



Rocks

**ROCKS
THAT
TELL
TIME
!**

**WHEN
PLATES
COLLIDE
!**

THE DAY THE DINOSAURS DIED



**ROCKS
ROCK
!**

**FILL 'ER UP WITH
ZOOPLANKTON**



Herbison Woods School Library
3147 W. Herbison Road
DeWitt, MI 48820

Rolling Stones

Rocks are famous for staying put. If something is as “solid as a rock,” you assume that it’s not going to change or go anywhere. However, in reality, rocks are always changing and on the move. Nature’s constant recycling of them can be seen in mountains,

rivers, oceans, volcanoes, canyons, and earthquakes.

Rocks come in about one hundred varieties. There are also approximately 3,500 minerals—the stuff of which rocks are made. Together, rocks and minerals pave streets, give color to paints, decorate jewelry, and put “lead” in pencils. Rocks are added to food—

iron into cereal and chalk into bread—to make bones strong. We put rock salt on food for taste, and we also use salt to preserve foods. Rocks are found in toothpastes and cosmetics. While rocks may not have supernatural powers—as many once believed—they do have an influence on our lives.

WHAT IS A ROCK?

A rock is one or more minerals packed together. What is a mineral? A mineral must have these qualities:

1. IT MUST BE NATURAL (OCCUR IN NATURE). HOWEVER, TODAY SOME MINERALS ARE MANUFACTURED, OR SYNTHETIC.

2. IT MUST BE INORGANIC. Inorganic matter is anything that is not alive and never was alive.

Sedimentary, my dear Watson.

3. IT MUST HAVE A DEFINITE CHEMICAL STRUCTURE. IN OTHER WORDS, THE ELEMENTS (SUCH AS OXYGEN, CARBON, IRON, AND SILICON) THAT MAKE UP A MINERAL ARE ALWAYS PRESENT IN THE SAME PROPORTION.

O, C, Fe, Si?*

4. And finally, its atoms must be arranged in a regular pattern, which is called the mineral's crystalline structure. Would you agree?

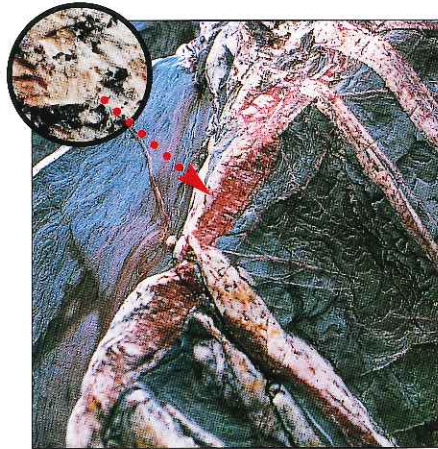
OF QUARTZ!

* Element symbols for oxygen, carbon, iron, and silicon



▲ **EVERY MINERAL, IF** given space to do so, forms crystals with specific shapes, such as columns, needles, cubes, or rosettes (petals). Gypsum, a mineral found in deserts and dry areas, forms petal-shaped rosette crystals. Because the crystals often look like flowers, they are called desert roses or gypsum flowers. Some minerals, like diamonds and rubies, are called gemstones. They are desirable because of their rarity, durability (hardness), and beauty.

► **THE ROCKS SAND-**stone and quartzite contain only one mineral, quartz. Most rocks, however, are made up of more than one mineral. In granite, the three major minerals are feldspar (pink and white), quartz (gray), and mica (black and clear).



▼ **ALL ROCKS FALL** into one of three categories, depending on how they were formed. Igneous rocks include obsidian, basalt, and granite. Sedimentary rocks include sandstone, limestone, and breccia. Metamorphic rocks include marble, slate, and quartzite.

Igneous

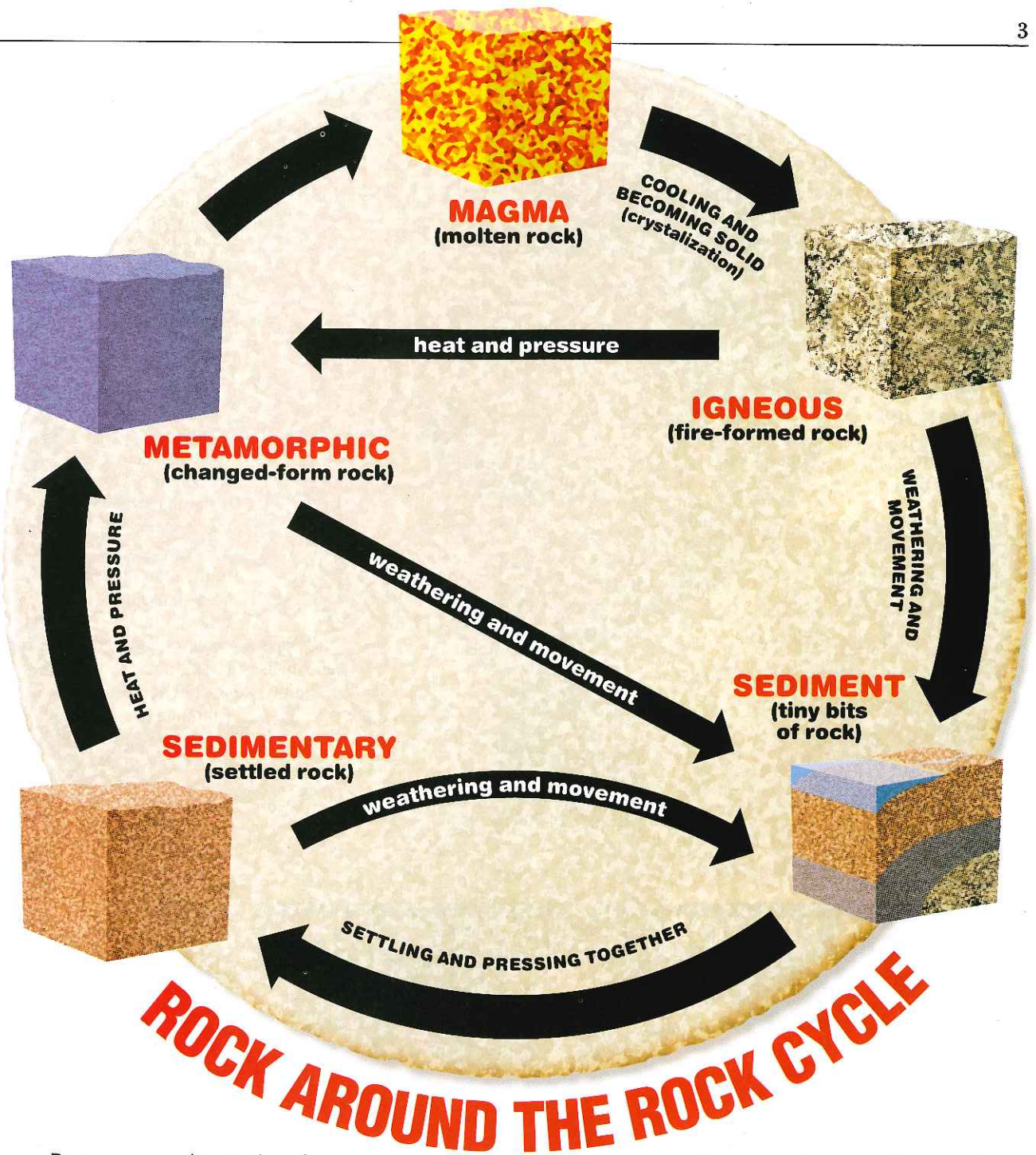
OBsIDIAN

Sedimentary

LIMESTONE

Metamorphic

MARBLE



IGNEOUS Rocks

These start out as melted rock, called magma, deep inside Earth's crust and mantle. When the magma erupts on Earth's surface, it is called lava. When the magma

or lava cools and hardens, it becomes igneous rock. The best-known igneous rock is granite, which is used as a building material. *Igneous* comes from the Latin word for "fire."

SEDIMENTARY Rocks

Wind and water are constantly changing rocks chemically, breaking them down, and then transporting tiny bits of rocks and minerals elsewhere. These small bits of rock, called sediment,

may be carried to riverbeds, deserts, and ocean floors. The layers of sediment are lithified (compacted), forming new rocks, called sedimentary rocks. Sandstone is one of the best-known sedimentary rocks.

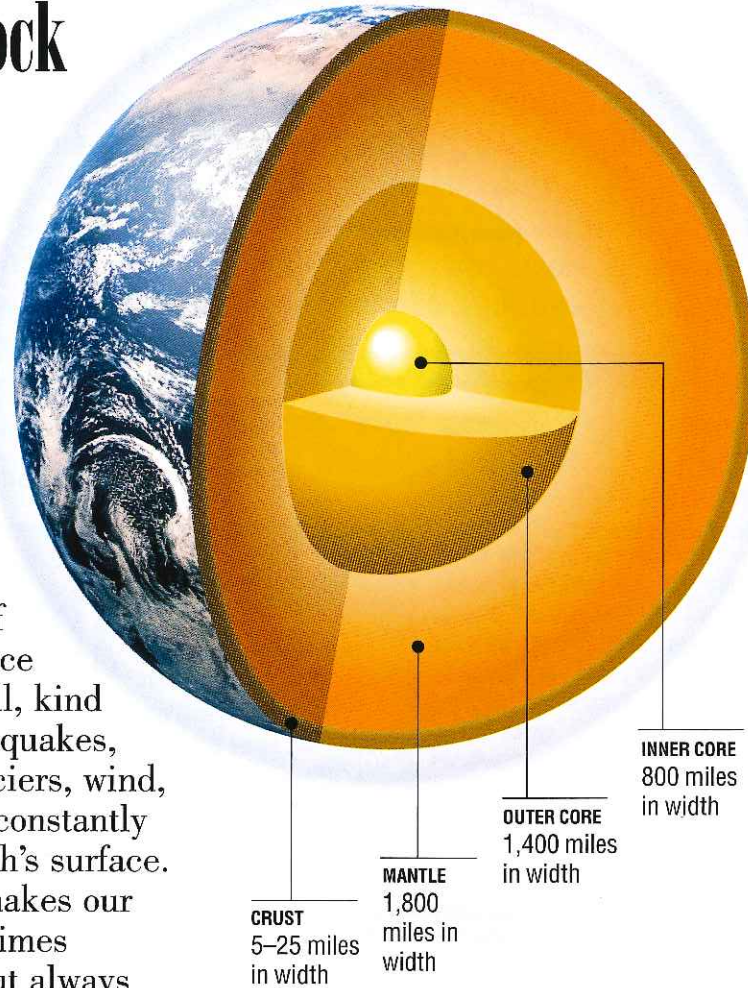
METAMORPHIC Rocks

These rocks get their name from the Greek *meta* and *morph* meaning "change of form." They begin as igneous, sedimentary, or even other metamorphic rocks and then go through a metamorphosis, or change. For instance, rocks that are deep

within Earth have pressure exerted on them from rocks above. The high heat and pressure can turn the igneous rock called granite into gneiss (pronounced "nice"). Over time, when the top rocks are worn away, metamorphic rocks appear on Earth's surface.

Third Rock From the Sun

Earth is one of four small planets in our solar system that are composed mostly of rock. The 4.6 billion years of Earth's existence have been, well, kind of rocky. Earthquakes, volcanoes, glaciers, wind, and water are constantly reshaping Earth's surface. This activity makes our planet a sometimes dangerous—but always fascinating—place to live.



◀ **EARTH'S ROCKY** surface is covered by soil, trees, grass, buildings and roads. But underneath, it is all rock. If you could slice the Earth in half, you would see that it has four main layers: the crust, the mantle, the outer core, and the inner core. Pressure and radioactivity cause Earth to become hotter and hotter as you move closer to the innermost core. Temperatures in the core are believed to approach 13,000 degrees Fahrenheit!

EARTH'S MAJOR TECTONIC PLATES



◀ **EARTH'S CRUST** and upper mantle are broken up into 15 giant tectonic plates. The mantle beneath the plates is hot and moldable and can creep, causing the plates to slide around and crash into one another. Over time, this has caused huge changes in Earth's surface. When the plate carrying India collided with the Eurasian plate, between 40 and 60 million years ago, the collision formed the Himalayas, the tallest mountains in the world.



MOST EARTHQUAKES occur at the edges of tectonic plates, along what are called fault lines. As the huge plates try to slide past each other, stress builds up until the plates lurch in opposite directions. This sudden movement can force giant sections of Earth to move either up and down or side to side.



▲ **IN ANY GIVEN YEAR,** Earth experiences about a million earthquakes. Fortunately, only 3,000 or so shake Earth noticeably. In a large quake, the surface of the

Earth ripples, like waves on an ocean. Buildings collapse, and fires from gas and oil lines occur. On average, quakes kill about 10,000 people annually.

It's **NOT** my fault.
It's **NOT MY FAULT!**
Okay, it's my fault...



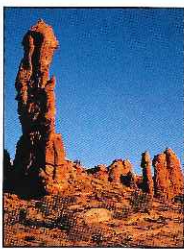
▲ **VOLCANOES ARE** common near the edges of tectonic plates. Volcanoes are openings in Earth's surface, where molten rock and gases rise up from the mantle. On May 18, 1980, Mount St. Helens in Washington State erupted. Hot ash and rock blew down forests up to 230 miles away.

▼ **A GLACIER IS A** giant mass of ice that flows slowly over Earth. As it flows, the glacier scoops up and crushes rocks. Over time, a glacier can gouge out a huge area. The fjords (fee-ORDS), or inlets, of Norway are the result of glaciers carving a path through steep cliffs.

CHECK IT OUT!

What are these?

(answer on back cover)



Tools and Tombs

Prehistoric humans began using stone tools around two million years ago. At first, stone tools were simple—hand axes or flints to light a fire. But as people became more sophisticated, their use of rocks grew. By 2700 B.C., humans could erect colossal stone tombs, like the pyramids of Egypt. Today, rocks and minerals shape our lives in many interesting and complex ways.

► **PREHISTORIC PEOPLE** made colored paint by crushing rocks and charcoal (charred wood) and mixing the dust with water and animal fat. The first known paintings were done on the rocky walls of caves, and the oldest works date back to 28,000 B.C. The quality of painting is excellent.



▼ **IN LATIN,** *petroleum* literally means “rock oil.” Petroleum comes from tiny sea animals and plants, known as zoo-

plankton and phytoplankton, which sank to the sea floor after they died. Once buried in sediment, the plankton became

fossilized. Over millions of years, with pressure and heat exerted on them, these fossils were transformed into valuable oil.



▲ **PREHISTORIC TIMES** are often called the Stone Age because most tools and weapons were made of rocks, like flint (a sedimentary rock) or obsidian (an igneous rock). These two rocks

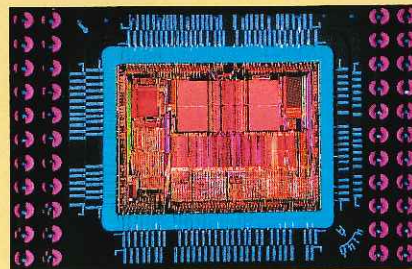


chip easily into sharp points and flakes. Around 3500 B.C., when people began mixing together the elements copper and tin to make bronze, the Bronze Age began.

► **By 2700 B.C.,** humans could quarry rocks to erect tombs, like the pyramids of Egypt. The pyramids were built to protect the eternal souls of pharaohs, or kings. The largest pyramid, called the Great Pyramid, contains more than two million limestone blocks (and each block weighed over two tons). The Great Pyramid was more than two thousand years old when the ancient Greeks, around 450 B.C., used marble to create some of the most awe-inspiring buildings of the ancient world. One example is the Erechtheum (right), on the Acropolis in Athens.

▼ **SILICON CHIPS,** ultra-thin slices of silicon crystals, are vital to the workings of computers, VCRs, and other electronic equipment. Pure silicon works as an insulator—it keeps an electric

current from flowing. When impurities are added to the silicon, it lets a tiny electric current pass, or flow. This action makes the chip a semiconductor that can be used for electronics.





▲ **SINCE AROUND** A.D. 1000, compasses have helped mariners find their way around the oceans, although in modern times, more sophisticated equipment is also used. The compass needle always points either north or south in the direction of one of Earth's two magnetic poles. On long ocean voyages in the past, a compass would become useless without a piece of lodestone. Lodestone is naturally magnetic, and every so often, the iron compass needle had to be rubbed against it to keep the compass magnetized.

CHECK IT OUT!

Are pencil leads made out of lead?
(answer on back cover)



◀ **WITHOUT SILVER,** there would be a lot fewer snapshots in the world. Photographic film is coated with tiny grains of silver

salts that are held in place by a jelly-like substance called gelatin. Silver salts change chemically when they're exposed to light. The

amount of change depends upon the time of exposure. Because they're so sensitive, silver salts are perfect for capturing images.

Gemstones Are Forever

The hardest natural substance in the world is a diamond. Along with beauty and rarity, the hardness of a diamond helps to make it valuable. Diamonds are the most sought-after crystals in the world. But they are just one star in a galaxy of sparkly gemstones, minerals born deep within Earth.



▲ **GEMSTONES, LIKE** topaz (above), are minerals found in nature and used in jewelry and other ornaments. Most gems are minerals, but some are not. Pearls, for instance, form in the shells of living oysters. Coral comes from the skeletons of small sea creatures. Amber is fossilized tree resin.



▲ **THE LARGEST** diamond ever found, the Cullinan, weighed 3,106 carats, or about 1½ pounds. Today, pieces of the Cullinan are part of the British crown jewels. One piece, the Star of Africa (on the bottom part of the crown), is the

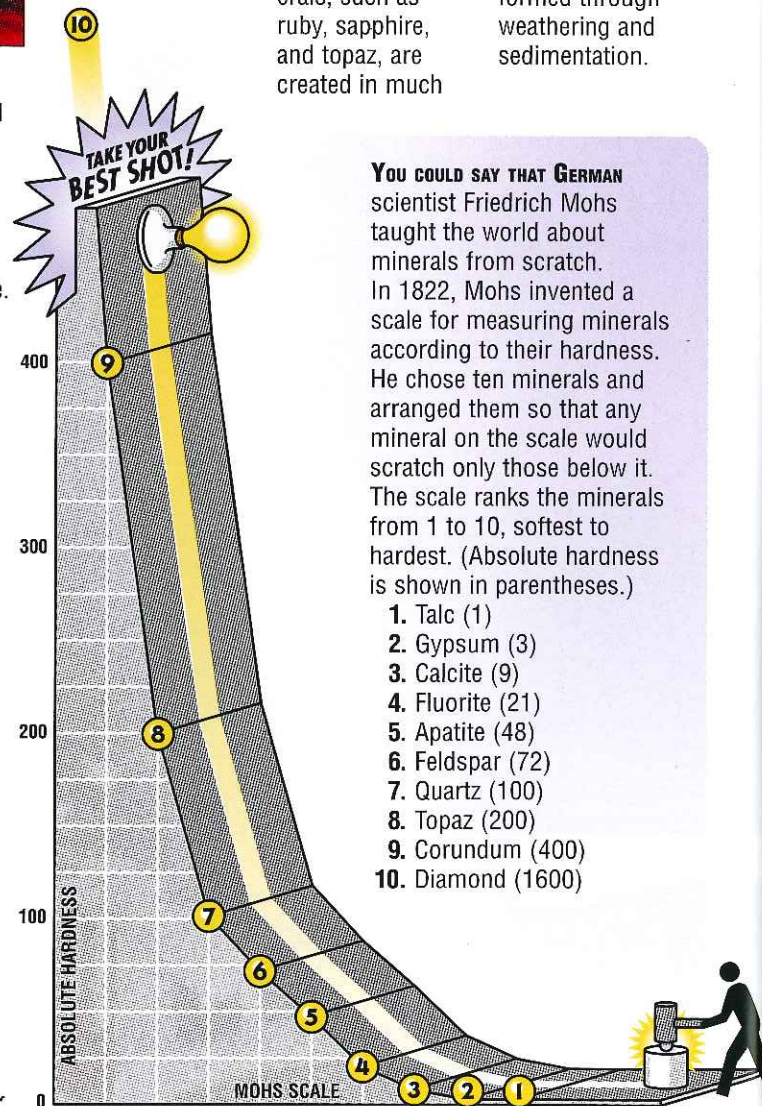
world's largest cut diamond. All precious stones or gemstones are weighed in carats. It takes 142 carats to make one ounce.

▲ **A DIAMOND IS A** crystalline form of pure carbon. Millions of years ago, the carbon came under incredible heat and pressure in Earth's mantle.

Ancient volcanoes spewed some of the resulting diamonds onto Earth's surface, while others remained deep underground. Most gem minerals, such as ruby, sapphire, and topaz, are created in much the same igneous processes. A few gemstones are formed by metamorphism—garnet, for example. Even fewer gemstones, such as turquoise, are formed through weathering and sedimentation.



◀ **YOUR FINGERNAIL** has the absolute hardness of 4.2, so it will scratch talc. A United States penny has the hardness of 11.5. Window glass is 60. Diamond, which has the absolute hardness of 1600, scratches all the minerals, including other diamonds.



► **PRECIOUS GEMS** are precious in part because they are rare and hard to find. On average, miners must move 100 tons of earth just to find 50 carats of ruby. About 250 tons of diamond ore must be mined and processed to produce a one-carat stone.



CHECK IT OUT!

Why do women wear diamond engagement rings on their "ring finger"?

(answer on back cover)

▼ **MANY ROCKS AND** minerals have superstitions tied to them. In medieval Europe, people believed the brilliant sparkle in opal meant the devil lived inside. Apache Indians thought that turquoise helped them shoot straight. Centuries ago, some Chinese believed that jade preserved dead bodies. This jade funeral suit was made for a Chinese prince in the second century B.C.



REAL RUBY

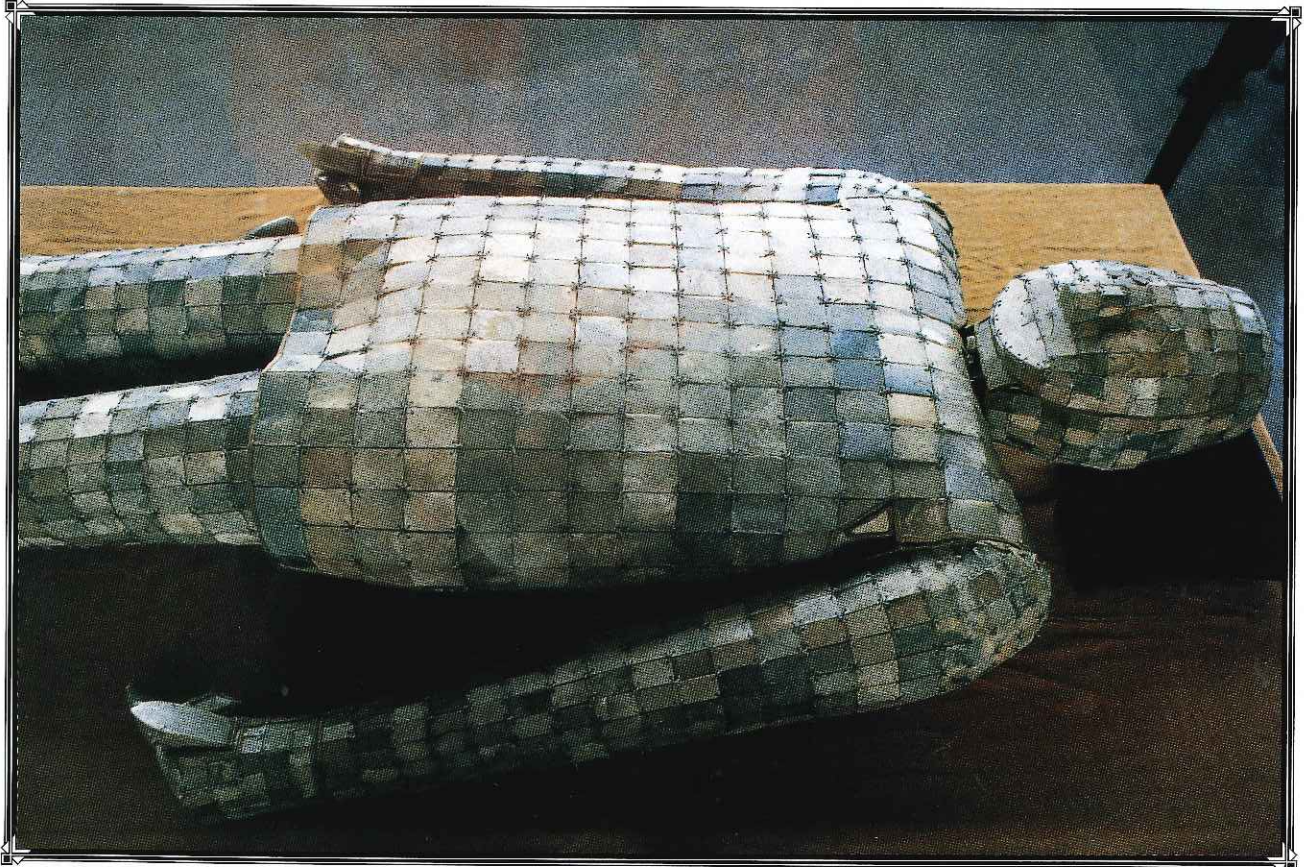


ARTIFICIAL RUBY

◀ **THE RARITY OF** precious stones has always created a demand for substitutes. Glass was a popular—but not very convincing—fill-in for centuries. Today,

scientists can make artificial gems. The manufactured stones are identical in structure to the real thing (without any impurities), but they are usually one-

twentieth the price. Artificial diamonds are generally used by industry to make super-sharp saws or drill bits.



The image shows the Stonehenge monument in silhouette against a vibrant blue sky filled with wispy white clouds. The monument is set on a lush green field. The overall scene is captured in a high-contrast, almost monochromatic style, emphasizing the shapes of the ancient stones.

STONEHENGE

is a group of huge ancient stone slabs standing in Wilshire, in southern England, dating from 2000–1500 B.C. Archaeologists believe they may have served as an astronomical calculator, predicting solar and lunar events, including eclipses.

