

HOW-TO-DO-IT An Inexpensive, Simple, Homemade "Microtome" To Prepare Thin Sections of Tissues for Microscopic Study

• NATHAN DUBOWSKY

"... we (can) understand ... life itself only to the extent that we understand the structure and function of cells."

—Swanson, 1960

In the middle of the 17th Century, Robert Hooke reported that he used a "... Pen-knife sharpen'd as keen as a Razor ..." to cut "... an exceedingly thin piece ..." of cork and, using his microscope, observe the "... Honey-comb like structures ..." (cell walls) he referred to as "... cells ..." (Hooke, 1665). Since that time, biologists and biology students have been preparing thin sections of various tissues to study cells and cell structures.

Today, while there are sophisticated methods and instruments (e.g., microtomes) available to prepare thin sections of tissues, these methods and instruments are not usually available and/or practical for use in high school and introductory college level biology classes. Instead, most often students still use "freehand" methods to make thin sections to prepare tissues for microscopic examination. Although these freehand techniques can be accomplished, the procedure often requires considerable time, patience, and practice, especially for students in introductory laboratory biology classes. This article describes an inexpensive, simple, homemade "microtome" that can be used by students to quickly prepare thin sections of tissues appropriate for microscopic study.

○ Procedure

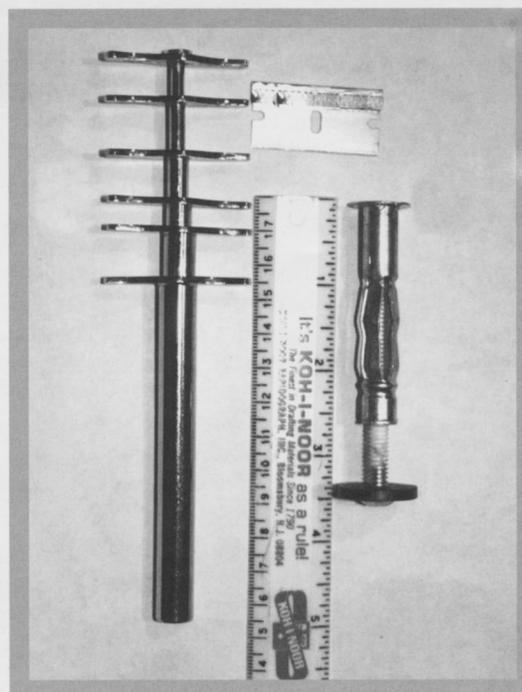
Most of the materials needed to construct a student microtome can be obtained in any hardware store. These include:

- a hollow wall anchor (largest size available)
- a plumbing washer
- epoxy glue
- single-edge razor
- Teflon (plumbing) Tape

The cork borer set that is required should be available in virtually any school biology or chemistry stockroom.

To begin, remove the screw from the hollow wall anchor. Wind the plumbing washer onto the screw until it reaches the screw base and secure with a small drop of epoxy glue. The washer will serve as a handle and thus permit more precise adjustment of the screw position. Permit the glue to cure and then reinsert the screw into the hollow wall anchor **in the opposite direction** so that, as the screw is turned, it moves closer to the flat "platform" of the hollow wall anchor. If the screw is slightly loose and/or "jiggles", this can be eliminated by wrapping

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the screw with a turn or two of Teflon Tape.

To prepare a tissue sample for sectioning, determine the diameter of the cork borer that best matches the diameter of the aperture in the center of the platform of the hollow wall anchor. Use that cork borer to "punch out" a cylinder of tissue (rigid plant tissue like carrot works best although animal tissue can be used especially if the tissues are frozen first). Insert the tissue cylinder into the aperture in the hollow wall anchor (now called the "microtome") and

push it down until it reaches the top of the screw. Using the single-edge razor, slide the blade along the platform to cut off any excess tissue sticking out of the aperture. Then turn the washer handle until a **very small section** of the cylinder is visible sticking out of the aperture. Using the razor, carefully cut a tissue section and float it onto a small drop of water (or dilute stain) on a slide. Cover with a cover glass. Observe microscopically. To cut additional sections, simply repeat the procedure above.

It is possible to estimate the thickness of a cut section in a very simple way. Measure the pitch of the screw (i.e., the number of screw turns per centimeter). So, for example, if there are 10 turns to the centimeter, one complete turn of the screw will elevate the cylinder 1 mm and will permit the student to cut a 1 mm section; $\frac{1}{4}$ of a turn will yield a 0.25 mm (250 μ) section. •

References

- Hooke, R. (1665). *Micrographia*. In M. Gabriel & S. Fogel (Eds.), *Great Experiments in Biology*. Englewood Cliffs, NJ: Prentice-Hall, Inc.
- Swanson, C. (1960). *The Cell*. Englewood Cliffs, NJ: Prentice Hall, Inc.

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