

SCIENCE

FRIDAY, MAY 20, 1921

THE ELECTRON THEORY OF MAGNETISM¹

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EVER since the time of Faraday it has been known that all varieties of matter can be grouped in three classes on the basis of magnetic behavior, ferromagnetic, paramagnetic and diamagnetic.

It would be far too much to claim that the electron theory has as yet given anything like a complete account of the phenomena witnessed in connection with these three types of magnetism; but it is the only theory proposed which has been in any way satisfactory and which appears to hold out any hope for the future.

In accordance with the plans of this symposium I shall restrict myself to a consideration of the more general aspects of the theory and its simplest applications. For the sake of logical completeness I shall have to refer to many matters well known. The extension of the theory and its application to more special and complex cases, in so far as they can be handled on this occasion, will be treated by my colleagues.

The first electrical theory of ferromagnetism was proposed by Ampère just about one hundred years ago. On the basis of his own experiments on the behavior of electric circuits and magnets, and on the assumption, already justified, that magnetism is a molecular and not a molar phenomenon, he concluded that the molecule of iron is the seat of a permanent electrical whirl and thus essentially a permanent magnet with its axis perpendicular to the whirl. When the iron is fully magnetized, all the whirls are oriented alike, and

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