to be totally obscured in the visible. Multisized grain distributions have, however, been proposed with some components centred around sizes larger than 1 μm. For grains of this size the optical and X-ray scattering efficiencies of most materials are roughly similar and hence this may provide a means of evaluating the multicomponent grain size models proposed.

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Magnets in Electromagnetic Theory

Two recent communications on electromagnetism[1,2] exemplify the two basic approaches to the problem. It is possible to regard E, D, H and B as labels identifying different properties which it is convenient to distinguish, and in the main this is the approach taken by Rosser[1]. On the other hand, it is possible to look for physical realities corresponding to each of these terms and to examine various relationships to see whether these correspond with "reality". This is basically the approach of Stopes-Roe[2].

The first approach is quite unexceptional but is rarely carried out consistently. It is, for example, usually assumed as *a priori* "fact" that charge is a fixed entity and that the movement of a real charge from one medium to another does not in any way affect the magnitude of the charge. I know of no experiment which proves this convenient assumption. There is no doubt that electrostatic calculations would be very much more difficult in a system in which the magnitude of a charge was a function of the medium (for example, $q=q_0\,\varepsilon^{-1/2}$, ε being the dielectric constant of the medium). This is a sufficiently good reason for defining a charge as being an entity which is independent of the medium.

The corresponding case of the magnetic dipole is rarely, if ever, considered in terms of convenience, but reference is made to hypothetic or real experiments. The results of these experiments are always open to different interpretations and no conclusive proof of one interpretation or another is ever produced. For example, experiments are made with long thin "hard" magnets which it is assumed may be taken to represent accurately the properties of elementary magnetic dipoles. This, however, is open to the objection that this form of magnet is that most influenced by demagnetizing effects. The classical ring magnet with a small gap is least affected by demagnetizing effects.

Experiments made with ring magnets would tend to show that "real" magnets produce a constant flux (constant B), but thin magnets in the same type of experiment will appear to produce a constant H.

It is further assumed that because a current carrying solenoid produces some magnetic effects like those of a permanent magnet then the latter "is" a system of atomic currents.

A solenoid is usually connected to a source to supply the current in it, however. In this case when the external medium is changed (even if the solenoid core is an evacuated enclosure in which the medium does not penetrate) energy is taken from or given to the source.

A permanent magnet, however, has no such external source from which it can draw energy and in this it differs from the hypothetical solenoid.

This objection can be overcome by postulating a superconducting solenoid carrying a current as being the equivalent of a permanent magnet. This concept avoids the problem of interchange of energy with a source but introduces another basic difficulty. A superconducting ring has an infinite current induced in it if the magnetic flux linking with it changes. If, therefore, the medium around such a solenoid is changed the superconductor prevents any change of magnetic flux through it. Compensating changes occur in the current circulating in the solenoid.

This type of solenoid therefore has the property that the magnetic flux linking it is independent of the medium. It is therefore the equivalent of a magnet of constant B (unlike the ordinary constant current solenoid which is the equivalent of a magnet of constant H).

The superconducting solenoid cannot be described by writing its magnetic moment as $m=IA$ because the current I involved is not a constant but is a function of the medium, falling if the permeability of the surroundings increases, and vice versa.

A magnet made up of superconducting elements would probably act more like real permanent magnets than any of the other models proposed. It would be a constant flux magnet (and therefore would be a direct analogue of the constant electrostatic charge which is generally favoured) and its properties would be very similar to those of single-crystal magnetic materials.

If, therefore, it is considered necessary to invent atomic concepts to account for macroscopic behaviour—instead of accepting E, D, H and B as convenient definitions—it seems more logical to take an elementary permanent magnet as a constant flux device and not as a constant H device.

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Derivation of Rate Equations used in Thermogravimetry

THERE have been many attempts to extract kinetic parameters, such as energy of activation or order of reaction, from dynamic thermogravimetric data[1–3]. The main reasons for using thermogravimetry (TG) instead of the more traditional isothermal methods are that it is unnecessary to know the time and temperature of the onset of decomposition, and with TG it is possible to use only one set of experimental data to derive the desired parameters. In other methods, several isothermal experiments must be performed at different temperatures to yield a value for the energy of activation. It should be noted,