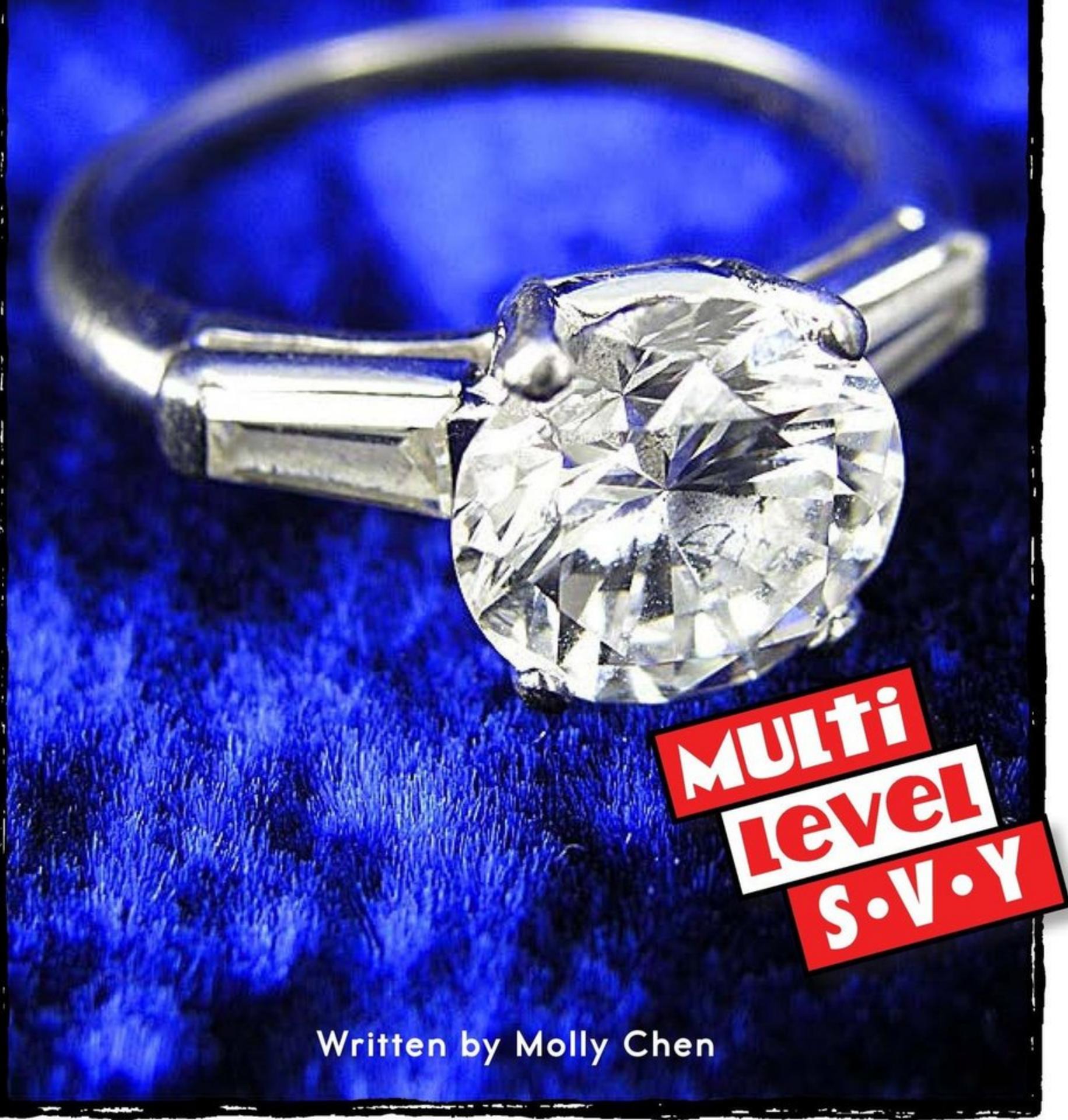


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# GEMS

## Treasures from the Earth



MULTI  
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Written by Molly Chen

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## Treasures from the Earth



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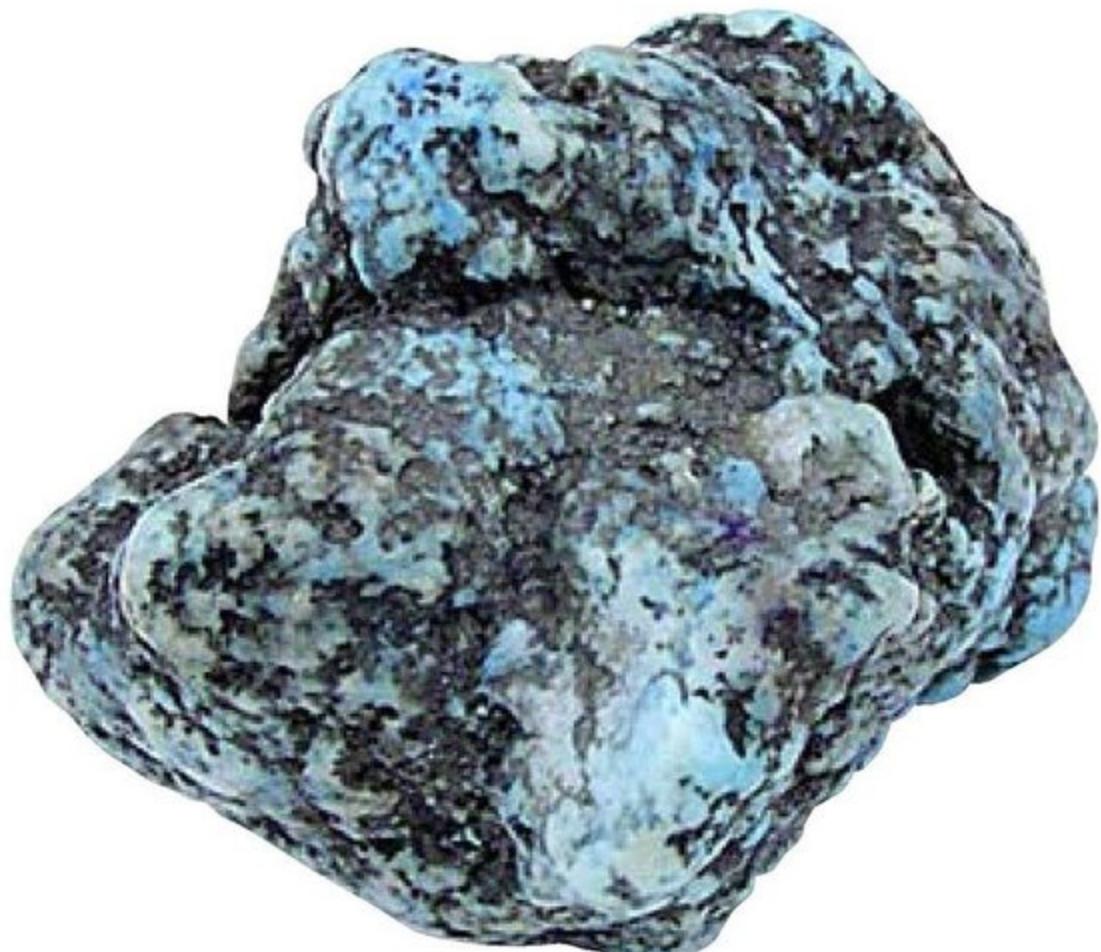
## Introduction

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.



Many gems decorate the most beautiful and valuable jewelry.

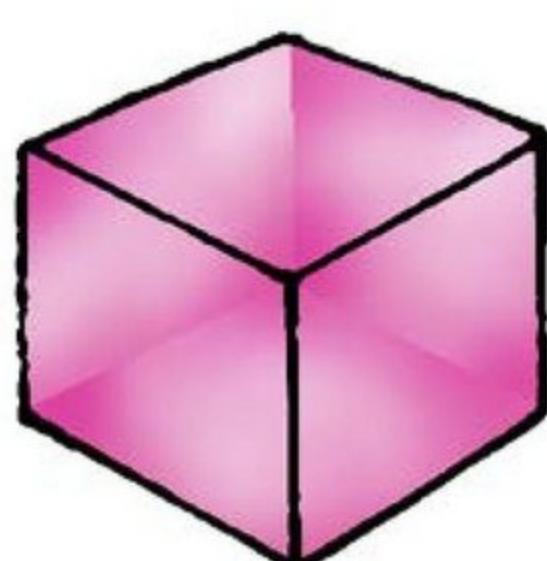
There are three main types of gems. The first two, **crystals** and stones, are made of minerals, the natural, nonliving substances that make up most rocks. Crystals are minerals that form in tight shapes and neat patterns. Stones are mixed minerals that have beautiful colors and patterns but do not have strict shapes. The third group, **organic gems**, are made by living things.



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

## How Are Gems Formed?

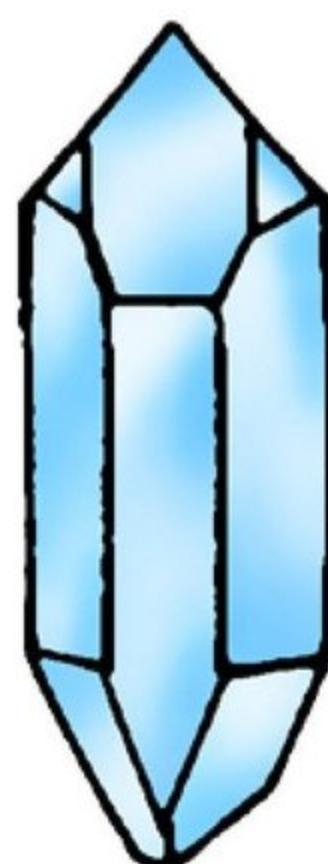
Crystals are special forms of minerals. Every mineral is made of millions of particles called **atoms**. In most rocks, the atoms are mixed together. But in crystals, the atoms are arranged in neat, orderly patterns. Crystals have flat sides, called faces, which form shapes.



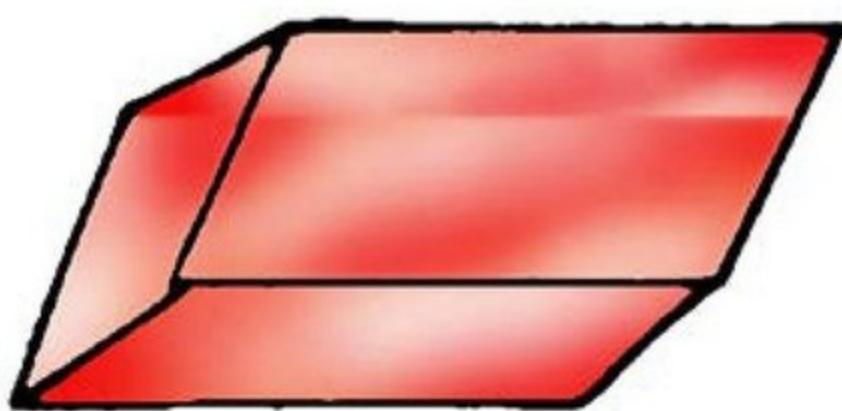
cubic



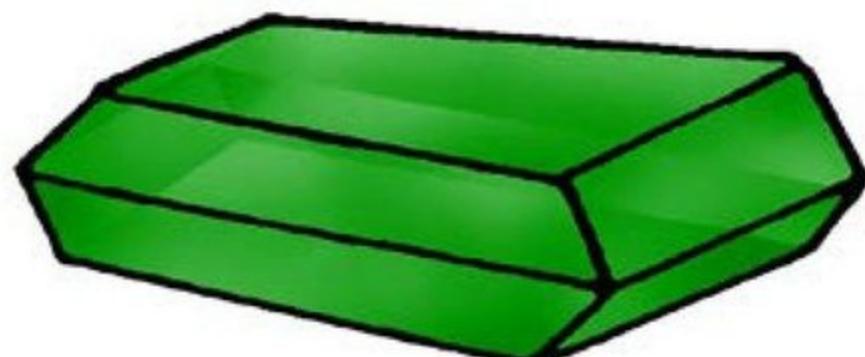
tetragonal



hexagonal

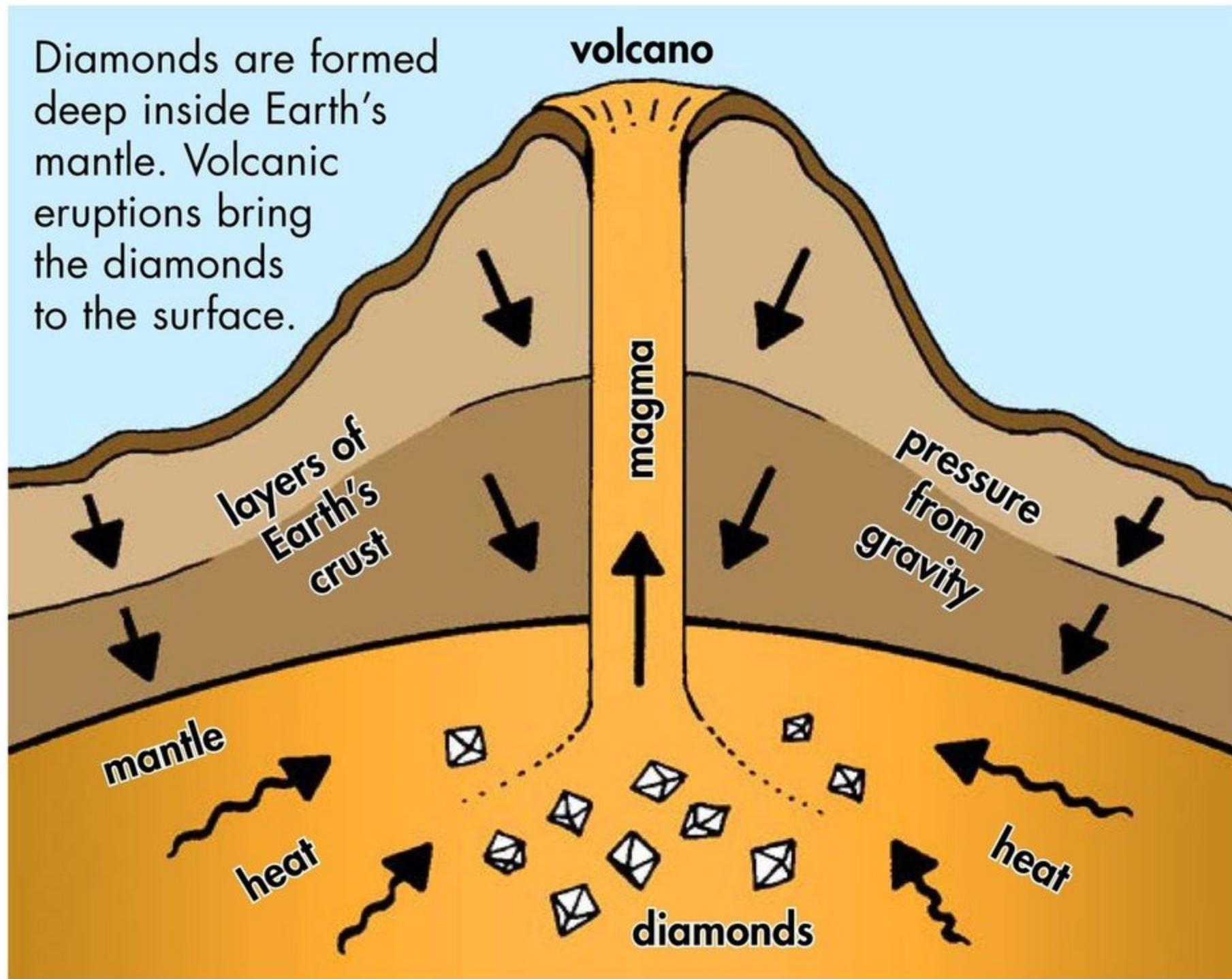


trigonal



monoclinic

### Examples of Crystal Shapes



Most crystals form deep within the earth under very special conditions. Some, like diamonds, form when the mineral is squeezed under layers of rocks. The squeezing forces the atoms to arrange themselves 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 form 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!



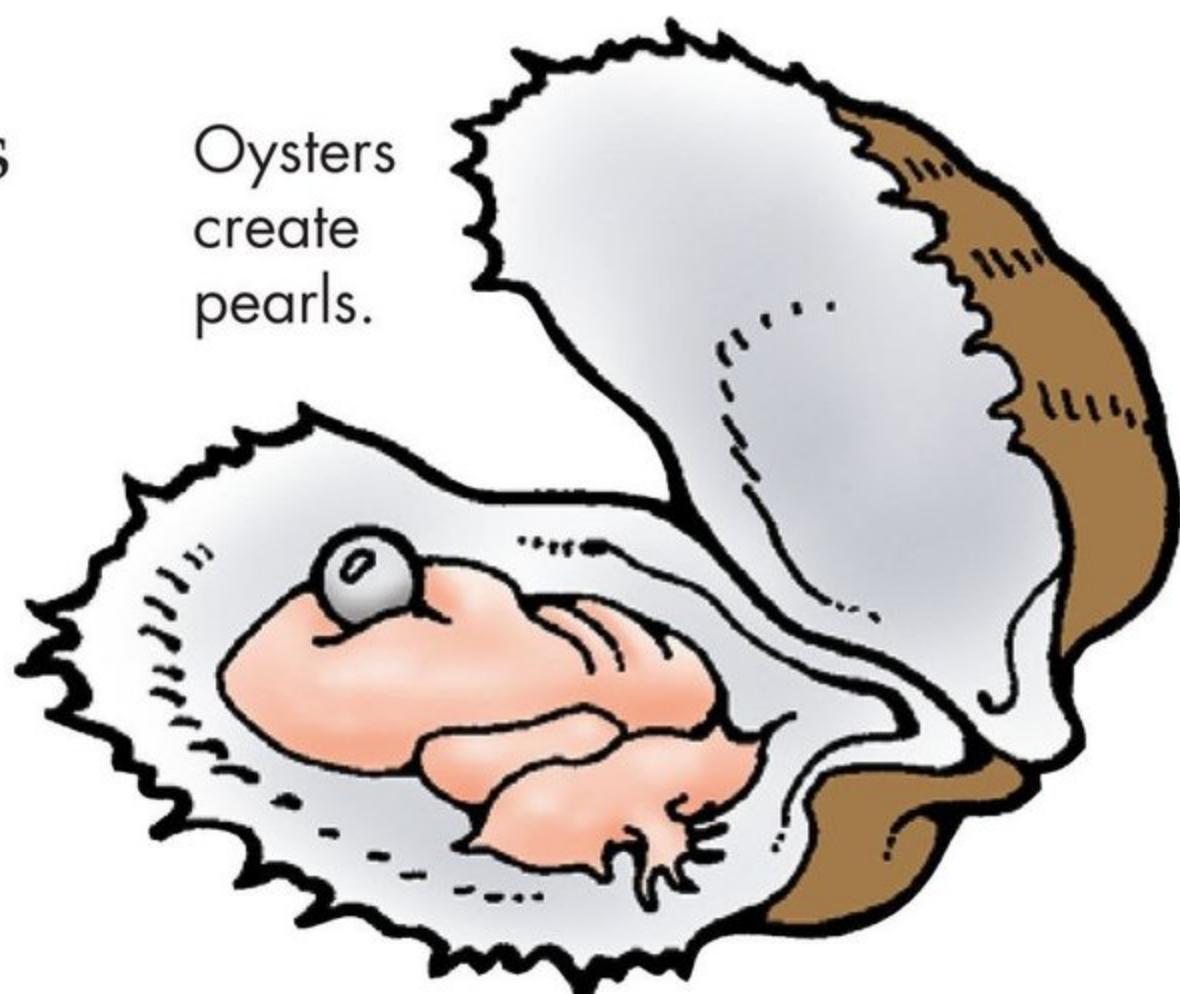
Rock salt, also known as halite, forms when salty seas evaporate. You can watch a much smaller version of this same process using just water and ordinary salt.

- 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**.

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 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.

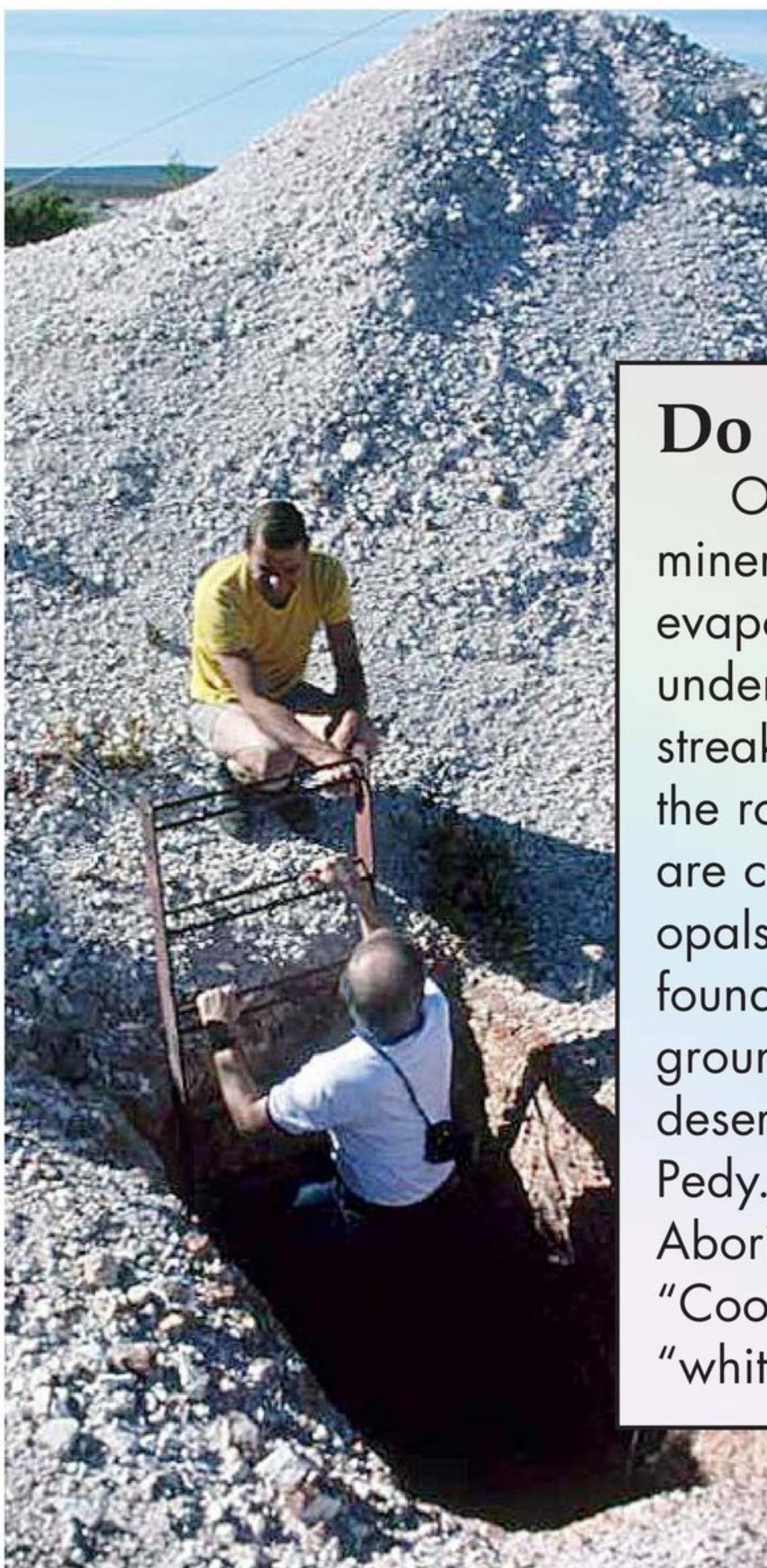


Amber often contains the fossils of insects or spiders that got caught in the sap.

## How Do Gems Get into Jewelry?

Most mineral gems are found deep within the earth. 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 within it.



### 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."

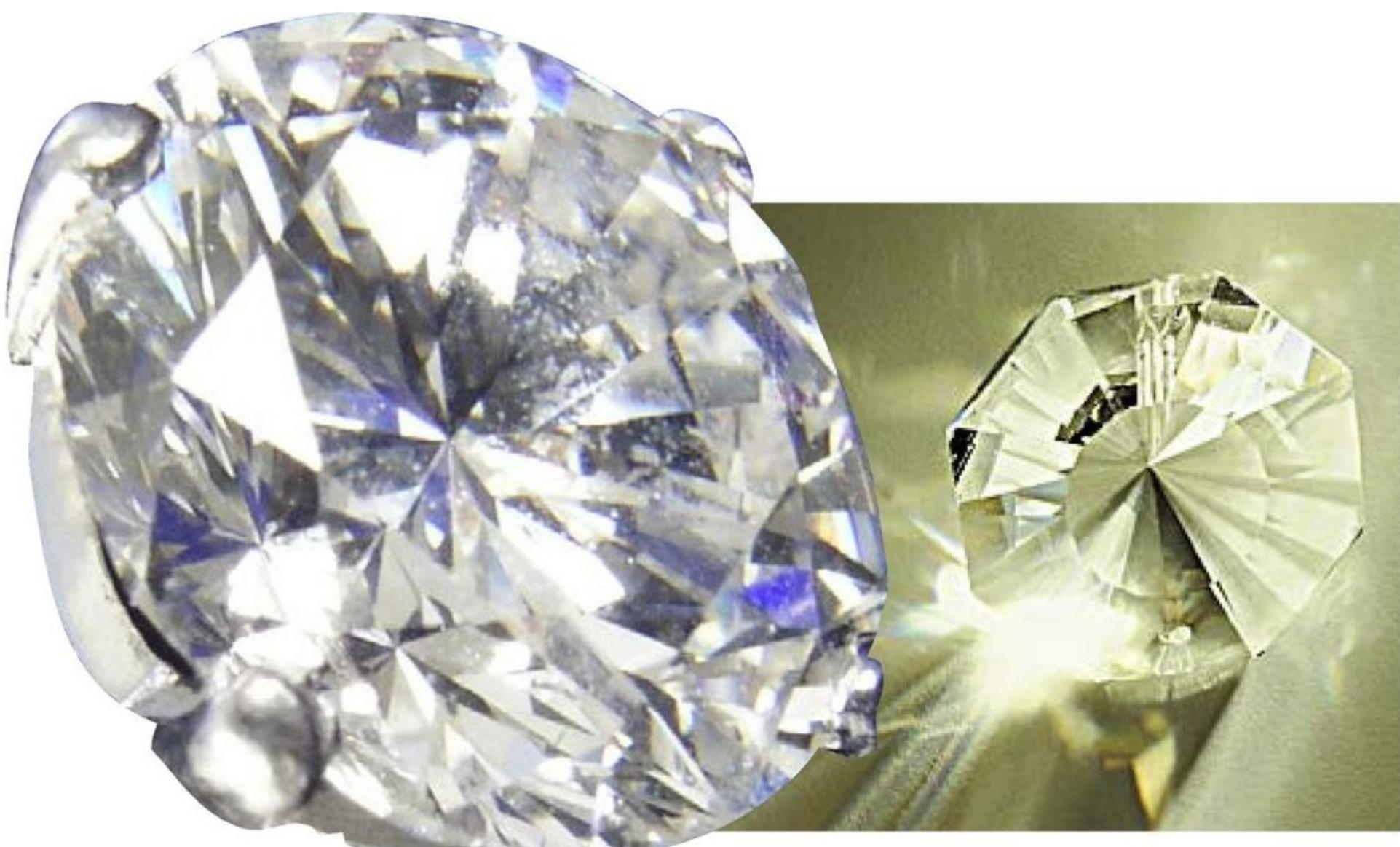
Opal mines are simple holes in the ground.

When a miner finds a gem, it is often very rough. 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 parts and cover their flaws.

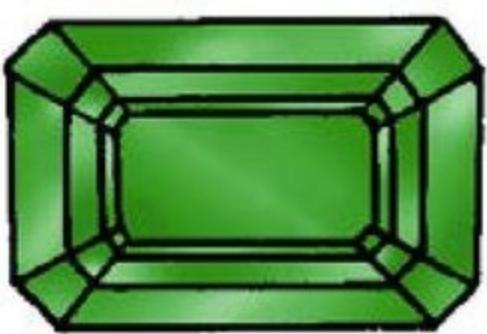


An uncut diamond looks uneven and flawed.

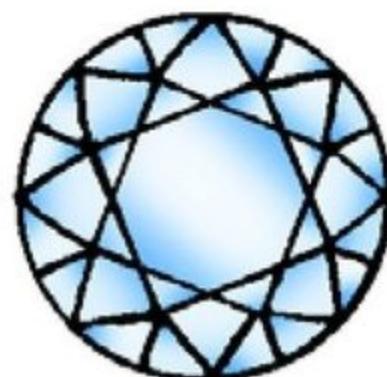
Most crystal gems are cut into flat surfaces called **facets**. Facets show off the gem's color and pattern, and allow it to sparkle.



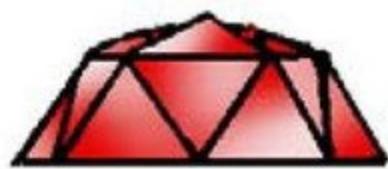
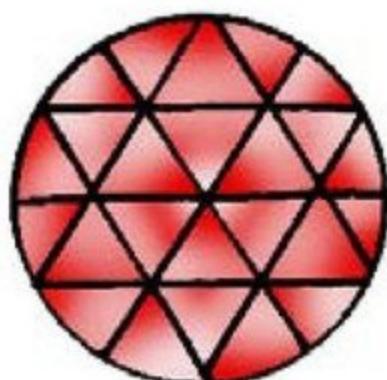
A cut diamond reflects lots of sparkle.



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. This style has many facets that reflect light off the gem. Deep green emeralds are often cut into a style called the step cut. The rose cut was 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** stones. Other gems, such as jade and coral, can be carved into small shapes.

## What Makes Gems Valuable?

Gems are valuable because 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. Carat weight is the size of the stone. One carat weighs about as much as a piece 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 things that makes gems 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.

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

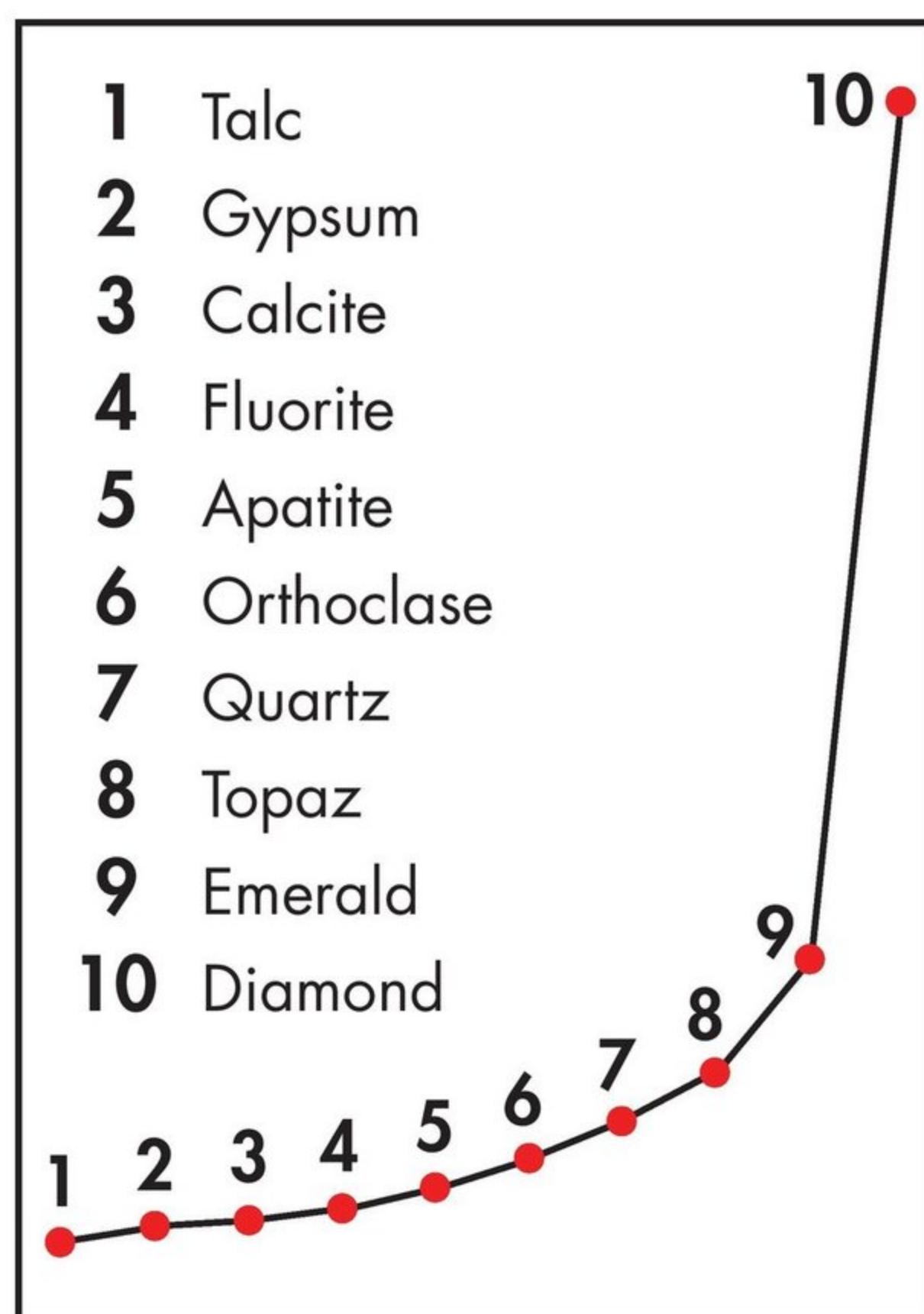
Hardness indicates how pure and tightly structured the mineral is in a gemstone. A geologist named Friedrich Mohs developed a scale to test the hardness of gemstones.

He simply scratched one gem with another. A gem can only scratch other gems that are softer than it is. Diamond, the hardest substance on Earth, can scratch anything but can only be scratched by another diamond.

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.



Apatite is a gemstone of medium hardness.



	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 diamonds are often put on saws and drill tips. Very rare diamonds can be yellow, red, or blue.

Diamonds are extremely popular for engagement rings.



One of the most famous diamonds, the Hope diamond, is not the largest, but it is an unusual sky-blue color. The largest diamond ever found is the Cullinan diamond, which was

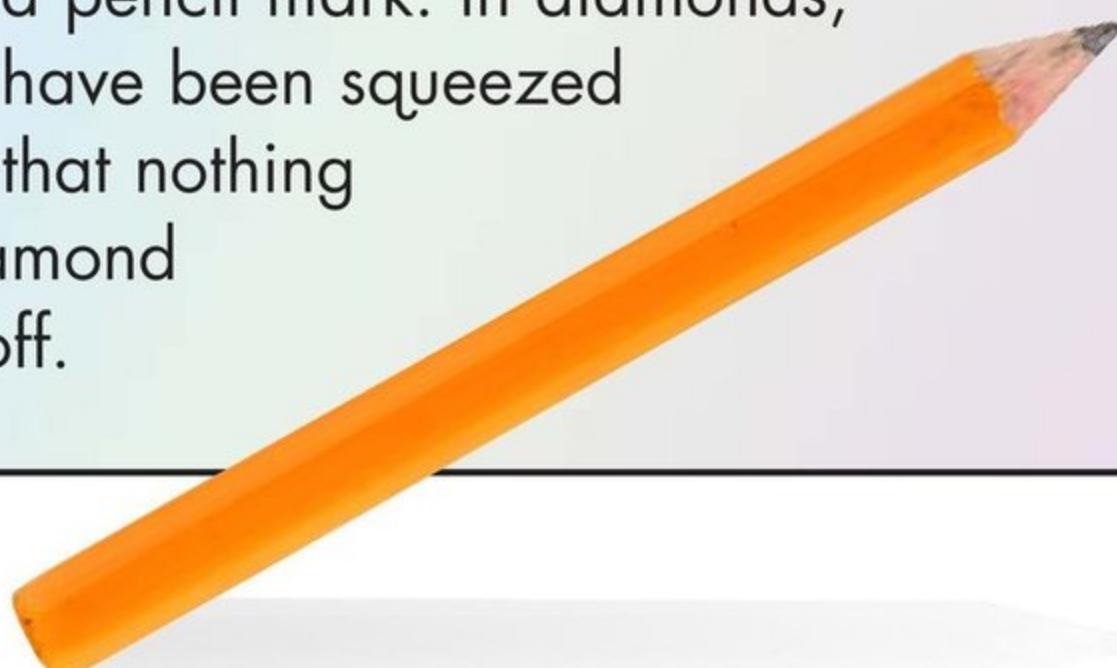


The Hope diamond is one of the most famous diamonds in the world.

discovered in South Africa. It weighed over 3,100 carats and was as large as a pineapple.

## 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.



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.

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



The quartz family is the most common of all crystals. Quartz is found all over the world, in all colors of the rainbow. The most valuable quartz is a stone called opal.



Quartz crystals are common and can grow very large.

Emeralds are another kind of crystal and are known for their strong green color. Gem-quality emeralds are rare and usually small, but people prize their color so much that emeralds are more valuable than diamonds.

Jade is one of the most beautiful stones. Jade can be lavender, white, and almost every shade of green, which is the most valuable.



Jade figurine (top); carving jade (above)



Turquoise is often specked and striped with black.

Blue-green turquoise often has pretty spots and streaks running through it. Much of the world's turquoise is set in silver.

Natural pearls are not perfectly round 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 come from pearl farms. Pearl farmers place a round shell bead into an oyster's shell. The oyster covers the bead with a special substance to create a perfectly round pearl.



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



This strip mine clears an immense area of land.

## Conclusion

Beautiful gems can be found around the world. For centuries, people have killed and died for them. 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. One day, created gems might help fill our desire for gemstones' beauty while protecting Earth and its people.

## Glossary

<b>atoms</b> ( <i>n.</i> )	tiny particles that make up all substances (p. 6)
<b>crystals</b> ( <i>n.</i> )	minerals formed in regular, tight patterns (p. 5)
<b>facets</b> ( <i>n.</i> )	flat surfaces of a cut gemstone (p. 11)
<b>grain</b> ( <i>n.</i> )	lines and patterns made by layers of minerals in a stone (p. 9)
<b>opaque</b> ( <i>adj.</i> )	not see-through (p. 12)
<b>organic gems</b> ( <i>n.</i> )	gems made from substances created by living things (p. 5)

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