Mud Fossils

Rita Gares (661 342-3774; mgares@sbcglobal.net)

This lesson plan will be used with the Second Grade curriculum and is a California State Standard.

Background (partially derived from materials provided the United States Geological Survey)

At the close of the 18th century, the haze of fantasy and mysticism that tended to obscure the true nature of the Earth was being swept away. Careful studies by scientists showed that rocks had diverse origins. Some rock layers, containing clearly identifiable fossil remains of fish and other forms of aquatic animal and plant life, originally formed in the ocean. Other layers, consisting of sand grains winnowed clean by the pounding surf, obviously formed as beach deposits that marked the shorelines of ancient seas.

Certain layers of rock are in the form of sand bars and gravel banks - rock debris spread over the land by streams. Some rocks were once lava flows or beds of cinders and ash thrown out of ancient volcanoes; others are portions of large masses of once-molten rock that cooled very slowly far beneath the Earth's surface. Other rocks were so transformed by heat and pressure during the heaving and buckling of the Earth's crust in periods of mountain building that their original features were obliterated.

From the results of studies on the origins of the various kinds of rocks (petrology), coupled with studies of rock layering (stratigraphy) and the evolution of life (paleontology), today geologists reconstruct the sequence of events that has shaped the Earth's surface. Their studies show, for example, that during a particular episode the land surface was raised in one part of the world to form high plateaus and mountain ranges. After the uplift of the land, the forces of erosion attacked the highlands and the eroded rock debris was transported and redeposited in the lowlands.

During the same interval of time in another part of the world, the land surface subsided and was covered by the seas. With the sinking of the land surface, sediments were deposited on the ocean floor. The evidence of the pre-existence of ancient mountain ranges lies in the nature of the eroded rock debris, and the evidence of the seas' former presence is, in part, the fossil forms of marine life that accumulated with the bottom sediments.

Such recurring events as mountain building and sea encroachment, of which the rocks themselves are records, comprise units of geologic time even though the

actual dates of the events are unknown. By comparison, the history of mankind is similarly organized into relative units of time. We speak of human events as occurring either B.C. or A.D. -broad divisions of time. Shorter spans are measured by the dynasties of ancient Egypt or by the reigns of kings and queens in Europe. Geologists have done the same thing to geologic time by dividing the Earth's history into Eras-broad spans based on the general character of life that existed during these times, and Periods-shorter spans based partly on evidence of major disturbances of the Earth's crust.

The names used to designate the divisions of geologic time are a fascinating mixture of works that mark highlights in the historical development of geologic science over the past 200 years. Nearly every name signifies the acceptance of a new scientific concept-a new rung in the ladder of geologic knowledge.

The major divisions, with brief explanations of each, are shown in the following scale of relative geologic time, which is arranged in chronological order with the oldest division at the bottom, the youngest at the top. Keyed to the relative time scale are examples of index fossils, the forms of life which existed during limited periods of geologic time and thus are used as guides to the age of the rocks in which they are preserved.

Activity (Allow 30-45 minutes)

INSTRUCTIONS & SAFETY PRECAUTIONS:

1. **This activity calls for the students to observe real fossils. If you have none, you might borrow some from a local geologist or a serious amateur fossil collector. Geologist can be found at most colleges or universities, through various State and Federal government agencies, or through a number of engineering and environmental consulting firms. Fossil collectors can often be found at local gem and mineral shows or through local rock shops.**
2. **This activity requires two class periods with 3-4 days in between to allow fossils to dry. Note: If you do not have any real fossils, go directly to item 2 of the Exploration Phase.**
3. **Prior to item 2 of the Exploration Phase, the teacher should mix soil and water in the dishpan to make a thick mud mixture. Try this before the lesson to be sure you get the correct consistency.**
4. **Emphasize that care is needed with the sharper objects and tools used to pick the fossils so that the students and those around do not get poked or hit by flying mud.**

EXPLORATION PHASE:

1. **You may wish to introduce this activity by having students observe real fossils.**
2. **Ask students questions such as:**
    a. **How does a paleontologist recover fossils?**
    b. **How do you think these fossils were formed?**
    c. **What could we learn by observing fossils?**
    d. **Where are fossils found?**
3. **Take students outside for this part if possible. Have each group of students number their margarine tubs. Then, have students place a layer of mud in the margarine tubs, more than half filling the tubs. Press the chosen material (leaves, bones, etc.) into the mud. Cover with 3-5 cm of mud. Let mud mixtures thoroughly dry in the sun (3-4 days).**
4. **Give each group of students a filled margarine tub. Have students carefully break mud apart to find materials and imprints. Emphasize that they are trying to get the fossils out in the best possible condition.**
5. **Display mud fossils.**

CONCEPT DEVELOPMENT PHASE:

1. **Ask the students the following questions:**
    a. **What are fossils?**
    b. **How do fossils get preserved?**
    c. **What problems are there in recovering fossils and prints from hardened mud? What would it be like to remove fossils from a rock?**
    d. **What are the best ways to remove fossils and prints without breaking them?**

APPLICATION PHASE:

1. **Discuss with students how geologists use fossils in the interpretation of earth history and in the location of petroleum and other economic resources.**

Materials

1. **Clayey soil (not sand)**
2. **Twigs**
3. **Fresh leaves**
4. **Large margarine tubs (1 per group)**
5. **Shells**
6. **Water**
7. **Dishpan**

8. **Feathers (optional)**
9. **Clean chicken bones (optional)**
10. **Toothpicks (Thick, round ones work best)**
11. **Other objects that can be used to pick at the fossils**

Extensions

1. **For an eatable activity, make or purchase chocolate chip cookies. The firmer type works best. Have the students pretend they are paleontologists that have unearthed some fossils. The students are to carefully pick the chips out of the cookie with a toothpick without splitting the chip.**
2. **Have students research the eras of geologic time and construct a time line.**