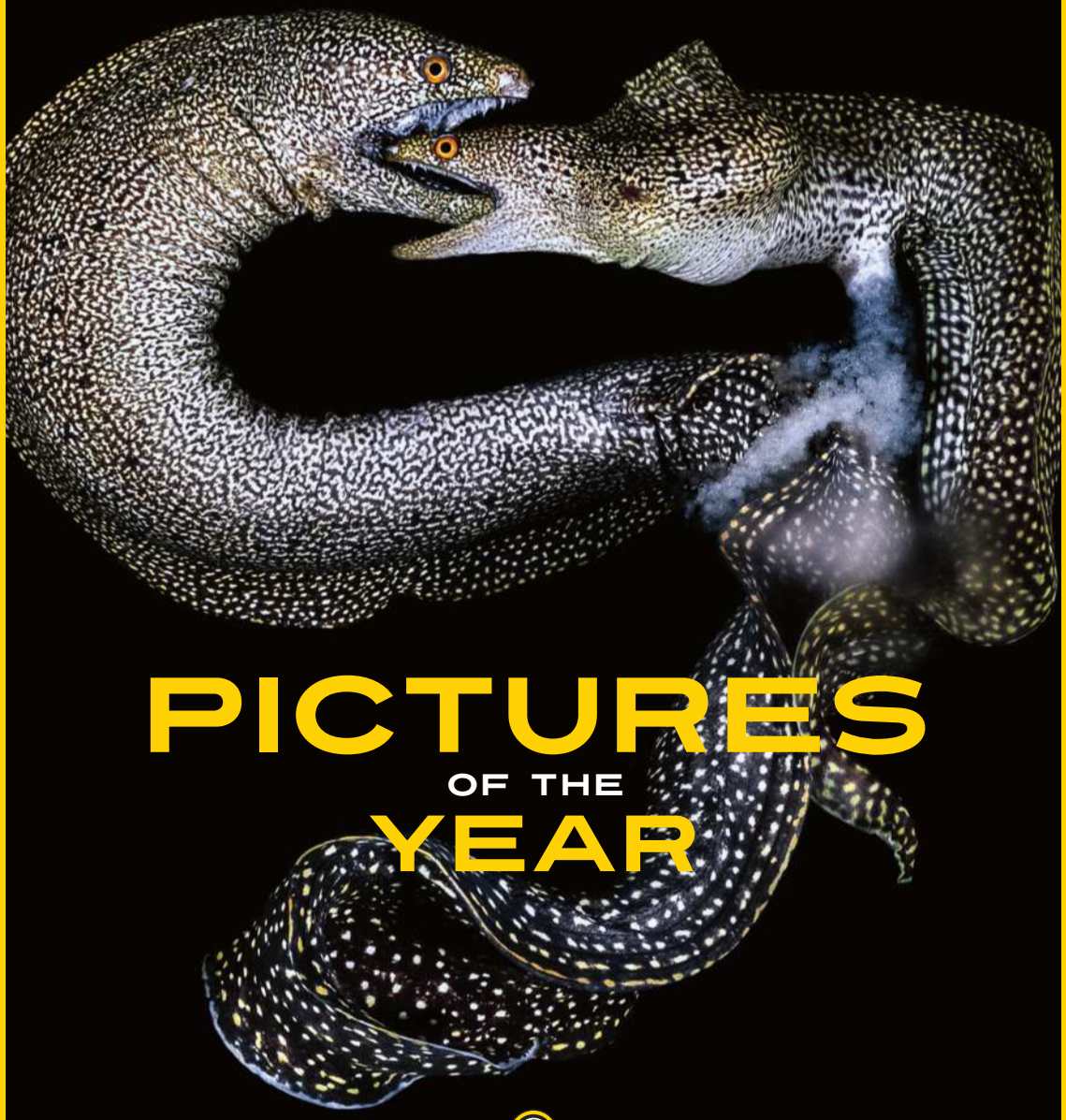
VOLUME 250 DECEMBER 2026 NUMBER 06

NATIONAL GEOGRAPHIC



PICTURES OF THE YEAR

THE MOST UNFORGETTABLE PHOTOS OF 2026



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REACH FOR THE CROWN

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FROM *the* EDITOR

NATHAN LUMP

WE HAD AN EVENTFUL 2026 at National Geographic, and in this issue, we share the culmination of some of our favorite projects. Regular readers will recall that in April we accompanied the Artemis II astronauts on their lunar flyby, a mission that brought humankind farther from Earth than ever before. We'd been working with NASA on Artemis II for years, including on a project training astronauts to use GoPro cameras specially modified and certified for spaceflight. This month, we share the images they captured for the magazine while aboard the Orion capsule—a rare, intimate perspective of this historic event.

The moon shot was just one of the monumental undertakings we witnessed from behind the scenes this year. In July we had special access to the move of the 1,000-year-old Bayeux Tapestry from its home in France to the British Museum in London, where it's currently on display. As you might imagine, safely transporting this fragile, 225-foot-long artwork was no simple task, and National Geographic documented the painstaking work that made it possible. This month we bring you a closer look at that process and at what the renewed attention is revealing about this singular record of the Middle Ages.

And, of course, this issue includes Pictures of the Year, our annual selection of the photos that most held our attention in 2026. During the past 12 months, National Geographic photographers have worked all over the globe to uncover, For Free Mags&Papers Check SoftArchive.is record, and share important and surprising stories about the state of our world and how it is changing. They bring incredible tenacity, curiosity, and artistry to what they do, and this year's selections demonstrate the power that a single image has to make us see things in an entirely new way.

All of this work is possible because of your support. Thank you, and I hope you enjoy the issue.



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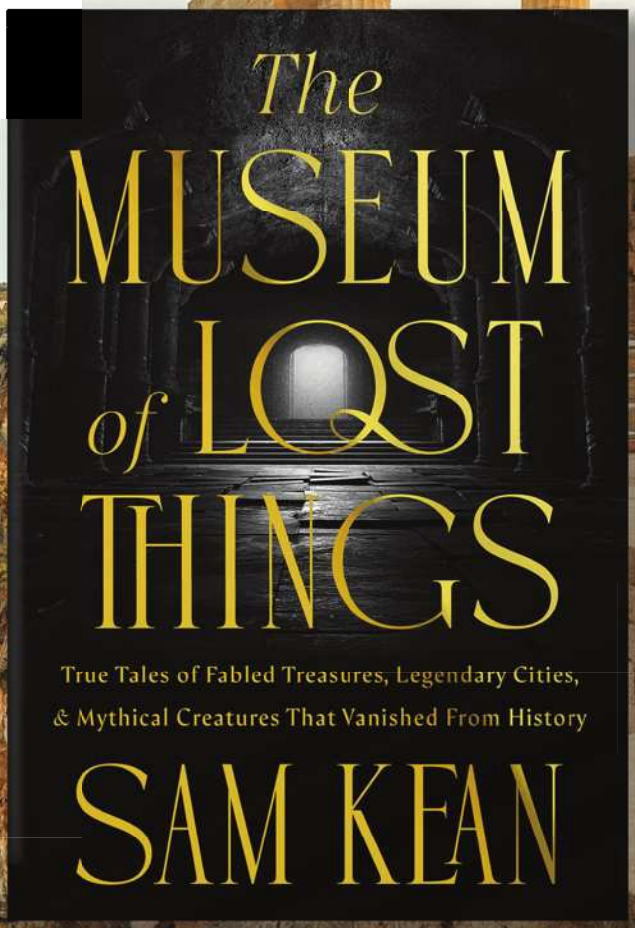
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The crew of NASA's Artemis II carried National Geographic cameras on their voyage to the moon. Their intimate, behind-the-scenes photos show another side of this year's biggest space story.

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ON THE COVER A pair of moray eels releases a cloud of gametes in the waters of the East China Sea. The rare photo of mating eels is one of our 2026 Pictures of the Year.
Photograph by TONY WU

TREASURE HUNTERS, MYTH SEEKERS, HISTORY LOVERS — **YOUR NEXT OBSESSION AWAITS!**



"Sam Kean has a rare gift of storytelling, and his elegant prose guides the reader through this fantastical labyrinth with simplicity, wit and charm."

—**Douglas Preston**, #1 *NYT* bestselling author of *The Lost City of the Monkey God*

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HOW TO FIND YOUR NEXT BEST PLACE





PHOTOS: JIMMY CHIN (MORRISON); THOMAS EKSTRÖM (NORWAY)

→ The mountains of western Norway's Vestland County are best appreciated from sea level—and a slow boat ride across a glacier-carved fjord (right) is the kind of sublime travel moment our annual **Best of the World** list celebrates. Our latest edition collects 25 remarkable places on six continents, selected by our editors, photographers, and writers: underappreciated global cities, spectacular new parks and heritage sites, and historically beloved places that are bringing visitors closer to local life. The Best of the World 2027 list is now on our website, along with 25 detailed destination guides. Visit *natgeo.com/bestoftheworld*. Meanwhile, the new, lushly photographed ***Best of the World*** hardcover collection from National Geographic Books is now in bookstores. It explores 50 more destinations worth planning a journey around.



AN EVEREST FIRST, NO SECOND TAKES

→ Filming ski mountaineer Jim Morrison's (left) descent of the most perilous route on the world's highest peak ("Conquering Everest, and Something Even Harder," p. 70) pushed directors Elizabeth Chai Vasarhelyi and Jimmy Chin to their limits. "This is absolutely the most challenging film I have ever made," says Chin, a National Geographic Explorer. The pair's new National Geographic documentary, ***Everest: The Other Side,*** in theaters and IMAX now, reveals the feat's emotional backstory.

NATIONAL GEOGRAPHIC EXPLORERS

These contributors have received funding from the National Geographic Society, which is committed to illuminating and protecting the wonder of our world. Learn more about the Society's support of Explorers at *natgeo.com/impact*.

A PATIENT QUEST TO SPOT AN ELUSIVE PREDATOR

→ Photographer **Aaron Huey** put around 10,000 miles on the odometer making trips from his home in Seattle to Northern California, where conservationists and ranchers are at loggerheads over gray wolves ("The Cost of a Comeback," p. 78). A longtime contributor to *National Geographic* and an Explorer since 2018, Huey took some revealing close-ups of wolves tranquilized for collaring by state officials. But to spot wild wolves as they ranged, he holed up for multiple nights in a blind in Siskiyou County, near Mount Shasta, before his persistence paid off. His motivation? To capture "the spirit of these wolves in their purest form," he says.





Documenting a Slow-Motion Disaster

→ In the three years she's photographed neighborhoods that mining pits swallowed in the Brazilian city of Maceió ("Their City Sank. They Held On," p. 102), São Paulo–based **Maíra Erlich** has witnessed how the disaster has continued to unfold. "During every visit," says Erlich, a contributor to Bloomberg, the *Wall Street Journal,* and Reuters, "I saw how the city was changing, with new evacuations, new demolitions, and new streets being blocked off."

PHOTOS: AARON HUEY; PABLO ALBARENGA (ERLICH)

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CULTURE

Jordan has been home to a significant community of Chechen immigrants ever since they began fleeing tsarist Russia in the late 1800s. National Geographic Explorer **Annie Sakkab** captured this image of Chechen women dancing to folk music in the town of Azraq while reporting on the collapse of the region's once lucrative salt industry. These women, Sakkab says, are "trying to conserve their identity, conserve their heritage, and conserve their past in a really broken land."



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VISUAL ART

Ghana-based photographer **Derrick Ofosu Boateng** used an iPhone to take this photo of a model near the capital, Accra, her head topped with a crown of foliage. Boateng coined the term "Hueism" to describe his style, in part as a reference to the bold colors he adds to his images digitally, enhancing their striking effect. Each of his portraits is inspired by an African proverb—in this case, "True royalty comes from the heart."

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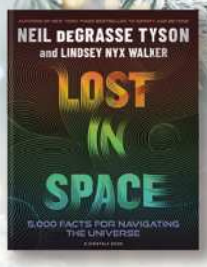
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NATURAL ARCHITECTURE

Prehistoric communities carved this tomb out of a natural rock formation in Sardinia, Italy, one of more than 3,500 of these burial sites on the island. Photographer **Vincenzo Pagliuca** has been documenting these ancient wonders, called *domus de janas* (fairy houses), which local myths suggest are home to witches and other magical beings. “I often felt a quiet sense of vertigo,” Pagliuca says, “trying to imagine the hands that carved them.”

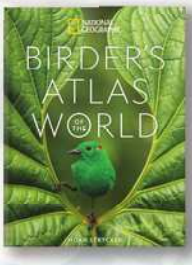
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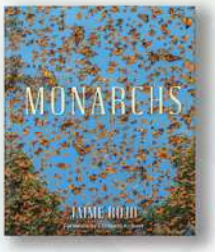


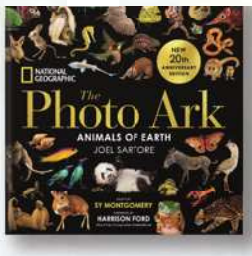












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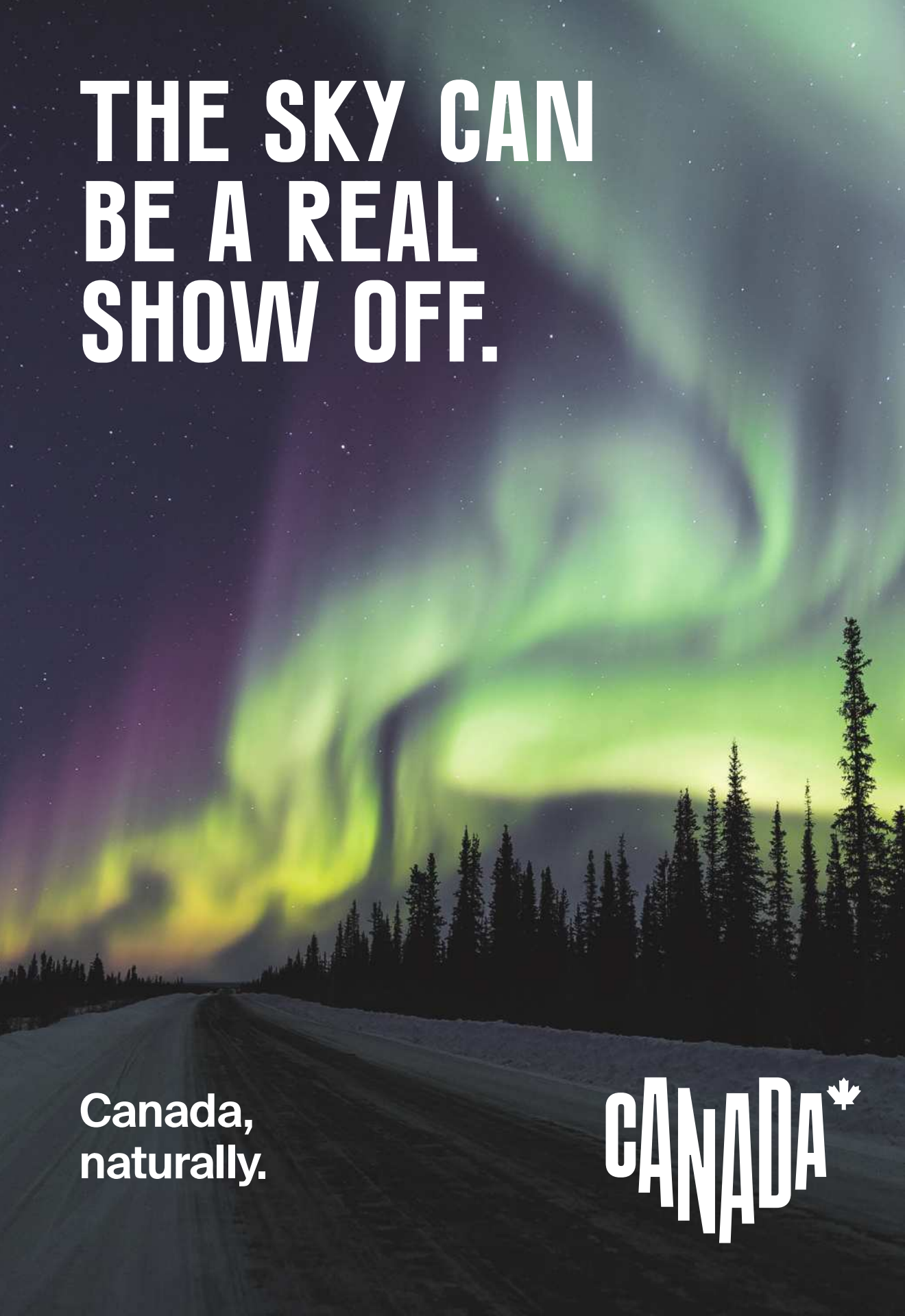
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CANADA
A YEAR IN PICTURES

The moment I met sisters Layla and Bailey Sarka, I was struck by the warmth between them. Through them, I saw the land not only as a place we inhabit, but as a relative, a teacher, and a source of healing. **Credit:** *Ami Vitale*

This open, breathtakingly beautiful country offers any traveler—photographer or not—genuinely authentic experiences. Seeking out something authentic means different things to different people—snapping a love-lock closed on a Parisian bridge can feel just as authentic as eating a bagel in New York. But most agree that traveling authentically means avoiding over-trodden, artificial experiences and instead looking for destinations with real depth. Authenticity is something Canada has woven into every corner, so much so that many National Geographic photographers have sought it out looking to tell its stories. To celebrate this fact, twelve of our photographers have offered their favorite images encapsulating what Canada's authenticity means to them. Throughout their assignments, these experts have captured the sense of connection they encountered to the country and the people who call it home. All twelve of these unique perspectives can be found at the QR code on this page — brought together for a stunning year in pictures.



The Toronto Islands are only ten minutes from downtown Toronto, yet paddleboarding across Long Pond felt like I was in a small waterfront community. **Credit:** *Michael George*



In the Northwest Territories, Canada's last free-ranging reindeer migrate each spring toward their calving grounds under the care of Indigenous Inuvialuit herders. **Credit:** *Katie Orlinsky*

See our photographers' favorite pictures here

This is paid content. This content does not necessarily reflect the views of National Geographic or its editorial staff.

These photographers, whose images are featured among this issue's Pictures of the Year, are also National Geographic Explorers and have received funding from the National Geographic Society.

Lalo de Almeida, *p. 42*
Based in São Paulo, de Almeida voyaged deep into the Brazilian Amazon to photograph fishermen harvesting pirarucu, one of the world's largest freshwater fish.

Jasper Doest, *p. 32*
Winner of four World Press Photo Awards, Doest was covering human conflicts with brown bears in the Alps when he took his photo in this issue of an Italian family with their horses.

Shane Gross, *p. 60*
The Canadian photographer turned his lens on underwater wildlife in the Experimental Lakes Area in Ontario, a renowned hub for scientific research.

Jason Gulley, *pp. 56, 68*
A drought in Florida enabled the Tampa-based Gulley to document the Gulf sturgeons' annual migration up the Suwannee River, an event normally obscured by hazy waters. He also photographed fishermen in Laos. His work is supported by the Society's Blue Boundaries program.

Justin Jin, *p. 21*
A 2027 Nieman fellow at Harvard University, Jin photographed participants squaring off in traditional wrestling matches in Mongolia's Darkhad Valley.

Diego López Calvín, *p. 34*
Spanish photographer López Calvín relies on months-long exposures to record the sun's movements, a technique he used in Peru for this issue.

Prakash Matada, *p. 38*
A filmmaker and cameraman, Matada has won awards at the Jackson Wild and Wildscreen film festivals.

Matthieu Paley, *p. 40*
Winner of a World Press Photo Award, Paley, based in Portugal, has spent decades profiling a seminomadic community in Afghanistan's Wakhan corridor.

Angela Ponce, *p. 58*
As part of a project charting the melting glaciers in Peru, Ponce joined pilgrims making a religious trek in the Andes.

Jaime Rojo, *p. 30*
The Spanish photographer's book *Monarchs* depicts his more than two decades charting the butterflies' migration.

John Stanmeyer, *p. 28*
With support from the Society's Food for Tomorrow initiative, Stanmeyer is documenting how desertification is upending communities in Kenya and Nigeria. He's contributed over 25 stories to *National Geographic*.

George Steinmetz, *p. 64*
A photojournalist for 40 years, Steinmetz has won several World Press Photo Awards for his images.

Brent Stirton, *p. 44*
A National Magazine Award winner, Stirton has visited over a hundred countries on assignment. He was in Washington State covering regenerative farming as part of the Society's Food for Tomorrow initiative

when he shot his photo in this issue.

Amy Toensing, *p. 50*
Toensing has contributed her photography to *National Geographic* for over 20 years. Her work has also appeared in the *Boston Globe* and the *Wall Street Journal.*

Anand Varma, *p. 26*
A founder of WonderLab, which is supported by the Society's Wildlife Intelligence Project, Varma authored the book *Invisible Wonders,* about the use of innovative photographic techniques to capture hidden science.

Paolo Verzone, *p. 36*
As part of a book project for the Gallerie d'Italia Museum in Turin, Verzone visited an astronaut training facility in Cologne, Germany—a place that felt like "another world," he says.

Tony Wu, *p. 18*
Wu's groundbreaking project photographing the mating of moray eels in Japan was the most challenging of his career, he says, because the creatures spawn in the dark. He's a recipient of National Geographic's Wayfinder Award.

Kiliii Yüyan, *p. 48*
Author of *Guardians of Life,* about Indigenous communities around the globe, Seattle-based Yüyan was searching for sharks in east Greenland when he captured the photo in this issue.



PHOTO: GABRIEL JENSEN

Pictures of the Year: Your Shot

All year long, we encourage members of our online community to share their photos with us on our Instagram account @natgeoyourshot. This year our photo editors chose this image of a banded jawfish, taken by **Gabriel Jensen,** as our Your Shot Photo of the Year. The fish are known as mouth brooders for how they protect their fertilized eggs, holding them in their mouths for eight to 10 days until they're ready to hatch. "They're very cartoon-like," Jensen says. To get this shot, he hovered motionless for almost an hour over the fish's burrow in the shallow waters of Florida's Lake Worth Lagoon, not far from his Fort Lauderdale home. He used a dim red light to illuminate the creature, hoping not to spook it—but he still felt the father's suspicious gaze. "He just looks at you with judgment," Jensen says, "to figure out if you're trying to steal his babies." Use the tag #NatGeoYourShot on your posts for a chance to be featured.







Caught in the Act

KAGOSHIMA, KYUSHU, JAPAN

How, exactly, eels reproduce is a mystery that has long confounded biologists, and no human on record had ever photographed the act in the wild until Tony Wu did. Since 2023, Wu and his team have spent hundreds of hours submerged in the waters of Kagoshima documenting the reproductive behavior of four species of eel, including these morays releasing gametes. The act of spawning, they've discovered, happens in less than two seconds, as eels rush out of their coral refuges, eject those gametes, and then sprint back to safety. Because eel sex happens at night, often in murky waters, Wu relied on faint red light that didn't spook the slender fish and, in his words, "as good a guess as possible" of where to point the camera.

Photographs by
TONY WU

PICTURES OF THE YEAR 2026

OVER THE PAST 12 MONTHS, OUR PHOTOGRAPHERS CAPTURED MORE THAN A MILLION IMAGES ACROSS THE GLOBE. THESE ARE THE ONES THAT SURPRISED, CHALLENGED, AND STAYED WITH US.

Words by Kaitlin Menza



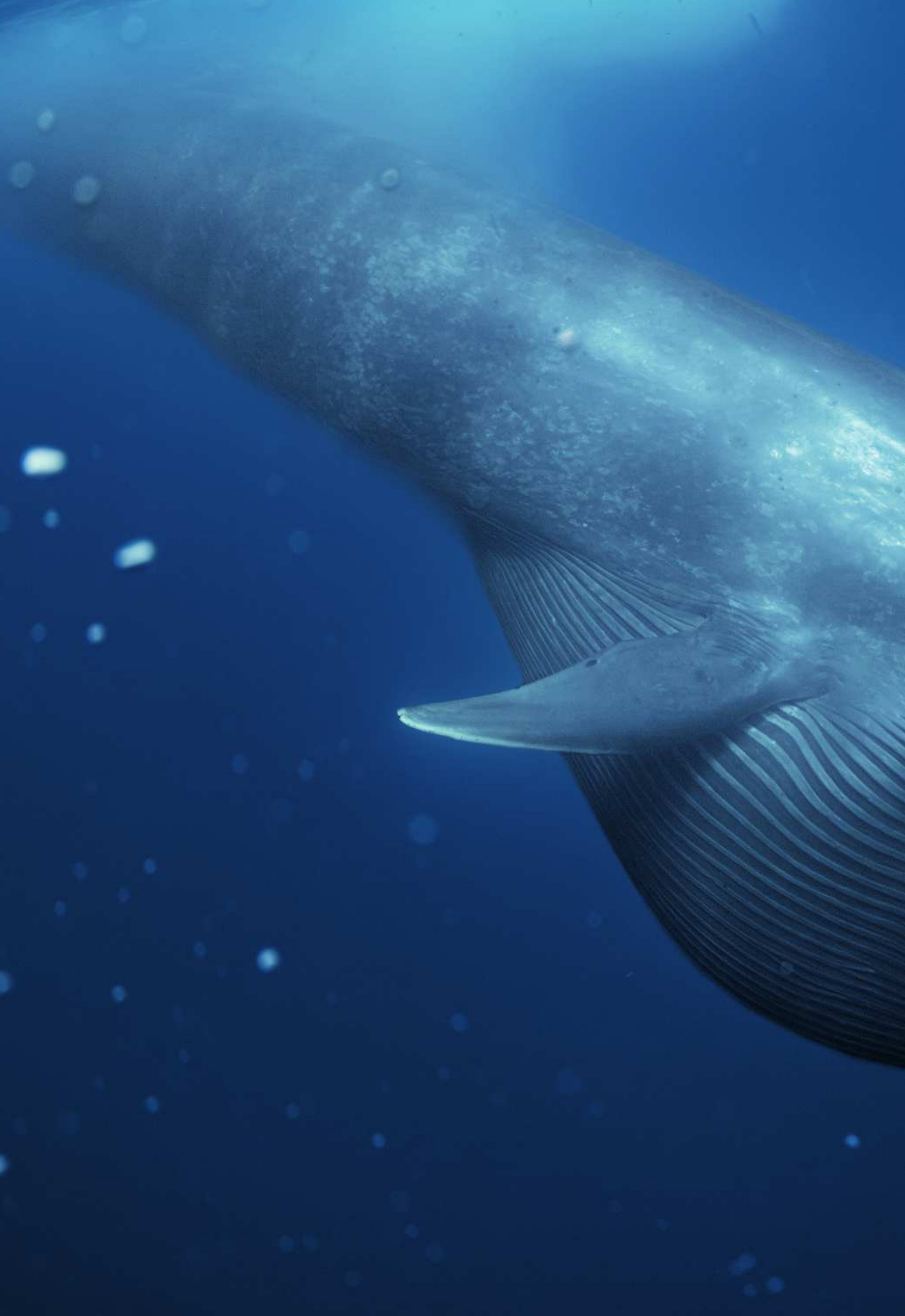


Coming to Grips

DARKHAD VALLEY, KHOVSGOL, MONGOLIA

The wrestling tournament is a signature event during Mongolia's Naadam festival, created to keep men battle-ready during the days of the Mongol Empire. This style, called *bokh*, tests balance, leverage, grip, and timing—and can leave athletes locked in a hold for hours, each waiting for a shift in weight to give him the advantage.

Photograph by
JUSTIN JIN



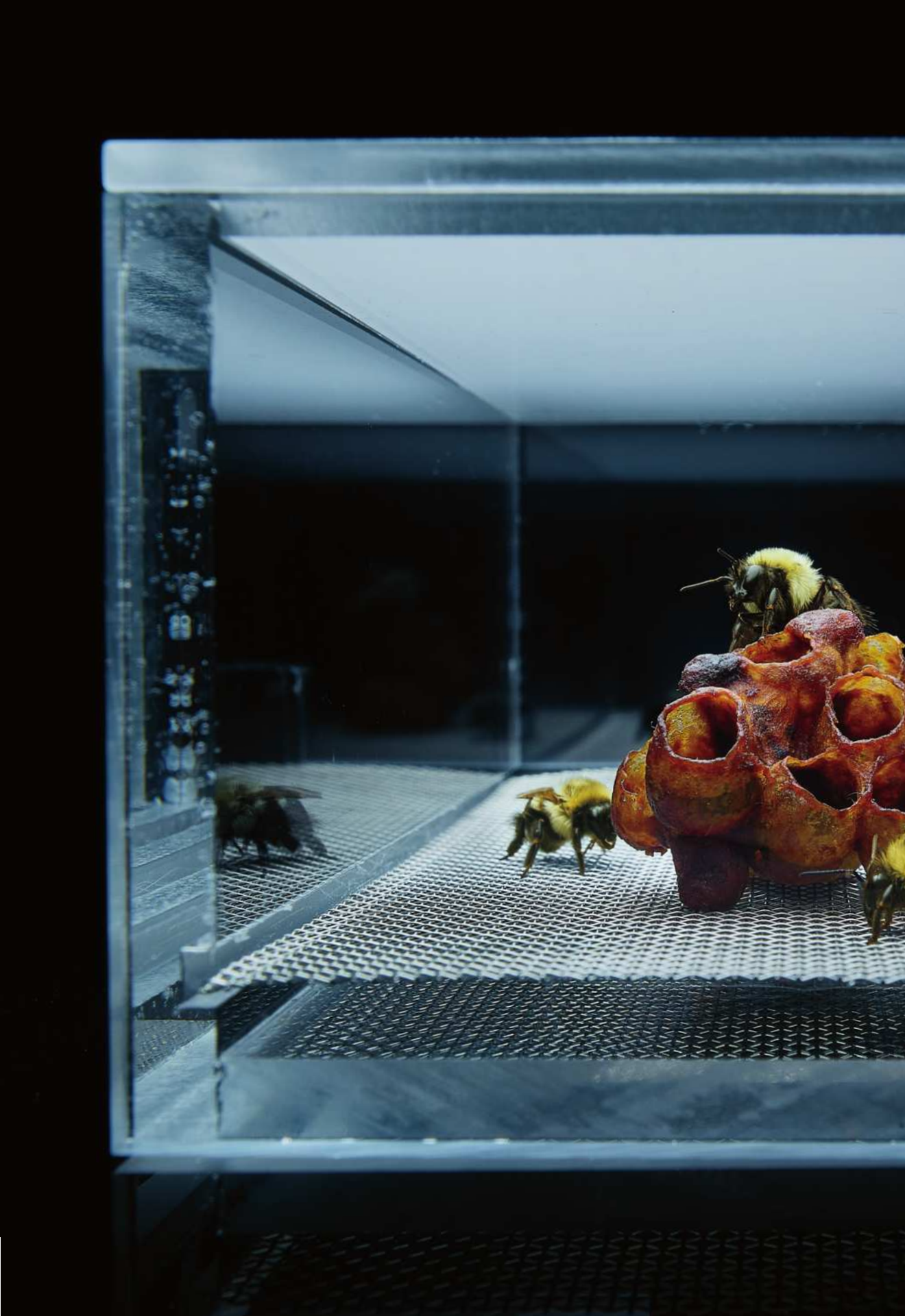


Open Wide

SOUTH TARANAKI BIGHT, NEW ZEALAND

In New Zealand's warming waters, a pygmy whale lunges, mouth agape, to feed on abundant krill. Although the giant species is ordinarily migratory, some 700 of them have settled here. Photographer Ralph Pace dived with researchers studying how climate change affects the krill and, in turn, the whales' feeding and breeding.

Photograph by
RALPH PACE





Busy Bees

BERKELEY, CALIFORNIA, USA

Three common eastern bumblebees crawl around irregular beeswax cells, which colonies build to store honey and raise young. Photographer Anand Varma documented the process alongside National Geographic Explorer Felicity Muth, who designed this acrylic box to study how bumblebee nests take shape.

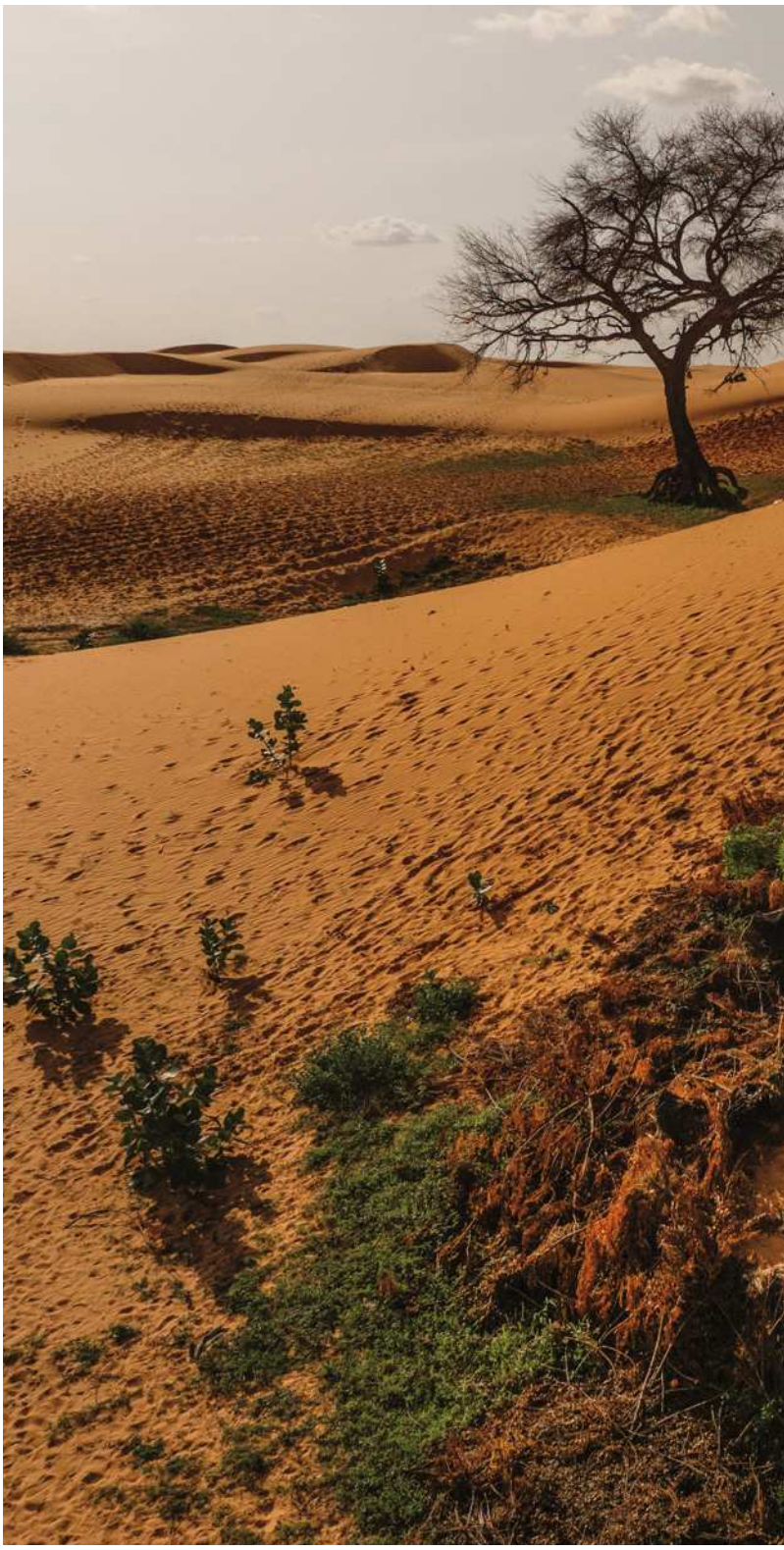
Photograph by
ANAND VARMA

Encroaching Sands

TULO-TULO,
YOBE, NIGERIA

Fifteen-foot dunes threaten to swallow the home of Haruna Modu, who has been forced to move four times as desertification spreads across the Sahel, the African region that separates the Sahara from humid savannas to the south. Rising temperatures, drought, deforestation, and overgrazing all help drive the sands' advance. Today more than 80 percent of the Sahel's former cropland is degraded, threatening food security for tens of millions. It's a global problem that troubles photographer John Stanmeyer. "Imagine the wars and conflicts we have today," he says. "It will be nothing [compared with] 40 to 50 years if we cannot feed ourselves."

Photograph by
JOHN STANMEYER









A Flourish in Flight

CHIAPAS, MEXICO

The Aztec and Maya revered the bird known as the resplendent quetzal, whose emerald tail evokes the serpent god Quetzalcoatl. Birders hoping to glimpse one come to Mexico's El Triunfo Biosphere Reserve, where Jaime Rojo spent 10 days in a blind before getting this shot of a male in flight.

Photograph by

JAIME ROJO



Unbridled Joy

SELLA GIUDICARIE, TRENTO, ITALY

Lorena Masei playfully offers her hat to a horse at the Masei family farm in the Italian Alps. Photographer Jasper Doest was in the mountains to document how communities there coexist with wild animals but found himself struck by the family's relationship to livestock they're raising in a landscape shared by bears and wolves.

Photograph by
JASPER DOEST



Catching Solar Rays

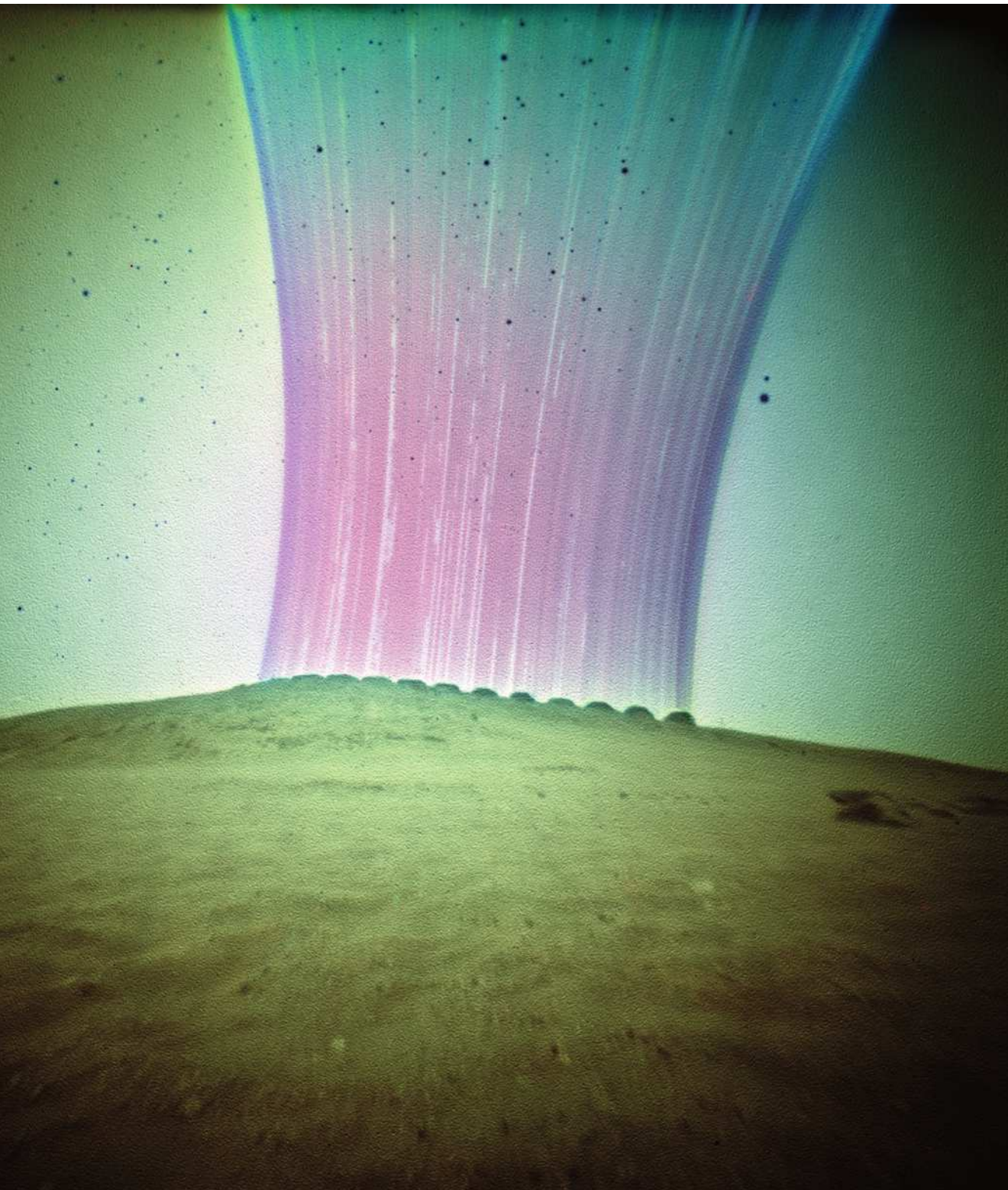
ANCASH DEPARTMENT, PERU



THIS IRIDESCENT COLUMN over a desert in western Peru is no mirage. Photographer Diego López Calvín made this image near the Chankillo Archaeoastronomical Complex, the oldest known solar observatory in the Americas, where 13 stone towers, built by a pre-Inca civilization on a ridge around the third century B.C., form a finely tuned calendar that frames solar movements across the year. There, over six months from the summer to the winter solstice, López Calvín traced the sun's daily arc across the sky using long exposures.

López Calvín set up a pinhole camera, a lensless box that lets light in through a tiny opening, to capture the sun's trajectory. Its rays were etched onto photosensitive paper, which López Calvín then scanned and reversed to show "something that you cannot see with your bare eyes." Each narrow band in the otherworldly arc represents a single day. The resulting pinks, blues, and purples stem from silver halide salts in the paper reacting to ultraviolet light. López Calvín calls his prints solarigraphs, and the Spanish photographer has been traveling the world making them since 2000. He sees this image as a visual representation of the work astronomers were doing at Chankillo long ago.

Photograph by DIEGO LÓPEZ CALVÍN





Shooting for the Moon

COLOGNE, NORTH RHINE-WESTPHALIA, GERMANY

Astronaut Thomas Pesquet trains for his upcoming ISS mission at LUNA, the European Astronaut Centre's simulation facility, where harsh lighting replicates the sun's unfiltered glare and pulverized basalt mimics lunar dust. Such space analogues are increasingly important as government agencies and private companies ramp up their lunar ambitions.

Photograph by
PAOLO VERZONE



Monkey Business

BONGAIGAON, ASSAM, INDIA

A curious troop of Gee's golden langurs—named for a naturalist who documented them in the 1950s—peer into a fish-eye lens that Prakash Matada affixed to a telescoping pole. The endangered canopy dwellers here have formed a rare bond with humans and proved anything but camera shy, gazing at their own reflections.

Photograph by
PRAKASH MATADA







A Hard Day's Rest

WAKHAN CORRIDOR, BADAKHSHAN, AFGHANISTAN

Twenty-six years ago, photographer Matthieu Paley first visited Afghanistan's Wakhan corridor, a narrow strip of land bordering Pakistan, Tajikistan, and China—and was transfixed. Repeated visits have only deepened his connection to the region and the local Wakhi people. Here, Hazal-u Din reclines by firelight after a long day herding yaks.

Photograph by
MATTHIEU PALEY





Guardians of Giants

MARAÃ, AMAZONAS, BRAZIL

Clubbing a 220-pound pirarucu requires violent force, but Solimões River fishermen are also fierce protectors of the giant creatures, which are among the largest freshwater fish on Earth. Conservation efforts that include tallying the fish and harvesting no more than 30 percent of adults have brought the species back from the brink of extinction.

Photograph by

LALO DE ALMEIDA





Future of Farming

UNIONTOWN, WASHINGTON, USA

Frankie and Joey Druffel play among the compost mounds on their family's farm. Their dad, Allen, a fifth-generation farmer, uses modernized forms of herbicide- and pesticide-free methods—drawing from the practices of his great-great-grandfather—and has implemented soil restoration techniques to quell weeds and add nutrients without chemicals.

Photograph by

BRENT STIRTON

Beams of Hope

NEW YORK, NEW YORK, USA

Every September for the past 25 years, a crew has lit up New York's night sky to commemorate those who died during the attack on the World Trade Center's twin towers. Christopher Payne combined four images to capture these technicians setting up the 9/11 "Tribute in Light," which forms two beams visible 60 miles away—a symbol of the city's resilience.

Photograph by
CHRISTOPHER PAYNE





Realm of the Zombie

AMMASSALIK FJORD, KULUSUK, GREENLAND



Sharks

Photograph by KILIII YÜYAN



WITH LIFESPANS OF up to 500 years, Greenland sharks are the planet's longest-lived vertebrates. These so-called zombie sharks drift through the ocean's coldest, darkest waters, reaching depths as low as 9,500 feet while scavenging almost anything in their path. Then, at night, they rise to the surface to pluck dead creatures off the sea ice. This one—a juvenile, photographer Kiliii Yüyan believes, likely born around the time of the American Civil War—showed no interest in the living as it swam by Yüyan and his dive partner Philipp Oppermann. Shortly after Yüyan got the shot, his team above on the ice tugged his dive line to urge him back up; they'd spotted a polar bear and wanted to steer clear without leaving the divers below. "Polar bears sit by ice holes and pull up big seals," Yüyan says. Resurfacing at the wrong moment could spell disaster. Later, when the bear had gone, the fishermen accompanying Yüyan came back to catch the shark. It's a legal harvest for Inuit in Greenland, where communities have long fermented the shark as a delicacy, feeding a portion to sled dogs.

Foraging Ahead

LINDÅS, VESTLAND, NORWAY

Several times a week, rain or shine, 79-year-old Bente Brekke Kampevold heads into the woods of western Norway to hunt for chanterelles. Adhering to routine, she believes, is one secret to good health in later life. She and her neighbors could be onto something: Norway has one of the world's highest life expectancies, averaging 83 years.

Photograph by
AMY TOENSING







A Real Softie

GONAREZHOU NATIONAL PARK, MASVINGO, ZIMBABWE

A pregnant pangolin named Fikile, rescued from poachers, shows off her underbelly while being weighed by caretakers from the Tikki Hywood Foundation, a wildlife nonprofit. When threatened, pangolins curl into balls, protected by tough outer keratin scales. The scales, prized in some traditional Eastern medicines, have made the pangolin one of the world's most trafficked wild mammals.

Photograph by
MARCUS WESTBERG







Total Cliff-Hanger

MAJORCA, BALEARIC ISLANDS, SPAIN

Climber Chris Sharma dangles from a completely horizontal limestone face in the moments after August's total solar eclipse in Spain. A pioneer of what's called deepwater soloing—scaling sea cliffs, without ropes, above open water—Sharma clambered along the craggy underside using just his hands, with the Mediterranean Sea below. Some 600 feet away, photographer Chris Burkard and his assistant Joel Barger set up on a beach, capturing Sharma's feat as the moon slid away from the sun and the sun dipped below the horizon. "Although the moment of totality was fascinating," Burkard says, the climb "was maybe the most unique thing I'll ever witness."

Photograph by
CHRIS BURKARD





The Night Shift

KHON ISLAND, CHAMPASAK, LAOS

A fisherman steals a few minutes of sleep while working overnight beneath the Khon Pa Soi waterfall, as the Mekong River's chocolate waters churn below. His bamboo-and-log weir doubles as a bed and a trap, snaring fish that swim upstream during a brief monsoon-season migration. New hydroelectric dams now threaten this centuries-old harvest.

Photograph by
JASON GULLEY





Pilgrims' Plight

SINAKARA VALLEY, CUSCO DEPARTMENT, PERU

Every year tens of thousands of people hike partway up Sinakara, a mountain in the Peruvian Andes, to worship the Colque Punku Glacier. This religious event is called Qoyllur Riti, and it blends the trappings of Catholicism with the ancestral veneration of an Apu, an Andean mountain spirit thought to protect communities below. In the past, the pilgrims carried sacred ice back down the mountain; today, with snowfields dwindling, the ice harvest is banned. Peru is home to nearly 70 percent of Earth's tropical glaciers (including the world's largest, nearby Quelccaya), many of which are retreating rapidly. When does a changing climate spell the end of religious traditions? In Cusco, the faithful keep climbing.

Photograph by
ANGELA PONCE





Pearls of the Pond

ONTARIO, CANADA

Toad eggs are arrayed like beads on a necklace in Ontario's Experimental Lakes Area, a living laboratory where scientists study how threats like acid rain, plastic pollutants, and algal blooms affect freshwater ecosystems. Here, two American toads spawn undisturbed, each of their strands holding up to 12,000 eggs.

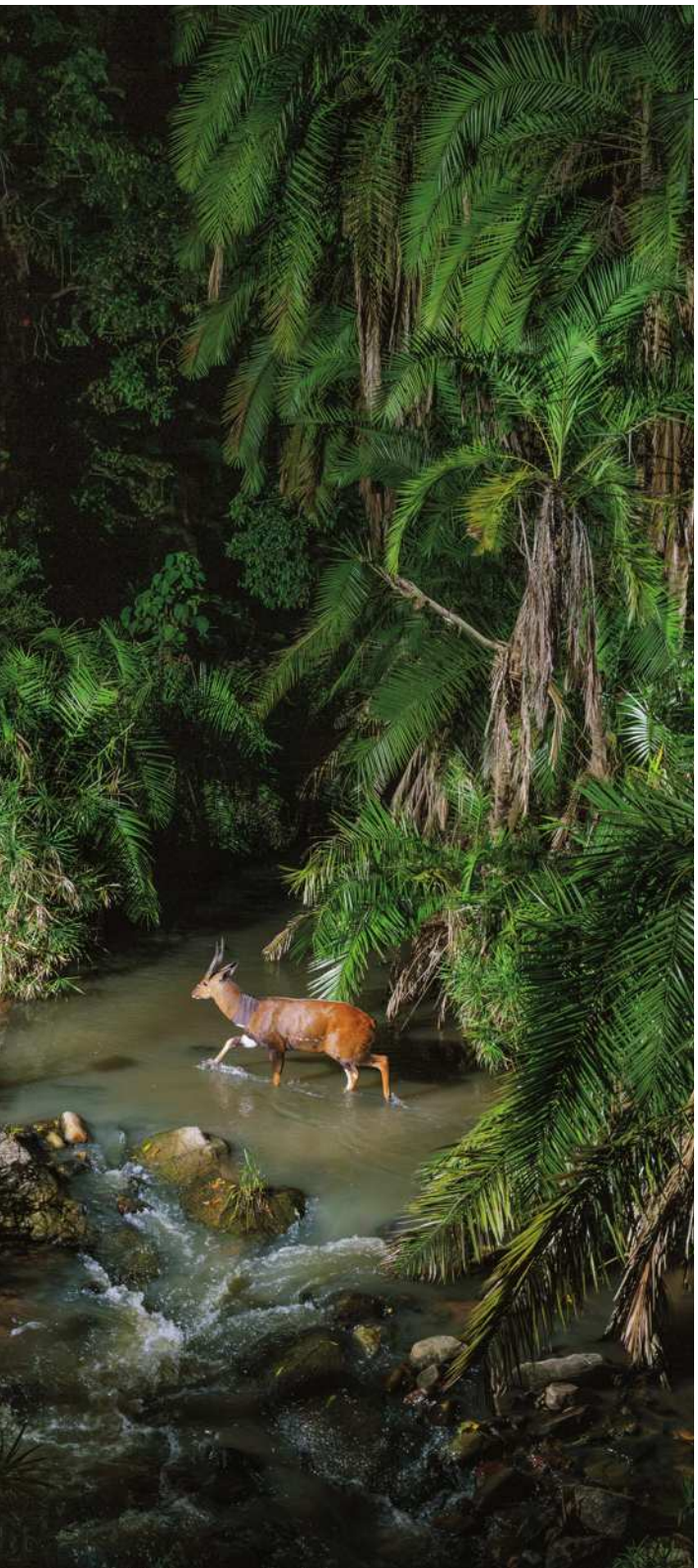
Photograph by
SHANE GROSS

Animal Crossing

MASAI MARA NATIONAL RESERVE, KENYA



Photographs by WILL BURRARD-LUCAS



DEEP IN KENYA'S Masai Mara, a reserve bordering the northern edge of the Serengeti, photographer Will Burrard-Lucas worked with a team of rangers to hide a camera trap high on a riverbank and waited for action. The images that came back revealed something extraordinary. The secluded crossing turned out to be a high-traffic wildlife thoroughfare. Among the passersby: a pair of slinking lions, unusual visitors here. The Mara has one of Africa's densest lion populations, but the cats are far more often seen patrolling open grasslands than slipping through the woods. Also passing through: a seldom-glimpsed antelope called a bushbuck.

Burrard-Lucas had originally set out to photograph the critically endangered black rhino, a species poachers nearly wiped out in the 1980s. The rhinos did turn up, but so did elephants, leopards, hippos, warthogs, and giraffes, coming and going at all times of day and night. He says this "magic" spot in the 583-square-mile reserve shows "a very different side of the Mara, one [with] more intimate scenery."

The photos also speak to the value of water and tree cover in a world that, due to deforestation and drought, increasingly has less of both. And how, in some ecosystems, many animals appear willing to share the hidden sanctuaries that help them survive.

Sun, Sand, and Salt Mines

QARHAN SALT LAKE, QINGHAI, CHINA

Once an industrial settlement built around salt and lithium mining, China's largest salt lake has recently become an unlikely tourist hot spot. A grand Ferris wheel is being constructed to provide views of some 2,300 square miles of crystal clear water—and the surrounding mine.

Photograph by
GEORGE STEINMETZ









Fiery Advance

EL JADIDA, CASABLANCA-SETTAT, MOROCCO

A crack of rifle fire marks the finale of a performance of *tbourida,* a Moroccan equestrian tradition in which a team of riders act out a cavalry charge. Women are gradually gaining a foothold in the centuries-old sport. At the festival pictured here, all-female brigades represented two of the 140 competing troupes.

Photograph by
CHANTAL PINZI





Survival of the Fishiest

SUWANNEE RIVER, FLORIDA, USA

Each spring, thousands of Gulf sturgeons swim up Florida's Suwannee River to lay eggs. This year, an intense drought that devastated the spawning season also cleared the river's usually dark, murky water—giving photographer Jason Gulley a rare view of the fish. Some sturgeons, fortunately, have started migrating in fall—a critical shift for this species that's been adapting for 200 million years.

Photograph by
JASON GULLEY

CONQUERING EVEREST, *and Something* EVEN HARDER

In a new National Geographic film, famed adventurers Jim Morrison and Jimmy Chin work together to transform a tragedy into one of the most audacious feats in mountaineering history.

Interview by NICK HEIL
Photographs by HENRY LEUTWYLER

→ **"I DECIDED:** I'm going to drop in and make the most of it," Jim Morrison casually explained, describing the decidedly not casual moment in which he pointed his skis off the edge of Everest and headed down. The mountain's imposing north face—a 9,000-foot wall of rock, ice, and snow—is hardly ever climbed, let alone skied.

Morrison and his climbing partner, the filmmaker and National Geographic Explorer Jimmy Chin, along with their team, had spent the previous days contending with a climb that hadn't been pulled off since 1991—a scramble to the top via the so-called Super Direct route, connecting the treacherous Japanese and Hornbein Couloirs. The preposterous notion of skiing back down was something Morrison had been thinking about for decades. "I don't think I could have done this when I was 25," the 51-year-old said. But, he explained, "it's not lost on me that at 25 I *wanted* to do this."

He had planned to tackle the Super Direct with celebrated ski mountaineer and National Geographic Explorer Hilaree Nelson, with whom he'd been in a relationship for several years. While the two were preparing for the adventure, tragedy struck in 2022, when Nelson was swept away by an avalanche on 26,781-foot Manaslu in Nepal. Morrison, who avoided the slide, found her body days later.

Morrison's astonishing journey back—into the mountains, to the top of Everest, and then down—is the subject of *Everest: The Other Side*, a new National Geographic feature documentary from Chin and Elizabeth Chai Vasarhelyi, the directing duo behind Academy Award–winning *Free Solo*.

Morrison recently sat down at his California home near Lake Tahoe to speak with Nick Heil about the joy and heartbreak of skiing the tallest mountain on Earth.

NICK HEIL: You've skied other major peaks. What sets Everest apart?

JIM MORRISON: It's significantly more



Last year Jim Morrison (at left) and Jimmy Chin made a risky ascent of Everest. At the summit, Morrison turned around and began an even more daring ski descent while Chin kept the cameras rolling.

difficult. The descent is unrelenting. It's two miles down, and it was in really tough conditions because so much snow had been blown free from the route. Before that, the hardest descent I'd made was on Papsura, in India, which was super steep, with patches of snow and ice, and we had to kind of dance down it making kick turns. This was similar but, like, three times as hard.

There's this incredible moment in the film where you're talking about how, if you slip or lose an edge, you're just going to relax and let the mountain take you. It reminds me of the samurai code of going into battle and thinking you're already dead.
That's a good analogy. I did have a tremendous amount of anxiety, fear, and anticipation of what was going to come. But I'd lived with that, day and night, for nearly a decade, and I made a decision that I was going to do this. If I make a less than perfect turn and pay the ultimate price, I'm just not going to sweat it. I've lived a good life.

How did you control that fear?
You have to let it help you focus on what's right—where you should turn and where you shouldn't—not put you in a fight-or-flight place. I just let all those emotions go over my shoulder and out the back.

It sounds like you had moments where you could pull back your own psychological lens and really experience what you were doing out there.
I fully did. On the way down, I was in such a good place physically, emotionally, and mentally that I could ski over to the nastiest part of the route, where I'm looking straight down the dragon's throat, and I

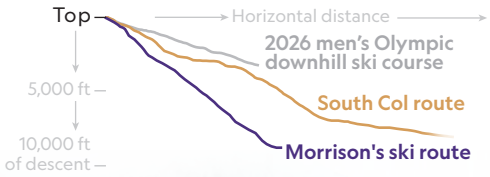
Skiing the Impossible

Mount Everest has been skied a few times before, usually via the South Col route, which is also the way most mountaineers climb the mountain. But until last year, no one had successfully descended the north face's Super Direct, which drops 9,000 steep and icy feet from the summit to the Rongbuk Glacier below. Here's how Jim Morrison and a team of elite climbers pulled it off.



MAP: SOREN WALLJASPER, NGM STAFF
SOURCES: VRICON; OLYMPIC STUDIES CENTRE

A precipitous drop
Morrison's descent averaged 45 degrees the entire way down, roughly twice as steep as an Olympic downhill course.



Lhotse
27,940 ft
8,516 m

Lhotse Couloir

Mount Everest
(Chomolungma, Sagarmatha)
29,032 ft, 8,849 m

SKI ROUTE START *1:25 P.M.*

Upper snowfields

LHOTSE FACE

Geneva Spur

Rocky terrain required a 650-foot rappel. *2:15 P.M.*

Hornbein Couloir

Great Couloir

South Col route

Camp III
26,080 ft
7,949 m
2:30 P.M.

SOUTHWEST FACE

NORTH FACE

Skiing in thin air
Much of the route was in the "death zone" above 26,000 feet, where there's a third as much oxygen as at sea level, making the physical demands of steep skiing even more severe.

Large sections were covered in rock-hard ice.

Western Cwm

Camp II
22,900 ft
6,980 m
4:30 P.M.

At its steepest, the route hit 50 degrees.

Japanese Couloir

NEPAL
CHINA

A crevasse known as the bergschrund provided a risky challenge near the end. *5:10 P.M.*

Rongbuk Glacier

Camp I
20,040 ft
6,108 m

SKI ROUTE FINISH *5:30 P.M.*

Climbing route

To Base Camp
1 mile

Khumbu Icefall

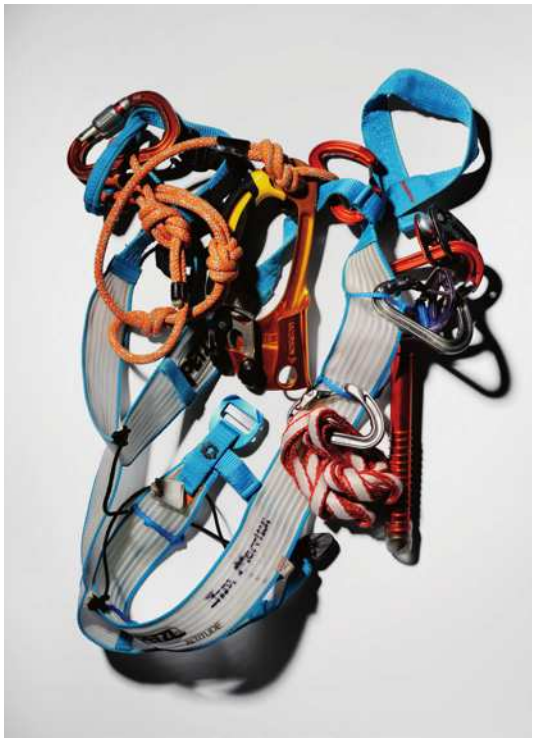
To Advanced Base Camp
5 miles


ATK
BINDINGS
SKI
KVASIAR
ATK
tip: 13.6
waist: 9.5
tail: 11.4
radius: 17
if you can read this
you're not skiing
mounting area
mounting area









To ski Everest, Morrison relied on a carefully chosen list of gear that he'd refined on peaks around the world. Clockwise from left: Morrison's skis; a photo of Hilaree Nelson he had tucked into a journal in his backpack; the ice ax he used on the ascent; a lightweight mountaineering harness for the two rappels; and a radio for communicating his progress to the rest of the team.

just felt like, I can totally ski this. I'm a few inches from glacial ice, and I'm totally confident I can make this turn. And this turn. And this turn. The whole expanse of that terrain, the airiness under my feet, it was really everything I've ever dreamed about and wanted in skiing.

How did you train?
Jimmy and I would load 45 pounds of weights in a backpack and hike up to the top of the tram in Jackson Hole. We'd lay that iron down on the floor and the tram operator would look at us like, Holy crap, what's in that pack? We'd take the tram down to save our knees, then we'd do it again to make an 8,000-foot day.

And when you went to Everest in the fall of 2025, you were just months off of knee surgery?
I had a partial knee replacement on April 23, in Florida, and I left for Everest four months later. I was focused on the recovery, and it was going great; I felt like I was 30 again. I guess you could say I was lucky I didn't have to ski until the end of the expedition, but it was a dramatic first run on my new knee.

You and Jimmy had a large team up there and ended up putting 12 people on the summit. How did you manage the risk with a group that size?
We pushed really hard when it was time to push and pulled back when it was time to pull back. That's a big part of why it took us three years and three different expeditions and why we weren't successful until we put together exactly the right team. They all truly wanted to be there, to be part of enabling me to do this descent and achieve this dream, and to celebrate Hilaree. Every person there was invested in that story in a way that was true to their passion and true to their heart.

What would Hilaree have thought of the descent if she had been with you?
I think she would have thought it was really intense. But I think she would have been proud of the way we all worked together to pull it off. Her energy and her spirit were big parts of our success.

How much did you two talk about risk and the possibility of not coming home?
We talked about it with each other a lot, and we talked about it in public. She had a profound desire to live her life fully as an autonomous human being. Especially as a woman, she felt a strong desire to break free from the guidelines imposed upon her, that because you're a mom you should do X, or because you're a woman you should do Y. She felt it was OK to leave for a month, or six weeks, to pursue her own dreams and to show her children that having passion is what gave her her compass. That passion was her direction, and it was solely hers. They could have whatever passion they wanted, but it was important that they followed it and fostered it.

In the film, we hear Hilaree talking about how hard it was for her to transition on expeditions, both leaving and coming home. How has coming home been for you?
It's always hard. It's been common to come back, and a couple weeks later my phone rings, and it's my friend Jeremy Jones, who's been on plenty of big expeditions. The first thing he says to me is, "How's the PTSD going?" Which is his acronym for post-traumatic stoke disorder. And he knows, because he's experienced this himself. You're across the world, you're organizing your team, you're motivating everyone. There's rockfall and snowfall and bad weather, and you've been living where everything is this life-or-death opportunity. Then you come back, and





At 1:25 p.m. on October 15, 2025, Morrison began his four-hour descent of the icy, exposed, and wildly steep north face of Mount Everest.

PHOTO: NATIONAL GEOGRAPHIC

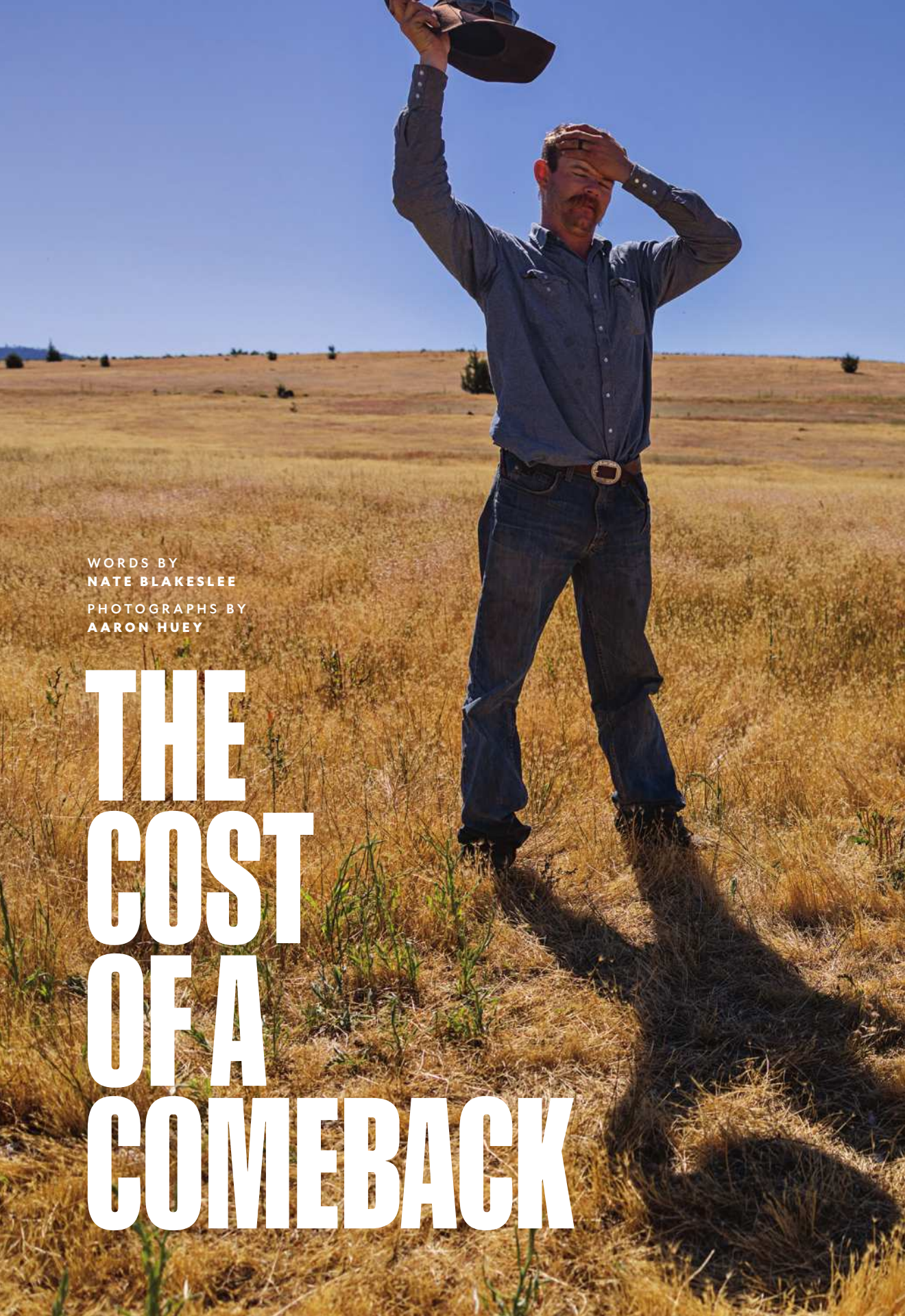
you land at the Truckee airport, and you go to the sandwich line, and the girl at the counter is like, "Hey, Jim. How's it going? How's your summer?" And she has no idea you've been doing all these things. Should I just say, "It's going good, everything's good," and get my sandwich? Or say, "You know what? I just barely survived this crazy thing. I walked through this incredible situation and somehow came out the other side."

Has completing Everest given you a sense of closure or catharsis?

There were lots of cathartic moments during the whole journey. I think it wasn't until I crossed the bergschrund at the bottom, and I got to camp, and we got everyone back, that I could take a deep breath and let my shoulders down and say, I did my best at that. It doesn't fix anything. It doesn't bring her back. But it lets me move forward in a positive manner. And hopefully it keeps her story alive. ▯

This interview was edited for length and clarity.

Everest: The Other Side is now playing in theaters and IMAX. Check local showtimes.



WORDS BY
NATE BLAKESLEE

PHOTOGRAPHS BY
AARON HUEY

THE COST OF A COMEBACK



Across the pastures of Northern California, more than 200,000 cattle are under threat as wolves return to their former range. Ranch hand Sam Harper discovers a dead calf near the city of Montague.

A century after being driven out, wolves are returning to California—and sparking a new fight over livelihood, identity, and the meaning of the wild.



A Department of Fish and Wildlife official checks on a wolf that's been trapped during a recent collaring operation. By tracking wolves more closely, officials have identified 11 wolf packs roaming the state.





SUSAN HART FIRST NOTICED the wolves one summer about six years back. They'd pop up in the evenings on the ridges of the ranch she runs with her husband, Blair, whose family has raised cattle near Montague, California, since 1852. The Harts are one of the oldest ranching families in Siskiyou County, an enormous, sparsely populated region of rugged mountains and pristine valleys near the Oregon border. The most frequent visitor Susan saw was a wolf with a distinctive light coat and an injured foreleg that spent a lot of time watching the herd. It was clearly too slow to catch a mule deer, the most common prey animal in the nearby mountains, and Susan was worried that it was just a matter of time before it became bold enough to attack one of her animals.

That day came in the fall of 2021, when she and Blair awoke to find a bloodied calf with a huge portion of its hide torn away. The calf somehow survived, but the wolves, known as the Whaleback pack, struck again roughly a year later, taking three calves in one night. At 2022 prices, it was a more than $7,000 loss.

Thus began a seemingly endless series of all-nighters watching pastures, patrolling fence lines, blasting music, and flashing lights—even spreading human urine as a deterrent. Still, the wolves lingered. Out of ideas, Susan called a wolf expert at the University of California, Berkeley named Arthur Middleton to plead for advice.

To her surprise, Middleton, a National Geographic Explorer, and another ecologist from the university named Justin Brashares, an Explorer in Residence, offered to drive five hours north for a visit. Like most ranching areas, Siskiyou County is a very conservative place. "It was all hush-hush because we didn't want the neighbors to know that we had Berkeley professors up here," Susan told me. It was the start of not only a lasting friendship



On many ranches, a new vigilance has taken hold. Ranchers are finding non-lethal ways of managing the threat of wolves, including hiring patrolmen like Miguel Rubio to stand watch all night and deter the animals before they strike.

but also a groundbreaking research project with results few could have anticipated.

The Whalebacks are the descendants of wolves that began drifting down from Oregon 15 years ago, starting with a single intrepid male known as OR7. His appearance in 2011 signaled the return of an animal that had been missing from the Golden State for close to a hundred years.

Canis lupus, commonly referred to as the gray wolf, can be black, gray, or white, and ranges in size from 60 to 145 pounds. It was once the world's most widely distributed land mammal, and was found across most of the contiguous United States. In the 19th century, fur trapping devastated the wolf population in the West, as it had done across the country. The arrival of ranching to the Rockies, which brought widespread poisoning of wolves, finished off the few remaining holdouts by the 1920s.

But in the absence of an apex predator, elk populations exploded, damaging the landscape. In an unprecedented effort, officials reintroduced 66 wolves to Yellowstone National Park and central Idaho in the mid-1990s. There are now some 2,500 of the animals across the northern Rockies, along with about 300 in Oregon and California. Wolves' impact on the greater Yellowstone ecosystem has gone far beyond restoring balance to the elk population. Competition from wolves, for

example, has reduced coyote numbers, which has resulted in more rodents left for raptors to eat and better pronghorn fawn survival rates. Carrion from wolf kills, meanwhile, has become an important source of food for bears. The wolf's return and rapid spread is widely considered one of the greatest wildlife conservation success stories in American history.

Ranchers in Northern California don't see it that way, though. The wolves that made their way here encountered a different landscape—more people, fewer game animals, and a lot more cattle. Not long after they arrived, wolves began killing livestock, mostly calves, which are far more vulnerable than adult cattle.

Middleton and Brashares, the two ecologists, spent the night in the Harts' bunkhouse, where they talked late into the evening. They knew that California lacked the enormous expanses of public land that had made the northern Rockies an ideal choice for wolf reintroduction. That meant private ranchlands would bear the brunt of the wolf's expansion, and it also meant that anyone who wanted to study the wolves would need access to those same ranches. Gaining the trust of the traditionally insular ranching community would be critical, and that meant that what mattered to ranchers was suddenly very important to biologists too.

In the bunkhouse, they hatched the plan for the California Wolf Project. The idea was to map out where wolves were likely to spread next, and to help communities deal with the issues that would arise.

At the time, Middleton imagined that the Whaleback pack might soon move on from the area around the Hart ranch, since so few deer were there for them to eat. But that wasn't what happened, and before long, the Harts' neighbors were losing calves at an alarming rate.

Outspoken ranchers and advocates like Julie Dawson-Parlee and Pat Oilar are convinced that the state government can do more to help them protect their cattle and livelihoods.



TO WRAP THEIR head around the problem, the Wolf Project team started setting up game cameras on public land to see how wolves were using the habitat and began collecting wolf scat to see what they were eating. Like most ranchers in the mountain West, Siskiyou County producers tend to summer their cattle at higher elevations, usually on public land leased from the U.S. Forest Service. The grass in the mountains is a cheap way to fatten calves, but roaming cattle are difficult to monitor and much more susceptible to predation.

At a community meeting last January, conservation scientist and National Geographic Explorer Kaggie Orrick, who now serves as the Wolf Project director, shared the findings of a recent two-year-long study with a room full of Siskiyou County ranchers. For a Tuesday evening in tiny Lake Shastina, population 3,000, the turnout was considerable—filling the conference room at the Lake Shastina Golf Resort.

Nobody was surprised when Orrick announced that the Whalebacks were the most prolific livestock hunters in the state. The pack, which had 10 pups the previous summer and numbered perhaps as many as 16 wolves, had been responsible for at least 114 confirmed or probable losses since 2021, though the actual number is no doubt higher, since the remains of many missing animals are never found. But the study results Orrick unveiled next sent shock waves through the room: Scat analysis revealed that the Whalebacks' summer diet was 92 percent livestock. Even Orrick, who had spent months compiling the data, seemed at a loss for words.

"All I'll say is this is extremely—," she began.

"Not OK," yelled a woman from the audience.

"Not OK," Orrick agreed.

"It's learned behavior," another rancher said. "The young wolf is learning to kill livestock from the older animals."

Even though such a dynamic has seldom been seen in the 30 years researchers have studied wolves in the northern Rockies, the possibility that it might be happening now in some of California's packs is forcing wildlife officials to make difficult choices.

Recently, 250 miles to the south, in Sierra Valley, the Beyem Seyo pack had killed dozens of cattle in just a few months. In response, the California Department of Fish and Wildlife decided to kill the pack's breeding pair and a mature female. It was an extraordinary decision that made national headlines. But Siskiyou County's ranchers seemed ready for similarly drastic intervention. "Maybe we should wipe out the



In Sierra Valley, when wolves were suspected of killing an elk in a residential area, a local sheriff took to social media to warn of a serious public safety concern.

PHOTO (SIERRA VALLEY): MATT KILMURRAY, COURTESY COUNTY SHERIFF



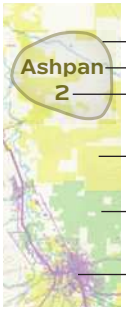
Researchers studying five of the state's packs discovered that for many months of the year, the wolves' diet consisted mostly of cattle.



A New Home for Wolves

When gray wolves began making their way back into California after nearly a century away, the state they found had changed dramatically—there were more people, more cattle, fewer animals for them to eat, and a complex network of public and private land crisscrossed by busy roads.

Landscape of the Gray Wolf



Wolf pack territory, July 2026
Ashpan — Pack name
2 — Minimum number of adult and juvenile wolves observed

Public grazing land
Cattle grazing, May–September

Private forest and agricultural land
Timber, ranching, and farming activities

Built-up area

Where wolves wandered

Most of California's wolf population descends from wolves that federal officials reintroduced in Idaho and Yellowstone N.P. in the mid-1990s. As they fanned out westward, wolves began entering California in 2011.

Range of gray wolf (*Canis lupus*) ← General dispersal

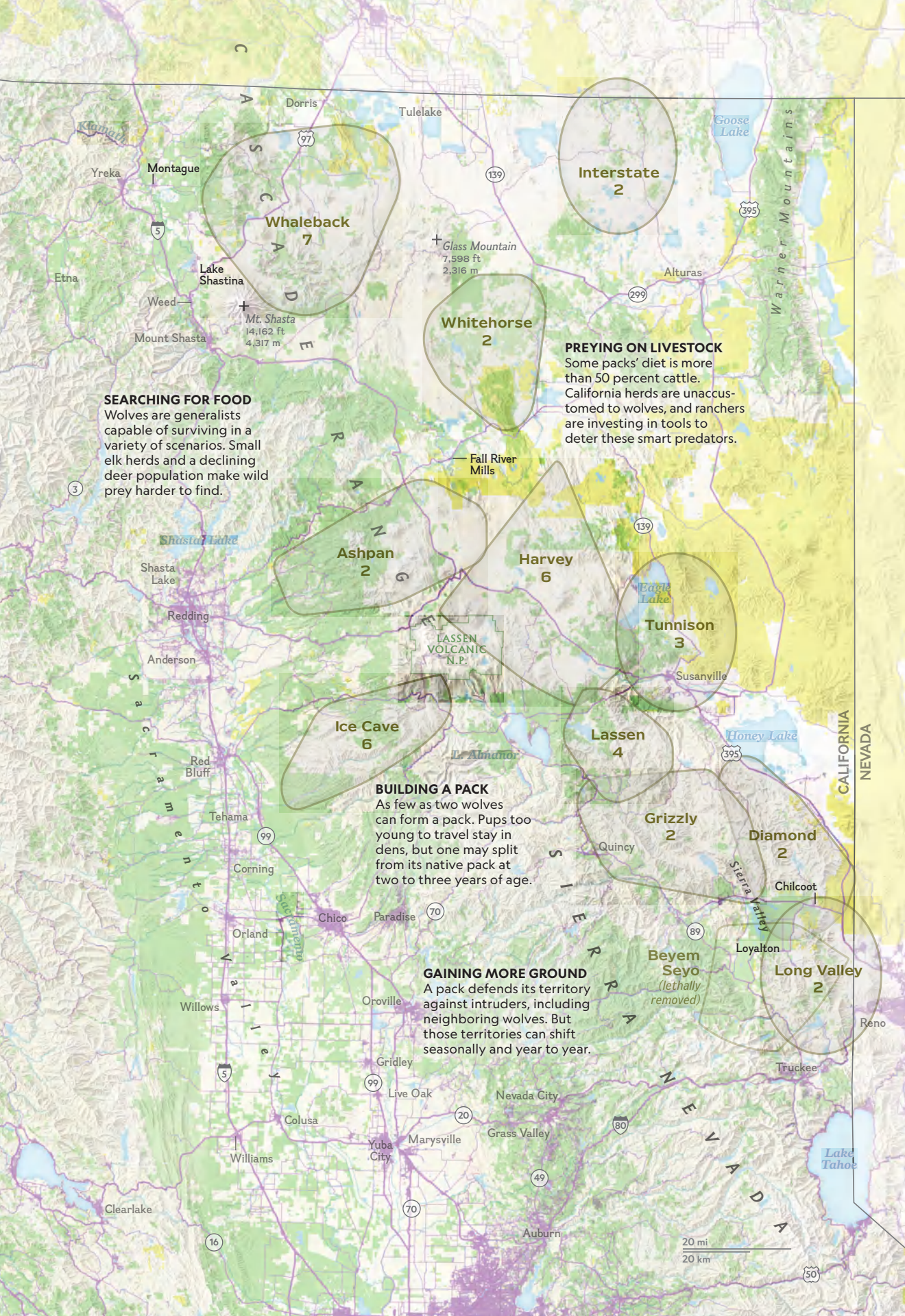
First entry
A wolf called OR7 crossed the California state line in 2011.

Longest trek
Wolf OR93 traveled about 1,000 miles before being killed by a vehicle in 2021.

Farthest south
In early 2026, wolf CA091 was spotted in Los Angeles County.

200 mi
200 km

CHRISTINE FELLENZ, BRANDON SHYPKOWSKI, AND EMMA DILIC, NGM STAFF. SOURCES: KAGGIE ORRICK AND ARTHUR MIDDLETON, CALIFORNIA WOLF PROJECT; AXEL HUNNICUTT, CALIFORNIA DEPT. OF FISH AND WILDLIFE; OREGON DEPT. OF FISH AND WILDLIFE; U.S. NATIONAL PARK SERVICE; U.S. FISH AND WILDLIFE SERVICE; CALIFORNIA DIVISION OF LAND RESOURCE PROTECTION; OPENSTREETMAP; LANDSCAN


Dorris
Tulelake
Goose Lake
Warner Mountains
Klamath
Yreka
Montague
Interstate
2
Whaleback
7
Glass Mountain
7,598 ft
2,316 m
Lake
Shastina
Etna
Weed
Mt. Shasta
14,162 ft
4,317 m
Mount Shasta
Alturas
Whitehorse
2
PREYING ON LIVESTOCK
Some packs' diet is more than 50 percent cattle. California herds are unaccustomed to wolves, and ranchers are investing in tools to deter these smart predators.
SEARCHING FOR FOOD
Wolves are generalists capable of surviving in a variety of scenarios. Small elk herds and a declining deer population make wild prey harder to find.
Fall River
Mills
Shasta Lake
Shasta
Lake
Ashpan
2
Harvey
6
Eagle
Lake
Tunnison
3
Redding
LASSEN
VOLCANIC
N.P.
Anderson
Susanville
Ice Cave
6
Lassen
4
Honey Lake
CALIFORNIA
NEVADA
Red
Bluff
BUILDING A PACK
As few as two wolves can form a pack. Pups too young to travel stay in dens, but one may split from its native pack at two to three years of age.
Grizzly
2
Diamond
2
Tehama
Quincy
Corning
Chilcoot
Chico
Paradise
Orland
Loyalton
Beyem
Seyo
(lethally
removed)
Long Valley
2
Willows
Oroville
GAINING MORE GROUND
A pack defends its territory against intruders, including neighboring wolves. But those territories can shift seasonally and year to year.
Reno
Truckee
Gridley
Live Oak
Nevada City
Colusa
Grass Valley
Marysville
Yuba
City
Williams
Lake
Tahoe
Clearlake
Auburn
20 mi
20 km

THE PACK MAY HAVE BEEN RESPONSIBLE FOR THE DEATH OF AS MANY AS 114 CATTLE SINCE 2021.

Whaleback pack," the frustrated rancher suggested, "and start over again."

The issue goes far beyond Sierra Valley or Siskiyou County. The Wolf Project collected data from five packs scattered mostly across the North State, as California's 10 northern counties are known. Every one of the packs had a summer diet consisting predominantly of livestock, and the data showed that predation on livestock went up as availability of native prey went down.

Nobody seems to know for sure why there are fewer deer in the woods here than there were a generation ago, but biologists cite drought and habitat lost to forest fires, which have devastated the North State in recent years. Ranchers add to that list the state's decision to protect the deer's natural predators like mountain lions and black bears.

For now, the mystery of the missing deer remains a puzzle. What is certain is that California's wolf problems are just beginning.

NOT ALL RANCHERS were immediately eager to work with Middleton. The Truaxes are a seventh-generation ranching family in Siskiyou County, and they'd never let him visit their property. But a graduate student on his team had recently met the youngest daughter in the family, Kylee, who at just 20 years old was gradually buying her grandparents out so that she could run the ranch with her father. This is always a dicey proposition, because it requires the next generation to take on debt, which is generally guaranteed by calf sales. Kylee's future now hinged in part on finding a solution to the wolf problem. After an attack, also called a depredation, last winter, she persuaded her father to let Middleton and his team visit.

Middleton, 47, has an easy smile and a salt-and-pepper beard. Boarding school took away his native South Carolina accent but not his southern manner; he has a slow, thoughtful way of speaking and seemingly boundless reserves of patience.

As is often the case when he meets a new ranching family, Middleton found himself listening to a considerable amount of venting about the California Department of Fish and Wildlife, which many ranchers believe is incompetent, overly secretive, and uncooperative. The department has a wolf collaring program, but currently only six of the state's 11 packs have a wolf with a working collar. Ranchers can access a website with a map showing location information collected from the GPS-enabled collars. But the data are uploaded only once a day, to preserve the collars' battery life. And the department shares only general location data, which makes it even more difficult for ranchers to know exactly where a pack might strike next. Sensitive information, like the location of dens with pups, is a closely guarded secret, as are the frequencies of the radio transmitters on the collars, which allow regular tracking.

Even if they find wolves, there is little California ranchers can do about them. In Wyoming, Montana, and Idaho, wolves were gradually removed from the endangered species list as they became more numerous, and can now be hunted and trapped in all three states. Wolves that prey on livestock, meanwhile, are routinely shot. But California wolves are another matter. Here the state's handful of wolves—estimates range from

60 to 90, spread mostly across the North State—enjoy the full protection of the federal Endangered Species Act, as well as state regulations that have historically prevented ranchers from using more than flashing lights or loud noises to drive them off. CDFW has encouraged ranchers to adopt management strategies that have had some success in limiting conflict elsewhere: installing specialized fencing that moves in the breeze (known as fladry) and automated noisemakers; limiting calving to one season of the year; promptly removing carcasses that might draw predators; and consolidating operations as much as possible so that cattle can be more carefully monitored. A few cattle ranchers have begun experimenting with livestock guardian dogs like Maremmas and mastiffs, which have long been used in the area to protect sheep from coyotes and mountain lions.

Eventually, Kylee and her father showed Middleton where the calf had been killed, in a pasture remarkably close to a house on the property. The night after Middleton's visit, the wolves came back and took a second calf. In the nights that followed, Kylee, her father, and her 80-year-old grandfather took turns patrolling the ranch until sunrise, hoping their presence would be enough to scare the pack off. But they couldn't stop the wolves from taking a third calf, which Kylee discovered at 3:30 in the morning. "I look, and there's a calf on the ground and it's all eaten up," she said. "And I'm nervous to get out because I don't know if these wolves are 10 feet from me or a hundred feet from me. You just don't know where the wolves are."

In relative terms, North State ranchers have not lost a lot of livestock—Siskiyou County alone produces some 25,000 calves a year—but the depredations tend to be clustered, disproportionately affecting individual

A female wolf from the Harvey pack, one of the largest in the state, is sedated for collaring. Such collars track an animal's location, which could be useful for ranchers hoping to protect their herds. However, wildlife officials have been hesitant to share precise data for fear of unauthorized killings.




American AgCredit



Cowboys in Siskiyou County brand a calf on the Chase ranch, where they have found success keeping their cattle away from wolves by modifying where and how they graze, although such shifts hurt already thin profits.

ranchers. Over the summer and fall of 2025, a single rancher in Sierra Valley lost nearly $90,000 worth of calves. And the habitat is not yet saturated with wolves, suggesting the problem could get much worse. According to the Wolf Project's study of available habitat, in the coming years wolves are likely to spread to the North State counties west of Interstate 5, as well as hundreds of miles south along the Sierra Nevada range.

For years, CDFW has compensated ranchers for livestock lost to wolves, but there is no way to account for the stress and uncertainty their presence has brought to ranching in the North State.

As one of Kylee's neighbors told me, "We are living in a never-ending nightmare."



On her ranch near Chilcoot, Crystal Emsoff breeds so-called guardian dogs to keep wolves away from her grazing livestock.

THE OFFICIALS ON the front lines of the governmental struggle to track and manage the wolves are contending with their own problems. Last winter, CDFW invited me to come along on their biannual collaring operation. Early one frigid morning I met up with Axel Hunnicutt, the state's chief wolf biologist, and his crew outside the hamlet of Fall River Mills, in Shasta County. Wolves from the Harvey pack had been spotted a few miles away, and a helicopter team was working to flush them into the open and dart one or more with a tranquilizer.

Hunnicutt, who cut his teeth studying hyenas and lions in Africa, was excited about the possibilities for how wolves might change the Golden State. Other parts of the country have seen the apex predators provide some surprising ecological benefits, from a greater diversity of plant species to a higher germination rate for blueberry seeds. "Exactly what those effects will look like in California is something we're still learning, and we shouldn't assume they will mirror places like Yellowstone," he said. "But the return of wolves adds another piece back into a complex ecological system." For now, though, he was worried that his base camp was too visible from the road. He knew that curious passersby would eventually stop and ask questions he preferred not to answer, such as where captured wolves would be released—inevitably close to somebody's ranch or grazing lease.

Presently we heard the helicopter coming over the ridge behind us. We could see a wolf's tail hanging out an open door as the pilot made a tight circle down into the clearing. The pilot, a private contractor with decades of wolf experience, had insisted that he and his crew not be photographed. He hoisted the enormous semiconscious wolf over his shoulder, looking like nothing so much as a 19th-century trapper returning to his forest cabin, if not for the bright red jumpsuit. The wolf was a young female with a thick black



winter coat. Moving efficiently, Hunnicutt's team laid her out on a padded tarp on the tailgate of a pickup and began taking her vital signs and preparing her collar.

Almost everyone in the camp had gone to Sierra Valley the previous summer, when the department brought in dozens of personnel to drive the Beyem Seyo wolves out of the area. When that failed, CDFW had tried to kill the wolves with its own staff. But that effort went tragically wrong: They accidentally shot a juvenile male, one of the animals they had planned to capture and relocate. It was the first legally killed wolf in the state of California in almost a century, and CDFW had gotten the wrong one. Eventually, the department called in the helicopter crew to dart the breeding pair so they could be euthanized.

I joined Hunnicutt's crew on the second day of the collaring operation, and he let me know they'd captured three wolves on the first day. Though we spent many hours together in the days that followed, he made no mention of a troubling fact I learned later: One of those wolves had died shortly after being captured. Anytime an animal is tranquilized, there is a chance it won't recover, sometimes due to a preexisting condition that is not immediately evident. It is also possible to run a perfectly healthy wolf to death with a helicopter, if a chase goes on for too long. (The department later issued a press release,





Instead of vilifying wolves, some animal welfare advocates are pushing for wider acceptance. Here, several members of the nonprofit Women for Wolves walk a wolf-dog hybrid on their sanctuary in the Sierra foothills.

reporting that the cause of the animal's death had yet to be determined.)

Many of the complaints about CDFW are attributable to the department's lack of resources. Even as wolves have now spread all the way into Southern California—one was spotted in Los Angeles County last spring—Hunnicutt has just three full-time staff to monitor them all. He told me that he had rolls of fladry sitting unused in his office. Even if he had the money to fund an education campaign about its use, he wouldn't have the personnel to put it up, at least not at anywhere near the scale needed. Meanwhile, funding for the livestock compensation program has often been on the chopping block.

There is a cold logic to the state's frugality: The North State is home to less than 2 percent of California's residents. Wolf attacks on people are extremely rare. And while agriculture has a powerful voice in Sacramento, wolves are not a threat to the state's livestock industry in general, which is concentrated in the Central Valley, where, because the ecosystem has been so altered, wolves are unlikely to ever become established. A majority of state legislators are from population centers like Los Angeles, and most have never been anywhere near the remote stretches of the North State. "I feel like 90 percent of my job is teaching people how we live," Sierra Valley representative Heather Hadwick has said.

Yet many feel that the department could do more with what it has. Hunnicutt told me he tries to call ranchers if he notices that wolves are clustering on their property. With existing technology, however, he could have them automatically notified by text when a collared wolf is detected on their ranch or grazing lease. Ranchers could then haze the wolves off before they got close to cattle. It wouldn't be real-time data, because of battery

Today state officials will compensate ranchers when a wolf kills a calf, making the job of attributing predation an important one. Here, Siskiyou County trapper Dennis Moyles inspects bite marks to confirm that wolves were the culprit.



limitations. But even switching from one morning upload to, say, three uploads of data a night—when wolves are most active—would help tremendously.

So would giving ranchers the ability to haze wolves with something more than bright lights and loud noises. Last summer, CDFW entered into agreements with sheriff's departments in several counties that will allow deputies to use rubber bullets. The state has tentatively suggested allowing ranchers to use paintballs and lengthier pursuit of wolves—on an ATV, for example—provided they first take a training course. CDFW has also signaled a willingness to begin sharing more timely and more precise location information with ranchers, though the details of such a plan are yet to be worked out.

Fifteen years into California's wolf era, ranchers could be forgiven for asking, What took so long? The problem is one of trust, and it originated with the Shasta pack, the Siskiyou County wolves that produced the state's first modern-day litter of pups, in 2015. Much to the dismay of many locals, the pack was thriving. Then one day, they were simply gone. Nobody knows for certain what happened to the wolves, but some biologists suspected they were poisoned. According to Pamela Flick at the nonprofit Defenders of Wildlife, caution is warranted: "Circumstances and population numbers are very different between the northern Rockies and California, just as wolf management should be—at least while wolves remain critically endangered here in the Golden State."

IT WAS THE FIRST LEGALLY KILLED WOLF IN THE STATE OF CALIFORNIA IN ALMOST A CENTURY, AND THEY HAD GOTTEN THE WRONG ONE.

EVEN IF THE STATE FINALLY loosens its rules on hazing, one needn't look further than a single mountainside in Siskiyou County to see that ranching in the North State will likely look different moving forward. No producer in California has lost more calves to wolves than the Martin ranch, which is one of the oldest in the county. Of the $3.7 million paid in compensation statewide through the spring of 2026, $683,000 went to this one ranch.

Yet the Martins' neighbors, the Chase ranch, haven't lost a single calf. The two operations share a fence line, and their summer range is on the same mountain. The difference is that the Chases have turned their operation upside down since wolves first appeared, as owners Dan and Becky Chase explained to me on a visit last January. These days they don't send calves up into the summer range, where the timber is heavy and their safety is difficult to monitor. They now calve earlier in the year and then wean and sell their calves before sending the adult cows—which have proved much less susceptible to predation—up onto the mountain. It means they must pay for more feed, to replace the grass their calves would have been eating in the summer range. And they have to sell them at a younger age and a lower weight, which makes them less valuable. But the change, along with others the couple have made, has meant far less conflict with wolves. (Scott Gliatto, who runs the Martin ranch with his wife, Janna Martin Gliatto, told me they now employ a man to patrol at night, and that depredations have since declined.)

One afternoon, Dan and Becky Chase drove me around their ranch, a sprawling high-country spread with views of Mount Shasta to the south. It is an exceptional operation:



organic feed, carefully monitored soil, meticulously vaccinated calves. It looks like a paradise for cattle and cattlemen alike, which makes it hard to remember that ranching here is hanging on by a thread. One bad year could be a disaster, Dan told me. "We couldn't buy a four-wheeler without a finance package."

Both the Chases and the Harts, who have also done almost everything state wildlife officials and environmental nonprofits have suggested, are an example of how to ranch in a future where wolves will be a fixture. But neither family is comfortable with being called a model. Blair Hart, who is in his seventies, gets up at three every morning to patrol his ranch for signs of wolves, and often helps his neighbors do the same. The stress has taken its toll. "It's not sustainable," Susan Hart said.

Both families look forward to the day when the state feels like a partner and not an adversary. The Wolf Project's Brashares pointed out that pilot programs in Africa alert villagers in real time when problem lions are nearby. "If impoverished countries in Africa can pull this off, then the fourth largest economy in the world has no excuse," he said. As for trusting ranchers with sensitive location information, Dan Chase said that he had passed up dozens of opportunities to shoot a wolf in the past few years. "If we haven't proven trust at this point," he said, "what are you waiting for?"



Born last April near Montague, this new addition to the Whaleback pack is just approaching the age where it will join its parents on hunts. Researchers suspect these packs will continue to grow in size.

The success of the Chase ranch has also resulted in something of a conundrum. In the beginning, the Chases were reimbursed for the cost of changing their operation to avoid conflict with wolves. But that funding didn't last, and the state began paying instead for direct losses only. It is too simple to say that this decision punished good management practices and rewarded poor ones, because not everyone can stop sending calves to their summer range, as the Chases have, and not every lost calf is a result of bad management. But with beef prices near an all-time high, it is not hard to find ranchers muttering about neighbors getting paid top dollar for calves—even scrawny animals that might have been hard to sell at all—left in harm's way and killed by a wolf.

I asked Dan and Becky to consider a thought experiment: If everyone changed operations the way they did when the first wolf arrived, what would things look like today? Becky wasn't sure she knew the answer or even if she liked the question. The management habits of neighbors is not a polite topic of conversation in ranching country, where you rely on them at branding time and in a thousand other ways. But Dan said he thought the wolves would have moved on by now. "All predators will move with the food," he said. "If there's no food source, they're moving to someplace where they can feed themselves. I mean, that's kind of common sense."

Moved on to where, though? The difficult truth may be that until the deer come back, these counties will never be a good place for a wolf to make an honest living. "I wish I could just pick up the wolves here and bring them to the other side of I-5," Hunnicutt said. When wolves finally do spread west of the interstate, they will find a much wilder landscape stretching across the Mendocino and Klamath National Forests and all the way to the coast—woods filled with deer and elk, and, crucially, fewer livestock. Hunnicutt said he could imagine a day when wolves are so well established there that packs in other parts of the state can be managed more aggressively without fear of damaging the wolf's long-term viability in California.

From Susan Hart's perspective, that is too long to wait. "My biggest fear is that the success of the species … is going to overrun the ability of our nonlethal techniques to be effective," she said. Even the state's removal of the Beyem Seyo wolves in Sierra Valley might be only a temporary solution, Susan said, since whatever pack replaces them will likely already be accustomed to eating cattle. Ranchers will continue to learn from the successes and failures of their neighbors, but it's the big picture that worries Susan the most. "We don't have a plan," she said. "That's the toughest thing." □

Their CITY SANK. THEY HELD ON.

Decades of salt mining hollowed out the ground beneath Maceió, Brazil. For those who've stayed as the ground gives way, life now is a surreal act of hanging on to a place that's slipping away.

Words by SHANNON SIMS
Photographs by MAÍRA ERLICH



→ **DAVID RAFAEL DA SILVA SANTOS** felt the ground shake under him. It was March 3, 2018, and Santos, then 14, was playing soccer in the streets of Maceió, a coastal city in northeastern Brazil. His grandfather had taught him to feel with his feet when he was learning to hunt for *sururu,* the mussels that locals dig with their toes out of the city's Mundaú Lagoon. But he'd never felt anything like this. "I remember the fear," Santos told me recently when I visited him in Maceió. "Before that, I'd never even heard of Braskem."

Braskem, the largest petrochemical company in Latin America, and its subsidiaries had for more than 40 years mined under the lagoon for rock salt, used to make chlorine and the plastic polymer PVC. Now the ground was shuddering due to subsidence caused by widespread perforation of the lagoon floor, as a study by the Geological Survey of Brazil later revealed. What Santos was feeling was a 2.4 magnitude earthquake in a country that doesn't have significant earthquakes. Maceió was sinking.

Like a slow-motion avalanche, the devastation to an area of around 890 acres has gradually, relentlessly,



Since 2018, more than a square mile near the lagoon in Maceió, Brazil, has been largely evacuated. Maxsuel Nunes dos Santos, in yellow shirt, has remained in his damaged neighborhood.





Like many of the displaced, Luzia Odete da Silva (top) has struggled to find new housing. Only recently did she find a suitable replacement.

Helena Valdevino da Silva's house (bottom) is one of thousands riddled with cracks. A lawsuit alleges that improper mining caused the damage.





Victims in this once vibrant neighborhood (top) accepted buyouts from the mining company Braskem, which then razed the empty houses.

Luciene Ferreira de Lima (bottom, at left), her grandson, Anthony, and daughter, Laís, revisit their former street. The disaster has scattered their extended family across the city.



upturned lives in this city of about a million people. When one of Braskem's mines partially collapsed a few years ago in the same area near the lagoon, local news reported a crater opening in the sururu-filled water. Sidewalks and streets have buckled, and houses across five large neighborhoods along the lagoon have cracked open, leaving jagged gashes in interior walls. More than 60,000 residents have been displaced and 14,000 properties abandoned, triggering a housing frenzy as prices in nearby neighborhoods have boomed, making it difficult for families to find new homes. The sinking of coastal cities around the globe has become a pressing issue, due largely to the excessive pumping of groundwater. But in Maceió, the crisis has become what Natallya Levino, a professor of finance at the Federal University of Alagoas in Maceió, calls the largest ongoing environmental disaster in any urban area in the world.

In response, the city government declared the affected neighborhoods uninhabitable. Braskem has committed nearly three and a half billion dollars to deal with the crisis, but some residents say the buyouts the company has offered them to relocate have been inadequate. Victims have petitioned local courts to increase the amounts,



The surrounding forest has started to reclaim houses awaiting demolition. Some residents who were offered buyouts have filed lawsuits seeking more compensation.





In this largely deserted neighborhood, the trains no longer run, and the residents who remain reportedly let their horses roam free.

and some have filed suit in the Netherlands, where Braskem has subsidiaries. In 2024, a Dutch court found the company liable and ordered it to pay a yet-to-be-determined amount of compensation. And in June, a federal court in Brazil allowed a criminal case to proceed against Braskem that alleges irregular extraction methods and misleading environmental studies. In a statement, Braskem maintains that its mining was conducted with proper oversight and "in accordance with the best available practices." And following the subsidence, the company "has implemented a broad range of initiatives developed in dialogue with public authorities and local communities to support improvements in infrastructure" and other city services.

When I visited recently, the urban clamor died down as I approached the affected area. Maceió is known for its fishermen's handmade wooden boats, called jangadas, and Caribbean-style beaches. But a haunting, heavy silence pervades the abandoned sections, now lined by a maze of corrugated metal walls. The forest on the edge of the city is slowly blanketing the houses with papaya trees and vines. Braskem has installed surveillance cameras to monitor the empty streets and seismographs to measure vibrations in the soil. Only graffiti recall the former residents' lives: "Braskem sank our dreams," reads one message. "We were happy here," laments another.

Luciene Ferreira de Lima, 50, worked as a teacher for 17 years in a now shuttered



Maxsuel Nunes dos Santos gives his cousin Robson Rafael Nunes dos Santos a trim in their partly vacated neighborhood. Victims have clung to old traditions even as the crisis—and lawsuits—continues.

school, one of about 40 that have been closed. Today her family is scattered across the city, and she is out of work. Since the disaster, Lima says, she's had trouble sleeping and sometimes takes medication to calm herself down. A report by the National Committee in Defense of Territories Against Mining attributes a dozen suicides to the fallout of the calamity. Lima sobbed as she told me she has not been able to find work. She was too emotional and cried during a job interview. Her mother died soon after the displacement—of sadness, Lima believes.

New portions of the city continue to be blocked off as construction equipment bulldozes the homes residents left behind. People in neighboring areas carry the pervasive stress of not knowing if they're next. "The process of subsidence is ongoing," says Levino. "The ground still isn't stable."

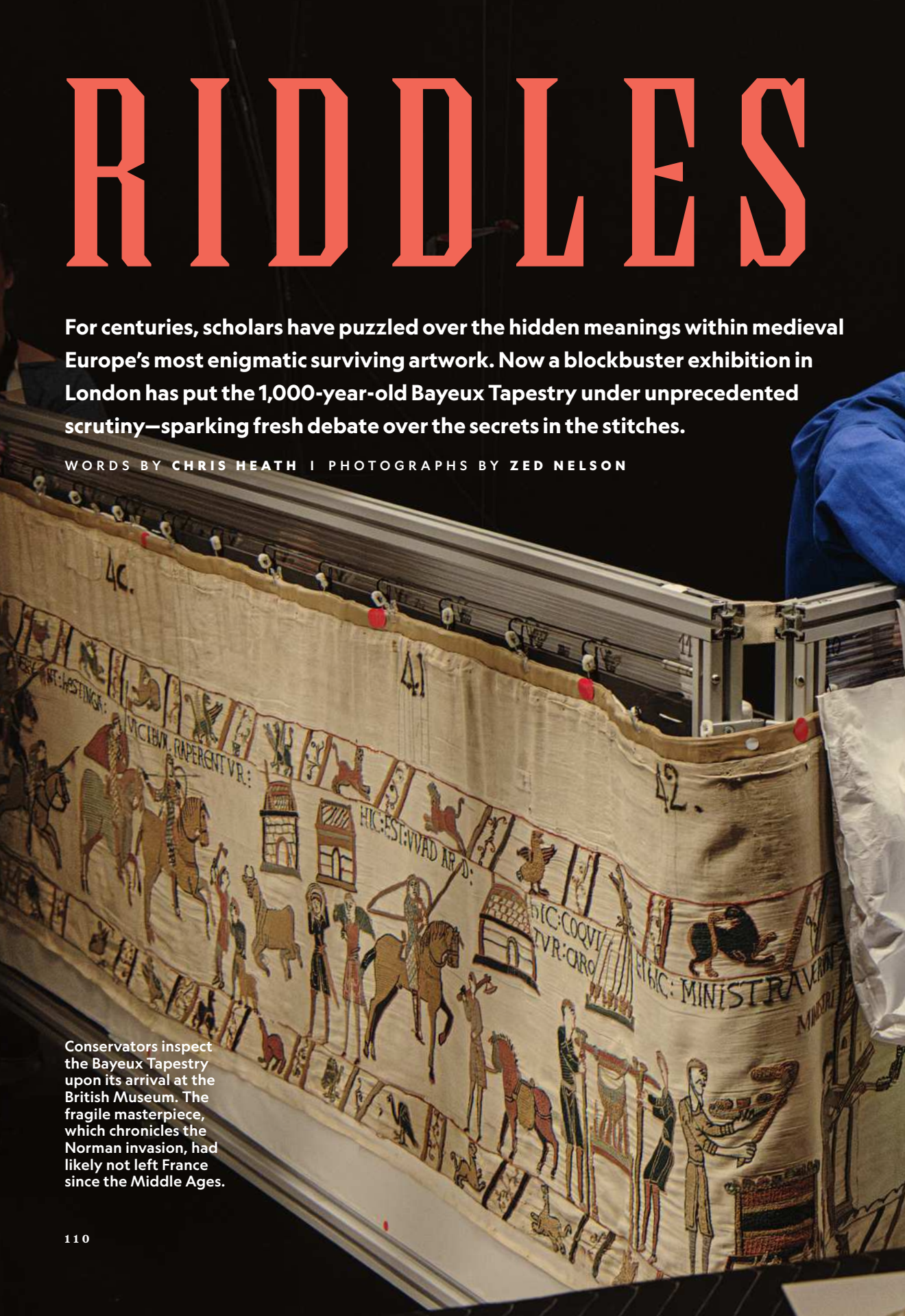
Amid victims' sadness over losing their former homes, some routines endure. Santos occasionally returns to the lagoon to hunt for sururu. A 65-year-old fisherman, Damião Carlos da Silva, and his wife, Luzia, once lived along the water. They recently secured public housing across town, but Silva refuses to move. Instead, he's set up a clandestine shelter paces from where he fishes. His home, he says, is here. ▯

▯ The nonprofit National Geographic Society, committed to illuminating and protecting the wonder of our world, funded the work of National Geographic Explorer and photographer Maíra Erlich featured in this story.

RIDDLES

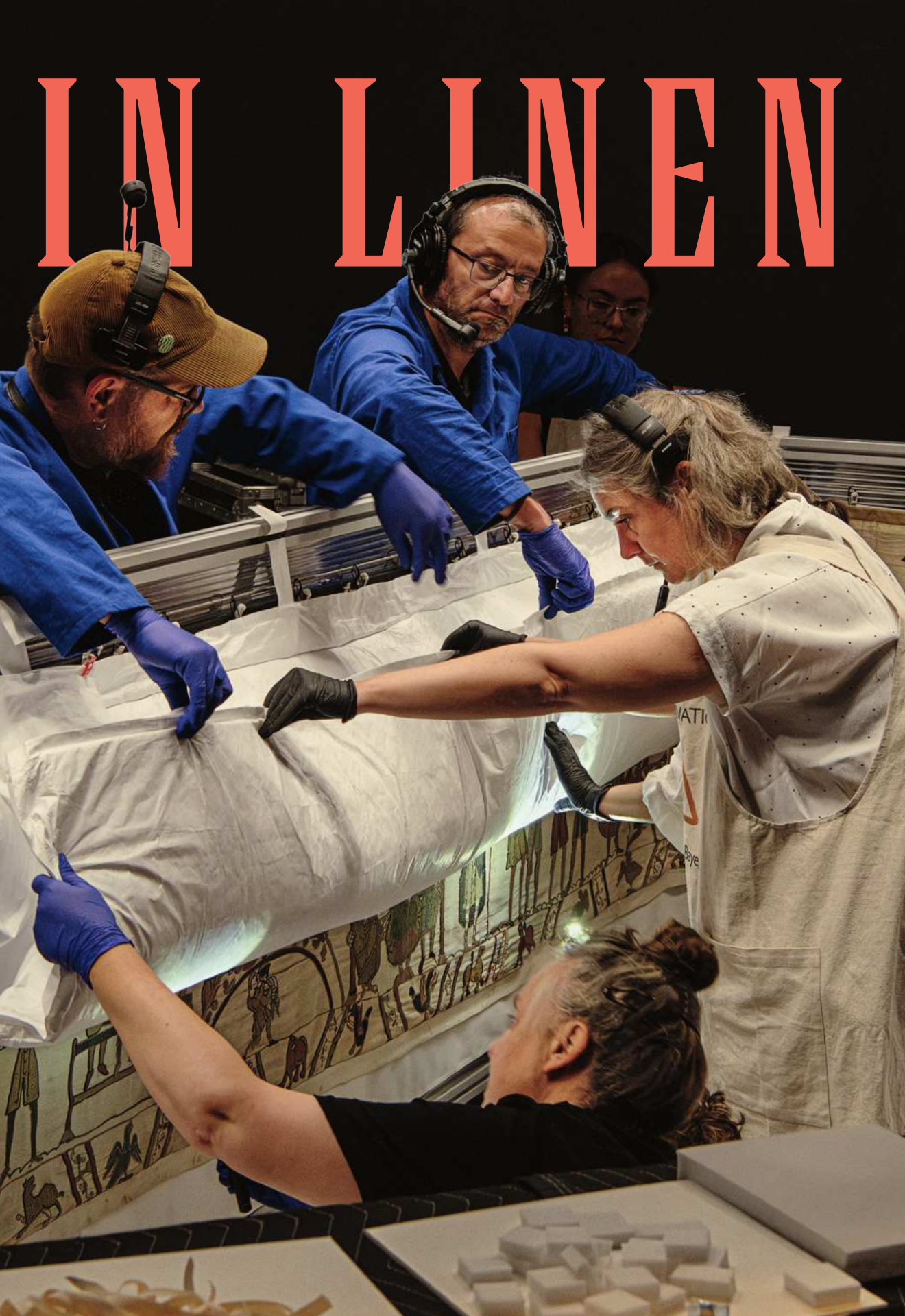
For centuries, scholars have puzzled over the hidden meanings within medieval Europe's most enigmatic surviving artwork. Now a blockbuster exhibition in London has put the 1,000-year-old Bayeux Tapestry under unprecedented scrutiny—sparking fresh debate over the secrets in the stitches.

WORDS BY **CHRIS HEATH** | PHOTOGRAPHS BY **ZED NELSON**



Conservators inspect the Bayeux Tapestry upon its arrival at the British Museum. The fragile masterpiece, which chronicles the Norman invasion, had likely not left France since the Middle Ages.

IN LINEN



Of all the wonders and mysteries that surround the 225-foot-long medieval artwork known as the Bayeux Tapestry, perhaps the greatest of all is its survival. There are so many ways for any fragile piece of fabric not to endure, whether by processes of nature (rot, heat, mold, pests, humidity, sunlight), by accident, or by the careless and destructive acts of humans. As the centuries pass, few such objects evade at least one of these fates. But the Bayeux Tapestry—not only a relic from a past almost inconceivably different from our own but also an incomparable window into that past—has done so for nearly a thousand years.

It hasn't come through unscathed. Its edges are scattered with pinholes where it was formerly exhibited using nails. It has been splattered by wax, likely while displayed in a cathedral in the northern French city of Bayeux. It is creased and frayed, in part from the winding and unwinding of a spool on which it was kept in the 19th century. In 1792, during the fervor of the French Revolution, it was once apparently taken as convenient material with which to cover a wagon, only to be saved by a citizen





The tapestry's loan, spurred by renovations at its home museum in France, offers experts an unusually intimate look—and perhaps opportunities to answer age-old questions.



A 19th-century postcard image shows the tapestry in a library in Bayeux, France, its home city since at least 1476 (when a Bayeux Cathedral inventory listed it) but likely for centuries before.

who valued its significance. The centuries of manhandling and entropy have taken a toll. A French conservation team, studying the tapestry in detail six years ago, documented 24,204 stains, 16,445 wrinkles, and 9,646 holes and gaps.

The Bayeux Tapestry, which is currently the subject of a headline-making exhibition at the British Museum, is not technically a tapestry at all but an embroidery: dyed wools stitched on bleached linen base cloth. Its embroidered scenes tell the story of the Norman Conquest of England, the 1066 invasion by William the Conqueror and an army from what's now northern France, which ended Anglo-Saxon rule and reshaped England's politics, culture, and language. It is broadly, though not universally, believed to have been created in the south of England in the late 11th century and brought to France soon after, and for as far back as it can be traced definitively—only to 1476—it has principally been kept in Bayeux. The current visit to London, most historians believe, is its first time out of France in roughly 950 years.

The enduring fascination that surrounds it partly relates to how little about the tapestry we can say for certain. Discussion and exploration of exactly what it depicts, and what each image means and how each relates to the others, and of how the tapestry was made, and when, and by whom, and every other kind of particular, have filled hundreds of books and scholarly articles. Its central story concerns the Battle of Hastings, the bloody confrontation at which William's forces defeated those of the English king Harold; generations of British schoolchildren have been taught that this is the moment at which the story of modern England begins. But the battle itself dominates only the tapestry's final third. Its earlier stretches broadly relate

SOCIÉTÉ DES SCIENCES, ARTS & BELLES LETTRES DE BAYEUX

how Harold, not yet king, embarks in 1065 on a voyage to France in which he ends up in William of Normandy's custody. There, he apparently agrees to support William's claim to the English throne—but the current king, on his deathbed, names Harold as his heir. It is only then that William, determined to right this wrong, whips up an invasion fleet, travels to England, defeats Harold, and takes the throne.

That's the basic plot, although lively debates persist about each part of that narrative. For those prepared to dive deeper, much of what the tapestry presents transcends straightforward storytelling. In its broad central strip, where scenes incrementally carry the main story forward, it is not always obvious who any given character is, what each one is doing, or why they are doing it. Words in medieval Latin intermittently offer guidance, but there are only around 380 of these over the tapestry's entire length. In thin panels along the upper and lower borders are many other curious, more allusive images: ghost ships, corpses, people plowing and sowing seeds, creatures both real (birds, dogs, lions, hares, deer, fish) and mythical (centaurs, dragons, griffins), and many scenes that appear excerpted or adapted from popular fables. At times, what is in the borders seems to offer some kind of context to, or commentary on, what is occurring in the main section; at many others, any connection seems, at best, hazy.

When you take in the whole of it, the tapestry offers a rich depiction of a world—of clothes, buildings, creatures, food, weapons, and labor but also of habits, behaviors, demeanors, and status—that seems by turns familiar and fantastically remote.

That, in part, is why the tapestry is so valuable and remarkable. What we know of medieval Europe must be deduced from the best clues we have: archaeological remains; hard-bodied objects like swords, coins, and buildings; what few documents and images have survived. Looked at one way, the scantiness of such clues is a reason the Bayeux Tapestry's mysteries may always outnumber its certainties. But looked at another way, as we continually try to decode that vanished world, the tapestry may itself be the greatest clue we have.

The British Museum's exhibit—which opened in September amid fanfare and lasts through mid-July—is the result of an extraordinary process of both diplomacy and technical precision. Efforts to have the tapestry exhibited in the United Kingdom began stirring long ago. The first formal entreaty to its owners, the French state, is believed to have been made in 1931. When a subsequent request was made in 1953 to coincide with the coronation of Queen Elizabeth II, plans were sufficiently advanced that text for the exhibition brochure was written and a delivery route mapped (by ship across the English Channel, then with a motorcycle escort to London). Then, for some reason, French authorities changed their minds.

Other requests periodically followed, all refused, until about a decade ago, when a specific set of circumstances created a new opening. At that time, plans began brewing to renovate Normandy's Bayeux Museum, the tapestry's home since 1983. To construct a new exhibition space that both improved the viewing experience and conformed to modern conservation standards, the tapestry would have to be taken off display for as long as two years.

The prospect of its removal jump-started a protracted, on-again, off-again political process at the highest levels of the French and British governments. Finally, in July 2025, French president Emmanuel Macron announced the loan was on. In the modern era, the most significant hurdle wasn't necessarily diplomatic but scientific: Many of those who had studied the tapestry most closely now argued that it was too fragile to be transported over such a distance and



The installation of the fragile, 225-
tapestry in a custom display ca
one that only just fits its gallery—w
painstakingly choreographed proc

put into a new display case, only then to repeat the process to return to Bayeux.

But last July, after months of logistical engineering and practice runs, a specially outfitted truck made a secret overnight journey from northern France, under police escort. Among a small group of people who'd been advised of this plan, I watched as the truck backed into the British Museum's loading bay, delivering the tapestry in the early hours of the morning.

I returned to the museum days later to witness the unboxing and installation. The multistage process of unpacking the tapestry and installing it, laid flat, in a custom 227-foot display case required dozens of workers, all playing a part in a delicate choreography. It began with the

opening of a metal box in which
estry had been stored, ingenious
in a kind of carefully padded co
Each fold was gently separated
a layer of white padding, which
vators referred to as a mattress.
new section of mattress was e
a four-person team of conserv
two French, two British—meth



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As each
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inspected every inch of it with a flashlight. Then, as the mattress was incrementally lifted to reveal the tapestry beneath, they repeated the procedure on its underside before eventually scrutinizing each new exposed section of the tapestry itself.

Very occasionally, as they did so, they spotted some tiny particle, which they carefully removed with tweezers and bagged, noting its precise location in a database. (Examined later, under magnification, none were found to be from the tapestry. In September, French authorities reported only two small breaks in threads from the de-installation, move, and re-installation.) Inch by inch, the four conservators repeated the process for five and a half hours.

Among the few permitted to watch the installation were the exhibition's curators. Michael Lewis, the principal curator, is one of the world's leading authorities on the tapestry and was an early agitator for its loan. He watched in fascination as it slowly emerged, in a way he had never before seen it. "An amazing thing to witness," he said.

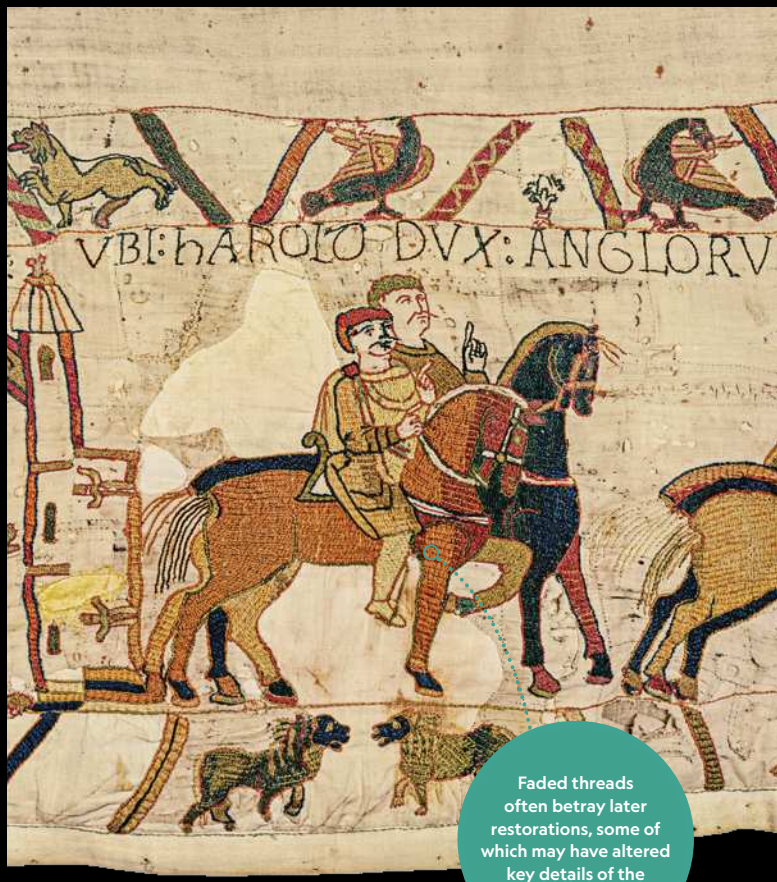
"It's just an absolute thrill seeing it unpacked," agreed project co-curator Millie Horton-Insch, an art historian specializing in medieval textiles. "I will never get to see it with glass off again—so few people are ever allowed to do that … And it's all the things that I always remember about seeing it. I can't believe how big it is, and I can't believe how beautiful it is. I can't believe how three-dimensional it is and how much you think about the people who made it when you look at each of the individual stitches."

As for who those people were, that's just one of the many facts about the tapestry that have been keenly debated for more than 200 years.

WHO, FOR INSTANCE, was responsible for the idea of making such an ambitious work of art and storytelling? As there are no surviving accounts of the tapestry's creation, most

EVERY STITCH A STORY

In 225 feet of embroidered linen, the Bayeux Tapestry chronicles a disputed throne and an epic battle that remade England. Look beyond the plot, though, and there's even more to interpret: mysterious figures, allegorical symbols, and nearly a thousand years of wear, tear, and care.



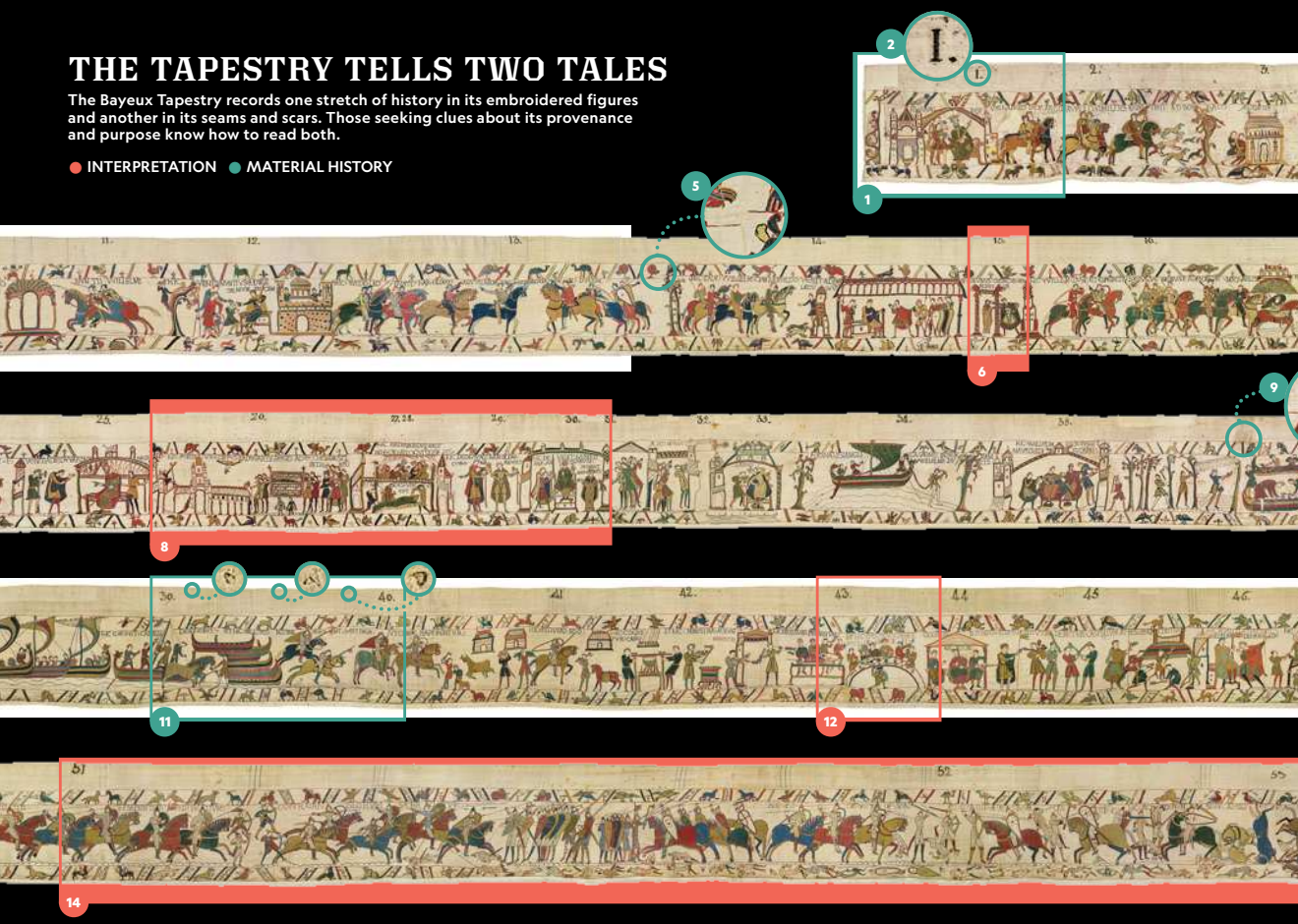
Faded threads often betray later restorations, some of which may have altered key details of the tapestry's story.

PHOTOS: ANTOINE CAZIN, LA FABRIQUE DE PATRIMOINES EN NORMANDIE

THE TAPESTRY TELLS TWO TALES

The Bayeux Tapestry records one stretch of history in its embroidered figures and another in its seams and scars. Those seeking clues about its provenance and purpose know how to read both.

● INTERPRETATION ● MATERIAL HISTORY



1

The story opens on England's King Edward the Confessor speaking to Harold Godwinson before Harold journeys to Normandy—but some believe that a length is missing from the tapestry's front end.

2

An unknown hand inked numerals onto the tapestry's backing around 1800, dividing its narrative into numbered scenes for reference.

3

Scenes seemingly from Aesop's fables play out along a segment of the lower border. Historians debate whether these are simply decorative or offer comment on the story unfolding above.

4

A figure named Turold appears as Harold is taken to Duke William of Normandy. A few scholars suggest that Turold and two others commissioned the tapestry as a gift for William, who'd imprisoned their lord, Bishop Odo.

5

The tapestry consists of nine linen panels sewn together. Embroidery covers most seams so well, they're hard to spot, but misaligned borderlines here give one away.

6

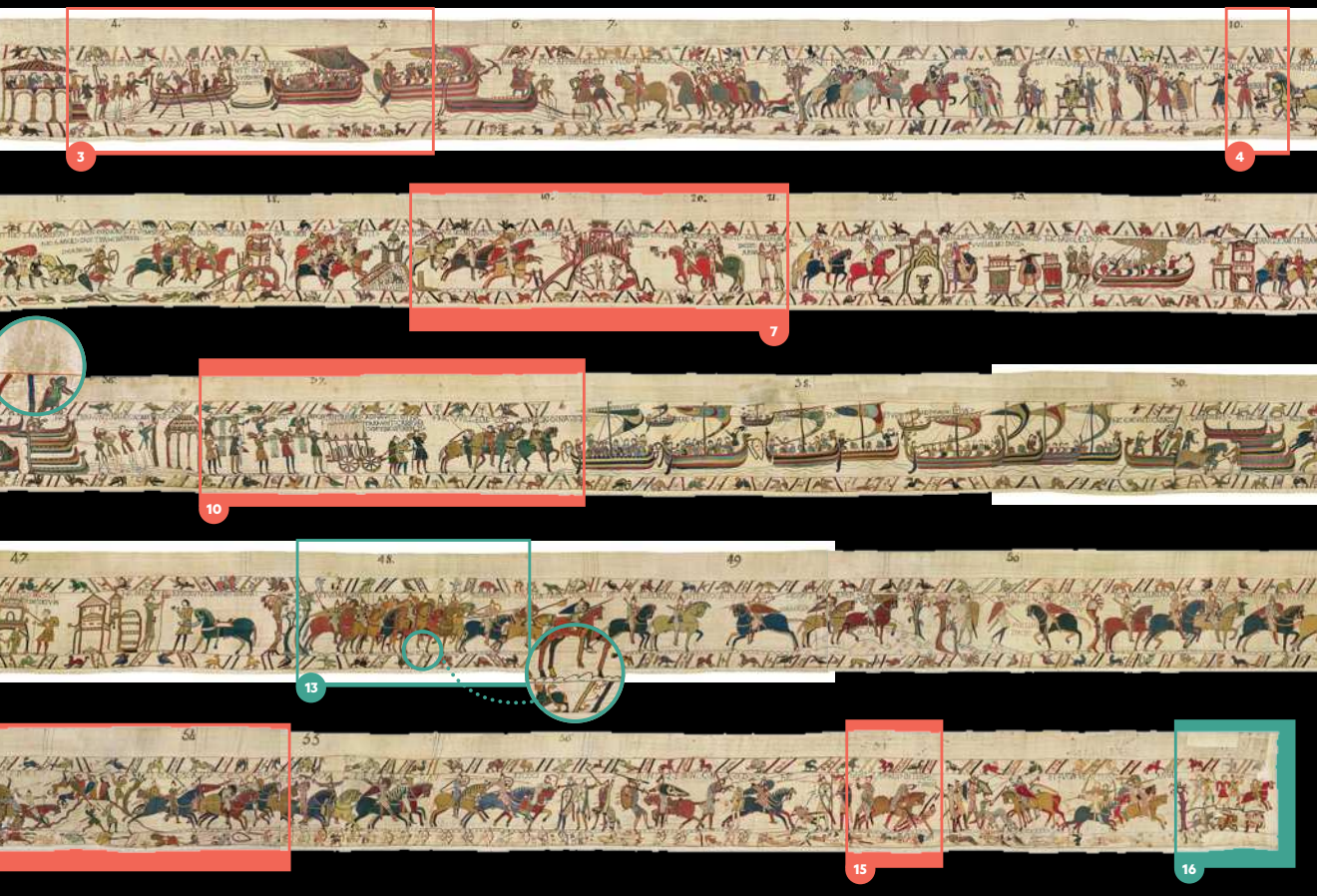
One of the tapestry's great mysteries concerns a woman the text labels Ælfgyva. An anonymous cleric is stroking—or slapping?—her face, while in the border below, a nude man mimics the gesture, prompting theories that the scene recounts a sex scandal.

7

Several panels follow Harold and William on a military campaign in Brittany. This apparent aside is given such attention, it's been pointed to as evidence the tapestry was made in France.

8

When Edward dies, Harold takes the throne, despite having seemingly sworn loyalty to William a few panels earlier. An ominous star above his throne is Halley's Comet—visible in 1066, though some months after Harold's coronation.



9

Conservators have recorded 26,867 stains, including around this scene of William's army building warships, where candle wax is streaked across the boatbuilders.

10

The tapestry lavishes attention on the Normans' invasion preparations, one of the reasons it is typically read as a story told from the Norman perspective.

11

Tiny dots along the upper and lower edges are holes. The tapestry was nailed up for exhibit during the 19th century.

12

Bishop Odo, William's half brother, hosts a prebattle feast. His otherwise surprising prominence—here and elsewhere—leads many to peg Odo as the tapestry's patron.

13

Some wrinkles and creases are clues to how the tapestry was stored—for example, it's thought to have been rolled and stowed in a chest for centuries at the Bayeux Cathedral.

14

The Battle of Hastings is depicted with fallen soldiers, stabbings, and beheadings. Some experts argue the tapestry glorifies the Norman victory; others see it as an invitation to ponder the conquest's human cost.

15

Debate surrounds which figure represents Harold falling in battle—the one with an arrow in his eye or the one cut down by a sword—as well as whether restorations have altered the evidence.

16

The story ends abruptly as the English retreat, and some length of tapestry is presumed lost, perhaps as much as 10 feet. William's coronation would be a fitting end, but no record of the missing conclusion survives.


1065
ce with King Edward,
embarks on a fateful journey.
2.
3.



David Owen, a project manager at the British Museum, uncovers the tapestry, which light can damage. The exhibit leaves room for interpretation around its more enigmatic scenes.

of what we believe we know is deduced, or at very least argued, from what is in the tapestry itself. The conventional modern-day view is that it was commissioned by William of Normandy's younger half brother, Bishop Odo of Bayeux, a conclusion largely based on the glorified ways in which he shows up in the tapestry at important moments. But other candidates have been suggested, from minor figures in Odo's world to the abbot of a monastery to William himself.

Where was it made, and by whom? Southern England is generally assumed, but by one or multiple needleworkers? In a secular workshop or a monastery or nunnery or other? All up for debate. Some scholars have argued for a French origin, but they're a substantial minority. Still, before the Bayeux Museum closed for renovations last year, an interpretive panel there acknowledged that "most researchers agree" on England—then expended more space presenting two alternative French locations.

Many of these debates inevitably overlap. Why was it made, and when? If the tapestry was indeed commissioned by Odo, it may have been for the consecration, in 1077, of the new Bayeux Cathedral he was having built, presumably to celebrate the Normans' triumph. Another theory is that Odo commissioned it in a slightly later period, after 1082, when he'd fallen out of favor with his half brother and was incarcerated. In that version, the tapestry is a gift to earn his way back into William's good graces.

One British scholar recently made headlines with a theory that the tapestry was created as mealtime reading for monks in a Canterbury refectory. If that were true, its purpose may have been less to record a series of events and more to provoke abstract moral reflection, the fables and mythical creatures in the margin crucial to what a viewer was supposed to understand. But we can only speculate, because we lack the cultural grammar that its medieval

makers, whoever they may have been, could take for granted. The object we now admire almost certainly contains, there in plain sight, copious lessons, warnings, jokes, and arguments that we are simply unable to see.

Not that researchers have surrendered the effort to decode it—on the contrary, very little of its imagery has gone unexplored. Curious about the role and symbolism of birds within the tapestry? An esteemed British professor has a paper on that. Wonder about its more ribald imagery? Choose a side in the recent scholarly kerfuffle over whether the tapestry depicts 93 phalluses or 94 (most of them, it should be noted, belonging to horses).

A further vigorous field of debate revolves around what the tapestry actually shows in particular scenes. One of its iconic images is of what was long said to be King Harold's final moment, clutching at an arrow that has pierced his eye (and so dramatizing both his tragic personal arc and the English defeat). But historians now argue over both the king and the arrow. The figure, some say, may not be Harold. Even if it is, the projectile may owe something to 19th-century restoration work. A detailed 1729 engraving of the tapestry shows this same figure apparently clutching a spear—no telltale flights and a slightly different, non-eye-penetrating trajectory.

All these variant shades of meaning and interpretation offer a challenge when exhibiting the tapestry, Lewis suggests—giving visitors information and guidance without being overly prescriptive about how to understand what's in front of them. Personally, he doubts the tapestry was intended to show an arrow in Harold's eye. "I'm happy to be proven wrong," he says. "I hope visitors to the exhibition will make sure they can spot the arrow and make their own minds up."

And while so much can be learned, proposed, and contested just by studying what can be seen, another tantalizing prospect remains: If experts were permitted to do more than look, what other kinds of secrets might the tapestry still have to share?

RESEARCHERS HAVEN'T SURRENDERED EFFORTS TO DECODE THE TAPESTRY—ON THE CONTRARY, VERY LITTLE OF ITS IMAGERY HAS GONE UNEXPLORED.

WHEN THE TAPESTRY returns to Bayeux and a new exhibition space next summer, the first priority will be some long-planned conservation work. Even if it survives the trip to and from London undamaged, conservators logged thousands of small tears and other vulnerabilities during a detailed examination six years ago, and the Bayeux Museum's new display case is being built to give conservators access to the tapestry without taking it off exhibition. Their work, says French conservator Thalia Bajon-Bouzid, will be painstaking and unobtrusive. Tiny patches—and, in some places, individual threadlike "hairs"—may be applied from behind to support weakened fabric and relieve the strain around existing imperfections. "We don't correct the defects," Bajon-Bouzid clarifies. The goal is to prevent them from spreading, helping secure the tapestry's future without erasing its past.

Although materials analysis isn't part of the loan agreement while the tapestry is under British care, Lewis hopes all the renewed focus on it might help nudge forward a conversation about what new

science could reveal. The last time any kind of physical testing was performed on the tapestry was also the last time it was moved—in 1982—from a previous municipal exhibit space into what became the Bayeux Museum. Conservators then examined fibers microscopically and used chromatography to identify chemicals in dyes, in addition to removing the tapestry's backing to study evidence of previous restorations.

Research undertaken since then has been less invasive. In 2017, for instance, imaging specialists photographed the tapestry under several kinds of light, including ultraviolet, which helped distinguish medieval materials from those added later. More recently, a team used hyperspectral imaging—measuring how threads reflect different wavelengths of light—to identify different types of dyes without taking samples, enabling them to date more precisely a major 19th-century restoration.

Lewis has set up a committee of conservators, historians, and others to weigh what kinds of research might be worth pursuing. For example, he asks, might closer scrutiny of the way threads are twisted, using tools like digital microscopy, help reveal which parts of the tapestry were embroidered by different hands, given that individuals have distinct styles? What could testing for isotopes or analyzing genetic markers tell us about physical materials—where flax for linen was grown or where the sheep that provided wool were raised? "Could you get as far," Lewis wonders, "as saying that these are definitely from England as opposed to France? Or are they in coastal areas or whatever?"

Carl Heron, the British Museum's head of scientific research and a member of Lewis's committee, is similarly intrigued by what materials science can reveal about the fabric—though one challenge, he says, is having few 11th-century textiles or genomic records of millennia-old sheep for comparing samples. He's more optimistic about what might be learned using mass spectrometry to get a chemical fingerprint of the tapestry's dyes: what recipes made each of the various shades, for example, or whether separate dye batches suggest multiple locations or stages of production.

And Lewis notes that the different elements of the tapestry have never been radiocarbon-dated. Those results wouldn't be so precise as to allow scientists to, say, determine the decade in which materials first existed, but they could likely disprove renegade theories that the tapestry was made as late as the 13th century.

For now, anyway, these are just proposals and hypotheses. Tests like these would require removing small parts of the tapestry—molecular dye studies, for instance, call for fabric samples one to three millimeters long. And it is far from sure that testing would be countenanced anytime soon, if ever, by the tapestry's French guardians.

Debates over such things will roll on. Meanwhile, the British Museum is welcoming wave after wave of the million paying visitors expected during the tapestry's stay in London. The very first arrived one morning in September, walking past museum staff dressed in medieval costumes to step into the gallery. In the world outside, there was a kind of commotion rarely associated with a museum exhibition. The BBC posted live updates all morning, as though the display of a near-thousand-year-old piece of fabric was a breaking news story. In the media, phrases like "Bayeux mania" and "Bayeux fever" were bandied about. But inside the museum, in the quiet of an immense darkened room, was what really mattered. One by one, the first visitors edged forward along the tapestry's length. Each was permitted to spend 40 minutes in its presence, free to decide whether to take a turn at deciphering its mysteries or simply to marvel in awe at the sight of such an improbable and singular beacon from a world long ago. □



Before NASA's astronauts returned to the moon earlier this year, National Geographic outfitted them with a handful of cameras for the journey. The images they brought back—unseen until now—capture the intimate and surreal experience of humanity's farthest trip away from Earth.

SNAPSHOTS OF A MOON SHOT

PHOTOGRAPHS BY THE CREW OF ARTEMIS II



During 10 days aboard the Orion crew module, the Artemis II astronauts typically dressed for comfort, but on Day 5, they tested space suits primarily designed for launch and reentry.





Above:
NASA astronauts Reid Wiseman, Christina Koch, and Victor Glover and Canadian Space Agency astronaut Jeremy Hansen spent Day 1 orbiting Earth.

Below:
Koch poses with Rise, a plushie of a grinning moon and, officially, a tethered indicator the cabin had reached microgravity. Unofficially, Rise was a toy for the crew.

Right:
Glover rests a tablet on the cargo netting that keeps equipment from drifting around the crew module's 330 cubic feet—a space about the size of two minivans.





THERE'S THE ARTEMIS II MISSION that NASA broadcast to the world this spring, and then there's the one that its astronauts saw firsthand. As the first crewed lunar flyby in more than 50 years brought humans farther from Earth than ever before, the team aboard the Orion spacecraft took National Geographic along, documenting their downtime with palm-size cameras that our staff trained them to use. Between checklists and mission tasks, commander Reid Wiseman, pilot Victor Glover, and mission specialists Christina Koch and Jeremy Hansen turned their lenses on one another, on their crew module's densely equipped quarters, and on "all of the things that you can capture [that] give context to what living there was like," Glover says. The snapshots from the 10-day voyage, published here for the first time, reveal something almost as rare as new perspectives on the moon: a loose, unguarded glimpse of four fellow travelers, passing time and sharing quiet moments on a journey unlike any other. **—BRIAN KEVIN**

Watch candid videos that the crew brought back from the mission, shot for National Geographic, at *natgeo.com/artemiscrew*.



Left:
Glover leans against a crew seat while photographing the lunar surface from one of Orion's four viewing windows. Two of the module's four seats were stowed after liftoff to open precious space in the equipment-cluttered cabin.

Right:
A shot of a display and control panel also shows off Wiseman's bracelet, made by one of his daughters. The beads spell "Tokyo Drifting," the title of an indie hip-hop track and a Wiseman family road-trip favorite—and one of the songs Mission Control played to wake the crew.



‘IT’S LIKE CAMPING. THAT THING IS LIKE A BIG TENT, AND WE’RE IN THAT FOR 10-ISH DAYS.’

–VICTOR GLOVER, PILOT





1. The crew made creative use of their close quarters, where advanced tech shared space with the flotsam of daily life, like the towels and washcloths hung to dry behind Koch.

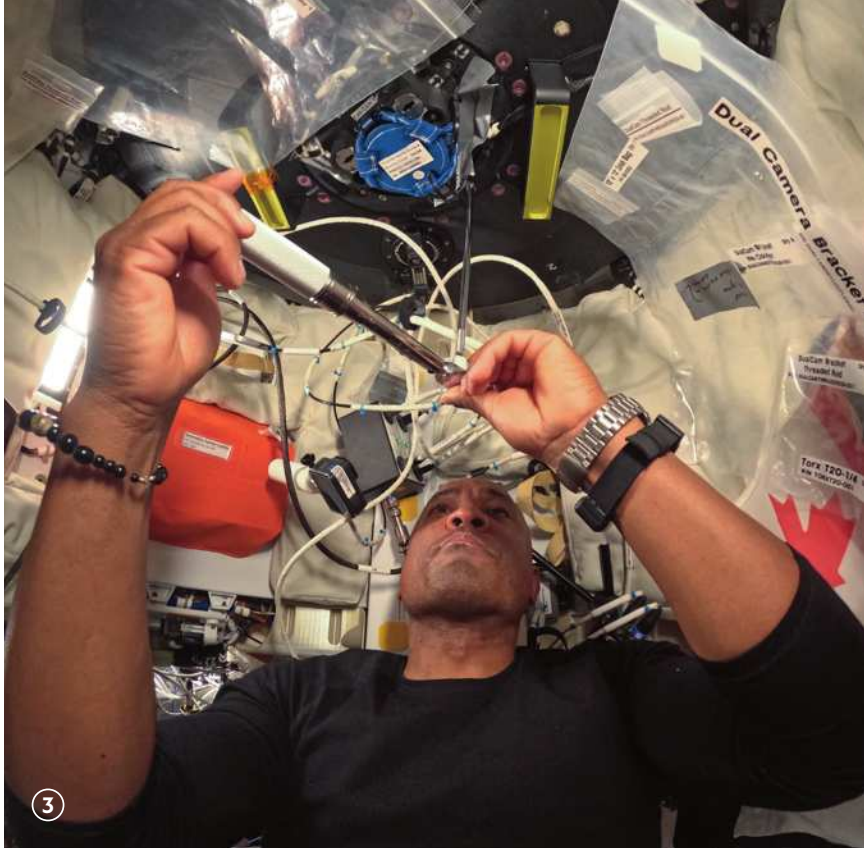
2. Surfaces throughout the cabin are dotted with yellow Velcro patches, which give items like clipboards, cameras, and food packets temporary mooring in microgravity.

3. Glover affixes a camera bracket to the docking hatch. Even routine maintenance demands extra care in space, lest a bit of hardware drift off to become a larger problem.







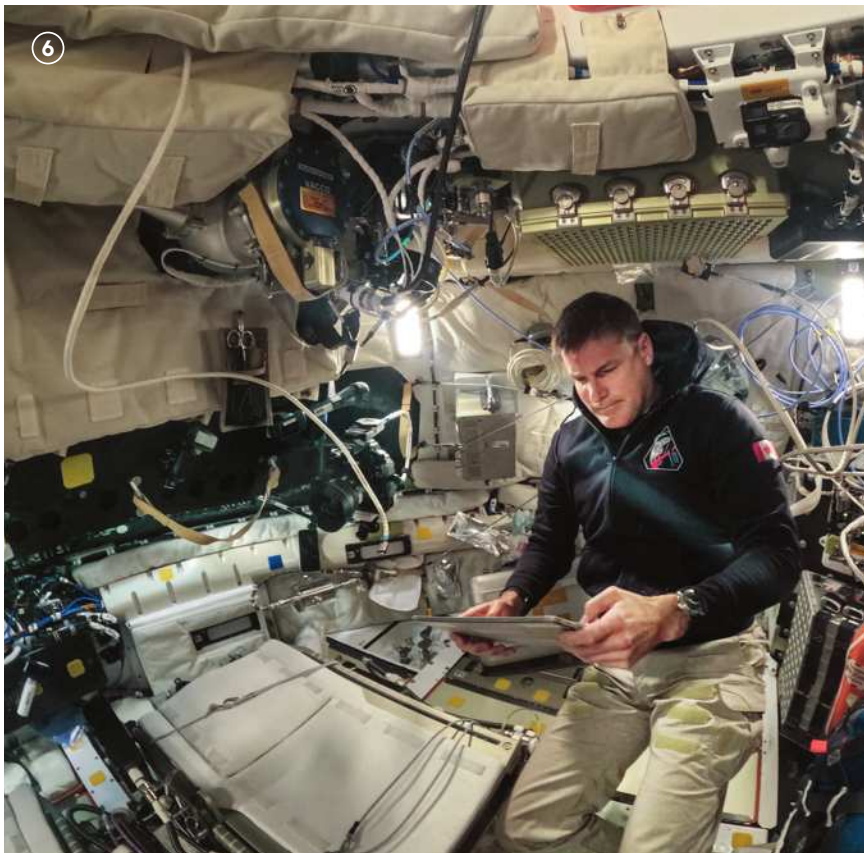


4. Handheld microphones let the crew reach Mission Control throughout the capsule without donning headsets—and this one captured audio for National Geographic.

5. In addition to packaged candies, shelf-stable sweets stowed in Orion's compact galley included pudding, cobbler, and Canadian maple cream cookies.

6. Power, data, and life support all rely on the cabin's tangles of well-protected cables, each one, as Wiseman has said, "a little bit thicker than it needs to be."







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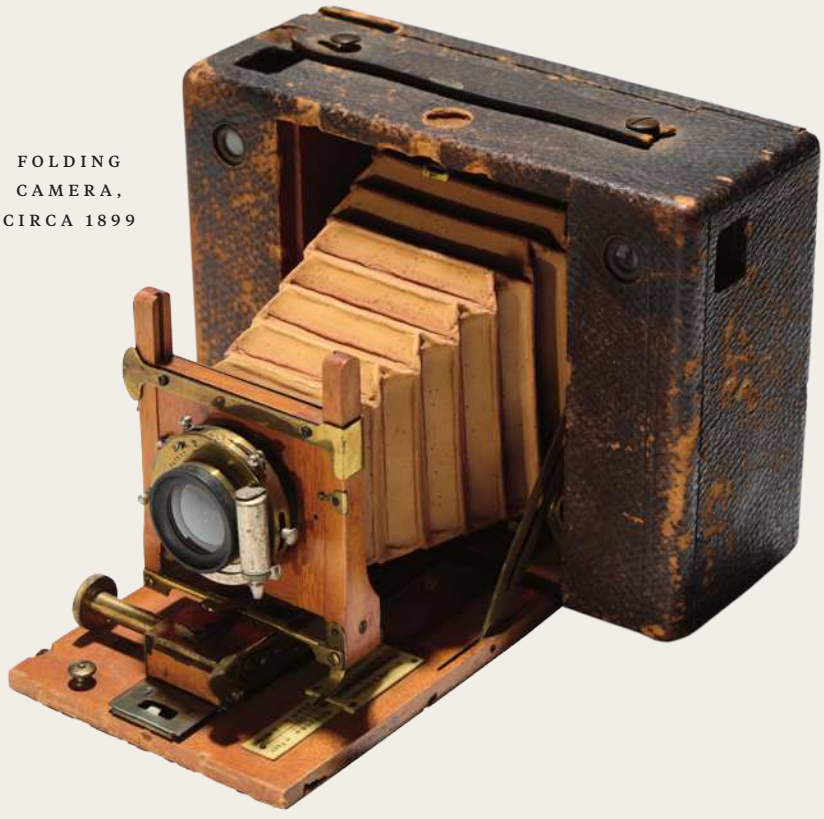


The crew darkened the interior lights during their seven-hour lunar flyby on Day 6, reducing glare on the windows for a better view of the moon's cratered surface below.

'I JUST HAD AN OVERWHELMING SENSE OF BEING MOVED BY LOOKING AT THE MOON.'

—CHRISTINA KOCH, MISSION SPECIALIST

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FOLDING CAMERA, CIRCA 1899

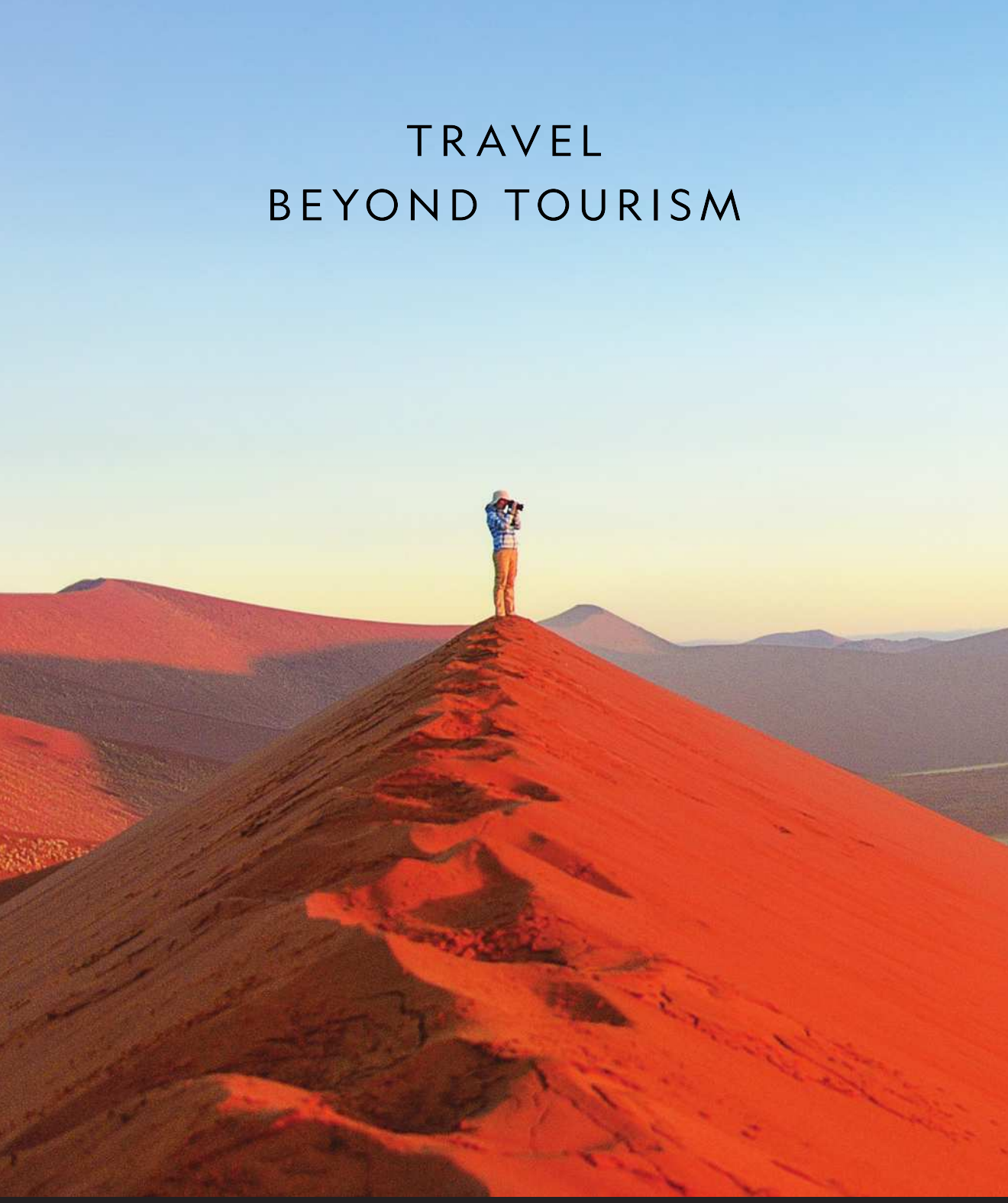
A COMPACT *Camera* *for* COLOSSAL AMBITIONS

THIS LEATHER-COVERED Kodak was built for the field. At about three pounds, it folded shut to the size of a hardcover book, and unlike other cameras of its day, its film cartridges could be loaded in daylight. National Geographic Explorer Robert Peary likely toted it to the Arctic in 1905, on a failed attempt to reach the North Pole (he'd claim success, controversially, four years later). The photos he brought back—of fantastic snowbound landscapes, wildlife, and Inuit communities—drew crowds to lectures that helped fund his expeditions. And he could frame a shot "like a beautiful, picturesque painting," says Beth Saunders, a photo historian and curator of a Peary photo collection at the University of Maryland Baltimore County. Donated to National Geographic after Peary's death, the camera bore early witness to a formidable world of ice, now rapidly changing. **–RACHEL SLADE**

Read more about the objects, stories, and photos that have defined National Geographic's history at *natgeo.com/fromthevault*.

PHOTO: REBECCA HALE, NGM STAFF

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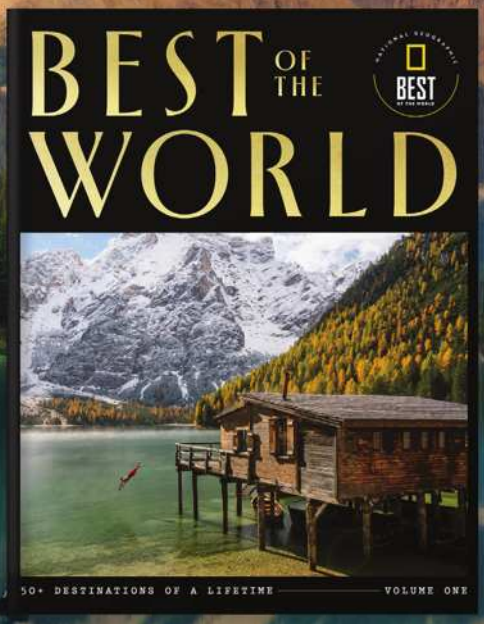
Bold by nature.

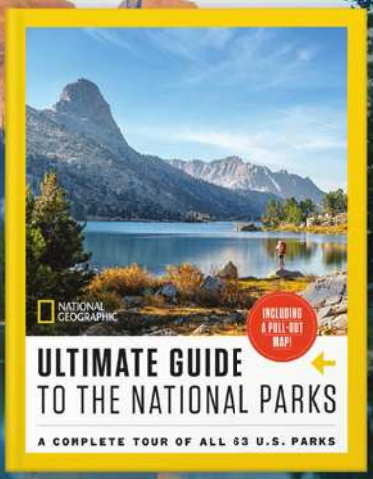
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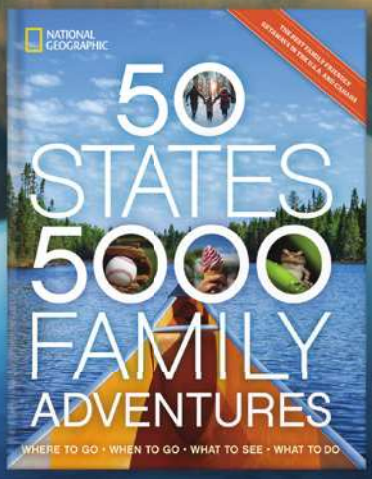
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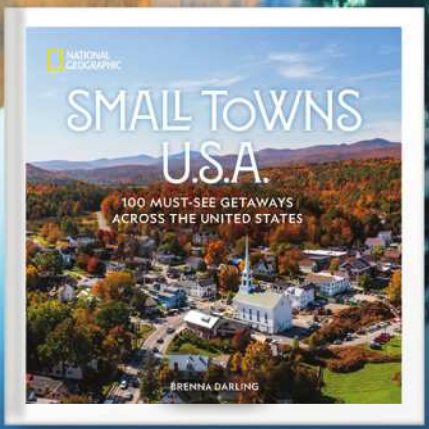
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