Letters to the Editor

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NOTES ON POINTS IN SOME OF THIS WEEK'S LETTERS APPEAR ON P. 753.

CORRESPONDENTS ARE INVITED TO ATTACH SIMILAR SUMMARIES TO THEIR COMMUNICATIONS.

Recent Solar Eruptions, Auroras, and Magnetic Storms

IN connexion with the aurora of January 25–26, 1938, discussed in detail in NATURE of February 5, p. 232, it may be of interest to report that a brilliant and prolonged solar eruption and an unusually severe radio fade-out were observed at the Commonwealth Solar Observatory, Canberra, on January 24.

Owing to cloudy weather, the first spectrohelioscope observation of the day was not made until 1512 Eastern Australian Standard Time (0512 G.M.T.; all times which follow are G.M.T.). An exceptionally large eruption was then seen to be in progress around the large spot group at 22° N., 80° W.; from then until 0700, when the intensities were still high, observations were made through breaks in the clouds. No abrupt changes in intensity corresponding to the maxima observed in the aurora were noted, although curved prominences, similar to Pettit's Sunspot Type[1] (Class 3*b*), developed between 0519 and 0540.

One of the severest short-wave radio fade-outs ever recorded with the Observatory automatic *P'f* equipment began at 0250. The ionospheric echoes during the morning were fairly normal, but disappeared suddenly at 0250, and no further echoes were recorded until 0645 when weak reflections from the F_2 region were observed. A further fade-out of signals occurred at 0700, followed by a rapid increase to normality by 0745. From previous experience of the correspondence between bright hydrogen eruptions and radio fade-outs it appears almost certain that the large eruption first seen with the spectrohelioscope at 0512 actually began a few minutes before 0250 G.M.T.

During a period of more than eighteen months of observations with the spectrohelioscope, we have found that, whereas a severe eruption is frequently followed by a number of small eruptions around the same spot group, on no occasion has it been followed within a few hours by another large eruption. Hence it appears likely that the remarkable aurora of January 25 was connected with the unusually prolonged period of intense solar activity commencing about 0250 described above, rather than with a later eruption occurring after sunset here.

The interval between the beginning of the earlier eruption and the reported time of commencement of the auroral display was 39 hours (or 35 hours if the very much smaller and later eruption at 0700, indicated by the radio observations, be taken as the time of the eruption responsible). The magnetic storm which accompanied the auroral display was reported[2] as commencing at 1151 G.M.T. on January 25. The interval between the beginning of the eruption and the outbreak of the magnetic storm was thus 33 hours, although the storm did not become intense until 1730, corresponding to an interval of 38½ hours. These times are considerably greater than the average (about 26 hours) given by Hale[3] for the interval between solar eruptions and corresponding magnetic storms and auroras. It would thus appear that the velocity of projection of particles at small angles to the sun's surface is considerably less than that along the normal.

The magnetic storm recorded at Abinger[4] at 22½ hr. on January 16 can be satisfactorily related to solar activity occurring earlier on that date. No spectrohelioscope observations were possible at Canberra on that day; but a severe fade-out, commencing at 0040 G.M.T. and lasting several hours, indicated without doubt the occurrence of a major eruption, probably connected with the same spot group then 30° E. of the central meridian, commencing at that time. The time interval in this case is 22 hours. This group, then 34° W. of the central meridian, was also very active on January 20–21. From the first spectrohelioscope observation at 2314 on January 20, until 0125 on January 21 there was considerable activity. At 0202 an eruption of importance 2 on the I.A.U. scale was in progress, the intensity gradually decreasing until conditions approached the normal at 0240 G.M.T.

The radio observations showed abnormally poor reflection conditions from 1950 January 20, culminating in a fade-out at 0150 January 21. A further fade-out of short duration occurred at about 0715 G.M.T.

An aurora was observed just after dusk at Canberra, at 1030 on January 22, although it probably began some considerable time before it was first noticed. An intense magnetic storm began at approximately 0500[4] on the same day. Although the connexion here is not quite so definite, it seems probable that the corresponding time lags, taking the radio fade-out times as indicating the commencement of the eruptive activity, were either 32½ or 27 hours for the aurora (though this time may be too great by a few hours) and 27 or 21½ hours for the magnetic storm.

A. J. HIGGS.
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[1] *Astrophys. J.*, **84**, 332 (1936).
[2] *C.R.*, **203**, 357 (1938).
[3] *Astrophys. J.*, **73**, 402 (1931).
[4] NATURE, **141**, 192 (1938).