By Dr. W. H. ECCLES, F.R.S.

Preceding speakers having marshalled the available evidence for the Heaviside layer, it may be most useful for me, while agreeing broadly with the conclusions drawn from that evidence, to refer to some other points of view and other agencies. For example, in connexion with wireless phenomena at short distances from the transmitting station, the diminution of the density of the air with increase of height, which causes the lower atmosphere to act as a prism with its base on the ground, taken together with diffraction, must be remembered. Consider a source from which electric waves of length 20 metres, 600 metres, and 20,000 metres are being simultaneously emitted, and consider especially the rays emitted horizontally. Up to distances of 100 kilometres, all these waves can be detected by an ordinary aerial—beyond that distance the 20-metre waves vanish but the others remain perceptible. This, I suggest, indicates diffraction of the longer waves, as is supported by the fact that an aerial on a high mast or hill can detect short waves passing overhead like the beam of a searchlight. I want to suggest also that variations of signal strength at these short distances may be due to variations in or movements of the lower atmosphere. (The well-known vertical oscillations of pilot balloons at a height of 10 kilometres suggest movements of the air.)

Beyond 100 kilometres, in daylight, the 20-metre signals are completely lost, the others are continuously perceptible. It has been found (*e.g.* by Hollingworth) that after falling off with distance, the long wave signals increase up to a distance of 400 kilometres. Here it seems that the ionised atmosphere is aiding diffraction and the prismatic action. At 700 kilometres the lost 20-metre signals reappear, though the tangent plane through the source passes 100 kilometres above. This suggests that the horizontal rays from the source have followed a trajectory perhaps only 30 kilometres in height at its apex and now graze the ground again. Rays starting with an upward angle from the source would, on this view, descend to earth at greater distances and perhaps at grazing incidence. These possibilities have caused me to remain unconvinced by Prof. Appleton's use of the 'skip' of short waves to deduce the maximum electron density at a sharply defined Heaviside surface nearly 100 kilometres high. This possible explanation by the aid of non-intersecting and gradually bending trajectories of varying height demands considerable thickness in the Heaviside layer. It is perhaps in disaccord with Sir Joseph Larmor's recent review of an old theory; for he appears to deny the possibility of bending in the lower atmosphere and also supports the 'whispering gallery' view, which assumes the formation of a thin caustic layer of radiation in the sky.

The preceding remarks refer to daytime propagation. At night the 20-metre waves make a larger skip, say 4000 miles, and are picked up at all distances beyond; the 600-metre waves are picked up at all distances to 5000 miles, and the 20,000-metre waves go everywhere. Measurements are available on the medium wavelengths and show that in the great fluctuations of strength beyond 2000 miles, the maximum may exceed the strength calculated for a perfectly conducting flat earth with a non-absorbing atmosphere. This seems one of the best proofs of the existence of the Heaviside layer, for otherwise we must believe that the earth is flat.

The Glaciers of Savoy.

AN important and unusually interesting report, of more than two hundred pages, on the glaciers of Savoy, especially those of the Mont Blanc "massif," the Tarantaise Alps, and those of Haut Maurienne, has been recently issued by the Ministère de l'Agriculture, Département (Direction Générale) des Eaux et Forêts. It is entitled "Études glaciologiques," and represents most valuable results, from the beginning of the century down to the year 1920, obtained by a special "Commission glaciaire de Savoie," composed of high officers of the Département des Eaux et Forêts, aided by specially appointed geologists, geodesy experts, M. Tairraz, the well-known Alpine photographer of Chamonix, and the late M. Joseph Vallot of the Mont Blanc observatory. In spite of the unavoidable reduction of the staff during the War, several members indeed being among the fatal casualties, the work was continued throughout the terrible four years 1914–1918.

The results achieved consist in annual, and in some important cases monthly, measurements of the lengths of the glaciers, determinations of their relative movements at the sides, snouts, upper surfaces, beds, and various parts of their width, estimations of their depths, total volumes, amounts of water they discharge at their lower ends, their gain by snowfalls, and their loss by solar fusion. In addition, a careful record has been compiled of all catastrophic occurrences, such as exceptional avalanches, bursts of lakes and water pockets, earth-quakes and -tremors which have resulted in avalanches or alterations of beds and configurations; and to render this portion of the report still more interesting, historical data have been added concerning all known happenings of this character since the year 1800.

During the last ten years (1910–1920) of the period dealt with, the glaciers on the Savoy side of the chain of Mont Blanc have in general been advancing. For example, the Glacier du Tour reached its minimum length and showed a tendency to grow in 1909, and although there was a slight set-back in 1910 due to special solar activity, in 1911 a distinct move forwards was made, and has continued without interruption up to the end of the report period, 1920. The progressive movement was only communicated to the Argentière glacier four years later, in 1913, as regards maximum length, but even from 1911 there was a growth of several metres a year on the right flank of the snout, until the total length became at last affected in 1913, and the elongation became more and more marked until in 1920 the glacier end moved forwards 40 metres.

The Mer de Glace was difficult to investigate, as its end had been hidden, by its retrogression, in an inaccessible ravine. But from such observations as could be got of the snout, and especially from those on the glacier proper above the Montanvert, it is clear