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# How to Recover Microfossils from Common Iowa Rocks

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# HOW TO RECOVER MICROFOSSILS FROM COMMON IOWA ROCKS

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## Introduction

The rocks of Iowa contain a great abundance and variety of fossils. Megafossils, those fossils of sufficient size to be seen with the unaided eye, are abundant in many Iowa quarries and roadcuts and are therefore common in most fossil collections of Iowa teachers and students. Unknown to many, however, is the fact that the abundance and diversity of fossils in the microscopic range is equally great. This article describes techniques by which microfossils can be recovered from sedimentary rocks, illustrates and describes some common microfossils and suggest some localities for collecting samples of microfossils.

## Procedure

Most sedimentary rocks contain some microfossils. The procedures described here are for the recovery of microfossils from shale and limestone. Both of these rock types are abundant in Iowa and both of these rock types can be expected to contain microfossils.

The first step involves collecting the samples. You may wish to collect and process some samples from a local limestone quarry or clay pit. A number of collecting localities for fossils are listed in Jean Rose's book on *Fossils and Rocks of Eastern Iowa*. A geologic map and a county transportation map will also be helpful in collecting in order to determine the age and location of your samples. The reference section of this paper indicates where you can obtain such maps. Lunch-size paper bags or plastic bags will serve as suitable containers for collecting your samples. You should always obtain permission of land owners and quarry operators before collecting on their premises.

The next step is the processing of the samples. Procedures for processing shale and limestone samples are outlined below.

> Shales —— Many Iowa shales can be broken down by merely soaking them or boiling them in water for a few hours. Another common technique for breaking down shale involves treatment with white gasoline. This latter technique involves the following steps and should be used with caution.

1. Place sample in pyrex beaker and place in drying oven to remove water from the sample. If a drying oven is not available allow sample to dry out in a room near the radiator for a couple of days.

2. Remove sample from oven and allow to cool somewhat. Pour white gasoline (unleaded) on the sample. Do not pour the gas on the sample while it is hot; allow the sample to cool first. Coleman-type stove and lantern fuel works well and is available in sporting goods departments.

3. Allow the sample to soak in the gas for several hours; cover the beaker to prevent evaporation and fumes.

4. The gas can be poured off of the sample and filtered back into another container for reuse. Make sure a proper container is used and that it is clearly labeled!

5. After the gas has been removed from the sample add water to the sample. The beaker can be filled nearly to the top with water. The water will replace the gas in the pores of the shale and the shale should start to break apart.

6. Allow the sample to remain in the water for several hours.

7. Carefully wash the residue, which should now look like a beaker full of mud, through a set of fine screens. Eight inch diameter brass screens work best and a set of 3 screens (sieves) should be arranged in a nested manner with a number 10 mesh (2.00mm) on top, number 40 mesh (.42mm) in the middle and a number 100 (.149mm) below. Screens of this type are available from Ward's Natural Science Establishment, Rochester, New York.

   Examine the top screen for larger fossils and save the residue from the bottom two screens to dry and examine for microfossils.

   Note: The washing process will take a lot of time and cannot be hurried or your specimens will likely be broken. It works best to wash the sediment through the screens with the spray from a rubber hose that has been added to the end of the cold water faucet of a laboratory sink. You will need a fair-sized sink for the washing. The residue on the lower two screens should be washed thoroughly and slowly worked to the side of the screens to be removed for drying in a small beaker or to dry on a filter paper.

8. After the residue is dry you are ready to examine it for microfossils. Pour a small amount of residue into a small tray or box. A 3" x 5" box works fine. You may wish to mark the bottom of the box with a grid to provide orientation in assisting your search.

9. Remove microfossils with a fine brush (camel's hair 0 or 00 size). The brush should be moistened or the fossils will be lost.

10. Mount microfossils on slides. Micropaleontology slides are available from Ward's Natural Science Establishment, Rochester, New York. A 3" x 1" cardboard slide with aluminum holder and glass cover works best.

Limestones — The limestone samples should be broken into small pieces, approximately 1" by 1" and placed in a large pyrex beaker. Fill the beaker about 1/3 full of limestone chips and then add 10 to 15 per cent glacial acetic acid to the beaker. The acetic acid will dissolve the limestone and leave microfossils of compositions other than calcium carbonate in the residues. Any microfossils of calcium carbonate composition will be dissolved in the process.

The filtrate should be poured off every few days and fresh acid should be added. This procedure should be repeated until most of the sample has dissolved. From here on the same procedures that were described for the shale processing can be used (see steps 7 – 10 above).

*Note: Special caution should be used with both methods. The white gasoline can present a fire hazard and the glacial acetic acid will blister the skin. Any processing of samples by students should be done under close supervision for reasons of safety.*

## Some Common Microfossils

Shown in Figure 1 are some common microfossils that you might find in your samples. Considerable variation and variety are found in each group so the forms illustrated here will not necessarily be the same as the forms that you recover from your samples. The specimens shown on the figure are not all of the same magnification. The actual sizes of the specimens shown range from 1 to 5 mm in long dimension. The figures were drawn by Karen Ozias as part of a paleonotology project at the University of Northern Iowa.

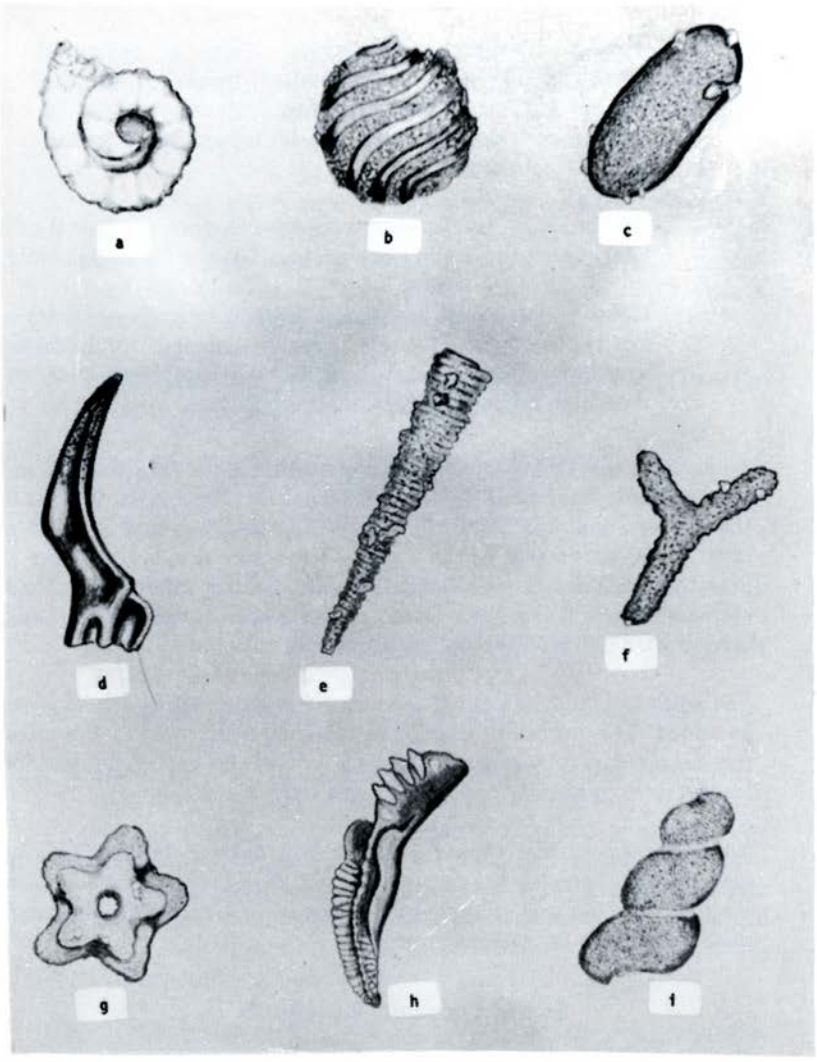


Figure 1

## FORAMINIFERA

Shown in Figure 1a is the calcium carbonate skeleton of a small organism called a *foram*. Since most foraminifera are composed of calcium carbonate they will be dissolved in acetic acid and will not show up in acetic acid residue unless they have slightly altered compositions.

## CHARAPHYTES

Figure 1b illustrates a reproductive body from an algal organism called a *charaphyte*. This reproductive body or oogonia can be found in shale residue from the upper beds of the Lime Creek Formation at the Rockford Brick and Tile pit, Rockford, Iowa.

## OSTRACODES

Figure 1c depicts an *ostracode*. Ostracodes are types of arthropods and, when living, have segmented appendages that extend from their shell.

## SCOLECODONTS

Figure 1d shows a *scolecodont*. Scolecodonts represent the jaws or jaw parts of a type of annelid worm. Scolecodonts are chitinous in composition, dull to lustreous in appearance, and jet black in color.

## SMALL CONOIDAL SHELLS

Figure 1e illustrates a type of conoidal shell known as *tenaculites*. The classification of these forms is uncertain and most workers consider the conoidal shells to be related to either mollusca or worms. The form illustrated here is common in some of the Upper Devonian shales in Iowa.

## BRYOZOA

Figure 1f shows a *bryozoan*. Most bryozoans are large enough to be seen with the unaided eye and are therefore considered megafossils rather than microfossils. Nevertheless, bryozoans often occur in microfossil residues. The form shown here is a small, twig-like variety with numerous small pits where the soft-bodied broyozoa once lived.

## ECHINODERM FRAGMENTS

Shown in Figure 1g is a segment from the stem of an echinoderm called a *crinoid*. The crinoids, or sea lilies as they are often called, are common constituents of some Iowa rocks. The part shown here was part of the stalk of the crinoid. Circular, disc-like segments are generally more common in residues than the star-shaped form shown here.

## CONODONTS

*Conodonts* (Figure 1h) are microscopic, tooth-like fossils of calcium phosphate composition. They are similar in composition to vertebrate bones and teeth. Conodonts probably represent an internal structure of a primitive fish-like organism. Conodonts are common microfossils and serve as excellent index fossils.

## GASTROPODS

Figure 1i illustrates a small *gastropod*. Gastropods, or snails as they are commonly called, are common fossils in Iowa and occur as both megafossils and as microfossils.

## Localities

The Upper Devonian Lime Creek Formation is exposed at the clay pit of the Rockford Brick and Tile pit, west of Rockford, Iowa (NE¼, sec. 16, T. 95 N., R. 18 W., Floyd County). Microfossils occur throughout the section but a greater variety of forms is generally found in the upper part of the exposure.

The Upper Devonian shales of the "Amana beds" can be collected along highway 220 between High Amana and Middle Amana in sec. 28 and sec. 29, T. 81 N., R. 9 W., Iowa County. You'll need to dig into the road bank to find a sticky, yellowish-gray clay which is the weathered shales of the so called "Amana beds". Glacial till covers the shale in most places but there are some shale exposures along the ditches.

The Upper Devonian Sweetland Creek shale can be collected along Sweetland Creek in Muscatine County. The Sweetland Creek section is exposed in the N ½, SW ¼, sec. 27, T. 77 N., R. 1 W. The exposure is on private property and you'll need to ask permission to collect. Stop at the first house east of the bridge where Sweetland Creek (unlabeled) crosses highway 22, east of Muscatine. Follow the stream upstream to the exposure. Your best access is from the east side and down over the east bank rather than directly upstream along the stream channel.

Other localities, including those in your area or those listed in Rose's book on *Fossils and Rocks of Eastern Iowa*, should also furnish samples that contain microfossils. The following references may be of assistance to you. Happy hunting!

## References


Easton, W. H. 1960. *Invertebrate Paleontology*. Harper & Row, Publishers. 701 p. (Contains good coverage of common megafossils and microfossils).

Iowa Geological Survey. 1969. *Geologic Map of Iowa*. Iowa City, Iowa. (Available from the Iowa Geological Survey, Iowa City, Iowa. This map will enable you to determine the age of the bedrock from which your collections are made. The map shows age and distribution of Iowa's bedrock formations).

Iowa State Highway Commission, *General Highway and Transportation Maps*. Iowa State Highway Commission, Ames, Iowa. (Available for purchase from the Highway Commission either as individual county sheets or in book form covering all 99 counties of the state. Useful to locate collecting sites by section and township and range method.

Klapper, Gilbert and Furnish W. M. 1962. Conodont Zonation of the Early Upper Devonian in Eastern Iowa. *Proceedings of the Iowa Academy of Science*. 69:400-410. (Contains site locations and stratigraphic information for Sweetland Creek shale localities in Muscatine County).

Moore, R. C., Lalicker, C. G., Fischer, A. G. 1952. *Invertebrate Fossils*. McGraw-Hill Book Company. 766 p. (A good book for general information on common megafossils and microfossils).

Rose, J. N. 1967. *The Fossils and Rocks of Eastern Iowa; Educational Series 1*. Iowa Geological Survey. (A good guide to collecting sites in Iowa. Stratigraphic information is also given for the collecting sites).