

Chipping Away at Fossils



MATERIALS & PREPARATION

For chocolate chip activity

- ☀ Activity sheets (1 per student)
 - ☀ Chocolate chip cookies* (2 per student)
 - ☀ Toothpicks (1 per student)
 - ☀ Paper towels (1 per student)
- *If you want to represent different types of fossils within a single cookie, substitute cookies with multi-colored candies.

For fossil dig activity

- ☀ A fossil dig kit is available free to teachers from PCS Phosphate. Send your request to cormond@pcsposphate.com. The kit includes a paleontology guide and a 5-gallon bucket of fossil-rich phosphate material.
 - ☀ 1/4 cup (or less) of the phosphate material for each student
 - ☀ Aluminum pie pans* (1 per pair of students)
 - ☀ Toothpicks or forceps
 - ☀ Pencils and paper for sketching
- *Necessary only if students will be not allowed to keep the material

Other materials:

- Index cards
- Poster paper
- 8 1/2" x 11" paper
- Markers

For alternate activity 1: Fossil reference books and field guides (see *Additional Resources*)

For alternative activity 2: 1 copy per team of the book *Time Flies* (see *Additional Resources*)

STANDARD COURSE OF STUDY CORRELATIONS:

Science, Grade 8, Goal 5: The learner will conduct investigations and utilize appropriate technologies and information systems to build an understanding of evidence of evolution in organisms and landforms.

5:01 Interpret ways in which rocks, fossils and ice cores record Earth's geologic history and the evolution of life, including geologic time scale, index fossils, evidence for climate change, extinction of species and catastrophic events.

5.03 Examine evidence that the geologic evolution has had significant global impact.

Earth and Environmental Science, Goal 3: The learner will build an understanding of the origin and evolution of the earth system.

3.01 Assess evidence to interpret the order and impact of events in the geologic past:

- Fossil evidence of past life.
- Divisions of Geologic Time
- Origin of the earth system.
- Origin of life.

3.02 Evaluate the geologic history of North Carolina.

INTRODUCTION FOR TEACHER: Students will simulate a paleontologist's job by removing "fossils" from cookies and by sifting through organic material to find actual fossils. They will also create an illustrated story about birds in the context of paleontology. Some alternate exercises are also proposed.

BACKGROUND FOR TEACHER: Earth is estimated to be about 4.6 billion years old. To make that vast amount of time more manageable, geologists have divided it into eons, which are subdivided into smaller eras, into periods and, finally, into epochs. Great shifts in geologic formations or occurrences (e.g., the onset of Ice Ages) and significant changes in plant and/or animal life usually demarcate these time "zones." Since Earth's history is largely stored in its rocks, our knowledge of the near past, geologically speaking, is more detailed than that of the distant past. As weathering and subsequent erosion wear down rock formations, pieces of geologic history may be lost forever.

To put the periods mentioned in the video into perspective, check out the delineation of Earth's timeline from the U.S. Geologic Survey (http://vulcan.wr.usgs.gov/Glossary/geo_time_scale.html).

engage > Ask students what they think paleontology is. Explain that paleontologists use fossils to learn about the lives of organisms in past geologic time. Convey that though the work of paleontologists is rewarding, it is also extremely time-consuming and tedious, requiring precise work.

Tell students that they are going to simulate a paleontologist's job of unearthing fossilized specimens using chocolate chip cookies. Hand out activity sheets to students and read the instructions aloud. Remind them that this exercise is a simulation of fossil extraction and so they cannot move the cookie once it is placed on their desktop. The goal is to remove as many intact "fossils" (chips) as possible without destroying them or the "land" around them. When students have completed the activity, have them clean their workstations and turn in activity sheets. Review the "Conclusion" question with class.

explore > Show Chapters 1 and 2 of the video. Pass a small quantity of material (no more than 1/4 cup) from the bucket to each student, if they will be allowed to keep it. If they must return the material, have the students work in pairs (distribute aluminum pie plates filled with enough material to cover the bottom). Have students use toothpicks, forceps or their fingers to dig through the material. Have students attempt to identify the fossils they find (using field guides and kit resources), sketch their findings and write possible names identifying the fossils. Most fossils will be in fragments. If identification is impossible, have students guess what type of animal the fossils may have come from, e.g., mollusks, fish, whales.

Alternate Activity 1: If fossil kits are unavailable, place students in teams and have them use field guides to research various types of fossils (e.g., snail, whelk, clam, fish, crocodylian, plant).

explain > Explain to students that Aurora is not the only location in North Carolina to harbor fossils. Tell them that the next video segment focuses on the Cape Fear region and subjects more familiar to many of them: dinosaurs and giant reptiles. Show Chapter 3 of the video. Divide students into teams (or have them remain in the same teams if you used the alternative activity in “Explore” section). Have students prepare a poster and oral presentation of their findings and present them to the class.

elaborate > Tell students that they will use everything they learned from the video clips to write a story. Show Chapter 4 of the video. Place students in teams and have them think of a present-day bird. Have them create an illustrated short story about this bird. Ask them to imagine what future scientists would be able to learn about this bird millions of years from now through fossil evidence (e.g., trace fossils, bones, imprints). Allow time for groups to share their stories with the rest of the class.

Alternate Activity 2: Pass out a copy of *Time Flies* to each team. Allow enough time for team members to write the storyline for their book (out of earshot of other groups). If desired, provide a list of relevant adjectives to each team. Encourage them to use imagery in their writing.

evaluate > Show Chapter 5 of the video. Give an index card to each student. Ask students to think about all they have learned from the video and activities. Tell them to write, in complete sentences, why fossils provide evidence that “time stands still.”

assignment answer key

1. What do the chocolate chips represent?
A: They represent fossils buried in the Earth.
2. What does the cookie represent?
A: The cookie represents the land/rock formations.
3. Why is it important for paleontologists to remove fossils carefully?
A: Paleontologists need to make sure they preserve the extracted fossils for study; they do not want to destroy history.
4. Which method of removing the chocolate chips worked best and why?
A: The method with the toothpick did the least amount of damage. This tool allowed more precise removal of whole fossils.
5. How might tools help paleontologists in the field?
A: Tools allow paleontologists to work more quickly and with more precision, and they enable deeper excavation.
6. What sort of tools and/or technology do you think a paleontologist might need to remove fossils from rock? List as many as you can think of.
A: Shovel, wheelbarrow, pick, chisel, hammer, sifter/screen, brushes of all sizes, buckets, containers, microscope, research books/maps, field notebook/pencil, string, pulley, camera, tripod, etc.



BEYOND THE CLASSROOM

- **The N.C. Museum of Natural Sciences** in Raleigh has a comprehensive, student-friendly exhibit on geologic time, fossils and evolutionary processes. Visit the museum Web site, www.natural-sciences.org, to explore the logistics of a field trip.
- **The Schiele Museum** in Gastonia (www.schielemuseum.org) has a permanent exhibit on evolution and offers programs on paleontology and fossils.
- **The North Carolina State Parks system** (<http://www.ncparks.gov/>) offers free Environmental Education Learning Experiences (EELs) for educators and students that may be used before, after, during and/or instead of field trips (download from <http://www.ncparks.gov/Education/eel.php>). Park staff will provide guided on-site activities with school groups (call ahead to make a reservation). Parks with EELs relating specifically to fossils and geologic past include:
 - Cliffs of the Neuse State Park (geologic time and fossils)
 - Stone Mountain State Park (geologic time and the Inner Piedmont Belt)
 - Hanging Rock, Morrow Mountain and Pilot Mountain State Parks (geologic processes)
- The Aurora Fossil Museum in Aurora (<http://www.aurorafossilmuseum.com>) has exhibits on the geology and paleontology of North Carolina’s Coastal Plain, including the display of a wide variety of Pleistocene, Pliocene and Miocene marine fossils. It also has an on-site fossil digging pile, which is a virtually unlimited source of Miocene age fossils donated by a local phosphate mine. In these fossil-rich soils, students may find the remains of ancient sharks, whales and bony fish alongside corals, shells and other invertebrates.

Additional Resources:

- Rohmann, Eric.** 1997. *Time Flies*. Dragonfly Books
- Mayr, Helmut.** 1992. *Princeton Science Library—A Guide to Fossils* (English translation). Princeton, N.J.: Harper-Collins Publishers.
- Rhodes, Frank H.T.** 1990. *Golden Guide: Fossils*. New York: St. Martin’s Press.
- Thompson, Ida.** 1982. *National Audubon Society Field Guide of North American Fossils*. New York: Alfred A. Knopf.
- Walker, Cyril et al.** 2002. *Fossils* (Smithsonian Hand Books). New York: Gem Guides Book Company.
- Taylor, Paul D.** 2004. *Fossil* (DK Eye-witness Books). D.K. Publishing.

Name: _____

Assignment

Chipping Away at Fossils



PURPOSE

To simulate how paleontologists extract fossils without damaging them.

MATERIALS

Two cookies, paper towel and toothpick

PROCEDURE

1. Place your cookie flat on the paper towel. The cookie must remain stationary on the paper towel throughout this exercise. Without using your fingernails, remove the chocolate chips from the cookie with your fingers. Try to do as little damage to the chocolate chips as possible.
2. Repeat the process with your other cookie, using the toothpick as a tool to help remove the chocolate chips.

RESULTS

Answer the following questions:

1. What do the chocolate chips represent?
2. What does the cookie represent?
3. Why is it important for paleontologists to remove fossils carefully?
4. Which method of removing the chocolate chips worked best and why?
5. How might tools help paleontologists in the field?
6. What sort of tools and/or technology do you think a paleontologist might need to remove fossils from rock? List as many as you can think of.

CONCLUSION

What did you learn about paleontology and fossils from doing this activity?