TRANSPARENCY OF THE ATMOSPHERE FOR ULTRA-VIOLET RADIATION.

By R. J. STRUTT.

[Dated: Imperial College of Science and Technology, South Kensington, London, Oct. 22, 1917. *Reprinted from* Nature, London, Oct. 25, 1917, 100: 144.]

It is well known that the solar spectrum, even when observed from a mountain top so that there are fewer than 4 miles of "homogeneous atmosphere" overhead, does not extend so far as $\lambda=2{,}900$, however long an exposure is given. It has further been long suspected that absorption by ozone is the cause, as originally suggested by Hartley. Perhaps it may be claimed that the recent work of Prof. A. Fowler and myself [1] leaves little or no room for doubt that this is the true explanation.

As a sequel to the work just mentioned, I have photographed the spectrum of a mercury-vapor lamp 4 miles distant, and found that it extends as far as the line $\lambda=2{,}536$, and perhaps farther. This line lies near the maximum intensity of the ozone absorption band, and therefore ozone can have nothing to do with the limit of the spectrum in this case. To reconcile the two results it is necessary to assume that there is much less ozone near the earth's surface than at high levels, a conclusion in agreement with the published chemical determinations of atmospheric ozone by Hayhurst and Pring.

The distant mercury-lamp spectrum showed a considerable falling off of intensity in the region of short wave lengths, long exposures being required to bring out $\lambda=2{,}536$, which is one of the brightest lines when atmospheric absorption does not intervene. Such a result is to be expected according to known data on atmospheric scattering of light, apart from the action of ozone.

In this connection I may mention that I have succeeded in observing the scattering of light by pure dust-free air in a laboratory experiment with artificial illumination. Details of these investigations will be published later.

[1] Proc., Royal Society, Sect. A, 1917, 93: 577; *Abstract*, this REVIEW, Sept., 1917, 45: 443.

523.7 (048)

A. BRESTER'S THEORY OF THE SUN.

[*Reprinted from* Nature, London, Oct. 25, 1917, 100: 154.]

In anticipation of a further volume on the constitution of the sun, Dr. A. Brester has issued the introduction and general conclusions in pamphlet form (La Haye. P. van Stockum et fils, 1917). As is well known, Dr. Brester does not accept the general view that the surface of the sun is subject to violent disturbances, and seeks to explain solar phenomena on the basis of a relatively tranquil gaseous globe which is practically undisturbed by convection currents. The solar gases decrease in density and luminosity from the center outward, but on account of their opacity their light never reaches us. The photosphere is a condensation stratum which is rendered luminous in the same way as a mantle in an ordinary gas flame, while a sunspot is a perforation through which the less luminous surface layer of the interior gases becomes visible. The varying frequency of spots is accounted for by supposing that at minimum the heat of the central nucleus is prevented from escaping by a photosphere of relatively great thickness, and that afterward, owing to contraction, the temperature of the nucleus increases to such an extent that the photosphere becomes attenuated and subject to perforations in the form of spots and pores. Radiation from the nucleus is then facilitated, so that the photosphere again increases in depth, and eventually produces another minimum. The chromosphere, prominences, and corona are regarded by Dr. Brester as effects of a permanent aurora which is maintained by electrons projected from the photosphere.

It is generally believed by astronomers and other students of astrophysical phenomena that the modern spectrograms of the sun's photosphere, and particularly the successive spectrograms for some particular and suitable line (e. g. H_α of hydrogen), demonstrate beyond question that the incandescent gases are there in pronounced motion and sometimes in very violent motion. The motions revealed by the displacement of spectroscopic lines and by comparisons of successive spectrograms, may be classed as (1) those of the general circulation of the sun about its own axis, motions which vary with both latitude and depth just as do those of the earth's atmosphere; (2) those of "local" disturbances, some of which appear as the familiar spots, motions of a vortical character, and adjacent disturbances often show related opposite whirls suggesting that they are often but opposite ends of one and the same vortex.

It is believed that the nucleus is constantly much hotter than the gases of the photosphere; because a relatively hotter photosphere would not absorb radiation in a manner to produce the dark-line spectrum actually produced by the reversing layer. This would not permit, apparently, of a nucleus relatively cooler than the photosphere (which would wipe out the dark-line spectrum), and thus seems to argue against Brester's explanation of the variation in frequency of sunspots.

C. G. Abbot's book "The Sun" (New York, 1911) is the most convenient reference work for those interested in this question. Recent notes on solar conditions will also be found in the MONTHLY WEATHER REVIEW, 1914, **42:** 168; 1915, **43:** 501–502; 1916, **44:** 113, 508.—C. A., jr.

LUNAR RAINBOW.[2]

Mr. Edward L. Wells, Meteorologist, Boise, Idaho, contributes the following notes on a lunar rainbow observed in Idaho.

A lunar rainbow was observed at Porthill, Idaho, on September 26, 1917, by Mr. H. A. French, cooperative observer. It was thought at first that an aurora had been mistaken for a rainbow, but correspondence with the observer has identified the phenomenon as a rainbow, without question.

Mr. French states that the bow was complete and quite bright, appearing at 8:50 p. m. Pacific time, and lasting about 10 minutes. The moon was slightly past the meridian and was shining with unusual brilliance, while the northern sky was cloudy and dark, with a heavy shower occurring at some distance in that direction.

Porthill is on the international boundary line between Idaho and British Columbia, in Lat. 49° 0′ N., and Long. 116° 35′ W. There are moderately high mountains toward the east and west, but the broad valley of the Kootenai River extends northward to Kootenai Lake, giving a rather low horizon toward the north.

Mr. French is a very capable and careful observer.

[2] Prepared and published by Division of Aerological Investigations.