

Science

Science

Earth Science

Crystals AND Gems

by Joyce Churchill



Genre	Comprehension Skill	Text Features	Science Content
Nonfiction	Picture Clues	<ul style="list-style-type: none">• Captions• Labels• Glossary	Natural Resources

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Vocabulary

boulder
erosion
minerals
natural resource
pollution
recycle
sand
weathering

Extended Vocabulary

atoms
crystal
facets
opaque
precious
semiprecious
synthetic
transparent



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ISBN: 0-328-13783-9

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What You Already Know

Rocks are all around us wherever we live. They are a natural resource of the Earth. Rocks can be large boulders. Sometimes they are broken into small pieces. They can even be finely ground up, like sand.



**garnet crystals
on a white rock**



Over a long time water from rivers and lakes changes rocks. Ice and wind also slowly change rocks and soil. These changes are called erosion and weathering.

Pollution happens when harmful things are put into the environment. We recycle materials to keep the Earth clean and protect its natural resources.

Minerals are natural resources found in rocks. Some kinds of minerals are very special. Most gemstones are special minerals. In this book you will learn how we find gemstones and why we value them.





Crystals and Gems

Minerals are made of atoms. An atom is the tiniest part of all things. Some atoms can come together to make crystals. A crystal is a group of atoms in a pattern, like eggs in an egg crate. Crystals come in different sizes. Rock salt comes in large crystals you can see.

Many gems are also large crystals. Gems that are crystals were formed underground long ago. Volcanoes and earthquakes push them to the surface. When gems reach the surface, people can find them.



Different crystal patterns can grow next to each other.



Pearls grow inside oyster shells.



pearls



Cutting Gems

Diamonds and other gems are cut in special ways so that they reflect light. The sides of a cut gem are called facets.



uncut diamond



cut diamond



Not all gems come from the Earth. Pearls grow inside oyster shells. They are shiny and beautiful when they come from the oyster. Most gemstones have to be cut by experts.

Gem cutters can make tiny rainbows of light bounce off a gem. The crystal patterns in the gem make the light do this.

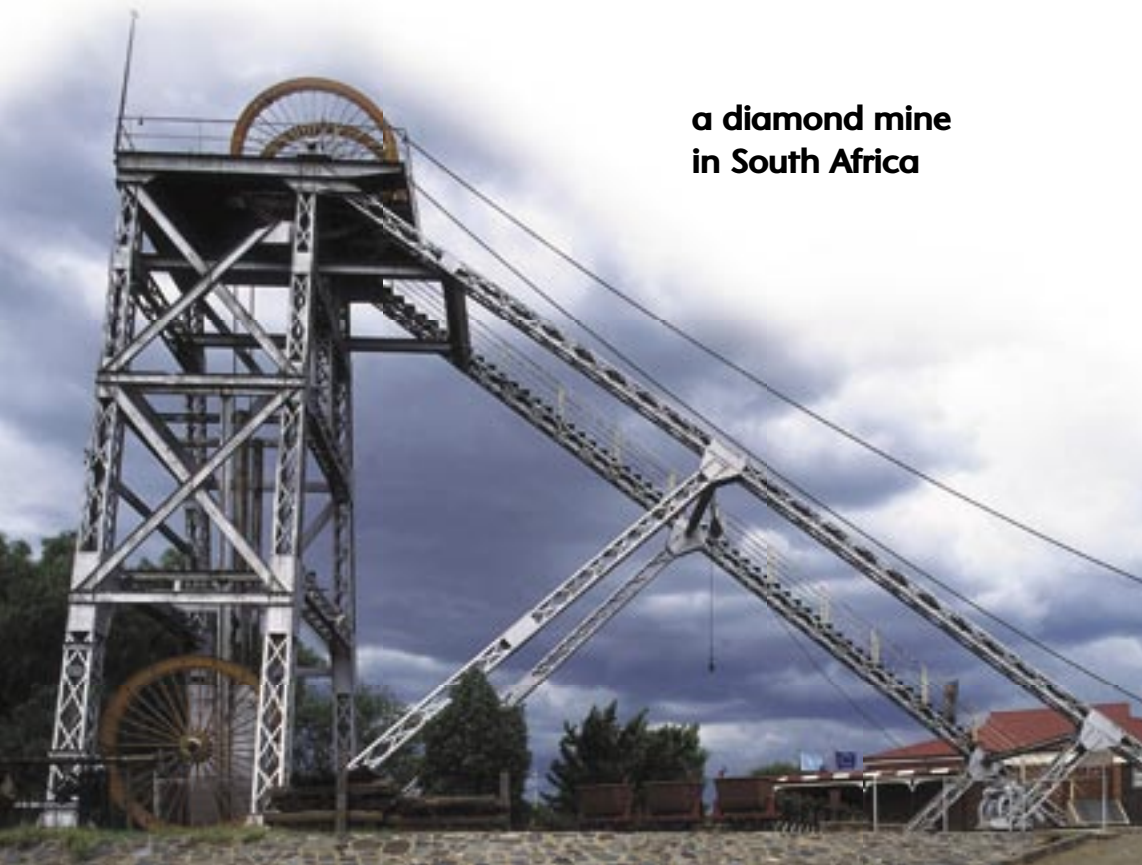




Diamonds can be found under the ground. People mine diamonds in many countries in the world.

Sometimes miners find diamond ore along rivers in sand and gravel. They use small pans and water to collect diamonds. It takes sharp eyes to tell which stones are the diamonds! Diamond stones have to be sorted, polished, and cut before they can become gems.

**a diamond mine
in South Africa**



**The diamonds in
this pan are not
cut or polished.**



Gems can be precious or semiprecious. Gems that are hard to find or collect are called precious. Gems that are easier to find are called semiprecious.

Scientists can also make synthetic gems. These are copies that look like real gems. Scientists grow crystals in a special container. Then they heat and apply pressure to the crystals. People buy synthetic gems because they cost less than real ones.

**Synthetic gems look
just like real gems.**

**synthetic
ruby crystal**



**synthetic
cut ruby**



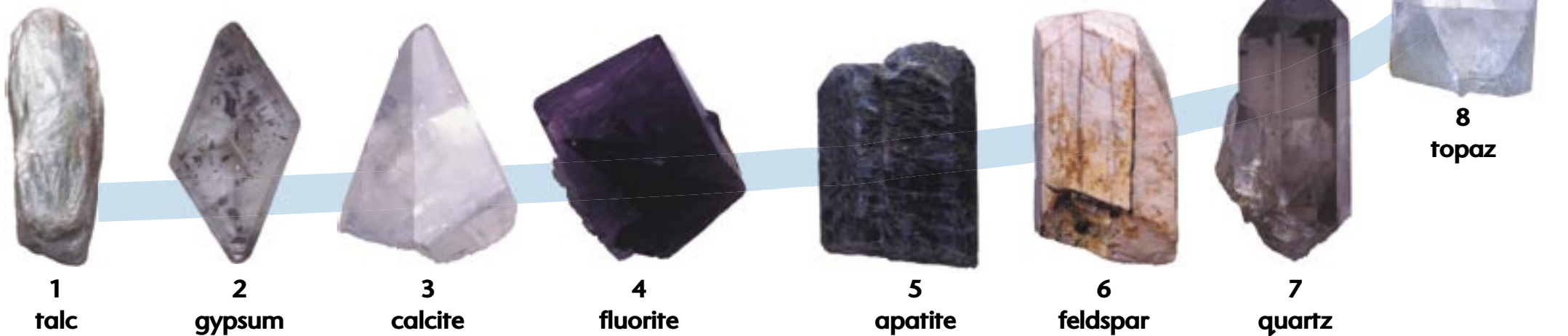


How hard are minerals?

Minerals can be hard or soft. Chalk is a soft mineral. You can scratch chalk with your fingernail and leave a mark. Soft minerals break into pieces. Their atoms link lightly together.

Diamonds are the hardest mineral. They have atoms made of carbon. The atoms in a diamond link together like a tight web. A diamond is strong enough to cut through other rocks. People use diamonds in cutting tools.

The Mohs scale shows how hard minerals are.



Frederick Mohs was a scientist from Germany. In 1822 he found a way to show how hard different minerals are. He gave minerals different numbers depending on their hardness. This is called the Mohs scale.

Look at the scale below. Soft minerals have low numbers. Talc is very soft. It is number 1 on the scale. Hard minerals get high numbers. Diamonds are number 10.





This rock from a volcano has a diamond in it.



diamond ring



Diamond

Diamonds were formed deep in the Earth many years ago. Diamonds need to be dug or blasted out of the ground. One of the most famous diamond mines is in South Africa.

Diamond ore is loaded into trucks and taken to a crusher. Crushed ore is then taken to be washed. Diamonds are separated from the waste material. The diamonds are sorted into five thousand different kinds! They are sorted by size, shape, color, and value.

Most diamonds are clear, like glass. Some can be light yellow. Light reflects through the patterns of their crystals. That is why diamonds sparkle. Most diamonds have facets like a baseball diamond cut into them.



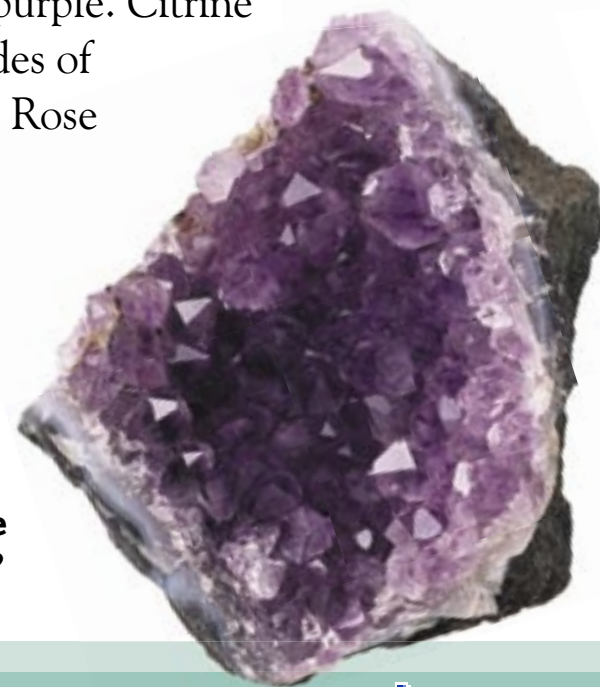
Quartz

Quartz can be found in small streams, in rivers, and on beaches. Quartz is made of crystals and is quite hard. Many semiprecious gems are made from quartz.

Quartz can be transparent. This means you can see through it, like water. Some quartz is opaque. This means you can't see through it at all, like milk.

There are many kinds of quartz. Amethyst quartz is purple. Citrine quartz comes in shades of transparent orange. Rose quartz is pink.

quartz beads



Amethyst is a type of quartz. Can you see the patterns of the crystals?





Ruby

Rubies come in all shades of red. They are precious gemstones. Kings and queens in Europe used rubies in their crowns. Rubies are cut from a mineral called corundum. It is very hard but not as hard as a diamond.

Rubies come from mines in Asia and Africa. Some countries where they are found are Myanmar, Sri Lanka, and Thailand.



The Edwardes Ruby is so large it is kept in a museum.



cut ruby



Can you see the star in this sapphire?



Sapphire

Sapphires are precious gems. They can be pale blue or almost black. Sapphires are a hard, transparent stone. Just like rubies, they are made of corundum.

Sapphires are found in Asia. They are mined in Thailand, India, Sri Lanka, and Myanmar. They are also found in Australia. In the United States sapphires have been found in the state of Montana.



sapphire in rock





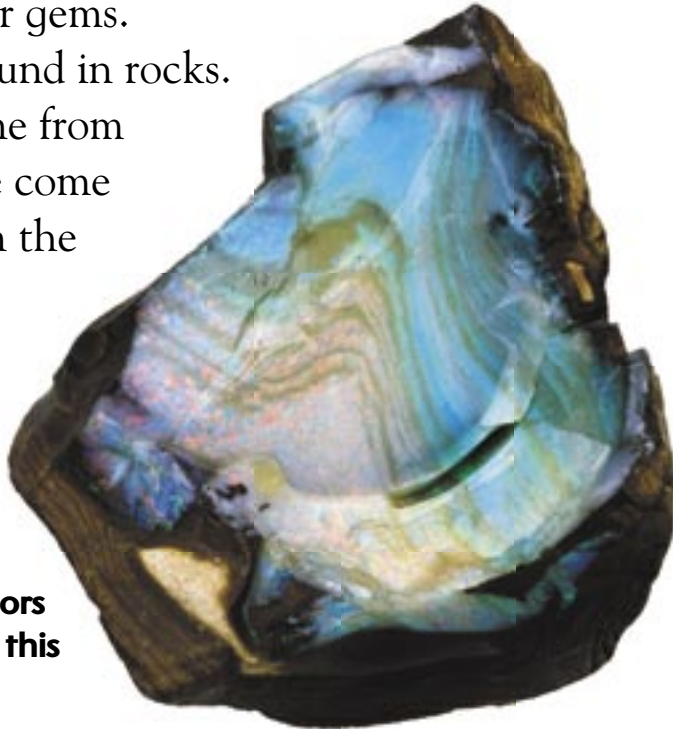
Opal

Opals are made up of tiny spheres. A sphere is a shape like a ball.

One opal stone can be red, green, blue, and yellow. The colors in an opal come from flaws. A flaw is a little crack or break in the stone. It can also be a small piece of something trapped in the stone. These flaws make opals beautiful. They also make opals softer than other gems.

Opals are found in rocks. Many opals come from Australia. Some come from Nevada, in the United States.

How many colors can you see in this uncut opal?



dark opal pendant



Emerald

Emeralds are precious gems. They are made of a mineral called beryl. It is a hard mineral with layers of crystals.

Emeralds have been valued for thousands of years. The ancient Egyptians mined emeralds and used them to make jewelry. The finest emeralds today are found in the country of Colombia, in South America. They have been mined there for more than four hundred years.

The top of this crystal is a green emerald.



polished emerald



cut emerald





Topaz

Another gemstone made from tiny crystals is topaz. It comes in many pale colors. Topaz can be brown, blue, or green. Some topaz is red. It can also be colorless.

Topaz is a hard mineral. It can be cut into many interesting shapes. Topaz is a semiprecious gem. It is often used for rings and other jewelry.

Topaz is found in Russia, Brazil, and Australia. It is also mined in Mexico and the United States.



This topaz has many flaws at the bottom.



topaz ring



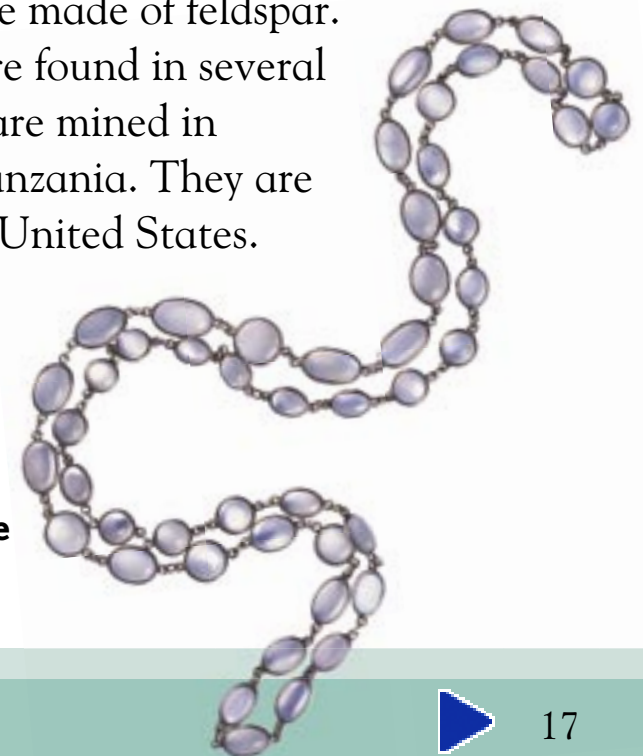
Uncut moonstone reflects silver, blue, and orange.



Moonstone

When light reflects off moonstone, it glows like light from the Moon. Moonstone is made from a mineral called feldspar. Half of all the rocks on Earth are made of feldspar.

Moonstones are found in several countries. Many are mined in Sri Lanka and Tanzania. They are also found in the United States.



moonstone necklace



Tree sap was a soft, sticky trap for this insect. The sap turned into hard amber.



Amber

Amber is different from many other gems. It is not made of crystals. Amber is made of resin, or sap, from ancient trees. Soft tree resin takes millions of years to turn into hard amber. Most amber is yellow or brown. Amber can also be red, green, or blue.

A piece of amber is very light. It is often transparent. You can sometimes see insects, leaves, or moss trapped inside. Scientists study animals and plants trapped in amber to learn about life long ago.



amber beads



Jet

Jet is also different from many other gems. It is sometimes called black amber. Jet is not made from crystals. It comes from ancient plant parts. Some jet used to be wood! Millions of years of pressure under the Earth changed the wood into a black mineral. Like amber, jet can be easily polished.

Jet is mined in Spain, France, and Germany. It is also found in Russia and the United States. Shiny, black stones in jewelry are often pieces of jet.



jet earrings



Look for the wood grain in this piece of jet.





Special Gems

Gemstones have been special for thousands of years. Long ago, kings and queens wore precious gems in their crowns. Pirates sometimes raided ships to steal the jewels. Many early peoples buried their rulers along with precious gems. Today, you can see the jewels from their tombs in many museums.

People in the past thought gems could help them. Emeralds were worn to protect people from animal bites. Topaz was thought to bring friends. Rubies were worn to protect people from feeling sad.

Many people still like to give gemstones as gifts for special celebrations. In many countries in the world, people give each other a ring with a gemstone when they get married. People also give gemstones as birthday gifts. Did you know there is a special list of gemstones for each month of the year? These are called birthstones.

Which of these birthstones matches your birthday month?

Month	Gemstone
January	garnet
February	amethyst
March	aquamarine
April	diamond
May	emerald
June	pearl
July	ruby
August	peridot
September	sapphire
October	opal
November	topaz
December	turquoise





Our Hidden Treasure



amber

Rocks are made up of minerals. Minerals are found all over the Earth.

Gemstones are a special group of minerals. Many come from deep in the Earth. Some have been pushed up to the surface of the Earth by volcanoes.

Gemstones are taken out of rocks through mining. They are washed and polished. Facets are cut into them so that they can reflect light from their crystal patterns.



sapphire

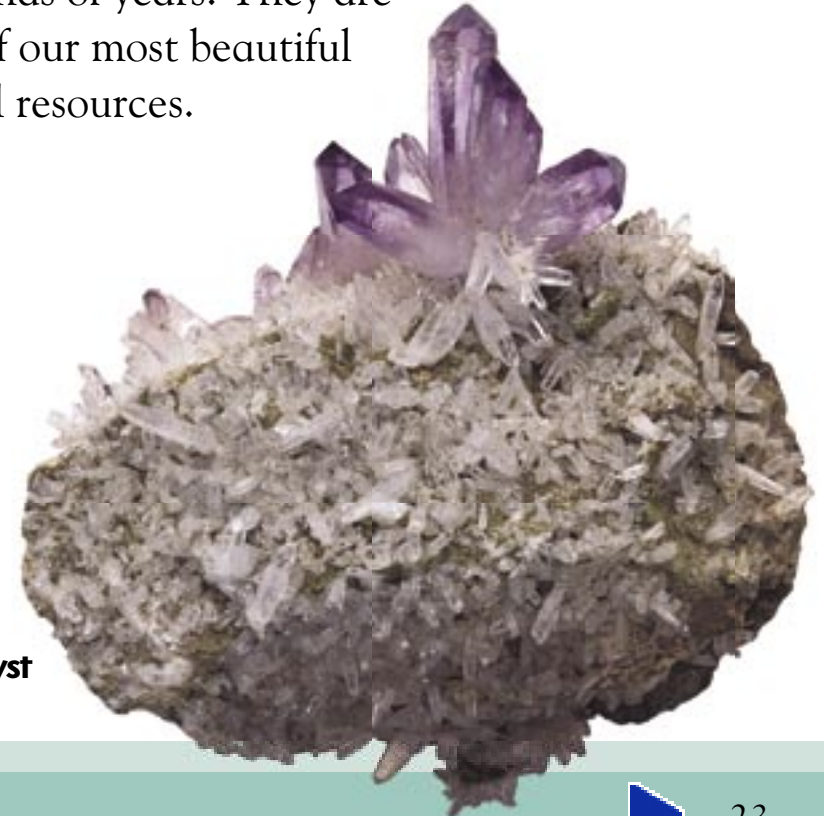


Proustite is a crystal mineral that is purple like amethyst.



Gemstones that are rare are called precious stones. Those that are more easily found are called semiprecious stones.

People have valued gemstones for thousands of years. They are some of our most beautiful natural resources.




amethyst



Glossary

atoms	the smallest parts of all things
crystal	a group of atoms in a pattern
facets	sides cut into a gemstone
opaque	something you cannot see through, like milk
precious	the most rare and valuable gemstones
semiprecious	the less rare and less valuable gemstones
synthetic	something made by people and machines
transparent	clear, see-through

What did you learn?

1. What is the difference between transparent and opaque gems?
2. Name two gemstones that come from ancient plants.
3. **Writing in Science** In this book you read about diamonds. Write to explain how diamonds are found and turned into gemstones. Use words from the book as you write.
4.  **Picture Clues** Which mineral is harder, gypsum or quartz? Use the Mohs Hardness Scale on pages 8 and 9 to answer this question.

