NATIONAL RADIO ASTRONOMY OBSERVATORY
Charlottesville, Virginia

Quarterly Report

July 1, 1978 - September 30, 1978

RESEARCH PROGRAMS

140-Foot Telescope

		Hours
Scheduled observing		2026.25
Scheduled maintenance and equipment changes		163.75
Scheduled tests and calibration		0.00
Time lost due to:	equipment failure	44.75
	power	3.50
	weather	3.25
	interference	5.75

The following line programs were conducted during this quarter.

Observer	Program
E. Grayzeck (Nevada) G. Rossano (Maryland) P. Angerhofer (Maryland)	Recombination-line measurements of NGC 7822 at 6-cm wavelength.
G. Rossano (Maryland)	Observations of H109α at 6 cm in selected areas of the Rosette nebula.
F. Clark (Kentucky) R. Fleck (Kentucky) J. Biretta (Thomas More College) H. Martin (Haverford)	Observations at 4830 MHz of H_2CO and at 1667 MHz of OH in an attempt to measure the rotation in three interstellar clouds.
A. P. Henderson (Manhattan)	Recombination-line studies of DR21 at 6-cm wavelength.
R. L. Brown	A search at 327.6 MHz for highly redshifted HI in absorption in PKS 0528-25.
R. Spencer (Jodrell Bank) R. L. Brown	Continued observations at 1018 MHz of 21-cm hydrogen absorption in 1229-02.
R. L. Brown M. Roberts	Observations at 1095 MHz in a search for redshifted OH in the BL Lac object AO 0235+164.

Observer	Program
S. Gottesman (Florida) D. W. Johnson (Florida)	Search for 18-cm H157α recombination lines toward NGC 253, 1068, 3034, and 5128.
L. DeNoyer (Cornell)	Survey for 18-cm OH emission in selected HI/CO clouds associated with supernova remnants.
F. J. Lockman (DTM)	Observations of 21-cm H166α recombination line emission to study the bulk motion in the ionized gas near the Rosette nebula and observations of 21-cm hydrogen and the H166α recombination line at positions near the galactic plane.
W. B. Burton	Study of 21-cm hydrogen streams near the galactic center.
M. Wright (Berkeley)	Study of 21-cm intergalactic hydrogen near M33.
R. Giovanelli (Arecibo)	Observations to extend a high-sensitivity 21-cm hydrogen survey at high velocities to the third and fourth galactic quadrants.
E. Chaisson (Center for Astrophys.) L. Rodriguez (Center for Astrophys.)	Observations of 9-cm H, He, and He^+ radio recombination lines from the extended thermal component in the galactic center and from M82.
K. Lang (Tufts) R. Willson (Tufts)	Search at 9 cm for CH toward Wolf-Rayet stars; for CH toward carbon stars, toward stars which exhibit intense CH^+ absorption lines and toward molecular clouds which envelop T Tauri stars.
P. Palmer (Chicago) L. Rickard	Search at 7.8 GHz for the $^2\pi_{1/2}$,J = 3/2 state of OH.

The following continuum programs were conducted.

Observer	Program
R. Hobbs (Goddard) S. Maran (Goddard) T. Gull (Goddard)	A study at 520 MHz of a possible new supernova remnant in Cygnus.

Observer	Program
F. Maloney (Villanova) D. Weisenberger (Villanova)	Study of the structure of the quasar 3C2 by observing at 321 MHz its occultation by the moon.
G. Rossano (Maryland)	Mapping of the Rosette nebula at 6 cm.
E. Grayzeck (Nevada) G. Rossano (Maryland) P. Angerhofer (Maryland)	Measurements of NGC 7822 at 6 cm.

The following very-long baseline programs were conducted, and the stations used in the experiments are coded as follows:

B - MPIR Bonn, W. Germany 100 m
C - DSN, Australia 210 ft
D - Dwingeloo, Netherlands 25-m
F - Harvard, Fort Davis 85 ft
G - NRAO 140 ft
H - Hat Creek 85 ft
J - Goldstone 210 ft, 85 ft
K - Haystack 120 ft
M - DSN, Madrid 2, 85 ft
O - OVRO 130 ft
P - Arecibo 1000-ft
S - Onsala, Sweden 66 ft
V - Illinois VRO 120 ft

Observer	Program
M. Cohen (Caltech) R. Linfield (Caltech) A. Moffet (Caltech) T. Pearson (Caltech) A. Readhead (Caltech) G. Seielstad (Caltech) R. Walker (Caltech)	Observations at 6 cm of "superluminal sources", using telescopes at F, O, and G.
M. Cohen (Caltech) T. Pearson (Caltech) A. Readhead (Caltech) G. Seielstad (Caltech)	Six centimeter observations of sources selected from the NRAO-MPIR 6-cm survey using telescopes at F, O, G, and H.
K. Kellermann (MPIR, Bonn) I. Pauliny-Toth (MPIR, Bonn) R. Porcas (MPIR, Bonn) D. Shaffer P. Crane	Study at 6-cm of flat spectrum sources selected from the NRAO-MPIR 6-cm survey whose fluxes are greater than 1 Jy, using telescopes at B, O, and G.
W. Cotton (MIT) I. Shapiro (MIT) J. Wittels (MIT) T. Clark (Goddard) C. Knight (Haystack)	Observations at 3.6 and 13 cm of selected variable radio sources using telescopes at C, J, K, M, O, S, and G.

Observer	Program
D. Backer (Berkeley) R. Sramek (Arecibo) K. Kellermann (MPIR, Bonn) L. Rickard S. Spangler	Observations at 21 cm of radio binary stars and of the nuclei of Seyfert galaxies, using telescopes at B, H, P, and G.
K. Johnston (NRL) A. Wolfe (Pittsburgh) R. L. Brown	Studies of the structure of 3C 446 at 2.8 cm, using telescopes at K, O, and G.
B. Burke (MIT) A. Haschick (Center for Astrophys.) R. Walker (Caltech) K. Johnston (NRL) M. Reid	Observations at 2.8 and 18 cm to study the x-ray QSO 0241+62, using telescopes at K, O, and G.
N. Cohen (Cornell) D. Jones (Cornell) D. Stinebring (Cornell)	Observations at 2.8 cm of 3C 303 using telescopes at K, O, and G.
B. Burke (MIT) A. Haschick (Center for Astrophys.) J. Moran (Center for Astrophys.) K. Johnston (NRL) R. Walker (Caltech) M. Reid	Observations at 18 cm of W3(OH) and W75 to produce full polarization maps of the OH maser complexes of these sources with telescopes at F, D, K, O, V, and G.

Interferometer		Hours
Scheduled observing		1864.25
Scheduled maintenance and equipment changes		163.75
Scheduled tests and calibration		180.00
Time lost due to:	equipment failure	113.75
	power	0.75
	weather	21.50
	interference	1.75

While several programs used the 45-foot telescope over a 35-km baseline, only those specifically requiring its use are indicated in the program description.

The following continuum programs were conducted at 2695 and 8085 MHz, unless otherwise noted.

Observer	Program
C. Purton (York, Canada) P. Feldman (Herzberg Inst., Canada) S. Kwok (York, Canada) T. Stiff (York, Canada)	Search for emission from early-type emission line stars.
R. M. Price (NSF) P. Crane	High-resolution observations of spiral galaxies.
J. Burns (Indiana) L. Rudnick F. Owen	Detailed mapping of selected head-tail radio sources, using the 45 foot.
L. Rudnick	Observations of extended structures in selected 4C sources.
P. Angerhofer (Maryland) M. Kundu (Maryland)	Synthesis map of the possible supernova remnant CTB 80, using the 45 foot.
G. Kaplan (USNO) W. Klepczynski (USNO) D. McCarthy (USNO) G. Westerhout (USNO) K. Johnston (NRL) C. Mayer (NRL) J. Spencer (NRL)	Observations to determine UT and polar motion, using the 45 foot.
D. Florkowski (Florida) S. Gottesman (Florida)	Observations of the mass loss from HD 197393, using the 45 foot.
P. Kronberg (Toronto) M. Normandin (Toronto)	Linear polarization measurements of about 260 galactic sources.
J. Condon (VPI & SU) M. Buckman (VPI & SU) D. Jauncey (VPI & SU)	Accurate position measurements of flat spectrum compact sources for the purpose of obtaining optical identifications.
M. Gearhart (Ohio State) J. Kraus (Ohio State)	Mapping of optically selected quasars.
R. M. Price (NSF) P. Crane	Monitor of the flux density variations of compact sources in spiral galaxies using the 45 foot.

The following 21-cm neutral hydrogen programs were conducted.

Observer	Program
F. J. Lockman (DTM) E. Greisen	Study of absorption profiles toward HII regions.
T. Thuan (Virginia) P. Seitzer (Virginia)	Synthesis mapping of hydrogen in blue compact galaxies.
R. L. Brown	Search for hydrogen self-absorption features near newly formed stars, and survey of hydrogen absorption toward bright point sources at low galactic latitude.
B. Burke (MIT) A. Haschick (MIT) P. Crane	Investigation of hydrogen absorption properties of 3C 178.
J. Dickey (Massachusetts)	Measurements of the galactic hydrogen opacity structure.
B. Balick (Washington) G. Boeshaar (Oregon) R. Kennicutt (Caltech)	Study of the hydrogen distribution in selected ScI galaxies.

300-Foot Telescope		Hours
Scheduled observing		1795.75
Scheduled maintenance and equipment changes		264.25
Scheduled tests and calibration		60.25
Time lost due to:	equipment failure	58.00
	power	4.00
	weather	0.25
	interference	2.75

The following line programs were conducted during this quarter.

Observer	Program
E. Seaquist (Toronto) L. Davis (Toronto)	Studies of 21-cm hydrogen in interacting galaxies.
A. Rots (Netherlands Foundation for Radio Astronomy) P. Crane	Observations to complete the mapping of nearby galaxies in 21-cm hydrogen.
P. Crane	Study of 21-cm hydrogen in a complete sample of spiral galaxies.

Observer	Program
R. M. Price (NSF) P. Crane	Study of 21-cm hydrogen in galaxies having compact nuclei.
P. Crane J. van der Hulst	Survey of 21-cm hydrogen in IO and Irr II galaxies.

The following continuum programs were conducted during this quarter.

Observer	Program
J. Cordes (Massachusetts) J. Dickey (Massachusetts) S. Spangler	Interstellar scintillation measurements of compact sources in supernova remnants of 850 MHz.
M. Gearhart (Ohio State) J. Kraus (Ohio State)	Flux density measurements at 740 and 990 MHz of BL Lac objects, quasars, and some OSU special sources.
W. Cotton (MIT) S. Spangler	Observations at three discrete frequencies between 320 and 450 MHz to continue the study of low-frequency variable sources.
F. J. Lockman (DTM) K. Turner (DTM)	High-resolution 1400 MHz mapping of the galactic plane between longitudes 80° and 190°.
B. Burke (MIT) J. Jernigan (MIT) C. Lawrence (MIT) P. Greenfield (MIT)	A survey at 5006 MHz of a square of sky 12° by 12°, centered at 13^h44^m R.A. and 21°.5 Dec, to study sources with faint x-ray emission.
A. Marscher (Goddard) J. Broderick (VPI & SU) R. L. Brown	Study of large-scale continuum emission from dense clouds at 1400 MHz.
P. Gregory (British Columbia) R. Taylor (British Columbia)	Observations at 6 cm of a region along the galactic plane through the Cygnus arm, in an attempt to determine the incidence of variable galactic sources.
M. Coe (Goddard)	Monitor, at 6 cm, the radio emission from Sco X-1 during satellite x-ray observations of this source, correlating radio and x-ray activity.

Observer	Program
Y. Kondo (Goddard) R. L. Brown	Observations at 6-cm of the BL Lac object MK501, in coordination with observations made elsewhere at other wavelengths.
V. Hughes (Queens, Canada) M. Viner (Queens, Canada) M. Fitzgerald (Waterloo, Canada) A. Moffat (Montreal) P. Jackson (Maryland)	Observations at 11 cm of 25 distant HII regions.
G. Rossano (Maryland)	Study at 9 cm of diffuse envelopes surrounding dark cloud complexes.
J. Burns (Indiana)	Mapping of the head-tail radio galaxy NGC 1265 at 9 cm.
R. Porcas (MPIR, Bonn) J. Armstrong (JPL) J. Cordes (Massachusetts) S. Spangler	Survey, using interplanetary scintillation, of compact structure in weak sources at 850 MHz.
W. Dent (Massachusetts) T. Balonek (Massachusetts) M. Hartman (Massachusetts)	Study at 6, 11, and 21 cm the polarization and flux density of known extragalactic radio sources, and an attempt to detect thermal emission from the Pleiades.

36-Foot Telescope		Hours
Scheduled observing		1205.25
Scheduled maintenance and equipment changes		72.00
Scheduled tests and calibration		930.75
Time lost due to:	telescope	4.00
	equipment	26.75
	weather	96.25
	power	0.00
	interference	0.00

Observer	Program
A. Barrett (MIT) M. Schneps (MIT)	Study of the nebula NGC 2359.
W. B. Burton (Minnesota) H. Liszt	Search for the dynamical center of the galaxy.

Observer	Program
E. Churchwell (Wisconsin) W. Hocking (U. British Columbia) A. Merer (U. British Columbia) M. Gerry (U. British Columbia)	Search for TiO in interstellar and circumstellar shells.
E. Epstein (Aerospace Corp.) J. Rather (W. J. Schafer and Assoc.)	Study of intra-day variability in BL Lac and other sources.
R. Hobbs (Goddard) P. Marionni (Maryland) R. Sinha (Maryland)	Observations of planetary nebulae at 90 GHz.
S. Gottesman (Florida) D. W. Johnson (Florida)	Study of carbon monoxide in early-type galaxies.
I. Kazes (Paris Observatory) J. Crovisier (Paris Observatory)	Search for CO in the direction of cool HI clouds.
K. Lang (Tufts) R. Willson (Tufts)	Search for CO emission in Wolf-Rayet stars.
C. Leung R. L. Brown	Measurement of velocity fields in selected Barnard objects.
H. Liszt W. B. Burton (Minnesota)	Investigation of radial distribution of CO emission in M81.
M. Morris (Columbia) M. Guelin (Inst. for Space Studies) P. Thaddeus (Inst. for Space Studies)	Observations of the relative abundances of HC_3N, HC_5N and HC_7N in molecular clouds.
P. Schwartz (NRL)	Continuum emission from compact clouds and globules.
L. Snyder (Illinois) J. Hollis D. Buhl (Goddard) L. Brown (NBS) R. Sueram (NBS)	Search for glycine.
B. Turner B. Zuckerman (Maryland) R. Gammon (Pacific Science Ctr. Foundation)	Search for C_2D and HDS to test deuteration theories.
B. Turner R. Gammon (Pacific Science Ctr. Foundation)	Search for rings and hydrocarbons as a test of gas phase chemistry.

Observer	Program
W. Wilson (Aerospace Corp.) R. Kakar (JPL) M. Klein (JPL)	Observations of CO in Venus and other planets.
A. Wootten (Texas) N. Evans (Texas) P. Vanden Bout (Texas)	The relationship of molecular ions to galaxies with active nuclei.

Very Large Array

During this quarter the completed portion of the array was scheduled for approximately 63% of the time; approximately 8% of the observing time was lost due to instrumental problems. A portion of the observing was assigned to instrumental development and tests, including studies of antenna pointing, amplitude and phase stability, and instrumental polarization. The following research programs were conducted with the VLA.

Observer	Program
D. Sramek D. Weedman (Vanderbilt)	Search for optically selected QSO's. (6, 21 cm)
R. Perley K. Johnston (NRL)	Structure of weak or compact halos in 3C 345, 3C 371, 3C 418, and 4C 39.25. (6 cm)
D. Gibson (NMIMT)	Time scales of variations in radio emission from Antares and Beta Lyrae. (all bands)
A. Willis (Brandeis) R. Strom (Netherlands Foundation for Radio Astronomy)	A study of the hot spot in the giant radio galaxy 3C 236.
R. Hjellming	Search for radio emission from x-ray objects. (all bands)
H. Zirin (Caltech) K. Marsh (Caltech) G. Hurford (Caltech) R. Hjellming	Observations of solar impulsive outbursts.
K. Johnston (NRL) A. Wolfe (Pittsburgh) R. L. Brown	Monitor variations of 3C 446. (all bands)

Observer	Program
R. Hjellming H. Schnopper (Center for Astrophys.)	Monitor variations of III Zw2. (all bands)
D. Gibson (NMIMT)	Search for radio emission from late-type subgiants. (6 cm)
P. Schwartz (NRL) J. Spencer (NRL) K. Johnston (NRL)	Confirmation and study of stellar radio sources detected at Arecibo. (6 and 2 cm)
R. Mushotzky (Goddard) R. Becker (Goddard) P. Serlemitsos (Goddard) R. Perley	Observations of Cen A, during x-ray observations with HEAO and OSO-8. (all bands)
D. Florkowski (Florida) S. Gottesman (Florida)	Observations of Wolf-Rayet binary HD 193793 and related objects. (20, 6 and 2 cm)
A. Dupree (Harvard) B. Burke (MIT) P. Greenfield (MIT)	Observations of active chromosphere stars. (6-2 cm)
A. Willis (Brandeis)	Structures and flux densities of 25 weak sources from a WSRT survey. (6 cm)
S. Goldstein (Virginia) K. Turner (DTM) R. Rood (Virginia)	Two deep survey fields at 21 cm.
J. Dreher	Mapping of Cyg A at 21 cm.
J. Condon L. Dressel (Virginia)	Compact nuclear sources in bright spirals. (6 cm)
J. Wardle (Brandeis) D. Altschuler (Inter-American U., Puerto Rico)	Twenty-one centimeter observations of extended structure around BL Lac objects.
H. Johnson (Lockheed) A. R. Thompson	X-ray sources near the galactic center. (6 cm)
H. Johnson (Lockheed) B. Balick (Washington)	Stellar planetary nebulae--flux densities and spectra. (6-2 cm)
R. C. Bignell	Observations of Virgo A. (6 cm)

Observer	Program
M-H. Ulrich (Texas) D. Meier (Caltech)	Compact components in Bologna radio galaxies. (6 cm)
J. Broderick (VPI & SU) R. L. Brown E. Fomalont	Hot spots in strong, extended radio sources. (6 and 2 cm)
P. Crane	Extended components around bright compact sources. (6, 2, and 1.3 cm)
R. Ekers (Kapteyn Labs, Netherlands) C. Kotanyi (Kapteyn Labs, Netherlands) T. van der Hulst	Two weak ellipticals--NGC 3665 and NGC 4472. (6 cm)
R. Hjellming N. Vandenberg (Goddard)	Observe Nova Vulpecula 1976. (21, 6, and 2 cm)
K. Johnston (NRL) E. Greisen R. L. Brown R. Walker	Positions of OH/H_2O maser regions associated with HII regions. (18 cm)
K. Johnston (NRL) G. Share (NRL)	Observations of x-ray QSO 0241+622. (6 and 2 cm)
M. Kundu (Maryland) P. Bowers	Search for emission from bright stars with optical evidence of coronal activity. (6 cm)
C. Kumar (Howard) K. Turner (DTM)	Search for supernova remnants in M31--first look. (21 and 6 cm)
R. Perley J. Scott (Maryland) A. Willis (Brandeis)	Observations of radio jets. (6 cm)
J. Stocke (UCLA) P. Crane	Survey of close pairs of galaxies at 21 cm.
T. van der Hulst	Six centimeter observations of the barred spiral NGC 5383.

In addition to these programs, a period of 12^h was devoted to short observations of specific objects. The observations and the first stage of data

reductions were made by the NRAO staff for the observers. Included in this period were observations of III Zw2, for R. Hjellming and H. Schnopper (SAO); of the central component of Cygnus A, for R. Hobbs, S. Maran (both of Goddard) and M. Kafatos (George Mason); of 3C 446, for K. Johnston (NRL), A. Wolfe (Pittsburgh) and R. L. Brown; of 3C 111 and Cen A, for W. Graf (Stanford); and of 3C 21.53, for W. Erickson (Maryland), J. Rickard, W. Cronyn (both Iowa) and R. Perley. Observers are encouraged to submit requests for "quick-look" programs that can be scheduled in similar periods in subsequent quarters.

ELECTRONICS DIVISION

Charlottesville

A week-long seminar was held to review the Model IV autocorrelator receiver for representatives from MIT and from institutions in Canada and Sweden which are copying the receiver.

Our first VLBI Mark III record terminal is currently being modified to provide full record capability and automatic control and monitor capability. The terminal will be ready for use at the 140-foot telescope in January 1979.

Work has begun on cryogenic GaAs FET amplifiers at 600 and 1400 MHz. Work is continuing on improving the performance of the 3-mm varactor down-converter. Development of Nb point-contact Josephson junctions is also continuing. The improved 1-mm subharmonically-pumped mixer has been tested and a second mixer of this configuration is being assembled. A liquid helium dewar is being adapted to permit cryogenic tests of the 1-mm mixer. A theory is being developed for comparison of fundamental and subharmonically pumped mixers at 1 mm. Specifications have been developed and a request for proposal is being prepared for a series of millimeter wavelength Carcinotrons to cover 3 to 0.75 mm range.

Green Bank

An improved 18-26 GHz maser has been installed on a 4 K refrigerator capable of cooling a 3-watt load, and is ready for the upconverters which will cover the 5-16 GHz frequency range. The 8.2-10.8 GHz upconverter has been fully tested at room temperature and cold tests are underway. AIL is having diode problems with the 12-16 GHz upconverter and delivery is very late. AIL has recently been awarded a further contract to develop an upconverter to cover 5-8 GHz.

The 300-1000 MHz receiver development is progressing. The dewar assembly has been started; an early prototype upconverter is being tested. The material for the new travelling box track for this receiver has been ordered.

The digital standard receiver has been interfaced with the DDP 116 computer at the 300 foot and has been fully tested. This backend is available for observer use for continuum work at the 300-foot telescope.

Tucson

During this quarter the second 256-channel, 1 MHz per channel filter bank has been installed at the telescope. The new quasi-optical polarization splitter gives two good channels at the carbon monoxide frequencies, and the availability of a second 1 MHz filter bank gives a factor of two improvement in observing time to many observers.

In collaboration with B. L. Ulich, a new split disc has been developed that gives good standing-wave cancellation over a wide frequency range.

The diode contacting facility is now completed, and we are able to contact both 80-120 GHz and 33-50 GHz diodes here in Tucson.

A third compressor has been built, enabling us to keep to receivers cold in our laboratory on the mountain.

A fast mechanical switch has been developed that will permit more efficient observations with the 9-mm receiver.

ENGINEERING DIVISION

Preparations were completed for the measurement of 72 radii on the 140-foot telescope surface with the "stepping bar" surface measuring equipment. A conceptual design for a new drive system for the 36-foot telescope was started. Detailed design continued on the 300-foot traveling feed drive system and structure modifications. Refinements in the 25-meter telescope conceptual structure design along with other studies and research continued. A contract was awarded for the development of surface plates for the 25-meter telescope, using new materials and manufacturing techniques. Some engineering assistance was provided the VLA for inspection, operation, and maintenance. Routine engineering assistance was provided operations and maintenance in Charlottesville, Green Bank, and Tucson.

COMPUTER DIVISION

Map Processing Development

Work is continuing on the map/image processing system. Two 168 Mbyte discs purchased from Ampex have been delivered and are being installed. An array processor and a television-like display system have been ordered from Floating Point Systems, Inc., and Stanford Technology Corporation, respectively. Delivery of these items is expected near the end of the year.

IBM 360/65

The IBM 360/65 has been purchased. Extension of the lease through 1980, the minimum useful lifetime of this machine, would have cost more than the current purchase price.

140-Foot Telescope Manual

A manual describing the 140-foot control system has been written and is in print. Copies may be obtained from the Computer Division Secretary by requesting User's Manual Report Series #27, "Computer Assisted Observing: The 140-ft Manual".

IBM 360/VLA Data Reduction Programs

This program package is now being used routinely for both VLA and Green Bank interferometer data. Major developments are not planned, although experimental algorithms will be implemented from time to time. Recent additions include a flexible premapping convolution algorithm and some improved output map display routines.

VERY LARGE ARRAY PROGRAM

The array was scheduled for observations and tests 63% of the time during the third quarter of 1978. At the last of September, thirteen antennas were operational, with the longest baseline 11.5 km.

Design work on the new baseband IF system (Modules T3, T4, T5, T6) progressed during the quarter, as did testing of the prototype front end IF system (Modules F4, F7, F8). The final design waveguide couplers have been installed in place of all the prototype couplers previously used on the East and West arms of the array. The coupler loss into the antenna waveguide has been reduced and the nitrogen leak rate on both the East and West arms has been reduced to less than the minimum detectable flow rate of 50 cubic feet per hour. Testing of the new correlator system was started and work progressed towards bringing it on line permanently. The first fringes were obtained with Antenna No. 15 on August 8, 1978.

VLA data can now be easily transferred to the PDP 11/70 computer, and map making software in that computer is being debugged. The new correlator system hardware was available for the first time for initial software tests in August.

The garage building was completed during the quarter and electrical wiring and air-conditioning work is in progress on the cryogenic lab extension. The Phase IV construction contract which was awarded to Pacific Railroad Constructors, Inc., has begun, with work well underway.

PERSONNEL

On October 1, 1978, M. S. Roberts will assume the Directorship of the NRAO, succeeding D. S. Heeschen.

Appointments

Richard A. Sramek	Systems Scientist	7/06/78
Rameshwar P. Sinha	Systems Scientist	7/19/78
Paul A. Lilie	Electronics Engr. I	7/31/78
F. Jay Lockman	Research Associate	9/26/78

Terminations

Chun-Min Leung	Assistant Scientist	8/29/78
Philip E. Hardee	Research Associate	8/31/78
W. Butler Burton	Scientist	9/01/78
James J. Condon	Vis. Assistant Scientist	9/01/78