$e \cdot J_2$ only slightly increases the complexity of the solution. For eccentricity=0.01, comparison with an exact numerical integration shows errors in geocentric distance of few tens of feet and errors in velocity of a few hundredths of a ft/sec.

Asymmetry in the Brightness Fluctuations of Solar Granulation. FRANK N. EDMONDS, JR., *The University of Texas*.—Recent determination of the amplitude of solar photospheric temperature fluctuations as a function of optical depth (Edmonds, F. N., Jr., *Astrophys. J.* 139, 1358) has been combined with the empirical model atmosphere of Pierce and Waddell (*Mem. Roy. Astron. Soc.* 68, 89) to calculate the skewness of source-function fluctuations and of emergent intensity fluctuations for assumed Gaussian and skew Gaussian-like distributions of the temperature fluctuations. These calculations show the skewness introduced into the emergent intensity fluctuations by the Planckian nature of the source function emission and by the stratification of the continuum contributing layers. This skewness is calculated as a function of position on the solar disk and is compared with that determined from a statistical analysis of solar granulation (Edmonds, F. N., Jr., *Astrophys. J. Suppl.* 6, 357). This photometric asymmetry of the granulation pattern is distinguished from the topological asymmetry (bright blobs surrounded by dark lanes) which is a manifestation of the upper boundary of the solar hydrogen convection zone.

Observations of the Planetary Nebula NGC 7027 at 8000 Mc/sec. JERRY R. EHMAN, *Radio Astronomy Observatory, The University of Michigan*.—NGC 7027 has been observed at a frequency of 8000 Mc/sec (3.75 cm wavelength) with the 85-ft radio telescope as a part of an observing program of planetary nebulae. A total of 68 scans were made in right ascension and declination on this planetary nebula. Calibrations were made each day with respect to Cygnus A, which was assumed to have flux density of $(200 \pm 10) \times 10^{-26}$ W m⁻² cps⁻¹.

Observed antenna temperatures were corrected for finite source size effects, errors in pointing, and for gain variations due to ambient temperature and antenna orientation. The average value for the observed corrected antenna temperature was $(0.57 \pm 0.01)^\circ\text{K}$, while the rms noise of the receiver output with a 1-sec time constant was 0.035°K . The flux density for NGC 7027 was found to be 6.07×10^{-26} W m⁻² cps⁻¹, with an estimated absolute accuracy of 7%; the largest uncertainty is in the flux density of Cygnus A.

Combining this result with those of Menon and Terzian (*Astrophys. J.* 141, 745, 1965) the spectrum of the nebula appears to be thermal and it is optically thin at 8000 Mc/sec ($\tau=0.13$) but opaque below 3000 Mc/sec. Osterbrock (*Astrophys. J.* 141, 1285, 1965) calculates a flux density of 22×10^{-26} W m⁻² cps⁻¹ for NGC 7027 at 8000 Mc/sec which is three times higher than our measured value. Assuming an electron temperature of $10\,000^\circ\text{K}$, the emission measure at 8000 Mc/sec is 2.5×10^{-7} cm⁻⁶ pc.

Research sponsored by the Office of Naval Research under Contract Nonr-1224(16), Authority No. NR 370-390 and NR 373-000X.

First-EPOCH Proper Motion Radio Observations on the Galactic Spur. FRED EDWARD ELLIS, *Louisiana State University*.—Postulation of a supernova origin for the Radio Galactic Spur (Brown, R. Hanbury, Davies, R. D., and Hazard, C., *Observatory* 80, 191, 1960) or any large arc-like object, implies proper motion if the object is not too old. The proper motion would be proportional directly to the tangent of the angular radius and inversely to the age. For example, if the Spur were associated with the "supernova" of A.D. 1006 the proper motion would be about 4 min of arc per year.

Background radiation maps are not suitable as proper motion material. Scan profiles are desired. To be along the direction of greatest anticipated proper motion the scan path must follow a radius of the circle which best fits the object.

If the observation includes a discrete source as a coordinate marker and only relative position measures attempted, precession, correction for time constant, and conversion from indicated to true coordinates are unnecessary. The observing program is more self-contained if it includes pairs of scans made in opposite directions through the same discrete source. Such pairs of proper motion observations simultaneously carry information on telescope pointing errors, time constant, and antenna beam.

To investigate observing techniques and to obtain first-epoch material for the Spur, observations were made in spring 1965 using the National Radio Astronomy Observatory 300-ft meridian telescope at 750 and 1415 Mc/sec. Declination scans at 2.5 min of arc per second included north-going and south-going scans through 3C310, 3C315, and 3C318. On 750 Mc/sec the ridge, seen on lower frequencies in this region at 18° declination, is conspicuous but because of the faintness of the Spur, an individual scan would not be useful for a position measurement. Only noise is seen on any individual 1415 Mc/sec record. Averaging of the digital records is in progress.