

DECEMBER 2010

NATIONAL GEOGRAPHIC

THE
SEARCH
FOR

King David

CHANGING
LIVES OF
AFGHAN WOMEN

ALASKA'S
CHOICE:
GOLD OR
SALMON?

TWILIGHT
FOR
THE BAT

New
Discoveries
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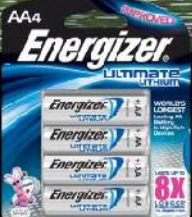
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NATIONAL GEOGRAPHIC

VOL. 218 • NO. 6

December 2010

Cover Story

David and Solomon

Archaeologists dig up
controversy as they dig
into the kings.

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MORE 



December 2010 | Features



Swan Serenade The majesty of a whooper.

Veiled Rebellion

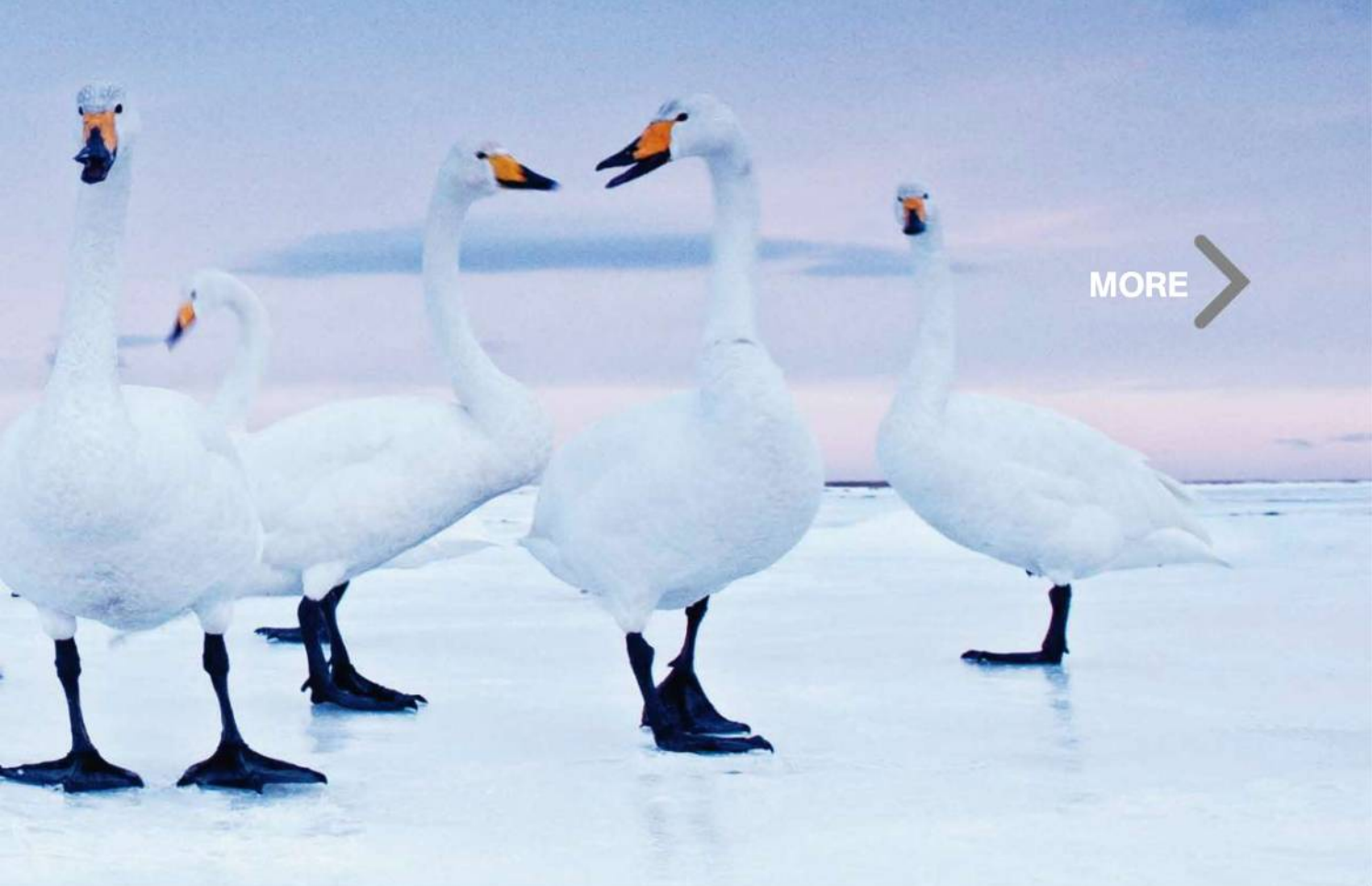
E-EXTRA: VIDEO Afghan women.



Heart of the Milky Way

E-EXTRA: TEXT The galaxy's secrets.





MORE 

Alaska's Choice

Gold mine vs. salmon run.

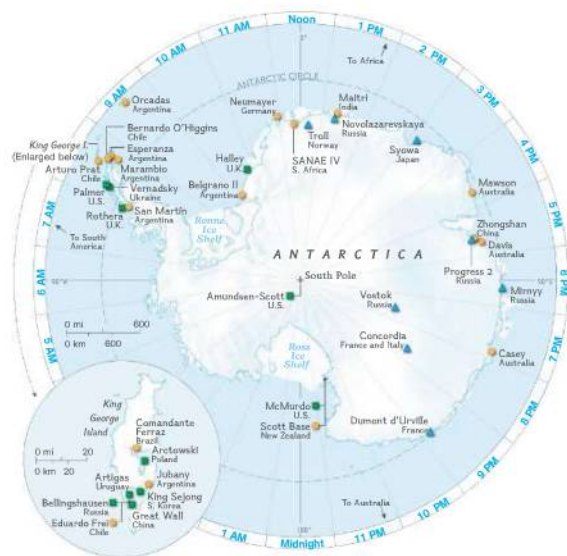


Twilight for the Bat

E-EXTRA: VIDEO A deadly fungus strikes.



December 2010 | Departments



Editor's Note

Letters

Your Shot

SLIDE SHOW

Visions of Earth

—

NGS Explorers

Inside Geographic Flashback

On the Cover

In this painting by Peter Paul Rubens, circa 1616, the biblical king-to-be is poised to wield the sword he took from Goliath.

Art: Norton Simon Foundation



GEOGRAPHY

Why a Watch Is Useless in Antarctica

The world's 24 time zones converge at the South Pole. That's a dilemma for visitors who want to set a clock.

CONSERVATION

Serengeti Road

A proposed highway could endanger herds of African animals.

CULTURE

India's Hidden Language

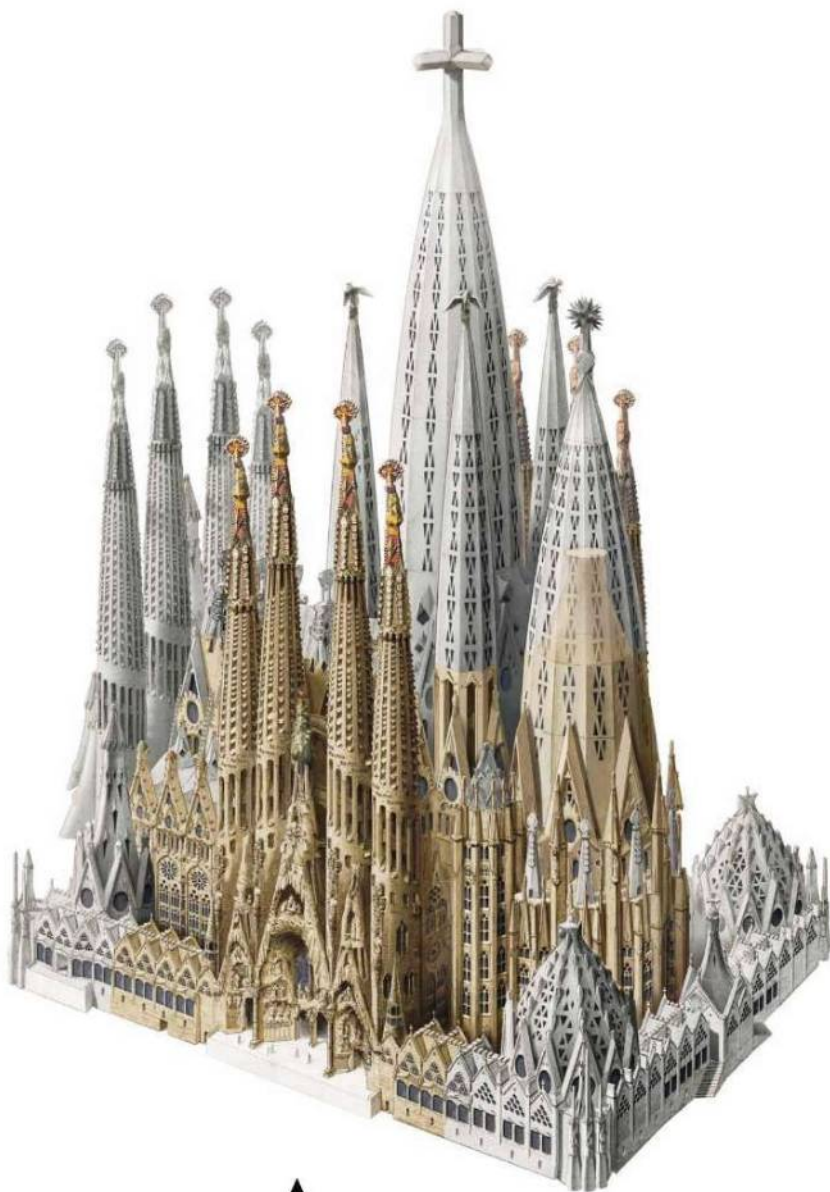
Few speak Koro, a language sometimes not even shared within families.

AUDIO



▲
WILD
A Nest of Petals

A loner bee found in Turkey and Iran deconstructs flowers to build a shelter for its larvae. Once hardened, the nest is humid inside, strong outside—and absolutely beautiful.



THE BIG IDEA
Gaudí's Masterpiece

His brilliantly conceived church in Barcelona has been under construction for 128 years. And it's still far from done.

INTERACTIVE GRAPHIC

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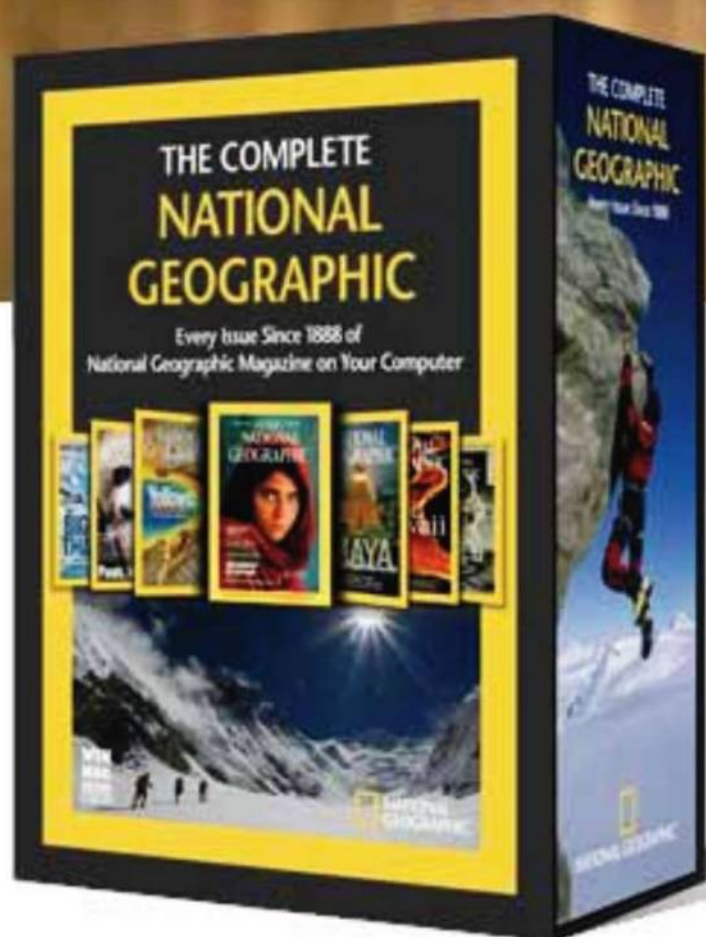
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- Stanley Breeden
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E D I T O R ' S N O T E

Setnet fishermen on Bristol Bay trap salmon when the fish swim close to shore with the incoming tide.

PHOTO: MICHAEL MELFORD

From my vantage point in the single-engine plane above Bristol Bay, I see an epidemic of salmon fever as big as the state of Alaska. Hundreds of boats are in high gear, chasing the millions of ready-to-spawn sockeye returning to the bay, hauling in nets filled with fish. Many boats are so laden with salmon they ride precariously low in the water, dangerously close to swamping. I had heard about this fishery for years, but nothing prepared me for the enormity of it until I saw it for myself. I was also not prepared for its beauty and remoteness—no dams, development, or human footprint, just endless miles of pristine creeks, lakes, and rivers. This was the wild Alaska I had imagined. A tranquil landscape. Nature at its grandest.

Today, nearly 28 years later, photographer Michael Melford and writer Edwin Dobb see the same breathtaking landscape and find the salmon still running. But the Bristol Bay watershed is no longer tranquil. Instead, it's filled with tension provoked by the discovery of what may be the world's largest deposit of gold and one of the largest deposits of copper. The lode, worth hundreds of billions of dollars, has spawned ambitions for an immense mining complex with an open pit possibly two miles wide and a cavernous underground mine. It's a face-off between salmon and gold; the battle between those who support the mine and those who oppose it has reached a critical point. The risk, the values and priorities, the balancing of potential gains and losses all present uneasy and complicated questions. In this month's issue Melford and Dobb wade into the fight.

A handwritten signature in black ink, appearing to read "Chris Schuss". The signature is fluid and cursive, with a long horizontal line extending from the end.

LETTERS

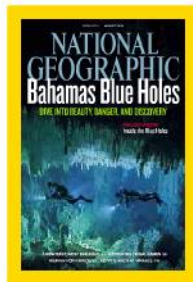
Bahamas Blue Holes

There could be no more fitting tribute to the memory of Wes Skiles than the spectacular cover and gatefold photo in your August issue. I dived with Wes on his first Bahamian blue hole dive more than 25 years ago. I watched him struggling to take photos in an unforgiving environment. We shared the goal of having a photo in *National Geographic*. He succeeded (and brought my dream along with him) when a photograph of his was eventually published. His determination and dedication led Wes to a career that included not only submerged-cave photography but also the conservation of caves and springs in Florida. Wes captured the essence of the beauty and mystery of the blue holes of the Bahamas. I am thankful for this lasting memory and for his sharing the importance of these submerged environments with the world.

JILL YAGER

Puerto Morelos, Mexico

I will never have the opportunity to visit the underwater caves, but the article and photographs by Wes Skiles really made me want to do what is needed to protect these special places. On a sadder note, I was so sorry to read of Skiles's passing. He was truly an amazing photographer, and as an amateur photographer, I find his work very inspiring. He will forever be remembered through his wonderful *(Touch Text button to read more.)*



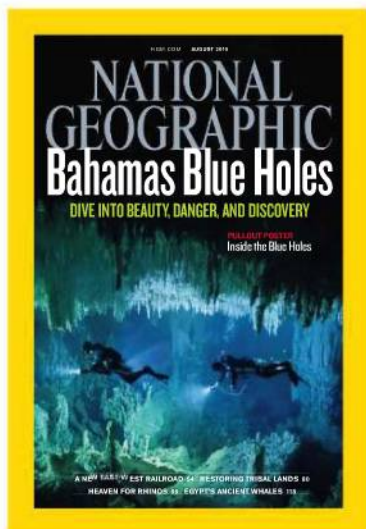
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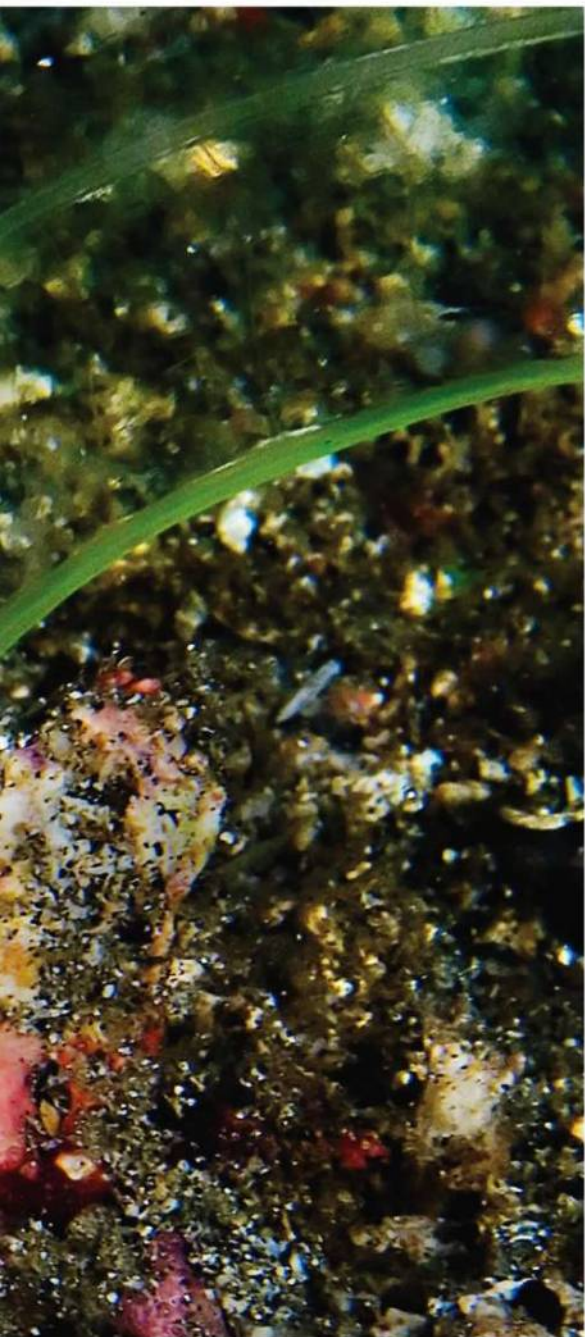
EDITORS' CHOICE **Tunc Yavuzdogan** Istanbul, Turkey

While on a diving vacation in Indonesia, scuba instructor Yavuzdogan, 40, happened upon this foot-long larval eel in the waters of the Lembeh Strait. "It did move around frantically," he says. "It was very hard to get a decent shot. Its movements were very rhythmic and very fast."



Selections from our editors





Selections from our editors



DING

VISIONS OF EARTH

Germany Braving fog and snow to visit Bavarian farms in December, a man in St. Nicholas garb leads revelers dressed as Krampus—a mythical Alpine mischiefmaker—toting gift baskets and birch switches.

PHOTO: CARSTEN PETER



Now to visit Bavarian farms in December, a man in St. Nicholas garb leads
s—a mythical Alpine mischiefmaker—toting gift baskets and birch switches.

PHOTO: CARSTEN PETER



Afghanistan At a hospital in Tarin Kowt, a newborn boy is weighed by a midwife. Afghan babies are kept tightly swaddled for a year. Local tradition holds that the practice promotes good posture.

PHOTO: CYNTHIA BOLL



wife. Afghan babies are kept
good posture.

PHOTO: CYNTHIA BOLL



United States Stripes and flakes share space at the Wilds, a refuge in Ohio. Here, a three-year-old Grévy's zebra named Elvis stomps the winter pen, whi



for rare and endangered species.
ch adjoins heated indoor quarters.

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PHOTO: MATT EICH, LUCEO





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G E O G R A P H Y



Times used at Antarctic winter stations, 2009

● Home country ■ Departure port ▲ Standard at geographic location

The Timeless Continent

Of the unusual phenomena that occur at the polar extremes of the Earth, time is a particularly peculiar one. Yes, the sky at the South Pole splits the year between whole days of light and dark. But how do humans who venture there—to a place where the world's 24 time zones converge—and to the rest of Antarctica set their clocks?

It all depends. While scientific observations follow coordinated universal time (UTC), each Antarctic research station (right) adopts one of three practices for coordinating logistics on the ice. The majority keep the time of their home country. Others stay on the clock of the city from which their ships or aircraft departed. Fewer still use the standard time at their geographic location. All of which means a smattering of times on a continent the size of the United States and Mexico combined.

So who plays Father Time at the Pole itself? New Zealand, last port of call for Americans headed to their station at the bottom of the world. —Luna Shyr



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C O N S E R V A T I O N

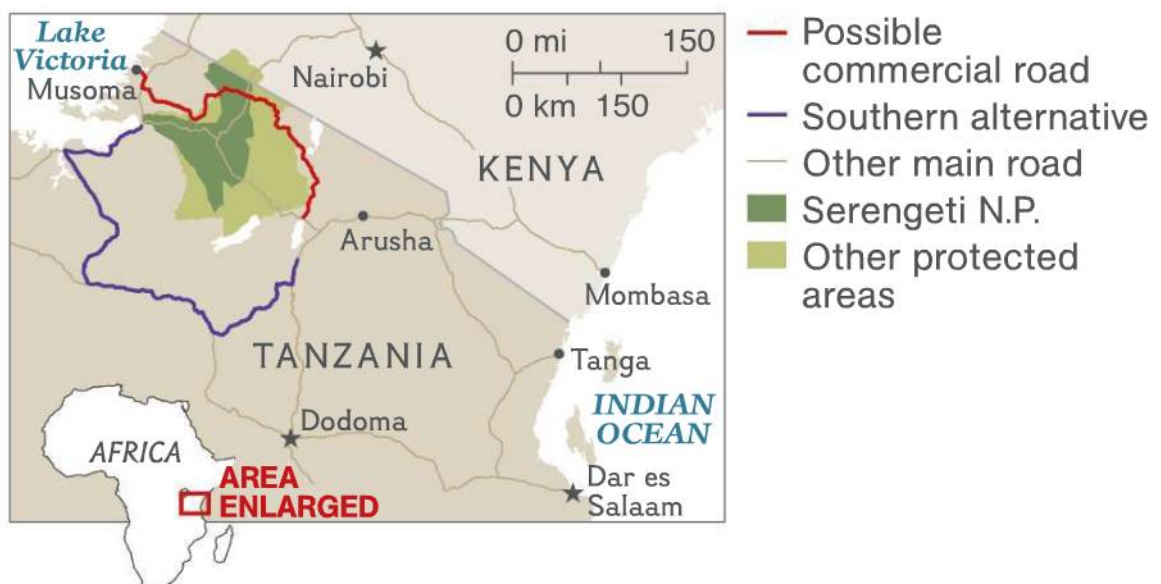
Animals skitter
away from a
vehicle in the
Serengeti.



PHOTO: ÇAĞAN H. ŞEKERCIOĞLU, STANFORD UNIVERSITY
NGM MAPS. SOURCE: AFRICAN WILDLIFE FOUNDATION

A New Road in the Serengeti? Every May when the dry season starts to settle over Tanzania, great herds of wildebeests, zebras, and gazelles head northward, leaving the Serengeti National Park for greener pastures in Kenya. As the rains return in November, so do almost two million animals. Now their migration path is the focus of a debate over the proposed construction of a commercial highway.

The government says such a road is needed to link the remote Lake Victoria area to ports on the Indian Ocean such as Dar es Salaam. It is studying the feasibility of running an unpaved, two-lane stretch across the Serengeti's northern wilderness. But conservationists say hundreds of trucks would use the road daily, risking collisions with migrating animals and increasing the possibility of poaching. They propose a longer route, to the south, that would skirt the park altogether. The country now faces the hard decision of how to balance development with the protection of its iconic wildlife. —A. R. Williams



W I L D

Flower Beds Call it ikebana for insects. Female *Osmia avosetta* bees, scientists have recently discovered, arrange flower petals to form unique nests that swathe their larvae in nutrients and warmth for the winter.

Biologists had never seen this species' creations until last year, when two research groups working simultaneously found and excavated nests at mountain-slope sites in Turkey and Iran.



Together they report that the female of this solitary bee—which eschews hive life—digs a shallow tunnel in loose ground with room for one or two chambers, or brood cells, each up to two inches deep. She

then papers the cell walls with overlapping petals flown in one by one from nearby fields, gluing two layers together with a thin coat of mud. Finally she stocks each chamber with larval food—a slurry of nectar and pollen—deposits an egg on top, folds the inner petals over, seals the door with damp soil, and ends with another petal fold. The process can take up to two days, the scientists say. The cell soon hardens into a tough nugget that's humid inside and predator- and water-resistant outside—an ideal winter shelter come drought or flood.

A petal nest's loveliness is no doubt lost on the larval bee, which develops in the dark and, without eyes at that stage, can't see regardless. And while scientists appreciate the artistry, says co-discoverer Jerome G. Rozen, Jr., of the American Museum of Natural History, "we're most intrigued by its beauty as an evolutionary mechanism for protecting offspring." —Jennifer S. Holland



HOUSE BEAUTIFUL

A female bee (left) brings a petal to her unfinished nest. Above is the product of one bee's efforts: a brood cell with petal shingles.

PHOTOS: JEROME G. ROZEN, JR. (BROOD CELL); JOHN S. ASCHER (BEE)

Abamo Degio
learned Koro when
she married a
native speaker.





India's Hidden Language Imagine a spoken language not shared by everyone in the same family—one that sounds as foreign to people in the next village over as Japanese does to most English speakers. That's what U.S. linguists K. David Harrison and Gregory Anderson found in India's remote northeastern state of Arunachal Pradesh. They traveled there in 2008 to document two obscure regional languages. They ended up detecting a third.

Locals had assumed that the 800 or so speakers of this tongue, Koro, were using a dialect. But the linguists—part of National Geographic's Enduring Voices, a project studying endangered tongues—have confirmed that it's a distinct new language. Its quiet presence mirrors that of the culture sharing its name, concealed for centuries within the dominant Aka-Miji society. Linguists estimate the world loses one of its 7,000 languages every 14 days. To help keep Koro alive, Enduring Voices is compiling a sound archive and an online dictionary—a sure way to get the word out. —Hannah Bloch



Touch an icon to listen
to each Koro phrase.

“Where are we going?” 

“What is this?” 

“I gave a pig to a man.” 

“How are you?” 

“A pig bit you.” 

“Where are you?” 

“Thank you.” 

Touch here to learn more about National Geographic's Enduring Voices project.

we going?”

a man.”

are you?”

you.”

“Thank you.”

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Gaudí's Masterpiece

When the pope said Mass there this fall, the Sagrada Família was already 128 years in the making—and still not finished. Yet the church's nature-inspired design remains ahead of its time.



"MY CLIENT IS NOT IN A HURRY," Antoni Gaudí used to say. The pious architect was speaking of God, explaining why the Roman Catholic Sagrada Família church was taking so long to complete. Nearly a century later it remains a work in progress—a dream of spires and ornate facades rising hundreds of feet above downtown Barcelona, drawing the eyes (and euros) of some *(Touch Text button to read more.)*



2000 The central nave vaulting is completed. In the decade since, technological advances have sped progress.

PERE VIVAS, TRIANGLE POSTALS

Text



2000 The central nave vaulting is completed. In the decade since, technological advances have sped progress.

PERE VIVAS, TRIANGLE POSTALS

THE BIG IDEA | CONTINUED



1915





2010 The Sagrada Família soars above the plazas and *avenidas* of Barcelona, defining the downtown skyline.

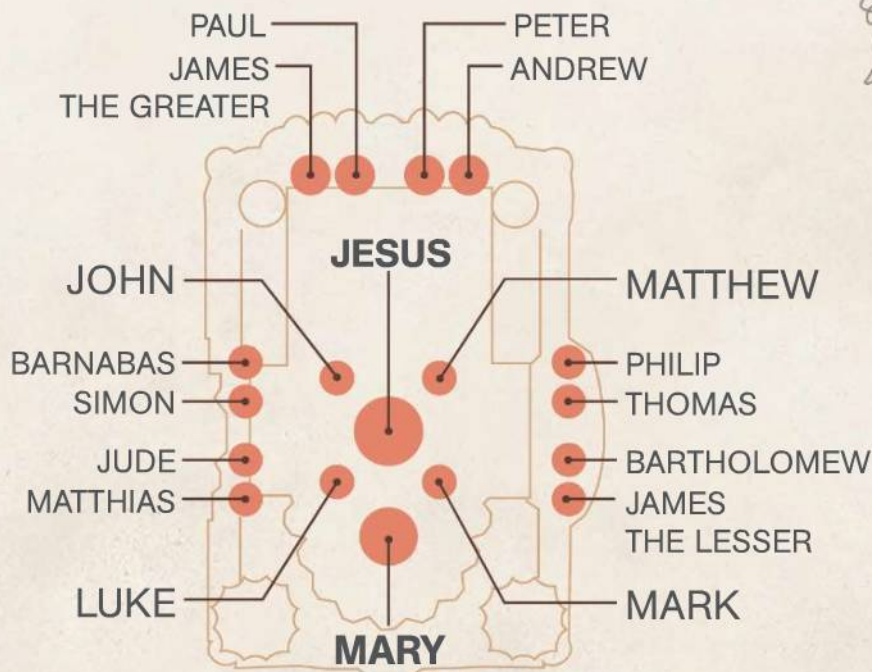
PHOTOS: PHOTOGRAPHER UNKNOWN (LEFT); PERE VIVAS, TRIANGLE POSTALS (RIGHT)

Barcelona's Natural Wonder

Financed entirely through private donations and tourist revenue, the Sagrada Família is inching closer to completion. A look at the church's layout and design reveals a marvel of imaginative—and unprecedented—engineering.

Symbolic Towers

Still unconstructed, the church's primary pillars will represent some of Christianity's most important figures: Jesus, Mary, the Gospel writers.





For his gargoyles, Gaudí chose to depict native wildlife—in particular, species (like this lizard) displaced by the church's construction.

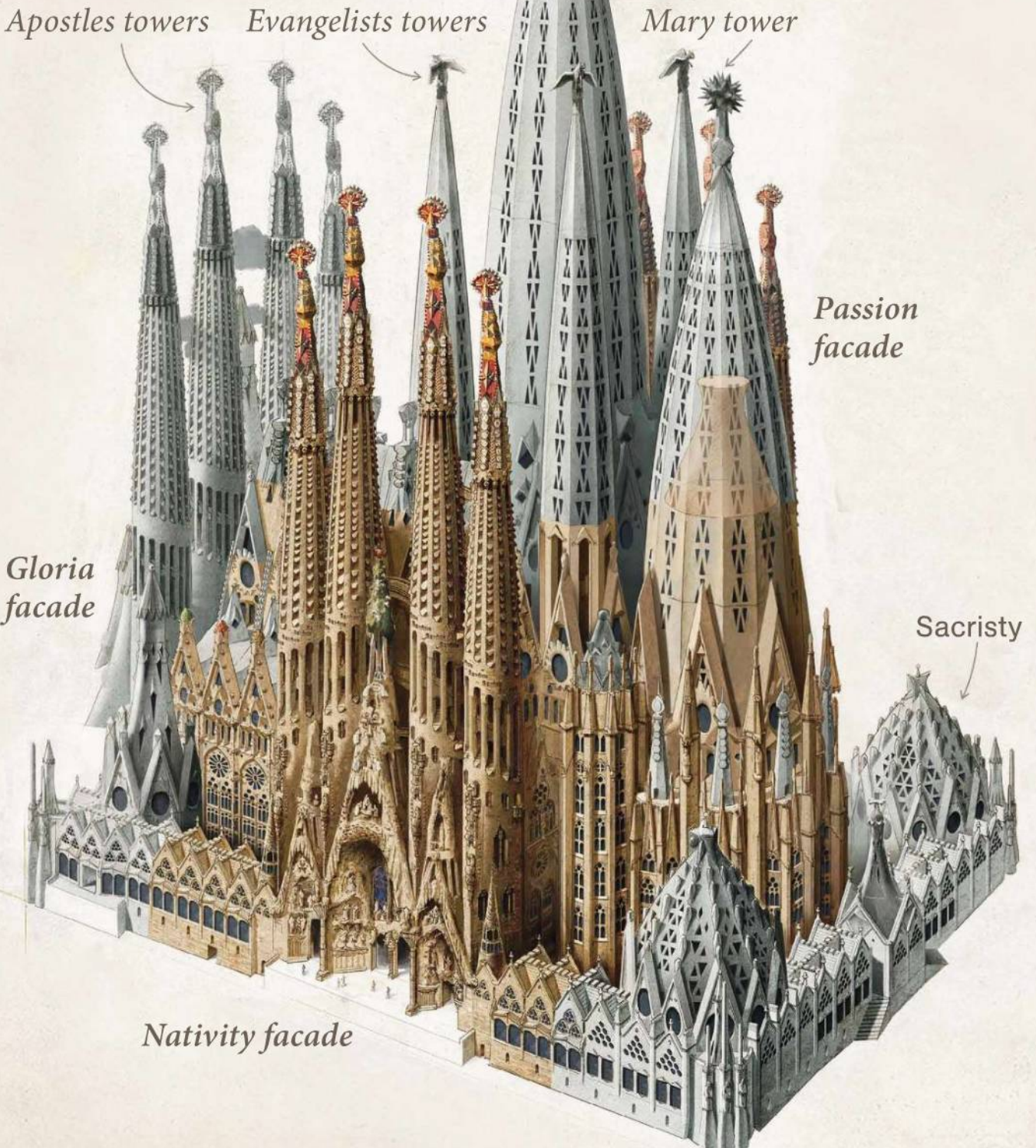
MORE 

Grand Facades

Each of the church's three facades depicts an event in the life of Christ. The east-facing Nativity symbolizes Christ's birth, the Passion (west) his death and resurrection, the incomplete Gloria (south) the salvation of humanity.

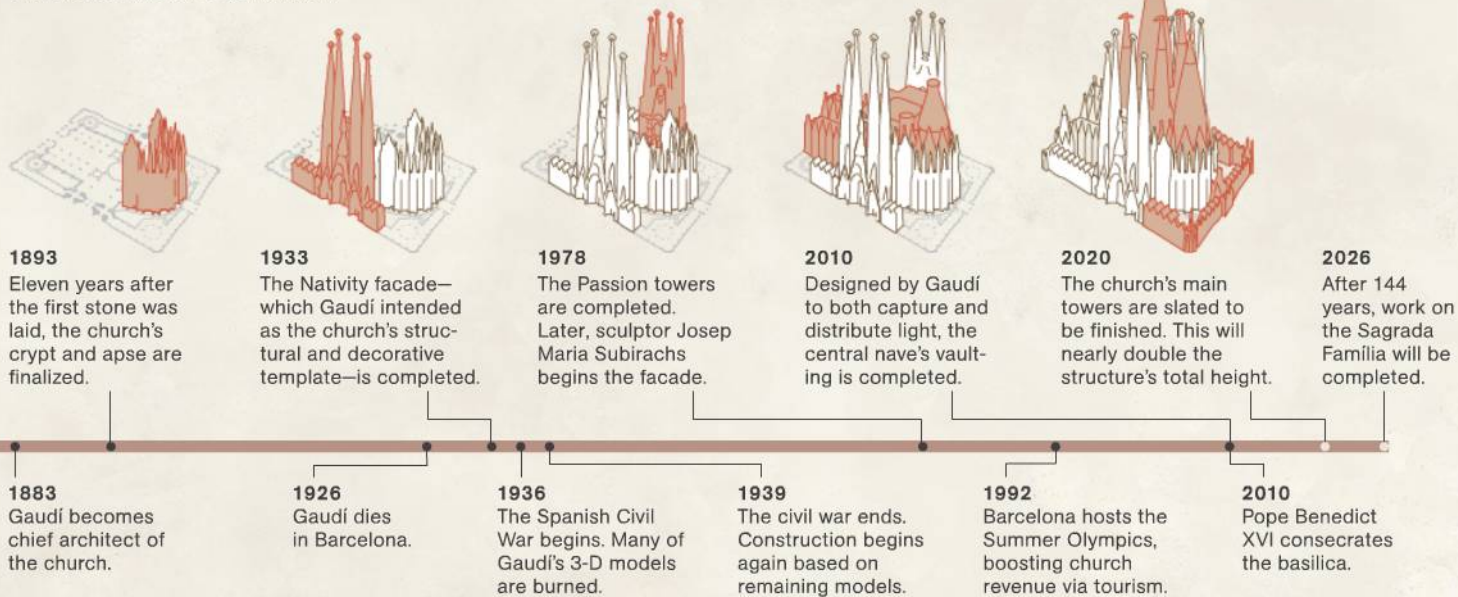
Construction stages

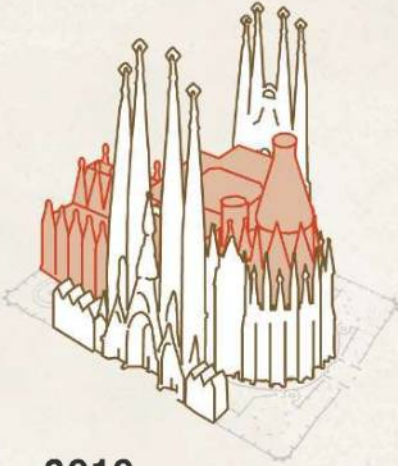
-  Completed section
-  Sections not yet built. Details not yet finalized.



A Work in Progress

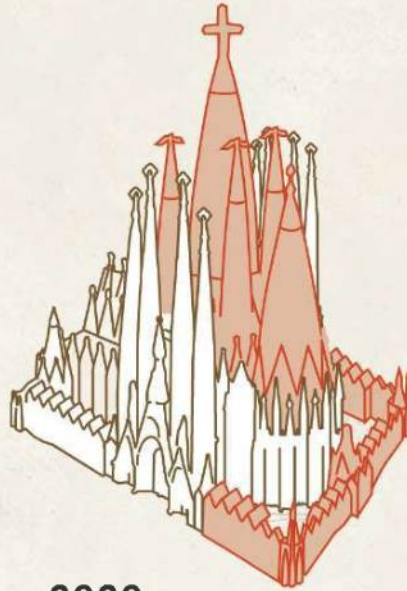
Here are some key steps in the church's slow march to completion.





2010

Designed by Gaudí to both capture and distribute light, the central nave's vaulting is completed.



2020

The church's main towers are slated to be finished. This will nearly double the structure's total height.

2026

After 144 years, work on the Sagrada Família will be completed.



1939
The civil war ends. Construction begins again based on remaining models.

1992
Barcelona hosts the Summer Olympics, boosting church revenue via tourism.

2010
Pope Benedict XVI consecrates the basilica.

Design by Nature

Antoni Gaudí pioneered an architecture based on nature's geometric forms. Structural and ornamental, they reflect his native region—and ingenuity.

Structures

Having observed their functional perfection in nature, Gaudí used twisted surfaces and curved planes as the organic bases of his buildings. His columns, arches, and stairways all stem from this notion of natural design.

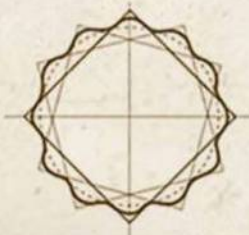
Columns

In his quest for a perfect column, Gaudí studied the helicoid growth of many plants—patterns that let leaves receive sunlight and lend structural strength.

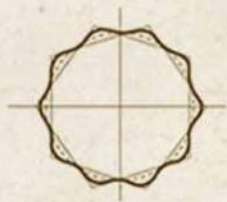


Chinese abelia grows in a helicoid pattern.

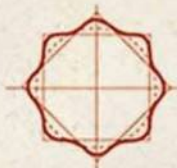
The main columns of the Sagrada Família come in four sizes and shapes, all of which finish in a circle. The diameter and number of sides depend on the load the column needs to bear.



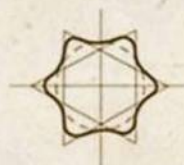
12-sided
69 feet tall



10-sided
57 feet

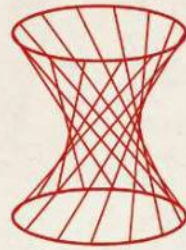


8-sided
46 feet



6-sided
34 feet

MORE 



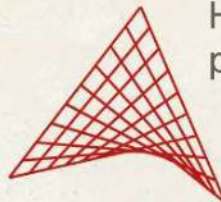
Double Roof

A unique feature of the church's roof, quadric surfaces called hyperboloids reflect and filter natural light.

Tree Structures

To create the church's inner "forest," Gaudí etched tree features into his columns. The crown of the column in the central nave represents the transition between the trunk and branches of a great tree.

Hyperbolic paraboloid



64 sides

32 sides

16 sides

8 sides

Designed to house artificial lights, Gaudí's columns copy the scars that form naturally when a tree branch is cut.



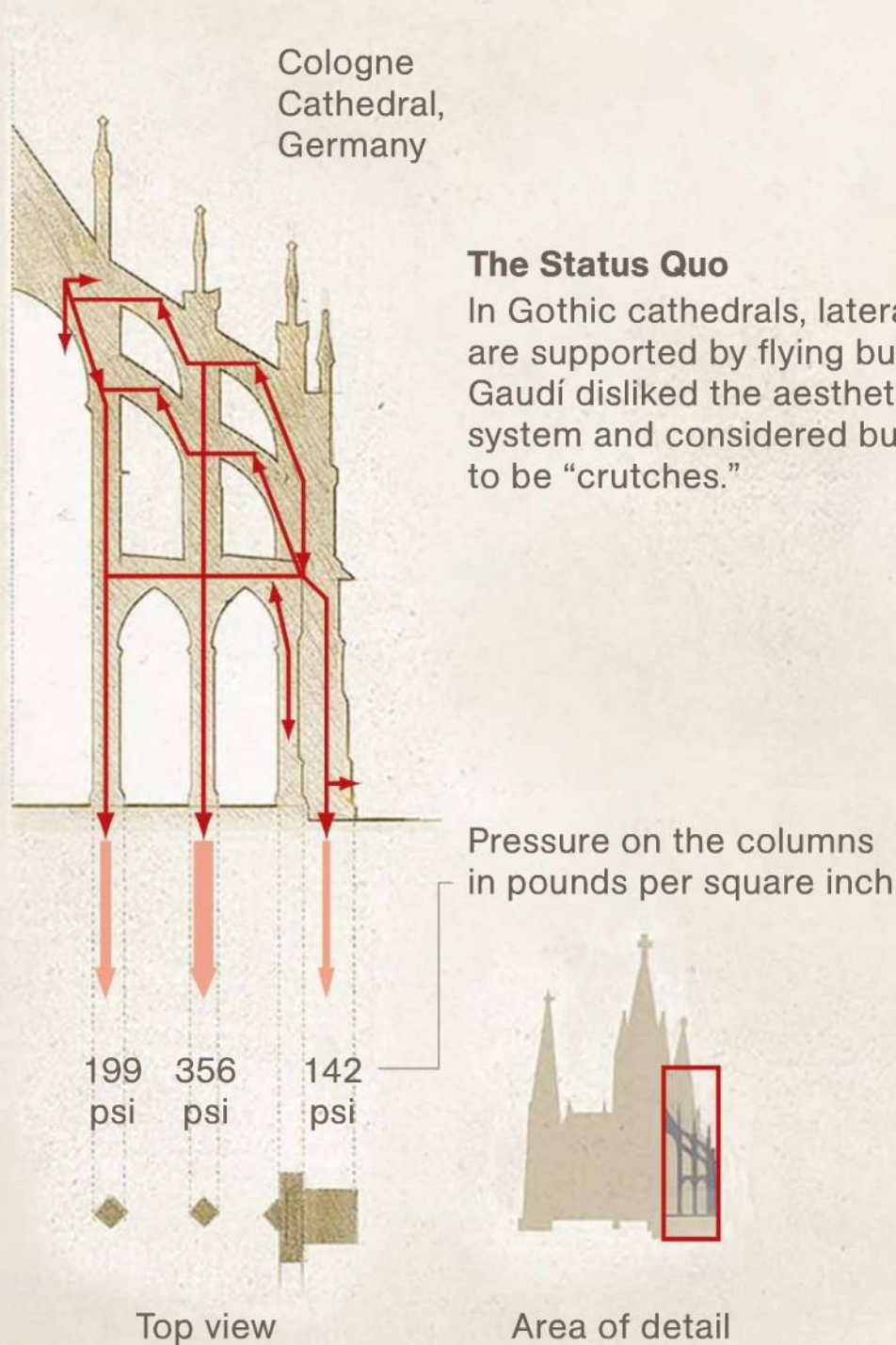
Kapok tree



Column base from the Passion facade

Structures

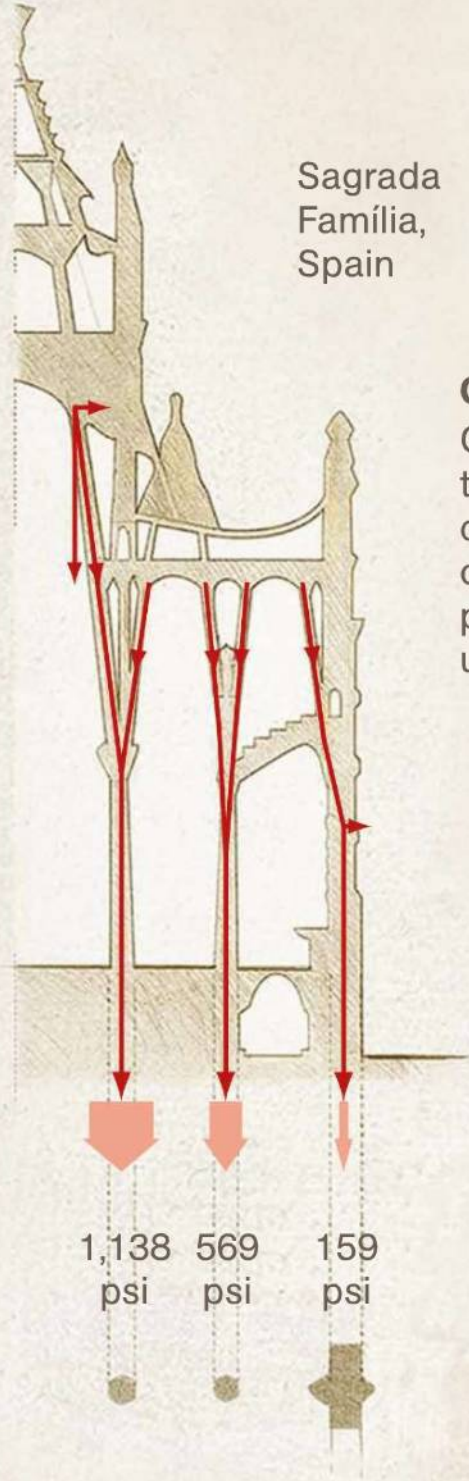
HOW COLUMNS WORK



Sagrada Família,
Spain

Gaudí's Response

Gaudí strayed from the Gothic tradition in part by shifting the lateral load of the Sagrada Família onto the nave columns—an engineering feat made possible due to the column systems' unique load-bearing capabilities.



Top view

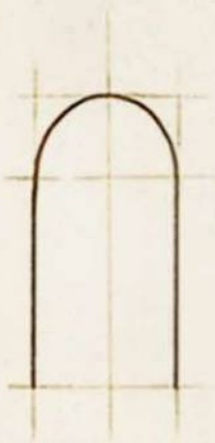


Area of detail

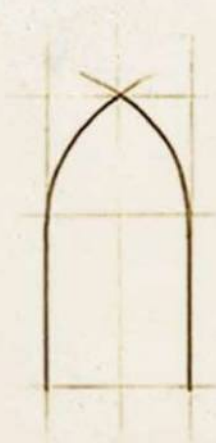
Structures

Arches Follow Gravity

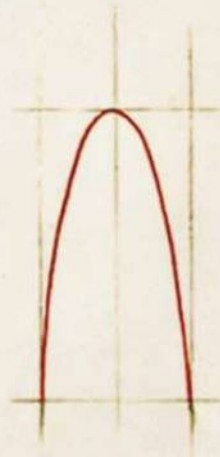
All of Gaudí's works feature catenary arches, which form naturally via gravity and are visible when a rope is hung. To determine the load capabilities of the church's arches, Gaudí hung proportionally measured sacks of lead.



Romanic



Gothic



Gaudí

Gaudí's ingenious three-dimensional arch models were photographed and used in lieu of building plans.



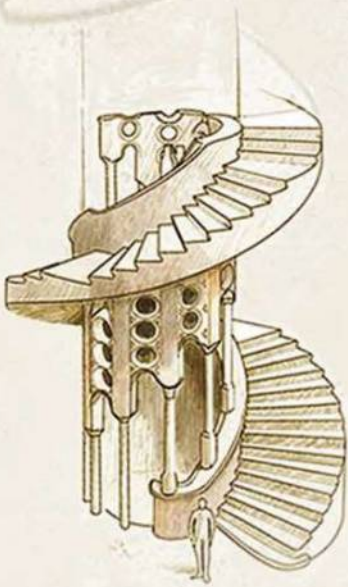
MORE



Spiral Stairways

Found in plants, animals, and planetary systems, spirals are a recurring shape and theme in Gaudí's works.

Stairway in
Sagrada Família



Garden snail

Snail shells and falling maple-seed pods are among the natural spirals that Gaudí studied.

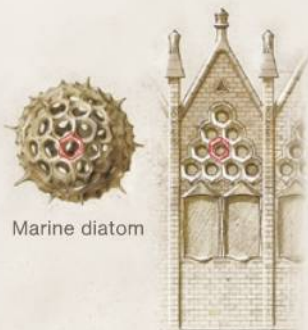


Ornaments

Gaudí's sense of aesthetic beauty was directly tied to physical utility. If perfect practicality arises in the natural world, he concluded, so too must sublime decoration.

Organic Windows

Following the patterns found on natural objects, like those on a marine diatom, Gaudí designed windows to allow for greater passage of natural light.



Marine diatom

Windows on the cloister

Pinnacles of Detail

The tower tops of the Sagrada Família are modeled on the architect's study of crystals, cereal grain spikes, and grasses growing in and around Barcelona.



Pyrite

Lavender

Pinnacle on the Apse

Gaudí looked at the geometry of crystallization in minerals such as pyrite, fluorite, and galena and incorporated them in many of his works.

Lavender, wheat, and grasses were some of the plants Gaudí studied as he designed his pinnacles.

Vine Lines

Gaudí often incorporated naturally spiraling helices. Passion fruit tendrils, for instance, adorn the side walls of the Nativity facade.

Passion fruit vine



Frieze on the Nativity facade



ART: FERNANDO G. BAPTISTA, SHIZUKA AOKI
 DESIGN: FERNANDO G. BAPTISTA AND OLIVER UBERTI
 RESEARCH: KAITLIN M. YARNALL. TEXT: JEREMY BERLIN
 MAP: SAM PEPPLER. TIME LINE ART: HIRAM HENRIQUEZ
 CONSULTANTS: JUNTA CONSTRUCTORA DEL TEMPLO
 EXPIATORI DE LA SAGRADA FAMILIA; JORDI CUSO
 ANGLES; JOAN BASSEGODA NONELL; ANDREW D.
 CIFERNI, PHOTOS: DOS DE ARTE (LIZARD); REBECCA
 HALE, NGM STAFF (VINE); DOS DE ARTE (PINNACLES)

MORE >



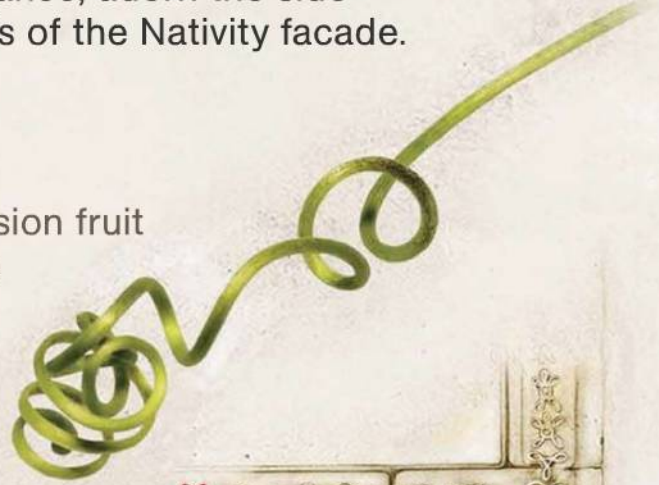
Pinnacle
on the Apse



Vine Lines

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Passion fruit
vine

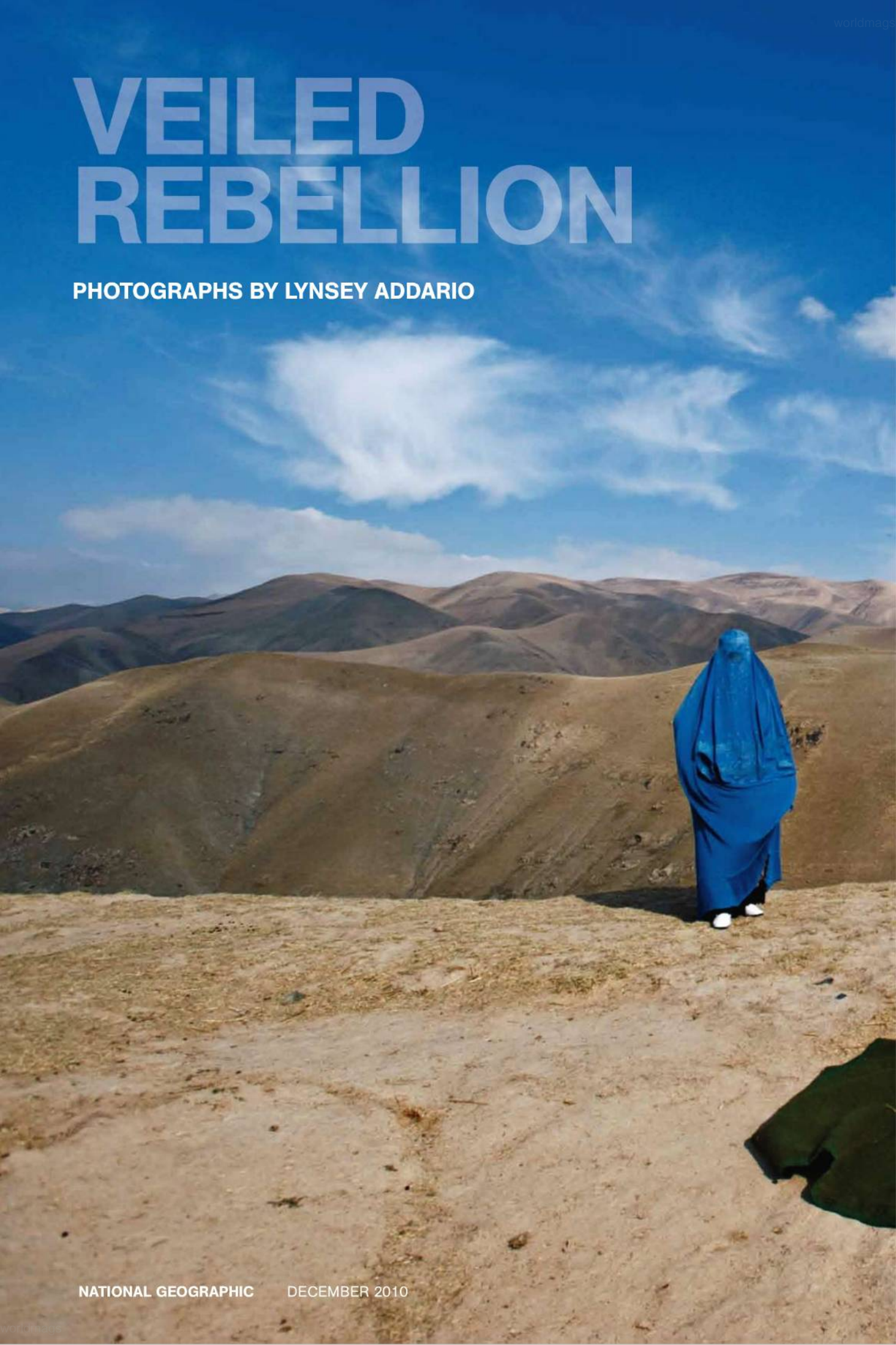


Frieze on the
Nativity facade

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CIFERNI. PHOTOS: DOS DE ARTE (LIZARD); REBECCA
HALE, NGM STAFF (VINE); DOS DE ARTE (PINNACLES)

VEILED REBELLION

PHOTOGRAPHS BY LYNSEY ADDARIO



AFGHAN WOMEN SUFFER UNDER THE CONSTRAINTS OF TRIBALISM, POVERTY, AND WAR. NOW THEY ARE STARTING TO FIGHT FOR A JUST LIFE.



< IN LABOR ON THE ROAD

I saw two women on the side of the mountain, in burkas and without a man. In Afghanistan you seldom see an unaccompanied woman. Noor Nisa, about 18, was pregnant; her water had just broken. Her husband, whose first wife had died during childbirth, was determined to get Noor Nisa to the hospital in Faizabad, a four-hour drive from their village in Badakhshan Province. His borrowed car broke down, so he went to find another vehicle. I ended up taking Noor Nisa, her mother, and her husband to the hospital, where she delivered a baby girl. My interpreter, who is a doctor, and I were on a mission to photograph maternal health and mortality issues, only to find the entire story waiting for us along a dusty Afghan road.





LYNSEY ADDARIO first traveled to Afghanistan in 2000, photographing life under Taliban rule. Her work there and elsewhere, often focusing on the challenges that women face, earned her a prestigious MacArthur Foundation Fellowship in 2009. The photos for this story were made over eight weeks in 2009 and 2010; her comments tell the stories behind the images.

UNAFRAID TO RALLY >

My first time in Afghanistan, the Taliban ruled the country. The only women on the street were beggars—usually widows or wives of disabled men. On many Fridays the Taliban performed public executions at the sports stadium in Kabul. Ten years later, at a rally for a presidential candidate in the same stadium, women participated—some in burkas, some not. In this picture, the women who did not want to be photographed covered their faces.







م
مرطوبه ز
زمينه را
از زيبات

و
جان
خند
با ما

این یک استند
مون را خوشی دارم.
این از من است

پرسش
یک
است

این یک است
او همیشه در است



تقسیم درجات معنیوار حقیقی اہل

دری	ریاضی	املا
ریاضی	دری	جد سازی
علوم و ہنر	دری	حسن خط
دری	ریاضی	املا
آداب ساکھ	دری	جد سازی

پیرشعنا
شہا کدوم فصل
سال را خوش درازید

ایں بیک است
او خود داشت



من دارم
بابا دارد

مادر باچہ خان خود
۳ بھگ داریم



< SETTING HERSELF ABLAZE

“I took the bottle of petrol and burned myself,” Fariba, who is 11 and lives in Herat, told me. “When I returned to school, the kids made fun of me. They said I was ugly.” She now says, “I regret my mistake.” The reasons for her action are unclear; Fariba claimed a woman came to her in her dreams and told her to burn herself. Many Afghan women burn themselves because they believe suicide is the only escape from an abusive marriage, abusive family members, poverty, or the stress of war. If they do survive, women fear being shamed or punished for what they did and may blame a gas explosion when they were cooking. Doctors know when the burns were intentional from their shape, location, and smell.





A FORTUNATE NEW MOTHER >

After traveling in remote areas where most women give birth at home, without even a midwife, I was relieved to visit the hospital in Faizabad, a provincial capital. The hospital's women doctors, nurses, and midwives work around the clock. These Afghan women, who trained both in Russia and Kabul, have the skills and equipment to deal with complications in childbirth, even though they barely have enough funds for rubber gloves and gowns. I photographed Kokogol, 25, delivering twins, with her mother by her side.





BY ELIZABETH RUBIN

Twenty-five years ago an Afghan girl with green eyes haunted the cover of *National Geographic*.

She became the iconic image of Afghanistan's plight, a young refugee fleeing the war between the Soviet-backed communists and the American-backed mujahideen. Today the iconic image of Afghanistan is again a young woman—Bibi Aisha, whose husband slashed off her nose and ears as punishment for running away from him and his family. Aisha fled to escape beatings and other abuse.

Why do husbands, fathers, brothers-in-law, even mothers-in-law brutalize the women in their families? Are these violent acts the consequence of a traditional society suddenly, after years of isolation and so much war, being hurled into the 21st century? And which Afghans in this

Elizabeth Rubin is a contributing writer for the New York Times Magazine. Photojournalist Lynsey Addario is based in New Delhi, India.



society are committing the violence? There are significant differences between the Hazaras, Tajiks, Uzbeks, and Pashtuns, the most populous and conservative group and the one that has dominated political life since the 1880s.

In the Pashtun crescent, from Farah Province in the west to Kunar in the northeast, life was—and in many ways still is—organized around the code known as *Pashtunwali*, the “way of the Pashtun.” The foundation of Pashtunwali is a man’s honor, judged by three possessions—*zar* (gold), *zamin* (land), and *zan* (women). The principles on which the honorable life is built are *melmastia* (hospitality), *nanawati* (shelter or asylum), and *badal* (justice or revenge).

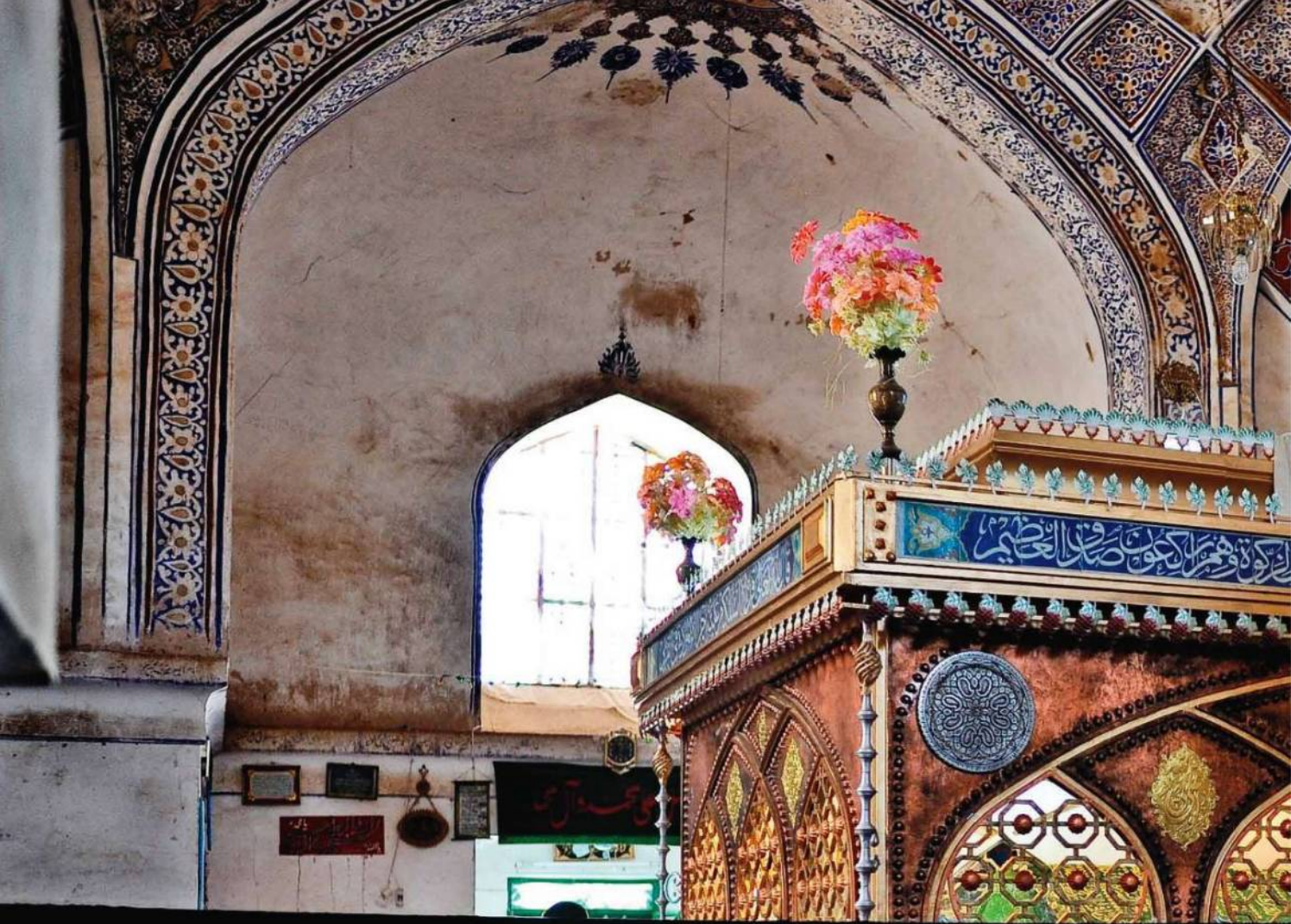
The greater a Pashtun man’s hospitality, the more honor he accrues. If a [Touch Text button to read more.](#)

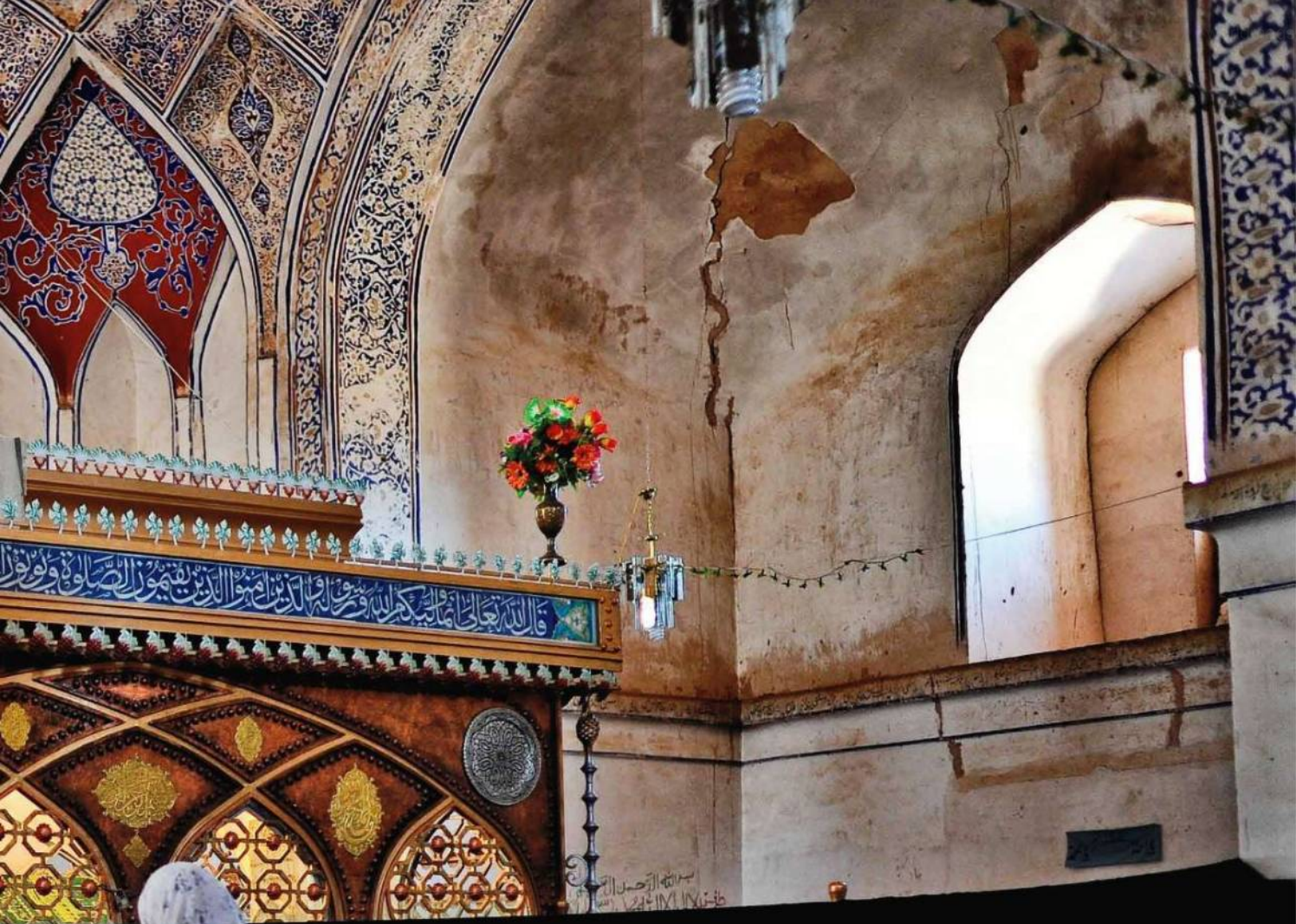


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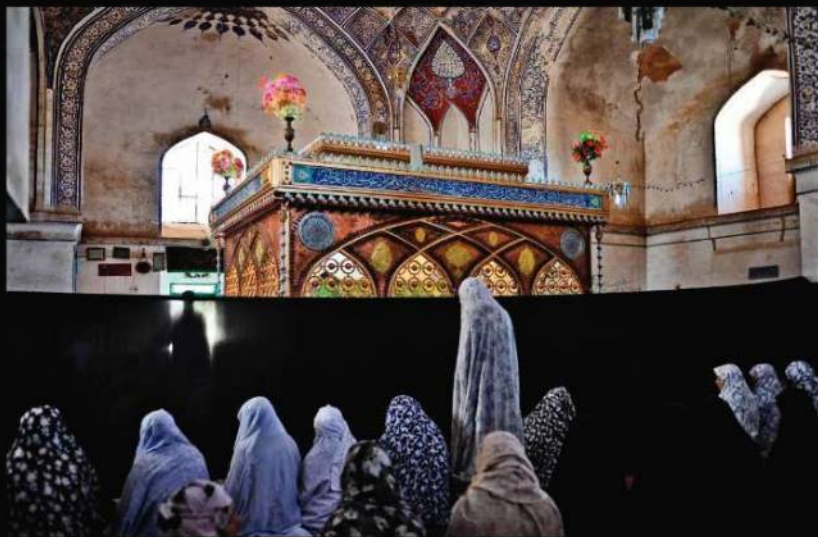




< PRAYING WITH TEARS

In Herat the shrine to Shahzada Qasim, a descendant of the Prophet Muhammad, is more than a thousand years old. One day of each week a section is partitioned so women can come to worship. Cordoned off to create a sanctuary for women, these prayer sections seem to me like some of the safest, most intimate places in the country. The women at the shrine in Herat are enveloped in chadors that cover them from head to foot, influenced by the style favored in neighboring Iran. In this shrine and in shrines throughout Afghanistan, some of the women weep uncontrollably. I always wonder why they are crying. Perhaps because of the deeply emotional nature of public prayer and the holiness of the place?





SCARRED FOR LIFE >

Bibi Aisha was 19 when I met her in Kabul's Women for Afghan Women shelter in November 2009. Her husband beat her from the day she was married, at age 12. When he beat her so badly she thought she might die, she escaped to seek a neighbor's help. To punish her for leaving without permission, her husband, who is a Taliban fighter, took her to a remote spot in the mountains. Several men held her while he cut off her nose, ears, and hair. She screamed—to no avail. "If I had the power, I would kill them all," she told me. I wanted to be strong for Aisha to give her hope she would be fine again. But when she described that moment, I began to cry. Aisha arrived in the U.S. in August for extensive reconstructive surgery.









< AN EMERALD BRIDE

It's very delicate to photograph an Afghan wedding. The women are unveiled and often wear revealing dresses and heavy makeup. They are reluctant to share these images with the outside world. At this Kabul wedding the bride is Fershta, 18. She wears a green dress for the ceremony—a color associated with prosperity and paradise in Islamic tradition. The groom is Amin Shaheen, son of film director Salim Shaheen. The sober expression on his wife's face reflects the fact that marriage is an enormous milestone in an Afghan woman's life, not just a celebratory event.





DARING TO DRIVE >

With face, hair, and arms in full view, actress Trena Amiri chauffeurs a friend around Kabul on a Friday. She blasts her favorite songs off a cassette and shimmies and sings along, tapping the steering wheel as she dances in the driver's seat. Even in relatively progressive Kabul, men and women glare, honk, and scream at her. It provokes men in Afghanistan to see strong women. It symbolizes a freedom they just aren't comfortable with. Amiri fled her husband of seven years, who, she says, kept her home and beat her. She left her three sons behind. She doesn't plan to remarry but knows she might have to in order to survive in Afghanistan, where women are dependent on men for so many things. When I ask about her current boyfriend, whose name is on the gold bracelet around her wrist, she says she couldn't marry him: "He won't let me act anymore, and I want to continue my art."



Hop in the car with Trena Amiri.
(1:00)



DING





< DREAMING OF OLYMPIC GLORY

These young Afghan women are part of a team that will compete at the 2012 Summer Olympic Games in London, where women's boxing will debut as an official sport. The athletes triumphed just by getting their families to sign on to the idea of their daughters participating in sports. During matches in public venues, the members of the Oxfam-supported team, now competing in South Asia, cover their hair with *hijab* worn beneath their head guards. That's not a problem for the International Boxing Association, as long as the boxer's face is clearly visible. Here, practicing indoors in Kabul, they can go bareheaded.





TRAINING DAY FOR POLICEWOMEN >

Afghan policewomen handle AMD-65 rifles at a dusty firing range outside Kabul. They are trained by carabinieri, Italian military police from the local NATO troops. Joining the police force is a bold decision for an Afghan woman. Insurgents often attack the police. Very few women get permission to sign up from their husband and male relatives. Of 100,000 officers, only about 700 are female. Yet women are welcome recruits. They can take on tasks that men cannot because of Islamic custom: frisking other women, searching homes where female family members are present. Many who take the job are widows of fallen officers cast in the role of breadwinner. The pay is about \$165 a month.







خداوند و حج ،
خداوند حج و آنکه است منسبت و مانند نماز
خداوند حج ، بجهان کنه زمین و آسمان و تمام
جهان است و نشان حاکم کورده زمین است
می باشد .
قریب کنه و نشان کورده کورستان

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ
أَقْرَبُ مَا تَقْتَضِيهِ دَعْوَةُ الْمَرْغُوبِ
وَأَقْرَبُ مَا تَقْتَضِيهِ دَعْوَةُ الْمَرْغُوبِ
وَأَقْرَبُ مَا تَقْتَضِيهِ دَعْوَةُ الْمَرْغُوبِ
وَأَقْرَبُ مَا تَقْتَضِيهِ دَعْوَةُ الْمَرْغُوبِ
وَأَقْرَبُ مَا تَقْتَضِيهِ دَعْوَةُ الْمَرْغُوبِ

أَخَذَهُ يَسْتَعِينُ وَلَا يَأْتِيهِ سِوَى اللَّهِ
يَسْتَعِينُ سَائِرِينَ أَيْ يَسْتَعِينُ مَا خَلَقَهُمْ
إِلَّا بِمَشَاةٍ وَسِعَ مَرْسِيَتُهُ السَّمَوَاتِ وَالْأَرْضَ
لَا يَبْزُؤُهُ حِفْظُهُمَا وَهُوَ الْعَلِيُّ الْعَظِيمُ

7/6 5

100

كريم



< THE WAILS OF A JAILED WIFE

A female inmate at a Mazar-e Sharif prison has just been released, prompting Maida-Khal, 22, to cry out because she is still trapped in her cell. When Maida-Khal was 12, she was married to a man of about 70 who was paralyzed. “I was so young, I couldn’t carry him because he was so heavy, so his brothers would beat me,” she recalls. When she asked for a divorce four years ago, she was imprisoned. “I am in jail because I don’t have a *mahram* [male guardian]. I can’t get a divorce, and I can’t leave prison without a man.” She says, with remarkable understatement, “I have had a difficult life.”





A TEACHER'S TREK >

All village women are invited to come to health and hygiene classes taught by a traveling midwife—wearing a white hijab and glasses in this photograph. She works for a mobile clinic sponsored by the United Nations Population Fund and the international medical relief group Merlin, which brings pre- and postnatal care to women in isolated villages like this one in northeastern Badakhshan Province. She travels with a male nurse, who gives routine checkups to the kids.









< UNUSUAL GRADUATES

Many girls in Afghanistan get no education at all. Even those who do enroll in a school typically study for just four years. So these members of Kabul University's class of 2010 are definitely in the minority. Wearing hijab under their mortarboards and seated in separate rows from their male peers, the women pictured are graduates of the department of language and literature. The Taliban had banned the education of women, but classes resumed after the regime fell in 2001. This graduation was held under tight security at a hotel in Kabul because of an upsurge in terrorist attacks.





DOLLED-UP WEDDING GUESTS >

These two girls have been dressed up and made up for a relative's wedding in Kabul. Many Afghan women and girls put on make-up and spend hours at the hair salon for such an occasion. Young girls are able to show off their makeovers. But once a girl arrives at the age of puberty, she masks herself from men with a burka or hijab.





PHOTOGRAPHS BY STEFANO UNTERTHINER

SWAN SERENADE

With its eight-foot wingspan, the whooper is a jumbo jet in the avian fleet of waterfowl. By turns angelic in flight, flashy in a display of triumph (right), stately in tucked-in repose (following page), it is elegance on the wing—a bird to inspire flights of fancy.











A pair of whoopers on Hokkaido, Japan, face off. Whoopers start migrating in the latter half of September and return north in March and April.

From the swirl
of its initial letter
to its sighing vowel and
feather-soft final consonant,
the very word—“swan”—
suggests grace.

Peter Ilich Tchaikovsky did not, after all, write *Duck Pond*. The whooper swan, like its onomatopoeic cousins, the whistling and the trumpeter, belongs to an elegant society of sisters; the mute, Bewick's, black, and black-necked fill out the ranks. First described by Carl Linnaeus in 1758, *Cygnus cygnus* can be considered a swan among swans, the type species, hence archetype, of all swans. It is also a swan of superlatives. With a population of about 180,000, the whooper, though vulnerable to loss of habitat, is among the most abundant of swans and trumps others in the sweep of its range.

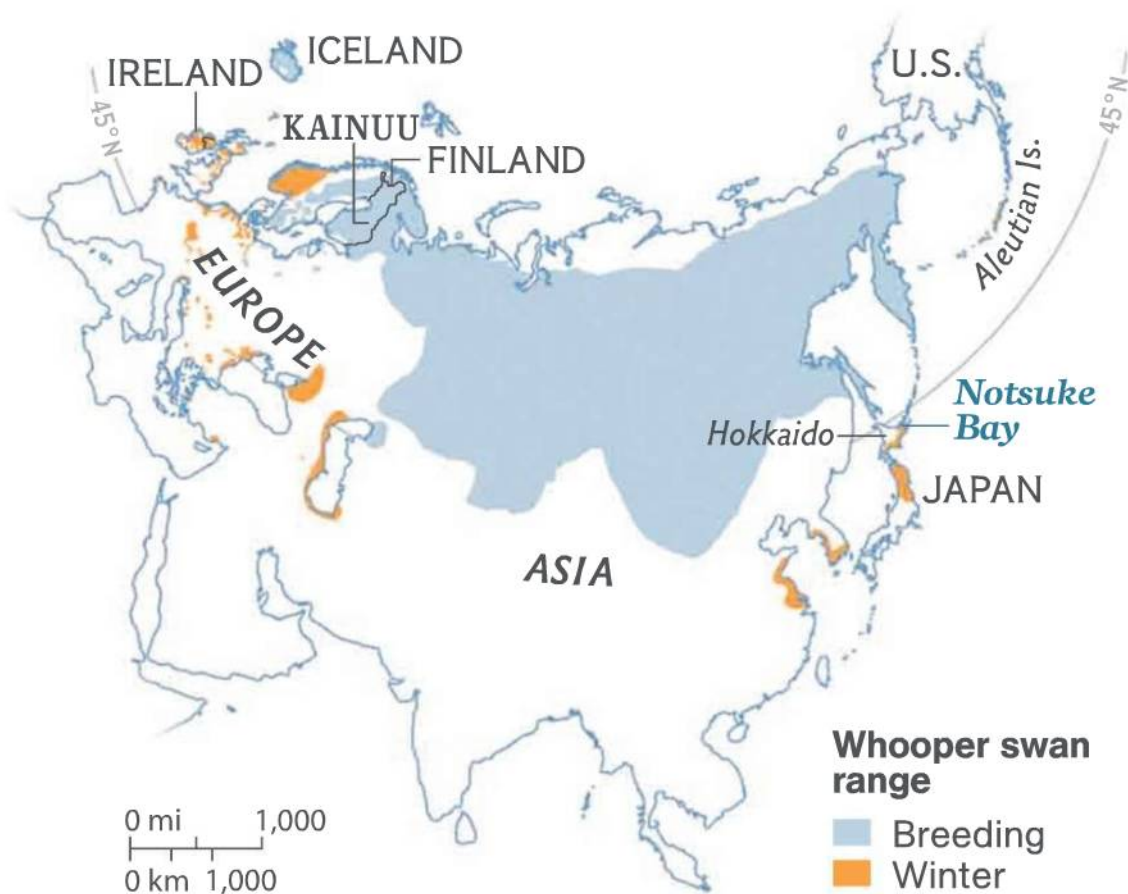
To the ancients, the appearance of a swan, with its effortless glide on the mirror of a lake and lovely, unfurling flight, signaled evanescence and evoked immortal longings. Socrates, Plato tells us, heard the song of a swan on the day of his death. The Valkyries, in the guise of swans, bore

their fallen heroes to the Valhalla of Norse mythology. Pythagoras believed the souls of poets passed into swans, a fitting entombment that turns the tattered phrase “poetry in motion” into a truly lyrical trope.

The swan, Russian poet Anna Akhmatova writes, “floats through the centuries” and into the turning wheel of seasons. Swans on their autumnal migratory flight—the celestial flutter of wings, the silver arrow of a flock splitting the sky—evoke poetic melancholy. Shadows lengthen. Days shorten. Another year closes in. Still, there is the reassuring uplift of fairy tales like Hans Christian Andersen’s duckling turned swan, with its metamorphosis from plain to princely.

Bittersweet, these beautiful birds. Yet their loveliness masks the toll exacted by the gravitational pull of their large bodies and the strain of daily survival. Labored takeoffs, the frantic paddling of webbed feet and heavy beating of wings before their soaring ascent, a territorial aggressiveness directed at other swans and waterfowl that can turn vicious and, occasionally, deadly, suggest that beauty does not come as easily or kindly as we might wish. —*Cathy Newman*

Stefano Unterthiner’s book about whooper swans, The Angels of Winter, was published in Italy this year.



NGM MAPS.

SOURCE: BIRDLIFE INTERNATIONAL

Breeding territory for whooper swans spans half the globe, from Iceland to the Aleutian Islands.



A couple (above) call at another bird that has invaded their territory. Nests, built of mud, moss, and grass, may be refurbished and reused in subsequent years.





Born down-colored and open-eyed, the young benefit from the vigilant surveillance of both parents. They join their parents for fall migration and stay with them their first winter.



Above and right

A parent swan in the Kainuu region at the eastern edge of Finland shepherds its cygnets, which hatch in June. Within a few days they venture from the nest to forage for aquatic plants and insects.



Following page

Whooper swans take off mostly on water, but can do so on solid ground, using a short run and beating their massive wings to achieve liftoff. Not only are they occasionally high fliers—a flock of whoopers was once spotted by a pilot at an altitude of 26,900 feet—but their migratory flights can amount to a marathon. One route, the 800-mile-long flight from Iceland to Ireland, is likely the longest sea crossing by any swan species.









Pale as moonlight, whoopers settle down for the night on a frozen stretch of Hokkaido's Notsuke Bay. Fed by humans, in some places they're a tourist draw. "Good for tourism, not the swans," a Japanese biologist says.





KINGS OF CONTROVERSY

WAS THE
KINGDOM OF
DAVID
AND
SOLOMON
A GLORIOUS
EMPIRE—OR JUST
A LITTLE
COW TOWN?
IT DEPENDS
ON WHICH
ARCHAEOLOGIST
YOU ASK.

A herder serenades his goats near Jerusalem, a few miles from where David tended his herds.



In Michelangelo's famous rendering of David, the young warrior strikes a heroic pose as he prepares to battle the giant Goliath, a Philistine enemy of Israel. Whether David was a powerful king or simply a local chieftain is hotly debated among scholars.

PHOTOGRAPHED AT GALLERIA DELL' ACCADEMIA IN FLORENCE, ITALY, WITH PERMISSION OF MINISTRY OF HERITAGE AND CULTURE





Tourists explore Megiddo, an ancient city north of Jerusalem where archaeologists found ruins of a palace and stables—evoked by a metal horse sculpture. They were first attributed to Solomon, but evidence now suggests the stables were built at least a century after the Bible says he died.

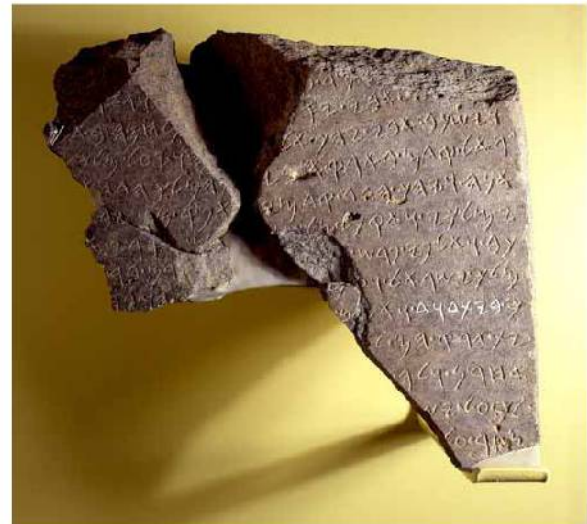


BY ROBERT DRAPER

PHOTOGRAPHS BY GREG GIRARD

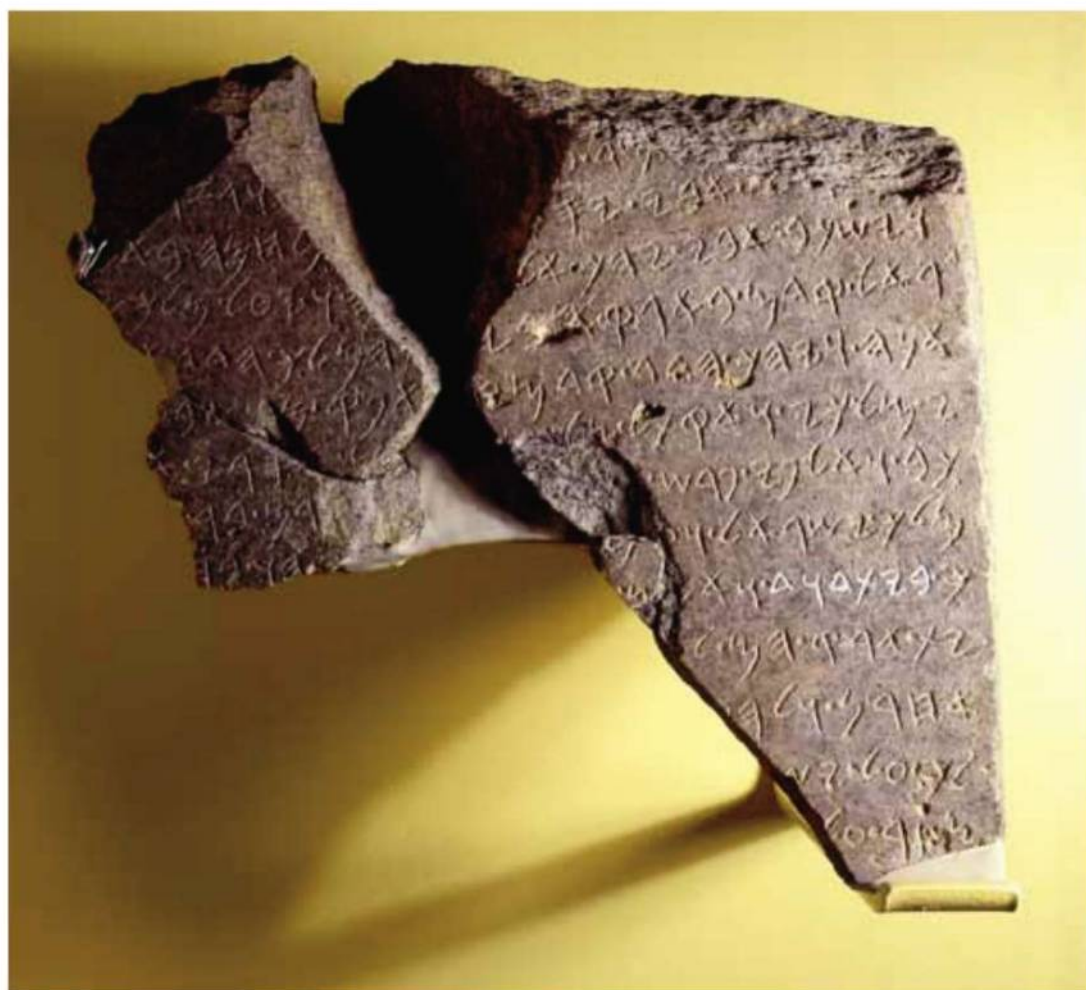
THE WOMAN SITTING on a bench in the Old City of Jerusalem, round-faced and bundled up against the autumn chill, chews on an apple while studying the building that has brought her both fame and aggravation. It doesn't really look like a building—just some low stone walls abutting an ancient terraced retaining wall 60 feet high. But because the woman is an archaeologist, and because this is her discovery, her eyes see what others might not. She sees the building's position, on a northern escarpment of the ancient city overlooking Jerusalem's Kidron Valley, and she imagines an ideal perch from which to survey a kingdom. She imagines the Phoenician carpenters and stonemasons who erected it in the tenth century B.C. She imagines as well the Babylonians who destroyed it four centuries later. Most of all, she imagines the man she believes commissioned and occupied the building. His name was David. This, she has declared to the world, is most likely the building described in the Second Book of Samuel: "King Hiram of Tyre sent...carpenters and masons, and they *(Click Text button to read more.)*"

Robert Draper wrote about the Aztec for last month's issue. Greg Girard is a Shanghai-based photographer who documents architectural and social change.



Until the 1993 discovery of a ninth-century B.C. stela inscribed with "House of David," there was no nonbiblical evidence that David actually existed. Few dispute it now.

■ **Society Grant** The archaeological work of Yosef Garfinkel and Thomas Levy is funded in part by your National Geographic Society membership.



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BIBLE QUEST

The golden age of a unified Israel lasted 80 years, from David's rise to king around 1010 B.C. to the death of his son Solomon in 930 B.C. At least, that's what the biblical chronology says. Archaeologists have found structures from the era, but neither carbon dating nor pottery evidence confirms exact dates, leaving the grandness of David and Solomon's empires open to interpretation.

① FORTIFIED CITIES

- The Bible says Solomon "built everything he desired," including the cities of Hazor, Megiddo, and Gezer.
- ✓ By 1960 archaeologist Yigael Yadin had identified six-chambered gates at all three sites and proclaimed them built by Solomon.
- ✗ Israel Finkelstein argued in 1996 that evidence suggests the gates were likely built by a different ruler a century later. The debate continues.

② CITY OF TWO GATES

- The Bible cites a Judaeen border town named Shaaraim, or "city of two gates," near the Elah Valley, where David battled Goliath.
- ✓ Yosef Garfinkel is excavating ruins there and has found olive pits and pottery he dates to David's time. Finding two gates, he announced he had found Shaaraim.
- ✗ With only 5 percent of the site excavated, some remain skeptical.



TURKEY

• Hatay (Antioch)
• Idlib



Lake Assad
Euphrates

-  **Biblical history**
Map elements in this color represent biblical history.
-  **Archaeological opinion supporting biblical history**
-  **Archaeological opinion contrary to biblical history**

MAXIMUM EXTENT OF TERRITORY CONTROLLED BY DAVID AND SOLOMON

Latakia •

Tripoli •

LEBANON

Beirut ★

SYRIA

Mediterranean Sea

Damascus ★

Jordan

Tel Dan

Hazor ①

Sea of Galilee

Haifa •
Nazareth •

① Megiddo

Irbid

Tel Rehov

Netanya •
ISRAEL

Nablus

Tel Aviv-Yafo •

WEST BANK

① Gezer

Jericho

Amman

Gaza City •
GAZA STRIP

Khirbet Qeiyafa

Elah Valley

Jerusalem ★

Hebron

Dead Sea

El Arish

② Beersheba

SAUDI ARABIA

EGYPT

NEGEV

MOAB

JORDAN

KINGDOM OF JUDAH

EDOM

En Hazeva
Khirbat en Nahas

MORE 

0 mi 50
0 km 50

③ HOUSE OF DAVID

- 📖 Most Judaeen kings traced their lineage to David; Jewish prophets said the Messiah would be a descendant of David.
- ✓ A stela appearing to be inscribed with the words “House of David” was found at Tel Dan in 1993.
- ✗ The inscription was made a century after Solomon’s rule; a few argue it may not refer to the biblical David.

④ CITY OF DAVID

- 📖 When David became king, the Bible says, he commissioned a palace in Jerusalem at the site of the Fortress of Zion.
- ✓ In 2005 Eilat Mazar uncovered a monumental building in Jerusalem and identified it as David’s palace, based on its location and pottery.
- ✗ The date of construction is contested; the style of pottery was used over a long period.

⑤ ANCIENT COPPER MINES

- 📖 Solomon’s temple, as described in the Bible, was filled with bronze objects that would have required extensive mines.
- ✓ Thomas Levy is excavating a large copper-production site dating to the tenth and ninth centuries B.C., which implies a complex, centralized society existed in Solomon’s time.
- ✗ Critics say the mines don’t prove the existence of an Israelite kingdom.



📖 Biblical history

Map elements in this color represent biblical history.

- ✔ Archaeological opinion supporting biblical history
- ✘ Archaeological opinion contrary to biblical history

MAXIMUM EXTENT OF TERRITORY CONTROLLED BY DAVID AND SOLOMON

Mediterranean Sea

SYRIA

TURKEY

• Hatay (Antioch)
• Idlib



Lake Assad
Euphrates

Latakia •

Tripoli •

LEBANON

Beirut ★

Damascus ★

Jordan

Tel Dan ③

Hazor

Sea of Galilee

Haifa •
Nazareth •

Megiddo

Irbid

Tel Rehov

Netanya •

ISRAEL

Nablus

WEST BANK

KINGDOM OF ISRAEL

Amman ★

Gezer

Jericho

Jerusalem ④

Gaza City

GAZA STRIP

Khirbet Qeiyafa

Elah Valley

Hebron

Dead Sea

Beersheba •

SAUDI ARABIA

JORDAN

EGYPT

NEGEV

MOAB

KINGDOM OF JUDAH

En Hazeva

Khirbat en Nahas ⑤

EDOM

0 mi 50
0 km 50

LAWSON PARKER, SAM PEPPE, AND LISA R. RITTER, NGM STAFF
SOURCES: BARRY BEITZEL, TRINITY EVANGELICAL DIVINITY SCHOOL; ERIC CLINE, GEORGE WASHINGTON UNIVERSITY



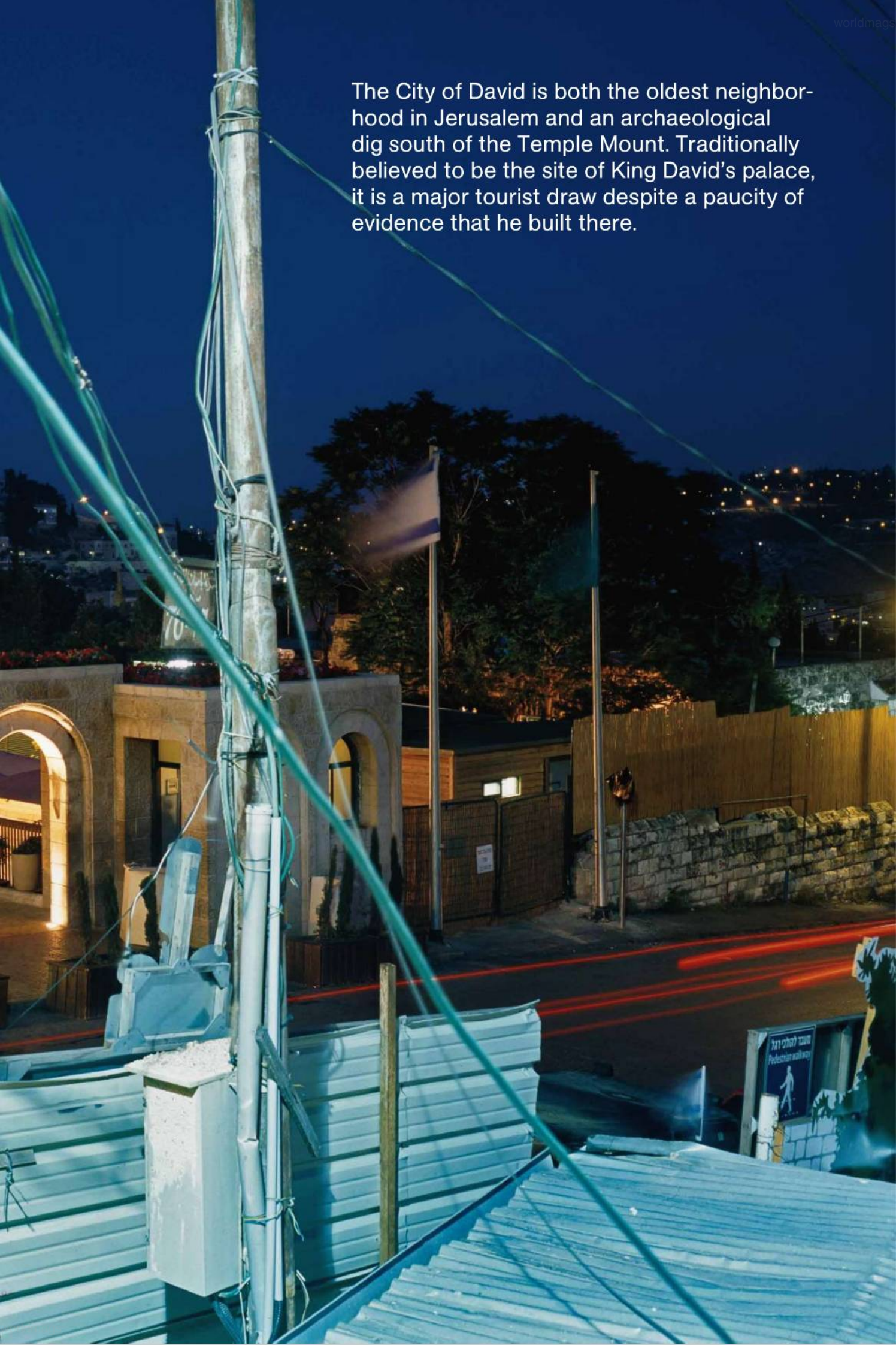


In the Elah Valley, where the Bible says David slew Goliath, excavations at the fortified city of Khirbet Qeiyafa in 2008 unearthed a multi-chambered gate and artifacts dating to David's time, around 1000 B.C.



עיר דוד
CITY OF DAVID

The City of David is both the oldest neighborhood in Jerusalem and an archaeological dig south of the Temple Mount. Traditionally believed to be the site of King David's palace, it is a major tourist draw despite a paucity of evidence that he built there.





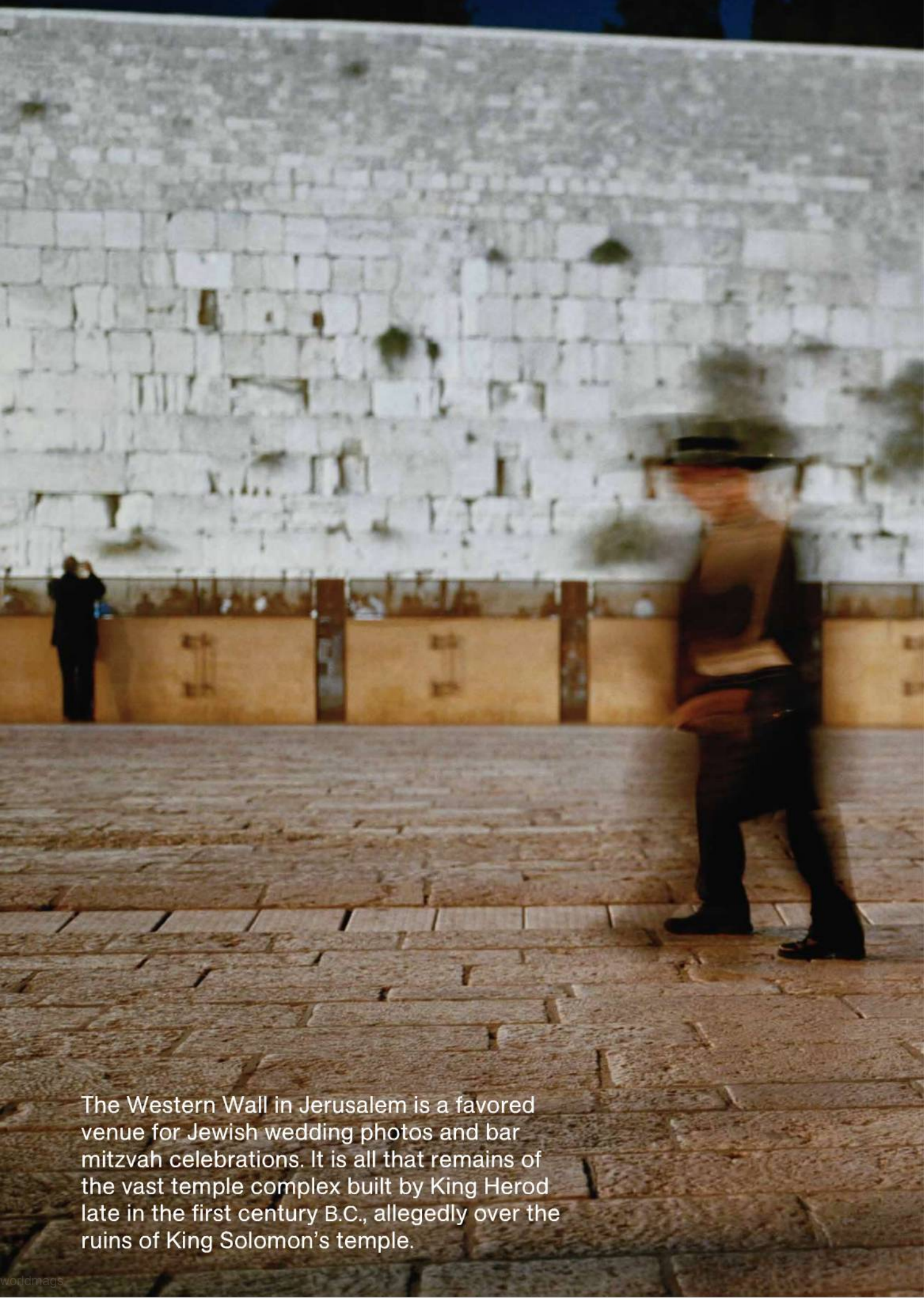
Archaeology students examine Khirbat en Nahas, an ancient copper-smelting center south of the Dead Sea. According to carbon analysis, the site dates to the tenth century B.C., suggesting it could be the famed mines of King Solomon.





Ethiopian Jews, also known as Beta Israel, celebrate a festival in Jerusalem. They believe themselves descendants of King Solomon and the Queen of Sheba. Most escaped famine and political turmoil when they were airlifted to Israel in the 1980s and '90s.





The Western Wall in Jerusalem is a favored venue for Jewish wedding photos and bar mitzvah celebrations. It is all that remains of the vast temple complex built by King Herod late in the first century B.C., allegedly over the ruins of King Solomon's temple.





Mansour Yousef al-Shyoukhi practices the risky art of fire-breathing—a homegrown hobby—on the back porch of his residence in Silwan, a neighborhood near the Temple Mount. Palestinians here go about their daily lives despite fears that further excavations might displace them from their homes.



STAR STRUCK

Astronomers turn their telescopes to the unbounded beauty of the Milky Way.

Text

Veiled by cosmic dust, the Milky Way arches over Haleakala Crater on Maui. *(Touch More button to find out how this panorama was made.)*

WALLY PACHOLKA (PANORAMA COMPOSED OF THREE SIDE-BY-SIDE PHOTOGRAPHS)



K

of the Milky Way.

DING

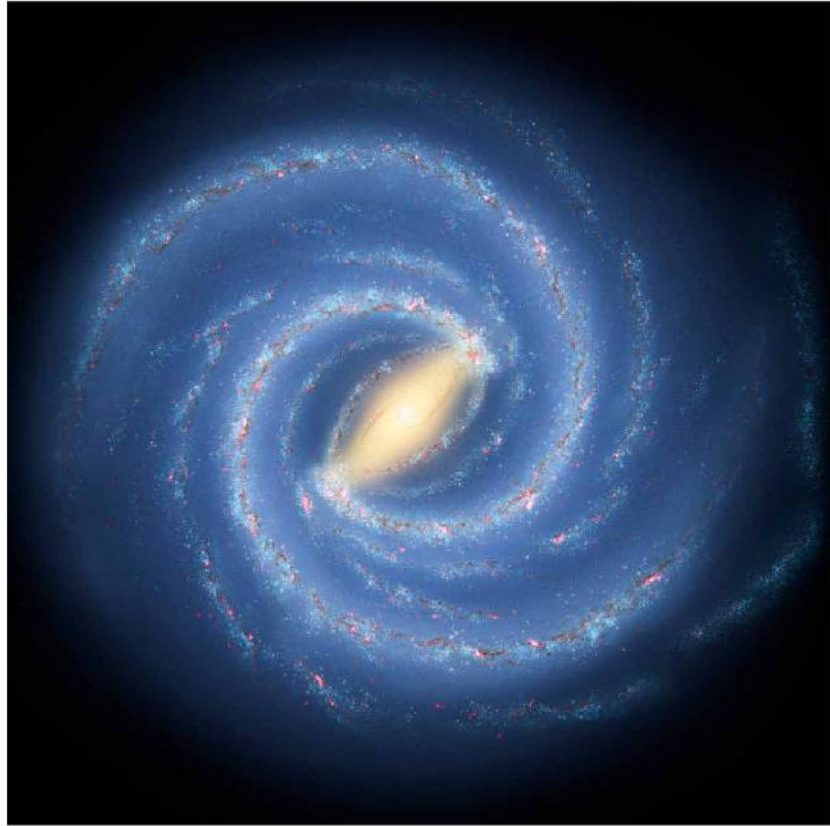
BY KEN CROSWELL

It's hard to be modest when you live in the Milky Way.

Our galaxy is far larger, brighter, and more massive than most other galaxies. From end to end, the Milky Way's starry disk, observable with the naked eye and through optical telescopes, spans 120,000 light-years. Encircling it is another disk, composed mostly of hydrogen gas, detectable by radio telescopes. And engulfing all that our telescopes can see is an enormous halo of dark matter that they can't. While it emits no light, this dark matter far outweighs the Milky Way's hundreds of billions of stars, giving the galaxy a total mass one to two trillion times that of the sun. Indeed, our galaxy is so huge that dozens of lesser galaxies scamper about it, like moons orbiting a giant planet.

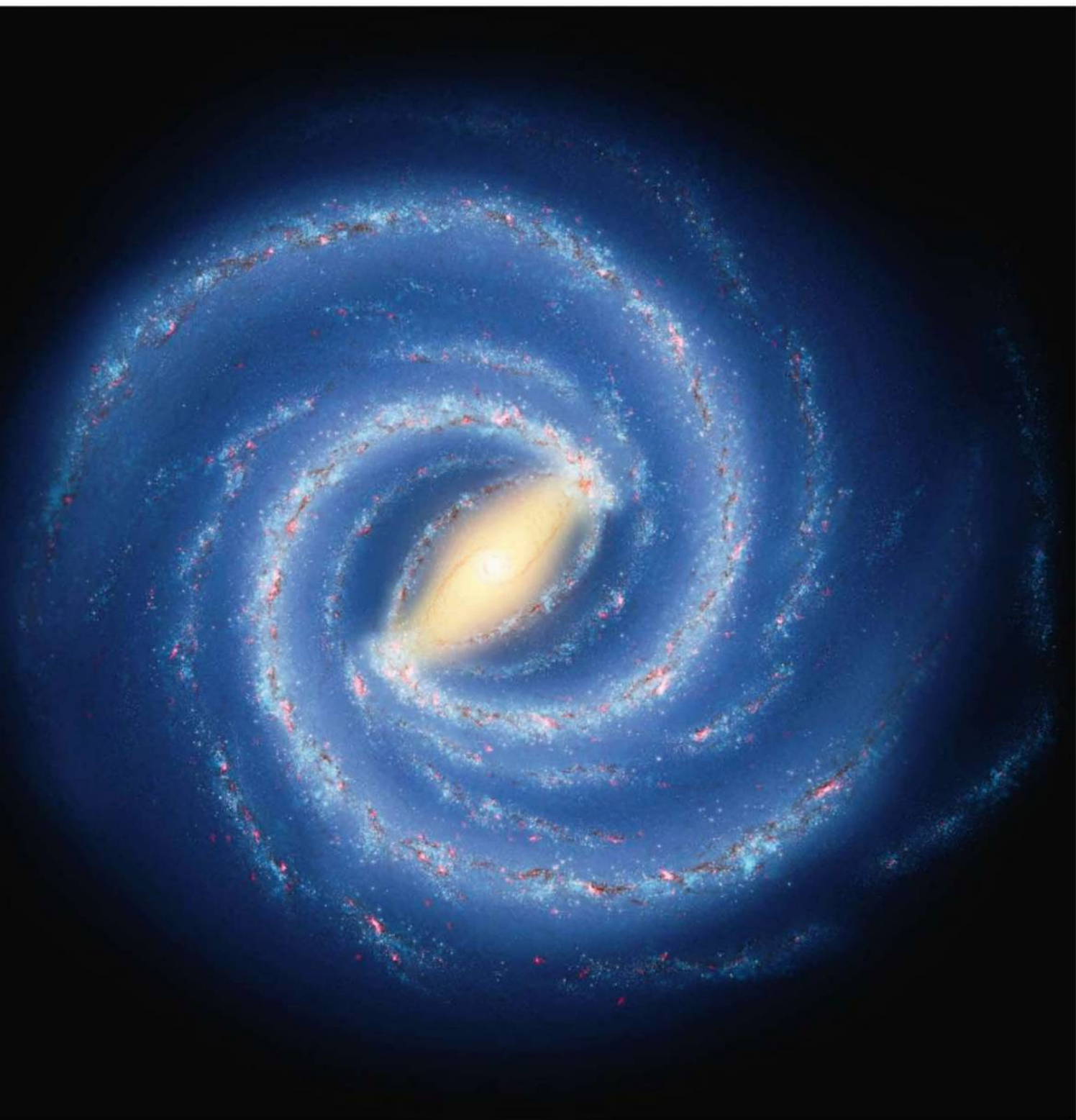
As a result of its vast size, the Milky Way can boast at least one planet with intelligent life. Giant galaxies like the Milky Way *(Touch Text button to read more.)*

Ken Crowell is the author of eight books on astronomy, including Magnificent Universe.



The two major spiral arms of the Milky Way, in an artist's conception above, extend from the ends of a central bright bar of stars. Less prominent arms are mostly gas and star nurseries.

ROBERT HURT, NASA/JPL



The two major spiral arms of the Milky Way, in an artist's conception above, extend from the ends of a central bright bar of stars. Less prominent arms are mostly gas and star nurseries.

ROBERT HURT, NASA/JPL

An infrared portrait of the galactic core, a composite from the Hubble and Spitzer space telescopes, reveals bright star clusters and hundreds of thousands of massive stars amid dust and swirls of hot ionized gas. The galaxy's black hole lurks within the luminous Central cluster at far right.

NASA/ESA/JPL/DANIEL WANG, UNIVERSITY OF MASSACHUSETTS, AMHERST, AND SUSAN STOLOVY, SPITZER SCIENCE CENTER, CALTECH



**DESPITE THE VIOLENCE AROUND THE BLACK HOLE,
THE GALACTIC CORE IS A FERTILE PLACE.**



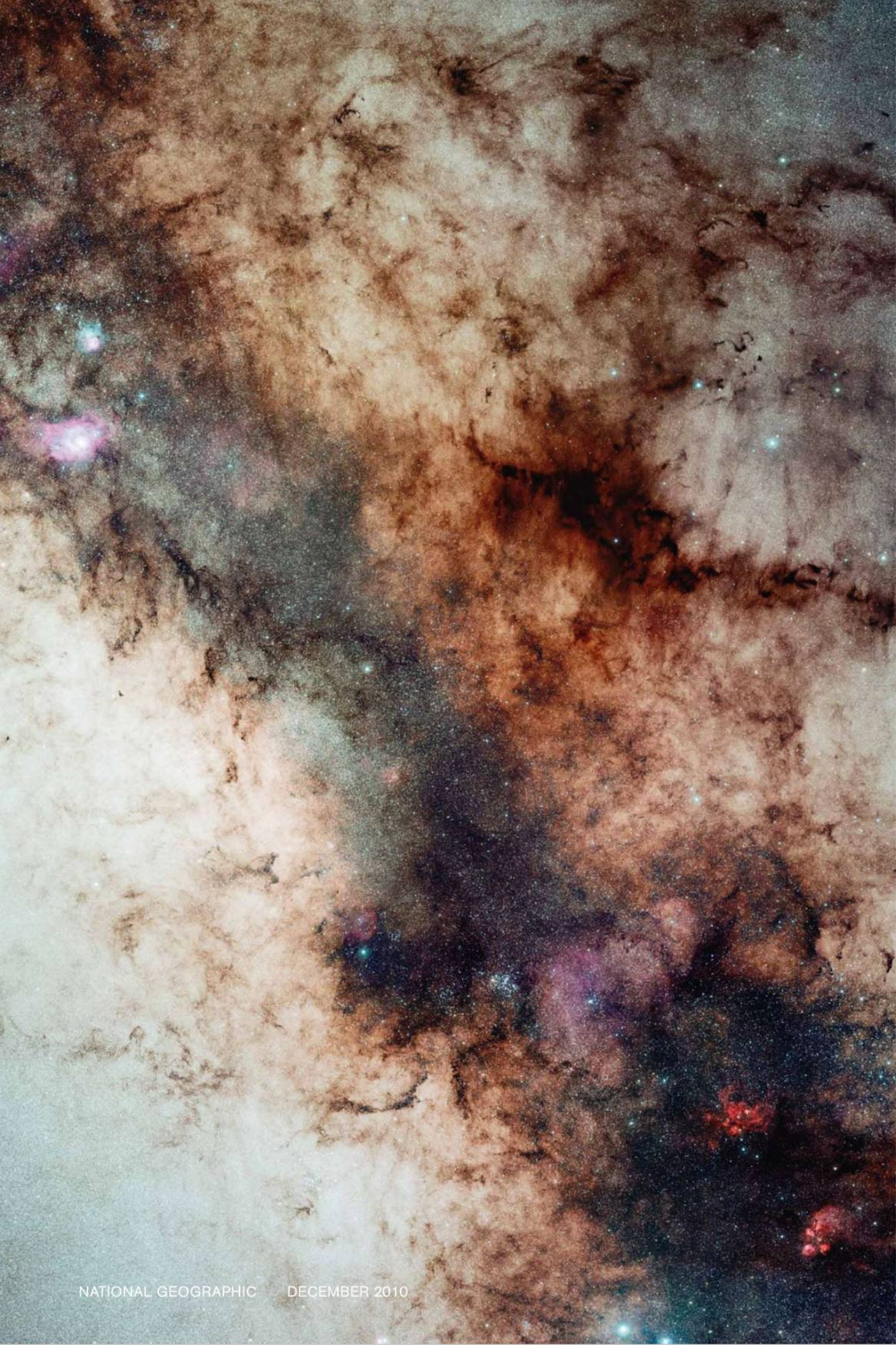
**OUND THE BLACK HOLE,
FERTILE PLACE.**

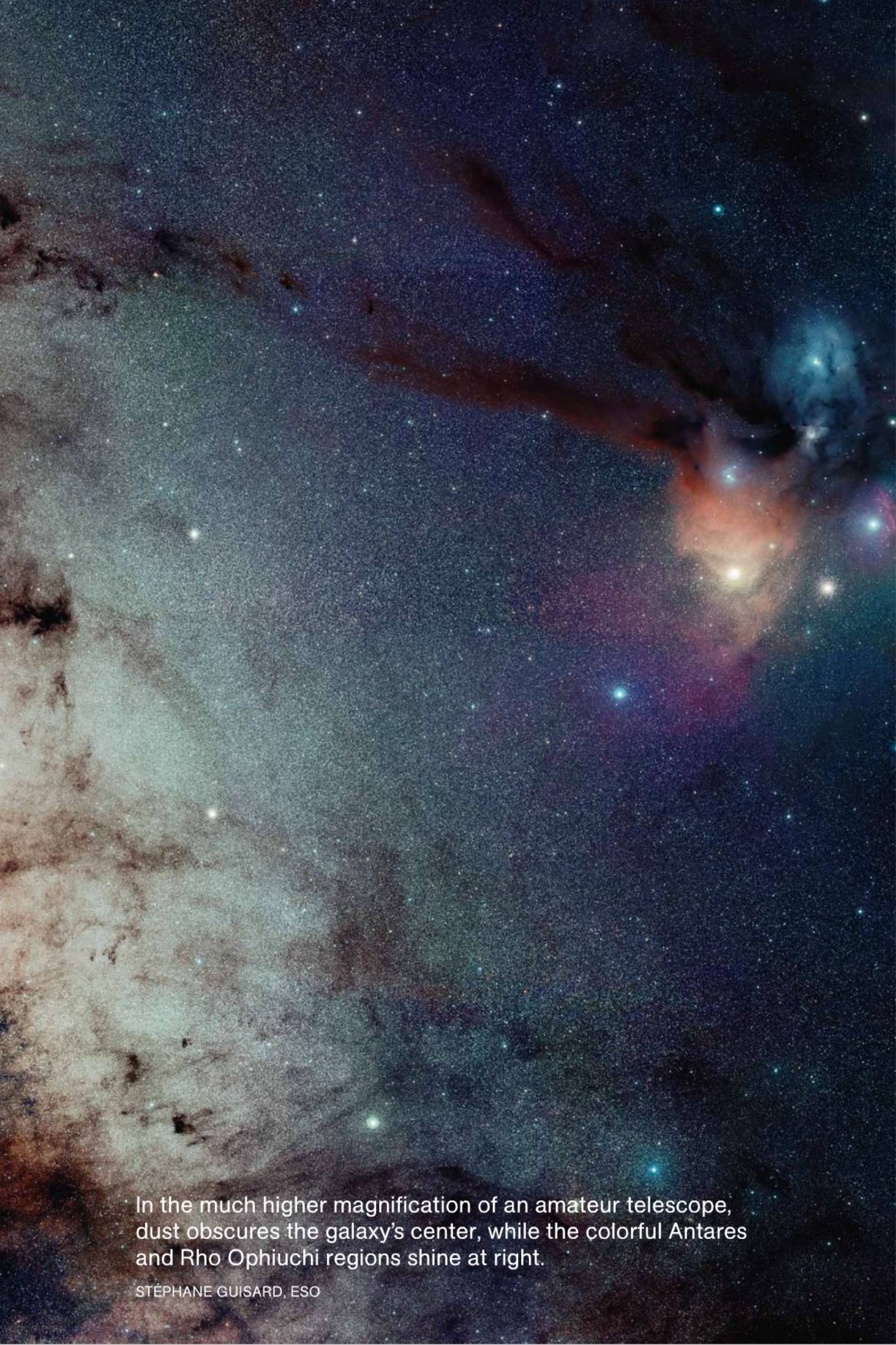




The beauty of the Milky Way unfolds in increasing detail over the next three pages through images from the European Southern Observatory's GigaGalaxy Zoom project. In this panoramic mosaic of the galaxy edge-on, a camera lens captures the entire celestial sphere.

SERGE BRUNIER, ESO





In the much higher magnification of an amateur telescope, dust obscures the galaxy's center, while the colorful Antares and Rho Ophiuchi regions shine at right.

STÉPHANE GUISSARD, ESO





The far more powerful 2.2-meter telescope at La Silla Observatory in Chile focuses on the Lagoon Nebula, 100 light-years across.

STÉPHANE GUISSARD, ESO

NASA's Chandra X-ray Observatory captures Sagittarius A*, the galaxy's supermassive black hole. Red lobes of 40-million-degree gas linger from violent eruptions in the past, when the black hole was consuming matter more voraciously than it is now.

NASA/CXC/FREDERICK K. BAGANOFF, MIT



EVERY NOW AND THEN, THE BLACK HOLE SWALLOWS A BIT OF GAS, A WAYWARD PLANET, OR EVEN AN ENTIRE STAR.



**THE BLACK HOLE SWALLOWS A BIT
OF IT, OR EVEN AN ENTIRE STAR.**



Alaska's Choice **SALMON OR GOLD**

If built, a huge mine would transform Alaska's Bristol Bay region, possibly jeopardizing the world's richest sockeye salmon fishery.

Storm clouds gather over Nushagak Bay, where a tempest is raging over the proposed Pebble mine. Fishermen say it could ruin salmon runs. Mine owners promise jobs and an infusion of money.





Relying on memory and a keen sense of smell, sockeye find their way from the ocean to their natal stream near Iliamna Lake, downstream of the mine site. Their fry will spend a year or two in the lake.





“We love our fish!” says Ina Bouker, a Yupik native and teacher from Dillingham who opposes the mine. “The salmon always run. But if their habitat is destroyed, they will not come back.”

BY EDWIN DOBB

PHOTOGRAPHS BY MICHAEL MELFORD

All that the American

West once was, Alaska still is. Abounding with natural marvels and largely untouched by human ambition, it strikes the newcomer as a land of endless prospect, an impression vividly reinforced from the passenger seat of a low-flying Cessna 180. Rick Halford, a bush pilot and former Republican state legislator, is showing me a piece of Alaska tucked between national parks and other protected lands about 250 miles southwest of Anchorage: the heart of the Bristol Bay watershed. Never was the term more meaningful. In every direction the dominant feature of the landscape, the element that binds everything together, is water. Within this 40,000-square-mile area are nine major rivers fed by dozens of tributaries that sometimes resemble stiff tree branches, sometimes sinuous arteries. Here are ponds so great in number and whimsical of shape they call *(Touch Text button to read more.)*



The 2.75-mile-wide pit in Utah's Bingham Canyon Mine (above) is visible even from space. With perhaps the world's largest deposit of gold and one of the largest of copper, the Pebble mine too would require a huge open pit—and fail-safe toxic-waste containment.

Edwin Dobb has written about mining in his hometown of Butte, Montana. Michael Melford's Hidden Alaska, Bristol Bay and Beyond will be published next spring by National Geographic Books.

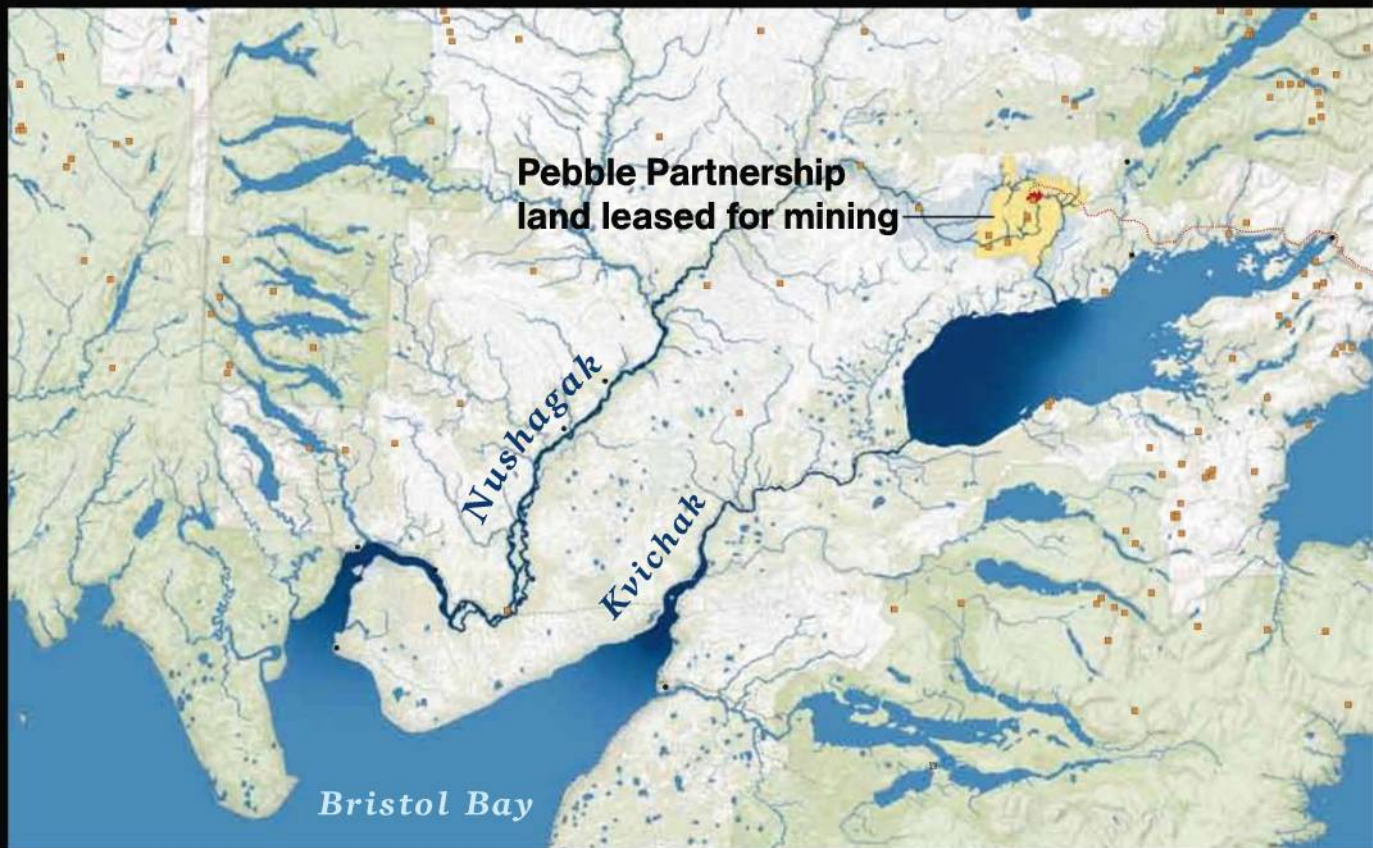
Text

AERIAL SUPPORT BY LIGHTHAWK



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Enlarged map on next page.

MORE



HIGH-STAKES MINE

In summer, millions of fish disperse up Bristol Bay's watershed to rivers and lakes that are breeding grounds for five species of salmon. If the Pebble mine is built, it will alter this wilderness and could, in time, wreak havoc with the salmon. Edmund Fogels, head of permitting in Alaska's Department of Natural Resources, says the mine will not be approved if there's "any chance of causing a collapse of the fisheries."



FINITE WEALTH

\$100-500 billion

Estimated total value of the Pebble mineral deposit

2,000

Estimated number of mine-construction jobs;
operating jobs would employ 800-1,000


SUSTAINABLE WEALTH


\$120 million


Estimated annual value of the Bristol Bay salmon fishery


11,572

Estimated number of resident and nonresident workers
in the fish harvesting and processing industry

 Rivers and streams important for fish that migrate from the sea upriver to spawn

 Other rivers and streams

 Downstream from proposed Pebble project

 Site of explored or potential mineral deposits

Pinch and zoom to expand map detail.



VIRGINIA W. MASON, NGM STAFF
SOURCES: USGS; ALASKA DEPARTMENT OF FISH AND GAME; ALASKA DEPARTMENT OF NATURAL RESOURCES; PEBBLE PARTNERSHIP (LEASING AND PEBBLE MINERAL-DEPOSIT DATA)

TOXIC TAILINGS

Huge tailing ponds within the leased area would hold toxic by-products. Any leakage into waterways could harm the fishery.

WATER RESOURCES

More than 30 billion gallons of water a year, used to sustain mine operations, could be drawn from the Koktuli River and Upper Talarik Creek.

BROADER ACCESS

An 86-mile expanded road and a pipeline would cross streams and could affect fish swimming to and from spawning areas.







The South Fork of the Kuktuli River—ideal habitat for coho salmon—flows near the Pebble site. Water withdrawals for the mine could drain the stream's headwaters, leaving fingerlings high and dry.





“This is nirvana for trout and salmon fishermen,” says guide Nick Jackson (above), holding a 27-inch rainbow caught at the mouth of Upper Talarik Creek. Far upstream, near the mine site, researchers found young salmon and trout (left) in the unprotected creek.





People aren't the only ones catching Bristol Bay salmon. A coastal brown bear grabs lunch at Brooks Falls in Katmai National Park. Fish in the park sustain a sizable number of bears—up to 2,000.





In Bristol Bay a tired but determined crew (above) hauls in a thousand pounds of sockeye before dawn. Fishing boats jockey for position (left) during flood tide, when returning salmon pour into the bay. "If you live in the area, you're somehow tied to fishing," says Everett Thompson, of Naknek.





Like his Dena'ina ancestors, Luther Hobson checks the salmon in his smokehouse for dryness. In his village, Nondalton, most residents favor their subsistence lifestyle over the promise of mining jobs.





Chikuminuk Lake reflects the raw wilderness of 1.6-million-acre Wood-Tikchik State Park. One of the largest state parks in the U.S., it is home to five species of salmon as well as moose, caribou, and brown bears.





An exploratory drill rig pumps water as it probes the Pebble deposit. Demand for gold and copper, used in most things electric, is fueling the project. But with fishermen, environmentalists, and some jewelers arrayed against the mine, its future—and that of Bristol Bay's salmon—remains uncertain.

BATS ARE CRUCIAL TO ECOSYSTEMS—DEVOURING INSECTS,
DISPERSING SEEDS, AND POLLINATING FLOWERS. BUT IN THE U.S.
AN INSIDIOUS NEW ENEMY IS CAUSING MASSIVE DIE-OFFS.



Crash

Damage is visible in the wing membrane of a little brown bat that died from a mysterious disease.

**INSECTS,
IN THE U.S.
IE-OFFS.**



Damage is visible in the wing membrane of a little brown bat that died from a mysterious disease.



FATEFUL SIGN



Little brown bats wintering in a West Virginia cave called Hellhole, the state's largest hibernaculum, show the fungus that gave white-nose syndrome its name. Intimate behaviors, such as dense roosting, allow the fungus to spread.



BAT SURVEY

To census gray bats in Hubbard's Cave, Tennessee, last winter, biologists counted individuals in small areas, then extrapolated. The estimate: 300,000 in this cluster and 513,000 in the entire cave. The fungus hasn't affected this endangered species—yet.



Video

Go behind the photo with
Stephen Alvarez. (1:00)



To census gray bats in Hubbard's Cave, Tennessee, last winter, biologists counted individuals in small areas, then extrapolated. The estimate: 300,000 in this cluster and 513,000 in the entire cave. The fungus hasn't

D I N O detected this endangered species—yet.

BY DAVID QUAMMEN
PHOTOGRAPHS BY STEPHEN ALVAREZ

ON THE OUTSKIRTS OF MADISON, WISCONSIN, stands a low brick structure equipped with ventilation scrubbers and surrounded by a tall chain-link fence: the Tight Isolation Building of the U.S. Geological Survey's National Wildlife Health Center (NWHC), a federal research facility devoted to combating wildlife diseases. Inside, a cinder block corridor circuits the Animal Isolation Wing, passing a series of well-sealed experiment rooms, each visible through a thick window. One room is furnished with sawdust and burrowlike pipes to approximate the habitat for prairie dogs involved in a vaccine trial against *Yersinia pestis*, the organism that causes plague. In another room zebra finches in birdcages are playing a role in research toward a vaccine for West Nile virus. Two rooms are darkened, for the comfort of hibernating bats. The first contains normal animals of the species *Myotis lucifugus*, commonly called little brown bats. They are the controls. The second dark room houses little browns exposed to *Geomyces destructans*, a filamentous white fungus of unknown origin that first appeared among North American bats in 2006. In just four years, it has hit hibernating bat populations in New [York](#). *(Click Text button to read more.)*

Contributing writer David Quammen wrote the October 2007 article "Deadly Contact," about zoonotic diseases. Stephen Alvarez photographed Madagascar's "stone forest" in November 2009.



GRIM EVIDENCE

Greg Turner, of the Pennsylvania Game Commission, and DeeAnn Reeder (at left), a biology professor at Bucknell University, find a fetid mulch of dead bats outside a coal mine in eastern Pennsylvania. "I'm not a sky is falling person," Reeder says. "But for North American bats, the sky is falling."



GRIM EVIDENCE

Greg Turner, of the Pennsylvania Game Commission, and DeeAnn Reeder (at left), a biology professor at Bucknell University, find a fetid mulch of dead bats outside a coal mine in eastern Pennsylvania. "I'm not a sky is falling person," Reeder says. "But for North American bats, the sky *is* falling."

Caves with bats affected by white-nose syndrome (WNS)

- WNS present**
 - 2006-07
 - 2007-08
 - 2008-09
 - 2009-10
- Fungal DNA present**
 - 2009-10
 - (Presence of the fungus *Geomyces destructans* can lead to WNS.)
- Hibernation areas where bats are at risk.

Hibernation sites in the West are poorly known.

Howes Cave
First signs of white-nose syndrome, February 16, 2006

200 miles from Howes Cave

Halles Cave

Hellhole

Hubbard's Cave

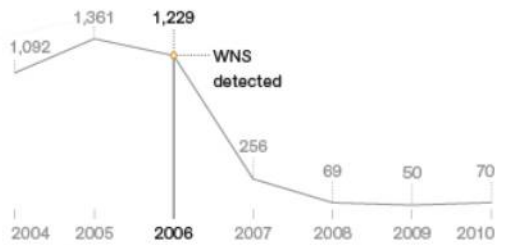
ATLANTIC OCEAN



SPREADING THREAT

The precipitous decline of little brown bats in Howes Cave in New York State reflects the catastrophic effect of white-nose syndrome on hibernating species. Recent surveys indicate that the disease has spread far from there and much faster than anyone had expected. With no end in sight, extinctions are possible.

Howes Cave population



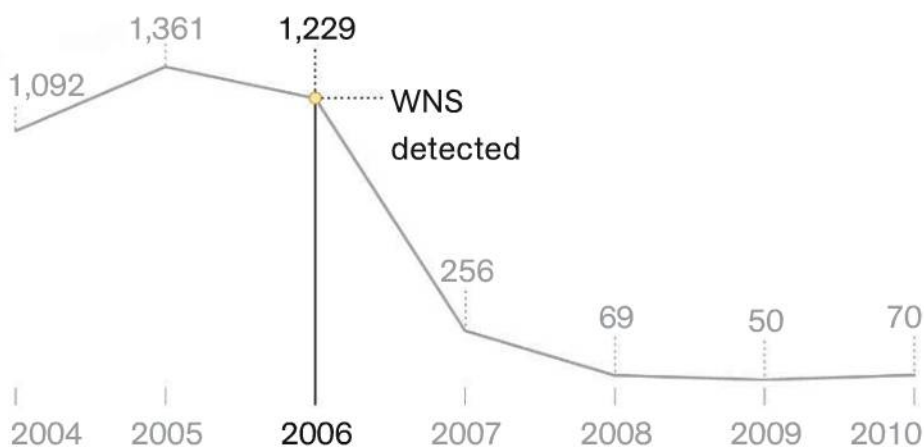
MAP: LISA R. RITTER, NGM STAFF; MAGGIE SMITH
 SOURCES: JEREMY COLEMAN, U.S. FISH AND WILDLIFE SERVICE; BAT CONSERVATION INTERNATIONAL; USGS
 CHART: MARIEL FURLONG, NGM STAFF; SOURCES: ALAN HICKS, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL
 CONSERVATION; KEVIN BERNER, STATE UNIVERSITY OF NEW YORK AT COBLESKILL



SPREADING THREAT

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Howes Cave population



DISEASED SPECIES AND THEIR RANGES

Of the two dozen bat species that hibernate in caves, six have WNS, and the rest may be in jeopardy.



Big brown bat



Eastern small-footed bat



Indiana bat





Little brown bat



Northern long-eared bat



Tricolored bat





ASSESSING THE DISEASE



In a lab at Boston University, biologist Jonathan Reichard has prepared bat remains for heat processing to render away their fat. By weighing them before and after the procedure, he can determine their fat content and deduce how badly the fungus had weakened them.



COLD KILLER

NATIONAL GEOGRAPHIC **DECEMBER 2010**



A little brown bat in Pennsylvania struggles in the snow against the effects of untimely arousal, caused by the disease. The fungus *Geomyces destructans* may not kill bats directly, but disturbance, activity, wasted energy, and hunger in winter add up to doom.

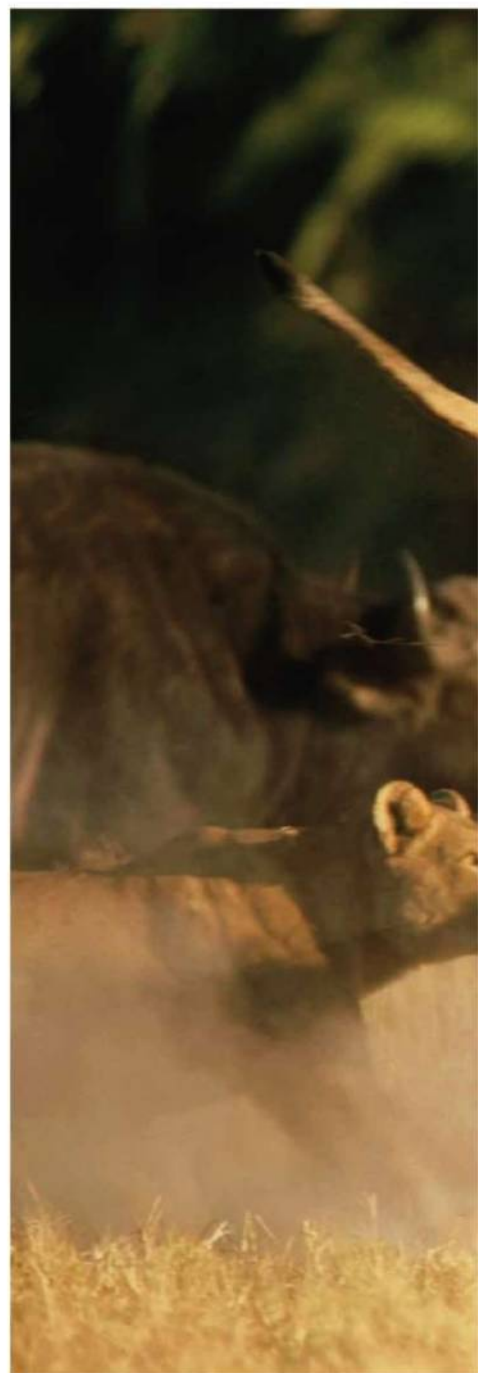
BOTSWANA

Protecting Predators

Dereck and Beverly Joubert have devoted their lives to the belief that big cats matter. Here's why.



The extraordinary animal that changed our lives was still a wobbly, half-blind, eight-day-old cub when we encountered her with her mother in Botswana's Okavango Delta in 2003. We'd been working for many years with big cats in Africa and had developed broad-stroke conservation ideas. But when we met this baby leopard we called Legadema (Setswana for "light from the sky") and followed her for nearly five years, she taught us something fundamental about all big cats: While we go about conservation, we often forget that beyond the alarming numbers, there are individuals with personalities and intricate



DERECK JOUBERT



On Botswana's Duba Island, lions risk their lives to prey on African buffalo.

PHOTOS: BEVERLY JOUBERT

EXPLORERS JOURNAL | CONTINUED



**Without lions, the ecosystem collapses.
Everything unravels. If we can't protect this species,
what hope is there for the rest? —Dereck Joubert**



PHOTO: BEVERLY JOUBERT

lives. As their numbers decline, conservation becomes more about saving these individual animals.

Legadema grew up to be magnificent. She's seven now, and thriving. She's become mother to at least two litters. We still visit her from time to time. But in the years that we've known her, other leopards have been less fortunate. The Convention on International Trade in Endangered Species (CITES) has set quotas that permit the export of up to 2,653 leopard trophies a year. Poaching and the trade for skins used in rituals and ceremonies take a toll as well. Although precise numbers are difficult to pin down, our research indicates a drop in the number of leopards left in the wild.

Working with Legadema and becoming explorers-in-residence at National Geographic turned us into advocates. It inspired us to launch National Geographic's Big Cats Initiative (BCI) as an effort to save these top predators. Big cats are keystone species that support the African and Asian ecosystems. Without these animals, vital wilderness areas are vulnerable to collapse. Protecting the





A lion attacks an elephant in
Botswana's Chobe National Park.

PHOTO: BEVERLY JOUBERT



An uncertain future faces lion cubs like this one, born on Duba Island.



majestic lion—Africa’s iconic predator, at high risk of extinction—is a major priority. If humans were systematically trying to eradicate these animals, we couldn’t be doing a better job. Most people assume that there are a lot of lions left and that someone is taking care of their conservation. The truth is we’ve seen lion numbers decline drastically in our lifetimes. At this rate, we fear that lions could soon vanish. Without lions, the ecosystem collapses. Everything unravels. If we can’t protect this species, what hope is there for the rest?

The main problem for lions is human beings. Hunters in Africa shoot hundreds of wild lions each year (in fact, 517 trophies were legally exported to the U.S. in 2008, according to CITES). As villages move closer to national parks where lions live, buffer zones vanish and conflict increases. Poor farmers lack adequate education and resources for husbandry and protection of their livestock. The result is more conflict.

To address these problems, BCI helps educate African farmers about better livestock protection and has compensated

them for cattle killed by lions. We've also funded a project in Kenya's Maasailand that builds "living walls"—fences made with fast-growing indigenous trees that reach about 15 feet high. These walls help protect cattle from attack.

For three decades, we've made our home in remote areas of Botswana's Okavango Delta, a part of the world that is hidden to most people. Most of the time, it's just the two of us living in a tent, filming and researching cats, away from the complexities of what most people consider civilization. The rewards are great. We've captured amazing

footage of lions attacking an elephant, and we've unlocked the mysteries of the intense relationships between lions and hyenas, and leopards and baboons. By getting to know individual animals intimately, we have helped to break down misconceptions about the world's greatest predators.

If you look into the eyes of a leopard, you can feel the deep, ancient connection between humans and this animal. We admire big cats; we fear them. We are at war with them in so many places on Earth. But there's one thing of which we're certain: Without them, we will be diminished.

Big Cats Initiative

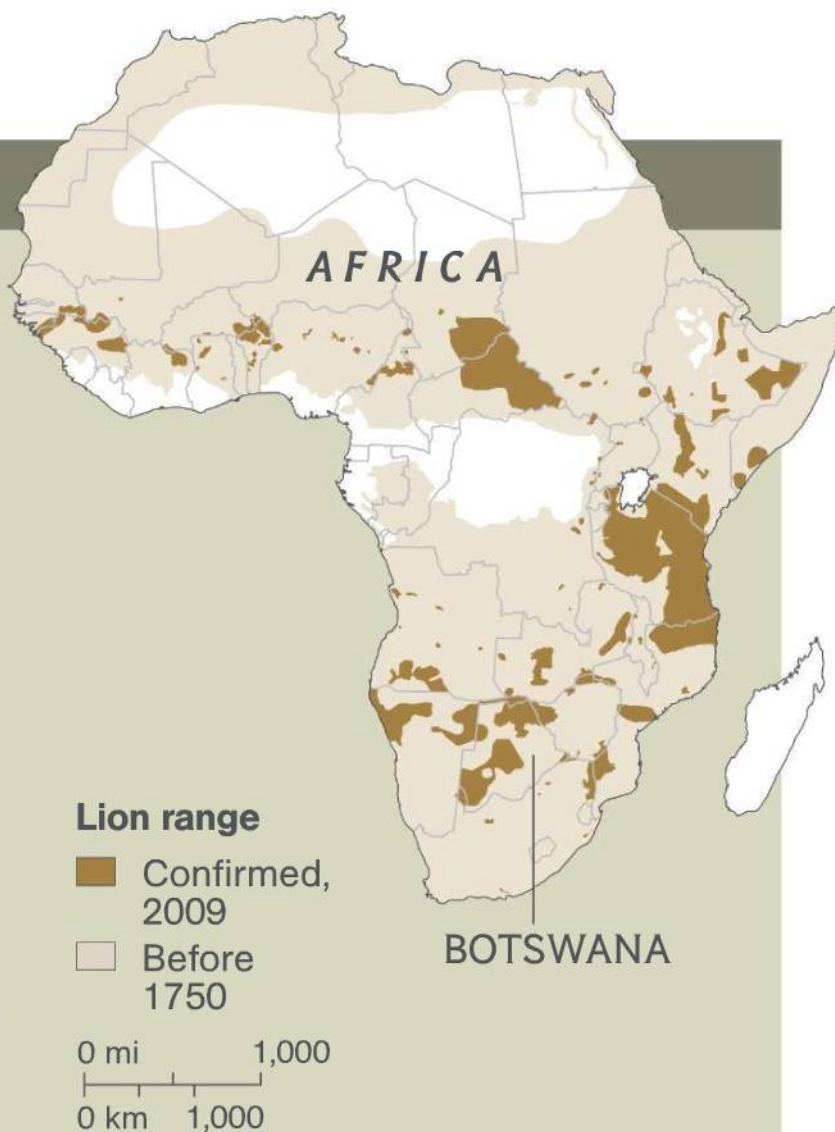
This Joubert-inspired project, supported by National Geographic, aims to assess, protect, and restore big-cat numbers. For more information go to causeanuproar.org.

Nat Geo WILD

At 9 p.m. starting Monday, December 6, watch Nat Geo WILD's first annual Big Cat Week—seven nights devoted to nature's fiercest felines.

Cat Count

As Africa's human population has increased to more than a billion, lion ranges and numbers have shrunk. The same is true for big cats elsewhere.



Lions remaining

30,000

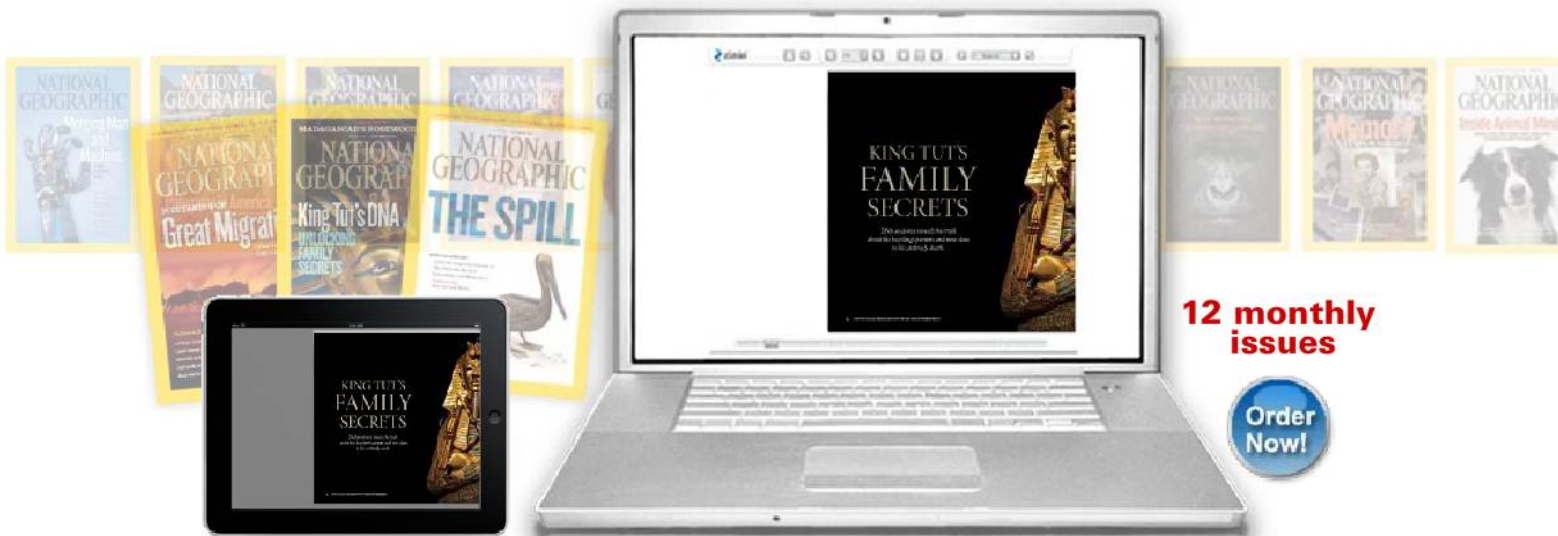
Threats to Lions

- Human conflict
- Loss of habitat
- Prey decline
- Trophy hunting
- Pesticide poisoning
- Tuberculosis

Conservation Strategies

- Reduce human/lion conflict by protecting against livestock loss
- Ban hunting and arrest poachers
- Ecotourism

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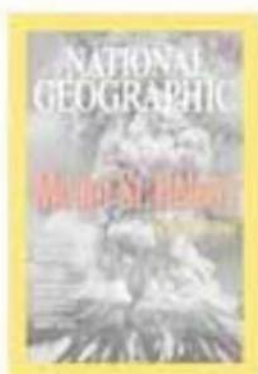
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I N S I D E G E O G R A P H I C

ON ASSIGNMENT

Female Bonding Photographer Lynsey Addario has spent much of the past decade working in Afghanistan, often under dangerous conditions. But during her assignment for this month's feature, she and a group of young university women shared a feeling of freedom while taking a boat ride on the Qarghah Reservoir. In nice weather the area is typically filled with people, explains Addario, but this early morning, the women were almost alone save for their driver. "It was one of those rare moments when we all let our guards down," she recalls, "and were just a bunch of giggling girls."





Lynsey Addario (center, seated) and a group of Afghan women smile from a boat outside Kabul.

INSIDE GEOGRAPHIC

ING BOOKS

The President's Photographer John Bredar's companion to the National Geographic television special (airing on PBS; check local listings for time) of the same name, *The President's Photographer* invites us to learn the private stories of the official White House photographers. These men—nine since the first was appointed in 1962—have illustrated the pages of *Life*, *Time*, and *Newsweek*; the five still alive today share the memories behind their iconic images. Current White House photographer Pete Souza wrote the foreword to this book, which includes coverage of President Barack Obama. Revealing close-ups in moments of both joy and anguish, plus unexpected angles on historic events, *The President's Photographer* is available in bookstores now (\$35).

AWARDS

Cathy Newman, a *Geographic* staff writer and editor at large, has won the prestigious Italian Premio Istituto Veneto per Venezia for her “Vanishing Venice” story, which ran in our August 2009 issue.

COMPLETE NAT GEO

An updated version of *The Complete National Geographic* (in DVD-ROM or hard-drive format) can now be ordered at completenatgeo.com.



 NATIONAL GEOGRAPHIC

Official
Companion to the
National Geographic
Special on
PBS

JOHN BREDAR with a foreword by PETE SOUZA,
Chief Official White House Photographer & Director, White House Photo Office

THE PRESIDENT'S PHOTOGRAPHER

FIFTY YEARS INSIDE THE OVAL OFFICE



FLASHBACK

The Sound and the Furry

“Too shrill for the human ear to hear,” a little bat’s voice turned visible when the animal was placed before a microphone hooked up to a cathode-ray oscilloscope. “The streaks above and below the central luminous spot are the visual representation of the creature’s cries, which have a frequency of 50,000 cycles per second—some 30,000 above the maximum range audible to man,” noted this photograph’s caption in “Mystery Mammals of the Twilight,” published in the July 1946 *Geographic*. “Such experiments... first proved that bats ‘see with their ears,’ guiding their flight by the echoes of their cries.” —Margaret G. Zackowitz





PHOTO: ROBERT F. SISSON, NATIONAL GEOGRAPHIC STOCK

GEOPUZZLE

↗ [Click here](#) for the answers.



ACROSS

- 1 Taj Mahal's city
- 5 Hamlet and countrymen
- 10 Flexible, as electric adapters
- 14 Green onion-like vegetable
- 15 Eyeball-bending genre popular in the 1960s
- 16 Scat!
- 17 Taking a year off, perhaps
- 19 Soccer champ Mia

- 20 Laugh half
- 21 Bryce Canyon's state
- 22 Agile circus performer
- 23 Moving like an eddy
- 25 Physicist for whom a coil is named
- 28 Told a whopper
- 30 Capital of Mongolia
- 34 On an ocean voyage
- 37 Major river of Spain
- 39 Puncture prefix

- 40 What are threatened by a deadly nose-whitening fungus and are lurking in this puzzle's answers
- 44 Ga. neighbor
- 45 Advocacy org. for seniors
- 46 Golfer Palmer, to pals
- 47 Something bird-ensome?
- 50 It borders Peru and Col.
- 52 No faster?
- 54 Tennessee Williams title reptile
- 58 Cookie-baking quantities
- 61 "Uh-huh"
- 63 Dingo, for one
- 64 Vaccine type
- 65 Slugger's statistic
- 68 Short letter
- 69 Early nuke trial
- 70 Shrink one's spare tire
- 71 Tore
- 72 Book after Daniel
- 73 Had down
- 11 Blacken
- 12 Major___ (steward)
- 13 War action
- 18 Kind of ground archaeologists "dig"
- 24 Ga. neighbor
- 22 "Mind if ___ myself out?"
- 26 It's "across the pond"
- 27 Like Sunday drivers
- 29 Cheapen
- 31 A Philippine surrender site of 1942
- 32 Fourth qtr. start
- 33 Wily tactic
- 34 Communications code word for a
- 35 Cash drawer
- 36 Take a ___ (try to accomplish)
- 38 "It feels like zero!"
- 41 90 degrees
- 42 Zero
- 43 Oktoberfest quaff
- 48 Reacted to a strong punch
- 49 W. Hemisphere defense alliance
- 51 Panini bread, often
- 53 Baseball's Sandberg and Duren
- 55 Supplementary component
- 56 Kind of pollution
- 57 He was followed by a Ford
- 58 Wands waved at winds, e.g.
- 59 It may need dusting
- 60 Enmity
- 62 To be, at the Forum
- 65 Olé in America
- 66 ___-Aztec languages
- 67 Deer's kin

DOWN

- 1 Hilo hello
- 2 Subject of modern engineering
- 3 Hem again
- 4 Rap sheet letters
- 5 Engage in fighting
- 6 Samoa's capital
- 7 German Christmas carol "Stille ___"
- 8 Historic period
- 9 The Cards, on scoreboards
- 10 ___ School (painting genre depicting gritty city life)

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N E X T M O N T H



Vendors and pedestrians are part of the traffic on a street in Kolkata, India.

PHOTO: RANDY OLSON

January 2011

Population 7 Billion

Find out why you shouldn't panic—at least, not yet.

Phoenix Islands Rising

After a bleaching disaster, Pacific reefs bounce back.

Telltale Scribes

Timbuktu's books and letters are historical, magical, romantic.

Conquering a Cave

Explorers scramble to the end of Vietnam's infinite cavern.

America's Lost City

Cahokia was born with a bang and died of unknown causes.