

SECTION

1

Earth's Story and Those Who First Listened

BEFORE YOU READ

After you read this section, you should be able to answer these questions:

- How fast do changes on Earth happen?
- What is paleontology?

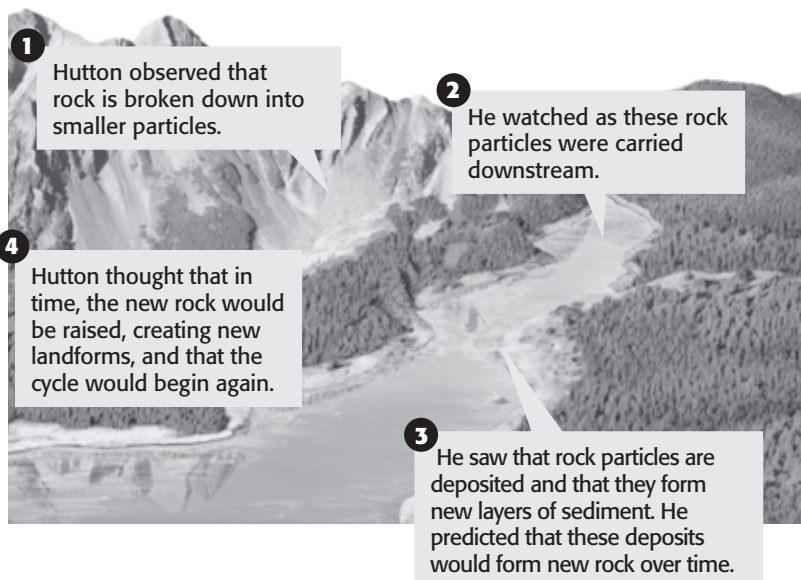
National Science Education Standards
ES 2a, 2b

How Fast Do Changes on Earth Happen?

Earth has not always looked the way it does today. Our planet is slowly changing all the time. Through history, many people have studied these changes. Many different ideas have been put forward to explain how Earth changes with time.

Until about 200 years ago, most people believed that Earth changes because of sudden events, such as floods. The belief that Earth changes only because of sudden events is called **catastrophism**. However, scientists soon realized that catastrophism could not explain all of their observations about the things that happen on Earth.

James Hutton was one of the scientists who first realized that geologic changes can happen very slowly. Hutton observed the processes that were happening around him. He hypothesized that the same processes have been happening for all of the Earth's history. The figure below shows some examples of these processes.



Graphic Organizer As you read this section, make a table comparing catastrophism, uniformitarianism, and modern ideas about how the Earth changes.

TAKE A LOOK

1. Describe What did Hutton predict would form new rock over time?

SECTION 1 Earth's Story and Those Who First Listened *continued*

UNIFORMITARIANISM

James Hutton reasoned that the slow processes that shape Earth now have been the same through all of Earth's history. Over a very long time, these processes have added up to form the features we see on Earth today. The theory that the Earth's features form only because of small changes over long periods of time is called **uniformitarianism**.

TAKE A LOOK

2. Identify Fill in the blank spaces in the table to show how catastrophism is different from uniformitarianism.

Catastrophism	
Uniformitarianism	

Hutton published his ideas in the late 1700s, but they were not accepted by most scientists at that time. However, in the early 1800s, a scientist named Charles Lyell reintroduced the idea of uniformitarianism. Lyell provided more evidence to support uniformitarianism. His work helped to convince many scientists that uniformitarianism was valid.

By the mid-1800s, many scientists had accepted that uniformitarianism can explain many of the Earth's features. However, they also saw that sudden events can change Earth's surface. For example, large storms can cause the Earth's surface to change very quickly. These observations helped scientists realize that not all changes on Earth happen slowly.

SLOW CHANGES AND SUDDEN EVENTS

Today, scientists understand that neither catastrophism nor uniformitarianism is completely correct. They know that most geologic change is slow, but sudden changes happen sometimes. ✓

Sudden changes can have short-term or long-term effects. The wind from a hurricane affects only a small part of Earth for a short time. However, the impact of a comet on Earth may put clouds of dust into the atmosphere. These clouds may decrease the temperature everywhere on Earth for many years.

READING CHECK

3. Explain According to scientists today, how fast do changes on Earth happen?

SECTION 1 Earth's Story and Those Who First Listened *continued*

How Do Scientists Study Earth's Past?

Scientists can use fossils to learn about what Earth was like in the past. A *fossil* is any evidence of past life. Some fossils are made from the remains, such as shells, of dead organisms. Other fossils are simply signs, such as footprints, that an organism once existed. The study of fossils and ancient life is called **paleontology**. The root *paleo* means "old." The root *onto* means "life."

Scientists who study paleontology are called *paleontologists*. Different paleontologists study different certain kinds of organisms. For example, *vertebrate paleontologists* study the remains of *vertebrates*, or animals with backbones. *Paleobotanists* study fossils of ancient plants.

Fossils provide evidence that life on Earth has changed with time. Different organisms have appeared and disappeared throughout Earth's history. For example, fossils show that dinosaurs once lived on Earth, even though none are alive today.



Fossils of dinosaurs have been found in many places on Earth. However, no dinosaurs are alive today. The fossils show that the kinds of life on Earth have changed over time.

Fossils also provide evidence of how Earth has changed over time. For example, there are fossils of sea life from millions of years ago in deserts and on the tops of mountains. The fossils show that some areas that are now deserts or mountains were once parts of an ocean.

Critical Thinking

4. Infer Paleobotanists study the remains of ancient plants. What do botanists most likely study?

STANDARDS CHECK

ES 2b Fossils provide important evidence of how life and environmental conditions have changed.

Word Help: evidence
information showing whether an idea or belief is true or valid

Word Help: environment
the surrounding natural conditions that affect an organism

5. Explain What are two things that paleontologists can learn from fossils?

Section 1 Review

NSES ES 2a, 2b

SECTION VOCABULARY

catastrophism a principle that states that geologic change occurs suddenly

paleontology the scientific study of fossils

uniformitarianism a principle that geologic processes that occurred in the past can be explained by current geologic processes

1. **Identify** How can sudden events affect Earth?

2. **Describe** What were two processes that James Hutton observed that helped him develop the idea of uniformitarianism?

3. **Define** What is a fossil?

4. **Describe** One kind of fossil forms from the body parts of organisms. What is another kind of fossil?

5. **Apply Concepts** Imagine that you find a layer of rock containing many fossil clams. The layer of rock is 50 km from the ocean. The fossils are about 5 million years old. Clams usually live in shallow ocean water. Based on the fossils, what can you guess about the environment in this area 5 million years ago? Explain your answer.
