

PATHFINDER EDITION

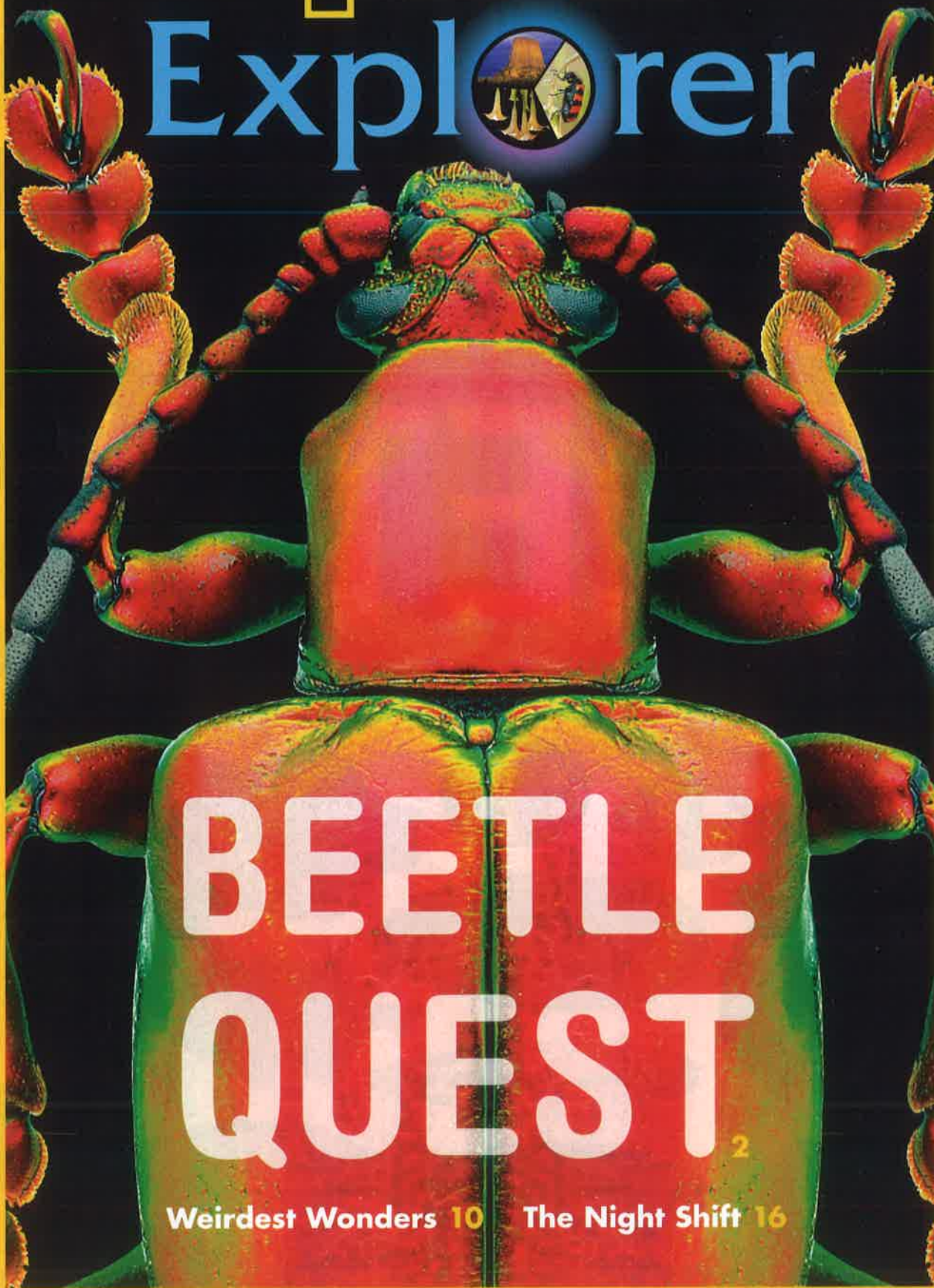
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NATIONAL GEOGRAPHIC

# Explorer



# BEETLE QUEST

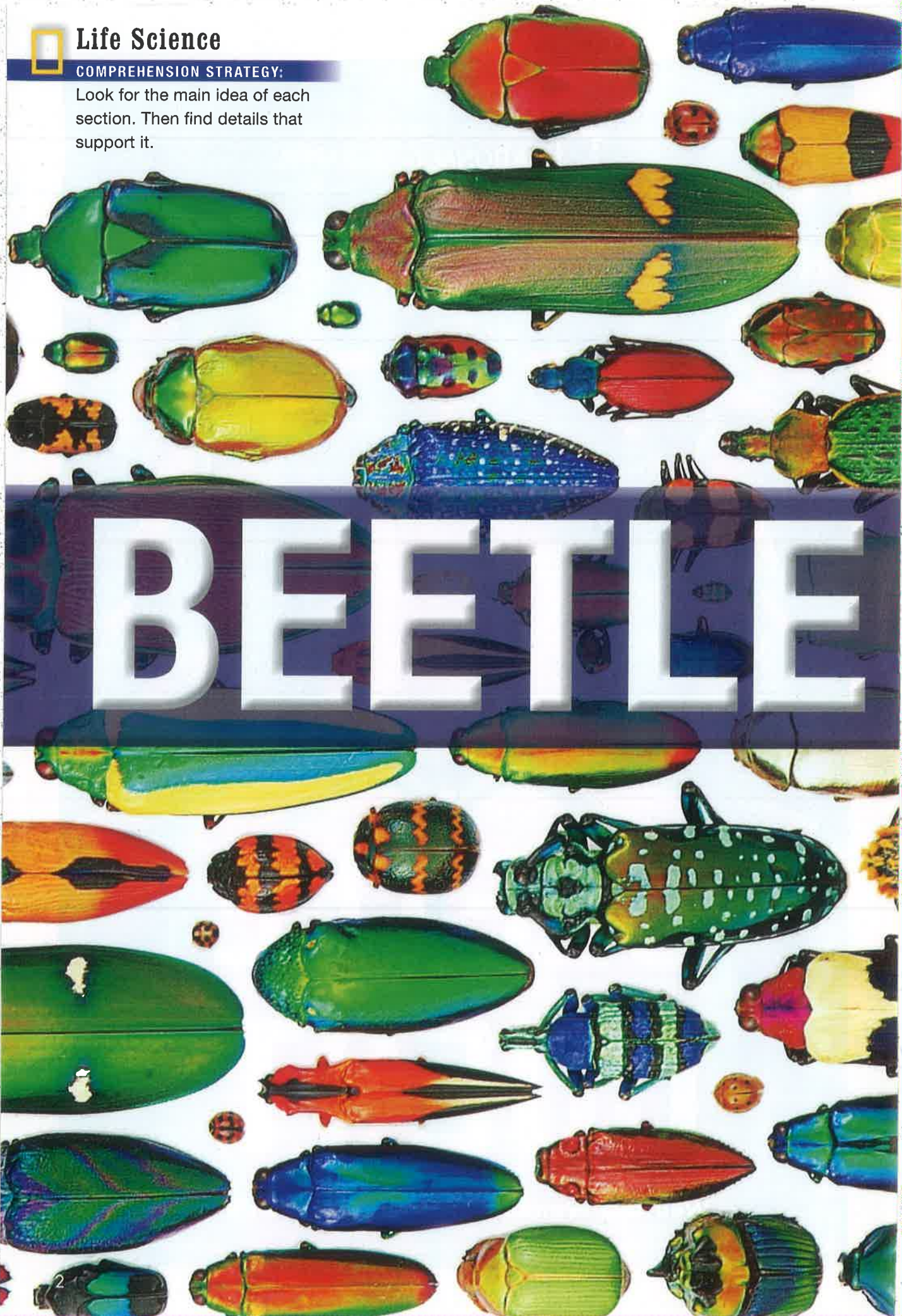
Weirdest Wonders 10 The Night Shift 16



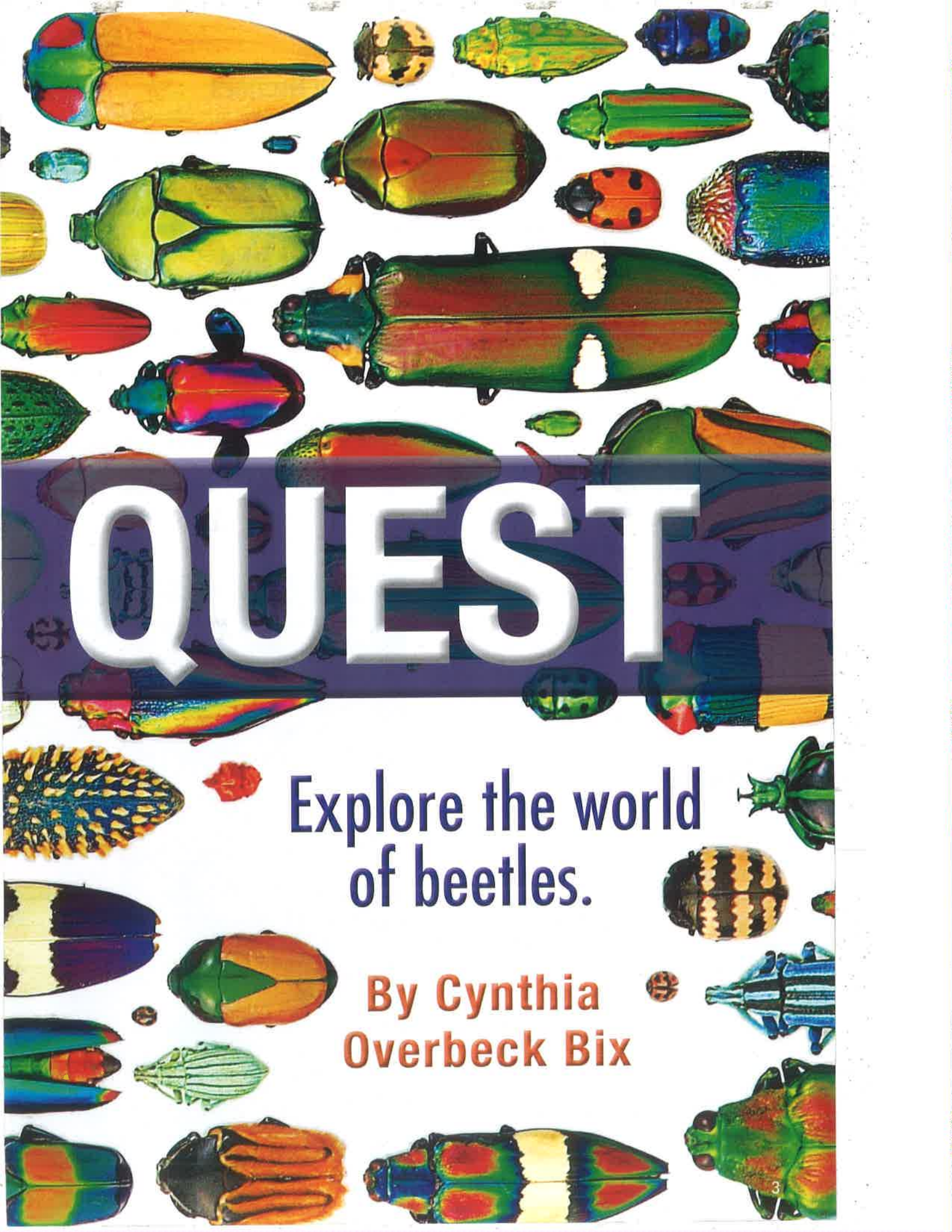
## Life Science

### COMPREHENSION STRATEGY:

Look for the main idea of each section. Then find details that support it.



# BEETLE



# QUEST

Explore the world  
of beetles.

By Cynthia  
Overbeck Bix

## It's dark and freezing

on the mountain. Dave Kavanaugh's boots crunch across the snow. His headlamp lights the way. Its bright beam shines on the snow ahead. Suddenly, he stops.

He sees something. A black beetle scuttles across the snow. It darts toward a smaller insect struggling in the snow. Chomp! The beetle grabs its meal and scurries away. Kavanaugh whoops with delight. He has just discovered a new kind of beetle.

Kavanaugh is an entomologist. That's a scientist who studies insects. He likes beetles best. A beetle is a kind of insect. It has hard front wings. These wings cover and protect a second set of wings. Some beetles use the second set to fly.

Kavanaugh came to this mountain looking for beetles no one has seen before. The one he finds is a new kind of ice beetle. It joins the more than 300,000 other **species**, or kinds, of beetles that are already known.

So far, he has discovered hundreds of new beetle species. He has seen beetles as big as his hand and beetles almost too small to see. He has studied their behaviors, habitats, life cycles, and diets. He knows that beetles will eat just about anything.

## On the Hunt

The ice beetle is a **carnivore**. It kills and eats mostly insects. It has a hard time finding prey. That's because not many creatures live on top of the mountain.

Luckily, the wind helps out. It picks up insects that live on lower levels of the mountain. It carries them up and dumps them onto the snow.

The insects aren't used to the cold and the snow. They struggle to survive. Not the ice beetle. It's at home in its cold habitat.

The ice beetle has a chemical in its body. It keeps the beetle from freezing. At night, this beetle goes hunting. It pounces on insects stuck in the snow.


## Hungry Hunters

Not all beetles can live in a cold habitat. Kavanaugh has to go to the steamy tropics to study the green tiger beetle.


Huge, bulging eyes help it spot prey. Long legs help it run fast. It's so fast, it could run across a classroom in a few seconds. The tiger beetle puts its speed to good use. It darts across the ground to catch up to other insects. Then it slices this prey with its sharp jaws.

Not all hunters look as fierce as the tiger beetle. Take the ladybird beetle, or ladybug, for example. It looks cute. Yet Kavanaugh says it's a killer. A single ladybug can catch and eat 60 aphids in one day. An aphid is a tiny insect.

A female ladybug can destroy a whole aphid colony. She barges into an aphid nest and lays hundreds of eggs. When the eggs hatch, hungry young ladybugs come out. They gobble up aphids by the thousands.



This ladybug swoops in to eat the aphids on this plant.





The green tiger beetle's jaws slice like scissors.



## Meatless Meals

Not all beetles prey on other animals. Kavanaugh knows of plenty of beetles that eat plants. These beetles are **herbivores**.

Herbivores feast on leaves, stems, and roots. They also bore their way through bark and wood. Many beetles that eat plants have special mouthparts.

The acorn weevil is a good example. It lives in Europe, North America, and Central America. This beetle has a long snout, or nose. The female's nose is longer than her body. Her nose curves downward. This shape helps her dig into plants.

When she spots a juicy acorn, she drills her snout into it. At the end of her snout is a pair of scissor-like jaws. The jaws snip away tiny pieces of the acorn for her to eat.

Other types of weevils use their jaws in a different way. The female giraffe weevil looks for leaves. When she finds a large one, she chews a slit in one end. Then she rolls it into a tube. She lays a single egg inside. The larva that hatches eats the leaf as its first meal.

## Plant Parts

A rhinoceros beetle looks like a tank. Yet it feasts on plants. As it moves along, it sweeps its antennae back and forth. They pick up the scent of plant sap. That's a juice that flows inside plants.

When the beetle finds sap, it slices the plant stem with its powerful jaws. As sap oozes from the stem, the beetle mops it up with hairs on its mouthparts. The hairs brush the sap into the beetle's mouth.

Unlike a rhino beetle, a Japanese beetle looks harmless. By itself, it is. But these beetles don't eat alone. They swarm.

Together, they chew each plant from the top down. Yet they don't eat all of it. They only like the soft parts inside the leaves. By the time they are done eating, each leaf is full of holes. It looks like a piece of lace.

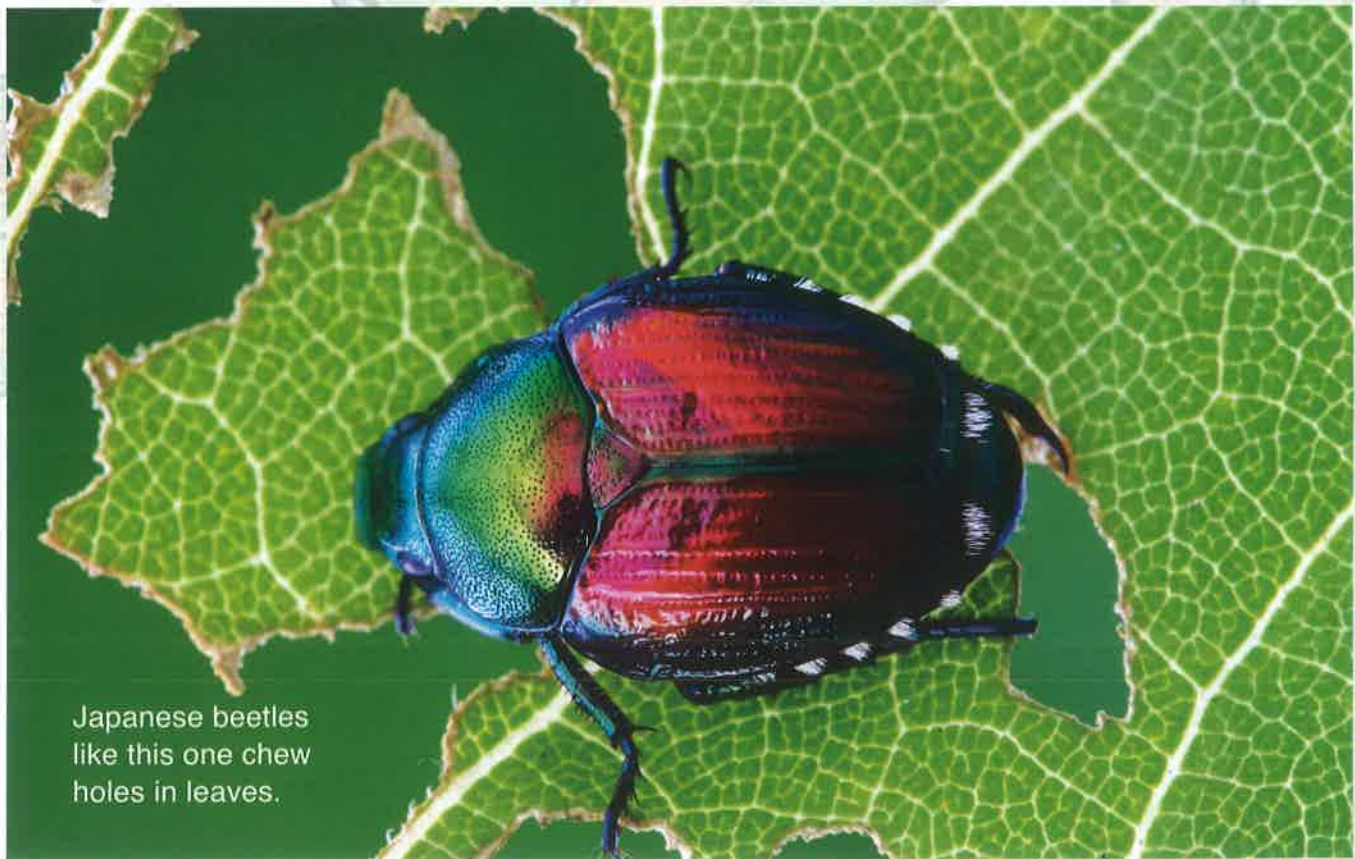
Some beetles even like poisonous plants. Take the blue milkweed beetle, for example. It eats milkweed leaves. The poison in the milkweed's leaves doesn't harm the beetle. It makes the beetle poisonous, though.



This male giraffe weevil has a long neck. It uses its neck to fight other weevils.



The rhinoceros beetle is one of the world's largest beetles.



Japanese beetles like this one chew holes in leaves.

## Cleanup Crew



Some beetles aren't too picky about what they eat. In fact, they eat things that most other animals wouldn't. These beetles are **scavengers**. As nature's cleanup crew, these beetles find dead or dying animals and gobble them up.

Kavanaugh knows many places where he can find beetles like these. He hikes along a stream in the woods. He spots a beetle zipping around in the water. It's a whirligig beetle. It's always on the move, looking for small insects that have fallen in the water.

A whirligig's eyes are split into two parts. That way, it can see above the water and below it at the same time. A whirligig has sensitive antennae. They pick up on changes in the surface of the water. That's how it finds other insects to eat. When the whirligig finds a struggling insect, it spins around the insect, making ripples before it attacks.

## Still Hungry?

A dead insect is a good meal for a whirligig beetle. Yet some beetles need a bigger meal. The sexton beetle looks for dead birds, mice, or other small rodents.

If the sexton beetle finds a dead mouse lying on soft soil, it digs all around the body. The mouse sinks into the ground. Then the beetle covers it up.

If the mouse is on hard ground, that's not a problem for the sexton beetle. This small but mighty beetle moves the body. Usually, two beetles work together. They squeeze under the mouse until it is on their backs. They walk the mouse forward until they reach a patch of soft dirt. Then they bury it.

Once the mouse is buried, the female beetle tunnels under the ground near the mouse. There, she lays her eggs. When the larvae come out, a meal is waiting for them. They eat the mouse.

This sexton beetle searches for a dead mouse to bury.





## An Unusual Meal

The sexton beetle isn't the only beetle that can carry a heavy load. A dung beetle can, too.

The dung beetle eats animal waste, which it rolls into a ball. Kavanaugh finds this beetle everywhere from rain forests to cow pastures.

The dung beetle lives where animals live. When it finds fresh dung, it goes to work.

A beetle shapes the dung into a large ball. The ball may be as much as 50 times as heavy as the beetle. With its head down, it rolls the ball over the ground. It pushes the dung with its strong legs.

As it pushes, it's also looking for a spot of soft dirt. Once it finds one, it's time to dig. Like the sexton beetle and its mouse, a dung beetle buries the dung.

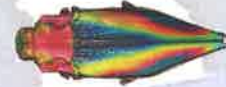
Then a female dung beetle tunnels under the ground near the ball. She lays eggs next to the dung ball. When the eggs hatch, the larvae eat the dung.

## More Beetles

Beetles eat a lot of different things. They eat meat, plants, and dead stuff. Kavanaugh can tell a lot about beetles based on what they eat. Yet he wants to know more. His search for beetles is neverending.

He stalks them all over the world. He beats the bushes. He pokes around rocks and along streams. He knows there are thousands of new beetles waiting to be discovered.

## WORDWISE




**carnivore:** an animal that eats meat

**herbivore:** an animal that eats plants

**scavenger:** an animal that eats dead or dying plants and animals

**species:** a group of living things that share common characteristics



Using its strong back legs, this beetle rolls a ball of dung.



Travel the world to see how  
powerful forces shape Earth's

# Weirdest



As you read, compare how each landform was created.

# Wonders

By Glen Phelan



## A Giant's Stepping Stones

The ground cracks open. Clouds of hot gases and steam billow into the sky. Sizzling hot lava spills out of these giant cracks. It oozes across the ground.

The lava covers everything in its path. Nothing is safe. Thick forests burst into flames. Streams and ponds boil. Animals flee.

Yet the lava keeps coming. Eruption after eruption, it fills a river **valley**. This low area of land tucked between hills is like a big bowl. Soon, it holds a lake of hot, molten rock that's 90 meters (295 feet) deep.

The lake is so deep that the lava cools very slowly. As it cools, it turns into rock. It also contracts, or shrinks. Then, crack!

Small cracks appear in the rock. They form shapes. Many have six sides like a hexagon. Soon the rock looks like a huge honeycomb. Many cracks are deep. They stretch all the way to the buried river valley. They form giant columns of rock.

Over the years, more lava bubbles up. It covers the land. So does dirt and grass. They bury the columns, hiding them for millions of years. High above them, the surface of the land keeps changing, too.

The sea rises. It floods the land. Sea levels drop. As the water goes out, it tugs at the land. Waves pound it. Winds blast it. Over time, these powerful forces wear away the land.

Bit by bit, the cracked lava rock reappears. The columns aren't all the same height any more. Some look like giant stepping stones. Today, 40,000 of these rocks stretch to the sea, forming the Giant's Causeway in Ireland. Other columns form a cliff. They're called The Organ. They look like pipes of a huge organ.

Lava doesn't erupt here any more. Waves and wind still beat this place, though. The tough rock slowly wears away. Someday, like the land that once covered it, the columns will crumble. Giant's Causeway will disappear.

# Rainbow Rocks

Rain pounds the ground. Streams turn into raging rivers. Floods race through a valley in ancient China.

Water isn't the only thing on the move. So are sand, dirt, and rocks. As the water rushes over them, it picks them up and moves them.

The water swirls specks of sand and mud. It tumbles pebbles. It pushes big boulders. This movement is called **erosion**.

Eventually, the water slows. The sand, mud, and rocks fall through the water. Some of them settle on the bottom of lakes.

Over time, more and more sand and rocks pile up. Their weight presses down. All this pressure glues the pieces together. They slowly turn into layers of new rock. Sand turns into rough kind of rock called sandstone. Mud becomes smooth mudstone. The pebbles make an extra bumpy kind of rock.

These layers of rock remain hidden for a long time. Then something happens. Giant chunks of Earth's crust suddenly shift. The ground shakes. It heaves and buckles.

In places, the crust rises. It pushes the hidden layers of rock upward. The buried rocks rise higher and higher. Eventually, they form mountains with many jagged peaks.

Rain then pelts the rocks. Ice cracks them. Sand whipped by winds rubs them. These forces break the rocks into smaller and smaller pieces. This process is called **weathering**. Then many of these same forces carry the bits and pieces away.

Today, in a desert in western China, the mountains are gone. Wind and water have sculpted them into wavy hills. Iron streaks the rock red. Other streaks of blue, gray, and gold make these rocks look like rainbow rocks.





## The Cotton Castle

Drip. Drip. Drip. Rain and melting snow seep through cracks on Earth's surface. The water flows downward. It sinks deeper and deeper under the ground.

Rumble. Rumble. Giant chunks of Earth's crust move. Earthquakes rattle the land. The planet's crust cracks a little more.

Gurgle. Hot magma rises. This melted rock comes from deep inside Earth's mantle. That's the layer of Earth right under the crust.

When the water and magma meet, the water heats up. Soon, it's boiling hot. The water fills with carbon dioxide, a gas from the magma.

Now, the water begins to bubble back up through the cracks. It passes through layers of rock. The water is still so hot that it dissolves some limestone. This rock is made from the skeletons of sea creatures. The water picks up a chemical from the limestone. It's called calcium carbonate.

Finally, the water bubbles up out of the ground. It forms about 20 hot springs in the country of Turkey.

As the water spills over the sides of the springs, the gas rises into the air. The water quickly evaporates. That leaves the calcium carbonate behind. At first, it's gooey. Then it hardens into a new kind of limestone.

This limestone is bright white. In some places, the rock hardens as water drips over it. It looks like frozen waterfalls. In other places, the new rock piles up like big, fluffy balls of cotton. That's why people call this place the Cotton Castle.

The Cotton Castle is probably most famous for its pretty pools, though. Over time, the rock formed a cliff. Its top looks like giant steps. They're called **terraces**.

Each snow-white terrace holds a pool of bright blue water. As long as the water flows, these rock formations will continue to grow.

# Catch a Wave

Deep inside Earth's mantle under Australia, magma bubbles. This hot, melted rock rises through a crack in Earth's crust. Up and up it goes. Suddenly, the crack widens into a large underground chamber. The magma fills it.

In some places, a magma chamber like this forms the bottom of a volcano. Not here. It's a dead end for this molten rock. Slowly, the pool of magma cools. It turns into a solid chunk of rock called granite.

The granite remains buried beneath soil and rock for a long time. Yet even under the ground, it begins to weather. Water seeps through the soil. Acids and salts in the water begin to eat away at the rock. They weaken parts of the granite mound.

High above the rock on Earth's surface, a wide river forms. It drains water to the sea. As this river flows, the water digs into the land. It picks up and carries away bits and pieces of dirt and rock.

Bit by bit, this erosion uncovers the granite. It washes away bits of weakened rock. The exposed rock curves over the land like a giant wave. As more and more land is carried away, the rock seems to grow taller. Today, the top of this rock wave rises nearly 15 meters (49 feet) above the ground.

Water drips down the wave, streaking it red and gray. Algae grow on it. These forces will slowly continue to break the rock apart. The same thing is still happening under the ground, too. Water weathers the buried rock. It builds a bigger wave.

Weathering and erosion create an endless cycle. Giant rocks rise as soil washes away. Rugged mountains wear down into rolling hills. Hot springs carry chemicals that build new rock.

These powerful forces keep changing the land. They will continue to create some of the weirdest and most wonderful places on Earth.



## WORDWISE

**erosion:** the process in which rock is moved from one place to another

**terrace:** a landform with a raised, flat top

**valley:** a low area of Earth's surface, usually between hills or mountains

**weathering:** the process in which rocks are broken into smaller pieces