Gyromagnetic Effect for a Ferromagnetic Substance above its Curie Point

UP to the present, no satisfactory explanation has been given for the magnitudes of the magnetic moment per atom of ferromagnetic substances as deduced from the saturation intensities at low temperatures. Furthermore, these data do not admit of correlation with the magnetic moment per atom (or ion) obtained from susceptibility measurements of the ferromagnetics above the Curie point. Hence it is advisable to measure the gyromagnetic ratio for a ferromagnetic substance above its Curie point in order to find the origin of the paramagnetism in this region.

Experimental difficulties preclude measurements at temperatures above room temperature, and so it is necessary to choose an alloy the critical point of which is in the neighbourhood of 0° C., or lower. A suitable alloy is found in the nickel-copper series, which possesses the additional advantage that the magnetic moment per nickel atom in the paramagnetic state is independent of the concentration in the range of alloys concerned; that is, it is the same as in pure nickel. The experimental difficulties are considerably greater than those encountered in the case of normal paramagnetic substances which I have investigated, being further complicated by hysteresis and permanent magnetic moment as additional sources of error. However, results were obtained on three different alloys (nickel content $\sim 56{\cdot}5$ per cent) the Curie points of which were $-14°$, $-9°$ and $-2°$ C., the mass susceptibilities ranging from 98 to 180×10^{-6}. The mean result for g is 1·9 with an estimated accuracy of 10 per cent. Thus the g value of 2·0 is within experimental error, indicating that the paramagnetism of the nickel is due to spin alone, as in the case for the ferromagnetic state.

Opportunity was taken to make a systematic test of the contention made by Barnett that my results on the gyromagnetic effect for paramagnetic substances, as well as earlier work on ferromagnetics, are vitiated by unsuspected sources of error peculiar to English physicists[1]. Conditions were particularly favourable to such tests as the disturbing effects are particularly large for the alloys investigated above. In no case, however, was any error detected in the technique previously employed. A full account of the work will appear elsewhere.

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[1] Barnett, *Phys. Z.*, **35**, 203; 1933. For discussion, see also Bates, NATURE, **134**, 50, July 14, 1934.

Humidity-Resistance Relations in Carbon-Coated Hygroscopic Materials

RECENT notes[1] on paper hygrometry recalled to me some earlier observations by myself on the decrease in electrical resistance with drying of a paper coated with a glue-lampblack mixture, and have led to further experiments with carbon-coated hygroscopic materials. This decrease in resistance is attributed to the closer and more numerous carbon contacts as the paper shrinks.

Data for the paper mentioned above, for 'Cellophane' with indian ink lines, and for human hair coated with indian ink appear in Fig. 1. For the paper and the 'Cellophane', the resistances are the equilibrium values attained in fanned air after standing over either calcium chloride or a saturated solution of potassium chloride (86 per cent relative humidity). The hair was studied only in quiet atmospheres of various humidities provided by salt solutions. The temperatures were those of the room.

Both the paper and the 'Cellophane' were 'conditioned'. They were exposed, alternately, to dry and to moist atmospheres until their resistances approached nearly constant lower values at given humidities. Half a dozen wet-dry cycles were sufficient. The hair was not so conditioned. All data obtained with it appear in Fig. 1.

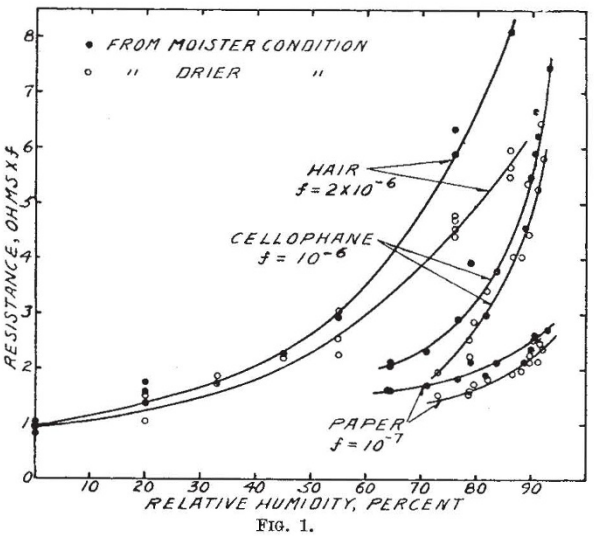

FIG. 1.

In nearly saturated atmospheres, the electrolytic conduction in the paper predominated over the conduction by carbon. As a consequence, its resistance passed through a maximum when the atmosphere changed to or from saturation. Corresponding experiments with 'Cellophane' and hair were not made.

The paper and 'Cellophane' resistors were 20 cm. $\times 1{\cdot}25$ cm., with ends dipping 1 cm. into mercury wells. The hair resistor consisted of 27 segments in parallel, each 2·5 cm. long. The hair had been boiled in ethyl ether. Resistances were computed from the currents given by a 1·5 volt dry cell.

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[1] K. Mellanby, NATURE, **132**, 66, July 8, 1933. J. Grant, *ibid.*, 677, Oct. 28, 1933. P. H. Prior, *ibid.*, 857, Dec. 2, 1933.

The Maüle Reaction and the Systematic Position of the Gnetales

IN a book just issued[1], Dr. Hagerup, of Copenhagen, has revived the much-debated question of the origin of the Angiosperms, basing his conclusions on a detailed, comparative study of the organogeny of the floral structures in a series of representative species of the Gnetales, Piperaceæ and Juglandaceæ. From this investigation he derives support for the belief in the close relationship of the Piperaceæ and the Gnetales, the differences between them being, in his view, of minor importance morphologically; so that either the Gnetales should be added to the Angiosperms, as Lignier contended, or the Piperaceæ should be regarded as having arisen directly from