The second point of interest is that, before detailed classifications of rheological systems be postulated, there is still a need for determining rheological constants in different apparatus on the same systems, to ensure that a true constant of the system is obtained. Thus in this example use of the ball viscometer would lead to the conclusion that the 860 p. viscosity of the solution at 20° C. was a constant of the liquid, whereas checking with the tube viscometer shows that 860 p. is, in fact, dependent on the apparatus as well as the liquid.

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[1] Wood, G. F., Nissan, A. H., and Garner, F. H., *J. Inst. Petrol.*, 33, 71 (1946).

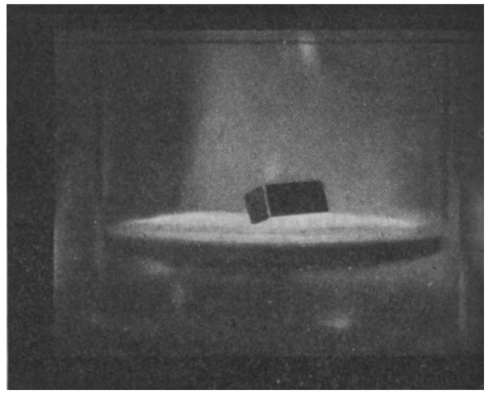
A Floating Magnet

BY assuming that diamagnetic bodies are pushed out of a magnetic field, it may be shown that a diamagnetic particle attracted to a magnet by gravitational forces will take up a position in space in the equatorial plane of the straight magnet at a certain distance from the latter. The 'satellite' can vibrate elastically about the point of equilibrium, describing a certain curve. The period of vibration in the radial and meridional directions is close to the period of the Kepler rotation of a magnetically indifferent satellite about a body of the same mass. Several identical particles arrange themselves around the magnet. Such a combination of bodies is in the nature of a static planetary system as distinct from the Kepler dynamic planetary system.

However, systems thus formed can only be of small dimensions. The orbit of the outermost bodies can be no larger than several metres, and in the case of small magnetized iron meteorites amounts to several millimetres.

Computation shows that in space a straight magnet keeps at a certain distance from a large diamagnetic body. Thus a magnet 1 cm. long will take up a position at a distance of 1 cm. from the surface of a copper sphere about 20 m. in diameter. Diameters of 300 m. and 3,000 m. respectively would be necessary for bismuth and carbon spheres. To prevent a magnet falling on to a diamagnetic sphere the size of the earth, the sphere must consist of the strongest diamagnetic substance, or be a superconductor. In this case, however, it is sufficient that the superconductor is placed only under the magnet itself.

The approach of a magnet to the surface of a superconductive semispace is accompanied by the appearance of the magnetic image of this magnet within the superconductor. In the case of a common steel magnet, this may lead to demagnetization, while a ferro-nickel-aluminium steel magnet will be repelled from the horizontal surface of the semispace with such force that it will hang suspended ('float') over the latter without any support. Thus one of the cases of a static planetary system may be reproduced in the laboratory. The earth, screened by a superconductor in the neighbourhood of a magnet, repels the latter with the same force as it is attracted owing to universal gravitation. The accompanying photograph shows a magnet, 4 mm. × 4 mm. × 10 mm. in dimensions, floating above a concave lead disk 40 mm. in diameter in a Dewar vessel over liquid helium.



The experimental test of these views was possible through the kindness of Prof. P. L. Kapitza, in the Institute of Physical Problems, Moscow.

The lower the coercive force of the magnet, the smaller the magnet itself must be. Carbon steel magnets, for example, can 'float' when they have the dimensions of 0·5 mm. × 9 mm. By scattering microscopically small magnets over the surface of a body, it is possible to reveal superconductive inclusions directly, since the magnetic particles will roll to the spots where there is no superconductivity.

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X-Ray Optics

ALTHOUGH optical reflexion and refraction of X-rays have been known for more than twenty years, they have so far found only one significant, although very important, application, namely, the spectroscopy of X-rays by means of optical gratings. But there is at least one other problem which should be solved by optical methods: the production of a finely focused beam which could be used to investigate both the action of X-rays on biological and other objects and the small-angle scattering from large molecules or fine powders.

I have therefore given attention to the problem of refocusing of X-rays passed through a fine slit by means of a curved reflector. It is known that all rays coming from one focal point of an ellipse are reunited at the second focal point. Further, it can be seen that the image formed by reflexion at a cylindrical elliptic surface of a source at one focus is a line parallel to the surface going through the second focus; therefore a line-object parallel to the surface and passing through one focus gives rise to a similar line-image going through the other focus. For the particular case of X-rays, reflexion occurs only at nearly glancing incidence, so that only a small part of a very elongated ellipse could be used. A perfect elliptic surface, however, can scarcely be realized, and neither slit nor photographic plate can be expected to be actually at the theoretical positions. I have therefore computed the aberrations which arise if the elliptic surface is replaced by a surface such as is formed by bending a rectangular beam, and also if slit and plate are displaced from their correct positions. It has been found that the surface