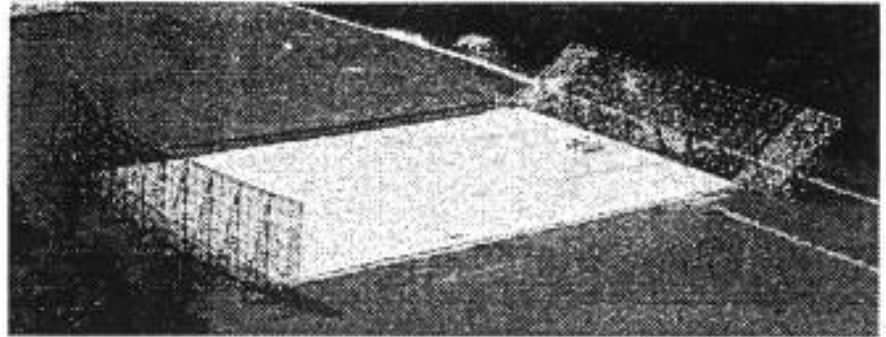




NAAPO (North American AstroPhysical Observatory)

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SIGNALS



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DONT FORGET THE RADIO OBSERATORY OPEN HOUSE MAY 11, 1:00 PM - 5.00 PM

Chief Observer's Report**February 13, 1996****By: Russ Childers***(rchilder@magnus.acs.ohio-state.edu)*

The declination is -03 degrees, 00 minutes. Sixty five percent of the survey is complete, with 14 months left in this 3.5 year sweep of the sky. The inner galactic plane has emerged from the sun, and is climbing higher every day. This is an echo of the coming of summer, when the galactic plane will emerge as the Milky Way, emblazoned across the night sky.

The **SERENDIP** program is once again collecting data. Bill Brown has repaired a malfunctioning replacement power supply. **SERENDIP** analyzes over four million 0.6-Hz wide channels, and saves the strongest 200. The system writes 200 channels to storage once every 1.7 seconds. Assuming 2-byte integer storage of each of the 200 channels, the system stores 20,329,412 bytes of data per day, plus some header information. Imagine if all four million channels were stored!

The **LOBES** system, by a strange coincidence, stores nearly the same amount of data per day as **SERENDIP**. Within 5%, in fact. This is very odd, considering the different sampling rates and number of channels stored, not to mention their two extremely different radio receiving systems. OK, so here's the puzzle: **LOBES** stores

3000 channels every 20 seconds, and **SERENDIP** 200 every 1.7 seconds. How does **LOBES** fit its data into 20 Mbyte (*or thereabouts*)? Remember, it's got to be simple, otherwise I would not be able to retrieve it easily. Hint: the LOBES analog to digital converters output in the range of 0 to 4095. Big hint.

The generation of this data produces the problem of how to store it. Through the generosity of **NAAPO**, Phil Barnhart purchased a *ZIP* external hard drive, which is now storing **LOBES** data. A *ZIP* drive was decided on because of its speed of data transfer and its portability. Compact disks of the latest data were produced by Bill Brown and Ken Ayotte. These CDs were made from data stored on **TRAKKER** tape backups. The *ZIP* drives will allow faster data transfer to CDs.

Major Receiver Problem Solved. There is an option as part of the receivers to analyze the "total power" of receiver channels. Normally, we look at the **DIFFERENCE** in power between the two front ends. Total power looks at the average power coming from both horns, not the difference. Unfortunately, the chips which control this receiver mode have gone bad. I removed 16 of these chips one day last month. The problems have not returned. There are more chips of the same kind, but used for a different application, still in the system. These would have to be replaced, not simply(!) removed. As a fortuitous check, the moon passed through the beams recently, generating a "strike" in 2951 of the 3000 channels. I suspect that the 49 missing are channels constantly rejected for interference. This confirms that the **LOBES** system is in tune.

My turtles continue to drowse in hibernation. Their water is between 45 and 50 degrees F. They have four more weeks left in their long winter's nap.

DAYTON HAMVENTION ANNOUNCES 1996 AWARD WINNERS

John Kraus, W8JK, is this year's Hamvention Special Achievement award winner. Kraus' contributions to advancements in antenna design continue to be enjoyed today by many Amateur Radio operators. Over the years, Kraus invented several antennas, but he's perhaps best known for the W8JK beam. Other Kraus designs include the helical antenna and his most-recognizable "*Big Ear*" antenna. In fact, with the building of the "*Big Ear*" antenna came the "**Wow**" signal, an apparently extraterrestrial signal that remains to be explained. During his tenure as a professor at Ohio State University, Kraus also authored many articles and textbooks.

* *SETI League* Executive Director H. Paul Shuch, N6TX, will be the banquet speaker

at the Dayton Hamvention May 17-19 at the Hara Arena and Exhibition Center, Dayton, Ohio. The banquet is Saturday, May 18, at the Convention Center in downtown Dayton. Shuch, a professor of electronics at the Pennsylvania College of Technology, has turned his microwave expertise toward the search for intelligent life in space. A poet, songwriter and guitarist, Shuch can be expected to surprise his Hamvention banquet audience with a few new songs. *The SETI League* is a non-profit group set up to support the search for extraterrestrial intelligence without government funds.

Chief Observer's Report

March 14, 1996

Russ Childers

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The declination is -5 degrees 40 minutes. We are 67 percent of the way through the current survey. This is the two-thirds mark in our journey southward from +62 to -38 degrees declination. It has been 30 months since the start, back in late September, 1993.

The **LOBES** receiver has been working well since I removed several bad chips. The receiver is actually 50 radio filters operating in parallel. The chips were causing simultaneous failures of some of the channels. Then they would recover spontaneously. The channels were either working well, or not at all, which is better than channels which half-work. At least it will be easy to go back during post-processing and filter out the bad channels. I estimate that no more than 35 percent of the channels were malfunctioning at any one time. Even though this means some narrowband data is lost forever, we can still do spectrum analysis of broadband, natural sources. Such astronomical data is an important byproduct of our **SETI** system.

The **SERENDIP** system has been off the air for many weeks now. I believe Bill Brown is working on a critical piece of the radio receiving equipment used by **SERENDIP**.

Ken Ayotte has created a new CD set with about five weeks' worth of **LOBES** data. This is the second CD set Ken has produced, and I greatly appreciate his time. Since **SERENDIP** has been off the air, the data storage program has been more rigorous. Thanks to our new *ZIP* drive, provided by **NAAPO**, data transfer from the **LOBES**

computer now causes minimal observation downtime. I wrote a program to display the data, so Ken could check its integrity. The display looks just like the display on the **LOBES** computer in the Focus Room at **Big Ear**. The program can run on any PC-compatible with a 386-or-newer processor, and with a color monitor. I would be happy to add features to my display program, but this looks like a job for an applications programmer. Applications, anyone?

The sun passed directly through the beams on March 7th, at -5 degrees declination. As spring arrives, the sun moves farther north every day. The sun is moving a much larger distance per day, right now, than at any other time of the year, so it zipped right by. As you may know, the Vernal Equinox is approaching. The word equinox means equal night (*equal to the day*). At the instant of an equinox, the sun is directly over the equator. This means that the sun is at zero degrees declination. (*Actually, from our vantage point at 40 degrees north latitude, the center of the sun is actually BELOW true zero degrees declination. We are looking down on the action. However, the sun is sufficiently wide enough so that PART of it is at zero degrees on an equinox. But I digress.*) Since the equinox is on the 20th, the sun will be at zero degrees then. We, on the other hand, will be down around -6 degrees 20 minutes. Such a large angle in 13 days. That is warp speed as far as celestial angular velocity goes. There is a beneficial side effect, however: the days are getting longer, and winter will soon be over.

SATURDAY MEETING REPORT

January 20, 1996

By: Tom Hanson

This meeting was chaired by Dr. Barnhart. It is believed that Dr. Dixon is away on his planned trip to England. Attending were: Earl Phillips, Ang Campanella, Bill Brown, Jerry Ehman, Russ Childers, Mark Sundstrom, Don James and Steve Brown.

Ang reported he has located a spell checker for Windows, which can be invoked to spellcheck email messages before transmission. The software came from an ftp site in England.

Don James checked the garage after the last meeting, and found that the garage is indeed heated. He said it's been too cold to do anything else.

Mark planned to download more Observatory data to his laptop, after the meeting.

Russ Childers announced the telescope is receiving from minus 1 degree, 40 minutes, or 64% of the survey. In response to an inquiry from Ang, Russ said the flat moving equipment is working 'fine', with the exception that he has had to climb ice coated ladders on some occasions, to persuade microswitches to perform their designed function.

Russ then informed us that some of the circuit boards containing phase detectors for the fifty channels of data are behaving in a flaky manner. The failures seem to be occurring in groups of four (*there are four detectors per circuit card*), and as many as 12 detectors may be failing at any one time. Russ said the boards appear to be operating in full power mode at the time of failure, and that touching the boards with a probe will normally clear up the problem. Dr. Barnhart said he believed those cards had been constructed by Ron Houk, who is no longer available to service them. Russ then announced that he had data for the last month, in a 'fashionable' athletic bag, which also contained the Colorado tape backup device, its cable and the software to run the device. Russ informed us that the Radobs CDROM guru, Raul Ordonez, is currently writing a text book, and will be unavailable to convert the taped data into CDROMs. Russ was looking for a volunteer to take on this challenge.

Bill Brown informed us that Dr. Klein may be interested in funding part of an improved data backup system, since that would also assist the **SERENDIP** project. There was an extended discussion of alternative backup methods, including ideas provided by Herb Johnson. Eventually Bill Brown accepted responsibility for the 'fashionable' athletic bag full of gear. Russ is requesting that three CDs of this batch of data be written.

Ang Campanella reported he has received one visitor at his new World Wide Web site. For anyone who may wish to add to Ang's visitor count, the address on Cindy Brooman's server is: http://www.point-and-click.com/campanella_acoustics/. Cindy advises that anyone viewing the site would appreciate the background colors if their browser supports that feature.

Steve Brown has been busy with exams. He said that one of the four focus room disk drives is down. Since the system only uses three drives actively, Steve has time to replace the failed drive with a spare from Dreese Hall. He will do this when the weather is better.

Jerry Ehman has been working on the *Argus Primer*. He's run into a few problems

converting diagrams from Lotus to Windows format. There was an extended conversation about the best way in which Jerry might develop his paper for electronic distribution to the widest possible audience.

Bill Brown said that **SERENDIP** is almost back on the air. He and Dr. Klein bought a 5 Volt regulator and a 9 Volt power supply from Radio Shack, as a solution to the need for 5 Volt power mentioned in last meeting's report.

Earl Phillips is working normal hours these days, and also working on the next edition of *Signals*. After the meeting Dr. Barnhart composed the next Coordinator's Corner 'on the spot', and turned it over to Earl.

The snow is almost gone from the Observatory Site. Four Wheel Drive vehicle tracks have put quite an impression on the golf course greens, where unauthorized hunters have made their way past the two Observatory chains up onto the grounds.

SATURDAY MEETING REPORT

February 3, 1996

By: Tom Hanson

A *TV 10* cameraman was busy videotaping scenes in the packed administration room as I arrived. His female reporter companion was waiting out in the hallway, looking at the posters and news articles on display there. Attending this meeting were Dr. Dixon, Mark Sundstrom, Russ Childers, Earl Phillips, Steve Brown, John Ayotte and Ken, Bill Brown, Ang Campanella, Cindy Brooman, Dan Fleisch and Joe Mitchell.

There was a discussion of the recent OSU press release, which announced that **Big Ear** would vacate the premises on 12/31/97.

It was proposed that **NAAPO** select one of five offered sites for the **Argus** facility, and begin to move there.

Dan Fleisch is willing to serve on a site selection committee, and he immediately recruited other members. The survey will include considerations such as electromagnetic radiation and security.

Dr. Dixon circulated a set of materials from his recent trip to England's Jodrell Bank, where he participated in a conference on "High Sensitivity Radio Astronomy". The conference included a presentation by Sir Bernard Lovell about the history of the

Lovell Telescope.

Russ Childers reported the telescope is positioned at 2 degrees 20 minutes. It has been too cold to move recently.

Dr. Dixon brought a set of No Hunting signs, and Steve Brown volunteered to post them on the perimeter of the facility, since he is familiar with the actual leased property limits. There was discussion of planning for Dr. Dixon's next conference trip.

Ken Ayotte informed us that he had successfully created a set of CD-ROMS from data supplied by Russ Childers, using a CD-rom writer facility at his school. Russ Childers will verify that the CDs turned out well.

This was an impressive accomplishment, and it offers hope that Russ will have an alternative site for recording new survey data in the months ahead.

Bill Brown reported a recent problem with **SERENDIP** — there are severe spikes around the local oscillator frequency.

Dan Fleisch — On the Beam Forming Front — GE Aircraft Engines division personnel in Cincinnati have developed some advanced beam forming algorithms. Dan is negotiating for possible use of this work for Argus.

Ang initiated a discussion of the merit of updating Steve Brown's **Argus** proposal for possible use in a presentation, should funding agencies ever express interest.

Steve Brown talked about the potential value of applying **Argus** in a lower frequency domain than the Water Hole, in order to increase attraction to potential funding agencies.

Joe Mitchell is still trying to contact Jodie Foster. He wrote Carl Sagan with regard to "*Contact*". Apparently a movie based on the novel is in production.

Dr. Dixon informed us the *SETI Institute* is doing well in gathering private funding. Barney Oliver made a generous bequest to the organization.

In closing, Dr. Dixon reported that two other groups are actively working on Argus

like projects. In contrast to the **NAAPO** volunteer effort, these are funded activities with full time employees.

There is an organization of 3 people in Holland who are working on this subject, and one person is dedicated to the topic in Australia.

SATURDAY MEETING REPORT

February 17, 1996

By: Tom Hanson

There was a FULL HOUSE for today's meeting. There was literally "Standing Room Only". Our Guest of Honor was Maddy Goelz, accompanied by her mother, Marilyn. Our Special Guests were Judy and Dennis Fraden, photographer and author of children's books, who are working on a book covering **SETI** and related topics. The filled chairs held: Dr. Dixon, Don James, Judy and Dennis, Joe Mitchell, Ang Campanella, Cindy Brooman, Earl Phillips, Jerry Ehman, Marilyn McConnell-Goelz, Russ Childers, Ken Ayotte and John Ayotte, and Mark Sundstrom.

Don James informed me after the meeting that he is planning two projects for after the weather improves. He will repair the clutch on the crane, and he will rebuild the carbureator of the truck, which has a new battery and a rebuilt radiator already.

Dr. Barnhart had asked if we can build a sample **Argus** element as this report begins. Ang inquired as to the desired frequency range, and Dr. Dixon specified 100 to 1000 MHz. Jerry Ehman asked if the Waterhole frequencies were to be omitted from consideration, and a discussion of the pro's and con's of including them followed. One benefit of lower frequencies, according to Dr. Dixon, is that since collecting area varies as the square of the wavelength, the lower the frequency the greater the collecting area. After the meeting, Don James recalled that Dr. Dixon had clarified the frequency range, by indicating that while the 100-1000 MHz range was desirable, a 600-1000 MHz range might be more practical for a demonstration Argus element.

Ken Ayotte reported that he is continuing his sky observations with his home based radio telescope.

Russ Childers announced that the flat reflector is positioned at minus 3 degrees, 20 minutes, and that he is working on a program which will enable him to read data from CD-rom to reproduce the real time display he is currently running in the focus room. In response to a question from John Ayotte, Russ has not yet validated the

accuracy of CD-roms created by Ken on the CD-rom writer at his school. It will be reassuring to know that the CD-rom disks created by Ken were a success. In the meantime, Russ has decided to provide a set of *ZIP* disks to Ken, in order to write a current set of data to another batch of CD-rom disks. Dr. Barnhart will be purchasing more *ZIP* disks and CD-rom blanks for this ongoing project. Russ said that after the meeting, he planned to re-analyze the moon's recent passage through the beam, due to the strong signals received. Dr. Dixon recalled 'detecting' the moon several times during earlier sky surveys. It was noted that the moon covers about 0.5 degrees of sky, enough to appear in both horns, and thus to produce a distinctive signature. In response to another question, Russ reported that power was restored two hours after a tree fell on a power line feeding the Observatory. The focus room equipment functioned normally after the outage.

Marilyn McConnell-Goelz has resumed work on securing tax exempt status for **NAAPO**. She is currently evaluating the pro's and con's of requesting Foundation status.

Jerry Ehman is studying related topics, in preparation for further work on the Argus Primer.

Dr. Dixon followed up on Jerry's report, by reminding us of the "**Wow**" study, for which funds have been provided by Carl Sagan. Dr. Dixon received inquiries at the recent conference he attended on the east coast, and he asked the Wow Study Committee, (*Ehman, Childers, Barnhart*) to try to move this effort forward. Cindy Brooman is planning to assist Dr. Barnhart with preparation of an online Volunteer Biography input Form. This will be YAB (*Yet Another Biography*), but it is hoped that this time the results will appear in a Web Page with scanned in Photographs. Ang Campanella reiterated his interest in helping with design of the antenna element for the proposed demonstration Argus receiver system. He investigated characteristics of conical array designs at about the same time as Dr. Kraus discovered the unique properties of helical antenna designs.

Joe Mitchell announced three recent developments: The OSU long distance telephone charges account was flagged as inactive by accountants there. Joe worked out a solution by discovering another active account which was acceptable to the accountants, and calls from the Observatory will once again be paid. Carl Sagan replied to Joe's inquiry about the movie version of "*Contact*", and Joe will follow up with the film's producers, Warner Brothers. This inquiry is in response to a

suggestion from Marilyn McConnell-Goelz. Joe's father donated a computer monitor to replace one originally loaned to Joe for the Card Project, and then requested back by Russ Childers and Steve Brown, to replace a failing monitor in the focus room. Joe sent two photographs taken by Dr. Barnhart to Paul Horowitz, who is writing a book about **SETI**. After the meeting, Joe informed me he has received three acceptances for graduate study in Electrical Engineering at universities including Ohio State, and he is hoping to make a decision sometime in March.

Dr. Barnhart opened the meeting for discussions with Judy and Dennis Fraden, about their current project, and about the business of writing children's books in general. Dennis is an amateur astronomer, and he and Judy have already travelled widely in doing research for their book. This book, for 5th and 6th graders, will include a section on *UFO's*, one on the idea of travelling to visit extraterrestrial civilizations, and one on **SETI**.

Following the meeting, Dr. Dixon and other volunteers took the Fraden's on a tour of the facility.

GALILEO MISSION STATUS

March 14, 1996

*PUBLIC INFORMATION OFFICE
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CALIFORNIA INSTITUTE OF TECHNOLOGY
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
PASADENA, CALIF. 91109
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Shortly after noon Pacific Time today NASA's Galileo spacecraft fired its German-made main rocket engine for the third and last time to complete the set-up for its 11-orbit tour of Jupiter's system.

Operating on a sequence of computer commands sent to the spacecraft a week ago, Galileo turned yesterday morning to the correct orientation for the rocket firing and then increased its spin rate to 10.5 rpm yesterday afternoon to stabilize the spacecraft during today's burn. The rocket firing started at 12:01 p.m. PST today, and stopped at 12:25 p.m. Tomorrow the craft will spin down and return to its normal orientation, with its antenna pointed toward Earth.

The rocket engine, part of a propulsion system built by Messerschmitt-Bolkow-Blohm and furnished by the German government as a partner in the Galileo project, delivers 400 newtons or about 88 pounds of thrust.

Acting on the 1-1/2-ton spacecraft for about 24 minutes, this force increased Galileo's speed in its orbit around Jupiter by about 377 meters per second or 842 miles per hour, nearly doubling its speed at the outer end of the orbit.

Now Galileo is aimed for an 844-kilometer (*524-mile*) encounter with the satellite Ganymede on June 27. Equally important, Galileo will not pass so close to Jupiter as it would have otherwise, resulting in much less radiation exposure from the planet's trapped radiation belts. It passed through the intense inner radiation zone last December of necessity to accomplish the probe mission, and had no problems then, but the spacecraft was not designed for multiple passes through that hazardous region.

Today the spacecraft is 19.3 million kilometers (*12 million miles*) from Jupiter, just past the farthest point in its orbit. Starting Saturday Galileo will begin to fall, and pick up speed, back toward Jupiter. Earth and the spacecraft are now less than 840 million kilometers (*about 520 million miles*) apart, as Jupiter and Earth approach each other in their solar orbits. As a result, Galileo's radio messages now take only 46 minutes, 19 seconds to get here.

ULYSSES MISSION STATUS

April 1, 1996

All operations and science experiments continue to go well aboard the Ulysses spacecraft as it journeys to the orbit of Jupiter. NASA's tracking facilities near Madrid, Spain and at Goldstone, Calif., are monitoring the spacecraft about 12 hours each day.

Today Ulysses is about 42 degrees north of the Sun's equator, traveling at a heliocentric velocity of about 55,000 kilometers per hour (*34,000 miles per hour*) with respect to the Sun.

Ulysses will reach Jupiter's distance of 5.4 astronomical units (*about 800 million kilometers or 500 million miles*) from the Sun on April 17, 1998. Once there, the spacecraft will loop around and return to high latitude regions of the Sun. In September 2000, the spacecraft will begin its second solar orbit, which will take it

over both poles of the Sun.

VOYAGER MISSION STATUS

April 1, 1996

Both Voyager spacecraft are healthy and continue their departure from the solar system. As they travel farther and farther from the Sun, the two spacecraft are returning data to characterize the outer solar system environment and search for the heliopause boundary, the outer limit of the Sun's magnetic field and outward flow of the solar wind.

Six science instruments on each Voyager spacecraft are collecting data on the strength and orientation of the Sun's magnetic field; the composition, direction and energy spectra of the solar wind particles and interstellar cosmic rays; the strength of radio emissions that are thought to be originating at the heliopause, beyond which is interstellar space; and the distribution of hydrogen within the outer heliopause. These data are transmitted to Earth in real time, at 160 bits per second, and captured by 34-meter antennas of the Deep Space Network. After transmission of the data to JPL it is made available in electronic files to the science teams located around the country for their processing and analysis.

Flight controllers believe both spacecraft will continue to operate and send back valuable data until at least the year 2015.

Voyager 1 is currently 9.33 billion kilometers (*5.79 billion miles*) from Earth, having traveled 11.14 billion kilometers (*6.92 billion miles*) since its launch in September 1977. The Voyager 1 spacecraft is departing the solar system at a speed of 17.43 kilometers per second (*38,995 miles per hour*).

Voyager 2 is currently 7.30 billion kilometers (*4.53 billion miles*) from Earth, having traveled 10.53 billion kilometers (*6.54 billion miles*) since its launch in August 1977. The Voyager 2 spacecraft is departing the solar system at a speed of 16.04 kilometers per second (*35,884 miles per hour*).

TOPEX/Poseidon MISSION STATUS

April 1, 1996

The ocean-observing satellite has made more than 17,000 orbits of the Earth since its launch on Aug. 10, 1992. The satellite is operating normally and is in cycle 130 of data collection. Each satellite cycle is 10 days long.

The satellite performance analysis team has conducted several routine maneuvers to calibrate the altimeter and the results show continued good pointing of the altimeter by the satellite. As TOPEX/Poseidon orbits the Earth, the altimeter bounces radar signals off the ocean's surface. The device records the time it takes the signal to return to the satellite and that gives it a precise measurement of the distance between the satellite and the sea surface.

On Friday, the weekly ephemeris and sequence loads were uplinked to the satellite. The ephemeris tables are updated weekly to ensure accurate pointing of the satellite to Earth and the high-gain antenna to the appropriate Tracking and Data Relay Satellite (*TDRS*). The stored sequences control the satellite's activities, such as tape recorder usage and antenna-pointing times.

SATURDAY MORNING MEETING NOTES

March 16, 1996

By: Tom Hanson

Prior to the meeting, Cindy Brooman observed a Pileated Woodpecker in the woods just north of the Administration Building. Cindy said that the bird was about the size of a crow, and that it was very similar in appearance to the popular cartoon character, Woody the Woodpecker. This bird has been on or close to the endangered species list, according to Cindy, so it is good to know it has picked the Observatory site for a breakfast stopover.

Attending today were: Dr. Barnhart, Russ Childers, Ken Ayotte (and Mrs. Ayotte), Jerry Ehman, Earl Phillips, Cindy Brooman, Don James, Dan Fleisch and Steve Brown.

The meeting opened with discussion of planning for the Open House, coming up in May. There are openings for several members of the Open House Stations Staff. Jerry Ehman has once again agreed to take the first lecture position at the entrance to

the ground plane.

Russ Childers said that the flat reflector is positioned to receive from minus 5 degrees, 40 minutes. He reported that the sun's passage through the beams resulted in striking images on the LOBES display, including what he believed were sidelobe shadows. Russ drew a representation of the display on the chalk board, and after the meeting he demonstrated the images to attendees who joined him in the focus room. In my judgment, Russ' ability to present the progress of the data gathering process as though it were in real time, combined with his enthusiastic speaking style, would lead to an interesting presentation to an audience of some size, if the output of his program could be projected on a large screen. Russ' report led to a brief discussion of the possibility there might be such a phenomenon as radio frequency 'sun dogs'.

Dan Fleisch spent some time since the last meeting investigating further the feasibility of using Argus for parasitic radar imaging. He reported that his study showed a positive signal-to-noise ratio, given the conservative assumptions he used. Dan requested keys to the Observatory, in order to host a visit by chess players in two weeks. Dr. Barnhart will be traveling in Texas at this time, so he provided a set of keys for Dan.

Ken Ayotte delivered two more CDs of Survey data to Russ Childers. These CDs cover the period from 6 January 1996 through 12 February. Russ reported that all data has been saved starting in October of 1995, as compared to the previous portion of the survey, during which it was only feasible to save summary data. The data between October and the end of January is subject to the problem of channel dropouts, which Russ has reported previously. Ken completed a paper on his amateur radio telescope, and he will provide a copy for Observatory files. The paper included color photographs, and appears to have been written at a college level. Ken is working on a new antenna, consisting of 4 corner reflectors from Radio Shack. Ken is planning to work on Channel 37, at 612 MHz or so. Steve Brown commented that the Radio Shack antennas are designed to function in the UHF range, which covers 470 to 770 MHz.

Jerry Ehman circulated an article about Carl Sagan's latest book. He opened the subject of the Debbie Cree report for discussion, and he closed with a question about Homenet. After the meeting, Jerry copied Homenet 3 to diskette, using the software replication computer on loan from Ron Leeseberg, who is currently visiting in Florida.

Cindy Brooman opened the subject of a CD-ROM of "Cosmic Search" for discussion. A variety of ideas were suggested for moving this worthwhile project forward. It was pointed out that a significant part of the time required for this project is entry of the text from the articles from each of the 13 issues. This is an activity which could be carried out by our membership in far flung parts of the country (*such as Cincinnati?*). If anyone would care to participate in this project, please contact Cindy, <cindy@POINT-AND-CLICK.COM>. In response to Cindy's report, Russ Childers said that former member Steve Crawford contacted him about using a Web Browser in connection with the proposed Cosmic Search CD-ROM. Russ will forward Steve's message to Cindy. Open question — would there be any potential fund raising potential, through offering space on the proposed CD-ROM for advertisers? This inquiry arose out of Dr. Barnhart's comment that there would be no need to reproduce advertisements from the original Cosmic Search issues on the CD.

Don James successfully ran the engine on the crane, and he is still interested in working on the failing clutch, when the weather is appropriate for this challenge. Don inquired about repair of some sections of the aluminum flashing on the ground plane. Longer roofing nails might have a better chance of holding than the ones used last year.

Steve Brown was one of five co-authors of the "paper" given by Dr. Collins recently in California. He said that the group is pursuing funding opportunities. It has already been turned down by one potential source, which he said represents progress of a sort.

COORDINATOR'S COMMENTS

On the next three pages [i.e., below] you will find a special supplement including the principal articles from the local press concerning the ultimate demise of BIG EAR. Some of the more glaring inaccuracies are noted and a few editorial comments are appended.

Phil Barnhart

[Note from webpage editor: The editorial comments about the "glaring inaccuracies" in the five newspaper articles reproduced below are all written by Phil Barnhart. These comments will be highlighted in this webpage either at or in the vicinity of each "glaring inaccuracy" using the text font color magenta.]

The Axe Falls — February 1, 1996

We have been aware for some time negotiations between administrators at Ohio State University and the owners of Green Highlands Ltd. have been going on without concern for the developers or operators of the 110 meter Kraus type radio telescope BIG EAR.

Indeed, this Feb. 1, 1996 article by David Lore in the Columbus Dispatch is the first official announcement any of us connected with BIG EAR have received. It has been evident from certain actions and tendered questions that the University was mounting a concerted campaign not only to close out BIG EAR but make it particularly difficult for the volunteer group to continue to operate at all under any aegis of the University. Arbitrary obstacles have been erected to be overcome before the University will provide facilities for continued radio astronomical research. These articles tend to show how the university has cast its defense of a strange limitation of the use of its facilities for a research project that has paid its own way since 1974 and has produced graduate degrees and extra income for the University over the ensuing times.

OSU to silence 'Big Ear' telescope

The Columbus Dispatch

Thursday, February 1, 1996

The sky-mapping instrument will be turned off at the end of next year.

By David Lore

Dispatch Science Reporter

Ohio State University's "Big Ear" on the universe will be turned off at the end of 1997, university officials announced yesterday.

The radio telescope, built during the 1950s at the initiative of John Kraus, OSU emeritus professor of electrical engineering, is south of Delaware, Ohio, on 24 acres originally owned by Ohio Wesleyan University.

OSU leased the site in 1985 to save the telescope after Ohio Wesleyan sold the property to developers for a golf course expansion. **No.1: The university leased the land from Green Highlands Ltd. after considerable public outcry against the idea of demolishing the one radio telescope in the state (while 28 golf courses are already located in Delaware County) at the very same time the governor of the state was calling for increased technological development in the state.**

Robert Haverkamp, assistant to the vice president of administration at OSU, said the site will be vacated by Dec. 31, 1997.

The move was not unexpected, although OSU in September signed a 10-year lease renewal. At the time, however, Haverkamp said potential maintenance costs probably would force the university to abandon the site after two or three years. **No. 2: For the past 12 years the University has not provided more than token maintenance. Repair to the ground plane was donated, painting of the flat reflector was accomplished by student volunteers and Gene Mikesell with donated paint. Computer and receiver upgrades have been accomplished with donated hardware and grants from NASA!**

The landowner, Green Highlands, is selling the site to New Green Highlands Development. The land is part of a larger tract to be used for housing and an expansion of the Delaware Golf Club course.

Under the agreement signed this week, OSU's rent through 1997 will be \$1 a year instead of \$31,188. Also, it won't have to paint the telescope, a savings of at least \$280,000, officials say. **No. 3: The \$280,000 painting figure was an early bid and has been used throughout the negotiations in spite of the fact that bids of \$160,000 and \$90,000 were also received. Mostly this has been used as a red herring.**

The university will get \$200,000 from developers for leaving early. That money won't be available until 1998, Haverkamp said, and much of it already has been spent on cleaning up a dump on the site.

Robert Dixon, assistant director of the radio telescope, yesterday said he's disappointed.

"I had originally been led to believe we'd get that \$200,000," Dixon said. "Big Ear" operators, he said, never thought they were liable for the dump since it predated construction of the telescope and contained wastes from various sources. **No. 4: The**

dump did not predate the construction of the telescope, but was present at the time of the land sale AND was essentially cleaned up by volunteers at the radio observatory after the initial lease agreement.

Through 1997, "Big Ear" will continue its sky-mapping program and its long-standing search for intelligent signals from alien civilizations.

Five sites have been offered for construction of a telescope, Dixon said, but the National Aeronautics and Space Administration has turned down a request for \$500,000 to finance the project. **No. 5: The National Aeronautics and Space Administration DID NOT "turn down a request for \$500,000" to finance the project. What they SAID was, ". . . technically it is a great proposal, there is simply no money to fund it at this time!" This is not the same as turning down a request!!!**

Big Ear closing called setback for astronomy

The Delaware Gazette

Friday, February 2, 1996

Ohio-State University has received five offers of free land, including some in Delaware County, for a new radio telescope. However, funding would have to be obtained and it would probably take three years before a new Big Ear could be operational.

DG staff reports

When Ohio State University's radio telescope closes Dec. 31, 1997, it will be a setback to the world's search for intelligent extraterrestrial life, said the site's assistant director.

Bob Dixon, also OSU's advanced technology group director, said he was "terribly disappointed" by the school's decision to close the telescope named Big Ear. Termination of the lease between OSU and Green Highlands Ltd. clears the way for sale of the land to New Green Highlands Development Ltd., which plans a nine-hole golf course and 450-home development on the property along U.S. 23S.

"Under pressure from developers, the university did not want to get involved in a fight. So they quit." Dixon said.

In addition to searching for radio signals from intelligent civilizations, Big Ear also collects natural radio waves emitted by pulsars [No], gas clouds, galaxies, and exploding objects, providing data for astronomers.

"We are the longest-running program [for SETI] and one of the major players, ... There are only two or three others that are on the air continually," Dixon said.

Big Ear covers an area roughly equivalent to three football fields, making it three times larger than Harvard University's radio telescope.

Dixon said OSU has received five offers of free land, including some in Delaware County, for a new radio telescope. However, funding would have to be obtained and it would probably take three years before a new Big Ear could be operational.

OSU had plans to construct a new radio telescope design using part of the existing Big Ear. Now, Dixon said, that effort must start from scratch. The international astronomy community hopes eventually to build a radio telescope a kilometer wide, using the new design Big Ear would have pioneered, Dixon said.

Dixon said Big Ear also ran on a "zero budget". Its workers are volunteers and Big Ear has received grants, providing its operating costs.

FOLLOW-UP TO THE INITIAL ANNOUNCEMENT

It is clear representatives of OSU have centered their objections to maintaining BIG EAR in operation on inflated cost estimates — distorted ideas of what the instrument is capable of doing.

Somehow the objections seem to rest in part on NASA's " . . refusal . . ." to fund the ARGUS Project. We emphasize that NASA responded with great enthusiasm to the proposal, but is enmeshed in the drastic congressional budget cutting of the past several years and simply cannot fund new programs at the present. Besides, the funding or not funding of ARGUS is totally irrelevant to the continued operation of BIG EAR.

OSU gives telescope backers ray of hope

By David Lore

Dispatch Science Reporter

The Columbus Dispatch

Saturday, February 3, 1996

Ohio State University is leaving the door slightly ajar to proposals to replace its "Big Ear" radio telescope after 1997 — as long as the university doesn't have to pick up the tab.

The College of Engineering probably will provide \$30,000 over three years so telescope backers can develop a new telescope design for use at another location, Associate Dean William Baeslack said yesterday. [Only with great strings] But beyond that, he said, "they have to prove to us there's some value in going ahead with some of this."

OSU officials said Wednesday that developers will take control of the telescope and its 24-acre site near Delaware after Dec. 31, 1997. The giant instrument, built by OSU engineers in the mid-1950s, had lease renewal rights through 2005 but would have required a \$280,000 paint job to stay open [Wrong!], they said.

Robert Dixon, assistant director of the telescope, has proposed building an "Argus" radio telescope elsewhere to continue Big Ear's mission of mapping intergalactic radio sources, to help NASA track its spacecraft and to continue the search for extraterrestrial civilizations.

The Argus design would arrange hundreds – or eventually thousands – of small computer-linked conical antennas in a spiral array instead of employing a single large antenna like Big Ear.

The name comes from the mythological guardsman, Argus, who had 100 eyes and could watch in all directions at once.

OSU's support would be for "exploratory, advanced research" that might lead to a prototype telescope, Dixon said. Even a prototype, however, probably won't be ready by the time Big Ear closes, Dixon said.

Argus technology also may have uses in commercial aviation, he said, giving pilots better radar images of terrain and approaching storms.

Dixon said officials at the National Aeronautics and Space Administration liked the idea, but because of budget cuts, turned down [Not accurate!] his \$500,000 funding request.

It will take federal support to get any major telescope built, Baeslack said. "We can provide planning money over the next couple of years, but in terms of the university investing significant dollars beyond that, I don't believe that's going to happen." [Irrelevant! OSU did not support before — we do not expect it in the future.]

Even research support, he said, will depend on evidence from Argus supporters that the project will mesh with OSU's teaching and research goals. Baeslack said he'd also like to see more academic disciplines – including astronomy – involved.

The astronomy department, however, isn't interested, Chairman Patrick Osmer said. "We concentrate on optical (telescopes) and theory. This is not a direction we're going in."

Ohio and Ohio State will be making a big mistake if they abandon the state's only radio telescope and don't support the Argus initiative, said Philip Barnhart, a retired professor of physics and astronomy at Otterbein College.

Barnhart is coordinator for the North American Astrophysical Observatory, a group organized in 1984 to promote use of Big Ear by students and volunteers from various campuses.

"The Argus concept is one that really grew here in central Ohio, and it would be unfortunate if we simply exported it out of state," he said.

State and university officials have said they want to spur technology development in Ohio, Barnhart said, but since the 1980s have failed to recognize the potential for advances in radio astronomy.

"Argus is certainly an affordable technology for the state and one that will blossom in

the next couple of decades," he predicted.

Big Ear researcher proposes replacement

The Delaware Gazette

Tuesday, February 13, 1996

Paul Comstock, city editor

AREA/STATE

Staff, wire reports

About \$500,000 would be needed to build a prototype of a new detector to look for signs of intelligent life in the universe. A full-scale model would require at least several million dollars more.

An Ohio State University researcher, disappointed that the University will dismantle [\[Developer will dismantle! \(Comment by Robert S. Dixon\)\]](#) its Big Ear radio telescope at the end of next year, is developing a proposal for a replacement [\[Unrelated to Big Ear or dismantling! Doing anyway. \(Comment by Robert S. Dixon\)\]](#).

About \$500,000 would be needed to build a prototype of a new detector to look for signs of intelligent life in the universe. A full-scale model would require at least several million dollars more, said Robert Dixon, OSU's advanced technology group director and Big Ear assistant director.

The National Aeronautics and Space Administration already has turned down [\[Not accurate!\]](#) Dixon's proposal. He told *The Plain Dealer* in an interview published Monday that he would try to find private donors, but added, "there's no huge hope there." He earlier told *The Gazette* that OSU has received five offers of free land, including some in Delaware County, for a new radio telescope.

Dixon said Sunday in Baltimore at a meeting of the American Association for the Advancement of Science that Ohio State has agreed to terminate its lease for the Delaware County land that is occupied by Big Ear. Green Highlands Ltd. has sold the land to New Green Highlands Development Ltd., which plans to build a golf course

and homes on the property.

Ohio State spokesman Robert Haverkamp said Monday from Columbus that the university would have spent more than \$280,000 to paint the telescope if it had continued the lease for another 10 years [Wrong (and Haverkamp knows it!) We got bids of \$160,000 and \$95,000. (Comment by Robert S. Dixon)]. He also said that the 1960's-era telescope is no longer a state-of-the-art device [and he is an expert on this]. Dixon told *The Gazette* Big Ear ran on a "zero budget" using volunteer workers, and brought in grants to cover its operating costs.

The university will receive \$200,000 for terminating the lease and leaving the property by Dec. 31, 1997.

Dixon and 25 volunteers have used the listening device, which is the size of three football fields. In addition to searching for radio signals from intelligent civilizations, Big Ear also collects natural radio waves emitted by pulsars, gas clouds, galaxies, and exploding objects, providing data for astronomers.

The telescope captured the highest intensity signal ever recorded [on the SETI program] in 1977. It was called the "Wow!" event because of the notation a volunteer made next to his [sic; the] log of what happened. The origin of the signal remains a mystery and no signal like it has been received since.

Dixon could not be reached for additional comment Monday. There was no answer to calls to his office.

'Big Ear' loses land to homes, golf course

By Sam Bagby and Angela Miller

Lantern staff writers

Feb. 2, 1996

OSU Lantern — the student newspaper

Ohio State's "Big Ear" radio telescope in Delaware County will be dismantled and the lease terminated on Dec. 31, 1997. [The dismantling will occur later than Dec. 97.]

OSU leased the land from Green Highlands Ltd. and earlier this year renewed a 10-

year lease. The new agreement to terminate the lease in two years will include the sale of the land from Green Highlands Ltd. to New Green Highlands Development Ltd.

New Green Highlands Development Ltd. plans to build a golf course and housing complexes on the land.

"I attribute much of the reason to lack of interest," said Robert Dixon, associate director of the telescope facility. "The university is not committed to the kind of research we're doing."

When asked why OSU has decided to turn over the lease, Dr. Philip Barnhart, Big Ear staff member and emeritus professor of physics from Otterbein University, said, "I have heard that in some quarters of the university there has been a bit of scoffing at the kind of research being done here, in searching for extraterrestrial life."

The Big Ear telescope is sensitive to radio astronomical signals — basically, radio waves — given off by galaxies and stars. By picking up such signals the telescope is able to plot the location of stars, Dixon said.

In this way, scientists at OSU mapped the sky 20 years ago and are in the process of doing so again. The telescope also searches for radio astronomical signals given off by alien civilisations, Barnhart said.

One of the conditions to having the original ten-year lease renewed was to paint the telescope, which officials estimated would cost more than \$280,000, Dixon said.

[Dixon did not say that.]

Dixon said OSU was hesitant to renew the lease because of the high cost of having the telescope painted. The annual rent owed by OSU for the first ten years of the lease was \$10,000, he said.

Dixon said the telescope program has brought in \$3 million of government grant money since the original ten-year lease began.

Some of that money is used for the direct cost of running the program, such as purchasing equipment, supplies, and paying salaries; some of it is also used as "overhead", to pay the indirect cost of running the program, such as maintenance and

repairs, he said.

The usual percentage of a government grant dedicated to "overhead" is approximately 40 to 45 percent, Dixon said.

With this percentage, OSU would have accumulated overhead funds amounting to far more than the \$200,000 necessary to paint the telescope, he said.

Overhead funds should be applicable to a task like painting the telescope," Dixon said. Dixon said such funds were not made available to the telescope program for painting or any other purpose.

OSU will receive \$200,000 from New Green Highlands Development Ltd. for leaving early and will now pay \$1 in rent for the remaining two years they occupy the land.

OSU has already allocated approximately \$180,000 to cleaning up a dump site on the land, Dixon said. Dixon and Barnhart said they felt disappointed the money would not be allocated to the telescope program for the construction of a new telescope, which Dixon estimates will cost approximately \$500,000.

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Designed by Jerry Ehman

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