Auroral Phenomena and the Behaviour of the Ionosphere during a Total Solar Eclipse

FROM the appearance of very long auroral rays in the middle of the night, as described for the auroral display at Oslo of October 16 [see NATURE, Nov. 28, p. 930], it follows that the density of matter also during the night may decrease very slowly upwards.

This state is essentially due to the large number of free electrons present. On account of the high mobility of the electrons, the coronal structure of the upper atmosphere[1] produced on the day side will spread (diffuse) into the night region. This spreading process will counteract the night contraction and support the maintenance of 'a coronal distribution' on the night side of the earth.

In this way we may also account for the fact, shown by radio-echo measurements, that the reflecting layers maintain their conductivity and reflecting power during a total solar eclipse[2].

Thus the distribution of matter and the corresponding electrical state on the night side of the upper atmosphere which is revealed by auroral investigations enable us to understand certain essential features regarding the behaviour of the ionosphere during a total solar eclipse.

The spreading or diffusion process essentially effected by free electrons has also to be taken into account in any estimate of the rate of recombination from changes of ion concentration derived from radio-echo measurements.

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[1] L. Vegard, "Die Korona der Erde und Sonne, etc.", *Gerlands Beiträge zur Geophys.*, **32**, 288 (1931).
[2] Cf. L. V. Berkner and H. W. Wells, "Report on Ionospheric Observations during Solar Eclipse of June 19, 1936". Presented to the Edinburgh Congress of the International Union of Geodesy and Geophysics.

Demonstration of Phosphorescence

THIS letter describes an interesting lecture experiment in connexion with phosphorescence. It provides a striking demonstration with apparatus of a simple character, and makes available a 'permanent' source of 'cold' light.

It is well known that most, if not all, materials that phosphoresce as a result of exposure to light are also fluorescent. This fact, coupled with the initial rapid decay of phosphorescence characteristic of phosphors, renders it difficult to appreciate visually the extent to which phosphorescence may be excited. Luminescent powders are commercially available which exhibit marked phosphorescence when illuminated by wave-lengths of three thousand to four thousand Ångström units, and the modern electric discharge lamp, in which a discharge passes through mercury vapour at approximately atmospheric pressure, provides a convenient source of these wave-lengths.

Phosphorescence resulting from irradiating the selected powder can be observed at a constant value, if it is continually re-excited and viewed for a short period while the radiation is discontinued. If it is observed immediately after irradiation, then the phosphorescence will have suffered little decay and will be near a maximum.

This effect can be secured very conveniently by rotating an opaque cylinder coated with phosphorescent material in front of a lamp radiating suitable wave-lengths. The side of the cylinder remote from the lamp is then a source of 'cold' light of quite high brilliancy.

The apparatus that has been constructed is illustrated in Fig. 1, and it consists of a Mercra 400 watt lamp provided with a special outer bulb functioning as a filter to pass only ultra-violet radiation between 3,000 A. and 4,000 A. Chances No. 14 is a good example of a suitable filter. The cylinder may be rotated at various speeds and may have a surface

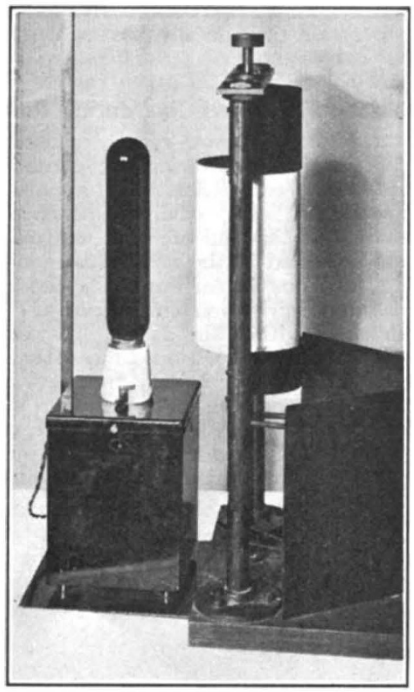

FIG. 1.

brightness of 10 equivalent foot-candles, and a total luminous output equivalent to that of a 1–1/2 watt tungsten filament lamp. In this connexion it is of interest to note that a road surface with a brightness of 0·5 equivalent foot-candles is considered to be illuminated to a fairly high standard, and one once again realizes the attractiveness of the (at present) impracticable suggestion to employ phosphorescent materials, excited during the daytime, on our road surfaces or surroundings.

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Diamagnetism of Mixtures of Organic Liquids

CERTAIN measurements of the magnetic susceptibility of binary mixtures of organic liquids made by us[1], which are at variance with the determinations of several investigators and which we have agreed are in error for reasons stated[2], are still being quoted in text-books and the literature.

We have now completed the remeasurement of the susceptibility of the binary mixtures under discussion, namely, acetone-chloroform, acetone-trichloroethylene, chloroform-ether, by the Gouy method[3] and find that the deviations of these