



SearchLites

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The Quarterly Newsletter of The SETI League, Inc.

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Alpha Centauri, Here We Come

by Paul Gilster, Tau Zero Foundation

I'm always fascinated with the way the media handle nearby stars and the planets that may orbit them, especially as our inventory of confirmed planets continues to grow. A recent National Geographic television special is a case in point. The show's graphics were superb, its narration gripping. But how puzzling to run into a fundamental misunderstanding about our nearest stellar neighbors.

In "Journey to the Edge of the Universe," putative travelers have moved out through the Solar System, passing (an ingenious touch) the various probes and artifacts we humans have scattered from Mercury out to the Kuiper Belt. As we move to the nearest stars, we pass what is obviously the red dwarf Proxima Centauri and make for the binaries Centauri A and B. Describing them, the narrator says, "Not one but three stars, spinning around each other locked in a celestial standoff, each star's gravity attracting the other, their blazing orbital speed keeping them apart."

And then this: "Get between them and we'd be vaporized."

Not a chance. We don't yet know whether there are planets around Centauri A or B. But we do know that there are stable orbits around these stars, and that both of them could have planets in the habitable zone, where liquid water can flow on the surface. Their mean separation is 23 AU. There is, in other words, plenty of room between Centauri A and B for a spacecraft to move without danger of being vaporized. I feel like I'm nitpicking given the intense effort that went into this production, but it seems important to clear up misconceptions that are widely distributed.

As with the show's treatment of Gliese 581 c. The National Geographic special shows the planet as a living world of continents and oceans, and indeed, the discovery announcement made it appear that 581 c was squarely in the habitable zone of this tiny red dwarf. But almost every subsequent study has shown this to be deeply unlikely - conditions on Gliese 581 c are probably much more like Venus than Earth. Moreover, although the show depicted the planet as rotating, so that the day/night terminator continued to shift, it's much more likely that this planet is tidally locked to its primary, one side always facing the star.

So, the initial euphoria about Gliese 581 c being "Earthlike" quickly gave way to skepticism. Indeed, if there is a habitable planet in the GL 581 system, it may (just possibly) be GL 581 d. If the media continue to get it wrong, let's hope science gets it right.

This column is excerpted from material that first appeared in the author's blog on the Centauri Dreams website, and is used here by the kind permission of the author. ❖

Remembering:

**SETI Patriarch Giuseppe Cocconi
(1914-2008)**

courtesy of CERN

(European Centre for Nuclear Research)

Giuseppe Cocconi, a central figure in particle physics and cosmic rays, passed away on 9 November, at age 94.

Even thirty years after his official retirement, he would regularly come to CERN to discuss the physics he loved. We were so used to meeting him as he made his way through CERN, that a feeling of loneliness has taken us all.

Born and raised in Como, it was there that Giuseppe first developed his passion for astronomy. As a teenager he used to observe and measure the night sky with the simple tools available to him, and it was this very direct approach that later became his characteristic style of research.

Following the advice of a friend and fellow astronomer, Giuseppe went to study physics at Milan University. Shortly after completing his university studies Giuseppe was invited by Edoardo Amaldi to go to Rome in February 1938 and spend six months at the Institute of Physics. There Giuseppe met Enrico Fermi, Gilberto Bernardini, who was later the first Director of Research at CERN, and others who had just started working in the field of cosmic rays. With Fermi in particular, Giuseppe worked on the construction of a Wilson chamber to study meson decay modes. Giuseppe often recalled how lucky he had been to share the laboratory with Fermi, and enjoyed telling us about him and about Maiorana who mysteriously disappeared while Giuseppe was in Rome. The Wilson chamber was finally completed in Milan.

In August 1938 Giuseppe, back from Rome, laid the foundations for research into cosmic rays in Milan. He worked with Geiger counters and cloud chambers at sea level and at Cervinia and Passo Sella, in the Alps, until 1942, when he was called to join the army to do infrared research work in Rome for the Italian Air Force.

It was in Milan that Giuseppe met Vanna Tongiorgi, a student who chose cosmic rays as the subject for her thesis and Giuseppe was her supervisor. They co-authored a first paper in 1939 on the nature of secondary radiation in cosmic rays. They married in 1945 and formed, for more than fifty years, an extraordinary couple. They both loved physics, fine arts and sports, in particular skiing and walking in the mountains.

In 1942, only five years after getting his Laurea (degree), he was appointed Professor at Catania University, a post which he only managed to take up at the end of 1944, due to the fighting during WW2. Giuseppe always talked with great pleasure of the people he met, and the cosmic ray work at Catania.

His most relevant work during his time in Italy was on extended cosmic ray showers. It was his initial work into this high-energy phenomenon that paved the way for research in this field for years to come.

In 1947 Giuseppe accepted an offer from Hans Bethe for a position at Cornell University. Giuseppe remained at Cornell as a full professor until 1963. Together with Vanna, he per-

formed various cosmic ray experiments at the university, and at Echo Lake in the Rocky Mountains. Two results emerged from this research: his observation of neutrons as one of the cosmic radiation components, with the accompanying phenomenon now known as spallation, and the proof of the existence of extensive showers, some of them of very high energy hinting at galactic, and even extragalactic, origins.

Giuseppe enjoyed his work at Cornell. The exchanges he had with the theoreticians were very friendly and stimulating. He wrote his most widely known paper with Philip Morrison, which was published by *Nature* in September 1959 (it was written at CERN at a time both were visiting). In this paper they showed that the best frequency to search for signals from intelligent extraterrestrials is 1420 MHz, corresponding to the 21-centimeter line of neutral hydrogen. The Search for Extra-Terrestrial Intelligence (SETI) based on the Cocconi-Morrison paper is still going on today.

During sabbatical leave (1959-61) at CERN, Giuseppe contributed to setting up the experimental programme for the PS, which came into operation in November 1959. He performed a series of measurements on proton-proton elastic and inelastic scattering and proton-nuclei total cross-sections. Back in the USA he continued this programme at the BNL accelerator to measure large angle scattering for two more years.

In 1963 Giuseppe and Vanna joined CERN. He, Alan Wetherell, Bert Diddens and others, formed a group working at the PS on proton-proton scattering. They found that the slope of the diffraction peak shrinks with energy, a phenomenon which was soon interpreted as a manifestation of the exchange of Regge-poles (the so-called pomeron!).

Giuseppe became CERN Director of Research in 1967, and held the position until 1969. At the end of the 60s he was enthusiastic about the perspective promised by the Intersecting Storage Rings, and his group joined forces with a group from Rome to study small angle proton-proton scattering with the technology that later became known as 'Roman pots'. He would hand-build the delicate hodoscopes made of tiny scintillators, and spend hours with PhD students in the ISR tunnel to align them. Thus came the discovery of the rising with energy of the proton-proton cross-section, something which for most people came as a complete surprise, showing that the proton expands with energy, and the correlated discovery that the nuclear-Coulomb interference becomes positive at high energy (as predicted by dispersion relations).

Later Giuseppe and the CERN-Rome collaboration decided to move to neutrino physics. Together with the group led by Klaus Winter, they formed the CERN-Hamburg-Amsterdam-Rome collaboration (CHARM) that built a marble calorimeter and ran the CERN neutrino beam until the beginning of the 80s. Giuseppe became very knowledgeable in the field of neutral and charged current interactions. He was especially interested in the delicate measurement of the elastic scattering of neutrinos on electrons.

After retirement in 1979, Giuseppe maintained an active interest in the experimental work going on at CERN and in the progress of the new accelerators. At same time he followed the progress in the field of cosmic rays and astrophysics. He had a

privileged relationship with his theorist friends, and the CERN library recorded him as one of the most demanding users.

Giuseppe enjoyed the respect of great physicists in the world. As a man of culture and vision, he was very curious and attentive to what was going on in the world, and not only in the field of physics. Very kind and always ready to listen, straightforward but humble in his relations with his colleagues, always ready to admire other people's success, he was happy to share his knowledge with juniors. His refusal of association with academies, and his lack of interest in prizes and honours, as well as his wish not to talk publicly, after his retirement, of his scientific life, are well known. He was a great physicist.

We miss his precious friendship. We share our sorrow with his children Anna and Alan and the whole family whom he loved.

Physicist, science fiction author, and IAA SETI Committee member Richard Carrigan adds this personal remembrance:

Cocconi and I shared a field of research in high energy physics, small angle elastic scattering. I remember showing him around the Meson Laboratory at Fermilab when it was still under construction in the early seventies. As I recall Cocconi was concerned to see some small frogs stuck in a new tunnel and wanted to save them. A charming man. ❖

Guest Editorial

The Case for Extraterrestrial Beacons

by Bob Krekorian

Former NASA SETI Signal Detection Analyst

The NASA Astrobiology Conference in April, 2008 had as one of its topics, Future SETI: Technologies, Techniques and Strategies. Its premise is that after five decades of negative results from radio and optical SETI searches, there should be new approaches to the problem like detecting the biosignature of an extrasolar planet. This premise regarding SETI is not supported by reality.

The search for an extraterrestrial civilization is one of the most intellectually stimulating and potentially rewarding pursuits open to humanity. As we approach five decades since the 1959 groundbreaking paper by Giuseppe Cocconi and Philip Morrison, *Searching for Interstellar Communications*, much discussion has taken place on how to detect interstellar signals. In actual fact, very little systematic exploration has been performed. The NASA SETI project and the use of the NASA targeted SETI signal processing equipment by a private organization over a ten year period was especially disappointing in what it accomplished.

Many ideas have been put forward speculating on the existence of extraterrestrial civilizations, their number in the galaxy and their longevity. For those civilizations that become technological and do not self destruct, it is reasonable to assume that some number reach long lifetimes and are still scientifically curious. An interstellar beacon, which has as its sole purpose communication with other contemporary technological civilizations in the galaxy, is quite plausible under these circumstances.

What would be the motivation to construct such a beacon? Perhaps there is an altruistic code in the galaxy to preserve the history of all civilizations, past and present? Perhaps there would be interest in contacting new technological civilizations like us, knowing that there is a time window (hundreds of years) after the discovery of radio when some societies disintegrate because of sociological and environmental factors. In all likelihood, we would not be the first civilization that they have made contact with, thus finding one could be the gateway to many contacts. What could they expect to learn from finding one more? They may know a lot and have great understanding of science but the Earth's civilization with its unique biology and history will be a new one for them to put into the larger context of life in the universe. Maybe they will ask for pictures and sounds from our culture? Maybe they will ask for detailed data on our solar system? This seems far more practicable and feasible than sending out an armada of space-ships to explore other star systems. In a way, we would be their interstellar space probes.

There is another possibility in the quest to find an extraterrestrial technological civilization. Might we detect their internal communication signals (leakage), like our TV or radar? This seems like an almost hopeless proposition and is beyond our current technological capabilities. Let twenty second century SETI researchers work on detecting leakage, should our efforts in this century prove fruitless.

When one considers all the concatenated probabilities connected with the formation of planet Earth, its composition, its stable environment over geological timescales that allowed complex life to flourish, the inescapable conclusion is that millions of sun-like stars will have to be examined to find one that is transmitting an artificial signal. That means the search volume of space could extend from one to two thousand light years. The NASA Kepler Mission, which is scheduled for launch in 2009, will for the first time give us hard empirical data on the number of Earth-like planets in habitable zones, their orbital stability in multiple star systems, and the types of stars that have them. This will be quite important in bounding the SETI search space.

Recently, the NASA Astrobiology Institute sponsored studies of M stars as potential sites where complex lifeforms could exist. Even though M stars comprise about two thirds of all stars in the galaxy, which makes them attractive from a numbers standpoint, they are however poor candidates as SETI targets for the following reason.

M type stars have an effective temperature of 1/2 and a radius of 1/3 that of our Sun. Using a basic model, one can calculate the habitable zone, the annulus around a star in which stellar flux is sufficient to allow liquid water to exist. This puts the M star planet at about 0.1 AU and it may well be tidally locked.

There are a multitude of reasons why biology, let alone a technological civilization, would be ill-suited to exist on such a planet. Imagine a tidally locked Earth orbiting a M star where half the Earth, say from 0 to 180 degrees west longitude, is in perpetual darkness and permanently frozen down to 200 degrees below zero centigrade. I trust none of us would be living in California.

If a targeted search is the strategy of choice and detection sensitivity is essential, a targeted search of millions of stars would take centuries to complete. And even if one of these stars is indeed broadcasting, detection could be missed because our detection sensitivity was just not good enough, or interstellar scintillation degraded the signal during the observation time frame, or the observation is not coincident with the duty cycle of the beacon, or we are not sensitive to the particular type of signal structure being transmitted.

Based on the above considerations, it is logical (logic flows from causality) to expect that our galactic colleagues will make the detection problem for the contact as simple and straightforward as possible. Universality of the laws of physics and the logic of mathematics will govern their strategy to maximize the probability of detection.

My own career with the NASA SETI project included 15 years working with Dr. Kent Cullers, the leading expert in the world on SETI signal detection. I never did stop working on the detection problem. During the 1990's, I organized a team to construct a radio telescope dedicated to SETI research. The team included Professor Frank Drake.

When I was with the NASA SETI project, one of the scientists told us that there really has not been a new idea with SETI in the last twenty years. Maybe this will all change? I have come up with new thinking in how the interstellar communication link would be achieved. Something has been overlooked. If my ideas are scientifically sound, it is quite possible to make a detection within a decade using existing telescopes and signal processing capabilities.

The expectation is that the contact/acquisition signal will be an address (pointer), like in the C programming language. It will direct contactees to where the actual communication channel is located. The exact frequency channel of the beacon transmitter may be known. Our astronomical capabilities might be insufficient to receive the text of the extraterrestrial transmission.

The charter of NASA includes a statement, the expansion of human knowledge of phenomena in the atmosphere and space. Some of us who were with NASA for the SETI inauguration on Oct 12, 1992 (500th anniversary of Columbus discovering the Americas) remember the worldwide interest and excitement created by what the agency was doing. Can we not rekindle this exploration spirit with a new generation of Americans?

NASA already has in place many of the resources needed to begin the search. The NASA SETI project was based on the 1977 NASA SP-419 report. See the conclusions from the report [NASA sp-419] which are still valid today. The 1993 congressional mandate to end United States funding for SETI is no longer in effect. Proposals for SETI grants are now being accepted by NASA and the NSF, but NASA is the proper federal agency to carry out a comprehensive search. The agency should form a small exploratory group, uninhibited by past orthodoxy, and take a fresh look at the search for extraterrestrial intelligence.

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. ❖

Book Review:

Extrasolar Planets and Astrobiology by Caleb Scharf (University Science Books, 2008) reviewed by Paul Gilster

Caleb Scharf is director of the Columbia Astrobiology Center. His new book is designed for university courses on the subject, with extensive background not only in the relevant physics and mathematics, but also in chemistry, biology and geophysics, studies the multi-faceted world of astrobiology melds into a complex whole.

The book is actually based on the upper-level course Scharf has been teaching at Columbia. The author tells me in an e-mail that his intent is specifically to reach students serious about moving into the discipline: "The aim is to provide the basis for students to gain a real understanding of how to actually do research on exoplanets, as well as some of the broader science encompassed by astrobiology." Making the point are the exercises designed for each chapter to draw newcomers into research and provide examples for calculation. I also want to mention the book's online component, where news items are cross-referenced with the book.

And I like what planet-hunter Geoff Marcy has to say in his foreword, especially in its hint of long-term interstellar travel:

For the future, NASA and the Jet Propulsion Laboratory have developed the Space Interferometry Mission that will use the interference of light waves gathered by a spaceborne pair of telescopes to detect earth-like planets, and measure their masses, around nearby stars. Just over the horizon are plans for a spaceborne telescope that blocks the glare of nearby stars, allowing us to take images of Earth-like planets and to determine their chemical composition from their spectra. Any worlds having oxygen atmospheres and surface oceans will smell fishy from 40 light years. This census of habitable earths will fill GoogleGalaxy with ports-of-call for our grandchildren who will send robotic probes and later themselves, at least those with extreme daring and patience. The urge to explore these new worlds comes from our anthropological roots at Olduvai Gorge two million years ago. What sets us apart from the stones and the stars is our insatiable desire to understand our kinship with both.

Nicely put, and I especially like that GoogleGalaxy bit, the updated and searchable version of the Encyclopedia Galactica. Scharf looks hard at how we study planet and star formation, how we observe exoplanets and undertake chemical and biological modeling. I'm glad to see that he does not claim definitive status for the book in a field as malleable as this, but treats astrobiology as an 'emerging interdisciplinary' - exactly the right phrase - while his audience is "...the student or researcher in astronomy or physics, or possibly someone from the geophysical, chemical, or biological sciences, looking for a deeper understanding of the 'astro' in astrobiology." Those looking for an astrobiology career will want *Extrasolar Planets and Astrobiology* on their shelves. ❖

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.

March 20 - 22, 2009: *Lunacon 2009*, Rye Brook, NY.
April 3 - 5, 2009: *Dr. SETI* to be Filk Guest of Honor at *I-Con 28*, Brentwood campus of Suffolk Community College, NY.
April 18, 2009, 0000 UTC - 2359 UTC: Tenth 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, 2009: Fifteenth *SETI League Annual Membership Meeting*, Little Ferry NJ.
April 24 - 25, 2009: 13th Annual *Southeastern VHF Conference*, Charlotte, NC.
April 24 - 26, 2009: 34th *Trenton Computer Festival*, Ewing NJ.
May 15 - 17, 2009: *Hamvention 2009*, Dayton OH.
May 22 - 25, 2009: *Balticon 43*, Hunt Valley, MD.
May 29 - 31, 2009: *Rochester Hamfest*, Rochester NY.
June 19 - 21, 2009: *Concertino '09*, Arlington, MA.
June 28 - July 1, 2009: *Society of Amateur Radio Astronomers Conference*, NRAO Green Bank WV.
July 1 - 5, 2009: *Dr. SETI* ® to perform at *Mensa Annual Gathering*, Pittsburgh, PA.
July 23 - 25, 2009: *Central States VHF Conference*, St. Charles IL.
August 6 - 10, 2009: *Anticipation*, 67th World Science Fiction Convention, Montreal, Quebec Canada.
September 4 - 6, 2009: *Fifth International Radio Astronomy Congress*, Heidelberg, Germany.
October 10 - 11, 2009: *AMSAT Space Symposium*, Baltimore, MD.
October 12 - 16, 2009: *60th International Astronautical Congress*, Daejeon, Korea.
October 23 - 24, 2009: *Microwave Update 2009*, Dallas, TX.
November 20 - 22, 2009: *Philcon 2009*, Cherry Hill, NJ.
April 17, 2010, 0000 UTC - 2359 UTC: Eleventh annual *SETI League Ham Radio QSO Party*: 3.551, 7.0309, 7.2039, 14.084, 14.204, 21.306, and 28.408 MHz.
June 4 - 6, 2010: *Rochester Hamfest*, Rochester NY.
June 2010 (dates TBA): *Society of Amateur Radio Astronomers Conference*, NRAO Green Bank WV.
September 2 - 6, 2010: *Aussiecon 4*, 68th World Science Fiction Convention, Melbourne Australia.
October 2010 (dates TBA): *61st International Astronautical Congress*, Prague, Czech Republic.
November 19 - 21, 2010: *Philcon 2010*, Cherry Hill, NJ.
October 2011 (proposed; dates and details TBA): *62nd International Astronautical Congress*, South Africa. ❖

Annual Meeting Notice

In accordance with Article IV, Section 1 of our duly approved Bylaws, the Trustees of The SETI League, Inc. hereby schedule our Fifteenth Annual Membership Meeting for 1 PM Eastern time on Sunday, April 19, 2009, at SETI League Headquarters, 433 Liberty Street, Little Ferry NJ 07643. Our office is located just two blocks north of Route 46 and one mile east of the Teterboro Airport, on the northwest corner of Liberty and Kinzley Streets.

We recommend that out-of-town members and guests flying in commercially use the Newark International Airport (EWR), which is about twenty minutes South of our office. There is a wide variety of hotels available at the Newark Airport. A rental car is recommended. From Newark, drive North on the New Jersey Turnpike to US Route 46 Westbound, cross over the Hackensack River, and two long blocks after the traffic circle, turn right onto Liberty Street.

Our members and guests using General Aviation are invited to use the Teterboro Airport (there *is* a landing fee). Of the half-dozen Fixed Base Operators offering transient parking, we recommend Atlantic Aviation (ask Ground Control for parking in the Atlantic Midfield). They should be able to assist you with ground transportation. Please coordinate your schedules and needs in advance through our secretary, Heather Wood.

As attendance by one percent of the League's membership constitutes a quorum, all members in good standing are encouraged to attend. The preliminary agenda for this meeting, per Bylaws Article XII, appears below.

Per Article IV, Section 3 our Bylaws, written or electronic notice of this Meeting is being provided to all members in good standing, not less than ten days nor more than ninety days prior to the meeting date. Members are encouraged to submit additional Old Business and New Business items for inclusion in the Agenda. Please email your agenda items to n6tx@setileague.org, not later than April 1, 2009.

The annual Board of Trustees Meeting required per Bylaws Article V, Section 3 will immediately follow the Membership Meeting. All SETI League members in good standing are welcome to attend.

Preliminary Agenda

- Call to Order
- Minutes of 2008 Membership Meeting
- Financial Report
- Committee Reports
- Old Business
- New Business
- Good and Welfare
- Adjournment

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SARA Announces 2009 Keynote Speaker

The Society of Amateur Radio Astronomers (SARA), a SETI League Affiliated Society that represents several hundred amateur radio astronomers around the world, is pleased to announce the selection of Dr. Jill Cornell Tarter, one of the world's best known and highly respected radio astronomers, as Keynote Speaker for its annual technical conference, being held from 28 June to 1 July 2009 at the National Radio Astronomy Observatory, Green Bank, WV. Dr. Tarter's presentation, titled "The Allen Telescope Array: The Newest Pitchfork For Exploring the Cosmic Haystack," is tentatively scheduled for Tuesday morning, 30 June 2009.

Dr. Tarter, who holds the Bernard M. Oliver Chair for SETI at the SETI Institute in Mountain View, CA, received her Bachelor of Engineering Physics Degree with Distinction from Cornell University, and her Master's Degree and a Ph.D. in Astronomy from the University of California, Berkeley. She served as Project Scientist for NASA's SETI program, the High Resolution Microwave Survey, and has conducted numerous observational programs at radio observatories worldwide. Since the termination of funding for NASA's SETI program in 1993, she has served in a leadership role to secure private funding to continue the exploratory science. Currently, she serves on the management board for the Allen Telescope Array, a joint project between the SETI Institute and the UC Berkeley Radio Astronomy Laboratory. When this innovative array of 350 6-m antennas begins operations at the UC's Hat Creek Radio Observatory, it will simultaneously survey the radio universe for known and unexpected sources of astrophysical emissions, and speed up the search for radio emissions from other distant technologies by orders of magnitude.

Tarter's work has brought her wide recognition in the scientific community, including the Lifetime Achievement Award from Women in Aerospace, two Public Service Medals from NASA, Chabot Observatory's Person of the Year award (1997), Women of Achievement Award in the Science and Technology category by the Women's Fund and the San Jose Mercury News (1998), and the Tesla Award of Technology at the Telluride Tech Festival (2001). She was elected an AAAS Fellow in 2002 and a California Academy of Sciences Fellow in 2003. In 2004 Time Magazine named her one of the Time 100 most influential people in the world, and in 2005 Tarter was awarded the Carl Sagan Prize for Science Popularization at Wonderfest, the biannual San Francisco Bay Area Festival of Science.

Tarter is deeply involved in the education of future citizens and scientists. In addition to her scientific leadership at NASA and SETI Institute, Tarter has been the Principal Investigator for two curriculum development projects funded by NSF, NASA, and others. The first, the Life in the Universe series, created 6 science teaching guides for grades 3-9 (published 1994-96). Her second project, Voyages Through Time, is an integrated high school science curriculum on the fundamental theme of evolution in six modules: Cosmic Evolution, Planetary Evolution, Origin of Life, Evolution of Life, Hominid Evolution and Evolution of Technology (published 2003). Tarter is a frequent speaker for science teacher meetings and at museums and science centers, bringing her commitment to

science and education to both teachers and the public. Many people are now familiar with her work as portrayed by Jodie Foster in the movie *Contact*.

At its 2009 gathering, Jill Tarter will be helping SARA to celebrate the club's 28th Anniversary. Members and guests are invited to participate in the annual Conference. Any SARA or SETI League member wishing to present a paper is invited to review SARA's 2009 Call for Papers. Further information about SARA can be found on their website, <http://radio-astronomy.org>. ❖



Dr. Jill Cornell Tarter, the 2009 SARA Keynote Speaker, poses amid a field of log-helix antennas at the Nancay Radio Observatory in France

New CD Available:



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5. Make a SETI Station from the Junk Behind Your Home (Shuch/Bill Sutton)
6. We Look at Starshine (Shuch/Jimmie Davis & Charles Mitchell)
7. The Green Bank Telescope (Shuch/Leslie Fish)
8. When They Build the ATA (Shuch/traditional)
9. Welcome, ETI (Shuch/Jack Segal & Evelyn Danzig)
10. Crazy (Shuch/Willie Nelson)
11. It Takes Time to Talk to ET (Shuch/Roger Bowling & Hal Bynum)
12. The Dish in Evpatoria (Shuch/traditional)

Bonus Track: NASA's Engineers (Shuch/Stan Rogers)

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All lyrics available online at www.setileague.org/songbook

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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 2008 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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Full Member	\$50 / yr
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Household Member (same address as a Full Member)	\$15 / yr
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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.

Pleased to Accept PayPal

The SETI League invites you to pay your membership dues and additional contributions via credit card, using the PayPal online payment system. Simply log on to www.paypal.com and specify that your payment be directed to paypal@setileague.org.

Order Your Membership Premiums:

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