ASTRONOMY SECTION OF THE A. A. A. S.
(Report of the Cleveland Meeting)

By PHILIP FOX.

The Cleveland program of Section D was the most extensive that has been presented without the presence of the affiliated American Astronomical Society. The attendance, which averaged about fifty, was also gratifyingly large. Dr. D. W. Morehouse, Vice-president of the Section, presided at all meetings.

Perhaps the most important astronomical event of the year, certainly the most dramatic, was the discovery of the planet Pluto at the Lowell Observatory. Various papers on the program of Section D concerned this planet. Nicholson and Mayall find the period to be 247.7 years, distance 39.46 A.U., perihelion passage 1989, eccentricity 0.25, and the mass 1.08 times that of the Earth. From a study of widely discordant preliminary determinations of the orbit of Pluto, Dr. Bartky derived some new and important general equations expressing the probable errors of orbital elements in terms of the probable errors of the observations. On Wednesday evening Roger Lowell Putnam, Trustee of the Lowell Observatory, in a general session reviewed the whole Trans-Neptunian campaign in an illustrated lecture, "Searching out Pluto, Lowell's Trans-Neptunian Planet." It is interesting to see that this discovery was truly an institutional enterprise in which many participated and to see how the progressive refinement of orbital elements has led to the discovery of images of the planet on plates earlier than those of the discovery date, on plates of 1918 at Mount Wilson and of 1915 at the Lowell Observatory.

The approaching important opposition of Eros was the basis of a paper by Seares, Sitterly, and Joyner, who have investigated the magnitudes and color indices of the comparison stars. They point out differences of color-coefficients and scale correction of various observers.

The Leonid meteors were so abundant in the early morning of November 17, 1930, that there is indication of a spectacular shower in 1932 or 1933. Morgan and Calvert report their observations which at the maximum gave 187 per hour. A new general estimate for the number of meteors is given by C. C. Wylie, who derives the figure for those which strike the Earth's surface and which would be bright enough to attract attention, as 20,000 annually.
Three papers dealing with the Sun concluded those bearing on the solar system. Alter presented a study by the method of correlation periodograms of the Planetary Tidal Hypothesis and Variation of Sun-Spot Activity. Extension into the future will test the validity of the conclusions which seem decidedly interesting. Stetson continues his observations on the close correlation of the intensity of radio signals with the sun-spot curve. The best reception was in mid-summer close in the wake of the low ebb of solar activity of the first part of July. His results led to a preliminary discussion of certain electronic theories now under consideration. Josef Johnson gave a preliminary report on the Solar Eclipse of 21 October, 1930, as observed at Niuafoʻou. Especial attention was directed to the intensity of various parts of the corona.

In the field of spectroscopy there was a group of interesting papers. Miss Payne presented a spectroscopic study of the Scorpio-Centaurus cluster. She emphasized the need of interpretation of the discordances in the character of the lines of the spectrum. In stars of the same type one may have strong lines, another weak; one may have sharp lines and another hazy. Pressure and stellar rotation were discussed as causes. The important paper by Struve and Elvey on Stellar Rotation came as an apt sequel to that of Miss Payne. The authors discussed the causes that produce broad, ill-defined lines and ascribed the effect to stellar rotation. From the contour of the lines they deduce rotation periods and find that equatorial velocities of 250 km/sec are not exceptional. The method was checked by observing the eclipsing variable Algol by the method discovered by Schlesinger and used by McLaughlin and substantial agreement was found.

As series of observations of spectroscopic binaries are extended, the possibility of detecting the presence of additional bodies increases. Miss Losh finds that the velocity of the center of mass of Zeta Tauri is variable with a period of 24.6 years and a range of 43 km. This long period variation may coincide with the changes of emission.

In eclipsing binaries there is often a discrepancy between the time of light minimum and the time of eclipse indicated by spectroscopic data. Carpenter suggests the consideration of the photometric observations, fitting in the time of primary eclipse, in the computation of the spectrographic orbit. A test case of υ Herculis yielded gratifying results.

Bobrovnikoff identifies certain nuclear bands in the spectra of comets with the Raffety bands of the presumably CH molecule. The agreement is not complete. Variations of intensity with heliocentric distance reveal that the cometary bands form at least two systems. Frequency formulae give fairly good representation for certain of the bands with the CN molecule suggested as the carrier. The remainder are probably due to the CH molecule.

Berman has studied the nebular lines at wave-lengths 3869 and 3967. Their intensity ratio is approximately constant in various planetary nebulae. Certain considerations lead to the rejection of C⁺⁺ as the source and the author inquires if P⁺⁺ or Si⁺⁺ are possibly available.
The photo-electric cell holds a place of increasing importance in astronomical research. It has now attained to high sensitiveness. Stebbins finds that the electric current produced in the cell by faint sources can be easily measured, the limit of detection being equivalent to a standard candle at about three miles. If the candle were as white as some stars it could be detected at double this distance. In the telescope the eye can perceive objects about two magnitudes fainter than the cell can detect.

The Eastman Kodak Company has prepared some new panchromatic plates whose characteristics were discussed by Mees. Their adaptation to visual refractors and their high speed will make them of interest to all engaged in stellar photography.

The remaining papers were brief. Mehlion's test of the Brashear objective of the Drake Municipal Observatory showed both visual and photographic combinations to be of excellent quality. MacMillan showed some ingenious stereoscopic pictures of star clusters. Dustheimer reviewed the astronomical Radio program of WTAM. This station has broadcast 62 astronomical talks in the last six years. The listeners use star charts and literature distributed from the station.

A joint session with Section L and the History of Science Society offered the following program: Galactic Explorations, address of the retiring Vice-president of Section D, Harlow Shapley; Historical Instruments in the Adler Planetarium and Astronomical Museum, Philip Fox; Life of Sir Isaac Newton, a Character Sketch, Louis T. More. The first and last of these will be published in full. In the second the author gave a brief survey of the Mensing Collection of Old Scientific Instruments which was acquired just a year ago. It contains examples of the work of the principal instrument makers of the sixteenth, seventeenth, and eighteenth centuries, Examples were exhibited and others were shown in slides.

Various members who attended the Cleveland meetings visited the Warner and Swasey Company, where so many of the great telescopes have been built, also the Warner and Swasey Observatory of the Case School of Applied Sciences, where the local representative for the Section, Dr. J. J. Nassau, received the guests. A third focus of interest was the interferometer house where Professor Dayton C. Miller continues the important observations of the ether drift experiments.

January 17, 1931.