tation of the original fabric[2] in relation to applied stress:

(1) The most pronounced and regular change in grain shape is flattening in the plane normal to the axis of applied compression. It is shown especially by grains which, by virtue of subparallel alignment of [0001] with the axis of compression, are unable to deform by normal twin gliding on $\{01\bar{1}2\}$. This applies to the majority of grains in specimens (*1* cylinders) compressed at right angles to the initial foliation (Pls. 1B, 3A).[3] In our compression experiments the ultimate fate of all grains is to become oriented (whether by twinning and rotation or by some other means) with [0001] approaching parallelism with the axis of compression. Flattening of grains normal to this axis should then ensue. In fabrics of *d* cylinders compressed at 45° to the initial foliation the mean plane of grain elongation seems to depart somewhat from that strictly normal to the axis of compression; but this is to be expected since deformation of such specimens is compounded of axial compression plus some degree of planar shear as described below under (4). Some counterpart of the fabrics experimentally developed under compression with or without accompanying shear should be expected among the fabrics of naturally deformed rocks. It is probably significant, therefore, that natural fabrics of a simple type marked by parallel lensoid grains, for the most part lacking recognizable twins, and having [0001] inclined at high angles to the corresponding foliation, are common.

(2) In extension experiments where most grains are unfavorably oriented for twinning on $\{01\bar{1}2\}$ (*T* cylinders in extension) the tendency for grains to become elongated parallel to the axis of extension, though recognizable, is not nearly so marked as the flattening effect described above.

(3) Twin gliding on $\{01\bar{1}2\}$ must invariably result in elongation of the grain parallel to [0001]. Now in the undeformed marble many grains have their shortest dimension more or less parallel or acutely inclined to [0001]. Consequently experiments which favor deformation of most grains by twin gliding will yield fabrics in which dimensional orientation of grains must necessarily be inconspicuous. Such is the case with compression (of *T* cylinders) parallel to the foliation (Pl. 4) or extension (of *1* cylinders) normal to the foliation (Pl. 3B).

(4) Where shortening or extension takes place at 45° to the foliation (in *d* cylinders; Pl. 2C, D) the average grain size is somewhat reduced, and continuous subparallel surfaces of slip appear in the rock fabric. These *s*-surfaces are compounded of individual grain boundaries, and so are necessarily somewhat irregular. In sections cut parallel to the cylinder axis their traces intersect the latter at angles of between 30° and 60°, so that, whatever their true form, they must be surfaces of high shear stress. In compressed cylinders the traces of visible *s*-surfaces intersect the compression axis at angles greater than 45° (Pl. 2C); in elongated cylinders they intersect the axis of extension at angles less than 45° (Pl. 2D). Similar rotation of crystal glide planes toward the axis of extension and away from the axis of compression during deformation of single crystals is well known to students of metal fabrics and is theoretically predicatable for this type of experiment. (Cf. Barrett, 1943, p. 303.)

The effects described above in paragraphs

PLATE 3.—PHOTOMICROGRAPHS OF DEFORMED YULE MARBLE

T sections; polarized light. SS = trace of initial foliation

A. Specimen 295 (*1* cylinder) shortened 19% normal to foliation at 300°C. B. Specimen 289 (*1* cylinder) elongated 18% normal to foliation at 300°C. C. Specimen 246 (*1* cylinder) shortened 20% normal to foliation at 20°C. D. Specimen 255 (*1* cylinder) shortened 19% normal to foliation at 150°C.

PLATE 4.—PHOTOMICROGRAPH OF DEFORMED YULE MARBLE

Specimen 365 (*T* cylinder) shortened 20% parallel to foliation (SS) at 300°C. *2* section; polarized light

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[2] Prior to deformation Yule marble has a single foliation marked by subparallel alignment of somewhat lensoid grains (Pl. 1A), and the *c* axes of the grains tend to be at angles of 50° to 90° to this foliation.

[3] All photomicrographs are taken in plane-polarized light, with analyzer out. The dark grains are ones in which internal reflection and refraction from closely spaced lamellae reduce the light transmitted.

(1)–(3) may also be observed in some of the material deformed at lower temperatures, but marginal fracturing and nonhomogeneous deformation of grains have tended to obscure the picture. Two figures illustrating the appearance of specimens deformed at 20°C and at 150°C are shown in Plate 3C and 3D.

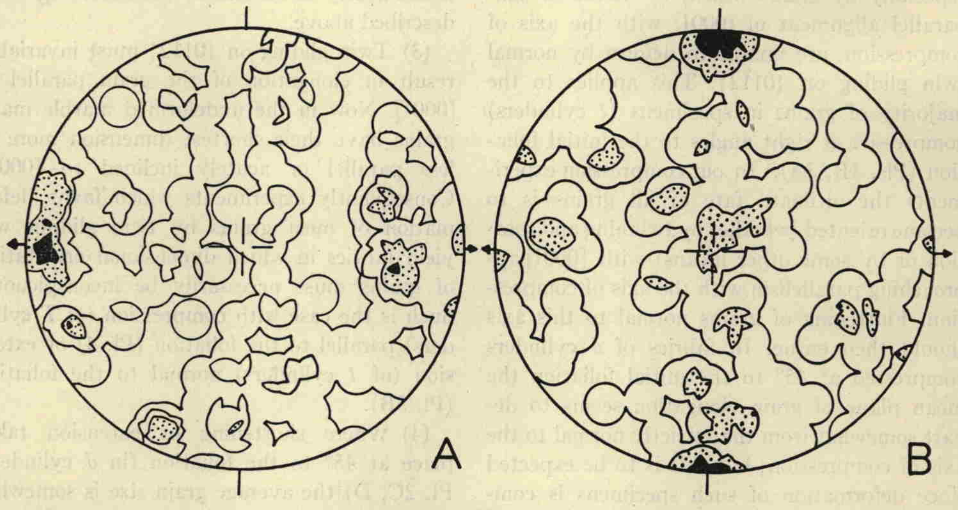

FIGURE 6.—ORIENTATION DIAGRAMS FOR *c* AXES OF CALCITE IN YULE MARBLE DEFORMED AT 300°C
Deformation of *1* cylinders by extension (E-W) normal to initial foliation.
A. Specimen 289, elongated 18%. 165 *c* axes in 150 grains (108 axes measured in *T* section, 57 axes in *2* section). Contours ½%, 1¾%, 3%, 5% per 1% area. B. Specimen 296, elongated 28%. 119 *c* axes in 100 grains. Contours 1%, 2½%, 5%, per 1% area.

Results of Petrofabric Analysis

Patterns of preferred orientation of [0001] axes, {01$\bar{1}$2} lamellae, and [*e*:*e*′] edges closely resemble those recorded in Parts III and IV for marble correspondingly deformed at lower temperatures. It is sufficient therefore to reproduce some typical orientation diagrams for specimens elongated or shortened by about 20 per cent at 300°C (Figs. 7, 8, 9), together with brief explanatory notes as follows:

Axes [0001] show the familiar strong tendency to become aligned parallel to the axis of compression or to distribute themselves in a girdle normal to the axis of extension. For strains of 20 per cent the initial pattern of preferred orientation (an E-W marginal concentration in diagrams of Fig. 7) is not completely obliterated. Comparison with diagrams for marble correspondingly deformed at 150°C (Part IV, p. 1397, Fig. 7) in some instances shows an apparent tendency for stronger preferred orientation at 300°C. It is doubtful, however, if this is real. In Figure 7, diagrams A, C, E, and F represent cases where many grains show strong effects of twinning. In these, especially in the high-temperature specimens, it is possible to measure directly the respective [0001] axes of the initial and of the newly twinned lattices. The apparently stronger orientation pattern of diagram A in Figure 7, as compared with Figure 7A (p. 1397) of Part IV, probably reflects the greater ease of measurement of [0001] in twinned lattices of calcite deformed at 300°C as contrasted with material similarly deformed at 150°C. In natural marble fabrics a similar difficulty arises in cases where many of the grains are strongly twinned. In Figure 6, diagrams for similarly oriented specimens (extension perpendicular to foliation) elongated respectively by 18 per cent and by 28 per cent at 300°C are compared. These diagrams illustrate progressive elimination of the initial E-W concentration of [0001] and establishment of a girdle in the N-S plane normal to the axis of extension. It is obvious that in the more deformed specimen twinning has proceeded so far in most grains that the newly twinned lattice is dominant and the [0001] axis of that