system of two orthogonal coordinates, the one defined by the filaments and the second by the luminous dashes perpendicular to the filaments. This type of pattern often appears in the 5303 corona. The pattern and behavior suggests the occurrence of magnetohydrodynamic shock waves, arising from some quasi-periodic source near the base of the prominence. If the filaments run parallel to the magnetic lines of force, the orthogonal pattern may be associated with currents. Alternatively the pattern may well be attributed to magnetohydrodynamic instability. The second type of fine structure refers to the loops themselves, whose quasi-circular filament consists of large numbers of parallel threads, whose diameters are less than the resolving power of the instrument. Here the forms clearly suggest the presence of electric currents along the loops, with instabilities arising from the "pinch effect."

Measurements of the K-Line in Spectra of Sunspots.

ORREN C. MOHLER, *McMath-Hulbert Observatory*.—The structure of the center of the K-line in spectra of sunspots has been observed on a number of occasions. The structure of the K-line exactly over the umbra most frequently shows a double reversal much like that present in the normal solar disk with the difference that the reversal in the umbra of a sunspot consists of two narrow components separated by about $\frac{1}{4}$ to $\frac{1}{6}$ the separation of the emission components that appear in normal disk spectra. The next most frequent structure visible in sunspots is a featureless line with a width approximately double that of the reversed emission components. In a small number of spots the structure is so completely disorganized that no general features have been found. In a normal plage region near the center of the disk the separation of the brightly reversed components of the K-line averages less than 0.75Å. The separation varies linearly from its value in the adjacent plage to the narrow separation (about 0.090Å) observed in the umbra of the sunspot. These values should be compared with the separation for the normal disk of about 0.600Å. The intensities of the emission components in the sunspot spectra are very low, approximately $\frac{1}{4}$ the intensity of the K3 emission components in the undisturbed center of the solar disk. Often the emission seems to be completely absent unless special care is used in making the photographic observations.

Motions of the Gas near the Nucleus of M31.

GUIDO MÜNCH, *California Institute of Technology*.—Some results of the observation of [OII] emission in the neighborhood of the nucleus of the Andromeda Nebula are presented. With the prime focus spectrograph of the Hale reflector at a dispersion of 66 Å/mm, the [OII] doublet at $\lambda 3726-28$ has been resolved and detected out to a distance of 50" from the nucleus, with the slit at various position angles. While the individual components of the doublet appear narrow, they show sudden large variations in velocity superposed on the rotational pattern of the system as a whole. Because of the underlying absorption spectrum, the true value of the velocities can not yet be found accurately, but, on the whole, the motion of the gas seems to have a well-defined outward motion, amounting to 50 km/sec at a distance of 200 pc from the nucleus. The noncircular nature of the motion is most clearly observed with the slit along the minor axis, where all rotational effects should vanish. There are reasons to interpret these observations in terms of motions taking place predominantly in directions confined to the symmetry plane of the system.

Some Remarks Relating to the Classification of Spectra from Objective Prism Plates Which Include the Ultraviolet Region. J. J. NASSAU AND C. B. STEPHENSON, *Warner and Swasey Observatory*.—The purpose of this investigation is a first step in the survey of stars of high luminosity in the northern sky, a project jointly undertaken by the Hamburg and Warner and Swasey Observatories. Slettebak and Stock have published criteria derived from objective prism spectra utilizing the UV region and particularly the Balmer discontinuity. A similar study has been undertaken by us with

our newly acquired objective prism which records spectra to about 3200Å. In the collection of standard MK-types, we have included a number of peculiar stars with the hope of augmenting their classification criteria from the UV region. Our results for the OB stars and the other highly luminous classes are, in general in good agreement with the previous investigation. Specifically, luminosity classes Ia, Ib, and II may be recognized between B7 and G0, and class III is recognizable from B7 to A5 and again at G0. The results for peculiar stars are as follows: The UV proves to be particularly useful for the identification of the common types of white dwarfs and is helpful in certain types of variables as, for example, R CBr-type and SS Cygni at minimum light. However, a number of peculiar stars appear normal at the dispersion used, even far into the ultraviolet. From the limited number of standards available, F-type subdwarfs fail detection. RR Lyrae appears as a normal A-type of luminosity Ib to II. The Milky Way survey includes plates in the region between 5900 and 7000Å in order to eliminate early type objects which simulate high luminosity OB-stars in consequence of Balmer emission. These plates prove useful in the detection of planetary nebulae and stars showing emission lines, also carbon, early M- and S-stars with greater certainty than the early infrared surveys. The space depth reached from these objects is comparable to the infrared.

The Frequency of Crater Diameters in Mare Imbrium.

ERNST J. ÖPIK, *Department of Physics, University of Maryland (on leave from Armagh Observatory, North Ireland)*.—Rim to rim diameters of 812 craters from 0.6 km up have been measured over an area of 465 000 km² in Western Mare Imbrium, on a print of the Mount Wilson photograph of September 15, 1919. The data are complete down to a diameter of 1.2 km. By assuming a ratio of projectile to crater diameter of 0.05, corresponding to an impact velocity of 20 km/sec (Öpik 1958), the observed cumulative number (N_{obs}) of projectile diameters is compared with a theoretical number of impacts (N_{theo}) during 4.5×10^9 years, calculated on the assumption that the frequency of impacts has been constant and equal to the present rate (Öpik 1958). The agreement is good except for the large craters.

Projectile diam, km	0.060	0.124	0.270	0.64	1.72	3.53
N_{obs}	733	208	35	10	3	1
N_{theo}	1050	202	35	5.0	0.44	0.10

It seems that the frequency of stray objects in the neighborhood of the earth's orbit has not varied greatly since the formation of the *Mare*, and that the age of the latter compares with that of the solar system.

Orbital Elements for the Spectrographic Binary U Ophiuchi,

HD 156247. JOSEPH A. PEARCE, *Dominion Astrophysical Observatory*.—A new determination of the spectrographic orbital elements of this eclipsing variable was made from a series of forty spectrograms (dispersion 30 Å/mm at $H\gamma$) taken by the author in 1935. The orbital elements are: $T = \text{HJD. } 2\,428\,054.881 \pm 0.1393$; $P = 1.6773458$ days; $e = 0.012 \pm 0.0020$; $\omega_1 = 306^\circ \pm 30^\circ$; $\omega_2 = 126^\circ \pm 30^\circ$; $V_0 = -10.8 \pm 0.64$ km/sec; $K_1 = 180.0 \pm 1.24$ km/sec; $K_2 = 199.4 \pm 1.43$ km/sec; mass ratio = 0.90 ± 0.009 . The probable error of a single observation of the primary component, spectral type B4, was ± 3.5 km/sec while that of the B5 secondary star was ± 4.5 km/sec. The provisional elements of Plaskett derived with less precision from fewer observations in 1919 are in good agreement with the above elements, but those of Abami, deduced in 1957 from the Asiago observations which suggested a change in the systemic velocity and a decrease in the amplitude of the secondary star, are not confirmed.

The Frequency of Stars of Variable Velocity. R. M. PETRIE, *Dominion Astrophysical Observatory*.—Frequency distributions of probable errors in radial-velocity determinations show, in each sample studied, a sharp rise from zero to