

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).*

THEVENET had considered as original an addition made by hand at a later date on the Leyden manuscript of the *Epistola de magnete* of Petrus PEREGRINUS of Maricourt (1269). This error was corrected in 1868 by BERTELLI (see below). PEREGRINUS does, however, mention magnetic variation, but in another place, and not explicitly but in an obscure way, i. e. without really recognising it himself.

Only copies of PEREGRINUS' essay have reached us, the two earliest of these being, it appears, preserved in the Vatican Library (Nos 1072 and 4082) although neither of them, according to SCHLUND (see below) can be considered to "conform to the original". More than thirty of those copies exist and, as is usual, they show a great many slight differences; systematic comparison between all the copies would even probably reveal that the contemporary addition to the Leyden manuscript is not the only arbitrary change made by a copyist.

No German translation of the document is as yet to be had, but there exist two English translations. From a bibliographical point of view, the following memoirs and publications should be noted :—

- GASSER, Achilles *Petri Peregrini Maricourtensis de Magnete Libellus* : Augsburg 1558. With long but rather unnecessary explanations. The whole in Latin.
- LIBRI..... *History of the Sciences in Italy*. Paris 1838. Latin text. Inexact because of numerous omissions. Annexed explanations.
- BERTELLI *Sopra Pietro Peregrino e la sua epistola di Magnete*. Bolletino di bibliographia e di Storia delle scienze matematiche e fisiche. Rome 1868.
Revised Latin text with detailed comparative historical matter (in Italian).
- HELLMANN, G. *Sammlung von Neudrucken von Schriften und Karten über Meteorologie und Erdmagnetismus*, Vol. 10 "Rara Magnetica" and epilogue in the last volume 15. Latin text with short commentaries and references.
- BERNARD QUARITCH..... *Facsimiles of Manuscripts, Petrus Peregrinus, de Magnete* reproduced from a manuscript written by an English hand. A.D. 1390, London, 1900. 50 copies only. Preserved in the library of the Marineleitung (Cat. 13477). Text only and incomplete. Two pages of manuscript are missing.
- Silvanus P. THOMPSON.. *Epistle of Peter Peregrinus of Maricourt to Sygerus of Foucaucourt (Soldier) concerning the Magnet*. London 1902. Text only, in English translation.
- ARNOLD and POTAMIAN *The letter of Petrus Peregrinus on the Magnet*. Electrical World and Engineer. New York 1904, Vol. 43, pp. 514 & 598. Also in book-form, New York 1904. The latter is in the library of the Marineleitung (Cat. 14319). Text in English translation (ARNOLD). Detailed explanations on the position taken (POTAMIAN).
- Silvanus P. THOMPSON.. *Petrus Peregrinus de Maricourt and his Epistola de Magnete*. Proceedings of the British Academy. London 1906. Considerations on the 1902 Edition only.
- SCHLUND, Fr. Erhard... *Petrus Peregrinus v. Maricourt, sein Leben und seine Schriften*. Archivum Franciscanum Historicum, Florence 1911/12, Vol. 4/5. Notes only (in German). Apart from the *Epistola* only one small manuscript "Nova compositio astrolabii particularis" exists (according to BERTELLI).
- GERLAND, Ernst *Geschichte der Physik*, 1913, Vol. 24 of the *Geschichte der Wissenschaft in Deutschland*. Notes only, without text.
- SCHÜCH, A. *Der Kompass*, Vol. II (1915), pp. 51-52.