pulses from the resulting protons were analysed by a ninety-nine channel kick sorter. An identical chamber, filled with ordinary hydrogen, was used for estimating the various background effects. The γ-ray flux from the fluorine target was measured by counting the α-particles emitted prior to the de-excitation of the residual oxygen-16 nucleus. The flux of higher energy γ-rays was measured with a thick-walled graphite ionization chamber: confidence in the computations was increased by the agreement (within 3 per cent) between the values of the 6·13-MeV. γ-ray flux deduced by this method, and by the more certain α-particle counting method. In the reduction of the results, allowance has been made for the small and known inhomogeneity of the γ-rays in both cases. The energies of the γ-rays have been adopted from the work of Walker and McDaniel[1], and their relative intensities from this work and from that of Burcham and Freeman[2]. For the purpose of these slight corrections, the form of the dependence of cross-section on γ-ray energy given by the 'old' theory[3] has been assumed.

Previous measurements of this cross-section have been reported, at the lower energy by van Allen and Smith[4], who find $(11{\cdot}6 \pm 1{\cdot}5) \times 10^{-28}$ cm.², and at the higher energy by Wäffler and Younis[5], who find $(8 \pm 3) \times 10^{-28}$ cm.².

The theory of the photo-disintegration of the deuteron is not sufficiently definite at the moment to enable a comparison with these experiments to be made in a short note.

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Sub-Crystals in Aluminium Observed with Polarized Light

In the course of some work on crystal-grain phenomena in creep specimens of aluminium alloys, we have used the polarized light technique for microscopic examination described by Hone and Pearson[1], and found clear evidence of the original crystals breaking down into sub-crystals under certain conditions of deformation. In this technique, any grain contrast seen is due to differential orientation in the aluminium, at least with unstrained metal.

Before creep tests were undertaken, material in course of preparation was examined, and distinct differences between hot- and cold-rolled metal were found. The microstructure of hot-rolled material is shown in Fig. 1; the original large grains still exist as regions between which there are large orientation differences; but they have broken down into much smaller sub-crystals between which there are usually relatively small contrast differences, suggesting relatively small orientation differences. The original grains have acquired an irregular outline which corresponds to the sub-crystal structure. The

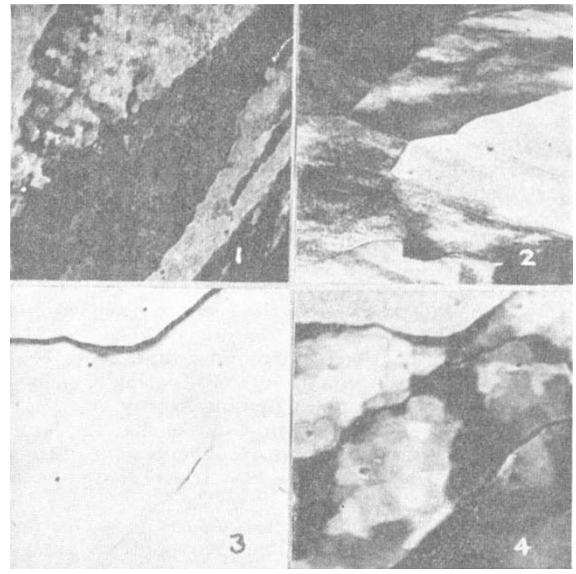

Fig. 1. Hot-rolled; polarized light
Fig. 2. Cold-rolled; polarized light
Fig. 3. Creep specimen; normal lighting
Fig. 4. Same area as Fig. 3; polarized light
All photographs × 200

structure of cold-rolled material is shown in Fig. 2 and has neither an irregular grain outline nor a clear sub-crystal structure. If the patchiness inside the large grains truly indicates orientation differences in this strained material, the change in orientation between patches occurs gradually over a considerable distance, and not sharply as in the sub-crystal structure of Fig. 1.

At this juncture the paper by Wilms and Wood[2] was received describing the observation of a 'cellular' appearance on the polished surface of a creep test specimen during test. This structure was not observed in specimens deformed at room temperature, so it seemed very probable that the 'cells' and the sub-crystals referred to above were identical.

It was therefore with added interest that examination of the creep specimens was commenced. A transverse section of a specimen strained 20 per cent in 20 hr. at 200° C. is shown under normal illumination in Fig. 3 and under polarized light in Fig. 4. The sub-crystal structure is actually well developed, although practically invisible under normal illumination.

These results thus support the observations of Wilms and Wood, and show that the sub-crystal structure develops not only at the surface but also throughout the body of the material during suitable hot deformation. The sub-crystal structure may be similar to that which has been observed in certain rather special samples of cold-worked and annealed aluminium[3].

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