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A method for setting the equi-inclination angle.

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It sometimes happens that the equi-inclination angle μ cannot be set precisely in advance, either because the lattice-level coordinate ζ is not yet known accurately or because the instrument has fallen out of adjustment (see Buerger, 1942; the nomenclature in this note is the same as his). The most important consequence of mis-setting μ is not, as is sometimes thought, that reflections will be lost (though this can happen) but that the Lorentz factor can be seriously affected, especially for near-in spots. This note describes a method for finding the correction $d\mu$ to be applied to μ. It takes only a few minutes, gives accurate results, and can be applied to any crystal whose symmetry is monoclinic or higher.

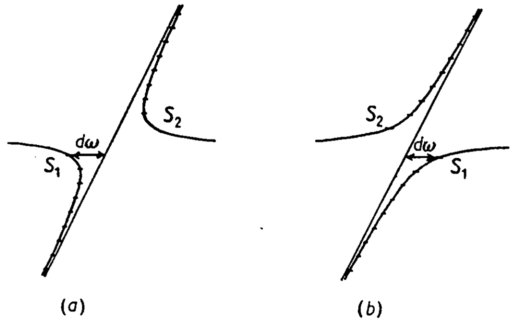

Fig. 1. Appearance of a central lattice line (*a*) when the μ used was too small, and (*b*) when the μ used was too large. Compare Buerger's Fig. 164.

An error in μ will be revealed by the fact that a central lattice line (row of reciprocal-lattice points which passes through the rotation axis) appears on the photograph not as a straight line but as one of the forms shown in Fig. 1. What has happened is that each spot has been formed at a moment when the rotation angle ω differed by $d\omega$ from what it should have been.

How is $d\omega$ related to $d\mu$? As shown in Fig. 2(*a*), when μ is correctly set the reflecting circle for the net being photographed passes through the rotation axis, but when there is an error $d\mu$ the rotation axis misses the circle by $\zeta d\mu$, passing inside the circle if μ is too large and outside it if μ is too small. Then, as is evident from Fig. 2(*b*), $\xi d\omega = \zeta d\mu$, or

$$d\mu = \frac{\xi}{\zeta} d\omega \,. \tag{1}$$

The method rests on this formula. A test Weissenberg is taken, which need be only wide enough to include such a pair of spots as S_1 and S_2 in Fig. 1, and exposed only long enough to make them visible. It is convenient to take this photograph twice on the same film, displaced horizontally by a few centimeters, to give an accurate horizontal. Two ten-minute exposures should be enough. The error $d\omega$ is read with the aid of a sheet of transparent plastic scribed with a horizontal line and one inclined at an angle (for most cameras) of $\tan^{-1} 2 \doteqdot 63{\cdot}4°$. Lastly, $d\mu$ is calculated from (1); the sign of $d\mu$ is obtained by reference to Fig. 1.

The method is applicable whenever there is a central lattice line. With a monoclinic crystal mounted on a or c this will be, say, the $40l$'s or the $h03$'s, respectively. A crystal of higher symmetry, or a monoclinic crystal mounted on b, will have many central lattice lines.

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Reference

Buerger, M. J. (1942). *X-ray Crystallography*. New York: Wiley.

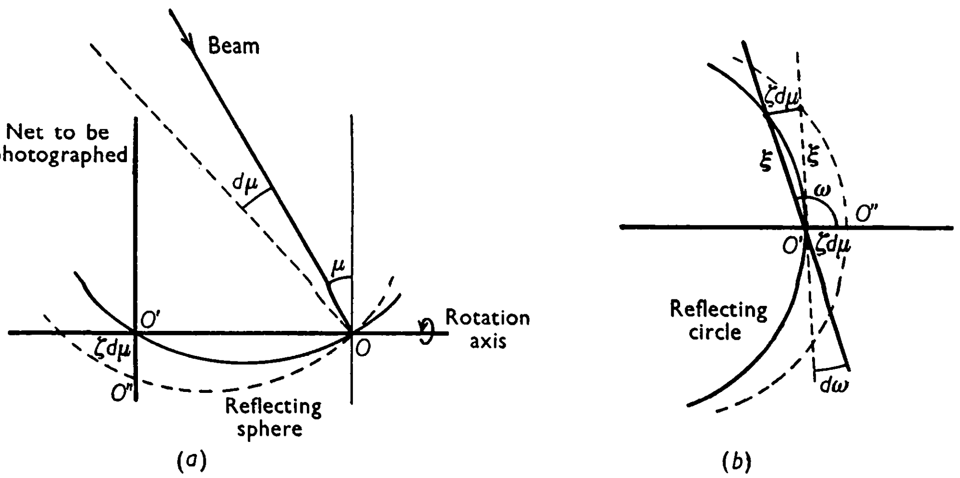

Fig. 2. (*a*) View from above, showing that the circle of reflection misses the rotation axis by $\zeta d\mu$. The circle of reflection is not explicitly shown here, because it is edge-on in this view, but its trace lies in the net to be photographed. (*b*) View down the rotation axis, showing that $\xi d\omega = \zeta d\mu$. Here the reflecting circle is explicitly shown. In both drawings the parts shown in broken lines refer to the case when μ is mis-set. These drawings correspond to the lower and upper parts of Buerger's Fig. 139.