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A DEVICE FOR VIEWING X-RAY PRECESSION PHOTOGRAPHS IN THREE DIMENSIONS*

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The understanding of the reciprocal lattice in *x*-ray crystallography is fundamental to the interpretation of the precession photographs taken with a Buerger precession camera. The undistorted *x*-ray diffraction photograph obtained with such a camera from an appropriately oriented single crystal shows the reciprocal lattice in two dimensions. A device is described here to show the photographed reciprocal lattice of the crystal in three dimensions.

In crystal systems with orthogonal axes, the reciprocal axes are also perpendicular to each other and coincide in direction with the direct axes. A precession photograph taken of such a crystal shows a square or rectangular net of reflections. Since the direct axis [*hkl*] is parallel to the reciprocal axis [*hkl*]*, the reciprocal nets of each level will superimpose exactly. In such cases, visualization of the orthogonal reciprocal cell is simple. If the crystal has an oblique cell, the direct axes and the reciprocal axes are not parallel. The reciprocal net of each level will then be displaced along a reciprocal axis by an amount related to the obliquity of the cell. If the displacement is considerable, visualization of the reciprocal cell is not easy.

A device which provides an excellent three-dimensional view of the photographed reciprocal cell can easily be built. It consists of a box made of $\frac{1}{4}$-inch clear plastic material such as Lucite. The side plates are "dadoed" or slotted and held together by screws to a top and a bottom plate. The precession films are inserted along the slots and are held in place one on top of the other. The slots are spaced 1 mm. apart to allow the films to be placed at the approximately correct heights according to the scale. Fig. 1 shows the transparent box with precession films in place. The dimensions of the box are as follows:

Width of cut of slots	$\frac{1}{64}$ inch or 0.4 mm.
Depth of slots	$\frac{1}{16}$ inch or 1.6 mm.
Spacing of slots	$\frac{1}{25}$ inch or 1 mm.
Width between side plates	$5\frac{7}{8}$ inches 12.4 cm.
Overall outside dimension	5 by $6\frac{3}{8}$ by $1\frac{1}{2}$ inches.

A stereoscopic pair of photographs (Fig. 2), is taken of superimposed films in this device and, when viewed with a pocket stereoscope, illustrates the clarity with which the oblique reciprocal cell can be visualized.

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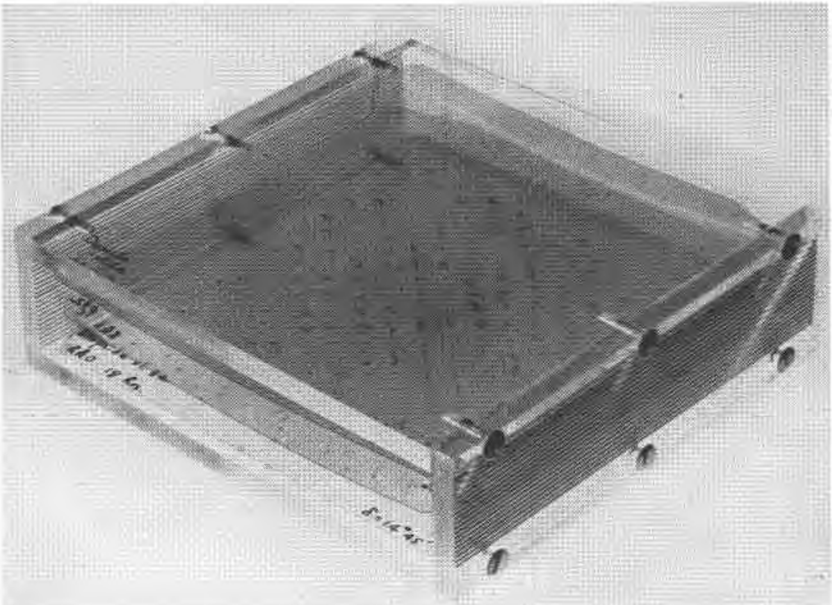

FIG. 1. An oblique view of the box showing the grooved side plates and the precession films in place.

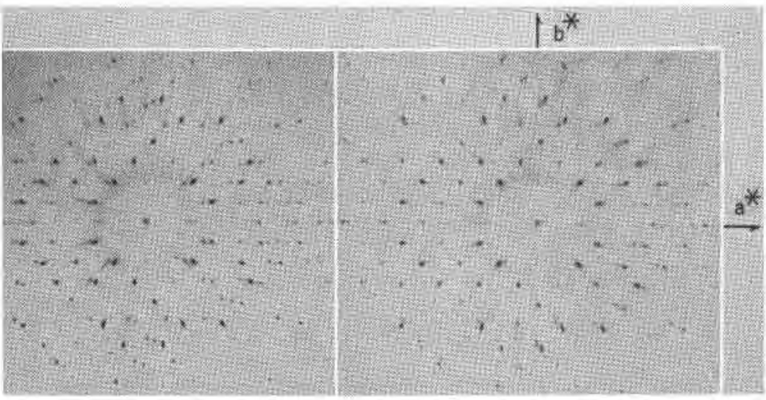

FIG. 2. Stereoscopic pair showing the reciprocal lattice of diopside with precession films of *hk*0, *hk*1 and *hk*2 in place in the device. $+b^*$ is towards the top of the paper, $+a^*$ is to the right and $+c^*$ is about 74° from a^* (c-axis is at the center, normal to the paper towards the viewer).

The crystal chosen for illustration is diopside, (monoclinic: $a=9.74_7$, $b=8.91_8$, $c=5.25_8$ Å, $\beta=105°\ 55'$; space group $C2/c$). The photographs were taken with the x-ray beam parallel to the c axis. The zero level is placed at the bottom, the first level is about 8 mm. above the zero level and the second level (which may not be needed) is placed 8 mm. above the first level. Both upper level nets are displaced towards the viewer's right, along the c^* axis. The reciprocal unit cell chosen is outlined by the reflections. With the three dimensional view of the reciprocal lattice in front of one, the indexing of the reflections is simplified and systematic extinctions of reflections readily observed. If more than one crystal of the substance is used, the device also helps in maintaining a uniform setting or orientation of the reciprocal cell chosen. The device should therefore be useful to experienced crystallographers as well as to students.

I wish to thank my colleague, Joseph F. Abell, who supervised the construction of the box, and to Joan R. Clark and D. E. Appleman for their helpful criticism.

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ORIGIN OF EMBAYED QUARTZ CRYSTALS IN ACIDIC VOLCANIC ROCKS

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Embayed or rounded quartz crystals are ubiquitous features of acidic volcanic rocks. Most petrology textbooks offer no explanation of why the quartz crystals of these rocks, that contain abundant normative quartz, are not in equilibrium with the groundmass. Almost all authors who have described these features have noted that the embayed quartz crystals are dipyramidal and so have the form of β or high temperature quartz (Cf., Williams, Turner & Gilbert 1954, p. 123 & 126). β quartz inverts to α or low temperature quartz on cooling past its inversion point.

In a recent textbook Moorhouse (1959), in describing rhyolites and quartz latites, notes (p. 207–208),

"Quartz phenocrysts often exhibit "corrosion" effects. . . . In the past these textures have been attributed to corrosion of the phenocrysts by the matrix. The suggestion has also been made that "corroded" quartzes are due to irregular amoeboid growth rather than corrosion. In corroded feldspars, such as those in Fig. 113A (quartz latite, San Juan Mts., Colorado), there can be little doubt that they have been attacked and invaded by the matrix. Surely these are xenocrysts foreign to the magma enclosing them. The same impression is given by the textures of Figs. 15A, B, C (quartz latites, San Juan Mts., Colorado). In these, angular, sometimes corroded chips and fragments of quartz, feldspar and ferromagnesians occur in a glassy or microcrystalline matrix of acid composition. It is