FURTHER MEASUREMENTS OF STELLAR TEMPERATURES AND PLANETARY RADIATION.

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[Author's abstract]

During the past summer, through the generosity of the Lowell Observatory, Flagstaff, Arizona, who financed this research, a further opportunity was presented to continue the measurements of 1921, relating stellar temperatures and planetary radiation. Especial acknowledgement is due Dr. C. O. Lampland for kindly operating the telescope. The speaker reported a verification of the estimates presented before this society (the meeting of December 17, 1921) of the temperatures of 16 stars as determined from their spectral energy distribution, which was obtained by means of a new spectral radiometer, consisting of a series of transmission screens and a vacuum thermocouple.

By means of these screens, which, either singly or in combination, had a uniformly high transmission over a fairly narrow region of the spectrum and terminating abruptly to complete opacity in the rest of the spectrum, it was possible to obtain for the first time the radiation intensity in the complete stellar spectrum as transmitted by our atmosphere. The recent measurements of the spectral radiation components, made principally on the sun, the temperature of which was used as a standard of comparison, verify the previous measurements of stellar temperatures which range from 3000° K. for red, class-M stars, to 12000° K. for blue, class-B stars.

Planetary Radiation.—The thermal radiation emitted from a planet as a result of warming by exposure to solar radiation, including heat which may be radiated by virtue of a possible high internal temperature of the planet itself, is essentially of long-wave lengths 7 μ to 12μ. Hence, by means of a 1-cm cell of water interposed in the path of the total radiation emanating from the planet, this long-wave-length radiation can be separated from the reflected solar radiation, and in this manner a measurement obtained of the energy reradiated. If there is planetary radiation then the water cell transmission will be less than that of direct solar radiation.

It was observed that the water cell transmission of the total radiation emanating from Jupiter is practically the same as that of the direct solar radiation. From this it appears that the outer atmosphere of Jupiter does not radiate appreciable long-wave-length infra-red energy as the result of warming by solar rays, and that the atmosphere is sufficiently thick and opaque to trap all the energy reradiated as the result of warming of its interior by solar radiation, or by internal heating, if the interior of Jupiter is still highly heated.

The radiometric measurements on Venus, Jupiter and Saturn are in good agreement with similar measurements made at Mount Hamilton, Calif., in 1914, showing a decidedly lower transmission of radiation through the water cell, in the case of Venus and Saturn. The intensity of the planetary radiation increases with decrease in the density of the surrounding atmosphere and (as interpreted from the water cell transmissions)