

The Recurrence of Magnetic Storms.

A FEW remarks seem expedient on Dr. Deslandres' letter in NATURE of October 30. Various recurrence phenomena, including pulsations with periods of a few seconds or minutes, have attracted the attention of magneticians, but my original letter referred only to the recurrence of magnetic storms, that is, large disturbances of considerable duration experienced simultaneously all over the earth. The various members of a recurring series of storms do not seem to bear any special family resemblance to one another. The methods I have employed have demonstrated recurrence after intervals of 27 days or multiples thereof, but not in shorter intervals. I am uncertain whether Dr. Deslandres agrees that these large prolonged disturbances show only the 27-day interval T , or whether he believes that they also tend to recur to a lesser extent in intervals $iT/6$, where i is integral, and that the failure to show these shorter intervals is the fault either of my data or of my methods. He refers to doubts entertained respecting the international character figures. So far as I am aware, the only criticism passed on these is that any particular character figure, for example, 1.5, is not an absolute measure of disturbance, but may signify different amounts of disturbance in quiet and disturbed years. This criticism is one I have made myself, but the defect does not prejudice the use of the figures for discriminating between disturbance on consecutive days, the only purpose for which the figures have been used in the present connexion.

Dr. Deslandres also seems to suggest that the use of mean data from a number of years may obscure real recurrence intervals prominent in individual years. If, however, mean data from a number of years reduce to insignificance a period prominent in one or two years, it implies a remarkable deficiency of recurrences with this period in the other years, a phenomenon difficult to explain unless the prominence during the one or two years was a matter of pure chance.

As a matter of fact, the results which I gave from the international character figures did not represent an 11-year period, as Dr. Deslandres seems to suppose. Two separate periods, one of six years, 1906 to 1911, and one of five years, 1920 to 1924, were dealt with separately, and neither showed the intervals $iT/6$. The 11-year period 1890 to 1900 which I dealt with preceded the existence of international figures. The results for it were based on Kew data alone, the criterion of disturbance being the absolute daily range of the horizontal force. No trace of a period a submultiple of T appeared in that case either.

As regards the suggestions which Dr. Deslandres has made for the better utilisation of the international character figures, the employment of 14 instead of 5 selected days a month has two rather obvious drawbacks. It entails nearly three times as much arithmetic, and it largely waters down the amplitude of the primary pulse. There is admittedly no special virtue in the number 5; it merely happens to be the number of quiet or disturbed days internationally selected for each month. But long experience has shown that in disturbed months it is difficult to secure more than 5 reasonably quiet days, while in quiet months it is sometimes difficult to get so many as 5 reasonably disturbed days. The suggestion to consider individual cases individually embodies the procedure which I originally followed after Mr. Maunder's investigations directed my attention to the subject. When following this procedure I did not succeed in arriving at any conclusions from which I felt assured that the influence of personal bias had

been excluded. For ascertaining definitely the cause of the phenomenon the consideration of individual cases may be essential. It has of course special attractions for astronomers like Dr. Deslandres or the late Rev. A. L. Cortie, S.J., who have corresponding solar data immediately available.

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THE letter on the above subject by Dr. Deslandres in NATURE of October 30, contains a reference to some preliminary investigations made by me some fourteen years ago.

From Dr. Deslandres' remarks I gather that he regrets that I should have confined myself in these investigations to 10 spots, and I wish to correct this impression, inasmuch as I have subjected all spots which appeared during the years 1912-14, that is, three years, to the identical examination, but the space available permitted only of the publication of one specimen table. The result in all the many other tabulations was the same, but when the material I worked upon gave out, I certainly came to a standstill. However, by an odd coincidence, on the very day I read Dr. Deslandres' communication, I received a letter from Stonyhurst offering to provide me with all the required data on similar lines as those the *Observatory* used to provide so very suitably. Therefore I intend to take the matter up again, and desire at this juncture already to express my thanks to both Dr. Deslandres and the Stonyhurst Observatory officials for their kind encouragement.

I wish to add that I am equally delighted to read that Dr. Deslandres has also found the presence of the D_3 helium-line over merely faculic areas, an observational fact of many years' standing with me, and to which I have often referred in lectures and papers.

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Post-Cretaceous Igneous Activity in Western India.

THE discovery of nepheline-syenite and monchiquite in Girnar, Kathiawar, announced by Dr. J. W. Evans in 1901 has, after a lapse of a quarter of a century, been followed by detailed petrographical and field investigations published in recent issues of the *Records of the Geological Survey of India* and the *Journal of Geology* respectively. The central mountain forms a dome of plutonic rocks intruded into the overlying Trap. Further investigations in Gujrat and Kathiawar have revealed a fascinating chapter in the history of post-Cretaceous igneous activity in India which is not dissimilar from the Tertiary igneous activity of Scotland. They acquire a special interest in view of the recent theory of magmatic cycles and its application by Dr. G. W. Tyrrell to the British Isles.

The plateau basalt which was presumably erupted from long fissures is, as a rule, free from evidence of explosive activity and the mode of its extravasation needs no description. This was followed in India by laccolithic intrusions, of which the Girnar and Barda hills are better known than others. A large circular dyke, corresponding to the ring-dykes of the Scottish intrusions, occurs round the central intrusion of Girnar (*Journal of Geology*, Vol. 34, No. 4). The long dykes which follow an approximately elliptical course east of Girnar and are so conspicuous in the Gir Range and near Gondal are, likewise, to be explained as