



NAAPO (North American AstroPhysical Observatory)

"Signals"
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New Flag of Earth Flies at Big Ear

NO, IT ISN'T IWO JIMA!!



New Flag of Earth Flies at Big Ear

Pictured is **Earl Phillips** (on ladder), and **Phil Schumacher** (steading ladder) raising the new Flag of Earth at Big Ear. At the radio scope, we have flown this flag 24 hours for quite some time. This tradition continues with the raising of the third Flag in as many years.

COORDINATOR'S CORNER

Early Fall? I spotted a loon on Alum Creek Lake in mid-September. He did not stay around long, due in part to the presence of jet-ski operators on the lake. The operations at the Radio Observatory are on the upswing. Summer activities have gotten us on the air routinely, calibration is coming on line, proposals are getting out to granting institutions and the new Flag of Earth flies on the pole. I only wish those who steal the flags would steal the descriptive literature so they can carry the message with them when they display the flag.

As a reminder to those of you who read these newsletters regularly we always enjoy hearing from you. We welcome suggestions about our operation as well as questions we might be able to answer. If you have even a slight inclination to help us financially we welcome the occasional check. We are a tax exempt educational and research organization and all donations are tax deductible. If your employer has a matching gift program, please inform them that you are supporting our efforts and would appreciate it if they would match your donation.

If I haven't said it recently let me reiterate the tremendous support we have had from a growing number of friends of the radio program at Big Ear. There are really few ways to adequately express how much you are all appreciated. I want to extend as

big a THANKS as I can.

9/7 MEETING NOTES

The meeting began at roughly 10:15am. Those in attendance were **Barnhart, Phillips, Schumacher, Leeseberg, Hanson, Brown, Huck, Mike Corbin, and Todd Crane, an Otterbein student.**

Barnhart reports that he has brought all the Foster stuff to the RO, due to its being evicted from storage at Otterbein. He also reports that the position of soda fund manager is still open, and we need a volunteer still for this task.

Hanson reports that **Leeseberg** has invited the SARA group to the RO for a tour.

Brown reports that he has been working on the Argus stuff, and putting RLO2s in the PDP he has installed in the RO office building. He also reports that ESL is still here, but will be out soon.

Phillips reports that he has sent information to **Dixon** about several astronomical databases available electronically, and hopes we decide to get access to them.

The meeting broke at roughly 11:30, with most going off to their respective tasks, or joining the tour.

9/21 MEETING NOTES

The meeting began at roughly 10am. Those in attendance were **Barnhart, Phillips, Schumacher, Hanson, Brown, Childers, Huck, Janis, Campanella, Derinda Worthing, an Otterbein student, and Sue Snyder with student Tom Nguyen, and Special Education teacher Jane Hunt.**

Barnhart brought copies of stories regarding the OSU pullout of Mt. Graham (ed. note: see article). A nice discussion then ensued on the subject. **Barnhart** then pointed out that we still need a business manager, and a volunteer is desperately needed. If you are interested, please contact **Dr. Barnhart**.

Hanson reports that the card reader is on the fritz, and can't seem to find anyone to repair it. The repair seems to be caught up in the OSU bureaucracy. He also reports that the 11/750 has been moved, and is waiting to be hooked up.

Childers reports that the PC monitor at the RO is also on the fritz, and another is needed. He reports that he is having problems with the newly installed memory expansion in the PC in the focus room.

Brown reports that he has replaced 2 of the RL01s in the office building 11/23, with RL02s. This has doubled the capacity of that machine. If you'd like to get involved in software development, or whatever may need such a machine, let **Steve Brown** know.

The meeting broke at roughly noon, with most going off to their respective tasks.

We Need PCs!

Do you have, or know of, a PC that is in need of a good home, with lots to do? If so, we need them! Please let us know if you would like to donate one to the cause, at the address on page 1 (i.e., to **Dr. Philip Barnhart, NAAPO Coordinator**).

GLEANINGS FROM THE E-MAIL BAG

From: **Stephen B. Brown**

Subject: flat reflector

Date: Wed, 21 Aug 1991 15:36:27 GMT

The current flat reflector setting is -13 degrees. Yesterday, I replaced some pneumatic hose which had developed a leak. This corrected the most serious problem. However, because the system had been shut down with low pressure before the hose was replaced, some of the valves were stuck in an intermediate position. These had to be unstuck before the system could be pressurized. The only way we know to do this (determined empirically) is to apply generous amounts of persuasion to the recalcitrant valve with a hammer. **Russ** and I did this to lower brake valves on bays 2, 3, and 6, after which the system was pressurized smoothly. When it came to moving, the east upper brake arm on bay 8 proved to be delinquent, but gentle influence applied with a hammer, crowbar, and generous amounts of penetrating oil convinced it of the error of its ways. After that, it was straightforward to bring bays 8 and 9 in line with the rest of the flat reflector. Because of ESL's experiments, the flat reflector will be stationary for several days. The next move will probably be in the middle of next week.

Steve Brown, N8HFI

Editor's Note: The following brief chronology will help you understand the following "Private.Radobs" Article.

In Article 660, **Jim Bolinger** requested information to help write the Argus proposal.

In Article 662, **Bob Dixon** replies in part "...I thought the plan was to make Mark II operate in the TVRO band, to minimize cost and use off-the-shelf receiver systems. Otherwise I am concerned that the cost and development time will be too high."

Jim Bolinger (Article 663) then posed a series of questions regarding using TVRO equipment for the Argus project.

Article 673 given below (edited slightly) includes **Jim's** questions (numbered and highlighted) and **Bob's** replies.

Article 673 in private.radobs

From: **Bob Dixon**

Subject: (none)

- 1. Can the LO's be phase locked to a master oscillator?** That is one of the things to investigate. An alternative is to have a single LO centrally located, and distribute it to all remote mixers. Either way may be easier than doing it entirely from scratch ourselves.
- 2. How stable are they?** Another thing to investigate. Certainly they are stable enough for high quality TV. They are likely more stable and trouble-free than something built from scratch.
- 3. How noisy are they? (Remember satellites are blindingly strong and 'high gain' antennas are used.)** I have heard typical numbers of 80 degrees, and there are likely better ones. That is plenty good enough. Remember that TV requires a very high SNR to get high quality pictures, so TVRO equipment is low-noise.

4. Can we afford to experiment with learning to use them when the algorithms/methods need to be developed? The idea is that it is easier to work with existing technology instead of developing something from scratch ourselves. That will indeed then let us concentrate on the algorithms and methods without having to do much hardware development.

5. Is there a survey at 3.5GHz that we can use to tell if the thing is working? Yes, but that is not critical. There are surveys at all frequencies, and the sky does not change drastically as a function of frequency. One of the advantages of the TVRO band is that the satellites provide standard candles of known position and intensity that are very good for testing and calibrating the receiving system.

6. Is there any interest in SETI at 3.5GHz? NASA is interested in the entire 1-10GHz range, but that is irrelevant. The MARK II Argus is not intended for this generation of SETI. It is intended as a means to develop the technology for the next generation of SETI. It could extend current SETI searches by being able to detect pulses omnidirectionally, and could detect astronomical events in the same way. It can also make continuum maps of the sky continuously. None of this has ever been done before. The limiting factor will be the speed of the computers involved, which in turn translates directly into the RF bandwidth to be observed. I wild guess we will be lucky to achieve 100KHz in the MARK II, so its continuum sensitivity and frequency coverage will be low. Hence I do not regard it as capable of making very serious SETI or astronomical observations. Therefore its frequency of operation is not very important for observational purposes. Nevertheless it will enable us to develop all the techniques needed, and then expansion is easy with faster computers in the next generation. And the observations it CAN make will be very interesting and attention-getting.

7. Do we really want to contend with the blindingly strong signals and resulting dynamic range problem at the same time we are trying to just get the thing to work in the first place? We need strong calibrators to test the system. Another important facet of SETI is the problem of RFI. Satellite RFI cannot be eliminated by any form of shielding, as terrestrial RFI can be. A critical factor in future SETI systems will be the ability to operate in the face of all satellite RFI. Since Argus is conceptually intended to see all the sky at all frequencies, it must be able to cope with things like the TV satellites. Argus will not be taken seriously by the SETI community unless it can handle that problem. So we must face it directly from the

beginning, and the TV satellites can be regarded as a worst-case condition. This requirement also argues for use of TVRO equipment, since it clearly has the dynamic range to deal with the TV satellite signals. Our situation is even better because we will use low-gain antennas instead of 10-foot dishes, so the signal level at the receiver will be less.

8. Do TVRO receivers sacrifice some other performance spec in order to get wide bandwidth (700 MHz)? Probably so, but this is likely not relevant since they seem to be good enough for our purposes as they are. But that does raise the possibility that if we someday wanted to improve the noise temperature etc. we could do so by adjusting them to cover less bandwidth.

9. TVRO uses FM modulation and FM receivers are not well suited to linear operation? The only non-linearity in most FM receivers occurs at the limiter and detector stages, and we will not be using those. If an FM receiver were to be nonlinear before those stages, it would have terrible intermod and cross-mod characteristics. Since TVRO receivers must be able to distinguish between strong signals on the basis of frequency separation, they could not function if they did not have good intermod and crossmod characteristics.

From: **Stephen B. Brown**

Subject: circular polarization

Date: Wed, 28 Aug 1991 17:11:21 GMT

With regard to the subject of converting linear to circular polarizations, I have spoken with Dr. Michael Klein of JPL about the 'Ortho-mode transducer' which they are designing for NASA. He directed me to Robin Winkelstein, also of JPL, who's been more directly involved with the design of the gadget.

The ortho-mode transducer is not a gadget for producing circular polarization from linear polarization. It is a waveguide-to-coax transducer which has two orthogonal linear polarizations as output. That is, it has one waveguide input and two coax outputs. It is intended to go on the back end of a feed horn.

It is cryogenically cooled and very low noise. It has about an octave bandwidth, which is apparently impressive given the design constraints. ESL's horn design for

Big Ear presumably includes the waveguide-to-coax transducers. I don't know what, if any, additional constraints prompted NASA to go to the trouble of designing cryogenic ones, or whether NASA will find ESL's (non-cryogenic) ones insufficient. NASA may intend to use the OMT in applications other than SETI MOP.

I asked Robin what NASA intends to use (in the MOP) for converting linear to circular polarization. He thought they were using stripline 90 degree hybrid couplers, just like the ones that Dr. Peters of ESL suggested. Loss is not an issue, because NASA will do this after the LNAs. **Bob Dixon** is concerned that it will be difficult to maintain two identical phase paths through the two LNAs, but NASA seems to feel this is not a problem.

Robin agreed to send me some documentation on the OMT. They have just completed design and contracted for construction of a model.

At this point, the only thing I can think of to do is to talk directly to the people at the NASA MOP, to find out how they intend to produce linear polarization, whether relative phase distortion in the LNAs is a problem, and why they feel it's important that the pickup in the feed be cryogenically cooled.

For the purpose of our proposal, I think the best we can do at the moment is assume we will use stripline components, after amplification.

Steve Brown, N8HFI

From: **Steve Janis**

Subject: PDP 11/24

Date: Fri, 30 Aug 1991 18:12:25 GMT

On another bboard I found that OSU Physical Facilities has the following for sale:

PDP 11/24

3 RL02 disk drives

RX02

Fortran, RSX-11M

The contact person is Ron Forrest in Physical Facilities, 292-3546. The posting says that interested parties should 'make an offer'. I realize we are not in the position to offer cash, but I thought I could make a standing offer of 'we will pick it up and take it away for free.'

Question: If we could get it for free, do we want it? (Space considerations, spare parts considerations, etc.)

SJ

From: **Tom A Hanson**

Subject: Card Preservation Project — End-of-Year Report

Date: Sun, 8 Sep 1991 02:06:36 GMT

During the 1990/1991 academic year, the Radio Observatory Card Preservation Project Team, consisting of:

Dave Langford — Team Leader

Andrea Carr — Outstanding Performer

Andy Bohn — Team member

Tom Hanson — Team member

preserved a total of 198 boxes on magnetic tape. In addition to carrying out his responsibilities in preparing input for team members, collecting output on weekly tapes, and returning completed work to Dreese Hall, **Dave Langford** made a number of improvements to system software and procedures. **Dave** has left OSU to pursue other opportunities. I shall miss his energy and enthusiasm, attention to detail and devotion to the goals of the project.

The Radio Observatory Card Preservation Project Team for 1991/1992 will be announced in the next few weeks. We shall endeavor to meet or exceed the record of achievement set by **Dave Langford** and his team.

(th)

From: **Tom A Hanson**

Subject: Dreese Hall Progress; Baker Hall Holding Pattern

Date: Mon, 16 Sep 1991 22:42:50 GMT

Steve Brown, Steve Janis and I were able to put another dent in the collection of donated equipment in Dreese 805, to the point that the VAX 11/750 donated by Cedric Sze was brought into the room. It appears that at least another day of combined effort will be required to bring us to the point of applying power to the 750.

A message has arrived from Mark Selover, indicating that we may be able to persuade him to return to Dreese 805 to have another look at the VAX 11/730, now that we have discovered that the RL02 disk drive may be operational after all. Mark had checked out the 730 CPU last spring, and established that it is in good working order. The RA80 disk drive on the 730 may have been formatted, or it may be non-working. We can find out by booting a small VMS operating system from the RL02 disk drive.

I will tentatively schedule another Dreese 805 work day for September 23rd, from 10 AM until about 6 PM or so. As always, anyone interested in working with old hardware is welcome to attend. Please RSVP, so that any changes in the schedule can be passed along to you.

At Baker Hall, I have given the lead operator a request that a service person take a look at the CARDAMATION card reader. It gives a READ CHECK for every card read. Presumably it has not been used much since the card preservation project came to a halt last April.

(th)

From: **Tom A Hanson**

Subject: Various Items, following Dreese Meeting

Date: Tue, 24 Sep 1991 23:46:57 GMT

To **Dr. Dixon**: The folks at the computer room informed me that they had decided to request a replacement card reader from the manufacturer.

The card reader is clearly marked as "out of order". I'll follow upon a weekly basis

to see how the replacement is coming along.

Steve Brown: The donor of the 11/34 gave me information for booting the processor, but when I followed the instructions, there was no output on the monitor. I think it would be useful to put an RS232 signal detector on the terminal line, to see if we have the correct cable connections. The donor could not remember how he had wired the terminal, but thought null modem wiring was correct.

Steve Brown: While searching the cabinets for documentation on the 11/34, I found a user manual on the 34, as well as an installation guide for the 11/750, ** and ** a service manual on the TU45 tape drive. The manuals are on or next to the respective equipment.

(th)

OSU BACKS OUT OF COLUMBUS PROJECT

Editor's Note: Although the RO is not a part of the OSU Astronomy department, nor is it related to the Columbus Project, we felt the following would be of interest to our readers.

OSU BACKS OUT OF COLUMBUS PROJECT

OSU, through its president, Dr. Gordon Gee, has decided to drop out of a partnership that would have built one of the largest telescopes on Earth. Dubbed "The Columbus Project", OSU, the University of Arizona, and Italy's Arcetri Astrophysical Observatory, were the main partners. The plans were to build twin 8 meter diameter, interferometric telescopes on Mt. Graham, in southeastern Arizona. The instrument was to see "first light" in 1994. It was to have the light gathering power of a single 11.3 meter (448 inch) mirror, and the resolving power of a 22 meter (866 inch) telescope.

In a telephone interview with Dr. Gee, he stated that the reason for the decision was a financial one. OSU simply did not have the money to fund the project. Though Dr. Gee stated that "he personally would love to see the project go through", he cited OSU's lack of necessary funding. The funding plan called for part of the cost of the project being set aside by OSU's Trustees, and the rest being solicited from private donors. When the Trustees failed to allocate funds, OSU's development office could not legally solicit private donations. This combined to effectively guarantee almost

zero dollars for the project. Dr. Gee also stated that the project's costs would not have ended at the publicized 15 million dollars, but would have actually been closer to 60 million dollars over the 15 to 20 years of the project, once the costs of personnel, equipment, etc. were factored in.

This is not the first telescope project that Dr. Gee has had to reluctantly back out of. While at the University of Colorado, that institution entered into an agreement with the University of North Carolina to build a 4 meter telescope in Chile. That project was expected to cost around 5 million dollars. Fund raising efforts for this project also failed, despite Dr. Gee's personal involvement. In his interview, Dr. Gee stated that lunches he had with several prospective benefactors of that project, in which he pleaded for the project, netted no funding. Not being able to pay their share of the costs, he had to decide to back out of the project.

The Columbus Project has met with opposition from the start. Environmental activists opposed the project, fearing that it would eradicate a large portion of the habitat of a sub-species of Red Squirrel, found only on Mt. Graham. The environmentalists believed that, by taking away some of the habitat, the sub-species would be pushed over the edge to extinction. A study published at the time seemed to back up that claim. Newspapers at the time see-sawed back and forth with reports of legal postponements, then ok's to go ahead, on the project, as the claim was pursued by first one side, then the other. It now seems that those earlier claims may be in error; studies done since seem to indicate that the habitat of the sub-species is much larger than everyone initially believed. Additionally, the project could have helped to ensure the survival of the sub-species, by making the area a protected one, thus not allowing hunting or logging, which is responsible for lowering their numbers dramatically.

All in all, the decision is a big set-back to the astronomical community. Telescopes all over the world are greatly over-booked. This project would have alleviated that situation somewhat, while also giving astronomy a first-rate scientific instrument with which to ply their trade. For OSU, this would have ensured their placement at the forefront of astronomy as a science, with all the associated prestige. Such a decision is regrettable, but understandable. Though OSU will surely be the brunt of many a negative comment in the near future, it seems sensible, in this day of "deficit spending", to want the money in pocket before signing on the dotted line.

NOTED IN PRESS:

As the final copy crosses my desk on its way to the readers we received word that NASA has agreed to fund our proposal that the OSU and Canadian SETI programs merge.

Negotiations have begun with Bob Stephens who will be offered a contract to work at Big Ear, bringing his unique talents to our facility along with spectroradiometric hardware appropriate to a merged search program. The NASA grant is the a down payment on a possible three year grant.

The first installment of \$94,500 will be used largely to set up the facility Bob to live and work. Future grant allotments will enable the installation of powerful receiver and analyzing instruments.

We are looking forward to a productive affiliation with Bob Stephens, who has demonstrated great ingenuity and talent in the area of SETI and general instrumentation.

P. Barnhart

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Designed by Jerry Ehman

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