

**A Method for Evaluating Glass Knives.\*** BY HUNTINGTON SHELDON. (From the Departments of Surgery, Orthopaedic Division, and Pathology, Johns Hopkins Medical School, Baltimore.)†

In microtomy, faults of the cutting edge are an obvious and avoidable source of artifact. The purpose of this communication is to describe a simple apparatus for viewing and marking the cutting edge of the glass knives which are used in sectioning for electron microscopy (1, 2). The apparatus consists of a monocular microscope with base, arm, body tube, coarse and fine adjustments, an annular incident light objective lens, and a mechanical stage that has been modified to hold a glass knife. The apparatus is illustrated in Text-fig. 1.

The advantage of the annular incident light illumination is that rough surfaces reflect light into the objective and appear bright; an effect opposite to that obtained when strictly vertical illumination is used. A facet without faults appears as a narrow, white line in a dark field, while a faulty or dirty edge is a speckled, widened, or fissured white line. Three different knives are shown in Figs. 1 to 3. We have found a 50 × objective lens combined with a 15 × eyepiece satisfactory for discriminating between cutting edges.

The glass knife is mounted vertically between a rigid pillar and thumb screw allowing adjustment of the angle of viewing. This vertical mounting together with the length of the objective lens make it necessary to increase the usual working distance between the objective lens and the mechanical stage. To that end a block was placed in the arm of the microscope above the mechanical stage.

However, a microscope with a vertically adjustable stage and adequate range of motion as well as the annular incident light illumination and objective lens is commercially available.<sup>1</sup>

The glass knife holder is mounted on a plate which is screwed to the usual slide-holding mechanism of the mechanical stage. This provides for systematic lateral and transverse motion of the knife. While moving the knife laterally to examine the edge it is necessary to adjust the focus continually because of the slight curvature of the cutting edge. When a region of the cutting edge is found to be free of faults, its exact location may be marked by introducing the diamond point until it touches the glass below the knife edge.

The diamond marking pencil is mounted just below the level of the glass knife edge and its mounting is fixed to the stage itself in line with the midpoint of the objective lens. Screws permit precise adjustment of the small diamond marking point to the exact midpoint of the objective lens. The slotted and machined mounting of the diamond allows a mark to be made perpendicular to and below the cutting edge so there is no danger of shattering or fragmenting the cutting edge. These marks are seen subsequently with the dissecting microscope when the knife is mounted in the microtome. The specimen may be sectioned then by the most perfect part of the edge of the glass knife.

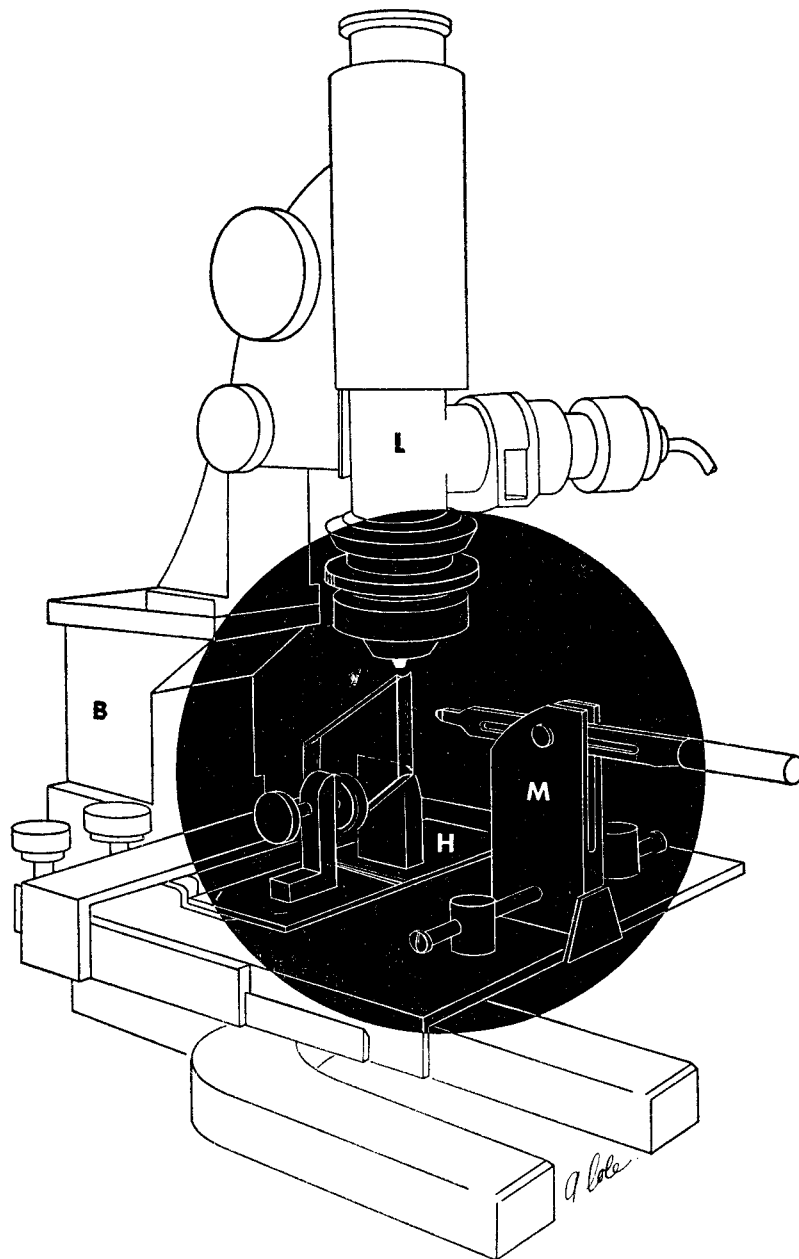
#### REFERENCES

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2. Cameron, D. A., *J. Biophysic. and Biochem. Cytol.*, 1956, **2**, No. 4, suppl., 57.

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<sup>1</sup>E. Leitz Incorporated, New York.



**TEXT-FIG. 1.** A monocular microscope is modified for viewing and marking glass knives by inserting a block (*B*) in the arm of the microscope to increase the working distance between the mechanical stage and the incident light illuminator (*L*). The glass knife is vertically mounted in a holder (*H*) which is screwed to the slide clamp of the mechanical stage. A slotted diamond marking pencil in a machined mounting (*M*) is attached to the stage at the midpoint of the objective lens.

EXPLANATION OF PLATE 204

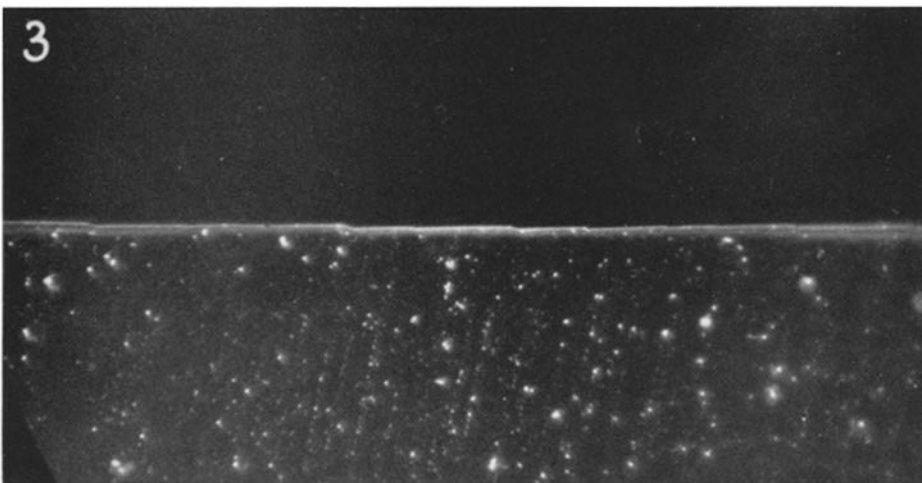
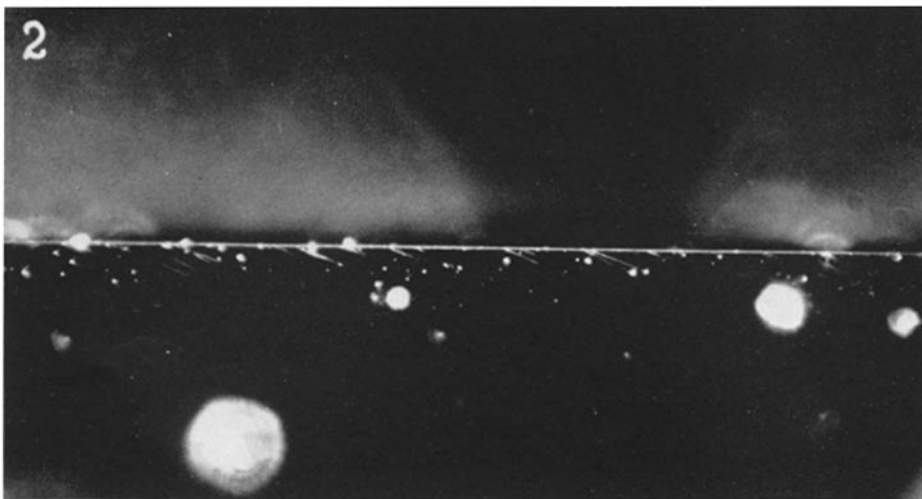
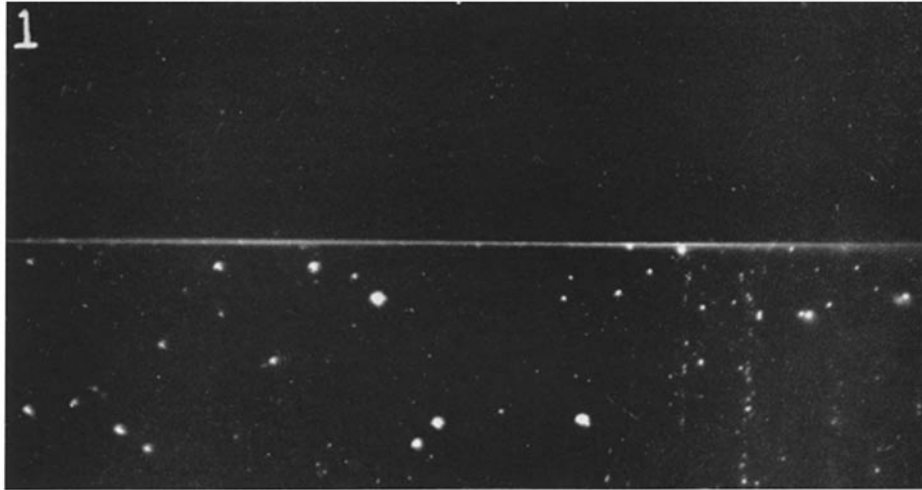
## PLATE 204

FIG. 1. A cutting edge with a thin facet and very little irregularity.

FIG. 2. A cutting edge with a thin facet. Delicate fracture lines which cannot be seen in a cursory examination may give the edge a saw-tooth effect.

FIG. 3. A cutting edge with a thick facet. The step-like fracture lines are often found near the lateral portions of knives. With proper illumination such faults are visible to the unaided eye.

All micrographs are  $\times 500$ .



(Sheldon: Method for evaluating glass knives)