- If you were going to build a monument to a great hero, what type of rock would you use? Why would you choose this type of rock?
- Butterflies go through the process of metamorphosis when they enter their cocoons as caterpillars and emerge as butterflies. How is this process similar to the formation of metamorphic rock?
- What is the rock cycle? Why is it called a cycle? Compare this cycle to other cycles in nature (water, carbon, seasonal). How are these cycles similar and different?

Follow-up Activities

- Have students bring in rocks from their neighborhoods to create a classroom rock collection. Students should then make observations, considering the color, shape, weight, hardness, sheen and texture of the rocks. Magnifying glasses, rulers and scales should be made available to students throughout their investigation. Students can also use a guide to identify their rocks such as *The Encyclopedia of Rocks and Minerals* by Nicola Cipriani (1998). Then students can compare their rocks in pairs, creating a Venn diagram that illustrates the similarities and differences between two rocks.
- The minerals found in rocks are used in many aspects of everyday life, including agriculture, arts, communication, construction, manufacturing, medicine, transportation, science and technology. Challenge students to research how certain minerals are used in daily life, and create a class chart that summarizes these uses of various minerals.
- Encourage students to imagine that they are an igneous, sedimentary or metamorphic rock. Have each student write a narrative that presents the details of this rock's history. In the story, the rock should describe its formation and a description of itself. It should also describe its position in the rock cycle and make predictions about its future as a rock. The story can be presented in different formats — as a picture book for younger children, a poem, cartoon, play or television show.
- Invite a geologist for a class visit to share rock samples and to discuss her work. This visit would be particularly valuable if the geologist provides information about local rocks that students might encounter in their neighborhoods and communities.

Suggested Internet Resources

Periodically, Internet Resources are updated on our web site at www.libraryvideo.com

- **sln.fi.edu/fellows/payton/rocks/index2.html**
  The "Rockhounds With Rocky" web site presents information about rock formation and a virtual rock collection for students to examine. Teaching connections, including lesson plans, activities and literature suggestions are also provided.

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- **www.childrensmuseum.org/geomysteries/index2.html**
  The Children's Museum of Indianapolis offers this "Geo Mysteries" web site that provides animated illustrations of rock formation. This site also contains answers to frequently asked questions about rocks, and tips for collecting rocks in the field.
- **www.bwctc.northants.sch.uk/website/html/projects/science/ks34/rocks/list.html**
  This web site enables students to identify a selection of rocks, based upon their qualities and properties. Good images and descriptions are provided for the rocks in the sample.

Suggested Print Resources

- Cole, Ron. *Remarkable Rocks.* Newbridge, New York, NY; 1996.
- Curtis, Neil. *Rocks and Minerals.* Oxford University Press, New York, NY; 1998.
- Kittinger, Jo S. *A Look at Rocks: From Coal to Kimberlite.* Franklin Watts, Danbury, CT; 1997.
- Trueit, Trudi Strain. *Rocks, Gems and Minerals.* Franklin Watts, Danbury, CT; 2003.

TEACHER'S GUIDE CONSULTANT

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TITLES

- EARTHQUAKES
- FOSSIL FUELS
- FOSSILS
- GEOLOGICAL HISTORY
- LAND FORMATIONS
- MINERALS
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Earth Science IN ACTION™

Rocks

Grades 5–8

Students in grade 5-8 classrooms possess a wide range of background knowledge. Student response to this video program is sure to be varied, so the teachers at these grades need all the help they can get! This guide has been designed to help the 5-8 science teacher by providing a brief synopsis of the program, previewing and follow-up questions, activities, vocabulary and additional resources.

Before Viewing: Extensive research tells how important it is for the teacher to discover what the students know — or think they know — about a topic, before actually starting a new unit. Therefore, after prompting discussion with the pre-viewing questions, lead your class to create an "Everything We Think We Know About…" list. You may also wish to preview key vocabulary words, and have students raise additional questions they hope will be answered.

After Viewing: Have your students share video excerpts that fascinated or surprised them, then challenge your students to prove or disprove the accuracy of the facts they put on their "Everything We Think 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

Rocks are the solid materials that form the surface of the Earth, both on land and at the bottom of oceans. Rocks come in different colors, qualities and strengths, depending on the minerals that compose them and the formation process involved in creating them. There are three major kinds of rocks: igneous, sedimentary and metamorphic. Igneous rocks are created from extremely hot, molten magma beneath the Earth's crust. When the molten material cools and hardens, rocks are formed. If they form above the surface when lava cools, they are called extrusive rocks. Obsidian and basalt are examples of this type of rock. If they form beneath the surface when magma cools, such as with granite, they are called intrusive rocks.

Sedimentary rocks are formed by the layering over time of sediments such as mud, pebbles, shells, bones or leaves. As layers pile up, the weight of the layers above compacts the layers below into solid rock. There are three types of sedimentary rocks: clastic, organic and chemical. Clastic rocks such as conglomerates, sandstone and shale are made of pieces of other rocks, cemented by mud and sand under pressure. Organic rocks like limestone are made of the shells of once-living organisms such as clams and mussels. Chemical rocks are formed when water evaporates, leaving minerals behind like when stalactites and stalagmites form in caves, and when lakes or oceans dry up and create salt flats.

Metamorphic rocks are formed by changes in existing rocks over time as a result of extreme pressure, heat and chemical reactions. These three forces deep in the Earth can change limestone to marble and shale to slate, for example. Over time, with weathering, erosion and volcanic activity, the rock cycle continues the process of rock formation, changing igneous rock to sedimentary, sedimentary into metamorphic and metamorphic back into igneous. The Earth's crust is always in motion, always being changed.

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.

rocks — The solid materials that form the Earth's crust or surface, made of minerals and other substances. There are three different groups of rocks: igneous, sedimentary and metamorphic.

minerals — Naturally occurring solids of the Earth's crust that have a definite composition and structure.

rock cycle — The process by which rocks are changed to form new rocks, as a result of weathering, erosion, volcanic action or heat and pressure deep within the Earth.

igneous rocks — From the Latin word "ignis" meaning "fire," these rocks are formed when molten magma cools and hardens into rock, either under or above the surface.

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crust — The outer layer of the Earth, consisting of rock plates floating on magma.

magma — The molten rock found beneath the Earth's surface. When magma is above the Earth's surface it is called lava.

extrusive rocks — Igneous rocks formed on the Earth's surface by cooling lava. Obsidian and basalt are examples of extrusive rocks.

intrusive rocks — Also called plutonic, these igneous rocks are formed under the Earth's surface by cooling magma. Granite is an example of intrusive rock.

laccoliths — Hard, intrusive, igneous rock formations that rise above the surface and weather more slowly than surrounding rock.

sedimentary rocks — Rocks formed by the compacting of layers of particles or sediments like mud, shells, bones and leaves over time. There are three types of sedimentary rocks: clastic, organic and chemical.

clastic rocks — Sedimentary rocks that are formed by the cementing of fragments of other rocks and sand. Sandstone, shale and conglomerates are clastic rocks.

conglomerates — Clastic sedimentary rocks that are made of pebbles cemented by mud, clay and sand.

organic rocks — Sedimentary rocks that are formed from the remains, often the shells, of organisms that were once living.

chemical rocks — Sedimentary rocks that are formed when water evaporates, leaving mineral deposits behind as rocks. This type of rock can be found when an ocean or lake dries up, or when stalactites and stalagmites form in caves.

stalagmites — Chemical sedimentary rocks that form when minerals build up on the floor of an underground cave.

stalactites — Chemical sedimentary rocks that form when minerals build up on the ceiling of an underground cave.

metamorphic rocks — Rocks formed by changes to existing rocks over time as a result of great pressure, heat or chemical reactions deep within the Earth. One example of a metamorphic rock is slate that has been changed from shale.

Pre-viewing Discussion

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

- How are rocks formed?
- What are some properties or characteristics of rocks?
- Why are rocks important to us? Discuss how humans use rocks in their everyday lives.

After the class has completed their "Everything We Think We Know About..." list, 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

1. What are rocks and where can they be found?
2. Why are rocks important to Earth and to humans?
3. In general, what are rocks made of?
4. What is the rock cycle?
5. What are the three groups of rocks? Why are they grouped that way?
6. How are rocks formed?
7. What is the meaning of the Latin term "ignis" from which igneous rocks derive their name? Why are intrusive igneous rocks also called plutonic? How do these terms help us to understand what igneous rocks are?
8. How is magma different from lava?
9. How does molten magma or lava become solid rock?
10. Why is intrusive igneous rock usually much harder than extrusive rock?
11. What are laccoliths and why are they unique?
12. What are sediments? Name the types of sediments that often create sedimentary rocks.
13. Why does it take thousands or millions of years to create sedimentary rocks when it may only take minutes to form igneous rocks?
14. Compare these two clastic rocks: sandstone and conglomerates. Explain how each was formed.
15. What does it mean if layers of limestone are discovered on a hillside?
16. Why are stalactites and stalagmites in caves classified as chemical rocks?
17. What three factors are responsible for forming metamorphic rocks?
18. Name a type of sedimentary rock that was changed into a metamorphic rock.
19. Why is the rock formation process referred to as a cycle?
20. Give examples of the Earth's forces that are responsible for changing one type of rock into another type of rock.

Follow-up Discussion

Research indicates that students will retain their previous misconceptions about a topic, in preference to new information, until they actively recognize and correct their own errors. Therefore, it is important to have your students re-examine the facts/beliefs they put on their "Everything We Think We Know About..." list. It might also be helpful to review the list by marking each entry with a "+" or "-" to show which facts were correct and which were incorrect.

Thought-provoking discussions provide a good way to assess the overall depth of student understanding. The following are some suggested discussion topics.

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