Middle School Science Experiment

Past and Present

In this experiment, you will work in a team to collect microscopic images from a variety of organisms that lived in the past and that are alive now. When you compare these images, you will be able to determine how they are alike and different.

Objectives

In this experiment, you will:

- Use a computer and the ProScope Digital USB Microscope to collect images
- Compare images collected from the samples
- Draw conclusions based on your observations

Materials

- Power Macintosh G3 or better
- ProScope Digital USB Microscope and software
- Fossilized specimens (See the "Teacher information" section for details.)
- Modern specimens

Procedure

1. Prepare the computer for data collection by opening the USB Shot software and connecting the ProScope Digital USB Microscope to one of the computer's USB ports.
2. Select a fossil specimen from those available.
3. Using a word-processing application, create a data table to present your images, past and present, and describe their similarities and differences. See the sample data table in the "Data" section on page 2.
4. Using the ProScope Digital USB Microscope, create a still image of the fossil specimen.
5. You may need to change lenses on the microscope in order to obtain a useful image.
6. Continue creating images of fossil specimens as well as modern specimens.
7. Paste these images into your data table.

Data

In your data table, make sure to note the magnification level or lenses you used to capture the images.

Fossil specimen	Modern specimen	Similarities/differences

Processing the data

1. Describe how each of the samples are similar. How many characteristics do they share?
2. Describe how each of the samples are different. Which characteristics are different?

Extension

Of the specimens you examined, which would you classify as a living fossil? Why?

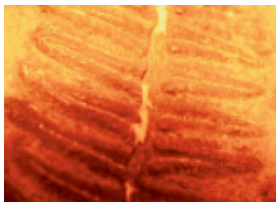
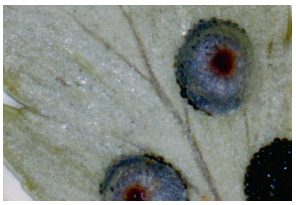
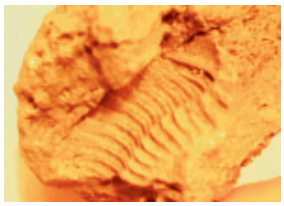
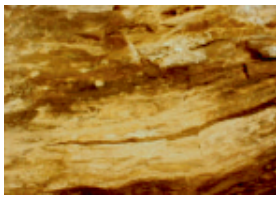
Teacher information

- You could begin the experiment by asking the students how they would describe an organism called a living fossil. They might suggest (in their own words) that such a thing might be relatively unchanged from those found in the fossil record. You can elicit several examples. This would lead into first looking at the fossils and then set the stage for them to collect modern specimens that are similar.
- You may have accumulated a collection of fossils during the course of your tenure. If so, you can use these as your specimens. Soliciting samples from the students is another way to get specimens to use. Also, fossil specimens are available from science suppliers, such as those listed here:

  http://www3.carolina.com/onlinecatalog/Templates/Default/mainscreen2frame.asp?workspace=home&button=home

  http://www.sciencekit.com/Products/Display.cfm?categoryid=188328

Sample results

Fossil specimen	Modern specimen	Similarities/differences
Fern  **mOW lens**	**Leather leaf fern**  **50X**	Between modern and ancient ferns, there are many similarities. The fern fossil here was in the process of reproducing. At higher magnification (100X), you can see buttonlike structures located along the margins of the leaflets called sori. These hold the fern's spores. These structures (small brown fuzzy buttons along the edge of leaflets) can often be seen in ferns you purchase today from florist shops or grocery stores. While fern leaves are common fossil types, they don't always bear these structures. More common and readily observable at 50X and 100X magnification is the venous structure of the leaves.
Sea urchin  **mOW lens**	**Sand dollar**  **mOW lens**	This fossil sea urchin is 320 million years old. Compared to the sand dollar from a beach in Florida, you can see the five-pointed star pattern, characteristic of this group of animals. Members of this phylum eciinodermata remain relatively unchanged from millions of years ago. The pattern is produced by a system of pores that can be observed in ancient and modern species.
Trilobite  **mOW lens**	**Sow bug**  **50X**	The sow bug and the trilobite belong to the group of arthropod (jointed foot) animals called isopods (same foot). The trilobites (now extinct) had compound eyes, a jointed exoskeleton that enabled them to roll up into a little ball, gills, and jointed legs. The sow bug has many similar characteristics, the same numerous jointed legs and the same articulated armadillo-like exoskeleton, allowing them to roll up into a little ball. The exoskeleton is the most readily recognized similarity. Sow bugs also have the compound eyes and sensory antenna but their eyes are not as predominant as those of the trilobite.
Petrified wood  **mOW lens**	**Pine tree stem**  **mOW lens**	The petrified wood and pine tree bark and wood look almost identical. When cut with a diamond saw, the petrified wood reveals annual rings just like the modern counterpart.

Answers to questions

Processing the data questions

1. Answers will vary according to the specimens, of course, but by design the experiment allows students to find similarities in structures, eyes, appendages, wings, roots, stem leaves, and so on.
2. Size is often the way the specimens differ, especially when it comes to fossil insects, which are often larger. The key is for the students to provide a correspondence between features in each specimen.

Extension question

Each of these samples is or could be termed a living fossil.

Special thanks to the curriculum writer, Bruce Ahlborn, Technology Coordinator of Northbrook School District, Northbrook, IL.