This suggests that in a future theory lengths may enjoy a more fundamental status than times. This need not conflict with relativistic invariance within its valid field, that is, where four co-ordinates are used, for the new theory may take advantage of the fact that in quantum-mechanical stationary states there is no observable time co-ordinate.

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[1] A fuller treatment, with references on lengths, will appear in *B. J. Phil. Sci.*, **1**.

[2] Whyte, L. L., *Z. Phys.*, **56**, 809 (1929); "Critique of Physics" (1931). Fürth, R., *Z. Phys.*, **57**, 429 (1929). Podolsky, B., *Phys. Rev.*, **46**, 734 (1934). Born, M., *Proc. Ind. Acad. Sci.*, (2), **6**, 533 (1935). Flint, H. S., *Proc. Roy. Soc.*, A, **159**, 45 (1937).

[3] Heisenberg, W., *Z. Phys.*, **101**, 533 (1936).

Decay Energy of Beryllium-8 Nuclei observed in Cosmic Ray Stars

DURING the examination of about three thousand cosmic stars in Ilford *G*5 plates 200 μ thick, exposed at balloon altitude, we observed in several cases two prongs of comparable length, making a small angle with each other, ending in the emulsion and looking like α-particles of about 10–20 MeV.

One may suppose that such pairs are the decay products of beryllium-8 nuclei, ejected from the nucleus and disintegrating before travelling an observable distance, according to the known reaction $Be^8 \rightarrow 2He^4 + Q$.

On this assumption, the kinetic energy Q of the two α-particles in the centre-of-mass system can be easily computed from the range of the α-particles and the initial angle of their tracks[1].

A rather narrow band of energy for the value of Q was found about 100 keV. (16 pairs between 63 and 100 keV.). A broader and lower peak was also observed around 600 keV. (12 pairs between 500 and 750 keV.). Only four cases were found outside these two peaks.

In the 100-keV. band we have six events which are readily analysed, corresponding to $Q = 76$, 94, 89, 91, 77 and 92 keV. The main cause of error is, in most cases, the difficulty in measuring the angle; this is principally due to the scattering of the tracks. The estimated error ranges from $\pm$ 9 keV. to $\pm$ 19 keV.

In ten other events, for which the length of the tracks did not allow a definite identification of the particles, the measured values of Q vary from 63 to 100 keV., with possible errors ranging from $\pm$ 25 to $\pm$ 50 keV.

The decay energy of beryllium-8 in the ground-state has already been measured by various authors, using other methods. Recent results are those of Hemmendinger[2] (103 $\pm$ 10 keV.), and Tollestrup, Fowler and Lauritsen[3] (89 $\pm$ 5 keV.).

Therefore, the 100-keV. peak we have observed can be attributed to beryllium-8 nuclei, emitted in the ground-state. Our measurements give a value $Q = 85 \pm 10$ keV., which is in good agreement with the previous results.

The broader band around 600 keV. may indicate the existence of some other nuclear process.

Sincere thanks are due to Prof. Leprince-Ringuet for his advice and direction, to the balloon staff of the laboratory of the École Polytechnique, and to Françoise Bousser and Mady Rougeul for the preliminary examination of the plates.

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[1] Similar work has already been done on this subject by D. H. Perkins (private communication).

[2] Hemmendinger, *Phys. Rev.*, **73**, 806 (1948); **75**, 1267 (1949).

[3] Tollestrup, Fowler and Lauritsen, *Phys. Rev.*, **76**, 428 (1949).

Slow Neutron Cross-Sections of Molybdenum and Bromine

THE total neutron cross-sections of molybdenum and bromine have been measured between 0·05 and 10 eV. using a crystal spectrometer, and between 0·0025 and 0·1 eV. using a mechanical time-of-flight spectrometer. The crystal spectrometer is of the type described by Sturm[1] using the (110) planes of a calcium fluoride crystal in transmission. The mechanical spectrometer is similar to the one described by Brill and Lichtenberger[2]. Both instruments use the Harwell pile as a source of neutrons.

The molybdenum cross-section was measured using a 2½-in. square piece of molybdenum sheet (15·7 gm. per cm.²) which had been produced by rolling bars prepared by powder-metallurgy technique. (The sheet consisted of several thicknesses of 99·97 per cent pure molybdenum foil supplied by Johnson, Matthey and Co., Ltd.). The total cross-section as a function of energy is shown in Fig. 1. In the region from 0·0025 to 0·03 eV. the elastic scattering cross-section has been calculated from the theory of the transmission of slow neutrons through micro-crystalline materials[3], and the theoretical curve shown has been obtained by adding to these values the absorption cross-section

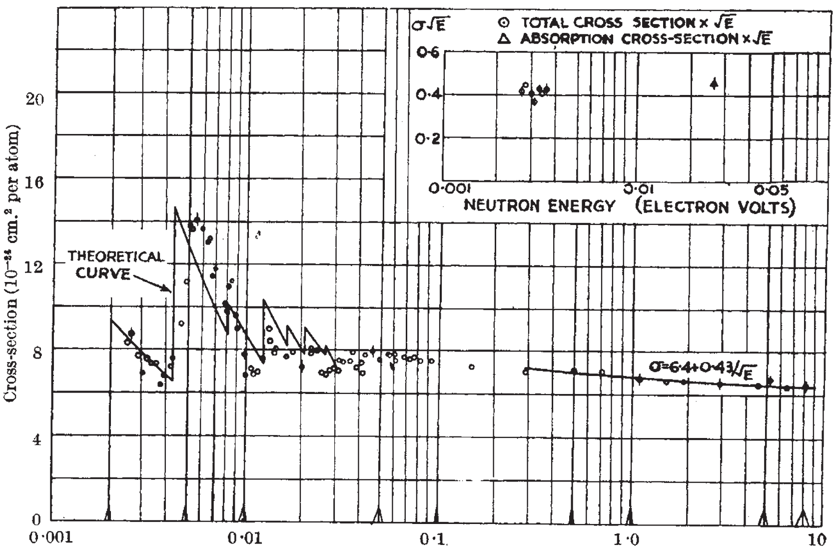

Fig. 1. Observed total cross-section of molybdenum as a function of neutron energy