between light-scattering and fluid viscosity, illustrated in the accompanying spectra of light scattered in four liquids of increasing viscosity, namely, benzene, acetic acid, salol, and glycerine, all of which depolarize light strongly. It will be noticed that in the spectrum of glycerine the rotational 'wings' accompanying the Rayleigh line, which are so prominent a feature with the more mobile liquids, are almost completely absent, thus indicating that, in respect of light-scattering, glycerine is practically indistinguishable from an amorphous solid.

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Anomalous Properties of some Anhydrous Salts of the Iron Group at Low Temperatures

IT has been established in the Leyden Laboratory[1] that the susceptibility of nickel, cobalt, ferrous and chromium chlorides at the temperatures of liquid hydrogen depends on the intensity of the magnetic field.

It has been found in our laboratory[2] that all these substances show jumps in the specific heat similar in shape to those exhibited by ferromagnetics. These two facts have led to the view that the anomalies observed, namely, dependence of the susceptibility on the field and the jumps of the specific heat, might be due to a transition of the salts from the paramagnetic to the ferromagnetic state. A detailed investigation of the temperature dependence of the susceptibility, carried out by us, showed that the ferrous and cobalt chlorides and cobalt iodide exhibit at the temperature of the specific heat jump a maximum of susceptibility the position and sharpness of which depends on the intensity of the magnetic field, and in such a manner that on increasing the field the maximum shifts to the lower temperatures. This fact does not fit in with the usual notions of ferromagnetism. The low value of the susceptibility and the absence of signs of saturation in these salts are likewise inconsistent with the hypothesis of ferromagnetism.

It seems possible to explain the dependence of the susceptibility on the field, the anomaly of the specific heat and the temperature dependence of the susceptibility by the 'quenching' of the orbits of metallic ions in the electric field of the crystal, a concept introduced by Stoner. The dependence of the susceptibility on the field is then accounted for by the external magnetic field forcing out the orbits from their quenched states, that is, increasing the effective number of the carriers of magnetism. The temperature influences the quenched orbits in the same sense, namely, increase of the temperature diminishes the effectiveness of the crystalline field. The existence of the maximum of susceptibility is accounted for by the increase of the effectiveness of the electric field due to the lowering of the temperature, and its location is determined by the internal electric field, the temperature and the external magnetic field. As the latter two are disturbing factors with regard to the quenching of the orbits in the crystalline field, the increase of one of them, say, of the magnetic field, diminishes the temperature of the maximum. The jump in the specific heat is due to the orientation of the orbital moments in the crystalline field.

Investigations of the magneto-caloric effect and the specific heat of ferrous and cobalt chlorides in magnetic field, carried out by G. Miljutin and S. Shalyt, show that at temperatures below that of the susceptibility maximum the magneto-caloric effect is negative, that is, the salt cools when the magnetic field is applied and vice versa. The position and magnitude of the specific heat jump depend on the intensity of the magnetic field. These new facts support the hypothesis of the quenching of the orbits and cannot be explained by the ordinary transition to the ferromagnetic state.

A detailed description of the results obtained will appear in the *Journal of Experimental and Theoretical Physics* (Russian).

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Experiments on Pumping Liquid Helium to Low Temperatures

TEMPERATURES sensibly lower than those usually attained by pumping liquid helium are accessible now that the design of apparatus can take into account the known characteristics of the creeping film phenomenon[1] of liquid helium II. In a previous paper[2] it was shown that temperatures below 0·8° K. could be reached very simply by constricting the lower part of the pumping tube, to restrict the creeping of the helium II film. We suggested that still lower temperatures might be attained by using a membrane pierced by a small hole instead of the constriction tube. The advantage of this design is that it reduces the film flow while offering the minimum impedance to the flow of gas evaporating from the surface of the liquid owing to the normal heat influx.

Experiments in which the hole was 0·15 mm. in diameter have confirmed this suggestion: using an ordinary laboratory pump of speed 10 litres/sec., we obtained a temperature of 0·73° K. in a vessel of 4 c.c. capacity. The temperature was measured magnetically using chrome alum as thermometer, and calibrating its magnetization (corrected to that of a sphere[3]) against temperature between 4° K. and 1·5° K., as given by Keesom's 1932 vapour pressure curve[4].

There is at present an uncertainty of some hundredths of a degree in the value of the temperature reached. If Keesom's 1937 vapour pressures[5] are used in the calibration, the figure for the temperature becomes 0·76° K. Some of the values on the 1937 curve are probably in error, however, for application of the Clausius-Clapeyron equation leads to improbable thermal properties of helium gas. Also, careful measurements of vapour pressure against the susceptibility of paramagnetic salts (which form a more adequate thermometer in this region than can a gas thermometer) indicate that there is some inconsistency in both vapour pressure curves. (This question is being further investigated in the Clarendon Laboratory.) The same uncertainty, of course, applies