

LEVELED Book • V

GEMS

Treasures from
the Earth



MULTI
level
S•V•Y

Written by Molly Chen

GEMS

Treasures from the Earth



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Introduction

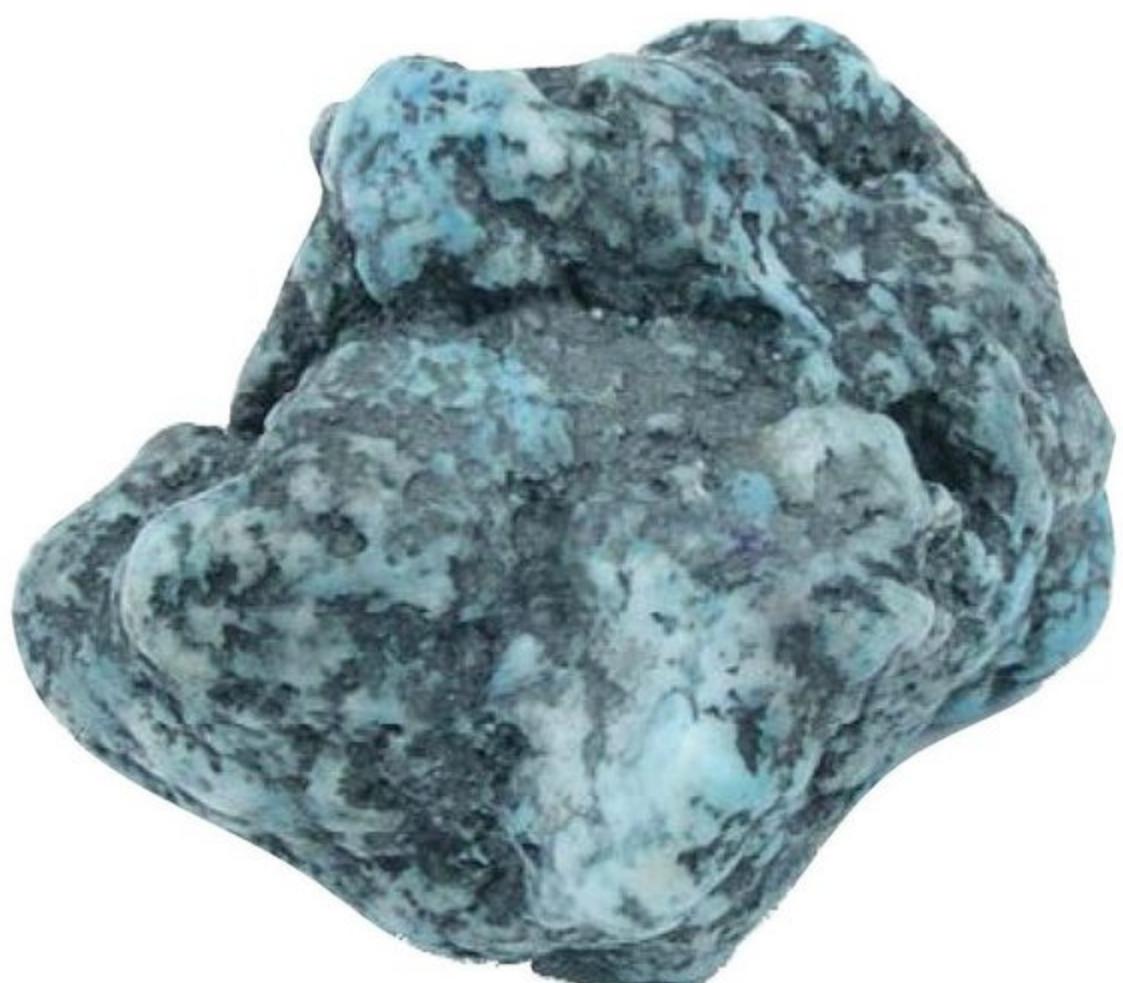
Many people consider gems to be Earth's most beautiful creations. They are willing to spend thousands of dollars for even a small bit of that beauty. Sparkling gems are worn on the fingers, necks, and wrists of people around the world. Families pass them down through the years. They can be found on crowns worn by royalty and on sacred religious objects.



Many gems decorate the most beautiful and valuable jewelry.

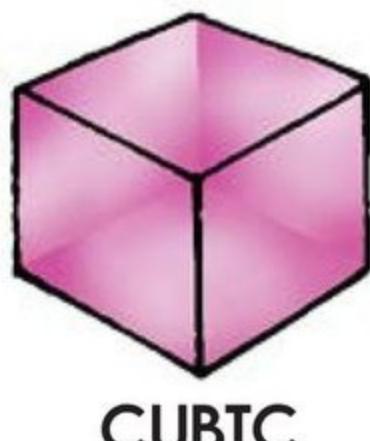
A gem is any beautiful stone that can be used in jewelry. Most gems have beautiful colors or sparkle. There are three major types of gems. The first two, **crystals** and stones, are made of minerals—the natural, nonliving substances that make up ordinary rocks. Crystals are very pure minerals that form in tight shapes and neat patterns. Stones are mixed minerals that have beautiful colors and patterns, but do not have strict shapes. The third group, **organic gems**, comes from substances made by living things.

Garnet, a crystal (top);
turquoise, a stone (center);
natural pearl, an organic
gem (bottom)

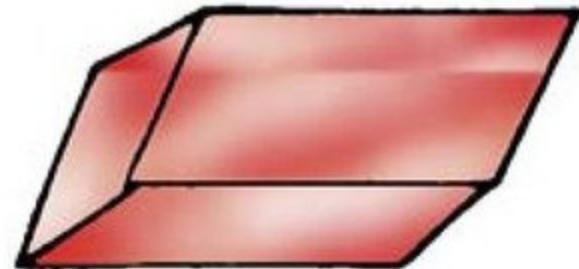


How Are Gems Formed?

Some of the most famous and expensive gems, including diamonds, emeralds, and rubies, are crystals. Crystals are very pure forms of minerals. Every mineral is made of millions of tiny particles called **atoms**. In ordinary rocks, many kinds of atoms are mixed together without any kind of pattern or order. But in crystals, the atoms are arranged very precisely in neat, orderly patterns. Crystals have flat sides, called *faces*, which form shapes. Different kinds of crystals form in different shapes, some of which are shown below. Some crystals form cubes, while others form long, six-sided columns.



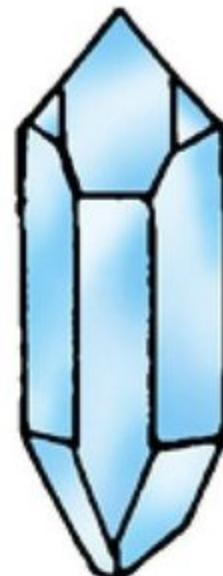
CUBIC



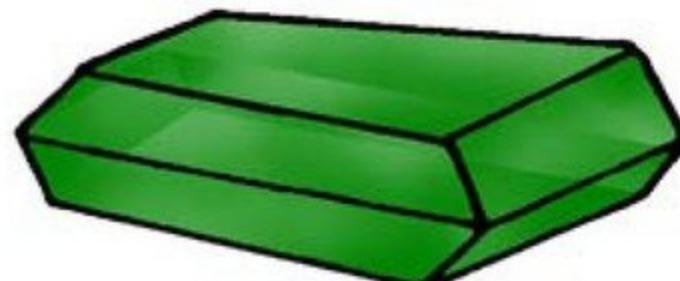
TRIGONAL



TETRAGONAL

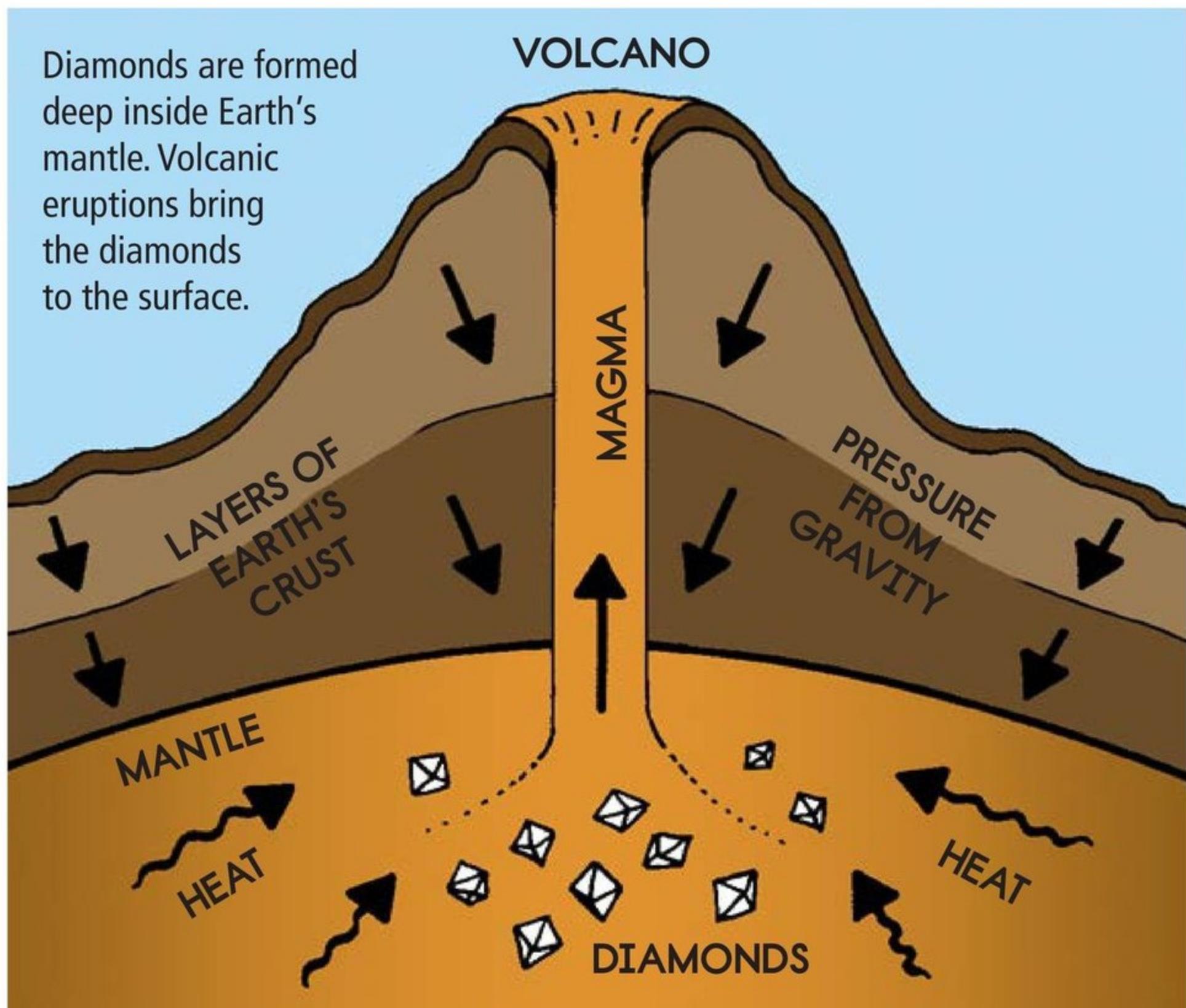


HEXAGONAL



MONOCLINIC

Examples of Crystal Shapes



Most crystals form deep within the earth under very special conditions. Some, such as diamonds, form when the mineral is squeezed under layers of rocks. The squeezing forces the atoms to arrange themselves until they are in the smallest shape possible. Others, such as sapphires, form when a mineral gets so hot inside the earth that it melts. As it slowly cools, the atoms fall into place to make a regular crystal pattern. And still other gems, such as opals, form when minerals dissolve in water. As the water evaporates very slowly, the mineral left behind forms a crystal.

Try This

Make your own crystals!

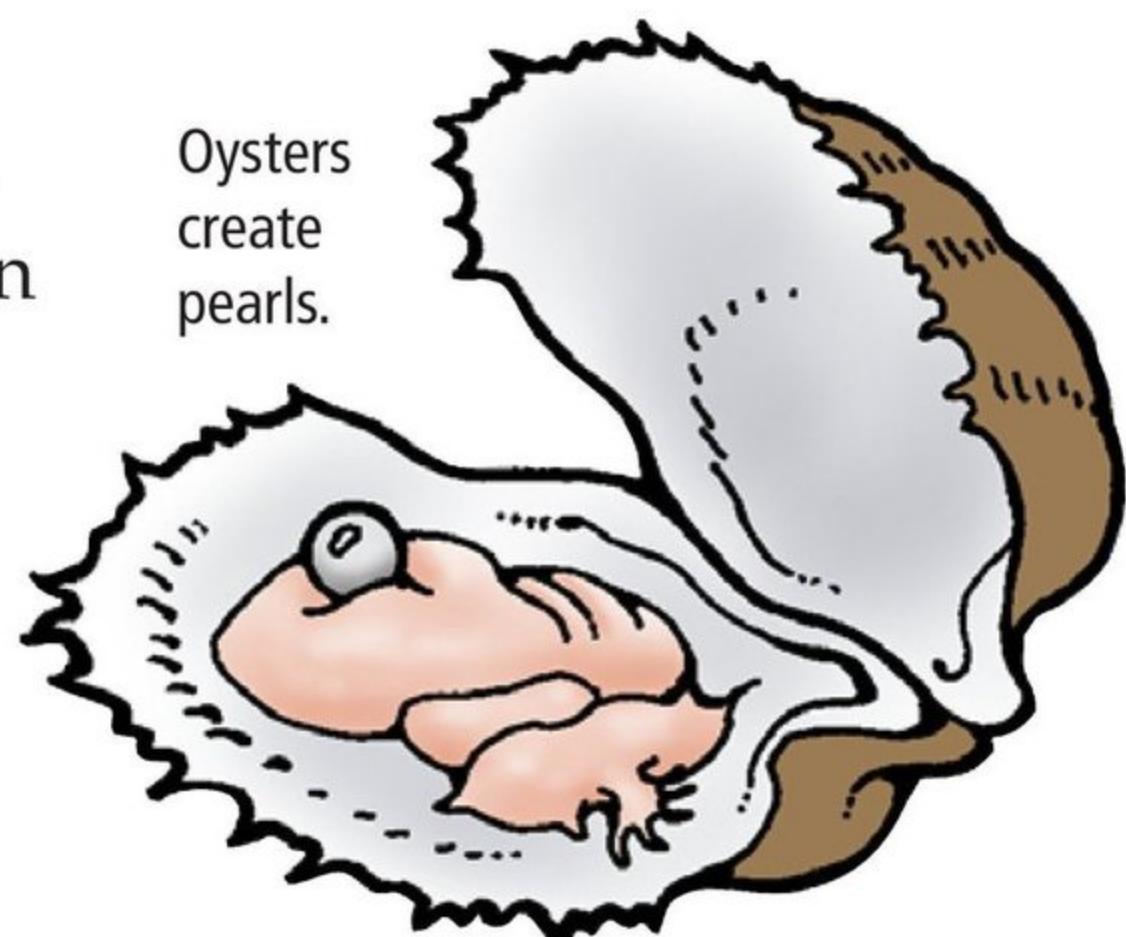


Rock salt, also known as halite, forms when salty seas evaporate. You can watch a much smaller version of this same process using just water and ordinary salt.

- 1 Mix a tablespoon of salt into a cup of warm water. Stir it until it dissolves.
- 2 Keep adding salt, a little at a time, until no more salt will dissolve.
- 3 Put a clean toothpick in the water.
- 4 Place the cup somewhere warm in the sun. As the water evaporates, crystals will form on the toothpick and the sides of the cup.
- 5 Look at the crystals under a magnifying glass. What do they look like?

The minerals in stones do not form orderly patterns, and they may have other minerals mixed in. Stones often form in layers that make streaks and lines, called the **grain**. Grain gives stones beautiful patterns and surfaces.

Organic gems, which include pearls, amber, and coral, come from living things. Pearls begin when a grain of sand gets trapped inside an oyster's shell. The oyster covers the grain with layers of smooth **nacre**, the material it uses to build its shell.



Coral is made of skeletons left behind by millions of tiny sea creatures. Amber began millions of years ago as tree sap. Amber often contains the fossils of insects or spiders that got caught in the sap.

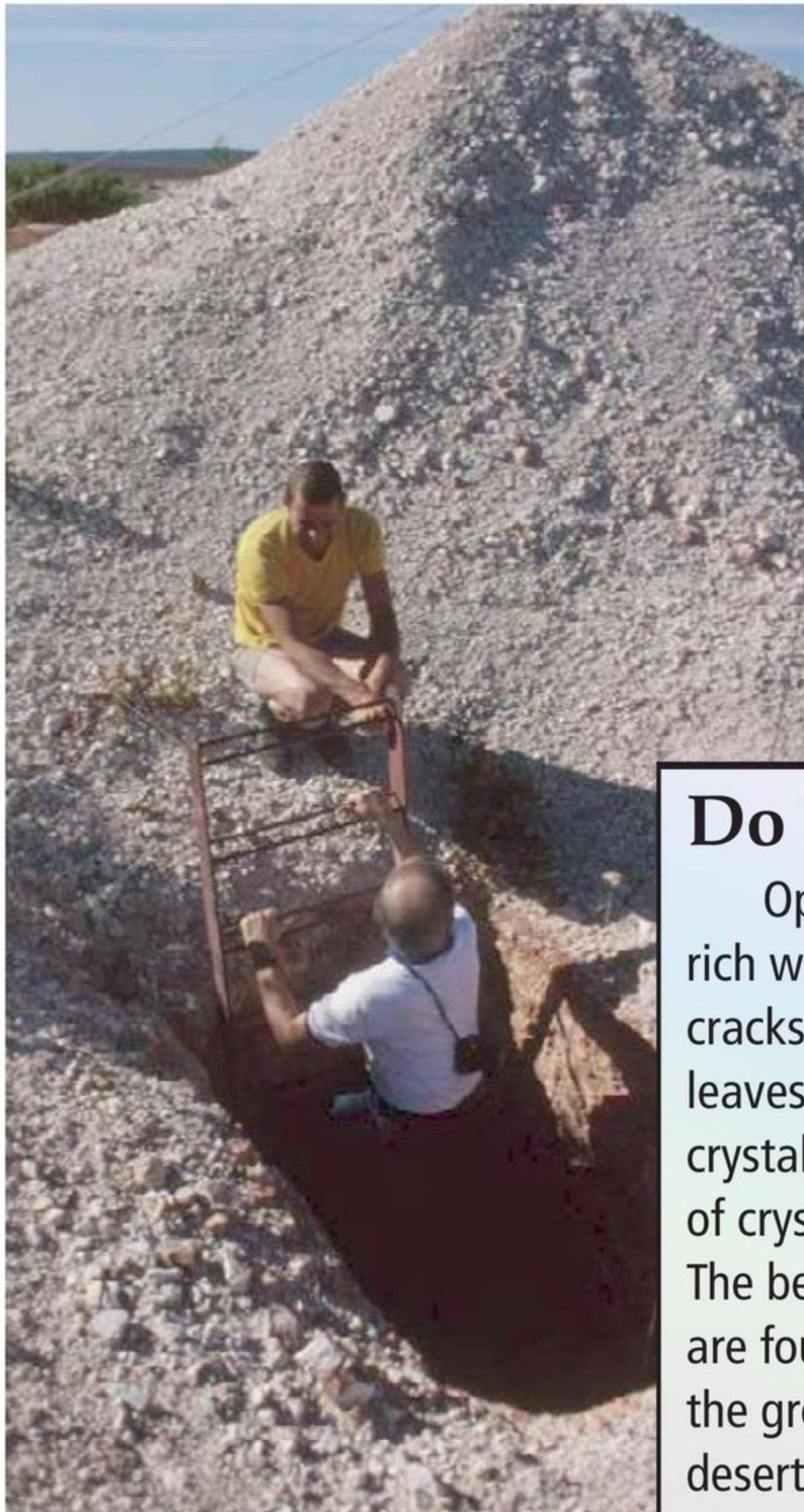


A spider in amber

How Do Gems Get into Jewelry?

Most mineral gems are found deep within the earth. Humans must dig mines to get them. Because gems are so small and rare, mining is

often still done by hand. Miners must chip and cut at the rock, looking for stones **embedded** within it.



Opal mines are simple holes in the ground.

Do You Know?

Opals form when mineral-rich water evaporates from cracks underground. This leaves a streak of mineral crystal in the rock. Streaks of crystal are called veins. The best opals in the world are found in veins under the ground in the Australian desert town of Coober Pedy. In the Australian Aboriginal language, *Coober Pedy* means "white man in a hole."

When a miner finds a gem, it looks very different from the one you see in a ring or necklace. The gem often has rough edges. Its surface looks dull. Its shape is bumpy. Gems often have cracks, dark marks, bubbles, and other flaws. Gem cutters cut gems into regular shapes that show off their best qualities and cover their flaws. Gem cutters once used diamond-edged saws and polishers, but recently they began using lasers to cut gems.

Most crystal gems are cut into flat surfaces called **facets**. Facets show off the gem's color and pattern, and allow it to sparkle with reflected light.

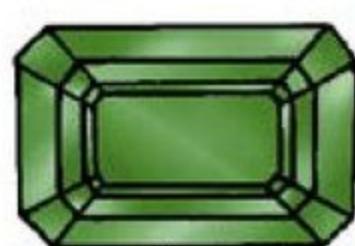
Gem cutters cut different gems using several different cutting styles.



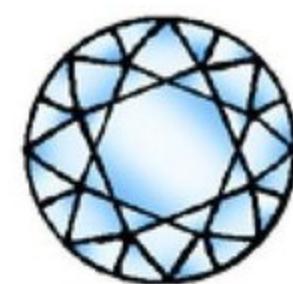
An uncut diamond looks uneven and flawed.



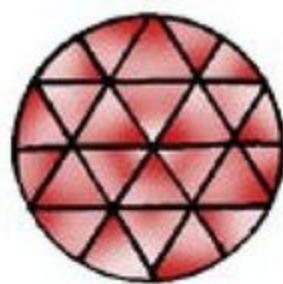
A cut diamond reflects lots of sparkle.



STEP



BRILLIANT



ROSE



CARVING



CABOCHON

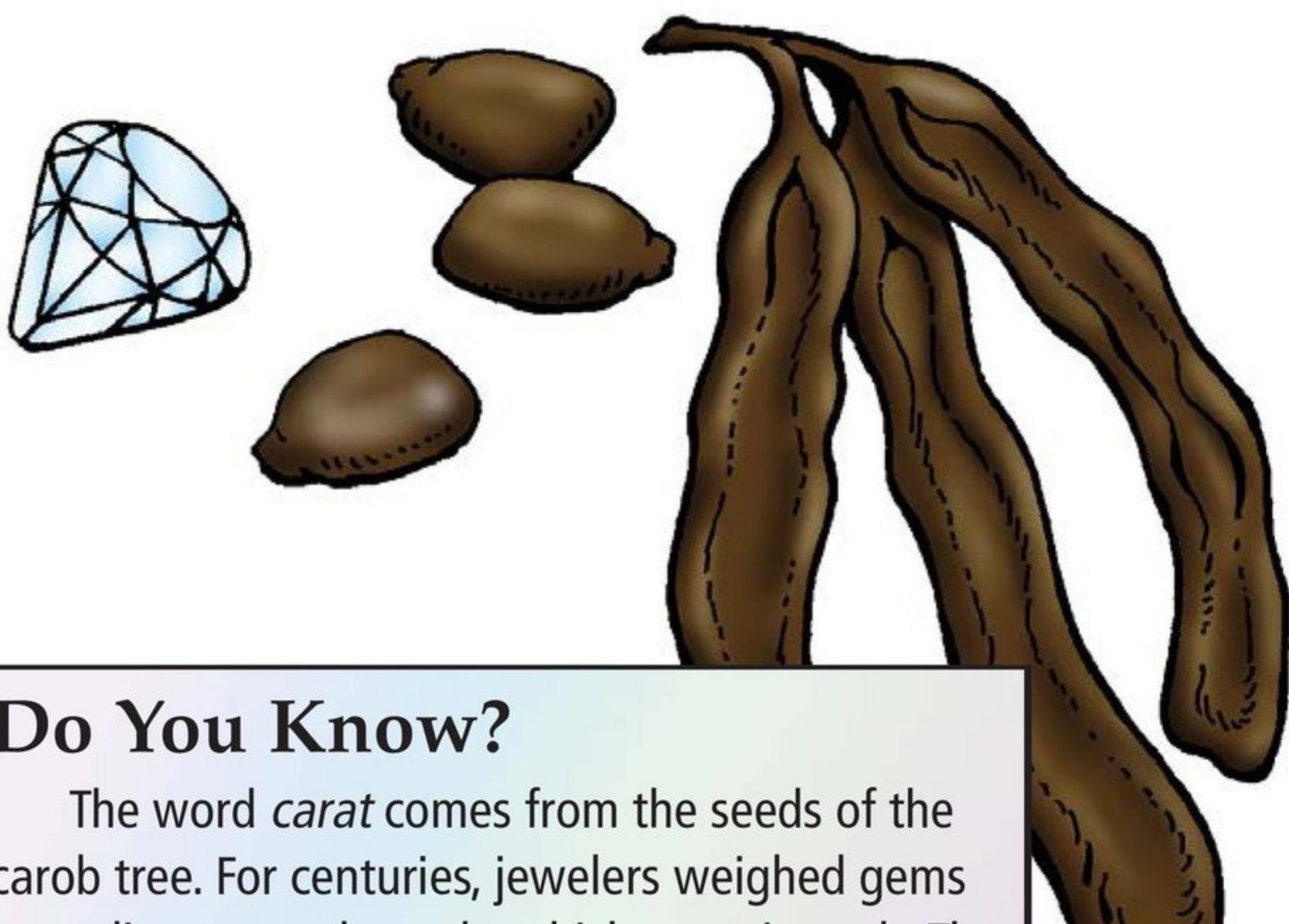
Cutting styles (top and side views) show gems' best features.

The popular brilliant-cut style is often used with diamonds, which have more sparkle than color. This style has many facets that reflect light off the gem. Deep green emeralds, on the other hand, are often cut into a style called the step cut. This cut, with its rectangular facets, creates a wide, flat top of pure color. The rounded top and triangular facets of another style, the rose cut, are most often found on older gems. The oldest style of cut, the cabochon (KAB-uh-shon), is simply rounded and polished. It is most often used with **opaque** or patterned stones. Other gems, such as jade and coral, can be carved into small sculptures.

What Makes Gems Valuable?

Gems as a whole are valuable for two reasons: they are beautiful, and they are rare. The value of a gem is determined by the gem's hardness and a system called the "four Cs": cut, carat weight, color, and clarity.

Cut refers to how well the gem is cut and polished, or how beautiful the natural gem is. A poorly cut gem may look dull or uneven. Carat weight is the size of the stone. One carat weighs about as much as a kernel of unpopped popcorn.



Do You Know?

The word *carat* comes from the seeds of the carob tree. For centuries, jewelers weighed gems according to carob seeds, which grow in pods. The seeds are incredibly similar in weight, no matter which tree or pod they come from. The modern carat weighs about as much as one carob seed.

The next of the four Cs, color, is one of the major reasons why gems are considered beautiful. Unlike regular rocks, gems have bright, pure, strong colors. The stronger and purer the color, the more valuable the gem is. Often, the same mineral can form different-colored gems. Red rubies and blue sapphires both contain the same mineral. The different colors come from tiny bits of other chemicals mixed with the main mineral. It only takes one different atom in a thousand to change the color of a gem.

Clarity refers to how flawless the gem is. Gems with dark marks, cracks, and bubbles are less valuable than gems without these flaws. Gems that are cloudy are also less valuable than clearer gems. But clarity is often not as important as the size and rarity of a gem. Emeralds often have many flaws, but because they are so rare, a flawed emerald is more valuable than a flawless diamond.



This uncut emerald shows many cracks and other flaws.

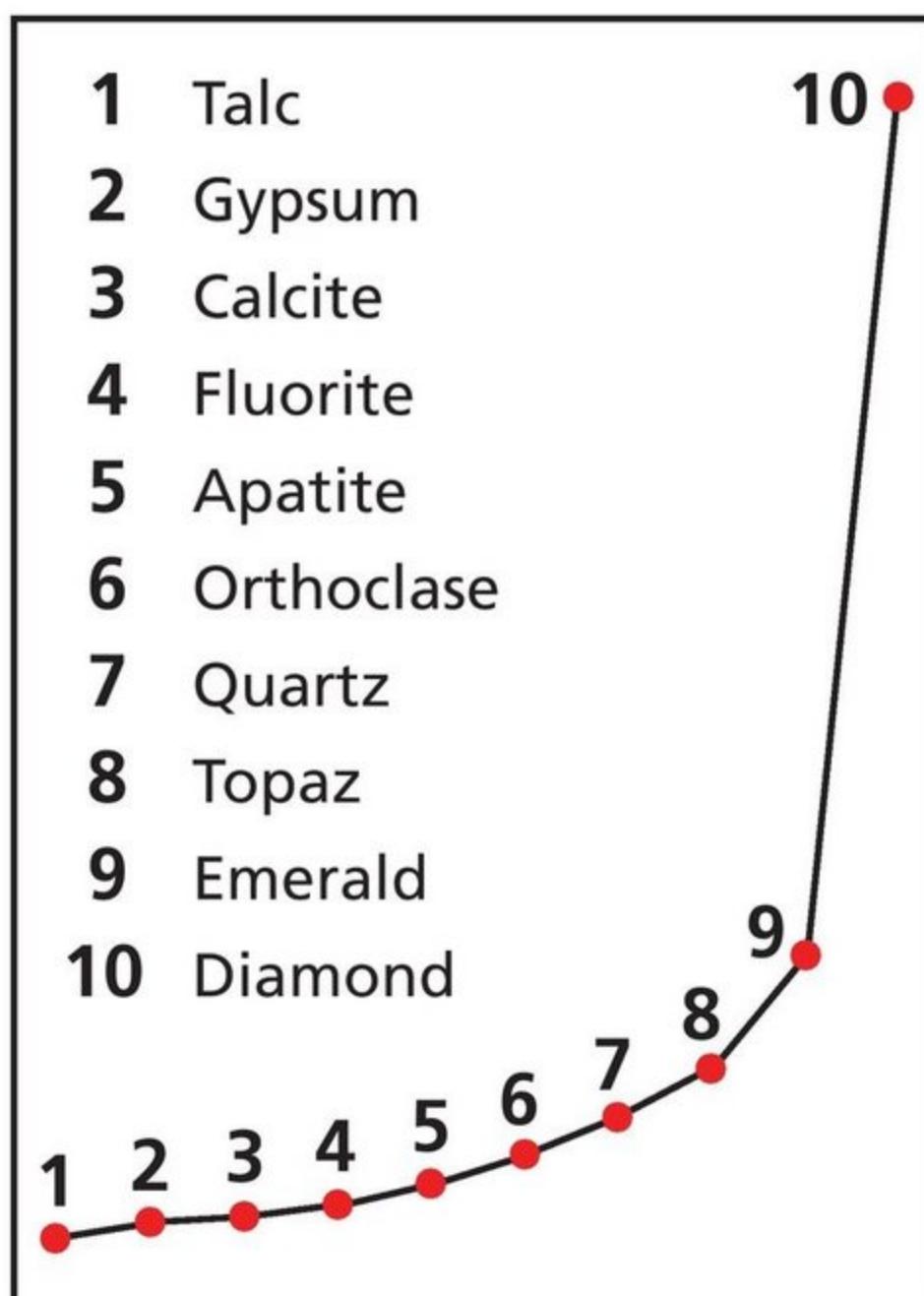
Hardness and the Mohs Scale

Hardness indicates how pure and tightly structured the mineral is in a gemstone. It tells how well a gem will hold up to daily wear. A geologist named Friedrich Mohs developed a scale to test the hardness of gemstones.

He simply scratched one gem with another. A gem can only scratch other gems that are softer than it is. The softest mineral, talc, which cannot scratch anything else, is a 1 on the Mohs scale. Diamond, the hardest substance on Earth, can scratch anything, but can only be scratched by another diamond. Diamond is a 10 on the Mohs scale. Most gems must be 5 or above to be strong enough for use in jewelry.



The Mohs scale measures the hardness of various gems. For comparison, a fingernail has a hardness of 2.5, and a penknife measures 5.5.



	Diamond	Emerald	Jade	Opal	Pearl	Quartz	Ruby	Sapphire	Turquoise
Africa	✓	✓				✓	✓	✓	
North America			✓	✓	✓	✓			✓
South America		✓	✓	✓		✓			
Europe	✓				✓	✓			
Asia			✓		✓	✓	✓	✓	✓
Australia	✓		✓	✓		✓	✓	✓	
South Pacific					✓	✓			

Gems Around the World

What Are Some Types of Gems?

Diamonds are the hardest natural things in the world. Because diamonds can cut anything, including metal and stone, flawed or unattractive diamonds are often put on saws and drill tips. Most diamonds are almost colorless, but very rare diamonds can be yellow, red, or blue. They are most often found in South Africa, Russia, and Australia.

Diamonds are extremely popular for engagement rings.



One of the most famous diamonds, the Hope diamond, is not the largest, but it is a rare sky-blue color. Its long history of theft and ownership by royalty and the rich gave it a legend of being cursed. The largest diamond ever found is the Cullinan diamond, which was discovered in South Africa. It weighed over 3,100 carats and was as large as a pineapple. It was cut into nine gems, one of which, the Greater Star of Africa, weighs 530 carats.



This photo of the Hope diamond shows its actual size.



Do You Know?

Graphite, or pencil lead, is exactly the same mineral as diamonds. In graphite, the atoms are arranged in loose layers. This makes graphite very soft—so soft that if you rub it on a piece of paper, the atoms break off, leaving a pencil mark. In diamonds, those same atoms have been squeezed together so tightly that nothing except another diamond can scratch them off.

Rubies and sapphires are made of the same mineral. Rubies are always blood-red or pink. Any other form of the mineral, no matter the color, is considered a sapphire. However, sapphires are most famous for their deep blue color.



Red ruby (left) and two sapphires, one blue and one yellow

Do You Know?

Birthstones were first worn in the Middle Ages. Astrologers and fortune-tellers often associated birthdays with certain stars, planets, flowers, and gems. Your gemstone supposedly brought you good luck, protection, and wealth. There are different lists of birthstones in different places. The following is a current list of birthstones in the United States.

January	Garnet	July	Ruby
February	Amethyst	August	Peridot
March	Aquamarine	September	Sapphire
April	Diamond	October	Opal
May	Emerald	November	Topaz
June	Pearl	December	Turquoise



The quartz family is the most common of all crystals. Quartz is found all over the world, in all colors of the rainbow. Most quartz is so common that anyone can afford it. The largest quartz crystal ever found was about 6 meters (20 ft) long. It weighed more than 44,000 kilograms (48 tons)—more than a loaded 18-wheeled truck. The most valuable quartz is a multicolored stone called *opal*. Opals often contain white, blue, and red-orange colors. They are most often found in Australia.



Quartz crystals are common and can grow very large.

Emeralds are known for their green color. Gem-quality emeralds are rare and usually small, but people prize their color so much that emeralds are more valuable than diamonds. The finest emeralds are found in Colombia. The same mineral that forms emeralds also forms a blue-green stone called aquamarine.

Jade is one of the most valued stones. It occurs in lavender, white, and almost every shade of green, which is the most valuable. Jade is very tough but easy to carve along its grain. Many civilizations, especially in Asia, used jade to make beautiful knives, swords, and axes.



Jade figurine
(above);
carving jade
(left)



Turquoise is often specked and striped with black.

Blue-green turquoise comes from the deserts of Iran, Tibet, and the southwestern United States. This stone often has pretty spots and streaks running through it. Much of the world's turquoise is set in silver, as the Navajo Native Americans traditionally wore it. The Navajo believed turquoise to be pieces of the sky that had fallen to Earth.

Natural pearls are strangely shaped and are very rare. It takes an oyster many years to create a pearl from a tiny bit of sand. Almost all of the beautiful round pearls in jewelry stores are **cultured**, or made by people. Pearl farmers place a round shell bead into an oyster's shell. The oyster covers the bead with nacre, creating a perfectly round pearl. Cultured pearls come in every color of the rainbow, from creamy white to pink to yellow to green and even black.



Natural pearls (inset) are rare and oddly shaped; cultured pearls are round.



This strip mine clears an immense area of land.

Conclusion

Beautiful gems can be found around the world. Many gems are symbols of power and wealth. For centuries, people have killed and died for them. In some places, such as West Africa and Colombia, the gem trade is still filled with blood and violence. Mining gems with dynamite and strip mines is often dangerous, damaging both humans and the Earth.

Scientists can grow gems in the lab that are identical to the finest natural gems but cost a thousand times less. In the future, created gems might help fill our desire for gemstones' beauty while preserving Earth and its people.

Glossary

atoms (<i>n.</i>)	tiny particles that make up all substances (p. 6)
crystals (<i>n.</i>)	minerals formed in regular, tight patterns (p. 5)
cultured (<i>adj.</i>)	made with the help of human beings (p. 22)
embedded (<i>adj.</i>)	buried in; surrounded by (p. 10)
facets (<i>n.</i>)	flat surfaces of a cut gemstone (p. 11)
grain (<i>n.</i>)	lines and patterns made by layers of minerals in a stone (p. 9)
nacre (<i>n.</i>)	the material oysters use to make their shells and to make pearls (p. 9)
opaque (<i>adj.</i>)	not see-through (p. 12)
organic gems (<i>n.</i>)	gems made from substances created by living things (p. 5)

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