

NEW YORK STATE

CONSERVATIONIST



ROCKS ROCK!

Spot
the fossil
on the
cover!





**CAVE OF
WONDERS**

Howe Caverns is a cave in Schoharie County, New York, that is composed mainly of limestone. The cave contains an underground lake and many unique geological formations.

James Casil

NEW YORK STATE

CONSERVATIONIST

In this issue, students will get an overview of geology, including rocks and minerals, earth processes, and how scientists at the New York State Department of Environmental Conservation (DEC) use geology in their everyday work.



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NYS Dept. of Environmental Conservation
Conservationist for Kids
625 Broadway 4th Floor
Albany, NY, 12233-4502
kidsconservationist@dec.ny.gov
(518) 402-8047

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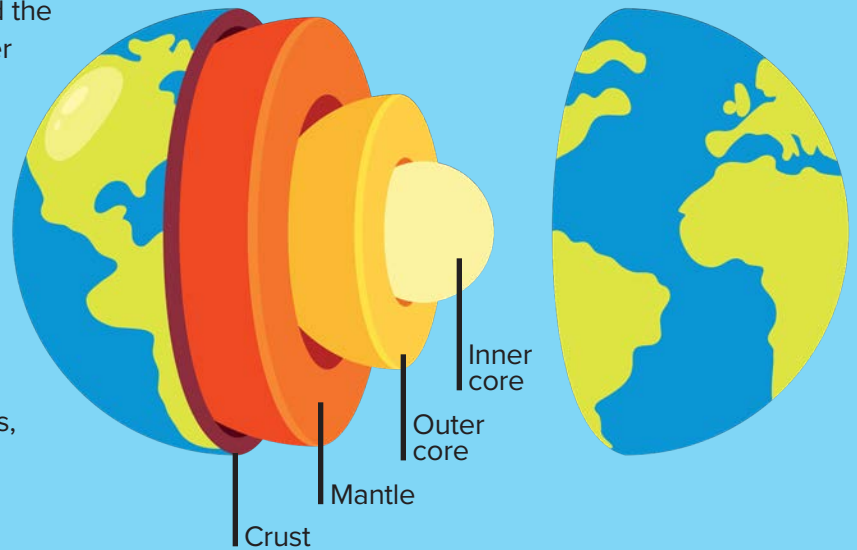


What is Geology?

Simply put, geology is the study of the Earth, the materials it is made of, and the processes that formed and act upon it today.

Scientists who work in the field of geology are called geologists. The Earth is made of several layers called the inner core, the outer core, the mantle, and the crust. The inner core is hot and solid, the outer core and mantle are hot and liquid, and the crust is made of cold rocks. We live on the crust, and most geologists study the crust's rocks to better understand the way that the Earth was formed and how it continues to change. They study the minerals and other natural resources found in rocks, such as gas and oil. Geologists also study the important events in the history of the Earth, including things like volcanic eruptions, earthquakes, floods, erosion, the movement of continents (called plate tectonics), and the forming of mountains (called orogeny).

LAYERS OF THE EARTH



There are many specialties within the broad category of geology. Some of these specialties include:



I am a geologist and my specialty is how rocks form. I study:
(choose from list)

Hydrogeology – the study of how water moves over and beneath the Earth's surface

Environmental geology – the study of the interaction between humans and their environment, especially the soil and water; environmental geologists work to ensure that the environment and human health are protected

Paleontology – the study of fossils

Petrology – the study of how rocks form and where they formed

Mineralogy – the study of minerals

Volcanology – the study of volcanoes, which can occur on land or under the oceans

Seismology – the study of earthquakes

Petroleum geology – the study of petroleum (oil and gas) deposits in rocks

Economic geology – the study of natural materials that can be used by humans, like iron and stone for construction

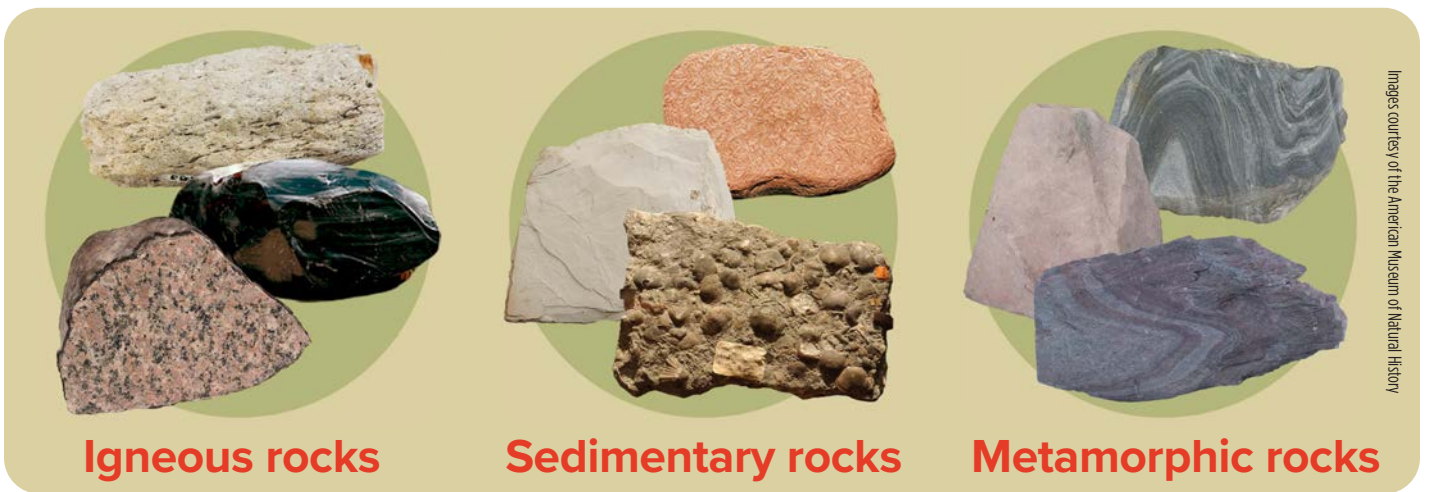
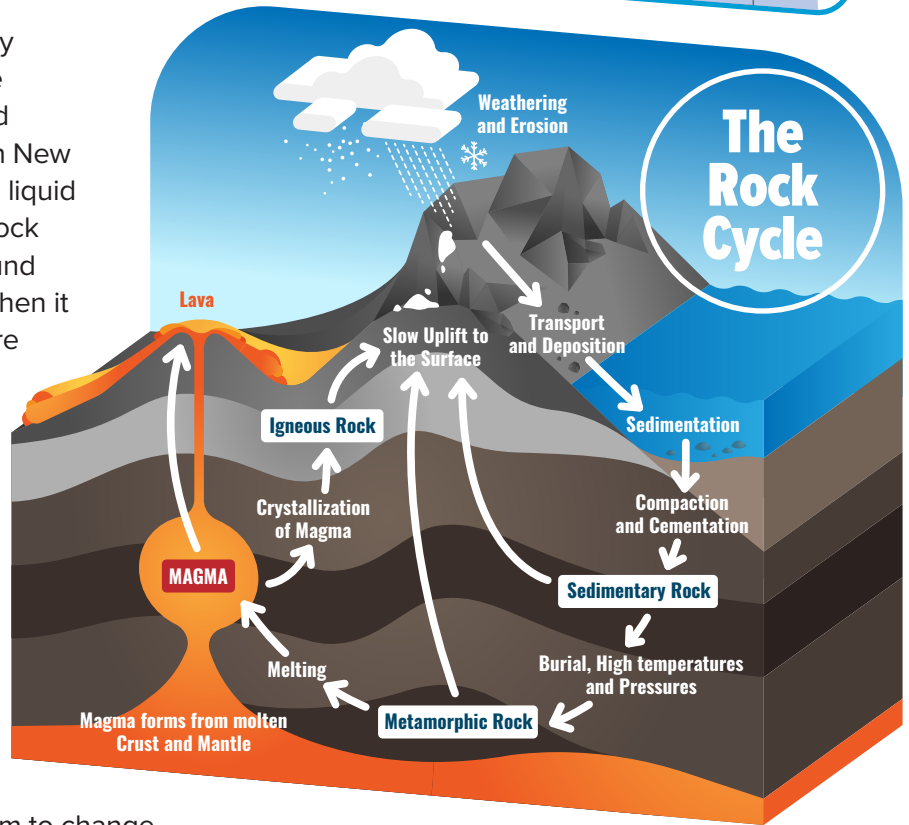
Types of Rocks

Rocks come in many different shapes, sizes, colors, and textures.

Some rocks are rare, while others are very common. All rocks belong to one of three different types: igneous, sedimentary, and metamorphic, all of which can be found in New York State. Igneous rocks form when hot, liquid rock cools and hardens. That hot, liquid rock is called lava when it appears above ground from volcanoes, and it is called magma when it is still underground. Sedimentary rocks are made from layers of sediments, which include things like clay, gravel, and sand. When these layers are pressed together and harden over time, they form sedimentary rocks. The sediment comes from the erosion of other rocks. Sedimentary rocks can also be made of the remains of plants and animals, like wood and shells. Metamorphic rock is a kind of rock that has been changed over time. When other rocks are buried deep below the surface, heat and pressure can cook the rocks, causing them to change

into metamorphic rocks. Rocks are often used as building materials, either in their original form or when combined with other materials. Granite is an igneous rock that is commonly used for buildings. Marble is a type of metamorphic rock that can be carved and polished, and it is used for everything from countertops to statues. Limestone and sandstone are sedimentary rocks commonly used in building projects, especially for things like walls, bridges, dams, and in the case of limestone, as one of the ingredients in cement.

Let's learn about the rock cycle!



Images courtesy of the American Museum of Natural History



Herkimer diamond

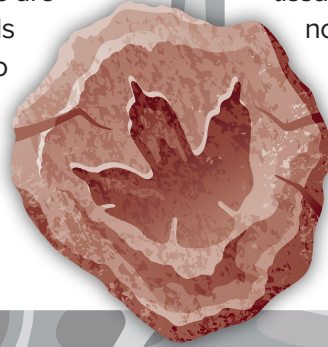


Copper ore in rock

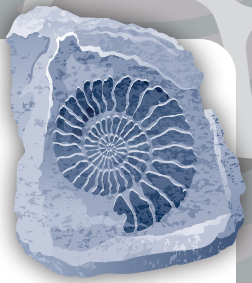
What are Minerals?

Minerals are substances that are formed naturally within the Earth. They are made from inorganic materials (not containing carbon), have a specific chemical composition, and have a crystal structure. The most common mineral on Earth is quartz, and New York is famous for its very well-formed quartz crystals

known as “Herkimer diamonds.” Some minerals are called ores. Ores are mined as the source of materials humans use for building things, like iron in tools and copper in wires. Other minerals are called gems (or gemstones). Gems are usually rare minerals of specific colors that can be cut or polished and made into jewelry. Most gemstones are usually hard. In addition to building materials, rocks and minerals are used in many different products we use every day, including things like glass and ceramics, toothpaste and makeup, televisions, cleaning products, kitty litter, and even foods!



What is a Fossil?



Fossils form in sedimentary rock and are the remains of ancient living things. In some fossils, the body of an animal or plant was replaced over time by minerals, turning it into rock. It still looks like the animal or plant, but the living tissues have been replaced by

nonliving materials. Other fossils are the imprints that were left behind by a plant or animal, such as footprints left in mud, which turned into rock over time. These are called trace fossils.

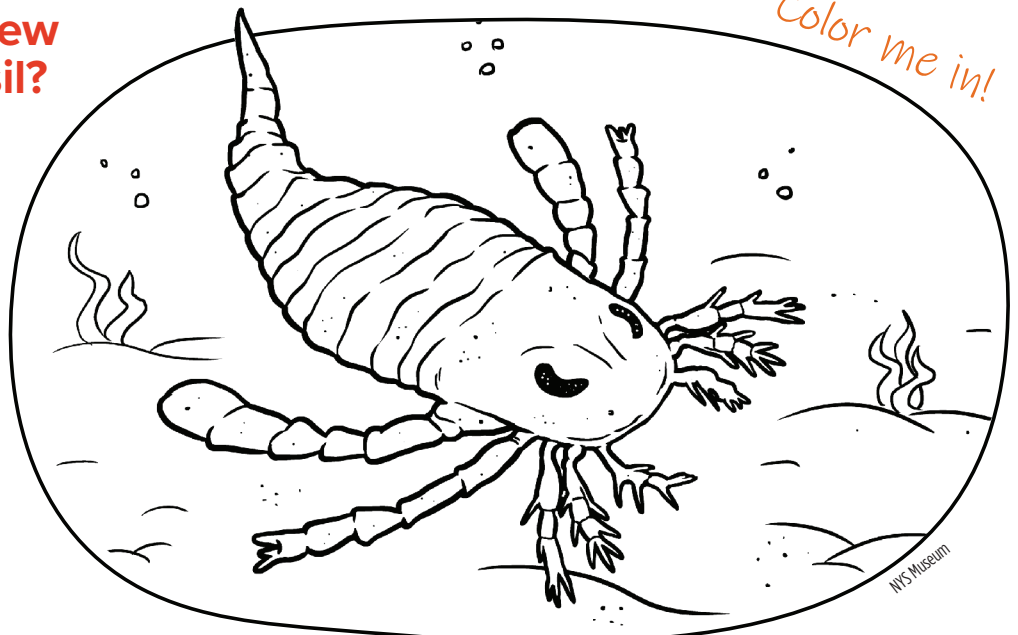


Garnets in boulder

The garnet is the state gem of New York State, chosen in 1969. In New York, garnets are usually a dark red color, although in other places they can be green, orange, brown, yellow, or purple. Garnets are formed in metamorphic rocks, and New York produces more garnets than any other state. Garnet is a very hard mineral, which is used for things like sandpaper and polishing glass, although garnets are also sometimes used in jewelry. In New York, most garnets are found in the Adirondacks and the southeastern portion of the state.

Did you know that New York has a state fossil?

The eurypterid was chosen as the state fossil in 1984. A close relative of horseshoe crabs, scorpions, and spiders, eurypterids lived more than 400 million years ago! Also known as sea scorpions, they are thought to have been fierce underwater predators. Eurypterid fossils have been found from Buffalo to Schenectady and south to Poughkeepsie. They are rare worldwide, and only found in a few U.S. states. Most eurypterid fossils are four to eight inches in length.



Color me in!

Making Mountains and Forming Lakes

Mountains are usually formed through a process known as orogeny.

Orogeny involves the collision of two of Earth's tectonic plates, resulting in a crumpled and thickened area of Earth's crust, known as a mountain range. Over time, the forces of wind and water erode the mountains, making them shorter and less jagged. Glaciers can also erode mountains. Glaciers are thick, slow-moving ice sheets that grind away the rock beneath them.



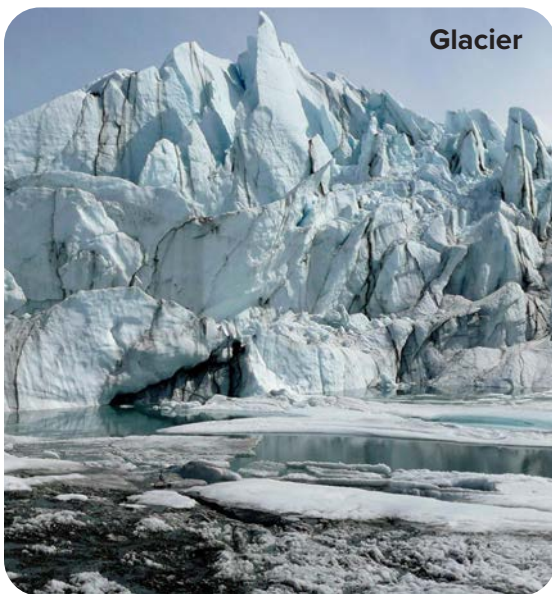
New York had glaciers during several periods over the past 2 million years. The glacial ice was over one mile thick sometimes! As the glaciers advanced and retreated, they eroded and sculpted the landscape. They even eroded the mountains of New York.

New York has three mountain ranges – the Adirondacks, the Catskills, and a portion of the Appalachian Mountains. The Adirondacks are considered young, and are still slowly rising, although the rock that they are made from is the oldest in the state, more than 1 billion years old! The Catskills are made of sedimentary rocks that are about 350 million years old, and are related to the Appalachian Mountains. The Appalachian Mountains formed from several orogeny events over 480 million years.

In addition to helping sculpt and shape mountains, glaciers played another important role in the history of New York State – they helped carve out many of the lakes and valleys found around the state. A great example of this is the formation of the Finger Lakes. These 11 lakes in the center of the state were carved by glaciers approximately 2 million years ago.

NAME THE FINGER LAKES!

- Conesus Lake
- Hemlock Lake
- Canadice Lake
- Honeoye Lake
- Canandaigua Lake
- Keuka Lake
- Seneca Lake
- Cayuga Lake
- Owasco Lake
- Skaneateles Lake
- Otisco Lake



Glacier

NYS Museum



Satellite view of New York's Finger Lakes

NASA



Inspecting a gas well



Murray Mine

Geologists at Work

Petroleum geology and economic geology are some of the most common jobs of geologists. Some scientists study the ways that things like landslides, volcanic eruptions, earthquakes, and floods can be dangerous to people, and how to help people be better prepared to deal with them. This includes figuring out where to avoid building structures and roads to prevent damage to them, determining where floods are most likely to happen (flood zones), and to help people avoid living and working in those dangerous areas.

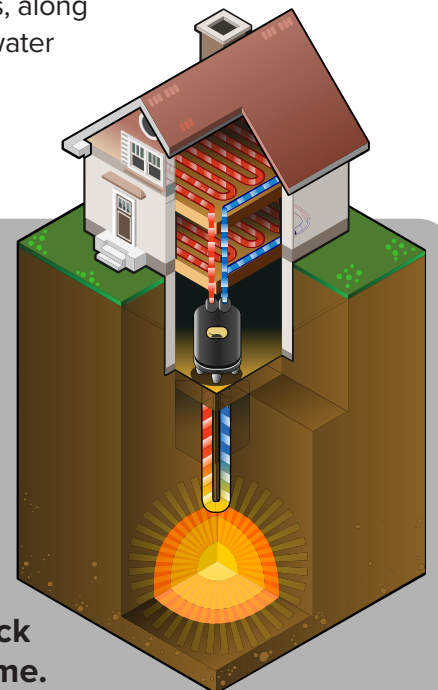
What do you call water that is beneath the surface of the earth?



In New York State and at DEC, some of the most important jobs in geology are hydrogeology and environmental geology. Many of DEC's geologists study the water beneath the surface of the state, called groundwater. Understanding how the water moves through different types of soils, rocks, and fractures or faults (cracks in the rocks) helps scientists better determine how it can be used for things like wells, along with ways the water could become contaminated.

Other geologists at DEC work with mineral resources, such as oil and natural gas, sand, and gravel. These geologists are responsible for managing and regulating the development of mineral resources in the state, as well as overseeing things like mines and wells (except for water wells). Geologists at DEC also regulate geothermal wells. Geothermal means heat from inside the earth, and geothermal energy is a renewable resource that can be used to heat and cool our homes and to generate electricity.

Geothermal means heat from inside the earth. This diagram is an example of how geothermal energy is used to heat water in pipes that extend down into the earth. When the water is heated, it is pumped back up to help warm the home.



Get Outside!

GEOLOGY SCAVENGER HUNT

No matter where you live in New York State, rocks and geological features are everywhere!

Start making notes of the different features of the landscape around you, ranging from mountains to hills to rivers to valleys and lakes, and see if you can figure out what might have made them.

Some examples:



**Watkins Glenn State Park
in Schuyler County**

Image courtesy of Dr. J Bret Bennington



**Mine Lot Falls
in Albany County**

Image courtesy of Loren G. Dohert



**Whiteface Mountain
in Essex County**

Image courtesy of Dr. J Bret Bennington



**Barton Garnet Mine
in Warren County**

Image courtesy of William Kelly

Try to spot different kinds of building materials made from rocks and learn more about them. Rocks are used in many different types of projects, from roads to buildings and bridges, to things like gravestones and monuments. No matter where you live, you can see things made from rocks!

Use this blank space to list the things that you see or draw pictures of them. Ask your parents or teachers to help you find resources about geology, such as books, magazines, and websites, to learn more about the things that you see on your adventures!

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J Walker, Designer



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New York State Department of Environmental Conservation
625 Broadway, 4th Floor, Albany, NY 12233-4502
P: (518) 402-8047 | F: (518) 402-9036 | kidsconservationist@dec.ny.gov
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Mineral Research

As was discussed briefly in this issue of *Conservationist for Kids*, minerals can be found in many of the products that we use every day. Below is a matching game that you can play with your students. See how many they can guess right away, and if need be, have your students research those that they can't figure out. They will be surprised to learn about all of the ways that minerals impact our lives! Have students complete the Mineral Match activity on the back page. For help with the research, below are some suggested resources.

Online Resources*

DEC Division of Mineral Resources: Learning Resources www.dec.ny.gov/lands/5039.html

DEC Unique Geologic Features www.dec.ny.gov/permits/53826.html

American Museum of Natural History: Ology www.amnh.org/explore/ology

Geology.com Teacher Resources geology.com/teacher/

Kiddle Geology Facts for Kids kids.kiddle.co/Geology

Kids Discover: Geology online.kidsdiscover.com/unit/geology

New York State Museum: Geology nysm.nysed.gov/research-collections/geology

New York State Museum: Paleontology nysm.nysed.gov/research-collections/paleontology

OneGeology Kids onegeology.org/archive/extra/kids/english/what_is.html

Paleontological Research Institute www.priweb.org/

**Please note, the listing of websites is not to be considered an endorsement, as not all have been fully reviewed by the editor.*

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Mineral Match

Use these minerals to complete the sentences.

garnet

clay

mica

gypsum

silicate minerals

talc

sand, limestone, and talc

graphite and clay

1. We call them lead pencils, but the points are really made of _____ and _____.
2. Baby powder is made of _____, which is the softest mineral.
3. You'll find _____, _____, and _____ in glass.
4. Sandpaper is made from _____, which is New York's State gem.
5. The sparkles in toothpaste are made from _____.
6. Wallboard is made from _____.
7. Roof shingles are colored by _____.
8. Porcelain toilets are made from _____.



New York State Rocks and Minerals Word Search: Find These Words (Look forward, backward & diagonally too!)

Clay
Gold
Talc
Garnet
Oil
Gravel
Sand
Gas
Salt
Zinc

