



NAAPO (North American AstroPhysical Observatory)

**"Signals"
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**Edited by: John Ayotte, 528 Whitson Drive, Gahanna, Ohio 43230
[614-476-3834]**

**NAAPO Coordinator: Dr. Philip E. Barnhart, Dept. of Physics/
Astronomy, Otterbein College, Westerville, Ohio 43081 [614-898-
1516]**

Barnhart to Carry the Message to Consortium Institutions

During the fall term this year, Phil Barnhart will visit as many member colleges as possible to directly carry the message of undergraduate research opportunity to the students. Starting in the middle of September he will spend a few days at St. Mary's University in Halifax, Nova Scotia.

While visiting the campuses he will speak on the radio observatory, research opportunities, and will be available to address classes in introductory astronomy, physical science, general physics or advanced physics. It is possible that large convocations may be arranged. Large group (whole student body or general public) topics are "Limits to Science" or "The Search for Extra-Terrestrial Intelligence".

Any Consortium member that would like to schedule a two or three day visit please contact Dr. Philip E. Barnhart, Dept. of Physics/Astronomy, Otterbein College, Westerville, Ohio 43081 (Area Code 614) 898 1516.

Electronics Wish List

Jim Bolinger

1. Cart motor speed control. I have already blocked out a design for this and Manchester college is supposed to be working on it but we haven't heard anything from them.

2. New continuum integrator.

This should be done at the same time as:

3. New Dicke switch that takes a TTL drive signal.

This should be done at the same time as

4. New switch drive source.

While were at it we should also think about

5. Rebuilding the 50ch phase detectors. The possibility of total power operation could then be correctly implemented.

6. An accurate signal calibration source. This should have selectable amplitude and

frequency.

There are probably other items that are needed but I can't think of them at this time.

Grote Reber, Founder of Radio Astronomy

By John D. Kraus

The following is part one of a piece that I felt you would all like to read. It is just too long to run in one issue of Signals. -ja-

Ohio State University Radio Observatory, Columbus, Ohio, U.S.A.

Journal of the Royal Astronomical Society of Canada, vol. 82, no. 3, 1988

Grote Reber first became known to me through his Wheaton neighbor, E.H. "Bill" Conklin. Bill was a radio amateur, W9FM, so was Grote, W9GFZ, and so was I, W8JK.

By day, Bill worked for an investment firm in Chicago. By night and while on the commuter train, Bill was an editor of *Radio*, an amateur magazine published in California. In 1937 I published several articles in *Radio* on a new type of antenna, now known as the W8JK beam, which caused a sensation in amateur radio circles. Bill, as editor, and I, as author, became well acquainted and he kept me informed about Grote's activities. For example, according to Bill, Grote came to his house one Saturday and asked if Bill could come over and help him. When Bill arrived at Grote's yard he found many piles of neatly stacked wooden timbers, all drilled, painted and numbered alongside some concrete piers. Bill helped Grote place the timbers which Grote bolted together and within a few hours the framework for Grote's big dish went up without a hitch.

This sequence typifies Grote. Everything he does is planned with meticulous care. He designs and builds most or all of his apparatus himself. But he doesn't stop there. He goes on and makes his own observations, plots and interprets his data and relates his results to theory. In a word, Grote Reber conducts all aspects of his research himself; he is a one-man self-supported scientific laboratory, a veritable one-man Bell Labs. For the most part Grote has not been dependent on any institution, foundation or school. And, as Grote puts it, "There have been no self-appointed

pontiffs looking over my shoulder giving bad advice."

From his amateur station W9GFZ, Grote had communicated with amateurs in more than 60 countries on all continents and he looked for more distant conquests. Grote had read Karl Jansky's articles in the "Proceedings of the Institute of Radio Engineers" about radio waves from our galaxy. Clearly, new equipment especially designed to measure these celestial radio waves was needed. After much consideration and analysis he decided to construct as large a dish as mechanically and economically practical. It was 32 feet in diameter with a 20-foot focal length.

At that time, the most likely explanation of celestial radio radiation was that it was of thermal origin which should be stronger at shorter wavelengths. So on this assumption Grote designed and built his first cosmic static receiver to operate at 9 cm, the shortest wavelength it was possible to use at that time. To build this receiver was a feat of electronic engineering requiring much experimental work and development. But by the spring of 1938, Grote's entire system, antenna, receiver and indicator, was in working order and he began systematic observations of the sky but detected nothing. At 9 cm, thermal radiation should be 26,000 times stronger than at Jansky's wavelength of 14.6 m and Grote Reber's equipment should have easily observed it. From this negative result Reber suspected that the radiation from our galaxy was not thermal but may be stronger at longer wavelengths and, accordingly, he decided to try a wavelength of 33cm. It was not merely [sic; correct spelling is "merely"] a matter of retuning the 9 cm receiver. An almost entirely new receiver had to be designed and built. This Grote had working by the autumn of 1938 but again results were negative.

So once again he set about constructing a receiver for the still longer wavelength of 1.9 m. At this wavelength, he found that the ignition systems of passing automobiles produced a severe interfering static or popping noise but late at night this subsided and by April 1939 Grote obtained strong indications of cosmic static from the centre of the Milky Way! Pointing his antenna further north he found that the cosmic static became weaker confirming Jansky's findings in a general way.

All this took place while Grote worked by day designing receivers at a nearby radio factory (Stewart Warner, in Chicago). After supper he slept until midnight. Then, until he left for work the next morning, he sat in his basement beside his receiver and recorded the output meter readings at one minute intervals. On weekends he

had the opportunity to record data at other times but during the day the automobile ignition noise prevented him from making good observations. During the summer of 1939 Grote pointed his antenna at many other celestial objects but found nothing besides the Milky Way radiation.

Encouraged by his detection of galactic radiation, Grote Reber next made improvements in his receiver and also purchased an automatic recorder giving a pen trace on a moving paper chart. No longer would he have to sit up all night to record data. With these changes he then embarked on the first survey of the radio sky.

Then, for a while Grote left Wheaton to do research on the protection of ships at the Naval Ordnance Laboratory in Washington, D.C. I was also working at the laboratory on the degaussing of ships and it was here that I first met Grote. We stayed at the same rooming house where he told me about his equipment and observations of the Milky Way with a contagious enthusiasm. Grote instilled a desire on my part to build a radio telescope but my opportunity to do it did not come until 10 years later at the Ohio State University.

During 1940, while we were working together in Washington, we had several discussions about his dish and its possibilities. At centimeter waves it would have a lot of gain and could be pointed at the moon for several minutes during each lunar transit. Radar was still a few years in the future. However, pulse technique had been available since 1926 when Breit and Tuve first directly measured the height of the ionosphere. Accordingly, if centimeter-wave technology could be developed adequately, it seemed as if radio echoes could be obtained from the moon. We discussed this at some length. While such tests were never made, the idea anticipated Jack DeWitt's successful experiments by six years.

Grote worked in a group headed by Joseph Keithley. One day Joe said to me that Grote was the most ingenious and productive person in his group and that he wished he had more like him. I said, "I would expect that. Grote, you know, has done some remarkable pioneering observations of cosmic static." "Cosmic static?" Joe replied, "what's that?" I explained, but in a wartime setting, noise from our galaxy seemed unimportant compared to urgent matters on planet earth. After the war Joe Keithley started an instrument company in Cleveland specializing in instruments for measuring very small currents and voltages. It has not become as famous or as big as Hewlett-Packard, but his company is well known and highly respected.

Once every week or two some of the laboratory people went bowling. I don't recall if Grote went with us but I should mention that the best bowler in the group was John Bardeen, who subsequently received not one but two Nobel prizes, one for his invention of the transistor and the other for his definitive theory of superconductivity.

When Grote's work at the laboratory ended he returned to his old job in Illinois but I stayed on at the lab. Back in Wheaton, Grote undertook a more complete survey of the sky. This was in 1943. He also detected very strong radio waves from the sun. Although European radars had detected solar emission at about this time, the fact was not announced until after the war.

From his survey, Grote produced the first maps of the radio sky. They showed clearly the concentration of radiation along the plane of the Milky Way. The strongest radiation came from the centre of our galaxy, in Sagittarius, with other less strong maxima or hot spots in Cygnus and Cassiopeia, a precursor observation to the later discovery of the strong discrete sources there.

Although Jansky's merry-go-round antenna was physically larger than Reber's, the Wheaton antenna operated at a much shorter wavelength giving Reber better resolution. Thus, the beam width of Jansky's antenna was about 30° whereas Reber's was about 12° . Later when Reber went successfully to a wavelength of 62 cm, he sharpened his beam to about 4° .

Grote Reber published his results in the *Proceedings of the Institute of Radio Engineers* and in other scientific journals. His first *Proceedings* paper on "Cosmic Static" was submitted September 1939 and appeared in the February 1940 issue. Grote also submitted a "Cosmic Static" paper to the *Astrophysical Journal* and in my book *Radio Astronomy* I tell a story about it. It was the first time an article reporting cosmic radio observations had been submitted to an astronomical journal and most persons were either skeptical or puzzled about the results. The *Astrophysical Journal* was, and is, a refereed journal, that is, manuscripts submitted to it are sent to anonymous experts for their appraisal. Accordingly, Dr. Otto Struve, the journal editor, sent Reber's manuscript to a number of referees. Astronomer referees returned the manuscript with the comment that they didn't understand the radio terminology. Radio-engineer referees returned the manuscript with the comment that they didn't grasp the astronomical implications. So Struve found no

reviewer willing to defend the paper or recommend its publication. In desperation, he wrote to the Institute of Radio Engineers to find out what they knew about this man Reber. As Struve related, the Institute reply was short and to the point, stating that Reber was a member of the Institute in good standing and that he paid his dues regularly!

Struve was in a quandary. He had ample grounds for rejecting Reber's contribution but reasoning that a good article rejected would be a greater evil than a poor one accepted, he approved Reber's article for publication and it appeared in June 1940.

To be continued...

Radobs Notes

9 Jun 88 17:15:11-EDT

From: Bob Dixon

Subject: Terminals available

All new people please note:

We have CRT terminals available to loan to any radobs volunteer who needs one. You must supply your own modem and be active with the group.

11 Jun 88 08:04:17-EDT

From: Bob Dixon

Subject: PC needed

It would be nice if we had an IBM PC clone in Dreese, to act as an intelligent terminal. This would allow program listings to be made easily from the 11/23 (of course the PC has to have a printer) and do file transfers, etc. I can get Procomm communications software and Kermit file transfer software free on campus.

11 Jun 88 20:08:05-EDT

From: Bob Dixon

Subject: New PDP 11/34 moved to Dreese

A good crew showed up this morning and the 11/34 was moved to Dreese without

incident. Beyond the things already mentioned, it has spare parts for RL01 disks, Fortran, a 4-channel parallel i/o card, several serial i/o cards, a digitizer system (not complete), and others. The previous owner will find more manuals and materials for us later. The system is probably operational if someone spends a lot of time figuring out what cards to put where, and how the backplane is wired. All the software (including the standard Versatec fortran graphics library) is on the disks we have, but is in RT-11 format. To use it, we have to make the system work as is, or find some other system to translate to RSX format. Since we have many other things to do, this has to take low priority for now.

Sat 11 Jun 88 20:12:10-EDT

From: Bob Dixon

Subject: 11/23 A/D Kaput

I cannot get the 11/23 a/d converters to do anything sensible, so I believe there are hardware problems. I have a program called adsimp which does nothing but set adcsr1=5. The a/d instantly responds by setting adcsr1 = 8084 (hex). This seems impossible.

13 Jun 88 07:42:40-EDT

From: Bob Dixon

Subject: Kermit Project

I have asked Frank Shen to get the latest PDP11 version of Kermit, and install it on the 11/23 so that it works correctly and reliably. Then he will also document how to use it for the rest of us.

13 Jun 88 08:06:05-EDT

From: Bob Dixon

Subject: August Conferences

Here is the current plan (subject to revision) for the summer conferences we plan to attend. I will drive my air-conditioned medium-sized station wagon if there are no better ideas. This would leave room for 3-4 people beyond myself.

Saturday Aug 6 - 10 am meeting at RO, as usual

Sunday Aug 7 leave early in the morning to drive to Baltimore. I will make reservations in El Cheapo motel there.

The International Astronomical Union is the world's premier astronomical organization. They have a world congress every 3 years, in various parts of the world. This is the first one in the USA in 27 years. The Congress is Aug 2-11, at Johns Hopkins University in Baltimore. The portion we are most interested in is the SETI portion, Aug 8-9. We will present our Radio Camera paper then, with Jim Bolinger and I as Co-authors planned at present. There is a \$150 registration fee for this conference, and I can bring only 1 guest. There will probably be other OSU members going from the astronomy dept, so we may be able to use their unused guest credits for more people if needed. Check with Walt Mitchell to arrange that.

Mon-Tues Aug 8-9 SETI Papers

Wed-Thurs Aug 10-11 unplanned. May be interesting things in Baltimore, or we could go to Washington early.

Fri Aug 12. Travel to Washington, DC if not already. Journey is only about 2 hours. Stay in El Cheapo motel #2. I will make reservations.

Sat-Tues Aug 13-16 IAU Colloquium on Light Pollution, Radio Interference and Space Debris, in Washington, DC. Omni Shoreham Hotel. We present our RFI survey paper. Potential co-authors as of now are myself, Steve Ellingson and Ron Koch. This will require great effort to get the research done before then. We do not know what day our paper will be scheduled. We could leave to return to Columbus as soon as the paper is presented. This conference has a registration fee of \$100, with no limit on the number of people.

I have registration forms for both conferences, and they must be filled out and sent in soon for all participants. NAAPO will fund some of the expenses for a few students to help out. More co-authors would be fine, if people really want to pitch in and help. Plans could be changed if people have better ideas or find problems with the above. Please contact me ASAP with your specific desires and I will handle the paperwork.

13 Jun 88 15:45:15-EDT

From: Bob Dixon
Subject: More pdp 11/34 goodies

The pdp11/34 has a d/a board intended to drive a CRT point-plot device, and we got 2 Tektronix display CRTs of the kind needed for this. They are quite small (6-8 inch screens). There is also printer paper, lots of chemicals and paper for the Versatec plotter, spare air filters for the disk drives, etc. Also another LA36 printing terminal.

14 Jun 88 08:42:47-EDT

From: BOLINGER-J
Subject: a/d errors

I have discovered a cause of the 8084 type a/d error that was occurring in Bob's program.

I quote:

When set this bit indicates that an error has occurred due to one of the following.

- Trying an external start or clock start during multiplexer settling time.
- Trying a start while an A/D conversion is in process.
- **TRYING ANY START WHILE THE A/D DONE BIT IS SET**
(My emphasis)

This bit can be cleared by writing the CSR or by an INIT

(and, pertaining to the a/d done bit....)

Read only--this bit is set at the end of an A/D conversion and is reset by reading the A/D data buffer register.

end quote.

So, before the CSR is written to for the first time, any left over operation from a previous access **MUST** be completed by reading the data buffer.

This was demonstrated by using Bob's program ADSIMP. In its original form the program gave continuous errors since it was writing just to the CSR without reading the buffer register. When modified to read the buffer register it worked EXCEPT when there was a left over operation from the previous program run. When modified so that it read the buffer register at the beginning of the program before writing to the csr it worked perfectly every time. (Ron Huck is my witness on this.)

This could explain why some programs work and some don't.

Also, the a/d is rated at 40000 conversions per second. Any access faster than this, such as in a tight loop, may cause errors. Bob: The adsimp program has been modified to take these facts into account, and may be used as a model for other routines to correctly access the a/d's.

14 Jun 88 12:07:23-EDT

From: Bob Dixon

Subject: a/d errors

What is remarkable and hard to understand is that NONE of the a/d routines we have ever used on the 11/23 has used a dummy read of the data buffer at the beginning. I have been aware of all the factors Jim mentioned, but his results with the adsimp program are very useful. Since the a/d routines clearly have worked in the past, so far as we have known, perhaps something has changed. It is also possible that errors have always occurred in the past, but only sporadically the first time an a/d was used, depending on whether some previous program aborted, etc. Once any of the a/d routines got started, they would always read the data before exiting, thus leaving the a/d in the correct state. A further possibility is that since my most recent programs are more careful about error checking, this problem has come to light forcefully only now. In any case, it is not necessary to know the full history of the problem. I will press on with Jim's suggestion of a dummy read at the beginning of each a/d routine and see if that solves all the problems. It would be nice if there were some "reset" code that could be sent to the a/d to clear all previous conditions and start fresh.

15 Jun 88 08:05:30-EDT

From: BOLINGER-J

Subject: flat status

The flat has been moved to -30 degrees declination.

16 Jun 88 08:07:29-EDT

From: Bob Dixon

Subject: 11/23 software progress

After I incorporated the dummy read idea that Jim suggested into the a/d routines, that problem went away. So with great enthusiasm I incorporated that change in all the programs, took out all the debugging statements, etc. Of course then all the a/d programs then failed in newer and more exotic ways. So back in went the debugging statements again, and this time they really revealed some deep truths. It all has to do with the moment of truth, a problem that has bugged us before. When an argument is passed to a subroutine, the subroutine gets the parameter value at the instant of passing. If the parameter value in the main program should change during execution of the subroutine, the subroutine does NOT know that, a fact which leads to great intricacies and malfunctions in the a/d routines. However, now that I know that, I can redesign around it and hopefully make things work soon.

It continues to astound me that all these programs have worked mostly OK for some time now, even in the presence of these problems.

16 Jun 88 12:08:51-EDT

From: Bob Dixon

Subject: RFI Research Project ideas

Here are some ideas for the RFI project. I am posting this here because a number of people need to see it, and all may have ideas to contribute.

Here are some of the illustrations we need: Photos of the Icom receiver (close-up), overall computer, overall telescope, discone (close-up), discone mounted in place. Block diagram of overall receiver system and computer. SWR plot of discone Data displays of many kinds, to be decided.

We must have some way to absolutely calibrate the system, so we know the signal strengths being received.

Another diagram - a map of the telescope location, showing surrounding cities,

buildings, any potential sources of RFI, power lines, etc.

We can measure the percentage of time a given signal strength is exceeded at each frequency. Can be done as a function of time of day and day of the week.

We could have the computer do all the scanning and recording. This is computer intensive. OR we could use the scanning functions of the Icom, and just interrupt the computer whenever the loom squelch level is exceeded. This is much less computer intensive and may be easier or harder.

Much of this can and should be done now, to avoid the last-minute crunch.

Any ideas are welcome.

16 Jun 88 23:34:48-EDT

From: Steve Ellingson

Subject: RFI survey ideas

1. LOGISTICS

Considering the urgent nature of this project, I agree that we should get things squared away now. It would help if we delegate specific responsibilities for clearly identified tasks ASAP.

I am willing to be responsible for

- a. Getting the discone ready, including changes and testing.
- b. Taking care of the software required.

Other tasks that need to be assigned might be:

- c. Squaring away discone mounts, cables, the preamp, and anything else between the discone and the icom.
- d. Creating, collecting, and coordinating any graphics associated with the report (including the items Bob mentioned).
- e. Possibly some background research: Does anybody know if this has been tried before? The FCC or OSU perhaps? It might be useful to see if these guys have any data for this area, or even for other areas. This research might turn up some ideas for methodologies or identify pitfalls and shortcuts.

2. A CALIBRATION IDEA

I don't think it's a good idea to rely on the icom's s-meter for calibration.

Do we know about any identified sources in the area that are in the passband of the discone/icom system? If we could identify a few transmitters, find out their location and output, couldn't we use them as references? This method would have the advantage that:

- a. No extra data collection would be required (such as from the s-meter),
- b. Assuming several sources widely spaced in direction and freq., we could dynamically subtract out the angle/freq. response of the system.
- c. We would easily be able to deduce the effects of weather conditions, etc.

The reasons I think the s-meter should not be used are:

- a. We have way to be sure that the meter is correctly calibrated and scaled.
- b. If we end up with a funky freq. response on the discone, such as the rapid oscillations w.r.t. freq. that appeared in the last set of measurements, we would lose accuracy no matter how good the s-meter was. A ripple of 1:1 to 2:1 VSWR w.r.t. freq., for example, would introduce an uncertainty in signal power of 10dB. Obviously this will not be a problem if the VSWR varies slowly, however.

17 Jun 88 08:48:01-EDT

From: Bob Dixon

Subject: measuring signal strength with the Icom

There are two separate issues here:

1. Measuring the strength of incoming signal routinely during the RFI survey. For this purpose we have little choice but to use the Icom facilities, such as connecting its S meter to one channel of the a/d converter.
2. Calibrating the Icom meter on an absolute scale. This need only be done once beforehand, or at most an occasional check after that. The calibration needs to include the effects of the discone, AIL preamp, Icom, etc. There may be non-linearities, but I suspect they are not too serious. There are probably frequency-dependent gain variations, etc. that must be determined. If we know all these dependencies, it is not hard to automatically correct for all of them in the computer.

One possibility would be to use known radio stations as Steve E. suggests. If we know their output power, antenna gain, distance, etc we could theoretically calculate their signal strength at the RO. It may not be easy to get that info for

enough stations, and there would still be the unknowns of local terrain attenuation, etc.

Another possibility is to use one of our calibrated signal generators with a standard antenna such a simple dipole. We could have a number of dipoles to work at various frequencies, and put the signal generator on a cart to move it around the site. Or we could reverse the situation and leave the signal generator in the focus room and move the receiver around (may be easier as it would run from batteries).

We could measure the frequency response of the Discone by making TWO of them, and then transmitting with one and receiving with the other. If all else is held constant, this measures the SQUARE of the frequency response, and then we can take the square root.

Or some combination of all the above.

17 Jun 88 08:58:19-EDT

From: BOLINGER-J

Subject: icom calibration

The problem with using a transmitter as a calibration source is that you don't know the effects of propagation. Also there may be reflections from the telescope and other objects that would effect accuracy.

Don't forget that the S meter has a log scale, so one measurement will not suffice to calibrate the readings. Besides, you have no choice but to use the S meter since that is the only thing available to the 11/23 for signal strength measurements.

You could write to the FCC and see if they have a list of allocations between 1 and 2GHz for this area. Don't forget about satellites, particularly low orbit ones that might be on our horizon.

17 Jun 88 13:35:10-EDT

From: Steve Ellingson

Subject: icom calibration

Bob's idea of using of signal generators and reciprocity is definitely the most accurate approach, we should use it if possible. The advantage of using known fixed

stations, however, requires no extra hardware, so I think we should use both. (Comparing the results would allow us to deduce propagation effects, Jim!) I am willing to explore the latter approach to see if it is possible. Who wants to take on Bob's calibration approach?

P.S. Jim's point about the s-meter is well taken. The "known fixed station" approach may be advantageous in this respect since it allows the data to be constantly self-calibrating (by checking against the reference stations at any given time).

P.P.S. Can someone post an address/phone number for the appropriate FCC offices?

Coordinator's Corner

Phil Barnhart

I am beginning to swing into the job of coordinating nearly full time. It is still an amazement to me how far behind routine tasks are apt to fall when I become immersed in the teaching/learning game. I will be playing catch-up a large part of the summer. Among the nearly lost tasks are several bits of correspondence I have neglected these many months.

We are approaching a time of sharp financial crisis. There are on the horizon a number of expenditures that we are well aware of and a balance in the consortium account which is obviously limiting in its stature. Among the tasks taken on by the Publications Group (one of the newly organized volunteer arms of the consortium) is solicitation of corporate support for some of our on-going tasks. First among these is a search for corporate underwriting of the very important role of getting the message of the work of the group before the scientific community. We are looking for donations to see to it that members who have a message can get to the appropriate meetings to deliver papers and engage in discussions with colleagues from across the world.

One of the biggest things to hit radio astronomy in recent years is the concept of the all-sky radio camera. Jim Bolinger has perfected the first phase (pun certainly unintended, but quite appropriate) of this project and will be reporting on his work at the IAU meeting in Baltimore with Bob Dixon in August. We would like to see their trip supported from outside sources so that the funds we are nursing along will go for more immediate needs here at the observatory.

I am also instituting several proposals for research funds, publication funds, consortium expenses and internships for students. Faculty representatives at the member institutions should be ready with updated resumes and descriptive information about your interests and willingness to supervise undergraduate research interns in the programs of the observatories. I will be sending along descriptive information about the program of the consortium to be included in the grant proposals. This should help in gaining a feel for where you will likely fit in to the program.

I can scarcely express the immense gratitude I feel for the work John Ayotte has put forth in the past two issues of Signals. It has not only taken a great load from my shoulders, but is lending a superb image to our organization and presents a very professional appearance to the newsletter. He is also going to keep us all on our toes to be able to get our work done in time for the twice-monthly deadlines.

Joe Snider at Oberlin College is attempting to set up a consortium not too unlike NAAPO for the purpose of carrying out research at the Mount Wilson Observatory above Pasadena, California. He seeks support from like minded institutions so that the Mount Wilson Institute can set about seeking some hundreds of thousands of dollars to fund the de-mothballing of the observatory.

Any of the consortium directors that would like to affiliate themselves with the Mount Wilson project should contact Joe ASAP at the Dept. of Physics, Oberlin College, Oberlin Ohio 44074 or call his secretary at (216) 775-8330 before July 5. I do not feel I am able to commit the NAAPO institutions to such an undertaking, but we certainly are gaining experience in how such a group might operate. Give him a call if you need to know what is involved. Joe will not be in Oberlin till July 5!

Working Session Notes

18 June 88

Attending:

Ayotte-J, Ayotte-K, Barnhart-P, Bolinger-J, Dixon-B, Huck-R, Mitchell-W, Ellingson-S, Riordan-R, Able-M, Crawford-S, Adkins-S, and late arrival Schaefer-R (Faculty, OSU Department of Physics)

Announcements:

1. Dixon will be extra busy in light of the resignation of the Director of IRCC. As Deputy Director all stuff now falls to him.
2. John Kraus presented a guest lecturer at the electrical engineering department at OSU. The lecture was titled "Feed Systems for the 100 meter (328 foot) Eiffelberg Radio Telescope" by Dr. Rudolph Wohlleben of the Max Planck Institute for Radioastronomy, Bonn, West Germany. Bolinger reports it was a very interesting presentation and of considerable interest to the Radio Observatory projects. The telescope is the world's largest steerable parabolic antenna. It stands 40 stories tall and weighs (moving parts) 3200 tons.
3. Dixon provided Barnhart with invitations for proposals to OSU for support of research and computer time. These will be explored along with other sources this summer.
4. Crawford has produced copies of the 11/23 manuals for interested users. There are 6 copies available and most are spoken for.
5. Barnhart announced a trip to St. Mary's University in Halifax Nova Scotia to carry the message of NAAPO to the students at the beginning of the fall term
6. On a trial basis Barnhart is going to experiment with the mailing of electronic bulletin board messages to selected sites. These will be multiple printout copies (up to 3 available at present) of the Radobs bb.
7. A new development is being proposed for the southeast corner of Cheshire Rd

and RT. 23. Dixon is monitoring and advocating for the RO and Perkins observatory interests.

8. A request has been made to regulate the attic vent in the office building for the summer.

9. An offer has been made to provide graphics assistance to the project for a variety of purposes. This will come through the publications group.

Status Reports:

HEADQUARTERS

1. Two requests from St. Vincent's were explored. Barnhart apparently still has the documentation from suitcase SETI. He will try to unearth it as the painters drop cloths disappear. It will probably require another computer to drive it.

2. There are only sketchy references to Horowitz's META system. He will probably be the prime source. Gordon Macintosh is encouraged to keep trying and someday may hear from Paul on the subject.

3. Morrison and Macintosh will try to get to the second Meeting in July to discuss matters with the working session and the software group.

4. The strip chart recorder still shows no movement in our direction. Barnhart is to keep bird-dogging the Gould people.

DREESE

1. The donated 11/34 (From Riverside Hospital) has been moved into Dreese 805. A stellar crew (Bob Dixon, Ron Huck, Steve Ellingson, Tom Van Horne, Chuck Ebert, and John Ayotte) came out on short notice and bent their various parts to the task. There are many peripherals that will be of considerable use.

2. Dixon and students are preparing to attend two conferences in August -- at which papers are scheduled to be presented. These are the IAU meeting in Baltimore and the Radio Frequency Interference (among other things) conference the following week in Washington. So far, Bolinger will be attending with Dixon the Baltimore

meeting and Ellingson will be at the Washington meeting.

3. Bolinger is starting the second draft of his thesis. It should hopefully be out of the way by mid July.

4. We are beginning to contemplate the recruitment of graduate students for the project.

SITE

1. Huck reports the flat has been moved 20" further south. [The value of 20" probably should be 20'; webpage editor.]

2. The mast is up for the discone antenna. As soon as the antenna is mounted we should be ready to begin RFI measurements.

3. The last of the IBM 1130 parts have been moved out of the focus room.

4. There are still serious wildlife problems. Groundhogs are undermining many strategic locations. They also seem to be reproducing. Control is fast becoming a necessity. A copperhead was dispatched just outside the focus room. He was not particularly lively, but is less so now. Bolinger and Huck took care of it in true Indiana Jones fashion. Neither was fatally attracted to the critter. Everyone is warned to take precautions when working around the observatory site.

Working Groups:

SOFTWARE

Dixon reports Steve Leibrand is working on the 11/23 auto power failure recovery routine. Crawford is working on some graphics subroutines and Ellingson is working on the ICOM subroutines. Crawford offered to donate emergency long distance service for anyone wishing to call up the 11/23 for routine programming. We will take the offer under advisement. Chris Winget is working on the clock problems and the general category of time-keeping. Jim Nugen is on the problem of archiving and data processing. Frank Shen is seeking to transfer a new version of Kermit to the 11/23. Dixon is embroiled in the A/D routines in the SETI program.

RFI

Ellingson reports the discone is back in the hands of Battelle for the necessary modifications to try to clean up the response and high frequency sensitivity.

MECHANICAL

Huck reports it is yet to meet.

PUBLICATIONS

Plans for graphic support to the various projects are being formulated, and the materials we need to begin to go after corporate and other sponsorship of the activities of the Observatories are being defined. Sam Adkins is currently pursuing some dramatic visualizations of the telescope and conceptualizations of a full scale radio-camera. One thing that must be stressed is that our fund raising effort is to be built on the concept of offering individuals and corporations the opportunity to participate in something exciting and of value. We are not going to be begging for donations like a charity, because we don't stand much of a chance if we take that approach.

ELECTRONICS

Bolinger reports no one has yet volunteered for this group. He suspects it will cost money when someone does.

Next Meeting:

2 July at 10:00

Barnhart will not preside as he is going out of state for a social event. Dixon, unless you learn otherwise will preside.

Planetary Society

The following letter from the Planetary Society to its membership is reprinted for two reasons. First of all, I feel that we should, as a group, know about the activities of other groups conducting related projects. Secondly, Tom Van Horne and I feel that there is much that our group can learn from the manner in which organizations like the Planetary Society conduct themselves. There are also some good ideas in this letter that we ought to "borrow", and a few, factual distortions (like the galactic center only being visible from the southern hemisphere) that ought to generate some comments. Let's hear from you on this. -ja-

Dear Member,

I have some wonderful news for you ... and an urgent request.

The good news is that after years of determined effort, we can now seize an enormously important opportunity to extend our radio Search for Extra-terrestrial Intelligence (SETI) into the largely unexplored skies of the Southern Hemisphere -- in effect, advancing our SETI coverage to include the entire sky.

In cooperation with Argentina's Institute of Radio Astronomy, we can now begin construction on META II - the second 8.4 million channel Megachannel Extraterrestrial Assay unit. By 1990, META II should be sweeping the skies from two radio telescopes near Buenos Aries [sic; correct spelling is "Aires"], seeking signals from other civilizations on planets of other stars!

Naturally, we're delighted about the tremendous expansion of our SETI efforts that this represents. But we're especially excited about the location for META II.

The fact is, until now there has been no ongoing SETI observation made from anywhere in the Southern Hemisphere. This despite the fact that it contains the center of our galaxy. And some scientific arguments have been raised that this is precisely where we should be looking to find older, more advanced civilizations.

So it's high time this step was taken. And it's appropriate that the Planetary Society is the one taking it. For as you perhaps know, we have for some time been the sole supporter of the only ongoing, and still most sensitive SETI program in the world (U.S. and Soviet programs are still several years away). Our tradition of leadership in this area is simply unmatched.

And with META II, we're continuing that tradition.

But there is one problem -- one that requires us to act immediately. You see, the Radio Astronomy Institute in Argentina has responded quickly, and graciously agreed to provide not only the radio telescopes and related facilities, but also three engineers to help construct META II. And on top of that, the Institute has also agreed to actually operate the system once installed, at its own expense.

Now we must hold up our end of the bargain. It's our responsibility to pay for the META II equipment ... and to host the three Argentine engineers during the year they work side-by-side with us at Harvard University on this vital project.

The total cost is expected to run to about \$150,000 ... and we must commit ourselves to that expense, in writing, within weeks. Argentina has made her commitment, and has sent an official proposal to us.

But we cannot act until we hear from you. That's because your response will dictate whether we can forge ahead into this unexplored new realm ... or whether we must turn and walk away.

We've proceeded confidently so far, for we have a lot of faith in our members - in you. Because since 1981 you and thousands of other Planetary Society members have consistently supported the SETI program and the important scientific work it represents.

You see, not only does the SETI program advance the search for life beyond our solar system, it also advances one of the most important principles that The Planetary Society stands for: global participation in

the search. The entire operation was, after all, first initiated by our International Space Cooperation Fund, in part because - for scientific reasons - SETI requires a global effort with many widespread observers.

But beyond that, META II is an excellent example of how space research can promote peace, goodwill, and cultural pride right here on Earth. Consider: Argentina is a new democracy - with some very old and proud traditions of intellectual and scientific inquisitiveness. The META II project is precisely right for them. It draws upon the best of their emerging high-tech community, it provides valuable educational opportunities for their students, it is affordable to a country facing tight economic times ... and it makes a meaningful contribution to the world's scientific knowledge base.

And META II will also sever [sic; correct spelling is "serve"] as a basis for the Planetary Society's growing involvement in Latin America, and our plans to provide major support for new Latin American efforts in space science and exploration.

As in the Northern Hemisphere, so now in the southern half: META will begin the orderly process of scanning the 6 to 10 'magic' frequencies most likely to yield extraterrestrial signals, in each case narrowly watching millions of channels adjacent to those magic spots on the dial ...

... if you and other Planetary Society members elect to have us follow through. And that can only happen with your immediate financial assistance.

That's why I'm making this urgent request for your immediate help. Your contribution of \$20, \$35, \$50 -- whatever you can afford - is what will enable us to say 'yes' and move ahead with this tremendous new expansion in our search for life beyond this earth.

One estimate says there are as many as one million advanced technical civilizations in the Milky Way Galaxy alone. Perhaps many of them

(but we require just one) are trying to reach out to us. All we have to do is listen. Your help now will help make that possible. Please, we're counting on your most generous support Could you get back to us today? Thank you.

Sincerely,

Louis Friedman
Executive Director

P.S. Exciting news! Argentina's Institute of Radio Astronomy has just agreed to a special arrangement whereby Planetary Society Members who contribute \$50 or more will have their names permanently inscribed on the site of META II in Argentina It's our way of giving special thanks to our most loyal supporters.

Last Words

I'm out of space, and I didn't even get to include one picture with this issue. There is a lot of exciting work going on at the observatories.

-ja-

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Designed by Jerry Ehman

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