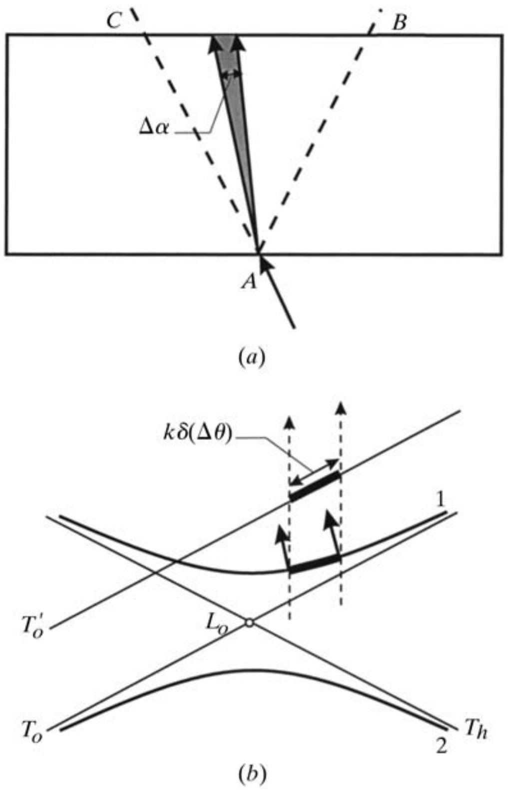

Fig. 5.1.8.2. Packet of wavefields of divergence $\Delta\alpha$ excited in the crystal by an incident wavepacket of angular width $\delta(\Delta\theta)$. (*a*) Direct space; (*b*) reciprocal space.

(ii) Large values of $\mu_o t$ (of the order of 6 or more) (Fig. 5.1.8.3*b*). The predominant factor is now anomalous absorption. The wavefields propagating along the edges of the Borrmann triangle undergo normal absorption, while those propagating parallel to the lattice planes (or nearly parallel) correspond to tie points in the centre of the dispersion surface and undergo anomalously low absorption. The intensity distribution now has a maximum in the centre. For values of μt larger than 10 or so, practically only the wavefields propagating parallel to the lattice planes go through the crystal, which acts as a wave guide: this is the Borrmann effect.

5.1.8.3. *Spherical-wave Pendellösung*

Fig. 5.1.8.4 shows that along any path *Ap* inside the Borrmann triangle two wavefields propagate, one with tie point P_1, on branch 1, the other with the point P'_2, on branch 2. These two points lie on the extremities of a diameter of the dispersion surface. The two wavefields interfere, giving rise to *Pendellösung* fringes, which were first observed by Kato & Lang (1959), and calculated by Kato (1961*b*). These fringes are of course quite different from the plane-wave *Pendellösung* fringes predicted by Ewald (Section 5.1.6.3) because the tie points of the interfering wavefields are different and their period is also different, but they have in common the fact that they result from interference between wavefields belonging to different branches of the dispersion surface.

Kato has shown that the intensity distribution at any point at the base of the Borrmann triangle is proportional to

$$\left\{J_o\left[A(x_o x_h)^{1/2}\right]\right\}^2,$$

where $A = 2\pi(\gamma_o\gamma_h)^{1/2}/(\Lambda_L \sin\theta)$ and x_o and x_h are the distances of *p* from the sides *AB* and *AC* of the Borrmann triangle (Fig. 5.1.8.4). The equal-intensity fringes are therefore located along the locus of the points in the triangle for which the product of the distances to the sides is constant, that is hyperbolas having *AB* and *AC* as asymptotes (Fig. 5.1.8.4*b*). These fringes can be observed on a section topograph of a wedge-shaped crystal (Fig. 5.1.8.5). The technique of section topography is described in *IT* C, Section 2.7.2.2. The *Pendellösung* distance Λ_L depends on the polarization

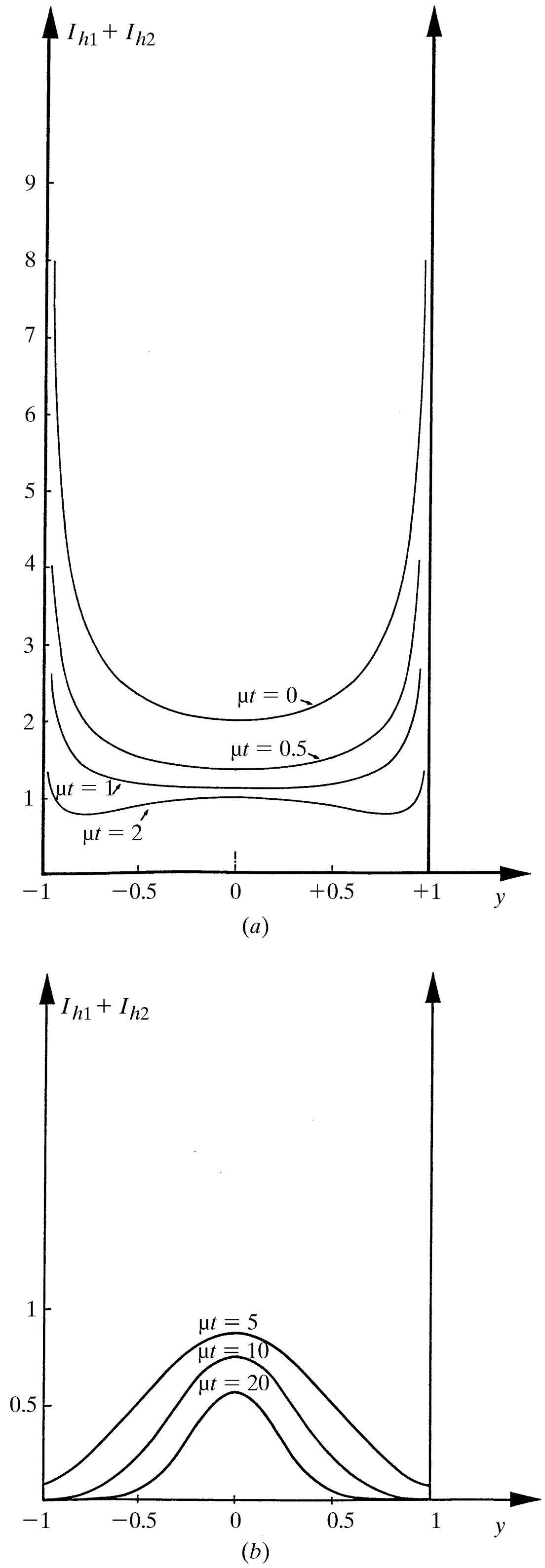

Fig. 5.1.8.3. Intensity distribution along the base of the Borrmann triangle. *y* is a normalized coordinate along *BC*. (*a*) Small values of μt. The interference (spherical-wave *Pendellösung*) between branch 1 and branch 2 is neglected. (*b*) Large values of μt.

references