Magnetic Fields in the Local Spiral Arm. D. S. MATHEWSON, *Division of Radiophysics C.S.I.R.O.*—The large-scale distribution of linear polarization at 408 Mc/sec may be explained on the basis of synchrotron radiation theory if the sun lies almost at the center of a spiral arm which has a magnetic field directed along it towards $l^{\text{II}}=70^\circ$ and 250° . The directions of the intrinsic polarization angles derived from some 620 and 408 Mc/sec observations (Mathewson, Broten, and Cole, *Australian J. Phys.*, to be published) support this explanation. Analysis of the rotation measures for these polarized regions suggests that the magnetic field is directed towards $l^{\text{II}}=70^\circ$. The concentrations of relativistic electrons may be confined to regions about 25 pc in diameter elongated in the direction of the arm with a magnetic field strength of 5×10^{-5} G. The observations show that the magnetic fields in these "synchrotron" regions are very ordered. Their distance may be about 150 pc.

Evidence from other observations such as the rotation measures of sources, polarization of starlight and H-line Zeeman experiment suggests that the magnetic fields in H II regions, dust clouds, and concentrations of neutral hydrogen are ordered and lie in approximately the same direction as the magnetic fields in the "synchrotron" regions. It appears that the local "synchrotron" regions are manifestations of a larger-scale field extending throughout the spiral arms.

These polarization studies enable the near emission to be separated from the more distant emission. Past continuum surveys reveal clearly the existence of the local band of radio emission and the positions of the three observed minima in the large-scale intensity distribution agree well with those predicted on the basis of the proposed model. This local emission should be removed before estimates are made of any coronal or extragalactic component.

A Liquid-Nitrogen-Cooled Telescope for Infrared Rocket Astronomy. D. P. McNUTT, K. SHIVANANDAN, AND B. J. ZAJAC, *Naval Research Laboratory*, AND MARTIN HARWIT, *Cornell University*.—An Aerobee rocket carrying a liquid-nitrogen-cooled telescope was launched at 4:30 a.m. MST, 29 October 1965 from the White Sands Missile Range, New Mexico. The $f/0.8$, 5.5-in. diameter Cassegrain system, with 2° field of view, focused radiation on two sensors, an indium arsenide photo-voltaic detector and a gold-doped germanium photo-conductor. Each detector was preceded by a long-wavelength pass filter. The spectral ranges covered in this way were InAs: 1 to 3μ and Au-Ge: 3 to 7μ . The detectors were insensitive to thermal radiation from any part of the payload since the entire telescope interior was liquid-nitrogen cooled and baffles were installed to prevent stray radiation from reach-

ing the detectors. The only signals registered by the detectors, therefore, were due to radiation incident on the telescope from the earth or sky. This radiation was chopped at the entrance aperture by a chopper spinning at 8000 rpm. Both the chopper and chopper drive motor were kept at liquid-nitrogen temperature so that specially lubricated bearings were required. The chopping frequency was 933 cps. The detector signals were fed into a low-noise amplifier and then amplified once more in a lin-log amplifier that gave a linear response for small signals and a logarithmic response for large signals. This made measurement of small astronomical signals convenient and still allowed us to obtain order of magnitude information about the far stronger signals emitted by the earth. The sensitive range of the amplifier covered five decades. The amplified signals were fed into a phase sensitive detector which obtained a reference signal by means of a magnetic pickup mounted close to the chopper. During flight a two-level calibration light went on every 65 sec to allow a comparison of detector sensitivity during and prior to flight. Magnetometers and optical aspect sensors were flown. These permitted an evaluation of the rocket's aspect and gave the instantaneous viewing direction of the telescope.

Preliminary Results of a 21-cm Line Investigation of M33. S. Y. MENG AND J. D. KRAUS, *The Ohio State University Radio Observatory*.—The neutral hydrogen emission at 21-cm from M33 has been observed with the 260-ft radio telescope of the Ohio State University. The half-power beamwidth of the telescope is $10' \times 38'$ of arc in right ascension and declination, respectively. A liquid-nitrogen-cooled parametric amplifier and an 8-channel receiver with channel bandwidths of 100 kc/sec were used. Drift curves were obtained with 15 different radial velocity settings, ranging from -21 km/sec to -316 km/sec, at seven different declinations between $29^\circ 30'$ and $31^\circ 00'$ (1950.0). An equal-mean-radial velocity map, a neutral hydrogen distribution contour map as well as contour maps of equal antenna temperatures at different radial velocities are presented. The mean systematic radial velocity with respect to the local standard of rest is found to be -170 km/sec. The position angle of radio major axis of M33 is $18^\circ \pm 7^\circ$. The peak concentration of neutral hydrogen in M33 forms a ringlike structure, which has a diameter of about 7 kpc assuming a distance of 630 kpc. The center of the ring is close to the optical center of M33.

Abundance of Lithium in Early M-Type Stars. ANN E. MERCHANT, *Lick Observatory*.—A survey of over 200 early M stars has been made at disper-