

NGM.COM • MAY 2010

# NATIONAL GEOGRAPHIC

## Mount St. Helens

NEW LIFE  
IN THE BLAST ZONE

Mexico's  
Shocking  
New Saints

THE SCIENCE  
OF SLEEP

TREKKING CHINA'S  
TEA HORSE ROAD

WILD WONDERS  
OF EUROPE

THE WORLD'S  
RAREST CAT

# NATIONAL GEOGRAPHIC

MAY 2010 • VOL. 217 • NO. 5



PHOTO: MAGGIE STEBER

Don't hit that cow! A simulator at Washington State University tests the effect of sleep deprivation on driver attentiveness. [Story on page 72.](#)

OFFICIAL JOURNAL OF THE NATIONAL GEOGRAPHIC SOCIETY

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Thirty years after the blast, Mount St. Helens is reborn.

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A team of photographers captures rebounding wildlife.

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Spanish conservationists care for the world's rarest cat.

Photographs by Pete Oxford and Renée Bish

**ON THE COVER** When: May 18, 1980, about an hour after Mount St. Helens's 8:32 a.m. eruption. Where: in a plane three-quarters of a mile from the volcano's south side. PHOTO BY ROGER WERTH, *DAILY NEWS*

# NATIONAL GEOGRAPHIC



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➔ **A Blast From the Past** Revisit our coverage of the Mount St. Helens eruption, with photos, graphics, and a story called "Mountain With a Death Wish." The writer's first line: "First I must tell you that I count it no small wonder to be alive."

STEVE RAYMER, NATIONAL GEOGRAPHIC STOCK



Retired logger Ralph Killian searched in May 1981 for his son, lost after the eruption of Mount St. Helens.

PHOTO: CHRIS JOHNS, SEATTLE TIMES



Listen as Editor in Chief Chris Johns recalls photographing one man's emotional journey following the Mount St. Helens eruption.

**In 1981**, nearly a year after the eruption of Mount St. Helens in Washington State, I flew over a monochromatic landscape littered with the shattered trunks of old-growth firs. Before the deadly event that killed 57 people, this had been one of the most beautiful mountains in the Cascades. Afterward, it was a gaping hole breathing plumes of steam.

A colleague from the *Seattle Times* and I were looking for Ralph Killian, a man on a mission. We spotted him, digging in a tangle of trees (left). He had the weathered look of someone who had spent most of his 61 years working the timberland of the Pacific Northwest. Over the past year Ralph had been searching for the remains of his son, John, and daughter-in-law, Christy, who had been camping in the area at the time of the eruption.

"A lot of people would just try to forget about it," he said when we landed to interview him. "We go on living. Have to. But we can't just forget that easy. I've got to know what happened." Ralph had accepted the deaths of his loved ones long ago. But he still wanted to fill in the details of that day. In a bittersweet ending, he did recover his daughter-in-law's remains though not those of his son.

Science helps us understand many things: We can track a hurricane and measure a tsunami's wall of water. But some things are beyond the dissecting lens of science. An aching heart, for one.



The National Geographic Society is chartered in Washington, D.C., as a nonprofit scientific and educational organization "for the increase and diffusion of geographic knowledge." Since 1888 the Society has supported more than 9,000 explorations and research projects, adding to knowledge of earth, sea, and sky.

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# water

## OUR THIRSTY WORLD

The Annenberg Space for Photography is proud to present a print and digital exhibition complementing the Special Issue of National Geographic you are now holding. "Water: Our Thirsty World" features the work of award-winning photographers covering the precarious state of our most precious resource: the world's fresh water.

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JOHN STANMEYER, VII  
© National Geographic



January 2010

## Bionics

There was no mention of the cost of the bionic arm the woman received. How could anyone afford it? Research and development can never stop, but it is strange to see an article where the cost to society is not quantified, where the miracle of technology is not balanced against those who are given or allowed nothing. I applaud providing prosthetic legs to soldiers who need them, but I detest a society that spends hundreds of billions on wars that lead to legless citizens. There was pertinent information missing from this month's magazine. Costs and associations should be made, even if painful.

**DAVID JULIAN MOSCOVITCH**

Montreal, Quebec

Bionic devices are wonderful inventions for restoring function that has been lost. Cochlear implants are wildly successful for adults who lose hearing after acquiring speech. However, they are less effective for the acquisition of new skills. Readers should be aware that many prelingually deaf children who receive cochlear implants remain essentially without language until parents switch to using sign language, which is learnable by all children—not just the exceptional cases. If the child's brain has learned a natural sign language, a cochlear implant may be more likely to succeed.

**MATT HALL**

La Jolla, California

Over 50 years ago I managed to run my right hand through a machine on my father's farm. I had an amputation of the index finger at the first knuckle and damage to the other three fingers. My third and fourth fingers needed reattachment; some of the functions never returned, and cold and moist weather can produce severe pain. The exceptional design and implementation being done by the professionals referred to in your article are a service to society. They are

[Bionic devices] are giving so many deserving people back their mobility, self-respect, and the ability to perform processes that were once considered impossible for anyone dealing with amputations.

## Corrections, Clarifications

**January 2010:**

**Asia's Wildlife Trade**

Page 91: The ceremonial robe shown is trimmed with skin from a leopard, not a snow leopard.

**Email** ngsforum@ngm.com

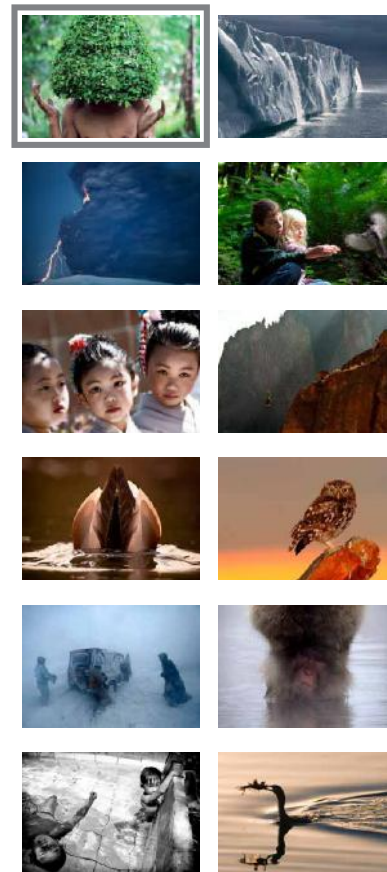
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EDITORS' CHOICE

**Estan Cabigas**

On Good Friday in the Philippine town of Infanta, this Roman Catholic flagellant donned a floral headdress called a *tukarol*. Cabigas, 36, captured his image while documenting Holy Week practices for a school assignment.





**India** Silhouetted in the Andaman Sea, a 60-year-old elephant named Rajan—here with his handler, Nasru—takes a morning dip in the warm waters. The now retired pachyderm hauled timber in the Andaman Islands for 30 years.

PHOTO: CESARE NALDI





**China** Vehicles form a line for natural gas on a spiral bridge in Chongqing. Supplies of the fuel were diverted to snowed-in northern China last November, sparking a shortage in the central and eastern provinces.

PHOTO: WEN RAN, REUTERS



**Indonesia** In waters off the Raja Ampat Islands, a honeycomb coral glows green. The archipelago is a hot spot of coral diversity—some 75 percent of all known coral species can be found there.

Order prints of *National Geographic* photos online at **PrintsNGS.com**.

PHOTO: MARK PICKFORD





**Fit for a King** Wielding his metal detector in a plowed field in Staffordshire, England, last summer, amateur treasure hunter Terry Herbert hit an astonishing jackpot—more than 1,600 Anglo-Saxon objects of gold and silver from about A.D. 650. The largest such hoard ever found, it is composed mainly of fittings from hilts of swords—but also includes parts of at least one helmet, three crosses, and a band that bears a Latin inscription from the Bible. With many pieces displaying intricate designs and some inlaid with patterns of garnets, the exquisitely worked collection likely belonged to a ruler of Mercia, one of the warring kingdoms of the period.

Why the hoard was buried may remain a mystery. But as experts carry out their studies over the next few years, the treasure will offer valuable insights into the art, wealth, power, and politics of the time as well as the region's transition from paganism to Christianity.

Meanwhile, local museums hope to raise \$5.3 million, the appraised value, to purchase the collection from the British crown. Terry Herbert and the owner of the field will each receive half—a fine reward for making history themselves. —A. R. Williams



PHOTOS: ROBERT CLARK. NGM MAPS



A 1.6-inch-long figurine (left) and other relics (in protective foam, above) are among the treasures found.

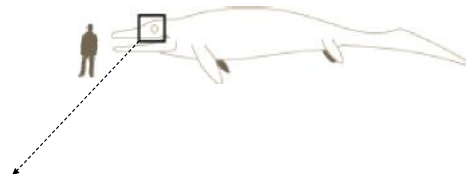


**Watch** *Lost Gold of the Dark Ages* on the National Geographic Channel, check local listings.



A jaw full of five-inch, knife-edged teeth let this newly unearthed ichthyosaur (above) tear into prey. The four-finned, 40-foot-long species swam in what's now Nevada.

PHOTO: JOHN WEINSTEIN  
SOURCE: RYOSUKE MOTANI, UNIVERSITY OF CALIFORNIA, DAVIS



NG GRANTEE

## How the West Was Swum

Nevada is covered in desert and ranks as the driest U.S. state. Yet 240 million years ago it was submerged under a vast ocean. A land animal turned marine reptile called the ichthyosaur—"fish lizard"—was so common there it's now the official state fossil. But serrated teeth nearly half a foot long on a specimen bigger than a killer whale? Unheard of—at least until recently.

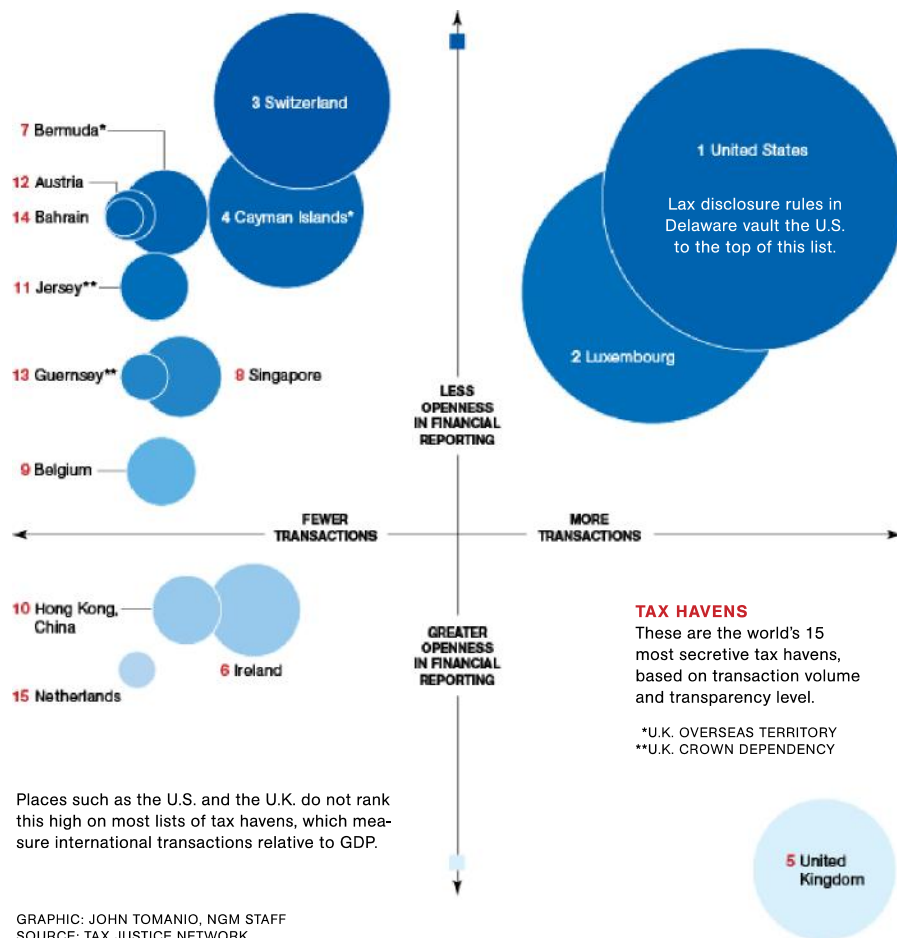
University of Chicago paleontologist Nadia Fröbisch, who excavated the fossil in 2008 from the Augusta Mountains, thinks this top predator used its teeth to rip through the flesh and bones of defenseless fellow ichthyosaurs, many of which were smaller, and some of which had no teeth at all. No one knows how long this particular species ruled these waters, though the entire order died out around 90 million years ago, after a 160-million-year run. As Fröbisch explains, "They were a very successful group." —*Hannah Bloch*



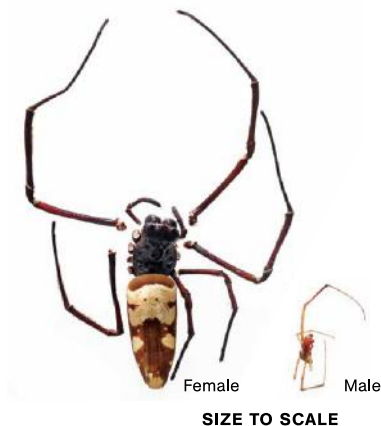
**Guarded Treasure** Every year individuals and corporations transfer billions of pounds, euros, and dollars to 60 tax havens worldwide. These “secrecy jurisdictions” keep levies low or nonexistent and guard financial information, hiding trails a tax man might otherwise follow. Some free marketeers say havens improve banking competition and economic growth. Yet the U.S. Treasury loses an estimated \$100 billion a year to them. The biggest losers, says John Christensen of the Tax Justice Network, are the poor: A 2009 study found that developing countries forfeit up to a trillion dollars a year.

Last year governments in Europe and North America brokered information-exchange pacts with many havens. Christensen says that’s a start, but only full transparency—and bringing poor nations to the table too—will fix the problem.

—Shelley Sperry



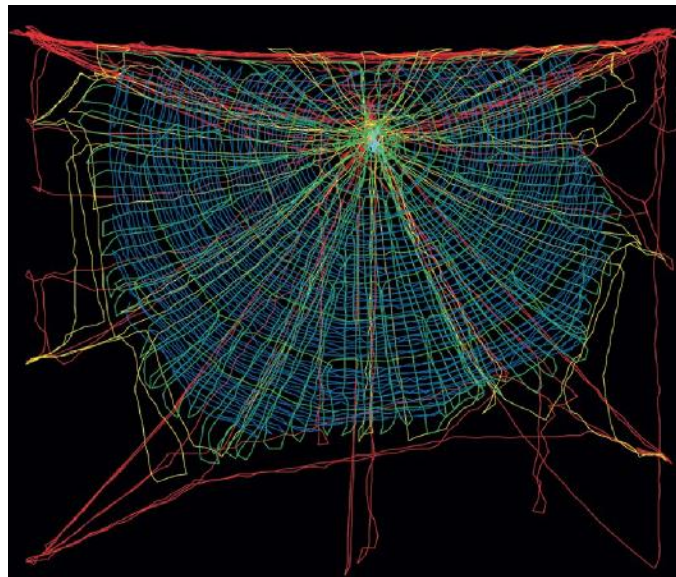
GRAPHIC: JOHN TOMANIO, NGM STAFF  
SOURCE: TAX JUSTICE NETWORK



**World's Widest Web** Those stray strands in the corner of the spare room? Not the work of the spider genus *Nephila*, aka golden orb weavers. Their orbs—those familiar spirals with silken spokes—are the world's biggest, topping three feet across. And *Nephila* are the largest spiders that spin orb webs.

To add another superlative, researchers recently discovered the most imposing species of the widely dispersed genus, called *N. komaci* (above left)—the first new *Nephila* in 130 years. The specimens on this page look a bit out of joint because Matjaž Kuntner of the Slovenian Academy of Sciences and Arts and Jonathan Coddington of the Smithsonian Institution discovered them, misclassified, in museum collections. Later, a colleague in South Africa found a few more crawling in the wild.

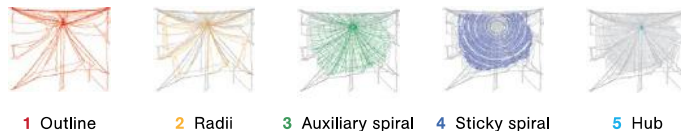
Female *N. komaci* have leg spans that exceed four inches, yet males (above right) are diminutive—a dramatic case of sexual dimorphism. Like other *Nephila*, these spiders spin tough, gold-colored webs. They usually snare insects, but, Coddington says, “they’d be happy eating a bird, bat, or lizard.” —Chris Carroll



PHOTOS: REBECCA HALE, NGM STAFF. WEB IMAGE: SAMUEL ZSCHOKKE

*Nephila* spiders first attach support threads, establishing an outline up to three feet across **1**, then unfurl radii **2** to hold an auxiliary spiral **3** that helps support the structure. A prey-snaring sticky spiral **4** is overlaid, followed by a nonsticky spot at the hub **5**, where the spider awaits a meal.

#### Silk Stages ROLL OVER IMAGES TO ENLARGE



**Pop Cultures** *Refrescos* in Spanish, *mashroob ghazi* in Arabic, *kele* in Chinese: The world has many words, and an unslakable thirst, for carbonated soft drinks. Since 1997 per capita consumption has nearly doubled in eastern Europe. In 2008 Coca-Cola tallied soda sales in some 200 countries. Even the global recession, says industry monitor Zenith International, has merely caused manufacturers to lean on promotional offers and try cheap social-networking ads.

But some are sour on all this sweetness. U.S. obesity expert David Ludwig calls aggressive marketing in emerging nations —where people tend to eat more and move less as they prosper—“deeply irresponsible. That’s the time of greatest risk for heart disease, diabetes, and obesity.”

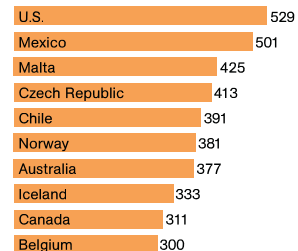
As that thinking catches on, places including New York and Romania are mulling levies on sugared drinks. Others argue that taxing a single product isn’t the fix; promoting healthy lifestyles and zero-calorie drinks is. Fizz for thought? —*Jeremy Berlin*



A Japanese favorite, fruity Ramune soda is sold in a unique bottle.

**Consumption of carbonates\***

12-ounce servings per person, 2008



\*INCLUDES REGULAR AND LOW-CALORIE SODAS

PHOTO: REBECCA HALE, NGM STAFF  
SOURCE: ZENITH INTERNATIONAL

# Scanning Life

**Life would be simpler if all species wore name tags. And in a way, they do. Turns out they've got a bar code in their DNA.**

IF YOU TURN ON A LIGHT AT NIGHT in the mountains of Papua New Guinea, says Paul Hebert, you will collect some 2,000 species of moth. Moving up the mountain a bit will net you a different but equally daunting crowd. As a young postdoc in the 1970s, Hebert, now an evolutionary biologist at the University of Guelph in Ontario, spent five years trying to make sense of that fluttering confusion, before finally deciding it was beyond his or any human's capacity. For two decades after that he retreated to water fleas, of which there are only 200 species. Then in 2003 he did something new. In a paper that year he began by describing the diversity of life as a "harsh burden" for biologists, and proceeded to suggest some relief: Every species on Earth could be assigned a simple DNA bar code, Hebert wrote, so it would be easy to tell them apart.

The bar code Hebert suggested is part of a gene called *CO1*, which helps produce the energy-carrying molecule ATP. *CO1* is so essential that every multicellular organism has it. But there is enough variation in its sequence—each of the 600-odd spots in the bar code region can be filled by any of four different DNA bases—that two species rarely have the exact (Continued on next page)



Go behind the scenes with photographer Joel Sartore as he coaxes animals to sit still for the photographs used here and in his new book *Rare*.



*Tolypeutes matacus*, the southern three-banded armadillo of South America, can close its shell in a tight ball. Like all creatures, it has a bar code represented by four colors—one for each of the DNA bases (G, T, C, and A).





same one. Such differences in a gene are readily scanned by machine even when the animals themselves might confound an expert; Hebert's group is now sequencing a thousand specimens a day. They've bar coded nearly 40,000 species of moth and butterfly already. The technique has commercial as well as scientific promise. Mislabeling of fish on menus is rampant, it turns out.

Bar coding has spread throughout the animal kingdom and even to plants and fungi. With a seal of approval from the United Nations, which has declared 2010 the International Year of Biodiversity, researchers in 25 countries are now aiming to bar code 500,000 species—of the 1.7 million already named on Earth—by 2015. "I'm convinced this approach is scalable to the planet," says Hebert. "Any species humans encounter frequently will be bar coded by 2025."

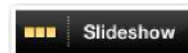
Some biologists dislike that grand plan; they worry that bar coding, which is best at identifying species that have already been described, will steal scarce research dollars from the more valuable work of describing unnamed species. Hebert sees the technique as popularizing biodiversity at a time when it is vanishing fast. People are now sending him specimens from their backyard to identify, but within ten years, he thinks, the technology will follow the path of GPS: Someone will invent a handheld DNA bar coder. "I can imagine every kid getting one of these in his or her Christmas stocking," Hebert says. When those kids grow into postdocs, they'll be better equipped to plunge into the wilds of New Guinea and sort out the moths. —Robert Kunzig




SILVER-STRIPED HAWK MOTH  
(HIPPTION CELERIO)



DNA BAR CODE FOR HIPPTION CELERIO



PHOTOS BY JOEL SARTORE  
MOTH PHOTO AND BAR  
CODES BY BIODIVERSITY  
INSTITUTE OF ONTARIO



Mount St. Helens, flanked by Mount Adams (far left) and Mount Hood, is settling fitfully back into the volcanic landscape. Three decades ago the mountain's eruption killed 57 people and destroyed more than 200 square miles of forest.

# Mountain Transformed

*Thirty years after the blast, Mount St. Helens is reborn again.*



Torn from the hills, thousands of dead trees still float on Spirit Lake. Toxic in the immediate aftermath of the blast, the lake is now richer than ever—filled with tadpoles, aquatic plants, and 20-inch rainbow trout.



## Beer cans once lay at the bottom of Spirit Lake.

Mark Smith remembers them perfectly: 20-year-old Olympia flat-tops, their shiny gold lettering somehow preserved by the clear, cold water. He remembers ten-inch rainbow trout; planters for the tourists. He remembers a sunken rowboat from the YMCA camp, its bow resting on a submerged stump. A teenager when he began scuba diving in the shadow of Mount St. Helens, he remembers the lake as it was before the May 1980 eruption, before the top 1,300 feet of the volcano—more than three billion cubic yards of mud, ash, and melting snow—avalanched into it. Before the lake became twice as big but half as deep. Before virtually all evidence of life, animal and human—the cabins and roads and camps and cans—were obliterated. Before the lake became a stinky soup, devoid of oxygen and covered with a floating mat of tree trunks ripped from the landscape. What Smith remembers best is what he called the “petrified” forest: a ghostly stand of sunken, branchless firs, buried upright dozens of yards below the surface. The underwater forest was a mystery to him until the mountain exploded. Then it made perfect sense. The trees were evidence of a past eruption—a sign Spirit Lake has always been in the line of fire.

Three decades later, Spirit Lake holds a new mystery: How did fish, now twice the length of those pre-eruption rainbows, reappear? Everyone has a theory. Smith, who runs Eco Park Resort at the edge of the volcanic monument, thinks the trout slid down from smaller, higher St. Helens Lake during a flood year. But that lake has only mackinaw—and the Spirit Lake fish are rainbows.



The morning of  
May 18, 1980.

ROGER WERTH,  
DAILY NEWS

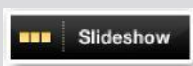


Why show St. Helens with its summit intact? Ramona Kmetz Lauzon, who painted the mural in Castle Rock, Washington, in 1996, explains, "People said they'd rather see the old mountain."





Early colonists (above) bloom on a hill near the volcanic monument's Coldwater Lake: foxglove, lupine, pearly everlasting, red alder. The tree stump is a reminder of pre-1980 logging operations. A ghostly stand of trees (right) eight miles from St. Helens shows how pre-blast remnants can shape the ecosystem's recovery. Nurtured and shaded by the old forest, a new forest rapidly grows.



## ICELAND ERUPTS

View National Geographic's spectacular images of a volcano on a rampage.







Along the braided North Fork Toutle River, ash-laden sediment clogs the valley bottom, choking stands of fir and alder. In the early 1980s, the river carried 500 times more sediment than before the eruption.

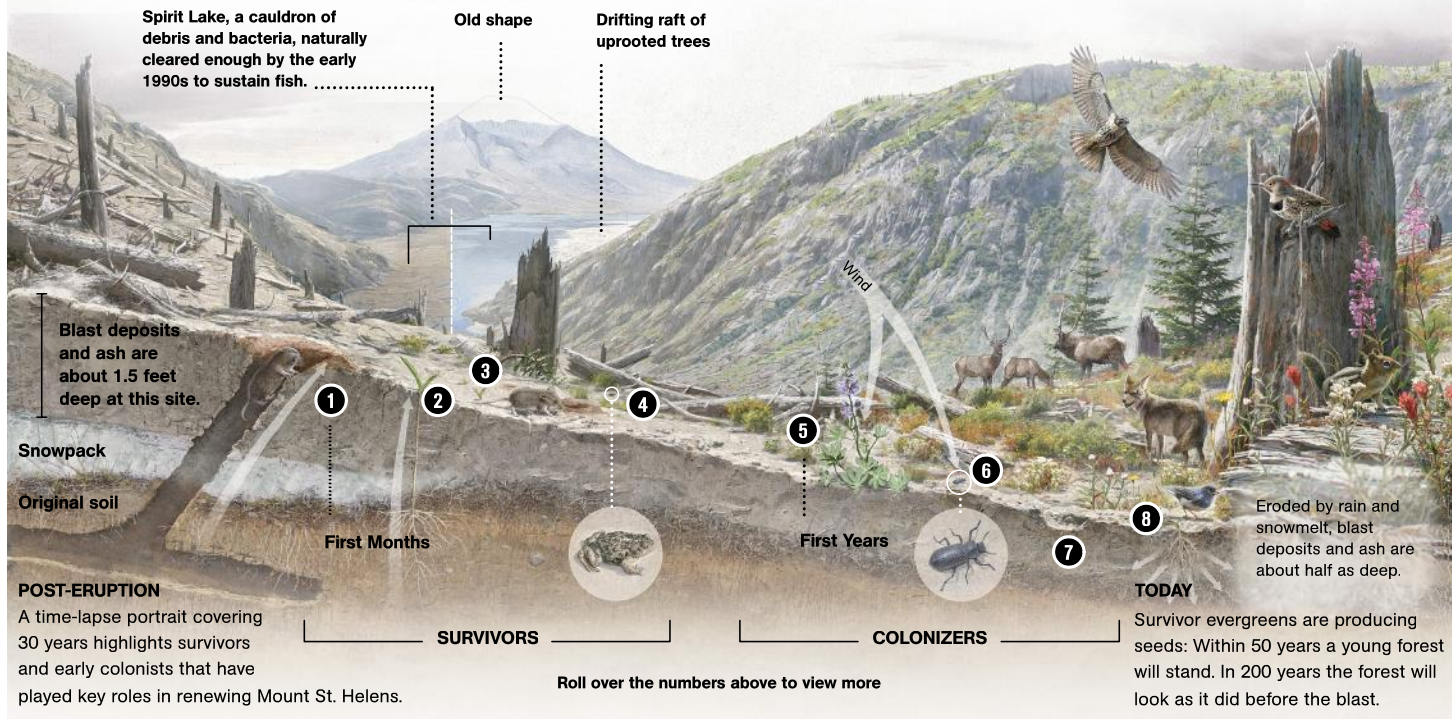


# Rebirth of the Blast Zone

How does an ecosystem rebound from catastrophe? The 230-square-mile blast zone around Mount St. Helens has been a natural lab for that study. Scientists expected that renewal of the once dense evergreen forests would begin slowly, with drifting seeds and animals migrating from nearby areas. But what set the pattern of recovery, and accelerated its pace, were species that survived the blast because of protection by snow cover, topography—or luck.



**VIEW A MAP OF  
THE BLAST ZONE**



SCALE VARIES IN THIS SOUTH-LOOKING PERSPECTIVE. DISTANCE BETWEEN JOHNSTON RIDGE OBSERVATORY AND MOUNT ST. HELENS'S SUMMIT IS SIX MILES (TEN KILOMETERS).

ART: FERNANDO G. BAPTISTA, NGM STAFF; TONY SCHICK. MAP: MARTIN GAMACHE, NGM STAFF. SOURCES: PETER FRENZEN, U.S. FOREST SERVICE (ART); U.S. FOREST SERVICE AND USGS (MAP)



On the regreening Pumice Plain, the elk population has soared, causing game managers to invite the first post-eruption hunters—eight a year—into the restricted research area.





Buried in ash and washed out by mud slides, then controversially rebuilt in the 1980s and '90s at a cost of \$160 million, State Route 504 leads to the Johnston Ridge Observatory, overlooking the Pumice Plain and Mount St. Helens's gaping crater.



# TROUBLED SPIRITS

IN MEXICO, THE HARSH REALITIES OF DAILY LIFE HAVE ELEVATED UNHOLY SAINTS, WHO NOW STAND BESIDE TRADITIONAL ICONS.

In a colonial-era Mexico City parish, young men hoist statues of St. Jude. As drug violence has intensified, so has the urge to draw strength—and hope—from the patron saint of desperate causes.

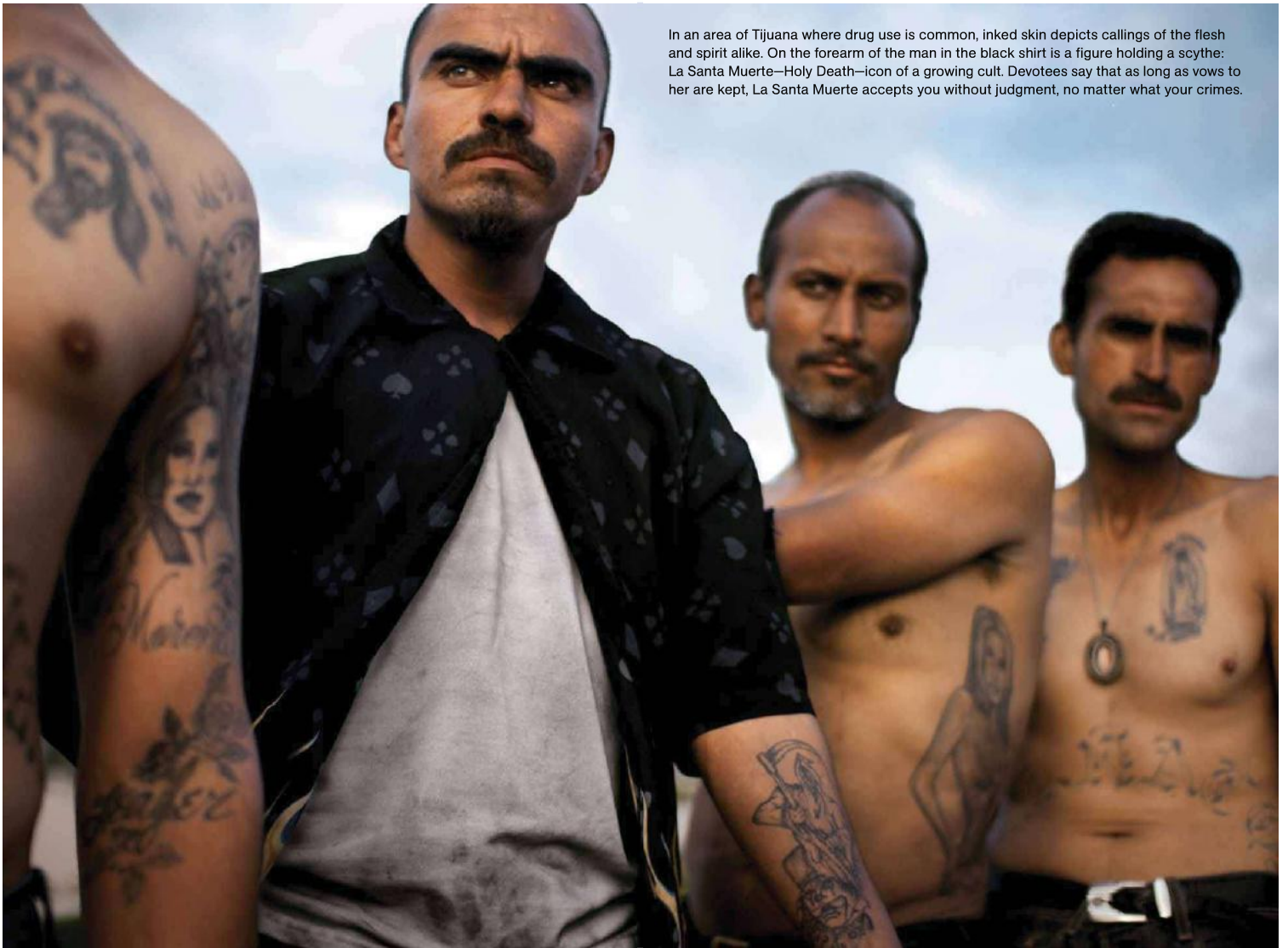




Death is not the end of bravado for Mexican drug traffickers laid to rest in lavish mausoleums at a cemetery in Culiacán, heart of the Sinaloa cartel. The woman in the foreground is the wife of a construction worker.



In an area of Tijuana where drug use is common, inked skin depicts callings of the flesh and spirit alike. On the forearm of the man in the black shirt is a figure holding a scythe: La Santa Muerte—Holy Death—icon of a growing cult. Devotees say that as long as vows to her are kept, La Santa Muerte accepts you without judgment, no matter what your crimes.





By Alma Guillermoprieto  
Photographs by Shaul Schwarz

The inmate known as El Niño, or Little Boy, entered the Center for Enforcement of the Legal Consequences of Crime nine and a half years ago. Tall and gangly, with a goofy, childlike smile, he appears never to have grown up, though the memory of his deeds would make another man's hair go white. Abandoned by his father when he was seven years old and raised by his maternal grandparents, he was 20 when he committed the murder that landed him in this prison in the north of Mexico. His buddy Antonio, neatly dressed, alert, quick moving, and round eyed, was shoved into the same holding cell, charged with kidnapping. "We've been friends since then," one says, as the other agrees.

When he will leave prison is anyone's guess, but El Niño has reason to feel hopeful: He relies on a protector who, he believes, prevented jail wardens from discovering a couple of strictly forbidden objects in his possession by decades. "The guards didn't see a thing, even though they were right there," he says. This supernatural being watches over him when his enemies circle around—and she is there, as Antonio says in support of his buddy's faith, after all the friends you thought you had have

**DRUGS AND SAINTS** Drug cartels have destabilized many states in Mexico, where they are influencing popular culture and even religious devotion. Cartels have long fought bloody battles over narcotic supplies and smuggling routes but now may be linking up to fight increased federal efforts to curtail trafficking.



NGM MAPS AND INTERNATIONAL MAPPING. SOURCES: UNIVERSITY OF SAN DIEGO TRANS-BORDER INSTITUTE; U.S. DRUG ENFORCEMENT ADMINISTRATION; CONGRESSIONAL RESEARCH SERVICE; STRATFOR



In a Los Angeles storefront "Professor Sysiphus," the Mexican-born overseer of a shrine to La Santa Muerte, reads prayer requests. A growing number of worshippers in the U.S. seek cures or help for loved ones crossing the border.




Love, money, protection—all are reasons to greet La Santa Muerte with a kiss. On the first of each month worshippers crowd a shrine in Tepito, a Mexico City barrio, despite the Roman Catholic clergy's denouncement of the icon.





A fictional drug lord bleeds at the feet of a heroine on the Tijuana set of *Narcojuniors*—one more addition to the popular genres of trafficking films and songs. The producers say most of the movie's profits will flow from the U.S.





**SAY YOU LIVE IN A  
BORDER CITY TAKEN  
OVER BY THE DRUG  
TRADE, AND GUNFIRE  
BURSTS OUT  
EVERY NIGHT. IS  
IT NOT UNDER-  
STANDABLE TO PRAY  
TO THE NARCO-SAINT  
JESÚS MALVERDE?**

In Tijuana a man visits a modest roadside chapel (left) honoring the folk saint Jesús Malverde, a legendary outlaw said to have been hanged by officials in Sinaloa a century ago. Sinaloan drug traffickers adopted Malverde as a Robin Hood-like symbol of honorable thievery. Worshippers come to his main shrine in Culiacán (above) to pray and leave votive offerings.





In a prayer to La Santa Muerte at his private altar in Tepito, merchant Luis Demetrio Pérez Díaz blows smoke clouds redolent of indigenous American rituals. Scholars debate the death saint's origins—Mesoamerican, European, or both?





THE NEW ERA HAD  
ARRIVED, AND THE  
FOOT SOLDIERS  
IN THE ESCALATED  
DRUG WARS, FACING  
THE PROSPECT OF A  
TERRIBLE DEATH,  
INCREASINGLY TURNED  
TO DEATH ITSELF FOR  
PROTECTION.



Outside a Mexico City church that holds monthly festivals, or *romerías*, honoring St. Jude, young people (left) huff solvents. After an ambush at a shopping mall in Ciudad Juárez, a driver (above) and two passengers joined more than 2,600 murder victims last year in a city where drug-related killings have become terrifyingly commonplace.



A woman sprinkles lime to absorb blood from another Juárez drug murder. For families trying to live normally here, such measures can't hide the reality: Violent death is everywhere. Meanwhile, traffickers jockeying to feed the U.S. appetite for drugs seek solace in narco-saints, who symbolize the hope of a holy death after a brutal life.





# *The Secrets of* **SLEEP**

*From birth, we spend a third of our  
lives asleep. After decades of research,  
we're still not sure why.*

Seven-month-old Miles Juste of Miami, Florida

By D. T. Max

Photographs by Maggie Steber

## CHERYL DINGES IS A 29-YEAR-OLD

Army sergeant from St. Louis. Her job is to train soldiers in hand-to-hand combat. Specializing in Brazilian jujitsu, Dinges says she is one of the few women in the Army certified at level 2 combat. Level 2 involves a lot of training with two attackers on one, she explains, with the hope of “you being the one guy getting out alive.”

Dinges may face an even harder fight in the years ahead. She belongs to a family carrying the gene for fatal familial insomnia. The main symptom of FFI, as the disease is often called, is the inability to sleep. First the ability to nap disappears, then the ability to get a full night's sleep, until the patient cannot sleep at all. The syndrome usually strikes when the sufferer is in his or her 50s, ordinarily lasts about a year, and, as the name indicates, always ends in death. Dinges has declined to be tested for the gene. “I was afraid that if I knew that this was something I had, I would not try as hard in life. I would allow myself to give up.”

FFI is an awful disease, made even worse by the fact that we know so little about how it works. After years of study, researchers have figured out that in a patient with FFI, malformed proteins called prions attack the sufferer's thalamus, a structure deep in the brain, and that a damaged thalamus interferes with sleep. But they don't know why this happens, or how to stop it, or ease its brutal symptoms. Before FFI was investigated, most researchers didn't even know the thalamus had anything to do with sleep. FFI is exceedingly rare, known in only 40 families worldwide. But in one respect, it's a lot like the less seri-



The genetic history of sisters Carolyn Schear (at right) and Cheryl Dinges puts them at risk for fatal familial insomnia, a deadly inability to sleep. Schear learned she doesn't carry the gene. Dinges declined testing. “Why let the knowledge rule your life?”



Author D. T. Max probes deeper into the mysteries of sleep in *Explorer: Fatal Insomnia*, on the **National Geographic Channel**, check local listings.

Wake up and see how sleep differs around the world in an interactive graphic at [ngm.com/sleep](http://ngm.com/sleep).



# THE BRAIN IN SLUMBER

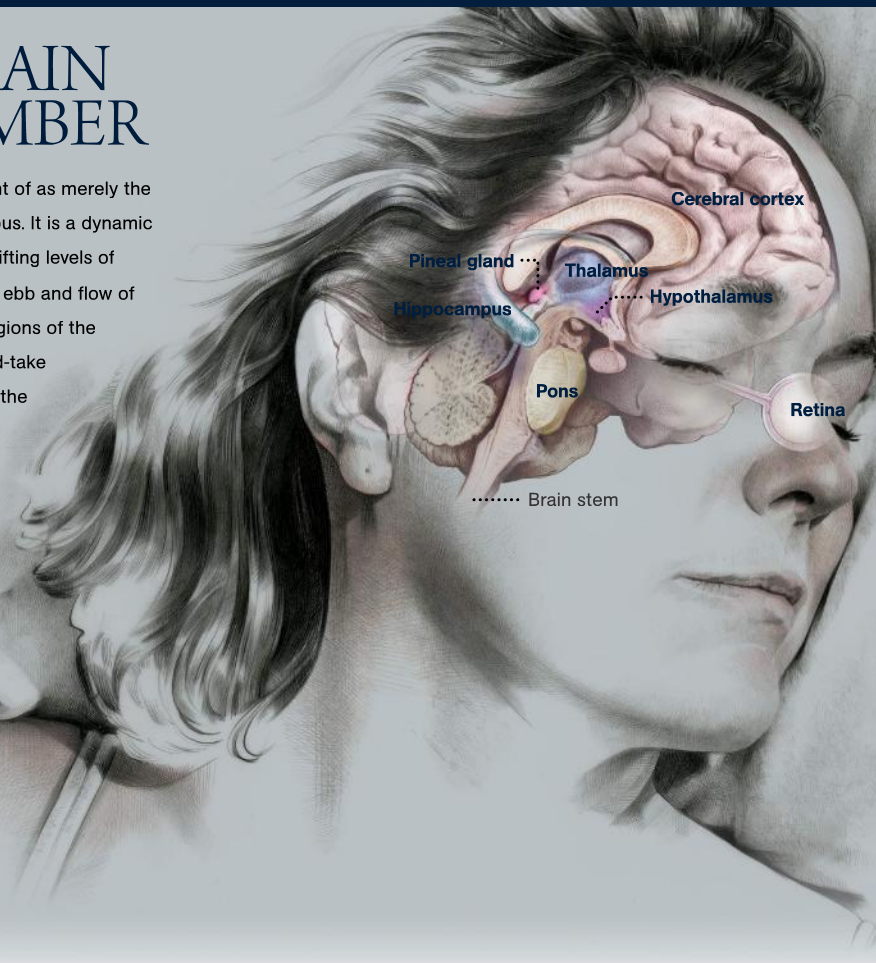
Sleep is no longer thought of as merely the time we spend unconscious. It is a dynamic state characterized by shifting levels of electrical activity and the ebb and flow of chemicals into various regions of the brain. Key to this give-and-take are two tiny structures in the hypothalamus deep in the brain. The neural dance they engage in determines when we fall asleep, and when we wake again to face the day.

ROLL OVER LABELS  
BELOW TO VIEW

**FALLING ASLEEP**

**WAKING UP**

**STAGES OF SLEEP**



ROLL OVER LABELS AT LEFT TO VIEW

## THE ANATOMY OF SLEEP

### Hypothalamus:

Critical to sleep; contains clusters of neurons that govern circadian rhythms and regulate chemicals promoting sleep and arousal

HIRAM HENRIQUEZ AND ROBIN T. REID. ART: BRUCE MORSER. SOURCES: CLIFFORD B. SAPER, HARVARD MEDICAL SCHOOL; TIMOTHY H. MONK AND ERIC A. NOFZINGER, UNIVERSITY OF PITTSBURGH MEDICAL CENTER; CAROLE L. MARCUS, UNIVERSITY OF PENNSYLVANIA



## CHILD SLEEP

*The proportion of time spent in REM, or dream, sleep declines from 50 percent in infancy to 25 percent in toddlers.*

*Sleep terrors peak during preschool years.*

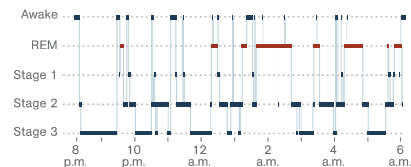
*Children who get less sleep are at greater risk of becoming overweight.*

*Daytime sleepiness in school-age children could be an early sign of approaching puberty.*

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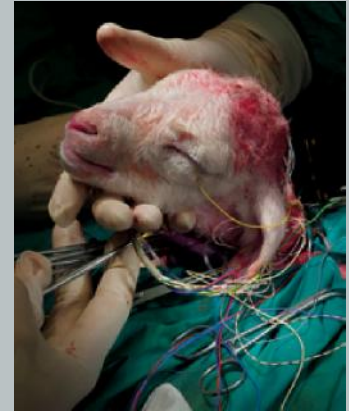
Sisters (clockwise from top)

Alexis Johnson, 5, Frederika Wright, 8, Amelia Johnson, 3, and Connie Johnson, 4, share a nap in their home in Miami, Florida.



ELECTRICAL BRAIN ACTIVITY IN A THREE-YEAR-OLD GIRL REVEALS A RAPID DESCENT AT BEDTIME INTO DEEP STAGE 3 SLEEP. MOST DREAMS OCCUR IN REM SLEEP.





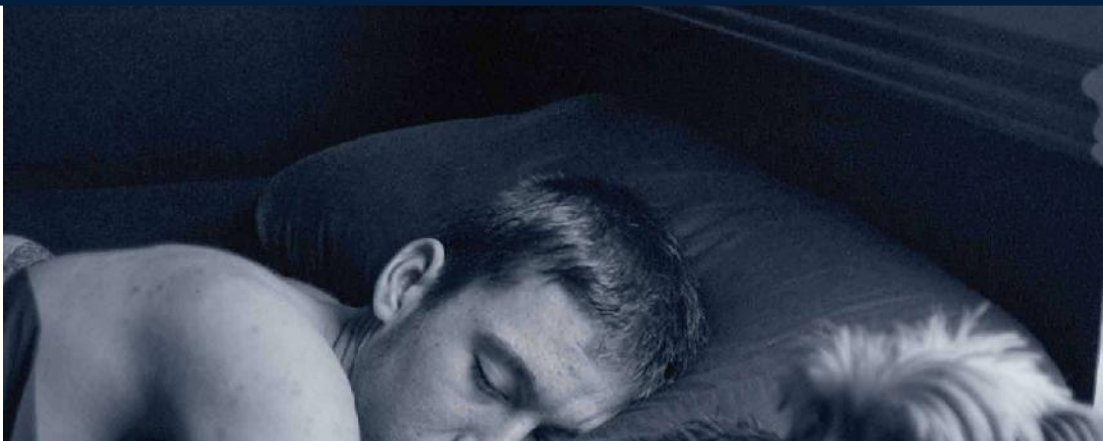
Lamb brains develop in utero on a course similar to human brains, allowing Matthias Schwab of Friedrich Schiller University, Germany, to use sheep as a window into prenatal sleep. He attaches electrodes to a fetal lamb's brain (above) and returns it to the womb for monitoring (left). His research suggests that fetal slumber is predominantly deep sleep, not REM sleep as once thought.



## ADOLESCENT SLEEP

*Only one in five teenagers  
gets the optimal nine hours  
of sleep on school nights.*

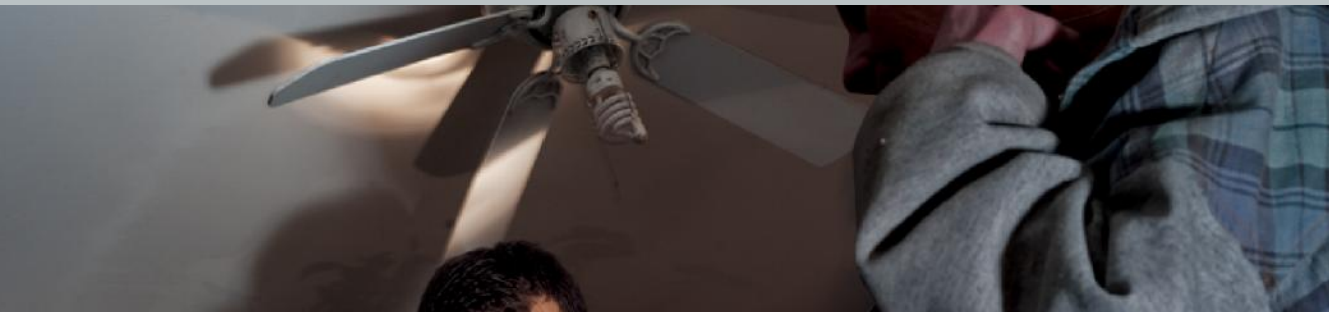
*High school students who  
report earning C's or lower get  
less sleep than those reporting*







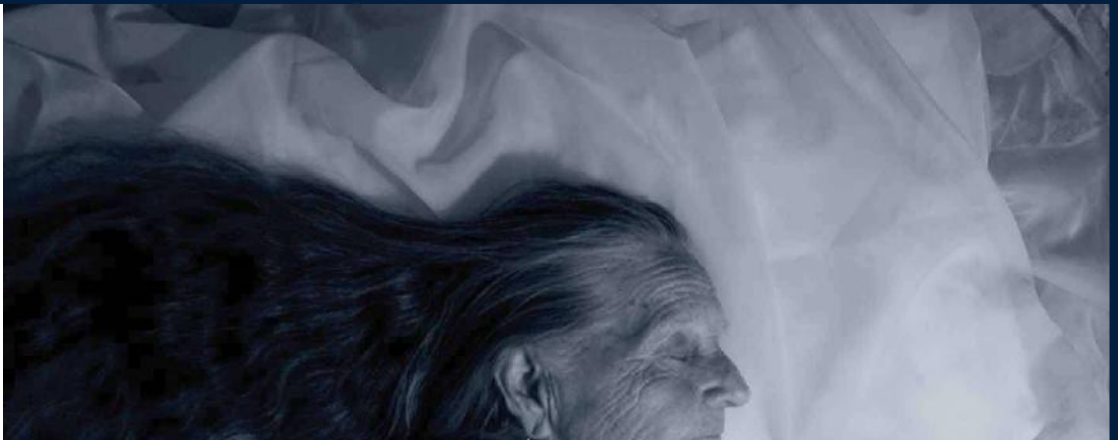
A hard night's day catches up with Officer Brian Eckersley, who works 4:30 p.m. to 3:10 a.m. for the Spokane Police Department. Sleep deprivation is insidious. Staying awake 24 hours causes an impairment equal to three shots of whiskey in one hour.





## ELDER SLEEP

*Older people get sleepy  
earlier and wake up  
earlier than younger adults,  
and may need a little less  
sleep to remain alert during the day.  
Insomnia affects nearly half of  
adults 60 and older.*

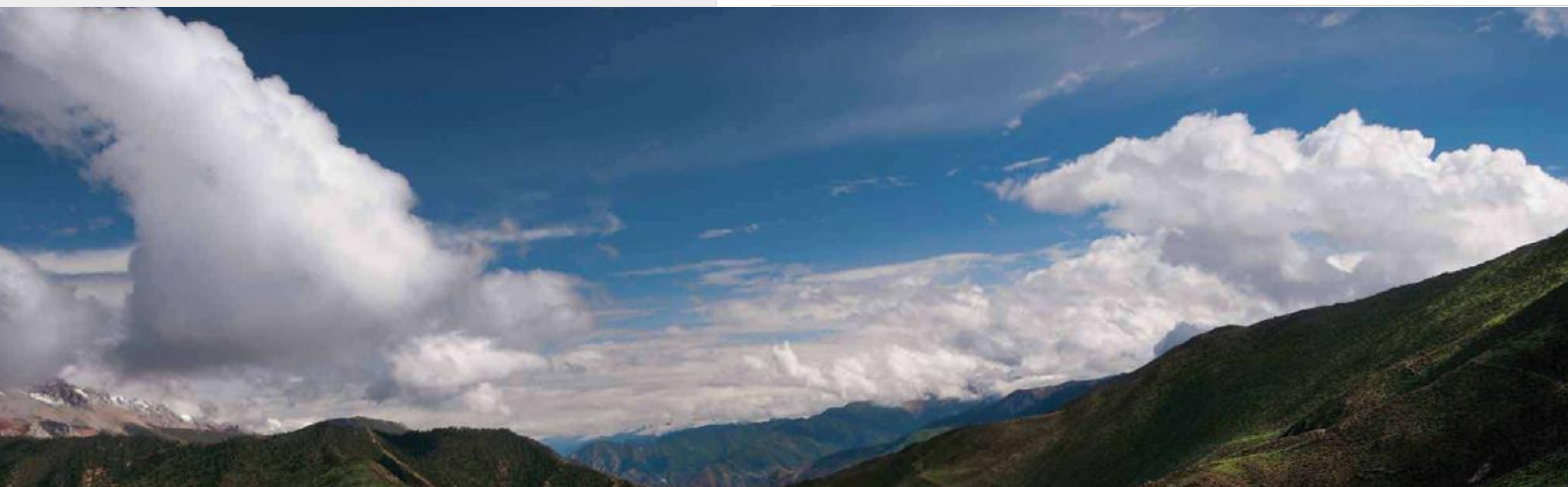






# The Forgotten Road





At Shechen monastery in Sichuan Province, monks mix tea into *tsampa*, roasted barley flour, to make a meal. The tea is seasoned with salt and yak butter.





Careful fingers pinch off the year's first—and best—crop of tea leaves in April at the Mingshan Ecological Tea Garden in Sichuan. Historians believe tea was first cultivated in the wet highlands of Sichuan and Yunnan.



DEEP IN THE MOUNTAINS of western Sichuan I'm hacking through a bamboo jungle, trying to find a legendary trail. Just 60 years ago, when much of Asia still moved by foot or hoof, the Tea Horse Road was a thoroughfare of commerce, the main link between China and Tibet. But my search could be in vain. A few days earlier I met a man who used to carry backbreaking loads of tea along the path; he warned me that time, weather, and invasive plants may have wiped out the Tea Horse Road.

Then, with one wide sweep of my ax, the bamboo falls. Before me is a four-foot-wide cobblestone trail curving up through the forest, slick with green moss, almost overgrown. Some of the stones are pitted with water-filled divots, left by the metal-spiked crutches used by hundreds of thousands of porters who trod this trail for a millennium.

The vestigial cobblestone path lasts only 50 feet, climbs a set of broken stairs, then once again disappears, swept away by years of monsoonal deluges. I carry on, entering a narrow passage where the sidewalls are so steep and slippery I have to hang on to trees to keep from falling into the bouldery creek far below. I'm hoping, at some point, to cross over Maan Shan, a high pass between Yaan and Kangding.

That night I camp high above the creek, but the wood is too wet to make a fire. Rain pounds the tent. In the morning I probe ahead another 500 yards before an impenetrable wall of jungle stops me, for good. I'm forced to admit that here at least the Tea Horse Road has vanished.

IN FACT, MOST OF THE ORIGINAL Tea Horse Road is gone. Recklessly rushing to modernity, China has been paving over its past as fast as



GEORGE PATTERSON

In 1946 porters were still hauling 300-pound loads of bundled tea on the road to Tibet. Pausing every few hundred yards to rest their loads on walking crutches, the bearers needed three weeks to cover 140 miles between Yaan and Kangding. Then pack animals took over.







# Tea Horse Road

*The Chinese military's need for horses and Tibet's appetite for tea created a trade network in the 11th century spanning the Tibetan Plateau. Opening China's western frontier, the Chamagudao (Mandarin for "tea-horse caravan route") lasted until the 1950s.*

MARTIN GAMACHE, MARGUERITE B. HUNSIKER.  
NGM STAFF. ART: FERNANDO G. BAPTISTA, NGM  
STAFF; MIKE REAGAN. SOURCES: GECKO MAPS;  
PATRICK BOOZ; JEFF FUCHS



Tea travels the old way, by foot, as a nomad heads back to camp carting two bundles purchased in the Sichuan market town of Ganze. A bundle holds four bricks, more than 20 pounds of tea. Given Tibetans' consumption—drinking up to 40 cups a day—that is barely enough tea to last a month.





At harvesttime in Yiwu in southern Yunnan, a farmer is busy with both family and setting out leaves to dry. From this area comes Puer tea, prized for its earthy taste and perceived medicinal benefits. A cup in distant Beijing may cost ten dollars or more.





The smoky whiff of black tea mixed with the aroma of yak butter candles pervades Tibetan monasteries, where monks for centuries have consumed the beverage to stay awake for meditation. At the Ganze monastery (left), the morning ritual involves cooking and ladling tea for 370. In Garthar, guests bring their bowls to the prayer hall (right) for a welcoming pour.



Teenage jockeys race Nangchen purebreds at the Nagqu Horse Festival, a centuries-old summer gathering on the Tea Horse Road in Tibet. The competition features the Nangchen, long prized for its speed and stamina.





Modern workhorses, Chinese-made motorcycles line a street in Sershul. Many belong to nomads who come to sell *yartsa gombo*—dried, fungus-infected caterpillars—marketed as a medicinal cure-all. Dug from high-altitude grasslands, a handful of “worm grass” (left) may sell for thousands of dollars, bringing much needed cash to rural families.





The Potala Palace, former residence of the Dalai Lama, commanded the view as caravans neared Tibet's capital of Lhasa. In the 18th and 19th centuries, the 13-story structure ranked among the world's tallest buildings.

On their way to Lhasa, pilgrims prostrate themselves every three steps. Having spent weeks on foot, the family still has nearly 300 miles to go on this thousand-year-old road.





A full-page photograph of a brown bear and its cub in a forest pond. The adult bear is on the left, standing on its hind legs and splashing water. The cub is on the right, also standing on its hind legs and reaching up towards the adult bear. The background shows a dense forest of tall, thin trees. The overall mood is playful and wild.

## Kuhmo, Finland

Standing his ground, a Eurasian brown bear play-fights with his mother in remote woodlands along Finland's border with Russia. Across Europe, big bruins and other wildlife are making a comeback.

STAFFAN WIDSTRAND; *URSUS ARCTOS*

# Europe's Wild Side

A dream team of European photographers captures the continent's wildlife and landscapes.



Oulu, Finland

Long on charisma, short on habitat, the great gray owl was once so feared as an evil omen that it was shot on sight. Now protected, it is reclaiming lost territory and thriving on voles, mice, and other small mammals.

SVEN ZACEK; STRIX NEBULOSA

## 69 photographers, 46 countries, 15

months, one mission: to celebrate wildlife and wild places on a continent more famous for monuments to human ingenuity—cities, railways, cafés—than for nature preservation. Yet as Staffan Widstrand, one of the project's directors, observes, "Wildlife is coming back because of changes in policy and lifestyles. Almost 20 percent of Europe is now under some form of protection, and there's a huge shift under way as Europeans abandon family farms for cities. So wildlife is actually gaining ground and becoming a more vital part of the European experience." This sampling of photographs proves his point. Along with thousands of others, they are the culmination of Wild Wonders of Europe, a photographic expedition to the wild heart of a civilized continent. —Don Belt

■ **Society Grant** *This project was supported by members of the National Geographic Society through its Mission Programs. Learn more, and view additional photographs, at [ngm.com](http://ngm.com) and [wild-wonders.com](http://wild-wonders.com).*





## Europe's Wild Wonders

Fanning out across Europe, the project's photographers carried out 125 missions in a variety of ecosystems, from marine environments in the Azores to forested steppes along the Caspian Sea. What they found was a continent in transition: While urban and suburban growth swallow up wild habitat, farmland in less fertile regions is returning to forest, giving wildlife new room to roam. Expect this trend to continue through mid-century, says ecologist Magnus Sylven, former director of Europe programs for the World Wildlife Fund. "As we abandon the countryside, plants and animals will simply take our place. There's no vacuum in nature."

NGM MAPS



## Mont Blanc, France

Dwarfed by Mont Blanc and a glacial lake, an alpine ibex (below, left) pauses on its journey back from the brink. Down to fewer than a hundred animals in the 1800s, ibex now number 40,000, thanks to aggressive reintroduction.

FRANK KRAHMER; CAPRA IBEX







#### Azores, Portugal

Trailed by pilotfish, a young loggerhead cruises Atlantic waters around the Azores, where all sea turtles are protected by the EU. Juveniles typically reside within 15 feet of the surface, where waters are warm.

MAGNUS LUNDGREN; *CARETTA CARETTA*; *NAUCRATES DUCTOR*

## Saltee Islands, Ireland

The northern gannet spends most of its life at sea, plunging into the water for prey. But during the summer breeding season, the migratory birds pause to colonize rocky outcrops.

PAL HERMANSEN; *MORUS BASSANUS*







#### Madeira Islands, Portugal

Once common in the Mediterranean, the monk seal is now the world's most endangered seal species. In the protected waters of the Madeira Islands, its population has increased from six to 35 individuals since the late 1980s.

NUNO SÁ; *MONACHUS MONACHUS*



## Gibraltar, United Kingdom

Transplants from North Africa, Barbary macaques have colonized the Rock of Gibraltar for hundreds, perhaps thousands, of years. Besides humans, macaques are the only European primates.

PETE OXFORD; *MACACA SYLVANUS*





## Oostvaardersplassen, Netherlands

Herds of red deer, abundant in primeval Europe, range free at Oostvaardersplassen, a 14,000-acre preserve where Dutch ecologists nurture a mixed landscape of forest and heavily grazed grasslands.

MARK HAMBLIN; *CERVUS ELAPHUS*



**Kalmykiya, Russia**

Stretching stubby wings, steppe eagle chicks share a nest at Cherniye Zemliye reserve. Ranging from southern Russia to Mongolia, these birds are born opportunists, feeding on carrion, small mammals, and other birds.

IGOR SHPILENOK; *AQUILA NIPALENSIS*





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IGOR SHPILENOK; *AQUILA NIPALENSIS*



## Kemerī, Latvia

Left behind when the Baltic receded millennia ago, the bogs, fens, and woodlands of Kemerī National Park are part of the European Union's Natura 2000 network, which protects 27,000 sites.

DIEGO LÓPEZ





## Inverness, United Kingdom

Losing ground and numbers, Europe's native red squirrel is poorly matched against *Sciurus carolinensis*, an invader from North America that muscles in on food supplies and carries a virus lethal to reds.

PETER CAIRNS; *SCIURUS VULGARIS*



## Donna Nook, United Kingdom

Kicking up sand, male gray seals fight over females at Donna Nook on the English coast, where a Royal Air Force bombing range doubles as a nature preserve, home to a breeding population of 2,000 seals.

LAURENT GESLIN; *HALICHOERUS GRYPUS*





## Białowieża, Poland

In Europe's wild east, conservationists reintroduced the iconic European bison to Poland's Białowieża Forest in 1952, bringing back an animal that had once inhabited the continent's woodlands.

STEFANO UNTERTHINER, *BISON BONASUS*.



## Gran Paradiso, Italy

Cousin to both antelope and mountain goat, a chamois cruises a snowfield in the Italian Alps. As Europeans abandon farming for other livelihoods and the countryside for cities, wildlife is reclaiming lost territory.

ERLEND HAARBERG; *RUPICAPRA RUPICAPRA*





Europe's Wild Side

# A Lifeline for the Iberian Lynx

Not since the time of the  
sabertooth has a feline species  
gone extinct. Earth's most  
endangered cat could be next.

Photographs by  
PETE OXFORD and RENÉE BISH



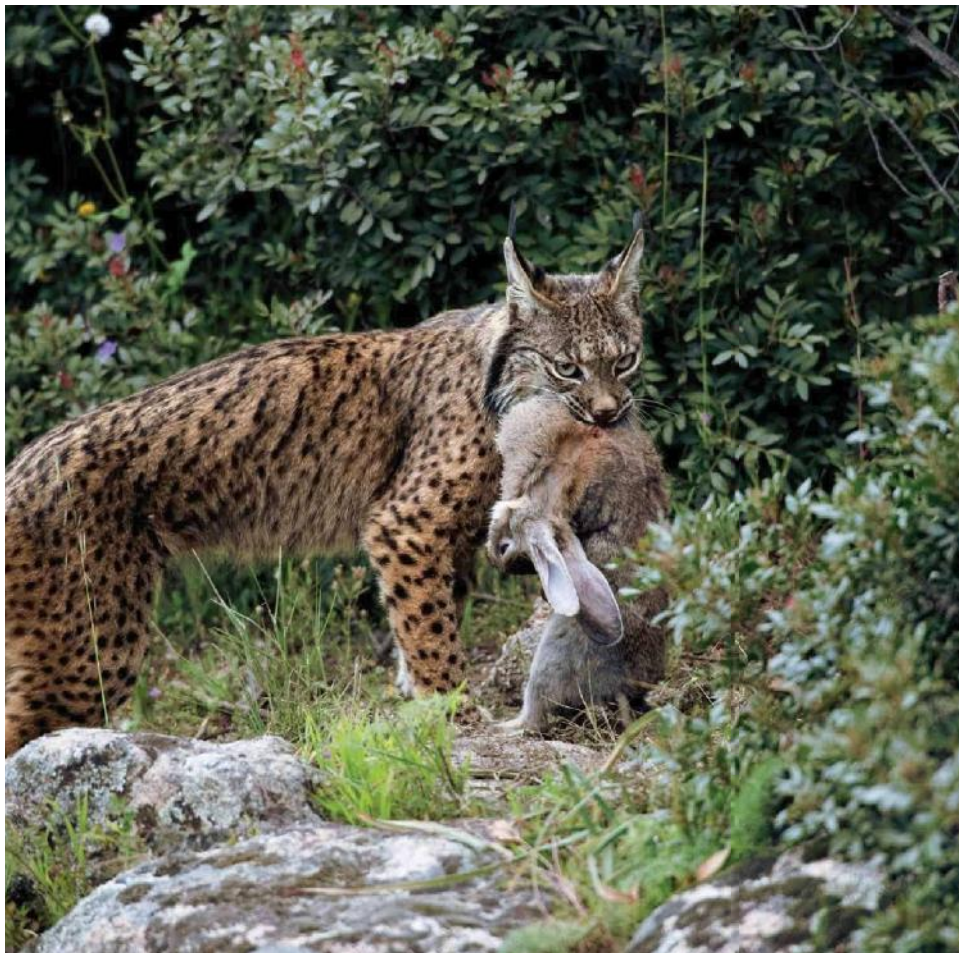




Spring-footed Elanio, a year-old male in Spain's Sierra de Andújar Natural Park, clears a "predator-proof" fence—just as wildlife managers intended. Designed to thwart other rabbit-eaters like fox and boar while letting cats up and over, the fence surrounds a feeding area seeded with prey. Offering extra food is extreme but, right now, crucial: Lynx simply won't breed if rabbits are scarce.







While one rabbit a day feeds a single lynx, a mother with cubs needs two or three.

MAP: LISA R. RITTER, NGM STAFF. SOURCE: LYNX LIFE NATURE, ANDALUSIA



**Its golden eyes** have shone across Mediterranean lands for a million years. But the 25-pound Iberian lynx, icon of Spain and Portugal, is on shaky turf. Its wild count is about 225 animals, up from 100 a decade ago but far too low for long-term survival. Hunting, road kills, and habitat loss have sped the plunge of *Lynx pardinus*, as has near-total dietary reliance on rabbits—themselves overhunted and slammed by disease. Only two breeding populations remain, based in protected areas in Spain (map). With pledges of \$35 million for conservation, the Lynx Life group is boosting rabbit numbers, moving cats to underused haunts, and safeguarding prey-friendly habitat. In the near future, it hopes to release captive-bred lynx into the wild. For now, says Lynx Life director Miguel Angel Simón, improving life for wild lynx on wild land is the best strategy. —Jennifer S. Holland

*Pete Oxford and Renéé Bish photographed the Iberian lynx while on assignment for Wild Wonders of Europe.*



His mother, Rappas, is still in charge for now, but Elanio will soon strike out and seek his own territory in the region's forest, thicket, and scrub. A radio collar will enable staff of Lynx Life, a Spanish conservation group, to monitor him.





Lynx tend to be solitary after their first year and have been reported to stick to narrow ranges of about ten square miles—and to shun farmed or developed landscapes. But last year Lynx Life staff tracked a female on a nearly 200-mile foray. She successfully hunted on agricultural land—a hopeful sign of adaptability for this most critically endangered of cats.





PHOTO: SVEN ZACEK, WILD WONDERS OF EUROPE

## ON ASSIGNMENT

### Wild Moment

Great gray owls aren't known for being shy. Sven Zacek learned just how bold the birds can be while on assignment in Finland's snowy Oulu region. Instead of choosing to rest in a distant spruce tree, this female settled atop the photographer's tripod, set up 40 feet from where Zacek stood. With another camera, he caught the bird's confident landing.

## Society Updates

### SPECIAL ISSUE

*Nature's Fury* portrays the power of forces shaping our planet. The 100-page special issue includes coverage of the earthquake in Haiti. Go to [ngm.com/natures-fury](http://ngm.com/natures-fury).



**PLAY SPECIAL  
ISSUE PREVIEW**





PHOTO: SHAUL SCHWARZ

## ON ASSIGNMENT

**Prison Patrol** Outside the Center for Enforcement of the Legal Consequences of Crime, Shaul Schwarz (above, at left) rode around in the back of a pickup truck with two anonymous guards. "It was hard to get access with a camera," explains the Israeli photographer, who covered this month's story on Mexican cults. The day before, Schwarz had been allowed into the prison, but only for two hours. "This is a hard-core jail," he says, adding that trust was an issue throughout the assignment. "Everybody is masked, and not knowing who is who is very scary."

## Society Updates



### NAT GEO WILD

Our new cable network, Nat Geo Wild, brings humans closer than ever to the animal world. Check local listings for information.

### BIOBLITZ

On April 30 and May 1 we join the National Park Service and thousands of volunteers to survey Florida's Biscayne National Park. Visit [nationalgeographic.com/bioblitz](http://nationalgeographic.com/bioblitz) for details.

### NG CHANNEL

The universe's most outrageous storms churn in outer space. What would happen if this wild weather hit Earth? Scientists find out in Storm Worlds, a three-part special debuting May 16 at 8 p.m. on the National Geographic Channel.



PHOTO: ACME NEWSPAPERS/NATIONAL GEOGRAPHIC STOCK

**Deep Sleep** In October 1940—as German bombs rained on their city—Londoners sought overnight safety in the Aldwych tube station, one of about 80 underground stops used as shelters during World War II. At times more than 170,000 people slept in the shelters. At first the station staff were unprepared, says Robert Bird, senior curator of the London Transport Museum. “Gradually, sheltering became properly organized, with admission tickets, bunk beds, medical aid, chemical toilets, and refreshments.” These days nobody sleeps at Aldwych—not even on a train car passing through. The station was permanently closed to traffic in September 1994.

—Margaret G. Zackowitz





PHOTOS: JAMES BALOG; PETER ESSICK (BELOW)

## June 2010

### **Greenland's Changing Face**

MELT ZONE: Dust lands, ice melts, rubber duckies drown.

VIKING WEATHER: Erik the Red's warm clime returns.

**Counting Cranes** How many whooping cranes are there? Not enough.

**Mandela's Children** South Africa wrestles with the legacy of apartheid.

**Foja Mountains Fauna** In New Guinea, biologists find the craziest creatures.

**China's Caves of Faith** Ancient Buddhas draw millions to Dunhuang.