Letters to the Editor

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Radioactivity Induced by Neutron Bombardment

USING neutron sources containing up to 250 millicuries of radon mixed with beryllium, we have been able to confirm many of the results reported by Fermi and his collaborators[1]. We have also obtained the following additional results :

Fluorine appears to give an effect of about 40 sec. period, which has an initial intensity of about 5 per cent of that of the shorter period already reported by Fermi.

Zinc. The longer period exhibited by this element appears to be about six hours, and chemical separation shows that the active body is an isotope of copper.

Copper also gives an effect of about six hours period, of the same order of intensity as the effect from zinc : the active body is probably identical.

Sodium. Besides the short period, we have found a very weak effect from sodium the period of which (*c.* 10 hr.) is within the errors of measurement the same as that of the long periods given by magnesium and aluminium, which are known to be due to an isotope of sodium[1]. The active body in each case is probably $_{11}Na^{24}$. We are indebted to Dr. Segrè for suggesting that we should look for this period, as it is apparently a definite case of capture of a neutron without expulsion of a material particle, since $_{11}Na^{22}$ is known to have a very short period (and to emit positrons)[2].

Search for a period of 13 days from phosphorus, which would be a similar case, was without result.

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[1] Fermi and others, *La Ricerca Scientifica*, 5, 1, 283, 330, 452, and 652 ; 1934. 2, 21 ; 1934. NATURE, 133, 757, May 19, 1934.
[2] L. Meitner, *Naturwiss*, 22, 420 ; 1934.

Dependence of Magnetic Induction on the Magnetic Field in Supraconducting Lead

SUPRACONDUCTIVITY is destroyed by a magnetic field, the critical field H_k depending on temperature. Until recently it was held that the magnetic state of a supraconductor could be computed from electrodynamics with the aid of a single assumption that the conductivity is infinitely great right up to H_k. The dependence of the magnetic induction B on the field strength H for this case is shown on Fig. 1 by the thick line.

Starting from Bridgman's hypothesis[1] that the supraconductive and non-supraconductive states could be considered as two phases, to which the laws of thermodynamics might be applied, Rutgers[2] and Gorter[3] derived a relation between dH_k/dT and the jump in the specific heat at the transition point, assuming that in the supraconducting phase the permeability $\mu = 0$, and that in the ordinary phase $\mu = 1$. The relation obtained was in good agreement with the values found for tin at Leyden.

In order to decide the question whether, indeed, two phases exist, it appeared to us important to measure μ as a function of H up to values greater than H_k. In order to gain a general survey, some measurements were made and the results published[4]. We now possess more accurate data, which we should like to report briefly in NATURE.

The experiments were carried out on a polycrystalline rod of lead, 5 mm. in diameter and 50 mm. long, at a constant temperature of 4·24° K. The axis of the specimen was parallel to that of a long solenoid, which produced a homogeneous field. We made use of two different methods, namely :

(1) $\Delta B/\Delta H$ as measured by suddenly changing H in small stages. For these measurements, a spool was tightly wound around the middle of the rod and connected over an amplifier with a ballistic galvanometer.

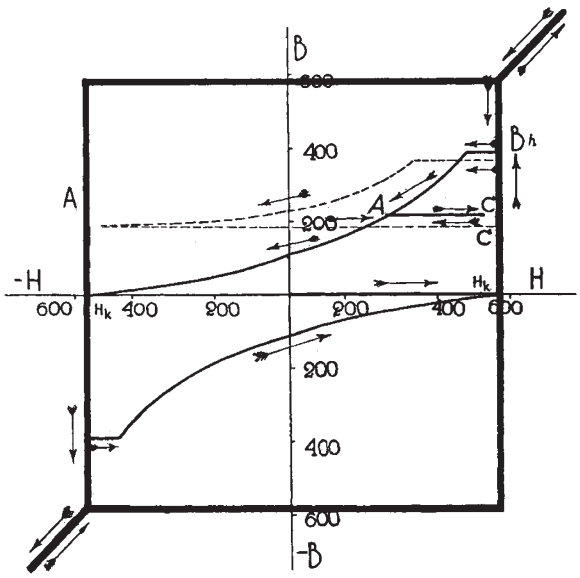

FIG. 1.

(2) The magnetic moment of the supraconductor was measured in a constant field by quickly removing the specimen itself far from the sphere of action of the spool surrounding it. The experiment consisted in observing the throw of the ballistic galvanometer, connected to the spool, when the specimen was suddenly removed or suddenly introduced. In the course of its motion the specimen always remained in a field of constant intensity. Fig. 1 shows the relation which we found between the induction B and the field strength H, represented by a thin line and by the thick line above H_k. The dotted curve was obtained with the first method ; the full curve shows the results obtained with the second method, part of which coincided with those gained with the first.

The following conclusions may be drawn from these experiments :

(1) When the specimen is first magnetised, B and also μ are equal to zero with an accuracy of 0·2 per cent, when the field varies from 0 to H_k. This result was found to be independent of time.

(2) In fields near to H_k the induction B increases very rapidly in a very narrow interval of field strength