(2) By D. F. MARTYN and A. L. GREEN, Australian Commonwealth Radio Research Board, University of Sydney.

WE have just received NATURE of June 3 and 17, containing letters by Messrs. Schafer and Goodall, and Appleton, Ratcliffe and White on the fine-structure of the ionosphere as observed in the United States and Great Britain. A series of experiments made in Australia in September and October 1932 have led us to similar conclusions regarding the existence of a layer of ionisation between the well-known E and F layers.

The observations consisted of a series of measurements of the equivalent height of the reflecting regions, using the frequency change method due to Appleton and Barnett[1]. They were made at five or ten minute intervals, usually from midnight until 7 a.m. (Eastern Australian Time) and covered a period of a month, with some gaps due to interference from atmospherics. The mean frequency employed was 1·43 megacycles per second (210 m.).

A typical graph showing the variation of equivalent height with time is shown in Fig. 1. It will be observed that at 0520 E.A.T. shortly before sunrise, the equivalent height of the F layer increased rapidly, and almost immediately afterwards decreased sharply to a value of 177 km. Thereafter the height fell more slowly until 0550 E.A.T., when a second rapid increase was followed by a jump down to the normal E layer.

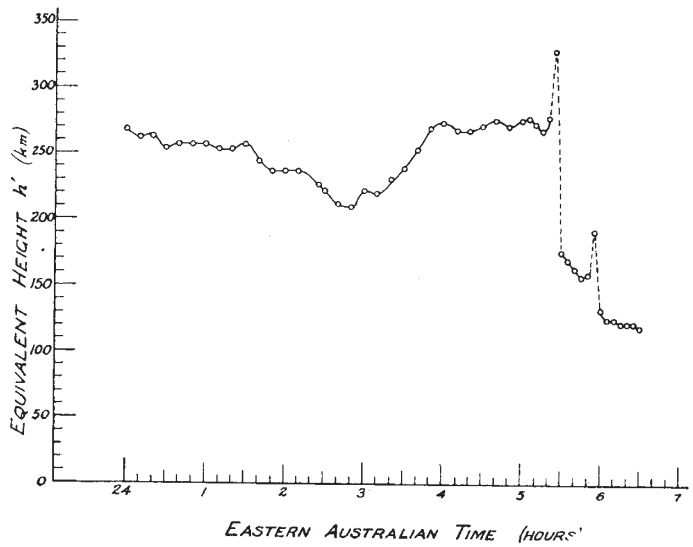

FIG. 1. (h',t) Curve for frequency of 1·415 megacycles sec. Oct. 6, 1932.

Although no measurements of the polarisation of the downcoming waves could be made during the observations described, we consider it to be most improbable that the appearance of the intermediate height could be ascribed to double refraction in either the E or F layers. For the frequencies employed, separation of the ordinary and extraordinary rays should be small, while the nature of the height discontinuities before and after the appearance of the intermediate region is strongly suggestive of those critical ionisation conditions, accompanied by the appearance of abnormally great heights, which are frequently manifested during jumps between the E and F layers[2].

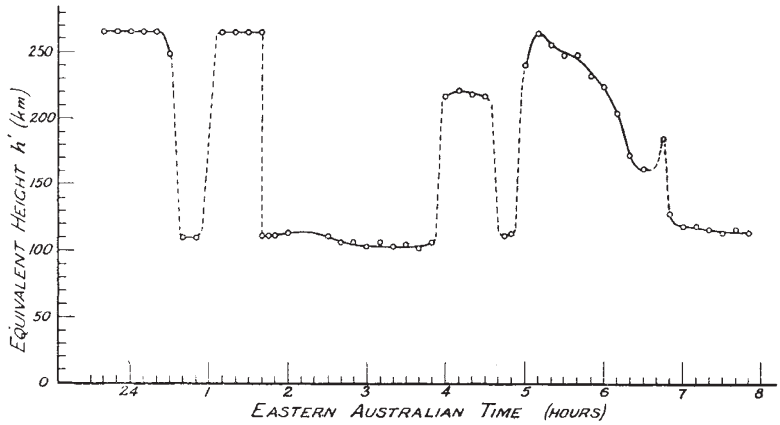

FIG. 2. (h',t) Curve for frequency of 1·45 megacycles/sec. Sept. 6, 1932.

While we have found that it is normal for the transition from the F layer to the intermediate layer to occur abruptly, on at least one occasion we have observed this change to take place quite gradually, unaccompanied by those marked changes in the amplitude of the sky wave which are a well-marked feature of the normal and apparently discontinuous height changes. The temporal height variations for this morning are shown in Fig. 2. It will be noticed that after falling gradually from an equivalent height of 265 km. to 162 km. over a period of 1·3 hours, a discontinuity eventually occurs at the transition between the intermediate and E layers. The abnormal height occurring at 0645 E.A.T. was marked by an abnormally small amplitude of sky wave, and is therefore to be classed as a typical layer jump. The fact that a gradual and smooth transition can take place between the F region and the intermediate region under the solar ionising influence suggests that there is a close affinity between the ionised components in these two regions and militates somewhat against Appleton's tentative suggestion that the components of the ionosphere may be associated with the ionisation potentials of atomic and molecular oxygen and nitrogen.

[1] *Proc. Roy. Soc.*, A, **109**, 621; 1925.
[2] Schafer and Goodall, *Proc. Inst. Rad. Eng.*, **19**, 1434; 1931.

(3) By W. BRUCE ROSS and JOHN T. HENDERSON, Macdonald Physics Laboratory, McGill University, Montreal.

FROM January until July of the present year, a series of radio observations on the ionosphere has been undertaken at McGill University in connexion with the International Polar Year. The normal height of the E layer is rarely found to be below 100 km., regular measurements on 2·0 and 4·0 megahertz giving a modal value of 120 km. The modal value for F on the same frequencies is 260 km.