

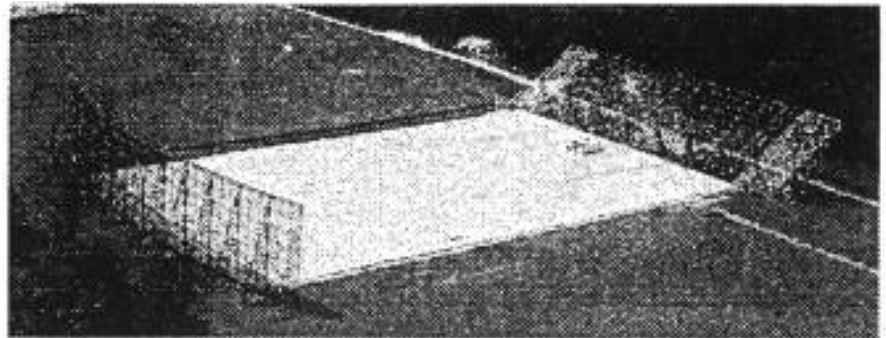


NAAPO (North American AstroPhysical Observatory)

"Signals"
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The NAAPO Newsletter
(May - December 1998)

SIGNALS

Visit us on the web! <http://www.bigear.org>.



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PLANETARY SOCIETY SPONSORS LECTURE SERIES

With support of Paramount Pictures, Inc. the Planetary Society is sponsoring a number of lectures around the country devoted to the scientific aspect of the Search for evidence of Extraterrestrial Intelligent life. Leaders in the field are being asked to present these programs ahead of the release of the new Paramount film "*Star Trek: Insurrection*".

Title of the program will be "**THE SEARCH FOR LIFE OUTSIDE THE EARTH.**" The purpose of the series is to emphasize the scientific aspects of the **SETI** as opposed to the fictional treatment of the movie series. In addition the

presentations will help kick off the Planetary Society's program SETI@home offering individuals a software screen saver program which will run analysis of segments of the **SETI** data generated by the *SETI Institute Project Phoenix*.

The Columbus lecture is scheduled in Independence Hall auditorium on the OSU campus November 7 at 7 pm. This is to coincide with the OSU celebration of Space Week honoring the John Glenn mission on the Shuttle "Discovery". In fact it will be the final event of that week as the shuttle is due to return to earth at noon on that day.

There will be two lectures that evening. Phil Barnhart will open the program with a lecture on the history and philosophy of **SETI**, and Bob Dixon will describe our research program, emphasizing **ARGUS** and a description of the SETI@home project. At the conclusion of the lectures there will be a question and answer period for the general public.

We will need volunteers to help with the setup and dispensing of literature as well as seeing to the gathering of materials and publication of publicity. Anyone interested in volunteering should contact Bob or Phil (882-6711).

OHIO HISTORICAL SOCIETY HAS AN INTEREST IN BIG EAR AND NAAPO

Marilyn McConnell-Goelz explored the possibility of donating the original of the **WOW!** signal to a museum. The Smithsonian in Washington was cool to the suggestion, but the Neil Armstrong Museum in Wapakoneta expressed strong interest. When Marilyn, Bob Dixon, Jerry Ehman, Tom Hanson and Phil Barnhart met with a delegation from the Ohio Historical Society great interest was expressed about not only the **WOW!** signal, but much of the history of radio astronomy at OSU, the history of Big Ear, the accomplishments of the observatory and the volunteer organization that has operated the telescope for the past decade.

We are in the process now of gathering publications, instruments, photographs and memorabilia of the forty year history. It seems a shame so much has been discarded during the many moves, remodelling and shuffling of storage space over the years. That someone has a strong interest in preserving the work and history of this great institution is truly gratifying.

The Museum expresses a desire to maintain availability of all materials for historical research and the *North American AstroPhysical Observatory* feels it is a secure place

to maintain the archive of the observatory. We are being careful to give the University first right of refusal of the archive or any part of it before turning it over to the Ohio Historical Society.

Admission is free. All friends of the **RO** and **NAAPO** should make the attempt to get to this program.

COORDINATOR'S CORNER

Philip E. Barnhart

As has happened in the past I find I must apologize for delay in communicating with our friends. *SIGNALS* has been a fairly constant link between those of us on the front line (so to speak) and the people who have a non-working stake in the organization. The few lapses in regular publication of this newsletter have almost always occurred as a result of my initiative, or lack thereof. When crises have arisen we have gotten the message out in a timely fashion.

This latest lapse, forcefully called to my attention by a phone call from Jim Cadle (the Flag of Earth guy) this very afternoon, comes as a result of a serious rethinking of the purpose of the newsletter and some feedback concerning the image of **NAAPO** presented by the former issues.

In preparing the donation to the Ohio Historical Society I have had opportunity to try to assemble a complete set of *SIGNALS* (aka *NAAPO NEWS*) for three years. Most issues have ample spares, but some are down to the original from which the mailing copies were run and a few even are missing that. It looks now like we will be four or five issues short of a complete set.

I made the mistake of stopping to read some of them. It got to be very time consuming. It also led me to note how the purpose of the newsletter has changed over the years. Part of the requirements specified for maintaining an IRS tax exempt status is the simple one of maintaining written minutes of our business meetings. We have used the newsletter as a medium for this task. The job has been handled admirably by a variety of scribes. (We have no 'official' recording secretary).

About 2 1/2 years ago when Cindy Brooman got us a neat home page on the World Wide Web [WWW.BIGEAR.ORG] we began archiving the meeting minutes in the active volunteer section of the home page. Though it is not available to the general

public in this location it serves the purpose for the requirement to maintain meeting minutes.

A further advantage to us, we no longer have to edit out sensitive and sometimes irrelevant matters. This will make the task a bit easier on all of us. My problem then became one of "how does the volunteer coordinator get the word of our progress out to the people who support us and are in need of knowledge of where we are and where we are going?"

This issue of ***SIGNALS*** will begin to resolve that question. I have elected to include in each issue a summary of specific task progress, listing not only accomplishments, but snags that need addressing and problems needing solution. How quickly these summaries can be put together remains to be seen. Suggestions from our readers will be welcome and we will try to address your concerns as best we can.

Desire to Publish Reader's Comments

As usual we would like to publish reader's comments. Consider a letter to the editor with your next donation or offer to volunteer.

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CHIEF OBSERVER'S REPORT

1. Observations were terminated on Big Ear on December 15, 1997.
2. A collection of data remains to be reduced. Volunteers interested in this phase of the operation should contact the volunteer coordinator.

There is data from the **LOBES** program, the Continuum records both in digital and analog form. We are trying to obtain software to aid in analysis of these data.

3. Regular observations are on hold until some form of operating antenna is up and running. The time scale for this to occur is a number ($6 < N < 60$) of months.

ARGUS ANTENNA DESIGN

Jerry Ehman has been working with a program to synthesize the antenna patterns, efficiencies and impedences for a variety of ideas for a frequency independent, wide beam antenna elements.

Possible configurations have been counter-wound tapered helix, tapered triple dipole and bent dipole arrays.

He has produced large amounts of printed tables and graphs. Though promising, the results are not complete as of yet. It appears unless **there is** some willingness to compromise, the complete solution in either the first two cases will require months of computing time. Actual field tests may at some point be invoked to get a handle on the true behavior of the elements.

ARGUS COMPUTER HARDWARE AND SOFTWARE DEVELOPMENT

Tom Hanson, Harry Kitchen, Ange Campanella and Bob Tournoux have taken on the job of matching the computer input to a beam-forming algorithm. It was realized early on that by the time the output of the individual antennas reach the beam forming stage of computation they will all be scaled to audio frequencies. As a result the hardware/software development has operated at audio frequencies from the inputs of the computers. Microphones are set up to receive audio frequency signals which are fed to the computer.

The team is working out beam forming algorithms to accomodate 3 separate microphone inputs. They are in the number crunching stage and are working to obtain suitable inputs for the process.

ARGUS ANTENNA CONSTRUCTION/TESTING

Steve Ellingson is applying a folded dipole antenna element proposed by Bill Munk to assemble a 64 element array for field testing. The last 32 elements were mounted by Cindy Brooman and Phil Barnhart. They will be wired to coax and mounted on their conducting ground plane by Hyung Joon Kim, an EE graduate student working with Steve Ellingson.

Preliminary tests with 4 elements of the first 32 element array were very promising. The intent is to test the larger array by observing geopositioning satellites.

Steve would also like a ten foot dish. If you have one laying around, let us know.

EDUCATION, PUBLICATIONS, PUBLIC RELATIONS

1. Harry Kitchen presented a lecture in Marion, OH.
2. Phil Barnhart presented a lecture to the Civil Air Patrol Annual Conference in Worthington.
3. *SIGNALS* is undergoing a review and restoration.
4. Cindy Brooman has maintained the *WWW.BIGEAR.ORG* website for over two years. Activity on the site has increased steadily with time. From 12,000 to 14,000 hits per month the September total leapt to 26,359 hits. This occurred because a Web site featuring the astronomical 'picture of the week' [actually NASA's "Astronomy Picture of the Day"] included a photo of **Big Ear** with a link to the BIG EAR web page.
5. Organizational plans are proceeding for the Nov. 7 Space Week presentation. Posters are being constructed, Planetary Society is sending 800 posters and \$150 for local publicity, and **NAAPO** is accumulating materials for the table at the lecture.

"Science of SETI" lectures are being held in Seattle, Boulder, Washington, D. C. among other sites. We will certainly have one of the better presentations in the country. The lecture will be broadcast live on the Internet through the good offices of Bob Dixon. The Planetary Society is mailing a special announcement of our Lecture to the 3000 members of the Society living in Ohio. A good number of these people

should attend the program.

SCIENTIFIC MEETINGS

Steve Ellingson attended a special session of the 'Square Kilometer Working Group' at the NRAO Green Bank Observatory. Dixon was unable to attend. We have not received a formal report of the meeting, but do know that future contacts set up before the Green Bank meeting are going to be carried through.

He was able to discuss with Jill Tarter and Kent Cullers the status of the RO report and proposal sent last month to the SETI Institute. They claimed ignorance of the proposal. Copies were then sent directly to them upon Steve's return.

Steve has been invited to travel to the Netherlands to discuss informally the progress on ARGUS technology. His expenses are being paid by the Netherlands group.

Bob Dixon intends to attend the next meeting of the Square Kilometer telescope group which will be held next year in the Netherlands.

NAAPO ORGANIZATIONAL MATTERS

1. Financial report 1 July 1997 through 30 June 1998:

Beginning Balance	\$ 5304.83
Total donations received	\$ 4820.52
Publication/Postage	\$ 253.61
Equipment purchases	\$ 185.00
Contracted Services (move, etc.)	\$ 2273.00
Supplies	
Travel	\$ 2397.00
Total income	\$ 10,125.35
Total Expenditure	\$ 4242.54
Ending Balance	\$ 4887.81
Fund Balance Change	\$ 417.02

2. The Next four Working Sessions are:

November 7, 10 AM

November 14, 10 AM

December 5, 10 AM

December 19, 10 AM

all in the conference room, SATCOM Bldg. behind ESL.

ARECIBO OBSERVATORY SUSTAINS MINOR DAMAGE IN HURRICANE GEORGES

Puerto Rico was badly hit by Hurricane Georges. Though the island in general sustained intensive damage, the 1000 foot dish suffered only minor damage. Power and telephone service was down for weeks after the storm and the observatory has supplied power from its emergency generator to its repair operations and staff housing as well as water and other services to its staff.

Repair is under way to a damaged tertiary support and some of the secondary panels in the Gregorian system. There were no injuries and the clean-up has been an intense and extended operation. (From a message radioed out by Paul Goldsmith, Director NAIC.).

Dr. SETI Launches UK Lecture Tour

For more information contact: Dr. H. Paul Shuch, Executive Director (201) 641-1770, or email n6tx@setileague.org

Dr. H. Paul Shuch, executive director of The SETI League, Inc., non-profit leaders in a privatized Search for Extra-Terrestrial Intelligence (**SETI**), will spend early November in England promoting the search for life in space. He looks forward to sharing with the media his views on extraterrestrial life, and the efforts of his international, membership-supported science group to seek conclusive evidence of our cosmic companions.

Popularly known as Dr. SETI, Shuch is an internationally recognized authority on the privatization of **SETI**, a science which was once thought to require the kinds of facilities which only governments can afford. Current thinking holds that dedicated amateurs can do much to further the research once conducted by **NASA**, much as it is amateur astronomers who are responsible for the discovery of most comets. The SETI League enjoys a strong presence in the UK, largely due to the efforts of local amateur radio astronomers to recruit and assist their fellows.

Dr. Shuch will be available on Friday, 6 November, for interviews at the Jodrell Bank observatories of Manchester University. His contact there for scheduling purposes is Dr. Ian Morison, email <im@jb.man.ac.uk>. At 1030 hours on Saturday morning he will address a gathering of SETI League UK members at Jodrell Bank. Members of the press are invited to attend his formal presentation, by prior arrangement through Kenneth Chattenton, SETI League volunteer Regional Coordinator for England, email <setiuk@onyxnet.co.uk>. A SETI League UK membership meeting, and tour of the Jodrell Bank facility, will follow on Saturday afternoon. On Sunday, 8 November, Dr. SETI will address the Martlesham Microwave Roundtable near Ipswich. Media persons interested in covering that event should coordinate with Microwave Roundtable organizer Samuel Jewell, email <jewell@btinternet.com>.

SETI scientists seek to determine through microwave measurements whether humankind is alone in the universe. Since Congress terminated NASA's SETI funding in 1993, The SETI League and other scientific groups have been attempting to privatize the research. Experimenters interested in participating in the search for intelligent alien life, or citizens wishing to help support it, should email to join@setileague.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 electromagnetic Search for Extra-Terrestrial Intelligence.

Jupiter's Moon Callisto May Hide Salty Ocean

Jupiter's second largest moon, Callisto, may have a liquid ocean tucked under its icy, cratered crust, according to scientists studying data gathered by NASA's Galileo spacecraft.

The Galileo findings, to be published in the Oct. 22 issue of the journal *Nature*, reveal similarities between Callisto and another of Jupiter's moons, Europa, which has already displayed strong evidence of a subsurface ocean.

"Until now, we thought Callisto was a dead and boring moon, just a hunk of rock and ice," said Dr. Margaret Kivelson, space physics professor at the University of California at Los Angeles (UCLA) and principal investigator for Galileo's

magnetometer instrument, which measures magnetic fields around Jupiter and its moons. "The new data certainly suggest that something is hidden below Callisto's surface, and that something may very well be a salty ocean."

This premise was inspired by Galileo data indicating that electrical currents flowing near Europa's surface cause changes in Europa's magnetic field. "This seemed to fit nicely with other data supporting the idea that beneath Europa's icy crust, a liquid ocean might be serving as a conductor of electricity," said Kivelson.

Armed with that information, Kivelson and UCLA colleagues Drs. Krishan K. Khurana, Raymond J. Walker, and Christopher T. Russell set out to test a similar theory about Callisto, "although it seemed far-fetched at the time," Kivelson said. The team went back and studied data obtained during Galileo's flybys of Callisto in November 1996, and June and September of 1997.

Kivelson and her colleagues found signs that Callisto's magnetic field, like Europa's, is variable, which can be explained by the presence of varying electrical currents associated with Jupiter that flow near Callisto's surface. Their next challenge was to discover the source of the currents.

"Because Callisto's atmosphere is extremely tenuous and lacking in charged particles, it would not be sufficient to generate Callisto's magnetic field, nor would Callisto's icy crust be a good conductor, but there very well could be a layer of melted ice underneath," Kivelson said. "If this liquid were salty like Earth's oceans, it could carry sufficient electrical currents to produce the magnetic field."

Lending further credence to the premise of a subsurface ocean on Callisto, Galileo data showed that electrical currents were flowing in opposite directions at different times. "This is a key signature consistent with the idea of a salty ocean," Khurana added, "because it shows that Callisto's response, like Europa's, is synchronized with the effects of Jupiter's rotation.

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