Raising a thought-provoking question is a good way to assess the overall depth of student understanding. A couple of suggestions are listed below:

- How do we know for sure that dinosaurs and other animals like the woolly mammoth ever existed?
- Why are rock layers sometimes called pages in Earth's history book?
- Look around your home and school. What kinds of things might fossilize and what could paleontologists tell about your area if they were to find some of these fossils millions of years from now?

Follow-up Activities

- A field trip to a nearby natural history museum is a perfect way for students to observe actual dinosaur fossils. Alternatively, a local paleontologist could visit the classroom and share smaller fossils with the students.
- Using leaves, twigs, small plastic dinosaurs and shallow pans filled with layers of soft clay or sand, have small groups of students create a prehistoric world, making imprint fossils of plant materials and 'animal tracks' by pressing items into the clay at intervals. After removing the materials from the clay, have the children examine the impressions left behind. What can the evidence tell about what occurred in their prehistoric world (traveling in herds, walking on two or four legs, fighting, types of plants available)?

Suggested Internet Resources

Periodically, Internet Resources are updated on our Web site at www.LibraryVideo.com

- **www.enchantedlearning.com/subjects/dinosaurs/index.html**
  "Zoom Dinosaurs" is a comprehensive site for kids that discusses what fossils are, how they form, and why they are studied. It is an excellent place for children to begin research on paleontology and fossils in general.
- **www.fmnh.org/sue/default.html**
  "Sue at the Field Museum" is a site describing a well-preserved and extremely complete Tyrannosaurus rex, found in 1990 in South Dakota. This Web site explains how dinosaur fossils are removed from their surrounding rock and how they are prepared for exhibition.

Suggested Print Resources

- Henderson, Douglas. *Dinosaur Tree.* Aladdin Paperbacks, New York, NY; 1999.
- Lauber, Patricia. *Dinosaurs Walked Here.* Econo-Clad, Topeka, KS; 1999.
- Lessem, Don. *All the Dirt on Dinosaurs.* Tor Publishers, New York, NY; 2001.
- Taylor, Paul. *Fossil.* DK Publishing, New York, NY; 2000.

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Earth Science for Children™

All About Fossils

Grades K–4

This guide is a supplement, designed for educators to use when presenting this program in an instructional setting.

Before Viewing: Research in learning suggests that it is important for the teacher to discover what the students know — or think they know — about a topic, at the start of a new unit, so that their accurate conceptions can be validated and reinforced, and their misconceptions identified and corrected. Therefore, after reviewing the pre-viewing discussion questions provided for your class, create an "Everything We Know About…" list. Preview key vocabulary words and have students raise additional questions they hope will be answered by this program. Most importantly, students should be told that as "science detectives" they must listen closely, so that after viewing the program, they will be able to tell whether or not the facts/beliefs they put on their list were scientifically accurate.

After Viewing: After a brief discussion about the program, challenge your "science detectives" to prove or disprove the accuracy of the facts they put on their "Everything We Know About…" list. Discuss what else they learned and use the follow-up questions and activities to inspire further discussion. Encourage students to research the topic further with the Internet and reading resources provided.

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Program Summary

Fossils are the remains or evidence of plants and animals that lived long, long ago and have turned into rock. They can be impressions left in mud during an organism's lifetime, such as footprints. Fossils can also be the actual remains of creatures. Fossils help scientists learn about the Earth and the organisms that lived millions of years ago. The evidence of ancient creatures that we see when we look at fossils comes from living things that have been buried under many layers of mud and sand, squeezed under high pressure over many years and turned into sedimentary rock. Over time, things like bones and shells were slowly replaced by minerals until nothing but a rock copy of the organism remains. Scientists say that these remains are petrified.

There are different kinds of fossils. A mold is created when a living thing is buried in mud and totally decayed over time, leaving a hollow spot in the rock around it in its exact shape. When the mold is filled in by minerals that later harden to rock, this new rock in the shape of the mold is called a cast. An imprint is another type of fossil. If a leaf is pressed into mud and leaves an impression of itself, and then the mud turns to stone, an imprint of that leaf remains behind as a fossil. The rarest kind of fossil is the actual preserved remains of a creature. Ancient insects crawling up tree trunks got caught in sticky tree sap that later hardened into amber. Today we can still see those insects, tightly sealed inside the clear amber. Other animals got trapped in tar pits or were frozen in ice and remained there for millions of years. Even human bodies from thousands of years ago have been found as preserved fossils.

Paleontologists, the scientists who study fossils, try to figure out the age of fossils in a number of ways. The easiest way is to see how deeply a fossil is buried in the Earth. Usually, the deeper a fossil is, the older it is, because more stuff has been layered on top of it over time. Another way of aging fossils is for scientists to examine the rocks above and below the fossil. If plant fossils are found between two layers of volcanic rock, we can conclude that these plants lived in between the times of two volcanic eruptions. Of course, there are more complicated methods of identifying the age of fossils. Paleontologists have learned a lot about the ancient Earth from studying fossil remains. By finding the same kind of fossils on the coasts of two different continents, they have learned that those two continents were once joined, millions of years ago. By finding shell fossils on top of mountains, they have learned that that mountain was once on the ocean floor. The fossil record of the Earth's distant past is far from complete; however, these prehistoric "pictures" help us to learn about the Earth and its creatures during a time long before people lived.

Vocabulary

The following words are included for teacher reference or for use with students. They are listed in the order in which they appear in the video.

fossils — Evidence or clues from the remains of living things that once lived on Earth. Fossils can be preserved body parts or impressions left during an animal's lifetime.

sedimentary rock — Layers of sand, mud and clay that push down on each other and harden over time into rock. Fossils are most often found in layers of sedimentary rock.

petrified — The remains of living things such as bones that slowly break down and are replaced by minerals, turning the original remains into stone.

mold — The imprint left behind by a living thing that has decayed. This fossil takes the shape of the outside of the original living thing.

cast — A fossil formed when the space left by a decayed living thing fills in with hardened minerals, creating a rock that is a copy of the original living thing.

imprint — A fossil formed after a living thing leaves an impression in mud or sand that becomes hardened.

preserved remains — Fossils that are the actual remains of living things that can be found frozen in ice or preserved in tar or amber.

amber — Ancient tree sap containing preserved animals that has hardened into a fossil.

paleontologists — Scientists who study fossils.

Pre-viewing Discussion

Before students generate their list of "Everything We Know About…" this topic, stimulate and focus their thinking by raising these questions so that their list will better reflect the key ideas in this show:

- What happened to the dinosaurs?
- How are fossils formed? Are all fossils dinosaur bones?
- Why do scientists study fossils?

After the class has completed their "Everything We Know About…" list, and before watching the show, ask them what other questions they have that they hope will be answered during this program. Have students listen closely to learn if everything on their class list is accurate and to hear if any of their own questions are answered.

Focus Questions

You may wish to ask your class the following questions to assess their comprehension of key points presented in the program:

1. What are fossils?
2. How are fossils formed? How long does this process usually take?
3. What is sedimentary rock? Why are so many fossils found in layers of sedimentary rock?
4. What happens to a plant or animal when it is petrified?
5. Describe how a mold fossil is formed.
6. How is a cast fossil different from a mold or imprint fossil?
7. What can imprint fossils tell us about the soft skin of an animal's body?
8. Why are things like fossil footprints helpful to scientists?
9. What is amber? How are fossils preserved in amber?
10. What is different about the fossils preserved in amber and ice compared to petrified fossils?
11. What kinds of things do paleontologists do to prepare fossils for museums?
12. What can fossils tell us about life long ago?
13. Where are some places fossils are found?
14. The same types of fossils were deposited in different continents around the world. How did this probably occur?
15. How do paleontologists figure out the age of fossils and the rocks they are found near?
16. What do paleontologists do once they locate a fossil?
17. If you climbed a mountain and found shell and fish fossils near the top, what would it mean?
18. Did every ancient animal create a fossil? Why or why not?

Follow-up Discussion

The most important part of this segment is to examine both the facts and beliefs generated by the class in their "Everything We Know About…" list. Research indicates that students will retain their previous misconceptions — in preference to the new information — until they actively recognize and correct their own errors. Because of this, it is important to lead students to the correct ideas while identifying and correcting any misconceptions from the class list. After reviewing the list, encourage students to share the answers they got to the questions raised, before viewing the program.

(Continued)