



NAAPO (North American AstroPhysical Observatory)

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**Steve Brown passed his Master's Oral Exam! 3 Mar
CONGRATULATIONS!!!**

COORDINATOR'S CORNER -- Phil Barnhart

Somewhere between writing it and Earl publishing it, my corner got cut last issue. I admit it didn't carry much weight, but ended with an appeal that "Earl not put it in 3-point type." Well, it seems he put it in zero point type. The RO has had its ups, downs and sideways for some time now. Projects have come and gone, some get a boost and fade away, others fly after a shot of thinking and hard work. Some stand up and shout for recognition. I want to recount some of the recent big news items out of Big Ear so that you, our friends, can share in some of the lively excitement that has been going through our regular meetings.

Not since the days of contract research have I felt as excited and stimulated as I have the past few working sessions with the observatory staff. Keeping in mind that we do not have a full time staff and that most of the work cited is done for little or no pay, the fact that we see so much in the way of frontier, cutting-edge work is a firm justification for what is recognized in the scientific community as "small science".

Following is a summary of some of the accomplishments to date growing out of the work of the past few months. Note that some of these projects have roots extending back as much as thirty years!

CARD - MAGNETIC DATA TRANSFER

Tom Hanson has enlisted the aid of Rudo Muzorewa (an EE major on work-study funding — a native of Zimbabwe) to continue the transfer of the original data for the Ohio Survey to magnetic medium.

Where lesser motivated individuals have blanched at the magnitude of the project and given up as unreadable many boxes of punched cards, Rudo has made the card reader sing and boxes are moving through on regular schedules. A box score will appear in subsequent issues of **SIGNALS**.

SYSTEM TEMPERATURE AND APERTURE EFFICIENCY MEASUREMENT

Russ Childers and Steve Brown have devoted much time to determining how well the receiver and detection system is operating. Cleaning dead flies out of the horn couplers was only part of the tasks completed to accurately determine the

attenuation to the calibration noise tube so that a reasonable determination of the system noise temperature can be made. These results, summarized in a technical note by Russ in another part of this issue, give us the best idea in a decade of just how the system is performing.

"LOBES" AND THE CART MOTION PROJECT

Russ Childers has accomplished another master task in getting the 3000 channel SETI bank clicking on most of the channels. A slow dance in front of the feed horns (the 'Childers do - si -do'?) elicits SETI-like hits in a majority of the narrow-band channels. The operation of the horn cart in a hop-sit, hop-sit mode to track 'interesting sources' has been implemented.

PATTERN RECOGNITION PROGRAM SOURCE IDENTIFICATION

Russ has written and installed a pattern recognition algorithm into the continuum output of the receiver. This detects sources down into the fractional flux unit regime, giving position and relative intensity information. An on-going part of this project is the on-line real-time identification of known sources by combining a source list with the detections that the program achieves.

EAST-WEST RAILROAD BED

Bob Stephens completed the tie- and track-laying for placing the horn cart on a set of straight, low-friction, level railroad tracks. This greatly eases the load on the cart drive mechanism and makes tracking a straightforward task for the SETI program.

STRIP-CHART SIMULATION

Ang Campanella and Don James are pursuing the long standing problems of non-working or fouled-up strip chart recorders that have plagued us for a number of years. Ideas have been pursued for a long time of making a PC driven dot matrix printer behave like a strip chart recorder. Now that George Jones of Charlotte, N. C. has announced such a software program in the Radio Observer #67, Ang and Don are pursuing the possibility of dedicating a PC to the task and loading and modifying the Jones program to our needs. They should be on-line in a few weeks.

RECEIVER AND LNA WORK

Steve Willard is working toward the development of a new concept in computer-controlled tuned front ends. He is also contemplating some advancement in LNA technology to test out against our present GAsFET amplifiers. We are simply

awaiting progress reports from his direction.

ARGUS AND NEW TECHNOLOGY RO

Bob Dixon was off to JPL and Ames Research Center this past week to present the philosophy of the ARGUS concept begun here some years back by the work of Jim Bolinger. The idea is not new, but the practical application has been implemented only here at the RO.

Bob has garnered a lot of supporting data — much of which was delightfully transformed to overhead transparencies by John Ayotte before he took off for Europe. A report of Bob's trip should make it into these pages before long. These have been exciting times. We are looking forward to a continuation of the upbeat atmosphere in the future. I have not exhausted the list of accomplishments by a long way, but I will complete the list next issue.

- PEB -

From: Russell K Childers

Subject: Source Identification Online

Date: Sat, 27 Feb 1993 20:54:00 GMT

Good news: The continuum pattern matching algorithm now can name the source which it detected. When a source is detected, a file is searched for the source which is closest to the detected source's coordinates. After 24 hours of running, about 15 sources were successfully identified. There were no false alarms, except when I simulated a source myself. The database which is searched contains all Ohio Sources between +55 and +51 degrees declination (epoch 1950), inclusive. We are observing 53.5 degrees declination (epoch 1993) right now. There are 864 catalogued Ohio Sources in that band of declinations. All sources detected were above 0.4 flux units. The source identification algorithm looks for all sources within +/- 1/8 degree in right ascension and +/- 1 degree in declination of the detected sources' coordinates. In the works is a method of determining whether a source has changed in intensity or position.

1/6/93 MEETING NOTES

The meeting began at roughly 10am. Those in attendance were Barnhart, Phillips, Bolinger, Dixon, Janis, Ayotte & son, Brown, Hanson, Childers, Campanella, & visitors Malinda & Jane McKay, Ryan Smith.

Stephens stopped by before the meeting to announce that he will not be attending today's meeting.

Dixon reports that Kingsley & Goodall effectively destroyed Tippler's arguments against SETI at the SPIE conference they recently attended. He has been invited to NASA/AMES & NASA/JPL to give a talk on the Argus project.

Barnhart reports that he has received a letter from Herb Johnson, a past volunteer. He also sent us a copy of "SkyGlobe", a shareware computer program which gives real-time display of the optical sky.

Ayotte continues to work on his real-time display project, though slowly. He has produced a set of overheads for the talk by Dixon on the Argus project.

Brown reports that he has set the PDP to auto-boot after power failures.

Childers reports that he & Brown have been measuring the effective aperture of the 'scope.

Bolinger brings a pictorial history of his working model of the Argus 'scope.

Hanson brings a printout of the status of his card-to-tape project.

Phillips donated 2 new boxes of 8" disks & many 8" disk jackets.

Janis brings a video from the SPPIE conference of Arthur C. Clarke's introduction.

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

2/20/93 MEETING NOTES

The meeting began at roughly 10:05am. Those in attendance were Barnhart, Dixon, Phillips, Brown, Janis, Hanson, Campanella, James, the McKay's, and Childers. Richard Smith, the carpenter that rennovated the apartment for us, stopped by for measurements of the garage for the siding project.

Barnhart reports that he has received a shipment from Skip Lewis. The shipment contained a reel-to-reel recorder and tapes, in response to our wish list. Thanks Skip!

Dixon reports that he received a call from Carol Abbott, offering another 11/785, which Dixon politely refused. He will be leaving tomorrow for NASA/AMES to give his talk on the Argus project. He has also been invited by John Billingham to the International SETI Conference, to be held in Austria, to give the Argus talk.

Brown reports that he and Childers have been taking more measurements at the feedhorns, attempting to find a way to cut out noise. A good chalkboard demonstration and explanation ensued.

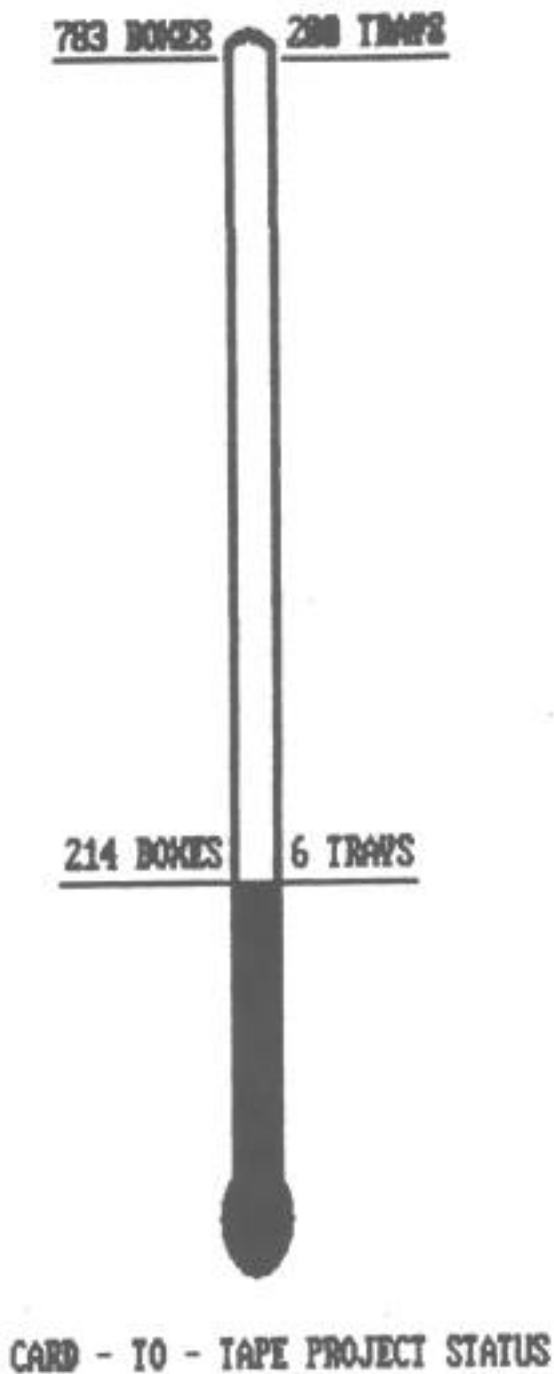
Childers reports that he has contributed to the Argus talk by calculating the declining cost in computing power as a function of time.

Hanson continues to work on the card to tape project.

The meeting broke at roughly 11:50am, with most going off to their respective tasks.

ed. note:

Tom Hanson, guru of the card-to-tape project, has suggested that we keep Signals readers informed as to the status of the project via an easy to read thermometer style graphic. Thanks for the suggestion Tom!



From: Stephen B. Brown

Subject: Big Ear calibration

Date: Mon, 22 Feb 1993

Russ Childers and I have been involved in an ongoing effort to measure the present aperture efficiency and system noise temperature of Big Ear. As part of this effort, Dr. Dixon asked us to measure the temperature of the calibration noise pulses, which are the reference for interpreting the continuum recorder output. To do this, we had to accurately measure the attenuation of the coupler which introduces the calibration noise into the waveguide. This measurement proved to be complicated

by two factors. First, when the coupler attenuation was measured in situ, the output power recorded included the sky signals picked up by the telescope as well as the controlled signal we were introducing through the coupler, so we had to use as much power as possible. Second, the signal generator is not accurate at its highest output levels. For these reasons, our initial measurements were unsatisfactory, with significant non-linearity in the measured data. Finally, we concluded that we would have to do some measurements ex-situ. So, we disassembled the waveguide at the end of the feedhorns and made measurements with the coupler isolated. By carefully selecting the ranges used for the measurements to coincide with the most accurate ranges of the instruments, and by using a nominal 20 dB amp raided from the receiver (this was a suggestion of Russ), I got data which were very consistent, with very little of the bothersome non-linearity we had been seeing in the data. At 1420 MHz, the attenuation of the three ports on the coupler in waveguide (nominally 30, 40 & 43 dB) are 30.13, 39.22, and 42.22 dB, respectively. The attenuation of the path through which the noise tube signal is introduced into the waveguide (including the cable between the focus room and the feed horn and a nominal 6 dB attenuator) is 39.32 dB. The gain of the nominal 20 dB amp is 21.86 dB. In all cases, I used at least 5 data points and did a least squares linear fit of the data (in dB.) The fits were excellent in all cases, and the results were within the range of the spec'd instrumental error in all cases. For this reason, I feel confident in stating that these figures are accurate to +/- 0.2 dB, which is the instrumental error. All this translates to a calibration pulse amplitude of $1.18 +0.06/-0.05$ K, assuming that this figure for attenuation is good for the entire range 1393-1433 MHz. On the basis of this figure and an observation of OC+575, Russ Childers has calculated the present aperture efficiency of Big Ear to be 42% and the system noise temperature to be 85 K. I also happened to find, buried in a file cabinet in the focus room, a record of a previous measurement made with this coupler. The record isn't dated and doesn't identify who made the measurement. This record shows the attenuation at the three coupler ports (at 1420 MHz) to be 30.0, 39.15, and 42.2 dB. My thanks to Larry Splain, who came by in the evening and helped Russ and I reassemble the waveguide. An extra pair of hands was very helpful. He also brought a torque wrench, which was useful for tightening the waveguide bolts to the specified torque.

[\[Back to List of Issues in Volume 9\]](#) | [\[Back to List of Volumes\]](#) | [\[HOME\]](#)

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Designed by Jerry Ehman

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