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NATIONAL GEOGRAPHIC

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VOL. 224 • NO. 6

NATIONAL GEOGRAPHIC

"Our cougars keep doing things cougars aren't supposed to do."
page 78

DIANE COOK AND LEN JENSHEL

A not-so-little tree of tumbleweeds rises yearly in Chandler, Arizona. Some 1,200 weeds are sprayed white, dusted with glitter, and affixed to a 30-foot-tall wire frame.

December 2013

December 2013

On the Cover In his trademark cowboy hat, Paul Salopek trudges across Ethiopia's Afar desert. With him are Suma'atuli (Branded on the Ear), the larger of the two camels, and A'urta (Traded for a Cow).
Photo by John Stanmeyer

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National Geographic is available on the iPad, the Kindle Fire, and the iPhone.

The Greatest Journey
Video
Walk with Paul Salopek as he starts a seven-year trek.

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Video
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PHOTOS, FROM TOP: JOHN STANMEYER; JONAS BENDIKSEN; CENTRE FOR DIGITAL DOCUMENTATION AND VISUALISATION

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Write of Passage

A quest, says journalist Paul Salopek, is the oldest form of storytelling there is. The quest he has set out to do is about the biggest one there is, as well. "To Walk the World"—the title of his article in this issue—sums it up. He has begun the first leg of an epic journey, the initial chapter in his Out of Eden Walk project, a retracing of the migration of the first modern humans who walked out of Africa to explore the world.

It's a walk across 2,500 human generations and 60,000 years of human history. It will span four continents and 21,000 miles, but it's more than just a retracing. It's a way to tell important stories of our time—stories about cultural survival, conflict, and climate change, stories about differences and similarities. "News as pilgrimage," Paul calls it.

"I am searching for the hidden connections that link global stories," he says. "By walking, I am forced to slow down. The world blurs and flattens with speed. On foot there is clarity."

The story begins in Ethiopia at Herto Bouri, the archaeological site where some of the oldest human bones have been uncovered. It will wind up years from now in Tierra del Fuego, where the continental migration of our ancestors ended. You might say this long journey is the culmination of everything Paul has done as a prizewinning journalist. He's covered wars, traversed the Sahel, canoed the Congo River. But his impulse to walk the world has little to do with physical accomplishment. Rather, it's about creating a portrait of humanity at the beginning of the third millennium, one step at a time.

MAP: RYAN MORRIS, NGM STAFF

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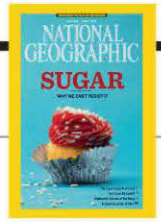
*Machine representation relative to Air Watts. Suction tested against upright market to ASTM F558 at cleaner head, dust-loaded as per IEC 60312-1.



Sugar

While you were quick to blame the "adman and candy clerk," I think the media also share a lot of the blame for addiction to sugar. Your article focused on the negative health effects of sugar and also the price paid by humans over the course of history for the crop to be grown and consumed. It didn't make sense to me then that the photographs would portray sugary food in a beautiful light. It's like doing the same article on tobacco and showing gorgeous people enjoying cigarettes. I might be a teenager, but for me the pictures didn't match the words.

RACHEL COHEN
Westport, Connecticut

Next time you include an article about the toxicity of sugar, please skip the pictures of cupcakes, candy, and cereals. My daughter loved them and wanted to eat the stuff despite the ominous words I read to her.

DIANE NEWLAN
East Haven, Connecticut

The chemical formula for table sugar is $C_{12}H_{22}O_{11}$. So sugar is 12 parts carbon (C). It stands to reason: Since we are carbon-based life-forms, sugar should be one of our best foods. Just kidding.

LOUIS D. KING
Sebring, Florida

Despite sugar's vast historical usage, the word never appears in the Bible. In that book "honey" is thought to refer to sweet food, and Proverbs 25:27 offers, "It is not good to eat much honey."

WILLIAM P. ALLMAN
Columbus, Ohio

What the author seems to ignore in his otherwise enlightening article is that America is not the whole world. Surely *National Geographic* writers and photographers must notice during their travels around the globe that obesity is not as widespread elsewhere, not even in equally affluent Europe.

WOLFGANG WITTENBERG
Squamish, British Columbia

Your article was hobbled because you didn't show many brand names. That's what lures us—the attractive packages. We see the pretty packages, we buy, we eat, we get fat.

GEORGE TASEOS
Phoenix, Arizona

In January 2013 I removed more than 95 percent of the sugar from my diet. The result: I lost 20 pounds, and my blood pressure dropped 15 points. Now I read labels. If there is sugar—or more than ten ingredients—the product goes back on the shelf. Food never tasted so good.

GLENN MENCER
Jakarta, Indonesia

FEEDBACK *Readers admitted to having a taste for sugar.*

EMAIL comments to ngsforum@ngm.com; for subscription help, ngsline@customersvc.com. **TWITTER** @NatGeoMag
WRITE National Geographic Magazine, PO Box 98199, Washington, DC 20090-8199. Letters may be edited for clarity and length.

GRAPHIC: JOSÉ MIGUEL MAYO

Mearns's Squirrel *(Tamiasciurus mearnsi)*
Size: Head and body length, 18.8 - 21.4 cm (7.4 - 8.4 inches) **Weight:** 220 - 360 g (7.8 - 12.7 oz)
Habitat: Open conifer forests of Mexico's Baja California region **Surviving number:** Unknown

Photographed by Claudio Contreras Koob

WILDLIFE AS CANON SEES IT

Long time no see. Endemic to the dry forests of a single mountain range, Mearns's squirrel has been separated from other members of its genus for nearly 12,000 years. During this long isolation, marked differences have developed. Unlike its close relatives, it is non-territorial, nests almost exclusively in tree cavities, and does not build and defend food stores. Instead, it simply caches pine and fir tree seeds and other food items in branches. Foraging consumes over half the squirrel's time as it scrambles to deal with deforestation and possibly competition with the introduced eastern gray squirrel. Could time be running out?

As we see it, we can help make the world a better place. Raising awareness of endangered species is just one of the ways we at Canon are taking action—for the good of the planet we call home. Visit **canon.com/environment** to learn more.

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GEVALIA KAFFE

LETTERS

Lions

Along with poaching, game ranches and their facilitators need to be permanently stopped. Realizing that the lions in the cage will lose their lives for nothing more than an individual's desire for a trophy sickens me. If the bow hunter on pages 66-7 thinks that he has accomplished something good, I fail to see it.

HOWARD T. MUNN
Woodbridge, New Jersey

David Quammen could have easily written that at least four continents, not three, have had lions. The world famous La Brea Tar Pits attraction in Los Angeles has a skeleton on display of the American lion (about 50 percent larger than today's African lion), with many more in its Page Museum collections. Californians rarely have fatal encounters with cougars and coyotes today, but try avoiding a pride of lions on Malibu Beach 10,000 years ago.

CLIFF CULPEPER
San Francisco, California

Painted Elephants

At the palace, animal rights activists have been protesting that the animals are driven too hard, especially during the heat of the day. They are pushed without proper food, water, and rest to the brink of exhaustion just so the mahouts can make more money. I was very let down to see an article that brushed over such a dark side to this tourist attraction.

REBEKAH PETRAKOVITS
Pittsburgh, Pennsylvania

NEXT: Carp

While eating the creatures in massive quantities would certainly work, alas, we are a nation of fish-eaters rather picky in our choices. Here we have an excellent source of premium fish meal for the harvesting—it even harvests itself by actually jumping into the boat.

LOUIS MELUSO
Charleston, South Carolina

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NATIONAL GEOGRAPHIC

The National Geographic Society is chartered in Washington, D.C., as a nonprofit scientific and educational organization "for the increase and diffusion of geographic knowledge."

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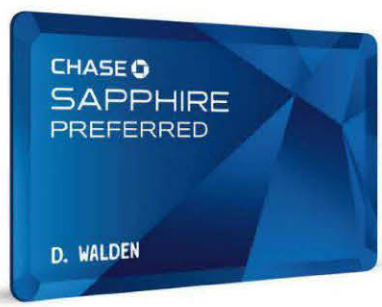

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Amy Dickman
National Geographic Grantee

EXPERTISE
Wildlife Biologist

LOCATION
Tanzania

Losing Sleep

It was my first night in the Tanzanian bush, and I was near Ruaha, a region known for its abundance of lions. The camp owner welcomed me and said, "Your tent is over that way," indicating the thick bushes next to the river, past the tents on raised platforms. I came across a clearing on the river's edge. I paused to watch hippos meandering into the water and noticed a pup tent perched on what appeared to be the main hippo trail down to the water. This tiny structure was to be where I slept.

Not wanting to be dragged down by a lumbering hippo to drown in the river in a heap of multicolored nylon, I moved my tent off the trail. I lay there listening to the bush sounds: nightjars and owls and screeching baboons and rushing water. Then I heard the unmistakable roar of a lion on the other side of the river. Then another—this time on my side. Then a third, deafening roar that split the night, followed by the crackle of nearby twigs as he stepped into the clearing and sniffed. I could smell him, so likely he could smell me too.

After circling, he stopped and stretched his body against the length of my tent, presumably to enjoy its warmth. As it buckled against him, I was pushed into the tiny space left against the opposite side—except for my left hand, which was under his bulk. After a few minutes he fell asleep. I didn't dare move my hand or risk startling him, so I lay there unmoving, trying to keep panic at bay.

I must have eventually fallen asleep in the aftermath of the adrenaline rush. The next thing I knew, sunlight was streaming in, and the tent was unbowed, with lion tracks in the sand outside. After that the pup tent was nicknamed the "death tent," and I was allocated a pitch on a raised platform.

ART: ISTVAN BANYAI. PHOTO: ANNE SCHMIDT-KÜNTZEL, CHEETAH CONSERVATION FUND

Humalog KwikPen is prefilled with mealtime insulin, so it goes just about anywhere you go.

Talk to your doctor to learn more, and go to KwikPen.com for a free trial offer.

Receive 5 free pens.

Who should use Humalog?

Humalog is used to treat people with diabetes for the control of high blood sugar.

IMPORTANT SAFETY INFORMATION FOR HUMALOG

What is the most important information I should know about Humalog?

- Do not change the insulin you use without talking to your healthcare provider. Doses of oral antidiabetic medicines may also need to change if your insulin is changed.
- Test your blood sugar levels as your healthcare provider instructs.
- When used in a pump, do not mix Humalog with any other insulin or liquid.

Who should not take Humalog?

- Do not take Humalog if your blood sugar is too low (hypoglycemia) or if you are allergic to insulin lispro or any of the ingredients in Humalog.

Before using Humalog, what should I tell my healthcare providers?

Tell your healthcare providers:

- About all of your medical conditions, including liver, kidney, or heart problems.
- If you are pregnant or breastfeeding.
- About all the medicines you take, including prescription (especially ones commonly called TZDs [thiazolidinediones]) and non-prescription medicines, vitamins, and herbal supplements.

How should I use Humalog?

- Humalog is a rapid-acting insulin. Take Humalog within fifteen minutes before eating or right after eating a meal.
- Always make sure you receive the correct type of Humalog from the pharmacy.
- Do not use Humalog if it is cloudy, colored, or has solid particles or clumps in it.
- Do not mix Humalog with insulin other than NPH when using a syringe. Do not mix or dilute Humalog when used in a pump.
- Inject Humalog under your skin (subcutaneously). Never inject into a vein or muscle. Change (rotate) your injection site with each dose. Make sure you inject the correct insulin and dose.
- Depending on the type of diabetes you have, you may need to take Humalog with a longer-acting insulin or with oral antidiabetic medicines.
- If you forget to take your dose of Humalog, your blood sugar may go too high (hyperglycemia), which can lead to serious problems like loss of consciousness (passing out), coma, or even death.
- Your insulin dose may need to change because of illness, stress, other medicines you take, change in diet, or change in physical activity or exercise.

What are the possible side effects of Humalog?

- Low blood sugar is the most common side effect. There are many causes of low blood sugar, including taking too much Humalog. It is important to treat it quickly. You can treat mild to moderate low blood sugar by drinking or eating a quick source of sugar right away. If severe, low blood sugar can cause unconsciousness (passing out), seizures, and death. Symptoms may be different for each person. Be sure to talk to your healthcare provider about low blood sugar symptoms and treatment.
- Severe life-threatening allergic reactions (whole-body reactions) can happen. Get medical help right away if you develop a rash over your whole body, have trouble breathing, have a fast heartbeat, or are sweating.
- Reactions at the injection site (local allergic reaction) such as redness, swelling, and itching can happen. If you keep having skin reactions or they are serious, talk to your healthcare provider. Do not inject insulin into a skin area that is red, swollen, or itchy.
- Skin may thicken or pit at the injection site (lipodystrophy). Do not inject insulin into skin with these types of changes.
- Other side effects include low potassium in your blood (hypokalemia), and weight gain.
- Serious side effects can include:
  - swelling of your hands and feet
  - heart failure when taking certain pills called thiazolidinediones or "TZDs" with Humalog. This may occur in some people even if they have not had heart problems before. Tell your healthcare provider if you have shortness of breath, swelling of your ankles or feet, or sudden weight gain, which may be symptoms of heart failure. Your healthcare provider may need to adjust or stop your treatment with TZDs or Humalog.
- These are not all of the possible side effects. Ask your healthcare providers for more information or for medical advice about side effects.

You are encouraged to report negative side effects of prescription drugs to the FDA. Visit www.fda.gov/medwatch or call 1-800-FDA-1088.

How should I store Humalog?

- Unopened Humalog should be stored in a refrigerator and can be used until the expiration date on the carton or label.
- Humalog should be stored away from light and heat. Do not use insulin if it has been frozen.
- Opened vials should be kept at room temperature or in a refrigerator. Opened cartridges or prefilled pens should be kept at room temperature.
- Once opened, Humalog vials, prefilled pens, and cartridges should be thrown away after 28 days.

Humalog is available by prescription only.

For additional information, talk to your healthcare providers and please see Information for Patients on following pages. Please see Instructions for Use that accompany your pen.

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If you need assistance with prescription costs, help may be available. Visit www.pparx.org or call 1-888-4PPA-NOW.

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Information for Patients about Humalog®

(insulin lispro injection, USP [rDNA origin])

Read the "Patient Information" that comes with Humalog (HU-ma-log) before you start using it and each time you get a refill. There may be new information. This leaflet does not take the place of talking with your healthcare provider about your diabetes or treatment. If you have questions about Humalog or diabetes, talk with your healthcare provider.

What is Humalog?

Humalog is an injectable, rapid-acting, man-made insulin. It is used to treat people with diabetes for the control of high blood sugar. You should take Humalog within fifteen minutes before eating or right after eating a meal.

What is the most important information I should know about Humalog?

- Do not change the insulin you use without talking to your healthcare provider. Doses of oral diabetes medicines may also need to change if your insulin is changed.
- You must test your blood sugar levels as your healthcare provider instructs.
- If you forget to take your dose of Humalog, your blood sugar may go too high (hyperglycemia). If high blood sugar is not treated it can lead to serious problems like loss of consciousness (passing out), coma, or even death.
- Always make sure you receive the correct type of Humalog from the pharmacy. Do not use Humalog if it is cloudy, colored, or has solid particles or clumps in it.
- Do not mix Humalog with insulin other than NPH when using a syringe.
- Inject Humalog under your skin (subcutaneously). Never inject into a vein or muscle. Change (rotate) your injection site with each dose. Make sure you inject the correct insulin and dose.
- When used in a pump, do not mix Humalog with any other insulin or liquid. The infusion set should be changed at least every 3 days. The Humalog in the pump reservoir should be changed at least every 7 days even if you have not used all of the Humalog.
- Taking other medicines known as TZDs (thiazolidinediones) with Humalog may cause heart failure. Tell your healthcare provider if you have any new or worse symptoms of heart failure, such as shortness of breath, swelling of your ankles or feet, or sudden weight gain.

Who should NOT take Humalog?

Do not take Humalog:

- if your blood sugar is too low (hypoglycemia).
- before checking with your healthcare provider regarding any allergies you may have to its ingredients.

What are the possible side effects of Humalog?

- Low blood sugar (hypoglycemia). There are many causes of low blood sugar, including taking too much Humalog. It is important to treat it quickly. You can treat mild to moderate low blood sugar by drinking or eating a quick source of sugar right away. Low blood sugar may affect your ability to drive or operate machinery. Severe low blood sugar can cause unconsciousness (passing out), seizures, and death. Symptoms may be different for each person. Be sure to talk to your healthcare provider about low blood sugar symptoms and treatment.
- Severe life-threatening allergic reactions. Get medical help right away if you develop a rash over your whole body, have trouble breathing, have a fast heartbeat, or are sweating.
- Reactions at the injection site such as redness, swelling, and itching. If you keep having skin reactions or they are serious, talk to your healthcare provider. Do not inject insulin into a skin area that is red, swollen, or itchy.
- Skin may thicken or pit at the injection site (lipodystrophy). Do not inject insulin into this type of skin.
- Other side effects include swelling of your hands and feet, low potassium in your blood (hypokalemia), and weight gain.
- Taking other medicines known as TZDs (thiazolidinediones) with Humalog may cause heart failure in some people.
- These are not all of the possible side effects. Ask your healthcare providers for more information.

You are encouraged to report negative side effects of prescription drugs to the FDA. Visit www.fda.gov/medwatch or call 1-800-FDA-1088.

What should I tell my doctor before using Humalog?

- About all of your medical conditions, including liver, kidney, or heart problems.
- About all the medicines you take, including prescription (especially ones commonly called TZDs [thiazolidinediones]) and non-prescription medicines, vitamins, and herbal supplements.
- If you are pregnant or breastfeeding.

How should I store HUMALOG?

- Unopened Humalog should be stored in a refrigerator and can be used until the expiration date.
- Humalog should be stored away from heat and light. Do not use insulin if it has been frozen.
- Opened vials should be kept at room temperature or in a refrigerator. Opened cartridges or prefilled pens should be kept at room temperature.
- Once opened, Humalog vials, prefilled pens, and cartridges should be thrown away after 28 days.

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Additional information can be found at www.Humalog.com

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VISIONS

Japan
Jigokudani—"hell valley"—Monkey Park is known for its hot springs, which may feel more like heaven in subzero weather to the Japanese macaques that congregate there.

PHOTO: JASPER DOEST

United States
The loading dock of a warehouse on Chicago's South Side resembled the South Pole after a five-alarm blaze on January 23, 2013. Met with single-digit temperatures, spray from the firefighters' hoses soon turned to eerie ice art.

PHOTO: SCOTT OLSON, GETTY IMAGES

Poland
From the ground, it was just another line for the lift at Czarna Góra resort. But from a motorized paraglider, the skiers became bright brushstrokes on a snowy canvas. Photographer Kacper Kowalski says he seeks "to show daily situations in the abstract."

PHOTO: KACPER KOWALSKI, PANOS PICTURES

NOW'S THE TIME TO HELP PROTECT YOURSELF WITH THE SHINGLES VACCINE

NO MATTER HOW HEALTHY YOU FEEL, SHINGLES COULD STILL HAPPEN TO YOU.

ZOSTAVAX®

Zoster Vaccine Live

Actual clinical rash image

Shingles is caused by the same virus that causes chickenpox. The virus stays in your body and can resurface at any time as Shingles — a painful, blistering rash. And no matter how healthy you feel, your risk increases as you get older.

The sooner you get vaccinated with ZOSTAVAX, the better your chances of protecting yourself from Shingles. In fact, the ACIP* of the CDC (Centers for Disease Control and Prevention) recommends that appropriate adults 60 years of age and older get vaccinated to help prevent Shingles.

*ACIP=Advisory Committee on Immunization Practices

Talk to your health care professional to see if ZOSTAVAX® (Zoster Vaccine Live) is right for you.

ZOSTAVAX is given as a single shot. ZOSTAVAX cannot be used to treat Shingles, or the nerve pain that may follow Shingles, once you have it. For more information, visit ZOSTAVAX.com or call 1-877-9 SHINGLES.

ABOUT *ZOSTAVAX*

ZOSTAVAX is a vaccine that is used for adults 50 years of age or older to prevent Shingles (also known as zoster).

IMPORTANT SAFETY INFORMATION

ZOSTAVAX does not protect everyone, so some people who get the vaccine may still get Shingles.

You should not get ZOSTAVAX if you are allergic to any of its ingredients, including gelatin or neomycin, have a weakened immune system, take high doses of steroids, or are pregnant or plan to become pregnant. You should not get ZOSTAVAX to prevent chickenpox.

Talk to your health care professional if you plan to get ZOSTAVAX at the same time as PNEUMOVAX®23 (Pneumococcal Vaccine Polyvalent) because it may be better to get these vaccines at least 4 weeks apart.

Possible side effects include redness, pain, itching, swelling, hard lump, warmth, or bruising at the injection site, as well as headache.

ZOSTAVAX contains a weakened chickenpox virus. Tell your health care professional if you will be in close contact with newborn infants, someone who may be pregnant and has not had chickenpox or been vaccinated against chickenpox, or someone who has problems with their immune system. Your health care professional can tell you what situations you may need to avoid.

You are encouraged to report negative side effects of prescription drugs to the FDA. Visit www.fda.gov/medwatch or call 1-800-FDA-1088.

Please read the Patient Information on the adjacent page for more detailed information.

BEFORE YOU GET SHINGLES, GET VACCINATED.

MERCK

Patient Information about ZOSTAVAX® (pronounced "ZOS tah vax") Generic name: Zoster Vaccine Live

9989115

You should read this summary of information about ZOSTAVAX before you are vaccinated. If you have any questions about ZOSTAVAX after reading this page, you should ask your health care provider. This information does not take the place of talking about ZOSTAVAX with your doctor, nurse, or other health care provider. Only your health care provider can decide if ZOSTAVAX is right for you.

What is ZOSTAVAX and how does it work?

ZOSTAVAX is a vaccine that is used for adults 50 years of age or older to prevent shingles (also known as zoster).

ZOSTAVAX contains a weakened chickenpox virus (varicella-zoster virus).

ZOSTAVAX works by helping your immune system protect you from getting shingles.

If you do get shingles even though you have been vaccinated, ZOSTAVAX may help prevent the nerve pain that can follow shingles in some people. ZOSTAVAX does not protect everyone, so some people who get the vaccine may still get shingles.

ZOSTAVAX cannot be used to treat shingles, or the nerve pain that may follow shingles, once you have it.

What do I need to know about shingles and the virus that causes it?

Shingles is caused by the same virus that causes chickenpox. Once you have had chickenpox, the virus can stay in your nervous system for many years. For reasons that are not fully understood, the virus may become active again and give you shingles. Age and problems with the immune system may increase your chances of getting shingles.

Shingles is a rash that is usually on one side of the body. The rash begins as a cluster of small red spots that often blister. The rash can be painful. Shingles rashes usually last up to 30 days and, for most people, the pain associated with the rash lessens as it heals.

Who should not get ZOSTAVAX?

You should not get ZOSTAVAX if you:

- are allergic to any of its ingredients.
- are allergic to gelatin or neomycin.
- have a weakened immune system (for example, an immune deficiency, leukemia, lymphoma, or HIV/AIDS).
- take high doses of steroids by injection or by mouth.
- are pregnant or plan to get pregnant.

You should not get ZOSTAVAX to prevent chickenpox.

Children should not get ZOSTAVAX.

How is ZOSTAVAX given?

ZOSTAVAX is given as a single dose by injection under the skin.

What should I tell my health care provider before I get ZOSTAVAX?

You should tell your health care provider if you:

- have or have had any medical problems.
- take any medicines, including non-prescription medicines, and dietary supplements.
- have any allergies, including allergies to neomycin or gelatin.
- had an allergic reaction to another vaccine.
- are pregnant or plan to become pregnant.
- are breast-feeding.

Tell your health care provider if you expect to be in close contact (including household contact) with newborn infants, someone who may be pregnant and has not had chickenpox or been vaccinated against chickenpox, or someone who has problems with their immune system. Your health care provider can tell you what situations you may need to avoid.

Can I get ZOSTAVAX with other vaccines?

Talk to your health care provider if you plan to get ZOSTAVAX at the same time as the flu vaccine.

Talk to your health care provider if you plan to get ZOSTAVAX at the same time as PNEUMOVAX®23 (Pneumococcal Vaccine Polyvalent) because it may be better to get these vaccines at least 4 weeks apart.

What are the possible side effects of ZOSTAVAX?

The most common side effects that people in the clinical studies reported after receiving the vaccine include:

- redness, pain, itching, swelling, hard lump, warmth, or bruising where the shot was given.
- headache

The following additional side effects have been reported with ZOSTAVAX:

- allergic reactions, which may be serious and may include difficulty in breathing or swallowing. If you have an allergic reaction, call your doctor right away.
- chickenpox
- fever
- hives at the injection site
- joint pain
- muscle pain
- nausea
- rash
- rash at the injection site
- swollen glands near the injection site (that may last a few days to a few weeks)

Tell your health care provider if you have any new or unusual symptoms after you receive ZOSTAVAX. For a complete list of side effects, ask your health care provider.

Call 1-800-986-8999 to report any exposure to ZOSTAVAX during pregnancy.

What are the ingredients of ZOSTAVAX?

Active Ingredient: a weakened form of the varicella-zoster virus.

Inactive Ingredients: sucrose, hydrolyzed porcine gelatin, sodium chloride, monosodium L-glutamate, sodium phosphate dibasic, potassium phosphate monobasic, potassium chloride.

This page summarizes important information about ZOSTAVAX. If you would like more information, talk to your health care provider or visit the website at www.ZOSTAVAX.com or call 1-800-622-4477.

Rx only

Issued June 2011

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VACC-1077054-0002 05/13

Moon Lands on Man!

The skeptics said it couldn't be done… but our ***Moon Phase*** *proves that one small step for Stauer is one giant leap for watch lovers!*

It has always taken scientific skill and artistic wizardry to discover the Moon's secrets. When Galileo Galilei turned his telescope towards the Moon in 1609, he relied on his knowledge of light and shadow learned as a painter to understand the movements of the heavenly orb. We relied on that same pairing of art and science to create one of our most complicated and beautiful movements yet… for an unbelievable price!

Previously offered for **$399**, the stars have finally aligned to make the ***Stauer Moon Phase Watch*** available for **ONLY $99!**

Solving the mystery of Moon time. Since earthly time is measured at regular 12 month intervals, the Moon's month is at odds with our calendar. A lunar month is 29.53 days, so a Moon-phase watch needs to keep time in two totally different ways. That's why antique watch collectors are always quick to bid on this type of complex lunar movement. You'll find them among the rarest and most expensive vintage watches ever sold at auction. Not long ago, one of the most important moon-phase timepieces fetched an incredible $5.7 million!

Our goal was to create a timepiece more accurate and affordable than its ancestors. As you can imagine, an offer this good on a watch this spectacular cannot last forever.

How we captured the Moon. We put so much effort into perfecting the mechanics behind this watch, but we didn't forget the aesthetics. The ***Moon Phase Watch*** boasts three different complications set in the guillochéed face: a standard monthly calendar, a day of the week indicator, and the moon phase display. Its rose gold-finished case features a hobnail-pattern bezel and a crocodile-embossed, genuine brown leather strap adds the final luxurious detail.

Your satisfaction is 100% guaranteed. If you are not thrilled, simply return the timepiece within 30 days for a full refund of the purchase price. This offer is limited to the first 2,499 callers to this ad, so please don't wait. This kind of watch only comes around once in a blue moon.

Stunning little machine! "I am in love with this watch!" **— R. M. from Asheville, NC**

Fused rose gold case with hydraulic pattern dial • Day, date, and moon phase dials
Crocodile-embossed leather band fits a 6¾"–9" wrist • 3 ATM water resistance

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Limited to the First 2,499 respondents to this ad only

Stauer Moon Phase Watch ~~$399~~

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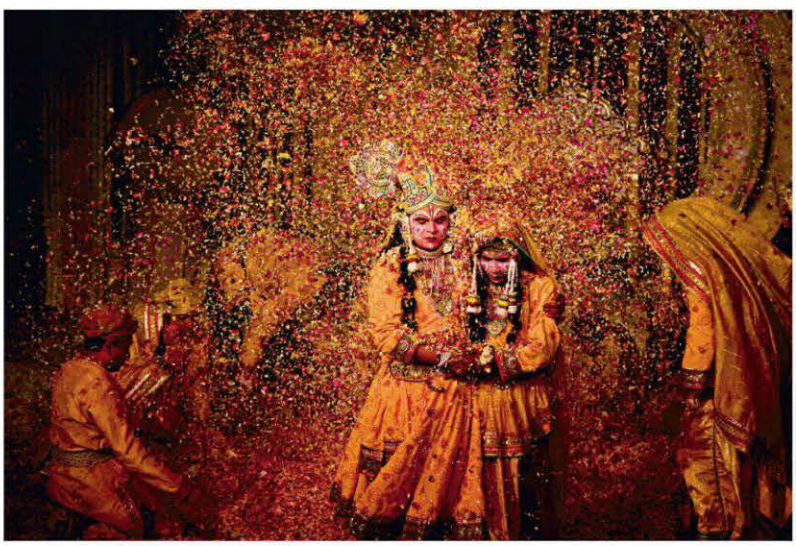
** Price quoted is for Call-In Customers only versus the original Stauer.com price.*

This page features two photographs: one chosen by our editors and one chosen by our readers via online voting. For more information, go to *yourshot.nationalgeographic.com.*

READERS' CHOICE **Tó Mané** Porto, Portugal

Near the western Portuguese town of Nazaré, Mané—a professional photographer—wanted to capture the coast's famously large waves from a new angle. Standing on the side of a hill, he watched a surfer tackle one of the biggest waves recorded that day.



EDITORS' CHOICE

Priyanka Telang
Gautam Buddha Nagar, India

In northern India, Telang watched a performance of a ritual dance known as Raas Leela, which celebrates the Hindu deity Krishna. To tell the story of Krishna's life, men dress in women's costumes and use flower petals to add color.

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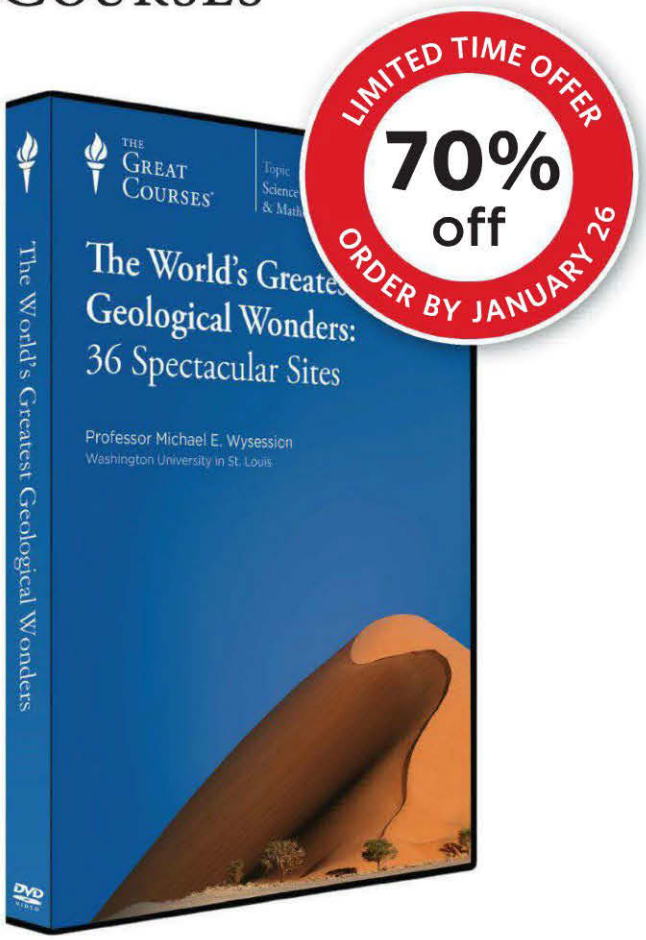

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Yellowstone, the Grand Canyon, Mount Fuji. These natural wonders make many people's short lists of geologically fascinating, must-see attractions. But what about Ha Long Bay, the Columbia Glacier, or Erta Ale lava lake? They also belong on the list, as do scores of other sites featuring breathtaking vistas that showcase the grandeur of geological forces in action.

Whether you're planning your next vacation or exploring the world from home, **The World's Greatest Geological Wonders** is your gateway to an unrivaled adventure. In these 36 lavishly illustrated lectures, award-winning Professor Michael E. Wysession of Washington University in St. Louis introduces you to more than 200 of the world's most outstanding geological destinations located in nearly 120 countries—and even some geological wonders found on other planets.

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5. Erta Ale—Compact Fury of Lava Lakes
6. Burgess Shale—Rocks and the Keys to Life
7. The Grand Canyon—Earth's Layers
8. The Himalayas—Mountains at Earth's Roof
9. The Ganges Delta—Earth's Fertile Lands
10. The Amazon Basin—Lungs of the Planet
11. Iguazu Falls—Thundering Waterfalls
12. Mammoth Cave—Worlds Underground
13. Cave of Crystals—Exquisite Caves
14. Great Blue Hole—Coastal Symmetry in Sinkholes
15. Ha Long Bay—Dramatic Karst Landscapes
16. Bryce Canyon—Creative Carvings of Erosion
17. Uluru/Ayers Rock—Sacred Nature of Rocks
18. Devils Tower—Igneous Enigmas
19. Antarctica—A World of Ice
20. Columbia Glacier—Unusual Glacier Cycles
21. Fiordland National Park—Majestic Fjords
22. Rock of Gibraltar—Catastrophic Floods
23. Bay of Fundy—Inexorable Cycle of Tides
24. Hawaii—Volcanic Island Beauty
25. Yellowstone—Geysers and Hot Springs
26. Kawah Ijen—World's Most Acid Lake
27. Iceland—Where Fire Meets Ice
28. The Maldives—Geologic Paradox
29. The Dead Sea—Sinking and Salinity
30. Salar de Uyuni—Flattest Place on Earth
31. Namib/Kalahari Deserts—Sand Mountains
32. Siwa Oasis—Paradise amidst Desolation
33. Auroras—Light Shows on the Edge of Space
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Look Again On March 6 we debuted our Tumblr blog Found, a collection of photos from the National Geographic archives. Within five months the site had 100,000 followers. You too can find Found—at *NatGeoFound.tumblr.com.*

Three shafts of sunlight illuminate St. Peter's Basilica and its marble floor in the Vatican, December 1971.

PHOTO: ALBERT MOLDVAY, NATIONAL GEOGRAPHIC CREATIVE


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The 2013 RAV4 with available adjustable power liftgate.
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Prototype shown with options. ©2013 Toyota Motor Sales, U.S.A., Inc.

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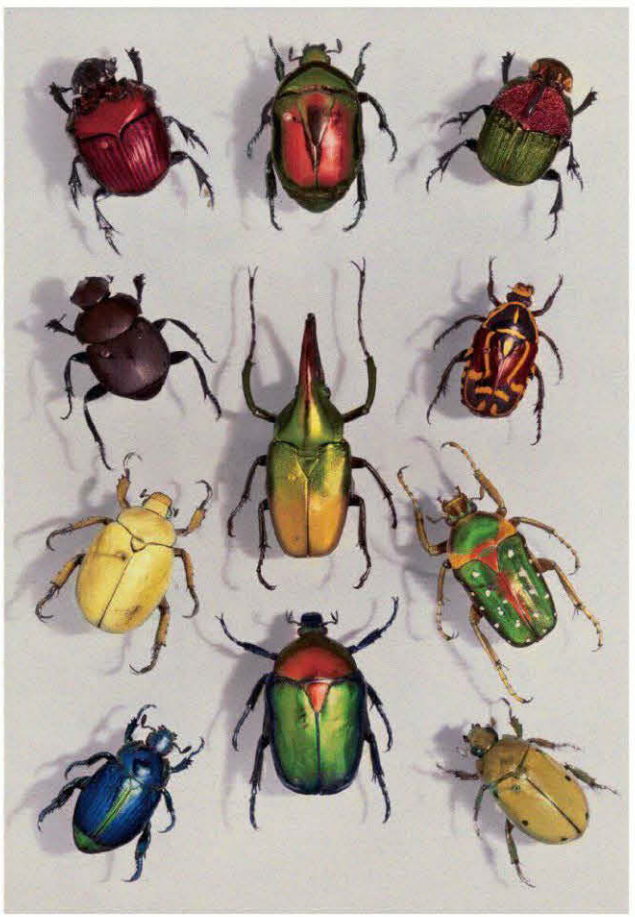


Girls eat large swirls of cotton candy in Copenhagen, Denmark, January 1963.

A swimming dock rests peacefully on Switzerland's Lake Thun, September 1985.

Scarab beetles from the Scarabaeid family gleam like jewels, July 1929.

Children form a circle around an ultraviolet lamp to get a dose of vitamin D in Murmansk, U.S.S.R., August 1977.

PHOTOS (CLOCKWISE FROM TOP LEFT): GILBERT M. GROSVENOR; JODI COBB; EDWIN L. WISHERD; DEAN CONGER; ALL NATIONAL GEOGRAPHIC CREATIVE

For people with a higher risk of stroke due to Atrial Fibrillation (AFib) not caused by a heart valve problem

I was taking warfarin. But I wondered, could I shoot for something better?

NOW I TAKE ELIQUIS® (apixaban) FOR 3 GOOD REASONS:

1. ELIQUIS reduced the risk of stroke better than warfarin.
2. ELIQUIS had less major bleeding than warfarin.
3. Unlike warfarin, there's no routine blood testing.

ELIQUIS and other blood thinners increase the risk of bleeding which can be serious, and rarely may lead to death.

Ask your doctor if ELIQUIS is right for you.

ELIQUIS is a prescription medicine used to reduce the risk of stroke and blood clots in people who have atrial fibrillation, a type of irregular heartbeat, not caused by a heart valve problem.

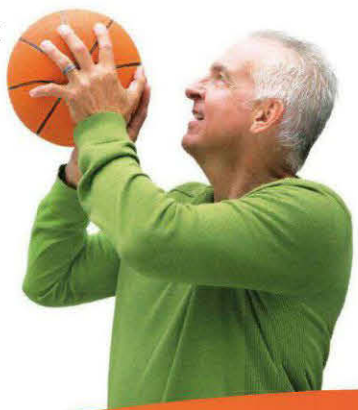
IMPORTANT SAFETY INFORMATION:

- **Do not stop taking ELIQUIS without talking to the doctor who prescribed it for you. Stopping ELIQUIS increases your risk of having a stroke.** ELIQUIS may need to be stopped, prior to surgery or a medical or dental procedure. Your doctor will tell you when you should stop taking ELIQUIS and when you may start taking it again. If you have to stop taking ELIQUIS, your doctor may prescribe another medicine to help prevent a blood clot from forming.
- **ELIQUIS can cause bleeding which can be serious,** and rarely may lead to death.
- **You may have a higher risk of bleeding if you take ELIQUIS and** take other medicines that increase your risk of bleeding, such as aspirin, NSAIDs, warfarin (COUMADIN®), heparin, SSRIs or SNRIs, and other blood thinners. **Tell your doctor about all medicines, vitamins and supplements you take.** While taking ELIQUIS, you may bruise more easily and it may take longer than usual for any bleeding to stop.
- Get medical help right away if you have any of these signs or symptoms of bleeding:
  - unexpected bleeding, or bleeding that lasts a long time, such as unusual bleeding from the gums; nosebleeds that happen often, or menstrual or vaginal bleeding that is heavier than normal
  - bleeding that is severe or you cannot control
  - red, pink, or brown urine; red or black stools (looks like tar)
  - coughing up or vomiting blood or vomit that looks like coffee grounds
  - unexpected pain, swelling, or joint pain; headaches, feeling dizzy or weak
- **ELIQUIS is not for patients with artificial heart valves.**
- **Before you take ELIQUIS,** tell your doctor if you have: kidney or liver problems, any other medical condition, or ever had bleeding problems. Tell your doctor if you are pregnant or breastfeeding, or plan to become pregnant or breastfeed.
- **Do not take ELIQUIS if you** currently have certain types of abnormal bleeding or have had a serious allergic reaction to ELIQUIS. A reaction to ELIQUIS can cause hives, rash, itching, and possibly trouble breathing. Get medical help right away if you have sudden chest pain or chest tightness, have sudden swelling of your face or tongue, have trouble breathing, wheezing, or feeling dizzy or faint.

You are encouraged to report negative side effects of prescription drugs to the FDA. Visit www.fda.gov/medwatch, or call 1-800-FDA-1088.

Please see additional Important Product Information on the adjacent page.

Individual results may vary.



Visit ELIQUIS.COM
or call 1-855-ELIQUIS

Eliquis®
(apixaban) tablets 5mg

IMPORTANT FACTS

Eliquis® (apixaban) tablets / Rx ONLY

The information below does not take the place of talking with your healthcare professional. Only your healthcare professional knows the specifics of your condition and how ELIQUIS® may fit into your overall therapy. Talk to your healthcare professional if you have any questions about ELIQUIS (pronounced ELL eh kwiss).

What is the most important information I should know about ELIQUIS (apixaban)?

Do not stop taking ELIQUIS without talking to the doctor who prescribed it for you. Stopping ELIQUIS increases your risk of having a stroke. ELIQUIS may need to be stopped, prior to surgery or a medical or dental procedure. Your doctor will tell you when you should stop taking ELIQUIS and when you may start taking it again. If you have to stop taking ELIQUIS, your doctor may prescribe another medicine to help prevent a blood clot from forming.

ELIQUIS can cause bleeding which can be serious, and rarely may lead to death. This is because ELIQUIS is a blood thinner medicine that reduces blood clotting.

You may have a higher risk of bleeding if you take ELIQUIS and take other medicines that increase your risk of bleeding, such as aspirin, nonsteroidal anti-inflammatory drugs (called NSAIDs), warfarin (COUMADIN®), heparin, selective serotonin reuptake inhibitors (SSRIs) or serotonin norepinephrine reuptake inhibitors (SNRIs), and other medicines to help prevent or treat blood clots.

Tell your doctor if you take any of these medicines. Ask your doctor or pharmacist if you are not sure if your medicine is one listed above.

While taking ELIQUIS:

- you may bruise more easily
- it may take longer than usual for any bleeding to stop

Call your doctor or get medical help right away if you have any of these signs or symptoms of bleeding when taking ELIQUIS:

- unexpected bleeding, or bleeding that lasts a long time, such as:
  - unusual bleeding from the gums
  - nosebleeds that happen often
  - menstrual bleeding or vaginal bleeding that is heavier than normal
- bleeding that is severe or you cannot control
- red, pink, or brown urine
- red or black stools (looks like tar)
- cough up blood or blood clots
- vomit blood or your vomit looks like coffee grounds
- unexpected pain, swelling, or joint pain
- headaches, feeling dizzy or weak

ELIQUIS (apixaban) is not for patients with artificial heart valves.

What is ELIQUIS?

ELIQUIS is a prescription medicine used to reduce the risk of stroke and blood clots in people who have atrial fibrillation.

It is not known if ELIQUIS is safe and effective in children.

Who should not take ELIQUIS?

Do not take ELIQUIS if you:

- currently have certain types of abnormal bleeding
- have had a serious allergic reaction to ELIQUIS. Ask your doctor if you are not sure

What should I tell my doctor before taking ELIQUIS?

Before you take ELIQUIS, tell your doctor if you:

- have kidney or liver problems
- have any other medical condition
- have ever had bleeding problems
- are pregnant or plan to become pregnant. It is not known if ELIQUIS will harm your unborn baby
- are breastfeeding or plan to breastfeed. It is not known if ELIQUIS passes into your breast milk. You and your doctor should decide if you will take ELIQUIS or breastfeed. You should not do both

Tell all of your doctors and dentists that you are taking ELIQUIS. They should talk to the doctor who prescribed ELIQUIS for you, before you have **any** surgery, medical or dental procedure.

Tell your doctor about all the medicines you take, including prescription and over-the-counter medicines, vitamins, and herbal supplements. Some of your other medicines may affect the way ELIQUIS works. Certain medicines may increase your risk of bleeding or stroke when taken with ELIQUIS.

How should I take ELIQUIS (apixaban)?

Take ELIQUIS exactly as prescribed by your doctor. Take ELIQUIS twice every day with or without food, and do not change your dose or stop taking it unless your doctor tells you to. If you miss a dose of ELIQUIS, take it as soon as you remember, and do not take more than one dose at the same time. **Do not run out of ELIQUIS. Refill your prescription before you run out. Stopping ELIQUIS may increase your risk of having a stroke.**

What are the possible side effects of ELIQUIS?

- See **"What is the most important information I should know about ELIQUIS?"**
- ELIQUIS can cause a skin rash or severe allergic reaction. Call your doctor or get medical help right away if you have any of the following symptoms:
  - chest pain or tightness
  - swelling of your face or tongue
  - trouble breathing or wheezing
  - feeling dizzy or faint

Tell your doctor if you have any side effect that bothers you or that does not go away.

These are not all of the possible side effects of ELIQUIS. For more information, ask your doctor or pharmacist.

Call your doctor for medical advice about side effects. You may report side effects to FDA at 1-800-FDA-1088.

This is a brief summary of the most important information about ELIQUIS. For more information, talk with your doctor or pharmacist, call 1-855-ELIQUIS (1-855-354-7847), or go to www.ELIQUIS.com.

Manufactured by:
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Princeton, New Jersey 08543 USA
Marketed by:
Bristol-Myers Squibb Company
Princeton, New Jersey 08543 USA
and
Pfizer Inc
New York, New York 10017 USA

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This independent, non-profit organization provides assistance to qualifying patients with financial hardship who generally have no prescription insurance. Contact 1-800-736-0003 or visit www.bmspaf.org for more information.

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Overhead this month in parts of the world

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The name Maasai is among the world's most valuable brands. More than 80 products estimated to be worth billions—including cars, clothing, and jewelry—are labeled with the name of the nomadic group. The only problem, says the Maasai Intellectual Property Initiative's Isaac ole Tialolo, is that no one asked the Maasai's permission.

The initiative is reaching out to all the tribes of the more than three million Maasai spread across Kenya and Tanzania. The goal is to elect an authorizing body to review requests to brand future products as Maasai, and assess the ones already on the market—much as the Navajo have done in the U.S. "As the cultural owners, we want respect," says Tialolo. "We want to protect our heritage, our name, our image."

—Johnna Rizzo

A Maasai youth jumps from a standstill to prove his strength—and gain female attention.

PHOTO: MICHAEL POLIZA

COOL TOOLS FROM MOTHER NATURE

We often get our best ideas by looking out the window. What's out there in nature represents 3.8 billion years of research and development, according to biomimicry expert Janine Benyus. Ideas that failed in evolutionary product testing are now fossils. What's left are some highly instructive success stories. This is a quiz about some of the spin-offs that have come from paying attention to life right here on Earth.

1. TYPE 2 DIABETES NOW AFFECTS TENS OF MILLIONS OF PEOPLE. RESEARCHERS RECENTLY DEVELOPED A TREATMENT THAT COMES FROM WHICH NATURAL PRODUCT?

A. The bark of the sycamore tree B. Gila monster spit C. A camel's gall bladder D. The Venus flytrap

2. WHICH ANIMAL, FIRST DISCOVERED IN THE HUDSON RIVER VALLEY, TURNED THE IDEA OF EXTINCTION FROM HERESY INTO A FACT OF LIFE?

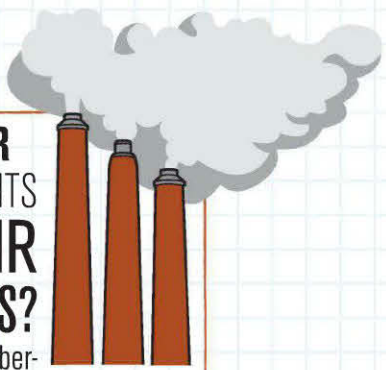
A. The American cheetah B. The giant ground sloth C. The American mastodon D. *Megalosaurus*

3. THE FIRST DRUG TO TURN HIV FROM A DEATH SENTENCE INTO A CONTROLLABLE DISEASE WAS BASED ON PRODUCTS FROM WHICH SPECIES?

A. A marine sponge B. An immune West African monkey C. The Pacific yew tree D. A cone snail

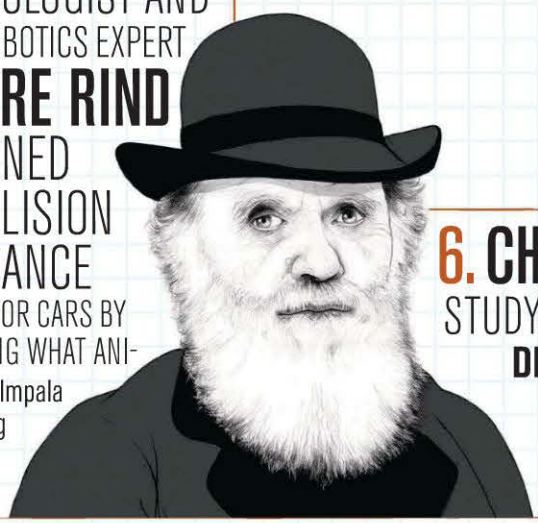
4. WHAT ANIMAL BEHAVIOR IS TEACHING POWER PLANTS A WAY TO CUT THEIR CARBON DIOXIDE EMISSIONS?

A. Tardigrade cryptobiosis B. Grizzly bear hibernation C. Albatross long-distance flight D. Coral calcification



5. BIOLOGIST AND ROBOTICS EXPERT CLAIRE RIND DESIGNED A COLLISION AVOIDANCE SYSTEM FOR CARS BY OBSERVING WHAT ANIMAL?

A. Impala B. Mustang C. Jaguar D. Locust



6. CHARLES DARWIN SPENT YEARS STUDYING WHICH ANIMAL GROUP AS HE DEVELOPED THE IDEA OF EVOLUTION BY NATURAL SELECTION?

A. Earthworms B. Galápagos iguanas C. Barnacles D. The peppered moth

FIND ANSWERS ON PAGE 29.

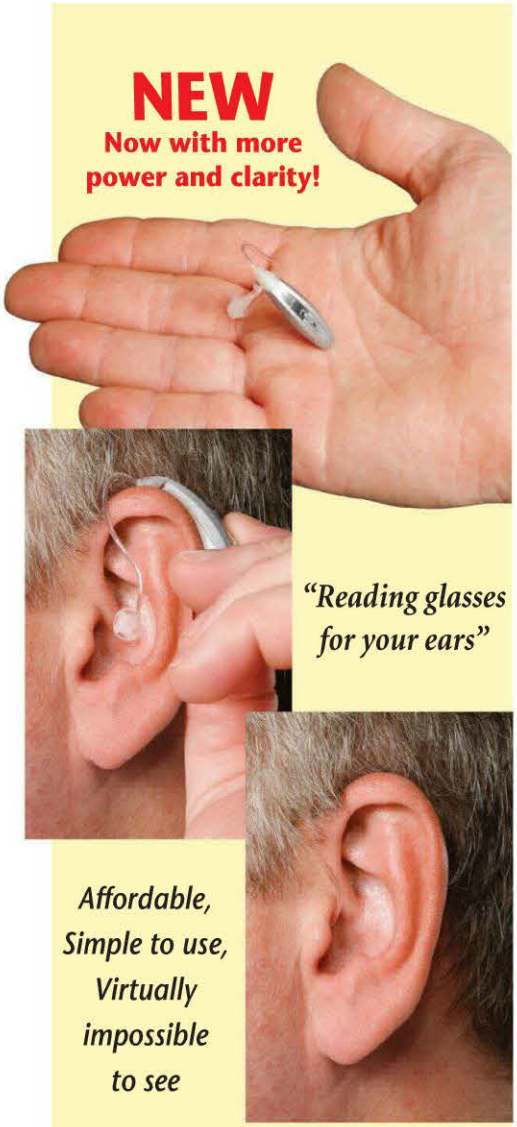
CUT HERE

HANNAH TAK, NGM STAFF. ART: GRAFILU (PORTRAIT); NGM ART. PHOTO: STOCKBYTE/GETTY IMAGES

An Affordable Option

Perfect Choice HD™ is easy to use,
hard to see and costs far less…
it's like reading glasses for your ears™!

The invention of the year is great news for your ears.



Over the years, digital electronic technology has made the way we live easier, safer and more convenient. In many cases, it's even made many products more affordable… (remember how much the first VCRs used to cost?). Unfortunately, the cost of many digital products, including the hearing aid never seemed to come down. Now, a new option has been invented… it's called Perfect Choice HD™.

Perfect Choice HD is NOT a hearing aid. It is a Personal Sound Amplification Product (PSAP). Hearing aids can only be sold by an audiologist. Once the audiologist had you tested and fitted, you would have to pay as much as $5000 for the product.

Now, thanks to the efforts of the doctor who leads a renowned hearing institute, there is Perfect Choice HD. It's designed to accurately amplify sounds and deliver them to your ear. Because we've developed an efficient production process, we can make a great product at an affordable price. The unit has been designed to have an easily accessible battery, but it is small and lightweight enough to hide behind your ear… only you'll know you have it on. It's comfortable and won't make you feel like you have something stuck in your ear. It provides high quality audio so sounds and conversations will be easier to hear and understand.

Try it for yourself with our exclusive home trial. Some people need hearing aids but many just need the extra boost in volume that a PSAP gives them. We want you to be happy with Perfect Choice HD, so we are offering to let you try it for yourself. If you are not totally satisfied with this product, simply return it within 60 days for a refund of the full product purchase price. Don't wait… don't miss out on another conversation… call now!

Why Perfect Choice HD is the best choice !	
Lightweight / Inconspicuous	Less than 1 ounce
Sound Quality	Excellent – Optimized for speech
Test and Fitting Required	No
Free Batteries for Life	Yes, ask for details
One-on-One Personal Set Up	Free
Friendly Return Policy	60 Days

Are you or a loved one frustrated in these situations?

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Perfect Choice HD is not a hearing aid.
If you believe you need a hearing aid,
please consult a physician.

80787

Tourism accounts for one in eleven jobs on the planet.

Workers prepare tusks for the June 21 ivory destruction ceremony in Manila. Five tons of ivory were crushed.

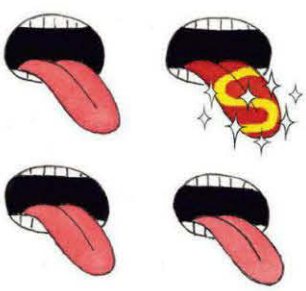
Ivory Crush

The battle against the illegal ivory trade went dental in June when the Philippines became the first non-African country to destroy its ivory stock. As both a consumer of illegal ivory—primarily for Roman Catholic religious icons—and a transit country for ivory headed to bigger markets, the Philippines has played a key role in the ivory smuggling problem. Now it hopes to play a role in its solution.

Crime syndicates slaughter tens of thousands of African elephants annually and smuggle their tusks mostly to China, where they are carved into ivory items, from chopsticks to religious figurines. It is a booming $50-million-a-year black market industry.

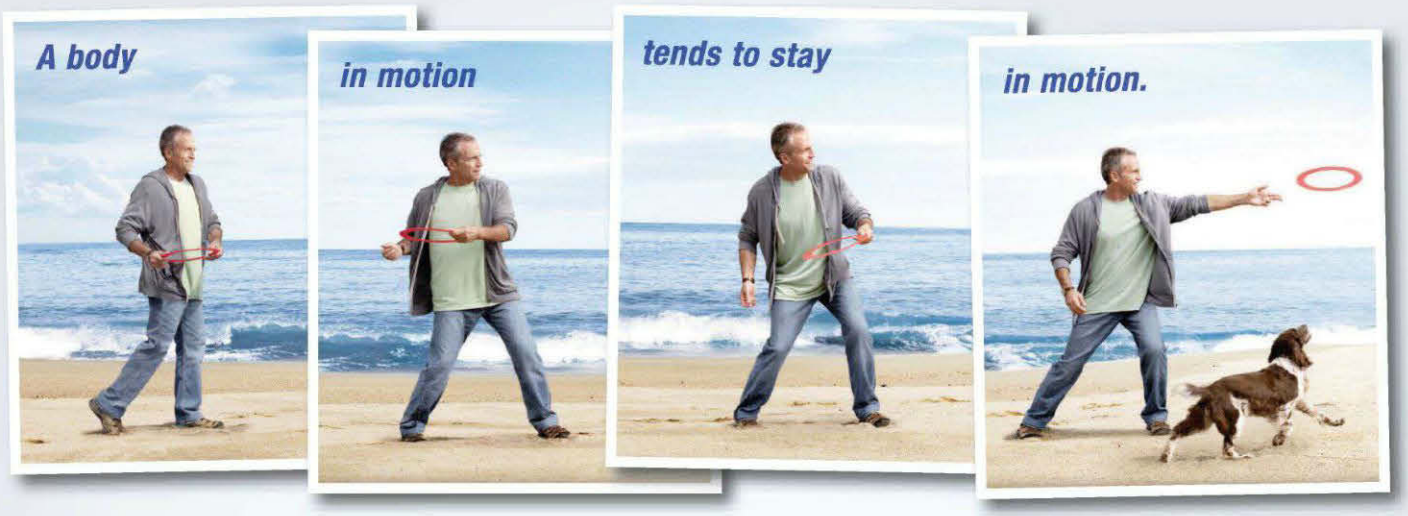
Workers spent days sorting tusks and drilling samples to be sent to the U.S. for DNA analysis. They spread the teeth in a parking lot to be shattered with a backhoe and road roller, then incinerated in an animal crematorium. The burned remains, officials say, will go to an elephant memorial.

"The Philippines will not be a party to this massacre, and we refuse to be a conduit to this cycle of killing," declared Department of Environment and Natural Resources Secretary Ramon J. P. Paje. Meanwhile, seized ivory piles up in national storerooms around the world. *—Bryan Christy*



Mouth Full One in four people is a "supertaster," a label for those who have a higher number of taste buds, which results in a heightened sense of taste. The condition—seen more in women—can be bittersweet. Supertasters eat fewer leafy greens, elevating the risk of colon cancer. They're also averse to fats. What they all have in common, says University of Florida's Linda Bartoshuk, is they're picky eaters. *—Daniel Stone*

PHOTO: BRENT STIRTON, REPORTAGE BY GETTY IMAGES. ART: MARC JOHNS; ÁLVARO VALIÑO (TOP). SOURCE: WORLD ECONOMIC FORUM



Celebrex can help relieve arthritis pain, so you can keep moving.

Staying active can actually relieve arthritis symptoms. But if you have arthritis, staying active can be difficult. Celebrex can help relieve arthritis pain…so *your* body can stay in motion.

- **Just one 200mg Celebrex a day can provide 24-hour relief for many with arthritis pain and inflammation.***
- **Celebrex is proven to improve pain, stiffness and daily physical function in clinical studies.****
- **Celebrex can be taken with or without food.**
- **Celebrex is not a narcotic.**

When it comes to finding the right arthritis treatment for you, you and your doctor need to balance the benefits with the risks. So ask your doctor about prescription Celebrex. It could be an important step towards keeping *your* body in motion.

Visit **celebrex.com** or call 1-888-CELEBREX for more information.

Celebrex has been an option for millions of patients for over 14 straight years.

*Individual results may vary. **Clinical studies with osteoarthritis patients.

You are encouraged to report negative side effects of prescription drugs to the FDA. Visit www.fda.gov/medwatch or call 1-800-FDA-1088.

Important Safety Information:

All prescription NSAIDs, like CELEBREX, ibuprofen, naproxen and meloxicam have the same cardiovascular warning. They may all increase the chance of heart attack or stroke, which can lead to death. This chance increases if you have heart disease or risk factors for it, such as high blood pressure or when NSAIDs are taken for long periods.

CELEBREX should not be used right before or after certain heart surgeries.

Serious skin reactions, or stomach and intestine problems such as bleeding and ulcers, can occur without warning and may cause death. Patients taking aspirin and the elderly are at increased risk for stomach bleeding and ulcers.

Tell your doctor if you have: a history of ulcers or bleeding in the stomach or intestines; high blood pressure or heart failure; or kidney or liver problems.

CELEBREX should not be taken in late pregnancy.

Life-threatening allergic reactions can occur with CELEBREX. Get help right away if you've had swelling of the face or throat or trouble breathing. Do not take it if you have bleeding in the stomach or intestine, or you've had an asthma attack, hives, or other allergies to aspirin, other NSAIDs or certain drugs called sulfonamides.

Prescription CELEBREX should be used exactly as prescribed at the lowest dose possible and for the shortest time needed.

See the Medication Guide on the next page for important information about Celebrex and other prescription NSAIDs.

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CELEBREX® (CELECOXIB CAPSULES) 100 mg 200 mg

For a body in motion™

Medication Guide
for
Non-Steroidal Anti-Inflammatory Drugs (NSAIDs)

(See the end of this Medication Guide for a list of prescription NSAID medicines.)

What is the most important information I should know about medicines called Non-Steroidal Anti-Inflammatory Drugs (NSAIDs)?

NSAID medicines may increase the chance of a heart attack or stroke that can lead to death.

This chance increases:

- with longer use of NSAID medicines
- in people who have heart disease

NSAID medicines should never be used right before or after a heart surgery called a "coronary artery bypass graft (CABG)."

NSAID medicines can cause ulcers and bleeding in the stomach and intestines at any time during treatment. Ulcers and bleeding:

- can happen without warning symptoms
- may cause death

The chance of a person getting an ulcer or bleeding increases with:

- taking medicines called "corticosteroids" and "anticoagulants"
- longer use
- smoking
- drinking alcohol
- older age
- having poor health

NSAID medicines should only be used:

- exactly as prescribed
- at the lowest dose possible for your treatment
- for the shortest time needed

What are Non-Steroidal Anti-Inflammatory Drugs (NSAIDs)?

NSAID medicines are used to treat pain and redness, swelling, and heat (inflammation) from medical conditions such as:

- different types of arthritis
- menstrual cramps and other types of short-term pain

Who should not take a Non-Steroidal Anti-Inflammatory Drug (NSAID)?

Do not take an NSAID medicine:

- if you had an asthma attack, hives, or other allergic reaction with aspirin or any other NSAID medicine
- for pain right before or after heart bypass surgery

Tell your healthcare provider:

- about all of your medical conditions.
- about all of the medicines you take. NSAIDs and some other medicines can interact with each other and cause serious side effects. **Keep a list of your medicines to show to your healthcare provider and pharmacist.**
- if you are pregnant. **NSAID medicines should not be used by pregnant women late in their pregnancy.**
- if you are breastfeeding. **Talk to your doctor.**

What are the possible side effects of Non-Steroidal Anti-Inflammatory Drugs (NSAIDs)?

Serious side effects include:

- heart attack
- stroke
- high blood pressure
- heart failure from body swelling (fluid retention)
- kidney problems including kidney failure
- bleeding and ulcers in the stomach and intestine
- low red blood cells (anemia)
- life-threatening skin reactions
- life-threatening allergic reactions
- liver problems including liver failure
- asthma attacks in people who have asthma

Other side effects include:

- stomach pain
- constipation
- diarrhea
- gas
- heartburn
- nausea
- vomiting
- dizziness

Get emergency help right away if you have any of the following symptoms:

- shortness of breath or trouble breathing
- chest pain
- weakness in one part or side of your body
- slurred speech
- swelling of the face or throat

Stop your NSAID medicine and call your healthcare provider right away if you have any of the following symptoms:

- nausea
- more tired or weaker than usual
- itching
- your skin or eyes look yellow
- stomach pain
- flu-like symptoms
- vomit blood
- there is blood in your bowel movement or it is black and sticky like tar
- skin rash or blisters with fever
- unusual weight gain
- swelling of the arms and legs, hands and feet

These are not all the side effects with NSAID medicines. Talk to your healthcare provider or pharmacist for more information about NSAID medicines.

Call your doctor for medical advice about side effects. You may report side effects to FDA at 1-800-FDA-1088.

Other information about Non-Steroidal Anti-Inflammatory Drugs (NSAIDs)

- Aspirin is an NSAID medicine but it does not increase the chance of a heart attack. Aspirin can cause bleeding in the brain, stomach, and intestines. Aspirin can also cause ulcers in the stomach and intestines.
- Some of these NSAID medicines are sold in lower doses without a prescription (over-the-counter). Talk to your healthcare provider before using over-the-counter NSAIDs for more than 10 days.

NSAID medicines that need a prescription

Generic Name	Tradename
Celecoxib	Celebrex
Diclofenac	Cataflam, Voltaren, Arthrotec (combined with misoprostol)
Diflunisal	Dolobid
Etodolac	Lodine, Lodine XL
Fenoprofen	Nalfon, Nalfon 200
Flurbiprofen	Ansaid
Ibuprofen	Motrin, Tab-Profen, Vicoprofen* (combined with hydrocodone), Combunox (combined with oxycodone)
Indomethacin	Indocin, Indocin SR, Indo-Lemmon, Indomethagan
Ketoprofen	Oruvail
Ketorolac	Toradol
Mefenamic Acid	Ponstel
Meloxicam	Mobic
Nabumetone	Relafen
Naproxen	Naprosyn, Anaprox, Anaprox DS, EC-Naproxyn, Naprelan, Naprapac (copackaged with lansoprazole)
Oxaprozin	Daypro
Piroxicam	Feldene
Sulindac	Clinoril
Tolmetin	Tolectin, Tolectin DS, Tolectin 600

* Vicoprofen contains the same dose of ibuprofen as over-the-counter (OTC) NSAIDs, and is usually used for less than 10 days to treat pain. The OTC NSAID label warns that long term continuous use may increase the risk of heart attack or stroke.

This Medication Guide has been approved by the U.S. Food and Drug Administration.
LAB-0609-1.0

Brazil Expedition Uncovers Thousands of Carats of Exquisite Natural Emeralds

Brandish a whopping 50 carats of genuine South American emeralds in a handcrafted new necklace design for less than $200..... and get a $100 Stauer Gift Coupon!

Halfway into our ambitious trek through the rain forest I had to remind myself that "Nothing good comes easy." These days it seems that every business trip to Brazil includes a sweltering hike through overgrown jungles, around cascading waterfalls and down steep rock cliffs. But our gem broker insisted it was worth the trouble. To tell you the truth, for the dazzling emeralds he delivered, I'd gladly go back to stomping through jaguar country.

Now our good fortune is your great reward. Don't miss this rare opportunity to own an impressive 50 carat strand of genuine South American emeralds for under $200. And for a limited time, we'll sweeten every necklace order with **a $100 Stauer Gift Coupon!**

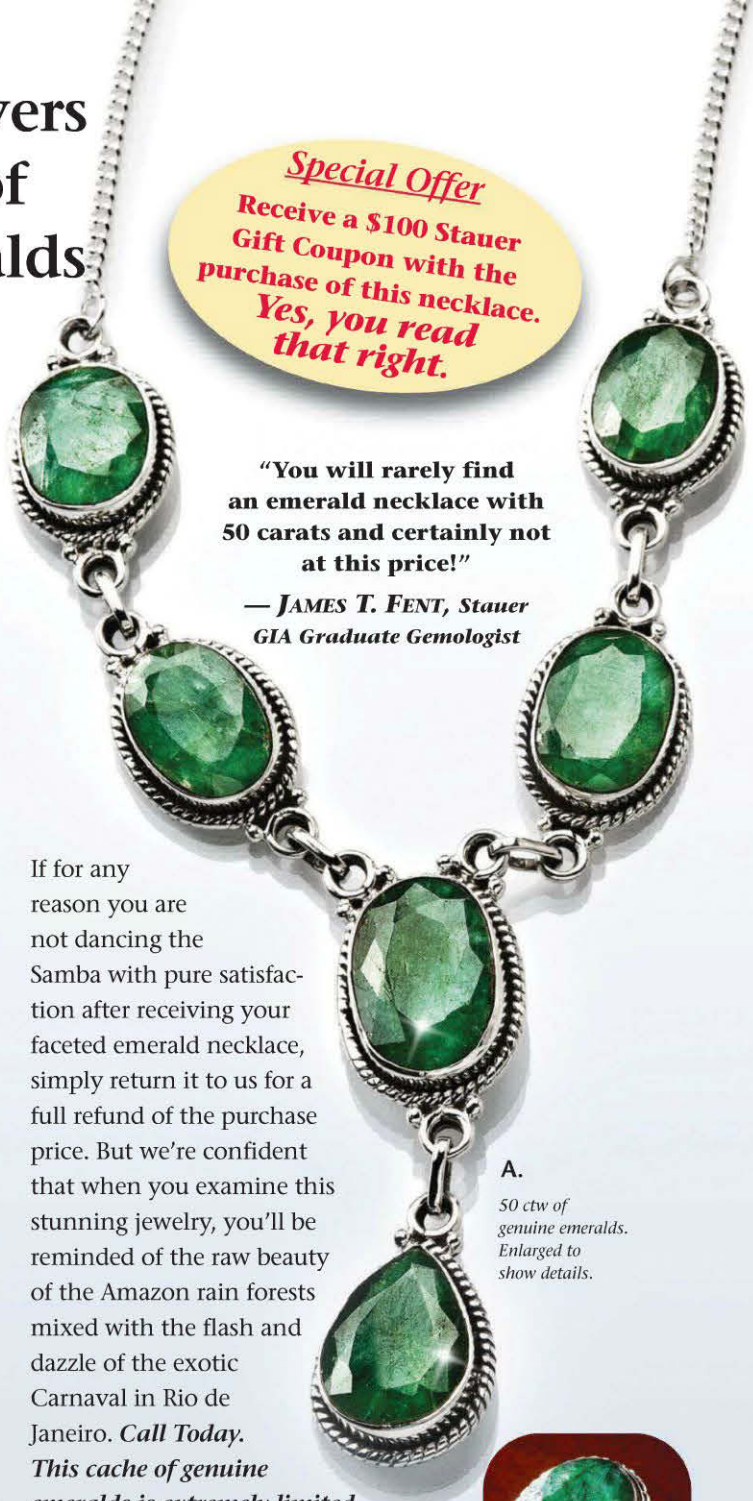
Faced with this embarrassment of riches, our designer transformed this spectacular cache of large stones (each is over 8 carats average weight) into a stunning 50 ctw necklace of faceted emeralds set into .925 sterling silver. Each emerald is surrounded by delicate sterling silver rope work and filigree in the Bali-style. The 18" necklace dangles from a sterling silver chain that fastens with a secure double-sided shepherd's hook clasp.

What is the source of our emerald's timeless appeal?

The enchanting color of the Stauer ***Carnaval*** **Faceted Emerald Necklace** comes from nature's chemistry. Our polished and faceted, well-formed natural emeralds are immediately recognized as something special. Indeed, when we evaluated these emeralds, color was the most important quality factor. Today, scientists tell us that the human eye is more sensitive to the color green than to any other. Perhaps that is why green is so soothing to the eye, and why the color green complements every other color in your wardrobe.

Emeralds are, by weight, the most valuable gemstone in the world.

Now you can wear genuine emeralds and feel great about knowing that you were able to treat yourself to precious gems without paying a precious price. A top-quality 50 carat emerald necklace found on Rodeo Drive or 5th Avenue could cost well over $100,000...but not from Stauer. Wear and admire the exquisite Stauer ***Carnaval*** **Faceted Emerald Necklace** for 30 days.



Special Offer
Receive a $100 Stauer Gift Coupon with the purchase of this necklace. Yes, you read that right.

"You will rarely find an emerald necklace with 50 carats and certainly not at this price!"
— James T. Fent, Stauer GIA Graduate Gemologist

A.
50 ctw of genuine emeralds. Enlarged to show details.

If for any reason you are not dancing the Samba with pure satisfaction after receiving your faceted emerald necklace, simply return it to us for a full refund of the purchase price. But we're confident that when you examine this stunning jewelry, you'll be reminded of the raw beauty of the Amazon rain forests mixed with the flash and dazzle of the exotic Carnaval in Rio de Janeiro. ***Call Today. This cache of genuine emeralds is extremely limited.***


B.


C.


D.

A. ***Carnaval*** **Necklace** (50 ctw) **$195**
B. ***Carnaval*** **Ring** (13 ctw) **$125**
C. ***Carnaval*** **Earrings** (20 ctw) **$125**
D. ***Carnaval*** **Bracelet** (50 ctw) **$175**
Carnaval **Collection** (83 ctw) ~~$445~~
Includes necklace, ring and earrings.
Now only **$295** ***Save $150!***

*Special Offer—Receive a $100 Stauer Gift Coupon with the purchase of the *Carnaval* Necklace or Collection.*

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Soaring Numbers

"Most people know more birds than they give themselves credit for," says the Great Backyard Bird Count's Pat Leonard. Since 1998 the count has been asking bird-watchers to record which ones they see over four days every February, just before birds begin migrating north again. The value comes over the long term—marking a drop in the population of American crows from year to year, for example.

Having citizens, not scientists, contributing data has a big upside: They can cover a massive area. It also comes with reliability challenges. Organizers—which include Cornell's Lab of Ornithology, the National Audubon Society, and Bird Studies Canada—flag and review reports that contain birds not known to be in the area or an unusually large number of species. Adds Leonard, "We also tell people, 'If you just can't ID a bird for sure, don't report it.'" *—Johnna Rizzo*

TOTAL SPECIES IN 2013
3,610

INDIVIDUAL BIRDS REPORTED
34,512,432

LISTS SUBMITTED
134,935

GREAT BACKYARD BIRD COUNT PARTICIPANTS
Formerly including only the U.S. and Canada, the GBBC tapped the Internet and let participants register online in 2013. People in 110 countries sent in lists of birds they'd observed. North America still had three of the four countries with the most submissions—including the top submitter, the U.S., with 120,500.

Checklists submitted by country/territory
No participation · 1-100 · 101-500 · 12,000+

MOST WIDESPREAD
House sparrow 43 countries

REPORTED IN EVERY U.S. STATE
Mallard, Canada goose, and rock pigeon

MOST STRIKING CHANGE 2012-13
Red crossbill, white-winged crossbill, common redpoll, and hoary redpoll
U.S. sightings of these four species of winter finch doubled or tripled since the previous count.

To register, go to *birdsource.org*.

LARGEST FLOCK ▶

Red-winged blackbird

An estimated five million in a single sighting at the Mark Youngdahl Urban Conservation Area in St. Joseph, Missouri

MOST REPORTED ▲

Northern cardinal

Appeared on 46,515 lists

◀ LEAST REPORTED

Spectacled finch

Appeared on one list

BIGGEST INCREASE 2012-13 ▲

Red-breasted nuthatch

Count grew from 6,865 to 17,767 lists.

NOTABLE SPECTACLE ▶

Lesser flamingo

A sighting of 50,000 simultaneously at Lake Manyara National Park, Tanzania

ART: KARL MÅRTENS. NGM MAPS. SOURCE: GREAT BACKYARD BIRD COUNT

PEOPLE WILL TALK.

"I LOVE your ring!"
- Bank teller

"How much?
... seriously?"
- Your husband

"There is NO WAY
this ring cost you
only $79!"
*- Linda from
accounting*

"Wow. That color
is unbelievable!"
- Your hairdresser

"I want one."
- Your best friend

"PLEASE tell me where
you found that ring! "
- Waitress at lunch

87% Less than the independently appraised value*

Wear this stunning 2-carat Tanzanite Ring for only $79! Random compliments are absolutely FREE.

This is not the ring to wear if you want to blend in. Two carats of genuine tanzanite attracts attention. Lots of it. People will talk. That's just what happens when you wear the passionate purple stone experts have called "the most beautiful gem discovered in generations." Put it on your finger and you'll understand why the **Stauer Sunburst Tanzanite Ring** is a spectacular piece of jewelry that refuses to be ignored.

Tanzanite is 1,000 times rarer than diamond. It became a sensation when it was first discovered in 1967 in Tanzania's Merelani Hills (in the shadow of Mount Kilimanjaro). It is found nowhere else on Earth and experts say supplies will not last forever.

Don't miss your chance to make gem history. Nobody knows exactly how much remains to be found, but Fifth Avenue is more than happy to charge you as if the mines were nearly empty. One of the largest jewelry retailers is selling genuine tanzanite rings online for well over $2,000 each. That's ridiculous. Order now and we'll send you an elegant .925 sterling-silver setting loaded with 2 carats of marquise-cut tanzanite for only $79!

Other jewelry stores hate us because we don't play by their rules. We took the Sunburst Tanzanite Ring to an independent appraiser who works with auction houses, estate sales and insurance companies. He valued it at $590.* We thanked him for his professional opinion and then ignored it. Because even if a graduate gemologist tells us that this tanzanite ring is valued at nearly $600, we want you to have it for **ONLY $79**. I know it sounds ridiculous, but we're absolutely serious. For this exclusive offer, we've actually lowered our price for one of the world's most endangered gemstones.

Your satisfaction is 100% guaranteed. If for any reason you don't completely adore your 2-carat Sunburst Tanzanite Ring, just send it back within 30 days for a full refund of your purchase price. Yes, it's really that simple. And yes... it really is that beautiful. *Mention ring size: 5-10*

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Was ~~$99~~ *Now Only* **$79** + S&P

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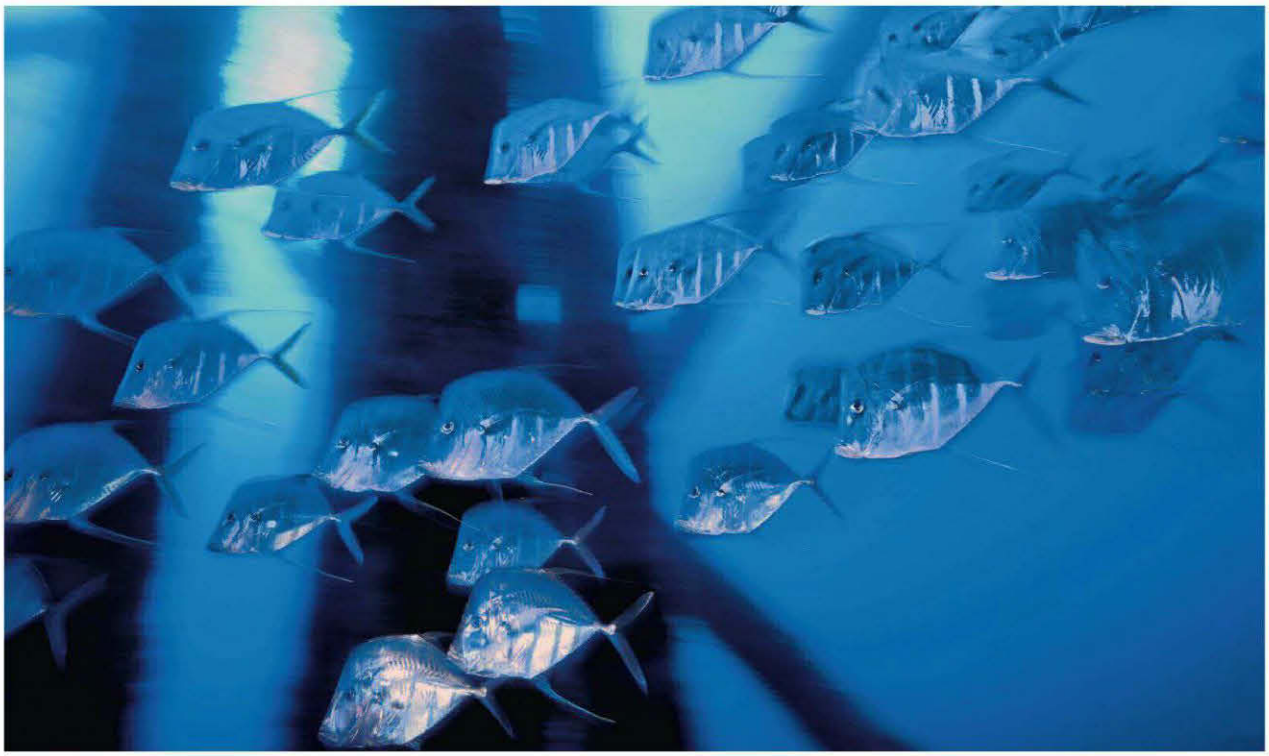
** For more information concerning the appraisal, visit **http://www.stauer.com/appraisedvalues.asp**.*

Mars—named for the Roman god of war—is represented by the male symbol. Venus—named for the Roman goddess of beauty—is represented by the female symbol.



Gone Fishing

The lookdown fish—named for its downward gaze—is a master at hiding in plain sight. Its skin manipulates polarized light, allowing the fish to remain mostly undetected by predators in its brightly lit Atlantic coastal habitat. The adaptation may prove useful for warfare too. The U.S. Navy requested research this year on whether the properties of the lookdown's skin may be mimicked on ships and submarines. Painting hulls with reflective paint, says biologist Molly Cummings, may boost underwater camouflage. *—Daniel Stone*

A school of lookdown fish is visible only from close range, a trait that could be useful for the military.

ANSWERS FOR EXPLORERS QUIZ

1. (B) Gila monster spit. John Eng, an endocrinologist in New York City, was studying venoms in the early 1990s when he began to work with a sample of Gila monster saliva he'd purchased by mail. The resulting drug, exenatide, was already on the market by the time Eng finally saw his first Gila monster in the flesh, 14 years later.
2. (C) The American mastodon. After its discovery in Claverack, New York, in 1705, this creature inspired debate. In 1796 French anatomist Georges Cuvier compared multiple pachyderm species and argued that the mastodon was an extinct species, an idea that shattered Western ideas about the nature of life on Earth.
3. (A) A marine sponge. In the 1950s compounds from a sponge species now known as *Tectitethya crypta* inspired researchers to develop early anticancer and antiviral drugs. In the 1980s they used that same model from the natural world to produce AZT, the first drug effective against HIV/AIDS.
4. (D) Coral calcification. By studying the way corals construct their exoskeletons, Stanford researcher Brent Constantz devised a similar technology to capture carbon dioxide emissions from power plants, mix them with seawater, and produce calcium carbonate as a raw material for cement. A current pilot project also aims to cut reliance on fossil fuels in cement manufacturing, the world's third largest source of greenhouse gas emissions.
5. (D) Locusts. To find out how African locusts fly in swarms without banging into each other, Rind made the insects watch clips of *Star Wars* movies. She recorded how their eyes and brains reacted to the fast-moving objects in the films. A three-wheeled robot guided by her team's locust-style collision avoidance software has so far racked up a 91 percent success rate—OK as tested in a model city built with Lego blocks, but not yet street ready.
6. (C) Barnacles. A tiny barnacle he once collected led Darwin to work out minute differences within the barnacle infraclass Cirripedia. It was exasperating work. He once said, "I hate a Barnacle as no man ever did before." But barnacles helped him develop his evolutionary theory and added to his credibility among scientists.

PHOTO: DAVID DOUBILET, NATIONAL GEOGRAPHIC CREATIVE. ART: ÁLVARO VALIÑO

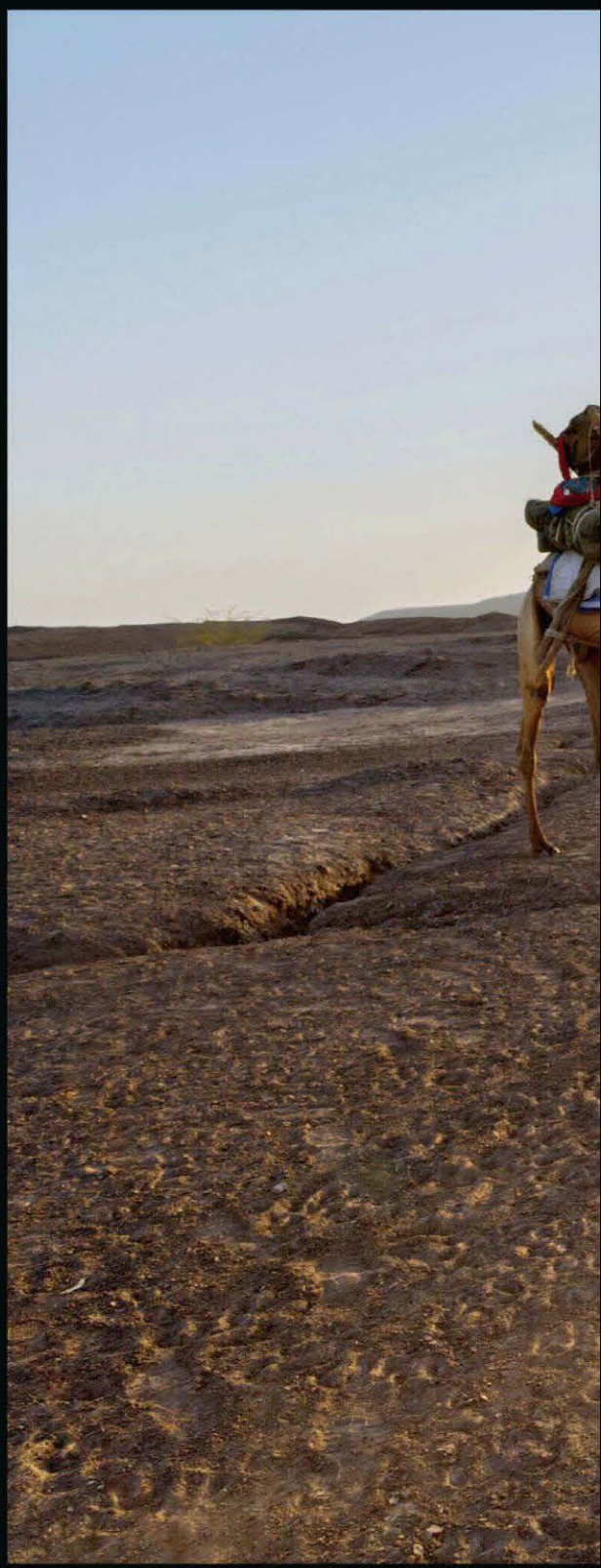
I AM IN PURSUIT
OF AN IDEA,
A STORY, A CHIMERA,
PERHAPS A FOLLY.
I AM CHASING GHOSTS.

—Paul Salopek

Following pages: Author Salopek's feet connect him to the earliest travelers as he leads camels across Ethiopia's Afar desert. Left: Impoverished African migrants crowd the night shore of Djibouti city, trying to capture inexpensive cell signals from neighboring Somalia—a tenuous link to relatives abroad. For more than 60,000 years our species has been relying on such intimate social connections to spread across the Earth.

JOURNALIST PAUL SALOPEK EMBARKS ON A SEVEN-YEAR GLOBAL TREK FROM AFRICA TO TIERRA DEL FUEGO, FOLLOWING IN THE FOOTSTEPS OF OUR RESTLESS FOREBEARS.

TO WALK THE WORLD



OUT OF EDEN

BY PAUL SALOPEK PHOTOGRAPHS BY JOHN STANMEYER

Walking is falling forward.

Each step we take is an arrested plunge, a collapse averted, a disaster braked. In this way, to walk becomes an act of faith. We perform it daily: a two-beat miracle—an iambic teetering, a holding on and letting go. For the next seven years I will plummet across the world.

I am on a journey. I am in pursuit of an idea, a story, a chimera, perhaps a folly. I am chasing ghosts. Starting in humanity's birthplace in the Great Rift Valley of East Africa, I am retracing, on foot, the pathways of the ancestors who first discovered the Earth at least 60,000 years ago. This remains by far our greatest voyage. Not because it delivered us the planet. No. But because the early *Homo sapiens* who first roamed beyond the mother continent—these pioneer nomads numbered, in total, as few as a couple of hundred people—also bequeathed us the subtlest qualities we now associate with being fully human: complex language, abstract thinking, a compulsion to make art, a genius for technological innovation, and the continuum of today's many races. We know so little about them. They straddled the strait called Bab el Mandeb—the "gate of grief" that cleaves Africa from Arabia—and then exploded, in just 2,500 generations, a geological heartbeat, to the remotest habitable fringe of the globe.

Millennia behind, I follow.

Using fossil evidence and the burgeoning science of "genography"—a field that sifts the DNA of living populations for mutations useful in tracking ancient diasporas—I will walk north from Africa into the Middle East. From there my antique route leads eastward across the vast gravel plains of Asia to China, then north again into the mint blue shadows of Siberia. From Russia I will hop a ship to Alaska and inch down the western coast of the New World to wind-smeared Tierra del Fuego, our species' last new continental horizon. I will walk 21,000 miles.

If you ask, I will tell you that I have embarked on this project, which I'm calling the Out of Eden Walk, for many reasons: to relearn the contours of our planet at the human pace of three miles an hour. To slow down. To think. To write. To render current events as a form of pilgrimage. I hope to repair certain important connections burned through by artificial speed, by inattentiveness. I walk, as everyone does, to see what lies ahead. I walk to remember.

The trails scuffed through the Ethiopian desert are possibly the oldest human marks in the world. People walk them still: the hungry, the poor, the climate stricken, men and women sleepwalking away from war. Nearly a billion people are on the move today across the Earth. We are living through the greatest mass migration our species has ever known. As always, the final destination remains unclear. In Djibouti city, the African migrants stood waving cell phones on trash-strewed beaches at night. They were capturing a cheap signal from neighboring Somalia. I heard them murmur: Oslo, Melbourne, Minnesota. It was eerie and sad and strangely beautiful. After 600 centuries we were still seeking guidance, even rescue, from those who had walked before.

Herto Bouri, Ethiopia

"Where are you walking?" the Afar pastoralists ask.

"North. To Djibouti." (We do not say Tierra del Fuego. It is much too far—it is meaningless.)

"Are you crazy? Are you sick?"

In reply, Mohamed Elema Hessan—wiry and energetic, the ultimate go-to man, a charming rogue, my guide and protector through the blistering Afar Triangle—doubles over and laughs. He leads our micro-caravan: two skinny camels. I have listened to his guffaw many times already. This project is, to him, a punch line—a cosmic joke. To walk for seven years! Across three continents! Enduring hardship, loneliness, uncertainty, fear, exhaustion, confusion—all for a rucksack's worth of ideas, palaver, scientific and literary conceits. He enjoys the absurdity of it. This is fitting. Especially given our ridiculous launch.

I awoke before dawn and saw snow: thick, dense, choking, blinding. Like plankton suspended at the bottom of a sunless sea, swirling white in the beam of my headlamp. It was the dust. Hundreds of animals in Elema's village had churned up a cloud as fine as talc. Goats, sheep, and camels—but, sadly, not our camels.

The cargo animals I had requisitioned months before (a key arrangement in a project that has consumed thousands of hours of planning) were nowhere to be found. Their drivers, two nomads named Mohamed Aidahis and Kader Yarri, were absent too. They never showed up. So we sat in the dust, waiting. The sun rose. It began to grow hot. Flies buzzed. To the east, across the Rift, our first border, Djibouti, was receding at the rate of three-quarters of an inch every year—the speed at which Arabia is drifting away from Africa.

Are you crazy? Are you sick? Yes? No? Maybe?

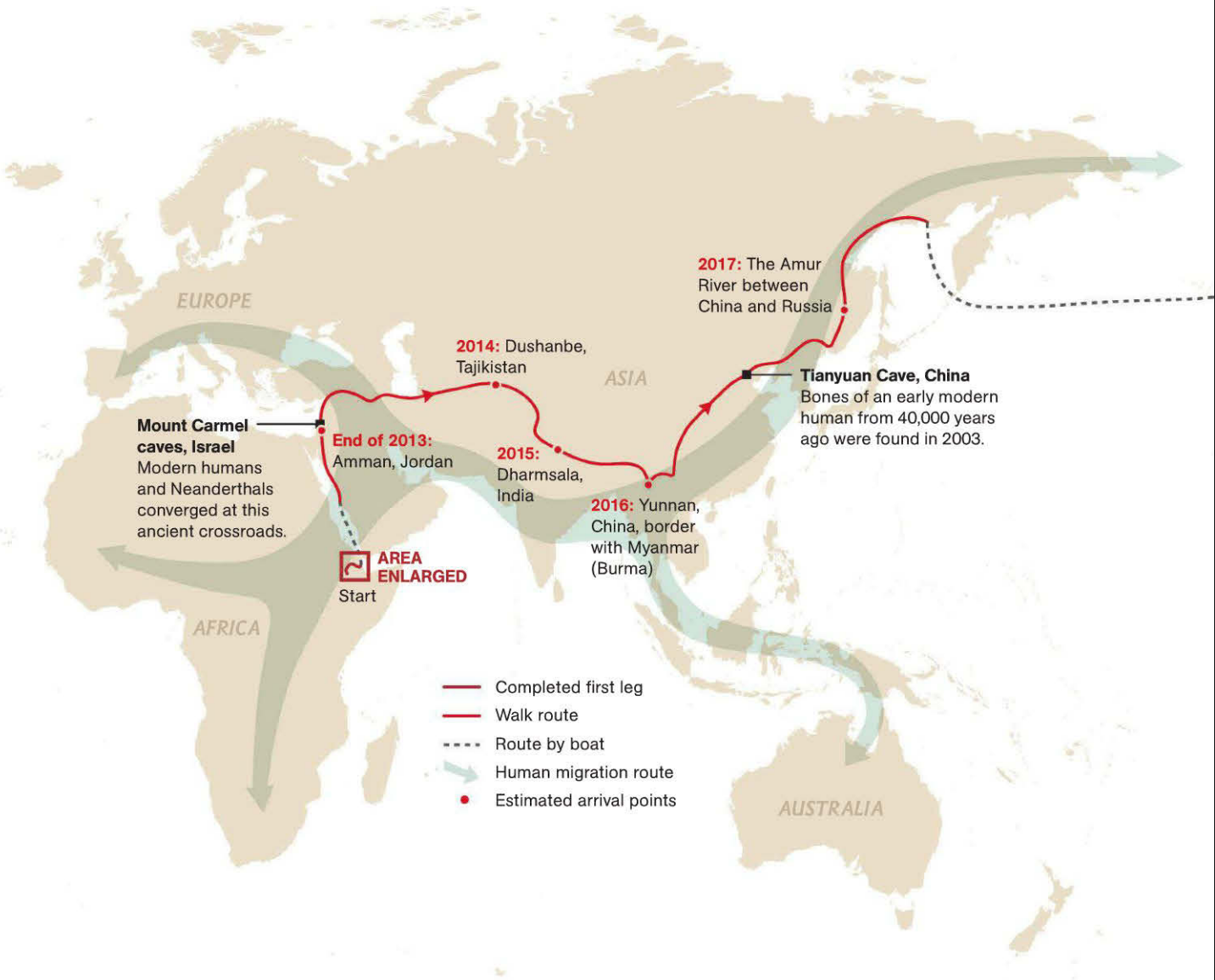
The Afar Triangle in northeast Ethiopia is dreaded as a waterless moonscape. Temperatures of 120°F. Salt pans so bright they burn out the eyes. Yet today it rained. Elema and I have no waterproof tents. We have an Ethiopian flag, which Elema wraps himself in as he walks. We have found and rented two camels. We plod across an acacia plain darkened to the color of chocolate by the warm raindrops. We tread on a photographic negative: The camels' moccasin-like feet pull up the frail crust of moisture, leaving behind ellipses of pale dust.

After a dozen miles, Elema already asks to turn back.

He forgot his new walking shoes from America. And his flashlight. And his hat—and the cell phone. So he hitches a ride from our first camp to his village to retrieve these vital items. And now he has jogged all the way back to catch up. He complains, laughing, of crotch rash.

This absentmindedness is understandable. It is

Paul Salopek is a Pulitzer Prize-winning journalist. His first book based on this journey, A Walk Through Time, *will be published by Random House in 2016. John Stanmeyer, a founding member of VII Photo Agency, has received the Robert Capa and the Magazine Photographer of the Year awards.*



THE LONGEST WALK

Homo sapiens set out to discover the Earth some 60,000 years ago, traveling from Ethiopia's Great Rift Valley to the farthest tip of South America. To retrace the diaspora, writer Paul Salopek has begun his own global journey, a seven-year, 21,000-mile trek that touches four continents. Calling the project the Out of Eden Walk, Salopek is using the latest fossil and genetic findings to plot his route. A record of his travels is being posted regularly at *outofedenwalk.nationalgeographic.com.*

FIRST LEG IN AFRICA

Salopek began his walk at what he calls "our ground zero"—the archaeological diggings at Herto Bouri, where some of the oldest human bones, from 160,000 years ago, have been found. With guides and two camels, Salopek followed historic caravan routes across the Afar Triangle. After 43 days and 400 miles, he reached the Djibouti coast, near where humans exited Africa for the rest of the world.

RYAN MORRIS, NGM STAFF

impossible to remember every detail on a walk of this scope. I have forgotten things myself—nylon stuff sacks, for instance. Because of this, I begin my trek out of Africa with airplane luggage, a city slicker's rig with plastic rollers and collapsible handle, strapped to a camel's back.

It is the scientists of the Middle Awash research project who invited us to begin walking at Herto Bouri, our symbolic mile zero in the Ethiopian Rift—one of the richest human boneyards in the world. This is the famous site where some of the world's oldest human fossils have been found. *Homo sapiens idaltu.* Gone for 160,000 years. A big-boned ancestor—a dawn version of us.

The Middle Awash Project researchers, a team led by Tim White, Berhane Asfaw, and Giday WoldeGabriel, have uncovered in Ethiopia many of the most important hominin fossils of our day, including *Ardipithecus ramidus,* a 4.4-million-year-old biped. My unpredictable Afar guide, Elema, is their veteran fossil hunter.

Raised in a nomad culture feared for its tough warriors, Elema speaks three languages—Afar, Amharic, and a profane English patois gleaned from the Middle Awash scientists. He is a paleontologist in his own right. He exclaims "Wow" and "Crazy, man" and "Jeezus" while identifying the Rift's key geological strata. (Me he calls, not without endearment, White Asshole; I return the compliment with equal fondness, dubbing him and his perennial rash, Burned Asshole.) He is the *balabat,* or traditional leader, of the Bouri-Modaitu clan of the Afar. His cell phone holds the numbers of Ethiopian grandees and French academics. Educated to the eighth grade in schools of the Emperor Haile Selassie, he bridges more cultures than a Malinowski. He holds more time warps inside his head than an Einstein. He is a phenomenon.

We are camped at Aduma when the Middle Awash scientists find us. They have come to show us a Middle Stone Age site.

"These tools are still a little early for the people you're following," says Yonatan Sahle, an Ethiopian researcher based in the Human Evolution Research Center at the University of California, Berkeley. "But their technology was basically as advanced. They made throwing weapons that allowed them to outcompete the other hominins they encountered outside Africa."

We lean over a delicate stone point, a work of art that lies where its maker dropped it 80,000 to 100,000 years ago. In the distance we hear screaming. We look up.

An Afar woman strides in from the desert, waving her arms wildly. Where did she come from? Is she warning us off her hill? Is she mad? No. She marches up to a man dozing nearby on the ground. She gives him a sharp kick. She hefts a stone—a Middle Stone Age tool, perhaps—and threatens to brain him. Is it the collection of a debt? A matter of the heart?

I hear the victim laughing. I know this maniacal laugh. It is the man who will guide me to Djibouti, to the Gulf of Aden.

Dalifagi, Ethiopia

Water is gold in the Afar Triangle of Ethiopia.

No surprise. This is one of the hottest deserts in the world. Walking for three days near the

Villagers pray for rain in the Afar desert. A mega-drought lasting thousands of years may have bottled up early humans in Africa, making travel risky. A climate shift bringing wet periods likely helped propel the first migration.

western scarp of the Rift, Elema and I find only one miraculous pool of muddy rainwater to ease our camels' thirst. But we stumble across a new type of water hole a day later—a coveted oasis of electrons, the village of Dalifagi.

The immense salt scapes that shroud the borders of Ethiopia, Djibouti, and Eritrea weren't even mapped until the 1920s. For centuries the martial Afar pastoralists who ruled the area resisted all incursions by the outside world. Today, though, besides their usual armament of pointy daggers and Kalashnikov rifles, they carry cell phones. They embrace the tool of instant communication with a vengeance. "It has given them power," says Mulukan Ayalu, 23, an Ethiopian government technician who maintains the tiny power plant at Dalifagi. "They can call different goat traders. They can choose their selling prices."

The diesel generator at Dalifagi chugs out a 220-volt current for six hours a day. Ayalu plugs in the nomads' cell batteries for a few cents each. On Mondays—market day—grizzled Afars line up at his office door. The folds of their sarong-like skirts bulge with dead cell phones of faraway neighbors. The nomads are addicted to the devices. "Hallow? *Hallow?*" Elema bellows into his phone on the trail, with an accent that sounds, to my ear, straight out of Brooklyn. But he is asking directions to some ancient well. Or exchanging news of the dreaded Issa, armed raiders from a rival nomad group.

The electronic oasis at Dalifagi would never draw tourists, much less inspire the verse of caravan poets. But it is the real story today in sub-Saharan Africa. Nine hundred million people. A headlong sprint into the digital age. Exploding aspirations. Consequences unknown.

Near the Talalak River, Ethiopia

Footwear is a hallmark of modern identity. How best to glimpse an individual's core values at the start of the 21st century? Look down at people's feet—not into their eyes.

In the affluent "global north," where fashion caters to every whim and vanity, shoes announce their wearer's class, hipness, career choice, sexual availability, even politics (the clog versus the cowboy boot). It is disorienting, then, to be walking through a landscape where human beings—millions upon millions of women, men, and children—slip on identical-style footwear every morning: the cheap, democratic, versatile plastic sandal of Ethiopia. Poverty drives demand. The only brand is necessity.

Available in a limited palette of chemical hues—black, red, brown, green, blue—the humble rubbery shoes are a triumph of local invention. They cost a pittance to manufacture. Any

Kanro Kairanto of the Middle Awash Project rakes dirt near Herto Bouri, Salopek's starting point, for bones of early humans. Salopek, who depended on his camels for "their honest bigness, their extraordinary power," rewards A'urta with a head rub.

PAUL SALOPEK, LEFT

pair can be had for the equivalent of a day's field labor. (Perhaps two dollars.) They are cool—permitting the air to circulate about the feet on the desert's scalding surface. The ubiquitous sandals of rural Ethiopia weigh nothing. They are recyclable. And home repair is universal: Owners melt and mend the molded-plastic straps over wood fires.

Our binary camel caravan—our two beasts are named A'urta, or Traded for a Cow, and Suma'atuli, Branded on the Ear—has been joined at last by its two long-lost cameleers, Mohamed Aidahis and Kader Yarri. These men caught up with us from our departure point at Herto Bouri, crossing miles of gravel pans and rumpled badlands during days of quickstep walking. In the manner of life here, no explanation was asked or given regarding the nature of their weeklong delay. They were late. Now they were with us. Each wore a pair of the region's signature plastic sandals. Color: lime green.

The dust of the Rift Valley is a palimpsest stamped by such footwear. Yet if Ethiopia's populist sandals are mass-produced, their wearers are not. One man might drag his left heel. A woman might mar her right shoe's sole by stepping on an ember.

Elema knelt the other day on the trail, examining this endless mutation of impressions.

"La'ad Howeni will be waiting for us in Dalifagi," he said. He pointed to a single sandal track. La'ad was waiting in Dalifagi.

Near Hadar, Ethiopia

We are walking in the direction of Warenso.

The world changes when you are thirsty. It shrinks. It loses depth. The horizon draws close. (In northern Ethiopia the Earth butts against the sky, hard and smooth as the surface of a skull.) The desert tightens around you like a noose. This is the thirsty brain compressing the distances of the Rift, sucking in the miles through the eyes, magnifying them, probing them for any hint of water. Little else matters.

Elema and I have trudged more than 20 miles through the crushing heat. We have separated from the cargo camels to visit an archaeological site folded into a wrinkled draw: Gona,

THE WORLD CHANGES WHEN YOU ARE THIRSTY. IT SHRINKS. IT LOSES DEPTH. THE DESERT TIGHTENS AROUND YOU LIKE A NOOSE.

the location of the oldest known stone tools in the world. (Age: 2.6 million years.) Our water bottles are empty. We are uncomfortable, anxious. We speak little. (What can be said? Why dry the tongue?) The sun's rays corkscrew into our heads. An Afar proverb: It is best, when you are lost or thirsty, to keep walking under the sun, because eventually someone will see you. To be tempted into shade, to drop under one of 10,000 thornbushes, means death: No one will find you. So we stagger on into the blinding afternoon—until we hear the faint bleating of goats. Then we smile. We can begin to relax. Goats mean people.

Our hosts: an Afar family camped on a hill. Two strong, smiling young women. Eight children in thin rags that once may have been articles of clothing. And a very old woman—she doesn't know her age—who hunches like a gnome in the shade of a reed mat. Her name is Hasna. She has been sitting there, weaving with spidery fingers, since the beginning of time. She invites us to join her, to rest our bones, to remove our shoes. From a battered jerrican she pours us water—chalky and warm, so salty, so alkaline, it oozes down the throat like soap, but precious nonetheless. She offers us a fistful of yellow berries from a wild tree that grows in wadis. She is our mother.

When our ancestors wandered out of Africa 60,000 or more years ago, they encountered other species of hominins. The world was crowded then with strange cousins: *Homo neanderthalensis, Homo floresiensis,* the Denisovans, and perhaps other varieties of people who weren't quite us.

When we met them, perhaps like this, on

some remote hilltop, did we share water, or even interbreed peacefully, as some geneticists suggest? (Outside Africa, modern human populations seem to contain as much as 2.5 percent of Neanderthal DNA.) Or did we rape and kill, launching our species' long and terrible history of genocides? (In a cave occupied by modern humans, Fernando Ramirez Rozzi, of Paris's Centre National de la Recherche Scientifique, has identified a Neanderthal jawbone mutilated by the cut marks of butchery, perhaps cannibalism.) Scientists still debate this puzzle. All that is certain is that we alone survived to claim the Earth. We won the planet. But at a cost: We are without close family. We are a species racked by survivor's guilt. We are a lonely ape.

Hasna's gentle voice lulls me to sleep.

When I awake, Elema is hunkered in low conversation with the men of the nomad camp. They have returned from tending their flocks. We shake hands. We thank them. We leave packets of crackers for grinning Hasna, and walk on. We are hurrying to meet the camels, walking toward Warenso. That night, while sipping our gift of salty water around a red fire that saws back and forth in the wind, Elema tells me the men of Hasna's camp had threatened him. He was not of their clan. He nearly hit them over the head with his walking stick.

Dubti, Ethiopia

Moving north and then east, we abandon the desert and stub our toes on the Anthropocene—the age of modern humans.

Asphalt appears: the Djibouti-Ethiopia road, throbbing with trucks. We drift through a series of gritty towns. Dust and diesel. Bars. Shops with raw plank counters. Garlands of tin cups clink in the wind outside their doors.

Then, near Dubti: a sea (no, a wall) of sugarcane. Miles of industrial irrigation. Canals. Diversion dams. Bulldozed fields. Levees crawling with dump trucks. Elema becomes lost. Night envelops us. We end up pulling the weary camels in a gigantic circle. "Wow, man!" Elema says angrily. "No way! Too much change!"

This is the multimillion-dollar Tendaho sugar plantation, an Ethiopian-Indian project that is making the Afar Triangle bloom. Fifty thousand migrant workers will soon toil here, tending 120,000 acres of desert that have been scraped, shaped, molded, and flooded by the Awash River to sweeten the world's coffee, its tea. Eventually, it could make Ethiopia the sixth largest sugar producer in the world. It will help break the country's dependence on foreign aid—a good thing.

But the benefits of economic progress are rarely shared equally with all involved. There are winners and losers in every improvement scheme. Here,

Camel prices, political news, family gossip all travel over the clunky "bush telephone" carried by Salopek's guide in Djibouti. After walking as many as 30 miles a day, Salopek reached the coast, cooling his boots in the Gulf of Aden surf.

PAUL SALOPEK, BOTH

one of the losers is a bright young Afar woman—a girl, really, though her poise makes her seem old beyond her years. She is wrapped in a red dress. She stands by a new levee. She is collecting water from what used to be the Awash River.

"The company moved us off our land," she tells us, waving her arm at the sheets of cane. "We get a little work, we Afars, but it is always the lowest work. Watchmen. Shovel work."

A typical sugar plantation salary: $20 a month. The girl says police came to expel the Afar diehards who refused to move. Shots were exchanged. Blood flowed on both sides.

How old is this story? It is one of the oldest stories in the world.

What are the individual names of the Sioux forced from the Black Hills of the Dakota Territory by gold miners? Who remembers this anymore? Who are the millions of people who surrender their livelihoods today—Irish farmers in the European Union, Mexican ranchers shunted aside by highways—for some abstract common cause? It is impossible to keep track. Humanity remakes the world in an accelerating cycle of change that strips away our stories as well as the topsoil. Our era's breathtaking changes flatten collective memory, blur precedence, sever lines of responsibility. (What disconcerts us about suburbia? Not just its sameness, but its absence of time. We crave a past in our landscapes.)

Dubti is a busy green frontier. Ethiopians are flocking there, bringing new hopes, tastes, ambitions, voices, a new future—a new history.

In Dishoto, another truck stop town, I recharge my laptop at a police station. The officers are all outsiders, non-Afar, from the highlands, from the south. They are friendly, curious, generous. They ply Elema and me with tea. (It is dense with sugar.) Our conversation is interrupted by government ads. The policemen watch these nation-building commercials intently: music played over video loops of strip mining, roadbuilding, workers in medical labs. We thank them. We walk on.

Milan Kundera, the Czech novelist, once wrote that the struggle of man against power is the struggle of memory against forgetting.

The Afar girl's name is Dahara. She is 15.

MOVING NORTH AND THEN EAST, WE ABANDON THE DESERT AND STUB OUR TOES ON THE AGE OF MODERN HUMANS.

Near the Ethiopia-Djibouti border

We camp on the flank of Fatuma mountain, a basalt sentinel overlooking the caravan trails that braid eastward to the old coastal sultanate of Tadjoura. The tiny Republic of Djibouti sprawls below: a scalded plain, hotter and drier than the Ethiopian desert, with dry lake beds of blinding white salt, scarps of gunmetal gray, and doubtless, huddled somewhere in the shade of a doom palm, more Afar nomads—herders cleaved from their Ethiopian brethren by a colonial border, speaking in halting French.

This is where I begin to say goodbye to the Afar camel men from Herto Bouri.

Elema, Yarri, and Aidahis declare themselves ready to push on. They wish to walk with me to the beaches of the Gulf of Aden. But this is impossible. Two of them have no passports, no documents, no scraps of paper attesting to their existence. ("This is all Afar land!" they say.) And besides, Elema is sick. He issues his camel-loading orders lying down, from under his shire, his sarong, which he drapes over his head like a sheet. In a few hours we will part ways in the ugly border town of Howle.

What is it like to walk through the world?

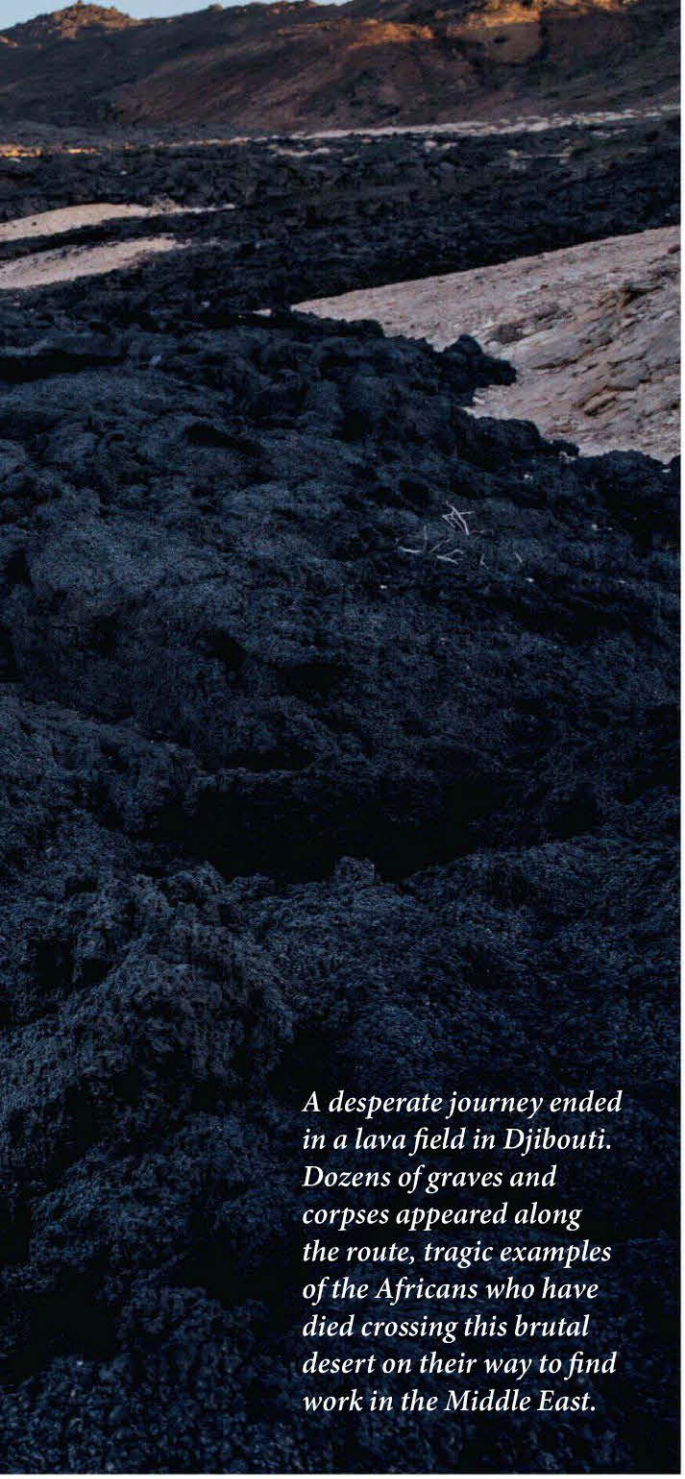
It is mornings like these: Opening your eyes to nothing but seamless sky for day after day; a pale, numinous void that for one fleeting instant, when you first awake, seems to suck you upward, out of your body, out of yourself. It is the clarity of hunger, a transparency that seems blown through by the wind, the way a hollow pipe is blown to make it whistle. (We trekked 18 miles yesterday on short rations, on a single bowl of noodles and a handful of biscuits each. My wedding ring, once

tight, jiggles loosely along my finger.) It is learning to read landscape with your whole body, your skin, not merely your eyes—sensing camel fodder in a thorn scratch, the coming dust in the smell of the wind, and of course, precious water in the fold of the land: a limbic memory of great power. It is watching the eternity of Africa slip by at a walking pace, and coming to realize dimly that, even at three miles an hour, you are still moving too fast. It is the journey shared.

To experience Paul's walk and post your comments, visit *outofedenwalk.nationalgeographic.com.* Follow his dispatches on Twitter: @outofedenwalk.

Mohamed Aidahis: a powerful ant-stomping gait. Kader Yarri: the marionette looseness of a skinny man's step. Mohamed Elema: the spring-loaded step of a square dancer. On our best days we four ramblers recognize our immense good luck. We ricochet down steep mountain trails, almost running, with the desert of Ethiopia shining at our feet. We bounce our voices off the walls of black-rock canyons in whooping contests. Then we catch each other's eye, three Afars and a man from the opposite longitude of the Earth, and grin like children. The cameleers catch the spark, and sing.

What is it like to walk through the world?



A desperate journey ended in a lava field in Djibouti. Dozens of graves and corpses appeared along the route, tragic examples of the Africans who have died crossing this brutal desert on their way to find work in the Middle East.

It is like this. It is like serious play. I will miss these men.

Ardoukoba lava field, Djibouti

The dead appear on the 42nd day of the walk.

There are five, six, seven of them—women and men sprawled faceup, facedown, on the black lava plain as if dropped from the sky. Most are naked. They have stripped off their clothes in a final spasm of madness. Sandals, trousers, brassieres, cheap nylon backpacks—their belongings lie scattered, faded, washed out, bleached by the sun to the pale gray of undersea things. The skin of the dead is parched a deep burned yellow. The little wild dogs that come in the night have taken their hands, taken their feet. They might have been Ethiopians. Or Somalis. A few, probably, were Eritreans. They were walking east. This is what unites them now in the mineral silences of the desert: They were making for the Gulf of Aden—for the open boats of the Yemenis who smuggle destitute Africans to peons' jobs in the Middle East. How many such migrants die in the Afar Triangle? Nobody knows. At least 100,000 attempt the crossing to the Arabian Peninsula each year, according to the UN. Police chase them. They become lost. Thirst kills them.

"A crime!" Houssain Mohamed Houssain shouts back at me. "A disgrace!"

Houssain is my guide in Djibouti. He is a decent man. He is angry and perhaps ashamed. He strides far ahead, shaking his walking stick at the stone white sky. I lag behind. I wipe the sweat from my eye sockets and study the dead.

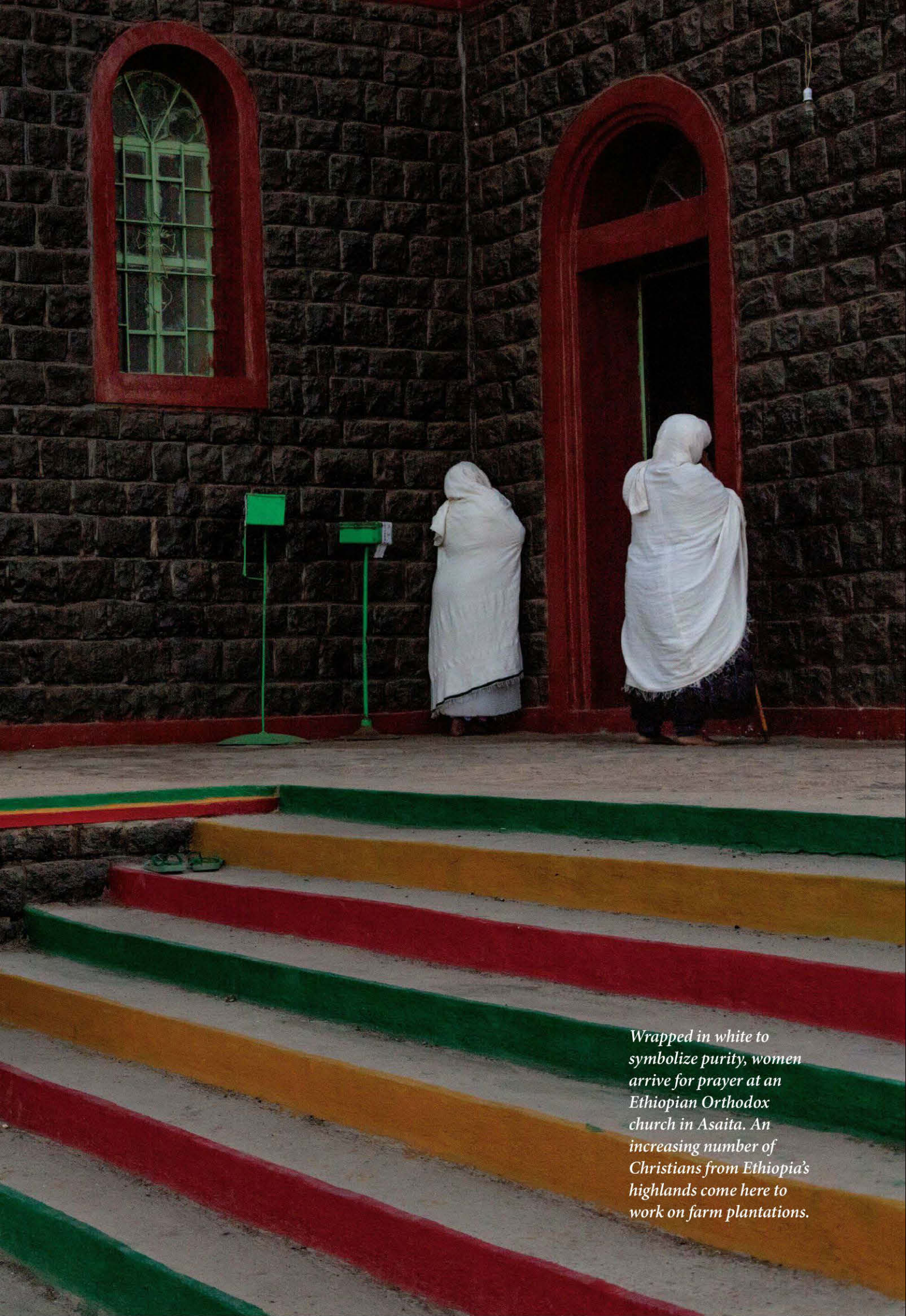
A demographer calculates that 93 percent of all the human beings who ever existed on Earth—more than 100 billion people—have vanished before us. Most of humanity is gone. The bulk of our heartaches and triumphs lie behind us. We abandon them daily in the wasteland of the past. Rightly so. Because even though I have told you that I am walking to remember, this isn't completely true. As we reenact the discovery of the Earth over and over again, to keep going—to endure, to not sit down—we must embark also on journeys of forgetting. Houssain appears to know this. He never looks back.

One day later we reach the Gulf of Aden.

A beach of gray cobbles. Waves of hammered silver. We shake hands. We laugh. Houssain opens a sack of hoarded dates. It is a celebration. We stand on the rim of Africa. The sea is walking—it falls endlessly forward into Africa and then rolls forever back, pulling away to the east…toward Yemen and the Tihamah Coast, toward the lupine valleys of the Himalaya, toward ice, toward sunrise, toward the hearts of unknown people. I am happy. I write this down in my journal: I am happy.

Brave, foolish, desperate travelers. You almost made it. You fell three miles from the coast. □

Wherever there's water, camels and their herders appear. Space for the traditional seminomadic life is shrinking though. A wall diverts the Awash River in Ethiopia as part of a project to turn desert into vast sugarcane fields.



Wrapped in white to symbolize purity, women arrive for prayer at an Ethiopian Orthodox church in Asaita. An increasing number of Christians from Ethiopia's highlands come here to work on farm plantations.

An urban oasis, the central market in Djibouti city pulses with traffic. Buses bring migrants who, Salopek says, have changed in a generation from premodern pastoralists to hustling wage-earners in this city of 500,000.

An acacia rustles with plastic trash dropped by travelers. Afar nomads use the term Hahai, or People of the Wind, to describe the refugees, deserters, migrant workers, and others who blow through the desert.

Two dozen men, mainly Ethiopians, languish in a shack in Djibouti city. Most are waiting for relatives to wire money to a smuggler for passage to Yemen. Some 100,000 migrants a year leave the Horn of Africa to look for work.

Backed by old AK-47s, coast guard personnel in Djibouti city monitor the Bab el Mandeb waterway. Early humans left Africa by crossing the strait. Salopek caught a boat here to Saudi Arabia to follow in their path.

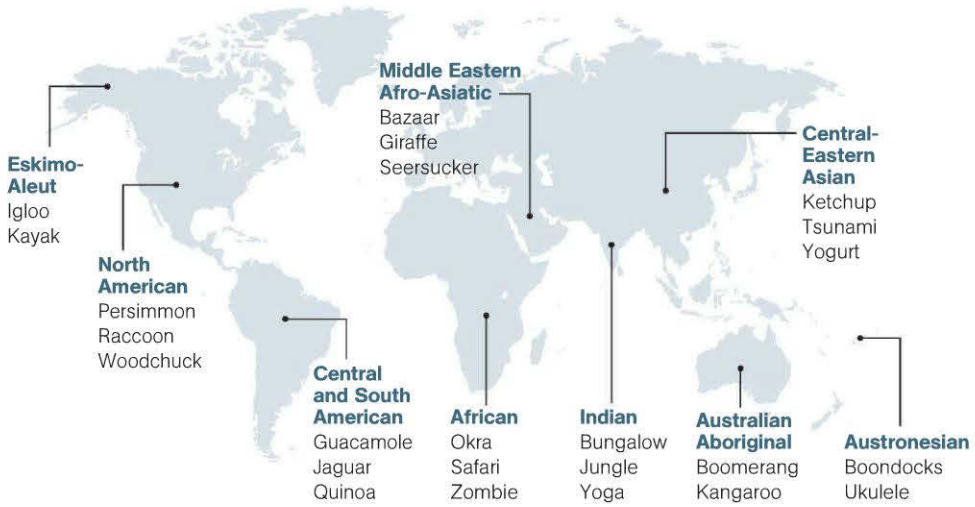
English by the Book

THE WORD "MAGAZINE" offers a lesson in how the English language evolved. The familiar term likely made its written debut in a 1583 letter from a British merchant traveling through the Middle East: "Neither any other Officer shall meddle with the goods, but that it may be kept in a Magosine." There it meant "storehouse," derived from Arabic. The word came to mean a periodical publication—a storehouse of information—in the early 1700s.

The roots of "magazine" were uncovered after the Philological Society of London began to catalog the history of words in 1859. It took 71 years to compile the initial ten-volume work, now known as the *Oxford English Dictionary (OED)*. The current version holds more than 600,000 entries, with new words arriving all the time. *—A. R. Williams*

WHERE WORDS CAME FROM

The *OED* traces the origins of words. Many arrived from other European languages or via global exploration.



WHEN WORDS ENTERED THE LANGUAGE

Reviewing more than ten centuries of literature, experts find the first documented use of each word.

PRE-12TH CENTURY
7,492 WORDS

Examples ↓ Occurs first in

Believe
Friend
▸ ***Beowulf,*** Old English
Laugh
Sorrow

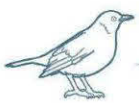
The *OED* mainly lists words from A.D. 1150 onward but includes earlier words that survived into that period.

12TH CENTURY
606

Peace

13TH CENTURY
4,953

Cringe
February
Mitten



14TH CENTURY
15,270

Blackbird
Creator
Earthquake
Humanity
▸ **Wycliffe Bible,** ca 1382
Noun
Substantial
Tetanus
University

15TH CENTURY
18,688

Accomplish
▸ **Chaucer**
Knight's Tale, ca 1405
Dictionary
Globe
Imaginary
Jet-black
Lovesick
Membrane
Promise
Royal
Tablecloth

Ventures abroad helped feed a new appetite for unusual words in the 16th and 17th centuries.

16TH CENTURY
37,047

Blueberry
Communicate
Dictatorship
Easter egg
Education
Heartbroken
Hellenism
Maritime
Mathematics
Mosquito
Nomad
Overpower
▸ **Shakespeare** *Richard II*, 1597
Potato
Procrastinate
Quinoa
Reality
Redhead
Runaway
Terrify
Timeless
Useful

17TH CENTURY
51,076

Aboriginal
Americanize
Black sheep
Caribbean
Civilization
Free market
Geographic
Hand grenade
Hotel
Ice cream
Identify
Islam
Key chain
Ladybug
Magnetism
Mahogany
Mezuzah
Moccasin
▸ **John Smith** Map of Virginia, 1612
Naive
Nincompoop
Orangutan
Ostracize
Palatable
Powwow
Prairie
Raspberry
Schoolteacher
Territorial
True blue
Volcano
Womanizer

Fewer new words were adopted in an era that emphasized precise writing.

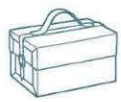
18TH CENTURY
24,980

Abolitionist
Bigwig
Capitalize
Dog-eared
Electrician
▸ **Benjamin Franklin** letter, 1749
Handyman
Homesick
Millimeter
Neurosis
Optimist
Pervasive
Roommate
Terrorism

The industrial revolution and booms in scientific research and publishing contributed to the jump in new words during the 19th century.

19TH CENTURY
75,029

Abuzz
▸ **Dickens,** *A Tale of Two Cities*, 1859
Acid rain
Bicycle
Biosphere
Blueprint
Cello
Dwarf planet
Dyslexia
Feminist
Headphone
Immunize
Lunchbox
Mammal
Mascara
Mesmerize
Mom
Narcissism
Neonatal
Omnivore
Pasta
Photograph
Polarize
Purebred
▸ **Darwin** letter, 1839
Quartzite
Radicalism
Rain check
Rhinoplasty
Rickshaw
Rigor mortis
Rubber band
Smart aleck
Southerner
Statehood
Subliminal
Subway
Taxonomy
Thingamajig
Urbanization
Vegetarian
Vertebrate
Wordsmith
World war
X-ray



The *OED* is still catching up with words for 20th-century technology and innovation. As a result, the number here is low—but growing.

20TH CENTURY
36,233
AND COUNTING

Acronym
Brainwash
Clone
Database
Gazillionaire
Gorp
▸ ***National Geographic*** May 1972
Icecapade
In-box
Lifestyle
Moped
Multiracial
Neurobiology
Nitpick
Oink
Postmodern
Racist
Recycle
Supernova
Techno
Vegan
Yeehaw

5W INFOGRAPHICS; ALEXANDER STEGMAIER AND JOHN TOMANIO, NGM STAFF
SOURCES: PHILIP DURKIN AND KATHERINE MARTIN, OXFORD UNIVERSITY PRESS

By Marc Silver Photograph by Marco Grob

Child Saver

LALE LABUKO will never know some things about himself—like his birth date. His tribe in Ethiopia's Omo Valley keeps no written records (his best guess is October, early eighties). But one thing he knows with absolute surety: He will not rest until he halts the custom of killing babies born out of wedlock, born to parents who didn't get permission from the elders to have a child, or whose teeth grow in top first instead of the usual bottom up. These babies are believed to be cursed. Labuko has rescued 37 children, ages one to eleven; they live in a home he built with the help of California photographer and filmmaker John Rowe, co-founder of Labuko's Omo Child organization.

When did you find out about this practice?
I was around 15. A village elder grabbed a two-year-old from the mother, and the mother was crying. I was not sure what was going on. My mother said, "Lale, some children in the tribe are declared *mingi,* and they kill them." She said mingi means "cursed."

How are the children killed?
Sometimes they're left in the bush, no water, no nothing. Or they're pushed off a cliff.

When did you first try to take action?
In 2008 I said to the elders, you think these children are cursed and bring disease and famine. Could you give me a child? Maybe the curse will follow me. Some elders agreed: "Let's try and see."

How big a risk was this?
Others warned me: "You rescue the children, one day [the tribe is] going to kill you."

Clearly you didn't listen.
Yes. And my tribe [the Kara] has stopped [the practice] completely. But the Hamer tribe still practices it. It's hard to change an ancient culture.

Do you tell the children you've rescued about the fate they escaped?
They are too young. I tell them, "You are here for school." When they are older, I will explain, "This is a custom. It's not your parents' fault. It was good I rescued you guys." This year I got an email from National Geographic recognizing me as an "emerging explorer." These children, one day, they will be the next emerging explorers.

Watch Marco Grob's video interview with Lale Labuko on our digital editions.

Ghost Cats

Masters of stealth, they seldom step from the shadows. But cougars are quietly reclaiming lost ground.

A hidden camera records Hollywood's most reclusive star—this male cougar first seen in Griffith Park in Los Angeles almost two years ago. A radio collar tracks his moves, but residents see scant sign of him.

Experts thought cougars rarely socialize, but F51, a female living near Grand Teton National Park, traveled and fed with another female one spring. Eventually the other female adopted one of F51's kittens.

By Douglas Chadwick
Photographs by Steve Winter

It's a warm winter day in southern California, and busloads of tourists are pulling into an overlook above Beverly Hills and West Hollywood. As their guides point out movie studios and the mansions of stars, Jeff Sikich, a wildlife biologist with the Santa Monica Mountains National Recreation Area, directs my gaze toward a thin ribbon of woods in the distance. At least ten months earlier a young male cougar from the Santa Monica Mountains set out, following that trickle of green through the vast human hive. After somehow crossing two of the world's busiest roads, including the ten-lane Hollywood Freeway, he settled in at Griffith Park, the huddle of hills rising just behind us, recognizable worldwide by the giant HOLLYWOOD sign partway up.

Homing in on signals from a radio collar on the animal, Sikich leads the way along the famous slope. He pinpoints the cat's current location; then we hike on to check sites where it lingered to feed on a kill. We discover two mule deer carcasses dragged into tangles of scrub oak and manzanita. Remains of a third lie in a ravine next to the manicured lawns of a cemetery where deer often graze. We pass dog walkers, bird-watchers, hikers, joggers, bicyclists, horseback riders, and scores of graveside mourners. If any know they're sharing this landscape with an invisible but potentially deadly predator, they show no sign of concern.

"There's only room in our Santa Monica Mountains for ten to fifteen cougars," Sikich says. "The average territory of an adult male there is around 200 square miles. With older, stronger males defending all the available space, this young one had to leave to claim a home of its own. Griffith Park takes in less than seven square miles, but our guy seems to be finding what he needs to survive here."

Think of it: A large carnivore that must kill to eat is meeting its nutritional needs in the heart of greater L.A., all the while avoiding attention better than a camera-shy celebrity. How does he do it? By moving with a whisper-soft tread mostly in the twilight and at night, sticking close to thick cover, zealously guarding his privacy in a metropolis renowned as the gateway to fame.

With a range that extends from southern Argentina and Chile to the edge of Canada's Yukon, *Puma concolor,* the cougar—aka puma, panther, painter, and brown tiger—is the most widespread large, land-dwelling mammal in the Western Hemisphere, yet among the least seen. In North America it also goes by the names catamount, mountain screamer, and mountain lion, though the species is more closely related to cheetahs and smaller felines than to African lions or other big cats, and it's at home in steamy tropical lowlands as well as among the peaks. North

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Douglas Chadwick has reported on wildlife around the world. Steve Winter is media director for Panthera, a big cat conservation organization.

Cougars are usually more shy than fierce. But when men with dogs approached this Montana female with babies, the baying hounds stirred up a whirlwind of feline fury. The mother later moved her family.

KENTON ROWE

America's cougars came to be thought of mainly as mountain dwellers because the highlands offered the last refuge from settlers' guns, traps, and poisons, as well as government-sponsored programs aimed at eradicating predators.

Cougars once inhabited the lower 48 states from coast to coast, but by the early 20th century, virtually all the survivors in the U.S. were confined to the backcountry of the Rockies, Pacific Coast ranges, and Southwest. (An exception was the subspecies called the Florida panther, which still holds out in that state's vast marshes.) Finally western states dropped the cougar bounties some were still paying as late as the 1960s. In 1972 federal law banned the use of predator poisons on federal lands. More wildlife departments started managing the cats as game animals with a regulated hunting season. And for the first time in 300 years cougar numbers began to rise. The story ever since has been about the comeback of a major carnivore—a recovery with broader reach and larger implications than the better-known and more controversial return of grizzly bears and wolves.

During the past 40 years cougars have continued to expand throughout the western United States. They also spilled eastward onto the Great Plains, establishing new groups in Montana's Missouri Breaks, North and South Dakota, and most recently, western Nebraska. In fact a growing number of confirmed reports—more than 200 since 1990—have revealed cougars visiting almost every state in the Midwest, along with Canadian provinces to the north. Like the Griffith Park cat, the wayfarers are typically young, dispersing males. Very few stay long before they push on, perhaps in search of a mate, or fall victim to nervous landowners, local cops,

A mother cougar and two nearly grown kittens cross a pasture near Kalispell, Montana. Young cougars generally strike out on their own between one and two years of age. Their search for territory not already claimed by older cats leads some into human habitat—and trouble.

MURRAY SUAREZ

poachers, or traffic. The most dauntless of the explorers made headlines in 2011 when he was killed by an SUV on a highway exit in Milford, Connecticut. According to genetic tests this animal came from the Black Hills of South Dakota via a route estimated to be more than 2,000 miles long, setting the continent's distance record for a journey by four-legged wildlife.

The U.S. Fish and Wildlife Service had just declared the eastern subspecies of cougar extinct when that South Dakota cat was killed in Milford. Two years later, in a forested suburb a block from where the cat died, resident Gary Gianotti told me he had recently spooked another cougar off his back porch.

"We've got a booming deer population around here, as well as wild turkeys, rabbits, and raccoons," Gianotti said. "I see cougar tracks all the time." Turning on a cell phone, he showed me photos of large feline paw prints in the snow. "There's a cougar population breeding in Connecticut," Gianotti insisted, referring me to a website filled with citizens' accounts of seeing the big cats or their sign. "None of the agencies want to deal with it."

Stories of supposedly unmistakable sightings, eerie nighttime caterwauling, or fresh kills with evidence of a big cat's signature choke hold on the throat have persisted generation after generation, from Maine to the southern Appalachians. Since the 1960s authorities have received thousands of reports of cougars in the East. As a rule the accounts they investigate turn out to be any and every creature except a cougar. Surprisingly, up to a third describe what they saw as a black panther, despite the fact that no scientist has ever found evidence of a black cougar anywhere in North America. But not all the eastern cougar sightings were illusions; experts confirmed well over a hundred. Most appeared to be animals that escaped from captivity—or were purposefully set loose. In other cases, though, the cats' origins remained obscure.

AS A SPECIES *Puma concolor* is faring better than any of the world's other great cats. How much further cougars will advance along the comeback trail ultimately depends on where the public is willing to tolerate them. That in turn hinges on what people believe these cats are really like.

Cougars have attacked humans on about 145 occasions in the U.S. and Canada since 1890. Just over 20 of those assaults—an average of one every six years—proved fatal. Perhaps the more telling statistic is that at least a third of the verified cougar attacks have taken place over the past two decades. More cougars plus more people in the countryside add up to more potential for conflict.

As ambush hunters most active after dark, cougars have never been easy to get to know. But with technology now able to keep eyes on the stealthy cats around the clock, much of the

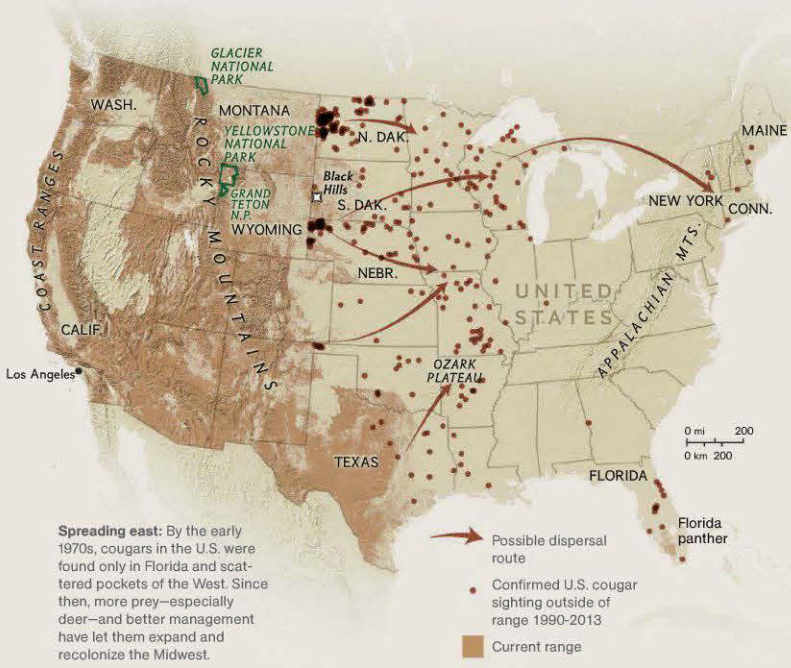
Society Grant This photographic coverage was funded in part by your Society membership.

DREW RUSH (BOTH)

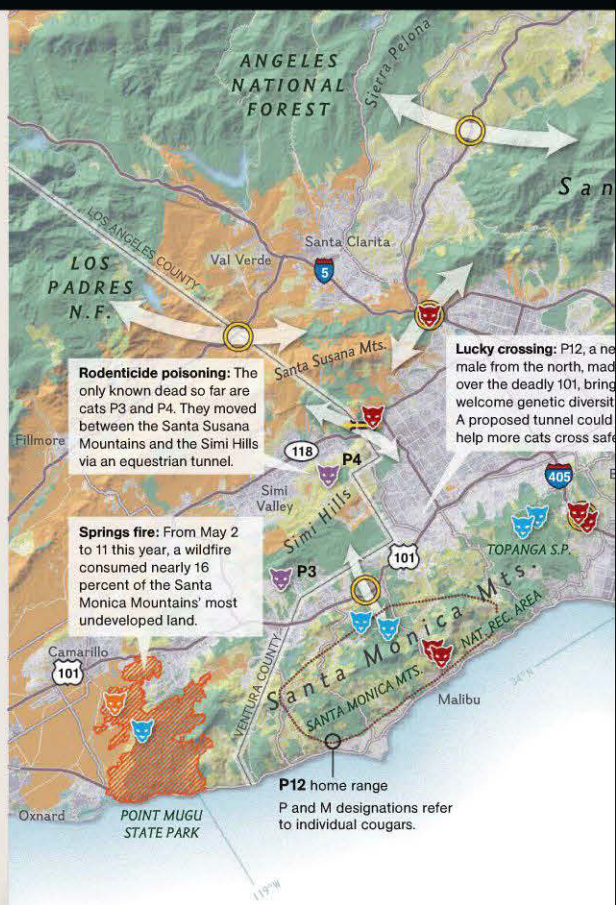
Clawing into a mound of snow to get at an elk carcass, a female cougar triggered a concealed camera. The snow's crust was frozen so hard she could open only a small hole to reach the meat.

Cougar Comeback

A big cat with a vast range, the adaptable cougar *(Puma concolor)* is found across a variety of habitats. The New World mammal is recognized as six distinct subspecies (with a possible seventh in Florida). Five inhabit Latin America. The sixth lives in North America, including in the hills of the second most populous U.S. city, Los Angeles.



Spreading east: By the early 1970s, cougars in the U.S. were found only in Florida and scattered pockets of the West. Since then, more prey—especially deer—and better management have let them expand and recolonize the Midwest.



HAZARDOUS HABITAT

The hills around Los Angeles offer prime cougar real estate—shrubland and forests filled with deer—but survival rates can be lower than in some hunted populations because of several threats.

Losing ground: As more land is taken up by roads and homes, suitable habitat for cougars shrinks and becomes more fragmented. Much of the remaining habitat is unprotected.

Deadly roadblocks: High-volume expressways such as the 405, the 101, the 15, and the 241 toll road cause fatal collisions and cut cats off from larger populations. Genetic isolation can lead to inbreeding.

CAT FATA

Collisions vehicles k other cau of confirm

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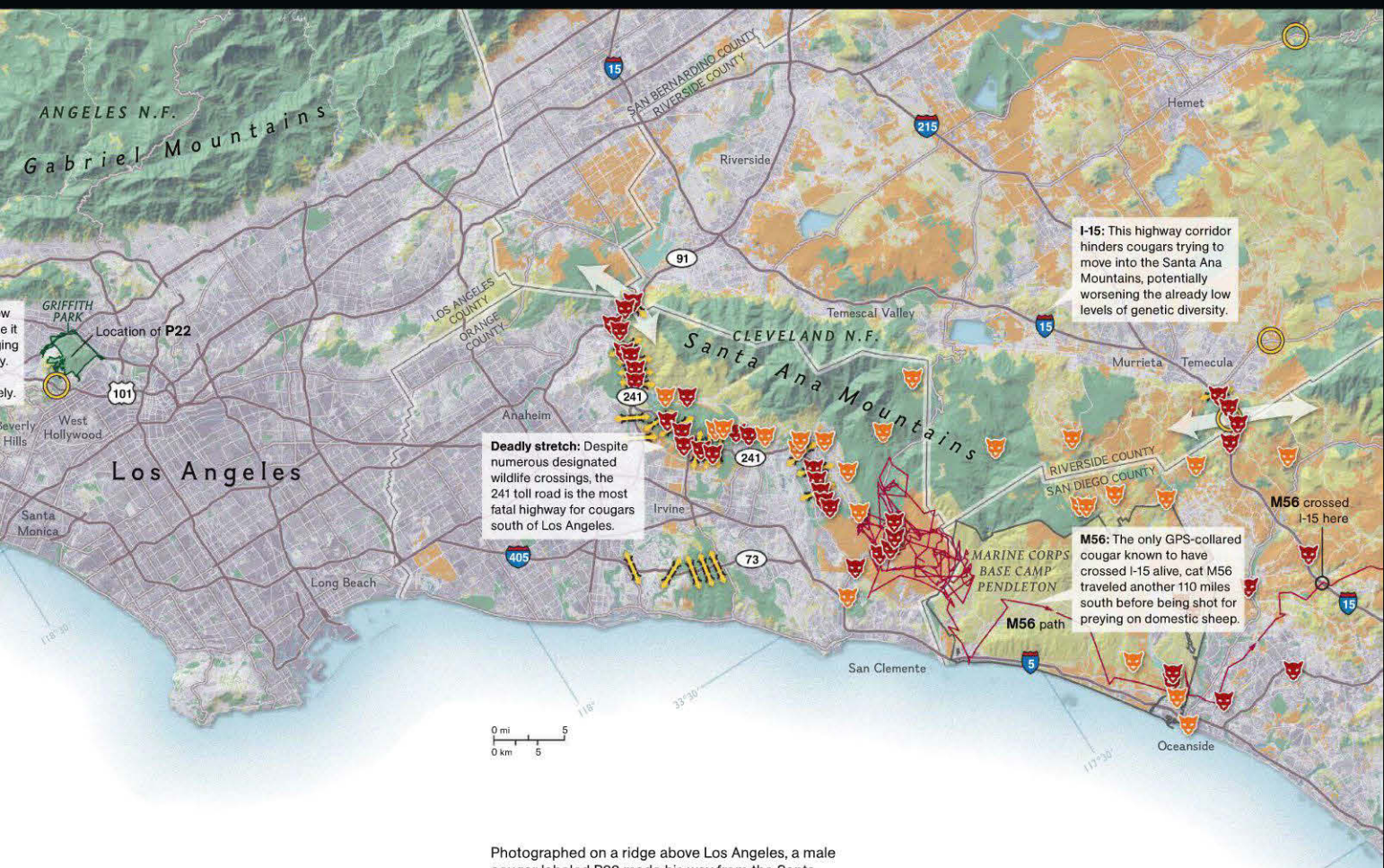


Photographed on a ridge above Los Angeles, a male cougar labeled P22 made his way from the Santa Monica Mountains to Griffith Park—an island of habitat surrounded by homes and highways.

LITIES

s: In car-choked southern California, kill as many or more cougars than any se related to humans. The locations ned kills are noted above.

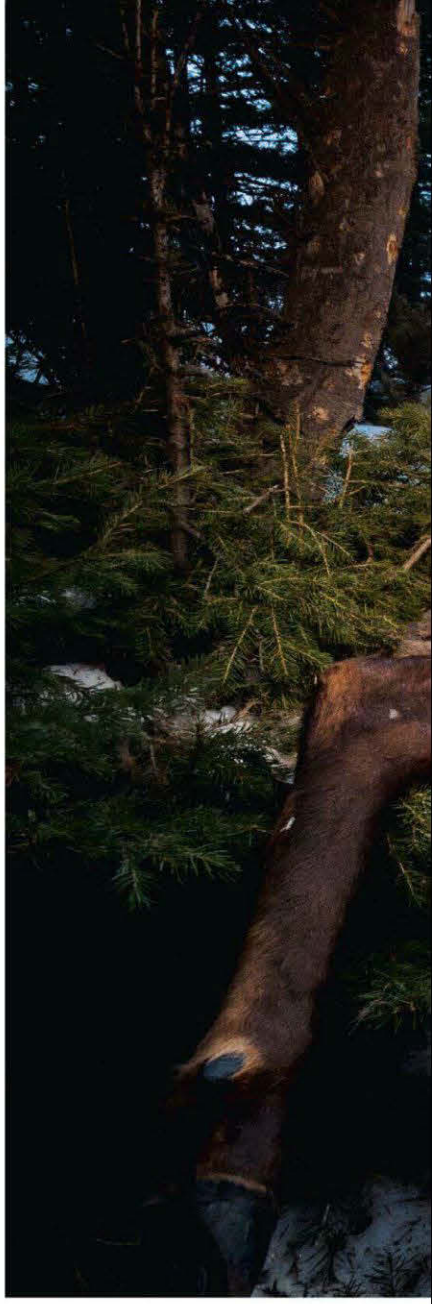
t: Habitats like the Santa Monica Moun- support only so many cougars. Males that the territory are apt to kill younger cats in control of breeding-age females.

ide: Anticoagulants commonly used in rat ave been detected in nearly all California ested to date—including mothers and at eat small prey near residential areas.

ion and poaching: Hunting cougars is California, but animal-control officers kill nat take livestock or threaten humans. have also slain numerous animals.

MARTIN GAMACHE AND MATTHEW TWOMBLY, NGM STAFF

SOURCES: HOWARD QUIGLEY, PANTHERA; CLAYTON K. NIELSEN, SOUTHERN ILLINOIS UNIVERSITY; THE COUGAR NETWORK; SETH RILEY AND JEFFREY SIKICH, SANTA MONICA MOUNTAINS NATIONAL RECREATION AREA; WINSTON VICKERS, HOLLY ERNEST, WALTER BOYCE, UC DAVIS WILDLIFE HEALTH CENTER; USGS NATIONAL GAP ANALYSIS PROGRAM; CALIFORNIA DEPARTMENT OF CONSERVATION



Perched atop dinner, this four-month-old kitten survived a wolf attack that killed two littermates, earning her the nickname bestowed by Teton Cougar Project researchers: Lucky.

mystery shrouding their lives is evaporating.

Patrick Lendrum is a biologist with the Teton Cougar Project, a long-running study in Wyoming's Grand Teton National Park region. At the project's field office in Kelly, Lendrum downloads the latest data from several cougars fitted with satellite radio collars. With a couple of computer clicks he converts the numbers into dots on a detailed satellite image of the landscape, which allows him to study the cats' movements almost in real time. To watch the animals themselves, he inserts memory cards retrieved from automatic cameras deployed at the most recent kill sites. Using natural light by day and infrared at night, the cameras tirelessly collect both photos and video—and all kinds of surprises. "Every day around here is a little like Christmas," Lendrum says as his computer screen displays two adult males, natural rivals, each taking a turn feeding on an elk while the other rests a few yards away. "I'm not sure anybody's seen that before. Our cougars keep doing things cougars aren't supposed to do."

A female labeled F61 is another prime example. When she and her siblings were six months old, a cougar mother living nearby was shot, leaving her three kittens suddenly on their own. The next week, F61's mother allowed the orphans to share a kill she and her own kittens were feeding on. As days passed, the mixed youngsters played and ate together at times and even groomed one another with rough-tongued licks. This was the first known kitten adoption in cougar society.

Years later grown-up F61 and a neighboring female, F51, had kittens at about the same time. (F51's were sired by one of the original orphans.) The two families frequently met, shared food, and traveled together through the spring. Eventually F61 began rearing one of the other's young as her own—the second case of adoption.

On my first visit to the Tetons, in November 2012, both females had new litters. When I returned a few months later, F51 had lost two of her kittens to wolves. One of F61's kittens seemed to have met the same end, judging from the unvarying location of its radio signal. Lendrum and his supervisor Mark Elbroch snowshoed toward the signal's source and came on tracks of the cougar family crisscrossed by wolf trails. There was blood on the snow and mingled with the mother's claw marks on a tree.

Sometime after the wolf attack F61 killed a mule deer, so the scientists set up remote cameras near the carcass. As expected, the video footage verified that she had lost a kitten. It also showed an unexpected addition—an adult male feeding with the family.

"The assumption has been that males and females associate to mate, period," Elbroch said. "Yet I'm seeing video after video of adult males

National Geographic's Big Cats Initiative is dedicated to halting the decline of wild felines around the world. To learn more about the projects we support, visit causeanuproar.org.

and females sharing a carcass. We've had seven cats at once at a kill site—a male, two females, and four kittens." He punched up a video of them. They looked like an American lion pride.

An earlier study in Glacier National Park in Montana found that wolf packs from Canada that recolonized the area occasionally killed cougars and often drove them off carcasses. Biologists observed the same thing happening in Yellowstone National Park after wolves were reintroduced there in the mid-1990s. Over the following decade packs began spreading southward into the Teton area, putting cougars there under more pressure to defend their young and food. Were the cats responding by becoming more social—"priding up," as some put it? Or were they just behaving as cougars have always behaved, only now scientists have the ability to watch them?

Whether or not wolves are affecting cougar sociality, they are definitely having an impact on some of the cats' behaviors. Cougars in Yellowstone National Park, for instance, used to hunt in open bottomlands and sagebrush flats. Now they prefer steeper or more heavily forested areas that offer better cover. And after wolves moved into the Teton area, the resident cougars made themselves scarce in open valleys.

"In the 60 or so years that modern wildlife science has been around, most of the animal communities we've studied had no apex predator," says Howard Quigley, senior ecologist with the big cat conservation group Panthera, which oversees the Teton Cougar Project in partnership with Craighead Beringia South. "Here in the Tetons and in Yellowstone, grizzlies and cougars survived the nation's anticarnivore purges. The addition of wolves amounts to a grand wildlife

experiment, the reconstitution of a complete North American ecosystem. It's a rare opportunity to learn how these systems work."

Cougars are now the most common apex predator across one-third of the lower 48 states. Most of the other two-thirds lack any big predatory mammal. So far, anyway, a large cat whose trademark is stealth appears to be the major carnivore modern society finds easiest to accept, or at least tolerate. But people still want a clearer understanding of potential problems. Beyond concerns over personal safety, some suburban and rural householders fear for their pets, while ranchers and farmers worry about damage to livestock. But the loudest calls to do something about cougars tend to come from sportsmen who resent these wild hunters as direct competitors for hoofed game.

"If you listen to some hunters around here, they'll tell you there's no game left in the woods," says David Gray, a former game warden and now mayor of Hill City, South Dakota. When hunters made the same complaint to state game commissioners at angry public meetings, the commissioners raised the 2013 cougar quota to 100 out of a total population estimated at 300—even though the decline of elk and deer was due mainly to excessive sport hunting.

Wildlife management operates at the intersections of science and politics, economics and social traditions. Policies regulating the killing of cougars vary widely from region to region and state to state. In Texas, for instance, cougars are still classified as varmints; you can shoot one almost anywhere anytime. California, on the other hand, has not allowed cougar hunting since 1972 and now has the most cougars of any state. It also has an abundance of deer and one of

This cougar was shot by a homeowner, then confiscated by South Dakota's game agency. Responding to complaints that the cats are reducing elk and deer numbers, the state this year allowed hunters to shoot up to 100 of an estimated population of 300 cougars.

the lowest rates of cougar conflicts with humans. How could that be?

Assuming that every cougar killed means more game for sportsmen, some states cull as many cats each year as wildlife managers think the population can withstand. The toll generally falls most heavily on adult males, which hunters prize as trophies. But as the biggest, strongest cats, they hold the prime territories and force young upstarts to leave, setting an upper limit on the number of cougars in a given area.

Studies by Washington State University professor Robert Wielgus and his co-researchers have shown that when too many large males are killed, footloose young males converge on the emptied territories. Fierce competition pushes more of them to the fringes of the space, often closer to human habitation. Meanwhile, females may roam more widely to avoid the influx of unfamiliar males, which sometimes kill kittens.

Wielgus sums up his surprising findings: "Heavy hunting can result in *higher* overall density of cougars, *increased* predation on game, and *more frequent* conflicts with people—in short, the exact opposite of what was intended."

Rather than ramping up the legal kill, Wielgus prescribes limiting the take to the cougars' natural rate of increase, around 14 percent annually. The state of Washington recently adopted such a policy. Given the widespread approval this strategy has received from wildlife biologists, it may set the standard for hunting of cougars—and perhaps other major predators—making it easier for them to coexist with people.

It seems vital to many people that something big and fierce is out there wilding the landscape, something that prickles the hair on the back of the neck and fires the imagination. Scientists think it's important too, since most ecosystems developed with large carnivores playing a pivotal role. In the absence of a major carnivore—and with sport hunting dropping in popularity—white-tailed deer have become a danger to drivers, a nuisance for gardeners, and a host for ticks carrying Lyme disease. Having no predators to cull the weakest and sickest animals leads to the spread of other parasites and diseases as well. And as unchecked deer populations overgraze shrubs and sapling trees, they are slowly but surely transforming portions of North America's native forests.

No one is saying that cougars belong in every patch of local woods. But some are asking why not in state and national forests across the Great Lakes states, or New York's Adirondacks, or maybe the Ozark Plateau—all places cougars have visited in recent years. Where the cougar will be tomorrow or in ten years is anyone's guess. But chances seem very good that it will continue reclaiming lost ground. As Howard Quigley says, "We're looking at one of the most successful large carnivores on the planet." □

Nat Geo WILD presents a week of exotic felines, premiering on Friday, November 29, with *Man v. Cheetah.* Check local listings.

The flash of a hidden camera diverts a Wyoming cougar from its kill. These largely nocturnal cats are so secretive that camera traps are one of the best ways to illuminate their lives.

Blasting through powder on wooden, horsehide-bottomed skis with a single pole for balance, an Altay skier shows off the skills and equipment his distant ancestors perfected.

On the Trail with the First Skiers

An ancient culture in the Chinese Altay Mountains offers a glimpse of how skiing evolved.

Ashatu bores holes for bindings into a nearly finished ski. With simple tools, the men in the Tuvan-speaking hamlet of Aukoram can craft a pair of skis from a spruce log in two weeks.

A lassoed elk struggles after Serik demonstrates the age-old technique of capturing game in deep snow. China bans elk hunting, so the animal was freed.

By Mark Jenkins
Photographs by Jonas Bendiksen

The hunting party slowly glides into the Altay Mountains in search of elk. It is dead calm, minus 38°F. Just as their ancestors have for millennia, the five men traverse deep, feathery snow buoyed on handmade skis hewed from spruce, with strips of horsehide attached to the bottoms. In lieu of poles each man carries a single wooden staff. Since boyhood, they have learned to master their deceptively crude equipment with exquisite efficiency and grace—the grain of the horsehair providing traction to move uphill and a slick surface for rapid descents, the staff aiding balance. I follow on state-of-the-art telemark skis, using modern poles, but at times still struggle to match their pace. Their lungs and legs seem impervious to the thin alpine air as they stride up even the steepest inclines, exhaling barely discernible wisps of steam that quickly evaporate in the frigid air. Falling into a satisfying rhythm, we slice through the drifts along a copse of birch, then veer left into the shadows of a spruce forest. They don't speak, the muffled swish of their furry skis as quiet as snowfall.

Each man has a knife tucked into his belt, a lariat of horse mane looped over his shoulders, and is pulling a goatskin sled with provisions: a horsehair blanket, a surplus Chinese army overcoat, and fried bread. The rest of the gear—two axes, a billycan, five chipped china bowls, a tin kettle, and a slab of horseflesh—is divided evenly. They don't know how long we will be out. It is common to track elk for several days deep into the mountains.

But as we set out from Aukoram, the hunters' remote hamlet located on the northernmost fringe of western China, their leader, Tursen, is not thinking about elk. Squinting into the blinding glare of the sunrise, he reflects on the unpredictability of snow. It was once a certainty in the Altay that winter would bring blizzards that would cloak its ridges and swallow its forests. Yet this is the first winter in four years where enough snow has fallen to make such a trip worth the effort. Without deep snow, stalking elk becomes a much more arduous, less practical endeavor. Though the Chinese have severely restricted firearms—and hunting, for that matter—the truth is that the men of the Altay never needed guns to hunt elk in these mountains. Their secret weapon has always been snow, deep snow.

This winter the perfect choreography of winds

"To be a hunter is to be a skier," says Tuntukh, 77, right, who recounts a lifetime of pursuing elk, bear, and sable. It is a lifestyle that extends back millennia, as evidenced by an ancient rock engraving (left) of a skier chasing an ibex. Says Tuntukh, "When I can no longer hunt, I will fish."

A History of Skis

After the last ice age, Stone Age hunters began strapping long pieces of wood to their feet to travel farther and faster over snow in pursuit of the game that flourished across Europe and Asia. Adaptations for terrain and snow conditions influenced the design of the skis in different regions. Scientists continue to find evidence of these early skiers engraved in rock and preserved in bogs.

8000 B.C. (disputed)
Altay, China

Altay skis are long by modern standards. Skiers use a single pole to aid balance. Some Chinese academics say the earliest Altay skis date back to 8000 B.C., but other scholars say skiing came to the region much later.

Downhill technique
Unlike a modern skier, who bends forward on his skis during descents, an Altay skier trails his pole behind, leaning back on it for balance. To turn, he moves the pole to the side he wishes to turn and leans in that direction, which tilts his skis. To slow down or stop, he swivels his heels off his skis and drags them in the snow.

Altay skis
The grain of the horsehair is aligned so it digs into the snow as the skier climbs but glides on descents.

Depictions based on archaeological and historical records

Altay ski bottoms are covered with horsehide. In the past the hide was laced on; now it is tacked in place.

FERNANDO G. BAPTISTA, DANIELA SANTAMARINA, AND MATTHEW TWOMBLY, NGM STAFF; DEBBIE GIBBONS, NG MAPS; PATRICIA HEALY. ART (SKIS, ABOVE, RIGHT): HERNÁN CAÑELLAS

SOURCES: E. JOHN B. ALLEN; ESTHER JACOBSON-TEPFER; NILS LARSEN; JEFF LEICH

Pathnasan uses an ax to crack a boiled cow femur to drink the marrow at the start of the "breaking bone" feast. Tutored as woodsmen from boyhood, Altay men skillfully wield axes for all manner of chores, from chopping firewood to hewing lumber to build their cabins.

and moisture has returned, producing a four-foot-deep mantle. Tursen revels in skiing and in the silence. Even if he won't actually kill an elk, even if it's just a journey to show a foreigner the ancient ways of carving life out of this harsh wilderness, it nourishes his spirit to venture back into this pristine white world of his ancestors.

Exactly who these ancestors were remains something of an enigma. The hunters come from seminomadic Tuvan-speaking clans who inhabited pockets of the Altay. Technically, they are Chinese citizens, but their log cabins stand within 20 miles of the converging borders of Russia, Kazakhstan, and Mongolia, and the roots of their language lie to the north in Siberia, where the majority of Tuvans now live.

Anthropologists say their lineage includes Turkic and Samoyed tribes who at various periods over the past several thousand years moved through these mountains. Nevertheless, each member of the hunting party will heartily attest that he descends from the mounted Mongol warriors who swept through the Altay in the 13th century. Each takes great pride in his expert horsemanship. Indeed, the horse remains the center of their culture, used to pull sleighs in winter and to herd cattle, goats, and sheep into upland summer pastures. Lest there be any doubt, it is Genghis Khan, not Mao, whose portrait hangs in each of their cabins. And it is in his honor that their sons are shaved bald but for a tuft of black hair.

I follow the men across a snow bridge spanning a buried creek. The burbling water beneath can be heard but not seen. Abruptly Tursen stops to examine some animal tracks.

"Börü," he says quietly in Tuvan. "Wolf."

Serik, who is Tursen's brother-in-law, stops to look. He nods. There is a pack of six blue-black wolves that also hunts these drainages, occasionally venturing close enough to the cabins to kill a horse. These tracks are old, but the wolves probably aren't far away. The men squat on their skis and study the snow. The paw prints are the size of a mittened fist, and deep, the claws leaving marks in the snow.

"Big börü," says Tursen, puffing himself up to mime the wolf's size, his smooth cheeks curving into a grin.

Wolves remain plentiful enough here that no one skis alone. Local lore holds that a motorcyclist once got stuck in the snow and was surrounded by a wolf pack. Panicked, he called the police on his cell phone. The police told him to light his motorcycle on fire, because wolves are afraid of fire, and that they would be there as soon as possible. When the police arrived, they found a motorcycle burnt black, blood everywhere, and a helmet with a faceless head inside.

Soon the men find a place near the buried creek to take a break. They sit on their sleds, remove their mittens. Some pluck cigarettes from inside their quilted coats. Most, like Tursen, are in their 20s. Serik is the old man at 33. Beneath the layers of clothing, their physiques are lean as willows. They have spent the entirety of their young lives exploring these mountains and seem inured to the bitter cold, unhurried as they cup their rough hands to light their smokes. Tursen, who doesn't smoke, is missing two fingers on his left hand. When he was three years old, he and his sister were sent into the woods with an ax to collect sap. Tursen reached up too soon and his sister accidentally chopped off his fingers.

The men resume their burdens, and after an hour they spot fresh tracks. Tursen leaves his sled and glides back and forth along the trough of tracks, probing at the snow with his staff.

"Sygyn," he says triumphantly. "Elk."

From the confluence of several tracks, size of scat, and location of urination, Tursen and Serik determine that there are four elk nearby: two large bulls, a cow, and a male calf. Tursen points out the zigzag trenches where the bulls plowed up the steep north slope.

"We camp here," he says.

Nightfall is about an hour away, and the men, using the tips of their skis as shovels, dig down to a layer of pine needles beneath the limbs of a conifer, creating a nest surrounded by four-foot

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Mark Jenkins wrote about summiting Mount Everest in the June issue. Jonas Bendiksen photographed Tibetan glaciers for the April 2010 issue.

The complex tides of Altay history are reflected in the home of a family celebrating Chinese New Year, with Tuvan delicacies under a portrait of Mongolian Emperor Genghis Khan.

Plans for building Western-style ski resorts in the Altay flitter among optimistic entrepreneurs. For now, at least in the high backcountry, skiing remains a way of mountain life.

walls of snow. Even in the severe cold, the work makes them sweat. They spread out the goatskins and the blankets. One man starts a fire using birch bark for tinder, another fills the billy-can from a hole punched in the ice, the rest fell dead trees uphill from camp and ski them down to the campfire. Soon the flames are leaping above the walls of snow and tea is boiling. The men don their army coats and squat around the orange tower of fire, holding their hands out to the leaping flames. After a period of silence, they slowly begin to tell stories.

"I fell into a lake once," says Tursen. He had been chasing an elk for three days. "The only thing that saved me was my *taiyak*." His long staff caught on either side of the hole in the ice. The others nod in approval.

Tursen stumbles backward on his skis, stabbing at the beast. The furious elk stamps the snow, raking the air with its antlers, intent on either impaling him or kicking him to death.

Serik offers that the fastest skier he ever saw was an 80-year-old herder he met when he was a boy. Instead of horsehide, the man used skin from an elk's foreleg for the bottoms of his skis. "His skis flew along the snow like he had wings."

Tursen's smartphone rings, and he answers. It's his wife. She asks when he will return. He tells her not to worry.

Serik describes a hunt when Tursen skied down on a bounding deer, leaped on its back, grabbed its antlers, and wrestled it down into the snow, the animal kicking and biting. It is a scene that has been repeated for thousands of years in these mountains. Within the Altay, a handful of petroglyphs have been discovered depicting archaic skiing scenes, including one of a human figure on skis chasing an ibex. Since petroglyphs are notoriously hard to date, it remains a controversial clue in the debate over where skiing was born. Chinese archaeologists contend it was carved 5,000 years ago. Others say it is probably only 3,000 years old. The oldest written record that alludes to skiing, a Chinese text, also points to the Altay but dates to the Western Han dynasty, which began in 206 B.C.

Norwegian archaeologists also have found ski petroglyphs, and in Russia, what appears to be a ski tip, carbon-dated to 8,000 years ago, was excavated from a peat bog. Each nation stakes its own claim to the first skiers. What is widely accepted, however, is that whoever first strapped on a pair of skis likely did so to hunt animals.

The men around this fire, now laughing at Serik's story, seem to care little about the history. Fewer and fewer of their generation are learning the old ways of making skis and tracking animals.

I ask Tursen how he killed the deer, but he just stares into the fire. Nervous about running afoul of the authorities, the men never speak to me of killing animals, only of tracking them. "In the old days we hunted. Now we only chase," says Serik. The others say nothing. I don't press him because I've heard that the penalty for killing an elk, or any of a host of other wild animals, is jail, though rumors circulate that Communist officials take frequent hunting trips.

Changing the subject, Serik waves his hand over the frozen darkness. The grass here in the summer is so tall you can't even see a deer. He lists animals that inhabit this verdant country: bear, wolverine, ermine, sable, fox, and lynx.

Tursen's wife calls again, and the talk turns to women, a much safer topic. One of the men wires Tursen's phone to a miniature set of speakers, and the hunters bob their heads and chant to a Tuvan rap song.

A hunk of the salty horsemeat is boiled, and the men eat hungrily in happy silence, then quickly drift into sleep under their blankets on the outer rim of the fire's warmth. It's difficult to find a comfortable spot in between the furnace-like heat and the brutal cold, and I lie awake, wondering how far into the mountains the elk

will lead us, listening for the howl of the wolves.

The next morning the thermometer stands at minus 40°F and the blankets are white and frozen stiff. The men emerge from beneath them with the bloodless pallor of cadavers. The silence is so complete it is possible to hear the faint cracking of frozen tree limbs. A ring of melted snow around the fire has refrozen into silvery plates of ice. The ice is kicked away, the fire coaxed back to life, black tea is boiled. Speechlessly the men hold their steaming bowls in both hands. After slurping down several, they come back to life.

A few hours after sunrise the temperature has warmed to minus 20, and the men are skiing uphill. They never slip. The slope is so steep they use their taiyaks like paddles, drawing themselves forward. Cresting the ridgeline, as anticipated, they locate the prints of the two bulls winding through the trees. Tursen points out where the antlers of the elk have broken branches.

We follow the tracks to a cliff that drops off the back side of the mountain. Without hesitation, Tursen leaps off the ridge and the other men follow. They sit far back on their skis, legs wide apart, arms clasping their taiyaks like rudders. They maneuver through thick timber, crash through brush, and leap insanely off snow-covered boulders, flying 20 feet in the air before landing in an explosion of powder.

Tursen picks up the elk tracks and follows them down into the next valley and up along the opposite hillside, where he stops. "They can smell us," he says. "That's why they're moving."

He decides we must stay well above the elk, where the wind can sweep away our scent. Moving silently, we file across a lower saddle and curl out into a high bowl. Suddenly, out front, Serik and Tursen are hooting and pointing their taiyaks. They have spotted the bulls far below in a stand of birch. Instantly they are plunging down the mountain, deftly carving around the trees.

Within seconds they are upon the two bulls. The elk make a break for a thick stand of timber. But the five skiers, working as a team, circle and drive them back into the open. In the glade the snow is so deep the elk are practically swimming. The two bulls thrust off in different directions, hooves pawing at the snow.

Coiling his lariat, Serik skis in close to the larger bull, an enormous creature. Just as he throws his rope, the elk lowers its head, and the lasso slides off. Immediately, the elk charges Tursen, who is blocking its escape route into the trees. Tursen stumbles backward on his skis, stabbing at the beast with his taiyak.

As Serik recoils his lariat, the furious elk rears and stamps the snow, raking the air with its antlers, intent on either impaling Tursen or kicking him to death. Tursen, on his back, holds his taiyak like a spear to protect himself. Even as the spinning lasso is dropping over the antlers, Serik is heaving it tight. The elk's head jerks as Serik falls backward and sets his skis perpendicular to the taut rope, anchoring himself in the sea of snow. It is the primeval picture of man against beast, a picture worthy of its own petroglyph.

The elk flexes its massive neck muscles and violently thrashes its antlers side to side, trying to throw off the lasso. When this fails, it heaves forward in a series of hopeless lunges, dragging Serik through the snow.

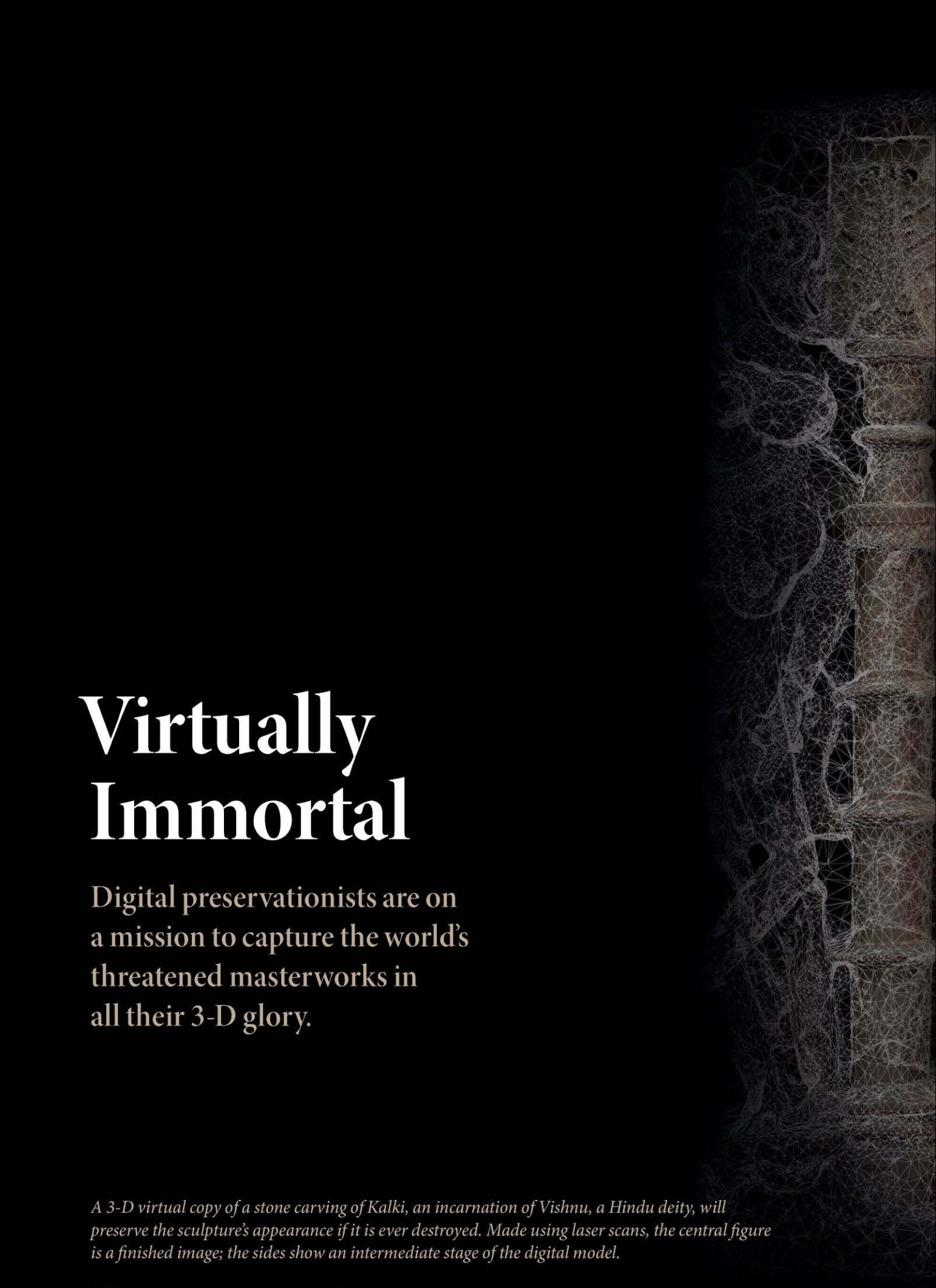
The other elk is subdued in the same manner. After two hours both animals are prostrate, legs splayed, lungs heaving, nostrils flaring with every sucking breath, the lassos around their antlers tied to trees. They have given up.

I never believed Serik and Tursen's protests that they didn't actually kill animals. The elk represents meat for their families, the hides and antlers, money. In the rush of the moment I expected them to default to instinct and heritage, unsheathe their knives, and cut the throats of the exhausted elk, closing the ancient circle—the sacrifice of one animal for the survival of another. But they don't. The two hunters glance at each other, then at me, and slip the lassos off the antlers of both animals. The elk, with prodding, slowly realize their inexplicable good fortune and eventually stagger off into the trees.

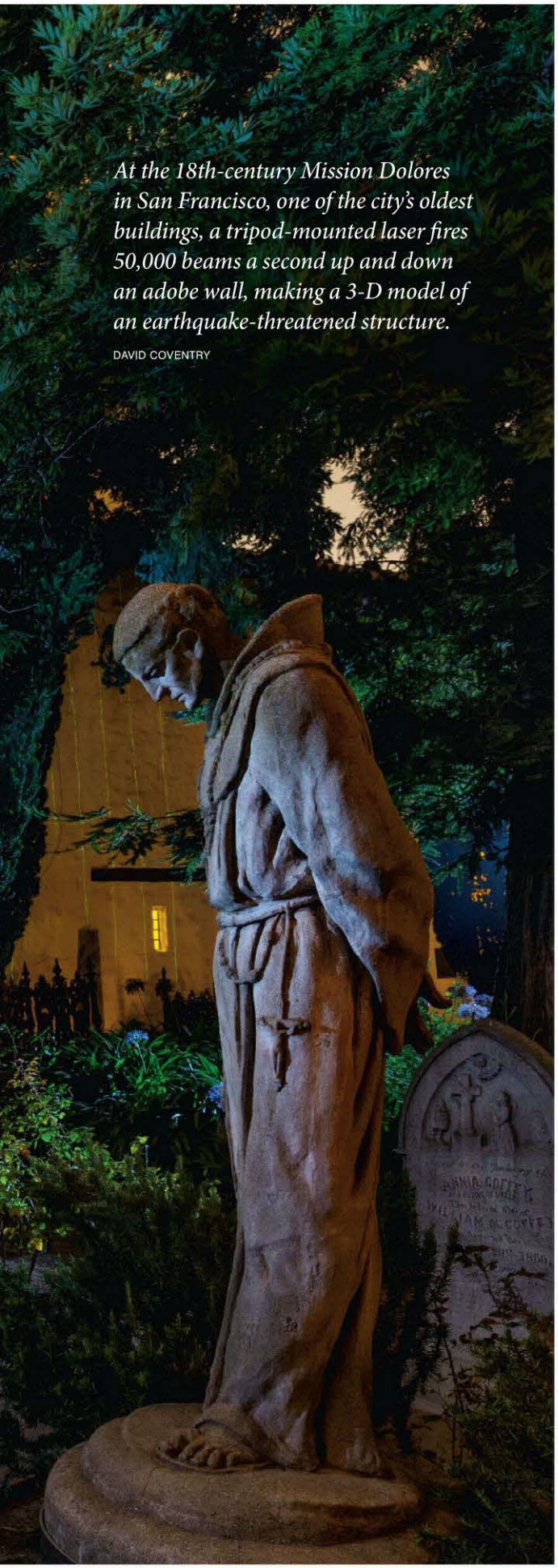
A week later, as I am leaving Aukoram, word arrives from another group who had tracked the same elk herd. They had found the carcasses of the two bulls. The wolves had eaten them. □

Virtually Immortal

Digital preservationists are on a mission to capture the world's threatened masterworks in all their 3-D glory.



A 3-D virtual copy of a stone carving of Kalki, an incarnation of Vishnu, a Hindu deity, will preserve the sculpture's appearance if it is ever destroyed. Made using laser scans, the central figure is a finished image; the sides show an intermediate stage of the digital model.



At the 18th-century Mission Dolores in San Francisco, one of the city's oldest buildings, a tripod-mounted laser fires 50,000 beams a second up and down an adobe wall, making a 3-D model of an earthquake-threatened structure.

DAVID COVENTRY

By George Johnson

The first surprises, after the long, dusty drive from Ahmadabad, are the shade trees and the rolling green lawn. Then you notice the monkeys, mynah birds, and parakeets swooping in and out of the trees. After passing through the entrance gate, you follow a long stone pathway until the ground begins to open up before you. There, on the far side of the grass, is a gaping sandstone canyon, sculpted not by wind and rain but by human hands: Rani ki Vav, the Queen's Step Well.

It is dry most of the year in northwestern India, the rain arriving abruptly during the summer monsoons and seeping down through the sandy soil. Centuries ago people dug to get at the water and then built stone stairways down to the pools. These step wells were simple at first, but some later became monumental works of art.

Rani ki Vav is among the most magnificent. Located near the Saraswati River in Gujarat, it was built late in the 11th century by Queen Udayamati as a memorial to her dead king. It saw little use, and by 1300 seasonal floods had filled it with silt. Not until the 1960s did the Archaeological Survey of India begin scooping it out. Witnesses were stunned by what had lain hidden beneath all that sand.

"We've seen photographs, but nothing compares with seeing it firsthand," says Lyn Wilson, an archaeological scientist from Glasgow, as she gazes at the descending tiers. With the latest in digital scanning technology, she and colleagues from the Centre for Digital Documentation and Visualisation (a partnership between Historic Scotland and the Digital Design Studio at the Glasgow School of Art) and CyArk aim to reduce the chances that Rani ki Vav, or at least the data describing it, will ever be lost again.

Of all the projects they have undertaken—from the standing stones of Orkney to Mount

Rushmore—this is among the most difficult.

By 12:30 p.m. the equipment has arrived. As team members open the crates, they are met with their first challenge: two busloads of Rajasthani schoolboys on a class trip. They swarm around Wilson as though she's a Bollywood star. A uniformed guard in a beret coaxes them back with a long, swinging stick.

For the next two weeks the team will fight the heat—the electronic scanners will have to be protected from the sun with handheld umbrellas—and cope with curious crowds while they bounce laser beams off every surface of the step well, feeling out every contour. Should the monument be lost again, through floods, war, earthquakes, or just the slow grind of time, there will be a precise three-dimensional simulation available on the Internet.

The India expedition is part of a program called the Scottish Ten, which aims to produce virtual reproductions of ten world-class cultural sites. Essential to the effort is CyArk, a nonprofit organization based in Oakland, California, that has been working with various groups to scan scores of sites around the globe, from Deadwood, South Dakota, to Pompeii, Chichén Itzá, and ancient Thebes. Whatever happens to the hard copies, the blow may be softened by the fact that there is a digital backup.

When I'd visited Scotland earlier in the year, Douglas Pritchard, then at the Digital Design Studio in Glasgow, gave me a virtual tour of a recent project: Stirling Castle, where Mary Queen of Scots was crowned in 1543. Sitting in the projection room wearing 3-D goggles, we swooped like birds through the dark entranceway and into the light of the courtyard. We soared past the Great Hall as clouds were reflected lifelike in the windows. When we reached the roof, it peeled back (reality is not so cooperative), allowing us to hover in the rafters and gaze down into the vast space where the Scottish Parliament once met and the thrones of the king and queen stood. About all that was missing was the cold, damp gloom that pervaded parts of the castle and the sounds of voices muffled by stone walls. Maybe someday that too will be simulated.

But there is more to these efforts than producing hyperrealistic simulations. Rosslyn Chapel, south of Edinburgh, has faced centuries of threats. "Oliver Cromwell's troops used the chapel as a stable in 1650," Pritchard said. Around the turn of the 20th century suffragettes tried to blow it up. With its intricate carvings—the novelist Dan Brown called it "symbology heaven" in *The Da Vinci Code*—the chapel has long attracted conspiracy theorists, who insist on linking it to the Freemasons, the Knights Templar, and the secret bloodline of Christ. Several years ago a man with a pickax made a bumbling attempt to break open a pillar he believed held the Holy Grail. Now that the stones have been scanned, damage could be faithfully repaired. Failing that, the old church could be conjured up in cyberspace.

THE NEXT MORNING at the step well the first full day of work begins. As the morning sun intensifies, I descend deep into the well, overwhelmed by the complexity the team must record. On a lower level seven incarnations of the four-armed god Vishnu adorn the walls. Kalki, the warrior king, sits tall on a horse, one hoof about to crush an enemy's skull. Then there's Varaha—Vishnu with a boar's head—and a tiny goddess perched on his shoulder lovingly rubbing his snout.

"It reminds me of the wonderful Hollywood movie *King Kong*," says K. C. Nauriyal, India's superintending archaeologist for this region, as he shows off his favorite sculptures. Interspersed among the gods, erotic serpent maidens called *nagakanya* stand naked with snakes slithering around their limbs. Subtler are the nature nymphs, or *apsaras*, putting on lipstick or an earring, gazing at a mirror, or drying their hair.

"The spice of life," Nauriyal calls them. In front of us an apsara playfully strikes a monkey as it pulls down her garment. Another apsara tugs the beard of a beggar mounting her leg like a dog. One blow with a hammer by a prudish vandal and the beauty would be destroyed.

As we near the well's bottom, we pass a colonnaded chamber and emerge in towering vista of more vulnerable carvi on the left is the Hindu trinity: Brahn and Vishnu. Between two of the gods, is disrobing and preparing to flick a from her thigh.

A final flight descends to the lowe pavilions and a dark passage that lead well shaft. Standing on a ledge, I look the bottom, which is barely damp, wit tub ring of algae clinging to the rock. Th higher: tier upon tier of stonework risi a hundred feet skyward to a distant light. On three lower levels, which wo have been underwater, Vishnu lies sle the back of the serpent Shesha. On the just above the waterline, he's sitting st

"Rani ki Vav is highlighting the sa water," Nauriyal tells me. "There was a b if there are Lord Vishnus in this form, t will never dry up here." But it did. Agr development and, perhaps, a warme sucked down the water table. You woul dig deeper now. Inevitably the carvings disappear, surviving perhaps only in so computer as sculptures of pure inform

Later in the week I watch Justin E CyArk as he sits in a makeshift tent at

George Johnson is the author of nine books. His most recent is The Cancer Chronicles.

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of the step well and assembles the first pieces. Weirdly colored columns and lintels appear on the screen. The colors—greenish in the brightest areas, grading to oranges and yellows—indicate reflectivity, or how readily the laser comes bouncing back. Barton grabs the image with the cursor and swings it around like a Lego block, fitting it into a model. He's also looking for "shadows"—places the scanner beam missed—and "ghosting." An apparition standing on the steps turns out to be me. With a few clicks of the mouse, I'm expunged from the scan.

Back in Glasgow the simulation will be completed, ultimately joining more than a hundred others already in CyArk's digital repository. But that's barely the beginning. "So much heritage is being lost on a daily basis," Barton says, "through war and human aggression, environmental changes, and the wear and tear of time."

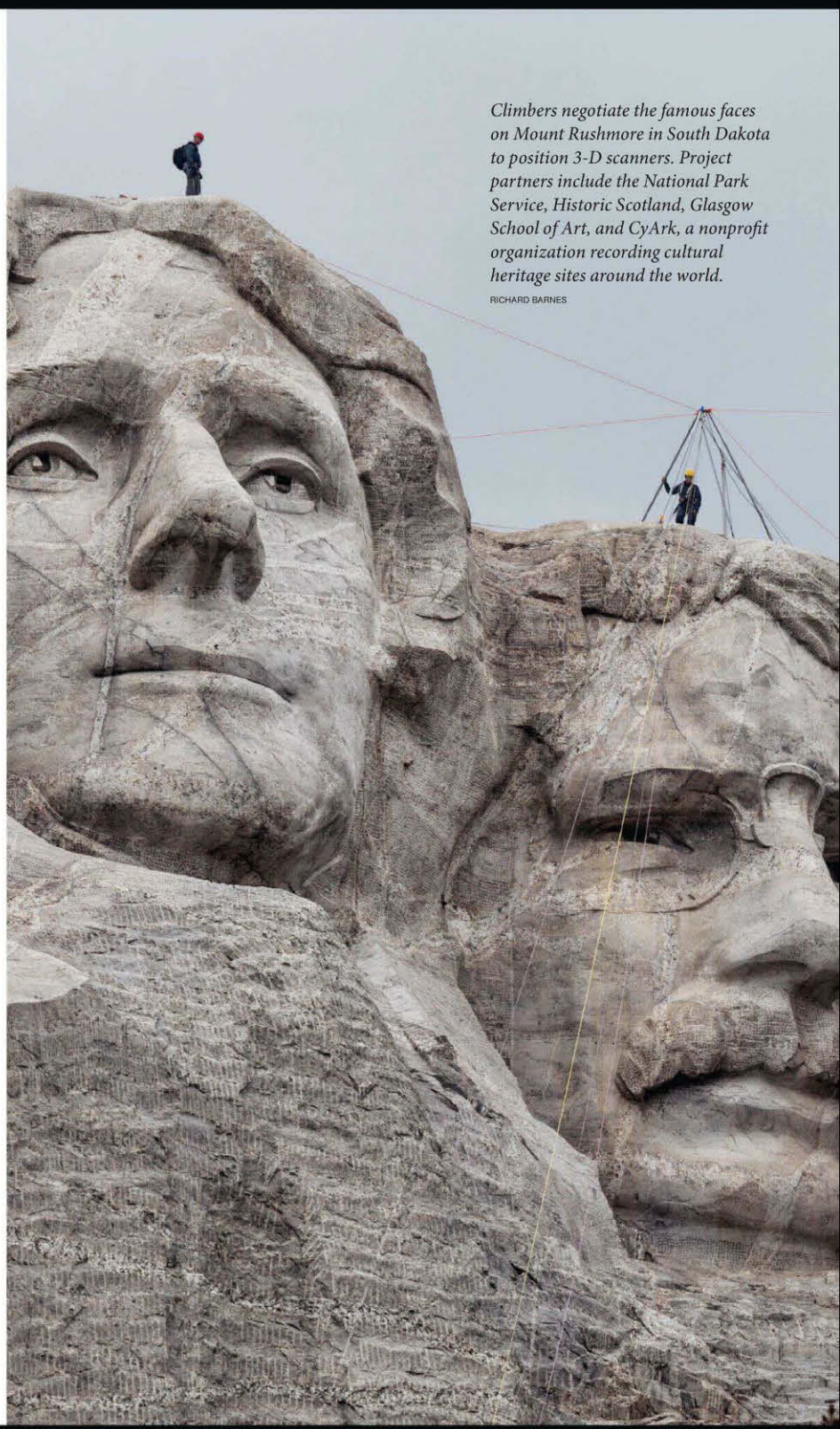
The Scottish Ten recently finished work at the Eastern Qing Tombs, an elaborate royal necropolis in China. During the next five years CyArk and its partners aim to scan 500 cultural heritage sites. But the projects need not be grandiose: Historic missions and other buildings along the El Camino Real in California are on the growing list of treasures to digitally preserve.

"Every day something gets a little older," Barton observes. "This is really an endless task." □

Every detail of a "green man," from fronds on its head to its gap-toothed grin, comes to life in a digital rendering of a stone carving in Scotland's Rosslyn Chapel. Scans of the 15th-century chapel's exterior and interior reveal niches and features that previously were hard to study.

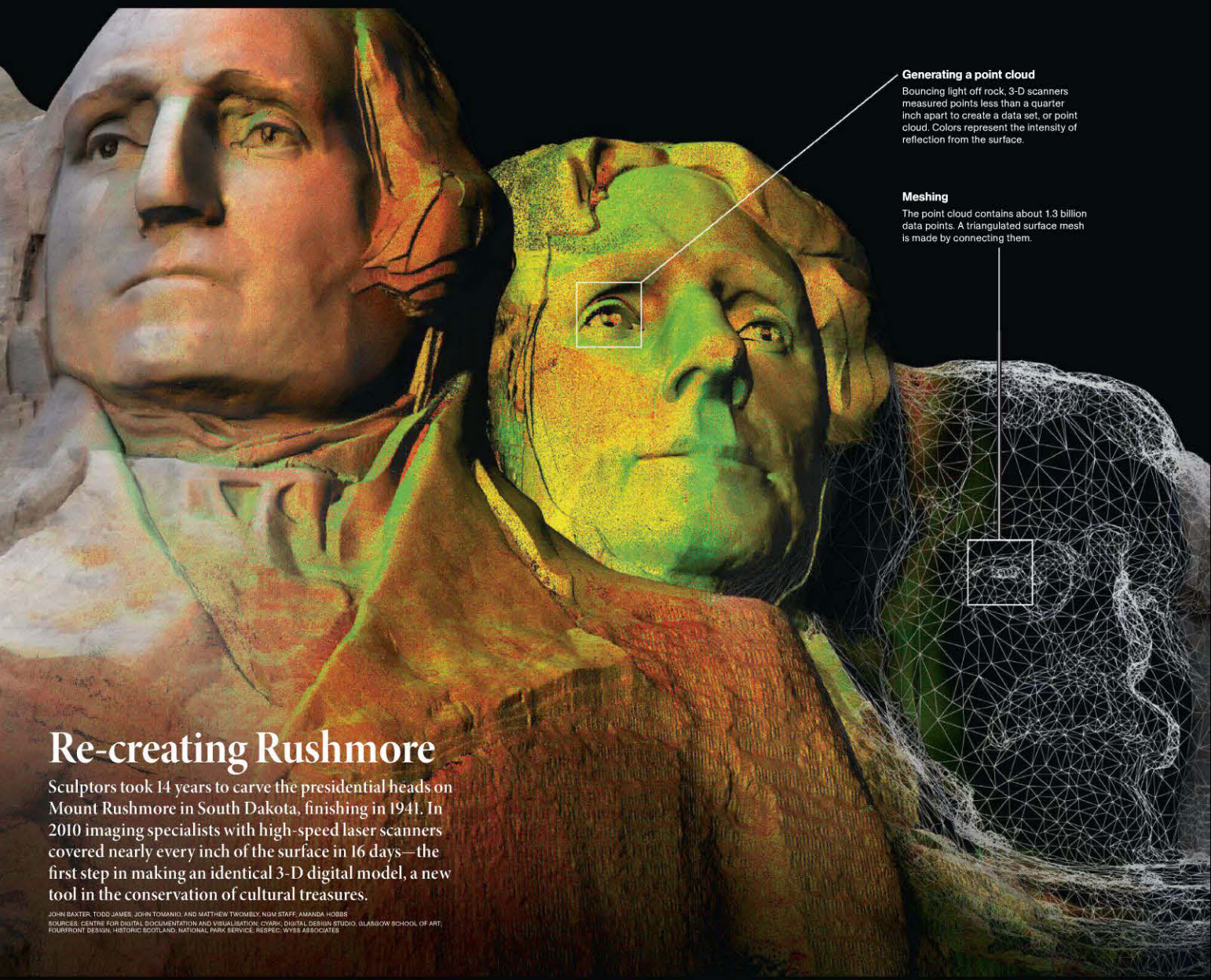
CENTRE FOR DIGITAL DOCUMENTATION AND VISUALISATION

See Rosslyn Chapel in 3-D glory on our digital editions.



Climbers negotiate the famous faces on Mount Rushmore in South Dakota to position 3-D scanners. Project partners include the National Park Service, Historic Scotland, Glasgow School of Art, and CyArk, a nonprofit organization recording cultural heritage sites around the world.

RICHARD BARNES



Re-creating Rushmore

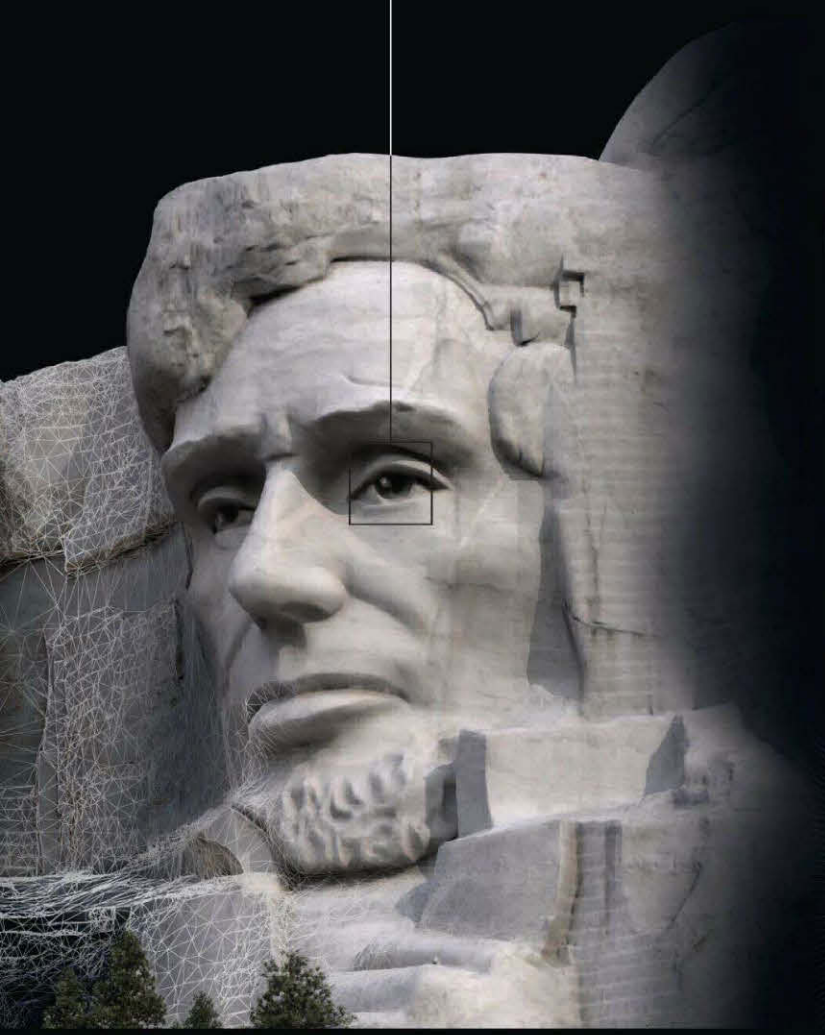
Sculptors took 14 years to carve the presidential heads on Mount Rushmore in South Dakota, finishing in 1941. In 2010 imaging specialists with high-speed laser scanners covered nearly every inch of the surface in 16 days—the first step in making an identical 3-D digital model, a new tool in the conservation of cultural treasures.

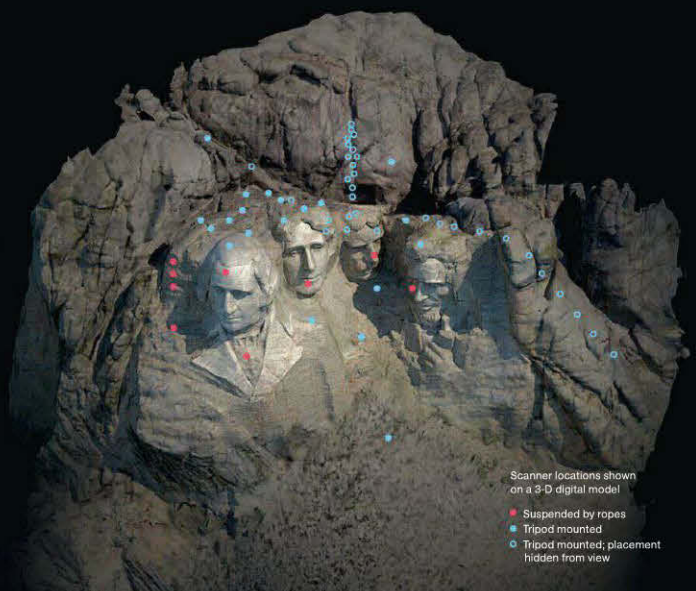
JOHN BAXTER, TODD JAMES, JOHN TOMANIO, AND MATTHEW TWOMBLY, NGM STAFF; AMANDA HOBBS

SOURCES: CENTRE FOR DIGITAL DOCUMENTATION AND VISUALISATION; CYARK; DIGITAL DESIGN STUDIO, GLASGOW SCHOOL OF ART; FOURFRONT DESIGN; HISTORIC SCOTLAND; NATIONAL PARK SERVICE; RESPEC; WYSS ASSOCIATES

3-D modeling

Software aligns points in the mesh with the same points in digital photographs, then applies the photos like a skin over the mesh. On the CyArk website visitors can navigate the 3-D simulation to gaze into Abraham Lincoln's eye.





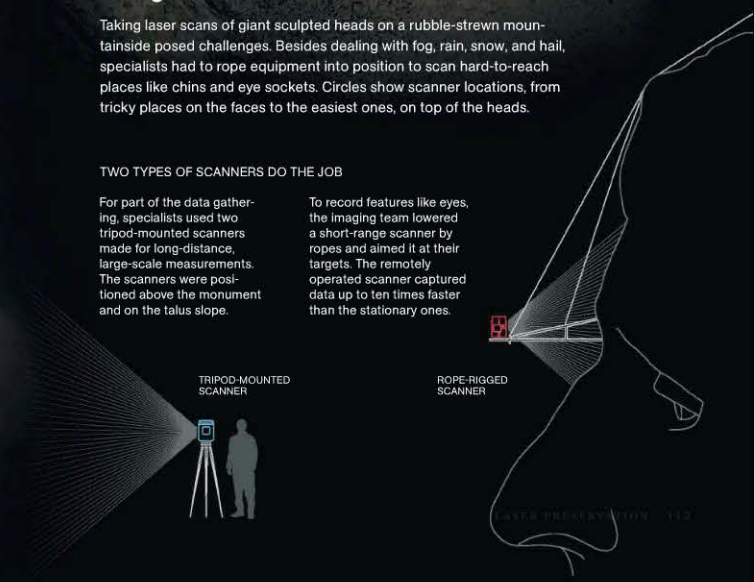
Taking the measure of a monument

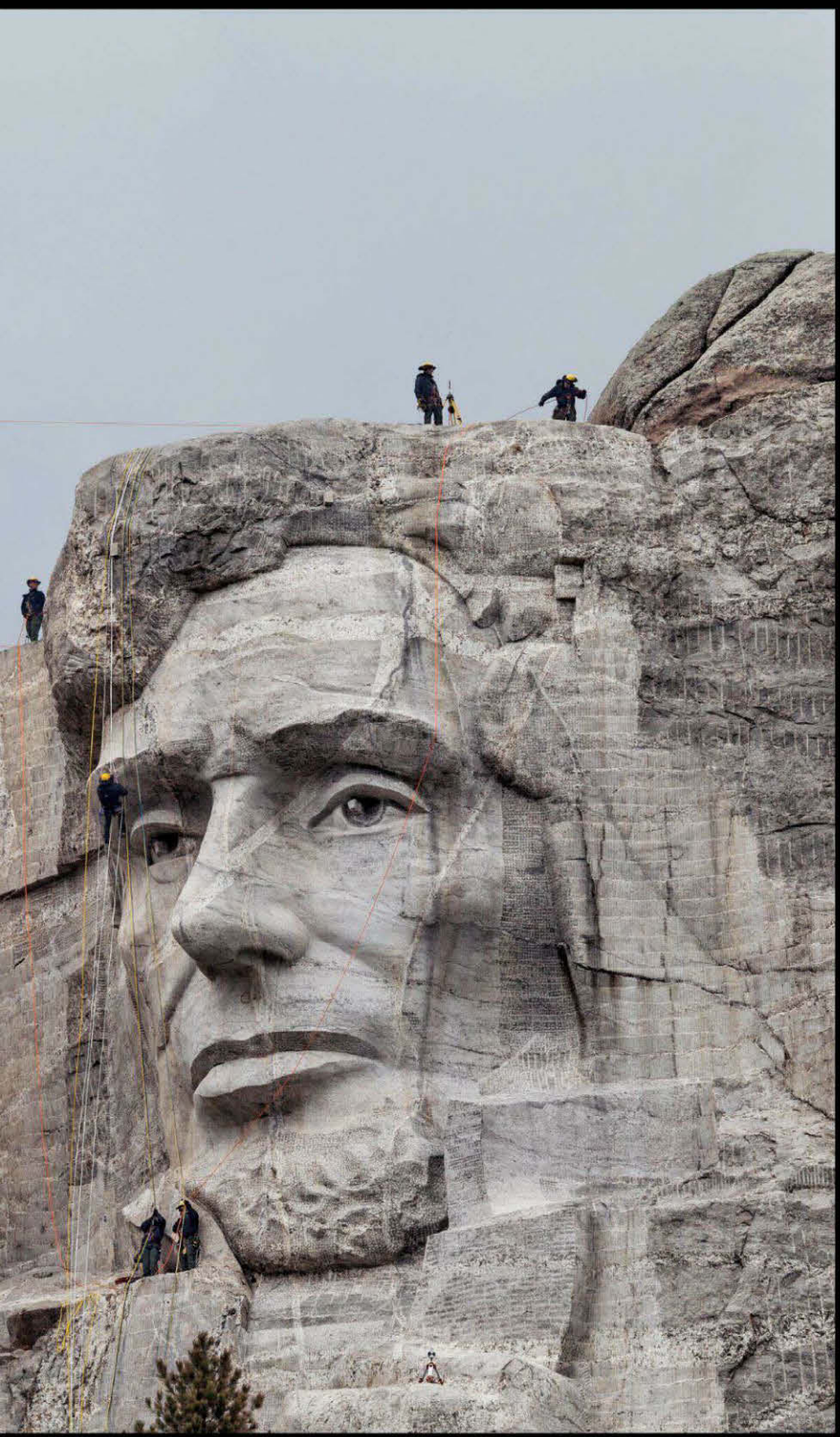
Taking laser scans of giant sculpted heads on a rubble-strewn mountainside posed challenges. Besides dealing with fog, rain, snow, and hail, specialists had to rope equipment into position to scan hard-to-reach places like chins and eye sockets. Circles show scanner locations, from tricky places on the faces to the easiest ones, on top of the heads.

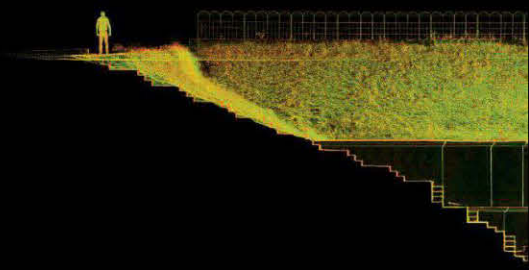
TWO TYPES OF SCANNERS DO THE JOB

For part of the data gathering, specialists used two tripod-mounted scanners made for long-distance, large-scale measurements. The scanners were positioned above the monument and on the talus slope.

To record features like eyes, the imaging team lowered a short-range scanner by ropes and aimed it at their targets. The remotely operated scanner captured data up to ten times faster than the stationary ones.







Preservation in Cyberspace

Millions of targeted laser beams were used to cre
of a frieze of Hindu gods and female attendants (
11th-century Rani ki Vav step well in western Ind
one of many levels of spectacular art unearthed a
The prospect that the carvings could be damaged
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Laser scans of the walls produced a point cloud (
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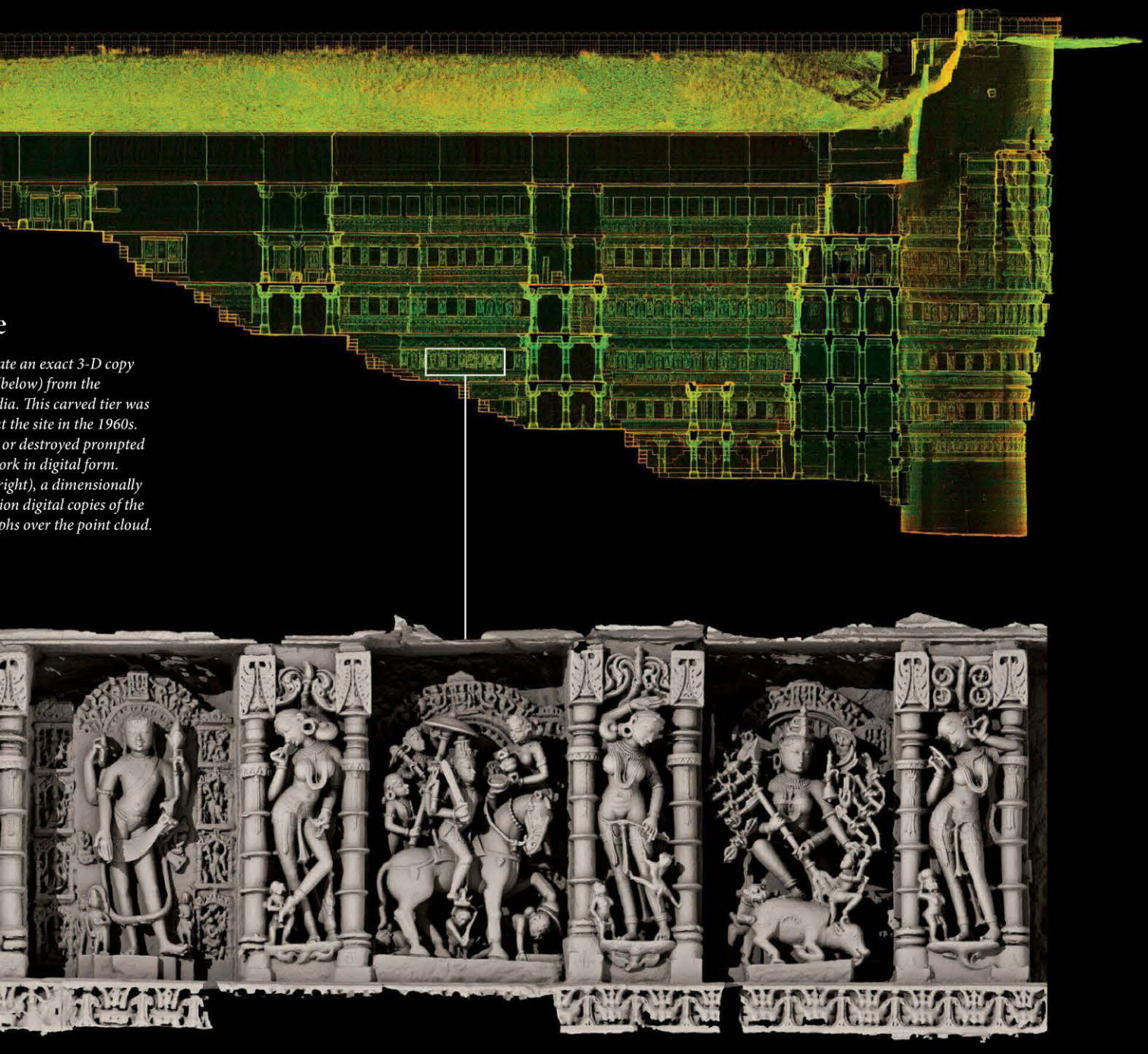
CENTRE FOR DIGITAL DOCUMENTATION AND VISUALISATION (BOTH)



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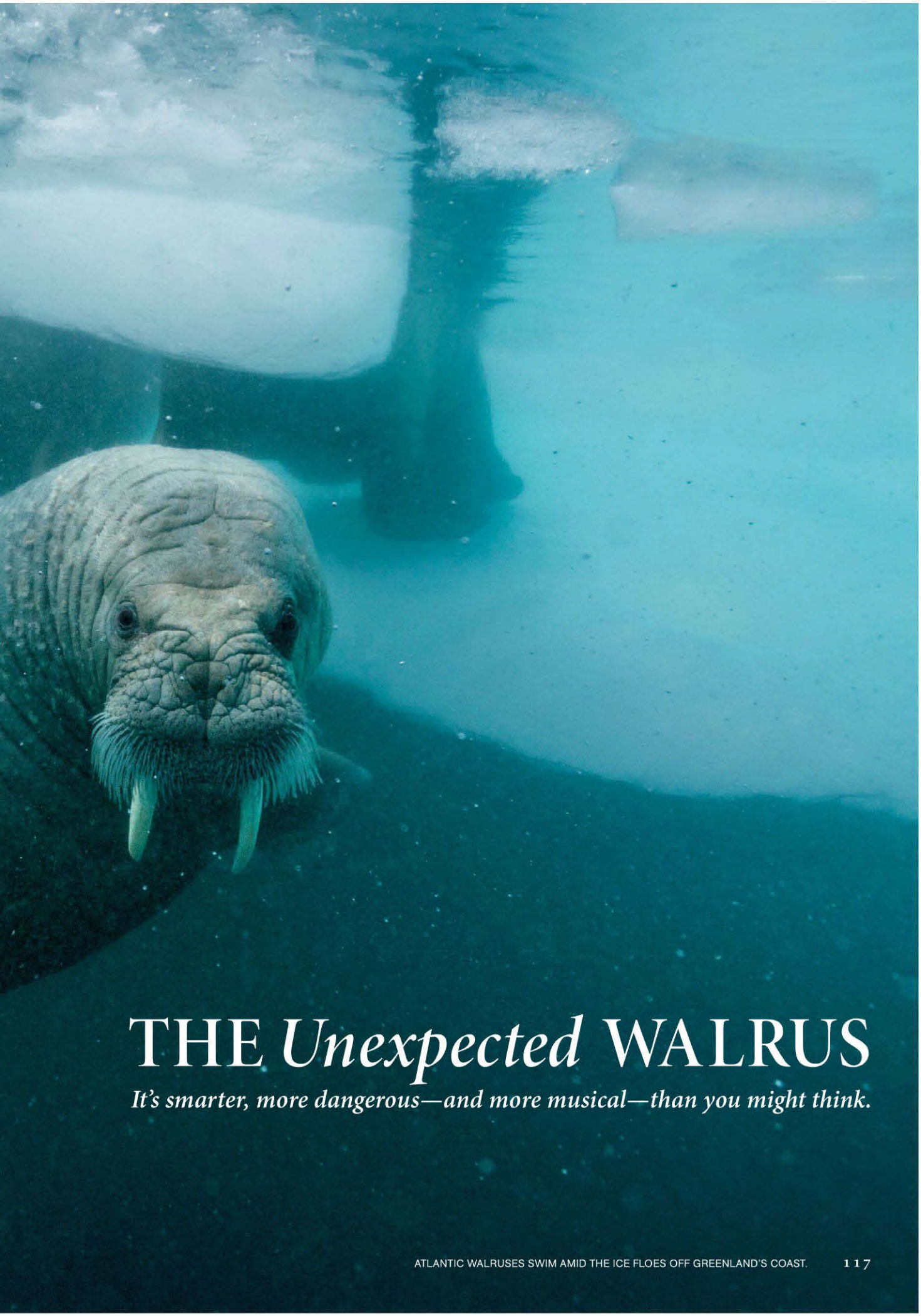


THE *Unexpected* WALRUS

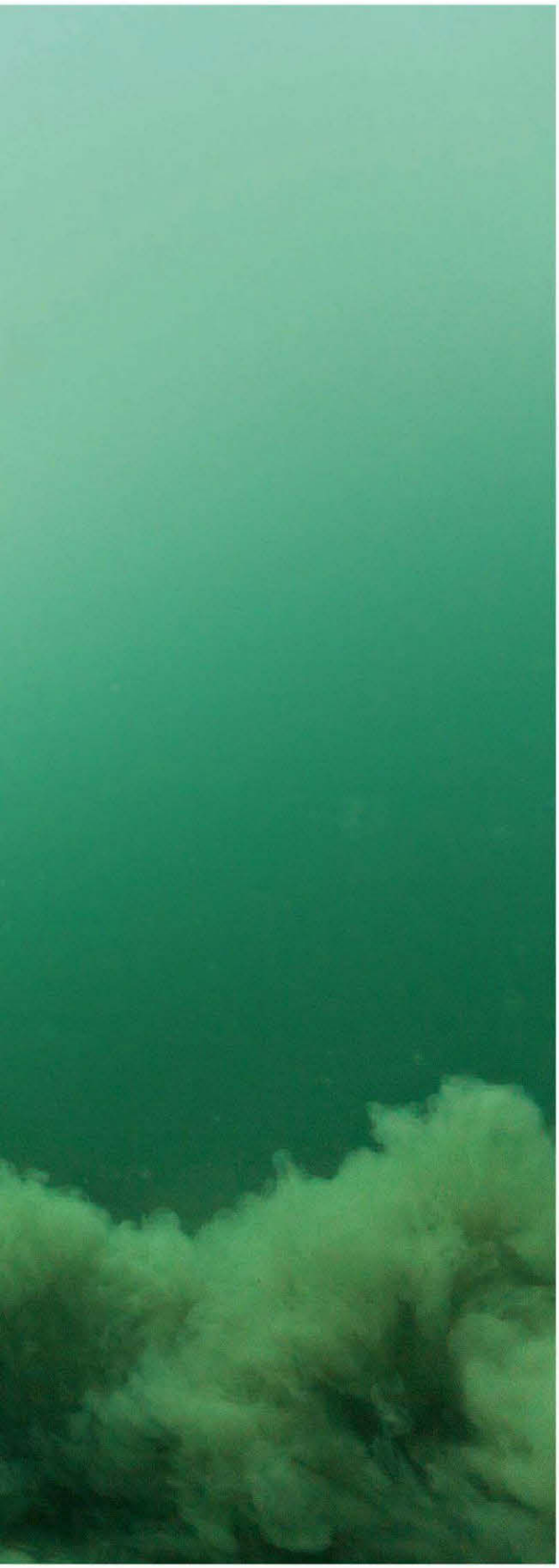
It's smarter, more dangerous—and more musical—than you might think.

ATLANTIC WALRUSES SWIM AMID THE ICE FLOES OFF GREENLAND'S COAST.

A male stands atop sea ice in Svalbard, Norway, where hunting has been illegal since 1952. "That's why this one's tusks are so big," says photographer Paul Nicklen. "You can tell which populations have been protected by the size of their tusks."

Walruses are dangerously unpredictable in the water, especially in groups. Nicklen documented this bull off the Greenland coast by heeding expert diver Göran Ehlmé's advice: Find a sheltered inlet and follow one walrus at a time.

By Jeremy Berlin
Photographs by Paul Nicklen



On ice floes and rocky beaches in the far North Atlantic, cinnamon brown blobs pile up in living heaps. Some weigh more than a ton. Some are longer than ten feet. Each is a rumpled portrait of buckteeth and whiskers, deep scars and bloodshot eyes. They nap, burp, squabble, and bark—"something between the mooing of a cow and the deepest baying of a mastiff," noted a 19th-century explorer.

Walruses may seem familiar from Beatles lyrics and Lewis Carroll verses, but most of us will never see a herd in the wild. And few photographers have documented this dangerous, musical, and socially sophisticated pinniped, a fin-footed kin to seals, sea lions, and sea elephants.

"I used myself as bait," says Paul Nicklen, who spent three weeks aiming his lens at Atlantic walruses with the help of Swedish diver Göran Ehlmé. "I sat on the shore, and the walruses would come along. They'd get curious. But they have to hit you with their tusks to figure out what you are. And for a walrus to hit one of us can be lethal."

Indeed, their ivory tusks can be nearly two feet long. Hooked into ice like an ax, they help a walrus clamber from the sea. They also jab rivals and fend off predators. Punctured polar bears have been found floating dead in the ocean.

The mustache is the other iconic feature. Hundreds of stiff, straw-colored whiskers bristle over walrus lips, thick as quills and sensitive as fingers. Using those vibrissae, walruses can tell the difference between objects half the size of an M&M. More practically, they can locate buried clams on the seafloor. To remove the meat, they use their mouths' vacuum-force suction—strong enough to pull the skin off a seal.

These powerful creatures are tuneful too. During the January to April mating season "adult males erupt with singing and all kinds of strange sounds, like castanets and bells and strums of guitars and tapping on drums," says Erik W. Born, senior scientist at the Greenland Institute of

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Jeremy Berlin is an editor at the magazine. Paul Nicklen's photographs of Mexico's sacred cenotes appeared in the August 2013 issue.

Atlantic walruses dive for food in 300 feet of water or less for about six minutes at a time. To get these rare shots of adults dining, Paul Nicklen and Göran Ehlmé descended into a Greenland fjord. There they found bulls churning up clouds of sediment (top left and bottom right) while

using their highly sensitive whiskers, or vibrissae, to find buried clams. To clear away the silt, some blow jets of water (bottom left); others fan with a flipper (top right). "Walruses feed for up to 48 hours in a row," says Ehlmé. "They go up and down, up and down—like machines."

A herd of bulls (top) snooze in the Svalbard archipelago. A cow gets to know her new calf (bottom) on the drift ice in Foxe Basin, Canada, using whiskers and nose more than eyesight, which is poor. She'll suckle the pup for two years.

Natural Resources. "The best singer is hoping his song attracts a beautiful lady walrus."

Fifteen months after he does, a hundred-plus-pound calf is born. Over the next two years that pup will be cradled like a football by its doting mother, given piggyback rides, fattened with rich milk. If all goes well, it might live 40 years.

That used to be less likely. Ninth-century Vikings slaughtered herds for blubber and hides. Medieval Europeans carved chess sets from tusks. From the 16th century to the 20th, commercial whalers exploited walruses, reducing a range that once reached to Nova Scotia.

Today hunting is mostly restricted to Inuits, who rely on walruses for food, clothing, tools, ivory crafts, and fuel oil. But it's impossible to say how many once swam in the Atlantic—perhaps hundreds of thousands. These days there might be 20,000 to 25,000. Yet even with aerial surveys and satellite monitoring, figures are elusive.

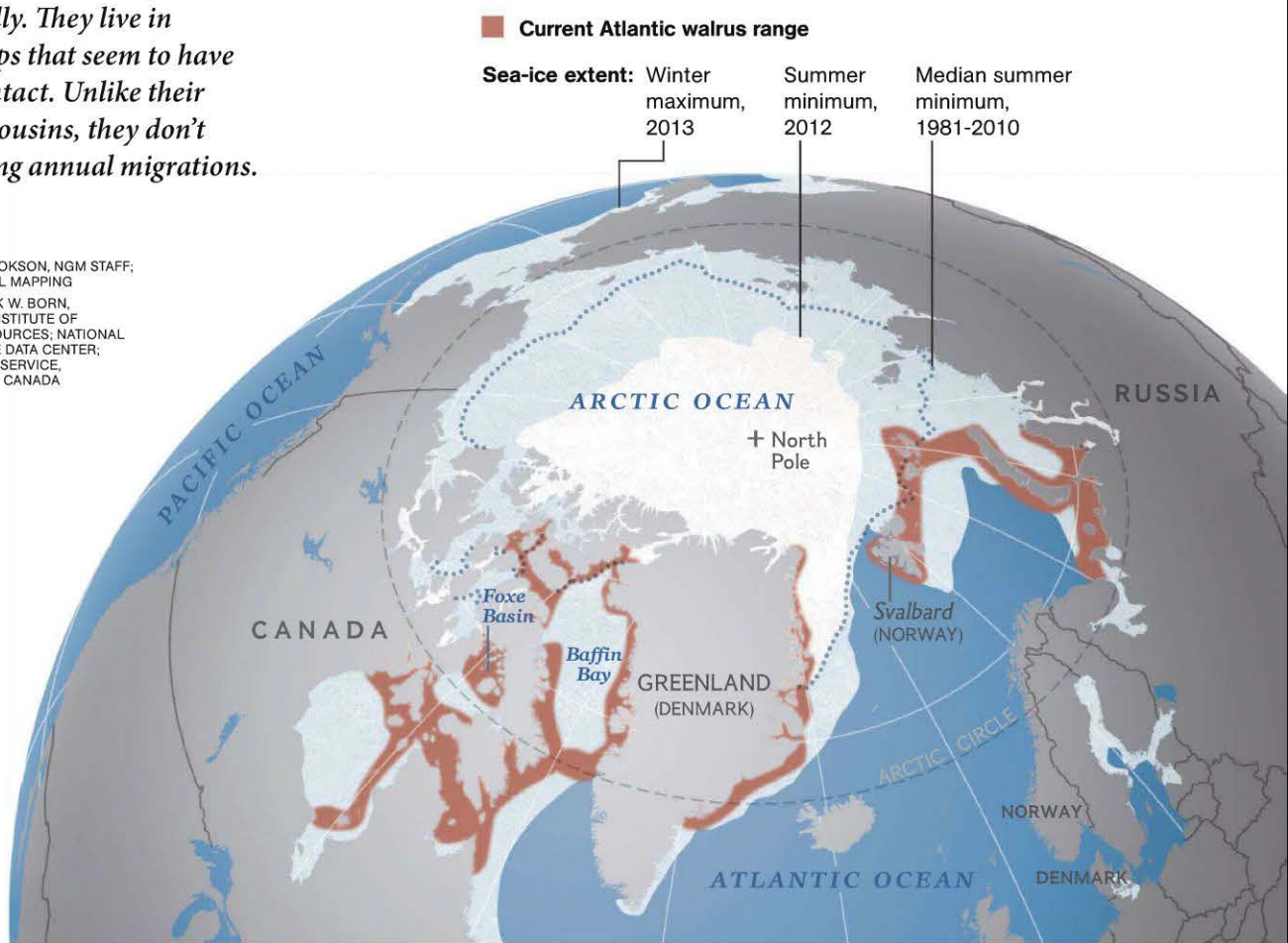
"Walruses are not easy to weigh, and they're *very* not easy to count," says Canadian research scientist Robert Stewart. "They're found over a big area and in clumps. We don't have data from 50 years ago either, so there's no evidence to say whether numbers are up or down."

The loss of sea ice would seem to be a major challenge. Walruses favor ice floes for feeding, birthing, and hauling out. Forced ashore, they're vulnerable to polar bears. Anecdotal evidence suggests some populations are already affected.

Born agrees there's cause for concern but also offers a sunnier prospect. The areas where Atlantic walruses eat clams "used to be covered with ice," he says, "and walruses couldn't gain access until the ice broke up. Now they can feed longer. So the retreat of sea ice could be beneficial."

The time may come when more troubles roil the walrus's world: Poaching, overhunting, large-scale shipping, and oil exploration top the list. But for the moment at least, the Atlantic walrus can enjoy its briny clams and splendid isolation. □

Atlantic walruses prefer to stay near sea ice that forms seasonally. They live in subgroups that seem to have little contact. Unlike their Pacific cousins, they don't make long annual migrations.



JEROME N. COOKSON, NGM STAFF; INTERNATIONAL MAPPING

SOURCES: ERIK W. BORN, GREENLAND INSTITUTE OF NATURAL RESOURCES; NATIONAL SNOW AND ICE DATA CENTER; CANADIAN ICE SERVICE, ENVIRONMENT CANADA

A mixed herd—bulls, cows, and calves—lies hauled out on an ice floe in Foxe Basin. "Someone who belches wrong is apt to get a poke from its neighbor," says researcher Robert Stewart. "But calves have some community immunity. They're allowed some indiscretions."

A male emerges from the brine in Svalbard, Norway. Swimming with walruses gave Nicklen pause. "Your gut is telling you you're making a foolish decision. It's like saying, 'I'm going to walk up to a lion in the Serengeti.' My nerves were tested the whole time."


radio f

The Weed That Won the West

How did an invader from the Russian steppes become a symbol of the American West?

Skeletons of Russian thistle, better known as tumbleweed, pile up in a yard in Lancaster, California.

Two western icons: the towering cliffs of Monument Valley in Arizona and the lowly tumbleweed. The latter is an impostor, an opportunistic Eurasian species that sneaked into the country almost a century and a half ago.

Each Christmas season a tumbleweed snowman, built by New Mexico's Albuquerque Metropolitan Arroyo Flood Control Authority, rises along Interstate 40. At 13 feet, the 2012 snowman was the biggest yet.


MAFCA

By George Johnson

Photographs by Diane Cook and Len Jenshel

The trouble begins around sundown, when a couple of city slickers out for a drive in the desert become stranded along a lonely canyon road. It's silent and windless. Yet one by one, like wolves in the night, tumbleweeds start gathering around them.

"They're following us," the heroine cries. When her husband tries to intervene, one of the tumbleweeds leaps at his eyes.

"It was just like an octopus!" he shouts, after tearing it from his face. "There was living strength in it!…Where did all that energy come from? How can you animate a dead weed?"

There were scarier moments in *The Outer Limits,* the old black-and-white science fiction series. But this episode, "Cry of Silence," holds a special horror for me.

My own encounter with these monsters began one autumn when my wife and I decided to buy some land—a couple of acres for horses on the outskirts of Santa Fe. We had noticed a few brittle tumbleweed skeletons lying around. But that was to be expected. *Salsola tragus,* as it's properly called, or Russian thistle, has become ubiquitous in the West. A few months later, after purchasing the property, we found more: piles of tumbleweeds that had accumulated against a stand of piñon and juniper trees during the March winds.

I tried not to worry. I had fought weeds of all kinds at our house in town, including the occasional tumbleweed. There was also kochia and flixweed, a wild mustard that seemed to resist both fire and herbicides, and yellow toadflax, which exudes a skin-burning chemical (a *Homo sapien*-icide) to fight off human pickers like me. The names we give these creatures are a testament to humanity's disgust: pigweed, dogbane, horseweed, sow thistle, stink grass, ragwort, poverty sumpweed. Programmed by evolution to eke out a living in the harshest regions of the planet, they find life anywhere else like retiring to Florida.

Salsola, I would discover, is their Genghis Khan. An invader from the Eurasian steppes east of the Ural Mountains, Russian thistle has shown an appalling ability to thrive in its adopted land. Every winter the plants die, and the stems become brittle, breaking with a gust of wind. Then they go rolling and rolling, merging into masses of ugly, brown thorn clouds that can bury a house or feed the fury of range fires. Good for almost nothing, the biggest plants—they get as large as Volkswagen bugs—can scatter as many as 250,000 seeds along a path extending for miles. The seeds

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Science writer George Johnson has lived in Santa Fe for 19 years. Diane Cook and Len Jenshel shot gardens at night for the March 2013 issue.

A couple of tumbleweeds make their way across the top of a sand dune near Sand Springs in Monument Valley. Round and lightweight, a single tumbleweed can roll for miles, scattering thousands of seeds along the way. Come springtime, a new crop will grow.

then lie in wait, preparing for the next wave of the invasion.

With the spring snowmelt and the first summer rains on the ranch, thousands of Russian thistle seeds began to erupt into the sunlight, appearing against the brown earth like tiny blue-green stars. They looked so pretty and innocent, the young ones, basking in the sun. Then they began to transmogrify. In a few days they were the size of my hand, their rubbery, purple-veined fingers pulling back troll-like as I tried to yank them from the ground. They weren't yet ready to go.

In another week some of the plants had grown as big as bowling balls. Knowing they would soon double and triple in size, we hacked them with hoes, loaded them into the back of my Jeep, and hauled them to the dump. Two weeks later they were back again.

Throughout the summer we would spend most Saturdays stuffing 40-pound trash bags with the latest crop, trying to interrupt the ancient cycle by preventing the young plants from setting seed. I'd canvass every square foot of the property, and one week later I'd have to do it all over again. Salsola was everywhere.

For the next few months the weeds and I fell into a cycle of prey and predator, and I acquired the instincts of a hunter. The tiniest glimmer of Salsola would catch my attention, and I'd have to chop a whole patch dead. I tried mowing them down with a weed whacker, burning the babies with a propane torch. I tried herbicides—chemotherapy—that were supposed to suppress the seedlings before they sprouted or disrupt the metabolism of those already born. No remedy was more than marginally effective. *Salsola* was always a step ahead.

Soon I found myself spending hours with books like Weeds of the West and *Fundamentals of Weed Science.* There is satisfaction in getting to know an enemy: its habits, its ethology—sometimes, it seemed, its psychology. By now I was sure the plants had learned to hide from me, hunker-

A crew removes tumbleweeds the size of compact cars from a slope in East Los Angeles. Bone dry and filled with air pockets, dead weeds can be ignited by a discarded cigarette—a hazard worsened by persistent drought.

ing down beside a rock and bursting into seed before I caught them. By November, when the infestation had finally subsided for the winter, I'd see Russian thistle when I closed my eyes. I'd hear Gene Autry in my head singing that horrible song "Tumbling Tumbleweeds."

Tumbleweeds around me sing their lonely song.
Nights underneath the prairie moon,
I ride along and sing this tune.
See them tumbling down
Pledging their love to the ground…

Pledging their love to the ground! Pillage and plunder is more like it. The next spring, after all of that work, the *Salsola* was as fierce as ever. And of course I was hardly the only one fighting this unwinnable war. How had this come to pass?

IT WAS IN OCTOBER 1880 that the Department of Agriculture in Washington first received word of a strange plant that had begun appearing in the newly tilled farmlands of South Dakota. Included with the report was a sample that had been found near the town of Yankton on the Missouri River. The information was filed away and forgotten until, a little more than a decade later, more specimens began arriving in the mail. One came from Aberdeen, 200 miles northwest of the earlier sighting, and another from all the way up in North Dakota. The march was already becoming relentless. In the early 1890s a legislator proposed that a fence be built around the state to stem the incursion. It was too late. By this time the weed had already found its way to Canada.

While tracking down its history, James A. Young, a USDA scientist, gathered letters documenting the invasion. "The greater portion of South Dakota east of the Missouri is infested," one farmer wrote in 1891. "This obnoxious weed has become so formidable in some portions of the state…that many farmers are driven from their homes on account of it."

Another correspondent wrote that "intelligent Russians" told him the weed grew abundantly back home around Odesa, "and it is supposed to have been brought to America by Russians in some manner not known." Some farmers suspected it had been introduced intentionally by subversive Mennonites.

Lyster Hoxie Dewey, assistant botanist, was sent from Washington to investigate. He interviewed anyone he could find who could provide information on the invasion. I imagine him on

In California's Central Valley tumbleweeds are ready to roll into an irrigated orchard (left), where their offspring will hog as much water as they can. Once a weed is stopped by a barrier, like this abandoned car (above) near the Great Salt Lake, it can seed a new infestation.

horseback clutching WANTED posters with mug shots of the weed. He dispatched questionnaires to the county governments in seven states asking when the plant had first been noticed and how far it had spread. He was appalled by what he found: "one almost continuous area of about 35,000 square miles which has become more or less covered with the Russian thistle in the comparatively brief period of twenty years."

Iowa, Nebraska, parts of Wisconsin—all were being overtaken. The infestation, Dewey was quick to assure his superiors, was not part of a conspiracy. Sometime in 1873 or 1874—that is how precise Dewey was—contaminated flaxseed from Russia had been sown, quite accidentally, on a farm near the town of Scotland, South Dakota.

"The rapidity with which the Russian thistle has spread, both in infesting new territory and in thoroughly covering that already infested, far exceeds that of any weed known in America," Dewey reported. "Very few cultivated plants even, which are intentionally introduced and intentionally disseminated, have a record for rapidity of distribution equal to that of this weed."

Taking root along roads, irrigation ditches, and railroad tracks, or stowing away inside shipments of grain, *Salsola* quickly spread across the West. By 1885 it had reached California. Within a few years *Salsola* had been sighted in more than a dozen states. Rollicking across its new homeland, *Salsola* was a frighteningly efficient seed-sowing machine.

It hardly bothers with leaves, putting its energy instead into producing small, spiny scales called bracts. Tucked in the cleft between bract and stem are small, barely visible flowers that give forth seeds. Inside each, coiled like a snake, is the *Salsola* embryo, ready to unfurl into a seedling as soon as daytime temperatures rise just above freezing. Given only a few drops of moisture, the weed begins to grow, pushing down a root that can extend six feet deep, with tentacles reaching out even farther.

Late in the autumn, when the mature plant

Like an army on the march, hundreds of windblown tumbleweeds crowd a flood-control ditch in the suburbs of Lancaster. A chain-link fence is hardly enough to stop the juggernaut.

is pregnant with seeds, a layer of cells at the base weakens like the stem of an apple to allow easy detachment. Then comes the inevitable wind. The plant breaks and rolls and reseeds. Rich soil, poor soil, wet or dry, clay or sandy, alkaline or acidic—wherever it finds an opportunity. As long as the ground has been loosened by a plow, a shovel, or the hooves of a cow, *Salsola* will grow. In 1959 it was collected for the first time in Hawaii. Today the USDA Plants Database lists Russian thistle growing in every state except Florida and Alaska.

The weed has also continued to thrive in its native land, spreading throughout the dry parts of Europe and Asia. Canada, Australia, Argentina, South Africa—all have been conquered too. During the early 1960s, after aboveground nuclear testing finally ceased at the Nevada Test Site, the first thing said to grow back was Russian thistle. Radioactive *Salsola* has come tumbling out of the old Hanford Nuclear Reservation in Washington, where plutonium was manufactured during the Cold War. I half expect to hear someday that Russian thistle has been found on the moon.

LATE THIS SPRING, wanting to see where the whole mess started, I flew to Sioux Falls, rented a car, and headed south to Bon Homme County, where those hapless South Dakota farmers had let the genie escape. As I drove along the farm roads, I thought of that *Outer Limits* episode. A half-mad old codger finally rescues the couple from their weedy attackers, and they take refuge in his farmhouse. On a table is a copy of his journal: "There is a malignant intelligence behind these weeds," he wrote, before losing it completely. "No, not behind them, *in* them."

A sign on the outskirts identified the village of Scotland, population 891. There was no arch over the road, like the one in Castroville, California, "artichoke center of the world." Being the home of Russian thistle is not something you advertise. A purple water tower rose over Main Street, which led to a park where children were playing. Off to one corner, beyond the zone of maintenance, several tumbleweeds crouched, waiting to come in. Most of the region is now cultivated for corn and soybeans, so I didn't see as many Russian thistles as I had expected. They appeared mostly along roadsides, in neglected hollows. Given fewer open spaces to travel and the heavy use of industrial-grade herbicides, *Salsola* has moved to a friendlier land farther west.

I drove on to Vermillion, where I had arranged to see historical samples at the University of

Tumbleweeds thrive where they can get a foothold in loosened ground, like the vacant lot at the edge of a bankrupt subdivision in Wasco, California (left), but have trouble taking root in cultivated lawns. An abandoned house near Lancaster (above) is easy game.

South Dakota's herbarium. James Robertson, a graduate student who oversees the collection, laid the weeds out on a table like a rogues' gallery. The oldest was dated August 1892—more than a hundred generations ago.

"I had an adviser who used to say that 'a weed' is a loser's term for a winner," Robertson said. "I think tumbleweeds won."

Not everyone is ready to surrender. To keep *Salsola* in check, scientists with the USDA have been working for years with colleagues in Russia, Uzbekistan, and Turkey on experiments with pests—mites, weevils, moths, and fungi—that prey on the weeds in their native habitat. Imported to the United States, biological controls like these "should help reduce the populations of this weed to innocuous levels over extensive regions," Lincoln Smith, one of the researchers, has predicted. But he has yet to receive federal permission for a release in the field. Federal regulations like these are a good thing, I suppose. I just wish they had been in place to stop the *Salsola*. For now the weed's only real foe is us.

We're not a very unified one. At Christmas the citizens of Chandler, Arizona, erect a tumbleweed Christmas tree. In Albuquerque a giant tumbleweed snowman looms menacingly over Interstate 40. Prairie Tumbleweed Farm, in Garden City, Kansas, actually grows *Salsola*—on purpose!—in long, neat rows: "Quality tested Tumbleweeds!" It ships them in boxes for $15 to $25 each as decorative items. (A special Web page caters to Japanese customers.) A man at Curious Country Creations in Utah proudly told me his tumbleweeds have been used in storefront displays by Ralph Lauren, in Broadway plays, and in Western-themed weddings. For $14.99 the guy will sell you a pack of tumbleweed seeds.

Maybe there is something to be admired about collective and commercial enterprises like these—something about making the best of things, embracing the inevitable. But I'm not buying it. To me, this is just consorting with the enemy. □

world beat

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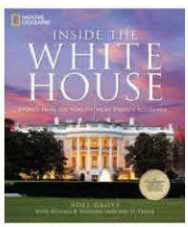

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Noel Grove with William B. Bushong and Joel D. Treese

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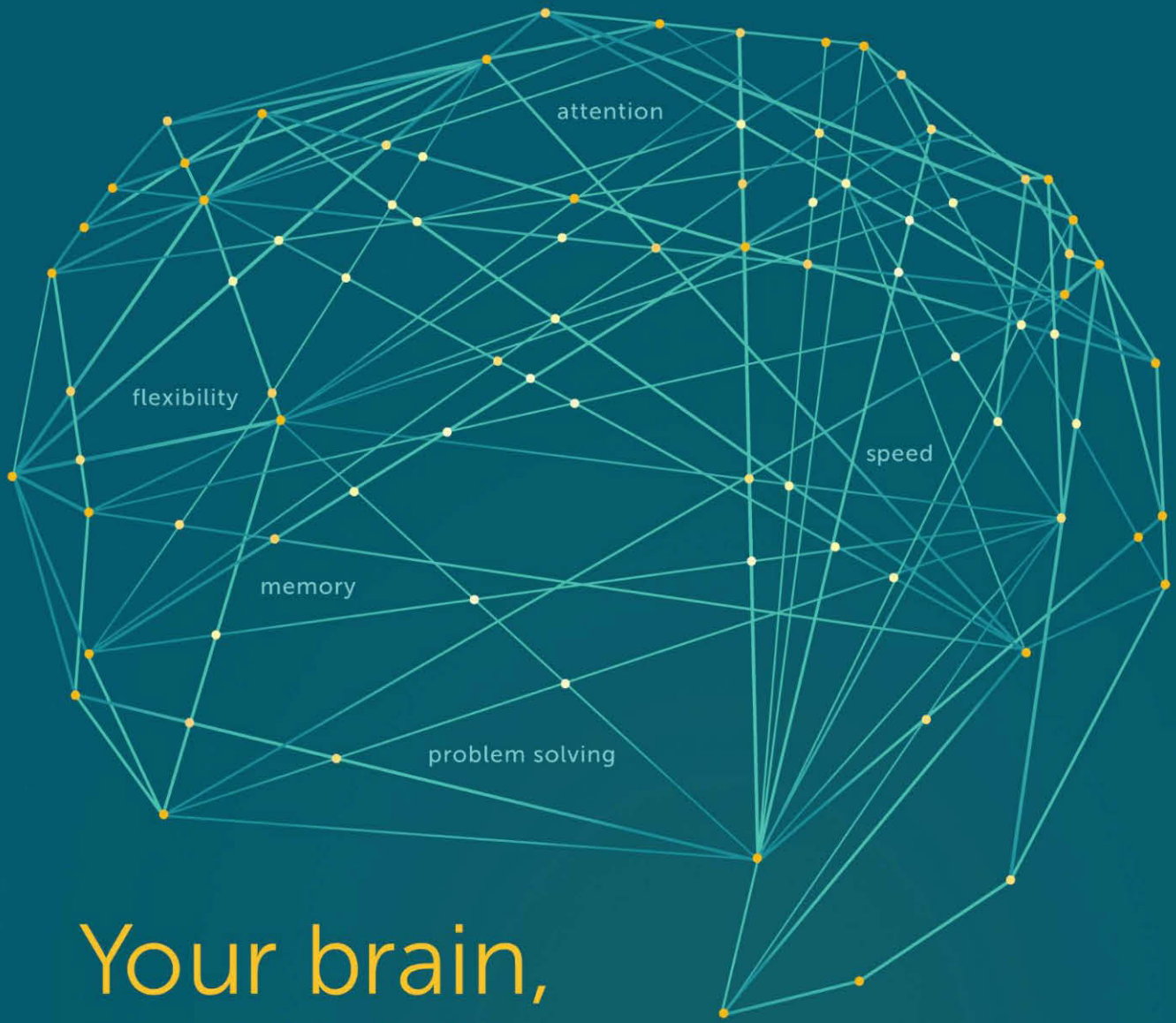

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In the Weeds

Perhaps you've seen them in old Westerns—those weeds that roll down a town's empty streets. They're the color of dirt, they're covered with spikes, they're nobody's idea of beauty. So Diane Cook and Len Jenshel were uncertain how to capture compelling images of tumbleweeds.

When they began the assignment, they learned that common photography rules didn't apply. Photographers usually avoid shooting in the middle of the day, when harsh light makes unflattering contrast. But with the weeds, the shadows added fullness and depth to the monochromatic clumps. "If it was overcast, the weeds didn't look good at all," says Jenshel. The pair attempted to capture the weeds interacting with the landscape, the way they'd pile up against big-box stores or gather in housing tracts.

Westerners try to get rid of the invaders, so Cook and Jenshel were surprised to find a business that sells tumbleweeds. Utah resident Mike Rigby jokingly started his company in college in the 1990s. Now several employees—as well as his seven-year-old son (below)—box and ship weeds to party planners and decorators who pay up to $30 apiece for a symbol of the West. *—Daniel Stone*

Listen to an interview with Diane Cook and Len Jenshel on our digital editions.

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In Plane Sight Spectators stopped to watch a Boeing 377 Stratocruiser taxi over the Van Wyck Expressway in Queens, New York, in the early 1950s. The Stratocruiser was at the time among the biggest, most luxurious commercial planes in the air. According to Boeing's description, "A circular staircase led to a lower-deck beverage lounge, and flight attendants prepared hot meals for 50 to 100 people in a state-of-the-art galley."

Nearby New York International Airport was then popularly called Idlewild, but its official name was changed to honor John F. Kennedy in 1963. This overpass is still there; it has since been strengthened to accommodate even heavier aircraft. *—Margaret G. Zackowitz*

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PHOTO: B. ANTHONY STEWART, NATIONAL GEOGRAPHIC CREATIVE

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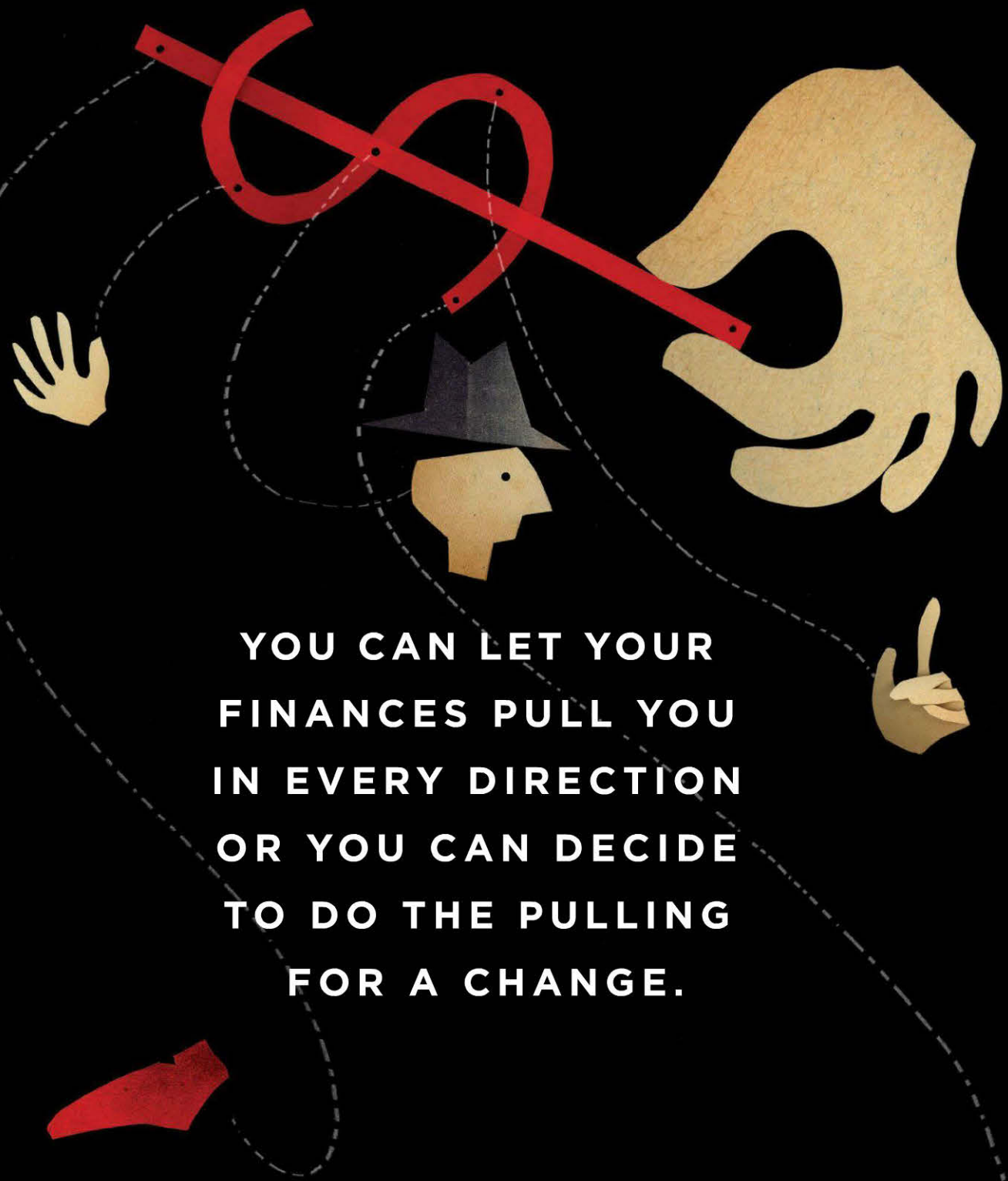

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