Short-period intensity fluctuations (of the order of seconds) in the radiation from the Crab detected by Hewish and Okoye at 38 Mc/sec [*Nature* 207 (4992), 59–60, 1965] were looked for at 26.3 Mc/sec with the Christiansen array at Clark Lake, California. Scintillations of this kind have been observed for many small-diameter sources and are generally thought to be due to scattering of the radiation as it passes through irregularities in the extended solar corona (interplanetary medium). Scintillations observed in Tau A apparently come from a very small source (angular diameter about $0''.1$) in the Crab that has a high enough brightness temperature at low frequencies to account for an appreciable fraction of the total radiation from the source.

Records of Tau A were taken in August 1965, corresponding to one of the two yearly periods of maximum fluctuation found by Hewish and Okoye. Comparing these with records of Vir A, which presumably show no interplanetary scintillations, differences are indeed apparent. Although preliminary statistical study with the limited data on hand has not produced quantitative results, further work is planned.

Nuclear Reactions during Stellar Collisions. J. S. MATHIS, *Washburn Observatory*.—A solution for the time dependence of the pressure and temperature of the material in two colliding solar-type stars has been obtained, with an aim of determining if nuclear reactions during collisions can appreciably affect the chemical composition of stars in the nuclei of elliptical galaxies (where collisions can occur with frequencies 10^{-2} per year or greater). The impact parameter is taken to be zero and the relative speed at large separations to be 778 km/sec. The temperature throughout most of the colliding mass increases to slightly over 1.0×10^8 °K and the density to 500 g cm $^{-3}$. After remaining at these values for about 100 sec, both of these quantities decrease rapidly as the hot, compressed object expands almost adiabatically.

Nuclear reactions have a very small influence on the chemical composition of the whole.

The Polarization Parameters for OH Emission from W3. M. L. MEEKS, J. A. BALL, AND J. C. CARTER, *M.I.T. Lincoln Laboratory*.—The Stokes parameters as a function of frequency have been measured for the 1665-Mc/sec line of OH from the neighborhood of the radio source W3. With a frequency resolution of 1 kc/sec seven emission features are resolved, and the corrected widths to half maximum range between 1.4 and 3.0 kc/sec. Three of the features are 100% polarized, one is 90%, and one

50%. All five of these features are almost totally right or left circular (axial ratio $.9 \pm .1$), and the degree of polarization does not change significantly across the full widths of these features. The most intense feature, however, exhibits large continuous changes in polarization parameters as a function of frequency, going from purely left circular to right-hand elliptical. The remaining feature also shows variation in polarization parameters of smaller extent across its full width. These variations, however, can be accounted for by a model that superimposes two, phase-independent, nearly Gaussian features, each 100% polarized, to form the single features observed.

The more intense features were observed with right or left circular polarization and with a resolution of 200 cps. With this resolution the features appeared asymmetric and deviated significantly from exact Gaussian shape.

The character of these emission features cannot be explained by straightforward application of the Zeeman effect to thermally excited clouds of OH.

The Distance of Tycho's Supernova from 21-cm Absorption Measurements. T. K. MENON, *National Radio Astronomy Observatory*, AND D. R. W. WILLIAMS, *Radio Astronomy Laboratory, University of California*.—The 21-cm line absorption profile in the direction of the radio source 3C10, which has been identified as the remnant of Tycho's supernova, has been observed with the 300-ft and 140-ft radio telescopes at Green Bank. Definite absorption can be identified over a velocity range of +5 to –50 km/sec. From a consideration of a number of galactic rotation models the distance to Tycho's supernova is estimated to be about 3.5 kpc. From the known diameter and the age of the nebula and assuming no deceleration, the initial expansion velocity of the supernova is found to be about 9000 km/sec. Following Minkowski's method, the absolute magnitude turns out to be –18.82. The properties of various known supernovae are discussed with a view to a new classification scheme.

Infrared Stellar Spectra. LAWRENCE MERTZ, *Block Associates, Inc.*—A progress report illustrates the performance of a previously described Fourier transform spectrometer (Mertz, L., *Astron. J.* 70, 548, 1965) on the 61-in. telescope of Harvard's Agassiz Station. This is significantly larger than the 10-in. telescope which was used for the initial report.

Spectra of a variety of stars, including the cool star in Taurus (Neugebauer, Martz, and Leighton, *Astrophys. J.* 142, 399, 1965), are presented. We

are not completely sure of the origin of several features which may be stellar, telluric, or possibly even systematic data processing errors, and we are currently checking these possibilities. A digital malfunction was discovered to have the effect of enhancing weak absorption features, and this may prove of use in the future.

Spectra of the major planets are also presented.

Airborne Observation of Stellar Scintillation with a Portable Stellar Photometer. A. H. MIKESSELL, *U. S. Naval Observatory*, AND CARL S. BROWN, *Melpar, Inc.*—A compact multicolor photometer, monitored by internal source and equipped with a small self-contained FM magnetic tape recorder has been developed. The photometer can be attached to any telescope, and the records analyzed as desired in the laboratory.

With this system attached to a 2-in. hand-held telescope, stars have been observed from the cockpit of commercial passenger aircraft during routine flights at altitudes up to 37 000 ft. As seen from the aircraft by naked eye, stars above the true horizon do not twinkle. The records of observations obtained from the aircraft indicate one quarter of the twinkling amplitude measured from the ground at a modulation frequency of 50 Hz, with little diminution in amplitude up to 600 Hz. Ground based measurements revealed no twinkling at 600 Hz. These data support the belief that star twinkling depends both upon air turbulence at the tropopause and upon observer motion.

Artificial Satellite Observations with Medium Focal Length Telescopes. ROBERT E. MURPHY, *Research & Analysis Division, U. S. Army Map Service.*—Geocentric parallax determinations of close objects are subject to significant systematic errors due to inaccuracies in the geodetic coordinates of the observing sites. If geodetic positions of the observing sites are not known and astronomically determined positions must be used, the errors will be larger by about a factor of 3.

Assessing the magnitude of the uncertainty in geodetic and astronomic positions from the internal consistency of the measurements, it is seen that the uncertainty in the distance between two sites 7000 km apart is about 300 m. The result of an error of this size on the observed parallax of Icarus when it is at its closest approach to the earth, would be about 0.01.

This error can be greatly reduced by making a series of simultaneous observations of artificial satellites from a number of observatories and using

“stellar triangulation” to determine their relative positions. The anticipated accuracy is thirty times better than that of the astronomic positions. At present only short focal length “ballistic” cameras are being used in this work. Medium focal length telescopes could be used to observe Geos, a flashing light satellite, with greater accuracy than is possible with the ballistic cameras. These observations could be used to establish an independent net linking interested observatories as well as to aid in the determination of an accurate world-wide net.

Observations of the Sky, Earth, and Airglow from OSO-B. E. P. NEY AND W. F. HUCH, *University of Minnesota.*—Four telescopes of 5° half-angle were used to observe dim light phenomena aboard the OSO-B satellite. These telescopes were pointed along the spin axis of the satellite and observed intensities and polarization with effective wavelengths corresponding to *B* and *V* photometry. The equipment worked very well for the entire nine months of the life of the satellite and only about 10% of the orbits were lost. The preliminary results on the intensity and color and geographic features of the airglow are presented along with the limits that we can presently set on possible intensity variations of the zodiacal light.

Muong Nong Tektites and Lunar Ash Flows. JOHN A. O'KEEFE, *Goddard Space Flight Center.*—Virgil Barnes has pointed out that the parent material from which tektites came is probably closely represented by what he calls the Muong Nong type. He has also drawn attention to the presence of angular voids in these tektites. The meaning of the angular voids is probably that the material consists of fragments incompletely welded together. This fact makes possible a test of theories of the origin of tektites.

If tektites are terrestrial, then the fragments should correspond at least in their chemical constitution to typical particles of soil or sedimentary rock (they cannot be terrestrial igneous rock because of differences in chemistry). If they are of lunar origin, the theories of O'Keefe and Cameron indicate that they should be particles of volcanic ash constituting a welded tuff.

Tracings made with the electron microprobe show that the material is homogeneous over large areas with the exception of inclusions of silica which form a few percent of the mass. The chemistry of the glass does not correspond to any known ordinary mineral; yet it could not have been produced by the melting of a sedimentary rock because the angular voids show us that the Muong Nong material was glass before the impact took place.