shows the remarkable consistency with which the same crystallographic planes control the faults in cylinders of the same orientation. The most prominent faults are invariably parallel to the basal plane or the unit rhombohedra r and z. Faults are present in a few specimens more or less parallel to the first order prism m and the second order prism a, but these are very rare.

The main faults are invariably parallel to planes of high shear stress. Generally when the basal plane or a unit rhombohedral plane is inclined at slightly less than 45° to the axis of loading, the main faults are parallel to this plane. But when the basal or rhombohedral plane with highest shear stress is inclined at slightly more than 45° to the maximum principal stress axis, faulting still takes place parallel to this plane. For example, in C and D cylinders, faulting takes place on rhombohedral planes inclined at approximately 48° to the maximum principal stress axis; in cylinders $\perp m$, the main faults are also rhombohedral planes, inclined at approximately 52° to the axis of compression.

Microtextures in the Deformed Quartz.—The deformed quartz in the samples contains small birefringent haloes (rosettes) which are visible when the sections are close to the extinction positions between crossed polarizers. They are most obvious when the crystal is at extinction as in other positions they are obscured by the higher interference colors of the remainder of the crystal. They appear to be of two distinct sizes: the rays of the larger rosettes range from 0.05 to 0.1 mm in length when the crystals are at extinction; the smaller ones are an order of magnitude smaller than this. Both types are situated in areas of the crystal that are free from faulting or severe fracturing, but the distribution of the two types is different.

Most of the large haloes are associated with the extension fractures parallel to the ends of the cylinders and are located at the inner ends of fractures which extend only part of the way across the crystal (plate 3A, B). A few are isolated and not apparently associated with visible cracks (pl. 3C). A number of the extension cracks in the thin sections do not extend to either side of the crystal, and there is a birefringent halo at each end of these cracks. One further relationship between the haloes and fractures appears to be significant: some of the larger haloes are located on a short fracture in a shear orientation, perfectly parallel to the main faults in the samples; these fractures (approximately 0.1 mm long) change orientation abruptly and become parallel to the ends of the sample; these cracks extend only to one side of the crystal (pl. 3C). The disposition of the bright and dark rays of the rosette-like haloes varies with the crystallographic orientation of the sample and with rotation of the section between crossed polarizers. The structures are most clearly visible in crystals sectioned parallel to the base (1-cut of $\perp$ m cylinders), which are almost isotropic. A few of these large haloes are present in the samples which were unloaded before rupture took place.

The smaller haloes are not associated with cracks and are much commoner than the large. They are much more evenly distributed through the sections and are generally, if not invariably, centered on minute dark inclusions. The bright rays in all the haloes are parallel, giving the quartz a striated appearance in thin section on a fine scale. A close examination of thin sections of the undeformed starting material revealed that a similar texture is present, in less

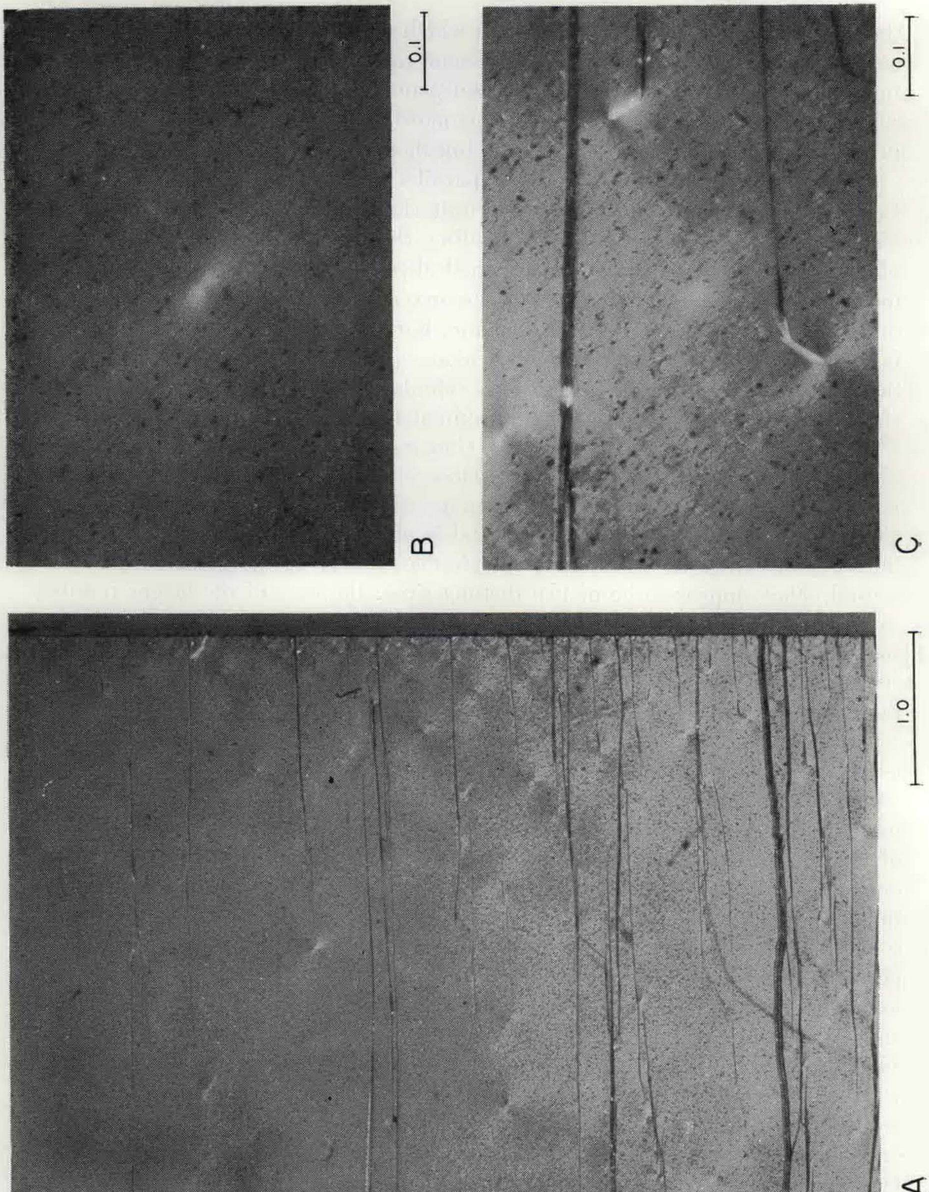

PLATE 3

Photomicrographs between crossed polarizers showing birefringent haloes (rosettes) in deformed samples. Scales are in mm.

A. Portion of sample 756, showing the relationship of haloes to extension fractures. Cylinder axis is north-south. Note localization of haloes at the ends of fractures and, near the center of the photograph, a short fracture terminating in a halo at both ends.

B. A large halo at the end of an extension fracture. Small haloes are also visible in the quartz.

C. Two haloes associated with short shear-fractures, which are deflected and become extension fractures. An isolated halo, unassociated with fractures is visible in the top left, above the extension fracture which traverses the photograph.