the lunar surface at least to a depth of 20 cm, and are in agreement with radar depolarization studies.

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Fine Structure of the Type IV Event of 5 February 1965. J. McKIM MALVILLE, *High Altitude Observatory*, AND H. D. ALLER, *Radio Astronomy Observatory*.—The rise times and decay times of over 400 meterwave bursts superimposed on type IV continuum are discussed in terms of collisional damping of plasma waves and the disruption of an excitor. At 345 Mc/sec the mean decay time is 5.5×10^{-2} sec corresponding to a coronal temperature of 3.0×10^6 °K assuming the decay times are controlled by the local collision frequency. The observed variation of the decay times suggests an increase of the local coronal temperature by a factor of 1.6 in a period of 3 min. The increase in decay times may also be interpreted as an increase in the local magnetic field by a factor of 1.3. Evidence for harmonics of bursts on the basis of the distribution of decay times is discussed. Examples are shown of bursts preceded by apparent absorption of the background radiation.

Observations of Comet Ikeya-Seki with the Climax Coronagraph. J. McKIM MALVILLE AND CHARLES EVANS, *High Altitude Observatory*.—Slitless spectra obtained on 20 October are used to obtain relative intensities of sodium D_1 and D_2 throughout the head and tail. The D_2/D_1 intensity ratio in the cometary head decreased from 1.7 at 2100 UT to 1.3 at 2330 UT indicating a steady increase in the optical depth of sodium. The ratio was consistently larger in the tail than in the head; at 2140 UT the ratio increased from 1.4 in the head to 1.95 in the tail. The ratio of the intensities of the D lines to the intensity of the neighboring continuum in the head decreased by a factor of more than 5 between 2100 and 2300 UT suggesting a more rapid expulsion of gas than of dust. At 2100 UT a sunward spike of sodium gas was present. By 2240 UT the spike had disappeared and a bright sodium condensation had appeared in the tail. Slit spectra show a redshift of the lines in emission in the head by 2.4 Å at 2226 UT and a blueshift of the D lines in absorption by 1.4 Å.

Peculiar Optical Features in Radio Galaxies. THOMAS A. MATTHEWS, *Owens Valley Radio Observatory*.—Fine grain plates have been taken with the 48-in. Schmidt telescope and the 100-in. telescope to aid in the identification of radio sources

and to study the objects identified. II a-D and II a-E emulsions have been used which give a significant improvement in information content over the sky survey plates when using the 48-in. Schmidt in seeing of 2 or better. The observations with the 100-in. telescope are restricted to the brighter objects because of the bright sky. Some earlier 200-in. plates taken by Minkowski and Schmidt have also been available.

The types of features found (the percentage of objects having the peculiarity is given in parentheses) in some 65 objects examined include absorption (10%), jets from the nuclear regions (7%), diffuse plumes outside the galaxy (9%), structure in the nuclear regions (17%), structure in the envelopes (9%), nonsymmetry in the surface brightness or in the extent of the envelope (47%), and a few other rarer peculiarities. Seventy-five percent of the objects have some peculiarity. The percentage of objects showing absorption features, nuclear structure, and jets is only a lower limit since large-scale photographs are not available on many of the objects. The types of nuclear structure found do not resemble spiral structure.

Some of the details for a few of the more interesting objects are given here. The D galaxy identified with 3C293 has the most absorption of any of the radio identifications, exceeding that in NGC 5128. The quasi-stellar object identified with 3C138 is nonstellar in appearance on a 48-in. II a-D plate taken in seeing 4. The identifications for Hercules A, 3C444, 3C346 are featureless diffuse objects with no nucleus, but each has a starlike image in the outer envelope. In addition 3C123, the strongest unidentified radio source, has been identified with a D galaxy at approximately the distance of Cygnus A, but heavily obscured.

Unfortunately, no comparable study has been done yet on nonradio source D galaxies, but the features discussed here are probably caused by the violent explosion which produces the radio source.

Model Planetary Nebulae. WILLIAM G. MATHEWS, *University of California, San Diego*.—The dynamics of gaseous shells of ionized hydrogen are studied. The gas is heated photoelectrically and cooled by [O III] radiation. The gas density, temperature, and velocity are calculated as functions of time and space for two models. The projected appearance of the shell in H β radiation, the H β line profile, the total H β luminosity, and the emission measure are also calculated with each model. The models fail to resemble the observations unless they are supported from within. This support is assumed to be produced by continued mass loss. The central star evolves during the nebular evolution.