



NRAO NEWSLETTER

1 July 1992

No. 52

GREEN BANK

GREEN BANK SITE DIRECTOR

After eight years of service and an impressive record of accomplishment, George Seielstad has asked to be relieved of his responsibilities as site director in Green Bank. I am sure the Observatory staff joins me in wishing George success in his research and the direction he chooses for the future.

A search will be conducted for a new site director. Meanwhile, and effective immediately, Dave Hogg will serve as Assistant Director for Green Bank Operations.

Users with questions about pending proposals to the 140 Foot Telescope, proposals they are considering for the telescope, or suggestions for operational procedures and priorities at Green Bank may contact Dave Hogg at (304) 456-2301.

P. A. VANDEN BOUT

GREEN BANK TELESCOPE CONSTRUCTION

The grade beams of the telescope foundation have been completed, and the work on the rest of the foundation is essentially finished. The circular ring shown in the central portion of the accompanying photograph is ready for the placement of the azimuth rail, the delivery of which will begin early in July. The installation will be completed in August, and the track adjustment finished in September. When it has been established that the track is properly aligned, it will be grouted, and the work on the telescope wheel assemblies can begin.

In the center of the ring is the concrete support for the azimuth pintle bearing of the telescope. The bearing has been fabricated and is undergoing acceptance tests prior to shipment to Green Bank at the end of June.

To the side of the ring are two areas currently being developed by the sub-contractor Wiseman construction.

The left-most set of pillars is a staging area in which major components of the telescope will be assembled and welded. The other area is the concrete pad for the derrick crane that will be the workhorse of the actual telescope erection. This derrick will be 250 feet high and is capable of lifting 130 tons. The erection of the derrick, which will dominate the Green Bank landscape for the next two years, will start in July and will be completed in November. The trucks in the foreground are bringing in the pieces of a small crane which will be used to erect the derrick.

The project scientist, F. J. Lockman, is developing the performance requirements for a new spectrometer which we hope can be built for use with the GBT. Spectral line observers interested in contributing to the formulation of these goals should contact Jay for additional information.

D. E. HOGG

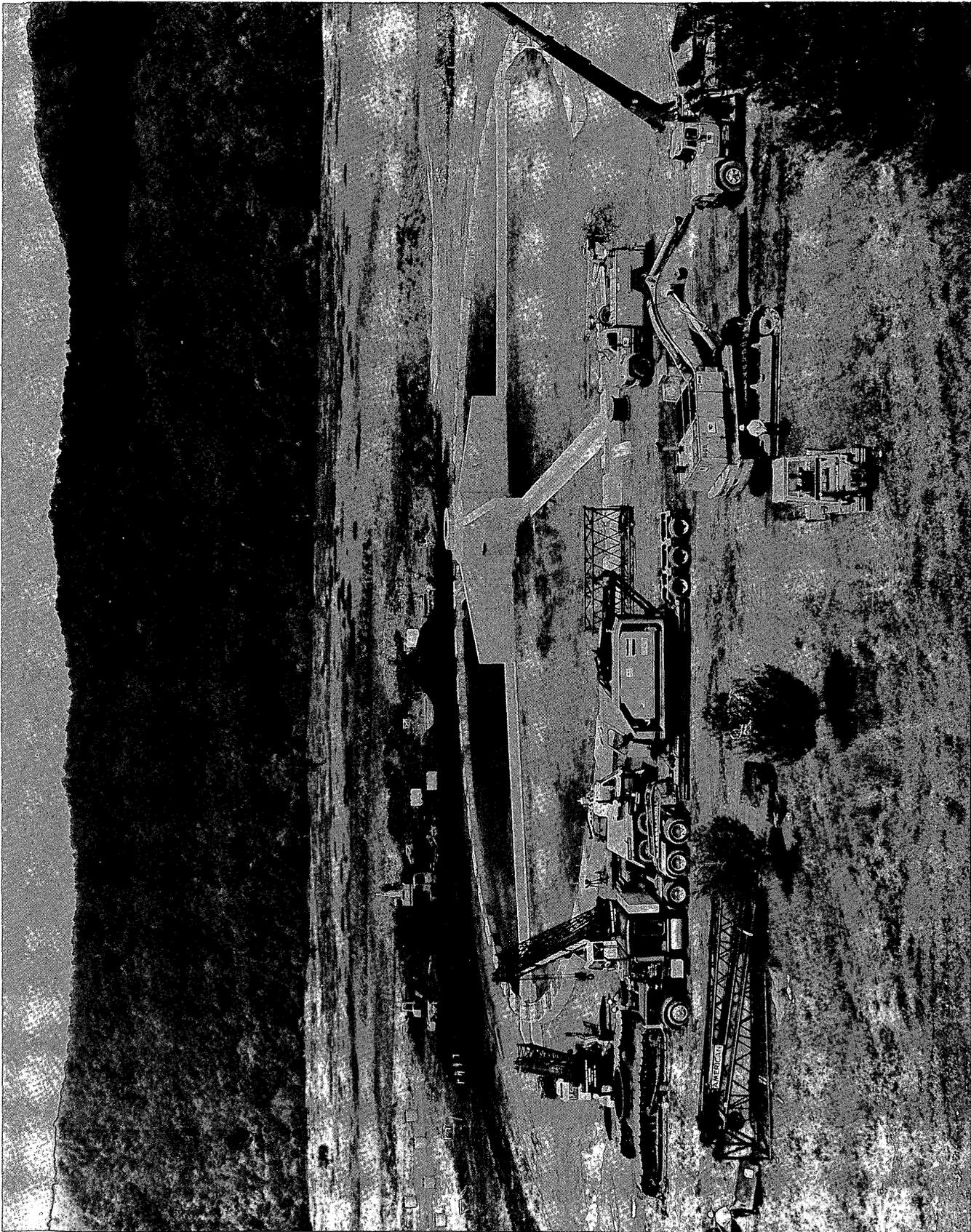


Figure 1. The Green Bank Telescope site, seen from the east. The picture was taken June 10, 1992.

GBT ACTIVE SURFACE

The first production surface adjustment actuators have been delivered and installed on a test fixture that simulates a section of the GBT surface. Four panels are mounted to a frame via nine actuators equipped with LVDTs and retroreflectors in a manner similar to the proposed installation on the GBT. This assembly is shown in the upper left of the figure. The panel assembly is movable to simulate thermal and gravitational deformations. A VME computer controls pre-production prototype circuit modules interfaced to the actuators and LVDTs. A SUN workstation, interfaced to the VME computer, commands the position of each actuator to a precision of 25 microns. This panel assembly is now ready for a full-scale test of the active surface concept using the metrology systems.

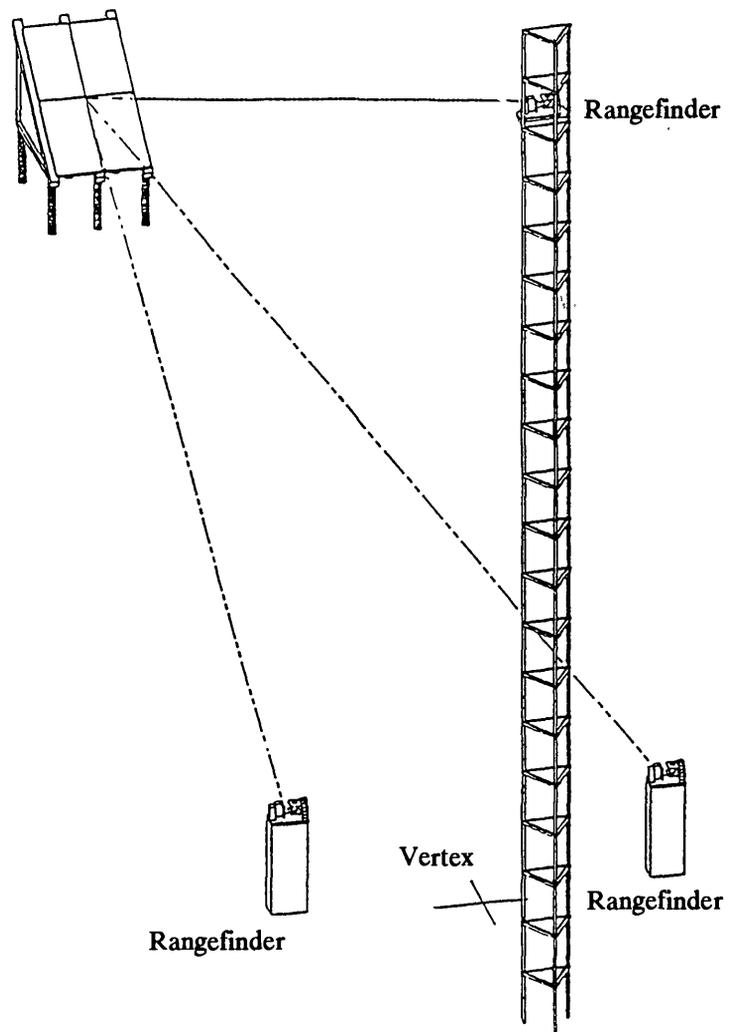
Production for both actuators and LVDTs is underway now. Sample LVDTs have been tested and have improved performance over the pre-production prototypes that were previously evaluated. The new devices are more linear and less sensitive to temperature changes than the earlier versions.

The metrology system has undergone further development. Three laser rangefinders have now been constructed and installed on an outdoor test range in a configuration suitable for measuring the 3-dimensional coordinates of a distant retroreflector. This trilateration measurement is controlled by a central processor linked to the three rangefinders. This experiment has been successful and all the software and hardware are now in place for a full-scale test of a portion of the active surface. The rangefinders will be moved into positions relative to the panel assembly that give the same geometry as that proposed for the GBT. Two rangefinders will be mounted on the ground and one approximately 40 meters above the ground as shown in the figure. The stability of the tower has been measured by ground-based rangefinders measuring to a retroreflector on top of the tower, and stabilities of 50 microns over periods of several minutes have been recorded. The panel assembly is mounted on actuators, so known mechanical disturbances may be injected and the ability of the metrology/actuator system to compensate may be evaluated. We hope to have initial results on this experiment in the next few months.

Work has continued on the autocollimation pointing system. Stabilities of 0.5 arc seconds over periods of 4-5 hours over a range of 60 m on our Green Bank test range

have been measured. This level of performance is more than adequate for the proposed application on the GBT.

J. M. Payne, D. Parker, R. Lacasse,
D. Schiebel, R. Creager, C. Brockway



Active Surface Test
in Green Bank, WV

NEW JOINT OPERATIONS CENTER

After a delay of several weeks, the design of the Joint Operations Center has been started. The Center, which has been described in earlier Newsletters, will provide sufficient room to control observations of all of the telescope systems now envisioned for Green Bank, as well as badly needed space for staff, visitors, and telescope

users. The design is scheduled for completion in January, 1993. It is hoped that a contractor can be selected quickly after that, in order to take full advantage of the next building season.

D. E. HOGG

VLBA

VLBA SELECTED CONSTRUCTION ITEMS

Stations Still Under Construction

St. Croix, VI - Antenna erection and electronic outfitting is complete. This site's operability awaits only an economical Internet connection, which is expected in July.

Mauna Kea, HI - Antenna erection is mostly complete, with all antenna panels installed. Electrical wiring and mechanical alignment are in progress. Completion of erection is scheduled for August. The antenna control building is complete except for local code compliance approval. NRAO outfitting of the Mauna Kea site is scheduled to start in August and to be completed by year-end 1992.

Data Recording

The production of VLBA recorders and playback units continues with units through serial #32 (PBD #15) either shipped or awaiting final testing at Haystack Observatory. Eight more units are largely completed at the AOC, with shipments to antenna sites to start in mid-July. The production of the eleven units in Haystack's fourth and final production run is well underway, with the first shipments planned for mid-November. A mechanical

upgrade to the tape path to reduce stress on thin tape has been developed by Haystack and installed on one transport at each site (except Mauna Kea, St. Croix, and Hancock).

Before the purchase of the major VLBA supply of tape in late 1992, an accelerated life test of a significant sample of thin tapes from three manufacturers is being performed, to determine any wear or performance degradation from field usage and shipping. This test involves repeated weekly shipping and multiple wind tests at each destination, which are most of the operable VLBA sites, the AOC, and Haystack Observatory. At Haystack the tape edges are examined for any evidence of damage after each cycle. These tests will continue at least through September. If the thin tape does not pass qualification by then, NRAO will delay procurement of a VLBA tape inventory until a fix can be made. In the meantime standard thick tape will be used as a temporary measure to allow early VLBA operations. NRAO and Haystack Observatory are now attempting to collect as many as possible of the thick tapes which are distributed at various Network and correlator sites.

K. J. STETTEN

VLBI'ERS AT THE AOC

As the VLBA nears completion, an increasing number of the staff scientists at the AOC in Socorro are engaged in VLBI science and support. The following list consists of those who spend an appreciable amount of time on VLBI research/VLBA operations: B. Clark, C. Walker,

J. Wrobel, A. Zensus, P. Diamond, J. Romney, J. Benson, B. Junor, T. Beasley, J. Conway, V. Dhawan, M. Claussen, D. Frail, M. Rupen, C. Flatters and A. Kembell.

W. M. GOSS

VLBA CORRELATOR "FIRST FRINGES"

On May 6, the VLBA Correlator first detected interference fringes from an astronomical source. This event was the first full end-to-end operation of the VLBA instrument--observed at VLBA stations under remote control from the Array Operations Center in Socorro, recorded and reproduced in VLBA format on the VLBA recording system, correlated, and the results loaded into AIPS for analysis.

Test data were taken on April 6--one month earlier--between 19:00 and 21:00 UT at the Pie Town, Kitt Peak, Fort Davis, North Liberty, and Brewster stations. Single-dish "self-spectra" were obtained on April 15. The search for cross-spectra began on April 20, and lasted an intense 16 days.

Fringes were detected in the 1665-MHz main line from the OH maser source W3(OH) on the Pie Town - Kitt Peak baseline, in a 2-MHz channel resolved into 256 spectral points. For an FX correlator, a line source is by far the most convenient target for fringe searching, since successful correlation can be detected directly by inspection of the cross-spectral power, without any "eyeball integration" of a fringe signal or post-correlation processing.

Figure 1 is an approximation to the real-time display used for this purpose; the actual display shows individual 131.072-ms cross-multiplier accumulations, while data extracted from the system to produce the figure was accumulated further (to 15 such dumps) in the integrator. Integrated output was also written into a computer file in the new FITS standard distribution format, and loaded into AIPS. Figure 2 was produced by AIPS task POSSM from the entire 13-minute observation, for the same VLBA channel (of four correlated simultaneously) as that appearing in Figure 1. (The amplitude scale is uncalibrated.) AIPS was also used to verify the presence of fringe power at the line frequency.

This test correlation was undertaken as part of an intensive checkout effort by the engineering and programming teams of the correlator group. Much of that work involved

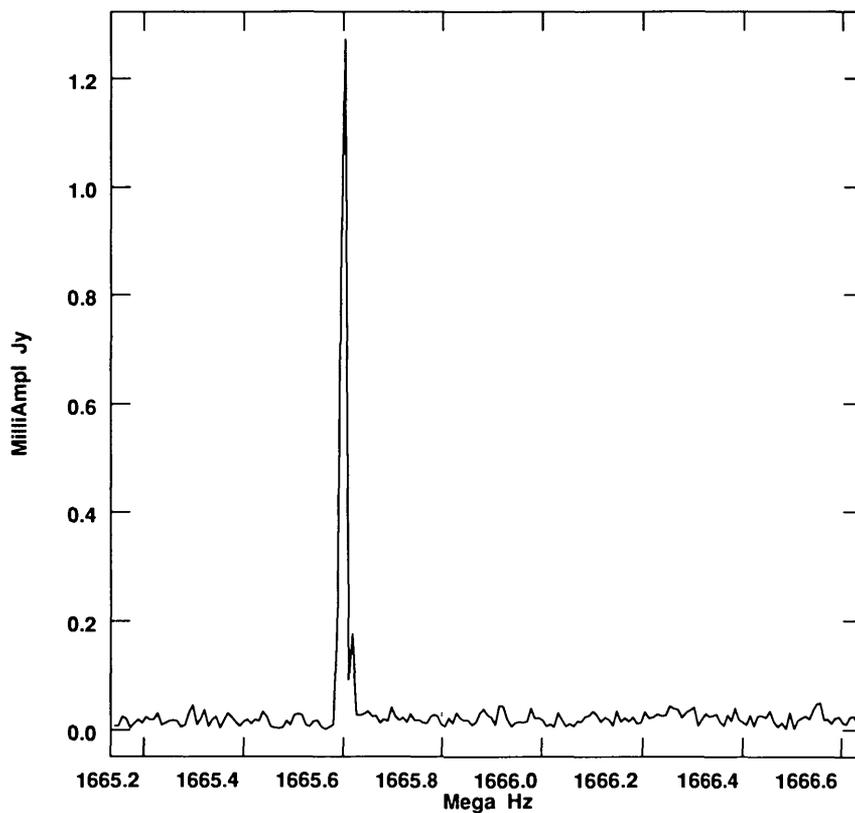
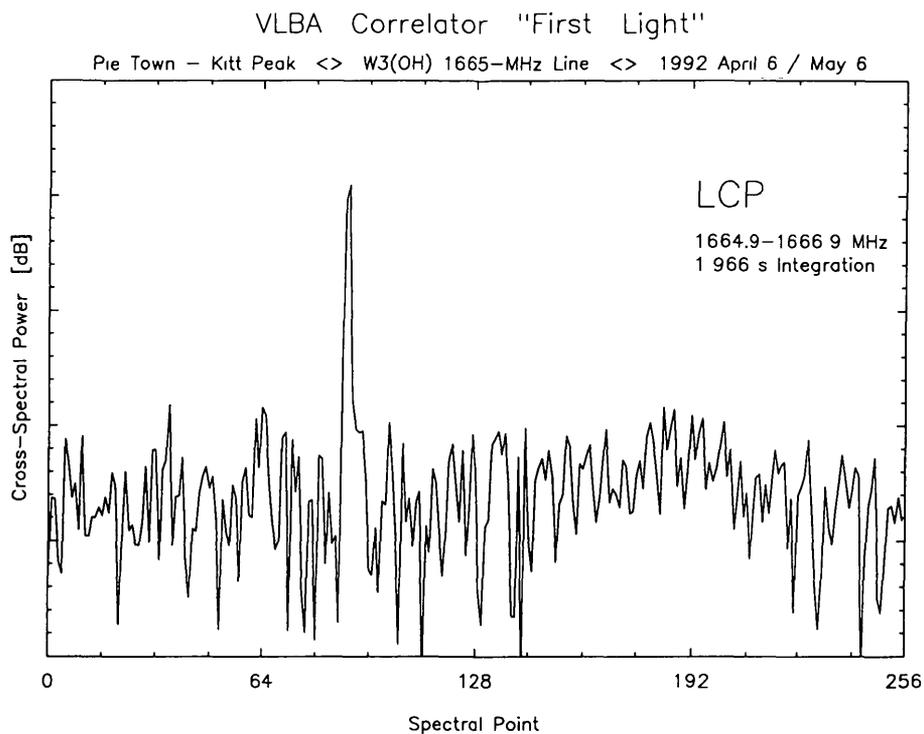
detailed verification of signal paths and synchronization of interferometer model computations in some of the many operating modes, activation of the data-validity and self-test functions, enhancements to the robustness of playback control, and testing of output devices for the correlator archive and distribution systems. Further test correlations had to be given lower priority during this period, but it was possible to extend the tests to use all five available playback drives. A five-station array was correlated and fringes detected on all ten baselines. Simultaneous correlation of a two- and a three-station array, observing different sources at different times, was also demonstrated. Toward the end of June, continuum fringes became an important tool in the continuing checkout.

On July 1, the correlator was shut down for the last time in Charlottesville and dismantled. It is currently en route to the AOC, where testing will resume and integration into the VLBA operational environment can begin. This process is expected to continue through the end of 1992, by which time it is hoped that limited production correlation will become possible. A transition of wideband astronomical observations from the Haystack Mark 3 correlator to the VLBA is planned to continue through mid-year of 1993. Also on July 1, the correlator construction group was disbanded. Five members are moving to Socorro with the correlator; of the five remaining in Charlottesville, many will continue to participate in completion of the correlator, either remotely or during extended visits.

"First fringes" is but the basis for an operational correlator system. Much still needs to be completed. Nevertheless, this is the most significant milestone in the correlator construction project, and is the appropriate point to acknowledge the superlative contributions toward its achievement by the extraordinarily talented and dedicated Correlator Group: John Benson, Chuck Broadwell, Walter Brown, Ray Escoffier, Ray Gonzalez, Joe Greenberg, Jim Horstkotte, Gene Runion, and Don Wells.

J. D. ROMNEY

John R. ...
My ...
Don Wells
Chuck Broadwell
John Benson
Joseph ...
James E. ...
Ken ...
Walter ...
Kenneth ...



VLBA PROPOSALS

Proposals for the use of the VLBA in Mark II and Mark III modes are invited for the 1 October 1992 proposal deadline. Please see the 1 April 1992 NRAO Newsletter for more details on the submission of VLBA proposals. Mark II systems are available on the first seven antennas and no more are planned. The existing systems may be moved to other VLBA antennas if there is demand to do so. VLBA recording systems, which can record Mark III data, will be available at the first nine VLBA sites by the time October proposals can be considered. Scientific observing during construction of the VLBA will continue to be limited by incomplete staffing and by ongoing construction and testing activities. Mark III observing is also limited by the availability of tapes and of time at the Mark III correlators.

The VLBA is approaching completion. Construction funding runs out at the end of 1992. The last of the ten antennas, the one on Mauna Kea in Hawaii, will begin operation early in 1993. The correlator has had fringes and is being tested in various modes. It was moved to Socorro July 1 where testing will continue. At some time late in 1992, or, more likely, early in 1993, processing of

astronomical observations will begin on the VLBA correlator. Thus it may be possible to schedule a limited number of observations using the full VLBA with the VLBA recording system before proposals submitted for the 1 February 1993 deadline can be considered. Proposals for this very early use of the VLBA should be submitted for the October deadline. Investigators should realize that there could be significant delays before such projects get time and that they may encounter problems with their observing or processing since they will be using systems that are still being debugged.

Early users of the VLBA recording system and correlator are strongly urged to visit the AOC in Socorro to reduce their data after correlation. This maximizes the feedback to the VLBA and will be a great help in working any bugs out of the system. Due to scheduling uncertainties and other constraints, visitors are not encouraged to be present during observations or correlation.

R. C. WALKER

VLBI NETWORK CALL FOR PROPOSALS

Proposals for VLBI network observing are handled by the NRAO. In particular, for the proposal deadline of October 1, proposals will be accepted for the 1993 sessions:

Session 1	February 19 to March 11 at 1.3, 3.6/13, and 6 cm
Session 2	May 27 to June 17 at 18, 6, and 1.3 cm
Session 3	September 8 to September 29 at 3.6/13, 6, and 50 cm
Session 4	November 3 to November 24 at 3.6/13, 18, and 90 cm

Dates and wavelengths for 1993 sessions are still somewhat tentative.

It is recommended that proposers use a standard coversheet for their VLBI proposals. Fill-in-the-blanks ASCII forms and fill-in-the-blanks TEX files (for those who have TEX support on their home computers) are available by anonymous FTP from zia.aoc.nrao.edu,

directory [/u/ftp/pub/vlbicover](ftp://u/ftp/pub/vlbicover). Printed forms, for filling in by typewriter, are available on request from Meri Stanley, AOC, Socorro.

Any proposal requesting two or more antennas in the European VLBI network constitutes a Global Proposal. Global proposals MUST reach both Networks' Schedulers on or before June 1; allow plenty of time for mailing. In general, FAX submissions of global proposals will not be accepted. For Global Proposals, or those to the EVN alone, send proposals to:

R. Schwartz
Max Planck Institut fur Radioastronomie
Auf dem Hugel 69
D 5300 Bonn 1, Germany

For proposals to the US network, the VLBA only, or global network proposals, send proposals to:

Director, National Radio Astronomy Observatory
520 Edgemont Road
Charlottesville, VA 22903-2475 USA

B. G. CLARK

SUMMER SCHOOL ON VLBI TECHNIQUES AND THE VLBA IN 1993

The NRAO will hold a summer school in Socorro June 23 to 29, 1993. Continuing the series of NRAO summer schools, this school will emphasize VLBI theory and techniques. In particular, we want to provide students and other future users with an opportunity to become familiar with the capabilities and user aspects of the VLBA. The program will include lectures and demonstrations by NRAO staff and by several invited speakers from the VLBI community.

If you are interested in attending the school and would like to be included in our mailing list, we ask that you return the attached form. Registration details will be distributed this fall.

A. ZENSUS

NRAO SUMMER SCHOOL ON VLBI TECHNIQUES

Socorro, NM

June 23-29, 1993

Preliminary

I am definitely planning to attend

Include me in the mailing list

Name: _____

Email: _____

Institution: _____

Phone: _____

Address: _____

Fax: _____

Return to:

Terry Romero
NRAO Summer School on VLBI Techniques
National Radio Astronomy Observatory
Post Office Box 0
Socorro, NM 87801-0387
Email: tromero@nrao.edu
Fax: (505) 835-7027

12 METER

2 MM SIS RECEIVER

The new 2 mm SIS receiver was used successfully for about two weeks of visitor observing in late May and early June. The receiver performed very well and all the observers who used it came away with good data. The only real difficulty encountered was an occasional oscillation in the output IF. The oscillation typically occurred for a few minutes at a time when the ambient temperature reached a certain level. This problem is subtle, but we expect to solve it shortly.

The receiver tunes from ~130 to 170 GHz. Receiver noise temperatures are ~80K (DSB) at mid-band. Although

these mixers give quite good performance, even lower noise mixers should be available from the NRAO Central Development Laboratory within the coming year. Current system temperatures (TR* scale) were 400 - 800 K during good weather and at middle elevation angles. By proper tuning of the mixer backshorts, it was possible to reject the image sideband by more than 20 dB at all the frequencies attempted. The 2 mm receiver will be scheduled for routine observations beginning this autumn.

TUCSON RECEIVER GROUP

270-300 GHZ SIS MIXERS

We expect to receive new SIS mixers covering the 270-300 GHz band sometime this autumn. The mixers and receiver inserts are being developed by the Central Development Laboratory in Charlottesville. They will be tunerless mixers, and we are anticipating rather good performance from them. The new mixers will be incorporated into the 1 mm SIS package that currently includes a dual polarization mixer covering 200 to 270 GHz. Two orthogonal polarization channels will be available in the new 270-300 GHz set. Using the quasi-optical image dumper that is part of the 1 mm SIS package, observers will be able to observe in a single or

double sideband mode. The image band is terminated on a cold stage inside the receiver cryostat to minimize noise.

Observers are invited to apply for observing time with the new 270-300 GHz mixers beginning with the October 1 proposal deadline of this year. The October 1 deadline is for the January 1 to April 1, 1993 observing period. As the deadline approaches, proposers may wish to contact us for noise temperature estimates.

D. T. EMERSON and P. R. JEWELL

8-BEAM, 220-250 GHZ SIS RECEIVER

The upgrade of the 8-beam receiver to its new, SIS version is proceeding at a rapid rate. The engineering design work is largely completed and many of the components have already been fabricated or are in the machine shop at this time. If all goes well, we should be ready to test the upgraded receiver before the end of the year. We hope the receiver will be available to visiting observers in early 1993. However, the completion and testing schedule is too

uncertain to call for observing proposals at this time. Please watch these pages or your private mail for an announcement of availability of the receiver. In order to give everyone an equal opportunity for first use of the upgraded receiver, we ask that you not submit proposals for the 8-beam receiver until it is formally announced.

D. T. EMERSON and P. R. JEWELL

SUMMER SHUTDOWN ACTIVITIES

A number of enhancements to 12 Meter systems are planned during the upcoming summer shutdown period. Summer shutdown begins on July 13 this year and will extend until mid-September. We will be taking several steps this summer to improve the reliability of the backup power systems at the 12 Meter. Foremost of these is the replacement of the old World War II-vintage GM generator with a new Cummins diesel generator. The Caterpillar diesel generator will be held as a backup. We will also be performing some renovation work on the uninterruptible power system (UPS) and will install some small, auxiliary UPS's to protect some critical electronic and computer systems.

Several significant computer enhancements are planned for this summer, including the replacement of the Sun 3's with

Sparc 2 workstations. Observers can anticipate a number of new observing modes to be available by the end of the summer, including a new "on-the-fly" mapping mode.

Some upgrades to the analog portion of the Hybrid Spectrometer are also planned for this summer. These changes should make the spectrometer filter modules more stable. An upgrade to the spectrometer IF processor is also in the works that will make all eight input IF sections of the spectrometer fully computer-tunable. We are also augmenting the filter bank "switcher" module to reduce the number of cabling changes required to change filter banks.

P. R. JEWELL

TUCSON VISITING APPOINTMENT

A visiting scientist appointment in Tucson is available, effective immediately, for an individual to develop new data reduction software for the 12 Meter Telescope. Recent developments at the telescope--the new control system, the 8-beam receiver, and new observing techniques--have increased the data acquisition rate by more than an order of magnitude. Additional data analysis software, running partly in real time and partly off line, is required in order to exploit the new capabilities at the telescope. The new software will be integrated into existing reduction systems, in coordination with other NRAO sites. Preference will be given to individuals having experience with astronomical data analysis and interests in spectral line mapping. Visiting scientists at the NRAO

are encouraged to pursue their personal research and are given time to do so.

The duration of this visiting appointment may be as long as 12 months. For more information contact:

Darrel Emerson
Assistant Director, Tucson Operations
National Radio Astronomy Observatory
Campus Building 65
949 North Cherry Avenue
Tucson, AZ 85721-0655

R. L. BROWN

VLA

VLA CONFIGURATION SCHEDULE

<u>Configuration</u>	<u>Starting Date</u>	<u>Ending Date</u>	<u>Proposal Deadline</u>
D	10 Jul 1992	28 Sept 1992	01 Feb 1992
A	23 Oct 1992	11 Jan 1993	01 Jun 1992
BnA	22 Jan 1993	08 Feb 1993	01 Oct 1992
B	12 Feb 1993	26 Apr 1993	01 Oct 1992
CnB	07 May 1993	24 May 1993	01 Feb 1993
C	28 May 1993	23 Aug 1993	01 Feb 1993
DnC	03 Sept 1993	20 Sept 1993	01 Jun 1993

The maximum antenna separations for the four VLA configurations are: A-36 km, B-11 km, C-3 km, D-1 km. The BnA, CnB, and DnC configurations are the hybrid

configurations with the long north arm, which produce a round beam for southern sources (south of about -15 degrees declination).

APPROXIMATE LONG-TERM SCHEDULE

	<u>Q1</u>	<u>Q2</u>	<u>Q3</u>	<u>Q4</u>
1992	B,C	C	D	A
1993	B	B,C	C	D
1994	A	B	B,C	C
1995	D	A	B	B,C
1996	C	D	A	B

Observers should note that some types of observations are significantly more difficult in daytime than at night. These include observations at 327 MHz (solar and other interference; disturbed ionosphere, especially at dawn), line observations at 18 and 21 cm (solar interference), polarization measurements at L band (uncertainty in ionospheric rotation measure), and observations at 2 cm and shorter wavelengths in B and A configurations

(tropospheric phase variations, especially in summer). They should defer such observations for a configuration cycle to avoid such problems. The B configuration daytime will occur at about 23^h RA, and the C configuration daytime will be about 8^h RA.

B. G. CLARK

NEW VLA VISITOR CENTER SLIDE SHOW

Most VLA users for the past nine years probably have stopped at the VLA Visitor Center and checked out the displays and the auditorium slide show. The original slide show was produced by Dick Sramek and Don Retallack in 1983 for the newly built Visitor Center (construction by the State of NM). The show, however, has gradually gotten out-of-date over the years and an updated version was planned for this year.

educational and entertaining 23 minute show that highlights the human aspects of VLA operation as well as its stimulating scientific impact. Technically challenging, the show uses 240 slides in 3 projectors, has a custom-music sound track, and includes many new superb photographs by Matt and other professional photographers. The production was almost entirely funded by AUI and Visitor Center donations. It is our intention to convert the slide show into a video format in the near future. As soon as this is accomplished, we will make it available to the community for instructional purposes.

Recently finished after an intensive five month effort, the new show is a completely new production from the ground up. Emmy award-winning producer/director Matt Middleton of Magdalena, NM has succeeded in creating an

R. J. HAVLEN

COMPUTING AT NRAO-NM

The near-real-time visualization system at the VLA site is now ready for extensive testing by observers. As it is currently the only workstation available to visitors there, we need to give priority to observers during their runs. Some data reduction may be done afterwards, but we are not yet at the stage where major projects can be processed entirely at the site. This is, however, a facility we plan to provide if there is sufficient demand for it.

VAX1, NRAO's first VAX/VMS system, was shut down for the last time on April 28 after 13 years of faithful service. ("Will I dream, Dr. Chandra?" "Yes, VAX1, all intelligent beings dream.") This leaves NRAO-NM with only one VMS system, the VLBA MicroVAX-II. As a result, we can provide little support for visitors requiring VMS-format tapes to be read or written. However, we do not anticipate that this will cause major inconvenience, since the need for it has declined considerably in the past two years.

The number of Sun workstations at the AOC continues to increase as new staff members arrive and the number of reservable visitor workstations is augmented. There are now seven such systems. Additional peripherals, such as new Exabyte tape drives and a high-speed networked PostScript printer, have also been installed. DAT drives have recently been successfully tested with AIPS in Charlottesville, and we plan to install several at the AOC. As part of the VLBA Computing Procurement, a replacement for the Dicomed film recorder has been ordered. The system is essentially a duplicate of the one in use at KPNO, a Solitaire connected to a low-end

SPARCstation. It will be capable of producing images on 35 mm, 4x5", and Polaroid film.

The high-performance visualization engine, an IBM RS/6000-560 with special graphics hardware and software, has been ordered and is expected to be installed in July. Extensive software development will be needed in order to make the system useful for astronomical display. This is expected to be ready by early 1993. In addition, the procurement for the high-end UNIX workstations was also recently completed; we expect to receive four IBM RS/6000-560 systems as a result, also in July. These will be reservable by visitors and in-house staff with major projects. Each will be equipped with 64 megabytes of memory and 3 gigabytes of disk space.

Despite the proliferation of workstations at the AOC, we still sometimes have difficulty providing for long-term visitors. If you have plans to spend a significant period of time at the AOC (e.g., a month or more), we would like to encourage you to consider bringing your workstation and/or disk with you if you can. Naturally, we can provide the best support for Sun SPARCstations, but we can also accommodate UNIX systems from some other manufacturers. Please contact Ruth Milner (rmilner@nrao.edu) to make arrangements for this as far in advance as you can, as we need to ensure that your system can be easily integrated into the AOC's networked environment.

R. MILNER

STAFF SUPPORT AT THE AOC

The VLA Proposal Cover Sheet requests an indication of the level of staff assistance that will be required during a visit to the AOC/VLA. The following guidelines define the levels of help available.

- **Staff Contact** -- For frequent visitors and/or experts who don't need technical assistance, the staff contact will provide a brief update on new procedures, hardware, and software at the AOC/VLA since the last visit.
- **Friend** -- Inexperienced users who are new to synthesis imaging and infrequent visitors whose experience is out of date will require a Friend for more than just an occasional consultation on technical matters relating to observing and data analysis.

Extensive initial "hand holding" is generally involved on the part of the Friend.

- **Collaborator** -- For many VLA users, both experienced and inexperienced alike, who anticipate the need for extensive staff interaction, we encourage them to seek the assistance of a staff collaborator who has common scientific interests.

In addition, the data analysts are available during working hours and some "off hours" as a resource for data calibration and production of archive tape copies. They are also the primary contact for OBSERVE file preparation. The data analysts are the initial filter when problems in these areas arise.

T. ROMERO

SUMMER TEACHER RESEARCH AT THE VLA

As a first step in a developing education program in Socorro, the NRAO has employed a New Mexico high school teacher at the AOC/VLA for the summer. This year's teacher/intern will be carrying out investigations in the Observatory's hazardous materials safety program. In future years we will be developing other teacher internships in astronomy, computing, and electronics. Funding for the infant program was obtained through the NSF Directorate of Education and Human Resources as a

supplemental grant to our long-standing summer student program--now referred to as an REU Site grant. The NRAO is encouraged by this development, which will give a few teachers a stimulating summer-long research experience and will positively impact the academic year classroom activities for many more students.

R. J. HAVLEN

FAXED PROPOSALS

Proposals arriving by fax often approach unreadability after reproduction for sending to the referees. We will no longer send referees copies of material that arrives by fax. Observers may still fax proposals to meet deadlines, but this fax will only be used for assigning referees and as a placeholder in the clerical work of organizing the refereeing. If a mail copy of the proposal does not arrive within 48 hours, the proposal will be dropped. The mail

copy should be accompanied by a note that states clearly that it was previously sent by fax. A fax of the coversheet only will suffice for this purpose. It need hardly be pointed out that it is more desirable to write your proposal two days in advance and avoid the fax altogether.

B. G. CLARK

AOC LIBRARY

Jasmine, the workstation in the AOC library, is available for public access to the NRAO libraries' collection (RAPCAT). At the Jasmine login, type 'rapcat' and the current AIPS password. RAPCAT is also accessible remotely from workstations at the AOC.

as general, infrared, optical, radio or X-ray, with Jasmine subdirectories for each category. A catalog and/or its documentation file, *.doc, can be found in the appropriate subdirectory. The catalogs account also uses the AIPS password. For more information, see the Librarian.

A selection of astronomical catalogs and documentation has been mounted on Jasmine. Catalogs are categorized

J. LAGOYDA

SHUTTLE NEWS

Shuttle service to and from the Albuquerque airport and Socorro is being provided by the Socorro Roadrunner Shuttle. The service operates with the following set schedule:

The shuttle rate is \$25.00 each way. Visitors are met at the Visitors Information booth, located on the same level as the baggage claim area.

Departure from Socorro to Albuquerque Airport

6:00 a.m.	4:00 p.m.
11:00 a.m.	9:00 p.m.

Reservations can be made through the reservationist, Eileen Latasa. If your travel plans change, please contact: Shuttle Service Office in Socorro - (505)835-1010 or Eileen Latasa - AOC(505)835-7357/Home (505)854-2328.

T. ROMERO

Departure from Albuquerque Airport to Socorro

9:00 a.m.	7:00 p.m.
2:00 p.m.	12:00 midnight

USER SUPPORT

In the past a two-week advance notice for a visit to the AOC/VLA for observing and/or data reduction was necessary. A two-week notice is still preferable to provide visitors with the best possible arrangements. A one week notice will be accepted with the understanding that the

user may not have an exclusive assignment of workstation and staff contact and/or friend.

T. ROMERO

IN GENERAL

THE MILLIMETER ARRAY

In the last year the Millimeter Array has cleared three significant hurdles and is entering a phase in which we can assess carefully the design of the instrument. As you know, the MMA project was included among the Bahcall Committee's recommendations for major projects in the decade of the 1990s. In addition, the AUI proposal for the MMA was favorably received by the NSF Division of Astronomical Sciences, and the Division's advisory committee encouraged the Division to support the design phase of the project. Finally, we are pleased to see that the MMA project appears in the long range plan for NSF Mathematical and Physical Sciences.

Presently work on the MMA proceeds in two ways that may be broadly categorized as site work and technical design studies.

The evaluation and comparison of potential sites for the Millimeter Array involves atmospheric transparency and stability data, and operational considerations including operations costs and all environmental considerations. Atmospheric stability and transparency data have been obtained for a common 10-month period on the potential MMA sites in the Magdalena Mountains, NM, near Springerville, AZ and, for comparison only, at the summit of Mauna Kea. All these data are presented by Dave Hogg in MMA Memo No. 79. (Copies of this and other memos may be obtained from Betty Trujillo in Socorro.) An estimate of the cost of MMA operations on the potential sites is being assembled now and should be available as a MMA memo around the first of the year. The potential for environmental impact on each of the sites will be evaluated in two stages, the first of which is a broad filter called an environmental assessment (EA). Under contract we are presently conducting an EA on the Magdalena Mountains site and will expand this effort to other sites as funding permits. It is the pace of this latter activity that largely dictates the time scale for MMA site selection.

Design of the instrument in the period 1994-1997 called for in the MMA Proposal will be detailed in a MMA Design and Development Plan to be presented to the NSF in September. It will involve funded work not only at the NRAO but also through the NRAO by the universities participating in the MMA Joint Development Group (JDG). The highlights of the plan are those emphasized in the MMA Proposal, namely development of:

- Broadband tunerless SIS mixers;
- HFET amplifiers to 115 GHz;
- Broadband, reliable, local oscillator;
- Simple, reliable 4 K refrigerator with > 1 W capacity;
- A passive antenna design that meets the MMA specifications when fully exposed to the environment;
- Software for control and analysis that gives the instrument the flexibility and feel of a single dish and that can be made available to local and remote users.

An integral part of the MMA Design and Development Plan is to prototype as much of the hardware as possible and to operate the instrumentation on the 12 Meter Telescope or, where appropriate, other telescopes. A single baseline subassembly of the antenna electronics will be fabricated for controlled evaluation in the laboratory.

The analysis software, AIPS++, will be generated in large part by the JDG participants presently involved with the AIPS++ project and will be used on one or both of the existing interferometers prior to the advent of the MMA. On the other hand, the genesis of an on-line display and imaging capability is available now to users on the VLA. We certainly encourage users to experiment with the VLA system as their observations are being made, and we welcome suggestions for the evolution of this system specific to the needs perceived for the Millimeter Array.

R. L. BROWN

1992 USERS COMMITTEE MEETING

The NRAO Users Committee met for two days, June 15 and 16, in Charlottesville. Committee members attending included:

John Bieging, Steward Obs.
Frank Briggs, U. Pittsburgh
Edward Churchwell, U. Wisconsin
Rachel Dewey, JPL
Nebojsa Duric, U. New Mexico
Andrew Fruchter, UC, Berkeley
Ralph Gaume, NRL
Carl Gwinn, UC, Santa Barbara
Jacqueline Hewitt, MIT, Chair
Alan Marscher, Boston U.
Karl Menten, CFA
Lee Mundy, U. Maryland
Mark Reid, CFA
David Shaffer, Interferometrics, Inc.
Russell Taylor, U. Calgary
Stephen Unwin, Caltech
Ann Wehrle, Caltech
Joel Weisberg, Carleton College
David Woody, Caltech

The first day of the meeting was focused on millimeter-wave astronomy, the work in the Central Development Laboratory, and an overview of the AIPS++ project. Interested members of the Committee toured the CDL and inspected the SIS and HFET fabrication/assembly facilities. Discussion on the first day (1) examined the expectations for the functionality of the AIPS++ software and the schedule on which it is to be available in a rudimentary form to users, and (2) emphasized the desirability of choosing a site for the MMA expeditiously.

On Tuesday, June 16, the Committee heard presentations on the Green Bank Telescope, operations of the 140 Foot Telescope, and operational aspects of the VLA and VLBA.

The electronics plans for the GBT, especially the priority for receiver construction and the scientific specifications of the backend instrumentation were the topics of much discussion. Jay Lockman, the GBT project scientist, can provide users with the current status of the GBT electronics planning. He would welcome the views of potential GBT users on these subjects.

In contrast to the GBT, the VLBA construction is essentially complete and hence the Committee's interest turned to VLBA operational issues. As noted elsewhere in the Newsletter, the VLBA correlator is working and it has produced multi-station fringes. The Committee was given a demonstration of the correlator in which two real observations, a line and a continuum observation, were correlated simultaneously in two "sub-arrays" of the correlator. There was much interest in knowledge of exactly what VLBA capabilities would be available to users and when. Unfortunately, this question doesn't have a precise answer because the array will be subject to a long "shake down" phase while we learn to operate the instrument. In addition, a few critical decisions (especially the thin tape/thick tape issue) remain to be made. We hope that proposers for the October VLBA deadline will recognize that their observations, if selected, will be an important part of the evaluation phase of the instrument and that (1) the full functionality of the instrument may not be available when their observations are scheduled and (2) we are depending on the help of the first users to identify problems.

Feel free to contact any member of the Users Committee for details regarding the issues raised at the meeting. The Committee's report will appear in a future edition of the Newsletter.

R. L. BROWN

NRAO COVER DISPLAY

A collection (total of twenty four covers) of NRAO images appearing on covers of the journals: Nature (11), Science (3), Astronomical Journal (9) and Sky and Telescope (1) has been compiled. The collection is off to a good start but may not be complete. If you have NRAO images which have appeared on the cover of any journal, please

contact me via email at tromero@NRAO.edu. This is an on-going effort and any NRAO images appearing on covers in the future will be included.

T. ROMERO

NSF US-AUSTRALIA GRANT FOR COLLABORATIVE RESEARCH

The NRAO has secured a two-year grant of \$14,750 from the NSF in support of US-Australia collaborative efforts in observational radio astronomy. These funds will be awarded on a competitive basis to astronomers from US institutions whose work is normally eligible for NSF support. Our goal is to support five projects during the life of the grant. All grant funds will be for support of travel to Australia by members of the US astronomical community.

Unlike the other foreign telescope travel funds, the new program will support lodging and other expenses while abroad, up to a maximum of (approximately) \$3000. Also unlike the older program, we will hold a general competition as a basis for making awards. A first round of awards will be held in the Fall of 1992 with a deadline for submission of 30 September 1992. If the new program is heavily over-subscribed, all funds may be committed in this first round. Otherwise, another round of competition will be scheduled in the second quarter of 1993.

The US-Australia grant is intended to support true collaborative efforts, not merely the use of Australian instruments by US observers. To this end, we will rank proposals on the basis of the degree of participation by astronomers from both countries and on the importance of travel to Australia for successful completion of the proposed work. It is a precondition of any proposal that an observational program using one or more Australian telescopes must be carried out as a main focus of the

project and must be approved for scheduling by the time of submission of a request for travel funds. The peer review process that led to granting of telescope time will serve as the only review of scientific merit.

Astronomers wishing to compete should send to the Director of the NRAO a proposal consisting of

- a description of the scientific goals and motivation;
- a description of the collaborative aspects of the project including details of the participation of all US- and Australia-based astronomers;
- copies of relevant observing requests and notifications of their disposition from the Australian authorities;
- a travel plan and budget in support of the observations and collaboration.

The initial proposal deadline is 30 September 1992. All awards are subject to approval by the US-Australia cooperative program manager at the NSF. Judging will be carried out by a committee of NRAO staff scientists appointed by the Director.

H. S. LISZT

GRADUATE STUDENT RESEARCH AT THE NRAO

As one mechanism to support the research efforts of graduate students in radio astronomy, the NRAO provides research appointments to selected students who are working on their Ph.D. thesis research. Qualifying students are those for whom

- the required graduate course work is complete, leaving only the thesis research as a degree requirement;
- the proposed thesis research involves observations with NRAO facilities; and
- there is an NRAO staff scientist interested in being involved in a supervisory way with the proposed research program.

With the permission of the university academic department, graduate students may spend up to 24 months in residence at one of the NRAO sites doing their thesis research. While in residence, the students receive a monthly stipend, a travel allowance to enable them to make observations or attend professional meetings, and full access to all the Observatory facilities.

If you, as a faculty advisor, wish to have a student considered for the NRAO graduate student research program, or you anticipate this being the case in the future, please contact me. Interested students should discuss the NRAO program with their department advisors first and then with me.

R. L. BROWN

JANSKY LECTURE SCHEDULED

The 1992 Jansky Lecturer, Dr. Irwin I. Shapiro of the Center for Astrophysics, will deliver his lecture on October 27 in Charlottesville, VA and in Socorro, NM at

a later date. The title of his talk is "Reckoning the Size of the Universe Through Gravitational Lenses."

P. A. VANDEN BOUT

RAP/unRAPSHEETS AVAILABLE BY E-MAIL OR ANONYMOUS FTP

The bi-weekly NRAO RAP/unRAPsheet is available via e-mail or on the newsgroup sci.astro, and you may now access the full database as an ascii file on anonymous ftp from NRAO.

The RAPsheet is a listing of all preprints received in the Charlottesville library of National Radio Astronomy Observatory in the preceding two weeks. The listing is meant to serve as an alerting service only; the NRAO library does NOT copy or distribute the preprints listed. Interested persons should request copies of preprints from the authors. The institution code on the RAPsheet will indicate either the source from which NRAO received the preprint or the affiliation of the preprint's authors. Upon request, I will be happy to send a file of the abbreviations we use and the institutions they represent.

The unRAPsheet is a listing of papers which appeared previously on the RAPsheet for which citations have been added in the preceding two weeks. We scan the tables of contents of all incoming journals and meeting proceedings in order to find citations and update the records.

We have mounted both the RAPS and OLDRAPS databases on an anonymous ftp server polaris.cv.nrao.edu in directory pub\rapsheet. The RAPS database is a cumulative listing of the biweekly RAP/unRAPsheets, containing all unpublished papers received to date, as well as published papers received as preprints in the current and previous year. The OLDRAPS database is a listing of published papers received as preprints between 1986 and 1990. Remember that both databases contain ONLY those papers received as preprints in the NRAO CV library.

To get either database, *ftp polaris.cv.nrao.edu*. Log in as *anonymous*, using *guest* as the password. Change to the correct subdirectory by typing *cd pub\rapsheet*. Files are uncompressed ascii, and therefore can be retrieved with the *get* command. Finish the ftp process with *quit*.

Please address any questions, comments, or corrections regarding the RAP/unRAPsheets, as well as requests for e-mail subscriptions to the biweekly distribution to: library@nrao.edu

E. BOUTON



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