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Animal Smarts ²

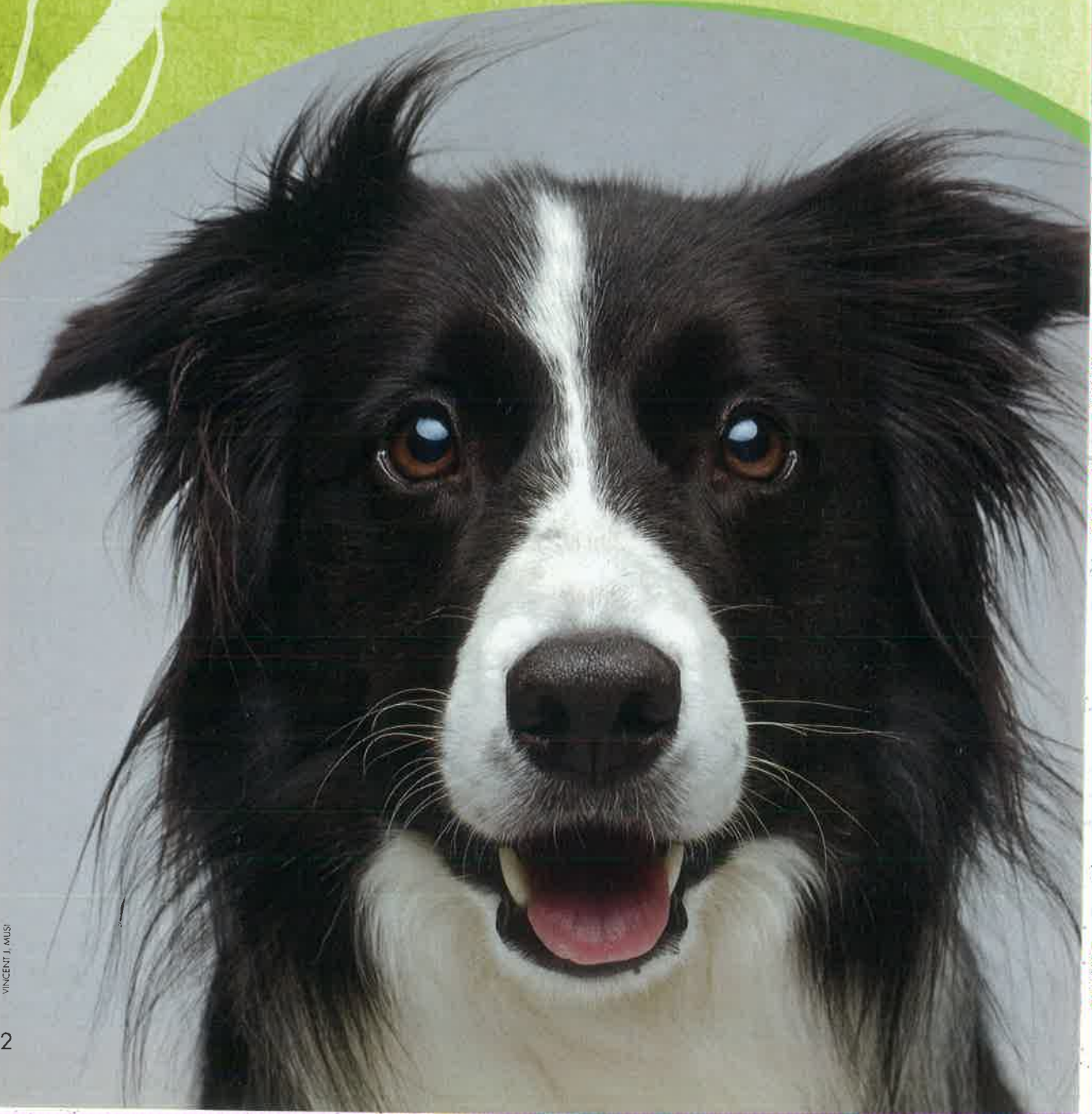
Death Valley 8

Waves 14

Sapporo Festival 20



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Reading Strategy: As you read about what each animal does, ask yourself, "How does this show intelligence?"

Animal Smarts

By Leslie Hall

What can animals do? From sharing information to using tools and even playing tricks on people—it turns out that animals are smarter than you may think.



Smart Dog. *This is Betsy. She understands hundreds of spoken words.*

Cool Tools

Using tools takes smarts. When you need to sort out a problem, you have to figure out *why* it is a problem. Then you have to find or make a tool to help you solve it.

Think of all the tools you use on any day. You might grab a fork or a pair of scissors. You might use a computer or even a cell phone.

For many years, no one thought animals could use tools. Then in 1960, scientist Jane Goodall made an amazing discovery. She saw chimpanzees taking leaves off sticks and using them to “fish” for food in termite nests. It was the first time anyone had seen wild animals making tools. Now we know **primates** and many other animals use tools in some pretty smart ways.

Orangutans, for instance, use leaves for rain hats, sandals, or even napkins. Some smart crows use sticks to reach food. A crow named Betty figured out how to use metal wire to make a hook. Then she used the hook to pull treats out of a narrow glass tube.

Land animals aren't the only ones that tinker with tools. The boxer crab uses another animal as a tool! To fight off predators, the boxer crab picks up anemones and holds them in front of its body. Anemones sting if they are touched. The crab's hard shell protects it from these living tools.

Do You Remember?

To remember things also takes smarts. Female poison dart frogs have incredible **memories**. After a frog's eggs hatch, she carries her tadpoles through the rain forest. She leaves each one in its own leafy spot.

The female frog returns to each spot every few days to bring bits of food to the tadpole.

That means the frog has to remember the location of as many as 30 tiny tadpoles!

A Way With Words

To be able to talk—to share ideas and news—takes brains. Scientists have found ways to talk with some of Earth's smartest animals. Koko the gorilla was one of the first animals to learn to **communicate** with human beings.

Scientists taught Koko sign language. Sign language is like talking with your hands. When people talk to Koko, she answers in sign language. She can sign more than 1,000 words.

Sometimes Koko makes up a new sign. This shows big brainpower! It tells us that Koko can think on her own. It also shows us that she wants to communicate her thoughts.

Meerkats don't communicate with people, but they sure do communicate with each other! These chattering animals make sounds that mean different things. Meerkats live in groups called mobs. While the other meerkats go off to look for food, one meerkat stands guard. It makes little peeps to tell the others everything is safe. When danger is near, the guard meerkat changes the sound. It yelps, barks, or whistles to warn the other meerkats in its mob.

Look and Fetch

What do you think a dog can do? Lots of dog owners talk to their pets. *Stay. Sit. Roll over.* Yet some dogs have shown amazing skill at understanding language.

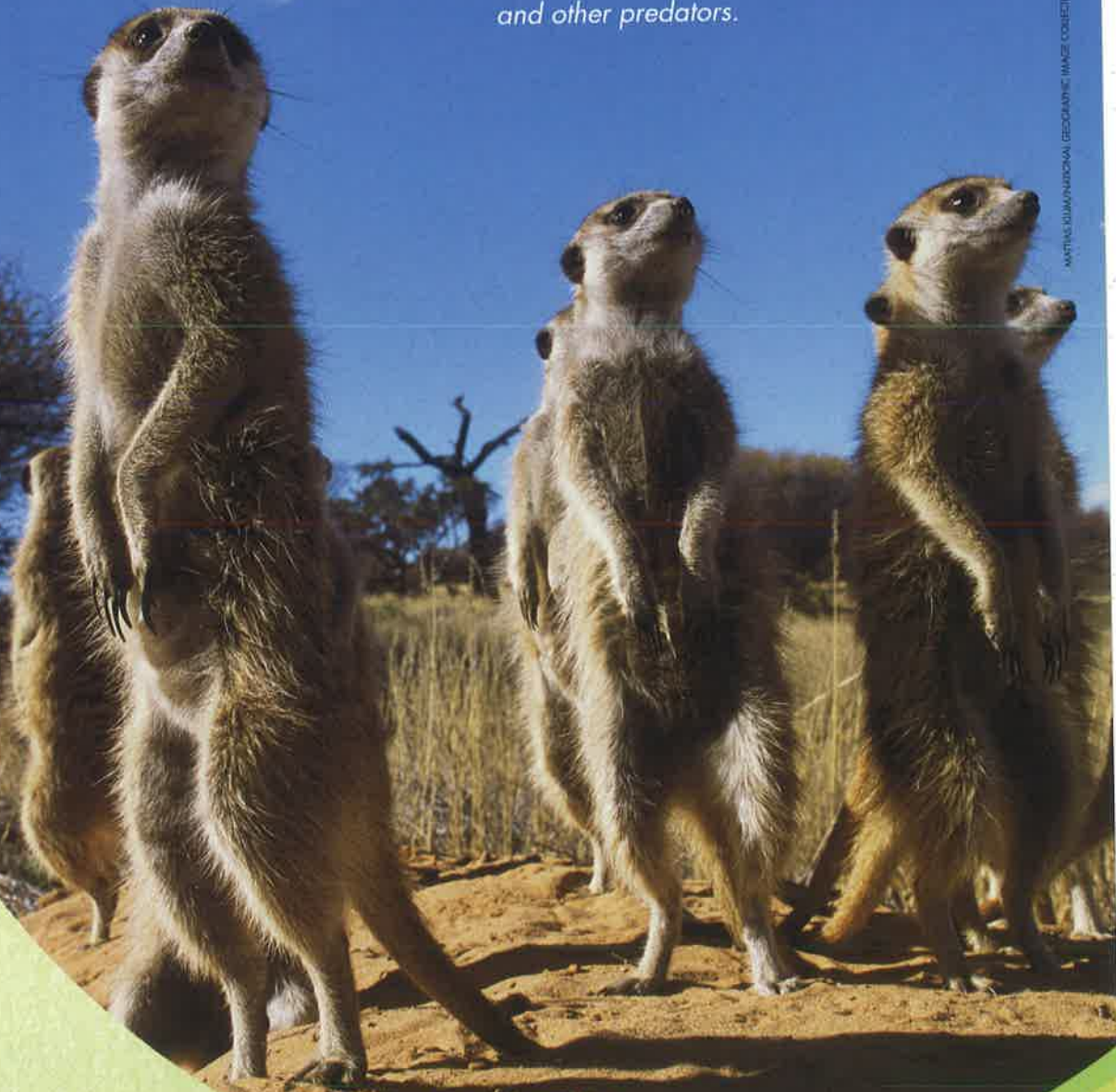
Betsy is an especially clever border collie. She understands 340 spoken words. Many dogs can follow commands, but Betsy takes it a step further. When someone shows her a picture of an object, something she's never even seen before, she goes and fetches it.

Another border collie, named Rico, also had a way with words. He knew the name of more than 200 toys. He could learn and remember words as quickly as a small child. These are some clever collies!

Mama's Memory. A mother poison dart frog can remember the location of as many as 30 tadpoles.

Animal Alarm. When meerkats are in danger, they give a warning. They make different sounds for birds, snakes, and other predators.

MARTINUS SUM/NATIONAL GEOGRAPHIC IMAGE COLLECTION



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Pausing to Play. Dolphins sometimes blow bubble rings to swim through.

PHOTOGRAPHY COURTESY OF GREAT ORANGE



PHOTOGRAPHY COURTESY OF GREAT ORANGE



Bird Brainiac

Do you think a bird can recognize **patterns**? An African gray parrot named Alex could. He amazed scientists by figuring out patterns—and then talking about them!

Like many parrots, Alex was able to talk. But Alex outdid his feathered friends. He was able to look at objects and say what was the same and what was different.

For instance, a scientist showed Alex a green cup and a green key. Then she asked him what was the same about the two objects. Alex replied, “Color.” When the scientist asked what was different about the objects, Alex answered, “Shape.” Now that’s a really brainy bird!

Outsmarting Humans

To play a trick on someone may take some intelligence, too. You have to guess how the person will act and then you have to find a way to trick her or him. Some animals have been terrific tricksters.

An orangutan named Fu Manchu escaped from his home at the Omaha Zoo—three times. First, he traded food with another orangutan for a piece of wire. Then he hid the wire in his mouth and waited for the perfect moment. When the time was right, he used the wire to pick the lock and set himself free!

Fu Manchu isn’t the only animal to think of an escape plan. In one animal park, an elephant used her trunk to take bolts off a locked gate. Then she opened the gate and let the other elephants out. When the trainers arrived in the morning, all the elephants were wandering around free! That must have woken up the trainers fast.

Ape Escape. *Orangutans have used tools to break out of cages.*

What’s on Your Mind?

A clever dolphin named Kelly knows how to get what she wants. Her trainers taught her to collect the trash that fell into her pool. When she gave it to a keeper, she got a treat in return. In this way, her pool stayed clean. Yet the tricky dolphin figured out how to trick her trainers.

Now, when paper drops into her pool, she hides it. When the trainers come, she swims down and tears off a piece of the paper. She gives it to the trainers in exchange for a fish treat. Then she goes back and tears off another piece. She knows big pieces get the same treat as small pieces. So she tears off small pieces to make the paper last longer. That way, the treats keep coming!

Observing animals helps scientists know more about what—and how—animals think. You may be amazed by the memory of a mother poison dart frog. You may be wowed that a parrot can talk about shapes, or that an elephant can plan a clever escape.

Yet in the future, these feats may seem simple when we know even more about what animals are capable of doing. Whether you chat with gorillas or tidy up with dolphins, it’s clear we have a lot more to learn from and about animals.

Wordwise



communicate: to share ideas or feelings

memory: the power to remember things

observe: to watch closely

pattern: repeated arrangement of colors, shapes, or numbers

primate: type of animal that includes apes and monkeys

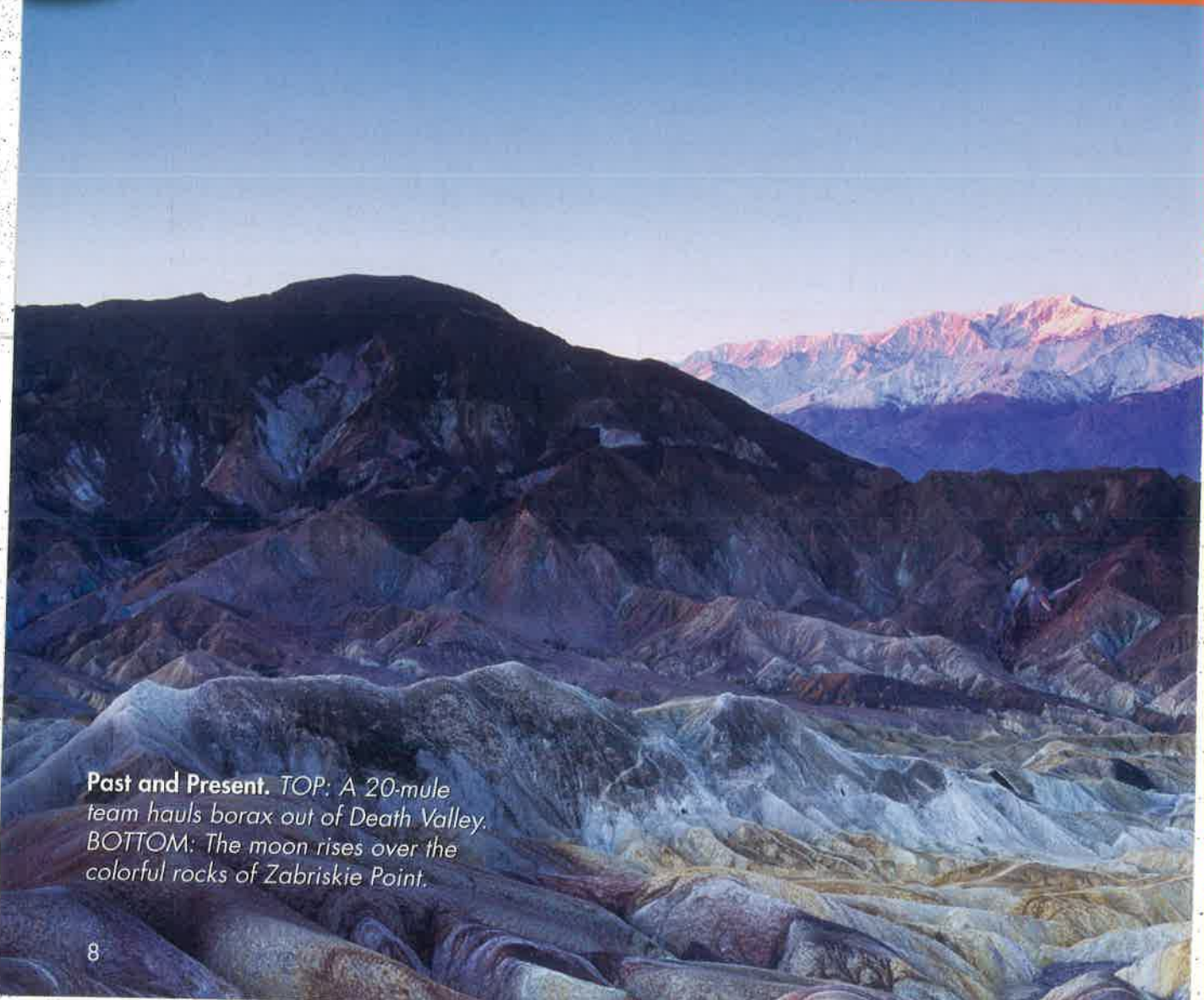
Reading Strategy: As you read, think about why people have gone to Death Valley. What were they looking for? What did they see?



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Death Valley

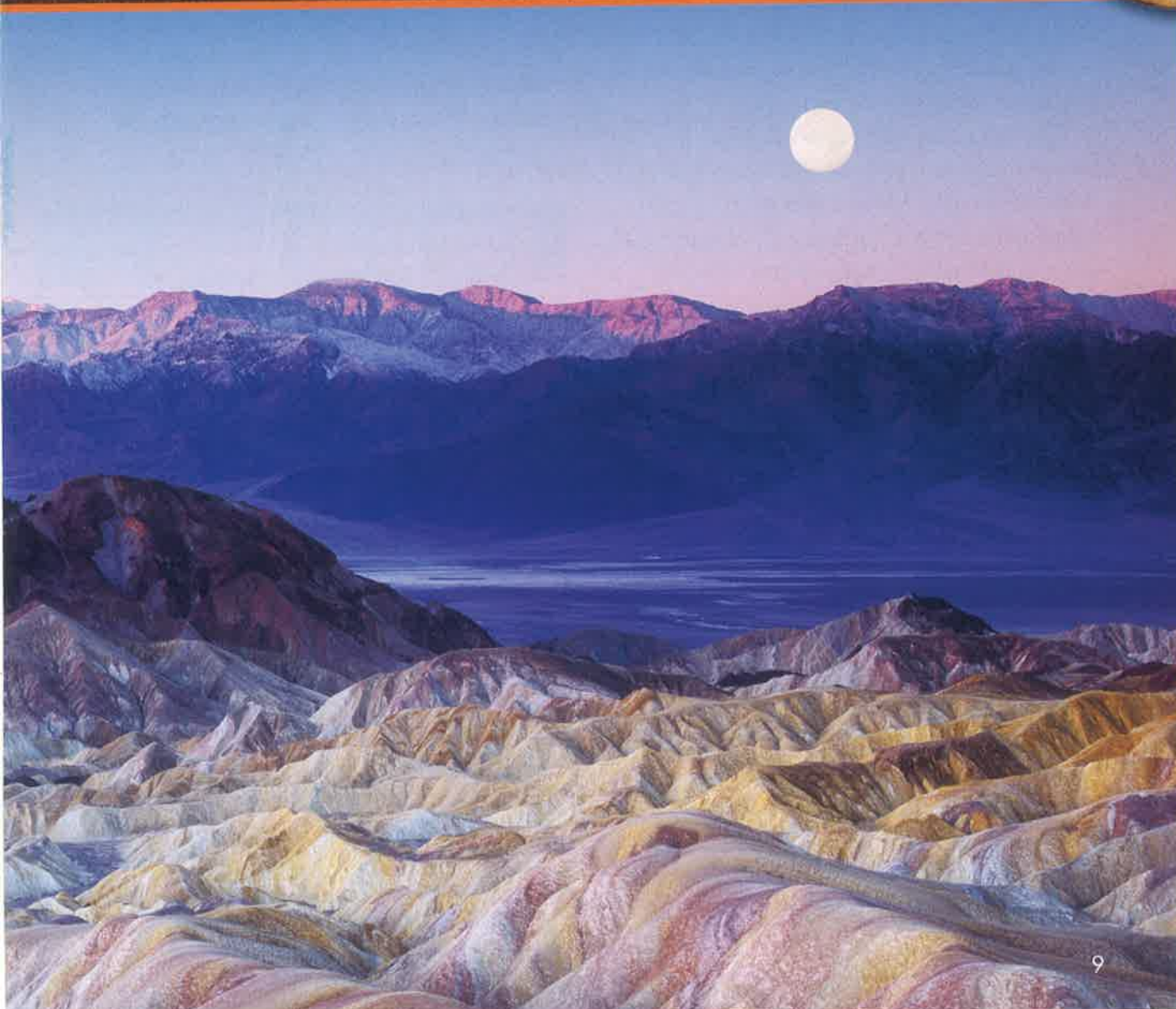
By Shirleyann Costigan



Past and Present. *TOP:* A 20-mule team hauls borax out of Death Valley. *BOTTOM:* The moon rises over the colorful rocks of Zabriskie Point.



ley Days



Death Valley

deserves its name. It is a sunburnt land of salt flats, bad water, and scorching sand. It is an eerie place where people get lost and are never heard from again. The valley is the burning heart of a much larger desert called the Mojave.

This parched place is the hottest, driest spot in North America. Summer temperatures may rise to over 49° Celsius (120° Fahrenheit). The valley gets less than five centimeters (two inches) of rain a year. Some years, no rain falls on the valley at all.

It may seem that no one could ever survive here. Yet people have lived in this valley for thousands of years. Let's meet some of these people and explore their stories.

At Home in the Heat

Death Valley has not always been a desert. It was once a lake. The climate was much wetter. The land nearby was rich with life.

The valley was still a lake when the first Native Americans arrived. That was about 10,000 years ago. About 1,000 years ago, the ancestors of today's Timbisha Shoshone people came to the valley. Over time, the climate changed. Temperatures rose. Less rain fell. The lake dried up. Only a few freshwater springs remained in the foothills, mountains, and valley.

The Timbisha adapted as Death Valley grew hotter and drier. They moved their villages close to the springs. They learned to survive on what they could find in the desert.

Jackrabbits, quail, and bighorn sheep provided meat. People learned to grind up pods from mesquite trees and make small cakes to eat. Branches and twigs became the walls and roofs of open, airy homes.

During the hottest season, the Timbisha moved into the mountains. There, the climate was cooler. The rest of the year, though, they lived in the valley. The Timbisha lived this unchanging life for centuries. They respected the desert and cared for it. Then, in 1849, **pioneers** arrived from the East.

The Lost Pioneers

This first group of pioneers was lost. They were trying to find a shortcut to the California gold fields. They had already spent two months crossing a desert in Nevada. Their wagons were breaking down. They were near starvation.

On Christmas Eve, they found a spring near the Timbisha settlements. There, they made camp and talked about what to do. One of the pioneers, William Lewis Manly, wrote about the experience.

"We all felt pretty much downhearted. Our civilized provisions were getting so scarce that all must be saved for the women and children, and the men must get along some way on ox meat alone. It was decided not a scrap of anything that would sustain life must go to waste. The blood, hide and intestines were all prepared in some way for food.

"This meeting lasted till late at night. If some of them had lost their minds I should not have been surprised, for hunger swallows all other feelings. A man in a starving condition is a savage."



Long Walk

The pioneers decided to split into several groups. Each had its own plan. Manly's group began a long walk toward the mountains.

The group faced new challenges. Since there was little for the oxen to eat, the animals grew weak. That meant they could no longer pull the pioneers' wagons.

The pioneers had no choice: They left the wagons behind. They killed several oxen for food. Finally, the pioneers crossed over the Panamint Range. They had made it through Death Valley.

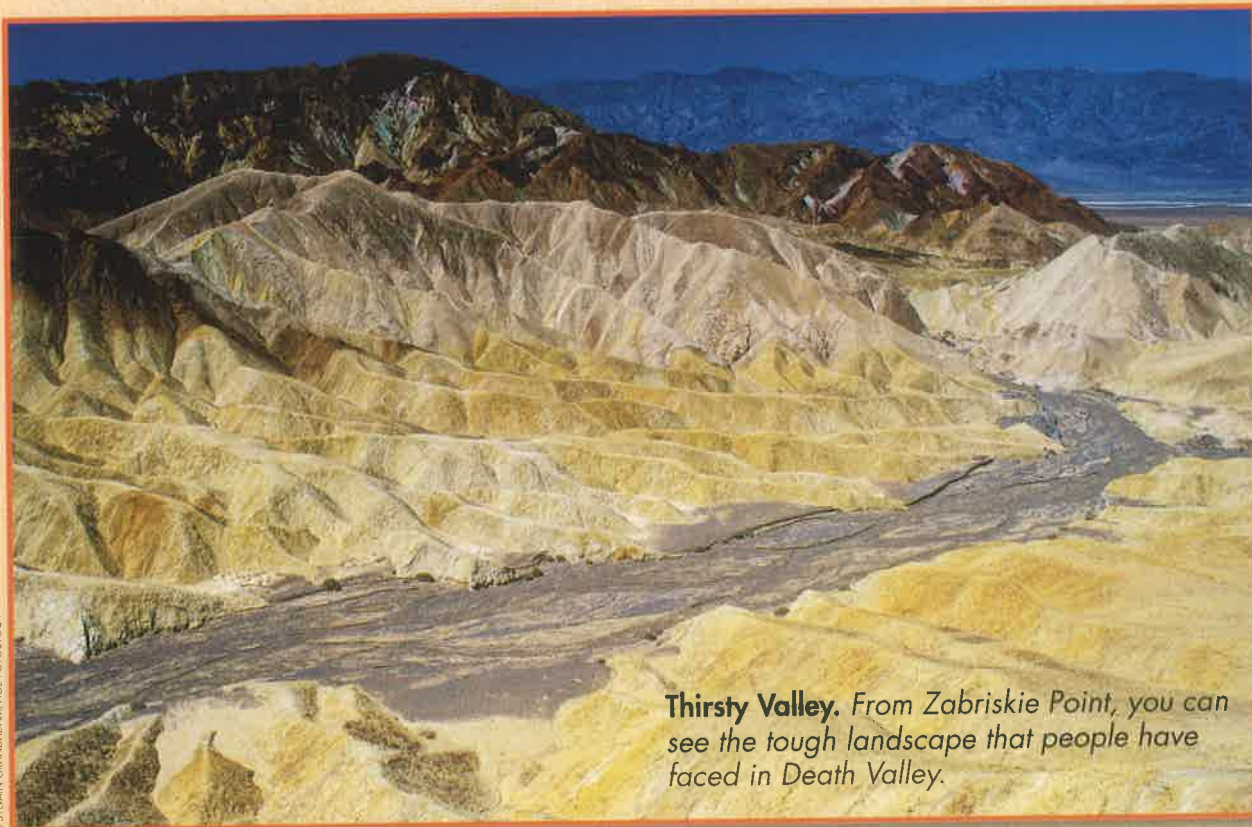
The flat, dry plains of the Mojave were the worst part of their journey. Luckily, it had been a wet winter. Puddles of melted snow and ice provided water. Without that, all of them would have died. "We were lucky in our misfortune," Manly wrote. Amazingly enough, the whole group survived the Mojave trek.

You might think the pioneers' experience would have kept other people from following. It didn't. Newcomers came with only mules and pickaxes. They, too, were searching for gold.

© THOMAS HALLSTEIN/ALAMY



Four-Legged Food. Native Americans hunted bighorn sheep and painted them on rocks.



Thirsty Valley. From Zabriskie Point, you can see the tough landscape that people have faced in Death Valley.

© STEWART GRANADAN/AGE FOTOSTOCK

The Fortune Hunters

Valuable **ores** lay hidden beneath Death Valley. These treasures included gold and silver. When miners gave up on the gold fields in other parts of California, many came to the desert.

Most mining settlements followed the same predictable pattern. First came the **prospectors**. They searched for gold deposits. When they made a **strike**, they staked a claim. Then they either worked the claim themselves or sold it.

Word got out about the strike: *Gold! Gold!* More prospectors came. Miners poured into the area. They set up mining camps. Soon the camps became towns. More people came. They built banks, hospitals, restaurants, hotels, and a jail. The towns became cities.

Everything in a mining town depended on the local mine. Sooner or later, though, it dried up. No more gold. Everyone left. The place became a ghost town. It was all over.

This pattern repeated itself many times in Death Valley. During the late 1800s and early 1900s, mining towns sprouted up everywhere. They had colorful names like Bullfrog, Skidoo, Ballarat, and Rhyolite.

Twenty-Mule Teams

Miners came to Death Valley for more than gold. Some came to mine a kind of salt. People used the salt to make a substance called borax. It was used to make glass, ceramics, and cleaning products.

In the 1880s, mining borax salts became big business. It also became a big challenge. Carrying huge loads of borax out of the valley wasn't easy.

William T. Coleman solved the problem. He used 20-mule teams to carry borax from his factory in Death Valley to the railroad line. Actually, it was 18 mules and two horses. (People tend to forget about the horses.) Each team pulled two full wagons, plus a water tank. Imagine hauling that huge load across a burning desert!

Tough Job

Between 1883 and 1889, mule teams hauled more than 9 million kilograms (20 million pounds) of borax out of the valley. The route ran 265 kilometers (165 miles) out of Death Valley. One round-trip took 20 days. It was a hard journey for both the mules and the men who drove them.

Driving a 20-mule team took talent and courage. One bad step, and the team could run the wagons into a mountain or off a cliff. The driver cracked a long whip to get the mules' attention. But mostly, he used just his voice.

A good mule driver didn't shout, though. At least that's how Tex Ewell remembered it. Only bad drivers raised their voices. Ewell said that when a skilled driver spoke, "a mule knew he wasn't fooling" and obeyed.

Death Valley Today

Today, Death Valley is a national park. It is the largest U.S. national park outside Alaska. There is plenty for tourists to see.

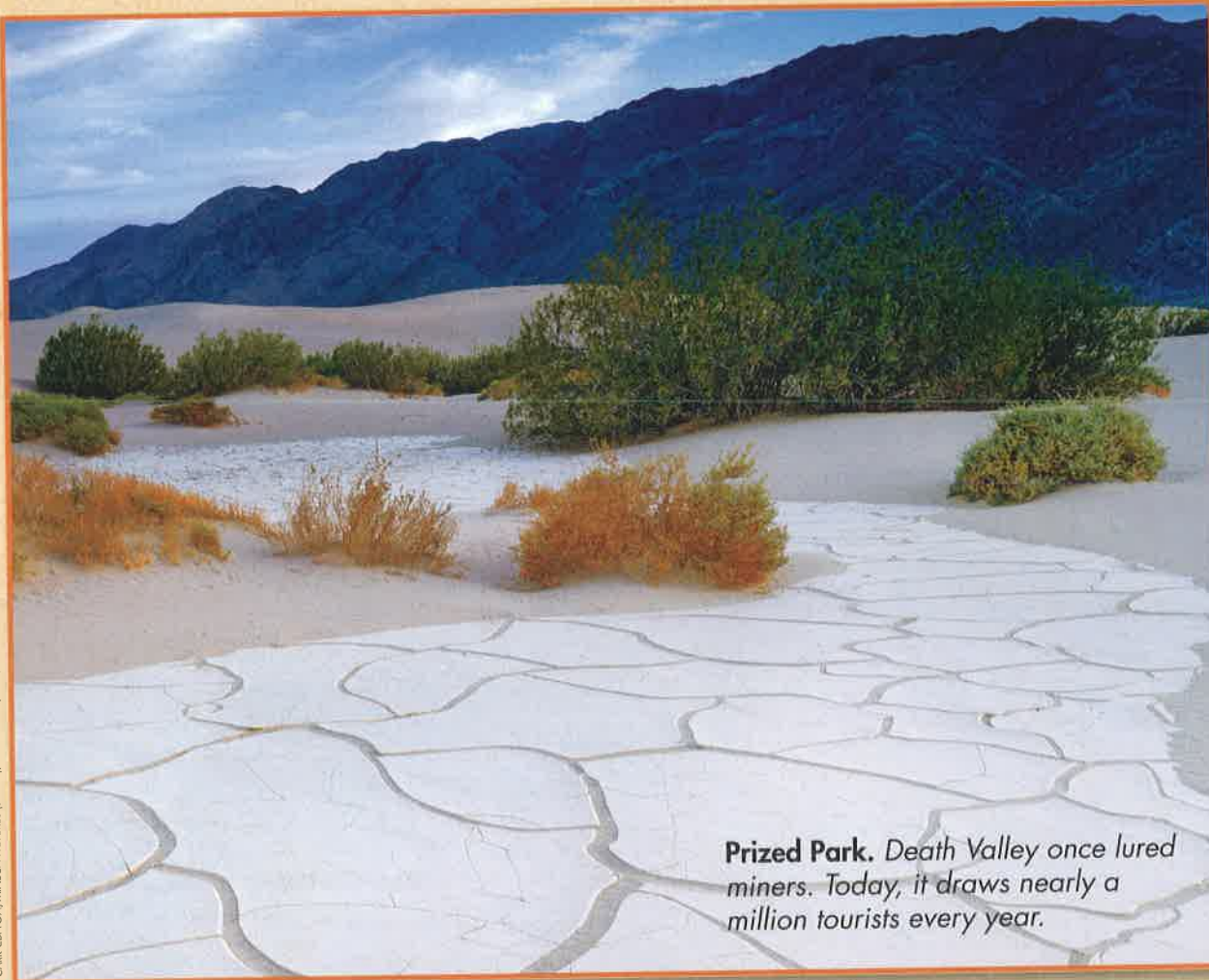
Some of the favorite natural sites include Badwater Basin, the spectacular Eureka Dunes, and the rainbow-colored clay at Artists Palette. These places never change.

Well, almost never. At a place called the Racetrack, rocks move around mysteriously. They carve long tracks in the mud. No one has ever seen it happen, so exactly what takes place is a puzzle.

All that remains of the mining days are ghost towns and tombstones. Through it all, the Timbisha Shoshone have continued to live here. This valley is still their home forever. For them, it is a valley of life.



A Gift for Gold. *Shorty Harris was Death Valley's most famous gold hunter. He made a big strike in 1904.*



Prized Park. *Death Valley once lured miners. Today, it draws nearly a million tourists every year.*

© CARL CLIFTON/MINDEN PICTURES (DESSERT; PHOTO DISC (SKULL))

Wordwise

ore: substance mined for its value

pioneer: one of the first people to move to a new place

prospector: person who searches a place for gold or other valuable material

strike: discovery of something valuable

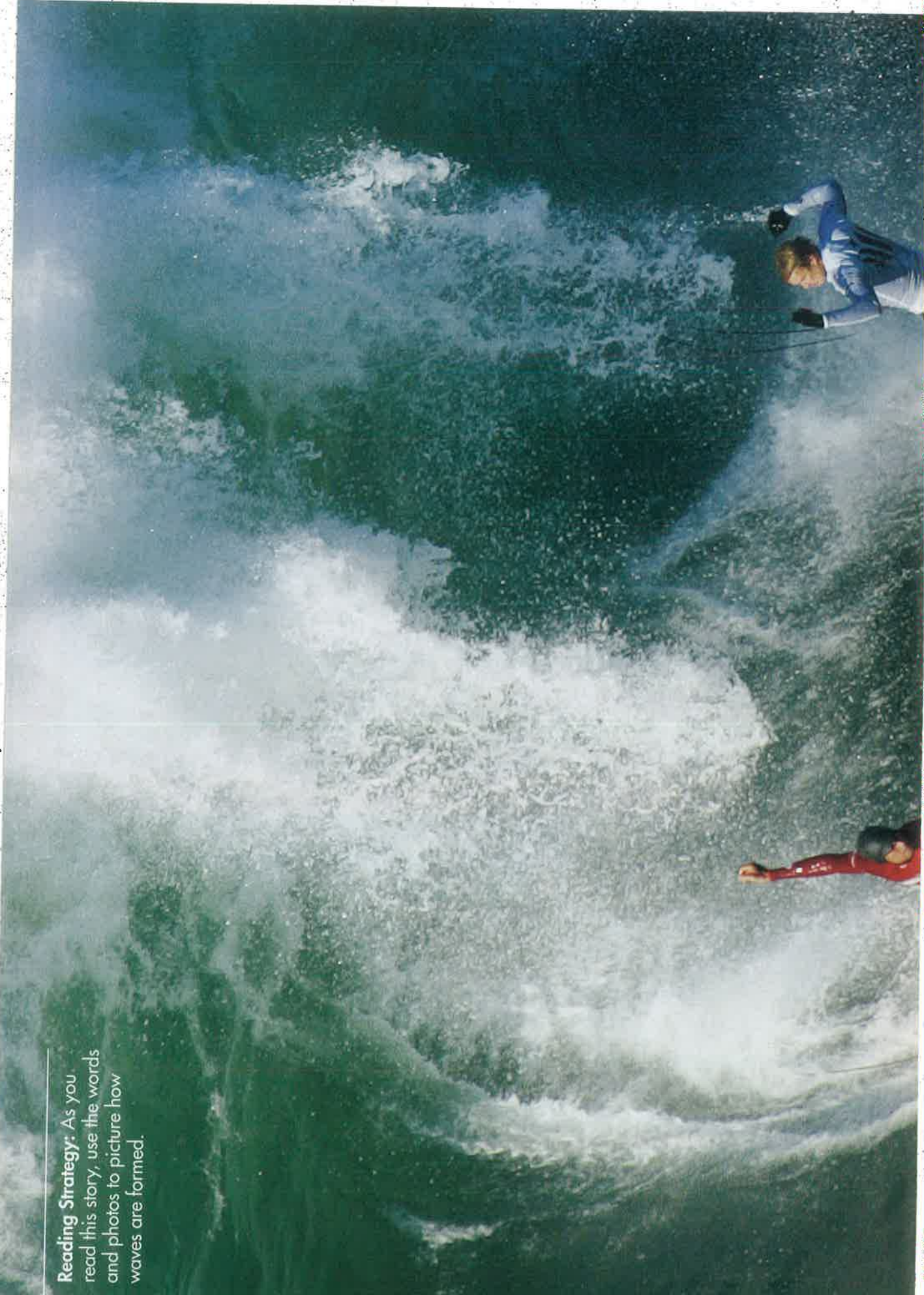


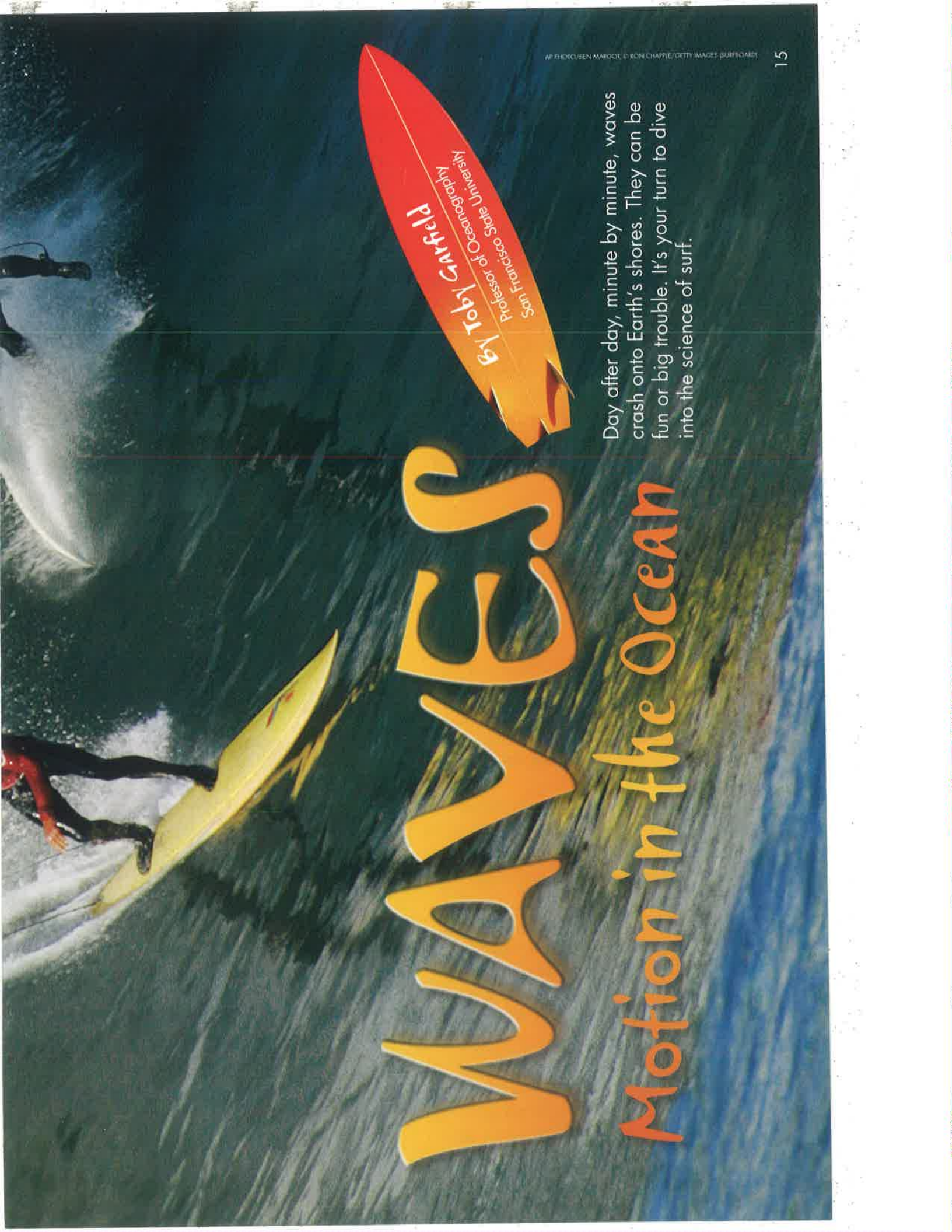
NATIONAL PARK SERVICE



PHYSICAL SCIENCE

Reading Strategy: As you read this story, use the words and photos to picture how waves are formed.





WAVES

Motion in the Ocean

By **Toby Garfield**
Professor of Oceanography
San Francisco State University

Day after day, minute by minute, waves crash onto Earth's shores. They can be fun or big trouble. It's your turn to dive into the science of surf.

Each winter, the word goes out. Emails and text messages reach surfers around the world. It's the news they've been waiting for: Huge waves are breaking off the coast of northern California. That means it's time for the Mavericks Surf Contest.

Surfers have 24 hours to make their way to the San Mateo Coast, about 40 kilometers (25 miles) south of San Francisco. They come from all over the United States and from all over the globe.

Surfers come to brave 12-meter (40-foot) waves, strong currents, jagged rocks, and freezing water. They come for the chance to surf some of the largest waves in the United States. The wonder waves at Mavericks can be taller than a four-story building! It takes skill and courage to ride them.

What Is a Wave?

You won't catch me competing at Mavericks. I'm an **oceanographer**, not a daredevil. That means I study the ocean. I explore how ocean water moves.

Still, I think the contest is cool. It gets people interested in waves, and it raises some important questions: Just what is a wave? How do waves form? What makes the ones at Mavericks so big? How are they different from the waves called **tsunamis**?

Let's start with the first question: What is a wave? You may think you know the answer. It's water moving toward the beach, right? Wrong. A wave is actually energy that is moving through the water.

This may be easier to understand if you think of dominoes. Picture them standing neatly in a line. Now imagine that someone knocks over the first domino. It falls. It hits the second domino, which falls, too. This continues all down the line.

What happened? That push was a bit of energy. It made its way through the line of dominoes. Along the way, it affected the dominoes, yet it didn't move them very far.

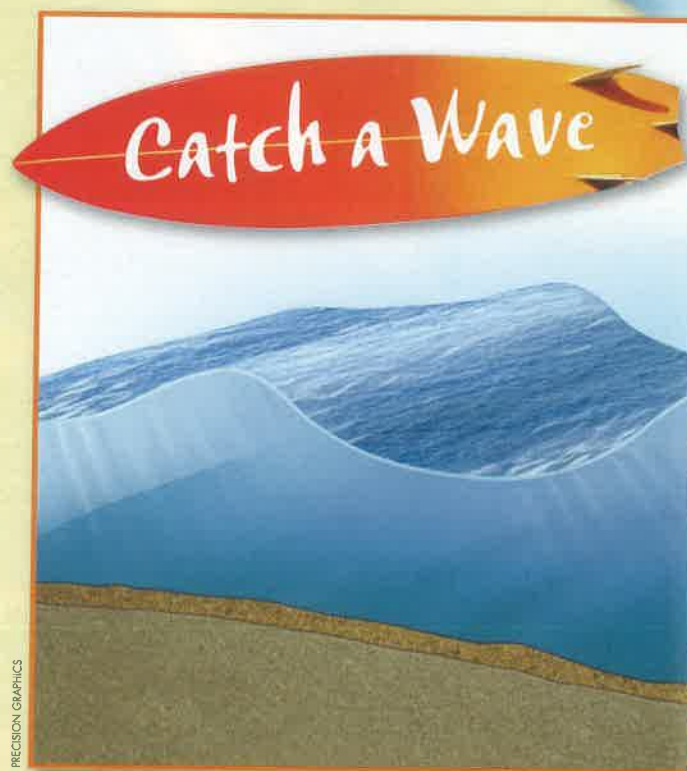
Waves in the Water

A wave moves through the water in a similar way. For most waves, the energy comes from wind blowing over the ocean. The wind transfers, or moves, energy to the ocean. Then it starts moving through the water.

If you drew a wave passing through the water, it would look like a line of hills and valleys. The top of the hill is the wave's **crest**. As the wave heads toward the crest, it pulls water upward. That's what makes the tall waves we see at the beach. The distance between two crests is called the **wavelength**.

Then the wave slopes back down. It reaches a low point called the **trough**. The distance between the crest and the trough is the wave height. The wave pulls the water down with it. That's why waves always topple over, or break.

Like the dominoes, the water is affected by the energy moving through it. Pulled up and down, the water molecules move in a circle. They don't, though, move any closer to the shore. You can see this for yourself. Next time you're at the beach, let a toy float in the waves. They'll move the toy up and down. Yet they probably won't carry it onto the beach.





© GARY BRAASCH/COMBIS

Energy at Work. Just as energy moves through and topples dominoes, wave energy moves through the water near Costa Rica in Central America.

Dive into the diagram to explore the key parts of a wave.

