

VALLEY OF THE BOOM

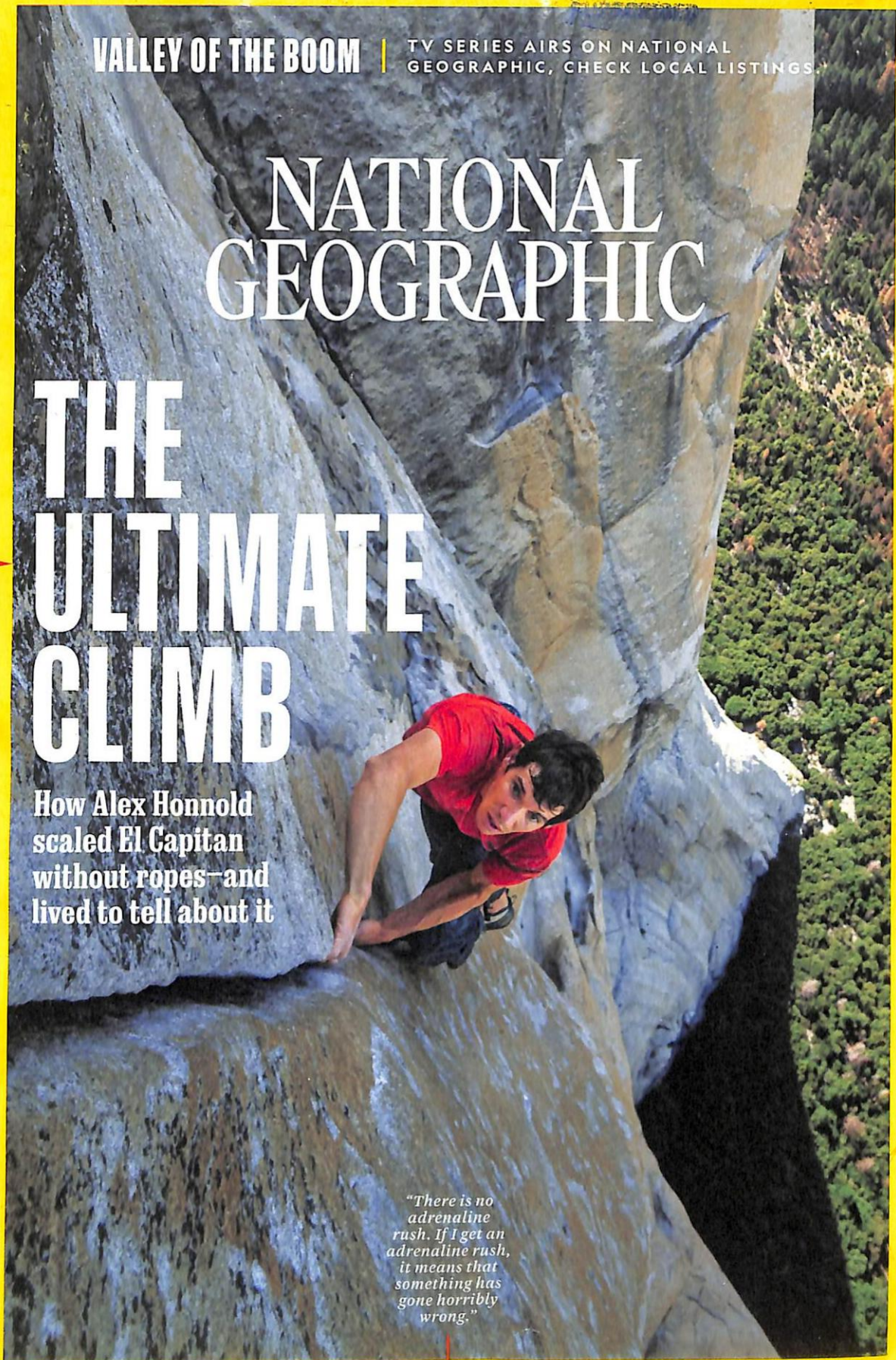
TV SERIES AIRS ON NATIONAL GEOGRAPHIC, CHECK LOCAL LISTINGS

# NATIONAL GEOGRAPHIC

# THE ULTIMATE CLIMB

How Alex Honnold scaled El Capitan without ropes—and lived to tell about it

*"There is no adrenaline rush. If I get an adrenaline rush, it means that something has gone horribly wrong."*





# CONTENTS

**On the Cover**

Since 2007 Alex Honnold had made “free-solo” ascents—alone, without a rope—of other daunting routes in Yosemite. But none compared to his June 2017 climb up El Capitan.

JIMMY CHIN

**PROOF**



# 8

**South Africa's Majorettes**

For girls and young women in South Africa, being a “drummy” requires dedication—and pays dividends in confidence and pride.

PHOTOGRAPHS BY ALICE MANN

**EMBARK**

# 17

**THE BIG IDEA**

**How Ketchup Made Food Safer**

Henry Heinz's view of wholesome food and preservatives still resonates today.  
BY DEBORAH BLUM

**GENIUS**

**Memories Remade**

This neuroscientist is working on suppressing bad memories.

BY RACHEL HARTIGAN SHEA



**ALSO**

Beetle Jaws  
Zoo Mothers' Milk  
Immigrant Economy

**EXPLORE**



# 36

**THROUGH THE LENS**

**The Shots That Almost Got Away**

His camera captured polar bear close-ups—and then it sank. But the photographer refused to give up.

BY AUDUN RIKARSDEN

**BASIC INSTINCTS**

**Puffed-Up Appeal**

Frigatebirds woo mates by inflating a body part and drumming on it. What's not to love?

BY PATRICIA EDMONDS

**ALSO**

Vegetation Threats  
Beekeeper's Tools



FEATURES

**Solo**

Alex Honnold is famous for climbing formidable rock faces without using ropes. But El Capitan?

BY MARK SYNNOTT  
PHOTOGRAPHS BY  
JIMMY CHIN ..... P. 42

**Unthinkable Sacrifice**

Mystery shrouds child killings some 500 years ago in what's now Peru.

BY KRISTIN ROMEY  
PHOTOGRAPHS BY  
ROBERT CLARK  
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**The White Gold Rush**

Lithium is key to making batteries. Bolivia has it in abundance.

BY ROBERT DRAPER  
PHOTOGRAPHS BY  
CÉDRIC GERBEHAYE  
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**Silicon Valley Grows Up (Sort Of)**

The tech mecca looks at the costs of success.

BY MICHELLE QUINN  
PHOTOGRAPHS  
BY LAURA MORTON  
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**A National Symbol —But Also a Pest?**

Australia grapples with a kangaroo issue.

BY JEREMY BERLIN  
PHOTOGRAPHS BY  
STEFANO UNTERTHINER  
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ON TV

**Valley of the Boom**

This docudrama about the internet's early days airs Sunday nights through January 27 at 9/8c, on National Geographic.

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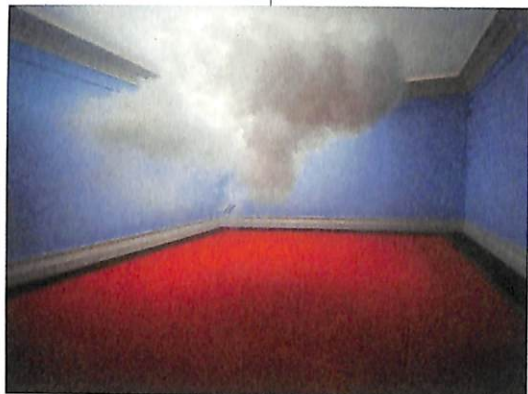
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## On the Cover

The Milky Way glows above one of the 64 antennas of MeerKAT, a supersensitive telescope that scans the sky for radio signals. It's located in South Africa's Northern Cape Province.

SAREL VAN STADEN AND MARYNA COTTON; PANORAMA COMPOSED OF THREE IMAGES

## PROOF



# 8

**Conjuring Clouds**  
With water vapor, smoke, lights, and imagination, a Dutch artist makes clouds in unexpected places—and coaxes them to pose for the camera.  
PHOTO PROJECT BY BERNDNAUT SMILDE

## EMBARK

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THE BIG IDEA

## A Wake-Up Call on Water Quality

One-quarter of Americans drink water from systems that aren't safe.  
BY RHEA SUH

GENIUS

## Safer. Cheaper. Greener.

Engineer Leslie Dewan wants to reinvent nuclear energy.  
BY RACHEL HARTIGAN SHEA



ALSO

Transparent Butterflies  
A Mighty New Dinosaur

## EXPLORE



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DECODER

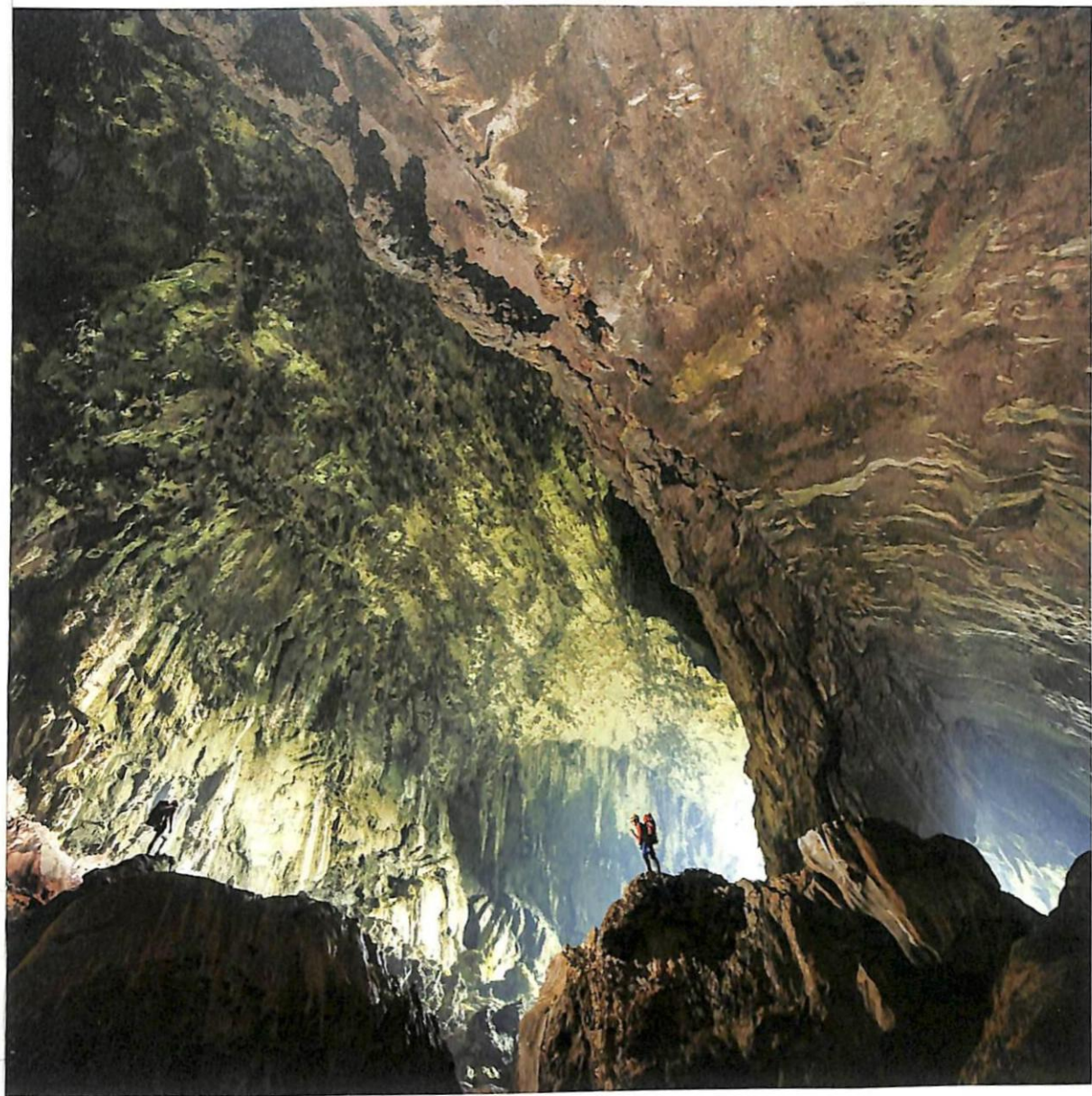
## Evolved to Crack

Scientists are learning more about how elephants get the creases in their skin and why those crevices are so important to them.  
BY MONICA SERRANO

THROUGH THE LENS

## Strange Reflections

During the annual flood season in Venice, buildings appear as distorted images on the water. Within those reflections, a photographer finds bizarre creatures—and also solace.  
BY JODI COBB



## FEATURES

### Who's Out There?

The big existential question is no longer, Is there life beyond Earth? It's a pretty sure bet there is. The question now is, How do we find who—or what—is alive out there? And we are getting really close to answering it.

BY JAMIE SHREEVE  
PHOTOGRAPHS BY  
SPENCER LOWELL  
ART BY DANA BERRY

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### No Way Out

Criminal gangs have fractured El Salvador.

BY JASON MOTLAGH  
PHOTOGRAPHS BY  
MOISES SAMAN AND  
ADAM FERGUSON

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### ▲ Borneo's Vast Underworld

Malaysia's Mulu caves boast chambers that are millions of years old.

BY NEIL SHEA  
PHOTOGRAPHS BY

CARSTEN PETER P. 100

### Treehoppers

These mini-monsters are masters of disguise.

BY DOUGLAS MAIN  
PHOTOGRAPHS BY  
JAVIER AZNAR  
GONZÁLEZ DE RUEDA

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### Rituals of Rebellion

The Americas' carnivals honor revelers' roots.

BY JACQUELINE CHARLES  
PHOTOGRAPHS BY  
CHARLES FRÉGER

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# NATIONAL GEOGRAPHIC

# CITIES

SPECIAL

IDEAS FOR A BRIGHTER FUTURE

ISSUE

DESIGNING SOLUTIONS

A TEMPORARY REFUGE BECOMES HOME

WALKING THROUGH A MEGALOPOLIS

RATS—THEY'LL ALWAYS BE WITH US



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## On the Cover

Completed in 1932, Sydney Harbor Bridge leads the way into the glittering modern downtown of Australia's largest city.

VINCENT LAFORET

## SPECIAL ISSUE: CITIES



# 8

### Double Vision

Eight seconds is all it takes to create astounding images that capture the energy of the world's most vibrant cities from more than one angle.

PHOTOGRAPHS BY  
NICOLAS RUEL

# 17

### THE BIG IDEA

## To Live Together, We Must Make Compromises

Urban life inevitably involves trade-offs. We may reap huge benefits in return for suffering enormous disadvantages when we choose between issues such as individual freedom and community interests, and between social ties and anonymity.

BY JARED DIAMOND



### ALSO

Smart (Kansas) City  
Skiing Copenhagen  
Robots and Drones



# 20

### INFOGRAPHIC

## Cities of the Future

What should cities be like in 2050 when an estimated 6.7 billion people live in them? We asked the architectural and city planning firm SOM to imagine those urban centers; the group created a vision based on 10 principles. Among them: putting ecology first; building an economy that supports the best use of resources; and promoting culture and livability.



## FEATURES

### **Walking Tokyo**

Tokyo is the world's most populous metropolis. It's also one of the wealthiest, safest, cleanest, and most creative—despite being partly destroyed and rebooted twice in the past hundred years. The best way to understand this modern megacity is on foot.

BY NEIL SHEA  
PHOTOGRAPHS BY  
DAVID GUTTENFELDER

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### **Rethinking Communities**

What if cities could be built to benefit the environment, residents' fitness, and social connection? City planners foresee dense, walkable, mixed-use communities linked by transit systems, curbing reliance on cars and helping clear the air.

BY ROBERT KUNZIG  
PHOTOGRAPHS BY  
ANDREW MOORE

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### **A City Rises**

Can Africa's largest refugee settlement grow into an urban hub?

BY NINA STROCHLIC  
PHOTOGRAPHS BY  
NORA LOREK

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### **In Our Shadow**

Wherever there are people there are rats, thriving on our trash.

BY EMMA MARRIS  
PHOTOS BY CHARLIE  
HAMILTON JAMES

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**Modern Girls, Ancient Rite**  
A village in Spain welcomes spring the same way it has for centuries, by placing a few chosen girls on flowery pedestals.  
PHOTOGRAPHS BY DANIEL OCHOA DE OLZA

## EMBARK

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**THE BIG IDEA**  
**The Future of Dying in Style**  
We memorialize the dead with the tools of our times.  
BY GLENN MCDONALD



**What's Keeping Scientists From Vanquishing Ebola?**  
Four reasons that the extremely lethal virus is so hard to fight.  
BY RICHARD PRESTON  
  
**ALSO**  
Astronaut Brains  
China's Science Boom

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**BASIC INSTINCTS**  
**Toads' Sex Life Hinges on Finding the Perfect Pool**  
Their choosiness may endanger them.  
BY PATRICIA EDMONDS

**THROUGH THE LENS**  
**Finding Dignity in a Dirty Job**  
*Bayakou* perform an essential service that they hide from other Haitians.  
BY ANDREA BRUCE  
  
**ALSO**  
Electric Spiders  
A Farrier's Tools  
Melting Mount Rainier



## FEATURES

**Sea of Plastic**

Plastic waste washes into the oceans at an average rate of about nine million tons a year. Much of it eventually breaks down into barely visible bits—microplastics, which are so abundant that larval fish are eating them in their first days of life.

BY LAURA PARKER  
PHOTOGRAPHS BY  
DAVID LIITTSCHWAGER  
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**Leonardo's  
Enduring Brilliance**

Five hundred years after his death, Leonardo da Vinci's stunning creativity and foresight in science, the arts, and engineering continue to amaze us—and to inform modern work in the fields he studied so long ago.

BY CLAUDIA KALB  
PHOTOGRAPHS BY  
PAOLO WOODS AND  
GABRIELE GALIMBERTI  
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**A New Day in  
Mozambique**

Gorongosa National Park recovers from war.  
BY DAVID QUAMMEN  
PHOTOGRAPHS BY  
CHARLIE HAMILTON JAMES  
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**▲ Smokejumpers**

These elite crews parachute into forests to keep small fires from becoming major ones.  
BY MARK JENKINS  
PHOTOGRAPHS BY  
MARK THIESSEN ..... P. 120

# NATIONAL GEOGRAPHIC MAGAZINE

## WORLD ON THE MOVE

Seas rise, crops  
wither, wars erupt.  
Humankind again  
seeks shelter in  
another place.

SPECIAL  
ISSUE

WALKING  
AMONG  
MIGRANTS

BABIES  
BORN AS  
REFUGEES

LEAVING AFRICA  
FOR THE GAMBLE  
OF A LIFETIME

U.S.-MEXICO  
BORDER  
PORTRAITS

# BUILDING BUGS WITH BLOOMS

An artist uses natural materials to make lively and lifelike insect portraits.

VOL. 7 NO. 1



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## On the Cover

Rohingya refugees fleeing Myanmar by boat often brave rough seas to reach the southern tip of Bangladesh. Some 20 feet from shore, a woman with a baby jumped from the boat and waded the rest of the way.

K M ASAD

## PROOF



# 10

### Building Bugs With Blooms

An artist uses natural materials he finds in his yard and among florists' discards to make lively—and lifelike—portraits of insects.

PHOTOGRAPHS BY RAKU INOUE

## EMBARK

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### THE BIG IDEA

### We Are All Migrants

Through time and space, humans are a migratory species.

BY MOHSIN HAMID

### PLANET OR PLASTIC?

### Reducing Plastic Waste From Food Containers

Designers and engineers are developing new food packaging materials.

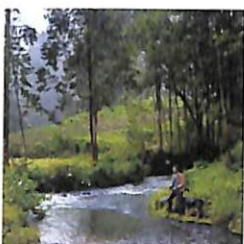
BY ELIZABETH ROYTE



### ALSO

Rocks in Crocs  
A Mass of Meteorites  
Secret Pollinator

## EXPLORE



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### THROUGH THE LENS

### Peace Like a River

For a photographer who's drained after years of covering conflict, fly-fishing offers solace.

BY PETE MULLER

### DECODER

### From Tank to Table

The sustainable future is now, with fish farms feeding plants that grow without soil.

BY MONICA SERRANO

### ALSO

Urban Hot Spots  
Totem Pole Climb  
Surfboard Shaper



FEATURES

**Walking With Migrants**

The author falls in step with people driven by circumstance “to leave a familiar world.”

BY PAUL SALOPEK  
PHOTOGRAPHS BY JOHN STANMEYER  
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**Born a Refugee**

Rohingya babies start life stateless in a Bangladesh refugee camp.

BY NINA STROCHLIC  
PHOTOGRAPHS BY TURJOY CHOWDHURY  
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**From Africa to Spain**

The migrants’ gamble has yet to pay off.

BY CYNTHIA GORNEY  
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The border, in faces.

BY NINA STROCHLIC  
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**The Birth of Europe**

Genetic tools tell what’s in the melting pot.

BY ANDREW CURRY  
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As warming shrinks wolverines’ territory, the fierce carnivores battle new threats.

BY DOUGLAS CHADWICK  
PHOTOGRAPHS BY STEVEN GNAM  
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**Rituals of Spirited Rebellion**

Carnivals in the Americas hold cultural resistance and a connection to ancestral roots.

BY JACQUELINE CHARLES  
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# NATIONAL GEOGRAPHIC MAGAZINE

THE NEW COLD WAR  
AS THE ICE MELTS,  
OLD RIVALS SCRAMBLE  
FOR POSITION

# THE

THE CARBON THREAT  
THAWING TUNDRA  
WILL SPEED UP  
GLOBAL WARMING

# ARCTIC

IS HEATING UP





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## On the Cover

This map shows the sea ice extent—the amount of ocean surface area covered by ice—in September 2012, its lowest point since record-keeping began in 1979.

NATIONAL SNOW AND ICE DATA CENTER; GREEN MARBLE

## EMBARK

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### THE BIG IDEA

## Why You Like What You Like

Our personal tastes and our actions are driven by hidden biological forces.

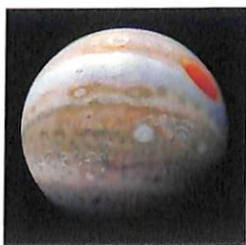
BY BILL SULLIVAN

### CAPTURED

## A Solar System Giant, Ready for Its Close-Up

A stunning data-driven image of Jupiter.

IMAGE BY KEVIN GILL



### ALSO

Bright Giant Squirrels  
An Art Scientist  
Funky Cheese

## EXPLORE



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### THROUGH THE LENS

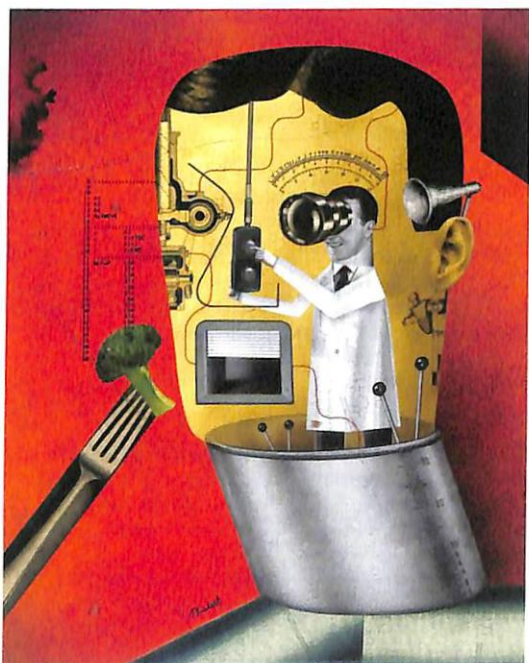
## Death Comes for a Crocodile

In Australia, an epic hunt for a saltwater crocodile ends on an unexpected note.

BY TREVOR BECK FROST

### ALSO

Herbs in Detail  
A Tool for Tigers







FEATURES



**The New Cold War**  
In the Arctic, nations are jostling for access to a frozen frontier.

BY NEIL SHEA  
PHOTOGRAPHS BY  
LOUIE PALU

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**The Threat Below**  
Permafrost is thawing fast, releasing carbon that fuels warming.

BY CRAIG WELCH  
PHOTOGRAPHS BY  
KATIE ORLINSKY

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**Uncovering an Arctic Mystery**  
The Franklin Expedition set out to chart the Northwest Passage.

Then it vanished.

BY HEATHER PRINGLE

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**Eyes on the Ice**  
Studying the warming Arctic means joining a unique community.

BY JENNIFER KINGSLEY  
PHOTOGRAPHS BY  
ESTHER HORVATH

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**Alone With Wolves**

A moving encounter with one of Earth's most adaptable predators.

BY NEIL SHEA  
PHOTOGRAPHS BY  
RONAN DONOVAN

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**Before It Melts**  
Camping trips teach Inuit youth how to survive on the frigid land.

STORY AND  
PHOTOGRAPHS BY  
ACACIA JOHNSON

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# NATIONAL GEOGRAPHIC MAGAZINE



# Last of Its Kind

WHAT WE LOSE WHEN AN ANIMAL GOES EXTINCT

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## On the Cover

Joseph Wachira, a keeper at the Ol Pejeta Conservancy in Kenya, says goodbye to Sudan, the last male northern white rhinoceros. Sudan died in 2018. Two females of the subspecies remain.

AMI VITALE

## EMBARK

# 13

### THE BIG IDEA

#### Cat vs. Bird: The Battle Lines

To save birds, should we kill off cats? A cat- and bird-lover seeks a better solution.

BY NOAH STRYCKER

### CAPTURED

#### First Photo in the Wild of Largest Bee

See a Wallace's giant bee roughly life-size.

PHOTOGRAPH BY CLAY BOLT

### ALSO

Saving the Vaquita



## EXPLORE



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### PLANT EXTINCTION

#### Weakening Life's Green Foundation

Hundreds of the plant species that anchor Earth's ecosystems have disappeared.

BY MICHAEL GRESHKO

### DECODER

#### Untangling Whales

Lines to lobster and crab traps harm right whales, but there are safer alternatives.

BY JASON TREAT

### ALSO

The Last of His Kind Rescuing Hawaii's Plants

## PROOF



# 32

#### Fragile Life in Freshwater

Many species that live in freshwater are endangered. A photographer is racing to document them before it's too late.

PHOTOGRAPHS BY DAVID HERASIMTSCHUK



## FEATURES

### Vanishing

The last mass extinction was caused by an asteroid. The blame for the next one lies much closer to home—with us. Soon all that's left of some of the planet's most vulnerable species may be the photographs of animals collected in Joel Sartore's Photo Ark.

BY ELIZABETH KOLBERT  
PHOTOGRAPHS BY  
JOEL SARTORE

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### Surviving, Despite Us

Sea turtles are resilient, but threats are rising.

BY CRAIG WELCH  
PHOTOGRAPHS BY  
THOMAS P. PESCHAK

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### Giraffes

Relocating animals could save species—but poses risks.

BY JOSHUA FOER  
PHOTOGRAPHS BY  
AMI VITALE

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### ▲ The Dinosaur in the Room

Fossils for the rich.

BY RICHARD CONNIFF  
PHOTOGRAPHS BY  
GABRIELE GALIMBERTI  
AND JURI DE LUCA

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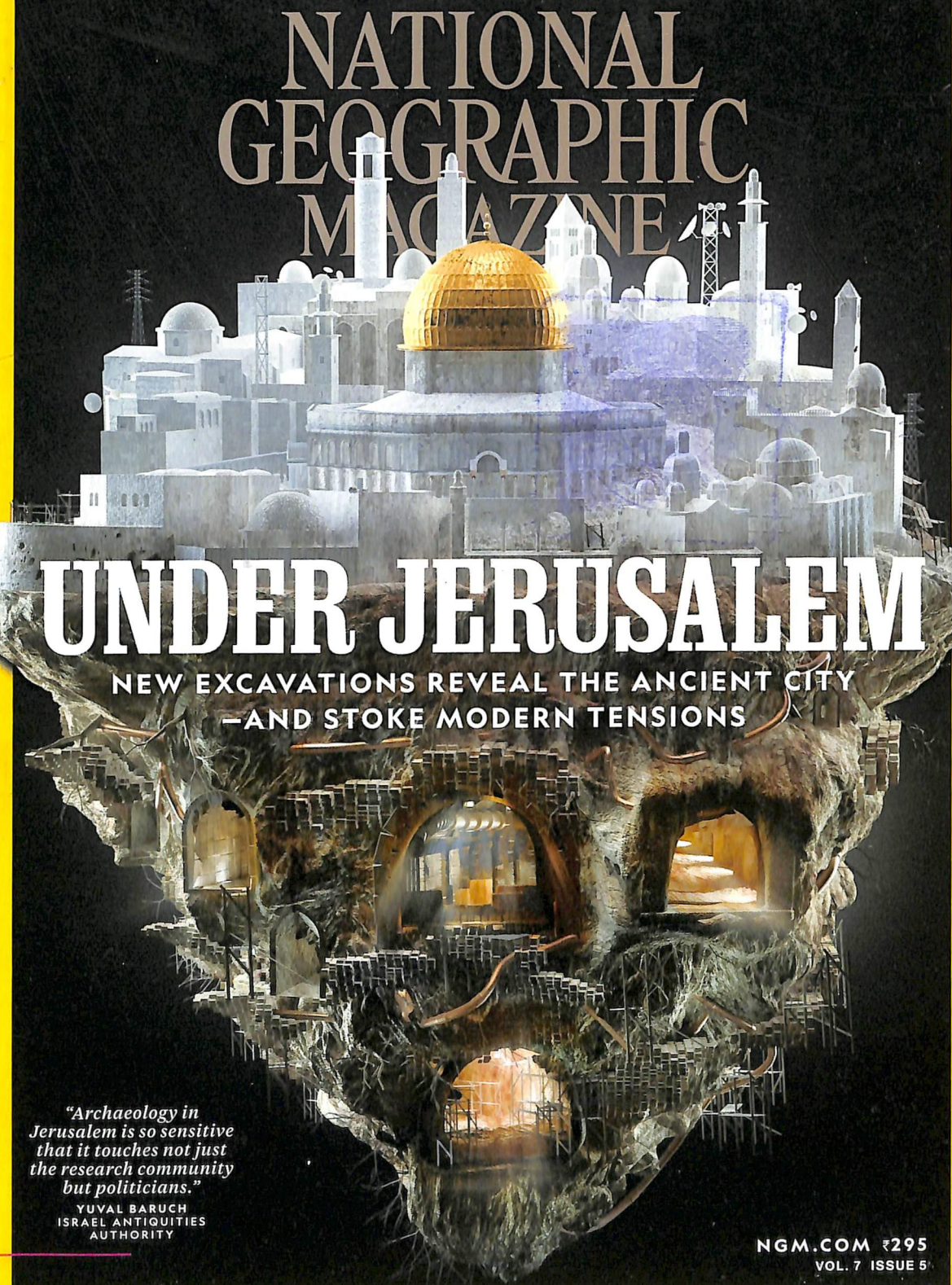
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MORE TIGERS LIVE  
IN U.S. CAPTIVITY  
THAN IN THE WILD

THE STORY OF  
PLASTIC: BREAKING  
THE HABIT

GLACIAL LAKES IN  
SOUTH ASIA AND THE  
DANGER AHEAD

# NATIONAL GEOGRAPHIC MAGAZINE



## UNDER JERUSALEM

NEW EXCAVATIONS REVEAL THE ANCIENT CITY  
—AND STOKE MODERN TENSIONS

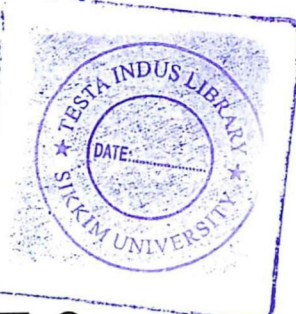
*"Archaeology in  
Jerusalem is so sensitive  
that it touches not just  
the research community  
but politicians."*

YUVAL BARUCH  
ISRAEL ANTIQUITIES  
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Jerusalem's churches, mosques, synagogues, and other sacred spaces vie for room in the Old City, both on the surface and below.

ILLUSTRATION BY BOSE COLLINS



### EMBARK

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### The Lure of Cold Spots

Some people love life in very cold places. If you can't stand the chill, can you understand the attraction?

BY KIERAN MULVANEY



#### CAPTURED

### Orchid Anatomy

Myth and folk medicine meet in the plant with testicle-like tubers.

BY PATRICIA EDMONDS



**FEATURES**

**Under Jerusalem, Ancient Finds—and New Controversies**

Aboveground, it's a holy site of the world's three great monotheistic religions. But under Jerusalem lies one of the world's busiest archaeological sites, where any digging can yield artifacts and stir animosities.

BY ANDREW LAWLER  
PHOTOGRAPHS BY SIMON NORFOLK

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**The Story of Plastic**

How convenient, disposable plastic items became a habit—and how we can break it.

PHOTOGRAPHS BY HANNAH WHITAKER

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**▲ U.S. Tigers in Crisis**

More live in captivity in the U.S. than in the wild. An investigative report.

BY SHARON GUYNUP  
PHOTOGRAPHS BY STEVE WINTER

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**Saving Africa's Parks**

Treating ailing parks like failing businesses is helping to revive them.

BY DAVID QUAMMEN  
PHOTOGRAPHS BY BRENT STIRTON

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**When the Roof of the World Melts**

Dangerous glacial lakes bring the threat of floods to Nepal.

BY FREDDIE WILKINSON

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