LETTERS TO THE EDITORS

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IN THE PRESENT CIRCUMSTANCES, PROOFS OF "LETTERS" WILL NOT BE SUBMITTED TO CORRESPONDENTS OUTSIDE GREAT BRITAIN.

NOTES ON POINTS IN SOME OF THIS WEEK'S LETTERS APPEAR ON P. 630. CORRESPONDENTS ARE INVITED TO ATTACH SIMILAR SUMMARIES TO THEIR COMMUNICATIONS.

The Atmospheric Layer from which the Yellow Line in Twilight originates

THROUGH measurements at the Pic-du-Midi, Garrigue[1] found that the average intensity of the yellow line in the night sky 10° above the horizon is about 2·8 times that at the zenith, from which Cabannes, Dufay and Gauzit[2] found the altitude of the layer emitting the yellow line to be about 130 km.

Bernard observed at Tromsoe the time at which the intensity of the yellow line *in twilight* suddenly drops. Assuming the excitation to be restricted to a region exposed to ordinary sunlight, and that, therefore, the disappearance of the yellow line takes place when the shadow of the solid earth exceeds a certain height (H_B), Bernard concludes[3] that the emission of the yellow twilight line is restricted to a layer below 60 km.

Bernard regards this result as in conflict with that of Cabannes, Dufay and Gauzit, which he considers to be based on unreliable data ; but as he is dealing with a different light phenomenon, for which the distribution with altitude of the excitation agency will be different from that of the night sky luminescence, there is not necessarily any conflict between the results.

On the basis of extensive observational material from Oslo, I have been able to show that *the yellow line is also emitted in twilight from a layer situated at the lower part of the auroral region.* By means of a small spectrograph of great light power, we took a series of twilight spectrograms, partly in the zenith and partly in a nearly horizontal direction. If, with Bernard, we assume that the emission of the yellow line is determined by the shadow formed of visible sunlight by the solid earth, then the observations near the horizon would give a greater upper limit (59 km.) of the effective emission layer than the spectra from the zenith (45 km.).

Assuming, however, that the yellow line is excited by some easily absorbed, probably ultra-violet solar radiation, and that the atmosphere below a certain height (H_s) acts as a screen for the effective solar rays, then *this screening height may be found from the condition that the spectra from the zenith and from the near horizon must give the same upper limit* (H_u) *for the emission of the yellow line.*

The observations from Oslo give for the effective screening height $H_s = 55$ km. and for the upper limit of effective excitation $H_u = 115$ km.

It is of interest to notice that the screening height is just above the region of relatively large ozone concentration. The effective height is found to be about the same in the evening and in the morning, showing that there is no noticeable time-lag in the emission process.

These results indicate an extra-terrestrial origin of the sodium from which the yellow line is emitted. It is possible that, in addition to the hydrogen showers previously dealt with[4], showers of sodium coming from the sun may enter the atmosphere. Possibly the hydrogen showers, in connexion with sodium and atmospheric oxygen, may account for the luminous night clouds. Our results regarding the position of the effective sodium layer also enable us to make certain estimates regarding the effective solar radiation. If it is ultra-violet light, it should be found somewhere in the interval 1900–3100 A. The screening limit (H_s) is due to ozone absorption, the maximum of which lies at about $\lambda = 2500$, or near the wave-length ($\lambda = 2412$) corresponding to the ionization potential of the sodium atom.

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March 11.

[1] Garrigue, *C.R.*, **205**, 591 (1937).
[2] Cabannes, Dufay and Gauzit, *C.R.*, **206**, 1525 (1938) ; NATURE, **141**, 1054 (1938) ; *Astro. J.*, **88**, 164 (1938).
[3] Bernard, *C.R.*, **206**, 448, 928 (1938).
[4] Vegard, NATURE, **144**, 1089 (1939).

Absorption of the Hydrogen Line 1215·7 A. by Air

IN a recent letter[1], S. E. Williams reports measurement of the absorption in air and oxygen of the first line of the Lyman series of hydrogen, Ly_a, at 1215·7 A. This problem is of interest because of the suggestion by Martyn *et al.*[2] that Ly_a radiation from solar eruptive areas may be responsible for radio fade-outs. Williams's result was that a path length of 0·04 cm. of oxygen reduces the intensity of Ly_a by a factor of one half. This represents an absorption coefficient about fifty times as large as that found in a recent determination of mine[3].

Without details of his experimental method, it is difficult to suggest any explanation for this startling disagreement. Since water vapour, carbon dioxide, and most organic vapours have relatively much larger absorption coefficients at this wave-length, small traces of impurities would be sufficient to explain a result that was much too high.

It is more difficult to imagine a source of error which would give too *low* a value for the oxygen absorption. Williams suggests that the absorbing oxygen in my experiment may have been largely dissociated. Ladenburg and Van Voorhis[4] were bothered by dissociation when measuring oxygen absorption in the 1350 A. region. The oxygen in their