Some investigators (FAIRBAIRN, 1941; INGERSON and TUTTLE, 1945; CHRISTIE and RALEIGH, 1959), emphasized therefore that Böhm lamellae have not to be parallel to rational lattice planes. FAIRBAIRN (1941) suggested gliding along a fixed direction, presumably the edge between rhombohedron and prism face, however in varying glide planes. CHRISTIE and RALEIGH (1959) proposed that Böhm lamellae are kinkbands (deformation lamellae) produced by gliding parallel to c: Kinking is assumed to occur along irregular surfaces inclined at high angles to c which are oriented such that there is high resolved shear stress suitable for gliding parallel to c.

The diagnostic characteristics of Böhm lamellae by which they can be distinguished from planar structures found in quartz from Ries rocks and from other suspected meteoritic craters can be summarized in the following way:

Böhm lamellae

(1) are not necessarily parallel to rational lattice planes and prefer an inclination of 10—20° to (0001),

(2) show nearly always an undulatory trend (bending),

(3) are very often not strictly parallel to each other,

(4) are always connected with zones of undulatory extinction,

(5) occur mostly in one and rarely in more than two sets per grain,

(6) show a distinct geometrical relationship between their fabric and the principle stress axes of the deformed rock.

4.2. Planar Structures Produced in Experiments under Static High Pressure Conditions

Earlier investigations of mechanical deformation of quartz at room temperature and pressures up to 30 kbar indicated only brittle fracture without evidence of plastic flow (CHRISTIE, HEARD, LA MORI, 1964). But application of higher temperatures (500—900° C) and confining pressures between 15 and 20 kbar resulted in plastic flow of single quartz crystals and polycrystalline materials (CHRISTIE, GRIGGS, CARTER, 1964; CARTER, CHRISTIE, GRIGGS, 1964).

Their recovery products displayed truly microscopic planar structures. CHRISTIE, GRIGGS and CARTER (1964) distinguished the following four principal types:

(1) Deformation lamellae: narrow, closely spaced planar or lenticular features, occurring in parallel sets, terminating inside the individual grain boundaries and extinguishing exactly or very close with the adjacent quartz. Commonly, the lamellae are approximately normal to zones of undulatory extinction. In plane polarized light, the lamellae show greatest relief (which appears to be negative on the basis of Becke line effects) when the vibration direction is parallel to n_e. In bright field illumination the lamellae have the appearance of thin bands 1—2 μ thick with an index of refraction and a birefringence slightly less than that of the host quartz. When the microscope is focussed on the upper surface of the thin section, they appear brighter than the host quartz and are flanked by fuzzy dark regions. In phase-contrast illumination the lamellae are asymmetric — dark on one side and bright on the other. It is concluded that the lamellae are comprised of a region higher index on one side of a sharp discontinuity, respectively, and

lower index of refraction on the other side. This variation in refractive index in the immediate vicinity of lamellae is associated with a variation in birefringence, one side having a higher, the other side a lower birefringence than the host. Each region of abnormal index decays within a very short distance into the index of the host quartz. The asymmetric nature of these lamellae is also confirmed by microphotographs using a two-ray-interference-microscope (own observation).

The poles of the lamellae are nearly symmetrically distributed around and angle of 45° to the direction of maximum compression, the lamellae, therefore originating in planes of maximum resolved shear stress.

In quartzite samples most lamellae are parallel or subparallel to (0001), the poles forming angles between 0 and 10° to c (maximum between 2 and 6°). The poles of other lamellae cluster between 20 and 60° to c.

The development of deformation lamellae in single crystals depends heavily on the orientation of the crystal lattice to the axes of stress. Deformation lamellae parallel to (0001) are most readily formed, when compressed in a direction perpendicular to $(10\bar{1}1)$. Closely spaced sets of this orientation are produced if shear stress on the basal plane is high. In crystals of the same orientation there are also lamellae parallel to one of the prism faces. Other lamellae have been identified with $\{10\bar{1}1\}$, $\{11\bar{2}2\}$ and $\{10\bar{1}2\}$ (Christie and Green, 1964).

The deformation lamellae parallel or subparallel to (0001) have been extensively investigated by Christie, Griggs and Carter (1964). The lamellae are interpreted to be caused by slip in the (0001)-plane along the a-axis. It was shown that the optical asymmetry is consistent with photoelastic effects which would be expected from an array of edge dislocations of Burgers vektor $\vec{b} = \vec{a}$ in the basal plane. Calculations of the stress field due to such an array show that a dislocation density of $8 \cdot 10^4$ cm^{-1} per lamella is required to produce the observed optical effects. The validity of this model was supported by electron micrographs of replicas of etched polished surfaces of crystals with such deformation lamellae. Pyramidal etch pits the density of which varied from $5 \cdot 10^4$ to $13 \cdot 10^4$ cm^{-1} were observed in rows parallel to the trace of (0001).

Further studies applying transmission electron microscope technique (McLaren Retchford, Griggs and Christie 1967) revealed that basal slip produces narrow Brazil twin bands parallel to (0001) and that the nature of the dislocations is either of pure screw type ($\vec{b} = \vec{a}$ [10.0]) or of a particular mixed character, predominately edge type with a 30° screw component.

Minor deviations of lamellae from (0001) are explained by Christie, Griggs and Carter (1964) by two possible mechanisms: (1) some lamellae may originate as "en echelon" arrays of basal dislocations locked in different slip planes. (2) lamellae being either initially parallel to the base or consisting of en echelon arrays may be internally rotated by slip on some other system.

(2) Extension fractures: are short, lenticular features which occur in subparallel sets. They invariably terminate within grain boundaries and are generally shorter and less continuous than the deformation lamellae. Their inclination in thin sections cannot be determined as accurately as that of lamellae. In the plane normal to the thin section they have strongly lenticular profiles. They are not associated