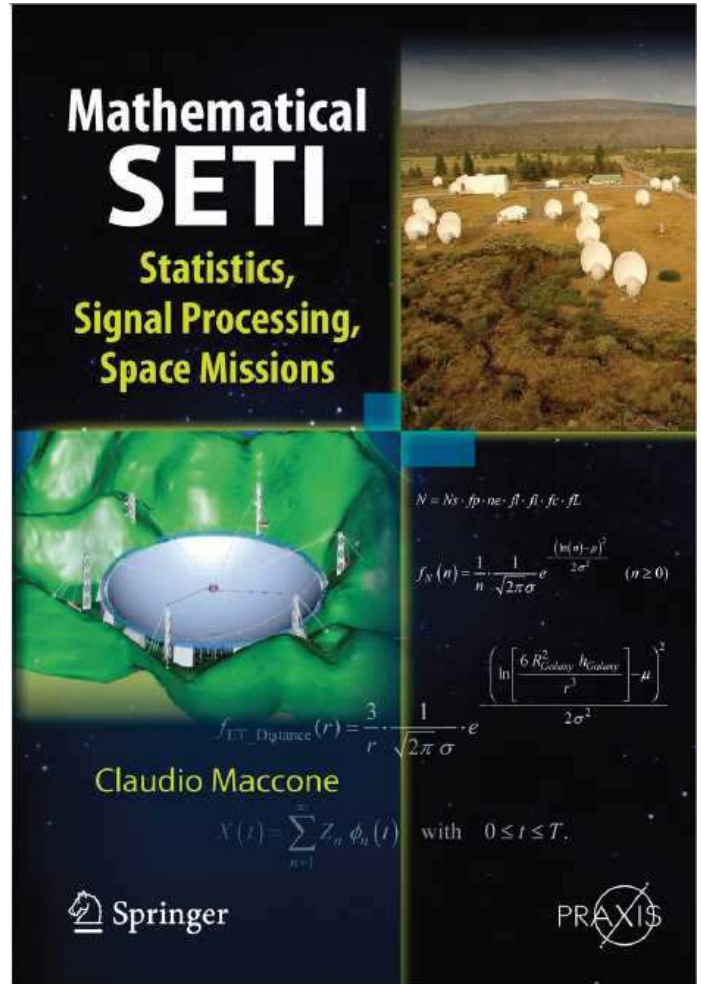
In this new book, SETI League member Claudio Maccone (a former recipient of our Giordano Bruno Memorial Award) introduces the Statistical Drake Equation where, from a simple product of seven positive numbers, the Drake Equation is turned into the product of seven positive random variables. The mathematical consequences of this transformation are demonstrated and it is proven that the new random variable N for the number of communicating civilizations in the Galaxy must follow the lognormal probability distribution when the number of factors in the Drake equation is allowed to increase at will.

Mathematical SETI also studies the proposed FOCAL (Fast Outgoing Cyclopean Astronomical Lens) space mission to the nearest Sun Focal Sphere at 550 AU and describes its consequences for future interstellar precursor missions and truly interstellar missions. In addition the author shows how SETI signal processing may be dramatically improved by use of the Karhunen-Loève Transform (KLT) rather than Fast Fourier Transform (FFT).

Finally, Maccone describes the efforts made to persuade the United Nations to make the central part of the Moon Far Side a UN-protected zone, in order to preserve the unique radio noise-free environment for future scientific use.

- The first book to include a full mathematical derivation of the Statistical Drake Equation and describe its many applications
- Demonstrates high level mathematical techniques for the solution of a variety of SETI problems
- Describes how use of the Karhunen-Loeve Transform leads to a dramatic improvement in SETI signal processing
- Discusses important topics of current SETI research relating to exoplanet searches and civilizations within the Galaxy

At the 2012 International Astronautical Congress in Naples, Italy in October, SETI League executive director emeritus H. Paul Shuch delivered the opening talk of the SETI Science and Technology session. >>



^ Appropriately, Maccone's new book was first introduced at the International Academy of Astronautics' *Searching for Life Signatures* conference, in the Republic of San Marino last September.



Photo Gallery



In Italy in late August, the Moon Walker's Jazz Band gave a concert dedicated to the memory of Neil Armstrong, who recently departed from Earth for the last time.

Adriano Autino photo



Last October in Italy, six SETI League members held an impromptu meeting in front of the Small Radio Telescope at the Medicina radio astronomy facility. Seen here (left to right) are Lori Walton, Stephane Dumas, H. Paul Shuch, Claudio Maccone, Greg Matloff, and Stelio Montebugnoli.



The once proud dish at Project Argus station FN11lh lies against the ground, in the aftermath of Hurricane Sandy's recent assault on the Northeastern US.



At the October, 2012 International Astronautical Congress in Naples, Italy, 24 enthusiasts gathered at a local restaurant for the annual no-host SETI dinner.



^ Among the respectable turnout at the September 2012 IAA Searching for Life Signatures conference in San Marino were half a dozen SETI League members. Two of them can be identified by their t-shirts.

^ *Francesco Brigante photo*



^ SETI League regional coordinator Stephane Dumas discussed a fast implementation of the Karhunen Loeve Transform (KLT), at the San Marino conference.

Portal of entry into the tiny Republic of San Mario, site of the September 2012 IAA SETI conference. >>





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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 2012 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.

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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:

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<i>Proceedings of SETICon02</i>	\$20	\$27
<i>Proceedings of SETICon03 (CD)</i>	\$15	\$17
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2006, 2007, 2008, 2009 (specify)	\$20	\$27
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<i>Project Cyclops 2nd Edition</i>	\$20	\$30
<i>The Listeners</i> by James Gunn	\$15	\$21
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<i>Sing More Songs of SETI (Songbook)</i>	\$10	\$13
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<i>Demented! (music CD)</i>	\$15	\$17
T-shirts, specify M, L, or XL	\$15	\$22
SETI Nerd Gift Set (one each Mouse Pad, Pocket Protector, <i>Project Cyclops</i> and <i>Tech Manual</i>) at 20% Savings to <u>Members Only</u> :	\$30	\$43

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