Letters to the Editor.

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Earth Currents and Terrestrial Magnetism.

THE study of a monograph on earth currents by Dr. D. Stenquist,[1] telegraph engineer, published in 1925 in Stockholm, suggests that telegraphists have it in their power to add much to our knowledge. The early observations by W. H. Barlow and C. V. Walker showed that an intimate connexion exists in England between magnetic storms and disturbances in telegraph lines, and similar observations elsewhere showed this to be a general phenomenon. So much is this the case that the authorities of the Ebro Observatory, Tortosa, accept as their quiet days for the study of the regular diurnal variation of earth currents the international magnetic quiet days selected at De Bilt, provided their records for these days are complete. Further, Messrs. W. J. Peters and C. C. Ennis, of the Carnegie Institution of Washington, have shown that the Ebro earth current data exhibit in a similar way to magnetic data, and to a similar degree, what is known as the 27-day interval, representing, it is believed, the rotation period of the sun's equatorial surface.

Dr. Stenquist gives a variety of statistical data having an intimate bearing on the subject. In particular, attention may be directed to his Table I., p. 26 *l.c.*, giving a total of 53 dates between Nov. 1, 1906, and Oct. 31, 1909, on which a current of at least 15 milliamperes was observed in the central telegraph station at Stockholm. According to Stenquist, this is the smallest current causing serious telegraphic disturbance. As is now pretty generally known, yearly lists are issued from De Bilt giving for each day a magnetic character varying from 0·0 (very quiet) to 2·0 (very highly disturbed). These figures are based on returns from some 30 to 40 magnetic observatories in different parts of the earth. An analysis of these international character figures for the 36 months covered by Stenquist's table led to the following results :

A	2·0	1·9	1·8	1·7	1·6	1·5	1·4	1·3	1·2	1·1	1·0	<1·0
B	6	4	13	10	14	8	27	25	32	61	71	825
C	6	4	10	6	4	2	5	4	2	3	5	2

A is the international character figure ; *B* the total number of days having each specified character within the 3 years ; *C* the number of these days included in Stenquist's table. The two days on his list with characters less than 1·0 were Oct. 11, 1907, with 0·6, and Oct. 20, 1909, with 0·8. A high value of an earth current may persist for only a short time, while the magnetic character represents the day as a whole. A short portion of a day of character 1·0 *might* be more disturbed than any portion of another day of character 1·5. Thus it was not to be expected that all the days on Stenquist's list would have very high character figures.

What, however, is really significant is that the 23 days of the three years which had magnetic characters of 1·8 or more supplied 20 of the 53 days on Stenquist's list, while the 504 days with characters of 0·5 or less supplied none. It is obvious that if data such as Stenquist's were available for different parts of the world, especially if the directions of the lines in which the high currents prevailed were known, much might be learned as to the prevalence of outstanding earth currents in different regions. A day of high magnetic character is certain to have been highly disturbed magnetically all over the world. But in general the amplitude of disturbance is larger and rapid oscillatory changes are more in evidence in high than in low latitudes. Further, in high latitudes large disturbance is usually in evidence at the same time in all the magnetic elements, whereas in low latitudes disturbance is often mainly confined to the horizontal force. It is obviously important to know from actual observation what the corresponding facts are as regards earth currents.

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[1] "Etude des courants telluriques." Mémoires publiés par la direction générale des télégraphes de Suède.

Light and Sight.

IN the article, "Light and Sight," which appeared in NATURE of Jan. 21, Sir John Parsons accepts as evidence "that the human eye has become specially adapted to sunlight," "the fact that the brightest part of the spectrum, as seen by the light-adapted eye, coincides more or less accurately with the summit of the curve of radiant energy." The implication that the eye has developed in the direction of maximum efficiency as a converter of energy justifies careful examination of the suggestion.

The coincidence in question involves at least three quantities—the sensitiveness of the eye, the amount of solar radiation reaching the earth's surface, and a quantity which serves to define the quality of the radiation. In "the curve of radiant energy" to which Sir John Parsons alludes, the third quantity, the abscissa of a point on the curve, is presumably the wave-length of the light. It is not irrelevant to consider whether the coincidence would be maintained if some other variable were substituted for the wave-length, and, if it should not be maintained, whether special significance can properly be attached to the coincidence observed when this particular variable is adopted.

Physicists will probably have little hesitation in saying that if, in such a connexion, one variable is of greater significance than another, that variable is not the wave-length of the light, but its frequency. The widespread use of wave-lengths is attributable to the convenience, in the experimental analysis of light, of employing apparatus which can be effectively calibrated by measurements of length alone, rather than to any theoretical advantages consequent on this usage. If now we substitute frequency for wave-length, the brightest part of the spectrum on the new basis will suffer a small change, but the highest point of the new energy curve (at least if we may regard the sun as a 'black' body) will lie well outside the limits of the visible spectrum. To me this fact appears conclusive evidence that the utilisation of the greatest possible amount of energy is not the factor which has led the human eye to utilise the particular spectral region to which we find it sensitive, and that the coincidence referred to is fortuitous.

An alternative suggestion may be offered. Many readers of NATURE will recall Prof. R. W. Wood's remarkable landscape photographs taken, some with infra-red light only, and others with ultra-violet light only. The former are notable for the strength of the reflections from directly illuminated surfaces and the blackness of the shadows ; the latter for want of contrast amounting almost to general fog. These effects are due to properties inherent in the