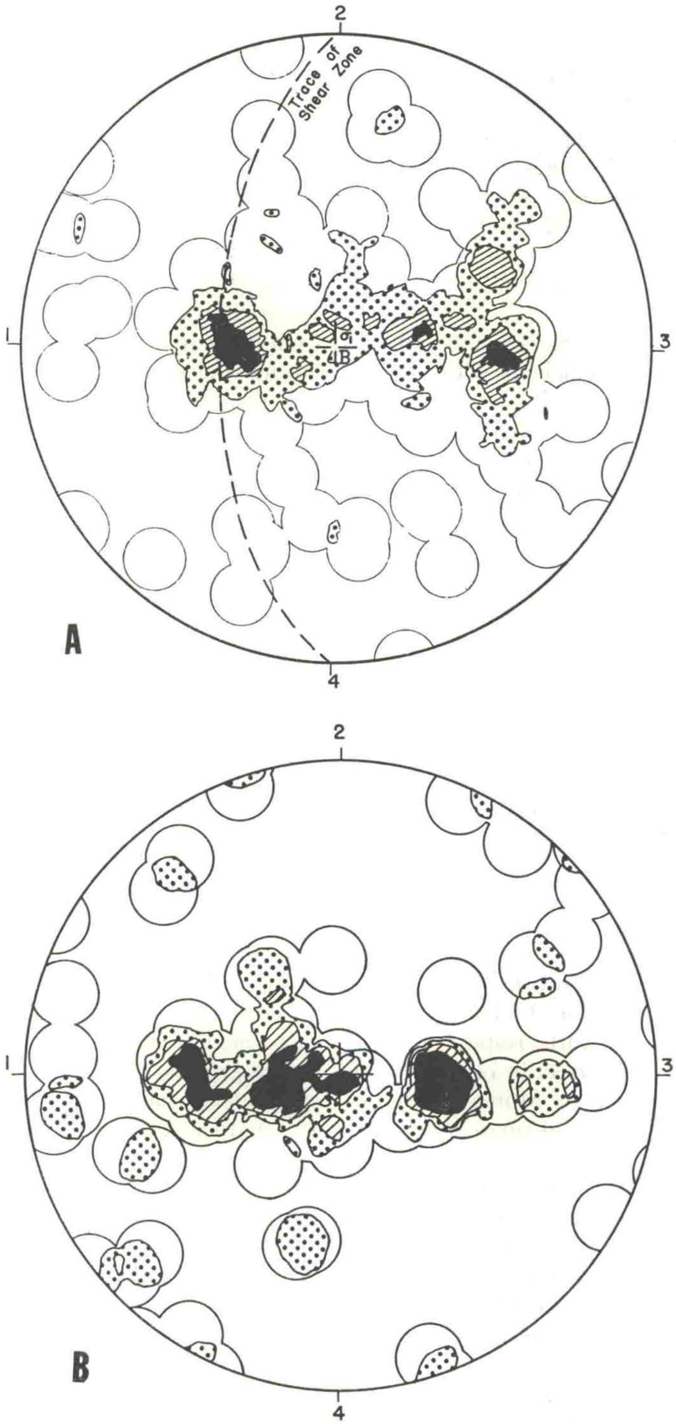

FIG. 15.—*A*, specimen 725. Composite diagram of normals to 102 *e* twin lamellae. The plane of the diagram is perpendicular to long axis of deformed cylinder, and σ_1 is at the center. Contours: 1, 3, 5, and 7 per cent per 1 per cent area. *B*, specimen 780. Composite diagram of normals to 61 *e* twin lamellae. The plane of the diagram is perpendicular to long axis of deformed cylinder, and σ_1 is at the center. Contours: 1.66, 3.33, 5.0, and 6.66 per cent per 1 per cent area.

each calcite grain the highest spacing index is correlated with the highest resolved shear-stress coefficient (S_0). That is, of the family of three *e* planes, twinning is best developed on that plane for which S_0 is highest. If this holds for calcite-cemented sandstones, then on the average the cement also responds to over-all loading instead of to local stresses at grain boundaries.

In specimens 762, 725, 778, and 780, resolved shear-stress coefficients with respect to the known position of σ_1 were determined for e_1, e_2, and e_3 in each calcite crystal which contained at least one set of twin lamellae. The method is described by Handin and Griggs (1951, p. 866–869, fig. 3). The results are listed in table 2. The direction sense for twinning with respect to the external load axis is correct in 74 per cent of the measured e_1 lamellae. Moreover, the S_0 values (0.23–0.30) are adequate for twinning. Since the direction sense of twinning and S_0 correlate significantly with σ_1 in each specimen, it is reasonable to conclude that statistically the individual crystals of calcite cement are twinned with respect to the load on each cylinder as a whole rather than to local stress concentrations.

TABLE 2

RESOLVED SHEAR-STRESS COEFFICIENT (S_0) DATA

Conditions	Specimen 762	Specimen 725	Specimen 778	Specimen 780
a) Number of grains measured	50	100	50	60
b) Number of grains exhibiting twin lamellae	49	98	50	49
c) Percentage of grains in which e_1 lamellae twinned in correct sense with respect to σ_1	76	74	76	71
d) Average S_0 on e_1 for grains in (*c*)	0.30	0.25	0.28	0.23
e) Percentage of grains (*c*) in which e_1 lamellae have the highest S_0 for correct sense of gliding when compared to e_2 and e_3	92	88	89	57

In specimens 762, 725, and 778, the highest values of S_0 are for planes other than those designated as e_1 in about 10 per cent of the cases (table 2, row *e*). In specimen 780, true e_1 lamellae were not identified in 43 per cent of the cases. Either this plane of highest spacing index is inclined to the thin section at too small an angle to be measurable, or the spacing indexes of two or more of the planes are too high or too nearly equal to permit distinction.

The fact that the calcite cement responds to over-all loading leads to the conclusion that it should be possible to determine average orientations of principal stresses in rocks from measurements of twin lamellae. Following the methods outlined previously, one can plot the compression axes that would be most effective in producing the observed e_1 lamellae in specimens 762, 725, 778, and 780 (fig. 16, *a–d*, respectively). For specimens 762, 725, and 778, the "center of gravity" of the highest concentrations in each diagram marks the deduced position of the greatest principal stress (σ_1'), which is about 20° southeast, 10° north, and 10°–15° southeast, respectively, of the known position of σ_1 in each specimen. Doubling the strain in specimen 778 sharpens the concentration of compression axes about σ_1. The distribution of compression axes is more diffuse for specimen 780 than for the other specimens because of the high percentage of incorrectly identified e_1 lamellae and because of the external rotations of many of the grains. Even so, there is an obvious grouping of compression axes about the correct position.

The lack of deformation effects in specimen 724, which was subjected only to uni-