restricted to deformation at high temperatures, which is relatively rare in all but intensely deformed metamorphic rocks. Crampton[124] studied Cambro-Ordovician dolomite and calcite marbles from the northwest Highlands of Scotland. He determined compression and extension axes from f twin lamellae in dolomite as well as from e twin lamellae in calcite. Both gave similar results--compression axes oriented at high angles to the foliation. Christie[125] studied deformed dolomite from the Moine thrust zone. He concluded that the compression and extension axes inferred from twinned f lamellae reflect the final stage of deformation. He found the derived compression axes to be oriented at high angles to the foliation in the Moine thrust block.

In general, there are certain inherent limitations in the use of twin lamellae to derive principal stress directions. (1) Derived compression and extension axes are fixed by the crystallographic orientation of the grains in the rock. Accordingly, only when the grains are nearly randomly oriented can one equate the derived stress axes to the principal stresses σ_1 and σ_3.[117] (2) Some of the spread in the fabric diagrams of derived compression and extension axes results from the assumption that S_o is always 0.5. In reality twinning can occur when the load axes are inclined at angles far from 45 degrees to the gliding plane and direction, provided τ_c is exceeded in the proper sense. The scatter in these patterns can be reduced by constructing partial diagrams containing compression and extension axes from only the best developed e_1 lamellae.[112] (3) Designation of host and twinned lattices (characterized by c_v and c_v', respectively) is difficult in intensely deformed grains. By necessity the host is defined as the dominant lattice of the crystal. As twinning on e_1 progresses, however, the host lattice gives way to the twinned lattice as the predominant structure. In grains which are in reality more than half twinned, an observer must select the now dominant lattice as the host.* Compression and extension axes located with respect to e_1 and this new "host" (c_v') will depart 90 degrees from the true axes associated with the twinning (Fig. 32). (4) Use of false e_1 lamellae to

*Crystals more than half twinned are usually elongated by the shear strain of twinning. The dominant lattice of nearly equidimensional grains, therefore, is very probably the "true" host.

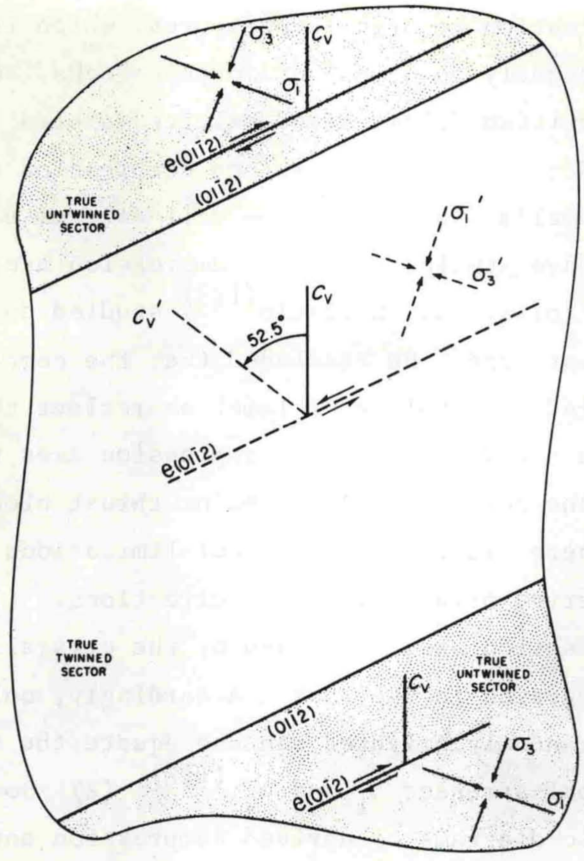

Fig. 32—Diagrammatic section through a calcite grain which is more than half twinned by gliding on $e(01\bar{1}2)$. Plane of the section is normal to the twin plane and contains the gliding direction. $(01\bar{1}2)$ is common to both the twinned and untwinned structures, which are designated by c_v' and c_v, respectively. Orientations of σ_1 and σ_3 that would best cause the twin gliding are shown at the top and bottom of the grain with respect to the true host structure. An observer, however, would mistake the dominant portion of the grain (the real twinned portion) to be the "untwinned host." That is, he would measure c_v' and the observed twin lamellae $(01\bar{1}2)$, and from these measurements would position σ_1' and σ_3' as indicated in the center of the grain. These orientations for the principal stresses are 90 degrees out of phase with those actually best oriented to produce the twinning.

position compression and extension axes results in misleading interpretations. For example, as twinning nears completion on e_1, the "true" e_2 lamellae may appear to be the best developed set in the grain and incorrectly designated e_1; e_2 or e_3 sets may appear to be the best developed in a grain because the true e_1 lamellae are inclined at too low an angle to the plane of the thin section to be correctly evaluated;