A new technique for picking and mounting radiolarians for scanning electron microscopy

ABSTRACT
For scanning electron microscopy, radiolarian specimens have to be mounted on stubs, often involving complicated procedures and expenditure of time. A simple method is proposed, requiring only basic, inexpensive materials, permitting manipulation of radiolarians with a minimal risk of breaking and providing an even black background for photography.

INTRODUCTION
The use of the SEM (scanning electron microscope) in micropaleontological investigations has increased considerably since its introduction in 1967. This instrument has proven to be useful not so much because of its greater magnification capability but also, its greater depth of focus produces better illustrations for publication. Furthermore, SEM facilitates taking photomicrographs of nontransparent radiolarian specimens which have been replaced by such minerals as pyrite, calcite and limonite. Such specimens are much more common in strata of the Mesozoic or Paleozoic than of the Cenozoic.

One of the basic problems, however, is mounting radiolarian specimens on SEM plugs (stubs). This often is time consuming, involving special care and techniques.

Before being mounted on the specimen holder, radiolarians have to be freed from the rock sample, selected from the residue, then dried and placed on the stub. During the drying operation some specimens stick to the beaker or filter paper, and are lost. To overcome such difficulties, Burma (1965, p. 19) suggested drying the sample in acetone or absolute alcohol rather than in water, but this tends to diminish the electrostatic attraction between particles in the residue. Moreover, because of their fragility (thin porous shell, tiny spines, long protrusions, etc.), a high percentage of specimens are entirely or partly destroyed as a result of so much manipulation. It is for this reason that I sought and found another technique. The present report will outline this simple procedure for mounting radiolarian specimens on plugs that permits manipulation of specimens without breaking them and provides an even, smooth surface for background contrast.

PICKING TECHNIQUE
Once dried, radiolarians can be broken by contact with a picking brush, shocks, etc, so it is advisable to keep them in water, especially when being moved, as water has a cushioning effect.

The procedure is as follows:
1) When the radiolarians are freed of matrix and all the cleaning operations are finished, place the specimens in water (distilled water is better because it prevents crystallization and specimens sticking together when evaporation occurs). Pour the residue and water into a plastic or glass tray of convenient size for handling (an 11 x 8 x 2 cm size is easily procurable) and examine it with a stereoscopic microscope. In such a tray the radiolarians can be observed with transmitted or reflected light depending on their opacity.
2) Wet a thin paint brush with saliva to limit the spread of the hair when it is immersed in water. Engage the chosen radiolarian with the point of the brush (text-fig. 1), thus trapping it. With the same movement take the brush out of the water horizontally. You may now go to the stub without fear of losing the specimen.

3) To free the radiolarian from the brush, touch the surface of the stub more or less horizontally; this will create a water connection (text-fig. 1) between the stub and the brush. Now pull slowly. When soaked with water the hairs tend to separate and the radiolarian is left with a small drop of water. If the drop seems too large, remove the remaining water from the brush (e.g. by passing the brush between your lips, or touching an absorbent paper) and touch the drop with the brush point. Don't remove the entire drop, as the water allows you to set your specimen in the desired position without breaking it or making it jump away.

4) When the water evaporates (which occurs rapidly) your radiolarian sticks to the stub sufficiently to permit some movement at this stage of the work (a tilt of 45° is possible without losing the specimen).

5) When your radiolarians are arranged on the stub you may fix them firmly by putting the stub, or several stubs, under a covering dish with an open container of acetone. The fumes will soften the varnish, and the radiolarians will be glued strongly. You may control this stage using a stereoscopic microscope or a hand lens. If desired, the radiolarians may be removed later by adding a drop of acetone.

PREPARATION OF THE SPECIMEN HOLDER

Several methods have been proposed to fix radiolarians on the stub, sometimes using sophisticated products and procedures (Clanton and Ladle, 1975; McCandless, McKay and Ladle, 1971; Pfefferkorn, 1970; Russ and Kabaya, 1970). I use fingernail varnish, which has the advantage of being universally available and inexpensive.

The nail varnish is dissolved in acetone, and spread on the surface of the stub with a thin paint brush. When dried the varnish makes a thin regular film over the surface. If such is not the case, dissolve it with acetone and try again. A red varnish permits estimation of the thickness of the film. If it is too thick (varnish distinctly red) the specimens may sink too deeply, causing the same inconvenience as double-faced adhesive tape, that is, the radiolarians sink into the glue.

This mounting substance gives a regular black background on the SEM pictures.

The advantages of this picking and mounting technique are: (1) low cost, (2) minimization of the risks of breaking radiolarians or losing them, and (3) the even black background apparent in the SEM.

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