A REFLECTION NEBULA AND AN ASSOCIATED VARIABLE STAR

The star HD 222142 (9.2, B9) = BD+47°4220 (9.0) is in the south-preceding end of an obscured region 16′ long and 6′ wide which contains no other stars as bright as magnitude 15.5. A 60-minute exposure on an Eastman 103*a*-O plate with the 10-inch reflector shows traces of a few fainter stars. Small-scale plates indicate that the dark nebula may be much longer, but either less dense or at a greater distance outside these limits.

HD 222142 is surrounded by a faint patch of luminous nebulosity of radius 0′.9, no trace of which is visible on 10-minute exposures with the reflector.

A star at $23^h32^m.8$, +47°51′ (1900) has been estimated on 400 plates taken since 1942. The light-curve indicates a rapidly varying irregular variable with a range from 12.7 to <14.4 (m_{pg}). Fluctuations of 1 mag. have been observed in 1-day intervals. A long search has revealed no evidence of periodicity. The star is in the edge of the dark nebula and may be involved in it. The median absolute magnitude of the variable, on the assumptions that it is unobscured and is at the distance of the B9 star, is +5, a value which is normal for variables of the Orion nebula type.

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NEW ABSORPTIONS IN THE URANUS ATMOSPHERE

In a recent publication[1] attention was called to an absorption in the atmospheres of Uranus and Neptune, not due to methane; the band is some 30–40 A wide and centered on 8270 A. On November 2, 1948, two additional features were found when Uranus was photographed with the same spectrograph (500-mm camera), but with only half the slit-width previously employed and on a contrasty plate (IV-N). The additional absorptions are situated at λ 7500 and λ 7524 and are remarkable for their sharpness. The spectrogram is reproduced in Figure 1, with a spectrum of Venus placed above it for comparison and with two later spectra of Uranus below. The latter confirm the reality of the narrow features; the lowest spectrogram, showing coarser grain, was obtained on I-N instead of IV-N.

During the months of December and January the writer, in collaboration with Dr. J. Phillips, examined a number of possible atmospheric gases in the Yerkes Observatory laboratory without finding a clue as to the identification of the new features. The Hilger spectrograph was used, which closely matches the dispersion of the McDonald Cassegrain spectrograph, about 200 A/mm in the near infrared. It was found that the absorptions are not caused by CH_4, C_2H_4, C_2H_6, CO, CO_2, or NH_3, and probably not by H_2S and N_2O. Dr. Phillips and the writer will publish the laboratory results more extensively in due course. In addition, Dr. Phillips has obtained a beautiful series of high-dispersion spectra (2.5 A/mm) of CH_4. They show no trace of CH_4 lines from about λ 7422 to λ 7594 with a path-length of 800 meter-atmospheres; this result practically rules out the possibility that the new features are CH_4 bands somehow strengthened as a result of the low Uranus temperature. The same holds true for a weaker absorption at λ 7471, reported below.

Obviously, improved Uranus spectra were highly desirable. It appeared that the McDonald infrared grating spectrograph (dispersion 50 A/mm)[2] was fast enough for the purpose, owing to the comparatively fast camera, *f*/3, employed. Dr. P. D. Jose, assisted

[1] *The Atmospheres of the Earth and Planets* (Chicago: University of Chicago Press, 1949), chap. xii; also *McDonald Observatory Contr.*, No. 161.

[2] W. A. Hiltner, *Ap. J.* **105**, 212, 1947.

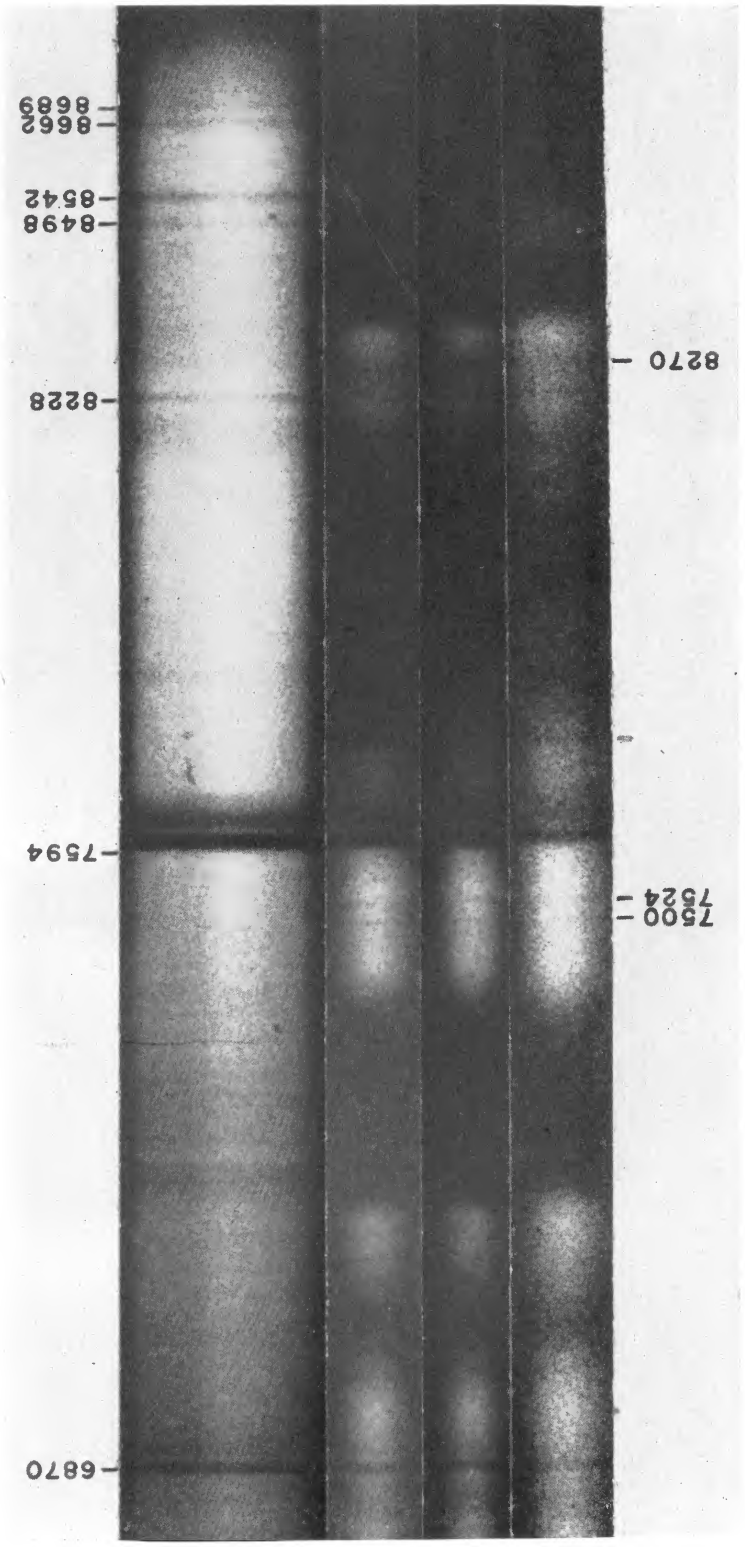

FIG. 1.—Three spectra of Uranus with Venus (*above*) for comparison. λλ 7500, 7524, and 8270 are unidentified; λ 8689 in Venus is due to CO_2

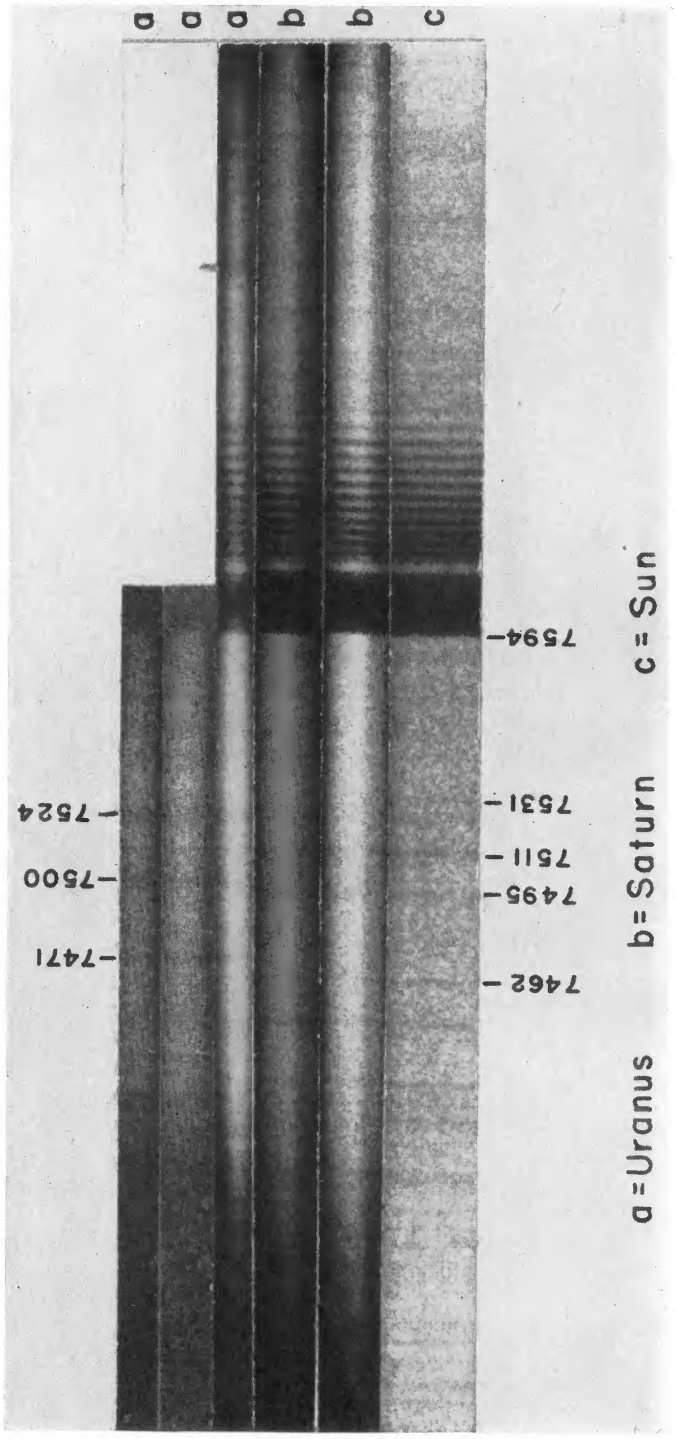

FIG. 2.—Spectra of Uranus showing unidentified bands at λλ 7471, 7500, and 7524. Saturn and sun for comparison