

MAGNÉTISME ET ÉLECTRICITÉ TERRESTRES (TERRESTRIAL MAGNETISM AND ELECTRICITY)

by
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Part I.

Terrestrial Magnetism.

62 pp. - Publication N° 287 of the *Actualités Scientifiques et Industrielles*
HERMANN et C^{ie}, Publishers, Paris, 1935.

This volume presents a very concise and well-documented study of the causes of terrestrial magnetism. The new concepts, particularly the theories of the electrified ions, present the explanations regarding terrestrial magnetism and atmospheric electricity in a manner which approaches more closely to the reality of these phenomena. With the aid of 75 observatories where regular magnetic observations are carried out over the entire globe, the advancement in our knowledge of the distribution of the magnetic field, and its analysis by the Gauss method, have greatly enhanced our comprehension of the subject. The studies of the anomalies show a definite relation between the composition of the subsoil and the geology.

This work reviews successively the general concepts relating to the terrestrial magnetic field, its periodic modifications, its accidental perturbations and their relation to solar phenomena, the polar aurora and the telluric currents. The two final chapters treat of the theories relative to the perturbations and the polar aurora, as well as the research directed towards the determination of the origin of the terrestrial magnetic field — a problem of prime importance which has not yet been solved. The analysis of the magnetic field indicates that it is due for the greater part to actions arising from the interior of the globe, but it is hardly probable that the internal portions of the globe, where very high pressures and temperatures exist, should be highly magnetised.

For the rest, it is subjected to a general magnetisation of the layers closest to the surface, which go to produce the greater part of the terrestrial magnetic field. The present tendency is to consider these actions as coming from the interior of the globe, as products of the internal currents due to the influence of the rotating motion of the earth, although the axis of the magnetic field does not coincide exactly with the earth's rotational axis and makes an angle with it of 11 to 12°. This lack of symmetry may result from an unsymmetrical distribution of temperature within the globe. In establishing an analogy between the magnetic field of the sun and that of the earth, — which turns in the same direction, and which has a similarly distributed magnetic field, — we may discern in the movement of the sun spots an indication of a circulation of a type suitable to the interpretation of the secular variations. However, the electric conductivity of the interior of the globe and its distribution are not well enough known at the present time to permit us to evaluate with any degree of accuracy the effects of induction produced by these internal movements, but it appears to be rather an enticing concept to follow and one which may possibly bring an important contribution to the research into the origin of the terrestrial magnetic field, which still remains a mystery.

FOG-PIERCING LIGHTS.

(Extract from an article of *The Pennsylvania Engineer*, Vol. I, N° 2,
published in the *Journal of the Franklin Institute*, Philadelphia, April 1936, page 577)

GJON MILI of the Westinghouse Lamp Co. before a joint meeting of the American Physical and Optical Society of America stated that for years research engineers have unsuccessfully sought a new source of color for light that would penetrate fog at a distance safe for aerial and marine navigation. Only recently, however, have engineers

thought to increase the brightness of marine signal lamps by operating the lamps over-voltage and utilizing reflectors and lenses to intensify the candle power of lightbeams. In a day-time fog of medium density, or one in which an object may be seen at approximately 400 ft., marine signals with a 50 candlepower lamp have a visibility range of about 800 ft. In a properly designed reflector or lens the same lamp burned over-voltage could produce as high as 500,000 candlepower. It would be visible three times farther than the 50 candlepower source. Over-voltage operation of an incandescent lamp is the application of a higher voltage than necessary to produce ample light over the usual average life of 1000 hours. The reduction in lamp life through over-voltage operation of signal lamps during a fog could be offset by burning them under-voltage during clear weather. At night the contrast of darkness would double the range of visibility. With possible visibility of about one mile at night in medium fogs, fewer liners and river craft would have to stand by because of night time fogs. The method of stepping up voltage need not be confined to fixed signals such as those operated from utility power lines. Some means might be worked out to equip light buoys, that operate from batteries, with devices to step up voltage in extremely thick weather.

HOW LONG HAS MAGNETIC VARIATION REALLY BEEN KNOWN ? (*)

(Extract from an article by HEINRICH WINTER in the *Annalen d. Hydr. u. Marit. Meteor.* Berlin 1935, Part IX, p. 352).

The author has searched in the published work of Petrus PEREGRINUS for original references to magnetic variation, and his investigations are set forth in detail in the article published in the *Annalen d. Hydr. u. Marit. Meteor.* to which the reader is referred. Below is given simply a brief summary of the article with the principal bibliographical notes.

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It was long a current belief that magnetic variation had been discovered by Christopher COLUMBUS on his first voyage. In reality, there is no authority for such a conclusion in the slight mention made of the subject in his log-book, for the phenomenon could not well become so suddenly apparent and afterwards disappear with equal rapidity; only on subsequent voyages does it become evident that he has taken magnetic variation into consideration.

In 1897 G. HELLMANN (1) proved that magnetic variation had already been observed on land (at Rome) in 1510 — a fact which was confirmed in 1904 by WOLKENHAUER (2), who reports that a portable gnomon, called a solar compass, indicated the line of magnetic variation as early as the year 1451.

More recently Hugo LANGE (3) proved that in 1380 the English poet CHAUCER, equally versed in astronomy, indicated the bearing of Venus by magnetic compass to be NNW instead of NW. In this connection the Potsdam Magnetic Observatory has stated that in that year the magnetic variation for London should, in fact, have been 22° W. i. e. exactly the difference between NW and NNW.

But even this, however, is not the earliest date relating to a knowledge of magnetic variation, it was, in fact, first given as the year 1269, by THEVENET (4) in 1681; but

(*) *The manuscript reached the editing department of the Annalen on 28th July 1934, the "Addendum" on 16th August 1935. Gerhard Castens.*

(1) *Hellmann*: Anfänge der magnetischen Beobachtungen, *Ztschr. f. Edvk.* XXXII, 115.

(2) *Wolkenhauer*: Beitr. z. Gesch. der Kartographie und Nautik, *Mitt. der Geogr. Ges., München*, I, 252.

(3) *Ztschr. Anglia*, Aug. 1934.

(4) For further details see *Hellmann, Neudrucke etc.* (See above).