US/GR BK/

NATIONAL RADIO ASTRONOMY OBSERVATORY
Charlottesville, Virginia

Quarterly Report

January 1, 1974 - March 31, 1974

RESEARCH PROGRAMS

140-foot Telescope

		Hours
Scheduled observing		1929.75
Scheduled maintenance and equipment changes		161.75
Scheduled tests and calibration		37.50
Time lost due to:	equipment failure	39.50
	power	0.00
	weather	85.55
	interference	0.00

The following line programs were conducted during this quarter.

Observer	Program
R. Tully (Observatoire de Marseille, France) J. R. Fisher	Extension of 1421-MHz neutral hydrogen survey of galaxies to declinations south of those attainable at the 300-foot telescope.
F. J. Lockman (Massachusetts) J. Lyon R. Brown	Search at 21-cm wavelength for C166α and He166α recombination lines along the galactic equator and measurements of neutral hydrogen at these points to investigate the ionization ratio of helium to carbon and hydrogen.
P. Giguere (NASA, Greenbelt) F. Clark (NBS)	Search at 9.12 and 9.13 GHz for HC_3N (cyanoacetylene) in Comet Kohoutek and in HII regions.
Y. Minn (Alabama) J. M. Greenberg (SUNY, Albany)	Observations of Comet Kohoutek, the Rho Oph Complex, NGC 2264, and IR sources at the 6-cm H_2CO (formaldehyde) line.
G. Rossano (Maryland) P. Bowers (Maryland) J. Cowan (Maryland)	Recombination line observations of small emission nebulae and high velocity clouds at 6-cm wavelength.

Observer	Program
P. Baker (NASA, Greenbelt)	Observations of optically thick neutral hydrogen at 1421 MHz.
F. J. Lockman (Massachusetts) M. Gordon	Observations at 21-cm wavelength of the recombination line H208β in Sgr B2.
F. J. Lockman (Massachusetts) W. B. Burton	Examination at the 21-cm line of neutral hydrogen selected regions near the galactic plane at successively smaller bandwidths.
W. B. Burton R. Sanders	Search at the 21-cm line of neutral hydrogen for velocity structure in the galactic nuclear disk, investigate kinematic distance toward Sgr A, and extend the Wrixon-Sanders high-velocity neutral hydrogen survey of the galactic center region to b = $\pm$ 3°.
B. Balick (U. California, Santa Cruz) S. Faber (U. California, Santa Cruz) J. Gallagher (U. Nebraska)	Attempt to determine at 1421 MHz the neutral hydrogen mass in selected elliptical galaxies.
R. Sinha (Maryland) S. Simonson (Maryland) P. Jackson (Maryland)	Conduct 1421 MHz neutral hydrogen survey of the galactic center between longitudes 340° and 12°, with a latitude extent of 4°.
P. Myers (Mass. Inst. of Tech.)	Observations at 21-cm wavelength of neutral hydrogen and of the C166α and H166α-recombination lines in the dust clouds B144 and L896.
A. Barrett (Mass. Inst. of Tech.) R. Martin (Mass. Inst. of Tech.)	Attempt to detect a fine structure line of atomic hydrogen at 632 MHz.
B. Burke (Mass. Inst. of Tech.) P. Crane (Mass. Inst. of Tech.) T. Giuffrida (Mass. Inst. of Tech.) J. Spencer (NRL)	Search at 500-750 MHz for neutral hydrogen absorption lines in the quasars PKS 0237-23 and H1331 + 170.

The following continuum observations were conducted.

Observer	Program
R. Hobbs (NASA, Greenbelt) W. Webster (NASA, Greenbelt) S. Jordan (NASA, Greenbelt) S. Maran (NASA, Greenbelt) R. Sears (NASA, Greenbelt) H. Caulk (NASA, Greenbelt)	Attempt to detect emission from Comet Kohoutek at 3-cm wavelength

Observer	Program
G. Rossano (Maryland) P. Bowers (Maryland) J. Cowan (Maryland)	Observations of small emission nebulae at 6-cm wavelength.
S. Goldstein (Virginia) R. C. Bignell (NRC Fellow, Canada)	Search at 2388 MHz for sources with large rotation measures.
R. Becker (Maryland) M. Kundu (Maryland)	Measurements of linear polarization in supernova remnants at 3-cm wavelength.
R. Becker (Maryland) M. Kundu (Maryland) T. Velusamy (Tata Institute, India)	Linear polarization measurements of selected extragalactic sources at 2 and 3-cm wavelength.
J. Dickel (Illinois) E. O'Donnell (Illinois) D. Milne (CSIRO, Australia)	Map at 2-cm wavelength the fine structure and polarization of supernova remnants.

The following very long baseline observations were conducted.

I. Pauliny-Toth (Max-Planck-Institut für Radioastronomie, W. Germany) O. Rydbeck (Chalmers, Sweden) A. Maxwell (Harvard) A. Moffet (Calif. Inst. Tech.) D. Shaffer (Yale) K. Kellermann G. Purcell	Observations at 6-cm wavelength to compare brightness distributions of 10 sources at 2 epochs to distinguish whether the observed structure variations are due to actual motion of components or to variations in fixed components using the Onsala, Sweden 84-ft telescope, the Fort Davis 85-ft telescope, the Bonn, W. Germany 100-meter telescope and the NRAO 140-ft telescope.
B. Burke (Mass. Inst. of Tech.) K. Lo (Mass. Inst. of Tech.) A. Haschick (Mass. Inst. of Tech.) G. Papadopoulos (Mass. Inst. of Tech.) R. Walker (Mass. Inst. of Tech.) K. Johnston (Naval Research Lab) S. Knowles (Naval Research Lab) S. Mango (Naval Research Lab) P. Schwartz (Naval Research Lab) J. Moran (Harvard/Smithsonian)	Observations at 22 GHz to measure (1) the size and spatial structure of H_2O sources in directions toward IR stars, (2) absolute positions of weaker H_2O sources, and (3) the size and flux of small diameter components in quasars using the Haystack 120-ft telescope, the NRL 85-ft telescope, and the NRAO 140-ft telescope.
S. Goldstein (Virginia) R. Goldstein (Jet Propulsion Lab)	Observations at 2388 MHz to improve the radar image of a portion of Venus by VLB and radar techniques using the Goldstone 210-ft telescope as a transmitter and a Goldstone 85-ft telescope and the NRAO 140-ft telescope as VLB terminals.

Observer	Program
M. Ewing (Calif. Inst. of Tech.) D. Backer (NASA, Greenbelt)	Observations at 1400 MHz to investigate the interstellar scattering of PSR 0329+54 and PSR 0833-45 emission using the OVRO 130-ft telescope and the NRAO 140-ft telescope.
M. Cohen (Calif. Inst. of Tech.) R. Schilizzi (Calif. Inst. of Tech.) J. Romney (Calif. Inst. of Tech.) D. Shaffer (Yale) G. Purcell K. Kellermann	Observations at 2.8-cm wavelength using the OVRO 130-ft telescope and the NRAO 140-ft telescope.
T. Clark (NASA, Greenbelt) L. Hutton (Maryland) G. Marandino (Maryland) I. Shapiro (Mass. Inst. of Tech.) J. Punsky (Mass. Inst. of Tech.) A. Whitney (Mass. Inst. of Tech.) D. Robertson (Mass. Inst. of Tech.) H. Hinteregger (Mass. Inst. of Tech.) C. Counselman (Mass. Inst. of Tech.) A. Rogers (Haystack) A. Niell (Jet Propulsion Lab) D. Spitzmesser (Jet Propulsion Lab)	Observations at 3.8-cm wavelength of the structure of quasars and related objects and for the purpose of performing geodetic and astrometric studies, using the Goldstone 210-ft telescope, the Haystack 120-ft telescope, the Onsala, Sweden 84-ft telescope, and the NRAO 140-ft telescope.
A. Niell (Jet Propulsion Lab) D. Shaffer (Yale) B. Clark K. Kellermann G. Purcell	Observations at 2-cm wavelength to measure a number of radio galaxies and quasars to investigate their small-scale structure and structural variations with time, using the Goldstone 210-ft telescope the Haystack 120-ft telescope, and the NRAO 140-ft telescope.

300-foot Telescope

	Hours
Scheduled observing	1989.75
Scheduled maintenance and equipment changes	154.25
Scheduled tests and calibration	0.00
Time lost due to: equipment failure	31.50
power	18.25
weather	8.50
interference	0.50

The following line programs were conducted during this quarter.

Observer	Program
V. Rubin (Dept. of Terrestrial Magnetism) N. Thonnard (Dept. of Terrestrial Magnetism) M. Roberts	Observations of a large sample of ScI galaxies at the 1421 MHz line of neutral hydrogen.
F. J. Lockman (Massachusetts)	Observations at 21-cm wavelength attempting to detect the H166α and H167α-recombination lines in nearby galaxies.
T. Giuffrida (Mass. Inst. of Tech.) A. Haschick (Mass. Inst. of Tech.) B. Burke (Mass. Inst. of Tech.)	Measurements of H189α and H190α-recombination lines in HII regions and a search for redshifted 21-cm neutral hydrogen in the radio source 3C 309.1, PKS 1317-00, PHL 938, and the QSO pair 4C11.50 over the frequency range of 750-1000 MHz.

The following continuum observations were conducted.

Observer	Program
F. Owen	Observations of Abell clusters of galaxies at 750, 775, 968, 2695 and 5006 MHz.
M. Kesteven (Queens, Canada) A. Bridle (Queens, Canada)	Observations at 2695 MHz to investigate the incidence of variable sources in a complete sample and to study the activity of variable sources at 2695 MHz in comparison with observations at other frequencies.
W. Erickson (Maryland) J. R. Fisher	A 110-1000 MHz study of metric wavelength radio source variability using the Clark Lake radio telescope and the NRAO 300-ft telescope.
S. Anand	Survey at 2695 MHz of Zwicky's compact and peculiar galaxies.
J. Kapitzky (Massachusetts) W. Dent (Massachusetts)	Monitor of the flux density and polarization of variable radio sources at 2695 MHz.
D. Gibson (Virginia) F. Owen R. Hjellming	Search at 5006 MHz for new radio stars.

In addition to the above programs, B. Zuckerman (U. of California, Berkeley) and P. Palmer (Chicago) searched near the 21-cm line of neutral hydrogen for intelligent life on planets near stars and near the sun.

Interferometer

		Hours
Scheduled observing		1828.00
Scheduled maintenance and equipment changes		166.00
Scheduled tests and calibration		149.00
Time lost due to:	equipment failure	77.25
	power	7.75
	weather	26.25
	interference	1.50

The use of the 45-ft telescope is indicated in the program descriptions.

The following continuum observations were conducted at 2695 and 8085 MHz unless otherwise indicated.

Observer	Program
R. C. Bignell (NRC Fellow, Canada) R. Predmore P. Napier	Polarization distribution in small diameter sources using the 45-ft telescope over a 35-km baseline.
C. Wade R. Hjellming	Measurements of the positions of approximately 200 small diameter sources using the 45-ft telescope over a 35-km baseline.
R. Hobbs (NASA, Greenbelt) W. Webster (NASA, Greenbelt) S. Jordan (NASA, Greenbelt) S. Maran (NASA, Greenbelt) R. Sears (NASA, Greenbelt) H. Caulk (NASA, Greenbelt)	Attempt to detect 8085-MHz emission from Comet Kohoutek. Pilot program of high resolution studies of the fine structure, active and quiet regions, and limb structure of the sun using the the 45-ft telescope over a 35-km baseline.
B. Burke (Mass. Inst. of Tech.) P. Crane (Mass. Inst. of Tech.) R. Walker (Mass. Inst. of Tech.)	High resolution studies of neutral stellar objects which possibly have high emission redshifts using the 45-ft telescope over a 35-km baseline.
D. Gibson (Virginia)	Investigation of variable radio emission in binary systems.
K. Lang (Calif. Inst. of Tech.)	Investigation of solar oscillations and high resolution observations of solar structure, the latter using the 45-ft telescope over a 35-km baseline.
S. Anand	Search for emission from nearby stars.

Observer	Program
G. Brandie (Queens, Canada) A. Bridle (Queens, Canada) E. Fomalont	Determinations of accurate positions and measurements of six quasistellar sources.
G. Brandie (Queens, Canada) A. Bridle (Queens, Canada) B. Guindon (Queens, Canada) E. Fomalont	Comparison of the radio and optical orientation of elliptical radio galaxies.
M. Kundu (Maryland) T. Velusamy (Maryland)	Observations of the sun to (1) detect and study spicules, (2) study the fine structure of active regions, and (3) investigate limb brightening.
J. Wardle (Brandeis) D. Altschuler (Brandeis)	Flux density and polarization measurements of approximately 80 radio sources.
K. Kellermann	Monitor of 10 sources for variability.
B. Clark W. R. Burns J. Hudson	Attempt to resolve a compact source in Cen A, search for a compact source in Pic A and observations of 3C 66 and 3C 380.
D. Heeschen	Observations of elliptical galaxies having compact cores, optical polarization features and millimeter wavelength variability using the 4-element interferometer with the 45-ft telescope over a 35-km baseline.
B. Balick (U. Calif., Santa Cruz) R. Brown	Investigation of the "knots" of radio radiation found in certain HII regions and a survey of such "knots" in other HII regions using the 45-ft over a 35-km baseline.
K. Lo (Mass. Inst. of Tech.) B. Burke (Mass. Inst. of Tech.) P. Crane (Mass. Inst. of Tech.) H. Dickel (Illinois)	Search for radio emission from early stellar objects using the 4-element interferometer with the 45-ft over a 35-km baseline.
E. Seaquist (Toronto, Canada) R. C. Bignell (NRC Fellow, Canada)	Observations of a selected group of 14 spiral galaxies and of 5 radio stars.
E. Fomalont R. Sramek	Observations utilizing the 45-ft over a 35-km baseline to measure the gravitational deflection of a radio source near the sun.

Observer	Program
D. Backer (NASA, Greenbelt) R. Sramek	Observations to determine pulsar proper motions using the 45-ft over a 35-km baseline.
R. Becker (Maryland) M. Kundu (Maryland)	Polarization and small-scale structure measurements in six possible supernova remnants.
T. K. Menon (Tata Institute, India)	Observations to determine the structure of 20 selected sources at 8085 MHz which have been studied using lunar occultation techniques at 327 MHz with the Ooty radio telescope in India.

36-foot Telescope

		Hours
Scheduled observing		1891.25
Scheduled maintenance and equipment changes		123.25
Scheduled tests and calibration		120.75
Time lost due to:	telescope and receiver failure	132.25
	digital system failure	135.00
	power	13.00
	weather	139.75
	interference	00.00

During this quarter observations of Comet Kohoutek were made at many frequencies. In the latter part of the quarter, the new 80 to 120-GHz cooled Cassegrain receiver was tested and used as a continuum receiver. A new telescope servo system has been tested and will be installed during the coming months. New filter banks of 256 channels covering 250 kHz and 1 MHz are now in use.

Observer	Program
P. Vanden Bout (Texas) R. Loren (Texas) J. Davis (Texas)	Observations of HCN associated with Herbig Be and Ae stars.
W. Dent (Massachusetts) R. Hobbs (NASA, Greenbelt)	Flux density variations of variable extragalactic radio sources.
L. Snyder (JILA) D. Buhl W. Huebner (Los Alamos Lab)	Search for molecules in Comet Kohoutek.
F. J. Lockman (Massachusetts) M. Gordon W. B. Burton	Search for CO in nearby galaxies.

Observer	Program
N. Kaifu (Tokyo Astronomical Obs.)	Search for methylamine.
M. Gordon T. Bania (Virginia) W. B. Burton F. J. Lockman (Massachusetts)	Investigation of galactic structure with carbon monoxide lines near 115 GHz.
J. Rather (Lulejian & Assoc.) N. Coron (Lab. de Physique Stellaire et Planetaire, France) P. Lena (Meudon, France) J. LeBlanc (Lab. de Physique Stellaire et Planetaire, France) G. Dambier (Lab. de Physique Stellaire et Planetaire, France)	1-mm continuum observations of selected regions.
M. Simon (SUNY, Stony Brook) M. N. Simon (Brookhaven National Lab.) T. Owen (SUNY, Stony Brook)	Search for molecules in Comet Kohoutek.
A. Vidal-Madjar (Lab. de Physique Stellaire et Planetaire, France) P. Bruston (Lab. de Physique Stellaire de Planetaire, France) N. Coron (Lab. de Physique Stellaire et Planetaire, France) J. Rather (Lulejian & Assoc.)	1-mm observations of Comet Kohoutek.
J. Leibacher (Lab. de Physique Stellaire et Planetaire, France) P. Lena (Meudon, France)	Observations of the slowly varying solar component at 1 mm.
P. Clegg (Queen Mary College, England) P. Ade (Queen Mary College, England) G. Rowan-Robinson (Queen Mary College, England)	1-mm observations of galactic sources, Seyfert galaxies and quasars.
D. Dickinson (Harvard/Smithsonian) C. Gottlieb (Harvard/Smithsonian)	Search for SiO in M17IR and excited SiO in M17IR and W3IR.
C. Gottlieb (Harvard/Smithsonian) C. Lada (Harvard/Smithsonian) M. Litvak (Harvard/Smithsonian) A. E. Lilley (Harvard/Smithsonian)	Map of $H^{12}CN$ and $H^{13}CN$ in M17, NGC 1333, NGC 2264, and Cloud 4.
T. Phillips (Bell Laboratories) K. Jefferts (Bell Laboratories) P. Wannier (Princeton)	Observations of galactic objects at 1.3 mm.

Observer	Program
P. Thaddeus (NASA Inst. for Space Studies) K. Tucker (NASA Inst. for Space Studies) M. Kutner (NASA Inst. for Space Studies)	Mapping of four unidentified lines near 87.3 GHz.
L. Snyder (JILA) P. Schwartz (Naval Research Lab) P. Giguere (NASA, Greenbelt) D. Johnson (National Bureau of Standards) F. Lovas (National Bureau of Standards) F. Clark (National Bureau of Standards) D. Buhl	Search for dimethyl ether.
L. Snyder (JILA) D. Buhl D. Johnson (National Bureau of Standards)	Search for thioformaldehyde and cyano-acetylene.
L. Snyder (JILA) J. M. Hollis D. Buhl	Observations of X-ogen and search for $H^{13}CO$.
C. Gottlieb (Harvard/Smithsonian) J. Ball (Harvard/Smithsonian) D. Johnson (National Bureau of Standards) M. Litvak (Harvard/Smithsonian)	Search for methylamine.
R. N. Martin (Mass. Inst. of Tech.) A. H. Barrett (Mass. Inst. of Tech.) P. Ho (Mass. Inst. of Tech.)	Spectral line mapping of small dark clouds in the CS line and a search for methylamine.
K. Kellermann	Continuum observations of sources with peculiar spectra and with non-variable fluxes.

ELECTRONICS DIVISION--EQUIPMENT DEVELOPMENT

During the past quarter the manpower assignments within the Electronics Division have been divided among the following programs.

500-740 MHz Receiver	3%
45-ft Telescope Equipment	5%
VLBI Effort	6%
Interference Protection	3%
Antenna Development	5%
256-Channel Multifilter Receiver	4%
Visitor Support and Routine Maintenance	30%
Improved LO System	2%
Cooled Mixer Receiver	10%
140-ft Cassegrain Receiver	13%
VLA Support	14%
Interferometer Digital Delay	5%

The 500-740 MHz receiver and 80-120 GHz receiver have been completed this quarter. The former will be used on the 300-ft telescope and the latter has been tested in Cassegrain mode on the 36-ft telescope; a double-sideband noise temperature of 550° K was achieved at 89 GHz. Front-end filters to provide image rejection for calibrating observations on several millimeter-wave lines have been completed. The breadboard VLA front-end has been completed.

The frequency range of a new 2670-2920 MHz receiver has been changed to 3170-3420 MHz to allow observations of the newly discovered CH line. Work has started on a 21/6 cm receiver primarily for the 300-ft telescope. The receiver will cover 1000-1450 and 4500-5000 MHz, will be dual-channel, and will have a system noise temperature of approximately 45° K.

ENGINEERING DIVISION

The Engineering Division continues to be involved in the engineering design, ordering of materials, supervision of construction of components, evaluation of installation methods and equipment access ways for the Cassegrain system for the 140-ft telescope. This includes the vertex building, Stirling mount, subreflector interface, nutating system interface, and vertex building air conditioning system.

Engineering assistance was provided to the operation and maintenance divisions at Green Bank, Kitt Peak and Charlottesville.

COMPUTER DIVISION

The new 360/65 computer has been installed and is now in use.

The Dicomed image film recorder is now in partial use. Contour maps (black and white or color) and gray scale maps (radiophotographs) can be made on a limited basis. The system is not yet integrated into the standard program packages.

The remote job entry station (RJE) (IBM 2922) is now in operation in Green Bank. Observers have remote batch access to the IBM 360/65 from Green Bank on a 24-hour basis.

VERY LARGE ARRAY PROJECT

Funding - $5,000,000 appropriation for CY 1974 was received. Funding level for CY 1975 appropriation is planned for a $13,000,000 level.

Land Acquisition - Negotiations are underway to acquire the right-of-way over five tracts on the southwest arm required for initial construction. The Corps of Engineers assures us that possession schedule will be met.

Design Activity

Electronics - Only minor modifications of the initially envisaged system were found to be necessary as a result of the breadboard assembly testing. Final design of the electrical system is proceeding on schedule.

Interference monitoring as well as waveguide stability testing continues at the site.

Antennas - Design completed on Stirling mount which interfaces between the antenna and the subreflector. Design is underway on feed mounting ring, dichroic reflector mounts and subreflector.

Antenna Configuration - A new configuration of antenna locations was proposed by Dr. Chow of Waterloo University, Kitchener, Ontario, reducing the number of stations from 99 to 72. After investigation, the VLA Steering Committee accepted the principle, which will result in a better array and will cost considerably less than the array originally planned.

Transporter - Detailed design and engineering is progressing and the completion date for this phase is expected to be met.

Engineer-Architect - Detailed design work was halted due to the antenna configuration change, but is now again underway. Sufficient time had been allowed and no delays in schedule are expected due to this change. The balance of the design work for the site work, utilities and buildings is going well. The E/A is investigating the possibility of solar heating for the buildings.

Major Procurement Activities

Antennas - E-Systems, Inc., is proceeding on the detailed design of the antenna structures, and AUI engineers continue to meet with E-Systems personnel on a biweekly basis. On January 4, AUI exercised its option for the Antenna Assembly Building at a fixed price of $311,579. Funding authorization has been granted E-Systems in a maximum amount of $870,275 to cover the commitments against advance procurements of specified non-recurring charges and long lead time equipment and materials for the two prototype antennas with the stipulation that each commitment must be authorized by AUI in writing.

Continuum Computer - Nine proposals were received, and after extensive review, negotiations were held with four firms. Final prices were requested from each of these four firms and all four have responded. Final negotiations are now underway.

Antenna Transporter - Final negotiations were held and a subcontract in the amount of $393,396 was awared to E-Systems, Inc., on January 30. The subcontract covers the detailed design and engineering ($82,613) and the fabrication, assembly, test and delivery of transporter No. 1 ($310,783). Options are included in the subcontract, either of which AUI may exercise, to procure one or two additional transporters at fixed prices.

TE_{01} Mode Circular Waveguide - Of the seven firms invited, only four firms, all foreign, responded with prices in the $70 to $87/meter range. The final negotiated price was $43.88/meter and a purchase order was placed with Fujikura Cable Works for 1250 meters of waveguide and 258 couplers for the sum of $54,860.

We continue our close contact with Bell Telephone Labs and Western Electric Company with regard to the possibility that Western Electric may be able to furnish waveguide from their new pilot plant for future requirements.

Front Ends - Cryogenic Systems, Up-Converters and Parametric Amplifiers - A purchase order has been placed with Vactronic Lab Equipment, Inc., for $9570 for two vacuum dewars for incorporation into the cryogenic system. Two CTI Model 1020 cryogenic refrigerators have been ordered from Cryogenic Tech for $18,684. A subcontract was awarded March 14 to AIL/Cutler Hammer in the sum of $58,517 for the procurement of six up-converters, four of which will be incorporated into the VLA prototype electronics. A subcontract in the sum of $84,000 was awarded to Cometch Laboratories, Inc., for parametric amplifiers which will be incorporated into the electronics for the two prototype antennas.

Railroad Rail - A purchase order in the sum of $38,371 was placed with the Atchison, Topeka and Santa Fe Railway Company on March 29 for railway relay rails and fittings necessary for the first construction phase.

Water Supply Well - A subcontract in the sum of $14,522 was awarded February 21 to Rodgers & Company, Inc., of Albuquerque to provide the well at the site.

Staffing

The VLA staff numbers 34 on March 31, 1974, including one part-time technician.

PERSONNEL

Appointments

Albert H. Steinemann	Shops Division Head	Feb. 13, 1974

Terminations

Dorsey L. Thacker	Electronics Engineer I	Feb. 28, 1974
Richard H. Gammon	Research Associate	Feb. 28, 1974
Anthony R. Kerr	Electronics Engineer I	March 1, 1974
Ross E. Jeffries	Administrative Services Officer	March 15, 1974

Leave of Absence

Sebastian von Hoerner	Scientist	Feb. 1, 1974

Deaths

William W. Powell	Purchasing/Procurement Officer	March 24, 1974