

How Paleontologists Work

Lesson Plan

Grade Level: 6-8

Curriculum Focus: Fossils

Lesson Duration: One or two class periods

Student Objectives

- Understand that discoveries about dinosaurs have a long history and that paleontologists add their work to a body of fossil evidence used to support theories about dinosaurs.
- Find out that paleontologists often support one theory over another until additional fossil evidence either confirms or disproves the theory.
- Understand that paleontologists can learn more about dinosaurs through new scientific techniques.

Materials

- Discovery School video on *unitedstreaming: New Dinosaurs*
Search for this video by using the video title (or a portion of it) as the keyword.

Selected clips that support this lesson plan:

- Giving Life to Fossils: Structure of Bones Lead to Discoveries
- Paleontologists Uncover Clues in Scat
- Chase or Attack: Paleontologists Look at Quadruped Animals for Clues

- Computers with Internet access (optional but very helpful)
- Encyclopedias
- Additional resources about paleontologists through history
- Pens, pencils, and markers
- Large sheets of paper
- Books and magazines

Procedures

1. Ask students to brainstorm what they know about dinosaurs. Then ask them how we know this information, especially since dinosaurs have been extinct for millions of years. If students mention the study of fossils, add to their thinking by telling them that this specialty is called

paleontology, the science dealing with life during past geological periods as known through the study of fossil remains. (If students are completely unfamiliar with this area of science, simply explain what the lesson will cover.)

2. Explain that scientists began studying dinosaurs in the late-18th century, when they found fossilized bones that they could not identify. Georges Cuvier and other specialists in anatomy realized that the bones belonged to animals from long ago. This led Cuvier to introduce the idea of extinction. Before that time, people believed that the animals on Earth had always existed unchanged.
3. Discuss how over time paleontology emerged as a specialty as scientists found enough fossilized bones to reconstruct entire dinosaur skeletons. By studying these skeletons, paleontologists have been able to propose theories about the world that existed millions of years ago.
4. Explain to students that they are going to conduct research about some major paleontologists and their discoveries. Divide the class into small teams of about 2-3 students. Each group will research a paleontologist to study in-depth and present an oral report to the class.
5. Following is a list of paleontologists who have made significant discoveries. If students are familiar with paleontologists, they may want to choose one from this list or from their own research. If this is a new topic to students, you could assign a paleontologist to each group:
 - Georges Cuvier (1769-1832)
 - Gideon Mantell (1790-1852)
 - Mary Anning (1799-1847)
 - Othniel Marsh (1831-1899)
 - Edward Drinker Cope (1840-1897)
 - Roy C. Andrews (1884-1960)
 - Roland T. Bird (1899-1978)
 - Robert Bakker (b. 1945)
 - James I. Kirkland (b. 1954)
 - Paul C. Sereno (b. 1958)
6. Have each group complete the Paleontologist Profile (see last page). Point out to students that advances in technology have given paleontologists new insight into the world of dinosaurs. For example, with accurate carbon-14 dating, scientists can place the bones correctly in the geological time span. With CAT-scan technology, they can see inside fossilized dinosaur skulls. Computers can now create virtual dinosaurs that show scientists how the giant beasts once moved. The examination of fossilized dinosaur coprolite, or dung, may tell scientists what dinosaurs ate. Encourage students to include maps of where the fieldwork has taken place and drawings of the scientists' major discoveries.
7. Suggest that students use the following Web sites as part of their research:

Georges Cuvier



- <http://www.ucmp.berkeley.edu/history/cuvier.html>

Geological Time Scale

- <http://www.ZoomSchool.com/subjects/dinosaurs>

General sites on paleontologists

- <http://www.ZoomSchool.com/subjects/dinosaurs/glossary/Paleontologists/shtml>
- <http://www.dinohunters.com/Hunters/hunter.htm>
- <http://www.dinohunters.com/Hunters/chronology.htm>
- <http://www.lhl.lib.mo.us/pubserv/hos.dino.welcome.htm>

Assessment

Use the following three-point rubric to evaluate students' work during this lesson.

- **3 points:** Students answered the stated questions in the report; gave a logical oral report using some graphics such as maps or drawings; took notes to use to fill in the timeline completely.
- **2 points:** Students answered the stated questions in the report; student gave a logical oral report; student took notes and partially filled in the timeline.
- **1 point:** Students answered most of the stated questions in the report; gave a somewhat logical oral report; student added some new information to the timeline.

Vocabulary

carbon-14 dating

Definition: A heavy radioactive isotope used to date archaeological and geological materials

Context: Paleontologists have come to depend on carbon-14 dating to determine the age of fossil remains.

CAT (computer-assisted tomography) scan

Definition: A three-dimensional picture of the internal structures of a solid object made by integrating an x-ray and a computer image

Context: Paleontologists use CAT scans to investigate the insides of fossils, such as the nasal passage of a skull.

coprolite (KAH-pruh-lite)

Definition: Fossilized excrement

Context: Thin cross-sections of coprolite examined under a microscope can help determine the diet of a dinosaur.

fossil

Definition: A remnant, impression, or trace of an organism of past geological ages that has been preserved in Earth's crust



Context: Paleontologists use great care not to damage a dinosaur fossil when they remove it from the ground.

paleontology (pay-lee-on-TOL-oh-gee)

Definition: The science dealing with the life of past geological periods as known from fossil records

Context: If you are interested in dinosaurs and fossils of ancient life forms, you may enjoy a career in paleontology.

Academic Standards

National Academy of Sciences

The National Science Education Standards provide guidelines for teaching science as well as a coherent vision of what it means to be scientifically literate for students in grades K-12. To view the standards, visit <http://books.nap.edu>.

This lesson plan addresses the following science standards:

- Life Science: Diversity and adaptations of organisms
- Earth Science: Earth's history

Mid-continent Research for Education and Learning (McREL)

McREL's Content Knowledge: A Compendium of Standards and Benchmarks for K-12 Education addresses 14 content areas. To view the standards and benchmarks, visit link: <http://www.mcrel.org/compendium/browse.asp>

This lesson plan addresses the following national standards:

- Science – Life Sciences: Understands biological evolution and the diversity of life
- Language Arts – Reading: Uses reading skills and strategies to understand and interpret a variety of informational texts; Speaking and Listening: Uses listening and speaking strategies for different purposes

Support Materials

Develop custom worksheets, educational puzzles, online quizzes, and more with the free teaching tools offered on the Discoveryschool.com Web site. Create and print support materials, or save them to a Custom Classroom account for future use. To learn more, visit

- <http://school.discovery.com/teachingtools/teachingtools.html>