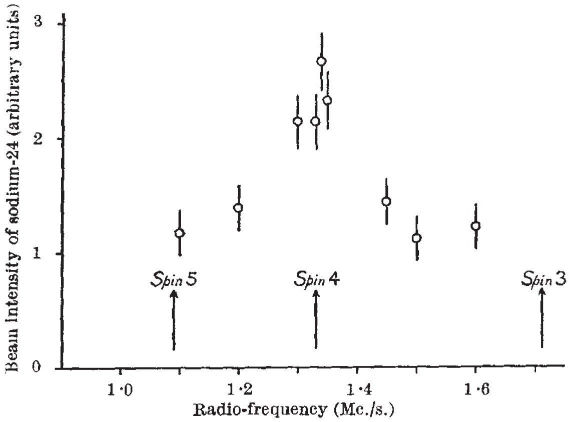

ing the activity of the sodium-24 deposited. The sodium-24 was produced by irradiating metallic sodium with slow neutrons in the pile at Harwell; thanks are due to the Isotope Division there for the repeated irradiations.

The result of one run is shown in the accompanying diagram; a second run gave the same location for the resonance maximum. The homogeneous magnetic field was adjusted so that sodium 23, which has a spin of 3/2 units, produced a resonance at 3·00 Mc./s. At the low value of magnetic field used ($\sim$ 4 gauss), the resonance frequency is inversely proportional to $2I + 1$; the expected locations of the resonances for spins of 3, 4 and 5 units are shown on the diagram. The resonance maximum for sodium-24 clearly lies at 1·33 Mc./s., so the spin of sodium-24 is 4 units.

The measurements are to be extended to higher magnetic fields to find the magnetic moment as well.

K. F. Smith

Cavendish Laboratory,
Cambridge. April 26.

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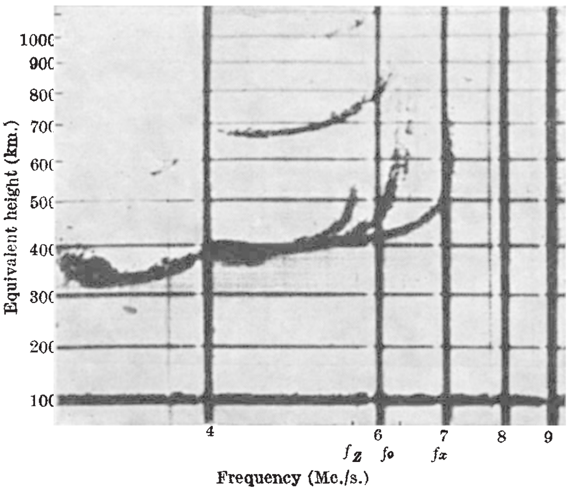
Polarization of the Z-Trace

THE appearance in northern Canada of the third critical frequency (Z-trace) in radio-wave vertical-incidence reflexions from the ionosphere has been a fairly common occurrence since it was reported by Meek[1].



An experiment carried out at Fort Chimo (lat. 58·1° N., long. 68·3° W.) on September 30, 1950, showed the polarization of the Z-trace to be ordinary, or in the northern hemisphere, anticlockwise as viewed in the direction of propagation. This is compatible with the theory that the Z-trace is the longitudinal ordinary reflexion (made possible at off longitudinal directions by the effect of collision[2]), rather than an earlier view that it is the second extraordinary reflexion.

The Z-trace appeared as shown in the accompanying photograph at 0900 hr. E.S.T. and persisted in great strength until 1100 hr. Polarization measurements were made continually during this period near the $F2$ critical frequency (about 6 megacycles) on a phase-shift and suppression-type equipment built by Mr. J. W. Cox and Mr. D. R. Hansen.

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Yield Phenomenon and Twinning in α-Iron

IRON containing small amounts of carbon and nitrogen exhibits a peculiar relationship between stress and strain which appears in different forms at different temperatures; it shows the yield phenomenon at room temperature, blue brittleness at temperatures in the range 200–400° C., and twinning at the temperature of liquid air. The part played by the carbon and nitrogen in the yield phenomenon has been explained by a recent theory[1–3] according to which certain foreign atoms in the metal collect preferentially at dislocations. Blue brittleness occurs when the temperature and strain-rate are such that strain ageing can occur during the time needed for a Lüders band to travel along the specimen. This causes repeated yielding to take place.

The question of whether single crystals of iron show the yield phenomenon, as is required by the dislocation theory, has been controversial for many years; certainly they do not show the strongly marked yield that is typical of fine-grained iron. Recently, using a rigid tensile testing machine and 2-mm. diameter wire specimens, we have observed yield points in lightly carburized 'Armco' iron single crystals (0·02 per cent carbon)[4] (see Fig. 1,*a*), and very similar results have been obtained independently by Schwarzbart and Low[5] in America. In these experiments, which were conducted at room temperature, a marked fall in stress at the yield point was not observed.

We now find that, by lowering the testing temperature to − 77° C. (acetone/dry-ice mixture), the yield point in the single crystals becomes more marked and a sharp fall in stress from 18,000 lb. per sq. in., at the upper yield point, to 15,000 lb. per sq. in., at the lower yield point, is observed. Under these conditions the yield elongation is about 1½ per cent (see Fig. 1,*e*).

On lowering the testing temperature to that of liquid air (− 190° C.) the yield phenomenon is replaced by deformation twinning. Carburized single crystals of 'Armco' iron (0·02 per cent carbon) twinned at stresses between 40,000 and 50,000 lb. per sq. in.