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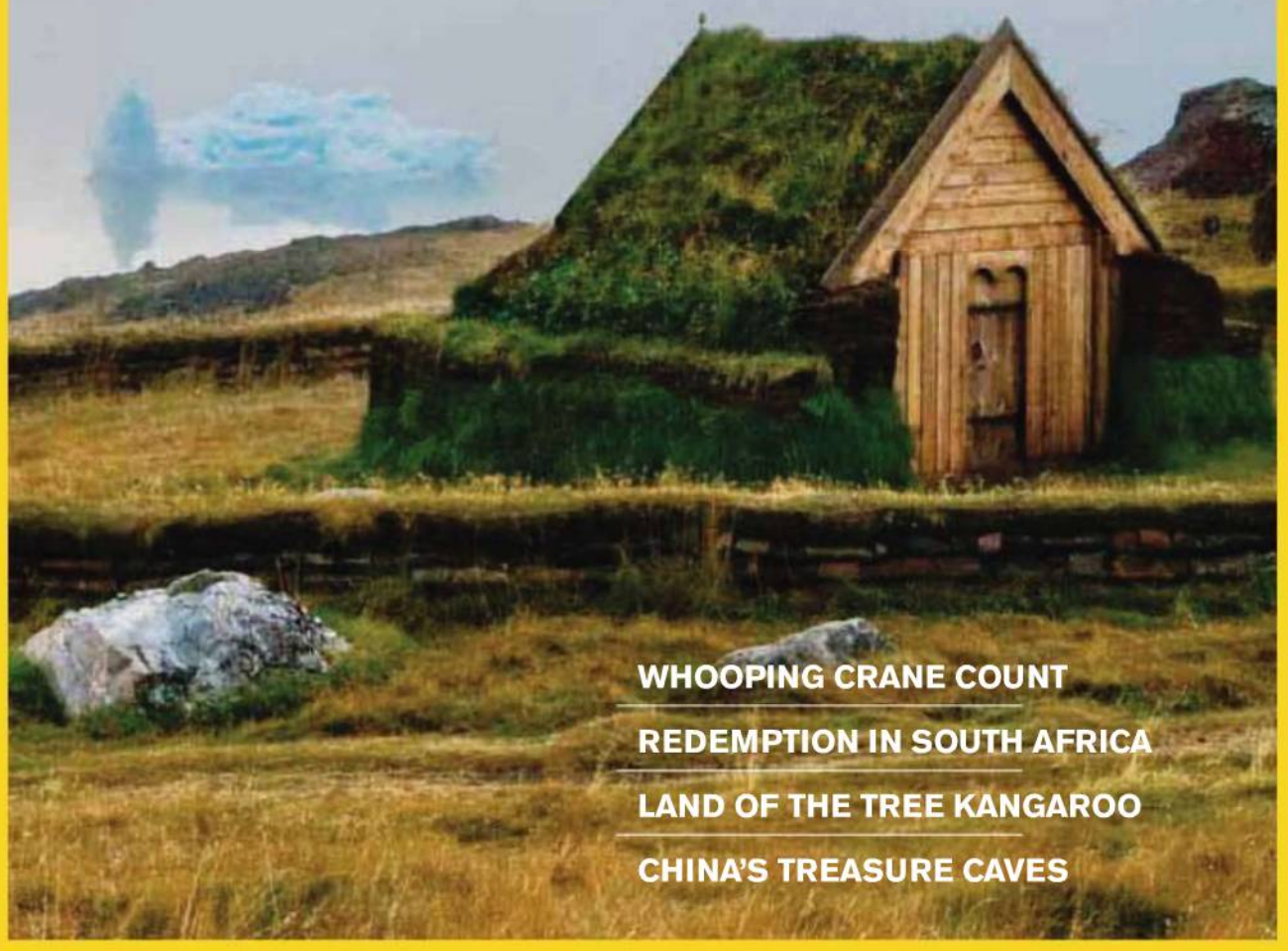
NATIONAL GEOGRAPHIC

Greenland

GROUND ZERO FOR GLOBAL WARMING



WHOOPING CRANE COUNT

REDEMPTION IN SOUTH AFRICA

LAND OF THE TREE KANGAROO

CHINA'S TREASURE CAVES

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A melting glacier can form a lake, which then might carve a deep shaft. Above, an ice explorer drops in for a closer look. Story on page 38.

OFFICIAL JOURNAL OF THE NA

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JAMES BALOG

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Dust settles, ice melts, lakes are born—
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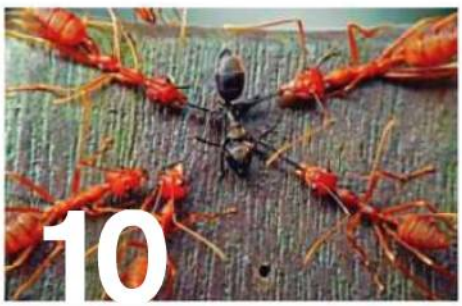

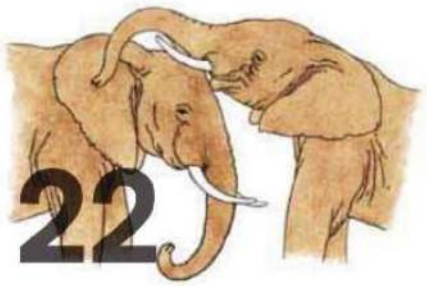

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On the Cover
The Greenland church is a replica of the one that Erik the Red built for his wife around A.D. 1000—an era when the island clime was relatively mild. *Photo by Peter Essick*

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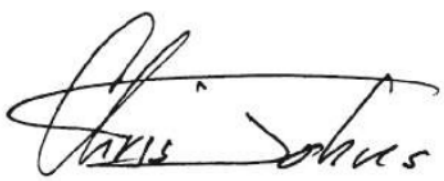
EDITOR'S NOTE

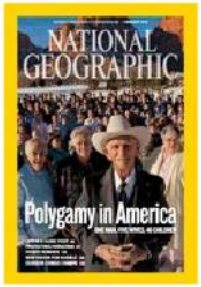
PHOTO: JAMES NACHTWEY

Fans of Soweto's Kaizer Chiefs soccer club cheer during the team's December 2009 match against Ajax Cape Town.

We felt the celebration move like a windstorm across Johannesburg on June 24, 1995. People danced in the streets, hugging strangers. The South African Springboks had defeated the New Zealand All Blacks in overtime at Ellis Park Stadium, winning the Rugby World Cup. As I sat in a living room seven miles from the stadium with friends and watched on television, South Africa's newly elected president, Nelson Mandela, walked onto the field in a Springbok jersey to present the trophy. Rugby and the Springboks had been, in apartheid South Africa, symbols of white privilege and power. When Mandela, who'd been imprisoned for 27 years by that racist regime, presented the trophy to the white captain of the Springboks and congratulated players of the nearly all-white team, he did more than just celebrate a rugby victory. He honored a nation that was coming together and moving forward.

In 2004 South Africans celebrated again when they were chosen to host soccer's 2010 World Cup games. This month the world will watch that tournament play out on the fields of their country. It too will be more than a sporting event. Apartheid is gone, but the slow process of reconciliation continues. In this issue, photographer James Nachtwey shows us contemporary South Africa, while writer Alexandra Fuller tells about a town, a victim of a hate crime, and the prisoner responsible. It's a tale of forgiveness and redemption—a story, one South African minister says, about how a nation prepares for the future.





February 2010

Early Mormon leaders knew what they were doing when they chose the beehive as the symbol of the state of Utah. Check with a beekeeper to see what the sexual power structure is in a hive.

The Polygamists

To infer that Fundamentalist Church of Jesus Christ of Latter-Day Saints communities are some sort of quaint slice of Americana whose residents have built a "self-sustaining" environment misses the main reason the inhabitants can afford their late-model SUVs and cell phones. If an FLDS man has four wives, only one of them is legally married in the eyes of the state and federal government. The other three are single women with no income, no assets, and multiple children who apply for and consume every state and federal entitlement benefit for which they are eligible. These communities thrive through the generosity of the American taxpayer and the willingness of state authorities to turn a blind eye to the misuse of entitlement funds.

TIM CROMWELL
Salt Lake City, Utah

I'd like to see if the smiles on the faces of these crusty old husbands would remain if they were forced to live in a community where each wife would have many husbands and the men would be relegated to doing the sewing and cleaning, while the wives were tending to the divine purpose of producing offspring by mating with their younger husbands.

NEAL GRACE
San Rafael, California

Are you kidding me? To approach the FLDS "breeding farm" and this crime against women with an attitude even approaching equanimity is irresponsible. These children are never given a choice. The practice of passing wives on as property is beyond

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EDITORS' CHOICE **Luke Chua Hwa Yong** Singapore
"I saw a group of red ants attacking a poor black ant," says Luke Chua, 39, a workshop supervisor who shot this in a local park. "I think we know what's going to happen next."

United States Like
splash—the result

e a glass sculpture forged in the Pacific's eternal churn, a four-foot-tall backwash of two waves colliding near Kaena Point on Oahu, Hawaii—refracts the dawn.

PHOTO: CLARK LITTLE

Sweden Near the village of Enviken, where nostalgia for mid-century Americana runs deep, 17-year-old Fanny Bergman (at left) and mother Ulrika Dotzsky, 48, head to a rockabilly concert in their 1959 Mercury Montclair.

PHOTO: ÅSA SJÖSTRÖM, MOMENT/SYDSVENSKAN

United States Over the past 17 years a decidedly sticky situation has developed in Seattle's Post Alley, where countless colorful wads—pressed down with coins or used to spell out names and places—form the "gum wall."

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PHOTO: JORDAN SIEMENS, AURORA PHOTOS

Golden Touch The World Cup title might be the most coveted honor in soccer, but there's one thing the winning nation can't possess: the actual trophy. The 18-karat-gold statue (below) has been kept mostly under lock and key at an undisclosed location since its predecessor, the Jules Rimet trophy, was stashed under a bed during World War II, held for ransom and recovered, then stolen for good in Brazil in 1983. That statue was first pinched in March 1966 from an exhibition in London, which hosted the final match that year. Fortunately a dog named Pickles helped his nation save face by ferreting out the newspaper-wrapped trophy in a garden, earning him a place alongside the prime minister when England celebrated its World Cup win that summer. It hasn't won since.

The champions of this summer's tournament in South Africa will get to keep only a gold-plated replica of the post-Rimet prize. But legions of soccer fans had a rare chance to see the real thing up close: The current trophy, in use since 1974, was the focus of a recent 83-country grand tour. "Only heads of state and World Cup winners can hold the trophy," says FIFA spokesman Alex Stone. The rest of us can only look—and dream. *—Luna Shyr*

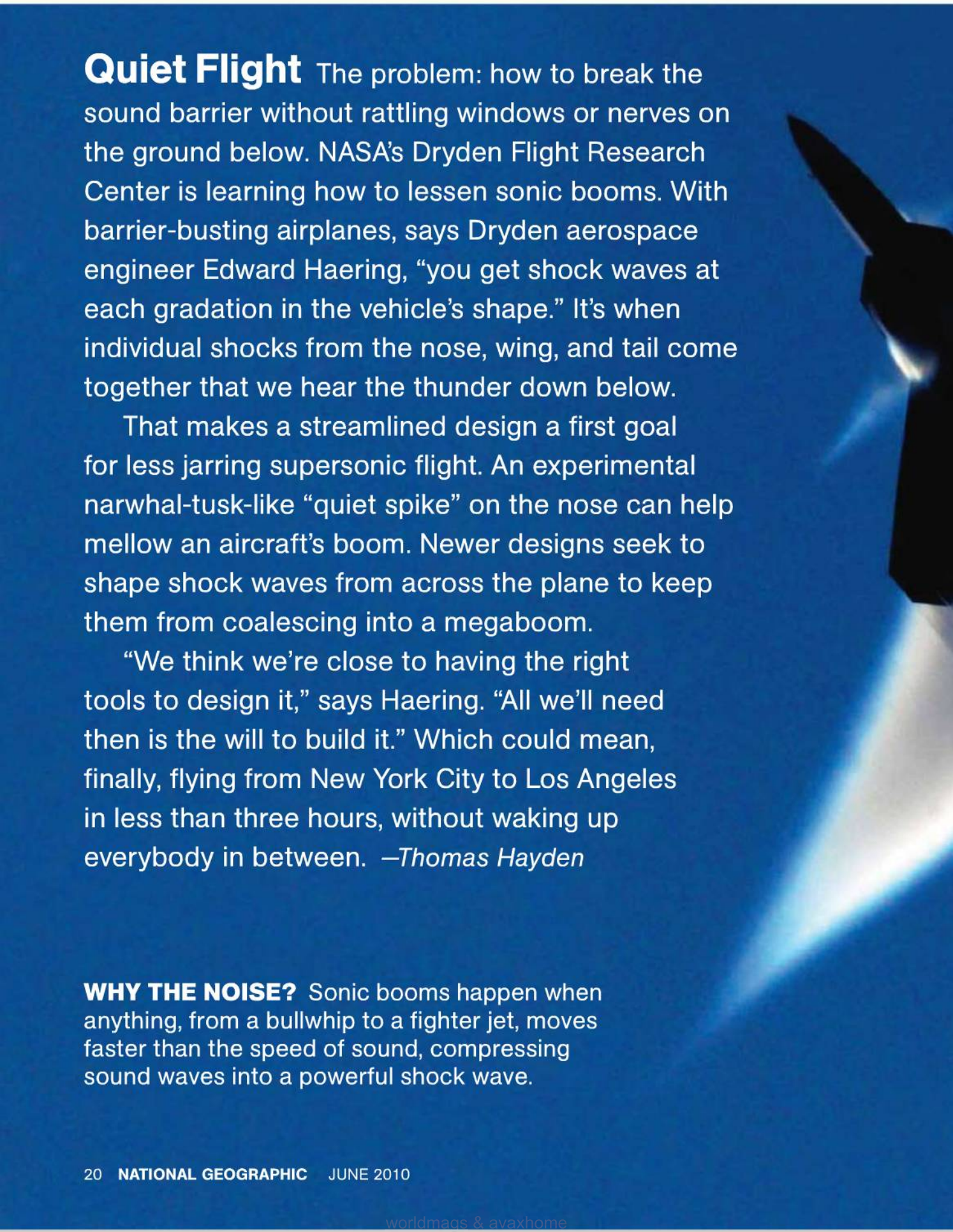
Soccer star Garrincha (second from left) and well-wishers celebrate Brazil's 1962 victory with the Jules Rimet trophy. The current World Cup trophy (left) depicts two victorious athletes holding up a globe.

PHOTOS: FRITZ REISS, AP IMAGES (LEFT); POPPERFOTO/GETTY IMAGES

Quiet Flight The problem: how to break the sound barrier without rattling windows or nerves on the ground below. NASA's Dryden Flight Research Center is learning how to lessen sonic booms. With barrier-busting airplanes, says Dryden aerospace engineer Edward Haering, "you get shock waves at each gradation in the vehicle's shape." It's when individual shocks from the nose, wing, and tail come together that we hear the thunder down below.

That makes a streamlined design a first goal for less jarring supersonic flight. An experimental narwhal-tusk-like "quiet spike" on the nose can help mellow an aircraft's boom. Newer designs seek to shape shock waves from across the plane to keep them from coalescing into a megaboom.

"We think we're close to having the right tools to design it," says Haering. "All we'll need then is the will to build it." Which could mean, finally, flying from New York City to Los Angeles in less than three hours, without waking up everybody in between. *—Thomas Hayden*



WHY THE NOISE? Sonic booms happen when anything, from a bullwhip to a fighter jet, moves faster than the speed of sound, compressing sound waves into a powerful shock wave.

A vapor cone blooms around an F-22 Raptor as it races through humid air during a supersonic flyby.

PHOTO: RONALD DEJARNETT, U.S. NAVY

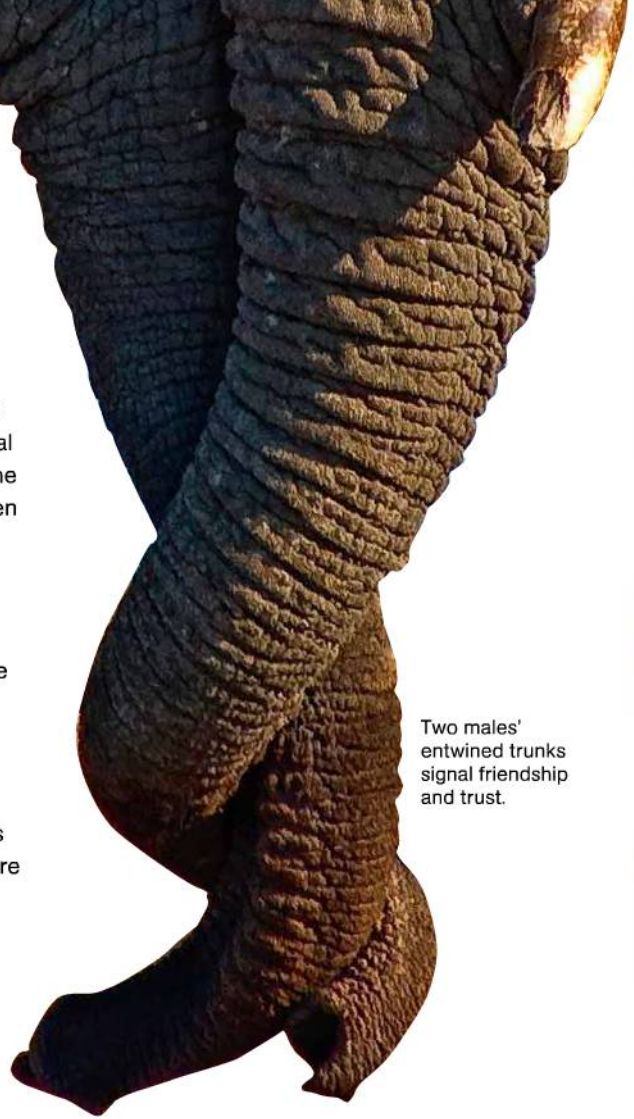
NG GRANTEE

Male Bonding

In the matriarchal world of elephants, males are known as mostly independent sorts. Females maintain close, lifelong family ties, while bulls tend to wander off solo, at times banding with another male or more loosely with groups of them.

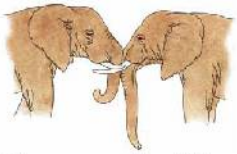
Or do they? During a six-year study in Namibia's Etosha National Park, Stanford University behavioral ecologist Caitlin O'Connell-Rodwell observed for the first time intense, long-lasting bonds among a dozen or so bulls—a tight-knit group of teenagers, adults, and seniors up to 55 she's dubbed the Boys' Club. Older males serve as mentors and mediators for younger ones, enforcing a strict social hierarchy and keeping underlings in line when hormones rage and rowdiness may erupt.

In drought-prone Namibia, rank becomes most rigid when water is scarcest. "In dry years the strict pecking order they establish benefits all of them," O'Connell-Rodwell says. "Everyone knows their place." That means young bulls supplicate more frequently to their elders—and peace is maintained while everyone gets to drink. *—Hannah Bloch*

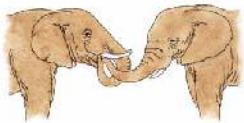


Two males' entwined trunks signal friendship and trust.

TRUNK TALK
Close-up communication is done vocally and via smell and touch. These gestures show affection.



Like arm-wrestling kids, elephants will test their strength against peers—and sometimes trusted elders.



A junior elephant (right) greets a senior with deference, placing its trunk tip into the elder's mouth.

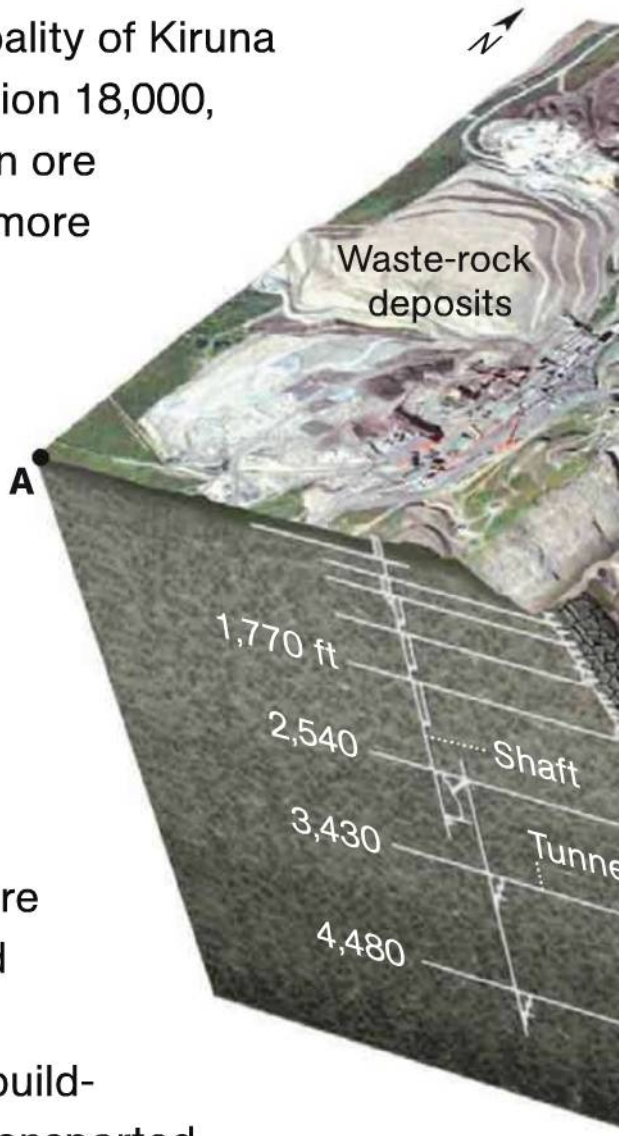
An over-the-head caress by a dominant elephant is akin to human hair tousling, says O'Connell-Rodwell.

Learn more about wildlife on the new Nat Geo WILD network. Visit **natgeowild.com.**

PHOTO: O'CONNELL & RODWELL. ART: ALDO CHIAPPE

Town on the Move Ninety miles above the Arctic Circle, the Swedish municipality of Kiruna is in trouble. The town center, population 18,000, sits atop one of the world's largest iron ore mines. After 110 years of mining and more than a billion tons of ore, huge cracks deform the bedrock, and Kiruna must either see the mine shut down or move out of harm's way.

What to do? Well, move, of course. Residents, many of whom depend on the mine for jobs, have decided to gradually relocate central houses, shops, and even a 98-year-old wooden church to more stable ground several miles away. Some buildings will be transported brick by brick; many will be constructed anew. Among the first to go: the 1899 house of Kiruna's founder. Railroad tracks, roads, and electricity lines have already started to migrate. The iron mine, key to new Kiruna's survival, will remain active—but at a safer distance. *—Hannah Bloch*



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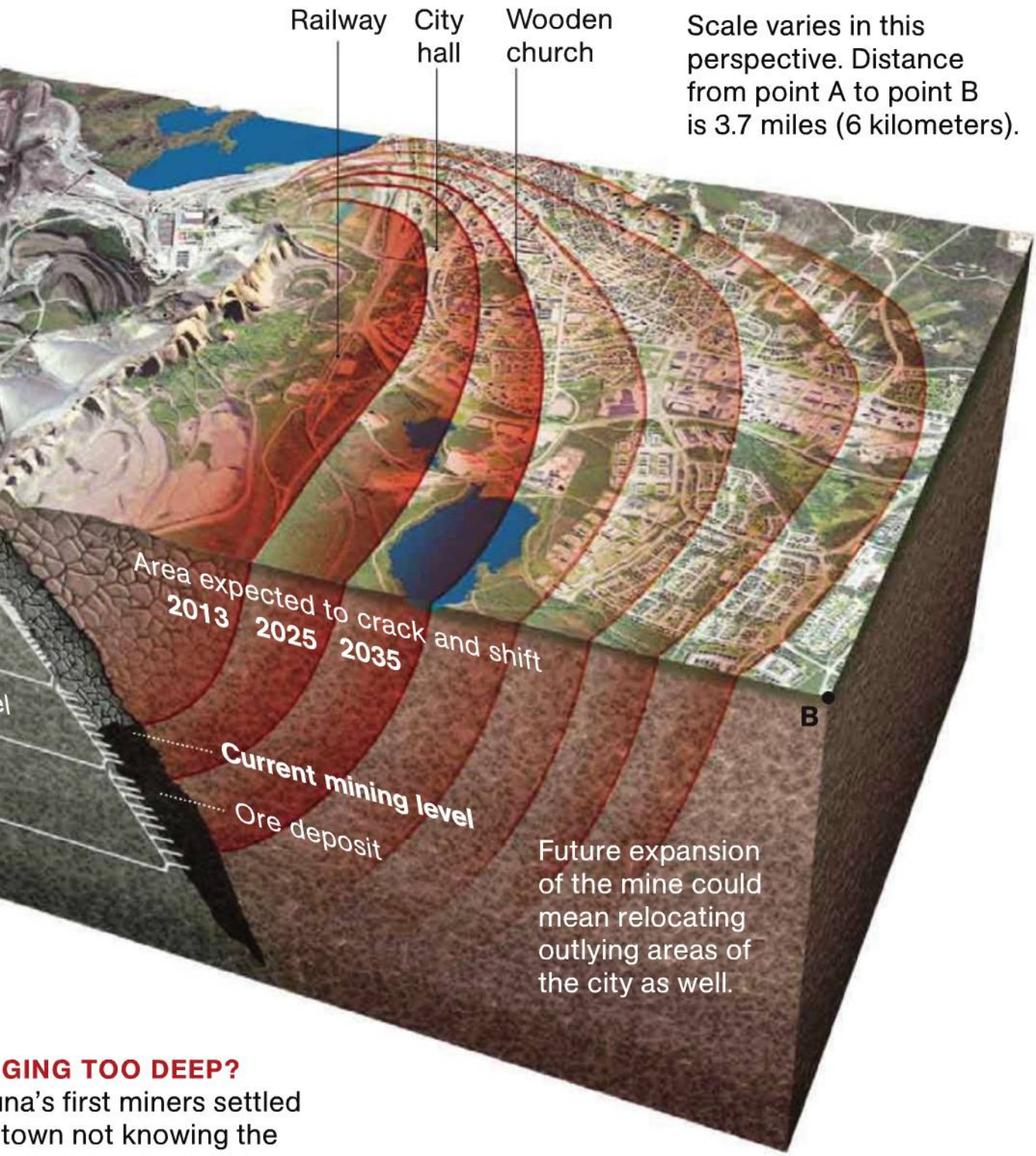


GING TOO DEEP?

ına's first miners settled town not knowing the ore deposit angled at degrees directly below town center.

GRAPHIC: CHUCK CARTER AND HIRAM HENRIQUEZ; MARIEL FURLONG, NGM STAFF
SATELLITE IMAGE: DIGITALGLOBE. SOURCE: KIRSTEN HOLME AND ANDERS LINDBERG, LKAB. NGM MAPS

A Revealing Relative Finds at Malapa cave in South Africa may provide a big piece to an unsolved puzzle of human evolution. Paleoanthropologist Lee Berger of the University of the Witwatersrand and his team discovered two fossil skeletons of a previously unknown human ancestor there, embedded in limestone almost two million years old. The new species, *Australopithecus sediba,* lived when human ancestors were evolving from more primitive australopiths toward our direct ancestor, *Homo erectus.* The small brain and long arms of *A. sediba* are like those of an australopith, but the shapes of its teeth and braincase are like those of *Homo.* Until now the bones of early hominin species known from this period were few and fragmentary.

"The origin of *Homo* is the question of the decade," says Susan Antón, a physical anthropologist at New York University. "Anyone working on that question will have to take these new fossils into account." Berger hopes for more—that the fossils solve the puzzle once and for all. —*Christopher P. Sloan*

This juvenile skull from Malapa cave emerged once the surrounding limestone was teased away.

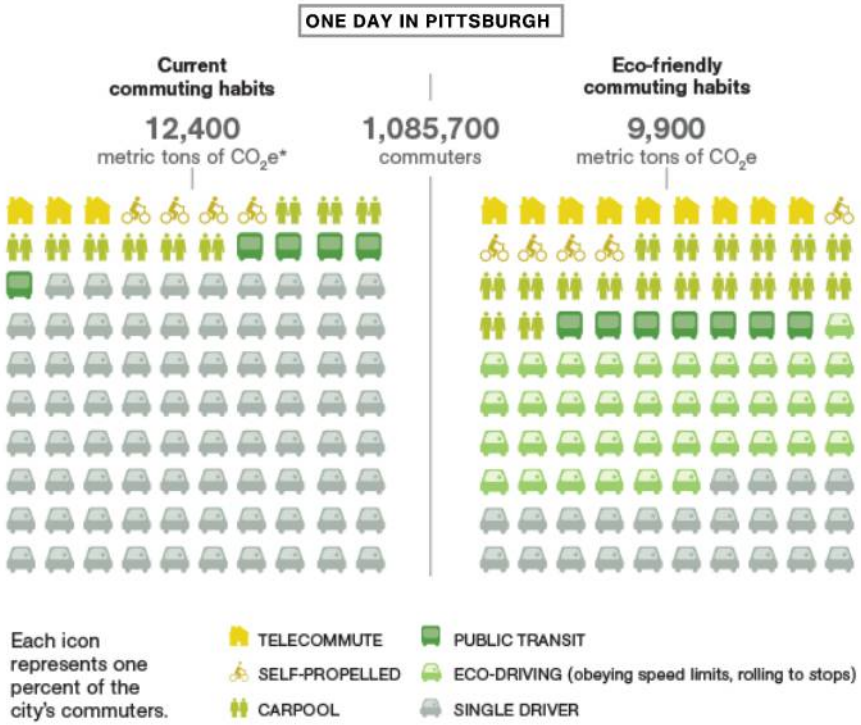
PHOTO: BRETT ELOFF, NGM MAPS

A Day With Less Driving

What if commuters were to cut back on driving for just one day? That's not the kind of sweeping change environmental advocates urge. But it seems doable. And there is an ongoing effort to encourage one-day vacations from Earth-unfriendly activities. The big question: Would a day of less driving make any significant difference?

To find out, *National Geographic* asked Luke Tonachel, vehicles analyst for the Natural Resources Defense Council, to crunch numbers for a big American city. He picked Pittsburgh, which has good commuting data, and projected modest changes. He filled empty mass-transit seats but added no new buses to the fleet and doubled carpooling from 9 to 18 percent of commuters, with a carpool defined as two people. He also factored in a jump in "eco-driving."

The stats are in. The drop in greenhouse gases for the "what if" day in Pittsburgh would equal taking 370 cars off the world's roads for a year. And cars would burn 213,700 fewer gallons of gas. At $2.50 a gallon, that's $534,250 in Pittsburghers' pockets. *—Marc Silver*



Can one day of eco-commuting make a difference? Pittsburgh is the case study. Compare the typical workday breakdown for the city and its metropolitan area (left) with a hypothetical green day (right).

*CO_2e = CO_2 AND ITS EQUIVALENT OF OTHER GREENHOUSE GASES

GRAPHIC: MINDY NICHAMIN. SOURCES: LUKE TONACHEL, NATURAL RESOURCES DEFENSE COUNCIL; MOVING COOLER STUDY, CAMBRIDGE SYSTEMATICS; 2007 AMERICAN COMMUNITY SURVEY, U.S. CENSUS BUREAU, ANALYSIS BY SOUTHWESTERN PENNSYLVANIA COMMISSION. PHOTO: RICHARD DRDUL

A Maasai warrior in southern Kenya raises an antenna to find a radio-collared lion. The NGO Panthera and National Geographic's Big Cats Initiative are both working to save lions. Learn more at *livingwithlions.org* and *nationalgeographic.com/bigcats.*

Guarding Lions Spearing lions used to be a rite of passage for young Maasai men. Now some warriors are guarding the big cats instead. As Africa's exploding human populations vie with wildlife for land and resources, the number of lions speared, shot, snared, and poisoned has soared, imperiling the species. As few as 20,000 now remain. In response, Living With Lions, funded by the NGO Panthera, has hired tribesmen to protect their former foes. Warriors track lions, help cattle owners build lion-proof corrals, and educate Maasai communities on lions' value. One study in Kenya found that each cat kills livestock worth $290 a year, yet brings in $17,000 in tourist revenue.

Nevertheless, some experts warn that within 25 years there may be no lions left outside of the biggest, best run parks. Wildlife biologist Craig Packer says for lions to survive, parks must be fenced and heavily guarded—perhaps by the United Nations. *—Karen E. Lange*

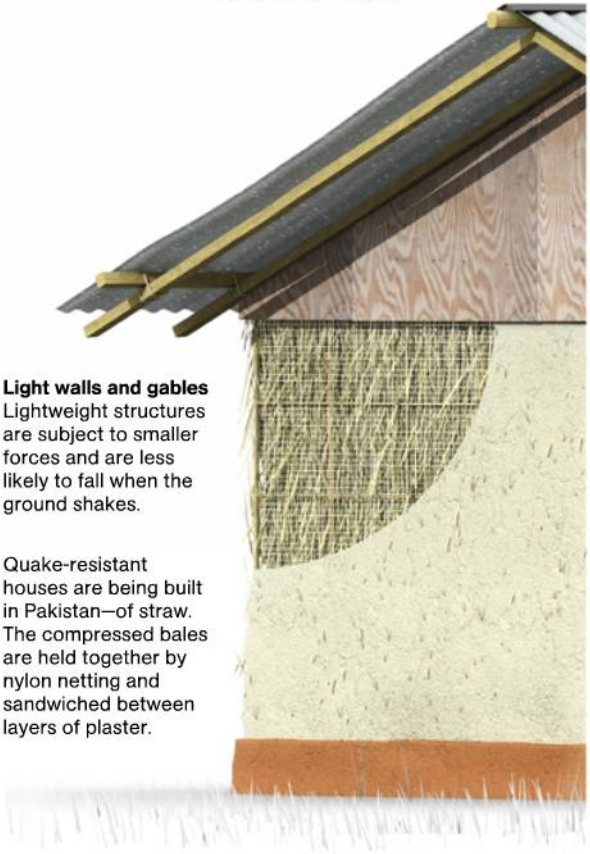
PHOTOS: SEAMUS MACLENNAN (RIGHT); AMY HOWARD

Safe Houses

The earthquake in Haiti was a reminder: Billions of people live in houses that can't stand shaking. But by applying a few general principles, safer ones can be built cheaply—using straw, adobe, old tires.

IN LOS ANGELES, TOKYO, and other rich cities in fault zones, the added expense of making buildings earthquake resistant has become a fact of life. Concrete walls are reinforced with steel, for instance, and a few buildings even rest on elaborate shock absorbers. Strict building codes were credited with saving thousands of lives when a magnitude 8.8 quake hit Chile in late February. But in less developed countries like Haiti, where a powerful quake in January killed some 222,500 people and left more than a million homeless, conventional earthquake engineering is often unaffordable. "The devastation in Haiti wouldn't happen in a developed country," says engineer Marcial Blondet of the Catholic University of Peru, in Lima. Yet it needn't happen

	Pakistan	Haiti
MOST DESTRUCTIVE QUAKE	October 8, 2005	January 12, 2010
LOCATION	Northern Pakistan/Kashmir	Port-au-Prince area
MAGNITUDE	7.6	7.0
FATALITIES	75,000	222,500



Light walls and gables
Lightweight structures are subject to smaller forces and are less likely to fall when the ground shakes.

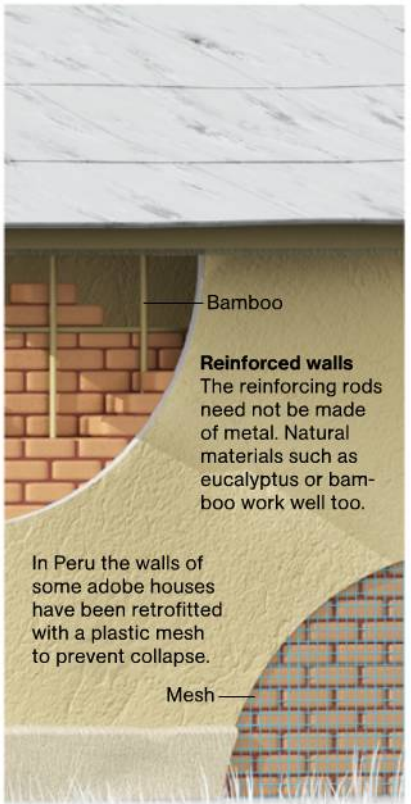
Quake-resistant houses are being built in Pakistan—of straw. The compressed bales are held together by nylon netting and sandwiched between layers of plaster.

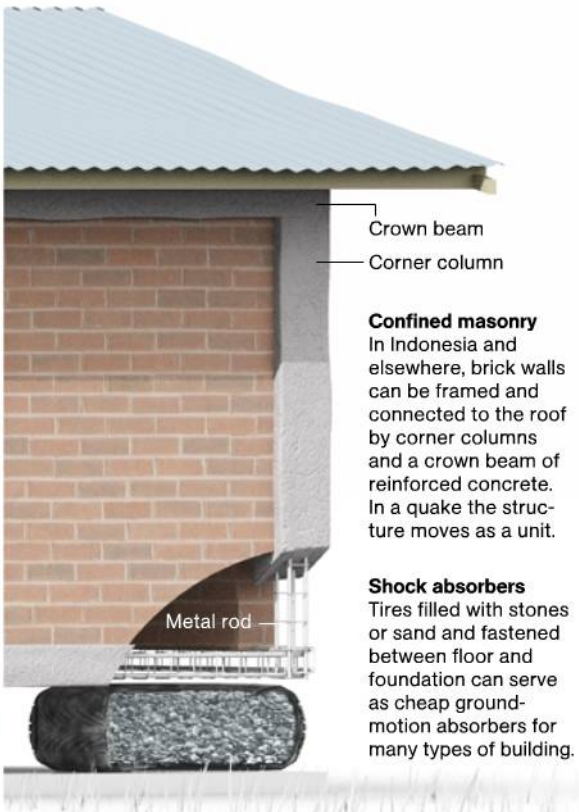
Light roofs
In Haiti heavy concrete roofs collapsed on many homes; in general, metal roofs on wooden trusses are more resilient.

Small windows
Small, regularly spaced openings create fewer weak spots in walls. But the bigger problem in Haiti was that walls were not properly reinforced.

ART BY BRYAN CHRISTIE

Peru	Indonesia	
May 31, 1970	December 26, 2004	MOST DESTRUCTIVE QUAKE
Chimbote	Sumatra	LOCATION
7.9	9.1	MAGNITUDE
70,000	227,900*	FATALITIES





anywhere. Cheap solutions exist.

Blondet has been working on ideas since 1970, when an earthquake in Peru killed 70,000 or more, many of whom died when their houses crumbled around them. Heavy, brittle walls of traditional adobe—cheap, sun-dried brick—cracked instantly when the ground started bucking. Subsequent shakes brought roofs thundering down. Blondet's research team has found that existing adobe walls can be reinforced with a strong plastic mesh installed under plaster; in a quake, those walls crack but don't collapse, allowing occupants to escape. "You rebuild your house, but you don't bury anyone," Blondet says. Plastic mesh could also reinforce concrete walls in Haiti and elsewhere.

Other engineers are working on methods that use local materials. Researchers in India have successfully tested a concrete house reinforced with bamboo. A model house for Indonesia rests on ground-motion dampers designed by John van de Lindt of Colorado State University: old tires filled with bags of sand. Such a house might be only a third as strong as one built on more sophisticated shock absorbers, but it would

*INCLUDES GLOBAL TSUNAMI DEATHS

also cost much less—and so be more likely to get built in Indonesia. "As an engineer you ask, What level of safety do I need?" van de Lindt says. "Then you look at what's actually available and find the solution somewhere in between."

In northern Pakistan, straw is available. Traditional houses are built of stone and mud, but straw is far more resilient, says California engineer Darcey Donovan, and warmer in winter to boot. Donovan and her colleagues started building straw-bale houses in Pakistan after the 2005 earthquake; so far they have completed 17.

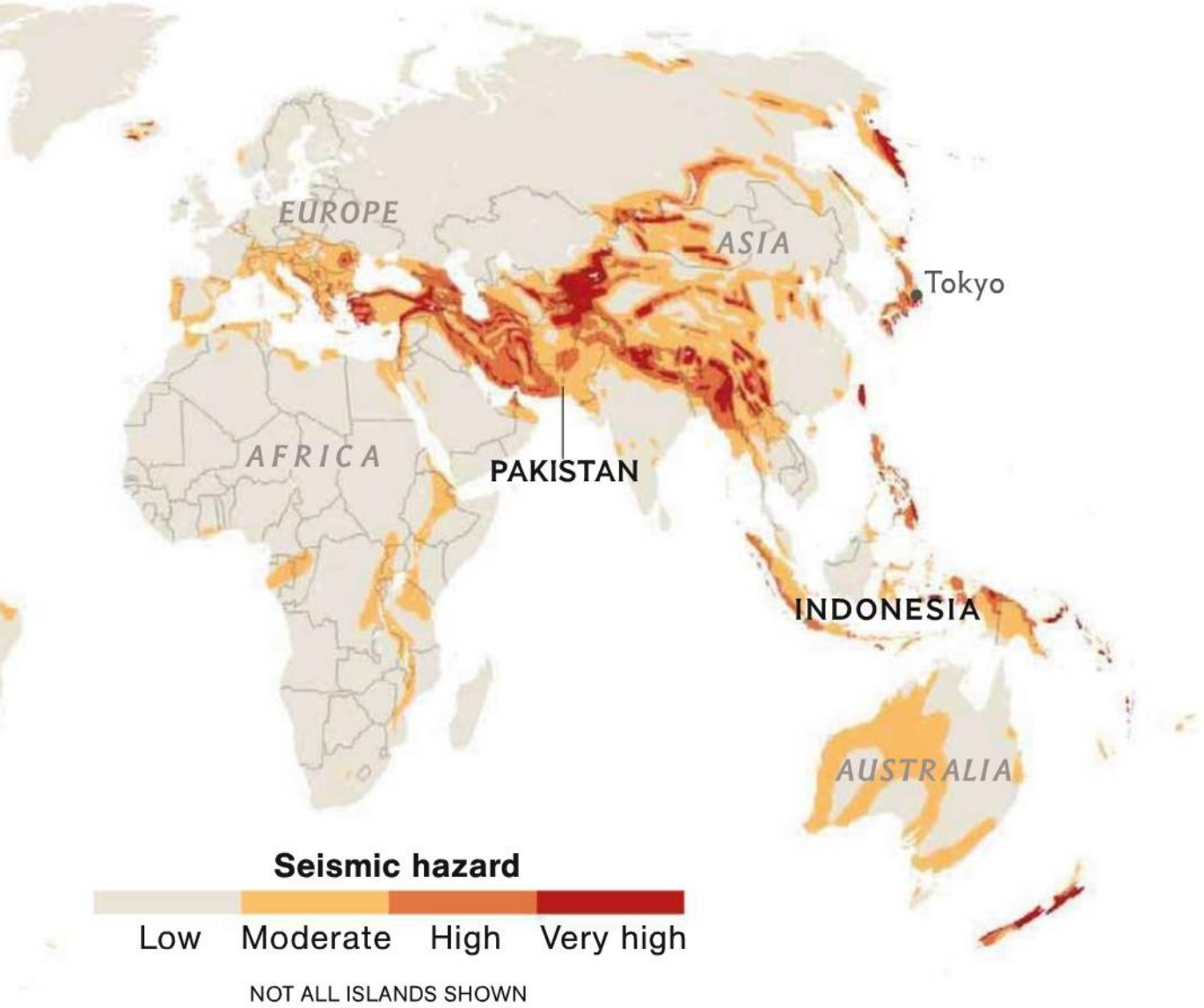
The same stark contrast prevails in other fault zones: encouraging ideas, discouraging progress. Even cheap ideas aren't always cheap enough. Since 2007 some 2,500 houses in Peru have been strengthened with plastic mesh or other reinforcements, with another 700 scheduled for this year. That leaves millions of houses and billions of dollars to go in Peru alone, to say nothing of other countries. "There are many millions of houses around the world," Blondet says, "that will collapse in the next earthquake." *—Chris Carroll*

Hazard Zone

to occur lie in less dev
claims the most victim

NGM MAP
UNIVERSITY OF
BLONDI

S Many of the zones where the most intense earthquakes are likely eloped countries. It's not the violent shaking of the ground itself that s, but the collapse of poorly constructed buildings.



S. MAP SOURCE: GLOBAL SEISMIC HAZARD ASSESSMENT PROGRAM. ART SOURCES (PAGES 34-7): GERNOT MINKE, KASSEL; ELIZABETH A. HAUSLER, BUILD CHANGE; ANNA LANG, UNIVERSITY OF CALIFORNIA, SAN DIEGO; MARCIAL ET AND ÁLVARO RUBIÑOS, CATHOLIC UNIVERSITY OF PERU; PIERRE PAUL FOUCHÉ, UNIVERSITY AT BUFFALO; USGS.

True Colors

There's a meltdown on the ice sheet.

THE CHANGING FACE OF GREENLAND

A field assistant rappels into the depths of a crevasse. The bottom of the crevasse could open into a vertical shaft, or moulin, through which a lake on the surface might drain to the depths of the ice sheet. Preceding pages: Meltwater has carved a canyon 150 feet deep.

BY MARK JENKINS

PHOTOGRAPHS BY JAMES BALOG

At first glance Greenland is an expanse of blinding white. But as my chopper swings low over the island, color catches my eye.

For miles on end, bands of blue meltwater fringe the ice sheet. Fields of white are threaded with rivers, etched with crevasses, and blotched with lakes. There is also ice that appears neither white nor blue but rather brown and even black—darkened by a substance called cryoconite. This muddy-looking grit is a key topic of investigation for my four companions: photographer James Balog with his assistant, Adam LeWinter, and geophysicist Marco Tedesco with Ph.D. student Nick Steiner, both from the City College of New York.

Balog photographs ice—and the absence of it. He founded the Extreme Ice Survey (EIS) in 2006 "to create a memory of things that are disappearing," he says. EIS has deployed more than 35 solar-powered, blizzard-proof, time-lapse

The black splotches mingled with ice and meltwater, above, are cryoconite—powdery debris blown to Greenland from often distant deserts, fires, coal plants, and diesel engines. Cryoconite reduces the ice's albedo, or reflectivity, allowing increased absorption of solar heat.

Society Grant This project was funded in part by your National Geographic Society membership.

In a pothole burned into the ice by cryoconite, buried air and gas from bacteria and algae bubbled to the surface, where a midnight freeze trapped them.

Paddling across a meltwater lake, author Mark Jenkins skims over a moulin 96 feet deep. As melting continues, cryoconite dust scattered on the surrounding ice will likely converge into a darker patch, creating another hot spot for ice loss.

Summer meltwater collects in a lake (top). Days later the water has drained through a snow-covered channel after a moulin opened under the ice several miles away.

Vanishing Ice

Greenland's ice sheet once seemed too big to melt substantially. Now, as weather warms, the ice is disintegrating faster. Scientists think this could continue for centuries or even millennia, changing the island's geography and the planet's sea level.

Melting Down

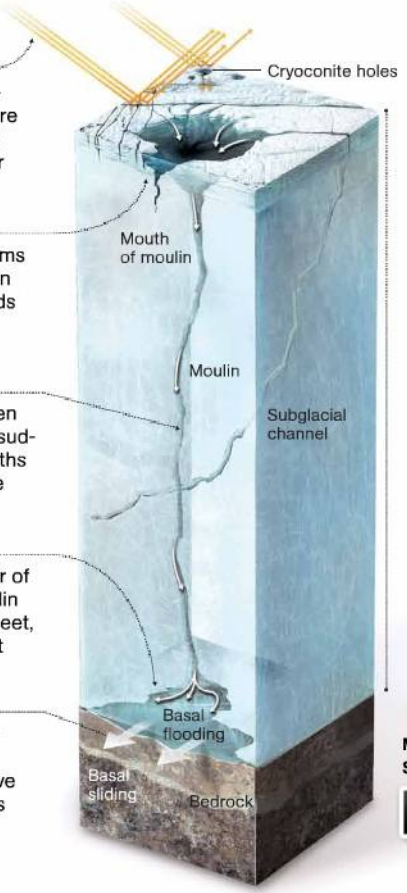
SOLAR RADIATION
As average summer temperatures rise in Greenland, more ice melts. Surface water and dark cryoconite absorb solar heat, speeding melting.

CREVASSE
A crack, or crevasse, that forms as the ice moves over uneven bedrock can plunge hundreds of feet. A flood of meltwater can drill it even deeper.

MOULIN
A shaft, or moulin, forms when meltwater weakens ice and suddenly flushes to unseen depths from the bottom of a surface lake or via a crevasse.

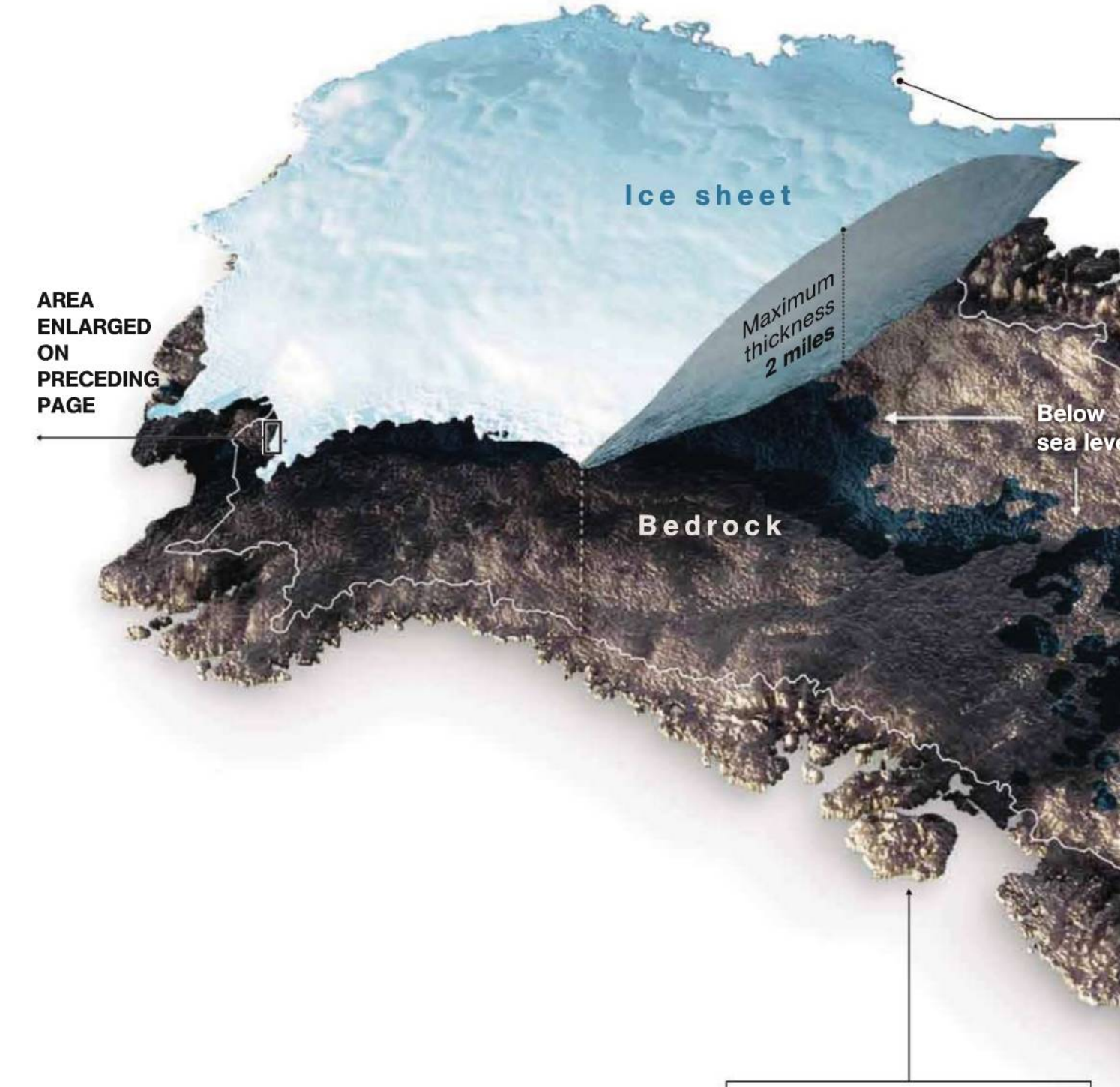
HYDRAULICS BELOW
The ice travels on a thin layer of water. When a draining moulin floods the base of the ice sheet, the ice begins to surf on that water and picks up speed.

THE WATER'S JOURNEY
Meltwater that works its way to the bedrock eventually turns into rivers that can carve ice tunnels many feet high as they flow to the sea.



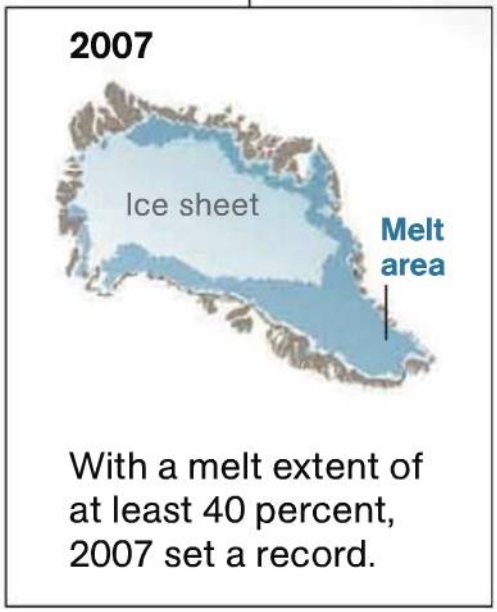
Meltwater drain
See more

▶ Video



Annual Melt Area

Almost three decades of satellite data reveal an escalating trend in the extent of the ice-melt zone—the part of the ice sheet where melting occurs between April and October. The rest of the year, the entire ice sheet is frozen. Even during the warmer months much of the ice refreezes overnight.



With a melt extent of at least 40 percent, 2007 set a record.

Greenland's Ice Sheet

Covering some 80 percent of the island, the ice sheet measures more than 650,000 square miles. Shaped like a lens, the ice is solid at its thick center but riddled with decay around the edges.

Ice-penetrating radar offers a detailed look at the land below. Every summer, as the ice margins melt and glaciers slide faster into the sea, Greenland loses more than twice the amount of ice in the European Alps.

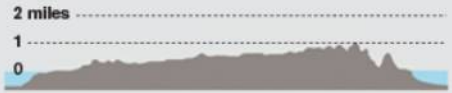
Scenarios for the year 2100
Climate change projections

MEDIUM ESTIMATE
4.5°F rise in global temperature

HIGH ESTIMATE:
9°F rise in global temperature

Origins of the Ice Sheet

50-10 million years ago
A warm climate bathed coastal mountains, rivers, and a high central plateau.



3-2 million years ago
As the climate gradually chilled, glaciers began to form in the mountains.

About 2 million years ago
The land continued to grow colder, and glaciers spread across parts of the central plateau.

2-1 million years ago
Separate glaciers merged to form a sheet of solid ice that covered most of the island most of the time.

Today
The solid ice sheet has depressed underlying rock by some 3,000 feet. Its weight also squeezes out a thin lip of ice to the sides.

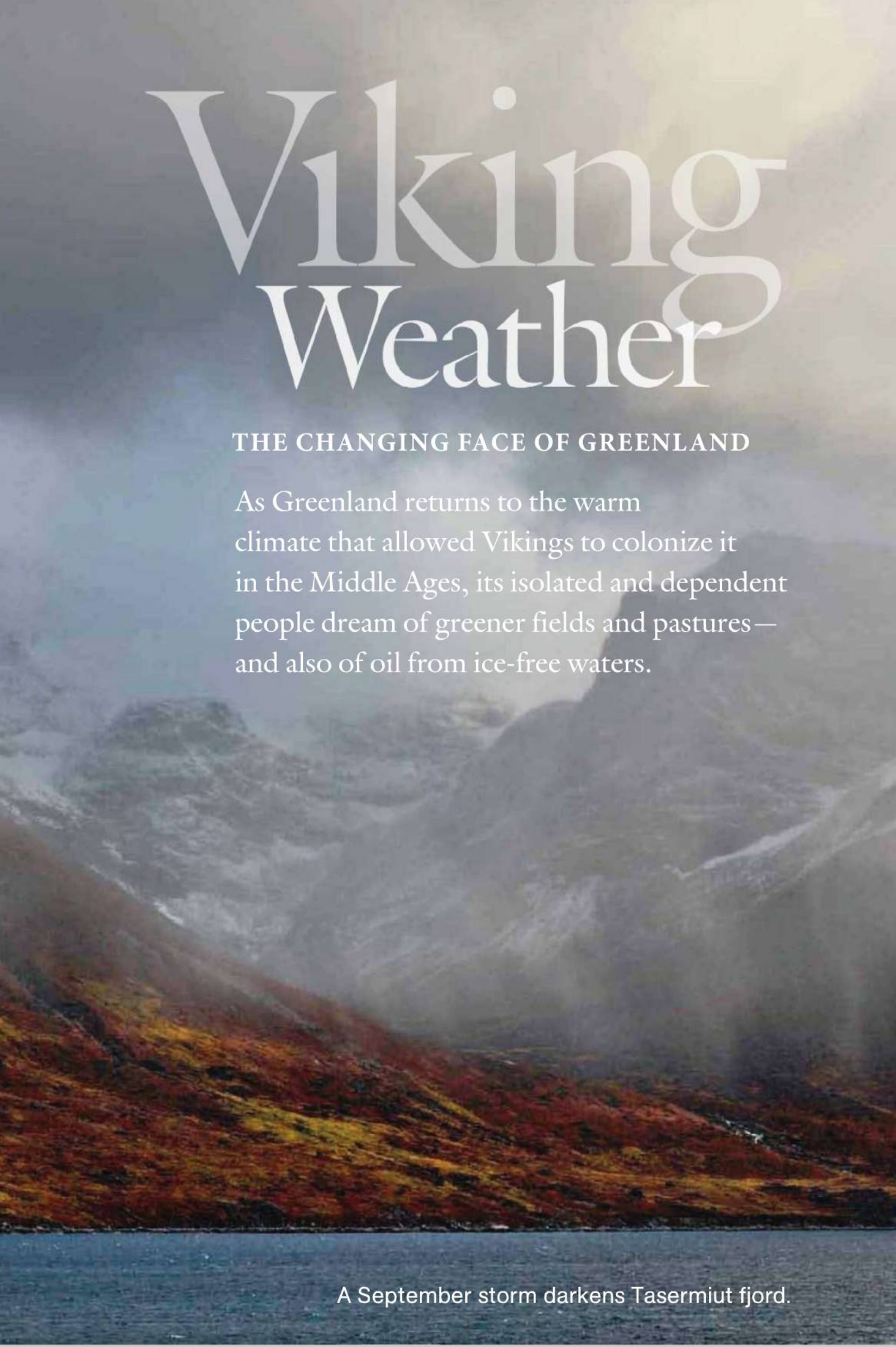
Scenario for the future
If melting continues at its current rate, the central plateau will slowly begin to rebound as the weight of the ice lifts from it.

PAGES 49-53: ALEJANDRO TUMAS AND TONY SCHICK. ART: CHUCK CARTER
SOURCES: KONRAD STEFFEN AND WALEED ABDALATI, UNIVERSITY OF COLORADO AT BOULDER; SRIDHAR ANANDAKRISHNAN, PENNSYLVANIA STATE UNIVERSITY; CENTER FOR REMOTE SENSING OF ICE SHEETS, UNIVERSITY OF KANSAS; JOSHUA MEISEL, HASKELL INDIAN NATIONS UNIVERSITY; GLAS/ICESAT, NATIONAL SNOW AND ICE DATA CENTER; PAUL MORIN, UNIVERSITY OF MINNESOTA AND ANTARCTIC GEOSPATIAL INFORMATION CENTER; SHAWN MARSHALL, UNIVERSITY OF CALGARY

Viking Weather

THE CHANGING FACE OF GREENLAND

As Greenland returns to the warm climate that allowed Vikings to colonize it in the Middle Ages, its isolated and dependent people dream of greener fields and pastures—and also of oil from ice-free waters.



A September storm darkens Tasermiut fjord.

On a dog day afternoon in Qaqortoq, a town of 3,500 in southern Greenland, the reservoir becomes a swimming hole. The snowmelt that fills it can warm to as much as 50°F.

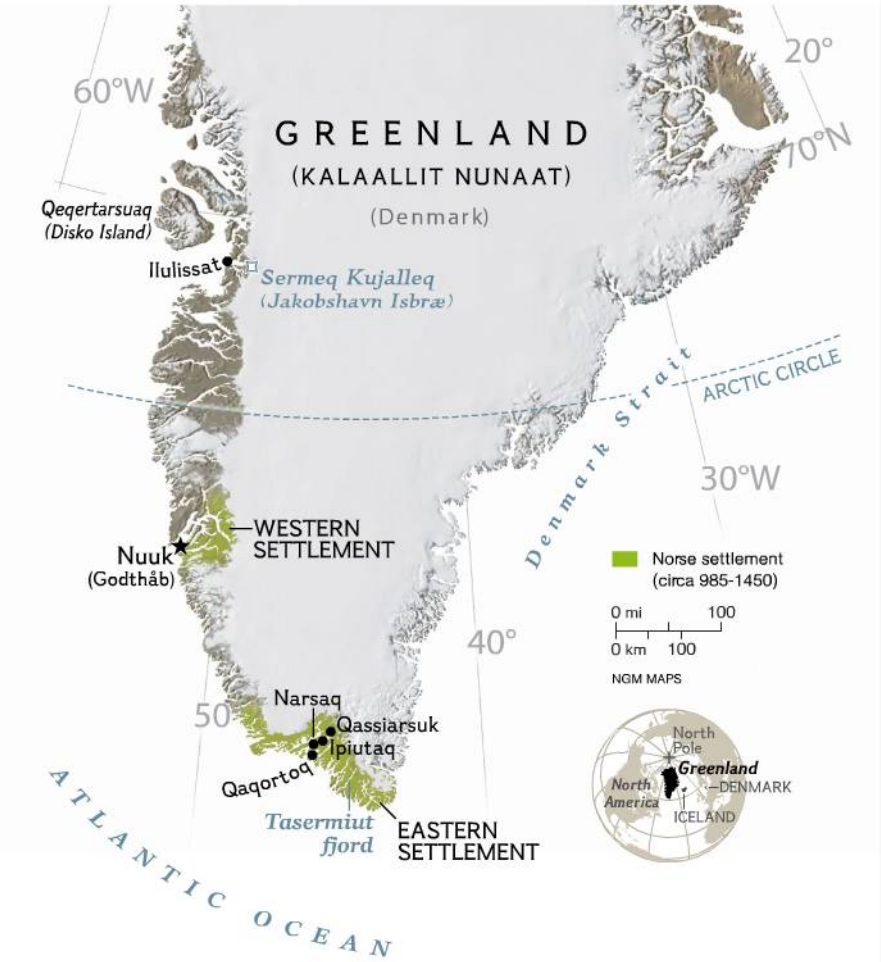
Sporting a Thor's hammer amulet, Sten Pedersen picks cabbage, a new crop for Greenland. He'll deliver it to a restaurant in nearby Nuuk, the capital. The edge of the ice sheet lies just 12 miles away.

BY TIM FOLGER

PHOTOGRAPHS BY PETER ESSICK

A little north and west of Greenland's stormy southern tip, on a steep hillside above an iceberg-clotted fjord first explored by Erik the Red more than a thousand years ago, sprout some horticultural anomalies: a trim lawn of Kentucky bluegrass, some rhubarb, and a few spruce, poplar, fir, and willow trees. They're in the town of Qaqortoq, 60° 43' north latitude, in Kenneth Høegh's backyard, about 400 miles south of the Arctic Circle.

"We had frost last night," Høegh says as we walk around his yard on a warm July morning, examining his plants while mosquitoes examine us. Qaqortoq's harbor glitters sapphire blue below us in the bright sun. A small iceberg—about the size of a city bus—has drifted within a few feet of the town's dock. Brightly painted clapboard homes, built with wood imported from Europe, freckle the nearly bare granite hills that rise like



Haymaking time in Greenland evokes the sunny side of global warming, which just might allow Aviaja Lennert and her family to grow enough grass for their 700 sheep.

In Greenland apprehension about climate change is often overshadowed by great expectations.

Erik the Red killed a man in Iceland over a trifle and worshipped Norse gods until the end, but at Qassiarsuk, site of his Greenland farm, there is a replica of the tiny wood church (left) he built for his wife, who converted to Christianity. A cold millennium later in the same area, a soccer fan in Qaqortoq cheers his nephew's team.

On a cool day in August, descendants of Inuit hunters harvest potatoes along a fjord the Vikings settled. Despite a modest rise in farm output, Greenland still imports nearly all its produce.

Sheep are rounded up near Qassiarsuk, where Erik the Red raised cattle. Greenland spends nearly two million dollars a year subsidizing its 50 sheep farms, which import much of their fodder.

Greenland's future may lie out beyond its sp
fishing grounds: That's where the oil is.

ectacular

An Inuit boy from a foster home in Nuuk learns hunting from a mentor; here they've bagged a caribou. Most Greenlanders hunt, and fishing is by far the dominant industry. Workers at the city's Royal Greenland plant (right) package whole, frozen cod for export. High labor costs make it cheaper to ship the fish to China or Poland for processing.

Rain blurs the view of icebergs in Narsaq, where a mysterious decline in shrimp has shuttered a processing plant and left dozens of residents pondering an uncertain future.

COUNTING

HOW MANY WILD WHOOPING CR

G CRANES

ANES ARE THERE? NOT ENOUGH.

An adult *Grus americana* makes a splashing run-up to flight through a marsh in Canada's Wood Buffalo National Park.

Bowing to its hatchling's hunger, a crane offers an insect morsel. Nestled at center, another egg should hatch in two days—though usually only one chick will survive the season. Parents take turns tending the nest.

BY JENNIFER S. HOLLAND

PHOTOGRAPHS BY KLAUS NIGGE

Nearly grazing the treetops, a tiny red plane swoops in dizzying circles over the bogs and forests of Canada's Wood Buffalo National Park. As pilot Jim Bredy banks hard for another pass, he and his two passengers press their faces against the glass, squinting to spot familiar white smudges on the ground—adult whooping cranes—with russet-feathered young in tow. This wilderness is the summer home of the last wild migratory flock of Earth's most endangered crane.

The aerial census takers are Bredy, Tom Stehn of the U.S. Fish and Wildlife Service, and Lea Craig-Moore of the Canadian Wildlife Service (CWS), and they're worried. The flock's population had reached 266 in the spring of 2008. But by the following spring, 57 had died, 23 of them on the birds' wintering grounds in south Texas,

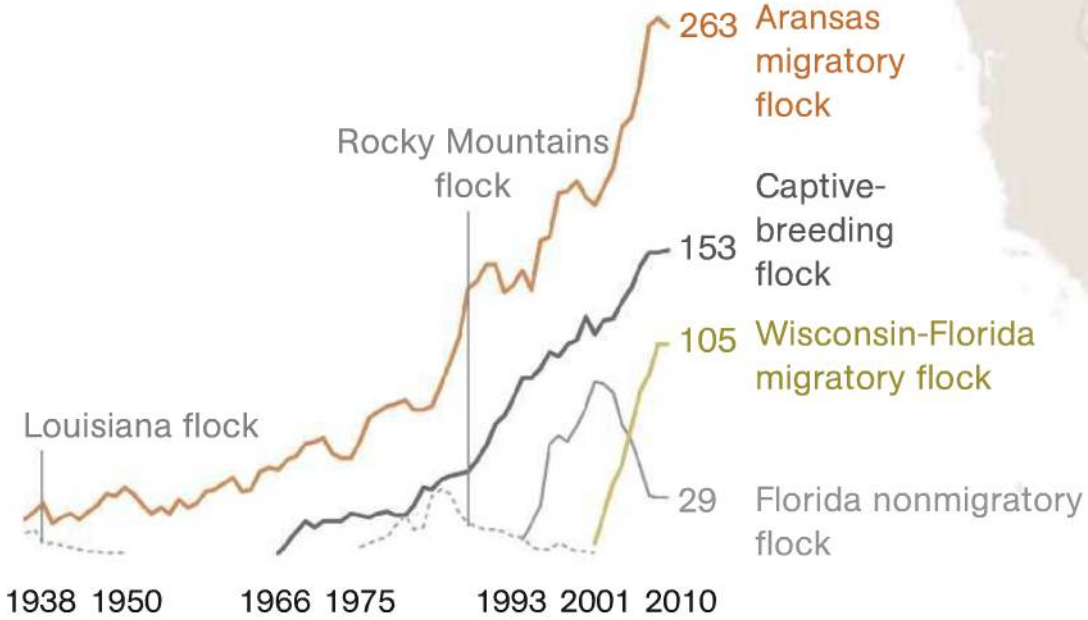
Months-old siblings, which will be mainly white by their second fall, cross paths in winter in Aransas National Wildlife Refuge, Texas.

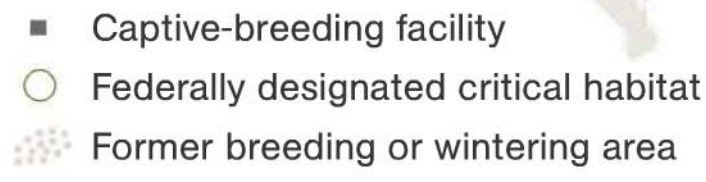
Whooper Whereabouts

In 1966 biologists set up a crane captive-breeding program at Patuxent. In a controversial step they took eggs from wild nests to seed the flock. Five sites now propagate whoopers. Reintroductions failed in Idaho; hope lies elsewhere. One captive-bred eastern flock is being trained to migrate behind ultralight planes.

Whooping Crane Population

(birds counted in winter season)





MAP: VIRGINIA W. MASON, NGM STAFF; CAITLIN SARGENT
SOURCES: U.S. FISH AND WILDLIFE SERVICE; INTERNATIONAL CRANE FOUNDATION


60°
Wood Buffalo-Aransas
migration corridor
CANADA
Wisconsin-Florida
migration corridor
(reintroduced 2001)
45°N
WI
NECEDAH N.W.R.
International Crane
Foundation
PLATTE RIVER
CHEYENNE
BOTTOMS
QUIVIRA N.W.R.
SALT PLAINS N.W.R.
USGS Patuxent
Wildlife Research
Center, Maryland
Nonmigratory
Louisiana flock
(disappeared 1950)
TEXAS
30°
Freeport-
McMoRan
Audubon
Species
Survival
Center
ST. MARKS N.W.R.
CHASSAHOWITZKA N.W.R.
Kissimmee Prairie
San Antonio Zoo
ARANSAS NATIONAL
WILDLIFE REFUGE
(N.W.R.)
MEXICO
Nonmigratory
Florida flock
(reintroductions
ceased in 2005;
research ongoing)
0 mi 300
0 km 300

Size trumps numbers as a crane scatters black-bellied whistling-ducks near a game feeder on a private Texas ranch. The conservation-minded owners have legally protected this land to shelter their annual visitors.

Youngsters grown up enough to migrate 2,500 miles to Texas still beg for crabs and clams from an adult probing brackish water at Aransas. Nearly a century into conservation efforts, including long-term monitoring of banded birds (right), whoopers have taken a big step back from the edge. But only with healthy habitat across their range can the wild flock persevere. Says biologist Tom Stehn, "There's just no wiggle room with this species."

PHOTOGRAPHS BY JAMES NACHTWEY

South Africa is a vibrant, multi-ethnic democracy striving, with mixed success, to fulfill its promise.

MANDELA'S CHILDREN

A BETTER LIFE At Eden Park near Johannesburg, the moon rises over government-built houses that reflect South Africa's drive to become the just society Nelson Mandela envisioned when he won the Nobel Peace Prize in 1993: "It will … be measured by the happiness and welfare of the children."

TIED TO TRADITION Xhosa teens, initiated into manhood in a centuries-old circumcision ritual called *ulwaluko,* stay in seclusion outside their Eastern Cape village, wrapped in ceremonial blankets and painted with white clay for purification. Hospital surgeries reduce the infection rate, but many boys opt for the old rite.

SLOW TO CHANGE Four generations on, and the rhythm of life continues much as ever for Afrikaner Bertie Swanepoel, who raises cattle and sheep on his 3,000-acre ranch in the Free State. Whites still own more than 80 percent of commercial farmland; reform efforts have delivered only a sliver of land to blacks.

PROMISES TO KEEP A girl in Soweto's struggling Kliptown neighborhood accepts an apple from a local woman. Many Kliptown residents lack electricity and have to collect water in buckets. President Jacob Zuma, smiling in a 2009 election campaign poster behind the child, has vowed to provide basic services.

SOCCER CITY Johannesburg's new 94,000-seat stadium, inspired by the shape of a traditional African pot, sparkles against the city's skyline. With all eyes on the World Cup host, South Africa aims to dazzle: President Zuma calls 2010 the most critical year since 1994, when apartheid ended.

BY ALEXANDRA FULLER

A DAY OF RECKONING

THE MINISTER

It turns out there is no shortcut, bolt-of-inspiration way to transform a person from layman to minister in the Dutch Reformed Church of South Africa. It takes seven years of rigorous training—seven years of Deon Snyman's youth—which made it all the more distressing when, toward the end of his studies at the University of Pretoria in 1990, Snyman realized he had all the theology a person could possibly need to function in the old South Africa but almost no skills to guide him in the country that had just released Nelson Mandela.

Snyman, who was born and raised in "a traditional Afrikaans family, in a typical Afrikaans town north of Johannesburg," says that back then he knew no black people, had no black friends, had never even had a meaningful conversation with a black person. "The church was divided into white congregations, Coloured congregations, Indian congregations, and black congregations," he says. He decided that the best way he could avoid waking up one morning a foreigner in his own country was to become the minister of a rural, black congregation.

On the day in February 1992 that Deon Snyman was installed as a minister in the Dutch Reformed Church in Africa—the church's black branch—in Nongoma, in the heart of the KwaZulu home-

"WORK, BREAD, WATER, AND SALT FOR ALL"

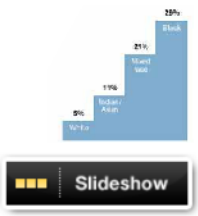
Nelson Mandela's 1994 presidential inaugural address spoke to basic dignities widely lacking under apartheid. During that era of extreme segregation, blacks—now 79 percent of the country's population of 49 million—were progressively stripped of civil rights. They were assigned to ethnic homelands, slated to become independent so that South Africa could be a white-majority nation. The millions living in black townships outside homelands, a workforce crucial to the economy, had to carry passbooks. South Africa's first democratic national election, which brought Nelson Mandela to office, dissolved the homelands and created nine provinces to help bridge ethnic groups.

Swaziland and Lesotho, landlocked monarchies, gained independence from the United Kingdom in the 1960s.

MAP: MARTIN GAMACHE, NGM STAFF
SOURCE: AGRICULTURAL GEO-REFERENCED INFORMATION SYSTEM, SOUTH AFRICA

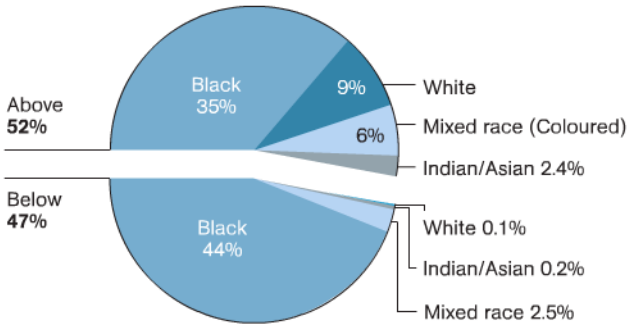
DISMANTLING APARTHEID

Government programs to counter historic inequities between whites and nonwhites have met both success and frustration. South Africa has the continent's highest GDP, and its postapartheid economy overall has grown, in part because international investors no longer shun the country as a pariah. But the society remains strikingly two tiered: Few nations have a greater disparity between the incomes of their richest and their poorest.



Graphics: South Africa by the numbers

Population above and below the poverty line*
2008



*502 RAND ($63) PER PERSON PER MONTH.
PERCENTAGES DO NOT EQUAL 100 BECAUSE OF ROUNDING.

ALL GRAPHICS: JOHN TOMANIO AND MARGUERITE B. HUNSIKER, NGM STAFF
SOURCE: NATIONAL INCOME DYNAMICS STUDY, UNIVERSITY OF CAPE TOWN

GIVING COMFORT A caregiver bathes and cradles the head of a patient receiving home care from Pretoria's Thola-Ulwazi hospice, which provides free services to 700 people with AIDS and tuberculosis. "There is no other place in our area where they could receive help," says director Venile Lekhwane.

ROUGH JUSTICE A Cape Town police officer subdues a suspect during a court-ordered search in Cape Flats, a violence-ridden district. Police stripped the man but did not arrest him. Infamous for gang wars and illicit drugs, Cape Flats is emblematic of South Africa's urgent need to curtail crime.

SOWETO RISING Its transformation from chaotic township to thriving Johannesburg suburb got a boost when the 700,000-square-foot Maponya Mall opened in 2007. Named for its developer, teacher turned entrepreneur Richard Maponya, the glass-and-steel hub draws 1.5 million people a month.

DAY IN THE SUN Young marrieds Felicity Nyikadzino Berold and Ralph Berold, both 33, enjoy a game of Scrabble near Johannesburg's Zoo Lake. "Things have changed a lot in the past ten years," Ralph says. "There are subtle forms of prejudice, but the younger generation is a lot more relaxed about diversity."

LOOKING AHEAD A
to deter criminals. Mande
still ring true: "Much has

woman in Soweto gazes past a length of lace draped to dry on razor wire set up
ela's words after a landmark 1976 uprising against apartheid by Soweto youths
been achieved and much remains to be done."

DISCOVERY *in the* FOJA MOUNTAINS

A BIOLOGICAL EXPEDITION TO A REMOTE NEW GUINEA RAIN FOREST EXPLORES A WORLD OF BIZARRE AND BEAUTIFUL CREATURES, AMONG THEM A SPIKE-NOSED TREE FROG AND A TINY INCHWORM MOTH AS FANTASTIC AS ANY COMPUTER-GENERATED SCI-FI MONSTER.

Near a tent serving as a makeshift laboratory, Australian herpetologist Paul Oliver records the call of a frog out and about at the start of the rainy season. Daily downpours nourish the Foja Mountains' diverse life but create difficult conditions for scientists, who must trudge miles on steep, muddy trails to research sites.

Rising over 7,200 feet, New Guinea's Foja Mountains stand above surrounding lowland forest as a virtual island where species have evolved in isolation for millennia. No evidence has been found of human occupation in the higher reaches, and animals gone from other New Guinea ranges still thrive here.

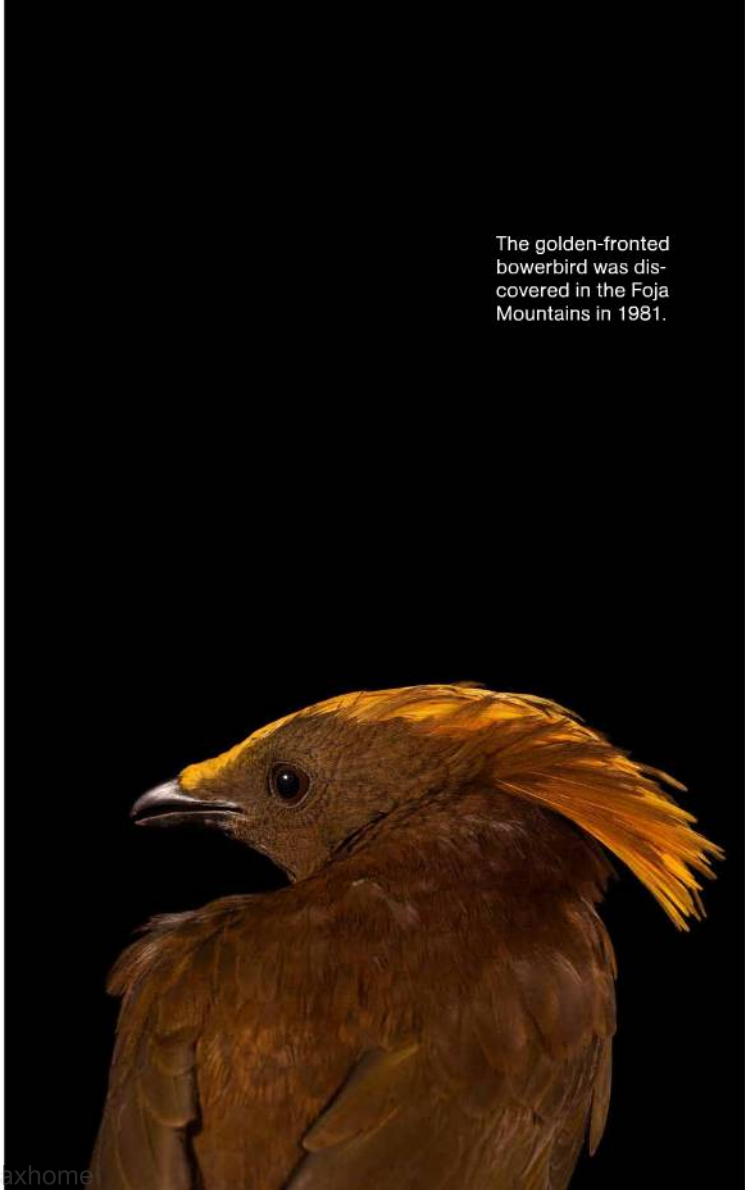
BY MEL WHITE PHOTOGRAPHS BY TIM LAMAN

Brother Henk is remaining remarkably calm about the loss of his clothes.

Only hours ago a helicopter dropped him into an opening in the rain forest a mile high in the Foja Mountains on the island of New Guinea, one of the remotest and most difficult to reach places on Earth. The sound of the chopper blades had barely faded when he discovered that his duffel bag was nowhere to be found and what he was wearing—a bucket hat; pink, short-sleeved shirt; jeans; and rubber boots—composed his entire wardrobe for the next three weeks.

Yet Henk van Mastrigt is very happy. Holding his red net, he stalks across a muddy bog, lunging at and occasionally catching one of the jewel-bright butterflies that dart by. "Come down, come close, don't be afraid," he calls to them in his Dutch accent. He stops to urinate on the mud, knowing butterflies will be attracted to minerals in the puddle.

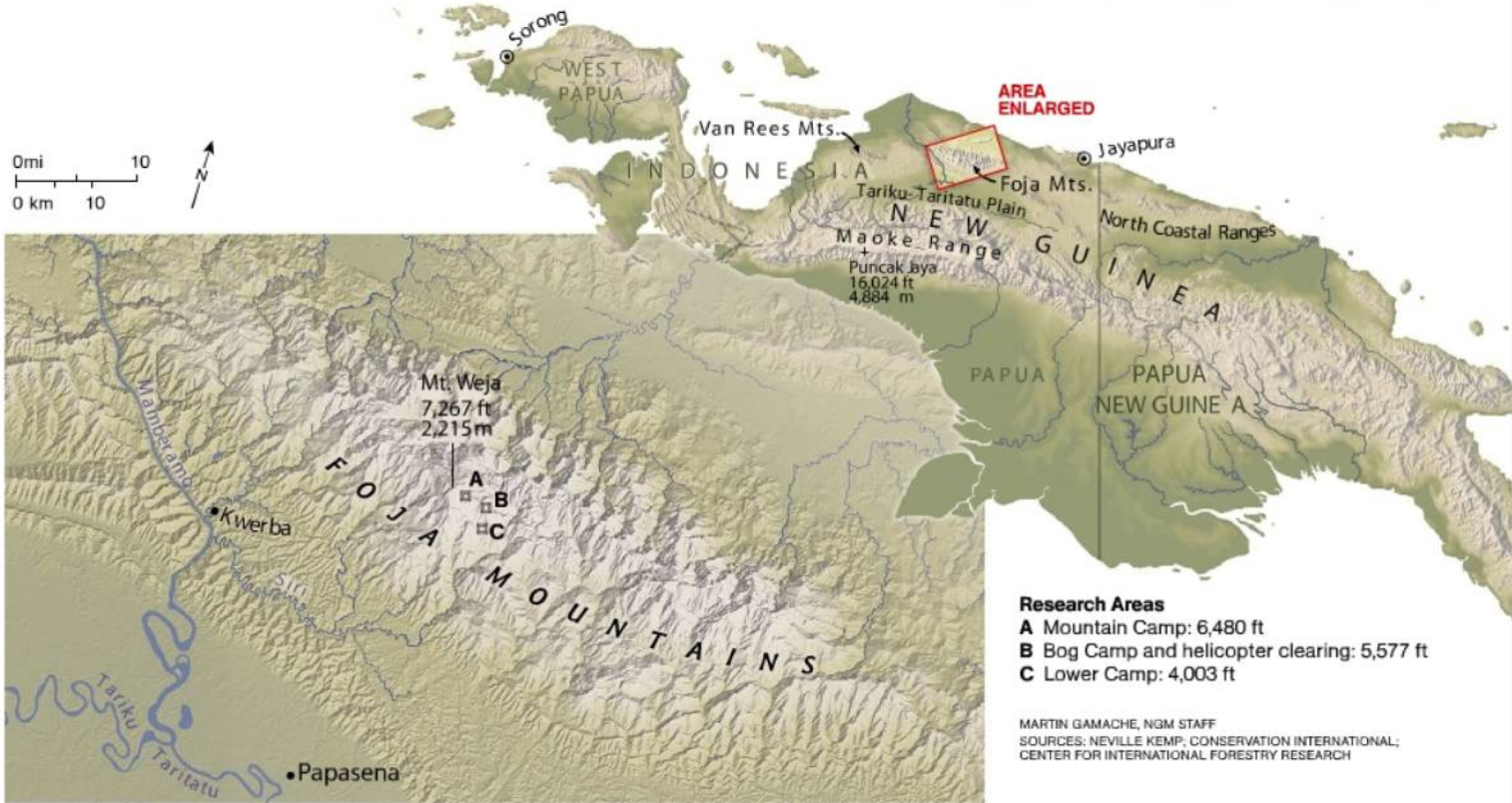
Brother Henk catches a medium-size butterfly. With blunt-ended tweezers he spreads its wings, which are deep black with J-shaped markings in gleaming white. "Oh, this is great, great, great!" he says, a huge smile on his white-



The golden-fronted bowerbird was discovered in the Foja Mountains in 1981.

Middle of Nowhere

The Foja expedition (map), in cooperation with the Indonesian Institute of Sciences, gained access to the mountains from the land-owning Kwerba and Papasena villages. Locals guided scientists, sharing knowledge of flora and fauna. Pristine rain forest is home to the long-beaked echidna (right). Related to the platypus, this nocturnal worm-eater is the largest egg-laying mammal in the world. An echidna can weigh up to 36 pounds.



Research Areas

A Mountain Camp: 6,480 ft
B Bog Camp and helicopter clearing: 5,577 ft
C Lower Camp: 4,003 ft

MARTIN GAMACHE, NGM STAFF
SOURCES: NEVILLE KEMP; CONSERVATION INTERNATIONAL; CENTER FOR INTERNATIONAL FORESTRY RESEARCH

A golden-mantled tree kangaroo triggered a camera and strobes as it crossed an infrared beam. Few scientists have seen the arboreal marsupial in the flesh. The Fojas provide a vital refuge for the species, critically endangered by hunting and habitat loss elsewhere in the mountains on the island of New Guinea.

Creatures of the Night

When the sun sets in the Fojas, hundreds of species of rain forest inhabitants emerge to take the place of those retiring for the night. As Indonesian entomologist Hari Sutrisno demonstrates (below), a couple of lightbulbs and a sheet attract scores of moths of staggering diversity. Many have yet to be identified. Night is also the best time to find frogs. New Guinea is home to around 350 frog species; an equal number may be awaiting discovery on the island.

Society Grant This project was funded in part by your National Geographic Society membership.

Yet to be given a scien
from forest flowers, wh
eries in the Foja Mount
threats so the intact w

tific name, this species of blossom bat uses its long tongue to feed on nectar ich it pollinates as it flies from plant to plant. Conservationists hope that discov- ains will provide incentive to protect the region from mining, logging, and other eb of biodiversity can function naturally for generations to come.

Caves of Faith

In a Silk Road oasis, thousands of Buddhas enthrall scholars and tourists alike.

CAVE 260, PAGE 141

A 51-foot Buc
will pass sere

CAVE 158, SEE PAG

ddha from the Middle Tang period (781-847) reclines to await death, when he
nely into nirvana. Followers painted on the cave walls express their agony.

E 137. PHOTOGRAPH COMPOSED OF THREE ADJACENT IMAGES

BY BROOK LARMER

PHOTOGRAPHS BY TONY LAW

A stand of poplars under the dunes of China's Gobi desert marks the presence of a seasonal river and a mile-long cliff carved by its waters. In the fourth century A.D. Buddhists began digging caves in the rock face and decorating the darkness with paintings and statues.

The human skeletons were piled up

like signposts in the sand. For Xuanzang, a Buddhist monk traveling the Silk Road in A.D. 629, the bleached-out bones were reminders of the dangers that stalked the world's most vital thoroughfare for commerce, conquest, and ideas. Swirling sandstorms in the desert beyond the western edge of the Chinese Empire had left the monk disoriented and on the verge of collapse. Rising heat played tricks on his eyes, torturing him with visions of menacing armies on distant dunes. More terrifying still were the sword-wielding bandits who preyed on caravans and their cargo—silk, tea, and ceramics heading west to the courts of Persia and the Mediterranean, and gold, gems, and horses moving east to the Tang dynasty capital of Changan, among the largest

On the dunes above the cliff face, workers lay down a grid of straw to combat a relentless enemy: windblown sand. A "great wall" of desert plants will eventually replace the 2.5 miles of synthetic fencing that has reduced sand invasion by 60 percent—ensuring that Mogao, unlike other Silk Road sites, will not be buried beneath the desert.

cities in the world.

What kept Xuanzang going, he wrote in his famous account of the journey, was another precious item carried along the Silk Road: Buddhism itself. Other religions surged along this same route—Manichaeism, Christianity, Zoroastrianism, and later, Islam—but none influenced China so deeply as Buddhism, whose migration from India began sometime in the first three centuries A.D. The Buddhist texts Xuanzang carted back from India and spent the next two decades studying and translating would serve as the foundation of Chinese Buddhism and fuel the religion's expansion.

Near the end of his 16-year journey, the monk stopped in Dunhuang, a thriving Silk Road oasis where crosscurrents of people and cultures were giving rise to one of the great marvels of the Buddhist world, the Mogao caves.

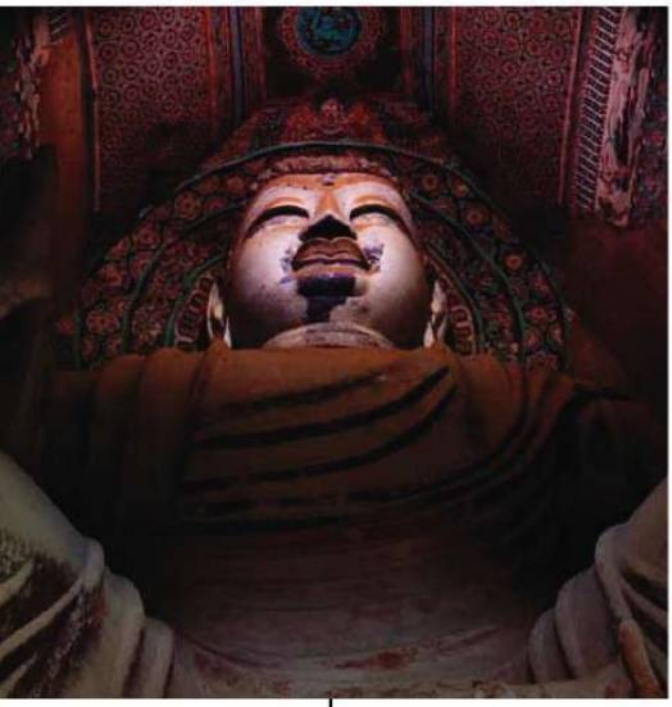
Emerging from the wind-sculptured dunes some 12 miles southeast of Dunhuang is an arc of cliffs that drop more than a hundred feet to a riverbed lined with poplar trees. By the mid-seventh century, the mile-long rock face was honeycombed with hundreds of grottoes. It was here that pilgrims came to pray for safe passage across the dreaded Taklimakan Desert—or in Xuanzang's case, to give thanks for a successful journey.

Within the caves, the monochrome lifelessness of the desert gave way to an exuberance of color and movement. Thousands of Buddhas in every hue radiated across the grotto walls, their robes glinting with imported gold. *Apsaras* (heavenly nymphs) and celestial musicians

GALLERIES IN THE GROTTOES

One of the world's finest galleries of Buddhist art is found in 492 of the Mogao caves near Dunhuang, a Silk Road oasis in northwestern China. Carved between the fourth and 14th centuries, the caves offer a time capsule of an ancient world.

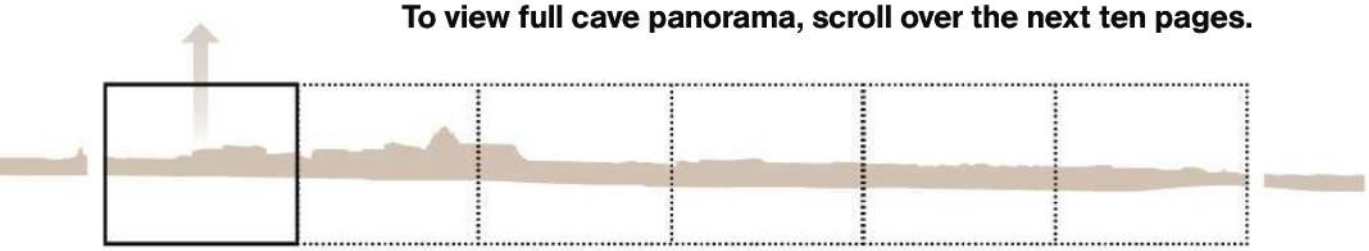
PANORAMA, COMPOSED OF HUNDREDS OF IMAGES: DUNHUANG ACADEMY



The statue of a seated Buddha in Cave 130 is 89 feet tall, one of Mogao's three largest. Intricately patterned ceilings are meant to mimic hanging cloth, as in a tent.

TANG DYNASTY
618-906 A.D.

To view full cave panorama, scroll over the next ten pages.

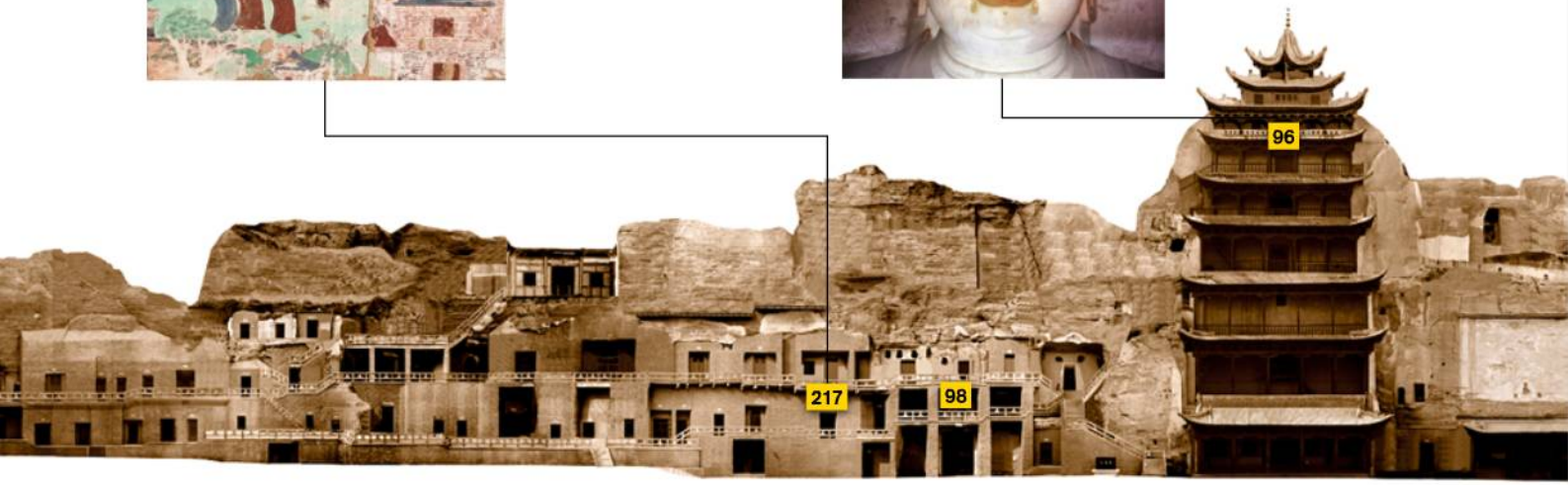


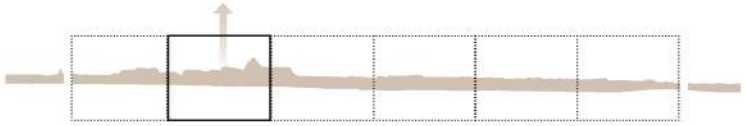
A mural in Cave 217 depicts an imaginary city, conjured up by the leader of a pilgrimage to serve as a resting place for his weary followers.

TANG DYNASTY 618-906 A.D.

Mogao's tallest Buddha, at 116 feet, peers out of Cave 96—a nine-story pagoda.

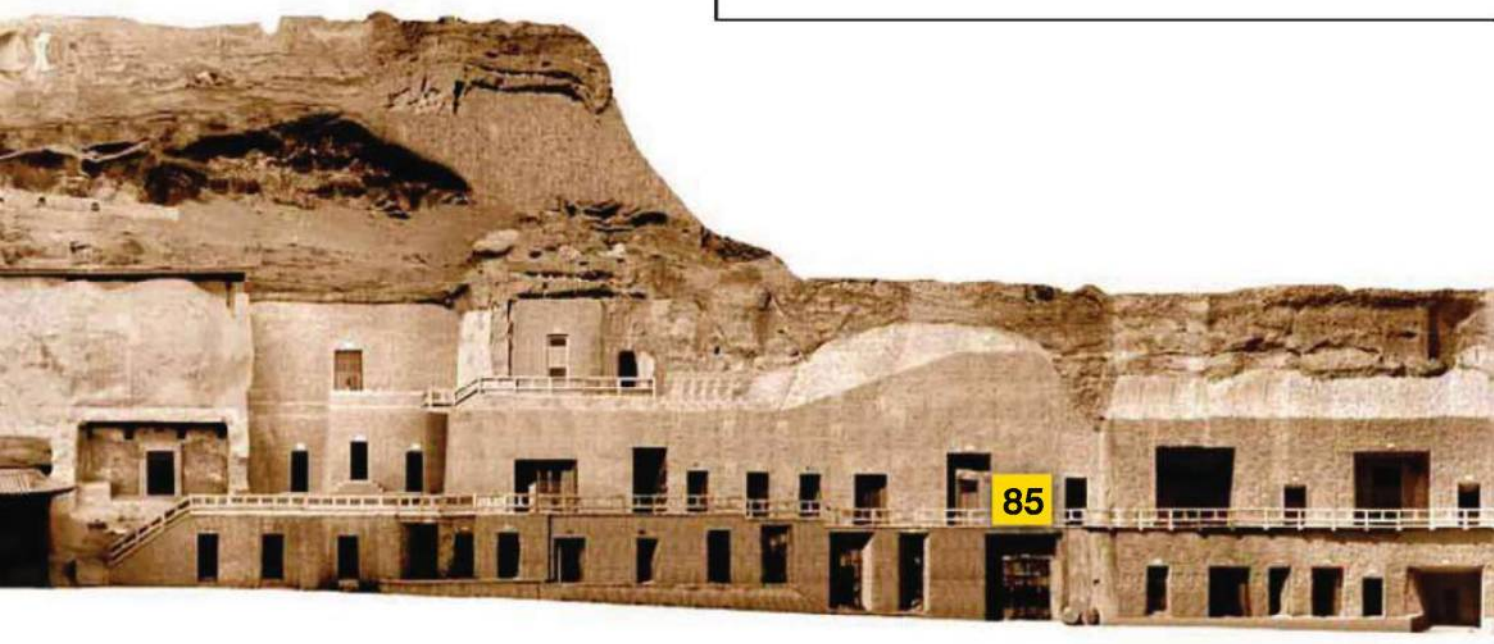
TANG DYNASTY 618-906 A.D.





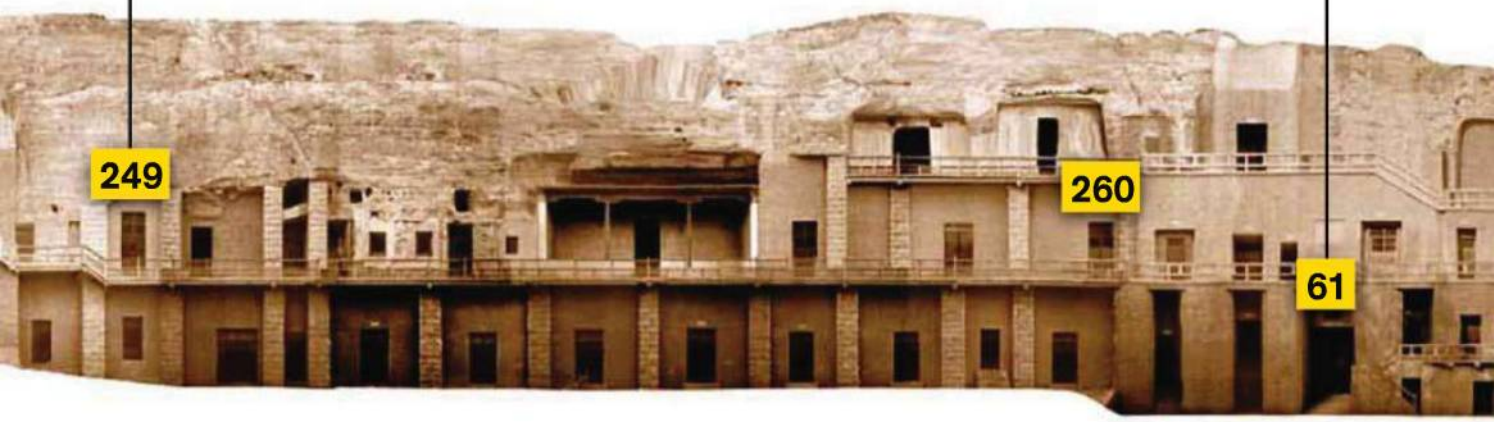
Indian and Chinese figures twirl around a demon on the ceiling of Cave 249, a sixth-century gem, showing how other deities were incorporated into the Buddhist pantheon.

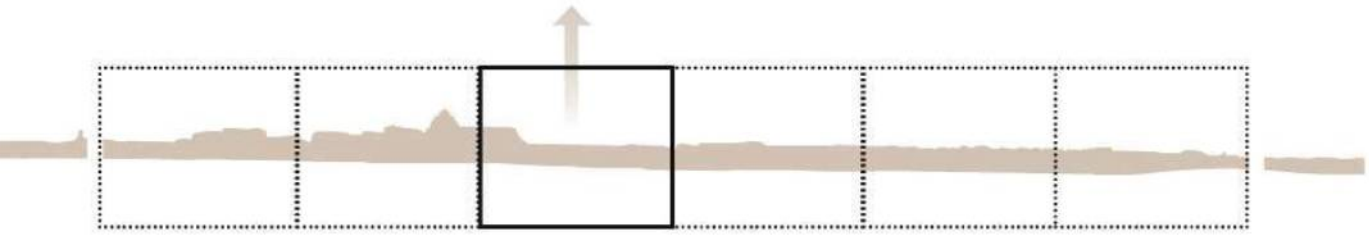
WESTERN WEI DYNASTY
535-556 A.D.



Patrons depicted in Cave 61 include women in Khotanese and Uygur dress—a sign of Dunhuang's tenth-century "marriage diplomacy" with regions to the west.

FIVE DYNASTIES
907-959 A.D.



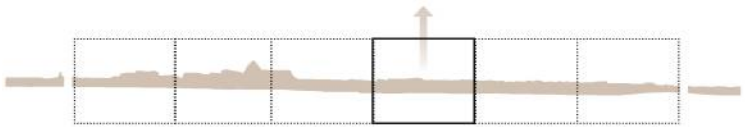


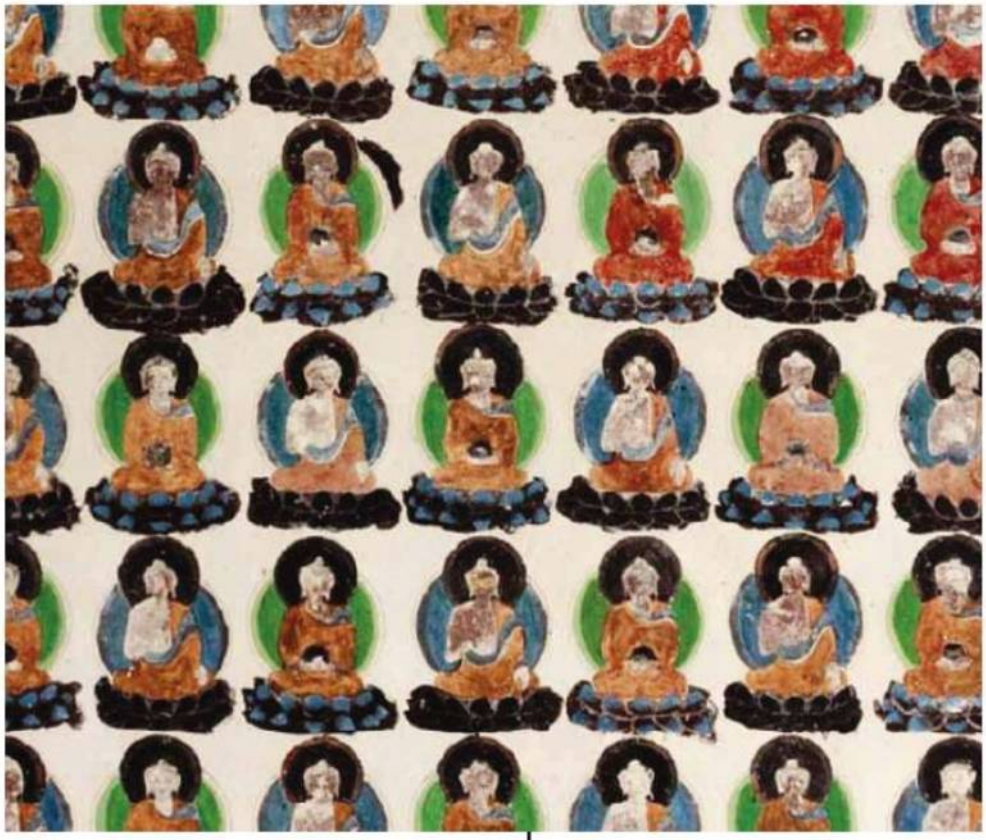
A reclining Buddha occupies a niche surrounded by thousands of Buddha images in Cave 46.

TANG DYNASTY
618-906 A.D.

Floral garments worn by sixth-century statues in Cave 427 reflect the influence of Persia, some 2,500 miles away—demonstrating the flow of ideas and fashion along the Silk Road.

SUI DYNASTY
581-618 A.D.





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**TANG
618-9**

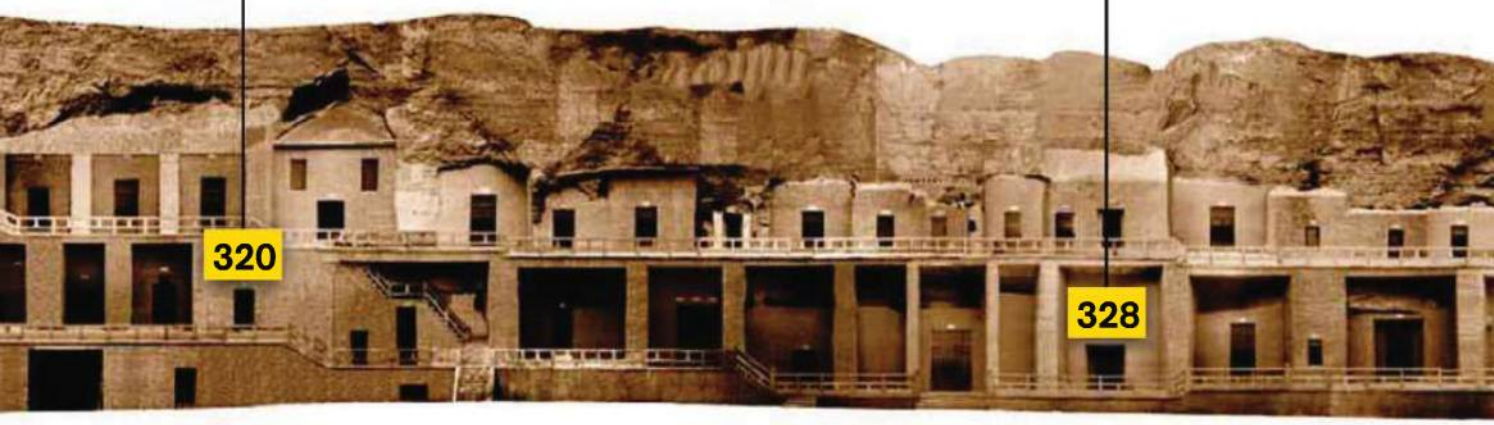

PHOTO: HARVARD ART MUSEUM/ARTHUR M. SACKLER MUSEUM (STATUE)

ecurring Thou-
Buddhas motif,
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doctrine of
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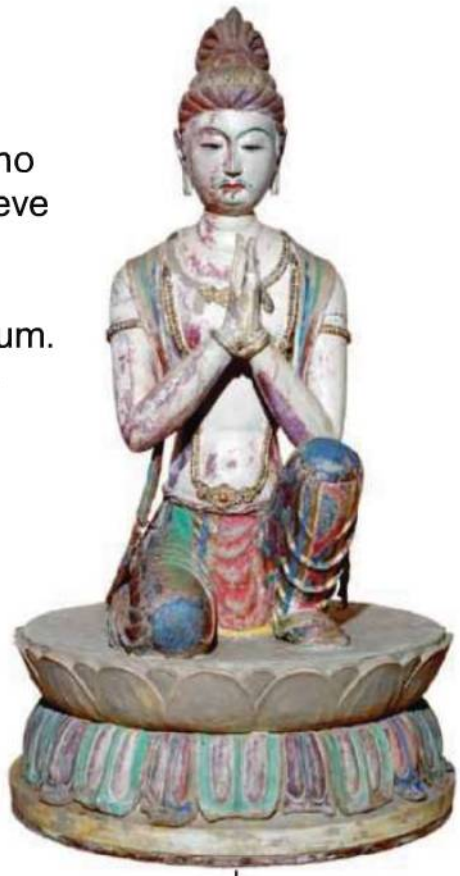
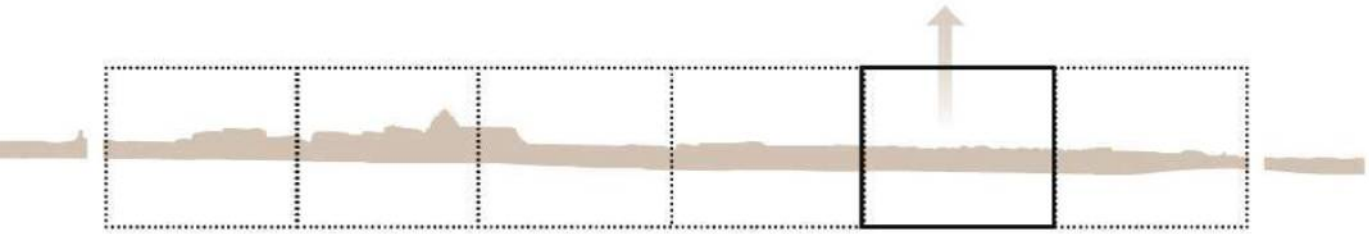
nse of infinity.

G DYNASTY
906 A.D.

Taken from Cave 328 in 1924, this statue of a bodhisattva—a being who helps others achieve enlightenment—now kneels in the Harvard Art Museum.

TANG DYNASTY
618-906 A.D.





The woodblock frontispiece from the world's oldest printed and dated book, the ninth-century Diamond Sutra, was removed from Cave 17 and now sits in the British Library.

TANG DYNASTY
618-906 A.D.

The 13th-century murals in Cave 465 (cave not visible in panorama below) are among the last—and most sexually charged—images created at Mogao.

YUAN DYNASTY
1227-1368 A.D.

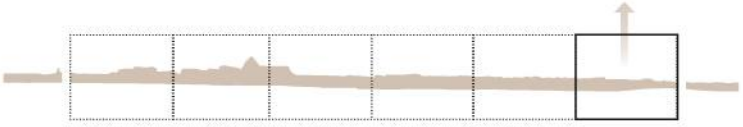


PHOTO: BRITISH LIBRARY BOARD OR. 8210/P2 (FRONTISPIECE)

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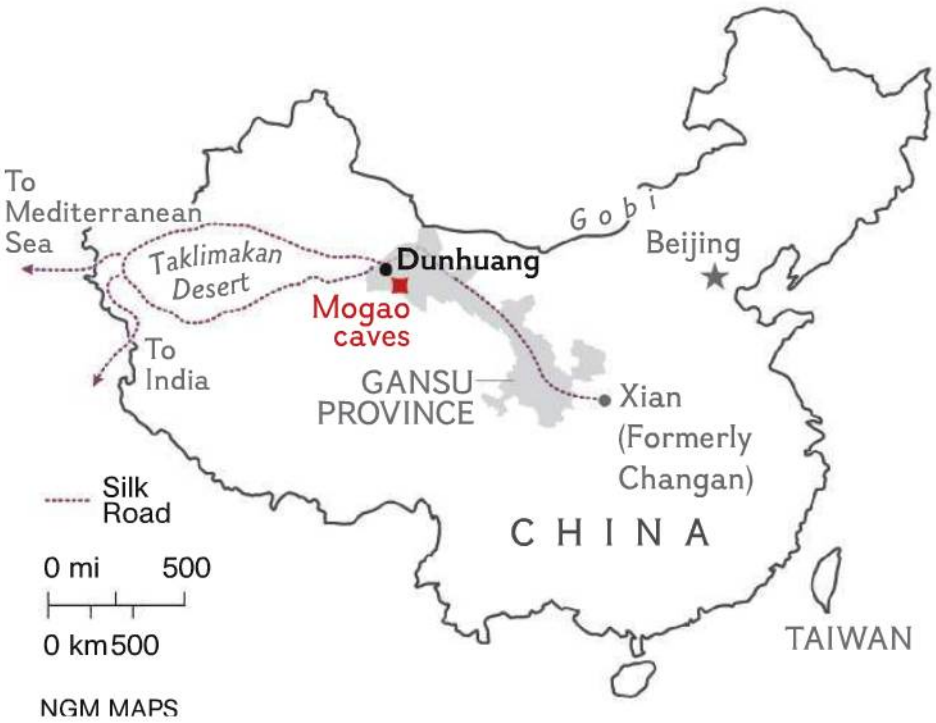


up to see the art inside the Mogao grottoes, which opened to the public in
ves are not far from Dunhuang, which was a thriving Silk Road oasis. Pilgrims
, at one of the great marvels of the Buddhist world, to pray for safe passage
eaded Taklimakan Desert.

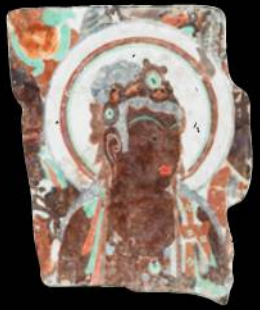
The natural, fluid poses of the Buddha's retinue characterize the High Tang period, when historians say both Buddhism and art reached their highest expression in the grottoes.

CAVE 45, PAGE 142. PHOTOGRAPH COMPOSED OF THREE ADJACENT IMAGES

Within the grottoes carved into the mile-long rock face, the monochrome lifelessness of the desert gave way to an exuberance of color and movement.

Jewelry encrusted with gold leaf makes this seventh-century portrait of the Bodhisattva Guanyin seem three-dimensional—and thus more real. Depicted as a male figure in Indian Buddhism, Guanyin would gradually transform into a female in China, in part to accommodate older Chinese beliefs in a female goddess of mercy.

CAVE 57, PAGE 142



The bodhisattva above, a fragment pried from this High Tang (705-780) mural by art historian Langdon Warner in 1924, is now in the Harvard Art Museum's collection. The scar is visible at right. Warner and others removed many artifacts from the caves in the early 20th century. It's a source of continuing ire in China that museums around the world display some of the missing pieces.

CAVE 320, PAGE 144
ABOVE: HARVARD ART MUSEUM/ ARTHUR M. SACKLER MUSEUM

Scaffolding rises in a tenth-century grotto, part of a conservation effort to stave off the effects of sand, salt, soot—and the damp breath of tourists.

CAVE 98, PAGE 139

Most other Silk Road sites were devoured by the desert. But the Mogao caves endured largely intact, their kaleidoscope of murals and sculptures capturing early encounters of East and West.

Eyes bulging as he tramples a foreign demon, an eighth-century heavenly guard in armor reveals the fiercer side of Buddhist cosmology. The grottoes' modern-day guardians at the Dunhuang Academy seem equally fierce about protecting the caves. Says director Fan Jinshi, "The caves may be in China, but they belong to the world."

CAVE 46, PAGE 142

ON ASSIGNMENT

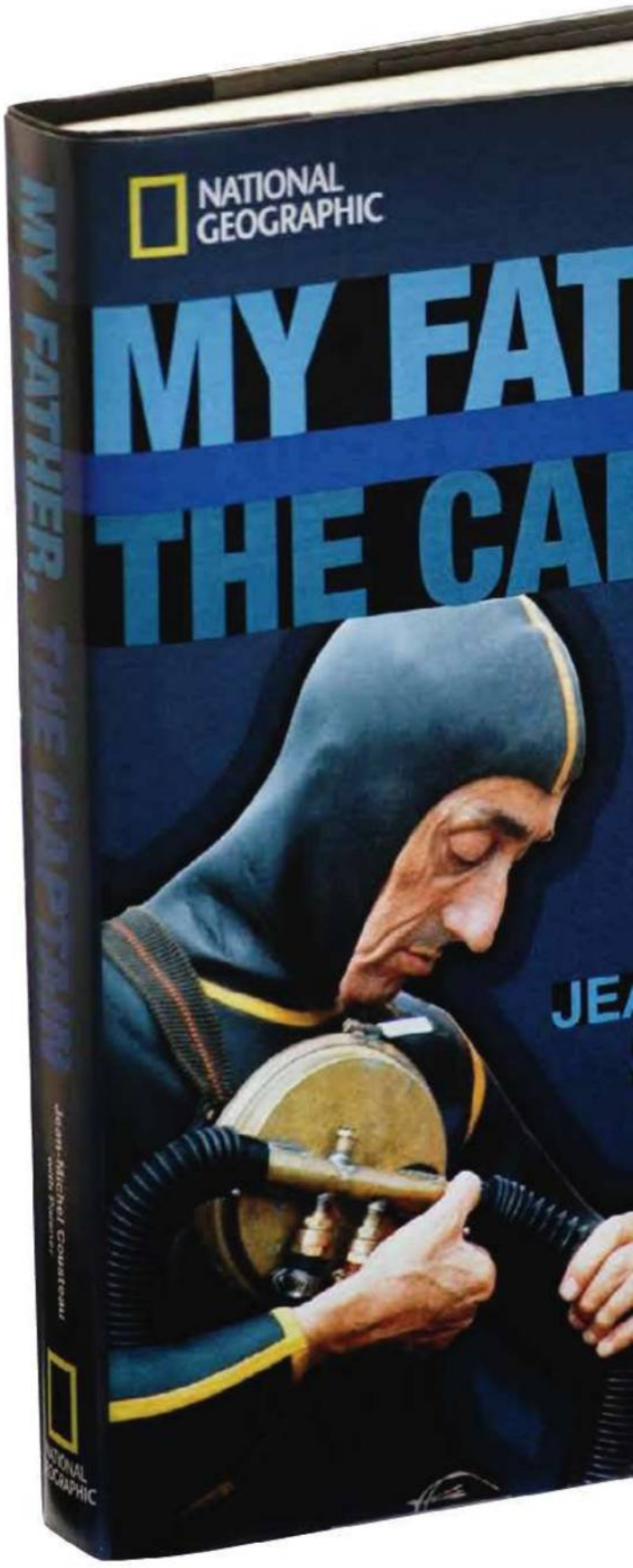
Ice Gauge "It's like Christmas Day when you open up those cameras," says photographer James Balog, referring to the dozens he has stationed around the globe and programmed to snap at regular intervals. The collection is part of the Extreme Ice Survey (EIS), an ongoing project he created to document climate change in glacial landscapes. While on assignment for this issue's "Melt Zone" story, Balog and his assistant, engineer Adam LeWinter, used their EIS techniques to record the shifting melt channels of Greenland. Working 50 miles from the nearest town, the team's long packing list included tents, generators, batteries, and climbing gear. "All that stuff weighed somewhere on the order of 1,200 pounds," estimates Balog. The payoff, he says, is in the pictures: "You see a vanished past that has returned."

Adam LeWinter installs a camera on the Greenland ice sheet (above). Back at the airport hangar, team members sort their gear before flying home (left).

PHOTOS: JAMES BALOG

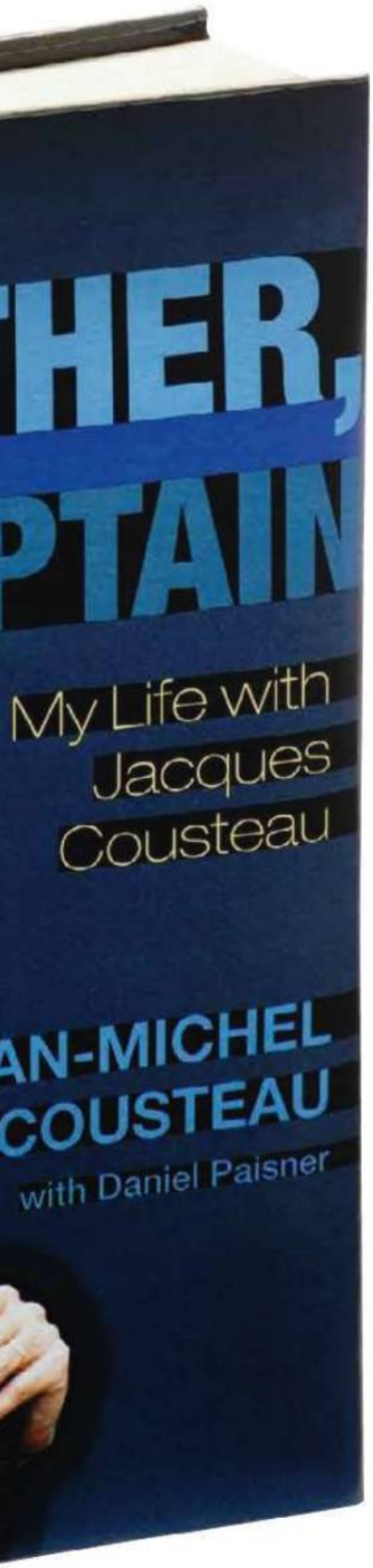
Society Updates

In *My Father, the Captain,* Jean-Michel Cousteau portrays life with his legendary father, who inspired millions to care about the sea and its creatures. In honor of what would have been Jacques Cousteau's 100th year, this memoir—based on the original French best seller—is in stores now ($26).



NAT GEO CHANNEL

Renowned shark scientist Michael Domeier spent the past decade studying great whites off the coast of Mexico. Now, with a team of ace anglers, he takes his work even further in *Expedition Great White,* a new Sunday night series premiering June 6 at 10 p.m. on the National Geographic Channel.



Crossword Answers

M	E	A	R	A	■	A	S	S	N	■	■	P	A	T
O	G	R	E	S	■	D	I	C	T	A	■	E	L	I
H	O	L	D	T	H	E	F	O	H	N	■	A	I	M
S	N	O	W	■	A	S	T	O	■	J	A	C	K	O
■	■	■	I	S	N	T	■	P	I	O	N	E	E	R
I	C	A	N	T	G	E	T	I	N	U	I	T	■	■
D	I	C	E	Y	■	■	A	N	G	■	L	O	S	T
E	A	T	■	E	M	E	R	G	E	S	■	W	O	E
S	O	I	L	■	M	X	S	■	■	A	G	E	N	T
■	■	V	I	S	I	T	I	N	G	N	O	R	S	E
S	T	E	E	L	I	E	■	I	A	G	O	■	■	■
H	E	D	D	A	■	N	A	B	E	■	D	O	G	E
O	S	U	■	M	O	D	E	L	A	F	J	O	R	D
A	L	T	■	S	T	E	R	E	■	R	O	N	I	N
L	A	Y	■	■	T	R	O	T	■	O	B	A	M	A

Winning Photos

More than 208,000 images were submitted to the fourth annual National Geographic International Photography Contest. Participation was open to readership of *National Geographic*'s English-language edition and 20 of its local-language partners; Poland and China accounted for 129,000 entries alone. Our judges selected photographs by Debra Jansen, Hugo Machado, and William Goodwin—in the categories of People, Places, and Nature—as grand-prize winners.

The winning photographers will receive all-expense-paid trips to National Geographic Society headquarters in Washington, D.C.

William Goodwin of Birmingham, Alabama, snapped this peppermint shrimp perched inside a tube sponge in Margate Bay, Bonaire, in the Netherlands Antilles.









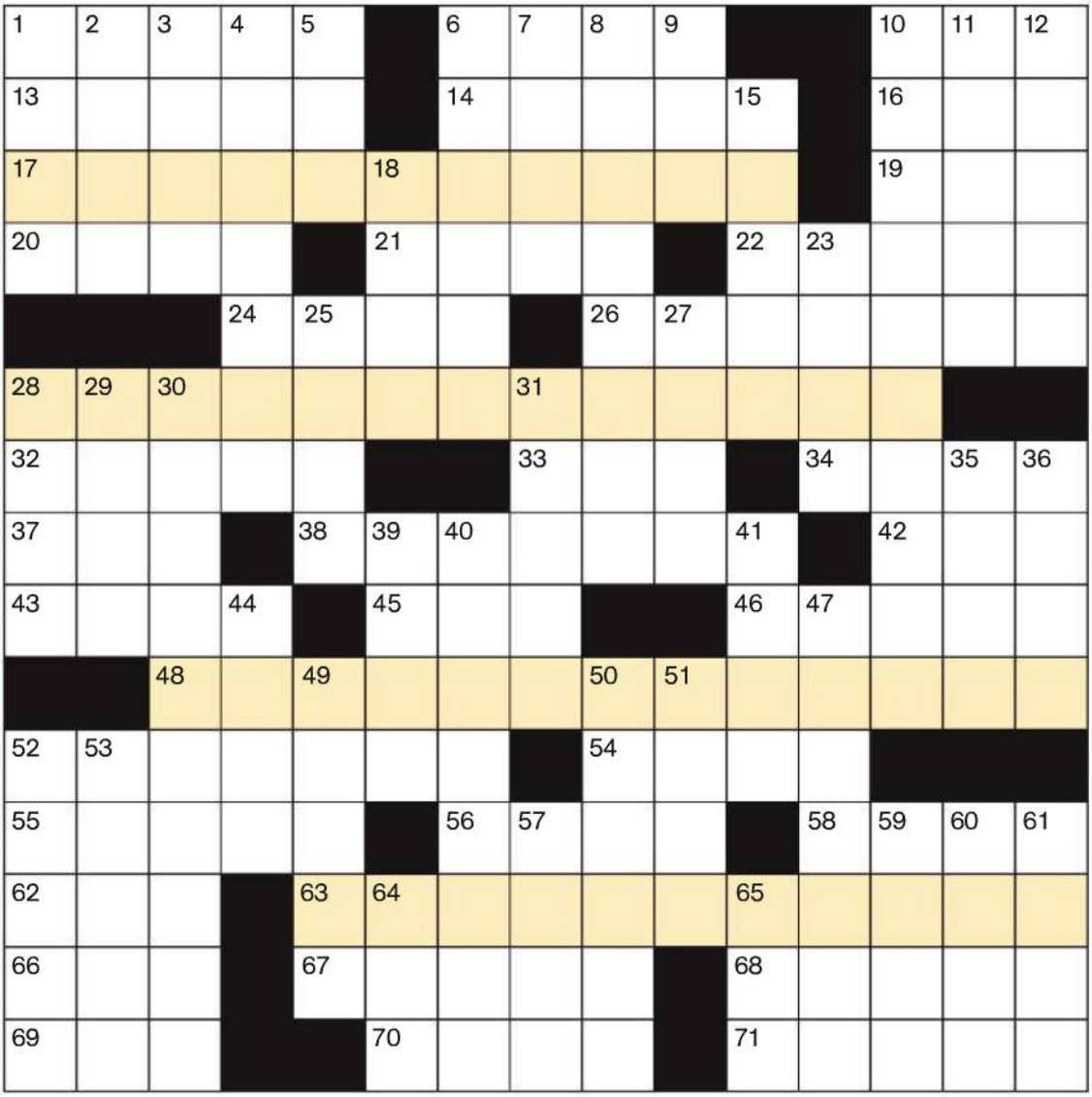
PHOTO: RALPH B. HUBBARD, JR., NATIONAL GEOGRAPHIC STOCK

Midnight Fun

A series of suns studs the night sky in this multiple exposure. A member of polar explorer Donald B. MacMillan's 1947 expedition to Greenland, photographer Ralph B. Hubbard, Jr., explained, "To obtain the picture, I set my cameras up on a prominence near Refuge Harbor, about 11.5 degrees from the North Pole, and aimed them towards the north. In all I made about 11 exposures of the sun while it was in the field of my camera, with one exposure being made every 20 minutes." The sun shown at the center was shot at exactly midnight.

—Margaret G. Zackowitz

GEO PUZZLE



ACROSS

1 Stiller's partner in laughs and love

6 Part of NBA or PTA

10 Edible stick slice

13 Fairy-tale fiends

14 Formal rulings

16 Giants quarterback Manning

65 Plea to Mother Nature to stop a downslope Greenland wind?

19 Intent

65 It's often mixed with rain in Greenland

21 Concerning

22 "Billie Jean" singer's nickname

24 "Say it _ so!"

26 Trailblazer

28 Lament of one struggling to learn Greenland's dialect Kalaallisut?

32 Touch and go

33 The Ice Storm director Lee

Crossword answers, page 163

34 Bewildered
37 Have Greenland's "pink gold"
38 Comes forth
42 Misery
43 Grub's habitat
45 Minuteman missile successors, for short
46 Broker
48 Erik the Red and some Vikings, while in Greenland?
52 Metal playing marble
54 Othello's betrayer
55 Ibsen title protagonist
56 Another name for the "hood"
58 Old Venetian magistrate
62 The Buckeyes' sch.
63 Greenland coastal feature of early creation?
66 PC key
67 Cubic meter
68 Masterless samurai
69 Not clerical
70 Harness-race pace
71 2009 Nobel Peace Prize winner

DOWN

1 He assigned gypsum a two
2 Austrian painter _ Schiele
3 Folkie Woody's son
4 Sangria ingredient
5 Zone for Greenland's w. tip
6 Start of a carol that ends with "Dominum"
7 Make finer, as flour
8 Ice-cream-parlor task
9 Ultimate, as degrees go
10 Iceland structure honoring John Lennon
11 Similarly
12 Sea to Australia's north
15 Pear variety
18 Type of gliding
23 Indigo dye source
25 Sore-eye site
27 Pulitzer winner for Picnic
28 Bad day for Caesar
29 "Later, Luigi!"
30 Full-time military service
31 Ankle bones
35 Leif and his brothers, to Erik
36 French-style bean?
39 Palindromic year of this century, Roman-style
40 Food additive, perhaps
41 Performed "Nunarput Utoqqarsuanngoravit"
44 Bore false witness
47 "Well done!"
49 Hardly puts down gently
50 Corn kernel, e.g.
51 Greek Earth goddess
52 Sandbar
53 Nikola in electrical power history
57 Prefix with dynamic
59 Mrs. Chaplin, née O'Neill
60 Macabre
61 She's a mixed-up Dane?
64 Giants right fielder Mel
65 Headless hairdo?

NATIONAL GEOGRAPHIC

JULY 2010 |

What's Next

PHOTO: TIM LAMAN

Evolutionary Road

The Middle Awash, in the Afar desert of Ethiopia, is humanity's hometown. *By Jamie Shreeve*

BIRTH OF BIPEDALISM

Sex may have been a motivation.

The Tale of a Tower

Too woo a "Mary," bowerbirds decorate with shells, cans, even pink paper clips. *By Virginia Morell*
Photographs by Tim Laman

Pakistan's Heart

The province of Punjab is prosperous, populous—and a Taliban target. *By John Lancaster*
Photographs by Ed Kashi

A Sea of Dunes

Fish splash in lagoons, goats graze. And this magical Brazilian sandscape is no mirage.
By Ronaldo Ribeiro
Photographs by George Steinmetz

21st-Century Grid

Can we fix the infrastructure that powers our lives?
By Joel Achenbach
Photographs by Joe McNally