Fossil Finds

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Article:

It is easy to tell students that a fossil is "any remains of plant or animal life of some previous geologic period.'" But do they really know what that means? When I ask middle school students to apply their knowledge of the term *fossil* by choosing one from a box of assorted rocks, petrified wood, seashells, and other items (both fossils and nonfossils), many students have no rationale to support their choice. Some students will recognize and select a piece of petrified wood, yet when asked to describe it, they reply that they are not sure if it is a fossil or not. Others will choose a seashell, but again, they are unsure whether a seashell can be a fossil. Some students will choose a rock and explain that all rocks are fossils.

Fossil site

I conduct this simple fossil site activity to introduce the concept of fossils and clarify students' misconceptions about what is, and is not, a fossil. To begin, a box (Figure 1) is passed around the room and every student is told simply to choose a fossil. Next, students take turns showing their fossil and talking a little about it. As students share their fossils, I make a list of the selected items on the board, grouping comments about plants, animals, rocks, minerals, and so on. I allow for discussion among students and ask for clarification of responses, but I do not make any corrections at this time.

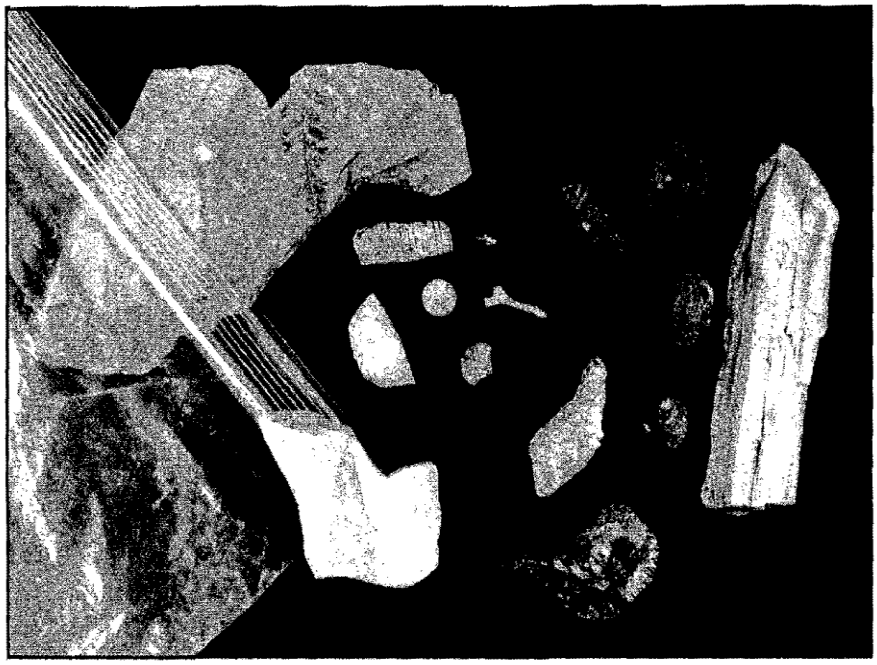
FIGURE 1. Fossil site

After all students have shared their "fossils," we discuss whether or not each of these items is a fossil and why. On the board, I cross out the nonfossils and draw relationships between similar fossils. In the process, the class arrives at a written description of the term *fossil* that all students understand.

Fossils in a bag

As a follow-up to this introductory activity, I give students working in groups of two to four a plastic bag containing 15 different fossils (see Figure 2). The fossils I use are all found in Idaho, where I was teaching at the time I-designed this activity, but you can select fossils that are appropriate to your own area if you wish. Students carefully empty their bags of fossils onto sheets of white paper, then discuss the fossils and speculate about what they have and why.

FIGURE 2. Fossils in a bag



After ample time for exploration, I ask a volunteer to describe one of the fossils, perhaps even give it a name. Naming the fossil gives students some common feature to identify it. At the same time, all groups locate the same fossil from their own bags. For example, one student may recognize a snail shell and decide to describe that. Each group then finds its snail shell and sets it aside. This activity continues until all 15 fossils have been discussed. At this point in the activity, students are simply investigating the contents of the hag and drawing any immediate conclusions they can.

1 ask students to divide their fossils into at least three groups according to any criteria they choose. Students share and discuss their grouping rationales (such as color, size, plants vs. nonplants, rock type, and so on), then I ask them to regroup their fossils into "plants," "gray animals," and "dark brown animals." We discuss the rationale for this new grouping; One group is plants; the other two groups are animals; the two animal groups are separated by color (which also represents environment in this particular case).

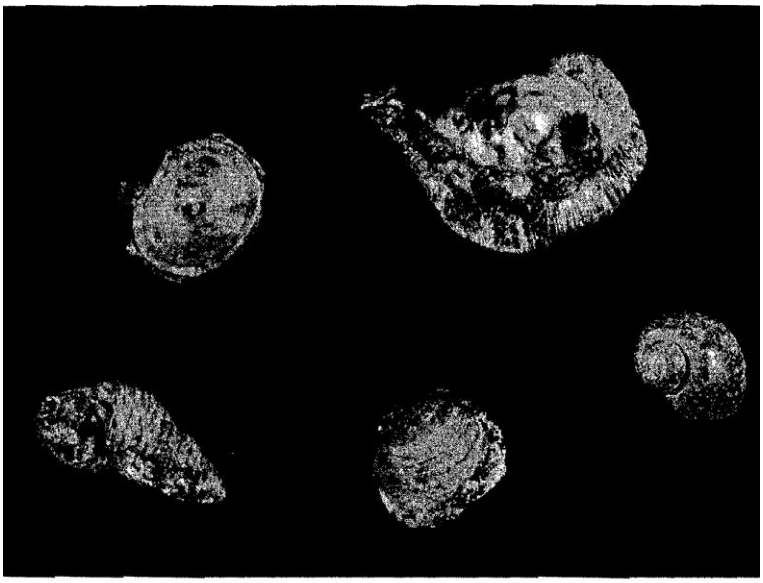
Next, students draw each fossil and then use reference materials to find an interesting fact or two about each fossil. They also make determinations about the relative ages of the two animal fossil groups. This activity can be extended to include a day or two of library investigation and a day or two using the MECC simulation program Fossil Hunter.

Once students have had an opportunity to study the fossils in the bag, we discuss their findings as a class. I provide information on each of the fossils to help students come to some understanding about the reason for the two different animal groups. Students quickly realize that the gray group consists s of invertebrates from a marine environment, while the dark brown group consists of invertebrates and vertebrates from a freshwater aquatic environment. The plant fossils are also from two different time periods. The fem is much older than the leaf and the petrified wood. And the petrified wood comes from the same location and time period As the dark

brown animal fossils. (If time is short, you can help students to quickly reach these conclusions by grouping them by site in the plastic bags, according to Figure 3.)

FIGURE 3. Fossil site descriptions

Site one
Great swamps covered the low-lying areas around the margins of the seas, and primitive plants including ferns as large as today's trees grew densely in the bogs. Brachiopods, which are strictly marine organisms, were common. Tall, flowerlike crinoids (shaped like doughnuts) flourished in diverse communities with horn-of-plenty–shaped horn corals and large single-celled protozoans that look like grains or wheat or rice. The Pennsylvanian or Carboniferous Period occurred approximately 300 million years ago.



Site two
Volcanic materials, sandstones, and limestones alternated to form an interesting deposit in freshwater lakes. Clams, snails, and fish with snail-crushing pharyngeal teeth that look like human baby teeth formed a food web of aquatic life. Petrified wood and a variety of fossil leaves (maples, oaks, willows, and so on) are associated with this site.

Next, ask each student to write a one-page story describing the Life and times of one of the fossils in the bag. Completed stories are shared and posted in the classroom.

In order to get the 15 fossils back into the bags at the end of the activity, we play a matching game. I read the descriptions of the fossils and students select the fossil matching the description, hold it up for me to see, and then place it back in the bag. If time allows, I read the site descriptions before the individual fossil descriptions to emphasize the different fossil sites and geologic time periods.

Fossil collecting

By this time, a real fossil-collecting trip is definitely in order. When I was in Boise, Idaho, we were lucky to have a small fossil site located right in town. In North Carolina, one of the state's best sites is owned by Texasgulf Phosphate in Aurora. Wherever you live, with a little research, you can probably find a real fossil site.

When students return to the classroom after a fossil-collecting trip, we spend several days identifying, cleaning, and mounting their finds. Then we write a story about our fossils and their site and compare our description of the collection site with the two site descriptions from the previous exercise.

These activities require minimal preparation time beyond collecting or purchasing the necessary fossils. By the time students complete the unit, they never have trouble defining and selecting a fossil again.

1. Ferns

Ferns have complex leaves that may bear spore cases on the undersides. Ferns and similar plants at heights of 150 feet or more were common during the Pennsylvanian time period. They grew in swampland forests populated by large soft-tissue trees, forming the great coal basins. These ferns are preserved in a sedimentary rock, shale.

2. Petrified wood

In petrified wood, silica has replaced the wood (cellulose) structure and it has become stonelike. "Petrified" comes from the Greek word *petros*, meaning stone. Dating of petrified wood can best be done according to the surrounding fossil record.

3. Tree leaves

Many modern tree leaves can be recognized in fossil specimens, including oaks, maples, and willows. The leaves are not very old—only a few million years versus hundreds of millions of years for the ferns.

4. and 5. Brachiopods

Brachiopods, marine invertebrates, are among the most abundant of the Paleozoic fossils. A brachiopod's shell consists of two unequal valves (unequal shell halves) with an opening for a pedicle (foot) to emerge.

6. Bryozoans or mosslike animals

Bryozoans are mosslike animals that resemble corals. Bryozoans are aquatic, colonial animals with encrusted, branching, or fanlike appearances. The fossil bryozoans in the bags are the branching ;ramose) type.

7. and 8. Crinolds or sea lilies, me disk and several pieces of Item

Crinoids, which first appeared during le Ordovician time period, still live the oceans today. Crinoids are animals called "sea lilies," which resemble plants. Like other echinoderrns, they are covered with limy plates. Beautifully colored, they live in colonies on the ocean floor. Most are attached to the sea floor by long stalks with various shapes; some are free-floating. All have five-fold radial symmetry.

9. Foraminifers or fusulinids or triticites

Fusulinids were abundant during the Pennsylvanian and Permian time periods and then became extinct. Fossil fusulinids are shaped like a grain of wheat or rice. They rolled like a paramecium as they moved through their aquatic environment. They grew to an amazing size for a one-celled animal and secreted a hard skeleton. The

fusulinids resemble each other externally and must be examined internally to be more specifically identified. They served as food for larger organisms.

10. Horn corals

A marine invertebrate, these solitary corals attached themselves to the sea floor at their small end. They lived in shallow, warm, clear bodies of water.

11. Clams

Mostly marine, although some are freshwater, clams are generally bottom dwellers. Some are borers (burrow in mud and sand) and some cement themselves to fixed objects. All pelecypods are known as clams, though some types may be called mussels, scallops, or oysters. Snails drill holes through their shells and eat the soft insides.

12. and 13. Minnow teeth and vertebra

The minnow had a throat structure with teeth that could crush mollusk shells on the roof of its throat. Pharyngeal teeth in the back of the throat hit the base of the skull.

14. and 15. Long snails and round snails

Once thought to be only marine animals, snails have been found to live everywhere on land, in freshwater ponds and streams, and in the ocean. The widespread nature of the fossil snail makes this phylum a useful index fossil. They have a spiral, coiled, or conelike shell with a single aperture, a broad muscular foot modified into an efficient creeping organ, and a well-developed head with eyes, mouth (a rasp-like feeding organ with series of pointed teeth), and tentacles. The shell may be closed by a lid when the animal draws in. Many snails are grazers that feed on algae. Some are predators and bore neat perfectly round holes through the shells of prey, which include other snails, oysters, and clams.

Reference

I. Fenton, C.L., and Fenton, M.A. (1958). *The Fossil Book*. New York: Doubleday & Company.