M reflections (that is, tracks of waves which have been reflected in succession from region *F*, the upper part of region *E*, and region *F* again before coming back to the ground). For that reason the term 'intermediate region' seems preferable.

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June 3.

[1] NATURE, **127**, 197, Feb. 7, 1931; see also *Proc. Roy. Soc.*, A, **137**, 36; 1932.
[2] *J. Inst. Elec. Eng.*, **72**, No. 435, 246; 1933.
[3] Pannekoek, *Amst. Acad. Proc.*, **29**, 1165; 1926.
[4] Eckersley, *J. Inst. Elect. Eng.*, **71**, No. 429, 423; 1932.

WE were much interested in the letter of Messrs. Schafer and Goodall in NATURE of June 3, p. 804, under the title "Characteristics of the Ionosphere", and in particular in their remarks about the presence of an ionospheric reflecting region between the *E* region and the *F* region of Appleton. While making automatic records of ionospheric reflections[1] we have recently found indications of this region on several occasions.

One of our records, for the morning of January 29, 1933, taken on a wave-length of 150 m., is reproduced in Fig. 1. On this occasion a "circularly polarised receiver"[2] was used, and was arranged so

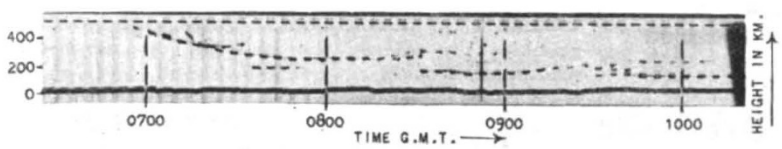

FIG. 1.

as to receive left- and right-handed circularly polarised waves alternately; a black line at the upper edge of the record corresponds to the reception of right-handed polarisation. At 0655 G.M.T., reflection of the right-handed component at the *F* region begins, at 0712 G.M.T. the left-handed component appears, at 0735 G.M.T. the right-handed component 'jumps' to the intermediate region at a height of 175 km. and at 0750 G.M.T. it disappears due to absorption. At 0835 G.M.T. the left-handed component 'jumps' to the intermediate region and a double reflection from the intermediate region is recorded. At 0930 G.M.T. a discontinuous 'jump' from the intermediate to the *E* region is seen, and for a few minutes reflections from the two regions occur simultaneously. A little later double reflections from the *E* region appear.

The sudden jumps from *F* to the intermediate region, and from the intermediate to the *E* region, indicate clearly that the three regions are distinct, while the fact that the jump from the *F* to the intermediate region takes place at different times for the right- and the left-handed components shows that the intermediate region is mainly composed of electrons.

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June 7.

[1] Ratcliffe and White, *Proc. Phys. Soc.*, **45**, 399; 1933.
[2] Appleton and Ratcliffe, NATURE, **130**, 472, Sept. 24, 1932.

The Hydroxyl Group and Soap Film Structure

IN view of the well-known 'stabilising' effect of glycerin on soap solutions, it is not surprising to find that the elastic recoil of aqueous ammonium oleate—demonstrated by Hatschek at a Royal Institution discourse in 1927[1]—is destroyed by a small addition of glycerin: the resulting solution having no obvious anomalous viscosity. (Hatschek supported a hollow glass cylinder on vertical pivots in a quarter per cent solution of ammonium oleate: when this cylinder was spun by the finger and thumb, it rotated for a few seconds, but then, after stopping, slowly returned in the opposite direction, as if by a coiled-up spring.)

Besides glycerin, many other alcohols, however, have an even more striking effect on aqueous ammonium oleate, sufficiently interesting to place on record. The mucilage-like consistency of 9 per cent ammonium oleate is changed by small additions of glycol, propylene alcohol, cyclohexanol, and ordinary ethyl alcohol, among other substances, first to a thick but perfectly clear gel, transforming in a short time, or on further small addition of the alcohol, to a limpid, free-flowing, normal, clear liquid. The actual amounts that produced this result, when added to 20 c.c. of 9 per cent aqueous ammonium oleate, were 4·5 c.c. glycerin, 2·8 c.c. glycol, 1·1 c.c. propylene alcohol, 0·5 c.c. cyclohexanol, and 1·2 c.c. ethyl alcohol. The resulting solutions, especially when diluted, give lasting thin films which have in most cases the interesting property of thinning to the 'black' state through several grades, so that ordinary photographs of three or four well-defined black grades can often be obtained present at the same time, though aggregating at different rates.

This reaction would also suggest that soap molecule aggregates are formed by means of hydroxyl groups rather than as ordinary hydrates; and seems to indicate a mechanism by which sheets of such molecules are rooted in a water surface, or linked in a stable soap film. In any event, the addition of alcohols as described here has evidently resolved some of the complications of the colloidal structure of the aqueous oleate.

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May 18.

[1] *Proc. Roy. Inst.*, **25**, 245; 1926-28.

Interaction between Soot Films and Oil

THE effect described by Mr. J. H. Coste in NATURE of May 13, p. 691, is a manipulation variation of the interaction reported by me in NATURE of March 12, 1932, p. 401, as a new observation.

The drop *falling* on the film, the result is a record of impact rather than the effect of an undisturbed interaction. The drop being carefully *posed*, the central dark zone, varying from 0·25 cm. to 0·5 cm. in diameter, is a beautiful self-contained ring system, of so small diametrical variation that microscopic examination is necessary. A minute clear-dot puncture circle—probably through faulty posing—sometimes occurs, like a planet on the zone centre with perhaps a dozen surrounding satellites. This puncture circle increases with increased distance of fall, and at 3 mm. is quite large, whilst at 3 cm.