

ROCK RANGERS

KIDS DIG ROCKS!
Turn 'em into Rock Rangers
for a gem of a time!



Children may think of everything from pebbles to boulders to the whole Earth when the word *rock* is mentioned. Help kids understand that the Earth is made mostly of rock. Mountains are made of rock, oceans and plains rest on deep layers of rock, and rock is found all the way to the center of the Earth.

Older Than Rock!

Rocks were here long before there was life on Earth, and many secrets that tell about this planet's past are hidden in those rocks. Humans have been recording history for only the last several thousand years, but the Earth has kept its own records locked in its rocks for billions of years. By studying

the rocks on our Earth, we have learned about the existence of dinosaurs, ice ages, volcanic eruptions, and earthquakes.

Transform students into Rock Rangers and get ready to unlock mysteries of the Earth's past. Create enthusiasm by making Rock Ranger headbands and badges that kids can wear during your studies. Duplicate the headband and badge patterns and ask the children to color and cut them out. Make the headband by stapling the medallion to the center of a 24" x 1-1/2" strip of construction paper. Adjust the strip to fit around the child's head and staple to secure. Make the necklace badge by punching a hole in the badge and threading a 28" length of yarn through the hole. Tie in a knot. Ask kids to collect stones from the schoolyard or bring small rocks from home. Glue (hot glue gun works well) a rock to both the medallion and badge. Now that you have official Rock Ranger identification, you're ready to begin!

Layers of the Earth

The Earth is like a big ball made up of three major layers of rock. The crust is the first layer. This is the part we live on and its thickness varies from 4 to 44 miles. The crust is made up of separate, constantly moving pieces called plates. The middle layer is called the mantle. Scientists believe that this layer is solid rock, about 1,800 miles thick. The third layer or center of the Earth is the core. There are two parts to the core. The outer core, which is molten rock or magma, is as hot as the surface of the Sun. It is about 1,400 miles thick. The inner core, the very center of the Earth, is solid rock about 750 miles thick.

The Rock Cycle

The Earth, which is now more than 4-1/2 billion years old, has changed dramatically over the years. These ongoing changes have taken place slowly as rocks constantly change in

size, shape, and even their inner nature to form new rocks. The changes, caused by Sun, wind, rain, and ice help large rocks become smaller rocks, then grains of sand, and finally soil and clay. The soil then washes down rivers to the sea where it settles in deposits. After years of heat and pressure, the deposits are forced tightly together and become rock again. Another part of the cycle occurs when mountains and hills are worn away by wind and weather. The broken rock becomes soil and is carried away to fill the valleys until the land is almost level. After many years, the rock that has turned to soil becomes rock once again. The rock cycle has been going on for hundreds of millions of years.

There are other changes in the Earth that also take place. The plates of the crust layer are constantly moving and responsible for these changes. When the plates push up higher and higher against each other, mountains are formed. When the plates are forced down beneath other plates, volcanoes erupt. And when the plates slide against each other, earthquakes occur.

The Big Three

Scientists divide rocks into three types according to how they were formed. Each type of rock has its own story to tell about the Earth's past.

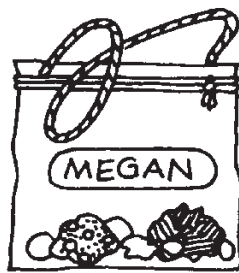
Igneous, which means "fiery," are rocks that had a fiery beginning. These most common types of rocks were once molten magma deep within the Earth. Some igneous rocks appear after years and years of erosion while others appear after the eruption of a volcano.

Sedimentary rocks were formed from sediment—matter such as bits of sand, soil, and decayed

plants and animals. The sediment collected for millions of years was deposited in layers and pressed together under great pressure to form new rocks. Fossils are preserved in sedimentary rock. The discovery of fossils helps geologists piece together the puzzle of what kinds of plants and animals lived on the Earth long ago.

Metamorphic, which means "changed," are rocks formed from igneous or sedimentary rocks that were exposed to extreme heat or pressure. They formed during the process of mountain building from the powerful movement of the Earth. Metamorphic rocks also formed during volcanic eruptions. The extreme heat actually melted rocks, causing the minerals to recrystallize and form new minerals.

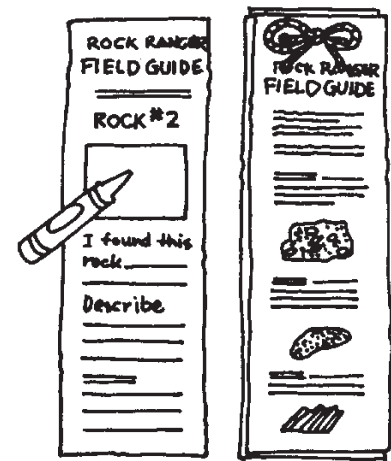
As your Rock Rangers take a closer look at rocks, they may notice that most rocks are a combination of two or more minerals. Minerals are something that is found in nature that is neither plant nor animal. Some minerals are easy to see while others cannot be identified with the naked eye.



Rock Round Up

Get your Rock Rangers ready for a rock hunt by making "rock hound" bags to store collected rocks. To make a bag, punch a hole in each side of a large, plastic, zipper freezer bag and attach a length of heavy twine. Children can wear the pouches over their shoulders so

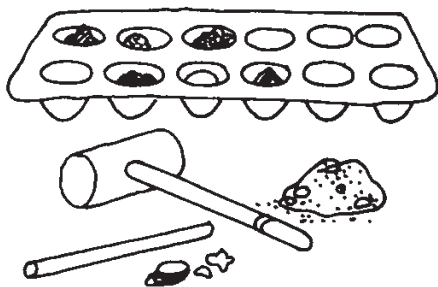
that their hands will be free to collect rocks. Scavenge the schoolyard, neighborhood, beach, park, or riverbank to give everyone an opportunity to find rock samples to place in their collection bags. Encourage the kids to collect as many different kinds of rocks as they can find. Take the samples back to the classroom so that they can be sorted and classified. Divide the children into small groups and challenge them to use their observation skills to group the rocks according to color, shape, texture, size, or weight. Remind the Rock Rangers to determine if the rocks are dark or light, smooth or rough, shiny or dull, heavy or light, crystalline or granular. Borrow or buy some inexpensive plastic magnifying glasses to facilitate the observations.



Field Guides

Help children become familiar with the three rock types and then record information about rocks they have found in a Rock Ranger Field Guide. You'll need the reproducible field guide pages, tagboard, scissors, hole punch, paper fasteners, pencil, and crayons. Have children cut pages on the dotted lines and punch holes at the top. Arrange the information and observation pages of the guide into a booklet. Cut a piece of tagboard the same size as the guide pages and place it as the

last page to make writing easier while “out in the field.” Bind the pages together with a paper fastener or yarn tie. With the help of your librarian, gather a collection of published rock field guides. Encourage kids to look at actual rock photos in the guides to become familiar with different rocks. Ask everyone to look carefully at the collected rocks so that they will be able to identify and record them for the observation pages of the field guide. Children will need to number each rock, draw a picture of it, and then record pertinent information about the rock in their field guide. Invite children to use as many observation pages as they can to make it a resourceful guide.



Dig It!

If you really want your Rock Rangers to get a feel for fieldwork, prepare a special rock sample that just “happens” to have a variety of rock samples hidden within. Collect common stones around your home. Provide more variety by purchasing small rocks from a hobby shop, rock shop, or bookstore that carries rock collector kit-type books. For each rock sample, include as many of the nine rocks listed in the Field Guide as possible, but be sure there is at least one rock from each type. Mix together a 4-pack of Play-Doh® and press one half of the mixture into the bottom of a Styrofoam meat tray. Push rock pieces into the dough, cover with the remaining Play-Doh, and allow to dry for a

day or two. Divide the children into small groups and provide each with a rock sample, toy wooden mallet, and wooden dowel. Ask the children to work carefully to “dig up” all the hidden rocks. Provide each group with an egg carton for holding recovered rocks. Then have kids use their Rock Ranger Field Guide to identify each “find.”

Fossil Clues

A fossil is a rock containing the remains, impression, or trace of a plant or animal that once lived on the Earth. At times, prehistoric plants or animals died and were buried in layers of mud, sand, or crushed shells. Usually the soft parts rotted away, but the hardest parts were preserved and turned to rock. The fossils found in sedimentary rocks such as limestone or shale, show details of plants and animals that lived millions of years ago. Make some fossils with your Rock Rangers. You can fossilize shells, twigs, chicken bones, ferns, etc. To make the fossil, work one half of a can of Play-Doh with hands to soften. Then press it into a plastic, disposable bowl. Spray a shell or twig with vegetable spray and press it into the dough to make a clean imprint. Remove the item and allow the imprint to harden for several days. This is called a mold fossil. Next mix equal amounts of sand and plaster of Paris with just enough water to make a pasty mixture. Keep stirring the mixture until you are ready to pour. Spray the mold fossil with vegetable spray

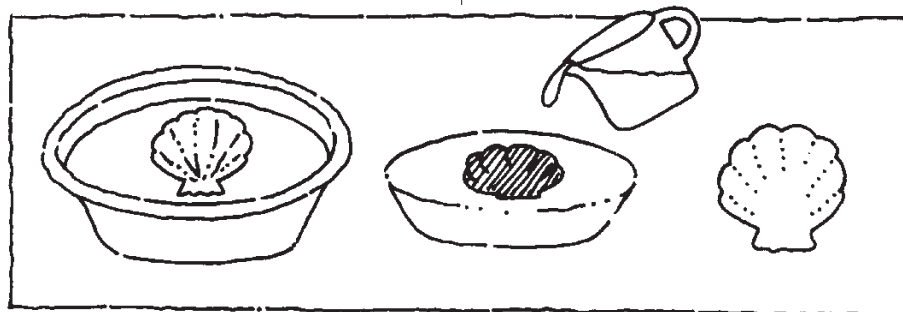
and pour the plaster of Paris mixture on top of the mold fossil. Let it dry. Carefully separate plaster of Paris from mold fossil to create your cast.

Rock Ranger Museum

Set up a Rock Ranger Museum in your classroom so that children can display their discoveries. Duplicate museum labels and instruct students to name and describe the rocks or fossils. Place the museum pieces throughout the classroom and invite parents or other classrooms to view the exhibits. Your rangers will enjoy standing proudly next to their “find” to answer questions and even create a tale about how he or she found it.

State Fossils

Set your rangers off on an adventure in the library to learn if your state has an official state fossil. For example, California’s state fossil is the saber-toothed cat, an enormous sea reptile called an ichthyosaur is Nevada’s state fossil, Wisconsin’s is a tiny sea creature called a trilobite, Nebraska’s is the mammoth, and Colorado’s state fossil is the Stegosaurus. Have your kids research information to see if a state fossil has been established in your state. If not, challenge students to read and find out about fossils that have been found in your state. Then cast votes to determine the best choice for your state fossil. You can even do what school children did in Montana. They



banded together and petitioned the state legislature to get a duck-billed dinosaur called the Maiasaura established as their official state fossil.

Rock Resources

You can obtain rock and mineral samples, fossils, and other geological materials from educational supply houses:

CAROLINA BIOLOGICAL SUPPLY COMPANY
2700 York Road
Burlington, NC 27215-3398
Visit their website at www.carolina.com or call 1-800-334-5551 to request the earth science brochure that lists the related products.

DELTA EDUCATION
P.O. Box 3000
Nashua, NH 03061-3000
Visit their website at www.delta-education.com call 1-800-258-1302 to ask for a catalog of current products.

AMERICAN COAL FOUNDATION
101 Constitution Avenue, NW
Suite 525 East
Washington, DC 20001-2133
Visit their website at www.teachcoal.org or call 202-463-9785 to request materials for your grade level and a coal sample kit.

Rock Ranger Books

Here are a variety of books concerning geology to share with your rock hounds.

Earth Alive!

by Sandra Markle (Lothrop)

Everybody Needs a Rock

by Byrd Baylor (Aladdin)

Let's Go Rock Collecting

by Roma Gans (HarperTrophy)

Eyewitness Explorers: Rocks and Minerals

by Steve Parker (DK Publishing)

If You Find a Rock

by Peggy Christian (Harcourt)

The Best Book of Fossils, Rock, and Minerals

by Chris Pellant (Kingfisher)

Rocks: Hard, Soft, Smooth, and Rough

by Natalie M. Rosinsky
(Picture Window Books)

Rocks and Minerals

Scholastic Science Readers
by Edward R. Ricciuti (Scholastic)

The Magic School Bus Inside the Earth

by Joanna Cole (Scholastic)
illustrated by Bruce Degen

How to Dig A Hole to the Other Side of the World

by Faith McNulty (Harper & Row)

What Can She Be? A Geologist

by Gloria Goldreich and Esther Goldreich (William Morrow)

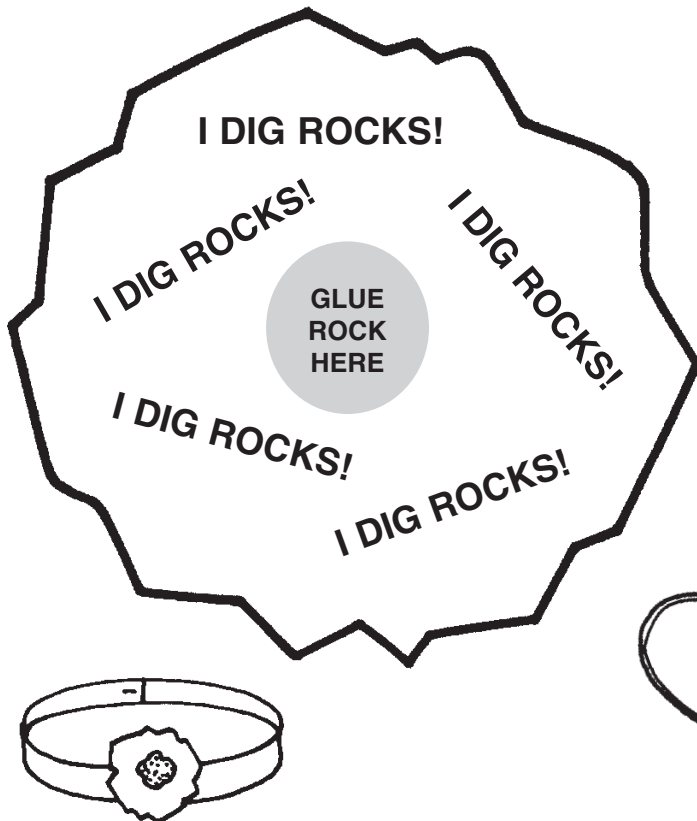
How Mountains are Made

by Kathleen Weidner Zoehfeld
(HarperTrophy)

Fossils Tell of Long Ago

by Ailiki (HarperTrophy)

Headband Pattern



Rock Ranger Medallion Pattern



ROCK RANGER MUSEUM

_____ rock or fossil name

is a _____ rock and one of our finest specimens.

Location found: _____

Description: _____

Discovered by _____

ROCK RANGER MUSEUM

_____ rock or fossil name

is a _____ rock and one of our finest specimens.

Location found: _____

Description: _____

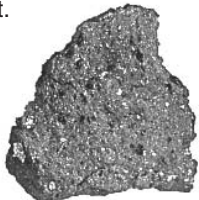
Discovered by _____

ROCK RANGER FIELD GUIDE

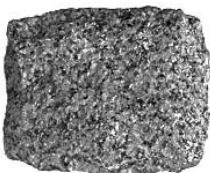
Igneous Rocks

- **Igneous** comes from a word that means “fire.”
- A good place to look for igneous rocks is near old volcanoes.
- Igneous rocks began as “melted” or molten rock deep inside the Earth. Some molten rock came to the surface after a volcano erupted and cooled quickly. Other molten rock formed beneath the surface where it cooled and hardened slowly.

Basalt was formed long ago when lava poured out of volcanoes and cooled quickly. Lava from volcanoes is mostly basalt. The Hawaiian Islands were formed from a build-up of basalt.



Granite cooled slowly below the surface of the Earth. It has a speckled-look because it is made of coarse grains of minerals. Many mountains are made up of granite. Granite is used to build statues.



Obsidian is formed when lava cools so quickly there is no time for crystals to grow. Obsidian is a smooth volcanic glass. It was used by early Native Americans for knives, arrowheads, and spearheads.



ROCK RANGER FIELD GUIDE

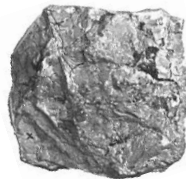
Sedimentary Rocks

- **Sedimentary** comes from a word that means “to settle.”
- A good place to look for sedimentary rocks is near oceans, rivers, and lakes.
- Sedimentary rocks began as other rocks. Bits and pieces were worn away by wind and water and carried away to a different place. In time, the layers of sediments were pressed down and cemented together to form new rocks.

Conglomerate is a mixture of smooth stones and pebbles that were rolled around on the bottom of seas or rivers. After being buried, the stones became cemented together. Sometimes conglomerate is called “pudding stone” because it looks like plum pudding.



Limestone is a fine-grained stone formed from broken shells and tiny sea animals. The shells settled on the ocean floor and after millions of years the layers turned into rock. Limestone is used in building roads and in making cement and plaster.



Sandstone is formed when grains of sand, under pressure, cement together over a long time. Minerals give sandstone different colors. It is used to build walls and buildings.



ROCK RANGER FIELD GUIDE

Metamorphic Rocks

- **Metamorphic** comes from a word that means “to change.”
- A good place to look for metamorphic rocks is where land was worn away.
- Metamorphic rocks began as sedimentary or igneous rocks. When these rocks were changed by heat or pressure or both, they become metamorphic rock.

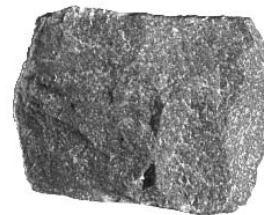
Coal began as plants in swampy forests. The plants rotted and were buried. Gradually the water was squeezed out and after a long time the plants were compressed into coal. Coal is an important source of energy.



Marble is formed from limestone that is exposed to very high temperatures. The many colors and textures of marble make it a good material for floors and statues.



Quartzite is formed when sandstone is exposed to high heat and pressure. It is used in making glass, ceramics, and floors.

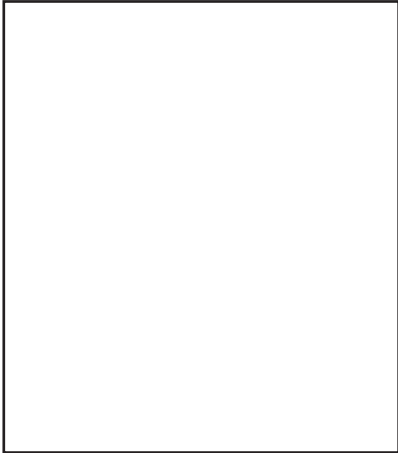




ROCK RANGER FIELD GUIDE

Rock # _____

Draw and color the rock.



I found this rock:

Describe the rock.

(Is it sharp, flat, smooth, shiny,
dull, heavy, light, colorful, grainy,
or crystalline?)

I think the rock is called

It is a

_____ rock.

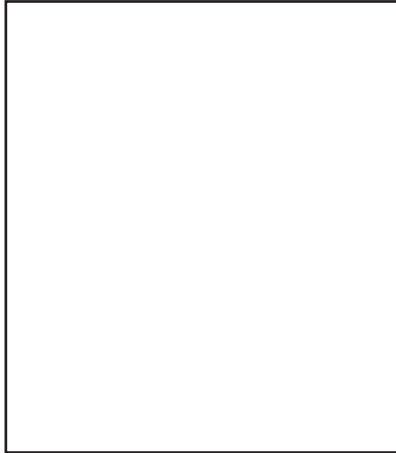
(Is it sedimentary, igneous, or
metamorphic?)



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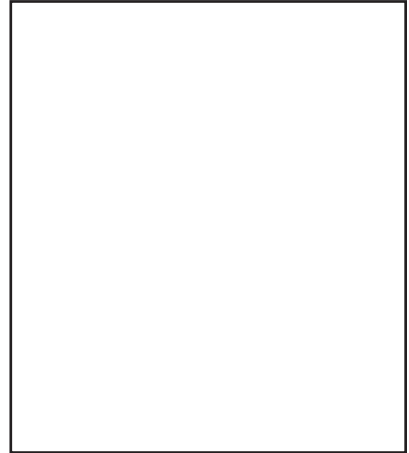
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