NRAO NEWSLETTER

1986 July 1 No. 28

VLBA

PROGRESS ON THE VLBA

As stated in a recent Newsletter issue, the State of New Mexico has authorized $3M for the first phase of the construction of an Array Operations Center (AOC) in Socorro, NM. When completed with the addition of VLBA/NSF funds, both VLBA and VLA operations and data processing will be centered there.

The current order of station construction is: (1) Pie Town, NM, (2) Kitt Peak, AZ, (3) Los Alamos, NM, (4) North Liberty, IA, (5) Brewster, WA, (6) St. Croix, USVI, (7) Mauna Loa or Mauna Kea, HI, (8) Ft. Davis, TX, (9) Owens Valley, CA, (10) "Northeast Site," not decided. This recent revision is intended to improve observing effectiveness during the time when only six or seven antennas are available.

Utilities are in service at Pie Town, concrete is being poured and the antenna foundation will be ready in July for the antenna, which will arrive about September. The Station building should also be available. Antenna erection and Station outfitting will require until mid-1987, at which time evaluation of the Station will begin.

The Kitt Peak site has been graded, construction bids are in, and a contract should be let in July. Acquisition of the Los Alamos site is being negotiated between NSF and the Department of Energy. The University of Iowa has offered its present North Liberty site for a VLBA station, and negotiations are in progress. The site near Brewster, Washington has been acquired, and a site near Harvard's station at Ft. Davis, Texas is being purchased.

Manufacture of the first four antennas by Radiation Systems, Inc., (RSI) is underway. Numbers 2, 3, and 4 should be on their respective sites by December 1986, March 1987, and June 1987, respectively. The contract is being renegotiated because 1986 funding cuts made it impossible to fund the contract provision for advance purchase of long lead items for the last nine antennas.

Prototyping of antenna feeds, receivers, and monitoring and control hardware and software needed for the stations is progressing well at Charlottesville, Green Bank, and the VLA. The first three hydrogen maser standards are under construction at Sigma Tau Standards, Inc.; the first unit to be delivered early in 1987. Data recording system prototypes are being built and tested at NEROC Haystack Observatory. Integrated system tests of most non-antenna equipment and software for Pie Town are planned this fall at the VLA.

NRAO's studies indicate that a spectral-domain ("FX") correlator concept can lead to a much less expensive and technically superior correlator as compared to the conventional lag correlator. Analytic studies, computer simulations, and architectural studies are in progress, and some prototyping of critical hardware elements is planned for 1987.

Since the release of the first $9M in construction funds May 15, 1985, considerable replanning has been necessary due to successive funding cuts for 1986 and 1987. It is hoped that funding for future years can be restored to the $15-18M annual levels expected earlier, leading to Project completion by 1990 or 1991.

P. B. Sebring

The NRAO NEWSLETTER is published quarterly by the National Radio Astronomy Observatory, Edgemont Road, Charlottesville, VA. 22903-2475 USA. NRAO is operated by Associated Universities, Inc. under contract with the National Science Foundation.

Green Bank

NEW 300-FOOT CONTROL SYSTEM

The 300-foot telescope is back in operation after a six-week period when it was out of service for the installation of a new control computer. A lot of development remains to be done on the new system, but all of the capabilities of the old system are again available. If you are scheduled to use the telescope during the next few months, please contact Harry Payne or Rick Fisher, preferably by telephone, so that we can provide example programs in the new command language and discuss the easiest way for you to bring observing programs to Green Bank. As we gain experience with the system we will put together an observer's cookbook. Sample observing programs can be sent to you on IBM PC or MacIntosh diskettes, 1600 bpi tape, or via Kermit file transfer from the Green Bank lab MassComp. Example observing programs and a brief description of the system are also in files on CVAX, the Charlottesville VAX (ask Harry Payne for details). We can translate the old card format into the new command language in Green Bank, given some advance notice.

The telescope tape format has been expanded to include most of the parameters defined in the single-dish FITS. Telescope tapes can be read by the Green Bank ModComp analysis computers or can be translated directly into FITS format upon request. Since we are still adding capabilities to the system, please let us know how you expect to handle your data so that we have what you need when you arrive.

During the shutdown the DDP116 was replaced with a MassComp 500 computer, the drive system electronics was modernized, the north-south focus tracking electronics were installed, and the old control console was replaced by keyboards and CRT displays and extra table workspace. Two of the CRT's are graphics displays for data monitoring with about three days worth of recall capacity in a chart recorder type format. Observing programs can be modified at the telescope with text editors. Interactive observing is still fairly primitive, but more of this will be added this year.

Rick Fisher

LATERAL FOCUSING OF THE 300-FOOT

Tests of the newly installed hardware, software, and interfaces for correcting the lateral defocusing problem on the 300-foot telescope have uncovered two mechanical problems which will delay the full implementation of the system during routine observations:

- Limit switches need to be installed in order to suitably insure that the several irregularly shaped NRAO receiver boxes never impact the feed cabin.

- The mechanical rigidity of the support structure needs to be improved so that the repeatability of the N-S feed motion falls within acceptable tolerance limits.

Meanwhile the standard observing mode requires the N-S position of the feed to remain fixed at the same location it was before the new hardware was installed.

Harry Payne

25-280 MHz RECEIVER

A new receiver with high dynamic range amplifiers to minimize interference susceptibility is now available for use on the 140-foot and 300-foot telescopes. This receiver features separate noise balancing for each of the two channels. Any of several feeds may be used with this receiver, depending on the frequencies of interest.

A fat dipole feed intended to operate on the 300-foot telescope in the 25-50 MHz range has been available for over a year. The edge illumination of this feed varies between -7.5 and -10.5 dB in the 25-44 MHz range. The VSWR is less than 2.5 between 25-36 MHz and less than 3.5 in the rest of the band.

An open-sleeve, crossed-dipole feed with a frequency range of 50-88 MHz is available for the 300-foot as well as the 140-foot telescope. This feed has dual orthogonal polarization capability (either linear or circular) and has a combined taper plus spillover efficiency of at least 64% on both the telescopes. This efficiency drops to 48% at 48 MHz. The return loss varies between -10.0 dB and -25.0 dB.

Finally, the RSI 110-240 MHz feed that has been available for years may also be used.

Interested observers may contact the undersigned for more details about the receiver and feeds.

J. Coe and S. Srikanth

INITIAL TESTS OF THE LATERAL FOCUSING OF 140-FOOT TELESCOPE

At large hour angles and low declinations, the axis of the paraboloid which best describes the surface of the 140-foot telescope no longer lies along the physical axis of the dish. If the subreflector is tilted in the proper direction and by the proper amount as the telescope looks at different regions of the sky, the distortion of the telescope beam caused by the off-axis paraboloid can be lessened and aperture efficiencies should approach the zenith value.

After the last few nuts and bolts for the lateral focuser were installed during late May, the subreflector on the 140-foot telescope can now be tilted under computer control in two perpendicular directions. Although bad weather plagued our initial tests of the instrument, we have seen large improvements in the aperture efficiencies at 21.0 GHz at large hour angles for 3C 84 and 3C 273; antenna temperatures at hour angles of six hours increased for both sources by about 50%. Sidelobes were also substantially reduced with the use of the lateral focuser. Since the coefficients used by the lateral focuser during these tests were only estimates of the correct values, the possible improvements could be higher.

By tilting the subreflector, the pointing coefficients used at the telescope are no longer correct and need to be remeasured. Further tests, scheduled for later in the summer, will concentrate on determining the best coefficients for both the lateral focuser and the pointing equation. Observers can easily switch the subreflector from its old configuration with the old pointing equations to the new configuration and an approximate pointing equation. However, observers who wish to use the lateral focuser are warned that the pointing of the telescope should be carefully watched until all tests are completed.

Ronald J. Maddalena
and Chuck Brockway

WARNINGS TO VLBI OBSERVERS CONCERNING THE POINTING OF THE 140-FOOT TELESCOPE AT HIGH FREQUENCIES

Although most VLBI observers send us observing decks which follow the standard practices for determining local pointing corrections for the 140-foot telescope, some observers do not, and their observations may be affected by bad pointing. If local pointing corrections are not updated occasionally, errors as large as three-fourths of a beam at 1.3 cm can occur due to thermal changes in the telescope and unknown causes. Since the staff at Green Bank has no idea how important pointing is for each VLBI observation, we cannot make the decisions for the observer as to when to make a pointing measurement and what object to use; it is up to the observer to include the appropriate cards in his or her observing deck. Measurements of the pointing corrections should be made every two hours at 1.3 cm and less often at longer wavelengths.

Observers should also be aware that pointing measurements at 1.3 cm toward sources weaker than 1 Jy fail even in the best of weather conditions with the observing procedure presently employed; a weak source for pointing can be more dangerous than not making any measurement, since bad pointing corrections much larger than the beam of the telescope can easily arise. During a 1.3-cm VLBI run last March, almost one-fourth of the pointing measurements were worthless primarily because of low fluxes. Typically, an observer should use a point source with a flux in excess of 2 Jy within 10 degrees of the desired position. Observations at longer wavelengths would also benefit by the same flux criteria.

Ronald J. Maddalena

12-Meter

NEW 12-METER OBSERVING PROPOSAL DEADLINES

Effective January 1, 1987, the proposed plan to modify deadlines for submission of 12-meter telescope proposals will be adopted. Following the suggestion in Newsletter No. 27, the new deadlines and observing periods will be:

Period	Observing Season	Deadline
I	Mid-September to 31 December	1 July
II	1 January to 31 March	1 October
III	1 April to mid-July	1 January

Special frequency-dependent considerations include:

- The 345-GHz receiver will generally not be available in periods I or III.
- 230-GHz observations will not be scheduled before mid-November or after mid-May.
- Summer shutdown will occur between mid-July and mid-September.

D. E. Hogg

UPDATE OF 12-METER POINTING STATUS

We have made progress in correcting some of the 12-meter pointing problems discussed in the 1986 April 1 Newsletter.

1. The cyclical point errors in the inductosyn position resolvers have been eliminated to the accuracy that we can measure them.

2. A prototype pointing history display program has been completed and is available at the telescope. Plans for an optical pointing telescope are proceeding.

Pointing stability during nighttime hours has been good, with a peak-to-peak scatter of about 10" in each coordinate when plotted against elevation angle. Daytime pointing stability has been more erratic, with occasional excursions of 20-25". We are suspicious of the feedleg insulation method and are considering ways to improve it.

P. R. Jewell

PLANS FOR SUMMER SHUTDOWN

Observations with the 12-meter telescope will end for the summer on July 16, in anticipation of the monsoon season. Test observations and calibrations will start in early September, as the inaugural activity of the next observing season.

Besides avoiding the uniformly poor weather that is characteristic of the wet summer season, the summer shutdown serves as an opportunity to refurbish the telescope and instrumentation and to make changes. Of most interest to the observers this year is the work planned for the receivers. We will put Gunn oscillators in the 3-mm and 1-mm Schottky receivers, thereby eliminating the need for klystrons. We will improve the mixers in the range 240-270 GHz. We will try to improve the coupling of the SIS receiver to the dish, and will work on the LO system and the receiver to try to decrease the time required to tune the receiver.

Other activities planned include work on the telescope drive servo, a study of the telescope pointing, and an improvement to the subreflector drive and control.

D. E. Hogg

SIS 3-mm RECEIVER

Following the March telescope trial of the SIS receiver, the failure of the second channel has been rectified. The receiver was installed on the telescope for scheduled observations at the end of May and was in almost constant use for four weeks. Observations have been made at 110, 115, and 116 GHz with SSB receiver noise temperatures in the range 170-280 K and image rejection of order 20 dB. At 115 GHz the system temperature was as low as 600 K. The aperture efficiency is around 35%, but some progress has been made in understanding this low value, and an efficiency similar to that of the Schottky receiver should be achievable by next season.

On the operational side, it has been found that re-tuning the LO and mixers can be time-consuming, though this is becoming less of a problem as we acquire more experience with the system. The Gunn oscillator and phase lock have generally been satisfactory; the main problem being loss of lock due to temperature changes between day and night. Helium fills are scheduled three times a week and take about one hour.

James Lamb

DIGITAL CONTINUUM BACKEND

A digital continuum backend for the 12-meter has been completed. The device accommodates two receiver channels and records four switching phases per channel (e.g., signal, reference, signal + cal, reference + cal). The backend is based loosely upon the approach of the Green Bank digital backend. To achieve the flexibility required by millimeter-wave observing, the signal for the digital backend is integrated in the telescope control computer. Final signal processing is performed in the analysis computer.

The digital backend passed a series of tests this spring and more tests are scheduled before summer shutdown. The data rate of the backend exceeds that which can be handled easily by the present control computer. As a result, the number of points that can be recorded in a single scan will be limited. We expect the digital backend to be available for routine use this fall.

P. Jewell and R. Freund

VLA

VLA CONFIGURATION SCHEDULE

I. 1986/87

Quarter	Configuration		Proposal Deadline
1986 Q3	A/B, B, B/C	[14]	March 15, 1986
1986 Q4	B/C, C	[16]	June 15, 1986
1987 Q1	C, C/D, D	[18]	September 15, 1986
1987 Q2	D, D→A, A	[19]	December 15, 1986

A/B, etc., are hybrid configurations with a long north arm. D→A is only suitable for point source observations.

[ ] indicates the number of antennas available at 327 MHz.

II. APPROXIMATE LONG-TERM SCHEDULE

	Q1	Q2	Q3	Q4
1986	D	A	B	C
1987	C	D	A	B
1988#	B	C	D	A
1989+	A	B	C	D

All antennas equipped for 327-MHz operation.
+ All antennas equipped for 8.4-GHz operation.

R. Ekers

1.3-cm FLUX DENSITIES AND GAIN CURVES

Analysis of our 1.3-cm observations of Baars' calibrators in December 1985, is complete. After correcting for system-temperature variations, atmospheric attenuation and pointing offsets and applying gain corrections, we obtained flux densities (with formal errors) at 22485.1 MHz for six calibrators:

3C 48	1.28 ± 0.01
3C 84	41.3 ± 0.3
3C 138	1.17 ± 0.01
3C 147	1.83 ± 0.01
3C 286	2.52 ± 0.01
NGC 7027	5.67 ± 0.02

The flux density for NGC 7027 was found by fitting its visibility data with a model of an elliptical gaussian source.

With respect to 3C 286, the flux densities of 3C 48 and 3C 147 are 16% and 9% above the extrapolation of Baars' scale to 22485.1 MHz. We need an accurate, absolute measurement of the flux density of NGC 7027 to determine the absolute scale.

As part of the analysis, we obtained gain correction curves for all antennas except 9 and 27. These curves vary significantly from antenna to antenna. Presently we attribute the variations to an unsetting of the longitudinal fours. A program is available on the DEC-10 for calculating gain corrections at specified declinations.

Additional details will be available in a VLA test memorandum.

Pat Crane and Rick Perley

X-BAND HEMT FRONT END

The first cooled HEMT X-band front end produced by the Central Development Lab was installed on antenna 24 in early May. Clear sky, zenith system temperatures were measured at 30 and 32 K in RCP and LCP, respectively. Under the same conditions, the cooled FET front end, which the HEMT replaced, measured 49 and 50 K in RCP and LCP, respectively. Another cooled HEMT front end on antenna 3 will join antennas 20, 21, and 24 at X-band in early July.

Bill Brundage

NEED EXTRA VLA TIME?

There are small bits of VLA time that could be used for astronomical observing, for instance, when the programmers finish their work before the end of the allocated software time. These bits of time amount to a few hours per month and typically occur in blocks of an hour or two. To use this time, we invite observers to provide us with suitable observation files. When we reject or cut the time of your proposal for reasons other than conflicts, you can submit such files to recover time not scheduled. (We require going through the formal proposal process to avoid piracy of longstanding projects of other people.)

Barry Clark

FARADAY ROTATION MONITOR

A polarimeter to measure ionospheric Faraday rotation has been obtained on indefinite loan from the Los Alamos National Laboratory. This device measures the Faraday rotation of 137-MHz emissions from geostationary satellites and will be installed on the roof of the control building. After a check-out period using an analog recorder, the data will be digitized and used to make corrections for ionospheric Faraday rotation.

Bill Erickson

INDEX OF AVAILABLE VLA ARCHIVE CATALOGS

DEC-10 File Name		Description
ACCUM.SRT	[13,542]	60 min or longer 09/81-12/84
1986.SRT	[13,542]	First Quarter of 1986
1985.SRT	[13,542]	All sources 1985
1984.SRT	[13,542]	All sources 1984
1983.SRT	[13,542]	All sources 1983
1982.SRT	[13,542]	All sources 1982
1981.SRT	[13,542]	All sources 09-12/1981

R. Ekers

A NEW GUIDE TO VLBI AT THE VLA

Version 2.0 (2 January 1986) of "A Guide to Very-Long-Baseline Interferometry at the Very Large Array" is now available from Lisa Tolin at the VLA. It will also be included in the new user's guide, "A User's Guide to the U.S. VLBI Network," being prepared by Bob Mutel.

P. Crane

HYDROGEN MASER FREQUENCY STANDARD

The Hydrogen Maser Frequency Standard had a problem of decaying IF level that required rejuvenation about once a year. Oscilloquartz modified the maser by externally mounting the source oscillator and reducing the source bulb temperature. After this modification no decay of the IF level has been noticed during the past month.

The maser was also modified by the replacement of the VCXQ and PLL assembly with newer type assembly to reduce the phase noise and improve the short-term stability over the original system specifications.

Larry Beno

THE IMAGE STORAGE UNIT AND ITS CONTROL PANEL

Some time ago NRAO decided to design and build an Image Storage Unit (ISU) and Control Panel for the IIS image display devices. The prototype has been completed and is now available for use on the VAX-11/750 OUTBAX at the VLA site. The hardware and firmware were designed by Ray Escoffier, the software by Don Wells and Arnold Rots. The device is an integral part of the IIS and can therefore be used independently of the display software running in the host (AIPS or PIPELINE). Although the ISU/CP is IIS-specific, it is completely independent of the host computer.

The IIS display devices at the VLA contain four 512x512 image memories (or channels) and allow very flexible control of the display parameters. The main limitations are in the interfacing to and user control of these functions; loading of images typically takes 30 seconds or more and image display control is through an alphanumeric keyboard and a single trackball unit that is used for many different tasks. The ISU attempts to alleviate such limitations. It contains mass storage for over five hundred 512x512 images, much of which can be loaded into an IIS image memory in about 0.6 seconds, while its control panel not only contains a module for directing the loading of images from the storage unit but also modules that control display functions. There are three advantages to the latter:

1. It works faster. For example, assume the user wants to zoom the display. Previously, this would require typing the appropriate command on the host's terminal and manipulating the trackball and its buttons. On the ISU's control panel it is simply a matter of turning the zoom magnification selector knob to the desired magnification.

2. It provides status information. Again, in the case of zooming, currently there is no way to find out what the zoom status is other than guessing from the size of the replicated pixels. The zoom magnification selector, on the other hand, will tell the user immediately.

3. It provides absolute flexibility in controlling combinations of display functions. For example, it is easy to control the zoom and the display transfer function, or transfer function and split screen, or even changing the transfer function while a movie loop is running. The limitation is in how many knobs a user can handle simultaneously. In the traditional systems the limitation is in the single trackball that is used to control all these functions, one at a time.

Functions currently available in and for the ISU include:

1. Loading of images, including background loading of entire data cubes in the Pipeline display system.
2. Backup facilities both save and restore, to and from magnetic tape, at a speed of about 3.5 sec/image.
3. Seven playback (or "movie") functions allowing control over the sequencing of the images as well as the display ("plain," split screen, or RGB three-color).
4. Seven display modes: single image, interactive split screen, blink, 1024x1024 roam, RGB three-color, RGB-and-shift, and movie.
5. Zoom with zoom center pixel coordinate read-out.
6. Transfer function (intercept/slope/curvature) with graphic display.
7. Single image plane clear.

In addition, the OUTBAX IIS is now equipped for video recording in standard VHS cassettes. We hope to gain experience with this system (and get user feedback) before enhancing its capabilities and finalizing its design.

Arnold Rots

SOCORRO SHUTTLE SERVICE

Effective July 1, 1986, the Socorro Shuttle Service rates will change as follows: One way fee is $20.00. Round-trip fee, paid by traveler on initial departure, will be $34.00.

Due to airport parking requirements, the shuttle is required to leave on schedule and can no longer wait for delayed flights.

R. E. Dorr

In General

RADIO OBSERVATIONS OF COMET HALLEY

The Radio Science Net of the International Halley Watch, an effort endorsed by the International Astronomical Union, is in the process of gathering observational data for inclusion in a comprehensive archive of the current apparition of Comet Halley. If you have obtained observations of the comet, and if you have not already informed the IHW, it would be very gratefully appreciated if you would contact the individual listed below as soon as possible. Note that upper limits of all kinds are useful and important for the archive. The data will not become public, except with your permission, before publication of the archive in 1989.

W. M. Irvine (Univ. of Massachusetts)

1400-MHz SKY ATLAS NOW AVAILABLE

The NRAO 91-meter telescope in Green Bank, West Virginia, was used to make a 1400-MHz sky survey covering the 6.8-sr declination band $-5° < \delta < +82°$, with approximately 12.7 arcmin x 11.1 arcmin resolution. The observations, data reduction, and error analysis were described by Condon and Broderick (A. J., 90, 2540, 1985, and A. J. 91, 1051, 1986). The resulting sky maps are confusion limited and contain $\approx 3 \times 10^3$ sources per steradian stronger than S = 0.15 Jy, which is about six times the rms extragalactic confusion and more than 10 times the rms noise. The NRAO has produced a 576-page, loose-leaf atlas of the sky maps which consists of contour plots supplemented with transparent, coordinate-grid overlays. The plot scale is $\approx$ 200 arcsec per millimeter.

Copies of the Atlas are obtainable from: NRAO, Attn: Carol Ziegler, P. O. Box 2, Green Bank, WV 24944. The cost for each Atlas is $10 plus shipping and handling ($3 domestic, $10 foreign), and payment must accompany each order.

J. J. Condon and J. J. Broderick

U.S.-BASED NOBEYAMA OBSERVERS

Investigators who have been granted observing time with the Nobeyama 45-meter telescope will be happy to learn that the NRAO has available a non-technical primer to guide travelers from Tokyo airport to Nobeyama Observatory and to introduce them to the way of life there. A package of materials including maps, guidebooks, detailed travel instructions, and comments for observers can be obtained by writing directly to R. Havlen in Charlottesville. Persons who receive air fare support from the NSF-funded program to use unique foreign telescopes will automatically be sent these materials.

R. J. Havlen

SIMULTANEOUS NRAO-HST OBSERVING

A procedure has been established for the evaluation of proposals which require simultaneous observations on any of the NRAO telescopes with the Hubble Space Telescope. Such proposals will be independently reviewed by the NRAO peer review system with the outcome being communicated to the STScI prior to the meeting of the HST Time Allocation Committee in the spring of 1987. The deadlines for proposal submission will correspond to the normal NRAO telescope proposal deadlines most nearly coincident with the HST deadline (Sept. 15, 1986).

Telescope	Deadline
VLA	September 15, 1986
12-meter	October 15, 1986
140-foot	
300-foot	During September 1986

The HST science justification should be attached to the NRAO proposal. The requirements of simultaneity should also be clearly indicated (optimum time scale = seconds, minutes, hours, days, or weeks?).

R. J. Havlen

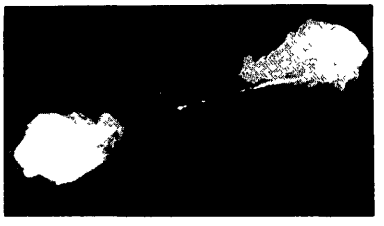
VISUAL AIDS

For some time now the Astronomical Society of the Pacific has made available two slide sets, shown below, specifically related to the NRAO which we belatedly bring to your attention.

AS 299 THE RADIO UNIVERSE This new set of 40 images of radio sources inside and outside our Galaxy was assembled for the A.S.P. by Dr. Gerrit Verschuur and the staff of the National Radio Astronomy Observatory. The set includes a variety of beautiful new color images constructed from data gathered with the Very Large Array of radio telescopes. Sources shown include supernova remnants (Cas A, Tycho), planetary nebulae, the Galactic Center, double lobed radio galaxies, swept-back jets, quasars, Jupiter, Saturn, the Sun, and much more. These images are a perfect complement to a visible light tour of the universe; many of the images have not been widely circulated and the A.S.P. is very pleased to be able to make them universally available for the first time. A detailed book of captions and an introduction to radio astronomy are included.

New

Price: $30.95



Radio galaxy Cygnus A

Sagittarius A the Galactic Center

AS 301 TELESCOPES OF THE WORLD With the help of observatory directors and staff from around the world, the A.S.P. has collected a wonderful set of the 50 largest or most important telescopes being used for astronomical research today. Included are good photos (most in full color) of the largest refractors and reflectors (including the Soviet 6-meter and the instruments atop Mauna Kea), radio dishes and arrays, IRAS, IUE, the Kuiper Airborne Observatory, the Einstein Satellite, and Ray Davis's neutrino detector. The set is accompanied by a 32-page booklet that features a nontechnical introduction to telescopes in general, detailed captions for each slide, a data table on the world's major telescopes, and a good bibliography.

Price: $37.95

European Southern Observatory
Schmidt Telescope

100-meter radio telescope
at Effelsberg, Germany

Several of you may have contributed images for this effort, for which we are genuinely grateful. Others should send your most spectacular images to the NRAO since future updates and additions to the sets are always under consideration.

Orders for either of the two slide sets should be sent directly to the A.S.P. Contact them for detailed shipping costs: Astronomical Society of the Pacific, 1290 24th Avenue, San Francisco, CA 94122.

R. Havlen

SCIENTIFIC STAFF--ARRIVALS AND DEPARTURES

During 1986 there will be several changes in the Observatory scientific staff. Two postdoctorals will leave this year: T. Armstrong to G. Winnewisser's group at the University of Cologne in Germany and H. Martin to R. Angel's group at the University of Arizona. K. Lind will arrive from Caltech this fall to begin a postdoctoral appointment.

G. Hunt has returned to the VLA following visits to the Space Telescope Science Institute and the Radio Astronomy Centre of the Tata Institute for Fundamental Research, India; and J. van Gorkom will return to the VLA this fall at the end of her year with the astronomy department at Princeton University.

M. Goss, currently at the University of Groningen, The Netherlands, has been appointed Scientist and will arrive at Socorro this fall. As a member of the basic research staff, he will provide leadership for spectral-line research at the VLA. M. Schenewerk from the University of Illinois has joined the staff at Green Bank as the system scientist for interferometer operations on behalf of the U. S. Naval Observatory.

Summer visitors to Green Bank this year include F. Kerr of the University of Maryland, H. Fulbright of the University of Rochester, and T. Troland of the University of Kentucky. E. Wollman of Bates College will spend the fall semester in Green Bank.

Charlottesville has had two visitors from the People's Republic of China: Yin Qi-feng of Beijing University and Lin Zhong-Yu of the Shaangxi Observatory. J. Maslowski will arrive this summer from the Jagellonian University, Krakow, Poland, for a three-month visit in Charlottesville and at the VLA. A. Kryzysztof will begin a one-year visit this fall on a Fulbright Fellowship. He is from the Technical University of Warsaw. Chiang Wei-Huan is spending the summer in Charlottesville before beginning an appointment at the University of Texas, Austin.

R. Perley of the VLA and P. Dewdney of the Dominion Radio Astrophysical Observatory, Penticton, Canada, are exchanging posts for the summer. Other summer visitors to the VLA include: P. Palmer of the University of Chicago and R. Laing of the Royal Greenwich Observatory, who will also be working with the Astrophysics Research Center of the New Mexico Institute of Mining and Technology. W. Erickson of the University of Maryland spent the first half of the year at the VLA. G. Bicknell will return to Mt. Stromlo Observatory in September after a six-month visit. R. Noble of Jodrell Bank spent six months with the VLA computing group. The computing group also was host to W. Brouw for several weeks. A. Pedlar will complete a one-year visit from Jodrell Bank in August. S. Gull visited for two months from Cambridge University this past spring.

D. Emerson of IRAM visited Tucson for two months this past spring, working on various aspects of telescope control software. Two astronomers from the Purple Mountain Observatory, Han Fu and Di Xiao-Hua, visited Tucson to study 12-m telescope systems in preparation for the construction of a millimeter-wave telescope in the People's Republic of China.

P. Vanden Bout

EDITOR NRAO NEWSLETTER
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