Portable Collections Program

Rocks & Minerals In Our Lives

BROOKLYN CHILDREN'S MUSEUM

touch the world!

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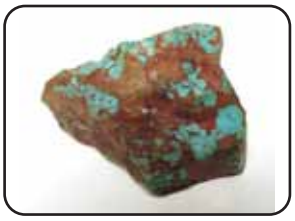
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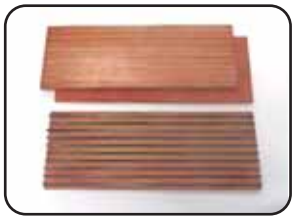

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BCM Rocks and Minerals Information Guide (printed booklet)

Rocks: "Quick Guide" to Rock Identification (laminated pamphlet)

Eyewitess: Rocks & Minerals by R.F. Symes

National Audubon Society First Field Guide to Rocks and Minerals by Edward Ricciuti and Margaret W. Carruthers

The Rock Factory: A Story About the Rock Cycle by Jacqui Bailey

Guidelines for Handling Museum Specimens

Learning to handle cultural objects and natural history specimens from the Museum's collections with respect can be part of your students' educational experience of the case. Please share these guidelines with your class, and make sure your students follow them in handling objects and specimens in the case:

- **Students may handle the objects and specimens carefully and under your supervision.**
- **Hold objects and specimens with two hands.** Hold them by the solid part of the body or by the strongest area rather than by their edges or protruding parts.
- **Paint, feathers, fur and fibers are especially fragile** and should be touched as little as possible. Remember that rubbing and finger oils can be damaging.
- **Do not shake the objects or specimens**.
- **Temperature differences, direct sunlight, and water can be very harmful to museum objects.** Please keep them away from radiators and open windows, and keep them secure.

Notes about Object-Based Learning and Inquiry

Learning about geology by examining rock and mineral specimens is much different from reading about it in a book. Specimens have the power to tell us many things, provided we are willing to look at them in detail and think about what those details mean. Encourage your students to carefully examine the rock and mineral specimens and touch them gently. Have them describe the specimen's shape, size, and color. Ask them questions about what they see, and what their observations might tell them. For example:

- What do you see in the specimens? Describe their shape, color, and structure. (It is important that your students use visual clues based on their observations when giving their answers.)
- What do you want to know about them?
- What else can you see?

You can assist this process by encouraging your students to examine individual rocks or minerals in detail, and to think about what those details might mean. Ask them questions about what they see, and what that might tell them. As the conversation begins to grow, you can ask more questions about the specimen:

- What does this rock look like? How does it compare to other specimens in the case?
- What kind of rock or mineral is this? How can you tell?

Providing books and Internet access for researching these and other questions encourages students to make discoveries that further their knowledge about rocks and minerals.

Introduction: Rocks and Minerals in Our Lives

To the teacher

Rock and minerals are everywhere. They are so common and familiar that they are almost invisible to us as we go about our daily lives. Yet the earth itself and most things in it are made of rocks and minerals. Even living things—including we human beings!—have minerals within them.

Even though we do not always pay them much attention, rocks and minerals are far more than just a gray, nondescript background for life. As the 31 specimens in this case will demonstrate for you and your students, rocks and minerals can be colorful and enormously varied in form. They have exciting biographies—born in fire, carried down mountains by rivers, crushed by glaciers and oceans, compressed and twisted and melted again into yet new forms! People also use rocks and minerals for an amazing variety of purposes, from constructing grand buildings and awe-inspiring works of art, to creating the filaments that light up electric bulbs and the insulation in our homes.

You can take many approaches to the study of rocks and minerals. With this Portable Collections case, we suggest introducing the specimens by connecting them with some of the ways people use them in everyday life, which students are likely to recognize and be able to relate to immediately. This case includes a selection of 14 cultural objects made from rocks and minerals, which demonstrate how parts of the natural world may be transformed into things we live with and use everyday.

The activities in this teacher guide go beyond a purely scientific scope—instead, they offer many opportunities for cross-curricular connections to the arts, language arts, social studies, geography, health, and math. We encourage you to build on these creative connections, and to incorporate new ones according to the needs and interests of your students. You may also approach the study of rocks and minerals by studying this case in conjunction with other Portable Collection cases, such as the one on Volcanoes (which focuses on the origin of igneous rocks), Crystals (which is about minerals and their structure), or Fossils (which mostly occur in sedimentary rock).

What are rocks and minerals?

The definition of a **rock** is as unglamorous and general as its image: a rock is a chunk of nonliving natural matter—in others words, practically everything natural and solid that is not living. Rocks are made up of **minerals** (or rarely, just one mineral). Unlike rocks, minerals are very specific and so is their definition: each mineral is solid nonliving matter that has a definite crystal structure and chemical composition. The study of rocks and minerals is known as **geology**.

Types of rock

Igneous rocks form during volcanic eruptions. When **magma** (hot, molten rock) flows out of a volcano, it cools and solidifies to form igneous rock.

Sedimentary rocks are formed when weathering and erosion break down sedimentary, metamorphic, or igneous rocks into small bits, or sediments. These sediments are then transported (by ice, air, water, and so on). Once they have been deposited, the

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sediments may be buried by other sediments and turned into rock through compaction (pressure caused from the weight of sediments above) or cementation (sediments are "glued" together by minerals that precipitate out of water that was between the sedimentary particles when they were buried).

Metamorphic rocks are made up of igneous, sedimentary rocks, or other metamorphic rocks that have been subjected to pressure, heat, or water until they take on a new configuration with a new crystalline structure. The heat, pressure, or water may cause the minerals in the rock to change in size or shape, or to combine with other minerals to form new or bigger minerals.

We may think of rocks as tough and unchanging, but the rock cycle demonstrates how, in our universe, matter is never gained or lost; it is simply recycled into another type of matter. Each of the three types of rock will change over time into another rock, depending on the environmental conditions to which it is exposed. To learn more about how rocks are formed in the rock cycle, read The Rock Factory by Jacqui Bailey (included in the case).

Identifying rocks and minerals

When trying to identify an unknown specimen, ask your students: Is this specimen a rock or a mineral? How can you tell? Have students look at it through a hand lens to find clues about its identity based on its appearance. For example, they should be able to tell that granite is a rock because it has large crystals and an uneven texture, and is obviously made up of different types of matter.

However, it is important to emphasize that identifying rocks and minerals is not an easy task. Even professional geologists are not always able to tell rocks or minerals apart without testing them for certain properties. They look at a specimen's luster (how it shines in the light), **streak** (what color it leaves behind when rubbed against a piece of white porcelain), **cleavage** (how it breaks), hardness, heaviness, and sometimes fluorescence or magnetism as well.

Your students will not be able to perform all of a geologist's standard tests, since some of them would damage the specimens in the case. They may be able to see a specimen's crystals (which may be big or very small), and they may also be able to identify rocks by their luster. However, whether or not your students can figure out the exact identity of the rocks and minerals they study during this unit, they will still be sharpening their observation skills and participating in the scientific process, which is the most important lesson of all.

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An Introduction to Rocks and Minerals (continued)

How we use rocks and minerals

Rocks and minerals are a vital part of our everyday lives. They provide us with shelter and even food, as well as innumerable objects that make our existence easier or more enjoyable.

Our use of rocks and minerals may be most obvious in the structures we build. Our homes, schools, hospitals, and skyscrapers are all made from these materials. Limestone is a solid foundation rock. Minerals and rocks such as black shale may be mixed together to form concrete and asphalt. Marble is used to decorate many buildings. The brownstones of Brooklyn and Manhattan get their name from the reddish-brown sandstone from which they are constructed.

Humans need to consume a variety of minerals to maintain good health. These minerals support and strengthen the body's different systems, including the skeleton, bloodstream, and nervous system. For example, calcium (represented in the case by the lump of calcite) is essential for building strong bones. Other minerals just make our food taste good, such as salt, which is really a granular form of the mineral halite.

Rocks and minerals are all around us. They make up our televisions, cars, clothing, computers, and even our currency. To learn more about the specific uses of the 31 rocks and minerals in this Portable Collections case, please see the BCM Rocks and Minerals Information Guide (also included in the case). ❑

Words in boldface have been included in the Vocabulary Words section on page 26.

Did you know?

There are 35 different minerals needed to make the average computer.
The average car contains 39 different minerals.
The average person in the United States needs almost 50,000 pounds of minerals each year in order to go about his or her daily life. Over the course of a lifetime, that person will make use of around 3.7 billion pounds of minerals.

Information About the Cultural Objects in the Case

ELEPHANT STATUE (India), 40.40.13

Painted with yellow, red, green, and gilt markings, this white marble elephant was made in India. There the elephant is a traditional symbol of royalty, fertility and strength. It is believed to guard against evil spirits and bring good luck. Statues like this one are usually carved in the city of Jaipur by professional craftsmen, who shape rocks such as marble and alabaster into figures representing Hindu and Jain gods or symbols.

EGG (Italy), 72.121.2b

Italy produces marble (a rock) in a variety of colors, including the vivid shade of green used to create this egg. The egg may have been intended as a decorative object like a paperweight, or used as a darning egg. Slipping a holey sock over a darning egg stretches the sock out so the seamstress can see the hole better, and repair it without the risk of accidentally sewing one side of the sock to the other.

MINIATURE SKILLET (U.S.), 61.5.14

This skillet is a miniature version of a cast-iron frying pan. Cast-iron is a type of iron that has so much carbon in it that it is brittle and cannot be worked with tools; instead, it must be melted and poured into molds (or casts). Cast-iron cookware is a favorite of experienced chefs because it distributes heat evenly and can be quite durable. When cared for properly, a cast-iron skillet can last for several generations.

BRACELET (Africa), 80.2.235e

In parts of West Africa, people traditionally used bracelets made of brass (an **alloy** or mixture of the minerals copper and zinc) and other precious metals as a form of currency. This bracelet may have been worn as a personal adornment, but its simple design and decorations suggest that it probably was made to be used as money.

BUCKLE (Navajo, U.S.), 99.21

Made from two minerals (silver and turquoise), this belt buckle is typical of the fine jewelry and accessories crafted by the Navajo people of the American Southwest. After the U.S. government forced the Navajo to move onto a reservation in the 1860s, the once nomadic tribe had to adapt to a more settled way of life. One of the most important new skills the Navajo learned was silverwork. By combining silver with turquoise, a brilliant blue-green stone highly valued by the peoples of the Southwest, Navajo artists created a distinctive jewelry style that continues to thrive today.

PORRINGER (U.S.), 2006.0.7

A porringer is a small bowl or cup traditionally used by children, especially to eat porridge (the food that gave this dish its name). This porringer is made from pewter, an alloy of the minerals tin and lead. With its decorative scrollwork handle, this porringer was probably made as an heirloom. Often fine porringers like this one are not meant to be used; instead they may be kept on display and passed down to later generations.

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Information About the Cultural Objects in the Case (continued)

ADZE (Native American, U.S.), 82.32.6

An adze is a tool used for smoothing the surface of rough-cut wood. To use this tool, a person stands astride a board or log and swings the adze downwards towards his or her feet, chipping off a piece of wood. The person walks backward while repeating this action over and over, leaving the wood with a relatively smooth surface. A Native American person carved this adze from granite, a very common igneous rock. This particular adze is probably not very old, but its design is similar to stone tools that some Native American groups have used for thousands of years.

CAN (U.S.)

This can was made from cassiterite, the main **ore** of tin (an ore is a mineral that contains a metal or other valuable resource that can be extracted through chemical processes). Although we often call them "tin cans," everyday food cans are not made entirely of tin. In reality, the cans are made primarily of steel, which is coated with an outer layer of tin to keep acids in the food inside from corroding the can's steel core.

TABLE SALT (U.S.)

Table salt is simply ground-up halite (a mineral with the chemical name of sodium chloride). However, most table salt sold today is not pure halite. It usually has the chemical iodine added to it (so it is called *iodized* salt). Iodine helps prevent people from developing certain thyroid problems, such as goiters (enlarged thyroid glands).

TALCUM POWDER (U.S.)

Made from ground-up talc, talcum powder is a cosmetic that has been used since ancient times. People dust this highly absorbent powder over their bodies to soak up their perspiration. Some talcum powders may be perfumed in order to fight body odor along with wetness.

TUBING (U.S.)

Much of the plumbing in modern homes is made of the mineral copper. Homeowners often prefer copper tubing above other materials because of its strength and durability. Under normal conditions, copper tubing has a lifespan of at least fifty years.

EMERY BOARD (U.S.)

This disposable paper board has been coated with emery, an abrasive made from almandite (a mineral more commonly known as garnet). People use emery boards to shape their nails. Rubbing the rough surface of the board over ragged edges or corners leaves a person's nails neat and tidy.

SANDPAPER (U.S.)

Like the emery board, sandpaper is also covered with an abrasive made from almandite (garnet). Carpenters use sandpaper to sand down rough wooden surfaces, leaving the wood smooth to the touch and free of splinters.

Information About the Cultural Objects in the Case (continued)

TICONDEROGA PENCIL SET (U.S.)

This set demonstrates the stages in making a Ticonderoga pencil. The production process begins with a cedar slat, into which is inserted a core of black graphite (a mineral). Then once the pencil has been lacquered and imprinted with the maker's name, it is finished! The Dixon Ticonderoga pencil is one of the oldest brand-name pencils in the U.S., and has been manufactured here since 1827.

To learn more about the rock and mineral specimens in the case, see the BCM Rocks and Minerals Information Guide included in the case

You and your students can learn more about these specimens and other objects from around the world by visiting our Collections Central Online database at ***www.brooklynkids.org/emuseum****.*

ACTIVITY 1 Introductory Activity: Animal, Plant, or Mineral?

All Grades
Related Specimens: All

Everyday, everywhere you go, and everywhere you look —everything around you is made from something! The Earth's natural resources consist of animals, plants, and minerals (remember, rocks are made from minerals, too). Our homes, our cars, our food, and our clothing are all made from one (or more) of those three things. Challenge your students to look around the classroom and figure out in what category (or categories) they should place each of the things they see.

Materials:

- Blackboard OR chart paper

What To Do:

1 Hold up an everyday object (like a book or a stapler) and ask your students where they think it came from. How was it made? What materials were used to make it?

2 Explain that everything on Earth is made from our natural resources, which fall into three categories: animals, plants, and minerals. These natural resources may be processed in different ways to create all the things we use every day.

3 Create a chart with four columns on the blackboard or chart paper. Give each column a heading: Object Name, Animal, Plant, and Mineral.

4 Challenge your students to look around the classroom. What do they see? For each object they name, write its name in the appropriate column of the chart. Then discuss with your students the things that were used to make that object, and put a check mark in the corresponding categories. For example:

- The chalkboard is made of slate, so it belongs in the "mineral" category.
- Students' shoes may be made from leather (animal) and/or synthetic materials (mineral).
- Desks are made from wood (plant), metal (mineral), and glue (animal).

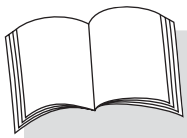
Remember, some everyday objects may be made from all three categories of natural resources!

5 Repeat step 4 as many times as you like. Once you have discussed the objects in your classroom, if time permits, ask your students to think about the things they see and use outside the classroom, too. What about cars, bicycles, and televisions? What are students' homes made from?

Discussion Questions:

- Did you know where all of the objects in your classroom came from? Did some of the answers surprise you?
- How can an object be made from plants, animals, and minerals? Name an object that falls into more than one category.
- Could plants and animals contain minerals? Could minerals be made from plants and animals?
- Can you name anything that isn't made from natural resources?

See page 27 for details on how this activity meets New York State Learning Standards.



LITERACY AND RESEARCH EXTENSION: GRADES 3–5

Using this guide and the rock and mineral samples and books included in the case, have students work individually or in small groups to brainstorm and write down a list of the rocks and minerals they think were used to make some of the everyday objects they discussed in this activity.

ACTIVITY 2 A Rock and Mineral Mystery

All Grades
Related Specimens and Cultural Objects: All

Rocks and minerals are not just used to make cement, bricks, or other construction materials—they are also the "building blocks" that make up many smaller objects we use every day! In this activity, your students will learn about how people around the world use rocks and minerals in their everyday lives.

Materials:
- Rocks and minerals from the case
- Cultural objects from the case
- Hand lenses from the case
- Copies of the "Rock and Mineral Mystery" worksheet (see following page), one per student OR one overhead projector and transparency for the class
- Blackboard or chart paper for recording observations

What To Do:

1 Ask students to name some things they know are made from rocks and minerals. They may come up with answers ranging from bricks and mortar to cars, televisions, and sidewalks, just to name a few. Record their answers on the blackboard or chart paper.

2 Set out the geological specimens and cultural objects from the case, along with the hand lenses.

3 Have students complete the "Rock and Mineral Mystery" worksheet on the following page by matching the cultural objects in the case with the mineral or rock they are made from. This portion of the lesson may be done in a number of ways:

- The class may work together as a whole, examining each cultural object in turn and working from an overhead transparency; or
- You may break students into pairs or small groups and have them rotate between objects, each one filling in an individual worksheet.

Keep in mind that **not all of the cultural objects have a corresponding specimen in the case**. For some, the answer will need to be found in the books and other resources provided in the case.

4 If students are working in small groups, reconvene as a class at the end of the activity to go over the answers to the worksheet. Did some of the objects fool your students? Discuss any pairings that proved problematic.

Discussion Questions:
- What are some things you know are made from rocks and minerals?
- Do objects made from a certain rock or mineral necessarily look like that rock or mineral? If they don't look alike, how can we tell one is made from the other?
- Could you find a rock or mineral in the case that looked like each cultural object?
- Did some of the answers surprise you? Why?
- Compare the sample of marble to the white marble elephant statue and the green marble egg in the case. How are these three examples of marble different?

See page 27 for details on how this activity meets New York State Learning Standards.

Worksheet Answer Key	
Object	**Rock or mineral source**
Elephant statue (India)	Marble
Egg (Italy)	Marble
Miniature skillet (USA)	Iron
Bracelet (Africa)	Brass (copper and zinc alloy)
Buckle (Navajo)	Silver and turquoise
Porringer (USA)	Pewter (tin and lead alloy)
Adze (Native American)	Granite
Can (USA)	Cassiterite (tin)
Salt (USA)	Halite
Talcum powder (USA)	Talc
Tubing (USA)	Copper
Emery boards (USA)	Almandite (garnet)
Sandpaper (USA)	Almandite (garnet)
Ticonderoga pencil set (USA)	Graphite

A Rock and Mineral Mystery

Rocks and minerals make up many of the objects we use every day. The same is true for this selection of objects from around the world. Examine the objects closely, using a hand lens if you like. Can you match each one with the rock or mineral it was made from? You will need to use one of the answers below twice.

Elephant statue

Miniature skillet

Can

Adze

Ticonderoga pencil set

Bracelet

Talcum powder

Buckle

Table Salt

Tubing

Emery board

Porringer

Sandpaper

Egg

ROCK AND MINERAL SOURCES

1 Iron
2 Pewter (tin & lead alloy)
3 Marble
4 Almandite (garnet)
5 Copper
6 Turquoise
7 Silver
8 Graphite
9 Talc
10 Brass (copper & zinc alloy)
11 Halite
12 Cassiterite (tin)
13 Granite

ACTIVITY 3 What Can Specimens Tell Me?

Grades 3–5
Related Specimens: All

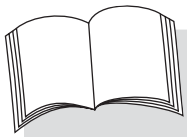
This activity gives your students a chance to look at a variety of rocks and minerals, and to think about what they can learn from those specimens just by observing them closely. Features like color, texture, and surface can give the students significant clues about how each specimen was created.

Materials:
- Rocks and minerals from the case
- Hand lenses from the case
- Copies of the "What Can Specimens Tell Me?" chart, one per student OR, for a whole class exercise, a transparency of the chart and an overhead projector
- Blackboard OR chart paper for recording group observations

What To Do:
1. Depending on the age and interests of your students and the amount of time you would like to spend, you can do this activity using a handful of specimens or every specimen in the case. It can be done in small groups or as a class, looking at the specimens in turn and filling out the chart using an overhead projector or large chart paper.
2. For small groups, prior to the presentation of the lesson, set the classroom up into stations (make sure there are enough stations so that you have only 3–4 students working at each one). Place one or more specimens at each station along with a hand lens.
3. Distribute the "What Can Specimens Tell Me?" chart and go over it with the students. Ask them to pay special attention to the physical properties of each of the specimens. You may want to practice with the class, using one of the specimens to model the activity.
4. Have the students fill in their charts as they look at the specimens. After a few minutes, the groups should rotate to a new station. Repeat this step as many times as you like.
5. Have the students reconvene as a class to discuss their findings. You may want to use the chart paper to make notes about the students' observations.
6. When you feel they have gone as far as they can with what they observed, introduce information from your own knowledge, this guide, or other resources about the different types of rocks.

Discussion Questions:
- Use a hand lens to examine the crystals of quartz, feldspar, and mica in the sandstone sample. Are the crystals smaller or larger than grains of sand?
- Compare the different samples of coal in the case. How are they similar? How are they different?
- Compare the crystals in basalt and granite using a magnifying glass. How are they different?
- Examine the **banding** in the gneiss sample. Compare it to granite or pumice. Do they have banding?
- Use a magnifying glass to compare mica crystals with those of other rocks and minerals.
- Compare the crystals of schist with those in the granite, sandstone, and marble samples. What are the differences? Can you pick out the shiny mica flakes?

See page 27 for details on how this activity meets New York State Learning Standards.



RESEARCH AND LANGUAGE ARTS EXTENSION: GRADES 3–5

Working individually or in groups, have students choose one rock or mineral specimen from the case to investigate further. Ask them to find out basic information about their rock or mineral, such as what type of rock it is (if applicable), what it is made up of, where it is found, and how people use it. They should also find or draw an image of a typical specimen. Students may research their rock or mineral using the BCM Rocks and Minerals Information Guide, the books in the case, or library or Internet resources (such as Brooklyn Children's Museum's searchable database, Collections Central Online, viewable at **www.brooklynkids.org/emuseum**). They may present their research to the class in a poster or an oral report.

What can specimens tell me?

Use your senses to observe each specimen carefully, using a hand lens if necessary. What can you tell about rocks and minerals just by looking at each specimen in detail? Use this chart to record what you discover.

	What color or colors is the specimen?	What is its texture like? Is it smooth or rough?	Does the specimen look the same all over, or does it appear to made up of different types of matter?	What else do you notice about this specimen?
				
				
				
				
				

What can specimens tell me?

Use your senses to observe each specimen carefully, using a hand lens if necessary. What can you tell about the rock just by looking at the specimen in detail? Use this chart to record what you discover.

	What color or colors is the specimen?	What is its texture like? Is it smooth or rough?	Does the specimen look the same all over, or does it appear to made up of different types of matter?	What else do you notice about this specimen?
				
				
				
				
				

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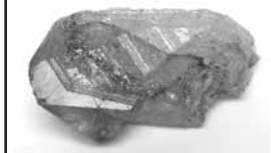				
				

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ACTIVITY 4 Rocks and Minerals In Your Neighborhood

All Grades
Related Specimens: All

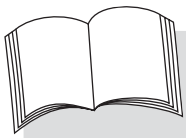
A previous activity focused on matching rocks and minerals with the products they may be made into. This activity encourages students to think about the rocks and minerals they may encounter in their rough form. Students will collect and observe specimens, and try to determine what they are by using a geology field guide.

Materials:
- Rock or mineral specimens collected from around the neighborhood, one per student
- Hand lenses from the case OR microscopes
- Rulers
- Scale
- Drawing paper
- Colored pencils, crayons, or markers

What To Do:
1. Have your students search their yards, nearby parks, or playgrounds for one small rock or mineral specimen that they can bring into school.
2. Students should brush or wash any dirt off their rocks or minerals, and then examine their specimens using a hand lens or microscope.
3. Students should draw a detailed picture of their specimen. They should also measure and weigh it, if possible, and record its dimensions below their drawing.
4. Ask students to answer the following questions about their specimens, either out loud or in writing on the same page as their drawing:
   - Where was it found?
   - What color is it?
   - Is it smooth or rough?
   - Is it dull or shiny?
5. After answering these questions and observing their specimens carefully, have your students compare their answers to descriptions of common rocks and minerals in one of the geology identification guides included in the Portable Collections Case. Can they determine if their specimens are rocks or minerals? Can they identify their specimens as a particular rock or mineral? Remind students that even if they cannot determine their specimens' identity conclusively, their description is still a valuable contribution to science!
6. Gather students' specimen pages together and bind them into a class field guide to rocks and minerals, or display each page with its corresponding specimen to create a "mini-museum" in your classroom.

Discussion Questions:
- Where did you collect your specimen?
- Why is it important to study your specimen? What did you learn about it?
- Could you figure out what type of rock or mineral your specimen is?

See page 27 for details on how this activity meets New York State Learning Standards.



EXTENSION: You may wish to extend this activity by asking your students to think of possible uses for their specimens. Students may research common uses for those rock and mineral specimens they are able to identify. Alternatively, if they are unable to match their specimen with a description, they may imagine more creative ways to put it to use (for example, as a hammer, a doorstop, a paperweight, and so on).

ACTIVITY 5 You Are What You Eat

Grades 2–5
Related Specimens: All

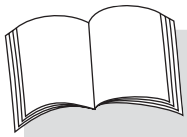
Minerals are a necessary part of our diet. There are dozens of minerals that humans must eat in order to live and to maintain good health. In this activity, your students will learn about nutrition and explore the mineral content of some of the foods they eat every day.

Materials:
- A mineral specimen from the case
- Food packaging nutrition labels brought from home, at least one per student
- Blackboard OR chart paper
- Paper and pencils

What To Do:
1. Preparation: Ask students to bring in food packaging nutrition labels from home, or save them up yourself over time.
2. Begin this activity by holding up a mineral specimen from the case and asking students if they ever eat minerals. They may be nutritionally savvy enough to know that they need some minerals to maintain healthy bodies. But if the children react with shock or laughter, show them the nutrition label from a package of food. Some of the minerals people need to eat are listed on the label.
3. Talk with your students about how small amounts of minerals are present in all of the foods we eat (see Discussion Questions below).
4. Ask your students to name any minerals they can think of that are necessary to a healthy diet. Record their answers on the blackboard or chart paper.
5. Pass out the food nutrition labels so that each child has at least one. Have students read their labels silently to themselves. Are there any minerals listed on the labels that your students have not yet named? Ask them to call out the names of these minerals. Record their answers on the blackboard or chart paper to create a master list.
6. Assign each student (or small groups of students) one of these minerals. Using the books in this case, in their school or local library, or the Internet, have them research why their assigned mineral is necessary for our bodies.
7. Optional: What happens when you have a mineral deficiency? Talk about some diseases that afflict people with mineral deficiencies, such as anemia (low iron) and osteoporosis (insufficient calcium).

Discussion Questions:
- Where do the minerals in our food come from? Can we taste them? Why or why not?
- Why do we need to eat minerals to stay healthy? What do they do for our bodies?
- Look at the mineral specimens in the case. Does the human body need any of these minerals to stay healthy? Are any of them used in food? (Hint: Calcite is a form of calcium, a mineral people need to build strong bones and teeth. Halite is the raw mineral form of everyday table salt.)

See page 27 for details on how this activity meets New York State Learning Standards.



SCIENCE AND LITERACY EXTENSIONS:

- Have students choose one mineral that appears on their nutrition label. How much of the recommended daily allowance (RDA) of that mineral does one serving of their food contain? How many servings would they need to eat to get 100% of the RDA of that mineral?
- Using their food nutrition labels, have students plan a full meal (including an entrée, side dishes, and an appetizer or dessert if possible). Ask them to calculate the mineral content of their meal by looking at the nutrition labels. How much of the RDA of each mineral will each of their courses provide? Have them tally up these percentages. Will their meal meet 100% of any of their daily mineral needs? If not, what are some other foods they could eat instead to boost their mineral intake?
- Create a table, chart, or graph indicating the mineral content of each of the foods your students have analyzed. Which ones have the most minerals in them? Does that necessarily mean they are the healthiest nutritional options?

ACTIVITY 6 Additional Activities and Curricular Connections

Literacy: What Would Life Be Like Without Rocks and Minerals?
All Grades
We depend on rocks and minerals every day, but what would life be like if they didn't exist? How would human existence be different? What are some things students would have to live without? (Hint: It takes 39 different minerals to build an average car, and 35 to make a computer.) Have your students write a paragraph or short story describing what they think their lives would be like without rocks and minerals.

Literacy: Adopt a Pet Rock
All Grades
Who says a pet needs to have fur, feathers, or gills? Introduce your students to the 1970s craze, the Pet Rock. Go on a rock-gathering expedition, or have students bring in a rock from home. They should give their pet rock a name, and tell or write a story about it. Encourage your students to make their stories interesting and inventive, and to convey a sense of their pet rock's personality. The point of this activity is to have fun with words—their stories do not need to be factually accurate or full of geological terms.

Literacy: The Autobiography of a Rock
Grades 3–5
Read The Rock Factory (included in the case) aloud to your students. Then have them write a story describing the rock cycle from the point of view of a rock. They should give their main character a name and a distinctive personality. Their story may begin during any part of the cycle, and may focus on one stage in particular or may take the reader through the entire cycle. Encourage students to make their stories lively and entertaining, but also factually accurate.

Literacy and Music: Create a Geological Rap
Grades 3–5
Have students put the names of rocks and minerals into a rap song. Since many of their names have rhyming endings (like "ite"), this should not be difficult. The song may convey facts about rocks and minerals (such as how they are used), or it may simply be a silly song just for fun. The lyric structure of a rap song is a series of couplets—two lines that end in a rhyme, followed by two lines with a different rhyme, and so on. Students can accompany themselves by making a variety of percussive sounds with their bodies (www.wiki.ehow.com/Be-a-Human-Beatbox tells you how). If students would rather sing than rap, they can write new words to go with a familiar tune.

Arts: Rock Art
Grades K–3
Rocks come in a variety of shapes, and may sometimes resemble other objects. Have your students gather rocks with interesting or unusual shapes, or smooth, flat rocks. Provide them with paintbrushes and paint in a rainbow of colors, and tell them to set their imaginations free! Students may paint their rocks in any manner they like. Rocks with a blocky, angular shape may remind them of cars or buildings. Flat, slightly rounded rocks may suggest a flower or a beetle. Alternatively, students may choose to create an abstract design. Display rocks as they are drying to create a mini art show within your classroom.

Geography: Mapping Rocks and Minerals
Grades 2–5
Working individually or in groups, have students choose a rock or mineral to investigate. Using the books in the case, or library or Internet resources, have your students research where in the world their rock or mineral occurs. They may demonstrate this knowledge by marking their rock or mineral's locations on an 8 1/2" x 11" copy of a world map. Does any one country have all the minerals it needs to produce everyday goods? What happens when a country needs a mineral it cannot produce itself?

Geography: Rocks and Minerals of New York State
Grades 2–5
Working individually or in groups, have students research what rocks and minerals are mined in New York State, and where they are produced. Students should plot these locations on a map.

Science: Build a Volcano
All Grades
Igneous rocks are created in volcanic eruptions. Explore this phenomenon with your students by making a model volcano in your classroom. Enter "volcano model" in your favorite Internet search engine to find lots of options for creating your own eruption.

Science: Magnetite and Magnetism
Grades 3–5
Hold the magnetite sample near a compass. It will make the needle inside sway. Why does this happen? Talk with your class about how magnetism works.

Math: Rocks and Minerals by the Numbers
Grades 3–5

Every year, about 20,000 pounds of sand, gravel, and stone are mined to meet the needs of each person in the United States. Have your students calculate the answers to the following questions:

- If there are 280 million people in the U.S., how many pounds of sand, gravel, and stone are mined here each year?
- How many pounds are mined each year just for the students in your classroom?
- If your students live to be 75 years old, how many pounds of sand, gravel, and stone will be mined for them during their lifetime?
- One ton (2,000 pounds) of sand, gravel, and stone is about equal to one cubic yard. Have your students convert their answers from pounds into cubic yards.

See page 27 for details on how these activities meet New York State Learning Standards.

Vocabulary Words

alloy:
a mixture of two elements, at least one of which is metallic.

banding:
a strip or layer of material within a rock whose color, texture, or structure is different from the materials around it.

bedrock:
the solid rock underlying the Earth's loose surface materials (such as rocks, soil, and sediment).

cleavage:
the tendency of some minerals to crack or break in a distinctive way, along flat surfaces or planes (as determined by their atomic structure). Geologists look at cleavage to help them determine a specimen's identity.

crystal:
a mineral body with surfaces that are smooth, flat, and regularly arranged. The regular shape of a crystal results from the regular arrangement of the atoms of which it is made.

crystalline:
made of crystals.

erosion:
the wearing down and transport of rocks as a result of forces such as wind, water, heating, freezing, and gravity.

hardness:
the cohesion of the particles on the surface of a mineral as determined by its capacity to scratch another or be scratched itself.

igneous:
one of the three types of rocks. Igneous rocks form when molten magma solidifies and crystallizes.

luster
the way a mineral shines in the light. Geologists look at luster to help them determine a specimen's identity.

magma:
molten (heated) rock made of minerals and often containing gases, which comes from deep within the earth and flows during volcanic eruptions; magma becomes igneous rock when it cools.

matter:
the substance of which an object is composed. Everything in the universe is made of different types of matter.

metamorphic:
one of the three types of rocks. Metamorphic rocks are made up of igneous or sedimentary rocks that have been formed by pressure, heat, or water into a new configuration with a new crystalline structure.

mineral:
a naturally occurring inorganic (nonliving) solid element or compound that has a specific chemical composition and a definite crystal structure.

ore:
a mineral that contains a metal or other valuable resource that can be extracted through chemical processes.

rock:
any solid natural material formed of minerals, or (less commonly) of a single mineral. Rocks are divided into three main groups: igneous, sedimentary, and metamorphic.

sedimentary:
one of the three types of rocks. Sedimentary rocks are formed when mineral fragments are transported from their source by water, wind, waves, ice, snow, or gravity, and deposited elsewhere.

streak:
the color a mineral leaves behind when rubbed against a piece of unglazed white porcelain. Geologists look at streak to help them determine a specimen's identity.

Correlations with New York State Learning Standards

The activities included in this guide meet the following New York State Learning Standard Performance Indicators for elementary students (K–5):

New York State Learning Standard Performance Indicators (Elementary Level)					Activity					
Standard Area	**Standard #**	**Subject**	**Letter**	**Students will**	**1**	**2**	**3**	**4**	**5**	**6**
Arts	1	Music	a	Create short pieces consisting of sounds from a variety of traditional, electronic, and nontraditional sound sources						•
Arts	1	Visual Arts	a	Experiment and create art works, in a variety of mediums (drawing, painting, sculpture, ceramics, printmaking, video, and computer graphics), based on a range of individual and collective experiences				•		•
English Language Arts	1	Listening & Reading		Gather and interpret information from children's reference books, magazines, textbooks, electronic bulletin boards, audio and media presentations, oral interviews, and from such forms as charts, graphs, maps, and diagrams	•		•	•	•	•
ELA	1	Listening & Reading		Ask specific questions to clarify and extend meaning	•	•	•	•	•	•
ELA	1	Speaking & Writing		Present information clearly in a variety of oral and written forms such as summaries, paraphrases, brief reports, stories, posters, and charts	•		•	•	•	•
ELA	1	Speaking & Writing		Use details, examples, anecdotes, or personal experiences to explain or clarify information	•		•	•	•	•
ELA	1	Speaking & Writing		Observe basic writing conventions, such as correct spelling, punctuation, and capitalization, as well as sentence and paragraph structures appropriate to written forms	•		•	•	•	•
ELA	2	Speaking & Writing		Create their own stories, poems, and songs using the elements of the literature they have read and appropriate vocabulary						•
ELA	2	Speaking & Writing		Observe the conventions of grammar and usage, spelling, and punctuation	•		•	•	•	•
ELA	4	Speaking & Writing		Listen attentively and recognize when it is appropriate for them to speak	•	•	•	•	•	•
ELA	4	Speaking & Writing		Take turns speaking and respond to others' ideas in conversations on familiar topics	•	•	•	•	•	•
Social Studies	2			Explore the lifestyles, beliefs, traditions, rules and laws, and social/cultural needs and wants of people during different periods in history and in different parts of the world		•				
SS	3			Study about how people live, work, and utilize natural resources	•	•				•
SS	3	Geography		Draw maps and diagrams that serve as representations of places, physical features, and objects						•
SS	3	Geography		Locate places within the local community, State, and nation; locate the Earth's continents in relation to each other and to principal parallels and meridians.						•
SS	3	Geography		Identify and compare the physical, human, and cultural characteristics of different regions and people						•

Correlations with New York State Learning Standards

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New York State Learning Standard Performance Indicators (Elementary Level)					Activity					
Standard Area	**Standard #**	**Subject**	**Letter**	**Students will**	**1**	**2**	**3**	**4**	**5**	**6**
Math, Science, & Technology	1	Mathematical Analysis		Explore and solve problems generated from school, home, and community situations, using concrete objects or manipulative materials when possible					•	•
MST	1	Scientific Inquiry		Ask "why" questions in attempts to seek greater understanding concerning objects and events they have observed and heard about	•	•	•	•	•	•
MST	1	Scientific Inquiry		Question the explanations they hear from others and read about, seeking clarification and comparing them with their own observations and understandings	•	•	•	•		•
MST	1	Scientific Inquiry		Develop relationships among observations to construct descriptions of objects and events and to form their own tentative explanations of what they have observed	•	•	•	•		•
MST	1	Scientific Inquiry		Organize observations and measurements of objects and events through classification and the preparation of simple charts and tables			•			
MST	1	Scientific Inquiry		Share their findings with others and actively seek their interpretations and ideas	•	•	•	•	•	•
MST	3	Numbers & Numeration		Demonstrate the concept of percent through problems related to actual situations				•		
MST	3	Operations		Add, subtract, multiply, and divide whole numbers					•	•
MST	3	Modeling & Representation		Construct tables, charts, and graphs to display and analyze real-world data					•	
MST	4	Physical Setting		Describe the relationships among air, water, and land on Earth						•
MST	4	Physical Setting		Observe and describe properties of materials using appropriate tools	•	•	•	•		
MST	4	Physical Setting		Describe chemical and physical changes, including changes in states of matter						•
MST	6	Models		Analyze, construct, and operate models in order to discover attributes of the real thing						•
MST	7	Strategies		Work effectively-Contributing to the work of a brain-storming group, laboratory partnership, cooperative learning group, or project team; planning procedures; identifying and managing responsibilities of team members; and staying on task, whether working alone or as part of a group	•	•	•		•	•
Health, Physical Education, & Home Economics	1	Health Education		Understand how behaviors such as food selection, exercise, and rest affect growth and development					•	
	1	Health Education		Know about some diseases and disorders and how they are prevented and treated					•	
	1	Home Economics		Understand the importance of nutritious food and how it contributes to good health, make simple nutritious food choices, and assist with basic food preparation					•	

Corresponding Field Trips

Perhaps we are fortunate that there are no volcanoes to visit in the New York City area. However, geological exhibits and programs are available. Check with the organizations below for details, and look for special National Earth Science Week activities held annually in October.

American Museum of Natural History
79th and Central Park West, Manhattan
(212) 769-5200
www.amnh.org
The AMNH has a spectacular geology collection, including many impressive gemstones. Several corresponding websites for educators offer downloadable guides to the galleries and activities to go along with your visit.

Geological Walking Tour
Many buildings in Brooklyn and Manhattan are made of limestone, sandstone, or marble. Scout out some local locations (perhaps even your own school building) and take your students on a walking tour to look at how rocks and minerals are used to construct the world in which we live.

Brooklyn Children's Museum
also offers programs on a variety of natural history topics. For a listing of programs currently available, please see our website at **www.brooklynkids.org**, or contact the Scheduling Assistant at 718-735-4400, extension 118.

Bibliography

The following books and websites have provided valuable source material for this guide and may also help you to enrich your experience with the objects in the case.

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Marzollo, Jean. I am a Rock. Hello Reader, Level 1. New York: Scholastic, Inc., 1998.

Parker, Steve. Rocks and Minerals. Eyewitness Explorers. New York: DK Publishing, Inc., 1993.

Planet Earth. Time Life Student Library. New York: Time Life Books, 1997.

VanCleave, Janice. Janice VanCleave's Earth Science for Every Kid: 101 Easy Experiments That Really Work. New York: John Wiley & Sons, 1991.

Web Resources

Bob's Rock Shop:
A non-commercial site with images of over 150 specimens, numerous articles on rock and mineral collecting, and extensive links to other rock-related sites.
www.rockhounds.com

Collections Central Online:
Look up geological specimens and cultural objects from around the world in Brooklyn Children's Museum's searchable online collections database.
www.brooklynkids.org/emuseum

Geologylink:
The site has fascinating geological information geared for teachers and geology enthusiasts, and includes several sections written especially for children.
www.geologylink.com

Interactive Rock Cycle Animation:
By clicking on parts of an erupting volcano, students learn about the different parts of the rock cycle and how rocks are formed.
www.classzone.com/books/earth_science/terc/content/investigations/es0602/es0602page02.cfm

The Mineral Gallery:
An online rock and mineral shop with lots of information on rocks and minerals and pictures of specimens for sale.
www.mineral.galleries.com

The Mineral Information Institute:
This site has a wealth of activities and resources for teachers (including free downloadable teaching materials) as well as a section for students.
www.mii.org

The Learning Zone: Rocks; Minerals:
These sites explain how the rock cycle works, and contain other information about rocks and minerals, along with online games for kids to test their geological knowledge.
www.oum.ox.ac.uk/thezone/rocks
www.oum.ox.ac.uk/thezone/minerals

Rockhounds Information Page:
This page includes answers to frequently asked questions about rocks and minerals. It also has a library of images, articles, and links to other sites.
www.rahul.net/infodyn/rockhounds

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For information about renting this or other Portable Collections Program cases,
please contact the Scheduling Assistant at 718-735-4400 ext. 118.