LETTERS TO THE EDITOR

Prompt publication of brief reports of important discoveries in physics may be secured by addressing them to this department. Closing dates for this department are, for the first issue of the month, the eighteenth of the preceding month, for the second issue, the third of the month. Because of the late closing dates for the section no proof can be shown to authors. The Board of Editors does not hold itself responsible for the opinions expressed by the correspondents.

Communications should not in general exceed 600 words in length.

Concerning the Probable Magnitude of the Next Sunspot Maximum

Although the sharp increase in sunspot numbers during the past four months suggests the approach of a high peak in the 11-year cycle of activity, there is some evidence which seems to indicate that the average degree of activity at the coming maximum may not greatly exceed the moderate values of the previous five cycles. This evidence, described below, is based on a correlation appearing in the sunspot data for the past two centuries. These data cover a relatively short range of experience, and the evidence, therefore, is far from conclusive. It appears to hold some promise as an indicator, however, and experience during the coming peak should provide an interesting test of its significance.

In Fig. 1 each sunspot maximum since 1761 has been plotted against the preceding minimum, using three-year averages of the Wolf-Wolfer sunspot numbers to determine the maxima and minima. The results show some evidence of a correlation between the activity at a minimum of the 11-year cycle and the magnitude of the following peak. The average sunspot number for the 1932–1934 minimum was 8.5; hence, it appears from Fig. 1 that the three-year average for the approaching maximum may possibly fall somewhere between 60 and 90.

Three-year averages of the sunspot numbers were used in Fig. 1 rather than single annual values because they give a better indication of the average degree of activity at the maximum and minimum epochs. The computed correlation coefficient for the data of Fig. 1 is +0.84. This is reduced to +0.65 when average sunspot numbers for single years of highest and lowest activity are compared.

In Fig. 2 each sunspot maximum, determined by a three-year average, is plotted against the minimum immediately following it. A correlation much poorer than that of Fig. 1 is clearly indicated. For this case the computed correlation coefficient is +0.37. While the magnitudes of these coefficients cannot be given much weight in view of the small number of data represented, the wide difference in the relationships of Figs. 1 and 2 does appear to be significant. The evidence in these two figures suggests that the magnitude of each sunspot peak is controlled to a considerable extent by activity originating at the preceding minimum,

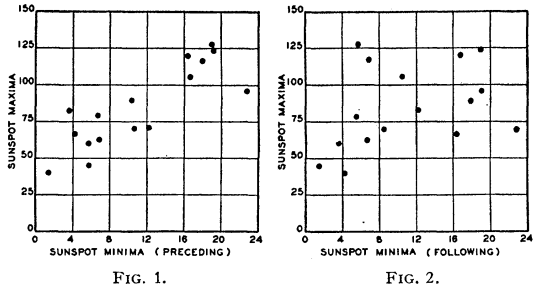

FIG. 1.

FIG. 2.

Fig. 1. Relation between sunspot maxima and preceding minima. (3-year averages.) Fig. 2. Relation between sunspot maxima and following minima. (3-year averages.)

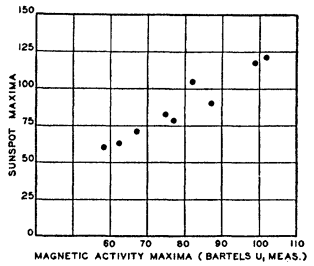

Fig. 3. Relation between sunspot maxima and corresponding terrestrial magnetic activity maxima. (3-year averages.)

and that this new activity is not closely related to the activity of the previous cycle. The abrupt change of the sunspots from low solar latitudes to high latitudes at each minimum of the cycle is a further indication that a new phase of solar activity may originate at each minimum.

It has been observed that years of highest sunspot numbers are not always years of greatest terrestrial magnetic activity, although both phenomena follow an approximate 11-year cycle of variation. Magnetic acitivity is of particular interest in connection with short wave radio communication because the more intense magnetic disturbances are almost invariably accompanied by disturbances to long-distance radio transmission. Data upon which to base forecasts regarding the magnetic activity maxima are even more limited than for the sunspot maxima. A series of dependable data extending back to 1835, based on day-to-day variations in the mean horizontal intensity of the earth's magnetic field, is given in a paper by J. Bartels.[1] Three-year averages taken at the peaks in this series were compared with the corresponding (although not always coincident) sunspot peaks, with the results shown in Fig. 3. On the strength of this rather meager evidence it appears that if a moderately high three-year peak of sunspot activity does occur in the present cycle, it should be accompanied by an equally moderate peak of magnetic activity.

A. L. DURKEE

Bell Telephone Laboratories, Inc.,
New York, N. Y.,
March 8, 1937.

[1] J. Bartels, Terr. Mag. **37**, 1-52 (1932).