The graphical method was used to determine the signs of $F(hk0)$'s and $F(0kl)$'s of tetragonal ethylenediamine sulphate. Using the above-mentioned chart, together with the inequality (1), the signs of 21 out of 31 $F(hk0)$'s and those of 38 out of 57 $F(0kl)$'s could easily be determined, and it was possible to make at once Fourier projections on (001) and (100). Details of the structure determination will be published later.

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The habit plane of the zirconium transformation.

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In connection with a recent investigation by Bowles (1951) concerning the habit plane of the β–α lithium transformation, we have carried out an analogous investigation of the habit plane of the zirconium transformation. These transformations have the same crystallographic character, both with regard to lattice type (body-centred cubic to close-packed hexagonal) and orientation relationship ($\{110\}_\beta || \{0001\}_\alpha$; $[111]_\beta || [11\bar{2}0]_\alpha$).

For lithium Bowles found the habit plane to be approximately {144} of the cubic lattice. As the mechanism proposed by Burgers & Jacobs (1934) for zirconium involves as the principal shear a shear parallel to a {211} plane of the cubic lattice, the habit plane found for lithium cannot be directly understood on the basis of this mechanism. Therefore, as Bowles suggests, the possibility must be envisaged that the Burgers mechanism proposed for zirconium must be revised.

For our measurements we employed the original material used by Burgers & Jacobs when determining the orientation relationship between the two lattices in the zirconium transformation, namely, two crystals prepared by de Boer and Fast by thermal decomposition of ZrJ_4 on a core wire at a temperature above the transition point ($\pm 862°$ C.). Prepared in this way, these two 'crystals' were cubic single crystals (cubic in the parent phase); they had the form of rods of about 1 cm. length and 1 mm. thickness, one with a six-sided and one with a four-sided cross-section. On grounds, given in Burgers's paper, it was assumed that the lengths of these rods were originally parallel to a [111] direction and a [001] direction respectively, whereas the side-faces of both rods were parallel to {110} planes.

Several faces of both rods, which in their present state at room temperature consist of aggregates of definitely oriented hexagonal crystallites, were etched with etchant No. 3 (Roborson, 1949) and tho directions of the relief effects observed on the surfaces were measured. The accuracy of these measurements lies within 2°. Fig. 1 shows an example of an etched surface.

By plotting in stereographic projection the zones that were normal to each of the traces and determining their common point of intersection in a way analogous to that followed by Bowles, we found in the case of the six-sided rod that the habit plane was either {569} or {145}. The ambiguity between these two possibilities arises from the fact that, for a particular {110} boundary face, it is not known which of the two [111] directions in this plane coincides with the axis of the rod. Dependant on this choice the chosen plane can be considered as 'right' or 'left'.

This ambiguity does not present itself with the four-sided rod, as the length in this case is the only [001] direction in a {110} plane. We therefore hoped to solve the alternative with the aid of this rod, but unfortunately,

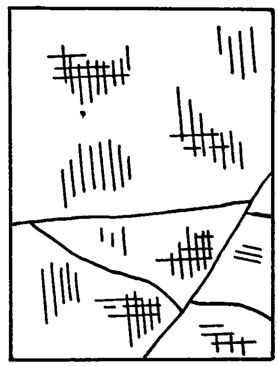

Fig. 1. Traces of habit plane on a {110} plane of a transformed single crystal of cubic zirconium, obtained with Roberson's etching reagent No. 3. Schematic drawing from actual photograph (magnification 50×).

for reasons unknown, we did not succeed with this rod in obtaining such well defined traces as with the six-sided one.

In an effort to solve this alternative we took the traces on *adjacent* boundary faces of the six-sided rod in pairs, considering each pair as the intersection of the habit plane with the two adjacent surfaces, and determined the poles of the planes of intersection for each of the two above-mentioned possibilities. For the possibility that gave {569} for the habit plane according to the method described above, the poles corresponding to the planes of intersection, while exhibiting a weak spreading, had —in stereographic projection—a 'centre of gravity' very close to {569}. For the other possibility not only was the spreading large, but also the point {145} lay outside the region enclosed by the poles. However, we do not want to stress this point too much.

We may conclude that our measurements agree with those of Bowles in so far as both point to a habit plane for the transformation of a cubic body-centred into a close-packed hexagonal lattice with rather complicated indices, different from the simple shear plane—{112}—which might be expected on the basis of the Burgers's mechanism. This, then, is in agreement with the results found for many transformations of 'martensitic' type (cf., for example, Table 2 given in a review by Cohen (1951)).

In addition, our results for zirconium leave open the possibility of a plane {569}, which is nearer to {112} than to {144}, as found by Bowles for lithium.

With regard to the physical meaning of habit planes with complicated indices we refer to a recent paper by Machlin & Cohen (1951) in which other recent considerations of this problem are discussed.

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Correction charts for Lorentz and polarization factors in anti-equi-inclination photographs.

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The equi-inclination method of studying the n-layer in a Weissenberg photograph has been widely employed, and recently tables and charts for applying corrections for the Lorentz and polarization factors (hereafter referred to as L and P) in a convenient and rapid manner have been published by many workers (Lu, 1943; Kaan & Cole, 1949; Cochran, 1948). In certain circumstances, e.g. when the crystal is in the form of a needle rotated about an axis perpendicular to it, or a thin plate about an axis parallel or perpendicular to it and is heavily absorbing, the normal-beam method of recording the zero level does not give a reliable set of relative intensities unless absorption corrections are carefully applied for each reflexion, a procedure which generally is rather laborious. In such cases, the anti-equi-inclination method comes in useful because the variation in the length of the X-ray path inside the crystal for the different reflexions is very much reduced and consequently the error introduced by neglecting a detailed absorption correction is also lessened. The author met with such a situation with some heavily absorbing inorganic crystals having a linear absorption coefficient of the order of 100 cm.$^{-1}$ even for Mo $K\alpha$ radiation, and which crystallized in the form of needles. As it was found that neither tables nor charts were available for making the geometrical corrections in a combined form, the author calculated the corrections $D = (LP)^{-1}$ over the whole sphere of reflexion and extending up to a value of 50° for the inclination angle μ.

It may be mentioned that the anti-equi-inclination method has also other applications besides the one mentioned above. Since the conditions for both anti-equi-inclination and equi-inclination methods are closely related, it provides a way of recording an equivalent zero-level photograph for every n-layer recorded by the equi-

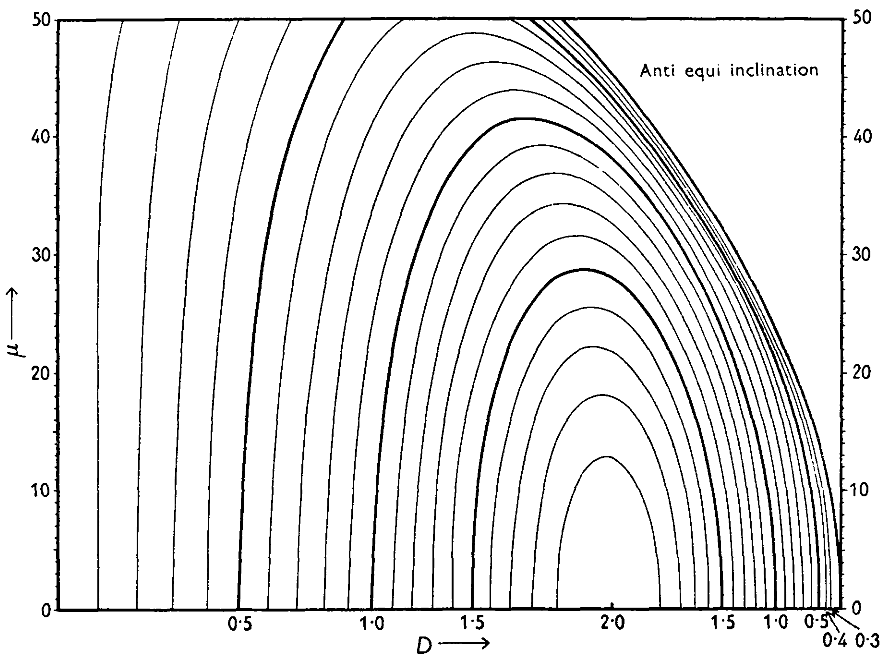

Fig. 1. Correction chart for Lorentz and polarization factors in anti-equi-inclination photographs. Approximately half full size.