

MICROPALAEONTOLOGY NOTEBOOK

Detecting radiolaria in the field

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Radiolaria can be preserved in all types of marine sedimentary rocks, the method for their extraction being dependent on the mineralogy of the radiolarian test and the nature of the rock-type in which they occur. In the past radiolaria could only be viewed in thin section (Hinde, 1890; Hinde & Fox, 1895), with no method of detecting the presence of radiolaria prior to sectioning. Modern extraction techniques are normally laboratory based and use hazardous chemicals, therefore it is advantageous to establish the radiolarian content of the sample before collection and transportation back to the laboratory. This can be achieved in a number of ways:-

1. **Non-lithified sediments.** Radiolaria are separated from the sediment by washing the sample over a set of small sieves. Two mesh sizes should be used, a coarse mesh around 150µm to separate large litho-fragments, and a fine mesh no greater than 63µm to concentrate the radiolaria. The fine fraction is then washed with dilute hydrochloric acid (HCl) to eliminate the calcareous microfossils, leaving a pure radiolarian sludge, which is dried on filter paper.

2. **Siliceous rock-types.** Methods for extracting radiolaria from cherts have been in use since the early 1970's (Dumitrica, 1970; Pessagno & Newport, 1972), and have recently been applied to field-work (Cordey & Krauss, 1990). The recognition of fossiliferous bedded cherts is possible with the use of a hand-lens in good sunlight. If radiolaria are present, they should be detectable as small protrusions, especially along laminae. To extract the radiolaria, break up the sample into small cubes and place in an acid resistant beaker. Add a pre-diluted solution of 2-3% hydrofluoric acid (HF) and leave for a period of no more than 24 hours, in an isolated, well ventilated place. Transporting acid in the field is dangerous, and care must be taken, both before and after use. When processing is completed a fine sludge will be present in the bottom of the beaker. This can then be further processed as a non-lithified sediment (as in 1 above). The acid must be neutralised and stored before it can be properly disposed of in a laboratory.

3. **Limestone.** Well preserved, diverse faunas can be retrieved from concretionary fine-grained, deep-water limestones. The presence of radiolaria can be determined by taking a flake of the limestone, and dipping it in dilute HCl. Leave it for 30 seconds to a minute, then dry in the sun. If radiolarians are present they will stand out in relief. To extract radiolaria, dissolve the limestone in dilute HCl and then sieve the residue (as in 1 above) .

If however, the radiolarian test has been replaced by calcite then the only method of extraction is to use concentrated HF, which is too dangerous and impractical for use in the field. In this case, simply wash the surface of the sample with dilute HCl, then

examine the surface carefully with a hand lens. If radiolarians are present they will dissolve to leave an identifiable mould of the test. If the test is replaced by dolomite in a calcite matrix, then the radiolaria cannot be extracted. However, they can be viewed on a surface etched by HCl (Holdsworth, 1967).

4. **Phosphate nodules.** Phosphate nodules form in mud, usually rich in radiolaria. The nodules are often onion-shaped and layered, with radiolaria concentrated in the rings. The nodules can be broken up and dissolved in dilute HCl. However, if the radiolarian test has been replaced by phosphate then the fossils can only be seen in thin section.

5. **Argillites.** Soft, fissile mudrocks can be dried in the sun, then boiled in water with domestic detergent over a gas stove. This should disintegrate the rock to some extent. Fragments can be rubbed between thumb and forefinger to aid disintegration to a fine residue which is then sieved (as in 1 above). In black shales radiolarian tests can sometimes be replaced by iron pyrites. However, unless this has further been altered to limonite, it should enhance rather than degrade the state of preservation.

These processes can quite easily be carried out in isolated areas, where access to a laboratory is not possible. Preliminary identification and initial dating of strata can also be carried out in the field using these techniques, in conjunction with a quality binocular microscope.

We are indebted to Dr B.K. Holdsworth of the University of Keele, for tuition in radiolarian preparation techniques. We would also like to thank Dr R.L. Austin for his comments on an earlier draft of this note.

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