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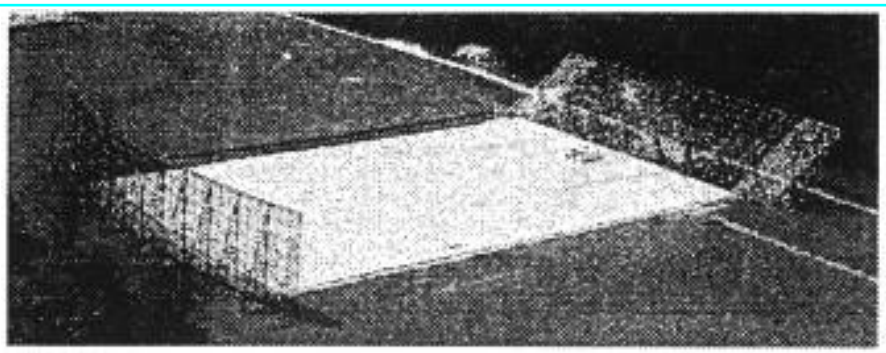
SIGNALS



Editor:
Earl W. Phillips, Jr.
7415 Saunderlane
Columbus, Ohio 43235
614-764-0476

NAAPO Coordinator:
Dr. Philip E. Barnhart
Dept. of Physics/Astronomy
Otterbein College
Westerville, Ohio 43081
614-823-1516 (NAAPO)
4655 Indian Ct.
Westerville, Ohio 43082
614-882-6711 (home)

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THE BIG MOVE-OUT
By: Phil Barnhart

There were many emotions at the surface as we loaded off the trucks that Saturday. I had a particular empathy for Bob Dixon and Jerry Ehman as they moved about among the artifacts of two long careers attached to this location. Bob had been associated with the operation of Big Ear from the time he was a graduate student working on the Ohio Survey. Jerry has well over 20 years association with the enterprize.

My own experience began as an interested by-stander. In 1955 I came to Perkins Observatory as a research associate. The radio telescopes in that year were on the Kenny Road farm site. It would be two years before a course in Radio Astronomy would be offered jointly by the EE Department and the Astronomy Department.

I saw the ground breaking for the telescope, watched as ground was levelled, sections of the parabola were erected, and the survey began. I stood on the ground plane with

visiting astronomers. I listened to Grote Reber's cosmic ray detector pinging along as gamma rays were absorbed in the saucer-shaped chamber. I noted progress in the research reported. The quasars and the completion of the Survey.

It was not until the crisis days of 17 years ago that I threw my lot in with the volunteers. Much has happened since then. Much stress has built and the "ship is finally sinking." When I was advised that my college would not jump on a sinking ship I felt a twinge of anger. Within a year with a new president holding the view that support of the project would not harm, but help the image of the college, I brought a measure of support from many institutions and volunteers to the task at hand. It seems now that we succeeded in postponing the final catastrophe for more than a dozen years.

We even have the gratification of seeing a new dawn of radio astronomy technology in the ARGUS developments. We may not have set the world on fire, but we have a dedicated group of volunteers dealing with fresh ideas and ready to take on new challenges in dealing with the realm of the unknown. Even when we are locked out of our new facility, we find a way to overcome. See Tom Hanson's meeting notes for November 15!

OCTOBER 1997
COORDINATOR'S CORNER
By: Phil Barnhart

The move has begun. As time winds down to the final dismantling of the Big Ear our activities have swung more to the transfer of material out of harms way. The telescope continues to operate at the southern-most declination. The effort and complication of moving to a more northerly position (such as the **WOW!** declination) was not deemed to be beneficial in light of the amount of effort necessary to get out of this location.

Moving involves many decisions. We are transporting much that probably will never be used again, but the alternative is to allow the bulldozers to grind it under. Storage was a rather costly option until Dlck Smith, our intrepid contractor-volunteer (he built the tank room and remodelled the apartment 7 years ago) stepped forward and offered storage space in his barn. Many seldom used items will find a temporary home with him.

The developer's crews have not made our task easy. They have taken out the paved

road, dug a large fishpond just west of the telescope, and continually throw huge clouds of fine dust into the air all around us. They have not provided the promised ramp for removal of the horn antennas, they continually sever the phone line. We have been without an on-site phone for over six months! Each time the phone company gets a new line in, it is immediately cut.

The new meeting area for volunteers will be on the west campus at OSU under the four large (unusable) dishes at the ElectroScience Laboratory. For access information you may contact Bob Dixon.

Our intention is to be out of the observing site by mid-December. This will give us a couple weeks leeway in case weather holds us up. The prospect of rain and massive mudflows in the next two months may allow the testing of all our 4-wheel drive vehicles. Work is going slowly on the **ARGUS** project. Jerry Ehman is doing a good bit of computer simulation of small numbers of **ARGUS** elements. Fabrication of the first antennas has been delayed by the frantic moving effort.

As much as we have expected this event, it is stressful, trying and a tragic situation. The sacrifice of an historical instrument for the benefit of housing development and a few golfers seems such a strong indication of [sic; incomplete sentence]. In the long history of this land, seen from the 22nd century or beyond, it will certainly be seen that the contributions of the hogs raised here during the latter half of the 19th century (giving rise to the establishment of the Perkins Observatory) and the 40 year tenure of the Radio Telescope will far outweigh the few tens of millions of dollars earned for the developers and the occasional hole-in-one scored on a multi-million dollar golf course. It, after all, is the expansion of the human spirit that marks the mile posts of civilization. Big Ear has without doubt contributed more than its share to this worthy and necessary cause.

7/19/97 Meeting Notes
By: Earl Phillips

Attending were Ayotte, Ehman, Brooman, Phillips, Barnhart, Dixon, Campanella, Sandy & Mike Kardules, Jing Yee, Hanson, Brown, and Childers.

Barnhart announces that he will be leaving on his extended camping trip the last week of July, and expects to return around mid-September or so. He brings a *Dispatch* article on our connection to the movie "*Contact*". He also brings a French UFO book which we're featured in.

Dixon reports that he saw the movie "*Contact*" and thought it was pretty good, although he did note some scientific inconsistencies. He feels that it will overall help the general public understand **SETI** a bit better. He brings a video tape of our last open house which was done by a volunteer. Barnhart volunteered to make copies. He reports that the president of Methesco called and left a message indicating that he is still willing to have us relocate to their property. He then brought up the suggestion that a monument of some sort be erected on the site, commemorating the efforts of the telescope and it's founder and volunteers.

Brown reports that he met with the OSU attorney and representatives of the developers and discussed many issues. He has purchased a replacement for the WWV antenna, which needs to be attached to a pole that has yet to be erected. **LOBES** is back on line, with the problem traced back to a faulty synthesizer, which he replaced. One of the controllers for the horn cart is bad, which means we cannot track right now.

Sandy Kardules proposes we start farming proposals to outside agencies for **ARGUS** funding, and volunteered to spearhead the effort. We will supply her with any material she needs for this very important project.

Ehman brings various articles; some he was interviewed for, some on the movie "*Contact*", some on Perkins Observatory. He has also tracked down several software programs for antenna modeling. Ayotte brings along a model he's built of an antenna for the **ARGUS** array.

NASA STATEMENT ON THE PASSING OF GENE SHOEMAKER


Dr. Eugene Shoemaker

Planetary scientist Dr. Eugene ("*Gene*") Shoemaker, 69, was killed in a two-car accident near Alice Springs, Australia, on the afternoon of July 18. His wife Carolyn Shoemaker suffered broken bones, and reportedly is hospitalized in stable condition.

A geologist by training, Shoemaker is best known for discovering, with his wife Carolyn and colleague David Levy, a comet near Jupiter. Comet Shoemaker-Levy 9 was broken up by tidal forces from Jupiter, and its fragments collided with the planet in July 1994. Together, the Shoemakers were the leading discoverers of comets this century.

"Gene was one of the most renowned planetary scientists in the world, and a valued member of the NASA family since the earliest days of lunar exploration," said NASA Administrator Daniel S. Goldin. "His work on the history of meteor impacts and the role that they play in the evolution of the Solar System is a fundamental milestone in the history of space science.

"Gene was an extremely articulate man who could explain the wonders of the planets in simple language that anyone could understand and get excited about," Goldin added. "Although he never realized his dream of doing field geology on the surface of the Moon, all future exploration of that rocky world owes a debt to his pioneering spirit. Our warmest thoughts are with his dear wife Carolyn as she recovers from her injuries."

Shoemaker's signature work was his research on the nature and origin of the Barringer Meteor Crater near Winslow, AZ, which helped provide a foundation for cratering research on the Moon and planets. This work led to the establishment of a lunar chronology, allowing the dating of geological features of its surface.

Shoemaker took part in the Ranger lunar robotic missions, was principal investigator for the television experiment on the Surveyor lunar landers (*1963-1968*), and led the geology field investigations team for the first Apollo lunar landings (*1965-1970*). In 1961, he organized the Branch of Astrogeology of the U.S. Geological Survey in Flagstaff, AZ, and acted as its director from 1961 to 1966. On his retirement from the U.S.G.S. in 1993, Shoemaker became a staff member at Lowell Observatory in Flagstaff.

An early supporter of the idea that an asteroid or comet impact had doomed much of Earth's life (*including the dinosaurs*) 65 million years ago, Shoemaker chaired key NASA working groups on how best to survey such near-Earth objects in 1981 and 1994. Most recently, he was active in the Clementine mission that imaged the Moon, and was science team leader on the planned Clementine 2 mission.

Shoemaker won numerous awards during his career, and in 1980 became a member of the National Academy of Sciences.

OSU'S 'BIG EAR' FACES TRANSPLANT

Ed. Note: This article originally appeared in the 7/21/97 issue of the Columbus Dispatch. *It is reprinted here with the permission of the author, David Lore.*

OSU'S 'BIG EAR' FACES TRANSPLANT
By: David Lore
Columbus Dispatch
Science Reporter
dlore@dispatch.com

Bulldozers already are encroaching on the perimeter of the 24-acre radio telescope site east of Rt. 23.

With less than six months left on their lease, operators of Ohio State University's radio telescope in Delaware, Ohio, are considering relocating to a neighboring seminary or to OSU's west campus.

Built by OSU engineer John Kraus during the 1950s, OSU's "Big Ear" radio telescope was a pioneer in the search for extraterrestrial intelligence program.

The telescope — as large as three football fields — consists of two flat radio signal

reflectors, each 70 feet long and 100 feet high, facing each other across a 3.5-acre aluminum ground plane. [Corrections: One reflector is a tiltable flat reflector 340-feet wide by 100-feet high (slant hieght); the other reflector is a non-movable curved (paraboloidal) reflector 360-feet wide by 70-feet high.] It will be razed as part of the expansion of the former Delaware Golf Club course.

Big Ear has been living on borrowed time since 1985 when Ohio Wesleyan University, the original landlord, sold the site to developers. Lease extensions run out Dec. 31.

Kraus, the 87-year-old director of the radio telescope, said neither side is seeking more delays.

Golf course construction already has disrupted the telescope's research program, said Philip Barnhart, a retired Otterbein College physicist who coordinates research activities. A small but critical horizontal antenna was recently destroyed by construction equipment, and two of three access roads have been blocked by piles of dirt, he said. OSU attorney John Reilly said he's been working to resolve the problems and that the developer, New Green Highlands, has been cooperative.

Ohio State University also has announced it will pull out of its 62-year-old joint operating agreement with Ohio Wesleyan for the nearby Perkins Observatory on Rt. 23. The radio and optical facilities are neighbors, but their situations are unrelated. Ohio Wesleyan plans to continue operating the observatory.

Norman Dewire, president of the Methodist Theological School in Ohio, which occupies a 70-acre site just north of Big Ear, said he suggested a year ago that the radio astronomy program move in with him. Dewire said school trustees have approved discussions on providing land for a new radio telescope array, as well as office space in a residence hall. In return, the school would hope to get free access to *OARNET*, the higher education computer network. "It brings us into the computer age," Dewire said.

Kraus, however, said he'd prefer the radio telescope program he founded return to the OSU campus. Before building in Delaware, Kraus developed smaller experimental radio telescopes on the west campus; so this would be somewhat of a homecoming, he said. Kraus and Robert Dixon, the telescope's assistant director, have talked with faculty at the OSU ElectroScience Laboratory about use of a small building and

some land at the lab's field off Kinnear Road. "The advantage at OSU is that it would be accessible, graduate students could get involved and the (*telescope*) staff could interact with the ElectroScience staff, which is pretty eminent in the world in electromagnetic research," said Kraus. "It would be a powerful connection."

In building a new radio telescope, Dixon and other Big Ear volunteers plan to adopt an "**ARGUS**" design, featuring an array of small conical antennae [Note: These antennae don't have to be conical.] linked by a powerful computer. The name comes from the mythological Greek guardsman, **ARGUS**, who had 100 eyes and could watch all directions at once. At Delaware, they've experimented with an eight-antennae **ARGUS** array, with each antenna only about 12 inches wide. [Note: Most of the work on that telescope was done on the main campus.]

Planning has begun for an array with 100 antennae; the prototype would require an acre of land and cost $250,000, he said. Grant requests are pending.

An acre would be available at the Methodist seminary. Less than a half-acre is available at the west campus field, although there are adjacent OSU agricultural lands.

Kraus said astronomers and engineers worldwide are discussing the possibility of building an **ARGUS** array of a million antennae that are computer linked. "The key to the **ARGUS** design is that you create beams which look in every direction at the same time, so that if you have short-term transient events, you'll be able to find them," Dixon said. This capability would be useful not only in astronomy and in the search for extraterrestrial intelligence, but in civil aviation as well, he said.

Dixon said rising construction costs are forcing scientists to seek alternatives to large, stand-alone radio telescopes. "**ARGUS** is limited only by computing power, and that's an area where costs are falling over time," he said.

WOW! PARTY NOTES
By: Bob Dixon

It was a great evening for all. About 25(?) people showed up, including many **NAAPO** volunteers, several **SETI** League members (the only one whose name I remember is Dan Fox KF9ET from Bloomington, Indiana). Of course there was Paul Shuch and his wife Muriel and young son Curran. **NAAPO** people I recall are: Steve Brown, Marilyn McConnell-Goelz, Paul and Jody Hurm, Jerry Ehman, Cindy Brooman, Harry Kitchen, Tom Hanson, Mike Brooks, Angie Campanella, Bob and Judy Dixon, John Ayotte, Mike and Sandy Kardules, Jian Yi and friend, Chris Pezzuti, Ron Leeseberg. One Big Ear admirer from the general public showed up, and we invited him to stay.

Cindy had arranged a great **WOW!** cake, complete with simulated green-bar paper and the famous *6EQUJ5*. The actual **WOW!** printout was there and Jerry saw it for the first time in 20 years. Paul sang many of his great **SETI** songs. The **SETI** League provided munchies and drinks, in addition to those provided by other NAAPO folks.

A number of press people were there, with much photographing and interviewing. Channel 4 TV made the biggest splash with their remote video truck. They put up their telescoping antenna and sent live video to the station. Chris Pezzutti got a copy of the video tape and will have copies made for us.

There was a short Big Ear tour for all attendees. The Flag of Earth was discussed, as well as the reasons for our being pushed out. Harry Kitchen played the tape he made from the WOSU-AM broadcast on his boombox. He provided us with a copy. We partied until about 11:30, and counted down the seconds until the exact 20th anniversary of the **WOW!** signal discovery.

Perkins Observatory was having a star party at the same time, and their incorrect driveway sign sent some Big Ear visitors the wrong way, so they asked us to provide someone to direct traffic. Harry volunteered. Afterwards, they asked us to drive out with our headlights off. I tried to do this, but found I could not see the road in front of me and declared it too dangerous and left my lights on.

11/15/97 MEETING NOTES
By: Tom Hanson

At 10 AM, Saturday 11/15/97, RO members gathered at the parking lot of the ESL laboratories. There was only one key to the satellite communications gate or facility, and Steve Brown had that, so we waited for Steve Brown. And we waited ... And we waited ... Finally, Dr. Barnhart lifted the top on his campervan, and we assembled in his van to hold a meeting. Present were: Dr. Barnhart, Dr. Dixon, Ron Leeseberg, Harry Kitchen, Jerry Ehman, Cindy Brooman.

Packages of photographs were passed around. These included pictures taken by a photographer from a Marion newspaper, who had come on a day when members were packing for the move from the Big Ear site. In addition, there was a large packet taken by Dr. Barnhart from Ang Campanella's plane. These pictures were taken in October, and showed the fall colors clearly. They also showed a small pond which appears to have been constructed southeast of Big Ear, as part of the golf course design.

Dr. Dixon reported that his effort to secure additional keys had run into a bureaucratic snag, and he would have to start all over. Dr. Dixon reviewed the events of last weekend, when a professional mover moved numerous items to Dick Smith's barn, and to the new facility. The movers arrived late by a couple of hours, and there was further delay when the truck engine would not start at Dick Smith's barn. As a result of the delays, it was dark when the movers reached Kinnear Road. Due to the late hour, it was discovered that lights in the front of the satellite communications facility have burned out, and it was difficult to unload the truck in the dark. At this point, the trailer has not been moved, and the driver is reluctant to attempt to move it while the ground is soft. A complication is the fact that the ground in front of the trailer was landscaped, and is now covered with soil, so that the driver cannot easily drive forward as had originally been planned. The trailer will have to be backed up before it can be moved forward. The driver appears to believe that there is sufficient air pressure in the trailer wheels for safety. Meanwhile, winter approaches. There was discussion of the wisdom of securing items inside the trailer. but no definite plan was announced for taking this step. Someone floated a question as to where we go from here, and Dr. Dixon suggested that unpacking and organizing the new facility ought to be the first order of business. It would be desirable to put some equipment in service, even if it is only the discone antenna and related devices.

At 11:00 AM. when Steve Brown had not yet arrived, Harry Kitchen inquired if we might assist him in unloading his station wagon, which was filled with cable and other items salvaged from Big Ear, including the discone antenna still mounted on a pipe. Thus began another ADVENTURE at BIG EAR.

Cindy Brooman took leave of the company at this point, as did Dr. Barnhart. A convoy of four vehicles followed Dr. Dixon around to the parking lot entrance on Lane Avenue, while Harry Kitchen took an overland route to the satellite communications facility. Harry had discovered this route when he rode his Honda motorcycle to the facility when we first visited the site.

Dr. Dixon's convoy proceeded confidently south on Lane Avenue toward the parking lot entrance, while noting heavy traffic as fans gathered to watch Ohio State entertain Illinois University. There were numerous traffic cones in evidence, and as we turned onto the parking lot entrance road, we could see signs announcing a $5.00 fee for parking. We ignored the ticket sellers as best we could, and followed Dr. Dixon as he turned into the gate protected entrance to the parking lot. Dr. Dixon swiped his faculty card through the gate station, and the gate obediently rose to let him through. The gate then lowered to block entry by the rest of the convoy. Curiously, Dr. Dixon's faculty card could not open the gate a second time. He had to persuade a member of the parking crew to unlock the gate, so the convoy could proceed through. At the satellite facility, Harry waved us into our parking spaces from the top of a grass covered mound. We crossed over the mound and a shallow trough, and onto the facility parking lot. Since we still had no key, Harry and Dr. Dixon made their way under the personnel gate. I was reminded of military trainees negotiating a barbed wire obstacle course, as both completed this exercise. Jerry Ehman then held the door of the station wagon high in the air, as Ron Leeseberg and Tom Hanson fed cable and other items over or under the fence to Harry and Dr. Dixon. After the wagon was emptied, the obstacle course negotiators returned to the outside world. Harry set out to retrace his journey over the unofficial access road, while the rest of us undertook to exit from the parking lot. Happily, as we approached the exit, we found the gate arm lifted. Dr. Dixon led us successfully through the maze of parking lot byways, and we exited onto Kinnear road south of the ElectroScience Lab.

I would like to commend Dr. Dixon for risking Mrs. Dixon's displeasure, by scooting under the personnel gate at the Satellite facility to assist Harry Kitchen. In putting his leather jacket in mud and gravel, Dr. Dixon provided support for a Radobs volunteer in a time of need.

BIG EAR
110-m version
REST IN PEACE

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E-mail Webmaster

Designed by Jerry Ehman
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