Science of Geology

Geologists Study the Planet

For **geologists**, the people who study the Earth, rocks tell a story. A rock may give clues about how a landscape got its shape. Or a rock may show scientists that the spot where they are standing looked very different thousands or millions of years ago.

There are many different kinds of geologists. Some geologists try to figure out what materials rocks are made of. Others study the location and movement of water under the Earth's surface. Still others might explore volcanoes to learn about how they work, and about the rocks that come from them.

Word Connection

geology—The science that involves the study of the Earth, including its history and the processes that shape it. From the Greek words geo- (the Earth) and logos (reason). A geologist is a scientist who studies geology.

Think About It!

In each of the examples below, how can geologists' knowledge of the Earth help improve people's lives?

- People use products that come from the Earth, such as iron, oil, and cut stone.
- Whenever we build a structure—a bridge, a building, or a power plant—we need to know about the ground it will be built on.
- Everything we eat and wear originally came from plants. Plants grow in soil that's partly made up of rock material.
- Geologic hazards, like landslides, volcanic eruptions, earthquakes, and tsunamis, can threaten us and our property.

Geologists use different tools and work in many places.

Geologists share their knowledge of the Earth to help build dams, roads, and buildings. They try to keep us safe by learning about earthquakes and predicting when they might strike. Geologists even travel into space to look down at the Earth to study the continents and different landforms.

History of Science and Technology

Sometimes new scientific ideas are born when people use new inventions. You may know already know about how the invention of the telescope changed how we see the planets and stars, or that the invention of the microscope helped people see the smallest living things. For the area of science known as geology, the steam engine was just such an invention.

Coal and Canals: Geology 200 Years Ago

In the early 1700s, people only used coal to heat their homes. But by the end of that century, they were burning coal to melt and shape iron, and to power the new steam-driven factories. Coal is a black rock formed from dead plant material that is millions of years old. In some areas, coal lies just below the surface of the Earth. In other areas, it's found hundreds of meters beneath the land. As more and more people wanted coal, the people who knew how to locate it became very popular.

Our Geosphere Fact

Coal is one kind of natural resource that humans use to heat water and produce electricity. Today, people also use oil and natural gas, which also come from the Earth.

During this time, the scientific field of geology became more important to people. They wanted to find the hidden coal, as well as other valuable rocks that lay beneath the Earth's surface. But the need for coal created a whole new set of problems that also helped make geology an important new science.

Our Geosphere Fact

By 1800, a million tons of coal a year were dug from all of Britain's coal mines.

One of these problems was that coal was bulky. Moving it from mines in the country to the factories and cities where people used it was difficult, especially since few roads at that time were paved.

In the earliest canals, heavy goods were carried in boats towed by horses.

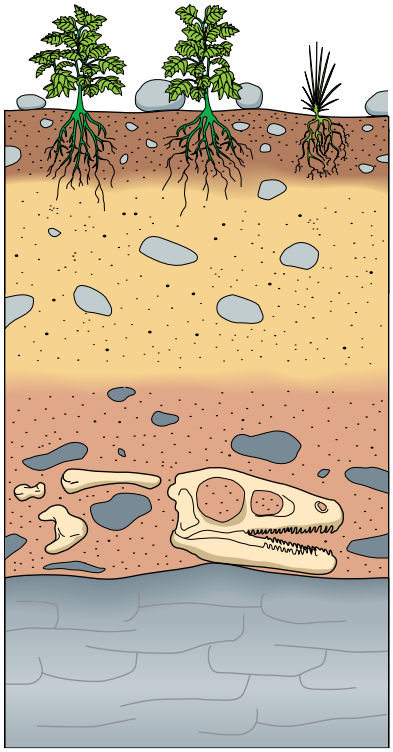
In the late 1700s, people began to dig canals that filled with water for transportation. Canals allowed people to float heavy loads on boats pulled by horses that walked on a path that ran alongside the canals. Instead of getting stuck on a muddy road, canals enabled goods to be transported in almost any weather, and for a lower price than using carts or wagons. Canal building was all the rage for fifty years, until railroads became cheaper and more dependable.

The need for coal and canals created one of those special moments in history when a clever person makes a remarkable new discovery. In this case, the new discovery came about because of one of the most important skills used by all scientists, even you: the skill of observation.

William Smith: An Early Geologist Makes a Discovery

William Smith, the son of a village blacksmith in England, was the first person to use his observations to make a map of the layers of rock beneath the Earth's surface. During the late 1700s, in England, he was hired to help plan two canals that would connect a rich coal mining area with the cities of London and Bristol. All his years of climbing down into mines and watching workers dig canals helped him to notice something no one else had noticed before.

What did he observe that was so important? First, by carefully looking at the underground world, he discovered that the different colored rocks and sediment below the ground were always layered in the same order, like the layers of a cake.



Layers of soil and rock

Second, by looking closely at the rocks in those layers, he discovered that each layer had its own special kind of **fossils**. One of these fossils was called an ammonite, which is a kind of snail that lived in the ocean millions of years ago.

Different ammonites lived at different times during Earth's long history. When an ammonite became fossilized, it became part of the rock around it. Like a bookmark sticking out from a group of pages, it marked a certain spot in the layers of rock.

Word Connection

fossil—A rock whose shape reveals information about an ancient plant, animal, or other organism. If an organism becomes fossilized, that means that its shape or remains have been replaced by rock material.

By comparing that spot with ammonites from other spots, Smith could tell which layer was which. By looking at the fossils in the Earth, anyone could identify the layer of rock and tell when it formed.

Ammonites come many sizes and shapes. This one was found in Montana.

For many years Smith traveled the English countryside collecting sample rocks and fossils. Finally, in 1815, he drew the first map of the types of rocks that make up the surface of England. In fact, this was the very first geological map of its kind anywhere in the world. It helped people understand that the Earth was composed of layers. When they asked how he made the map, Smith explained his theory about using fossils to identify the different layers of rock.

Today, geologists still draw maps of the rocks on the surface of the Earth and the layers of rock beneath the Earth. These maps help scientists and engineers explore the Earth, make new discoveries, and form theories about how the Earth was formed. But all of today's geologists owe thanks to William Smith for his first map.

People Doing Science

Women in Science

Collecting fossils became a trendy fashion in the mid-1700s. People could not travel safely very far from their homes. But they could travel through time by looking at dusty fossil bones, shells, and plants. Two British women were important fossil collectors during this time.

Ethelred Bennett once gave William Smith a piece of fossilized coral to add to his collection. She explored and collected fossils all over the county of Wiltshire, England. While most women in her day were learning needlepoint and piano, she was known as an eager fossil hunter by the people who collected them.

Another woman, Mary Anning, learned about fossil collecting from her father. He built cabinets for wealthy people to display their fossil collections. In 1811, when she was just 12 years old, she and her brother discovered a complete fossil skeleton of a giant fish. Scientists today know it as an *ichthyosaur*, a kind of dinosaur that swam in the sea millions of years ago. Mary later discovered a fossil of a baby *plesiosaur*, a huge marine reptile. She also discovered a nearly perfect fossil of a *pterodactyl*, a winged dinosaur.

Plesiosaur skeleton.

Ichthyosaur.

Pterodactyl fossil.

Glossary

fossil
A rock whose shape reveals information about an ancient plant, animal, or other organism.

geologist
A scientist who studies geology.

geology
The science that involves the study of the Earth, including its history and the processes that shape it.

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