

A Simplified Technique for Grinding Tooth and Bone Sections for the Microscope

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Making sections of bone or tooth or any similar substance for the microscope has been a laborious and prolonged process, done either by hand or by elaborate machinery. The hand method which I learned was demonstrated to me by Alphonse Lang of Xavier University.

A whole tooth, or a piece of bone cut to about 1/16 inch thickness with a fine saw, was mounted on a brass block approximately a cubic inch in size, in the plane in which the section was desired. Plenty of sticky wax, such as is used in the dental laboratory, was required in mounting as bulk was needed to insure strength. The grinding process consisted of rubbing the mount over different grits of sand paper, ending with the finest, and polishing on a hone until all the scratches were obliterated. The section was then reversed, so that the polished side was fastened to the brass, and the grinding repeated until the section was of the required thinness, when it was carefully removed by dissolving the wax with xylol and mounted on a slide in Canadian balsam.

My difficulties arose at this point. A section large enough to show both compact and cancellous bone invariably fell apart, or else was so thick that it could not be used in the microscope. It was necessary to devise a means of making a mount so that the natural relationship of parts could be preserved. To accomplish this I mounted my specimen directly upon the microscope slide, finishing and staining one side as was previously done. The section was fastened to the glass slide and the glass slide fastened to the brass block with sticky yellow wax. It was now no longer necessary to transfer the section from the brass to the slide. The frequent breaking of the wax, allowing the slide to become detached, made necessary the construction of a vise which gripped the slide firmly and eliminated the brass block. (Fig. 1)

Canadian balsam was substituted for the sticky wax mounting medium, which was too brittle to hold the section throughout the grinding process. In order to avoid the delay involved in natural drying of the balsam I placed a sufficient quantity on a slide and heated it over a very small flame until it could just be indented with the finger nail after it had cooled. To dry

it more results in a brittle mount with its subsequent breakage; to dry it less makes a gummy and sticky mount. A little experience is the best indicator of the correct consistency. The balsam was remelted and the specimen, polished side toward the glass, firmly pressed into it. It is necessary to have an insulating pad, such as a wadded rag or a cork, between the hot slide and the thumb. In order to prevent the balsam from adhering to the rag I interposed a piece of cellophane. Pressure must be constantly and equally applied to all parts of the specimen until the balsam has cooled. The cellophane strips off very easily, as the balsam does not stick to it. I have

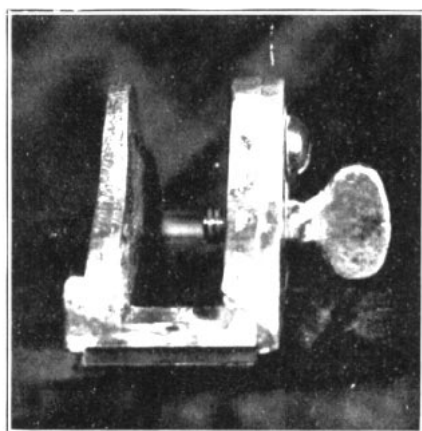


Fig. 1

found this method of attaching the specimen to the slide to be adequate for both large and small sections, and for materials harder than bone. Teeth may be so firmly held that the enamel cap and metal fillings remain in position and may be ground to microscopic dimensions.

Another improvement was the use of powdered abrasives instead of sand paper for grinding. An article which appeared in *Science** suggested the use of aloxite as a grinding material for bone sections. The aloxite I used was secured from a jewelers' supply house, and was the same grit used by opticians for lens grinding.

A plate glass slab, 5 x 7" or larger and preferably ground on one side, is the only other equipment needed. A thin paste of aloxite and water is

*Farris, Edmond J., "Aloxite as an Abrasive for Grinding Bone Sections for Histological Purposes," *Science*, Vol. 75, p. 389.

placed in the center of the slab and the mounted section in the holder is rubbed back and forth until the section has been ground down to the required thinness. Pressure is not required, as the weight of the holder is sufficient. It is only necessary to see that an even grip is secured and that the section is held in contact with the slab. The slide itself acts as a gauge while grinding: if the holder is held unevenly one corner of the slide will touch the glass. Progress may be determined by rinsing with water and observing the thickness of the section, which will be transparent when it is sufficiently ground. It may be removed from the holder and examined under the microscope, however, to determine thickness.

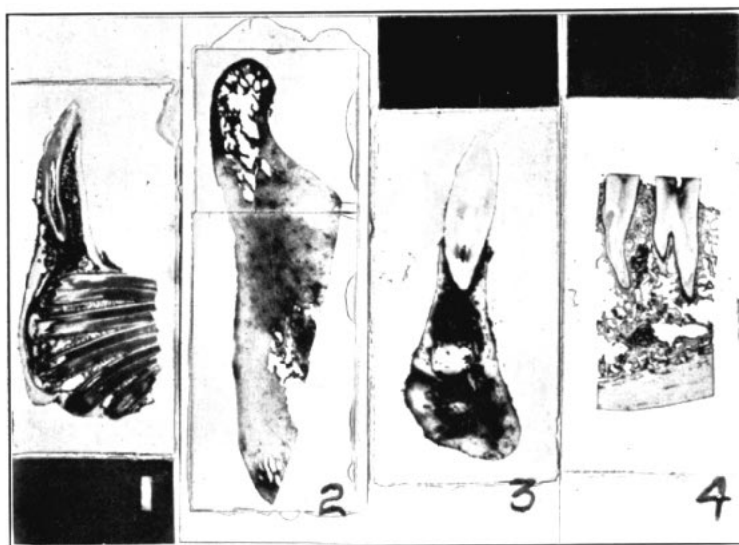


Fig. 2

1. Longitudinal section of the jaw of the rabbit.
2. Longitudinal section through the condylar process and ramus of the human mandible.
3. Cross section through the human condylar process and mandible.
4. Longitudinal section through the bicuspid and mandible.

The next step is to wash the section very carefully with a soft brush and clean water. Aloxite crystals will adhere to the mounting medium, but they may be almost entirely removed. Clearing and drying agents are not needed. The section is allowed to air dry and then protected with a cover glass in the usual manner, using Canadian balsam as the cement.

The specimen may be held in the fingers instead of being mounted for grinding the first side, unless it is too small or too brittle. If it has been carefully sawed, only a short time is needed to procure the desired surface.

This side must be carefully finished; once it is mounted it cannot be touched again. Staining is done immediately after this first surface is ground. Silver nitrate, india ink or aniline dyes will not penetrate the finished section as all pores have become sealed with balsam during the mounting process.

The sequence of preparation, then, is as follows:

1. Preparation of specimen.
2. Grinding and finishing one side.
3. Staining, if desired, and drying.
4. Preparation of balsam on the slide.
5. Fixing of specimen to the slide.
6. Fastening slide in the holder.
7. Grinding the unfinished side.
8. Washing and drying.
9. Affixing cover glass.

Approximately twenty minutes is required to grind and finish sections. Cross and longitudinal sections filling the whole of the slide may be handled with ease. (Fig. 2) The only exacting care required is that of mounting the specimen on the slide; if improperly mounted it will break away from the slide during the last stages of preparation. When grinding single teeth, work may be saved by sawing out the sections desired. Breakage and loss of enamel may be avoided by fixing the crown in sticky wax. A half inch hole is drilled in the end of a stick, the hole filled with wax and the tooth embedded in the wax. A tooth held in this manner may be sawed into sixteenth inch sections without loss of material by clamping the stick in a vise and using a fine jewelers' saw.

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