V. Note on M. Mascart's paper, "On magnetization"

E.F.J. Love B.A.

To cite this article: E.F.J. Love B.A. (1886) V. Note on M. Mascart's paper, "On magnetization" , Philosophical Magazine Series 5, 22:134, 46-47, DOI: [10.1080/14786448608627897](https://doi.org/10.1080/14786448608627897)

To link to this article: <http://dx.doi.org/10.1080/14786448608627897>

Published online: 29 Apr 2009.

Submit your article to this journal [↗](#)

Article views: 2

View related articles [↗](#)

mentioned metals yield with iodide of ethyl only zinc ethyl, a tin alloy should give such large quantities of tin tetrethyl. This may be accounted for perhaps by the greater stability of the tin tetrethyl at high temperatures, the organo-metallic compounds of bismuth, lead, aluminium, and antimony all decomposing when strongly heated.

V. *Note on M. Mascart's paper, "On Magnetization."**
By E. F. J. LOVE, B.A., *Demonstrator of Physics in the Mason Science College, Birmingham* †.

IN the above-mentioned paper, M. Mascart draws attention to the fact that the values of the coefficient of magnetization, as determined by using long cylinders, differ from those obtained by the employment of rings; and tries to demonstrate that "a special phenomenon is produced in the case of closed rings which exaggerates the effects of induction."

Without presuming to question M. Mascart's investigations, I may be allowed to point out that the facts admit of an entirely different and much simpler explanation.

Calling the two values of the magnetization-coefficient determined with the help of bars, f and f_1 , as is done by M. Mascart, I may first point out that f_1 is measured by finding the magnetic induction at the centre of the bar, while f is determined by the magnetic moment, which depends on the distribution of magnetic induction throughout the bar. In all cases the induction through the central section is the greatest, owing to lines of induction leaving the bar all along its length, and not all going right through to the ends; the effect of this is to diminish the apparent value of the magnetization-coefficient as determined from the magnetic moment. The extent to which the induction-lines escape is very surprising, as the following example will show:—

A rectangular bar of soft iron was bent into a ring, and turned in the lathe to a true circle, 10 centim. in diameter. It was then cut into two halves along a diameter, and the cut ends worked to true planes. On each half a primary coil of 185 turns was wound, and these were connected together, giving a primary of 370 turns covering up the iron. Two secondary coils of 10 turns each were then wound on, one near the end of one of the semicircles, the other forming a spiral extending over the surface of the same semicircle. The two electro-

* Phil. Mag. June, 1886, p. 515.

† Communicated by the Author.

magnets thus formed were placed on a block between springs which held their ends firmly in contact, thus giving a closed iron circuit. A magnetizing current being passed through the primary, the induction through the secondary coils on reversing the primary current was measured, and found to be the same for both coils. Then a piece of copper 0.5 millim. thick was interposed between each of the opposed pairs of faces of iron; and the induction near the end was found to be only 0.73 of the mean induction.

The effect produced with a long iron rod would naturally be of the same kind as with the ring described above, except that the leakage of induction would take place to a greater extent.

Another point is, that in experiments with a closed iron ring the lines of induction lie entirely within the iron, and hence the magnetic permeability μ ($=1+4\pi k$) is determined directly; but when a rod is employed, the lines of induction pass for the greatest part of their course through air, and what is measured is the *average* permeability of an air-iron circuit. Now air having always a smaller permeability than iron, the result is to bring out the magnetization-coefficient again too low.

Hence it would hardly seem necessary to adopt M. Mascart's suggestion that "a special phenomenon is produced in the case of closed rings which exaggerates the effect of induction."

VI. On a Theorem relating to Curved Diffraction-gratings.

By WALTER BAILY, M.A.*

IN a paper read before this Society in January 1883 †, I showed that if a plane be taken perpendicular to the lines of a curved diffraction-grating, and the normal to the centre of the grating be taken as the initial line, then the equation

$$\frac{\cos^2 \theta}{r} = \frac{\cos \theta}{c} + \frac{1}{d}, \quad \dots \dots (1)$$

in which c is the radius of curvature of the grating and d is an arbitrary constant, gives a curve having the property that if a source of light is placed at any point of the curve, the curve is the locus of the foci of all diffracted rays whether reflected or transmitted.

When d is greater than c , r may be infinite. Let ϕ be the

* Communicated by the Physical Society: read May 8, 1886.

† Phil. Mag. March 1883, p. 183.