when untreated gave 14 per cent infected plants, complete control of the organism was obtained. A larger field experiment, using infected seed from the same source, gave 0·26 per cent infected plants after the steeping treatment, and complete control after using a mercurial dust, Abavit B.

Germination of the seed is depressed by the steeping treatment, but not seriously so. In a field experiment unsteeped seed gave 79 per cent germination, and steeped 72 per cent. The steeped seed had been dried and stored for a short period after treatment. If the steeped seed cannot be sown wet immediately, and has to be dried and stored, the drying process must be rapid and thorough. Otherwise the seed will promptly germinate.

From laboratory experiments it would appear that the organism disappears from the surface of the seed during steeping, not through the activity of a bacteriophage, but through exposure to anaerobic conditions. These conditions are the result of bacterial activity, and oxygen absorption by the germinating seeds. The growth of *B. malvacearum* in culture is closely conditioned by the amount of oxygen present.

A. S. BOUGHEY.

Agricultural Research Institute, Wad Medani,
Anglo-Egyptian Sudan. Sept. 1.

[1] Massey, *Emp. Cot. Grow. Rev.* **14**, 301 (1937).
[2] Clouston and Andrews, Rep. Agr. Res. Serv. (1938).
[3] Massey, Rep. Gezira Agric. Res. Serv. (1933 and 1934).

Scattering of Neutrons in Deuterium

USING the neutrons released in the beryllium-deuterium nuclear reaction, we have investigated the scattering of medium fast neutrons in deuterium gas. The bombarding deuteron beam of 4 micro-amperes was accelerated with a peak voltage of 600 kilovolts in a short ion path tube[1], using the 1 Mv. cascade transformer at the California Institute of Technology. The neutrons emitted in a direction perpendicular to the bombarding deuteron beam traversed a brass pressure ionization chamber filled with deuterium gas at 7 atmospheres. The energy of the recoil deuteron was measured by a linear amplifier which fed a mechanical oscillograph, the pulses being recorded on a moving film. Calibration pulses were registered on the same film with a thyratron pulse generator and a standard condenser. More than 4,000 tracks were measured, the longest pulse track corresponding to an energy of 2 Mev. The curve giving the distribution in energy is shown in Fig. 1.

The maximum at 1·2 Mev. may correspond to the

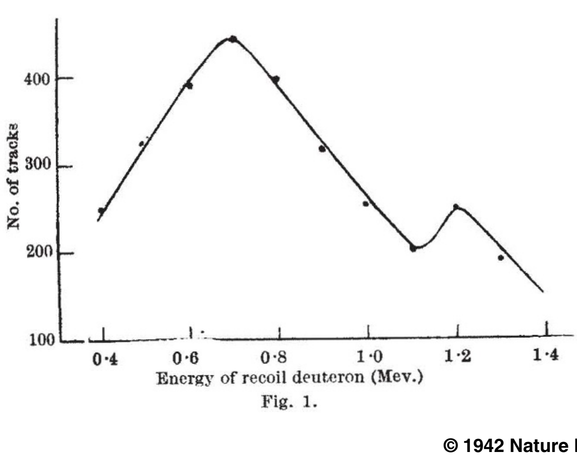

Fig. 1.

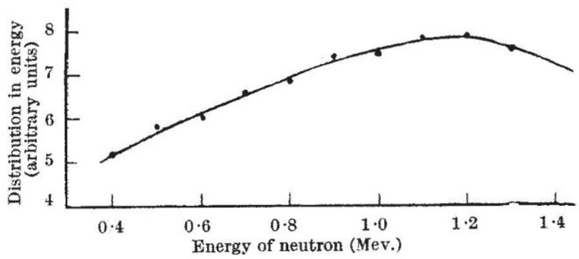

Fig. 2.

peak energy of the low-energy group of neutrons[2] released in the beryllium-deuterium reaction. The more prominent maximum at 0·7 Mev., presumably, is due to an anomaly in the neutron-deuteron interaction. It may be associated with the "Ramsauer effect" deduced[3] by Massey and Mohr on the basis of a potential interaction of range $4 \cdot 5 \times 10^{-13}$ cm. Assuming the approximate validity of the equation deduced by Baldinger *et al.*[4] for the distribution in energy of the primary neutrons in terms of the energy distribution of the recoil nuclei, the curve in Fig. 2 has been plotted with the cross-section values given by Massey and Mohr (*loc. cit.*). The graph indicates a wide spread of energy in the neutron beam, which gets scattered in the gas contained in the ionization chamber. The anomaly at 0·7 Mev. may also be associated with the critical wave-length $\lambda_{cr} = 5 \cdot 4 \times 10^{-13}$ cm. deduced by Bethe[5] on the basis of a continuum theory of the compound nucleus. As recently stressed by Massey and Buckingham[6], further experimental data may be needed to establish the nature of fundamental nuclear forces.

The details of our experimental work will appear elsewhere.

C. K. SUNDARACHAR.

Central College,
Bangalore.

J. F. STREIB.

California Institute of Technology,
Pasadena, California.

[1] Stephens and Lauritsen, *Rev. Sci. Inst.*, **9**, 151 (1938).
[2] Bonner and Brubaker, *Phys. Rev.*, **50**, 308 (1936).
[3] Massey and Mohr, *Proc. Roy. Soc.*, A, **148**, 206 (1935).
[4] Baldinger, Huber and Staub, *Helv. Phys. Acta*, **11**, 245 (1938).
[5] Bethe, *Phys. Rev.*, **57**, 1125 (1940).
[6] Massey and Buckingham, NATURE, **146**, 776 (1940).

Anomalous Viscosity of Lubricating Oil at High Velocity Gradients

AN analysis of data recently put forward by Spiers[1], on the flow of oil through engine bearings, shows that the results cannot be reconciled with the usual hypothesis of a viscosity coefficient independent of the velocity gradient. The data indicate that at velocity gradients between 10^4 and 10^6 sec.$^{-1}$, the viscosity coefficient falls down to a small fraction of its normal value. This effect is in agreement with experiments carried out by me in 1937[2]. It is presumably due to orientation under shear, an effect well known for particles of extreme anisometry such as those of cellulose and tobacco mosaic virus.

The analysis of Spiers's data will be published shortly. Experimental work on the problem is in hand.

S. M. NEALE.

College of Technology,
Manchester, 1. Dec. 18.

[1] Spiers, *J. Inst. Auto. Eng.*, vii (Jan., 1941).
[2] Neale, *Chem. & Ind.*, 140 (1937).