



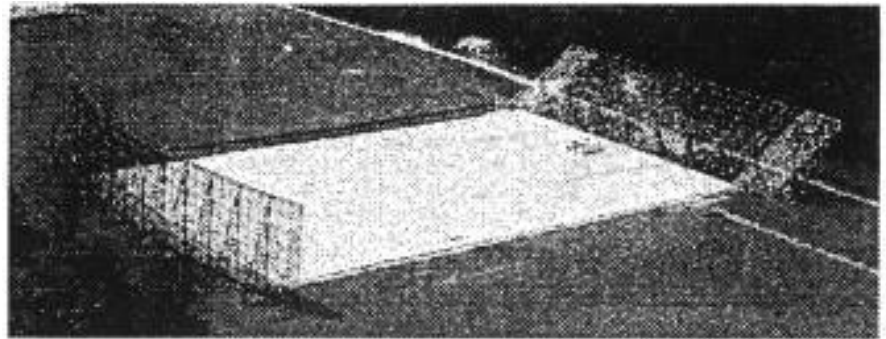
## NAAPO (North American AstroPhysical Observatory)

"Signals"

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# SIGNALS



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**COORDINATOR'S CORNER**

**By: Phil Barnhart**

We have endured many indignities at the hands of the peculiar bureaucracy surrounding the university during the shut-down of the Big Ear facility at Delaware — like the refusal (under threat of imprisonment) to allow removal or disposal of any university property prior to the termination of the lease, then upon the termination declaring ALL property at the site as abandoned and no possible salvage available.

The failure to recognize the effects of vandalism upon the safety of university property meant that much of value, to the university as well as to the ongoing Observatory project, resulted in the loss of much from the control hut and the garage weeks before termination of the lease. Tools and heavy equipment are now left to the employees of the developer or the bulldozer.

Demolition is commencing. The scrap dealer contracting for the removal of the telescope has contacted us for assistance in moving the flat **reflector** to a more level

position. Resolution of these negotiations are still pending.

Now it turns out the university has a problem with the nature of our operation. We have received a grant from the SETI Institute of \$25,000 seed money to develop **ARGUS** technology. The university in its fiscal wisdom does not want to receive research money without payment of 45% overhead — which effectively reduces the \$25K grant to \$13.75K. The solution has been to classify the grant as a directed donation.

Problem: the recipients of the donation are a bunch of volunteers — only a few of whom are employed at the university. Solution: we have recruited an OSU faculty member to volunteer as a scout troop leader because the university does not recognize volunteers as a viable part of the institution capable of doing anything. They apparently forget all the volunteers such as Friends of the Library and volunteers at the Medical Center. We seem to be the only non-people volunteering to do research work in the university environment.

We will keep our friends posted on our progress in becoming a recognized entity. We continue to project a low profile until we get more than one key to the gates and office at the SATCOM facility.

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## **SOUVENIR OFFER OFF AND RUNNING**

**By: Phil Barnhart**

In December we dropped the half-developed idea to David Lore (of the *Columbus Dispatch*) of offering mementoes from the Radio Telescope to willing donors to the on-going research efforts of NAAPO and the RO group. So far in response to Dave's article we have orders for a dozen items. We are in the process of producing the offered items and they will start out in the mail within a week or two from this time.

Included with this issue is a copy of the brochure prepared for this project and mailed to all who requested information from the article. We will do our best to keep up with the orders from our regular friends while adding new people to the list through the public solicitation. A system breakdown in the editing chain being used for the video tape tour has delayed that project a few weeks. Hopefully this will be corrected by the time it is necessary to send out the materials.

Feel free to submit your orders. We will have enough 21-cm squares of reflector

mesh for all. There are also about 100 sash weights that make excellent door stops or paper weights for your hard-to-buy-for cousin or boss.

## GETTING ON WITH THE TASK

**By: Phil Barnhart**

The pace of activities by the RO volunteers has accelerated in the weeks since moving out of the Delaware observing site. In spite of several hurdles placed in our way by edgy bureaucrats we have doubled our efforts in the required move out of Dreese 805 — the long-time center of campus operations for the Big Ear Telescope. Extra work sessions have been scheduled on the Saturdays between our regular meeting times. Bob Dixon has spent many hours of lunch time sorting and disposing in preparation for these moving days. Much of value and interest has been thrown out. We truly are entering a new era in radio astronomy at OSU.

Going apace with the move the volunteers are forging ahead on software development for the **ARGUS** array. With donated computers and many combined years of experience the detection and data processing procedures are being developed. At the same time, fabrication of antenna prototypes is progressing. The development of the tri-dipole arrays (coming to be known as "hexapoles") on a stand-alone configuration for mounting on regular icosahedron central forms is going apace. Computer simulation of the porcupine-appearing array is being carried out to evaluate the various parameters of spacing and gain. Reports of progress in these areas will be forthcoming in future issues of *SIGNALS*.

In the month of January, our first month full-time away from the Big Ear site we have accumulated over 200 person-hours of volunteer activity. That such effort will be productive is certain. Already we are seeing some of the ideas generated in the last months of last year beginning to come to realization. The learning curve, though steep is being pushed very hard and results are going to be evident before too many weeks.

The **NAAPO** account is beginning to rise after rather sharp attacks in the last months of last year. We have been reimbursed (as promised) for the moving company costs. Donations for the souvenir offer have pushed past \$200 and we hope to increase this with our long standing friends this year.

## **SATURDAY, 12/20/97 MEETING NOTES**

**By: Tom Hanson**

Attending: Dr. Barnhart, Ang Campanella, Cindy Brooman, Harry Kitchen, Bob Tournoux, Tom Hanson.

Cindy Brooman – Received a note from a Big Ear website visitor. The visitor is requesting back issues of Cosmic Search. Dr. Barnhart said we have been charging \$10 for issues. Cindy will check on cost of mailing three issues to Finland. Another question concerned the term Jansky and why it is used. Cindy will reply. Another question concerned noise levels. There was extended discussion of this topic. Someone else wanted to know which universities offer courses in radio astronomy. Dr. Barnhart provided the names of several universities. At this point, the discussion circulated vigorously on the general topic of stupid questions, whether received via Internet or not. Cindy concluded by reporting an inquiry from a web visitor who has expertise in fund raising. Cindy has already replied to the visitor, letting him know that she would bring up his question at the Big Ear meeting. Cindy will ask this correspondent to let us know more about him.

The group proceeded to consider what might develop out of Russ Childers' collection of data gathered over the past three years. At the last meeting, John and Ken Ayotte returned a stack of zip disks after they had successfully written CDROM disks of the data. Russ accepted the zip disks so he could complete transfer of remaining data from the LOBES PC.

Ang Campanella suggested that the Observatory should complete the report on the **WOW** Signal which was funded by the Planetary Society, with the support of Carl Sagan.

Dr. Barnhart reminded us that a committee of himself, Jerry Ehman and Russ Childers has yet to hold its first meeting. He made a note to pursue this.

Ang continued to expand on the theme of developing one or more papers out of the recent research.

Marc Abel's name was mentioned, in connection with previously collected data.

Harry Kitchen reported on his investigation of potential hardware for implementing

the vision Dr. Dixon articulated at the last meeting. Harry's report led to a reprise of Dr. Dixon's proposal for Ang Campanella. Harry proposed a working party at the SatComm site, to assemble sound cards into the existing 386 systems we now have. It was decided that we would meet at 10 AM next Saturday.

Discussion then moved to Dr. Dixon's current trip, and expanded to the southern skies. Dr. Barnhart said that a significant portion of achievement in astrophysics during the 20th century involved study of the Magellanic Cloud.

Dr. Barnhart described the adventure of moving the trailer from Delaware. The driver performed a remarkable feat, in successfully extracting the trailer from its five year home.

The Sunday December 14, 1997 edition of *Columbus Dispatch* contains an article by David Lore on page 2E, covering the last days of Big Ear.

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## **SATURDAY, 1/3/98 MEETING NOTES**

**By: Tom Hanson**

Those attending were: Dr. Barnhart, Dr. Dixon, Bob Tournoux and son, Jerry Ehman, Cindy Brooman, Ron Leeseberg, Harry Kitchen, Guest Susan - Harry's daughter, Guest Friend of Susan's, Ang Campanella.

Opening discussion: The proposal for distribution of souvenirs from Big Ear. An inquiry has come from the wife of a gentleman who worked on the original construction crew. Dr. Barnhart is thinking of NOT requesting a donation from persons in this special situation. The lady would like to offer the souvenir to her husband as a gift.

Dr. Dixon inquired about sale of Palomar overlays. There are some of these available at a warehouse in Dayton. Dr. Dixon found the re-named company on the World Wide Web, in Toledo. He asked for the salesman who had handled our orders in the past, and found that he was still there. The overlays are a set of 1,000 or so plastic sheets which can be placed over sky maps to locate or to identify stars. The cost from the warehouse is \$900, and in the past we have charged \$300 above that for sale to customers. The Mount Palomar observatory used their Schmidt telescope to photograph the entire sky which they could see. Ohio State University (Dr. Dixon and associates) spent years creating the overlays to identify the stars appearing in the photographs, and subsequently many copies of the overlays were sold to

observatories around the world. The need for the overlays arose out of the need to be able to identify stars in the vicinity of an unknown radio signal. The Palomar plates are not of uniform scale. Dr. Dixon and the team had to compensate for known distortions of the plates used in Schmidt telescopes, and other causes.

Dr. Dixon – Report from Australia: Conference was about construction of a 1 kilometer square radio telescope. This would be an international effort, because no one country could afford to build it. The process is highly politicized as well as technically challenging. At one point, the Canadians threatened to pull out, if the design were not to include the frequency range they wish to study. The Canadians offered a design which would employ a balloon to support a feed horn above a flat field of individually adjustable reflector plates below. The anticipated movement of the balloon in wind would be compensated for by computer control of the individual plates. The Chinese are proposing to build a large number of Arecibo style telescopes, because they have ideal locations in western China. Dr. Dixon brought along a folder of copies of the overhead displays he used for his talk. He said that there is concern among international radio astronomers that a plot of growth of radio telescopes (log log) over time calls for a one kilometer telescope to be constructed in ten years. The fear is that if such a telescope is not built, then radio astronomy will stagnate. Judy Dixon accompanied Dr. Dixon on the trip. She visited Canberra while he attended the conference, and the two of them visited other notable spots in Australia, including the sacred rock in the center of the continent.

MISC: Mail has arrived for Radobs. The question arose as to the location of the Serendip computer. Answer: This computer is now located in Dreese 805. A PC purchased in Sonoma California, with a University of California property tag, is sitting on a table there. However, there may be one or more components missing from the PC, since the components which are present appear to be standard components. An empty slot is present, where a circuit card may have existed. "*The Selected Papers of Bernard Oliver*" is published. Dr. Dixon has a copy. The BBC sent a letter about their recent visit to the Big Ear site. The Chinese sent a Christmas card, as did the SETI Institute. There was discussion of a paper on "slow scintillation" of the interstellar medium, which may account for the intensity of the "**WOW**" signal. The title is "*Scintillation-induced Intermittency in SETI*" Authors were: James M. Cordes, T. Joseph, W. Lazio and Carl Sagan. From the *Astrophysical Journal*, Volume 486, No. 2, Part 1, October 1, 1997.

Cindy Broomman had brought in a paper model of a sphere divided into triangles.

Harry Kitchen asked Dr. Dixon to review the progression of his thinking, from a flat telescope design to a spherical design.

Dr. Dixon has found a fair number of papers which discuss the spherical array. He noted that there is a tower on the SatComm site, which currently contains what looks like a radar antenna, and which might provide a mounting site for a prototype spherical antenna for Argus. Ron Leeseberg inquired how many processors would be required for the spherical design, and Dr. Dixon responded 60. He envisions 3 antennas on each of the triangular sections of the 20 sided sphere. He then gave us a remarkable demonstration of manual dexterity, by holding three pens at 90 degrees to each other, and showing the effect on incoming waves as we consider "tri-pole" antennas at various points on the sphere. Ang Campanella's question at this point led to clarification that Dr. Dixon envisions many clusters of "tri-poles" on the poles projecting from the 20 faces of the sphere. The "tri-poles" would increase in size as the distance from the center increases, so that the total assembly is receptive to a wide range of frequencies. Ron Leeseberg inquired about phasing problems, and Dr. Dixon replied that he envisions all the antennas on a single pole would feed into a single transmission line for each of three phases. This leads to the need for sixty receiver/processors for the assembly. He then provided a description of a system of feed lines which would provide physical support for the antennas. At one point he described a set of six feed lines forming a rigid support structure. Dr. Dixon described a system of non-conducting lines which would be strung from the tips of all the antenna support poles, to provide structural integrity.

Bob Tournoux brought in a paper model of a buckyball. The discussion continued, as the group considered the practical considerations of the size of the central "sphere". It is desirable to mount receivers and A to D converters in this space. On the other hand, it is desirable to keep the central sphere as small as possible to avoid blocking signal flow to antennas which are close to the center. It was mentioned that OSU has a VLSI facility on campus, and Dr. Dixon said he thought the department might be interested in a project which might arise out of the Argus effort. On the other hand, the group might be able to construct a single board system capable of processing all 60 inputs.

The next topic was back end processing. He then described the sonic band **ARGUS**. His first description was of a system which would employ 60 microphones. He then went on to describe a concept of using pipes which contain holes drilled to admit



sounds a different frequencies. Ang Campanella joined the conversation, by describing a microphone called a "shotgun" microphone which used soda straws at different lengths to admit specific narrow ranges of frequencies. Ang asked what frequency bands Dr. Dixon is considering for the RF **ARGUS**. The range considered for the "straw man" version is 500 MHz to 1500 MHz. Ron asked why we would want separate microphones for the three separate frequency bands. (What was the answer?) Dr. Barnhart asked what size center structure would be needed. Dr. Dixon is suggesting a single foot diameter for the RF version. 500 Hertz to 1500 Hertz was suggested as a desirable range for a prototype sonic **ARGUS**. Ang suggested using the **ARGUS** prototype to observe sirens which are turned on every Wednesday noon.

Bob Tournoux brought in a sound card for the **ARGUS** project. He offered to assist with software development. He also offered to donate an ethernet card so the SatComm room can connect to the OSU campus network.

Ang Campanella brought in Sound Blaster documentation and diskettes.

Harry Kitchen upgraded the software he wrote to talk to sound cards, so that it would scan for a sound card at any of the possible addresses. After the meeting, Harry successfully demonstrated use of this software on the older of two currently installed sound cards. The plug and play card did not respond to this version of Harry's code, but Harry believes that initializing the card with vendor supplied software may overcome this problem. Acoustic daylight papers – acoustic imaging – Harry mentioned this work, and Ang said that he was familiar with this topic. The work apparently relates to sonar exploration of the floor of bodies of water. The idea is to illuminate a surface with sound waves, and to pick up reflected waves at a number of receiving locations.

Ron Leeseberg said that he hopes his problems with Genie have been solved, so that Dr. Dixon and Paul Hurm will not receive hundreds of error messages. Paul has provided alias names for Ron's messages, to try to insure that Ron's messages will be accepted by the Radobs Listserver, despite the routing code assigned by the Genie network. Paul Shuch contacted Ron about using portions of the Big Ear reflector surface for fundraising. Paul has also asked for a roll of reflector screen, and Dr. Barnhart said we have one available. Ron has 8 boxes of cards. The decision was made to proceed with the Card Project, despite the loss of the original punched cards.

Cindy Brooman asked about security on the list server, and in the members portion

of the web site. She asked Dr. Dixon about monitoring of the list server. Dr. Barnhart expressed concern that some members of the list server distribution might not realize that some topics were of a sensitive nature. Cindy asked about reviewing the list of members. Dr. Dixon then reviewed the list of candidates to be removed. A few names of people on the list were considered for removal. A much greater number of people were considered for a special effort to contact them. Cindy asked if the group might establish a policy for reviewing listserver membership. One suggestion would be to conduct an annual review. This would be done by sending a message to the listserver, asking each person who wished to continue to receive messages to respond within 30 days. The message could also remind members that if they were to wish to be added back to the list in the future, they could contact the group. Cindy also asked about security for the web site.

Jerry Ehman brought in copies of articles about the Big Ear telescope from *The Columbus Dispatch*, by David Lore.

Dr. Barnhart has copies of the Channel 10 and Channel 4 news clips on VCR tape.

Ron asked about the IRS status for **NAAPO**. Dr. Barnhart said that Marilyn has posted a notice in the newspaper as required, and she is requesting a waiver of the fine the IRS announced for late posting of the notice.

Dr. Barnhart asked Dr. Dixon for status of the SETI Institute grant request. Otterbein College has agreed to provide the service of handling this grant if necessary.

## **Saturday, 1/17/98 Meeting Notes**

**By: Tom Hanson**

Attending: Dr. Barnhart, Dr. Dixon, Jerry Ehman, Cindy Brooman, Bob and David Tournoux, Ang Campanella, Harry Kitchen.

Opening by Dr. Barnhart: We need a volunteer to organize software. Several items were reported as salvaged from Dreese Hall. Dr. Barnhart then demonstrated a wooden dowel configured as a Hexapole, with antenna elements connected to six wires. Dr. Dixon has been investigating literature on the subject of multiple dipole antenna design. He used the blackboard to lead a discussion of possible designs. The discussion continued for some time, considering the Mark 1 Hexapole. Dr. Dixon reminded us he envisioned six dipole clusters mounted along a single pole projecting from the central mounting point. Dr. Barnhart's Mark 1 model was built to represent

the element which would be closest to the center.

Circulating item: Dallas Morning News, Monday, June 30, 1997, Discoveries section "Life Beyond".

Harry inquired about directivity, and Dr. Dixon clarified that his goal is to design a system which will have no directivity at all. There will be a set of nested spheres, each positioned at approximately 25% further out from the center than the preceding.

Dr. Dixon – Seti Institute grant – New term: directed donation – This would be the preferred terminology – SETI Institute agreed to this. Then a new complication appeared. An administrator desires that there should be a co-investigator to work with Dr. Dixon. Dr. Klein would not be the assigned person. The preferred person is someone Dr. Dixon knows. A question was asked: How can it be proved that the Radio Observatory exists? Dr. Dixon spoke to Dr. Kraus. He found a document dated 1956, which is the official memorandum creating the radio observatory. This document was signed by the presidents of Ohio State University and Ohio Wesleyan.

Discussion continued at some length about the ongoing relationships with personnel at Ohio State University.

Dr. Dixon then described the effort undertaken by Jerry Ehman and himself this morning, to bring over more items from Dreese Hall. It became clear that more than two people are needed for movement of many items. Dr. Dixon suggested a working party at Dreese Hall at 10 AM. Saturday, January 24. Jerry Ehman will meet Dr. Dixon at 9 AM. Meanwhile, Harry Kitchen will start a working session at SatComm at 10 AM. The telephone number at SatComm is 292-2394. Dr. Dixon's office number is 292-1638.

## **SCIENTISTS LAUNCH SEARCH FOR THE REAL ET IN AUSTRALIA**

**Wed, 21 Jan 1998 08:52:28 -0500 (EST)**

A search for extra-terrestrial life, using the most powerful radio telescope in the southern hemisphere to probe billions of stars in the universe, was launched here Wednesday.

Although sceptical about the possibility of finding a real live ET, the team is confident that if he or she does exist then Australian scientists will find him/her.

Project Southern Serendip, one of the most extensive investigations of its sort ever tackled, will use the Parkes radio astronomy telescope in central New South Wales.

The project was launched at a three-day conference, which started Wednesday, and is being hosted by the University of Western Sydney Macarthur's **SETI** (Search for Extra Terrestrial Intelligence) Australia Centre.

The project would initially screen eight million channels every 1.7 seconds over the next five years, "listening" for signs of communication from afar, a spokeswoman for the team, Carol Oliver, told reporters. It will increase to 72 million channels "fairly rapidly." "It's an extremely extensive experiment and Parkes is the largest radio astronomy telescope in the southern hemisphere," Oliver said.

The conference, focusing on the scientific and cultural aspects of **SETI**, will be addressed by British scientist professor Paul Davies, project founder Frank Drake and the co-discoverer of most of the planets outside the solar system, Paul Butler.

"Southern Serendip will piggyback other experiments, quietly in the background of other experiments going on at the radio telescope for almost 100 percent of the time," Oliver said.

Up to 40 visiting scientists were expected at the conference, coming from Ecuador, Canada, the United States, Italy, France, Norway, Peru, Japan, New Zealand and Britain, with up to 80 from Australia.

"Essentially **SETI** is an experiment that won't have success until we've discovered ET, and of course we all know we haven't discovered ET yet. But that's what we're hoping to do," Oliver said. "Dr. Drake, the pioneer of **SETI**, feels that the experiment

has now got good enough to expect something to happen within the next 10 years," she said. "And he thinks the Australians will do it."

Davies told ABC radio that not a shred of evidence exists to suggest the existence of life elsewhere in the universe, let alone intelligent life. He said that if it was discovered, it would be the most important discovery of all time.

## **BIG EAR Souvenirs**

Note from webpage editor.

The printed version of the newsletter contained two inserts: (1) a sheet entitled "BIG EAR Souvenirs"; and (2) a sheet entitled "BIG EAR SOUVENIR REQUEST SHEET". These referred to an offer to send one or more mementoes as gifts in return for a monetary donation to our organization (NAAPO). I have reproduced below (as JPEG images) these two inserts (each in both a small version shown on this webpage and a larger version obtained by clicking on the small image). Although the offer was appropriate at the time the printed newsletter was sent (early 1998), that offer probably cannot be honored at the time you are reading this electronic version. Hence, even if you print out the 2nd insert (the Request Sheet) and mail it to us with a donation, we are probably not able to give you any of those mementoes, due to the fact that our supply of those mementoes may be exhausted. However, if you wish to make a monetary donation to NAAPO without the expectation of receiving a gift in return, that would be a wonderful gesture on your part and we would be most appreciative.

### **BIG EAR Souvenirs (Insert 1)**

## BIG EAR Souvenirs

On December 31, 1997 the Ohio State University Radio Observatory was officially abandoned to the developers of the Dornach Country Club for the purpose of expanding their golf course to 18 holes. Complete demolition of the 110-meter Kraus type antenna will occur sometime before the start of the 1998 golf season.

For the past 25 years the telescope has been operated largely by volunteers and with few interruptions observations have gone on continuously in survey mode mapping particular regions of the sky, monitoring OH emission, attempting to detect P/Comet Halley, repeating the 1420 MHz all-sky survey and searching for indications of extraterrestrial technologies.

Since 1985 this volunteer effort has been coordinated by a private, non-profit foundation: The North American AstroPhysical Observatory (NAAPO). When it became evident a few years back NAAPO revised its original charter mission from ". . . to preserve, maintain and operate the 110-meter Kraus-type radiotelescope" to design, construct and operate new technology radio telescopes". Development of an all-sky radio telescope having resolution and sensitivity comparable to Big Ear, but looking at the entire sky above the horizon rather than the 1/200,000 part of the sky traditional large aperture instruments do. We will be able to continue development of this ARGUS system only through continued support by the general public to supplement modest institutional support and occasional foundation grants.

In addition to portions of the doomed radio telescope offered to those who make tax deductible contributions, we are offering a year's subscription to our occasional newsletter SIGNALS to those who donate over at the \$50 level or above.

We offer mementoes of the world class Big Ear telescope to donors at various levels of contribution. There may be additional items offered at later dates and announcement of these will be made as they become available. You may use the attached listing as an order form. Make checks payable to

NAAPO/Otterbein

and mail with your order blank to

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or

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reached by phone:

(614) 882 6711

or by E-Mail:

[pbarnhar@postbox.acs.ohio-state.edu](mailto:pbarnhar@postbox.acs.ohio-state.edu)

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## BIG EAR SOUVENIR REQUEST SHEET (Insert 2)

## BIG EAR SOUVENIR REQUEST SHEET

Dear Phil and all your volunteers:

Yes, I would like to support work on the new technology radio telescope under development by NAAPO and the volunteers displaced from the Big Ear Radio Telescope. I join others who believe there are some activities in our culture that should transcend golf and property development. Enclosed is my check for

\$ \_\_\_\_\_ (US\$)

made payable to: NAAPO/OTTERBEIN.

Please send the following indicated mementoes of the Big Ear Radio telescopes:

My check size:	Memento choice(s)
\$ 15 to \$ 24  Choose one.	<input type="checkbox"/> 1. 8 x 10 photo of Big Ear and the WOW! Signal  <input type="checkbox"/> 2. A 21-cm square swatch of Big Ear flat reflector mesh  <input type="checkbox"/> 3. Iron sash weight (16 lbs each) -- nearly 8000 were used to maintain tension on the reflector screens. Local delivery (Franklin and Delaware Co.) FREE UPS postage elsewhere EXTRA!
\$ 25 to \$ 49	<input type="checkbox"/> 4. Segment of wire reflector mesh framed with 8 x 10 photo of Big Ear and WOW! signal.
\$ 50 to \$ 99	Any one of the above AND: <input type="checkbox"/> 5. the volunteer newsletter SIGNALS for one year. -- OR -- <input type="checkbox"/> 6. approx. 1 hour video of Big Ear Open House tour in 1996.
\$ 100 or more!	Any one of the above AND: <input type="checkbox"/> 7. Complete set (13 issues) of <u>Cosmic Search</u> magazine published from 1979 to 1982 by staff of Big Ear.

My address:

Name \_\_\_\_\_

Street \_\_\_\_\_ APT. \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ ZIP \_\_\_\_\_

Send this with your check to:

Dr. Philip E. Barnhart  
4655 Indian Ct.  
Westerville OH 43082-8817

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Designed by Jerry Ehman

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