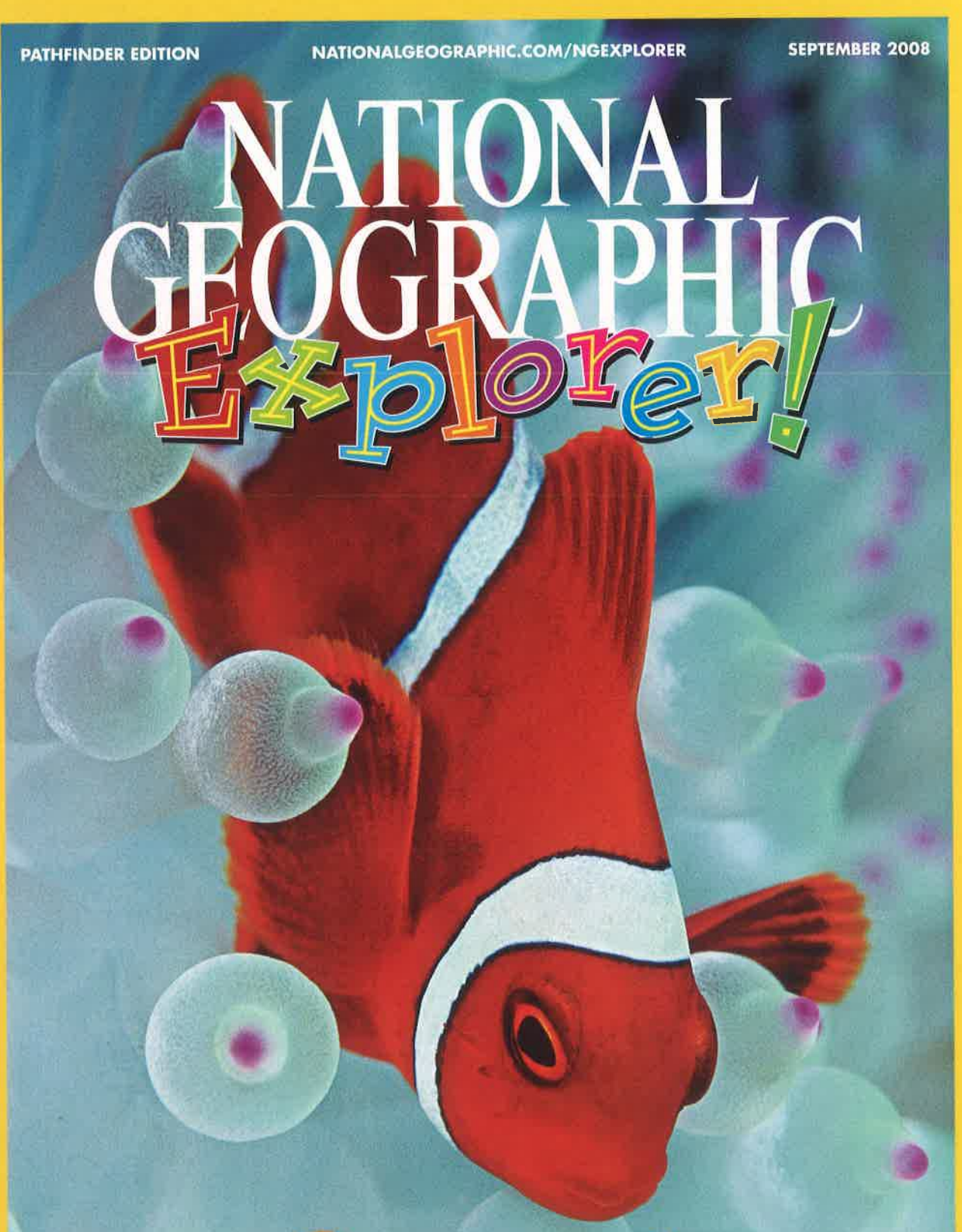
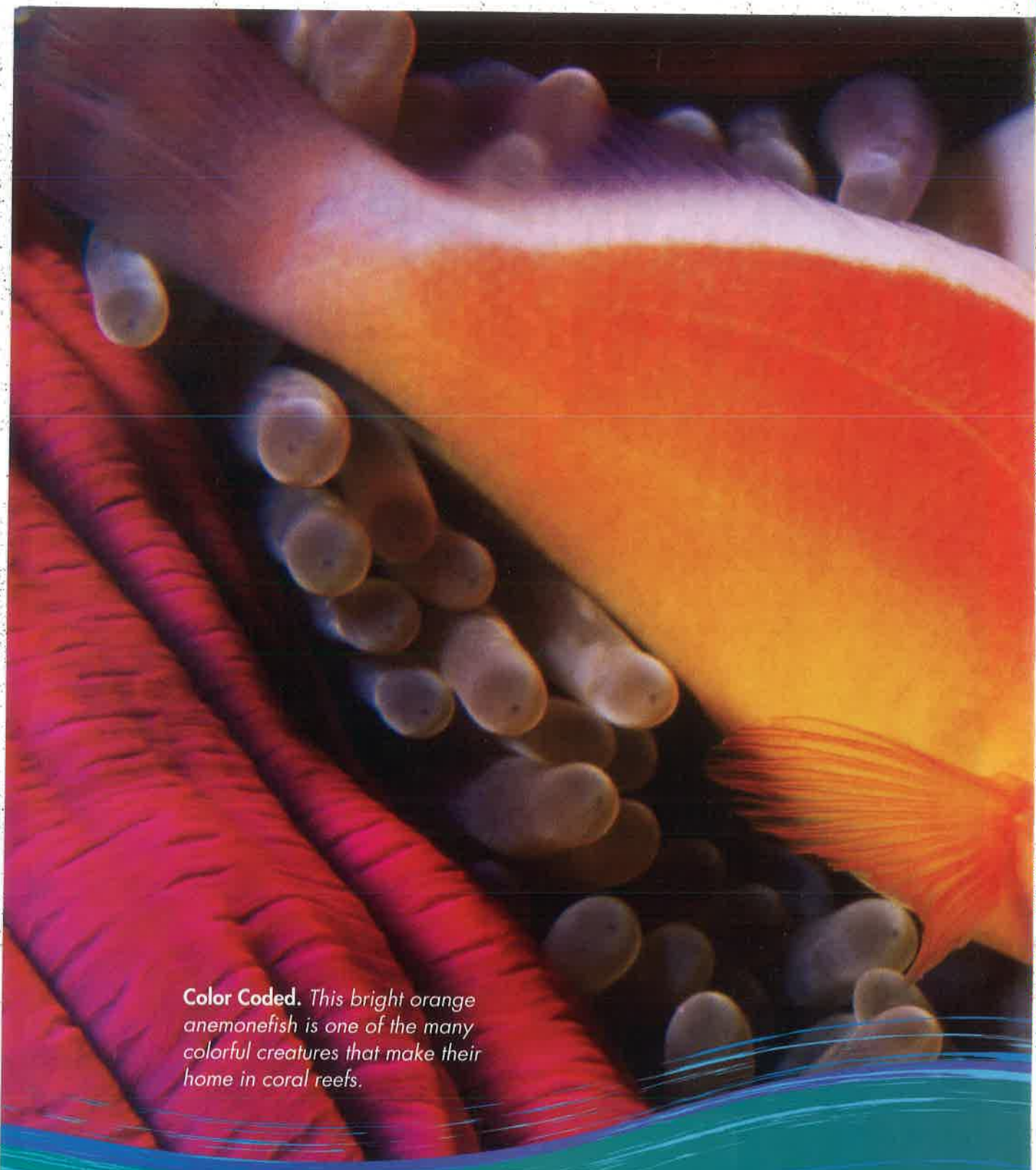
PATHFINDER EDITION NATIONALGEOGRAPHIC.COM/NGEXPLORER SEPTEMBER 2008

NATIONAL GEOGRAPHIC Explorer!



Reef Rainbow 2

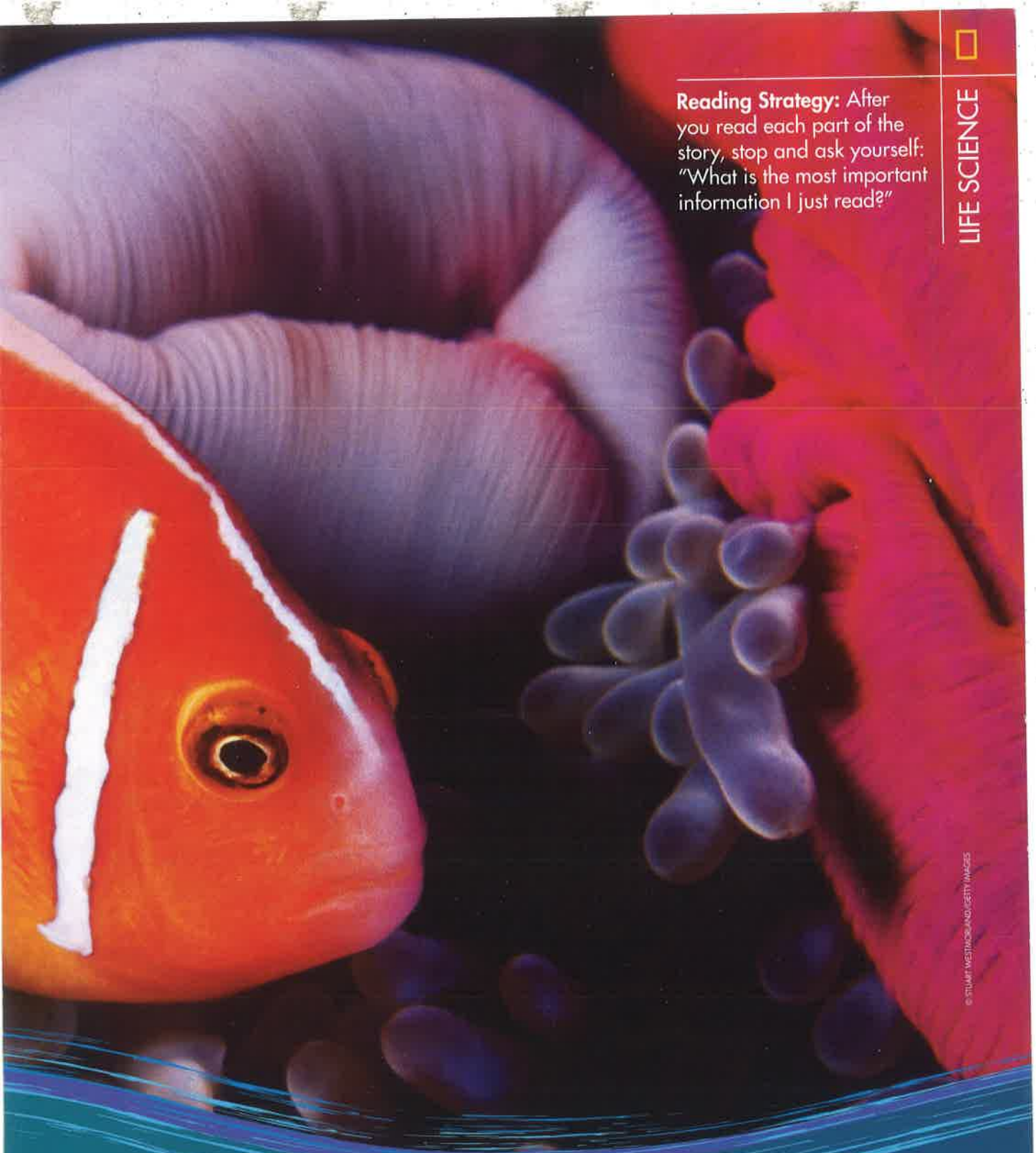


Color Coded. *This bright orange anemonefish is one of the many colorful creatures that make their home in coral reefs.*

By Maxine Rose Schur

Reef Rai

Reading Strategy: After you read each part of the story, stop and ask yourself: "What is the most important information I just read?"



nbow

Take the plunge and enter the dazzling world of coral reefs.

Dive into a **coral reef,** and you see swirls of color at every turn. Red, yellow, and blue fish dart through the sunlit water. Purple sea slugs slither past bright orange coral. There is more to the reef than meets the eye. Plunge into a rainbow of color to explore this underwater world.

Where It Happens

In shallow ocean water, tiny animals called coral polyps make big wonders. They build coral reefs. Each polyp builds a wall around itself. The wall is like a skeleton. When the polyp dies, the skeleton is left. Then new polyps build on top of the skeleton, creating the reef.

Over time, the coral reef grows and grows into amazing shapes. You can find coral that looks like a castle, a cabbage, a deer's antlers, or even a human brain!

Whatever their shape, coral reefs are home to many colorful creatures. The colors start with the polyps themselves. Polyps can be green, blue, pink, gold, and even purple. They get their bright color from algae, or tiny plants that live inside their soft bodies.

Hiding in Plain Sight

In this rainbow-colored world, bright colors actually work as **camouflage.** Many fish in coral reefs are vivid yellow or blue. That's because a lot of the coral and plants that grow in reefs are bright yellow and blue. So the fish just blend right in.

The patterns on an animal's body also help it hide in plain sight. Stripes or spots seem to break up the shape of the creature's body. The angelfish survives this way. Its yellow-and-blue-striped body is hard to see against the backdrop of yellow and blue coral. Predators can't tell where the coral stops and the angelfish starts!

Warning Signals

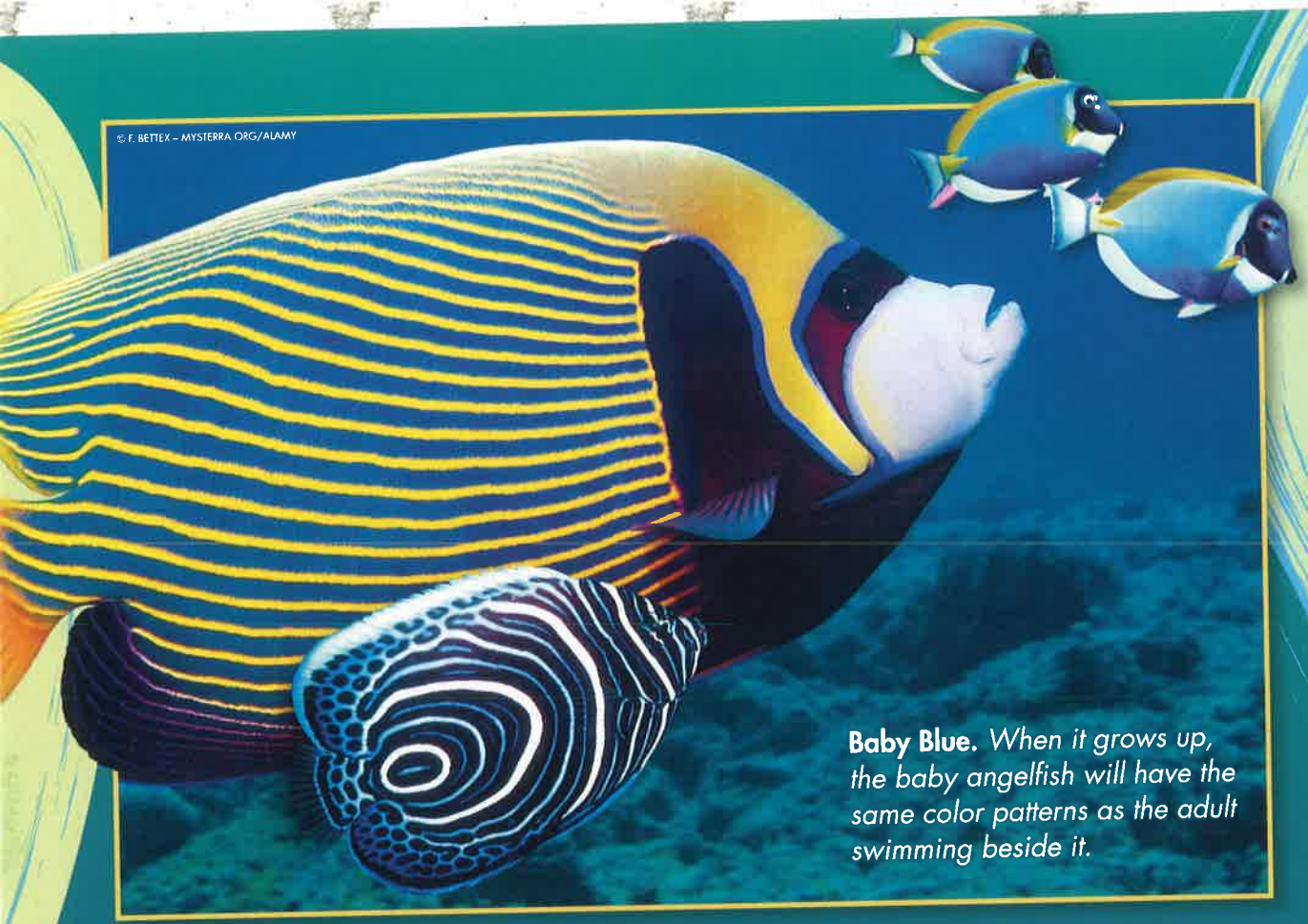
In a coral reef, the water is shallow, clear, and filled with sunlight. In such a brightly lit **habitat,** colors are easy to see. So color is a great way for reef animals to communicate. What do reef dwellers signal with their colors?

Many reef animals use colors to send warning messages. Take the fire urchin. This creature is as bright as a neon sign. It's probably one of the most colorful animals you will ever see. But don't touch it!

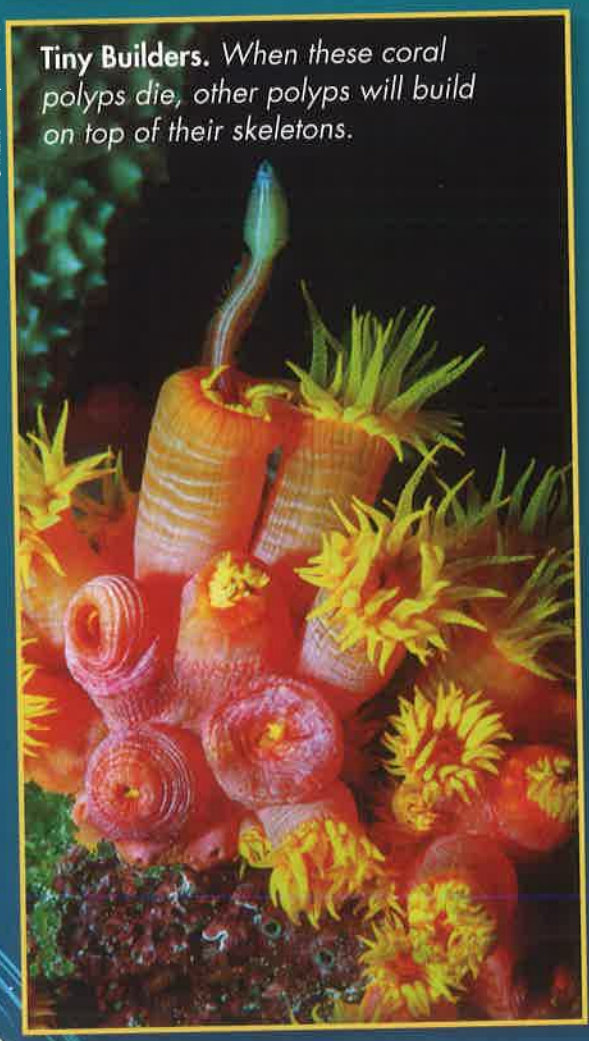
The fire urchin has brilliant blue globes on the ends of its spines. Each one is packed with poison. The blue color warns animals to back off. It's as though the electric blue color is sending the message, "Don't come near. I'm poisonous!"

A spiny devilfish also uses color to send a warning sign—but only when it has to. Most of the time, the fish looks like a brown blob on the ocean floor. It is hard to see. Sitting very still, the fish waits for food to swim by.

When it senses danger, however, the devilfish spreads out its flashy fins. Suddenly, the fish shows bright orange colors. The colors warn predators that the fish is poisonous. The predators may think that the devilfish is not such a good meal after all. They "get the message" and swim away.

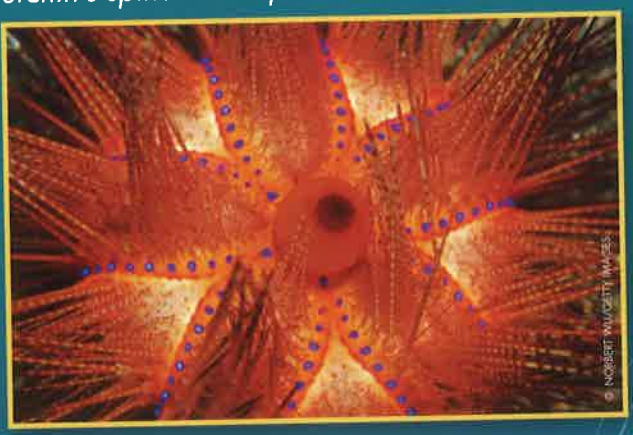


Baby Blue. *When it grows up, the baby angelfish will have the same color patterns as the adult swimming beside it.*



Tiny Builders. *When these coral polyps die, other polyps will build on top of their skeletons.*

Poison Power. *The bright blue globes on this fire urchin's spines warn predators.*



Cool Camouflage. *This frogfish seems to disappear near a yellow sponge.*

Come a Little Closer

"Stay away!" isn't the only colorful message reef animals send. Sometimes, in fact, they signal just the opposite. Eye-catching color can be an invitation to come a little closer.

To catch a mate's eye, a male flasher wrasse takes on an electric look. He flexes his fins to make himself look bigger. Then he shoots neon blue stripes across his body. This creates a stunning light show that gets beamed through the water.

The flashy act can put the fish in danger, though. What if a predator notices the colors, instead of a mate? When an attacker appears, the flasher wrasse just turns off his neon colors.

Tricked You!

Creatures in a coral reef use their colorful looks in another way, too. They trick other animals. The yellow trumpetfish has a clever color trick. On each side of its tail fin is a black circle that looks like an eye. These fake "eyes" trick other fish. They can't tell whether the trumpetfish is swimming toward or away from them. They get confused and don't know which way to go to escape.

The trumpetfish has another trick. Its bright yellow body is small and narrow, like a stick of yellow coral. When it's hungry, the trumpetfish swims near yellow coral and stays still. It keeps its body straight. Other fish come close because they think the trumpetfish *is* a stick of coral. Next thing they know—gulp! The trumpetfish swallows them.

The broadclub cuttlefish is another colorful trickster. This critter turns from dull to dazzling in the blink of an eye. With flashing blue, yellow, and red lights, it puts on a show like Fourth of July fireworks. The colors are so fantastic that prey stop to watch the show, instead of swimming away. Now the cuttlefish can gobble up its admiring audience!

Doing It All

Some reef animals use colors and patterns to blend in with the rainbow of color. Others display colors for defense in the brightly lit waters. Still others use color to attract mates or meals. Few animals can use color to do all of these things. Meet one that can—the amazing, ever-changing octopus.

When a male brown octopus is ready for a fight, its body turns red. When the octopus is startled, it turns white. If it needs to attract a female, it really shows off. In seconds, its skin shows flashing stripes, dots, or patches.

An octopus uses cells of color in its skin to make these quick changes. They are called **chromatophores.** Depending on what the animal needs, its brain sends signals to these cells. When they get larger, the color shows. When these cells shrink, the color fades. In this way, the animal sends out different color-coded messages, from one minute to the next.

The dazzling colors, shapes, and patterns found in a coral reef are unmatched. For reef creatures, these colors and patterns are important tools. Every splash of color in a reef has a purpose.

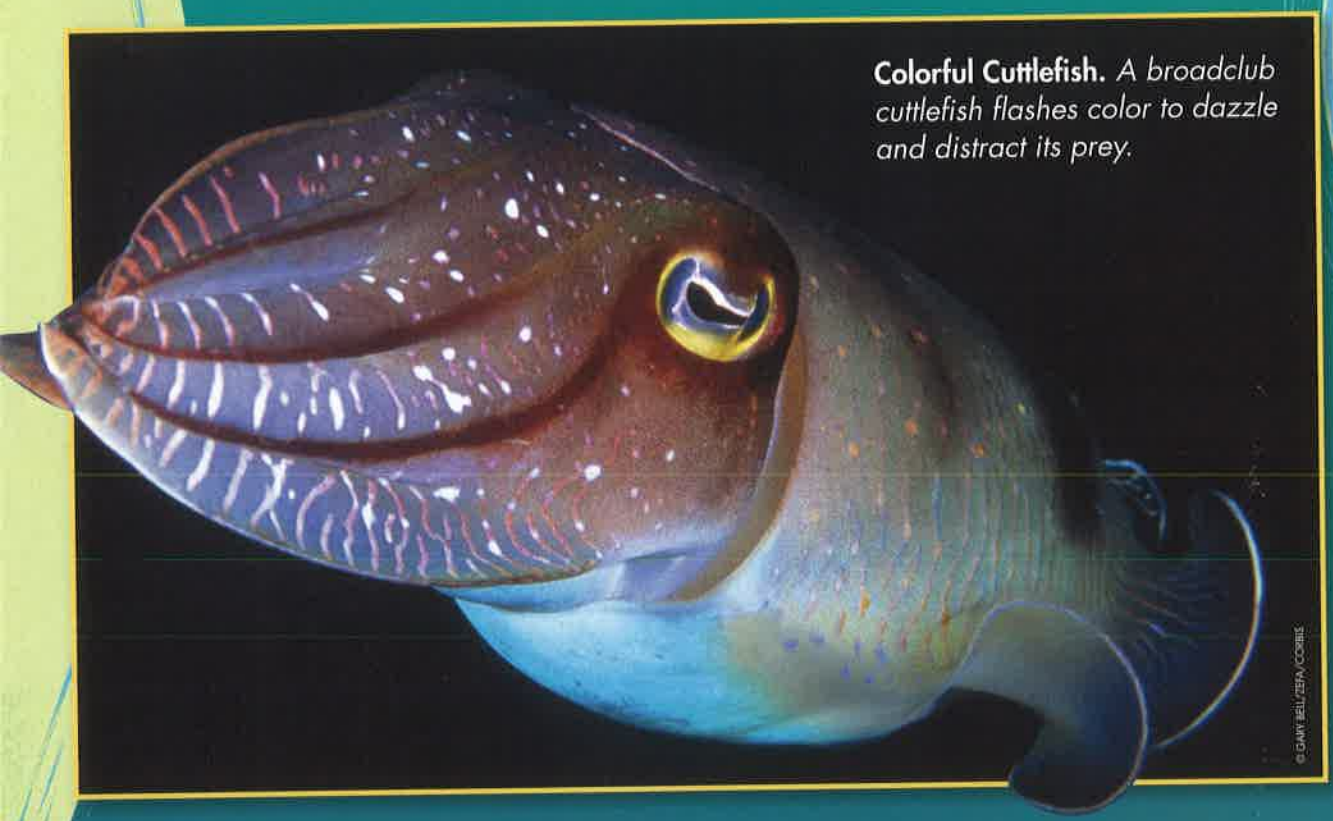
Wordwise

camouflage: colors and marks that help an animal blend into its surroundings

chromatophore: skin cell with color pigment

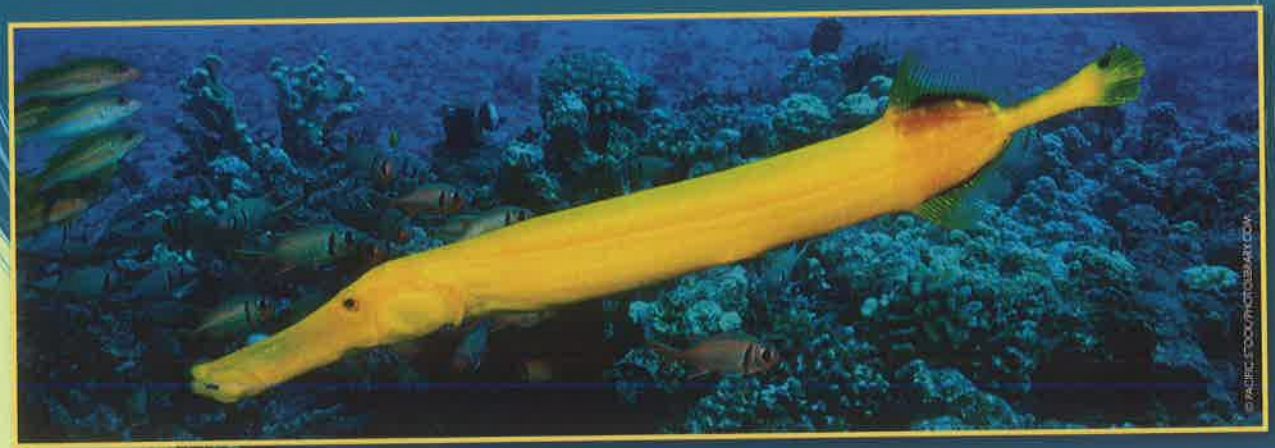
coral reef: rock–like structure built by tiny sea animals

habitat: place where a plant or animal lives



Colorful Cuttlefish. *A broadclub cuttlefish flashes color to dazzle and distract its prey.*

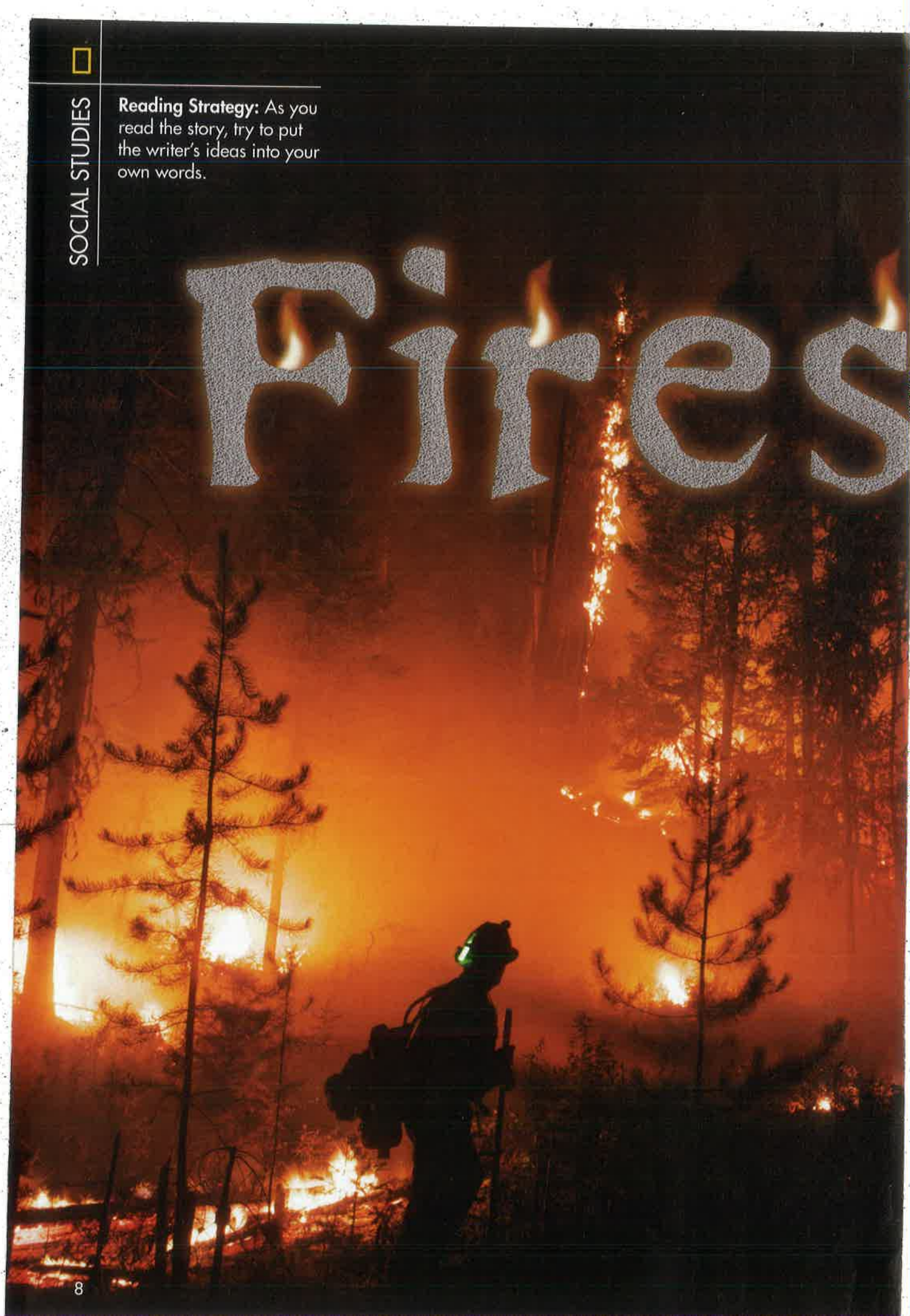
Flashing Fish. *To attract mates, a male flasher wrasse shows bright colors and flirty fins (left). When danger is near, it turns off the colors and hides its fins (right).*



Front or Back? *This trumpetfish has a black dot on each side of its tail fin. The dot looks like an eye, so prey can't tell if the fish is coming or going!*

Reading Strategy: As you read the story, try to put the writer's ideas into your own words.

Fires

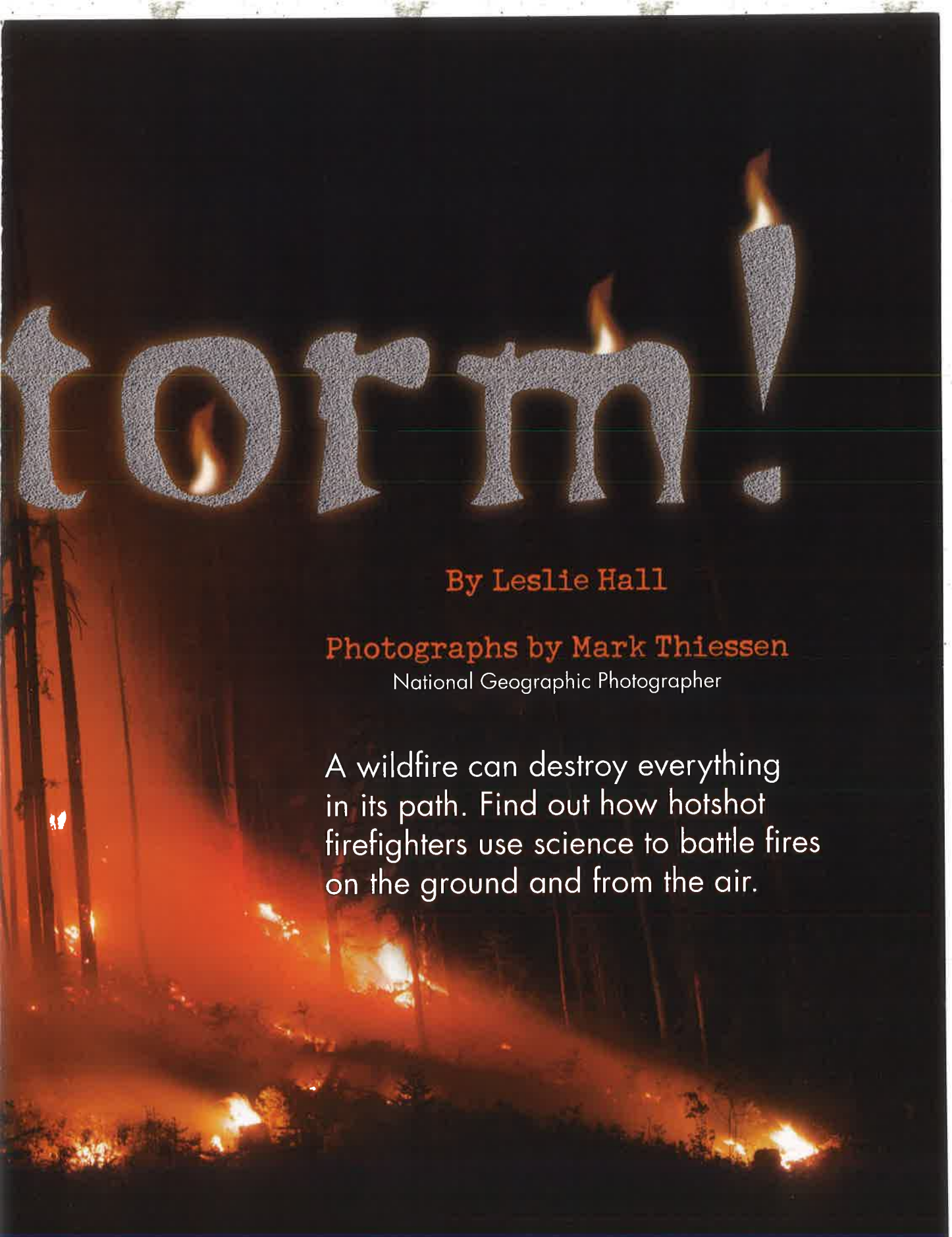


torn!

By Leslie Hall

Photographs by Mark Thiessen
National Geographic Photographer

A wildfire can destroy everything in its path. Find out how hotshot firefighters use science to battle fires on the ground and from the air.



Fighting Back. *In 2007, firefighters battled blazes throughout California.*

Clouds of smoke filled the sky. The day was as dark as night. A helicopter whirred overhead. Voices crackled commands over radios. Exploding propane tanks sounded like bombs. Scorching heat made it difficult for people to breathe.

That was the scene as firefighters battled huge blazes in California last October. Wildfires swept across San Diego County. The fires raced through forests and neighborhoods. They burned everything in their path.

The fires raged for days. They destroyed more than two billion dollars' worth of property. Nearly 2,000 families lost their homes.

What happened in California was dramatic. Yet wildfires are not unusual. Each year, some 100,000 wildfires blaze in the United States. They burn about two million hectares (five million acres) of land a year. Most wildfires occur in western states. That is where you find a deadly mix of **drought,** high temperatures, and lightning.

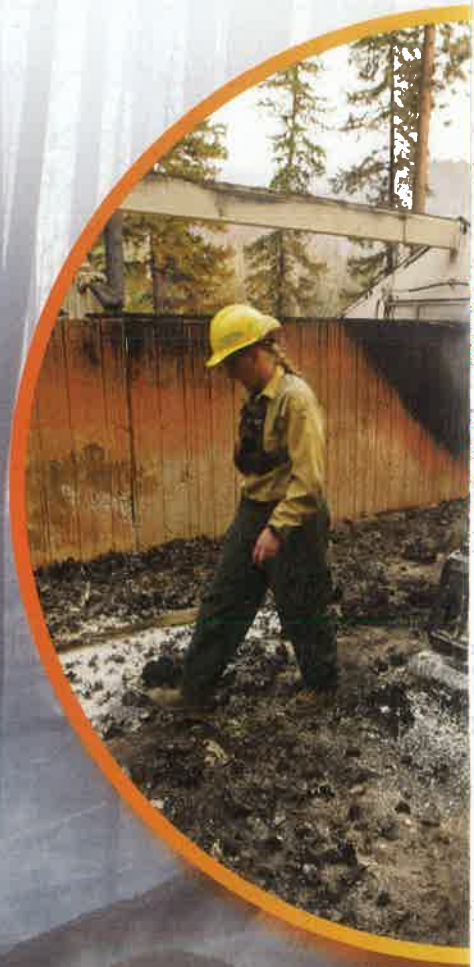
Fiery Factors

To understand wildfires, you need to know a few basic things about fire. A fire needs only three things. They are heat, fuel, and oxygen. This is what experts call the **fire triangle.**

Heat starts the fire and helps it burn. For a wildfire, the heat can be a sudden flash of lightning or heat from the sun. Even a blast of hot wind can cause fires.

Fuel is the stuff the fire burns. The fuel can be dry grass, fallen leaves, or dead bushes and trees. Oxygen is a gas in the air. It helps start the fire and keeps it blazing.

Wildfire is part of the natural life cycle of a forest. Just like a living creature, a forest can be healthy and growing. Or, it can be unhealthy and diseased. Wildfire can make helpful and important changes to a forest.



Helping Hands. *During the 2007 California wildfires, many people, such as this bystander, tried to rescue things from burning houses.*

Nature at Work

Small wildfires actually prevent larger and more destructive blazes. They burn dead brush and plants piled up on the forest floor. Removing this fuel makes it harder for larger fires to start.

Wildfires also set the stage for new life. When fire burns tree branches, sunlight can reach the ground. This gives new seedlings a chance to grow. Burned plants also add nutrients, or useful chemicals, to the soil.

Some trees don't just survive fire; they need it to thrive. Until the 1960s, the United States Forest Service tried to put out fires at the first spark. Then it was discovered that this was bad for a tree called the giant sequoia. The giant sequoia needs to be near high heat for its pinecones to release seeds. No fires meant no new giant sequoias.

A Growing Danger

If fire helps forests, why worry about it? The problem is most wildfires today are caused by people. Most often, people start fires due to carelessness. For example, sparks may spread from a campfire or even a burning cigarette. The result is more fires and more land destroyed than ever before.

Wildfires are a growing danger to people in the United States. Two changes have added to the risk. The first is that more people are moving closer to places that once were **wilderness.** So when a fire starts in a forest, people and homes are often nearby.

The second change is **global warming.** It is a worldwide rise in Earth's average temperature. Higher temperatures make spring and summer longer. That means less snow can fall in the winter. So there is less water from melting snow in the spring. These changes mean forests are drier longer. The drier a forest is, the more easily it burns. That's a recipe for more wildfires—and ones that burn longer.

Lost Homes. *Each year, wildfires destroy hundreds of homes. This house in California was burned in the wildfires of 2007.*

New Life. *When wildfires burn tree branches and shrubs, sunlight can reach the ground. This gives new plants a chance to grow.*

Into the Flames

Summer and fall are prime times for wildfires. That's no surprise. These seasons are hot and dry. In fact, people call this time of year the wildfire season.

During wildfire season, thousands of firefighters go to work in the woods. They risk their lives to battle blazes. The work is dangerous, but somehow irresistible.

National Geographic photographer Mark Thiessen knows that feeling. He started following fire in 1996 and hasn't stopped since. He spends his summers in a smoky haze. For instance, he photographed the San Diego fires for NATIONAL GEOGRAPHIC.

Thiessen has been right in the middle of firestorms. He says it can be very exciting. He says, "All your senses just come alive when you're in the middle of photographing fire."

Battling the Beast

Wildfires can race along at 14 kilometers (9 miles) an hour. Most people can't move that fast for long. Fire travels most rapidly uphill, especially if pushed along by wind.

Thiessen knows that a firefighter's job isn't to stop wildfires. That isn't possible. Instead, firefighters try to keep wildfires from spreading.

"Firefighters treat a wildfire like a fierce wild animal," Thiessen explains. "They attack it from the tail. That's the rear of the fire, where it started. Then they move up the flanks, or sides. The head is too dangerous to approach."

Just like a wild animal, a wildfire is unpredictable. You can't tell where it will go or what it will do. Rocketing sparks might start smaller fires in areas that seemed safe only seconds before. A sudden gust of wind might shoot fire in any direction.

Feeling the Heat. *Mark Thiessen has spent years photographing wildfires. He knows firsthand how dangerous they can be.*

Hotshot Heroes

Firefighters have different ways of fighting the flames. All the methods try to do the same thing. They take away a side of the fire triangle. Then the fire cannot burn and goes out.

Often, **smokejumpers** are the first line of attack against wildfires. They parachute out of planes into forest fires. They are called in when the land is too rugged to reach quickly on foot. If the fire still burns after 24 hours, other crews move in. Planes and helicopters may drop liquids on the fire to take away oxygen.

Firefighters often dig a fire line. It is a deep ditch at least a meter (3 feet) wide. The fire line clears away the fuel from both sides of the fire. Another way to remove fuel is to start a backfire, or smaller blaze. It burns off fuel before the wildfire can. When the wildfire catches up, there is nothing left to burn.

Living With Fire

Although wildfires are part of a natural cycle, they have become human problems. So the U.S. government is working with firefighters and scientists to find the best ways to combat wildfires that affect people and communities.

Keeping people safe from wildfires isn't easy. It takes hard work. It takes courage. And it takes science.

Wordwise

drought: period without rain or snow

fire triangle: three things that a fire needs (heat, fuel, and oxygen)

global warming: worldwide rise in Earth's average temperature

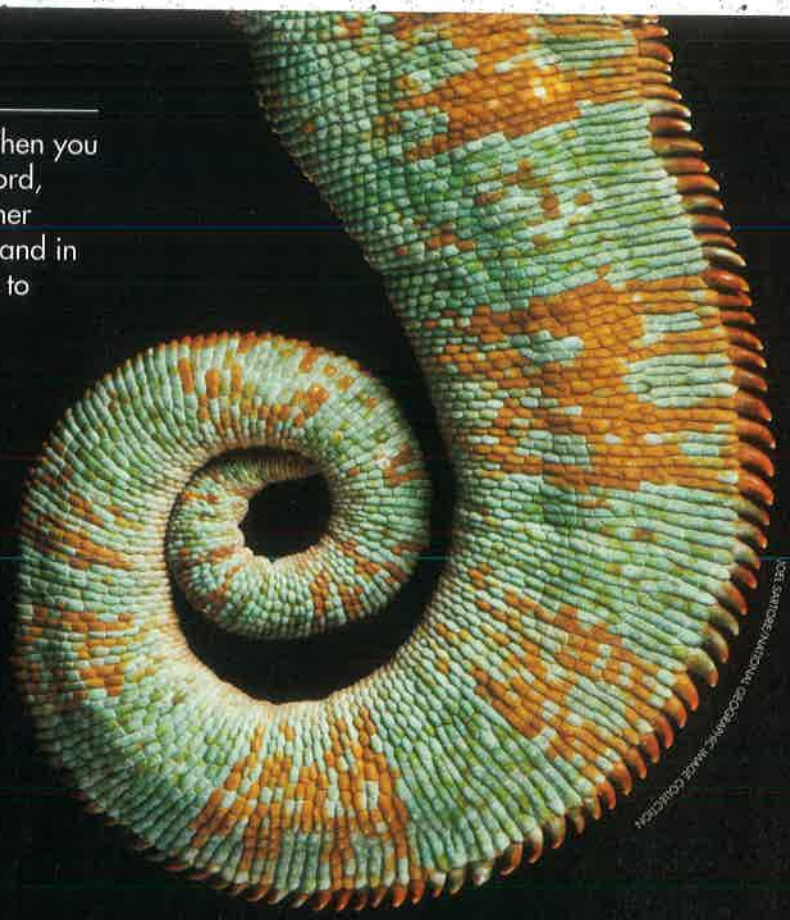
smokejumper: firefighter who parachutes from a plane to reach and fight a wildfire

wilderness: places in nature without people

Air Strike. *This plane is dropping special chemicals to slow a blaze.*

On the Line. *These brave firefighters put their lives on the line. They battle wildfires to keep people and property safe.*

Reading Strategy: When you come across a new word, use the meaning of other words in the sentence and in surrounding sentences to help you figure it out.



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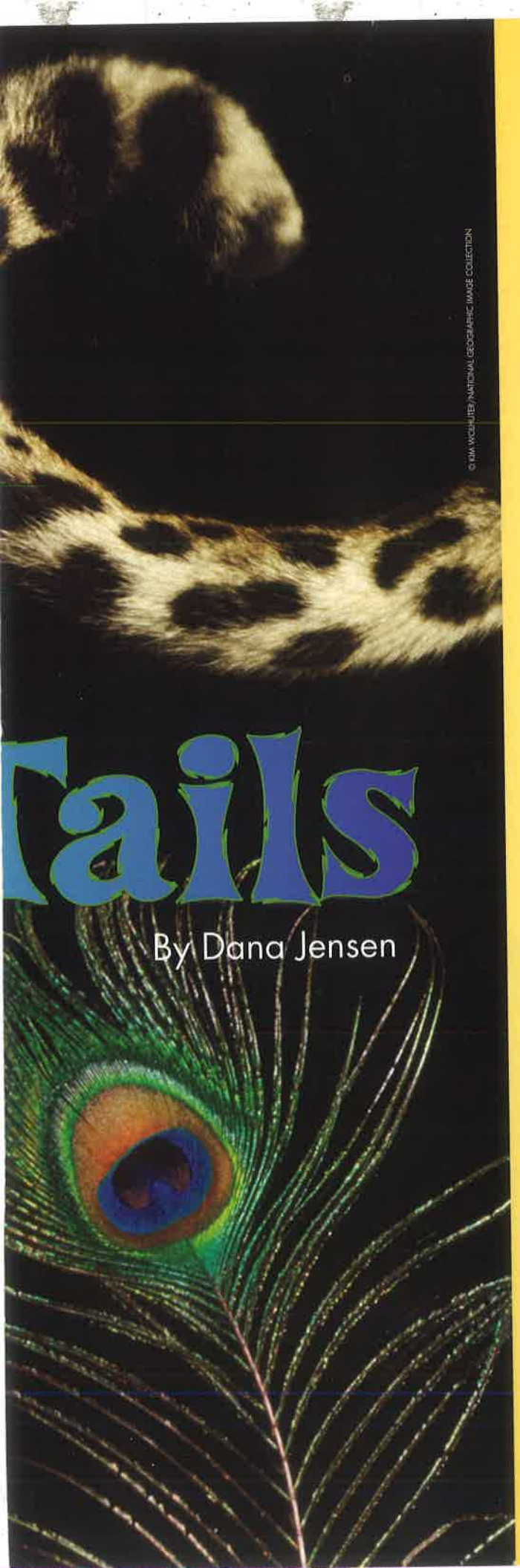
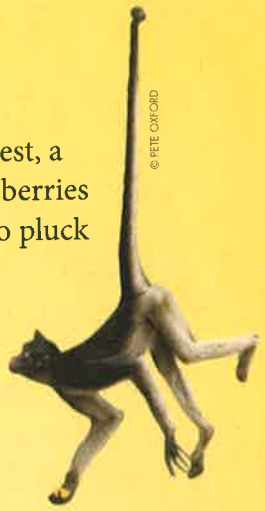


Tails

By Dana Jensen



High up in a hot, misty rain forest, a hungry spider monkey sees some berries in the trees below. It reaches out to pluck a juicy berry, but the fruit is just out of reach. No problem.

The monkey uses its long tail to reach the berries and pulls them off the branch. Then the monkey gobbles up the snack.

Like this munching monkey, many animals put their terrific tails to good use. Read on to find out about some of these amazing adaptations.

A Helping Hand

Some monkeys, such as the spider monkey, have prehensile tails. That means their tails can grasp things. It's like having an extra hand.

The tail is very useful when a monkey wants to swing quickly from one tree branch to another. The monkey can also dangle from its tail to pluck hard-to-reach food.

Monkeys aren't the only critters that can wrap their tails around branches. Many snakes, lizards, anteaters, and rats do, too. What makes a monkey's tail so terrific is that it can actually pick up and hold objects.

Steer Clear

What would you do if you saw a skunk doing a handstand? Maybe you'd run away. A skunk with its tail sticking up spells trouble. Skunks use their fluffy tails to defend themselves.

If a skunk runs into trouble, it stomps its feet, hisses fiercely, and shakes its head. Then it does a handstand and sticks its tail up in the air. If those warnings don't work, the skunk squirts a spray that smells like rotten eggs and burning rubber. That's usually enough to keep animals—and people—very far away!

Male ring-tailed lemurs use their tails to protect their turf. If another male gets too close, the lemur rubs its tail over smelly scent glands on its wrist. Then it waves its stinky tail until the challenger leaves.

Tricky Tail

It may surprise you, but there are times when *not* having a tail can come in handy. The blue-tailed skink is a lizard with—you guessed it—a bright blue tail. The bold blue color attracts predators to its tail. But the lizard has a surprise waiting for any attacker looking for lunch.

When a hungry predator tries to bite the tail, the tail suddenly falls off. Instead of a tasty lizard treat, the predator is left with one small body part. The fallen tail keeps moving all by itself! That distracts the attacker and lets the lizard scamper away to safety. The skink can grow back a new tricky tail in about a year.

Speaking of tricks, cats manage balancing acts that make even human acrobats take notice. Take the leopard. It spends a lot of time up in trees. Leopards even carry food up into the branches to eat. To avoid falling, balance is important. Their long tails help leopards keep their balance as they slink along narrow branches high in the treetops.

Balancing Act

Cats also use their tails down on the ground. The speedy cheetah is a great example. When a cheetah races into a herd of zebras or antelope, the animals scatter in all directions. They run away, trying to escape from the cat.

The cheetah must make sudden, sharp turns if it hopes to catch any food. That's not easy to do while running at high speeds without falling over. That's where the cheetah's tail comes in. The long tail keeps the cat steady. Then the cheetah can switch directions and make quick turns without slowing down.

Cats aren't the only animals that use their tails to perform balancing acts. Kangaroos do, too. When two male kangaroos fight, they fiercely kick at each other with their strong legs. To free up both its legs for kicking, each kangaroo leans back and balances on its tail. Then POW! It delivers a swift, strong kick to its opponent without tipping over.

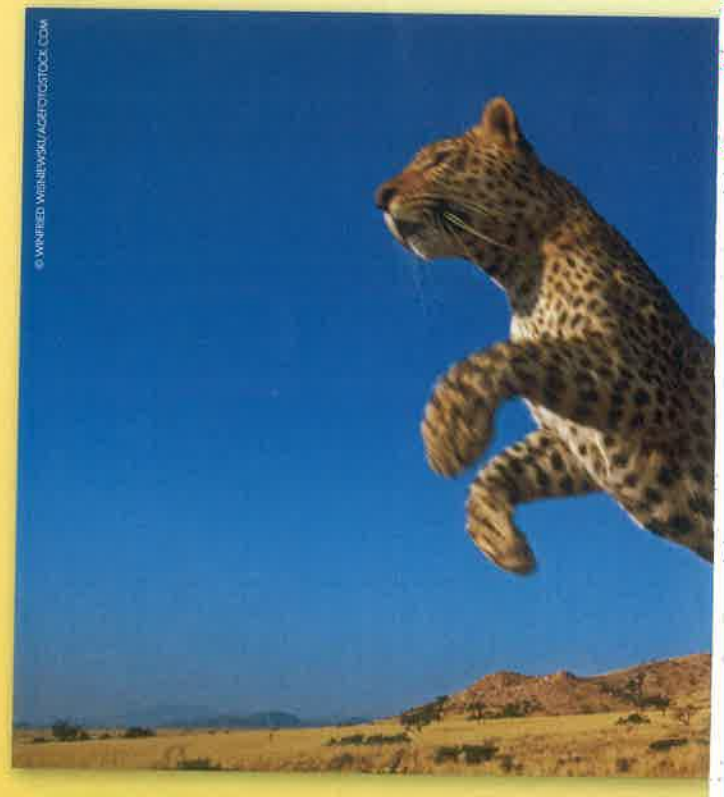
A Tail to Love

Some animals use their tails to catch the attention of a mate. When a male peacock is looking for a female, he spreads out his tail feathers like a huge fan. That creates a dazzling show of shimmering greens and blues. Peahens, or female peacocks, come squawking!

Scientists think peahens choose their mates by the look of their colorful tail markings. The tails are more than just decoration. They are signs that the male is healthy. A peacock has to be strong to grow a flashy tail. So the males with the showiest tails probably are the healthiest birds. That's what really matters to the peahens!

From winning mates to swinging through trees, tails seem to have endless uses. They keep cats and kangaroos upright. They help other animals stay safe. And that's just the beginning!

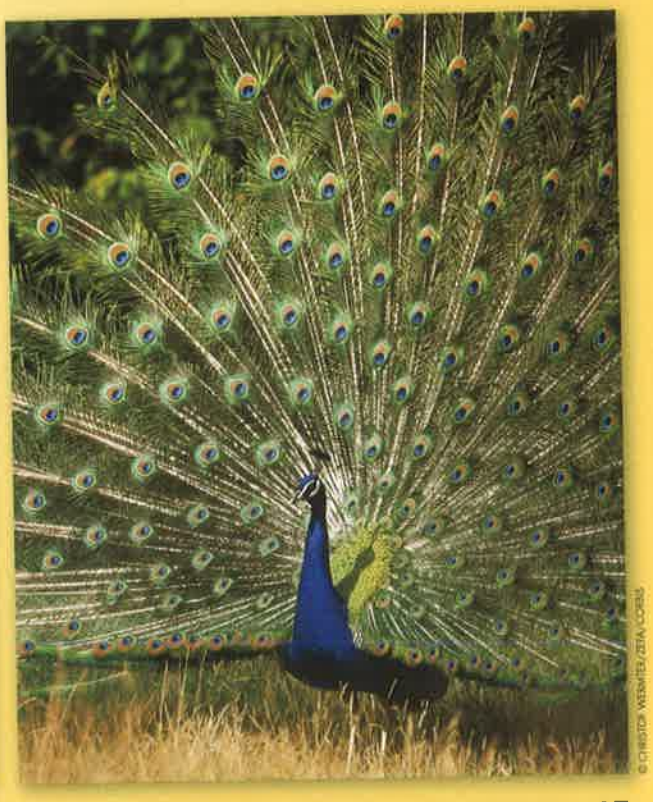
To keep dry in the rain, gray squirrels arch their tails over their heads like umbrellas. Scorpions' tails pack a poison punch. Foxes wrap their bushy tails around their bodies to stay warm. Can you think of other terrific ways animals use their tails?

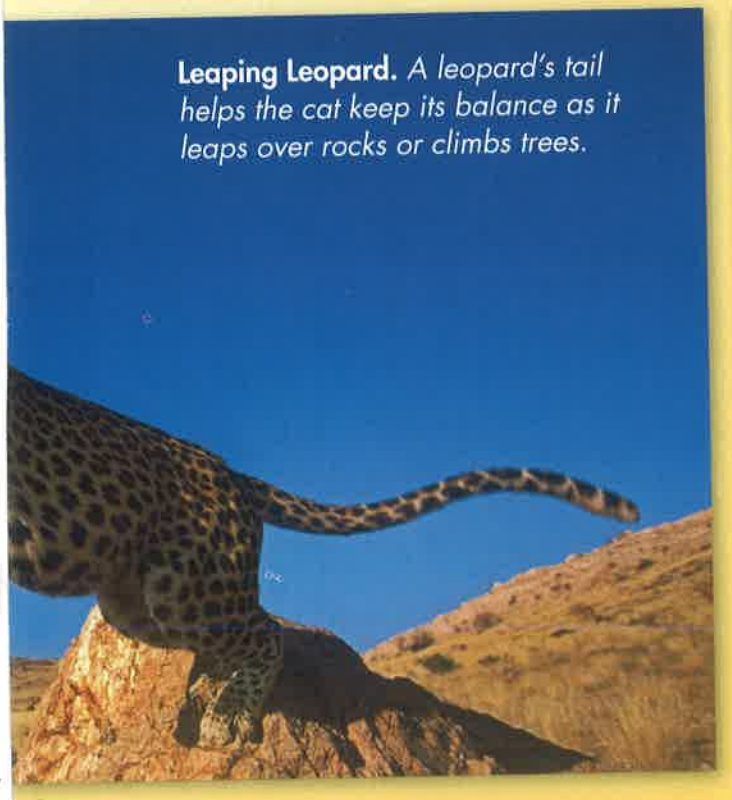


It's a Wrap. *This chameleon wraps its prehensile tail around a flower to stay firmly in place.*

All Shook Up. *When a skunk sticks its tail up, you can bet a smelly spray is soon to follow!*

Pretty Peacock. *Peacocks flash their beautiful tails to attract females.*





Leaping Leopard. *A leopard's tail helps the cat keep its balance as it leaps over rocks or climbs trees.*

Reading Strategy: What do you know about wind? As you read, connect what you know to new information.

Wind at Work

BILL HATCHER/NATIONAL GEOGRAPHIC IMAGE SALES

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Wind can power storms, make electricity, and carve rock. It can also whip up some wild fun.

By Beth Geiger

Have you ever tried windsurfing? It's like surfing, but with a sail attached to your surfboard. Feel the salt air hit your face. Wait for the wind to pick up. Then hang on! The next thing you know, you are tearing across the cool water.

You may not have windsurfed before. Maybe you've flown a kite on a spring day. Perhaps you've sailed in a sailboat. People have used wind in different ways for thousands of years.