SearchLites

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Don't Stop the Presses

By H. Paul Shuch, Executive Director Emeritus

Every decade or so, the SETI community is treated to a tantalizing (though inconclusive) hint that the existence proof we seek may indeed be within our grasp. Invariably, the popular press seizes upon incomplete information to increase circulation by prematurely announcing our success. In the 1960s, the discovery at CalTech of quasar CTA-102 was heralded as proof of extraterrestrial intelligence, until cooler heads prevailed and the true nature of the source was uncovered. In the 1970s, the Ohio State University "Wow!" signal was similarly exaggerated. In The SETI League's early days, the EQ Pegasi hoax (followed shortly by the Pearl Harbor Hoax) achieved their fifteen minutes of fame. Now, we're at it again with wild speculations about a single presumed detection associated with the star HD 164595.

The facts as I understand them are fairly straightforward. About a year and a half ago, our Russian colleagues used the RATAN-600 transit radio telescope to conduct a routine RF survey of the regions of the sky surrounding promising Kepler exoplanet locations. Using an extremely broadband receiver at a wavelength of 2.7 cm, their data revealed an extremely brief RF peak *somewhere* between 10.6 and 11.6 GHz. No spectral analysis was possible, so no Doppler velocity information could be inferred. The detection never repeated, nor was it duplicated at any other facility. End of story.

Last month, publicizing a paper to be presented at the upcoming International Astronautical Congress in Guadalajara, an email to members of the IAA SETI Committee referred to this possible detection. And, before we could say "X-files," the media was all over it with reports of extraterrestrials discovered just 94 light years away.

So, here is what I know: some sort of X-band radiation entered the telescope while it was scanning *in the general direction of* a known exoplanet. That doesn't mean the signal came from intelligence, or even necessarily from that planet; it merely entered the telescope. We get hits like this all the time, and usually trace them to satellite interference, or terrestrial RFI, or nearby microwave ovens or police Doppler radars. They are not SETI detections until either they repeat, or they are independently verified as such. No matter what conference agendas, article preprints, or the press may tell you. ❖

Guest Editorial

Arecibo Observatory: Translating Ripples in Spacetime into the Fabric of a Networked Sustainable Future for an Iconic Radio Telescope

by William F. Vartorella, Ph.D., C.B.C.
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Arecibo, in a very real sense, has spawned a science as revolutionary as Galileo's first observations with a rudimentary telescope. True to its purpose, it has sensed "ripples in spacetime," those mysterious, posited gravitational waves--the Holy Grail of Einstein's followers--that Albert Einstein predicted a century ago in his theory of general relativity. Arecibo Observatory, like space itself, needs to be flexible. This isn't about NSF's investigation of the "environmental impacts of potential Arecibo futures." To quote Galileo, "All truths are easy to understand once they are discovered; the point is to discover them." While NSF's universe is one of flattened budgets and "red-shifted" funding disappearing over some financial horizon, Arecibo's real challenge is to develop a new disruptive paradigm that addresses what scholars call the "cost-curve" of telescopes. U.S. $10 million—just less than NSF's and NASA's combined annual funding--is roughly the size and challenge of the Green Bank Radio Telescope's annual budget in West Virginia, another iconic 'scope seeking money and partners.

Yet the NASA funding to Arecibo at U.S. $3.7 million is part of the broader Earth defense of detecting potentially Earth-destroying asteroids and comets. Moreover, Arecibo's extraordinary facilities spearhead upper atmospheric research and the space environment to help us understand Climate Change. Ignoring its search for distant galaxies, signs of extraterrestrial life, and exoplanets, Arecibo serves as a cosmic oasis for some 20,000 students who visit it annually in debt-strangled Puerto Rico. Its STEM-related programs are hypercritical as Hispanic students are grossly underrepresented in the hard sciences. (See, for example, the Puerto Rico Space Grant Consortium.) The conundrum is that decommissioning Arecibo could cost some U.S. $100 million—which is roughly a decade's worth of current funding for telescope operations. U.S. $100 million is an achievable fundraising target for an endowment, particularly if Arecibo severs all ties and becomes a free-standing global Nongovernmental Organization (NGO). An endowment of U.S. $100 million would generate roughly U.S. $5 million in investment "interest" in a year—half the current Arecibo budget--which could be used as a creative "match" to attract long-term donors, corporate "underwriters," and green/science foundations worldwide.

Positioned with an aggressive grant-generating policy with an institutional overhead of 40% and U.S. $12 million in grants (cf. Arecibo's current NSF/NASA support levels) would yield nearly U.S. $5 million. In short, an endowment + grants' institutional overhead + asteroid and comet detection and Arecibo Observatory becomes self-sustaining. And, to take one example, the grants and "contract support" do not strictly have to focus on esoteric radio astronomy. As an emerging NGO, Arecibo could determine access, partners, and help set the agenda for broader global imperatives for radio telescopes. Lest we forget, radio telescopes worldwide are at risk—Green Bank, Very Long Baseline Array, Kitt Peak, Parkes Radio Telescope (Australia). The need here and what would potentially resonate with global donors is a "flagship initiative" in which Arecibo becomes the iconic face of radio astronomy, particularly in the "Global South."

With more than 100 radio telescopes worldwide that are or have been used for radio astronomy, these single dishes and interferometric arrays are uniquely positioned for funding, particularly as the "developing South" agitates for greater support, access, and prominence in Big Science. "Access" is fundable. Unfortunately, Arecibo is "prioritized" below other observatories such as Atacama Large Millimeter/Submillimeter Array. This needs to change. Arecibo is on the National Register of Historic Places and has potential as an UNESCO World Heritage Site, particularly as its restrictions on AM, FM, and TV transmissions within the four-mile access perimeter have effectively prevented intrusive development and negative impact on the flora and fauna of the nearby forests. Arecibo, in a very real sense, is a Sentinel, a canary in the coalmine of cosmic research and a guardian of local biodiversity. This underscores the potential for grants and donors and STEM research (and students and economic impact of 100,000 tourists per year).

NSF has listed five possible outcomes, ranging from continuing current operations to dismantling the telescope and returning the site to its natural state. What we advocate (and propose) here is a more creative approach-- a "thought experiment." We need to think through the consequences. NSF seems to take the position that this is Schrödinger's cat: that Arecibo is indeterminately alive or dead. Our thinking here is to quantify the event through live donors, what NSF has detailed as finding "partners." They are not Dark Matter. Examples abound

in the visual universe. Some high-profile, historic venues such as the Lowell Observatory have taken dramatic steps to ensure scientific and public access to new instruments (see, the Discovery Channel Telescope--DCT—a U.S. $53 million "fusion of research and outreach"). The Vatican's Advanced Technology Telescope (VATT) outside Tucson, Arizona has a strong "Friends" component (a model that should be followed by all existing `scopes of varying form and function), which apparently is developing, to borrow the words of Don Keel (co-author of Funding Exploration) a cadre of donors with connectedness (involvement with the observatory), clout (access to philanthropic sources and/or corporate leadership + influence with sources to which s/he has access), and capacity (identified ability to give). While most observatories would salivate over the "windfall" of the Gordon and Betty Moore Foundation grant to California Institute of Technology and the University of California (Oakland) for U.S. $7.5 million each over 15 months to complete the Thirty Meter Telescope, the grim reality is "Big Science" often requires a "Big Idea" with a "Big Supporter." Funding shortfalls aside, Paul Allen stepped up to create the Allen Telescope Array—a joint effort by the SETI Institute and the Radio Astronomy Laboratory at the University of California, Berkeley to construct a radio interferometer suitable for a multitude of observations, plus the search for "ET." Simply put, for public institutions, a "red shift" from "state-supported" (largely tax-based) model to "state-assisted," in which institutions, departments, and faculty compete for a diminishing number of Federal and largely-non-existent State dollars. What observatories such as Arecibo face is a combination of "donor fatigue," the lack of an urgent, compelling, interesting Case for Support capable of attracting New Economy money (entrepreneurial and risk-taking), and a systematic approach to competing for STEM grants (Science, Technology, Engineering, Mathematics).

With perhaps 50 defunct or nearly-so observatories dotting the landscape from the Midwestern cornfields to worldwide venues with exotic names such as Nizhny Novgorod (former Gorky) with its rusting relics of radio astronomy or Mohon del Trigo, Spain, whose facility was displaced by new observatories—radio and optical, it should come as little surprise that part of the expensive "red shift" in U.S. dollars have been replaced locally in the Far East, as the Asian Century ratchets into high gear. In Guizhou, China, FAST (Five Hundred Meter Aperture Spherical Telescope) is under construction with a projected completion date of late 2016. It is touted as the world's largest and most sensitive radio telescope—an estimated three times more sensitive than the Arecibo Observatory. (Operate at 300 MHz to 5.1 GHz).

Competition abounds. Yet, employing a decadal analysis, these corporate donors emerge for "Observatories, Planetariums, Physics, Astronomy"—Fireman's Fund Insurance Co., Genentech, Inc., Norton Co., Sedgwick, James, Inc., Toshiba America Foundation, Phillips Petroleum Foundation, Allied Signal, ARCO Chemical, Barnes Aerospace, Beech Aerospace, Boeing, EG&G Aerospace, Grimes Aerospace Foundation, Kaman Aerospace Corp. Giving Program, Sundstrand Corp. Aerospace Foundation, and Toyota USA (also active in STEM), etc. Scientific organizations are also potential funding sources, especially as companies such as Air France, Nestle, Unilever, Union Bank of Switzerland, and a host of mineral extraction, pharmaceuticals, and shipping companies support some arcane and typically low-profile academic societies. The same is true on the "mentorship" front: BP America, Michelin No. America, Beretta Corp., CIBA-GEIGY Corp., Glaxo Wellcome Foundation—name changes are relatively common in this environment, but the point here is made. (An interesting study would be a 50-year retrospective exploring all the companies—such as Union Carbide—which, at one time or another—expressed interest in or actively supported radio astronomy in the U.S. or abroad. These all deserve "revisiting" with strong proposals matching their current—if any—interest either in radio astronomy or broader, community-based STEM support.)

An excellent example of the counter-intuitive, highly-restrictive, but financially luscious "trustee discretionary grants" are those occasionally served up by the W.M. Keck Foundation, perhaps best known for its Special Project, the Keck Observatory, home to the twin 10-meter Keck telescopes near the summit of Mauna Kea, Hawaii. Other Special Projects—"exclusively initiated by the Board of Directors"—include the intriguing Institute for Space Studies — California Institute of Technology (www.kiss.caltech.edu). "The Institute combines the brainstorming of new ideas on space science and technology with follow-up research and development." (For a broader discussion, also see www.wmkeck.org , which indicates scientific, engineering, and regional interests.)

And, if the late Carl Sagan is to be believed, the definition of an "advanced civilization" is "one able to engage in long-distance radio communication using large radio telescopes."

NRAO has embraced "Google Sky" as part of its educational outreach; radio sky images would be a natural outgrowth as an overlay to that "one-pixel backyard" that many amateur radio enthusiasts take a decade or so to "map" via home-brew radio telescopes. Equally interesting are proclamations that next-gen large radio telescopes at frequencies below 100 (or so) MHz will exploit wide-band dipole-like antennas, each with a re-

ceiver instrument and linked via digital signal processing. "Galactic-noise-be-damned," if proponents are to be believed, as noise can be mitigated, perhaps when such antennae are employed as compact array elements.

Our recommendations, then, are these:

1. Re-purpose Arecibo Observatory as a free-standing, global NGO, with "flagship" status for radio telescopes in the Global South. Make it the networked bridge to the cosmos.

2. Bring meaning, motive, and method to the "squiggly lines" of radio astronomy through an urgent, compelling, and interesting Case for Support that embraces disruptive technologies as the central clearing-house and waystation for STEM, young scientists in developing settings, and next generation of earth-based radio astronomy observatories.

3. Embrace the Asian Century and the New Money donors worldwide who have a long-range vision for New Frontiers of Knowledge. Recognize that innovation often occurs at the interface of non-monetized ideas (but push for contracts and causes, regardless).

4. Create a two-tiered global Board, with the "wealthy, wise, workers" bringing cash and conviction to an expanded Scientific Advisory Board, who seek to know the unknowable.

5. Cultivate Foundations—STEM projects, perhaps tied to the International Space Station, space-based Earth Observation of the rainforests, student-based searches for Pulsars (cf. Green Bank), and innovative small RadioJOVE, etc. projects initiated by KP4AO A.R.C.

6. Develop budgets whose 40% Institutional Overhead will enable timely, sustainable upgrades to Arecibo Observatory and its (emerging) consortial networked partners.

7. In the short term, move to decrease NSF's financial burden (and NASA's) to less than 50% of the total Budget, with an independent Five-Year Plan for aggressive science and a free-standing Endowment. An immediately-fundable baseline would include support for Hispanic Scientists/graduate students and STEM projects.

Galileo Galilei gets the last word: "In the future, there will be opened a gateway and a road to a large and excellent science into which minds more piercing than mine shall penetrate to recesses still deeper."

Selected References:

Doty, Arch W7ACD. "Those Mysterious Signals: They may sound like noise to us, but to radio astronomers they are the desired signals." QST, October 2012, 37-39.

Ekers, R.D. "The Future of Astronomy." Paper [73.01] delivered at AAS 199th meeting, Washington, DC, January 2002.

Ferris, Timothy. Seeing in the Dark: How Backyard Stargazers Are Probing Deep Space and Guarding Earth from Interplanetary Peril. New York: Simon & Schuster, 2002.

Hall, Jeffrey. "Director's Update," The Lowell Observer: The Quarterly Newsletter of Lowell Observatory, Issue 97, Spring 2013, 2.

Matthews, Christine M. "The Arecibo Ionospheric Observatory." Congressional Research Service, February 23, 2012, [Summary], no page number.

Munns, David P.D. A Single Sky: How an International Community Forged the Science of Radio Astronomy. Cambridge, MA: The MIT Press, 2013.

"New Grants." The Chronicle of Philanthropy, April 11, 2013, 36.

Sagan, Carl. The Cosmic Connection: An Extraterrestrial Perspective. Papermac, 1981.

Vartorella, William F. and Keel, Donald S. Funding Exploration: the Challenge and Opportunity for Funding Science and Discovery in the 21st Century. Warren Center, PA: Marco Polo Monograph Series # 9, July, 2004.

Vartorella, William F. "Exploiting the New Space Economy: Cryptocurrency, CubeSats, and Atypical Consortial Alliances in a Rural Broadband Setting." Delivered before the Northeastern Kentucky and the Broadband Economy Conference, Morehead State University, Morehead, Kentucky, 10 November 2014. Keynote Address.

_____. "From the Earth to the Moon: `Barbicane,' `Nicholl,' and Jules Verne's Adversarial `Model' for Venture Capital." Delivered before the 2014 Aerospace Industry Day, Morehead State University, Morehead, Kentucky, 29 April 2014.

_____. "Beyond RadioJOVE: a Case for a COSMIC Paradigm Shift to Embrace A Community-Based, All-Wavelength Funding Model that Showcases Small Instruments, Old Observatories, and Linked Research Agendas," pp. 6-1 to 6-17 in Proceedings of the 2013 SARA Conference held at National Radio Astronomy Observatory, Green Bank, West Virginia, July 14-17, 2013.

_____. "`Lost Horizon'—Manned Missions focused on Nanotechnologies, Astrobiology, Space Telescopes, and Advanced Materials will Re-define NASA and NewSpace." White Paper, The National Research Council Committee on Human Spaceflight, July, 2013.

_____. "Venture in a Vacuum: NewSpace and the Plight of the `Explorer-Investor." White Paper, AIAA Commercial Space Group, May, 2012.

_____. "The New Space Race: The Quest for Venture Capital for Small Satellite Technologies." SatMagazine, Vol. 4, No. 12 (March, 2012), pp. 34-40.

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.

September 26 - 30, 2016: *67th International Astronautical Congress*, Guadalajara, Mexico.
November 10 - 15, 2016: *AMSAT Space Symposium,* Galveston, TX.
November 18 - 20, 2016: *Philcon*, Cherry Hill, NJ.
April 15, 2017, 0000 UTC - 2359 UTC:: Seventeenth annual SETI League Ham Radio *QSO Party*: 3.551, 7.0309, 7.2039, 14.084, 14.204, 21.306, and 28.408 MHz.
Spring 2017 (dates TBA):: *AbSciCon 2017* Astrobiology Science Conference, Phoenix, AZ.
April 23, 2017, 1300 EDT: Twenty Third SETI League *Annual Membership Meeting*, Little Ferry, NJ.
July 23 - 26, 2017: Society of Amateur Radio Astronomers Conference, NRAO Green Bank, WV.
July 27 - 30, 2017: Central States VHF Conference, Albuquerque, NM.
August 9 - 13, 2017: *75th Science Fiction Convention*, Helsinki, Finland.
September 25 - 29, 2017: *68th International Astronautical Congress*, Adelaide, Australia.
October 1 - 5, 2018: *69th International Astronautical Congress*, Bremen, Germany ❖

Member Activities

From Luserna S.G. (TO), Italy, SETI League member Stefano, IZ1BPN (Project Argus station JN34ot) sends along this photo of the Urania Observatory. Here, he and students from Liceo M. Curie high school in Pinerolo (TO), Italy are using an eight meter diameter dish, to conduct an experiment called "**S**ETI on exo**P**lanets **O**bserved and **C**onfirmed by **K**epler" (**SPOCK**). Their antenna, which has a 0.4 f/d ratio and a circularly polarized feed, exhibits +38 dBi, and a 2 degree beamwidth on the 21 cm neutral hydrogen line. Their off-the-shelf receiver and DSP system (below) provides 65K system noise temperature, 1.6 MHz observed bandwidth, and 12 Hz spectral resolution. Great work, Stefano!

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