



GEOGRAPHY AS YOU'VE NEVER SEEN IT BEFORE!

State abbreviations

INDI.	Indiana
KENT.	Kentucky
TENN.	Tennessee
ARKAN.	Arkansas
MISS.	Mississippi
ALAB.	Alabama
PENNS.	Pennsylvania
W. VIRG.	West Virginia
VIRG.	Virginia
N. CAROLINA	North Carolina
S. CAROLINA	South Carolina

Continental key

	North America
	South America
	Africa
	Europe
	Asia
	Australasia and Oceania
	Capital city





R U S S I A N F E D E R A T I O N

M O N G O L I A

C H I N A

J A P A N

K A Z A K H S T A N

U Z B E K I S T A N

T U R K M E N I S T A N

A F G H A N I S T A N

P A K I S T A N

I R A N

S A U D I A R A B I A

Y E M E N

S O M A L I A

E T H I O P I A

S O U T H S U D A N

S O M A L I A

K E N Y A

T A N Z A N I A

M A D A G A S C A R

M O Z A M B I Q U E

M A L A W I

Z I M B A B W E

S O U T H A F R I C A

B O T S W A N A

N A M I B I A

A N G O L A

C O N G O

D E M . R E P . C O N G O

U G A N D A

R W A N D A

B U R U N D I

S E Y C H E L L E S

C O M O R O S

M A U R I T I U S

R E U N I O N

M A D A G A S C A R

M O Z A M B I Q U E

Z I M B A B W E

S O U T H A F R I C A

B O T S W A N A

N A M I B I A

A N G O L A

A Z E R B A I J A N

A R M E N I A

G E O R G I A

S Y R I A

I R A Q

J O R D A N

L E B A N O N

I S R A E L

S A U D I A R A B I A

Y E M E N

S O M A L I A

E T H I O P I A

S O U T H S U D A N

S O M A L I A

K E N Y A

T A N Z A N I A

M A D A G A S C A R

M O Z A M B I Q U E

M A L A W I

Z I M B A B W E

S O U T H A F R I C A

B O T S W A N A

N A M I B I A

A N G O L A

C O N G O

D E M . R E P . C O N G O

U G A N D A

R W A N D A

B U R U N D I

S E Y C H E L L E S

C O M O R O S

M A U R I T I U S

R E U N I O N

M A D A G A S C A R

M O Z A M B I Q U E

Z I M B A B W E

S O U T H A F R I C A

B O T S W A N A

N A M I B I A

K A Z A K H S T A N

U Z B E K I S T A N

T U R K M E N I S T A N

A F G H A N I S T A N

P A K I S T A N

I R A N

S A U D I A R A B I A

Y E M E N

S O M A L I A

E T H I O P I A

S O U T H S U D A N

S O M A L I A

K E N Y A

T A N Z A N I A

M A D A G A S C A R

M O Z A M B I Q U E

M A L A W I

Z I M B A B W E

S O U T H A F R I C A

B O T S W A N A

N A M I B I A

A N G O L A

C O N G O

D E M . R E P . C O N G O

U G A N D A

R W A N D A

B U R U N D I

S E Y C H E L L E S

C O M O R O S

M A U R I T I U S

R E U N I O N

M A D A G A S C A R

M O Z A M B I Q U E

Z I M B A B W E

S O U T H A F R I C A

B O T S W A N A

N A M I B I A

A N G O L A

C O N G O

D E M . R E P . C O N G O

K A Z A K H S T A N

U Z B E K I S T A N

T U R K M E N I S T A N

A F G H A N I S T A N

P A K I S T A N

I R A N

S A U D I A R A B I A

Y E M E N

S O M A L I A

E T H I O P I A

S O U T H S U D A N

S O M A L I A

K E N Y A

T A N Z A N I A

M A D A G A S C A R

M O Z A M B I Q U E

M A L A W I

Z I M B A B W E

S O U T H A F R I C A

B O T S W A N A

N A M I B I A

A N G O L A

C O N G O

D E M . R E P . C O N G O

U G A N D A

R W A N D A

B U R U N D I

S E Y C H E L L E S

C O M O R O S

M A U R I T I U S

R E U N I O N

M A D A G A S C A R

M O Z A M B I Q U E

Z I M B A B W E

S O U T H A F R I C A

B O T S W A N A

N A M I B I A

A N G O L A

C O N G O

D E M . R E P . C O N G O

K A Z A K H S T A N

U Z B E K I S T A N

T U R K M E N I S T A N

A F G H A N I S T A N

P A K I S T A N

I R A N

S A U D I A R A B I A

Y E M E N

S O M A L I A

E T H I O P I A

S O U T H S U D A N

S O M A L I A

K E N Y A

T A N Z A N I A

M A D A G A S C A R

M O Z A M B I Q U E

M A L A W I

Z I M B A B W E

S O U T H A F R I C A

B O T S W A N A

N A M I B I A

A N G O L A

C O N G O

D E M . R E P . C O N G O

U G A N D A

R W A N D A

B U R U N D I

S E Y C H E L L E S

C O M O R O S

M A U R I T I U S

R E U N I O N

M A D A G A S C A R

M O Z A M B I Q U E

Z I M B A B W E

S O U T H A F R I C A

B O T S W A N A

N A M I B I A

A N G O L A

C O N G O

D E M . R E P . C O N G O

K A Z A K H S T A N

U Z B E K I S T A N

T U R K M E N I S T A N

A F G H A N I S T A N

P A K I S T A N

I R A N

S A U D I A R A B I A

Y E M E N

S O M A L I A

E T H I O P I A

S O U T H S U D A N

S O M A L I A

K E N Y A

T A N Z A N I A

M A D A G A S C A R

M O Z A M B I Q U E

M A L A W I

Z I M B A B W E

S O U T H A F R I C A

B O T S W A N A

N A M I B I A

A N G O L A

C O N G O

D E M . R E P . C O N G O

U G A N D A

R W A N D A

B U R U N D I

S E Y C H E L L E S

C O M O R O S

M A U R I T I U S

R E U N I O N

M A D A G A S C A R

M O Z A M B I Q U E

Z I M B A B W E

S O U T H A F R I C A

B O T S W A N A

N A M I B I A

A N G O L A

C O N G O

D E M . R E P . C O N G O

K A Z A K H S T A N

U Z B E K I S T A N

T U R K M E N I S T A N

A F G H A N I S T A N

P A K I S T A N

I R A N

S A U D I A R A B I A

Y E M E N

S O M A L I A

E T H I O P I A

S O U T H S U D A N

S O M A L I A

K E N Y A

T A N Z A N I A

M A D A G A S C A R

M O Z A M B I Q U E

M A L A W I

Z I M B A B W E

S O U T H A F R I C A

B O T S W A N A

N A M I B I A

A N G O L A

C O N G O

D E M . R E P . C O N G O

U G A N D A

R W A N D A

B U R U N D I

S E Y C H E L L E S

C O M O R O S

M A U R I T I U S

R E U N I O N

M A D A G A S C A R

M O Z A M B I Q U E

Z I M B A B W E

S O U T H A F R I C A

B O T S W A N A

N A M I B I A

A N G O L A

C O N G O

D E M . R E P . C O N G O

Country abbreviations

- BEL.** Belgium
- BOS. & HERZ.** Bosnia and Herzegovina
- CZECH REP.** Czech Republic
- KOS.** Kosovo
- LIECH.** Liechtenstein
- LUX.** Luxembourg
- MAC.** Macedonia
- MON.** Montenegro
- NETH.** Netherlands
- NZ** New Zealand
- Russ. Fed.** Russian Federation
- S.M.** San Marino
- SLVN.** Slovenia
- SWITZ.** Switzerland
- U.A.E.** United Arab Emirates
- UK** United Kingdom
- USA** United States of America
- VAT. CITY** Vatican City

WHERE
ON EARTH?





LONDON, NEW YORK, MUNICH,
MELBOURNE, and DELHI

Senior editor Rob Houston

Senior art editor Philip Letsu

Senior cartographic editor Simon Mumford

Editors Helen Abramson, Steve Setford, Rona Skene

US editor Margaret Parrish

Designers David Ball, Carol Davis, Mik Gates

Researchers Helen Saunders, Suneha Dutta, Kaiya Shang

Cartography Encompass Graphics, Ed Merritt

Illustrators Adam Benton, Stuart Jackson-Carter

Creative retouching Steve Willis

Picture research Taiyaba Khatoon,

Ashwin Adimari, Martin Copeland

Jacket design Laura Brim, Natasha Rees

Jacket design development manager

Sophia M. Tampakopoulos Turner

Pre-production producer Rebekah Parsons-King

Production controller Mandy Innes

Publisher Andrew Macintyre

Art director Phil Ormerod

Associate publishing director Liz Wheeler

Publishing director Jonathan Metcalf

First American Edition, 2013

Published in the United States by

DK Publishing

375 Hudson Street, New York, New York 10014

13 14 5 16 17 10 9 8 7 6 5 4 3 2 1

001-184769-04/13

Copyright © 2013 Dorling Kindersley Limited

All rights reserved

Without limiting the rights under copyright reserved above, no part of this publication may be reproduced, stored in or introduced into a retrieval system, or transmitted, in any form, or by any means (electronic, mechanical, photocopying, recording, or otherwise), without the prior written permission of both the copyright owner and the above publisher of this book. Published in Great Britain by Dorling Kindersley Limited.

A catalog record for this book is available from the

Library of Congress.

ISBN: 978-1-4654-0245-5

DK books are available at special discounts when purchased in bulk for sales promotions, premiums, fund-raising, or educational use.

For details, contact: DK Publishing Special Markets, 375 Hudson Street, New York, New York 10014 or SpecialSales@dk.com.

Color reproduction by Alterimage Ltd., UK

Printed and bound in Hong Kong by Hung Hing

Discover more at

www.dk.com

CONTENTS

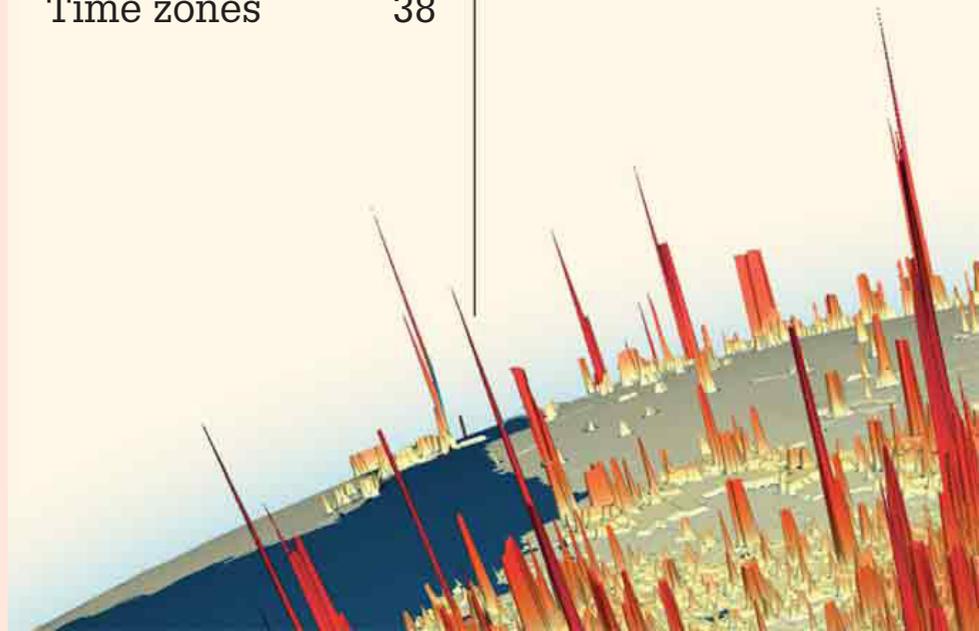


Land, sea, and air

Introduction	6
Earth's crust	8
Earthquakes	10
Mountains	12
Volcanoes	14
Ocean floor	16
Ocean in motion	18
Rivers	20
Craters and meteorites	22
Hot and cold	24
Rain and snow	26
Hurricanes	28
Biomes	30
Forests	32
Deserts	34
Ice	36
Time zones	38

Living world

Introduction	42
Dinosaur fossils	44
Predators	46
Deadly creatures	48
Alien invasion	50
Bird migrations	52
Whales	54
Sharks	56
River monsters	58
Insects	60
World of plants	62
Biodiversity	64
Unique wildlife	66
Endangered animals	68
Extinct animals	70





People and planet

Introduction	74
Where people live	76
Nomads	78
Young and old	80
Health	82
Pandemics	84
Poverty	86
The world's gold	88
Billionaires	90
Food production	92
Food intake	94
Literacy	96
Pollution	98
Garbage and waste	100
Clean water	102
Fossil fuels	104
Alternative energy	106
Climate change	108
Wilderness	110



Engineering and technology

Introduction	114
Air traffic	116
Shipping	118
Railroads	120
Roads	122
Tallest buildings	124
Internet connections	126
Satellites and space junk	128
Armed forces	130



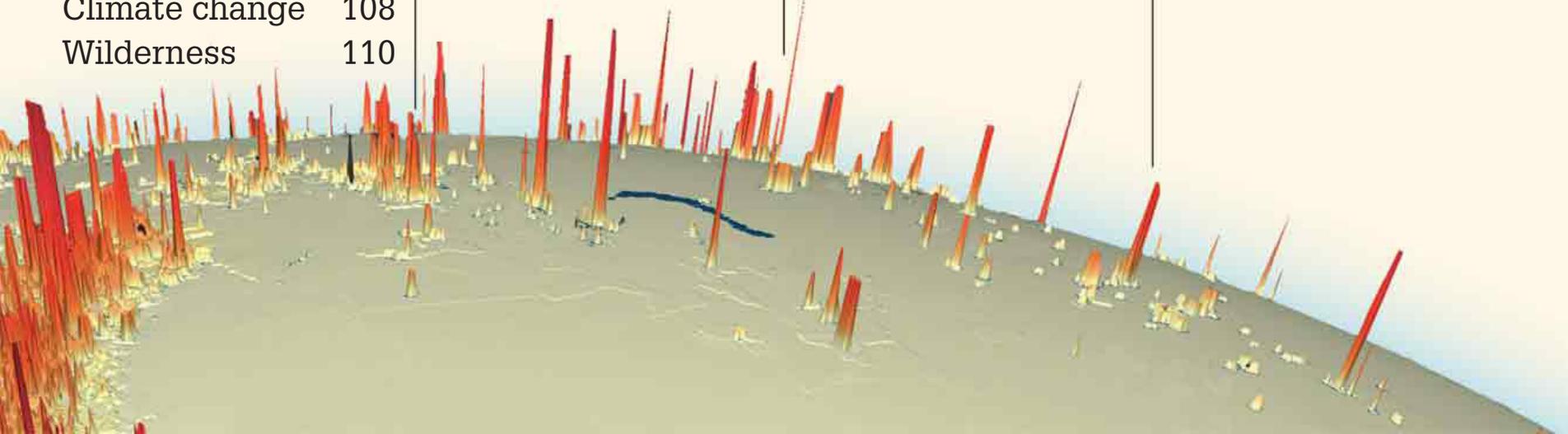
History

Introduction	134
Fossil humans	136
Prehistoric culture	138
Ancient empires	140
Ancient wonders	142
Mummies	144
Medieval wonders	146
Medieval empires	148
Castles	150
Battlegrounds	152
The last empires	154
Revolutions	156
Shipwrecks	158
Industrial wonders	160



Culture

Introduction	164
Languages	166
Holy Places	168
Tourism	170
Art	172
Statues	174
Festivals	176
Television	178
Stadiums	180
Car racing	182
Roller coasters	184
National flags	186
Index	188
Acknowledgments	192







Land, sea, and air

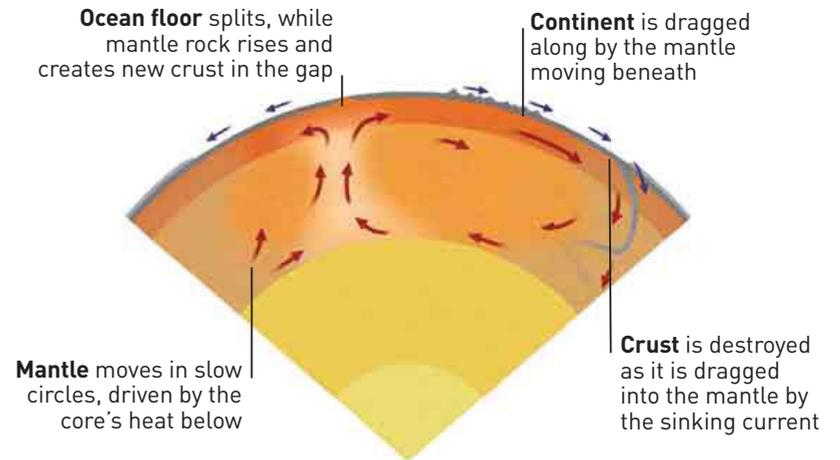
Skeleton Coast, Namibia
The Atlantic Ocean meets the edge of Africa's Namib Desert at the Skeleton Coast. Rainfall here rarely exceeds less than ½ in (10 mm) per year.

Introduction

Earth is a planet in motion, spinning on its axis as it hurtles through space around the Sun. Warmed by the Sun's rays, Earth's atmosphere and oceans are always on the move, while heat from the planet's core keeps the hot rock of the interior constantly churning. All this enables Earth's surface to teem with life.

Churning interior

The rocks in the mantle flow in currents that rise, flow sideways, cool, and then sink. These currents can force the plates of Earth's crust apart or pull sections of the crust back down into the mantle.

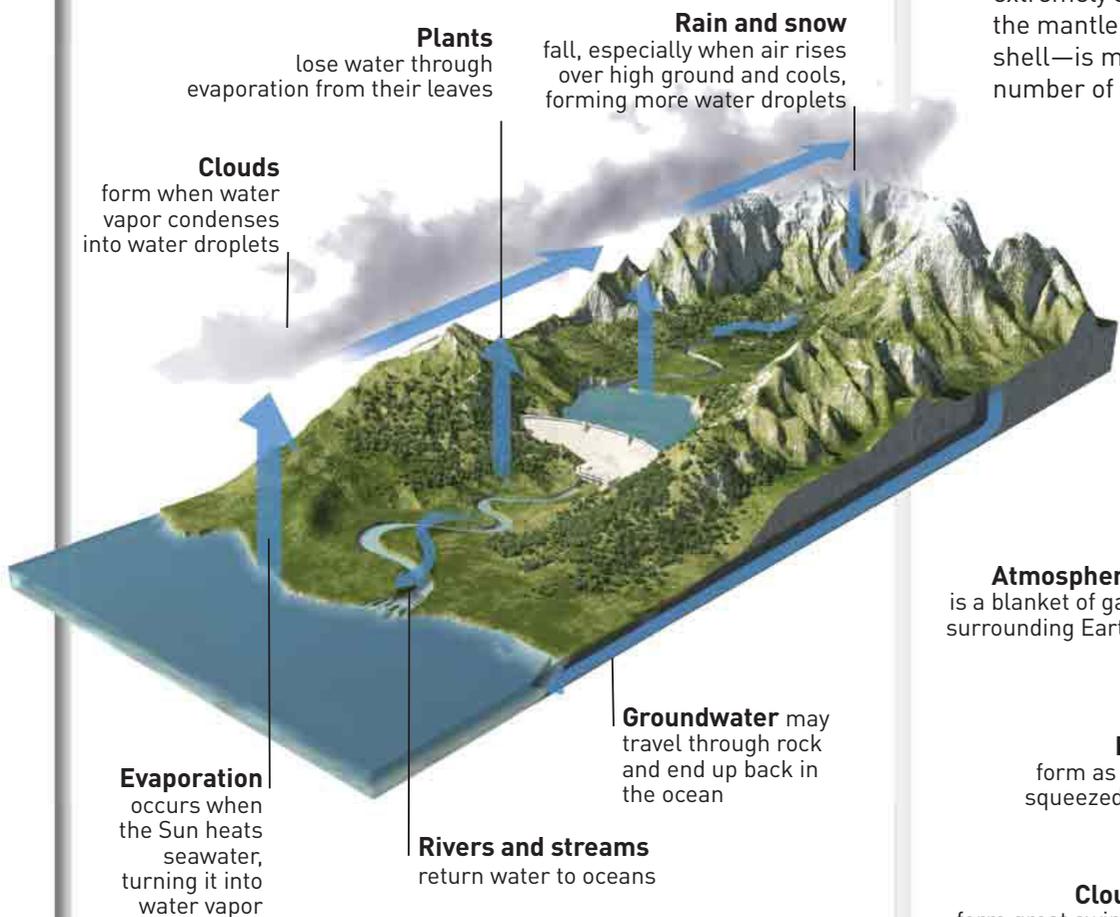


Earth's structure

If we could take a slice out of Earth, we would see that the planet is made up of layers. At its heart lies a solid inner core, surrounded by a liquid outer core. Both are made mainly of heavy iron. The outer core is enclosed by a deep layer of heavy, very hot, yet solid rock called the mantle. Heat from the core drives currents rising through the mantle that keep the rock moving extremely slowly. The crust—the mantle's cool, hard shell—is made up of a number of rocky plates.

Water cycle

The Sun's heat evaporates sea water, causing it to become water vapor in the air. As it rises and cools, the water vapor condenses into clouds of droplets or ice crystals. As the droplets or crystals grow, they fall as snow or rain. If it falls on land, some runs off the surface to form rivers and lakes, which return water to the oceans. A lot of rain seeps through gaps in the soil and rock. Known as groundwater, it may stay underground or trickle to the sea. This continuous circulation of water is known as the water cycle.



Atmosphere is a blanket of gas surrounding Earth

Mountains form as the crust is squeezed and folded

Clouds of water droplets form great swirling weather systems in the lower atmosphere

The Sun's energy

In the Tropics, near the equator, the Sun's rays strike Earth at a steep angle, so the energy is very concentrated. But near the poles, sunlight hits the surface at a narrow angle. This spreads the Sun's energy, giving a weak heating effect. The result is that polar regions are much colder than tropical zones, allowing ice to form in the Arctic and Antarctic. The difference in the solar heating at different latitudes sets bodies of air and seawater in motion, driving winds and ocean currents.

High latitudes (near the poles) receive sunlight at a low angle, dispersing its heat energy over a wider area than in the tropics

The tropics (near the equator) receive sunlight at a steep angle, so the heat is focused onto a smaller area than at the poles

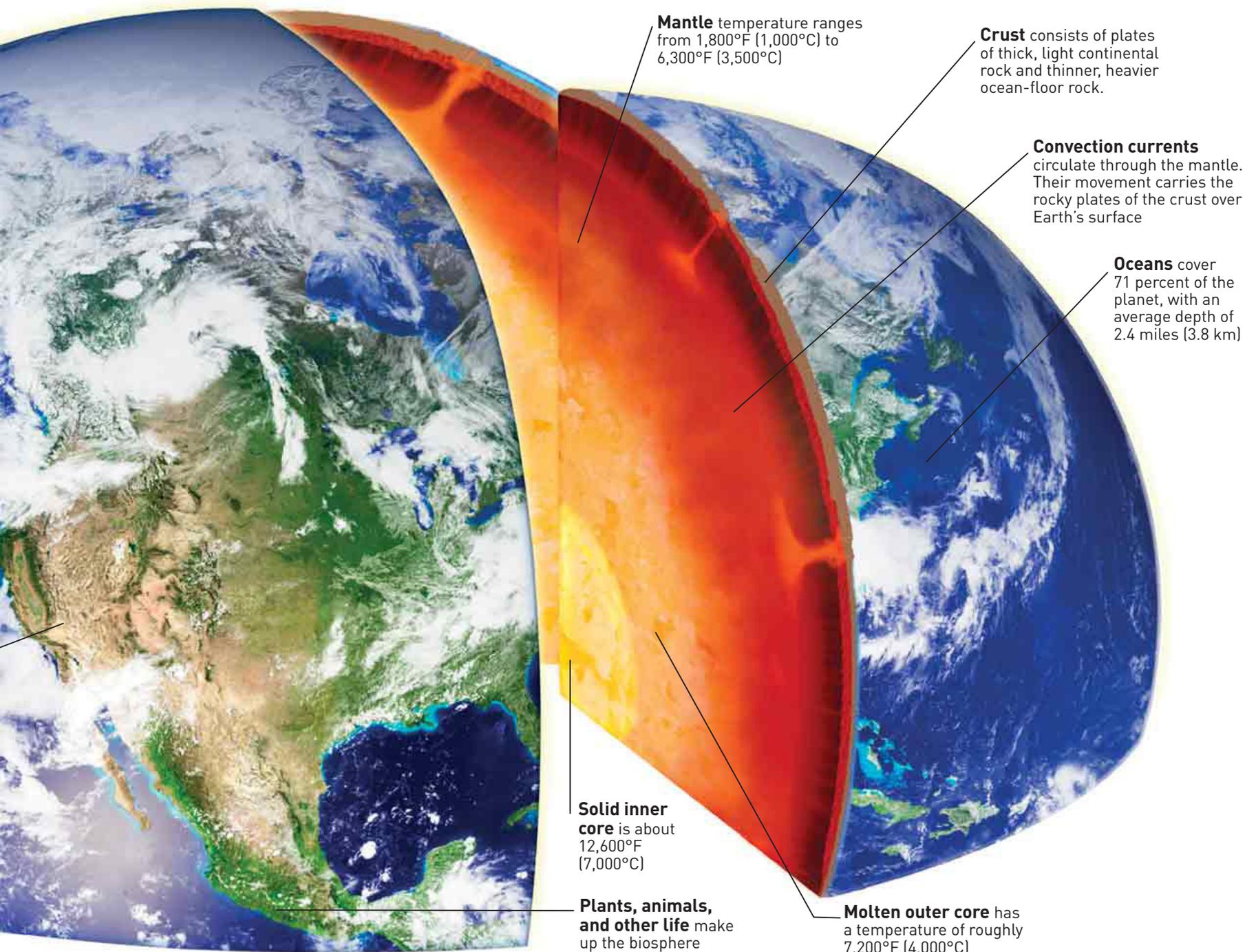
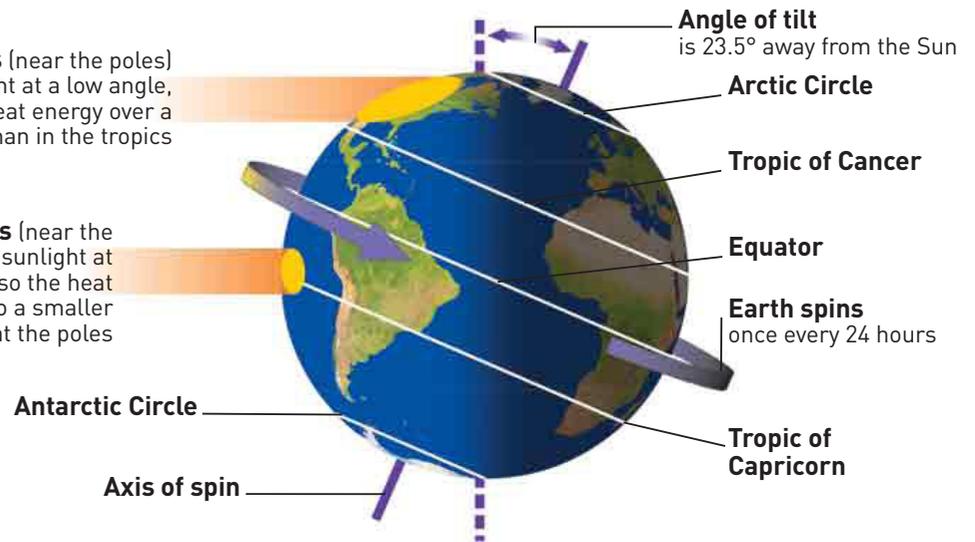


PLATE BOUNDARIES

When plates meet, the collisions can form new ocean trenches and mountain ranges—or cause huge volcanic eruptions and earthquakes.

-  Divergent or transform plate boundary
-  Convergent plate boundary
-  Convergent plate boundary creating a deep-sea trench

Caribbean/North American boundary

This transform border is a region of frequent earthquakes, tsunamis, and volcanic eruptions.

African Plate

East African Rift

This series of great valleys fringed in places by volcanoes are where the African Plate is in the process of splitting into two new tectonic plates.

Mid-Atlantic Ridge

The African Plate is moving northeast at just over $\frac{3}{4}$ in (2.15 cm) per year, creating the Mid-Atlantic Ridge—a chain of volcanic mountains.

South American Plate

Scotia Plate

Eurasian Plate

Indian Plate

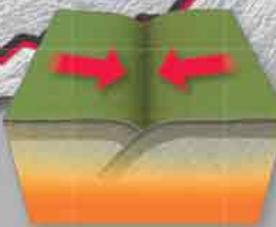
Arabian Plate

Himalayas

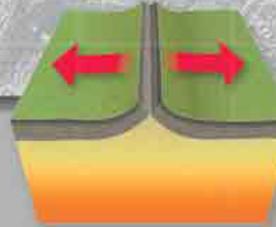
The Himalayan mountain range was formed when two plates of continental crust collided. The land masses crumpled and formed enormous, jagged mountain peaks.

Types of boundary

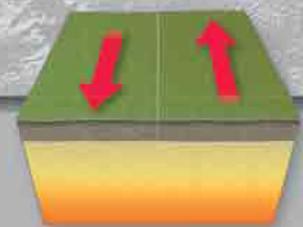
The huge slabs of rock that cover Earth are called tectonic plates. Where the plates meet, they form different kinds of boundary, depending on the type of crust they are made of and the directions in which they move.



Convergent boundary
Where two plates collide. In some cases, one plate is pushed under the other: this is called subduction.



Divergent boundary
Where plates move apart, molten magma rises from the mantle to fill the gap, building a mid-ocean ridge.



Transform boundary
Transform boundaries are formed where the two plates scrape past each other in a sideways motion.

Aleutian Trench

This deep trench is formed by the Pacific Plate being pushed under the North American Plate. Volcanoes have formed the Aleutian chain of islands.

North American Plate

Earth's crust

San Andreas Fault

A transform boundary, where the Pacific and North American plates grind against each other.

Philippine Plate

The outermost shell of the Earth is the crust. It is not an unbroken covering, but huge plates of rock that drift over a deep layer of semisolid rocks, called the mantle.

Caribbean Plate**Cocos Plate****Pacific Plate**

Peru–Chile trench
As oceanic crust pushes under continental crust, deep trenches like this form under the ocean.

Australian–Indian Plate

The **oldest** parts of the **Earth's crust** are nearly **4 billion years old.**

Nazca Plate**East Pacific Rise**

This boundary is spreading about 6 in (15 cm) per year—four times faster than your fingernails grow!

Antarctic Plate**Continental crust**

The Antarctic Plate, like most plates, contains an older and thicker type of crust called continental crust. It is made of much lighter rock than oceanic crust and sits higher, forming all the world's land, including Antarctica.

Oceanic crust

The Pacific Plate is the largest plate that is made entirely of oceanic crust. Oceanic crust is thinner, but much denser (heavier), than continental crust.

Strongest earthquakes

- 1 Valdivia, Chile—May 22, 1960**
This earthquake measured 9.5 in magnitude. It killed 1,655 people and caused a tsunami that hit Japan, the Philippines, and the US.
- 2 Prince William Sound, Alaska—1964**
This 9.2-magnitude earthquake hit Alaska on March 27. While it killed 15 people, it caused a tsunami that killed another 113.
- 3 Indian Ocean—December 26, 2004**
Occurring at sea, this 9.1-magnitude earthquake caused a tsunami that killed 227,898 people and affected 1.7 million more.
- 4 Kamchatka, Russia—November 4, 1952**
This 9.0-magnitude earthquake sent a tsunami across the Pacific. In Hawaii, no human lives were lost, but six cows died.
- 5 Tohoku, Japan—March 11, 2011**
This 9.0-magnitude earthquake and tsunami killed more than 15,000 people and destroyed a nuclear power plant.

KEY

Earthquakes are marked on this map according to their strength, or magnitude. An earthquake with a magnitude of 9.0 makes 10 times larger seismic waves than an 8.0-magnitude earthquake.

THE LAST 100 YEARS

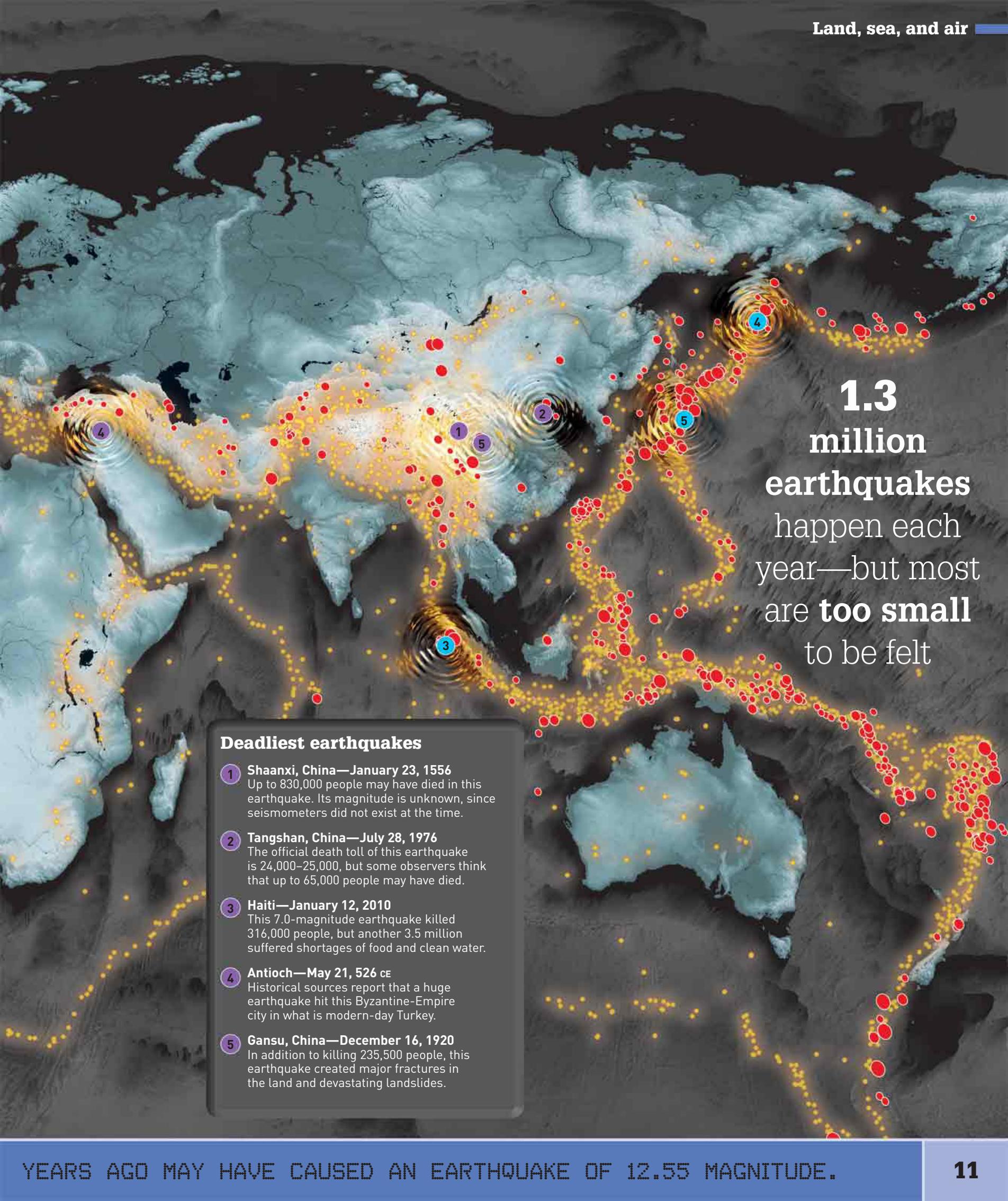
- Magnitude < 7.0
- 7.0–7.5
- 7.5–8.0
- Greater than 8.0

THROUGHOUT HISTORY

- Strongest on record
- Deadliest on record

Earthquakes

Most earthquake zones are at the edges of the tectonic plates that make up Earth's crust. When the plates press against each other, the pressure builds until the plates move with a jerk, sending out a shock called a seismic wave.



1.3 million earthquakes happen each year—but most are **too small** to be felt

Deadliest earthquakes

- 1 **Shaanxi, China—January 23, 1556**
Up to 830,000 people may have died in this earthquake. Its magnitude is unknown, since seismometers did not exist at the time.
- 2 **Tangshan, China—July 28, 1976**
The official death toll of this earthquake is 24,000–25,000, but some observers think that up to 65,000 people may have died.
- 3 **Haiti—January 12, 2010**
This 7.0-magnitude earthquake killed 316,000 people, but another 3.5 million suffered shortages of food and clean water.
- 4 **Antioch—May 21, 526 CE**
Historical sources report that a huge earthquake hit this Byzantine-Empire city in what is modern-day Turkey.
- 5 **Gansu, China—December 16, 1920**
In addition to killing 235,500 people, this earthquake created major fractures in the land and devastating landslides.

Mount McKinley
20,320 ft (6,194 m)
Alaska

Brooks Range
Alaska Range
Mackenzie Mountains
Coast Mountains

Rocky Mountains
The impact of the North American Plate and the Pacific Plate created these mountains, which stretch from Canada to New Mexico.

Laurentian Mountains

Appalachian Mountains

Sierra Nevada
Lower California
Sierra Madre Occidental
Sierra Madre Oriental

Scandinavian
Alps
Pyrenees
Atlas Mountains
Ahaggar
Adamawa Plateau

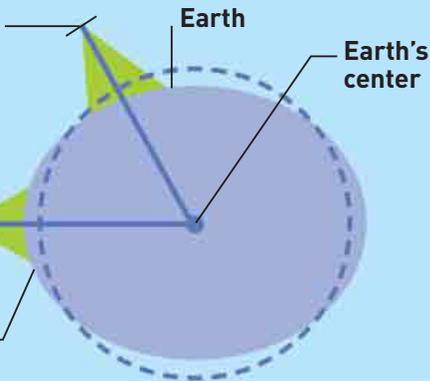
Farthest from center

Earth is a slightly squashed ball, with a bulge around the equator. Mount Chimborazo in Ecuador sits on this bulge. It is not as high above sea level as Everest, but its summit is farther from Earth's center—just over a mile (2 km).

Mount Everest
3,966 miles
(6,382 km) from
Earth's center

Mount Chimborazo
3,967 miles
(6,384 km) from
Earth's center

Equatorial bulge



Andes

Running from Venezuela to Chile, these fold mountains, topped by a string of volcanoes, formed when the South American Plate collided with the oceanic Nazca Plate.

Corallifera Occidental
Cordillera Oriental
Andes

Guiana Highlands

Planalto de Mato Grosso

Brazilian Highlands

Aconcagua
22,837 ft
(6,961 m)
Argentina

Highest fold mountains

These mountains form when two plates of Earth's crust collide. The edges of the plates are slowly crumpled and pushed upward.

- 1 **Mount Everest**
29,028 ft (8,848 m); Nepal/China; highest mountain on Earth; first climbed in 1953
- 2 **K2**
28,251 ft (8,611 m); Pakistan/China; world's second-highest mountain; first climbed in 1954
- 3 **Kangchenjunga**
28,169 ft (8,586 m); Nepal/India; world's third-highest mountain; first climbed in 1955
- 4 **Lhotse**
27,940 ft (8,516 m); Nepal/China; world's fourth-highest mountain; first climbed in 1956
- 5 **Makalu**
27,838 ft (8,485 m); Nepal/China; world's fifth-highest mountain; first climbed in 1955

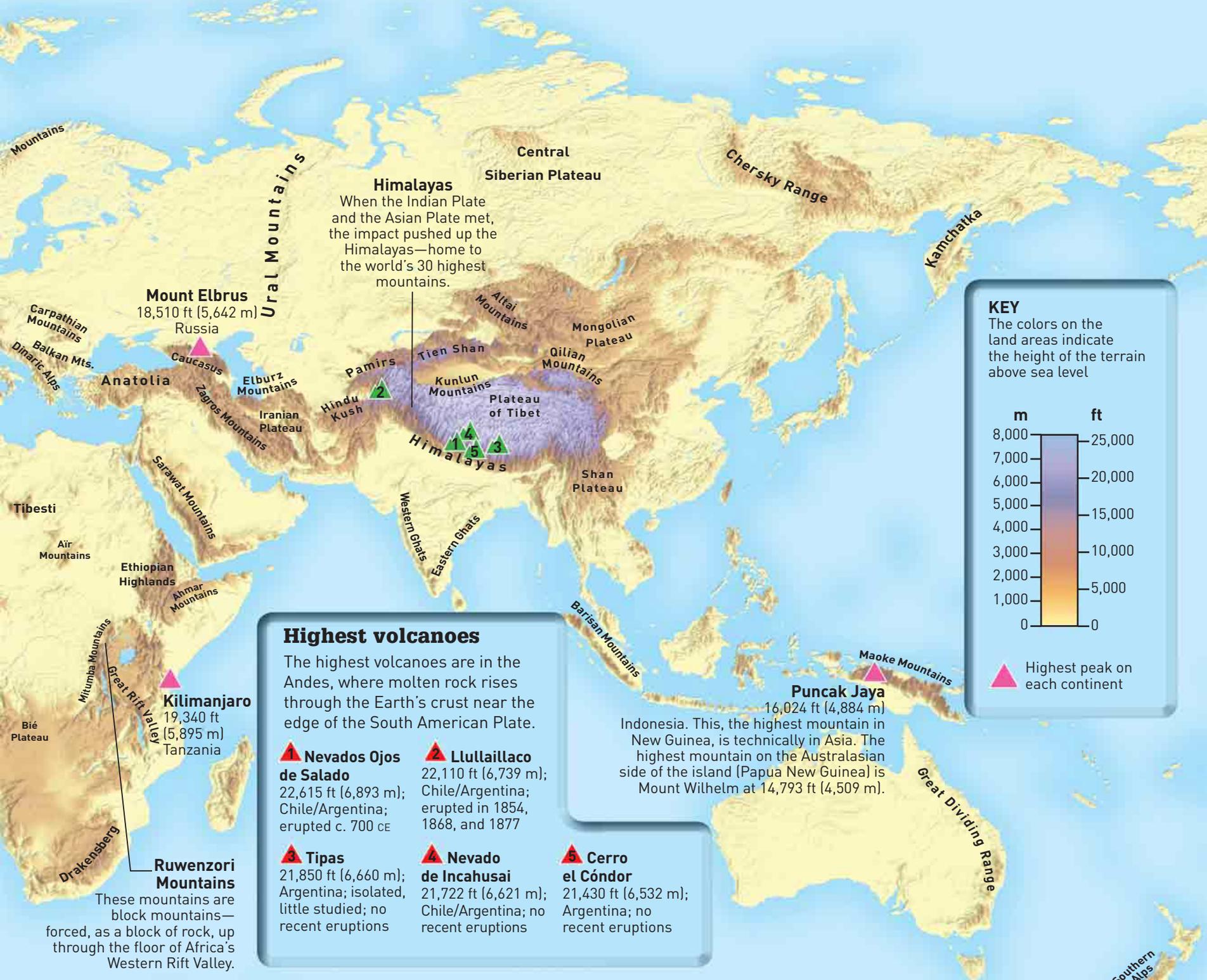


Mount Everest

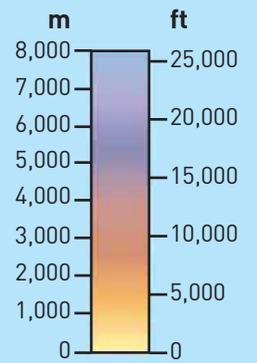
Vinson Massif
16,050 ft
(4,892 m)

Mountains

Mountains form over millions of years, thrust up as the tectonic plates of the Earth's crust grind together or crack while moving slowly over its surface. Many of the peaks we describe as "mountains" are actually volcanoes—active or dormant.



KEY
The colors on the land areas indicate the height of the terrain above sea level



 Highest peak on each continent

Highest volcanoes

The highest volcanoes are in the Andes, where molten rock rises through the Earth's crust near the edge of the South American Plate.

1 Nevados Ojos de Salado
22,615 ft (6,893 m); Chile/Argentina; erupted c. 700 CE

2 Llullaillaco
22,110 ft (6,739 m); Chile/Argentina; erupted in 1854, 1868, and 1877

3 Tipas
21,850 ft (6,660 m); Argentina; isolated, little studied; no recent eruptions

4 Nevado de Incahusai
21,722 ft (6,621 m); Chile/Argentina; no recent eruptions

5 Cerro el Cóndor
21,430 ft (6,532 m); Argentina; no recent eruptions

Puncak Jaya
16,024 ft (4,884 m)
Indonesia. This, the highest mountain in New Guinea, is technically in Asia. The highest mountain on the Australasian side of the island (Papua New Guinea) is Mount Wilhelm at 14,793 ft (4,509 m).

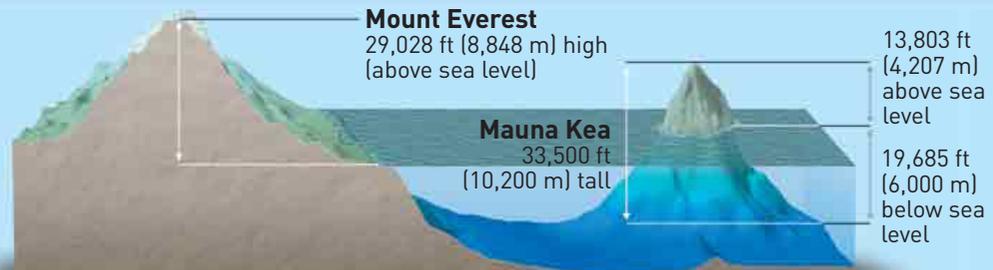
Kilimanjaro
19,340 ft (5,895 m)
Tanzania

Ruwenzori Mountains

These mountains are block mountains—forced, as a block of rock, up through the floor of Africa's Western Rift Valley.

Highest versus tallest

A mountain's height is measured from sea level. Everest is indisputably the highest mountain on Earth. Mauna Kea, in Hawaii, is nowhere near as high as Everest, but it is a volcano rising from the deep ocean floor. If measured from its base to its peak, Mauna Kea is Earth's tallest mountain.





Active Iceland
Iceland has many active volcanoes because it sits on top of the Mid-Atlantic Ridge, where magma wells up as the seabed splits apart.

Alaska
Alaska and the Aleutian islands are located on the Pacific Ring of Fire.

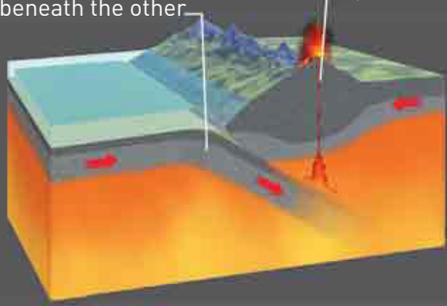
Hawaii
This chain of island volcanoes has formed as Earth's crust passes over a "hot spot" in the mantle below.

How volcanoes form

Molten rock (magma) from Earth's interior may erupt where plates pull apart, or force its way to the surface where plates collide.

Plates collide and one is pushed beneath the other

Magma forms and pushes upward



Volcanoes

Earth's crust is made up of plates of rock that fit together like a jigsaw puzzle. Most volcanoes occur where the plates meet, but some erupt in hot spots in the middle of the plates.

Mid-Atlantic Ridge
Volcanoes dot the seafloor in the middle of the Atlantic Ocean, where two plates are moving away from each other.

Largest eruptions since 1800

- 1 Tambora, Indonesia, 1815**
Tambora threw so much ash into the atmosphere that global weather was disrupted and temperatures fell.
- 2 Krakatau, Indonesia, 1883**
The explosion was heard 2,850 miles (4,600 km) away. It destroyed two-thirds of the island of Krakatau.
- 3 Novarupta, Alaska, 1912**
The largest volcanic blast of the 20th century marked the formation of this new volcano on the Pacific Ring of Fire.
- 4 Mount Pinatubo, Philippines, 1991**
A plume of ash 250 miles (400 km) wide rose 21 miles (34 km) into the sky, blocking out the Sun for days.
- 5 Santa Maria, Guatemala, 1902**
The explosion formed a half a mile (1 km) wide crater. Ash fell in San Francisco, California, 2,500 miles (4,000 km) away.

KEY

The map shows volcanoes above sea level. Many more volcanoes erupt on the seabed.



Most lethal



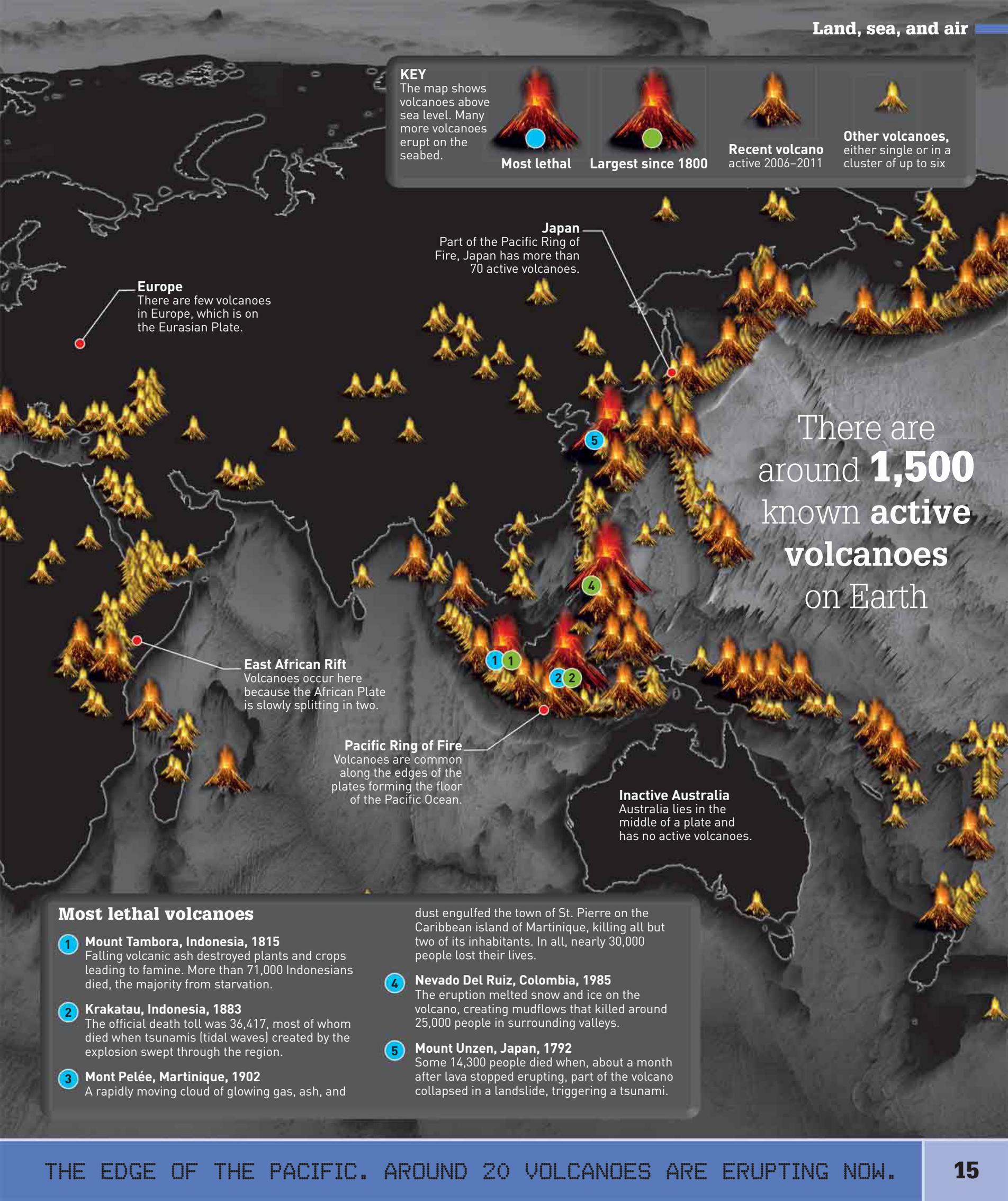
Largest since 1800



Recent volcano
active 2006–2011



Other volcanoes,
either single or in a cluster of up to six



Europe

There are few volcanoes in Europe, which is on the Eurasian Plate.

Japan

Part of the Pacific Ring of Fire, Japan has more than 70 active volcanoes.

There are around **1,500** known **active volcanoes** on Earth

East African Rift

Volcanoes occur here because the African Plate is slowly splitting in two.

Pacific Ring of Fire

Volcanoes are common along the edges of the plates forming the floor of the Pacific Ocean.

Inactive Australia

Australia lies in the middle of a plate and has no active volcanoes.

Most lethal volcanoes

- 1 Mount Tambora, Indonesia, 1815**
Falling volcanic ash destroyed plants and crops leading to famine. More than 71,000 Indonesians died, the majority from starvation.
- 2 Krakatau, Indonesia, 1883**
The official death toll was 36,417, most of whom died when tsunamis (tidal waves) created by the explosion swept through the region.
- 3 Mont Pelée, Martinique, 1902**
A rapidly moving cloud of glowing gas, ash, and

dust engulfed the town of St. Pierre on the Caribbean island of Martinique, killing all but two of its inhabitants. In all, nearly 30,000 people lost their lives.

- 4 Nevado Del Ruiz, Colombia, 1985**
The eruption melted snow and ice on the volcano, creating mudflows that killed around 25,000 people in surrounding valleys.
- 5 Mount Unzen, Japan, 1792**
Some 14,300 people died when, about a month after lava stopped erupting, part of the volcano collapsed in a landslide, triggering a tsunami.

Trenches

Rifts in the ocean floor that form when Earth's tectonic plates meet. The deepest places in the ocean and the lowest points on Earth, about 26,000–33,000 ft (8,000–10,000 m) below the surface of the ocean.

● Trenches

Mid-ocean ridges

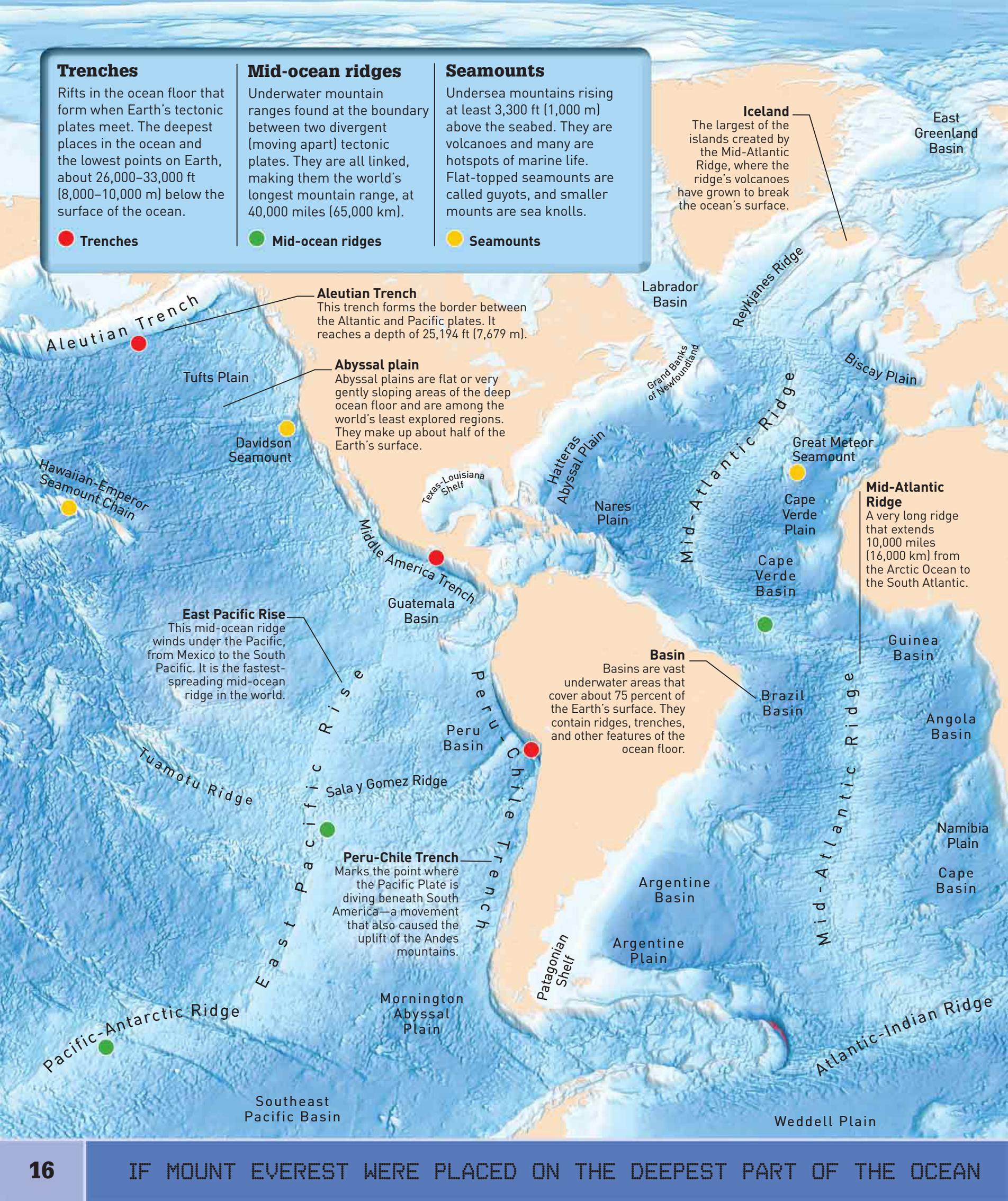
Underwater mountain ranges found at the boundary between two divergent (moving apart) tectonic plates. They are all linked, making them the world's longest mountain range, at 40,000 miles (65,000 km).

● Mid-ocean ridges

Seamounts

Undersea mountains rising at least 3,300 ft (1,000 m) above the seabed. They are volcanoes and many are hotspots of marine life. Flat-topped seamounts are called guyots, and smaller mounts are sea knolls.

● Seamounts



Iceland

The largest of the islands created by the Mid-Atlantic Ridge, where the ridge's volcanoes have grown to break the ocean's surface.

East Greenland Basin

Labrador Basin

Reykjanes Ridge

Biscay Plain

Aleutian Trench

Aleutian Trench
This trench forms the border between the Atlantic and Pacific plates. It reaches a depth of 25,194 ft (7,679 m).

Tufts Plain

Abyssal plain
Abyssal plains are flat or very gently sloping areas of the deep ocean floor and are among the world's least explored regions. They make up about half of the Earth's surface.

Davidson Seamount

Hawaiian-Emperor Seamount Chain

Grand Banks of Newfoundland

Hatteras Abyssal Plain

Nares Plain

Great Meteor Seamount

Cape Verde Plain

Mid-Atlantic Ridge
A very long ridge that extends 10,000 miles (16,000 km) from the Arctic Ocean to the South Atlantic.

Texas-Louisiana Shelf

Middle America Trench

Guatemala Basin

East Pacific Rise
This mid-ocean ridge winds under the Pacific, from Mexico to the South Pacific. It is the fastest-spreading mid-ocean ridge in the world.

Basin

Basins are vast underwater areas that cover about 75 percent of the Earth's surface. They contain ridges, trenches, and other features of the ocean floor.

Brazil Basin

Guinea Basin

Peru Basin

Angola Basin

Tuamotu Ridge

Salay Gomez Ridge

Peru-Chile Trench

Peru-Chile Trench
Marks the point where the Pacific Plate is diving beneath South America—a movement that also caused the uplift of the Andes mountains.

Namibia Plain

Cape Basin

Argentine Basin

Argentine Plain

Atlantic-Indian Ridge

Mornington Abyssal Plain

Patagonian Shelf

Pacific-Antarctic Ridge

Southeast Pacific Basin

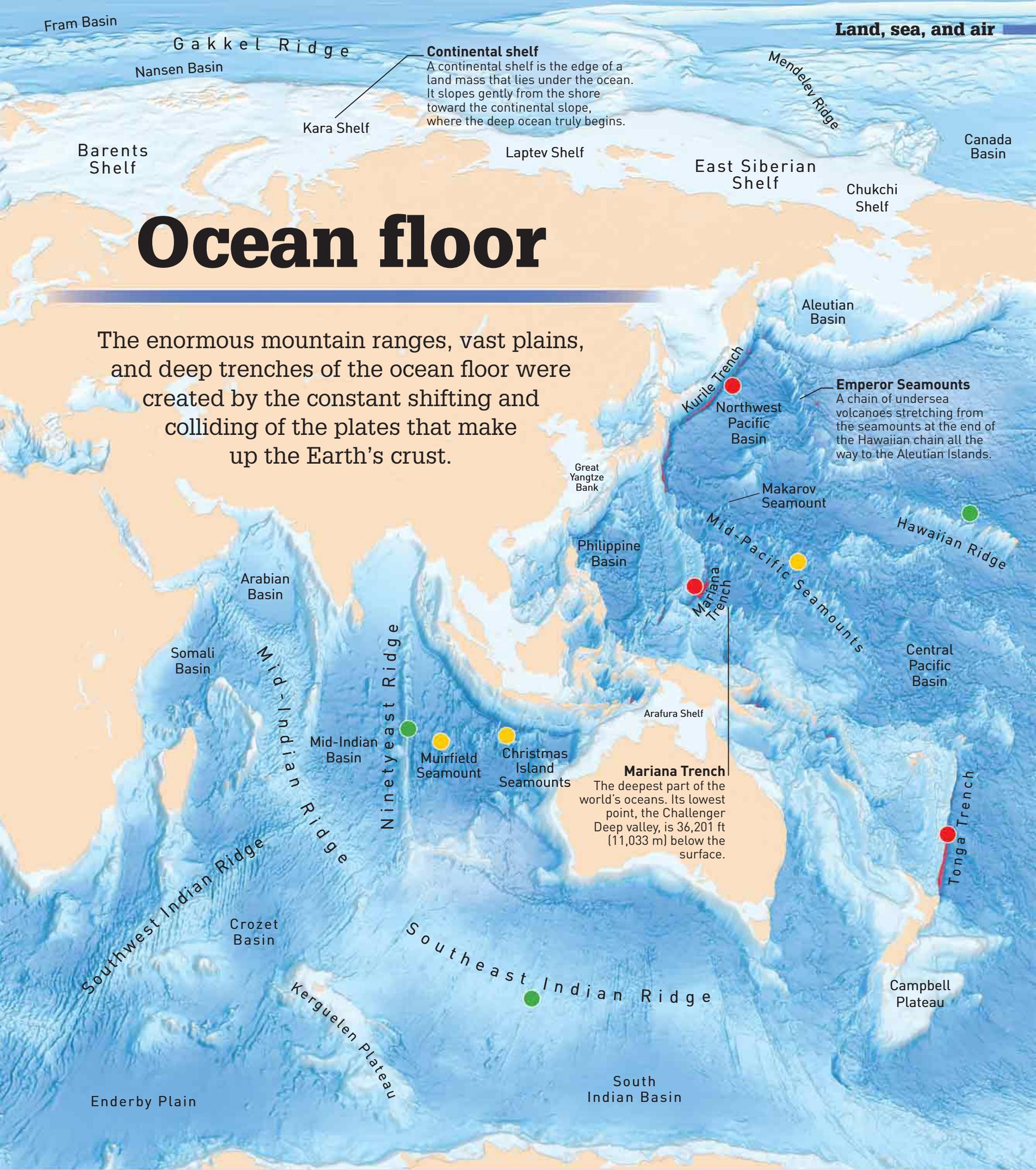
Weddell Plain

Ocean floor

The enormous mountain ranges, vast plains, and deep trenches of the ocean floor were created by the constant shifting and colliding of the plates that make up the Earth's crust.

Continental shelf

A continental shelf is the edge of a land mass that lies under the ocean. It slopes gently from the shore toward the continental slope, where the deep ocean truly begins.



Emperor Seamounts

A chain of undersea volcanoes stretching from the seamounts at the end of the Hawaiian chain all the way to the Aleutian Islands.

Mariana Trench

The deepest part of the world's oceans. Its lowest point, the Challenger Deep valley, is 36,201 ft (11,033 m) below the surface.

SURFACE CURRENTS

Surface currents are driven by the winds. They carry cold water to the tropics and warm water to the poles.

- Warm current
- Cold current

North Atlantic
Warm water is cooled by the ice of the Arctic and begins to sink.

Gyre

Surface currents, driven by winds and by the spin of planet Earth, often form circular patterns called gyres. Gyres north of the equator move clockwise, while those in the south move counterclockwise.

Ocean in motion

Ocean waters are constantly moving. Their movements, called currents, are driven by wind and Earth's spin. But ocean currents are also affected by the water's temperature and saltiness, as well as sea depth.

OCEANIC CONVEYOR

Surface currents and deep ocean currents link up to form a planet-wide conveyor belt flowing at times across the ocean basins, then rising to the surface, before sinking again to the deep ocean floor.



Gulf Stream

The warm currents of the Gulf Stream make northern Europe's climate warmer than it would be otherwise.

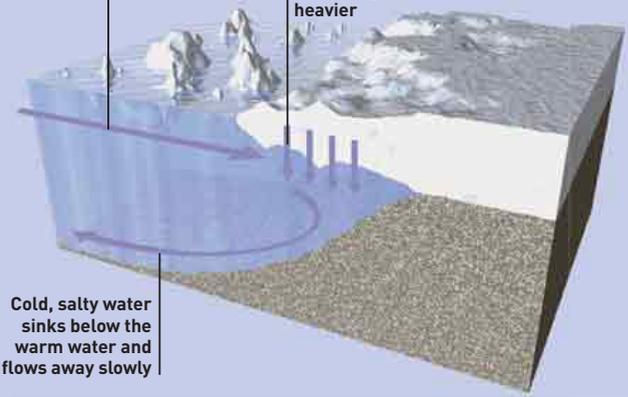
How currents sink

When currents reach the cold polar oceans, some of the seawater freezes. When it does this, it leaves its salt behind. The salt mixes with the remaining water, making it saltier and heavier. This water then sinks toward the ocean floor and drives the currents that flow slowly through the ocean depths. Where these deep-water currents flow back up to the surface, scientists call it "upwelling."

Warm surface water flows in

Salt leaves the water when it freezes and makes the remaining water saltier and heavier

Cold, salty water sinks below the warm water and flows away slowly



Great Pacific Garbage Patch

Plastics and other trash carried by currents collect within this slow-moving zone in the center of the North Pacific Gyre.

Deep water current

The deep current flowing across the basin of the Pacific begins to rise, warming up as it does so.

Friendly floaters

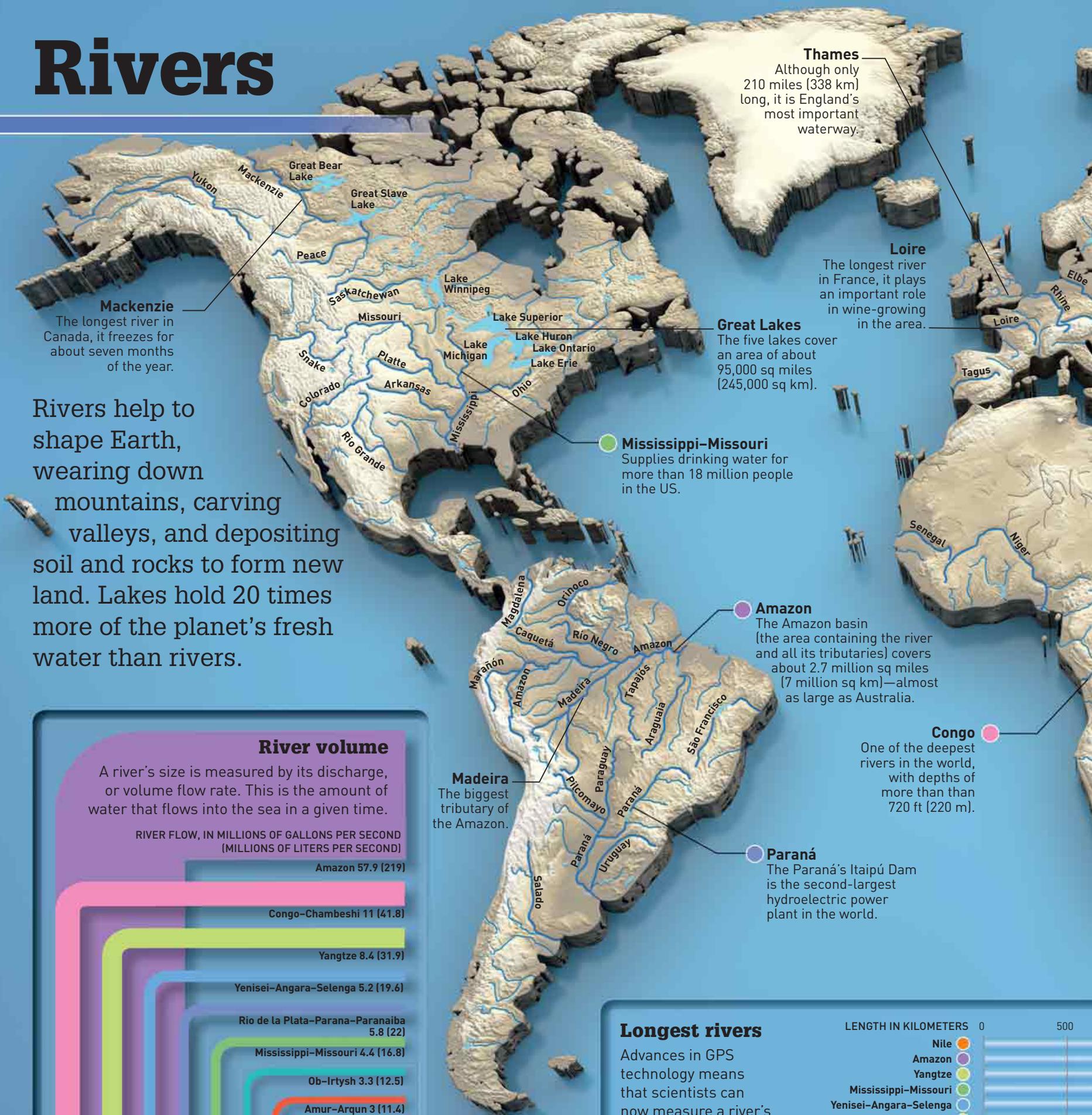
A cargo of plastic ducks lost in the Pacific in 1992 is still helping scientists to learn more about the speed and direction of ocean currents. So far, the ducks have drifted 17,000 miles (27,500 km).



Southern oceans

Cold, dense water flows east across the deep ocean floor in the Antarctic, then heads north.

Rivers



Thames
Although only 210 miles (338 km) long, it is England's most important waterway.

Loire
The longest river in France, it plays an important role in wine-growing in the area.

Great Lakes
The five lakes cover an area of about 95,000 sq miles (245,000 sq km).

Mississippi-Missouri
Supplies drinking water for more than 18 million people in the US.

Amazon
The Amazon basin (the area containing the river and all its tributaries) covers about 2.7 million sq miles (7 million sq km)—almost as large as Australia.

Congo
One of the deepest rivers in the world, with depths of more than 720 ft (220 m).

Paraná
The Paraná's Itaipú Dam is the second-largest hydroelectric power plant in the world.

Madeira
The biggest tributary of the Amazon.

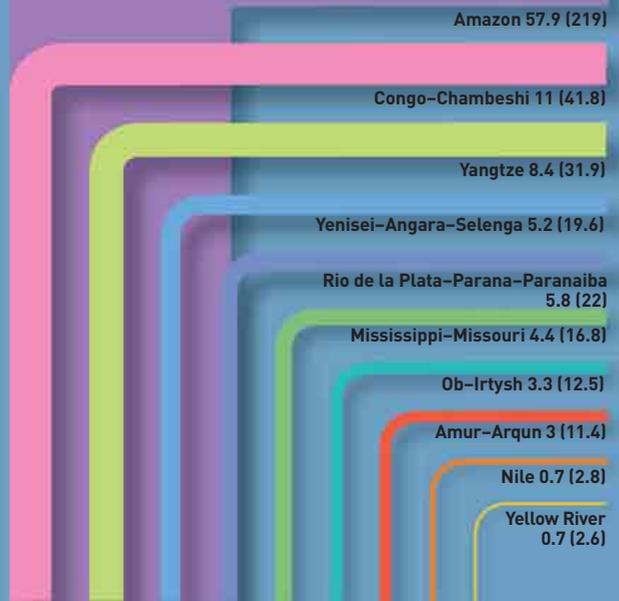
Mackenzie
The longest river in Canada, it freezes for about seven months of the year.

Rivers help to shape Earth, wearing down mountains, carving valleys, and depositing soil and rocks to form new land. Lakes hold 20 times more of the planet's fresh water than rivers.

River volume

A river's size is measured by its discharge, or volume flow rate. This is the amount of water that flows into the sea in a given time.

RIVER FLOW, IN MILLIONS OF GALLONS PER SECOND (MILLIONS OF LITERS PER SECOND)



Longest rivers

Advances in GPS technology means that scientists can now measure a river's length much more accurately than they could in the past.





Ob' Ends in the Arctic Ocean.

Yenisey
Freezes along its whole length by mid-November each year.

Danube
Flows through 10 countries on its way to the Black Sea.

Amur
Part of the Amur provides a natural boundary between Russia and the People's Republic of China.

Lake Baikal
At around 25 million years old, by far the oldest lake on Earth.

Yellow River (Huang He)
So-called because of the huge amounts of mineral-rich silt it carries downstream.

Yangtze (Chang Jiang)
One of the world's busiest rivers, it flows through the major Chinese cities of Shanghai, Nanjing, and Chengdu.

Nile
About 90 percent of the people of Egypt live close to the banks of the Nile.

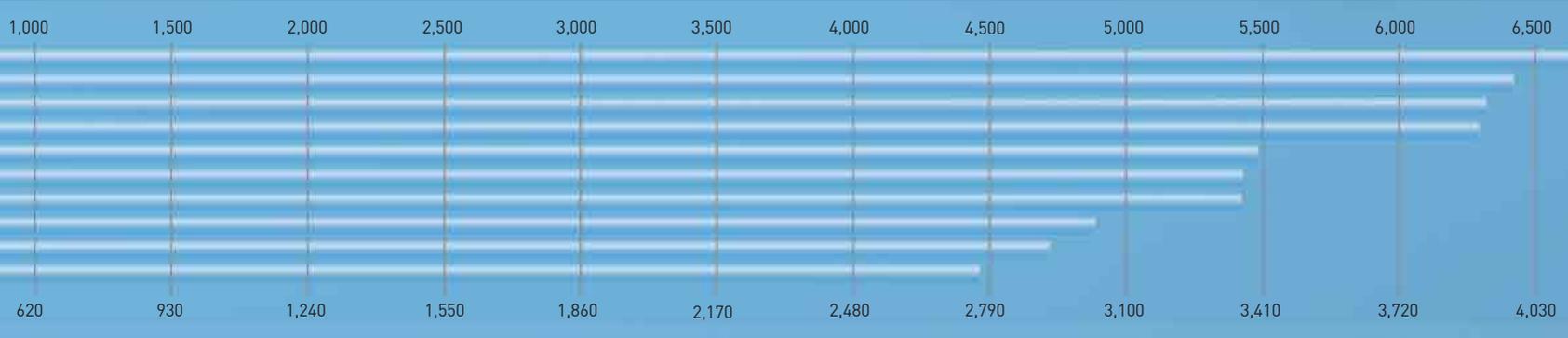
Seasonal rivers
Some rivers, shown in brown, flow only in the wet season. Some of these flow only in particularly wet years.

Lake Victoria
The world's second-largest freshwater lake by area (after Lake Superior), it provides water for the Nile.

Ganges
Holy river to the world's 900 million Hindus.

The **Amazon** carries **one-fifth** of all the **fresh water** emptied into the **oceans**

Murray-Darling
Crosses south-east Australia from the Snowy mountains to the Indian Ocean.



20 BILLION TONS OF LAND SURFACE TO THE OCEANS EACH YEAR.

Craters and meteorites

Earth would be peppered with craters like the Moon if it weren't for wind, water, and Earth's moving crust covering them up or wearing them away. More craters can be seen in old, quiet parts of Earth's crust such as in Canada and Australia.

IMPACT CRATERS

The largest objects that hit Earth—asteroids and comets—can make such a violent impact that they are destroyed. A crater is left behind, though, although over millions of years, it can be buried, worn away, and distorted by the Earth's crust moving. On the map are all the largest craters scientists know about.

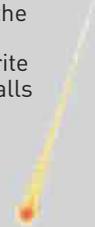


Largest known impact craters, by diameter in miles (km)

METEORITES

Meteorites are objects left over after a small body, or meteoroid, hits Earth. Sometimes, incoming objects are spotted falling as shooting stars, or meteors. When someone finds the fallen meteorite, it is recorded as a "meteorite fall." Just over 1,000 falls have happened since the 1950s.

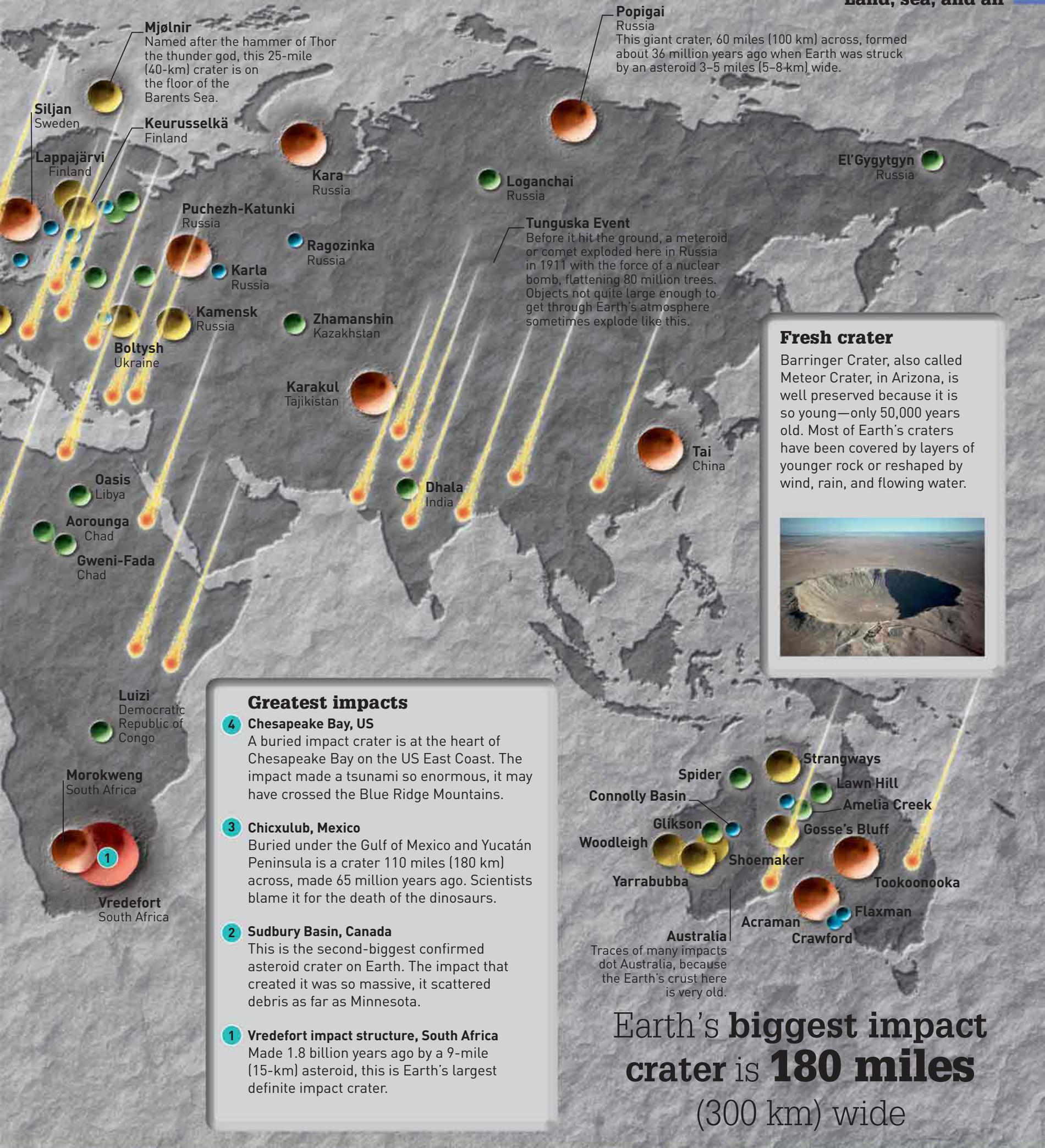
Meteorite falls 2003–12



The Great Dying

An asteroid probably killed off the dinosaurs, but an even bigger impact may have almost wiped out life completely 250 million years ago. Called the "Great Dying," this disaster may have been caused by an asteroid impact some scientists think they have discovered under the Antarctic ice sheet.





Mjølner
 Named after the hammer of Thor the thunder god, this 25-mile (40-km) crater is on the floor of the Barents Sea.

Popigai
 Russia
 This giant crater, 60 miles (100 km) across, formed about 36 million years ago when Earth was struck by an asteroid 3–5 miles (5–8 km) wide.

Siljan
 Sweden
Keuruselkä
 Finland
Lappajärvi
 Finland

Puchezh-Katunki
 Russia
Ragozinka
 Russia
Karla
 Russia
Kamensk
 Russia
Boltysk
 Ukraine
Zhamanshin
 Kazakhstan

Tunguska Event
 Before it hit the ground, a meteoroid or comet exploded here in Russia in 1911 with the force of a nuclear bomb, flattening 80 million trees. Objects not quite large enough to get through Earth's atmosphere sometimes explode like this.

El'Gygytgyn
 Russia

Karakul
 Tajikistan

Tai
 China

Fresh crater
 Barringer Crater, also called Meteor Crater, in Arizona, is well preserved because it is so young—only 50,000 years old. Most of Earth's craters have been covered by layers of younger rock or reshaped by wind, rain, and flowing water.



Oasis
 Libya
Aorounga
 Chad
Gweni-Fada
 Chad

Dhala
 India

Luizi
 Democratic Republic of Congo

- Greatest impacts**
- 1 Vredefort impact structure, South Africa**
 Made 1.8 billion years ago by a 9-mile (15-km) asteroid, this is Earth's largest definite impact crater.
 - 2 Sudbury Basin, Canada**
 This is the second-biggest confirmed asteroid crater on Earth. The impact that created it was so massive, it scattered debris as far as Minnesota.
 - 3 Chicxulub, Mexico**
 Buried under the Gulf of Mexico and Yucatán Peninsula is a crater 110 miles (180 km) across, made 65 million years ago. Scientists blame it for the death of the dinosaurs.
 - 4 Chesapeake Bay, US**
 A buried impact crater is at the heart of Chesapeake Bay on the US East Coast. The impact made a tsunami so enormous, it may have crossed the Blue Ridge Mountains.

Morokweng
 South Africa

Vredefort
 South Africa

Australia
 Traces of many impacts dot Australia, because the Earth's crust here is very old.

Spider
Connolly Basin
Woodleigh
Yarrabubba
Acraman
Crawford
Shoemaker
Flaxman
Tookoonooka
Gosse's Bluff
Amelia Creek
Lawn Hill
Strangways

Earth's biggest impact crater is **180 miles** (300 km) wide

Prospect Creek, Alaska

At -80°F (-62°C), this is the seventh-coldest place on the planet.



Snag, Canada

Recorded temperature of -81°F (-63°C), to make it the coldest site in North America.

Furnace Creek, California

The world's highest-ever air temperature, 134°F (56.7°C), was recorded here in 1913.

Ciudad Obregón, Mexico

Recorded temperature of 127.4°F (53°C), to make it the eighth hottest location on Earth.

North Ice Research Station, Greenland

Fifth-coldest spot on Earth, at -87°F (-66.1°C).

Kebili, Tunisia

Recorded temperature of 131°F (55°C) in 1931, tying for the third-hottest place ever.

Illizi, Algeria

Earth's tenth-hottest spot, at 123.8°F (51°C).

Al 'Aziziyah, Libya

Lost its title as world's hottest place in 2012, when weather scientists found its 1922 record measurement was probably wrong.

Cold mountains

The higher up you are, the lower the air pressure—and the temperature. The Andes mountain range is much colder than the land that surrounds it.

Amundsen–Scott Station, South Pole

The second-coldest point on Earth, at -116.5°F (-82.5°C).



Daily differences

Many deserts are hot during the day but drastically cooler at night. With no clouds or mist in the way of the Sun, the ground warms up fast during the day. With no blanketing cloud at night, the heat escapes quickly. In humid climates, daily temperatures vary a lot less.

1 Luxor, Egypt

Luxor has a dry, desert climate. In June, the daily temperature varies hugely, from an average maximum of 105.8°F (41°C) down to 71.6°F (22°C) at night.

2 Singapore

Singapore's climate is very warm and humid all year round. In June, the daily temperature varies from 88.3°F (31.3°C) to a sticky 76.5°F (24.7°C) at night.

Blazing summers, freezing winters

In the middle of large continents, it is often hot in summer and very cold in winter. In coastal areas, warm or cool winds and currents carried by the sea moderate temperatures. Without this balance, inland areas can become extremely hot or cold.

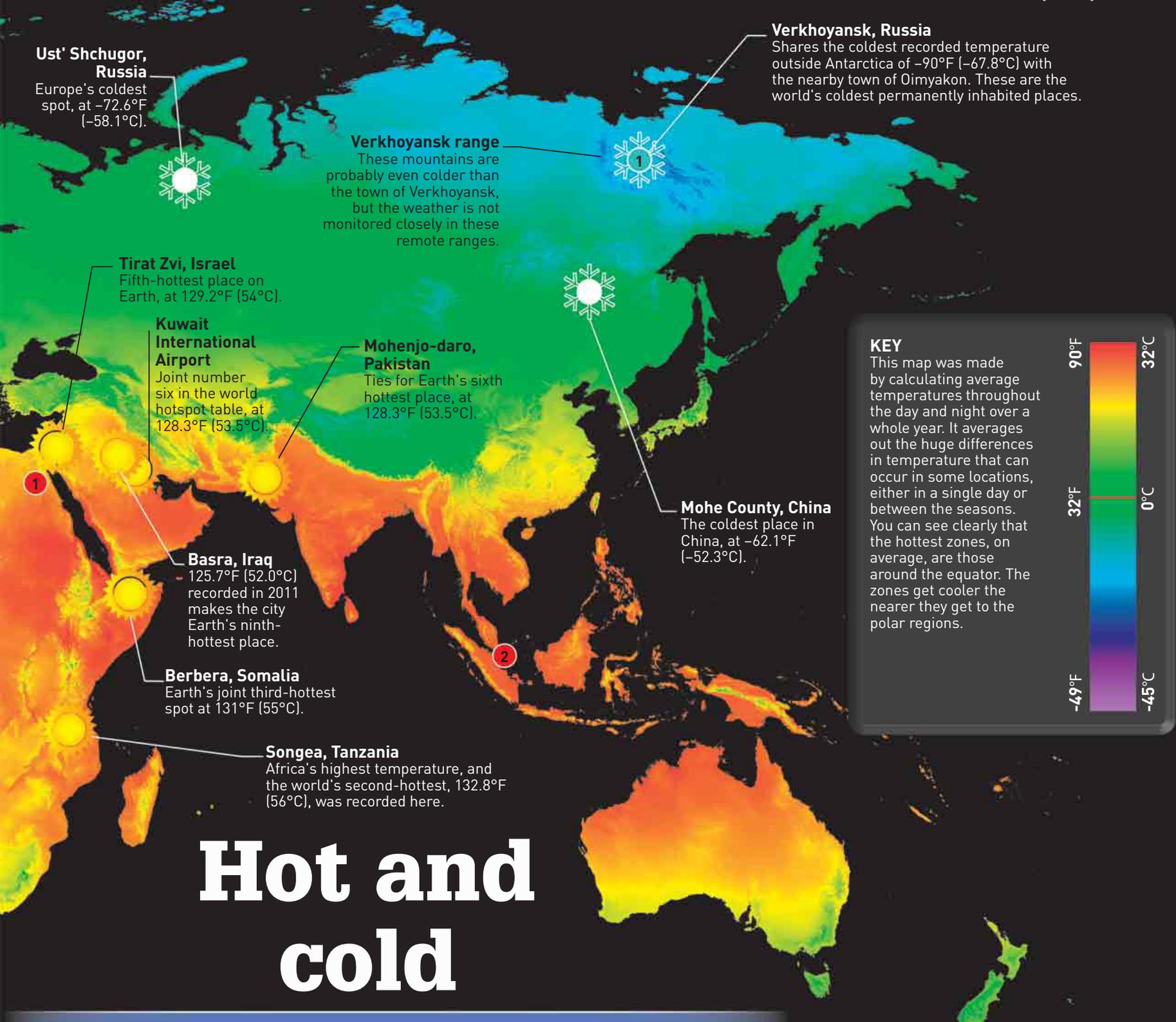
1 Verkhoyansk, Russia

The world's biggest seasonal temperature differences are found in Verkhoyansk. The highest temperature ever recorded was 103.8°F (39.9°C) and the lowest was -90°F (-67.8°C).

2 Regina, Canada

Regina's highest-ever temperature was 109.9°F (43.3°C) and the lowest was -58°F (-50°C).

In **1924**, the Australian town of **Marble Bar** reached 100°F (37.8°C) or above for **160 days** in a row

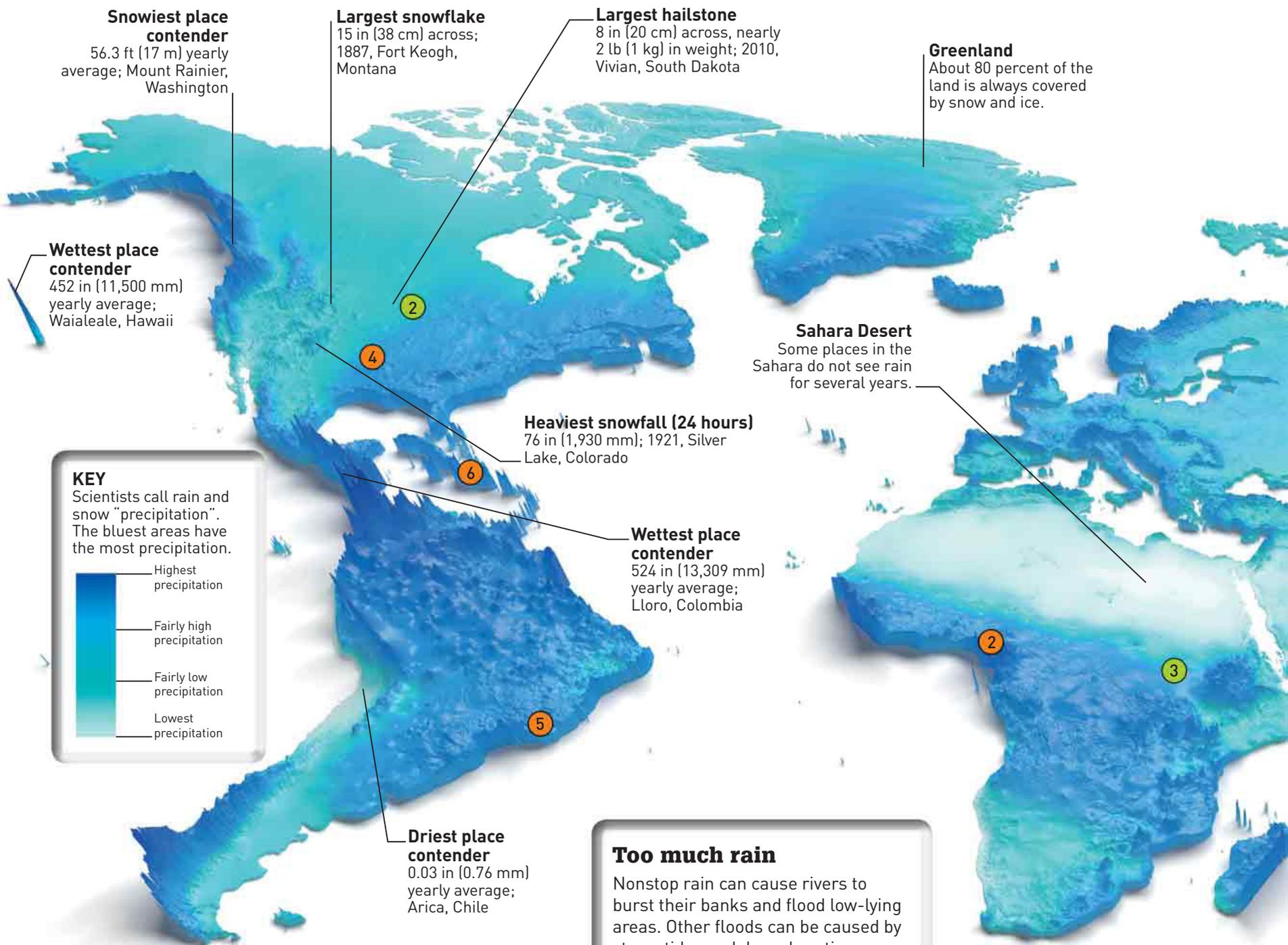


Hot and cold

Whether somewhere is hot or cold is mainly to do with how close it is to the equator, but other factors, such as ocean currents and altitude, are also important.

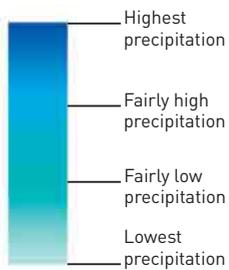
Dome A, East Antarctica
Earth's third-coldest spot, at -116.5°F (-82.5°C).

Vostok Research Station, Antarctica
Recorded temperature of -128.6°F (-89.2°C), Earth's coldest ever temperature.



KEY

Scientists call rain and snow "precipitation". The bluest areas have the most precipitation.



Flash floods

If a lot of rain falls in a short time it can result in "flash" floods, when torrents of water run off hills into valleys.

- 1 **Tehran, Iran, 1954**
A flash flood rushed through a gully killing around 2,000 people who had gathered for religious devotions.
- 2 **Black Hills, South Dakota, 1972**
There were 238 deaths in a matter of hours; total damage was \$165 million.
- 3 **Darfur and South Sudan, 2007**
Flash floods left 750,000 homeless.
- 4 **Krasnodarskiy Kray, Russia, 2012**
150 were killed in the worst flooding and landslides for 70 years.

Too much rain

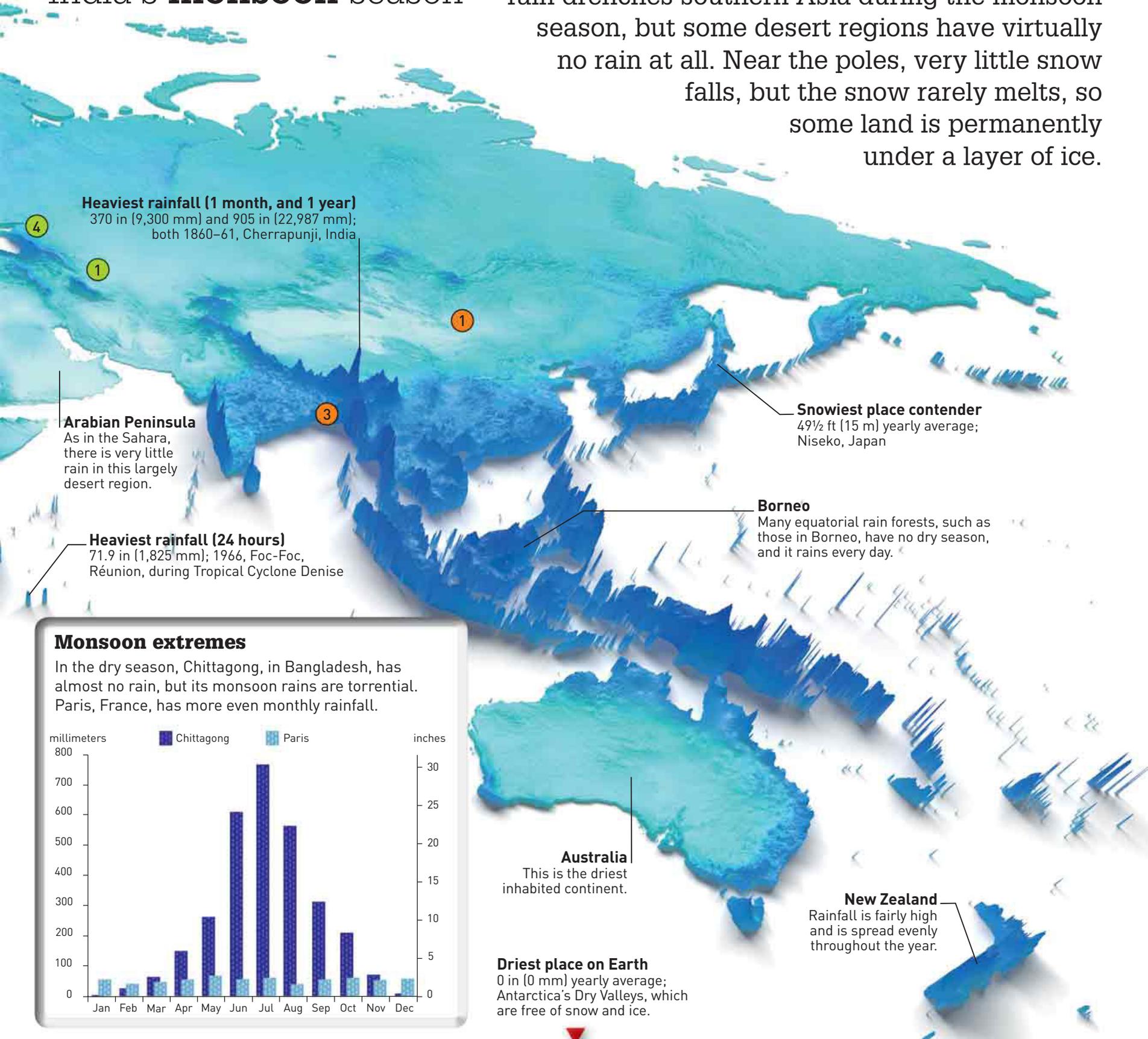
Nonstop rain can cause rivers to burst their banks and flood low-lying areas. Other floods can be caused by storm tides and dams bursting.

- 1 **Yangtze River, China, 1931**
Caused by the Yangtze bursting its banks. Killed 3.7 million people directly as well as from disease and starvation. China's Yellow River also flooded disastrously.
- 2 **African floods, 2007**
Some of the worst, most widespread flooding in history, affecting a belt of countries from Senegal eastward to Ethiopia and as far south as Rwanda.
- 3 **Bangladesh, 1998**
Two-thirds of the country was covered with water, and 25-30 million people lost their homes. Many floods affect this low-lying country, which is mostly floodplain.
- 4 **Mississippi Flood, 1927**
The most destructive river flood in the history of the United States, with 246 deaths reported.
- 5 **Rio de Janeiro, Brazil, 2011**
In 24 hours, the local weather service recorded more rainfall than was expected for the entire month; caused mud slides and 903 deaths.
- 6 **Haiti and the Dominican Republic, 2004**
Torrential rains made the Soliel River overflow, causing floods and mud slides that destroyed villages and killed more than 2,000 people.

Rain and snow

197 in
(5,000 mm) of rain may fall in one place during India's **monsoon** season

Rainfall varies dramatically from place. Torrential rain drenches southern Asia during the monsoon season, but some desert regions have virtually no rain at all. Near the poles, very little snow falls, but the snow rarely melts, so some land is permanently under a layer of ice.



Heaviest rainfall (1 month, and 1 year)
370 in (9,300 mm) and 905 in (22,987 mm); both 1860–61, Cherrapunji, India

Arabian Peninsula
As in the Sahara, there is very little rain in this largely desert region.

Heaviest rainfall (24 hours)
71.9 in (1,825 mm); 1966, Foc-Foc, Réunion, during Tropical Cyclone Denise

Snowiest place contender
49½ ft (15 m) yearly average; Niseko, Japan

Borneo
Many equatorial rain forests, such as those in Borneo, have no dry season, and it rains every day.

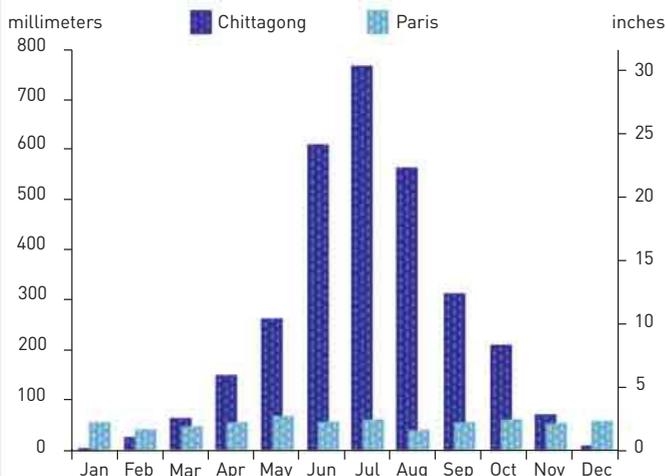
Australia
This is the driest inhabited continent.

Driest place on Earth
0 in (0 mm) yearly average; Antarctica's Dry Valleys, which are free of snow and ice.

New Zealand
Rainfall is fairly high and is spread evenly throughout the year.

Monsoon extremes

In the dry season, Chittagong, in Bangladesh, has almost no rain, but its monsoon rains are torrential. Paris, France, has more even monthly rainfall.



Cyclone remnants
A cyclone may travel thousands of miles before it is completely spent.

Hurricane Iniki, 1992

Iniki, which reached Category 4, was the most powerful storm ever to strike Hawaii, where it caused six deaths and \$1.8 billion of damage.

Hurricane Katrina, 2005

Over 1,800 people died when this Category 5 storm hit the East Coast of the US, causing \$106 billion of damage.

Hurricane Kenna, 2002

With wind speeds peaking at about 165 mph (265 kph), Kenna was a Category 5 storm. It hit San Blas, Mexico, killing four people and damaging 95 percent of homes.

TROPICAL CYCLONE STRENGTH

Big storms that rotate around a core of low-pressure air are called tropical cyclones. The fiercest of these are hurricanes (also known as typhoons or just "cyclones"), with winds over 74 mph (119 kph). Their category number is linked to their intensity, or strength.

	Category	Wind speed	Effects
	5	Over 157 mph (252 kph)	Buildings destroyed; catastrophic flooding
	4	130–157 mph (209–252 kph)	Roofs blown off; major coastal flooding
	3	111–130 mph (178–209 kph)	Large trees uprooted; mobile homes wrecked
	2	96–111 mph (154–178 kph)	Some roof, door, and window damage
	1	74–96 mph (119–154 kph)	Minor building damage; branches snapped
	Tropical storm	38–74 mph (63–119 kph)	No significant damage; some flood risk
	Tropical depression	Under 38 mph (63 kph)	No significant damage; some flood risk
	Unknown intensity	No recorded wind speed data	Various, sometimes catastrophic

STORM TRACKS

This map shows the paths of some tropical cyclones. When they move beyond the tropical regions, they become known as "extratropical" cyclones. By this time, they are much weaker.

- Tropical cyclone
- ▲▲▲ Extratropical cyclone/ cyclone remnant

Hurricanes



Structure of a hurricane

Winds blow in a spiral around the calm, low-pressure center, or "eye." Immediately around the eye is a dense bank of clouds—the eyewall—where the winds are strongest.

Satellite view of Hurricane Katrina

The eye is clearly visible, surrounded by a vast mass of swirling clouds.

Typhoon Tip, 1979

The largest, most intense tropical storm ever, Tip's winds reached 190 mph (305 kph); 86 deaths were recorded. It had weakened when it hit Japan.

Bhola Cyclone, 1970

This storm of unknown intensity caused up to 500,000 deaths in what is now Bangladesh.

Cyclone Gamede, 2007

Gamede (Category 3) dropped 18 ft (5.5 m) of rain on the island of Réunion over nine days.

Cyclone Monica, 2006

With winds of around 180 mph (285 kph), Monica was the strongest cyclone to hit Australia. There were no deaths because it struck a sparsely populated region.

Cyclone Zoe, 2003

The Category 5 Zoe was the most intense tropical storm recorded in the Southern Hemisphere.

Hurricanes are tropical cyclones—swirling storms that form at sea in tropical regions. Their deadliest feature is the storm surge, when winds force huge waves ashore that batter and flood the coast.



Tropical broadleaf moist forest

Also known as rain forest, these warm, wet woods support a huge variety of animal and plant life.



Tropical dry broadleaf forest

These areas are warm all year round but have a long dry season, and many trees lose their leaves.



Tropical coniferous forest

Many migrating birds and butterflies spend the winter in these warm, dense conifer forests.



Temperate broadleaf forest

The most common habitat of northern Europe and home to trees that lose their leaves in winter.



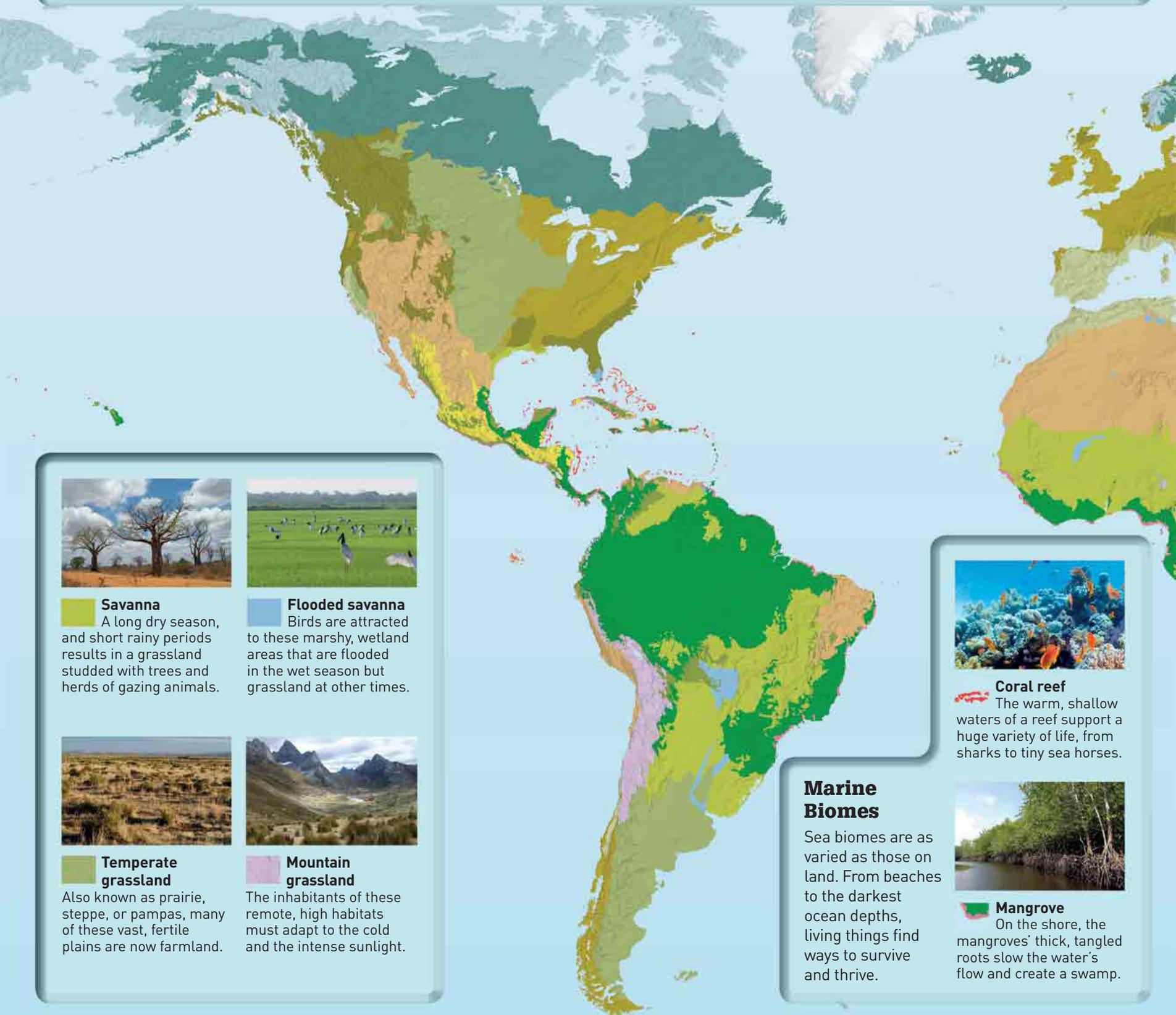
Temperate coniferous forest

Giant trees, such as the California redwood, thrive in these regions of warm summers and cool winters.



Boreal forest

Also called taiga, this is the largest biome on Earth. It is dominated by just a few types of coniferous tree.



Savanna

A long dry season, and short rainy periods results in a grassland studded with trees and herds of grazing animals.



Flooded savanna

Birds are attracted to these marshy, wetland areas that are flooded in the wet season but grassland at other times.



Temperate grassland

Also known as prairie, steppe, or pampas, many of these vast, fertile plains are now farmland.



Mountain grassland

The inhabitants of these remote, high habitats must adapt to the cold and the intense sunlight.



Coral reef

The warm, shallow waters of a reef support a huge variety of life, from sharks to tiny sea horses.

Marine Biomes

Sea biomes are as varied as those on land. From beaches to the darkest ocean depths, living things find ways to survive and thrive.



Mangrove

On the shore, the mangroves' thick, tangled roots slow the water's flow and create a swamp.



Mediterranean shrubland

Hot, dry summers can lead to fires that actually help the biome's typical shrubby plants sprout.



Desert and dry shrubland

Desert inhabitants have to be able to survive on less than 10 in (250 mm) of rainfall per year.



Arctic Tundra

A cold, dry biome where the soil stays frozen at depth. This permafrost stops trees from growing.



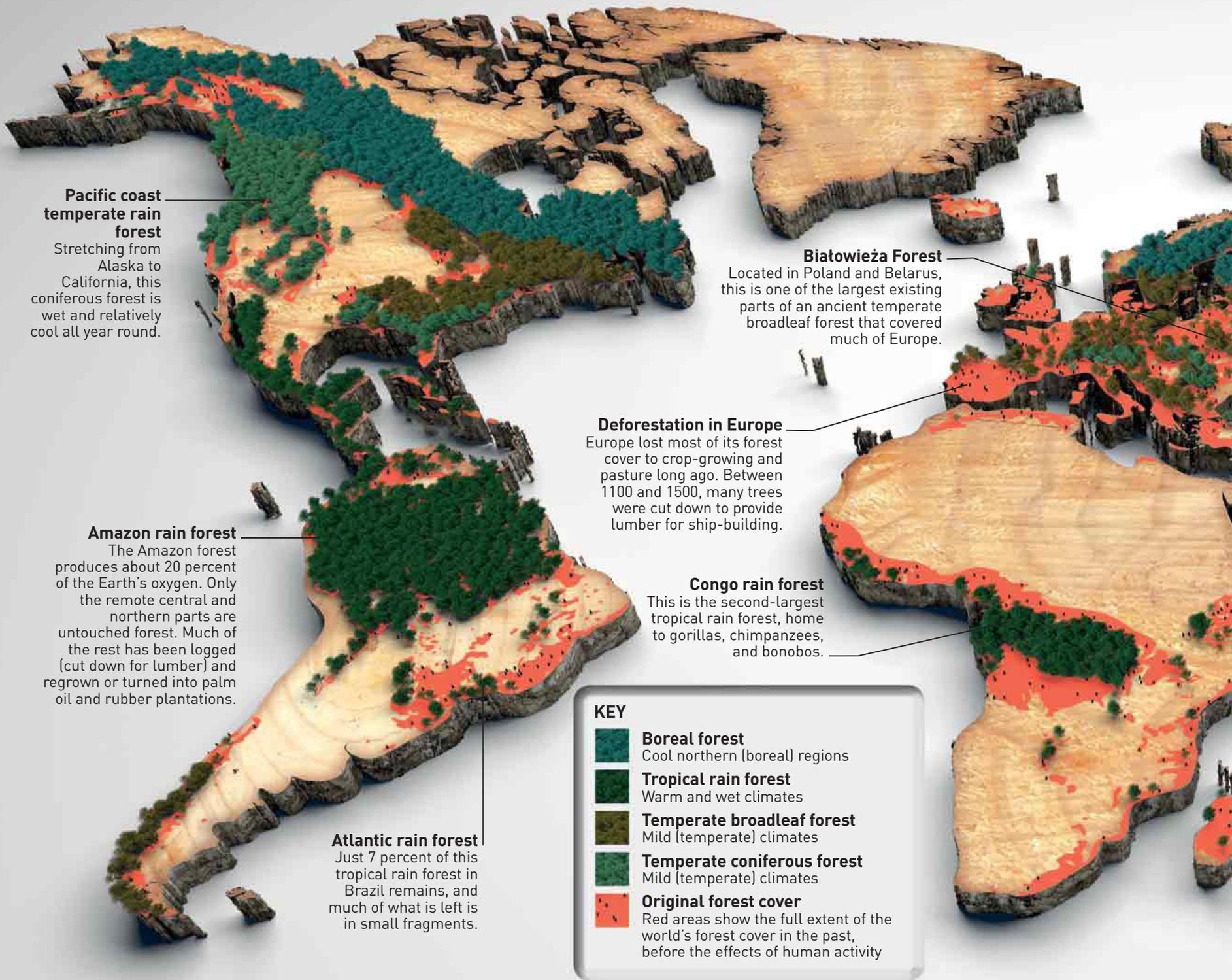
Polar desert

Too cold and dry for almost all plants. Only animals dependent on the sea, such as penguins, can live here.

A **biome's** plants and animals form a **complex** and **interconnected** community

Biomes

A biome is an area that we define according to the animals and plants that live there. They have to adapt to the biome's specific conditions such as temperature, type of soil, and the amount of light and water.



Forests

Forests are vital to life on Earth. They make the air breathable, protect the soil, and preserve fresh water supplies. But they are disappearing fast—by 2011, about half of the world's original forests had been cut down by humans.

Types of forest

Forests differ according to climate. Each type of forest has its own distinct collection of trees, forest-floor plants, and animal life. Tropical rain forests are the richest – 30 per cent all plant and animal species live in the Amazon alone. Some tropical forests are evergreen, but the trees in some others lose their leaves in the dry season.



Temperate broadleaf
Deciduous trees, such as oak and beech. Herbs, ferns, and shrubs on the forest floor.

Taiga

This vast belt of boreal forest stretches right across northern Europe and Asia. In the east, it is wilderness, but much in the west is working forest, managed for lumber and paper production.

Disappearing forests

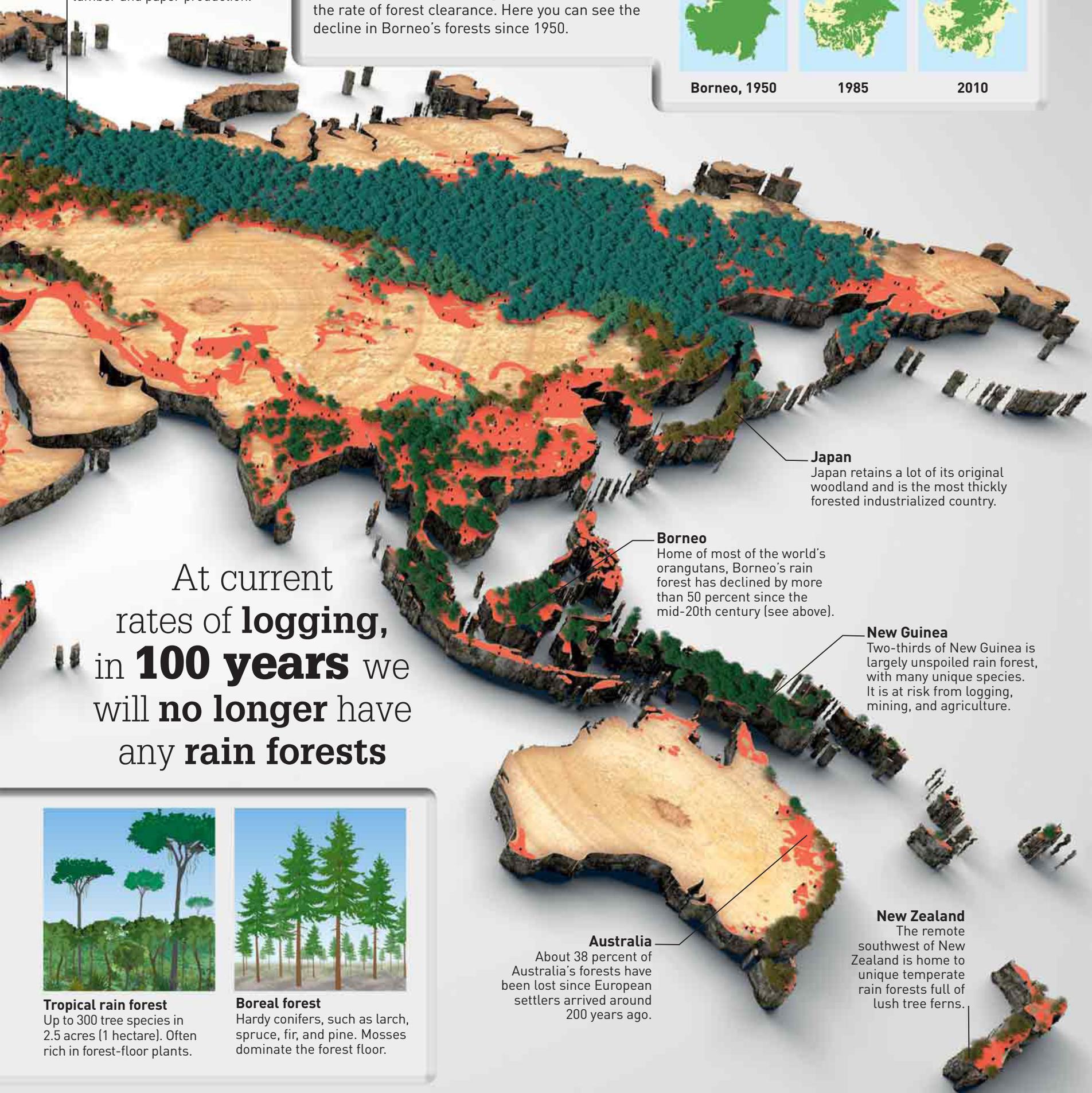
With the world's population growing, demand for lumber and land for farming and towns has increased the rate of forest clearance. Here you can see the decline in Borneo's forests since 1950.



Borneo, 1950

1985

2010



Japan
Japan retains a lot of its original woodland and is the most thickly forested industrialized country.

Borneo
Home of most of the world's orangutans, Borneo's rain forest has declined by more than 50 percent since the mid-20th century (see above).

New Guinea
Two-thirds of New Guinea is largely unspoiled rain forest, with many unique species. It is at risk from logging, mining, and agriculture.

Australia
About 38 percent of Australia's forests have been lost since European settlers arrived around 200 years ago.

New Zealand
The remote southwest of New Zealand is home to unique temperate rain forests full of lush tree ferns.

At current rates of **logging**, in **100 years** we will **no longer** have any **rain forests**



Tropical rain forest
Up to 300 tree species in 2.5 acres (1 hectare). Often rich in forest-floor plants.



Boreal forest
Hardy conifers, such as larch, spruce, fir, and pine. Mosses dominate the forest floor.

Desert tortoise

Has shovel-shaped forefeet that help it dig burrows, where it shelters from the extreme heat of the day and the cold of the night.

Mesquite

Tree with a long taproot that can grow up to 200 ft (60 m) long, as it searches for water deep underground.

Caribou

A deer specialized in living in the cold, high Arctic. Although it experiences the low rainfall of a desert, there is rarely a water shortage, because water collects in pools above the deeply frozen soil. There is no hot Sun to dry it up.

Greenland ice sheet

This region experiences the coldest and driest conditions in the Arctic. Nothing can live on top of the ice.

Great Basin
USA

Mojave Desert
USA

Sonoran Desert
USA and Mexico

Saguaro cactus

Tall, treelike cactus that grows in the Sonoran Desert. Survives by storing water in its fleshy trunk and stems when it rains. It lives off this water until the rains come again.

Patagonian Desert, Argentina

Some experts call this a dry grassland rather than a desert.

Chihuahuan Desert
Northern Mexico

Spadefoot toad

Digs a burrow with spadelike ridges on its back feet. It then makes a watertight cocoon of shed skin and waits—sometimes for months—for the next rains to fall.

Sechura Desert
Peru

Atacama Desert, Chile
Like the Namib, this is a coastal desert, kept dry by a cold ocean current nearby.

Lithops, or "living stones"

Plants also known as pebble plants, because their single pair of round leaves looks like stones, camouflaging them against grazers. The leaves also help the plants to save and store water.

Namib desert beetle

Collects minute droplets of water from early-morning fog on its legs and hard wing cases. When enough water forms, a droplet rolls down the beetle's body into its mouth.

Almería, Spain

Europe's driest region is true desert in parts.

Syrian Desert

Negev Desert

Dromedary camel

Native to Arabia but lives throughout deserts of north Africa. Can live on fat stored in its hump and survives for 2 weeks without a drink.

Sahara

Sahel

A belt of semidesert, also known as arid savanna, or dry grassland.

Tsamma watermelon

Wild ancestor of the watermelon. Grows in the Kalahari Desert and stores water in its big, round fruits.

Namib Desert
Namibia

Kalahari Desert
Botswana and South Africa

Deserts

Deserts are found from the icy poles to the tropics. So while all deserts have low rainfall—less than 10 in (250 mm) a year, and often much less—they are not always hot. Even in hot deserts, the nights are often cold.

Antarctica

One of the most arid parts of Earth's largest desert is its Dry Valleys region (right), the only area of Antarctica not covered in thick ice, and where there is almost no snowfall. Cold, dry winds blast down from mountain peaks and turn all moisture to water vapour.

Desert terrain

Deserts range widely in how they look. Soil forms only very slowly and the land is often bare rock or gravel. Any loose sandy soil may be blown into dunes. Sometimes, though, tough grasses or fleshy plants bind the soil together.



Dunes, or "sand seas"
Shifting mountains of sand can prevent plant growth.



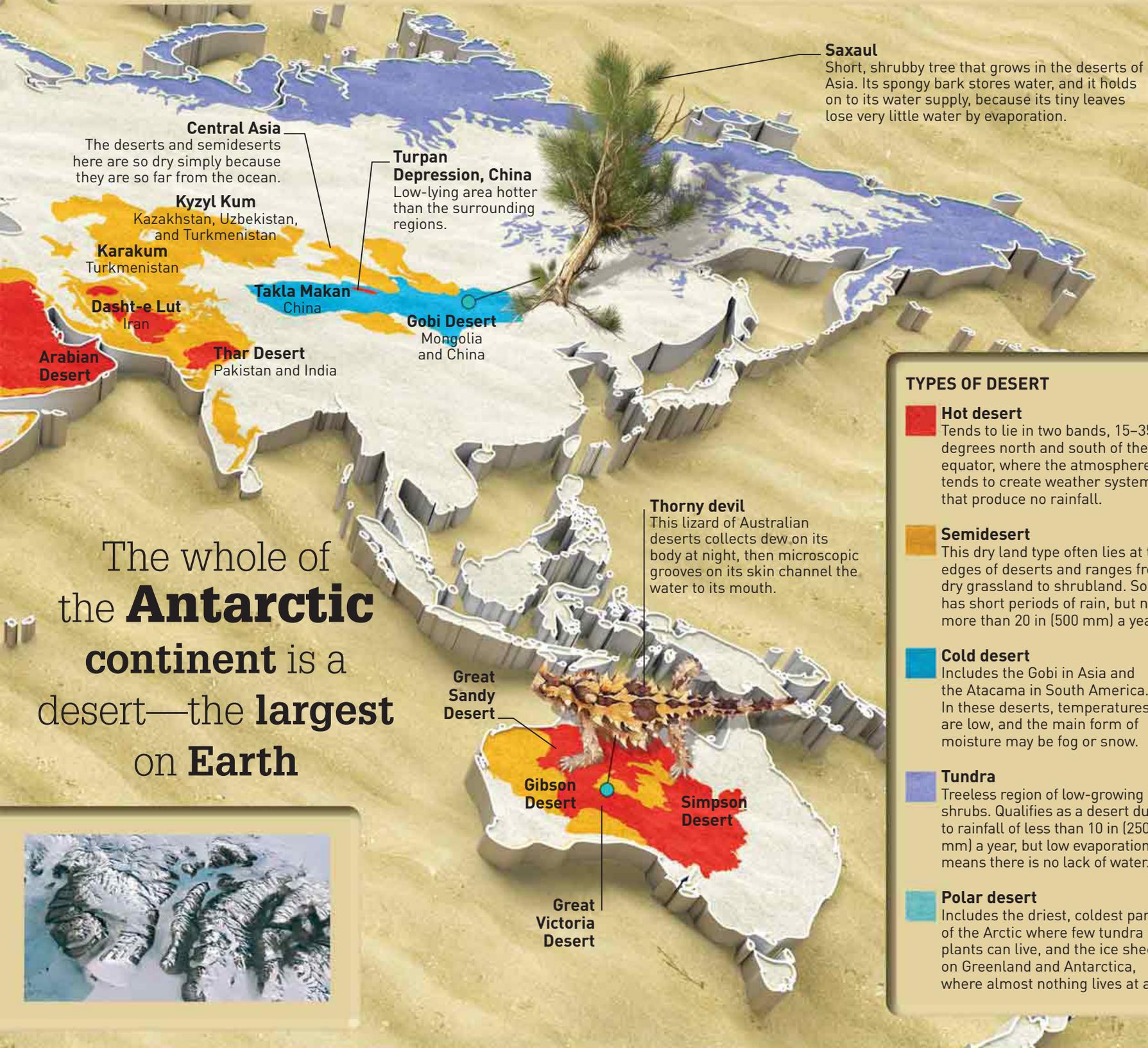
Rock and gravel
Where no plants grow, the bedrock is often visible.



Dry grassland
Desert grasses can form soil and provide food for grazers.



Fleshy plants
Fleshy, water-storing plants may form thick vegetation.



The whole of the **Antarctic continent** is a desert—the **largest** on **Earth**



TYPES OF DESERT

- **Hot desert**
Tends to lie in two bands, 15–35 degrees north and south of the equator, where the atmosphere tends to create weather systems that produce no rainfall.
- **Semidesert**
This dry land type often lies at the edges of deserts and ranges from dry grassland to shrubland. Some has short periods of rain, but no more than 20 in (500 mm) a year.
- **Cold desert**
Includes the Gobi in Asia and the Atacama in South America. In these deserts, temperatures are low, and the main form of moisture may be fog or snow.
- **Tundra**
Treeless region of low-growing shrubs. Qualifies as a desert due to rainfall of less than 10 in (250 mm) a year, but low evaporation means there is no lack of water.
- **Polar desert**
Includes the driest, coldest parts of the Arctic where few tundra plants can live, and the ice sheets on Greenland and Antarctica, where almost nothing lives at all.

AND IS AROUND THE SAME SIZE AS THE ENTIRE UNITED STATES!

Ice

Ice covers one-tenth of the Earth's surface, mostly in the polar regions. At earlier times in the Earth's history, when the climate was much cooler, ice covered an area up to three times larger than it does today.

Sea ice

Sea ice is frozen sea. It forms when the ocean's surface freezes in winter. Where it lasts year round, it may be 20 ft (6 m) thick—elsewhere it is thinner. "Pancake ice" (right) is disks of sea ice up to 4 in (10 cm) thick.



Summer ice The polar sea ice cover shrinks in summer, but some sea always remains under a layer of ice.



Winter ice As the weather gets colder, the polar sea ice spreads far beyond its summer limits.



Ice sheet A vast layer of land ice that has formed over thousands or even millions of years.



Ice shelf A floating extension of an ice sheet or glacier, usually hundreds of yards thick.



Land ice

Thick ice gradually builds up on land as old, unmelted snow is compacted by layers of fresh snow and turned into ice. Antarctica's ice sheet is up to 3 miles (4.8 km) thick.



PACIFIC OCEAN



GLACIERS

Glaciers and ice sheets

Glaciers are permanent bodies of land ice that form on high mountains in many parts of the world. These "rivers of ice" flow slowly downhill until the end melts or meets the ocean. As they flow, they dramatically shape the landscape by carving deep valleys in the rock over which they pass. The largest glaciers are the ice sheets that cover land in polar regions such as the Greenland and Antarctic ice sheets.



Icebergs

At the coast, waves, currents, and tides break chunks off ice sheets and glaciers, which float away as icebergs. Only about 12 percent of an iceberg is visible above the water.



Iceberg tracks The arrows show paths of two satellite-tracked icebergs as they drifted on the ocean currents.

Time zones map

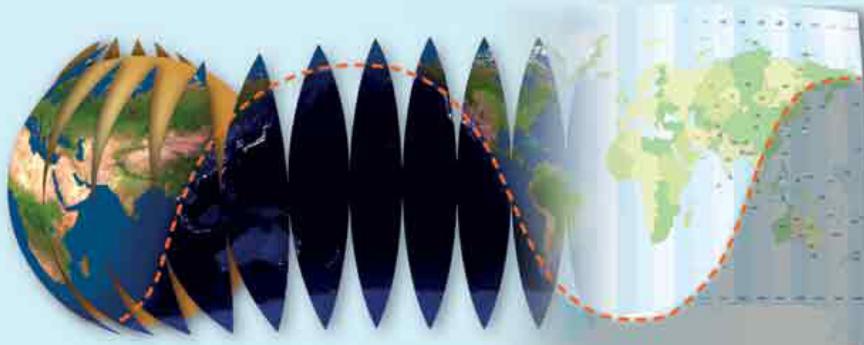
The map shows the time of day at 12 noon Coordinated Universal Time (UTC), the base from which all times are set. The columns are time zones labeled with the number of hours they are ahead or behind UTC. If you stood halfway between the boundaries of a time zone with your watch set to the correct time, at 12 noon the Sun would be at its highest point.

Time zones

As Earth rotates, some of the it faces the Sun and the rest is in darkness. Since the Sun is high in the sky at noon, noon is at different times in different places. We adjust by splitting Earth into time zones.

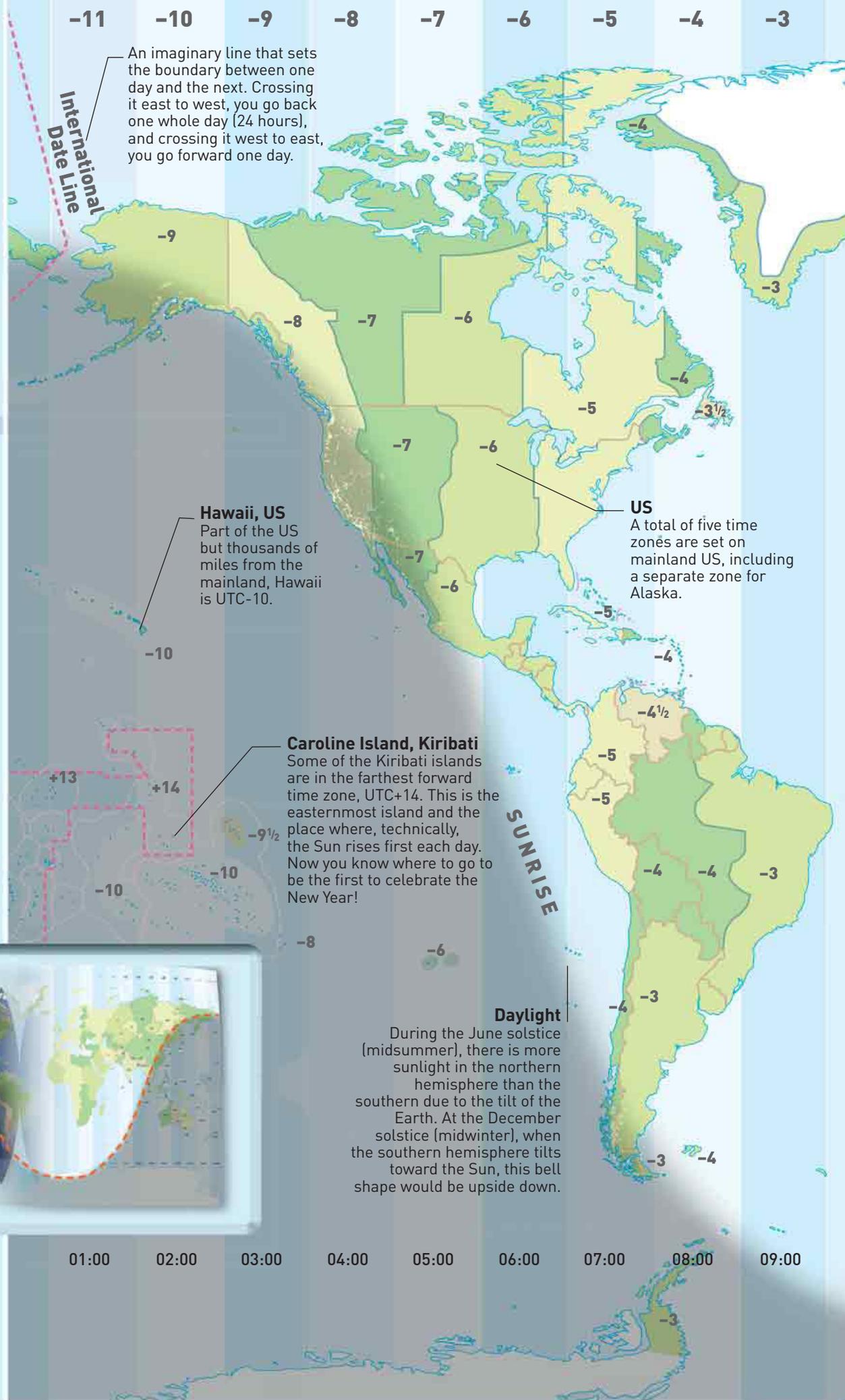
Day and night

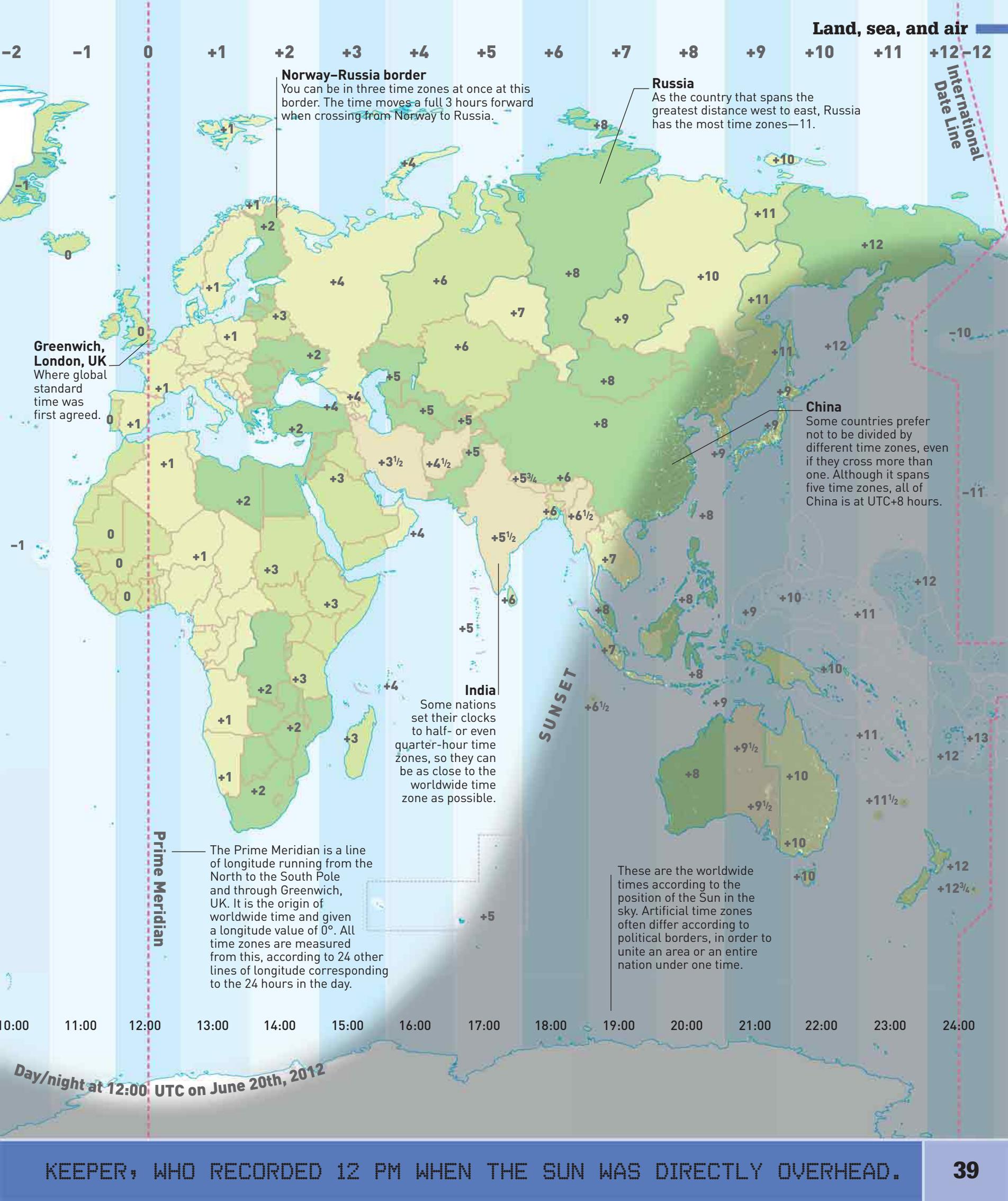
On the globe of Earth, we can see day and night divided by a straight line from north to south. When laid flat as on the map here, the light and dark areas form a bell shape.



Northern summer

Earth's axis is tilted. When the North Pole tilts toward the Sun and the South Pole tilts away, it is summer in the northern hemisphere (northern half of the world) and winter in the southern hemisphere, as on the main map.





-2 -1 0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10 +11 +12 -12

Norway–Russia border
 You can be in three time zones at once at this border. The time moves a full 3 hours forward when crossing from Norway to Russia.

Russia
 As the country that spans the greatest distance west to east, Russia has the most time zones—11.

International Date Line

Greenwich, London, UK
 Where global standard time was first agreed.

China
 Some countries prefer not to be divided by different time zones, even if they cross more than one. Although it spans five time zones, all of China is at UTC+8 hours.

India
 Some nations set their clocks to half- or even quarter-hour time zones, so they can be as close to the worldwide time zone as possible.

Prime Meridian
 The Prime Meridian is a line of longitude running from the North to the South Pole and through Greenwich, UK. It is the origin of worldwide time and given a longitude value of 0°. All time zones are measured from this, according to 24 other lines of longitude corresponding to the 24 hours in the day.

These are the worldwide times according to the position of the Sun in the sky. Artificial time zones often differ according to political borders, in order to unite an area or an entire nation under one time.

SUNSET

10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00 24:00

Day/night at 12:00 UTC on June 20th, 2012





Living world

Humpback whales
Two humpbacks “breach” (leap out of the water) off the coast of Alaska. During winter, humpbacks move south to warmer waters.

Introduction

Life exists in every corner of the planet—from high mountains to deep oceans, and from blazing deserts to the freezing polar regions. Each animal's body, life cycle, and behavior is adapted to its particular habitat, because this maximizes its chances of survival. Plant species, too, have their own adaptations that help them thrive.

Birds

The power of flight allows birds to reach the remotest islands, and some to live in different parts of the world in summer and winter, migrating between the two. There is almost nowhere on Earth that lacks bird life. Here are their secrets.

● Lightweight bones

Most bird bones are hollow, reinforced by bony struts.

● Warming feathers

Two layers of body feathers keep the bird's skin warm.

● Flight feathers

Wing and tail feathers provide lift and steer the bird in flight.

● Efficient lungs

Bird lungs are far more efficient than mammals', giving them the oxygen they need for energetic flight.



Bald eagle

A North American bird of prey, the bald eagle snatches fish from lakes.

Marine animals

Living in water gives more support than living on land, so many sea creatures survive without strong skeletons. Seawater carries clouds of microscopic life-forms and dead matter, and many sea animals can afford to give up moving from place to place, fix themselves to the seabed, and "filter feed" by grabbing these passing pieces of food.

Coral

Tropical coral reefs are giant growths of filter-feeding life-forms on the seabed.



● Gills

Sea mammals must surface to breathe, but fish take oxygen directly from the water using their gills.

● Smooth shape

Fast-moving marine animals have streamlined bodies that help them move through the water easily.

● Buoyancy aid

Some fish have an air-filled "swim bladder" to help control buoyancy.

● Bioluminescence

It is dark in the ocean depths. Many deep-sea animals produce light by chemical reactions in their bodies.

Desert cacti

The waxy, fleshy bodies of these desert plants store water. The leaves are reduced to spines, which lose less water to the air. The roots of a cactus may spread out over a wide area, to absorb as much water as possible.

Spineless cactus

A spineless variety of the prickly pear.





Polar regions

The water in the Arctic and Antarctic is so cold fish are in danger of freezing. Above the water, it is even colder, and no large, cold-blooded animals exist. Warm-blooded animals—those able to retain body heat—predominate. Polar mammals often have two layers of fur: an underlayer of soft hairs that trap air warmed by the animal's body close to the skin, and an outer coat of coarse hairs that keeps out the fiercest gales.

Polar bear

This Arctic mammal has a bulky, rounded body surrounded by fat and fur to keep it warm.

● **Natural antifreeze**

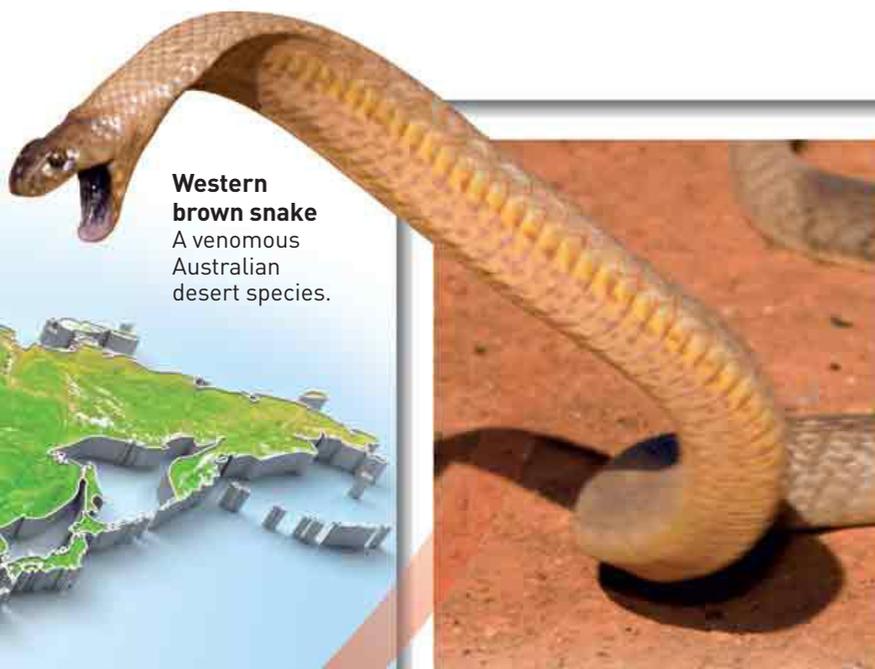
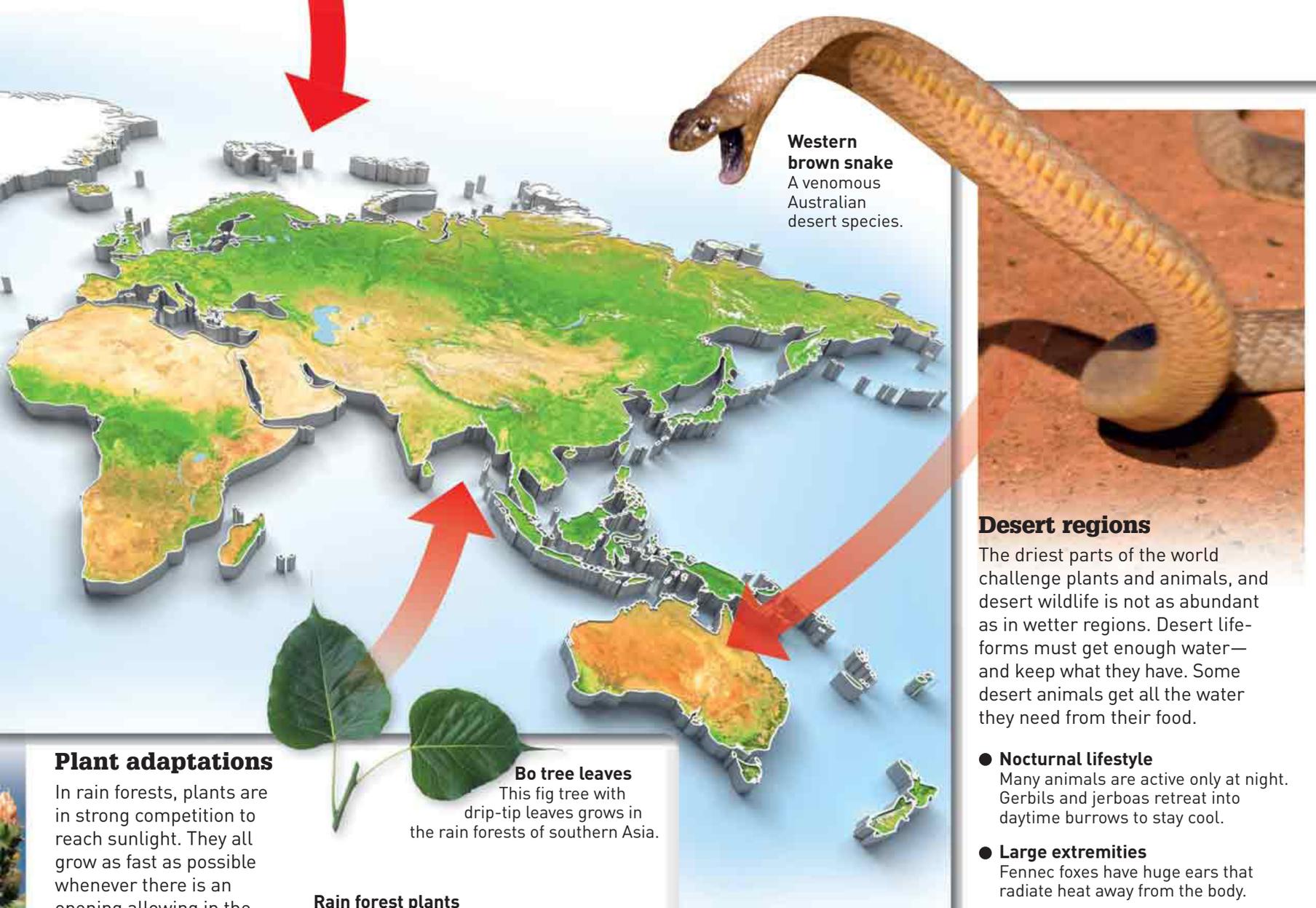
Most polar fish have a chemical in their blood that prevents ice crystals from forming in the body.

● **Small extremities**

Polar bears and Arctic foxes have small, rounded ears and muzzles that reduce heat loss.

● **Legs and feet**

Some animals have long legs that wade through snow or broad feet that act like snowshoes.



Western brown snake

A venomous Australian desert species.

Desert regions

The driest parts of the world challenge plants and animals, and desert wildlife is not as abundant as in wetter regions. Desert life-forms must get enough water—and keep what they have. Some desert animals get all the water they need from their food.

● **Nocturnal lifestyle**

Many animals are active only at night. Gerbils and jerboas retreat into daytime burrows to stay cool.

● **Large extremities**

Fennec foxes have huge ears that radiate heat away from the body.

● **Drinking dew**

Insects and lizards drink dewdrops. Larger desert animals that feed at dawn take in dew as they eat plants.

Plant adaptations

In rain forests, plants are in strong competition to reach sunlight. They all grow as fast as possible whenever there is an opening allowing in the Sun. In deserts, plants get plenty of light, but they struggle to get enough water from the soil.



Bo tree leaves

This fig tree with drip-tip leaves grows in the rain forests of southern Asia.

Rain forest plants

To reach the Sun, many rain forest plants are specialists at climbing, and others are epiphytes, which grow on top of other plants. Many rain forest leaves taper to a long point, a "drip tip," to help excess rainwater run off.

Dinosaur fossils

Dinosaur fossils occur in layers of rock that formed millions of years ago. Scientists excavate (dig up) the fossils in places where the movement of Earth's tectonic plates has forced these layers to the surface.

Zhucheng, or Dinosaur City, in China has yielded more than **7,600 fossils**

KEY

The dinosaur age spanned three geological periods. Fossil sites are colored according to period (mya = million years ago).

- Triassic (251–200 mya)
- Jurassic (200–145 mya)
- Cretaceous (145–65 mya)

Major fossil sites

Triassic

- 1 **Ghost Ranch, US**
Thousands of *Coelophysis* found here in 1947. They died when caught in a flash flood about 215 mya.
- 2 **Valle de la Luna, Argentina**
Eoraptor—perhaps the first true dinosaur, from about 230 mya—was discovered here in 1993.

Jurassic

- 3 **Dinosaur National Monument, US**
Famed for long-necked sauropod dinosaurs, such as *Barosaurus*.
- 4 **Solnhofen, Germany**
Discovered here in 1861, *Archaeopteryx* was an ancestor of modern birds. It lived 150 mya.
- 5 **Liaoning, China**
Many birdlike dinosaur fossils have been unearthed here, including the turkey-sized *Caudipteryx*.

Barosaurus 3

Ornithomimus 6

Tyrannosaurus 7

Coelophysis 1

Eoraptor 2

Dinosaur footprints

Fossil-hunters have found tracks preserved in mud and sand that later turned into rock. These tracks can tell us how dinosaurs walked, and whether they lived alone or in groups. The sites shown here are all in the US.



Dinosaur Ridge
Dakota, US. Hundreds of prints unearthed when building a road.



Dinosaur State Park
Connecticut, US. One of the largest track sites in North America.



Purgatoire River Site
Colorado, US. Giant sauropod prints left on a lake shore.



4 **Archaeopteryx**



5 **Caudipteryx**



9 **Hadrosaurus**



8 **Protoceratops**



10 **Leaellynasaura**

Cretaceous

- 6 **Dinosaur Provincial Park, Canada**
An entire *Ornithomimus*, from 75 mya, was discovered here in 1995.
- 7 **Hell Creek, US**
Ancient rocks here have yielded a range of dinosaur fossils—among them, *Tyrannosaurus*.
- 8 **Flaming Cliffs, Mongolia**
The first *Protoceratops* fossils and dinosaur nest were found here.

- 9 **Zhucheng, China**
Since the 1960s, over 50 tons of fossils have been found here. Rich in remains of “duck-billed” dinosaurs such as *Hadrosaurus*.
- 10 **Dinosaur Cove, Australia**
About 105 mya this was near the South Pole. Until the discovery of *Leaellynasaura* here in 1989, no one knew dinosaurs could live through cold, long, dark winters.

Americas

1. Bald eagle
Stabs its sharp talons into prey and rips open the body with its hooked bill.

2. Wolverine
Preys on rodents, other small mammals, and even weakened caribou.

3. Coyote
Eats almost anything, from insects and frogs to calves and lambs.

4. Boa constrictor
A large snake, the boa coils around its prey and squeezes until the victim suffocates.

5. Jaguar
Unable to run fast for very long, the jaguar relies on stealth to creep up on prey.

6. Piranha
Using razor-sharp teeth, a school can reduce a deer to bones in minutes.

Africa

7. African rock python
Growing up to 28 ft (8.5 m) long, preys on monkeys, pigs, and birds.

8. African lion
The females do most of the hunting. The male defends the pride's territory.

9. African wild dog
Can chase down prey at 25 mph (40 kph) for 3 miles (5 km) or more.

Eurasia

10. Polar bear
Can kill with a single swipe from one of its 40-lb (18-kg) front paws.

11. Golden eagle
With its amazing eyesight, can spot prey 1¼ miles (2 km) away.

12. Gray wolf
Packs can bring down animals as large as caribou or musk ox.

3,000–4,000:
the number of
tigers left in
the wild

Predators

Found on every continent and in every ocean, predators are animals that kill and eat other creatures. With their incredible array of hunting strategies and body parts adapted for killing, they include some of the most fascinating species on the planet.





13. Eurasian lynx
Furry ear tufts gather prey noises in the dense forest, where sounds are muffled.



16. Tiger
Camouflaged by its stripes, stalks its prey and kills with a bite to the neck.



17. Sunda clouded leopard
For its size, this shy forest-dweller has longer canine teeth than any other cat.



14. Peregrine falcon
Dives onto prey at 125 mph (200 kph), making it the fastest animal on Earth.



15. Eurasian badger
Eats worms, insects, birds, frogs, lizards, and small mammals, plus plants.

Oceans



18. California sea lion
May hunt nonstop for 30 hours, diving for up to 5 minutes at a time.



19. Killer whale (orca)
Many hunt sea loins, dolphins, and even whales. Can snatch seals off the ice.



20. Common dolphin
Together, dolphins can herd fish to the surface, where they are easier to catch.



21. Sperm whale
May dive to 4,000 ft (1,200 m) deep in search of giant squid.



22. Tuna
Able to swim at 50 mph (80 kph); hunts fish and squid near the surface.



23. Great white shark
Kills dolphins, seals, and big fish, including sharks, with its jagged teeth.

12. Gray wolf
Much of Asia, parts of Europe, and northern North America



13. Eurasian lynx
Europe (mainly northern and eastern parts) to northern and central Asia



15. Eurasian badger
Europe and Asia below the Arctic Circle



16. Tiger
Parts of India, China, Siberia, and Southeast Asia



14. Peregrine falcon
Lives on every continent except Antarctica

8. African lion
Africa, south of the Sahara



17. Sunda clouded leopard
Sumatra and Borneo in Southeast Asia

Australasia

24. Saltwater crocodile
Preys on water buffalo and cattle on land. Spends much of its life at sea, catching fish.



25. Tasmanian devil
This marsupial's strong jaws can crush the bones of birds, fish, and small mammals.



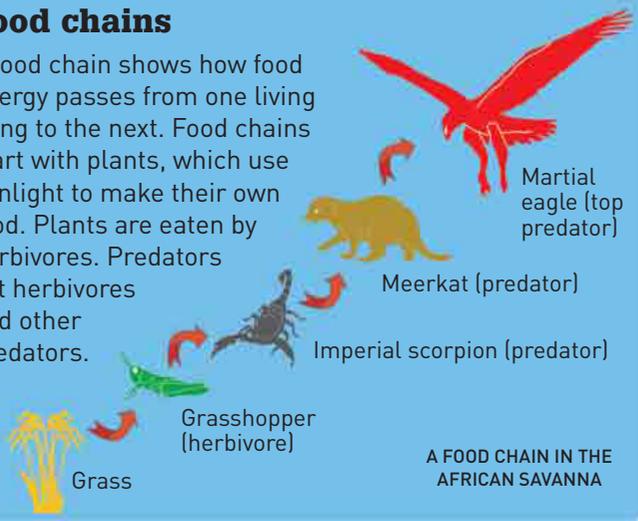
24. Saltwater crocodile
Southeast Asia and Northern Australia



25. Tasmanian devil
Tasmania, an island off the Southeastern tip of Australia

Food chains

A food chain shows how food energy passes from one living thing to the next. Food chains start with plants, which use sunlight to make their own food. Plants are eaten by herbivores. Predators eat herbivores and other predators.



A FOOD CHAIN IN THE AFRICAN SAVANNA

9. African wild dog
Africa, south of the Sahara

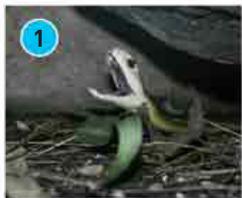


Deadly creatures

Very few wild animals hunt people for food, but many pose a danger when they feel threatened—especially those armed with venom.

Venomous hunters

Many snakes, spiders, and other animals inject venom (poison) to paralyze or stun their prey. This venom can also be deadly to humans.



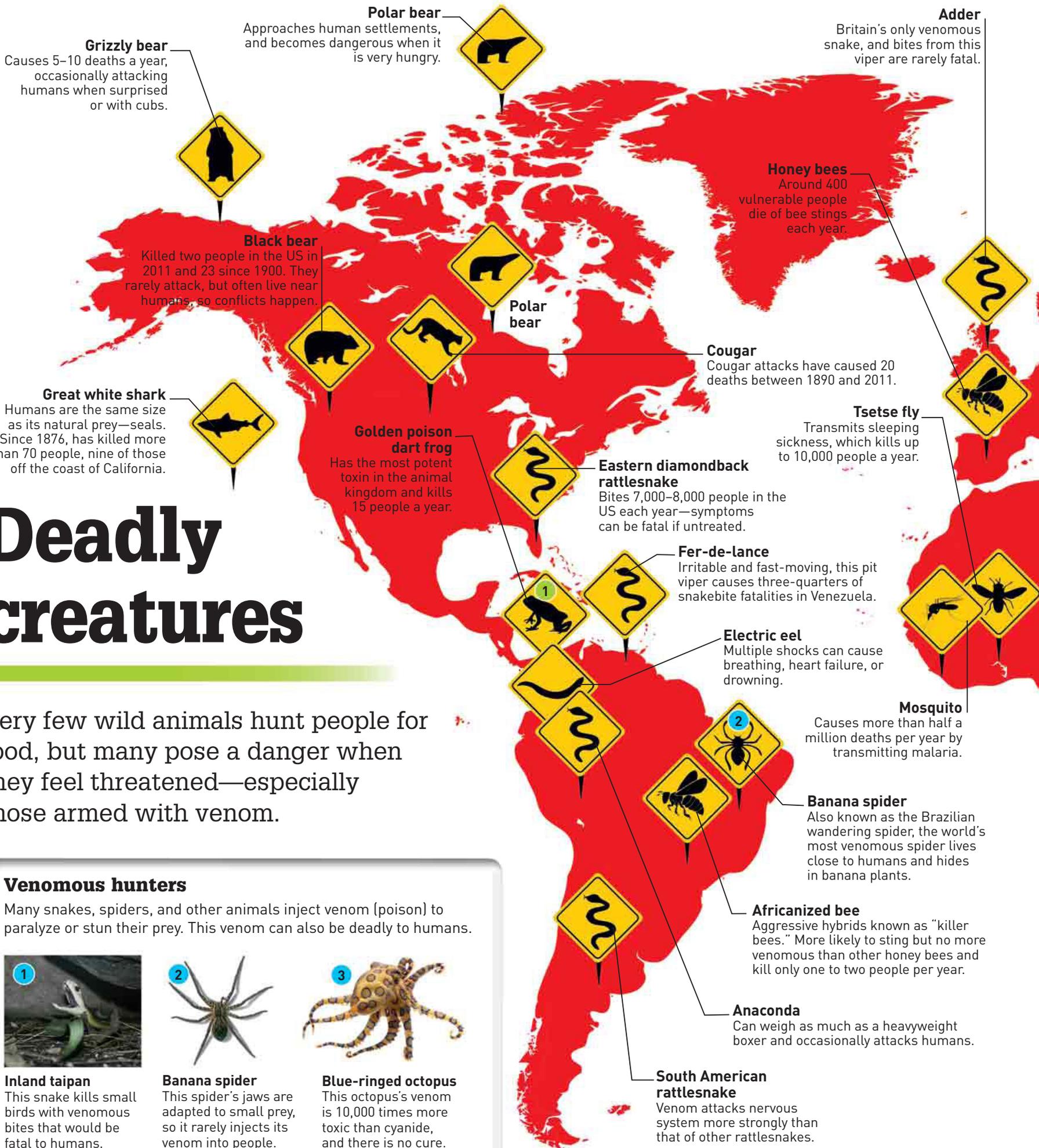
1
Inland taipan
This snake kills small birds with venomous bites that would be fatal to humans.



2
Banana spider
This spider's jaws are adapted to small prey, so it rarely injects its venom into people.



3
Blue-ringed octopus
This octopus's venom is 10,000 times more toxic than cyanide, and there is no cure.



Some victims of **stonefish venom** say it's good for their **arthritis**

Defensive poisons

Many animals use toxins (poisons) against predators. The poisons may be in spines or stings, or they may ooze from the skin.



Golden poison dart frog
The skin has enough toxin to kill 10 people. It is effective against its snake predators.



Pufferfish
The poison in puffers' skin and liver could kill a human, but these fish make a prized dish in Japan.



Stonefish
This fish's spines stop predators, but also endanger humans who are pricked by accident.

Asp viper
Causes about 90 percent of all snake bites in Italy, but only 4 percent of bites are fatal.

European black widow spider
Venom is 15 times stronger than a rattlesnake's.

Pallas's viper
0.1 gram (0.004 oz) of venom can kill a human, but only strikes if threatened.

Fat-tailed scorpion
Most dangerous scorpion in North Africa and the Middle East.

Common krait
Most venomous land snake in Asia.

Tiger
Until recent improvements in tiger management, hunted and killed around 50 people every year in the Sundarbans mangroves of India.

Malayan pit viper
Responsible for 700 snakebites annually in Malaysia.

Puff adder
Lives in heavily populated areas and is the most dangerous snake in Africa.

Elephant
Attacks people when threatened and kills nearly 300 people a year.

African lion
Kills 70 people a year in Tanzania, either by hunting them for food, or in defense.

Hippopotamus
Causes more than 300 deaths a year, sometimes by overturning boats.

Komodo dragon
Giant lizard that grows up to 10 ft (3 m) long and may, very rarely, attack and eat humans.

Asian cobra
Responsible for most deaths by snakebite (of the 50,000 per year).

Box jellyfish
Has enough toxin to kill 60 humans, and in the Philippines, 20-40 people die each year from stings.

Lionfish
Its venomous spines can cause severe injuries, breathing difficulties, and temporary paralysis.

Saltwater crocodile
Causes hundreds of deaths a year in New Guinea, the Solomon Islands, and Indonesia.

Stonefish
Venom injected by spines causes unbearable pain and death in a few hours if not treated.

Cape buffalo
Attacks when defending itself and kills more than 200 people a year.

Blue-ringed octopus
Enough toxin in its body to kill 26 adult humans. It can cause respiratory failure.

Redback spider
Also known as the Australian black widow. Deaths are rare, but bites can result in fatal complications.

Inland taipan
Deadliest venom of any land snake, but snake scientists are almost the only known victims. They recovered after treatment with antivenom.

Black mamba
Fastest snake on Earth kills any human it bites unless the victim takes antivenom.

Six-eyed sand spider
There is no antivenom for its bite but (luckily) it is shy and has little contact with people.

Funnel-web spider
Its extremely toxic venom could kill a small child in 15 minutes.

Tiger snake
In humans, 60 percent of untreated bites result in serious poisoning or death.

How the aliens invade

Stowaways

Fleas and other parasites can hitch a ride on animal or human hosts. Rats, mice, and insects can travel hidden in ships' cargo. Some species sneak in when empty cargo ships take on local seawater as ballast, then pump it out at their destination. Every day, 3,000 marine organisms are transported around the globe in this way.



Black rat

Introduced by humans

Some species are deliberately introduced by humans. This can be by hunters, for meat, fur, or sport, by farmers, or for biological control, where a new species is introduced to control native pests. Some invaders are escaped pets or plants washed out of home aquariums. A few have even been released by immigrants who introduce familiar wildlife to remind them of home!



Cane toad



About
90 percent
of the world's **islands**
have now been
invaded by rats

Alien invasion

Invasive species are animals or plants that enter and thrive in an environment where they are not native. Native species (plants and animals already living there) usually have no defence. The invading aliens can wipe out native species by preying on them or out-competing them.

Signal crayfish

Introduced from North America to Norway for food, but carries "crayfish plague" which hits native crayfish.

"Warty" comb jellyfish

A recent arrival via tankers from the US, it now accounts for 95 percent of the weight of all living things in the Black Sea.

Chinese creeper vine

Introduced to India in World War II to camouflage airfields, it is now a rampant weed.

African land snail

Brought to Taiwan as human food, it carries diseases, including meningitis.

Small Indian mongoose

Has destroyed seven native animal species on Japan's Amami Ōshima Island since 1979.

Arctic fox

Its introduction to the Aleutian Islands by fur-hunters has been disastrous for ground-nesting birds.

Brown tree snake

Accidentally introduced, it has caused the extinction of most of Guam's native birds and lizards.

Water hyacinth

Kills fish and turtles in Papua New Guinea by blocking sunlight and starving the water of oxygen.

Cane toad

Australians are trying to control their 200 million cane toads (which were themselves introduced to control beetle crop pests), by culling and genetic engineering.

Brown rat

A threat to island-nesting seabirds everywhere, it was eradicated from Vatu-i-Ra Island, Fiji in 2007.

Polynesian rat (kiore)

Stowed away with Māori settlers. Eats nesting seabirds.

Giant sensitive plant

A serious weed in Thailand, it clogs irrigation systems and lowers crop yields.

Nile perch

This fish has contributed to the extinction of more than 200 fish species in Lake Victoria.

Yellow crazy ants

On Christmas Island, 3 million red land crabs have been killed by these invaders.

European rabbit

More than 200 million rabbits overran Australia, from an original 24 released by an English immigrant for hunting.

Dromedary camel

Originally brought in for transportation, there are now 1.1 million feral ("gone wild") camels.

Feral cat

On the Kerguelen Islands, cats kill 1.2 million nesting seabirds every year.

Northern Pacific seastar

In Tasmania, volunteers organize "hunting days" to try to eradicate this Japanese starfish.

Prickly pear

South Africa is looking at biological methods of controlling this plant—for instance, by introducing the cactus moth, whose caterpillars eat it.

Common brushtail possum

First brought to New Zealand to establish a fur trade.

Black swan

Introduced in 1864 to New Zealand from Australia as an ornamental bird.

Wasp

Has reached plague proportions in the beech forests of the South Island.

Bird migration

Many birds breed in one location during summer and then fly off to spend the winter somewhere warmer. Later in the year, they return to raise the next generation. These annual flights, or migrations, cover thousands of miles and require incredible stamina.

The rufous hummingbird migrates from Mexico to its breeding grounds in Canada and Alaska.

Rufous hummingbird

So that it can feed on nectar during its journey, the rufous hummingbird times its migration to coincide with the blooming of flowers along its flight path.

Golden chequered warbler

This endangered warbler breeds in just a few patches of juniper-oak forest in Texas. It winters in the pine-oak woodlands that stretch from southern Mexico to Nicaragua, but these habitats are threatened by deforestation.

Red knot

Each spring, red knots travel from the tip of South America to their breeding grounds in the Canadian Arctic. They spend over half of the year on this 18,600-mile (30,000-km) round trip.

In the Atlantic, Arctic terns take different routes north and south, since they follow the prevailing winds.

Aquatic warbler

This rare songbird flies from eastern Europe to winter in Senegal.

Barn swallows breed in North America and winter in South America.

Arctic tern

In August, this tern leaves its summer breeding grounds in the Arctic to fly to the other end of the world for the start of the Antarctic summer. Because it experiences two summers, it sees more daylight than any other animal.

Some Arctic terns fly up to 49,700 miles (80,000 km) per year.

Red-breasted goose

After wintering on the Black Sea coast, the red-breasted goose heads north to raise chicks on the Russian tundra.

Swallows that spend winter in India fly north to nest in northern Asia.

Ferruginous duck

This widespread duck breeds on marshes and lakes and makes relatively short migrations. Ferruginous ducks that breed in western China and Mongolia winter in India and Pakistan.

A bar-tailed godwit may travel up to 286,000 miles (460,000 km) during the course of its life.

Barn swallows of southern Africa fly to Europe to breed.

Sociable lapwing

In 2007, the sociable lapwing's migration route from east Africa to Kazakhstan and Russia was revealed for the first time by satellite-tracking.

Barn swallow

Each year, huge flocks migrate between northern Australia and eastern Russia. These birds can catch insects on the wing and drink by scooping water from lakes.

Arctic terns fly from the **Antarctic** to **Greenland** in **40 days**

Aided by strong tailwinds at high altitude, the godwits can make the return journey to New Zealand in just over eight days.

Migration bottlenecks

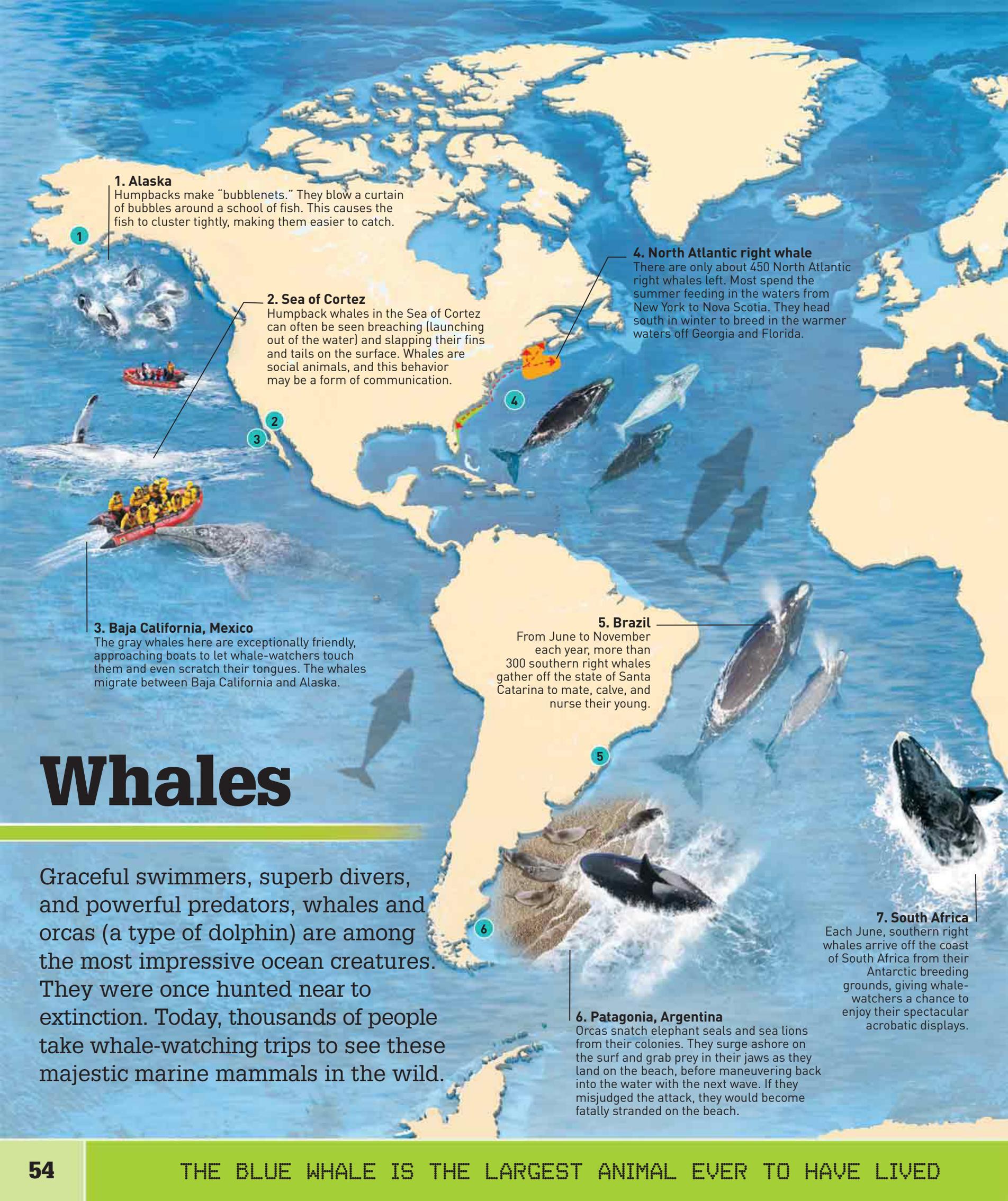
Places that lie on the flight paths of many birds are known as migration bottlenecks. They are especially important for soaring birds such as storks and birds of prey. These birds can't fly far over water, so they rely on routes with the shortest sea crossings. Millions of birds may pass at these favorite spots.

- 1 Panama**
About 3 million birds of prey use this land bridge between North and South America.
- 2 Strait of Gibraltar**
Soaring birds fly to Europe from Africa on this sea crossing of only 9 miles (14 km).
- 3 Sicily and Malta**
These islands are "stepping-stones" for birds flying from Italy to Tunisia and Libya.
- 4 Egypt**
Egypt has several bottlenecks—such as Suez, Hurghada, and Zaranik—for birds flying between Africa and Europe or Asia.

Bar-tailed godwit
Bar-tailed godwits fly from New Zealand to breed in Alaska. On the return trip, one was tracked flying 7,258 miles (11,680 km) nonstop over the Pacific Ocean—the longest continuous journey ever recorded for a bird.



This flock of white storks flying over Spain reached Europe via the Strait of Gibraltar.



1. Alaska

Humpbacks make "bubblenets." They blow a curtain of bubbles around a school of fish. This causes the fish to cluster tightly, making them easier to catch.

2. Sea of Cortez

Humpback whales in the Sea of Cortez can often be seen breaching (launching out of the water) and slapping their fins and tails on the surface. Whales are social animals, and this behavior may be a form of communication.

4. North Atlantic right whale

There are only about 450 North Atlantic right whales left. Most spend the summer feeding in the waters from New York to Nova Scotia. They head south in winter to breed in the warmer waters off Georgia and Florida.

3. Baja California, Mexico

The gray whales here are exceptionally friendly, approaching boats to let whale-watchers touch them and even scratch their tongues. The whales migrate between Baja California and Alaska.

5. Brazil

From June to November each year, more than 300 southern right whales gather off the state of Santa Catarina to mate, calve, and nurse their young.

6. Patagonia, Argentina

Orcas snatch elephant seals and sea lions from their colonies. They surge ashore on the surf and grab prey in their jaws as they land on the beach, before maneuvering back into the water with the next wave. If they misjudged the attack, they would become fatally stranded on the beach.

7. South Africa

Each June, southern right whales arrive off the coast of South Africa from their Antarctic breeding grounds, giving whale-watchers a chance to enjoy their spectacular acrobatic displays.

Whales

Graceful swimmers, superb divers, and powerful predators, whales and orcas (a type of dolphin) are among the most impressive ocean creatures. They were once hunted near to extinction. Today, thousands of people take whale-watching trips to see these majestic marine mammals in the wild.

Migration

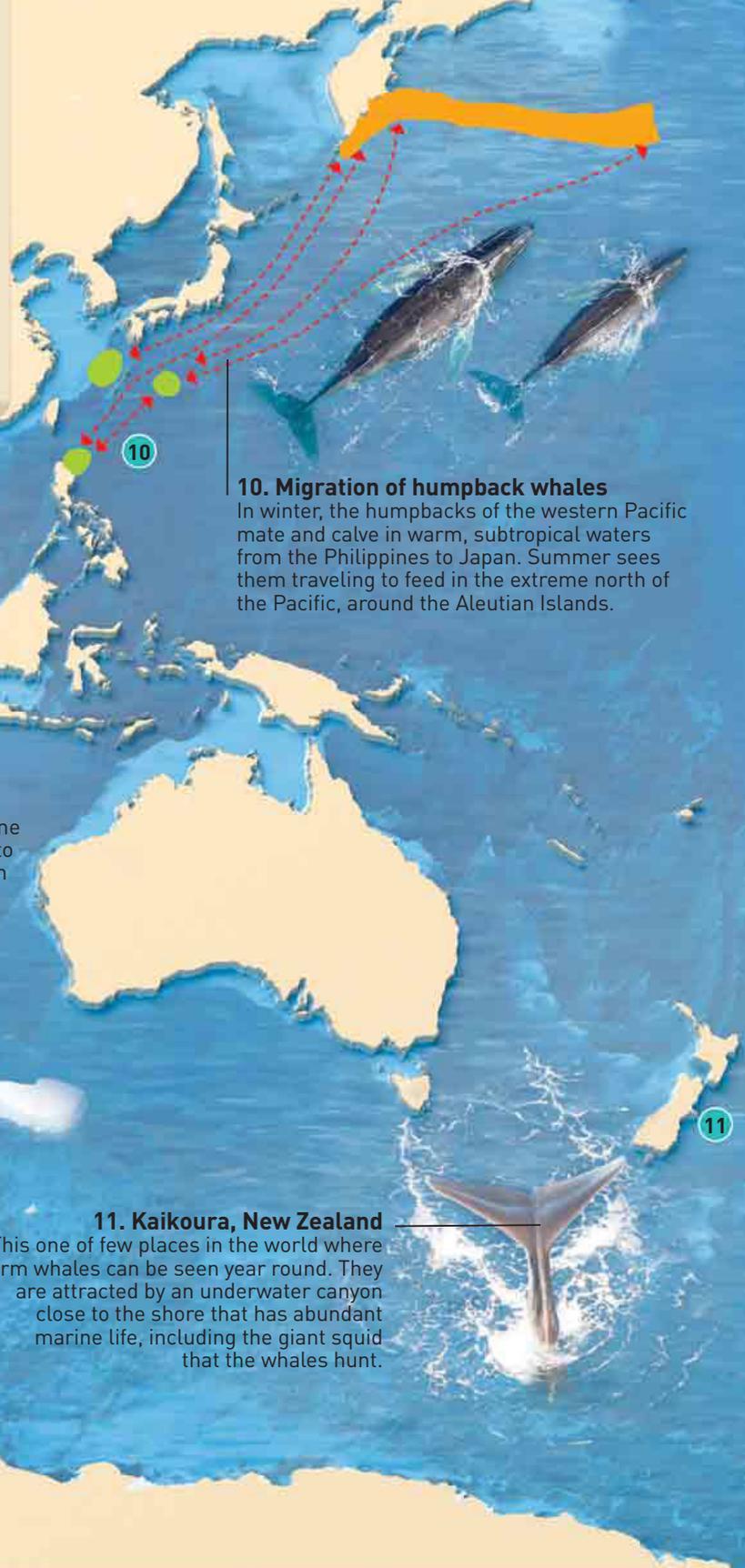
Whales travel to cold waters near the poles to feed, then move to warmer waters closer to the equator to breed. Few species migrate across the equator, so there can be separate populations in the northern and southern hemispheres.



KEY

- **Breeding areas** Warmer waters for giving birth
- **Feeding areas** Cooler waters that are rich in food
- ↔ **Migration routes** Breeding-to-feeding areas and back
- **Site of spectacular whale behavior**

1 million sperm whales were killed before hunting them was banned in 1981



10. Migration of humpback whales
 In winter, the humpbacks of the western Pacific mate and calve in warm, subtropical waters from the Philippines to Japan. Summer sees them traveling to feed in the extreme north of the Pacific, around the Aleutian Islands.

8. Sri Lanka
 Between December and April, Dondra Point, on Sri Lanka's southern tip, is the best place to see blue whales. Unlike most populations of blue whales, this one does not migrate to polar waters to feed. These northern Indian Ocean blue whales both breed and feed year round in tropical waters.

9. Antarctica
 Antarctic orcas often hunt in teams, herding their prey together before attacking from different angles. They will also tip over ice floes to knock penguins and seals into the water.

11. Kaikoura, New Zealand
 This one of few places in the world where sperm whales can be seen year round. They are attracted by an underwater canyon close to the shore that has abundant marine life, including the giant squid that the whales hunt.

Some **sharks** grow up to **30,000 teeth** in their **lifetime**



Freshwater sharks

Some shark species are found in freshwater habitats. The bull shark, for example, lives in warm coastal waters worldwide, but it sometimes swims up larger rivers and into lakes. Bull sharks are very territorial, so if they find humans swimming in their river, they may attack them.

Mississippi River

One bull shark reached Alton, Illinois, 1,150 miles (1,850 km) upstream.

Potomac River

Bull sharks up to 8 ft (2.4 m) long have been caught in the Potomac.

Lake Nicaragua

Bull sharks reach the lake via the San Juan River.

Amazon River

There have been sightings of bull sharks 1,200 miles (2,000 km) from the ocean.



Nicole

In 2003–04, a female great white shark, nicknamed Nicole, made the longest known migration by a shark. Nicole swam from Africa to Australia and back—more than 12,400 miles (20,000 km)—in 9 months. She mostly swam at the surface, but at times reached depths of up to 3,200 ft (980 m).



Nicole's route was tracked by an electronic tag attached to her fin.

DISTRIBUTION OF SHARKS WORLDWIDE

Some shark species cruise almost all the world's oceans, while others have a more limited range, preferring either cooler or warmer seas.



Whale shark

The largest fish in the ocean, reaching lengths of 40 ft (12 m) or more, the whale shark prefers warm waters. It feeds mainly on plankton.



Basking shark

At 30 ft (10 m) long, this is the second-largest fish. Found in temperate water, it swims open-mouthed, filtering plankton from the water.



Great white shark

Found in the majority of the world's oceans, the great white has made the most recorded attacks on humans. It can swim over 25 mph (40 kph).



Great hammerhead shark

Often found near tropical reefs, the great hammerhead preys on stingrays, using its hammer to pin down the fish before biting them.



Port Jackson

A reef-dweller from around southern Australia, this shark has wide, flat teeth that crush hard-shelled prey such as oysters, snails, and crabs.



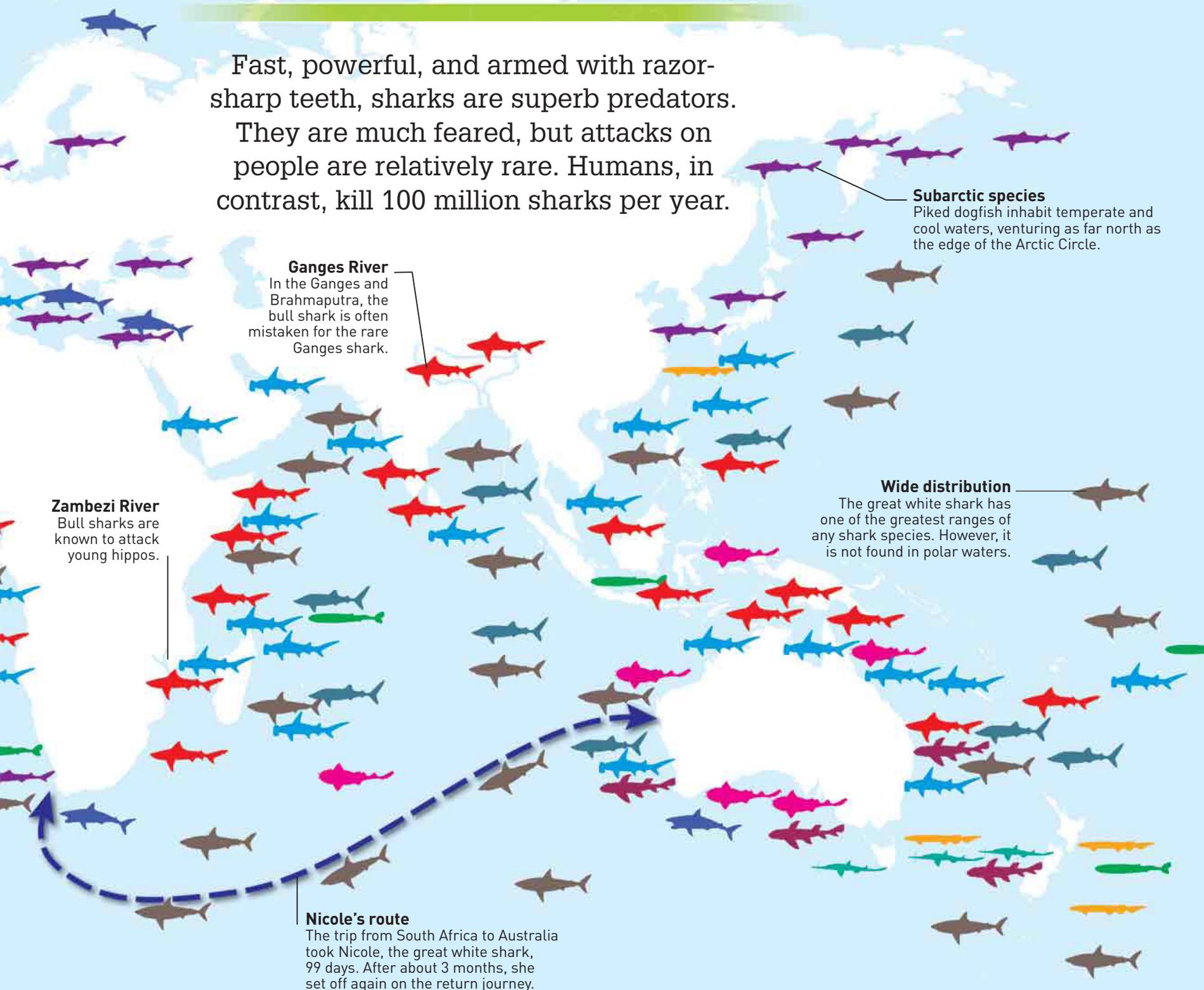
Pygmy shark

At 8–10 in (20–25 cm) long, this is one of the smallest sharks. It hunts squid at depths of up to 6,000 ft (1,800 m) in subtropical and temperate seas.

Sharks

Fast, powerful, and armed with razor-sharp teeth, sharks are superb predators.

They are much feared, but attacks on people are relatively rare. Humans, in contrast, kill 100 million sharks per year.



Ganges River

In the Ganges and Brahmaputra, the bull shark is often mistaken for the rare Ganges shark.

Zambezi River

Bull sharks are known to attack young hippos.

Subarctic species

Piked dogfish inhabit temperate and cool waters, venturing as far north as the edge of the Arctic Circle.

Wide distribution

The great white shark has one of the greatest ranges of any shark species. However, it is not found in polar waters.

Nicole's route

The trip from South Africa to Australia took Nicole, the great white shark, 99 days. After about 3 months, she set off again on the return journey.



Pacific angel shark

This shark of the eastern Pacific lies on the seabed and ambushes passing fish. It is superbly camouflaged by its mottled, sandy back.



Ornate wobbegong

Elaborately patterned and with fleshy projections around its jaws, this shark inhabits tropical waters, mainly around the Australian coast.



Frilled shark

With its flat head and eel-like body, this frilled shark looks very different from other sharks. It lives near the seabed in deep water.



Longnose sawshark

The longnose lives off southern Australia. Its snout is a long, sawlike projection edged with rows of large, sharp teeth.



Bull shark

This shark is one of the most dangerous to humans. It preys on sharks, rays, and other fish, as well as squid, turtles, and crustaceans.



Piked dogfish

Once among the most abundant of sharks, the piked dogfish is now threatened as a result of overfishing. It gathers in schools by the thousand.

Americas

1. North American white sturgeon

Similar to sturgeons living 100 million years ago, this fish depends heavily on its sense of smell.



2. American paddlefish

Takes its name from its long, paddle-shaped snout.



3. Alligator gar

Hides in aquatic plants to ambush its prey.



4. Electric eel

Generates huge electric shocks to hunt prey and ward off attackers.



5. Redtail catfish

Stops feeding to shed its skin like a snake.



6. Spectacled caiman

Named after the bony ridge between its eyes.



7. Arapaima

When oxygen levels in the water drop, this fish can breathe air. But its need to come to the surface makes it vulnerable to hunters.



8. Amazon River dolphin

Hunts in the murky water by sonar and uses its long snout to catch prey hiding in underwater plants. Females are normally larger than males.



Eurasia

9. Wels catfish

Uses its fins to capture prey before swallowing its catch whole.



10. Beluga sturgeon

The world's largest river fish, it spends some of its life in saltwater. Extra-large beluga no longer exist because of overfishing and poaching of the species.



The arapaima has existed for around **100 million years**

1 North American white sturgeon
20 ft (6.1 m)
Columbia River

2 American paddlefish
7 ft (2.2 m)
Mississippi River

4 Electric eel
6¾ ft (2 m)
Orinoco River

7 Arapaima
8¼ ft (2.5 m)
Amazon River

3 Alligator gar
8–10 ft (2.4–3 m)
Mississippi River

5 Redtail catfish
4¼ ft (1.3 m)
Essequibo River

6 Spectacled caiman
8¼ ft (2.5 m)
Essequibo River

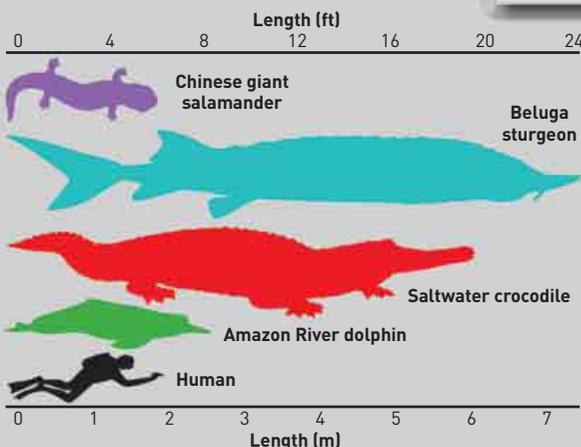
8 Amazon River dolphin
8¼ ft (2.5 m)
Amazon River

12 Goliath tigerfish
5 ft (1.5 m)
Congo River

11 Marbled lungfish
6½ ft (2 m)
Nile River

Becoming giant

The sizes of river monsters shown here are mainly extreme historical records. It has always been rare for them to reach such sizes, but especially so these days, since most are overfished and several are critically endangered.



Australasia

23. Saltwater crocodile

The largest reptile in the world, it can kill and eat prey as large as cattle, water buffaloes, and horses and will not hesitate to kill humans who invade its territory.



24. Freshwater crocodile

Much smaller than its saltwater relative, will not attack humans unless provoked.

Africa

11. Marbled lungfish

In the dry season, digs itself into a mud cocoon for up to 2 years.

12. Goliath tigerfish

Fierce fish known to attack humans.

13. Nile perch

When brought to live in new rivers and lakes, can kill so many fish that it causes the extinction of native fish species.

Asia

14. Giant Devil catfish

This rare species has sharp teeth similar to a shark's.

15. Wallago

Human remains have been found inside its stomach.

16. Gavia

An endangered crocodylian with a long, thin snout, good for catching fish. Can grow to 23 ft (7 m).

17. Chinese giant salamander

The world's largest living amphibian.

18. Giant freshwater stingray

Finds its prey using an electric field sensor.

19. Kaluga

Cannibalism is common among these sturgeons of the far east of Russian.

20. Taiman

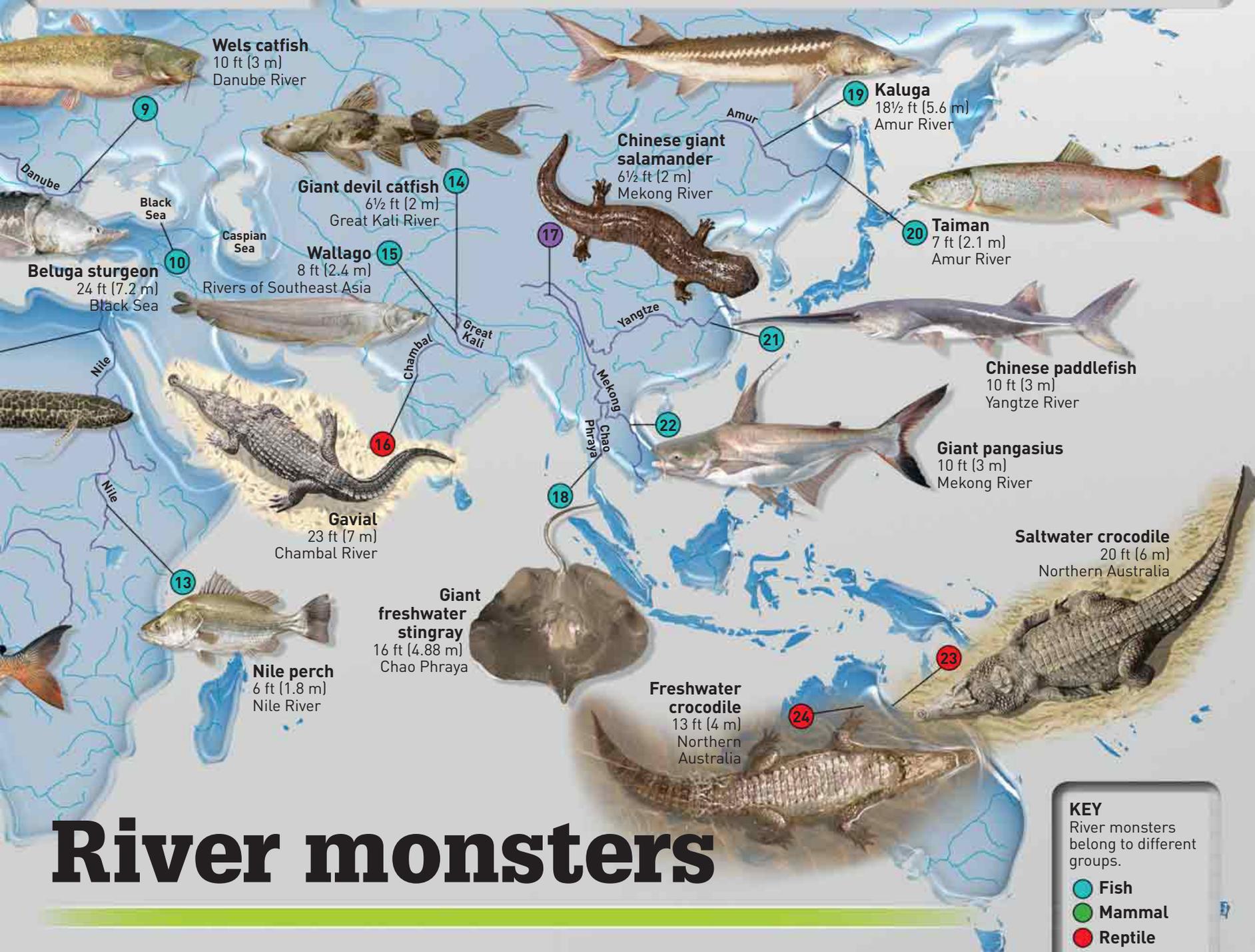
The largest of the salmon family, called the "Mongolian terror trout."

21. Chinese paddlefish

Verging on extinction—none has been seen in the wild since 2003.

22. Giant pangasius

Also known as the "dog-eating catfish." Another critically endangered fish.



River monsters

KEY
River monsters belong to different groups.

- Fish
- Mammal
- Reptile
- Amphibian

Hiding in the muddy waters of the world's greatest rivers are some of the largest and most ferocious underwater creatures in existence. Many can become larger than a fully grown human, and some are man-eaters.

KEY

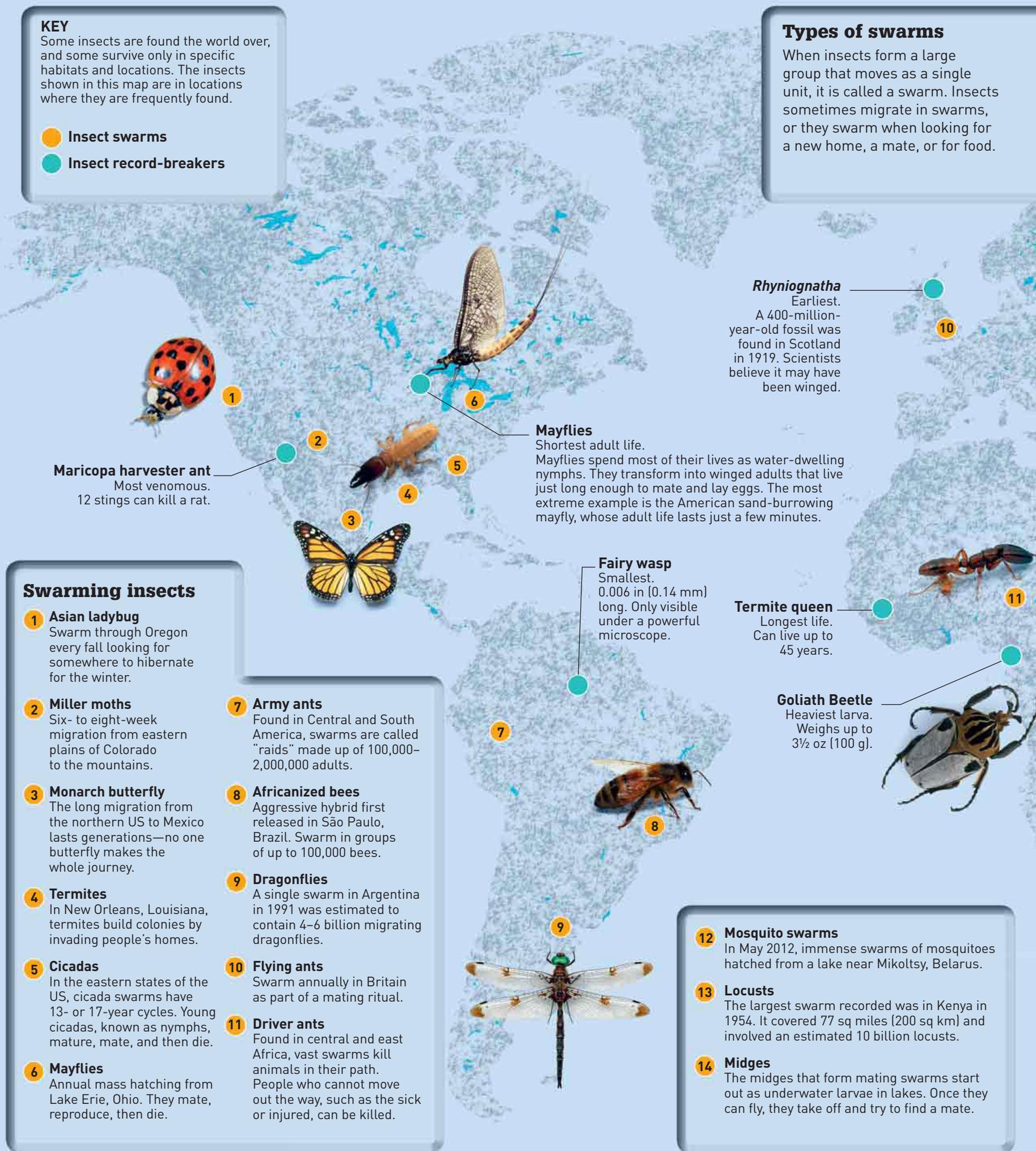
Some insects are found the world over, and some survive only in specific habitats and locations. The insects shown in this map are in locations where they are frequently found.

 Insect swarms

 Insect record-breakers

Types of swarms

When insects form a large group that moves as a single unit, it is called a swarm. Insects sometimes migrate in swarms, or they swarm when looking for a new home, a mate, or for food.



Rhyniognatha

Earliest.
A 400-million-year-old fossil was found in Scotland in 1919. Scientists believe it may have been winged.

Mayflies

Shortest adult life.
Mayflies spend most of their lives as water-dwelling nymphs. They transform into winged adults that live just long enough to mate and lay eggs. The most extreme example is the American sand-burrowing mayfly, whose adult life lasts just a few minutes.

Fairy wasp

Smallest.
0.006 in (0.14 mm) long. Only visible under a powerful microscope.

Termite queen

Longest life.
Can live up to 45 years.

Goliath Beetle

Heaviest larva.
Weights up to 3½ oz (100 g).

Swarming insects

1 Asian ladybug

Swarm through Oregon every fall looking for somewhere to hibernate for the winter.

2 Miller moths

Six- to eight-week migration from eastern plains of Colorado to the mountains.

3 Monarch butterfly

The long migration from the northern US to Mexico lasts generations—no one butterfly makes the whole journey.

4 Termites

In New Orleans, Louisiana, termites build colonies by invading people's homes.

5 Cicadas

In the eastern states of the US, cicada swarms have 13- or 17-year cycles. Young cicadas, known as nymphs, mature, mate, and then die.

6 Mayflies

Annual mass hatching from Lake Erie, Ohio. They mate, reproduce, then die.

7 Army ants

Found in Central and South America, swarms are called "raids" made up of 100,000–2,000,000 adults.

8 Africanized bees

Aggressive hybrid first released in São Paulo, Brazil. Swarm in groups of up to 100,000 bees.

9 Dragonflies

A single swarm in Argentina in 1991 was estimated to contain 4–6 billion migrating dragonflies.

10 Flying ants

Swarm annually in Britain as part of a mating ritual.

11 Driver ants

Found in central and east Africa, vast swarms kill animals in their path. People who cannot move out the way, such as the sick or injured, can be killed.

12 Mosquito swarms

In May 2012, immense swarms of mosquitoes hatched from a lake near Mikoltsy, Belarus.

13 Locusts

The largest swarm recorded was in Kenya in 1954. It covered 77 sq miles (200 sq km) and involved an estimated 10 billion locusts.

14 Midges

The midges that form mating swarms start out as underwater larvae in lakes. Once they can fly, they take off and try to find a mate.

Honey bees

Bees swarm when they leave their hive to find a new home. Once a small number of special "scouts" have agreed on the most suitable site, the queen and the main cluster of bees fly to the new location.



Monarch migration

By instinct alone, every year millions of monarch butterflies travel up to 2,500 miles (4,000 km) from northern parts of America to warmer climates as far south as Mexico, before they return north in spring.



Midges

Huge swarms appear over Lake Victoria in Africa during the annual mating season, as thousands of dancing male midges try to attract females. Swarms are so big they look like giant brown clouds.



Froghopper

Highest jumper. Jumps 28 in (71 cm)—150 times its own height—comparable to a human jumping over a 60-story building!



Himalayan cicada

Loudest. Calls at up to 120 decibels—as loud as an ambulance siren.



Stink bug

Smelliest. Toxic odor can be smelled by humans about 3¼–5 ft (1–1.5 m) away.



Flea

Longest jumper. Can jump over 200 times its body length.



Scientists estimate **4–20 million** types of **insect** have yet to be **discovered**

Chan's megastick

Longest. 22½ in (56.7 cm). Only six specimens have ever been found, all on the island of Borneo.

Australian tiger beetle

Fastest runner. 5.6 mph (9 kph). Equivalent to a human running at 480 mph (770 kph).

Dung beetle

Strongest. Can pull 1,141 times its own body weight—the equivalent to an average human pulling six double-decker buses full of people.



Giant weta

Heaviest. Weighs up to 2½ oz (70 g)—heavier than a sparrow.



Horse fly

Fastest flyer. Maximum speed recorded briefly on take-off at 90 mph (145 kph). The next fastest are dragonflies and hawk moths, at around 30–35 mph (50–55 kph).



Insects

We know of more than 1 million different types of insect, and more are identified every year. They have fascinating habits, and their strange appearances can be seen with the help of microscopes and special cameras.

(10,000,000,000,000,000,000) INDIVIDUAL INSECTS ALIVE.

European yew
Europe. All parts are poisonous, aside from the bright red, berrylike cones.

White snakeroot
Eastern North America. Poisons can travel in the food chain through cattle to humans, causing "milk sickness."

Water hemlock
North America and Europe. One of North America's most toxic plants.

Cobra lily
Northern California and Oregon. Like other pitcher plants, it attracts insects into its pitchers—pitcher-shaped body parts full of digestive juices.

Trumpet pitcher
Southeastern US. Uses a drug in its nectar to make insects slip into its pitchers.

Aloe vera
North Africa. Long valued for its medicinal properties, has a gel in its leaves that is said to help heal damaged skin and aid digestion.

Venus flytrap
North and South Carolina. Closes its jawlike traps on prey in 0.1 seconds.

Resurrection fern
Southeastern US. Can survive for 100 years without water. Appears to die but is quickly revived by moisture.

Manchineel
Florida, Central America, and the Caribbean. Milky-white sap causes blisters on human skin.

Sensitive plant
Central and South America. A type of *Mimosa* and one of the few plants capable of rapid movement. The leaves fold and droop when touched. They reopen after a few minutes.

Genlisea
Africa and Central and South America. Traps prey in the soil with its strange underground leaves.

The six floral kingdoms

Plant geographers divide the world into six "kingdoms." Each kingdom has its own unique collection of native plant life. Some kingdoms span more than one continent. The Cape kingdom, however, covers just the southern tip of Africa.



Boreal kingdom
North America and Eurasia. Native plant families include rose (above), birch, brassica, primrose, saxifrage, and buttercup.



Neotropical kingdom
Mexico to southern South America. Characteristic native plant families include bromeliads and cacti.



Palaeotropical kingdom
Most of Africa, southern Asia, and Polynesia. Umbrella thorn acacias (above) and baobab trees are native plants.



Australian kingdom
Australia. Many Australian plants are completely unlike those elsewhere in the world. Bottlebrushes (above) are an example.



Antarctic kingdom
Southern South America, New Zealand, and Antarctica. *Francoa* herbs (above) form one of the few uniquely Antarctic families.



Cape kingdom
A small yet highly diverse region around the Cape of South Africa, with around 9,000 plant types, including the king protea (above).

Butterwort
Boggy parts of Europe, North and South America, and Asia. Sticky hairs on its leaves trap insects.

Monkshood
Mountains of the northern hemisphere. Also known as aconite, it is a source of a deadly poison contained in the seeds.

KEY



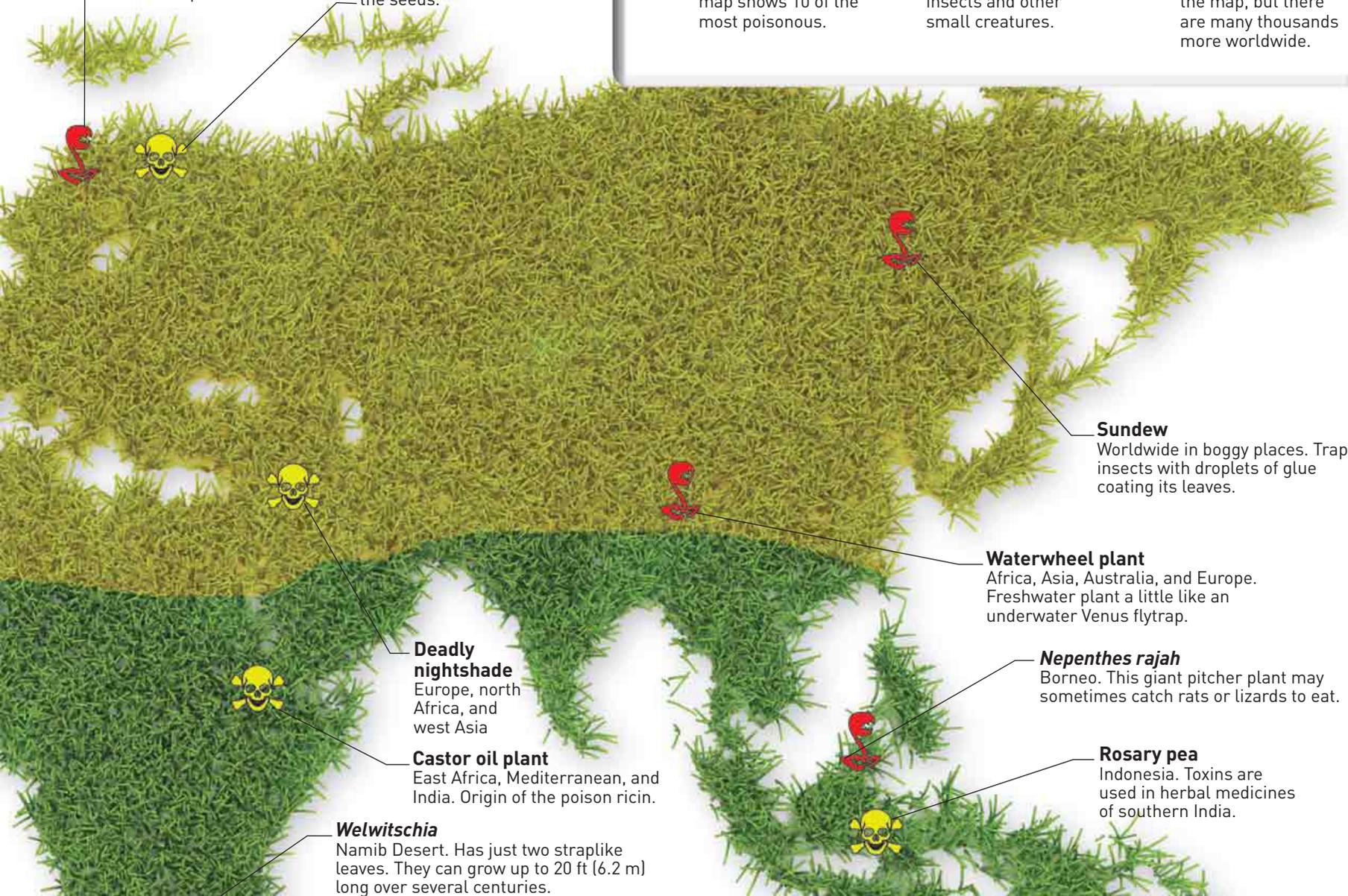
Poisonous plants
Some plants contain toxic chemicals. The map shows 10 of the most poisonous.



Carnivorous plants
These plants trap and consume insects and other small creatures.



Incredible plants
Four amazing plants are highlighted on the map, but there are many thousands more worldwide.



Sundew
Worldwide in boggy places. Traps insects with droplets of glue coating its leaves.

Waterwheel plant
Africa, Asia, Australia, and Europe. Freshwater plant a little like an underwater Venus flytrap.

Nepenthes rajah
Borneo. This giant pitcher plant may sometimes catch rats or lizards to eat.

Rosary pea
Indonesia. Toxins are used in herbal medicines of southern India.

Deadly nightshade
Europe, north Africa, and west Asia

Castor oil plant
East Africa, Mediterranean, and India. Origin of the poison ricin.

Welwitschia
Namib Desert. Has just two straplike leaves. They can grow up to 20 ft (6.2 m) long over several centuries.

World of plants

Scientists estimate there are at least 400,000 species of plant on Earth—and possibly many thousands more. Some parts of the world have a rich diversity of plant life; in others, such as Antarctica, plants are scarce.

Terrestrial bladderwort
Africa. Grows on wet, rocky surfaces and catches tiny prey in bladderlike traps.

Rainbow plant
Western Australia. Catches insects on its sticky leaves.

Total number of life-forms

There are many thousands of species of vertebrate animals, such as birds and reptiles. But these numbers are dwarfed by the amazing number of other life-forms, particularly insects.

NUMBER OF SPECIES IN EACH GROUP

13,000	Algae
74,000	Fungi
17,000	Lichens
320,000	Plants
85,000	Mollusks (squid, clams, snails, and relatives)
47,000	Crustaceans (crabs, shrimp, and relatives)
102,000	Arachnids (spiders, scorpions, and relatives)
1,000,000	Insects
71,000	Other invertebrates (without backbones)
62,000	Vertebrates (animals with backbones)

70,000 weevils

Weevils form only one family of beetles, yet there are more different types than all the world's vertebrates.



Giraffe-necked weevil



Cratosomus roddami, a weevil



Eupholus linnei, a weevil

Biodiversity

Richness of different life-forms, or species, is called biodiversity. Places such as tropical rain forests are naturally high in biodiversity. Harsh environments have fewer species, but those species might be unique and equally precious.

Barren Arctic

Plants grow very slowly in the cold Canadian Arctic, so there is not a lot of food to go around. Vegetation is ground-hugging, with little variety of homes for small animals—unlike forests. Biodiversity is low.

Rich Amazon

The Amazon is the largest and oldest tropical forest on Earth. In general, large, continuous areas of habitat support the greatest diversity of species.

Deserted Sahara

There are hardly any amphibians in this dry environment, but the few that survive here are uniquely adapted to the conditions. Preserving areas of pristine Sahara would ensure the survival of some rare creatures.

Unique Atlantic Forest

This small coastal strip of rain forest in Brazil is not only rich in species. Because it is isolated from other rain forests, many of its species are also found nowhere else.

KEY

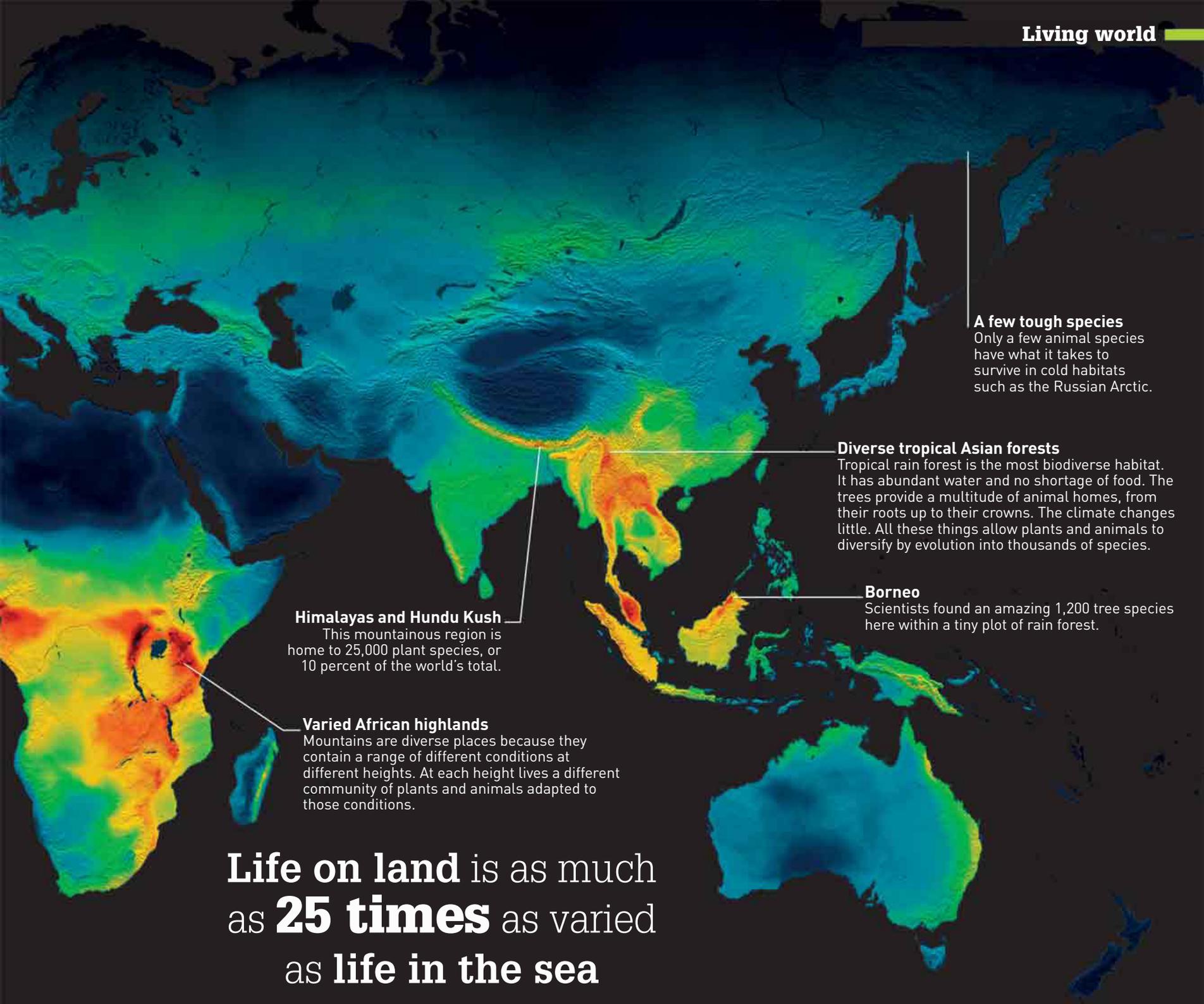
This map shows the pattern of biodiversity across the world's land, combining measures of 5,700 mammal species, 7,000 amphibians, and 10,000 species of bird. This gives an overall measure, because the variety of these three groups usually mirrors the total biodiversity, including the numbers of different insects and plants. Scientists know biodiversity in the oceans is lower than on land, but it is not shown on the map.



Lowest

Highest

BIODIVERSITY (SPECIES RICHNESS)



A few tough species
Only a few animal species have what it takes to survive in cold habitats such as the Russian Arctic.

Diverse tropical Asian forests
Tropical rain forest is the most biodiverse habitat. It has abundant water and no shortage of food. The trees provide a multitude of animal homes, from their roots up to their crowns. The climate changes little. All these things allow plants and animals to diversify by evolution into thousands of species.

Borneo
Scientists found an amazing 1,200 tree species here within a tiny plot of rain forest.

Himalayas and Hindu Kush
This mountainous region is home to 25,000 plant species, or 10 percent of the world's total.

Varied African highlands
Mountains are diverse places because they contain a range of different conditions at different heights. At each height lives a different community of plants and animals adapted to those conditions.

Life on land is as much as **25 times** as varied as **life in the sea**

POISON-DART FROGS

There are 175 species in the poison-dart frog family, which lives in the tropical rain forests of Central and South America. They are all related, but each has evolved slightly differently.



Mimic poison-dart frog



Granular poison-dart frog



Three-striped poison-dart frog



Yellow-banded poison-dart frog



Brazil-nut poison-dart frog



Golden poison-dart frog

Unique wildlife

Some parts of the world are home to animals and plants that live nowhere else. These places are often remote islands, where life is cut off. In other cases, they are patches of unusual habitat, complete with the unique wildlife that depends on it.

California

A Mediterranean-type climate results in some unique forests featuring the world's largest living organism—the giant sequoia, a gigantic species of coniferous tree.

Mexican pine-oak forests

These forests on Mexican mountain ridges are patches of habitat not found anywhere else nearby. There are nearly 4,000 endemic plants and unique birds such as the Montezuma quail.

Hawaii and Polynesia

Only certain life-forms have reached these remote islands. Hawaii has no ants, but 500 species of unique fruit fly, all evolved from a single species blown ashore 8 million years ago. Some of them are flightless and have taken up antlike lifestyles. Hawaii also has many unique plants, including the strange Hawaiian silversword, endemic to its mountaintops.

Galápagos Islands

These islands were made famous by Charles Darwin for their unique wildlife, including their giant tortoises.

Tropical Andes

Perhaps the richest region on Earth, these mountains are home to 664 species of amphibian, 450 of which are in danger of dying out. Of 1,700 bird species, 600, including this fiery-throated fruiteater, are found nowhere else.

Western Mediterranean

Europe's hot spot of unique wildlife. One species of midwife toad lives only on Majorca, and Barbary macaques live only on Gibraltar and patches of habitat in Morocco and Algeria.

Canary Islands

Rich in endemic plants, the Canary Islands off Africa are named after their unique bird, the canary.

Caribbean Islands

Each island has its own versions of many plants and animals. This Cuban knight anole lives only on Cuba.

Atlantic Forest

This thin strip of rain forest is cut off from the Amazon rain forest, so it has its own set of wildlife, including the endangered golden lion tamarin.

75 percent of the **unique** plants of the Canary Islands are **endangered**

ENDEMIC HOT SPOTS

Scientists have shown that these regions have the greatest number of plant species living only within a small area. They call these species "endemic" to that area. Wherever this occurs, lots of endemic animals also live there.

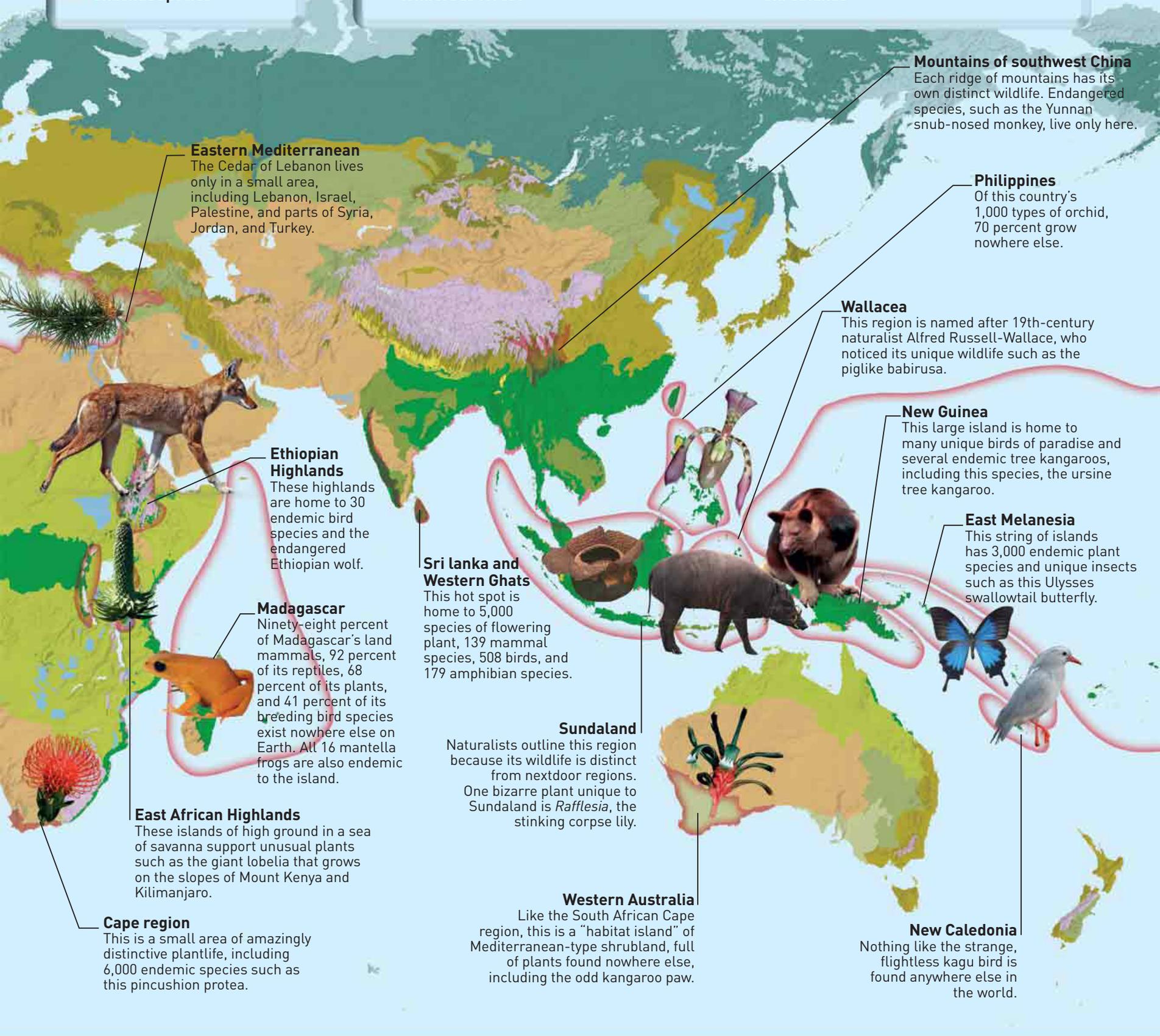
 Region rich in endemic species

BIOMES

-  Tropical dry broadleaf forest
-  Tropical coniferous forest
-  Temperate broadleaf forest
-  Temperate coniferous forest

-  Tropical moist broadleaf forest
-  Boreal forest
-  Savanna
-  Flooded savanna

-  Steppe
-  Mountain grasslands and shrublands
-  Mediterranean shrublands
-  Desert and dry shrublands
-  Arctic tundra
-  Polar desert
-  Mangroves



Eastern Mediterranean

The Cedar of Lebanon lives only in a small area, including Lebanon, Israel, Palestine, and parts of Syria, Jordan, and Turkey.

Mountains of southwest China

Each ridge of mountains has its own distinct wildlife. Endangered species, such as the Yunnan snub-nosed monkey, live only here.

Philippines

Of this country's 1,000 types of orchid, 70 percent grow nowhere else.

Wallacea

This region is named after 19th-century naturalist Alfred Russell-Wallace, who noticed its unique wildlife such as the piglike babirusa.

Ethiopian Highlands

These highlands are home to 30 endemic bird species and the endangered Ethiopian wolf.

New Guinea

This large island is home to many unique birds of paradise and several endemic tree kangaroos, including this species, the ursine tree kangaroo.

Madagascar

Ninety-eight percent of Madagascar's land mammals, 92 percent of its reptiles, 68 percent of its plants, and 41 percent of its breeding bird species exist nowhere else on Earth. All 16 mantella frogs are also endemic to the island.

Sri Lanka and Western Ghats

This hot spot is home to 5,000 species of flowering plant, 139 mammal species, 508 birds, and 179 amphibian species.

East Melanesia

This string of islands has 3,000 endemic plant species and unique insects such as this Ulysses swallowtail butterfly.

East African Highlands

These islands of high ground in a sea of savanna support unusual plants such as the giant lobelia that grows on the slopes of Mount Kenya and Kilimanjaro.

Sundaland

Naturalists outline this region because its wildlife is distinct from nextdoor regions. One bizarre plant unique to Sundaland is *Rafflesia*, the stinking corpse lily.

Cape region

This is a small area of amazingly distinctive plantlife, including 6,000 endemic species such as this pincushion protea.

Western Australia

Like the South African Cape region, this is a "habitat island" of Mediterranean-type shrubland, full of plants found nowhere else, including the odd kangaroo paw.

New Caledonia

Nothing like the strange, flightless kagu bird is found anywhere else in the world.



Kittlitz's murrelet
Alaska and far east of Russia

Maui parrotbill
Hawaii

Vaquita
Gulf of California

Hawaiian monk seal
Hawaii

Blue iguana
Grand Cayman Island, Caribbean

Iberian lynx
Spain

Lamotte's roundleaf bat
Mount Nimba (border area of Guinea, Liberia, and Ivory Coast)

Variable harlequin frog
Costa Rica

Short-tailed chinchilla
Mountains on the Bolivia-Chile border

Western gorilla
Congo rain forest

Blue-eyed black lemur
Madagascar

Maui parrotbill
In danger because of the loss of its forest habitat, only around 500 now survive.

Hawaiian monk seal
Once hunted for its skin and oil, today many become tangled in fishing nets or die because of pollution.

Glaucous macaw
Argentina, Uruguay, Paraguay, and Brazil

Over **4,000** species may soon be **extinct**

Critically endangered

All these animals are classed as "critically endangered" on the Red List—a list kept by the IUCN (International Union for the Conservation of Nature). This means they may soon die out completely in the wild.

- Vaquita**
This porpoise is the most endangered sea mammal in the world. Only 100–300 now remain.
- Kittlitz's murrelet**
Thousands of these seabirds have been killed by sticky oil, spilled from giant tankers.
- Blue iguana**
This lizard lives only on Grand Cayman Island. Fewer than five may now exist in the wild.
- Variable harlequin frog**
One of several harlequin frog species critically endangered due to a fungal disease.
- Short-tailed chinchilla**
Hunted for its soft gray fur, this small rodent is now almost extinct in the wild.
- Glaucous macaw**
Became rare because so many were caught and sold as pets. Only sighted twice in 100 years.
- Iberian lynx**
If it dies out, it will be the first big cat species to become extinct for 10,000 years.
- Western gorilla**
Many of these apes are killed for their meat, or have died from disease.
- Lamotte's roundleaf bat**
This African mammal has become endangered mainly through the loss of its habitat.
- Greater bamboo lemur**
Less than 100 have been spotted in 20 years of surveys.
- Blue-eyed black lemur**
Like many other lemurs, this one could soon die out due to loss of its forest habitat.
- Russian sturgeon**
This fish has been killed for its roe (eggs), known as caviar.
- Indian vulture**
Many of these birds died after feeding on cattle that had been given medicine to help them work longer.
- Bactrian camel**
Fewer than 1,000 survive in the wild.
- Irrawaddy river shark**
Since no one has seen this species for many years, it may be extinct in the wild.
- Sumatran orang-utan**
Just 7,000 of this species are left, since their forest is being cut down.

Endangered animals

Our world has thousands of species, or kinds, of animal. Many are in danger of dying out, mainly because humans are destroying their habitats, or homes. Some animals have not been seen in their habitats for 50 years or more and can be declared “extinct in the wild.”



Russian sturgeon
Caspian, Black, and Azov seas; Ural, Volga, and Danube rivers.

Bactrian camel
Gobi Desert of Mongolia and China

Indian vulture
Pakistan and India

Sumatran orangutan
Sumatra, Indonesia

Greater bamboo lemur
Madagascar

Irrawaddy River shark
Around the mouth of the Irrawaddy River, Myanmar

Javan rhinoceros
Java, Indonesia

David's tiger butterfly
Philippines

Southern bluefin tuna
These large, bony fish are dying out because too many have been caught by humans for food.

Kakapo (owl parrot)
These birds were hunted by the first humans to settle in New Zealand. Today, only 100 survive.

Attenborough's long-beaked echidna
New Guinea

Woylie
Western Australia

Southern bluefin tuna
Throughout southern oceans

Kakapo
Islands off the coast of New Zealand

Javan rhinoceros
Today, only around 50 adults survive in the remaining rain forest on Java.

David's tiger butterfly
One of the world's most endangered butterflies, found only in the Philippines.

Attenborough's long-beaked echidna
One of three critically endangered echidna (spiny anteater) species.

Woylie
Only 1,000 of these marsupials survive. The species has declined, mainly because of habitat loss.

Americas



Passenger pigeon
A flock of this once-common species could contain 2 million birds.



Laysan rail
This bird's Hawaiian habitat was taken over by non-native rats and rabbits.



Xerces blue butterfly
Its habitat of sand dunes in California was replaced by growing cities.



Golden toad
Its extinction may have been caused by habitat loss or a fungal disease.



Labrador duck
Its extinction was not caused by hunting, because its flesh reportedly tasted horrible!



Pinta Island tortoise
The last living member of the species, Lonesome George, died in 2012.



Red-bellied gracile opossum
Its Argentinian forest habitat was turned into grazing land for cattle.



Falkland Island wolf
Hunted to extinction by human settlers.

Eurasia



Great auk
Hunted by humans mainly for its meat and feathers.



Eurasian aurochs
Massive cattle species wiped out by overhunting.



Yunnan lake newt
Became extinct due to the introduction of exotic fish and frogs.



Baiji
Died out when its river habitat was taken over by industry.



Japanese sea lion
Killed by fishermen to prevent them from competing for fish.



Woolly mammoth
Lost much of its habitat when the Ice Age ended.



Extinct animals

The animal species on this map died out, or became extinct, quite recently and probably as a result of the actions of humans. But extinction has been happening naturally in the animal kingdom for millions of years.

Africa



Quagga
Its very distinctive markings made it an easy target for hunters.



Aldabra banded snail
A sudden decrease in rainfall, possibly caused by climate change, spelled extinction for this species.



Large sloth lemur
Gorilla-sized species that died out in Madagascar around 400 years ago.



Elephant bird
Huge flightless bird that was wiped out by hunting.

Dodo



This flightless bird became extinct within only 100 years of humans and their farm animals arriving on the island of Mauritius.

Australasia



Lesser bilby
Probably wiped out by cats and foxes.



Eastern hare wallaby
Extinction was partly due to the introduction of cats, which hunted them.



Desert-rat kangaroo
Thought extinct, recovered, then declared extinct again in 1994.



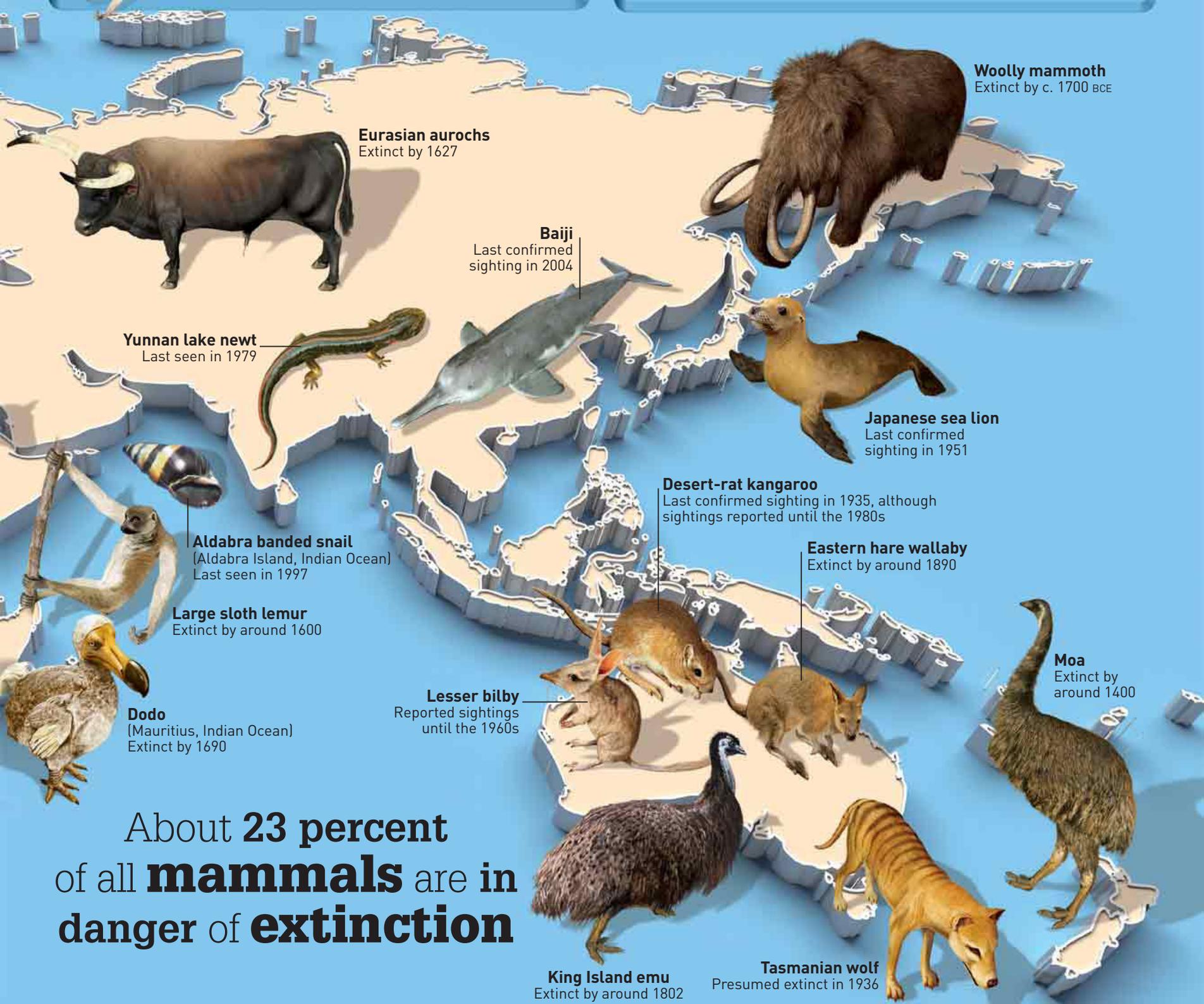
King Island emu
Wiped out by settlers and their hunting dogs.



Tasmanian wolf
Possibly lost the competition for prey to the dingo.



Moa
Victims of overhunting and loss of habitat.



Eurasian aurochs
Extinct by 1627

Woolly mammoth
Extinct by c. 1700 BCE

Baiji
Last confirmed sighting in 2004

Yunnan lake newt
Last seen in 1979

Japanese sea lion
Last confirmed sighting in 1951

Aldabra banded snail
(Aldabra Island, Indian Ocean)
Last seen in 1997

Desert-rat kangaroo
Last confirmed sighting in 1935, although sightings reported until the 1980s

Eastern hare wallaby
Extinct by around 1890

Large sloth lemur
Extinct by around 1600

Moa
Extinct by around 1400

Dodo
(Mauritius, Indian Ocean)
Extinct by 1690

Lesser bilby
Reported sightings until the 1960s

About **23 percent** of all **mammals** are in **danger** of **extinction**

King Island emu
Extinct by around 1802

Tasmanian wolf
Presumed extinct in 1936





People and planet

Sprawling city
Los Angeles, California, stretches as far as the horizon in this photo taken from Mount Hollywood. The skyscrapers of downtown LA can be seen on the left.

Introduction

Humans, together with animals and other living things, form what is called the biosphere—the living part of the world. Since modern humans first appeared in Africa about 200,000 years ago, we have colonized virtually the entire world—even hot deserts and the ice-cold Arctic. As we have done so, our impact on the biosphere has been far-reaching.

Human impact

The human “footprint” on planet Earth is deep and broad. We have transformed the landscape—clearing forests to produce food, digging minerals and ores from the ground, and channeling and storing water to meet our needs. Our living space is concentrated into larger and larger cities, but these cities are hungry for food and energy taken from the surrounding land.



Energy

New ways of harnessing the energy of sunlight and wind are reducing our use of fossil fuels. Unlike fossil fuels, these energy sources will never run out.

Natural resources

Buried within Earth’s crust there are limited supplies of minerals, metal ores, and fossil fuels (coal, oil, and gas). Once these reserves are exhausted, we will not be able to replace them. Recycling materials and renewable energy will become ever more important.

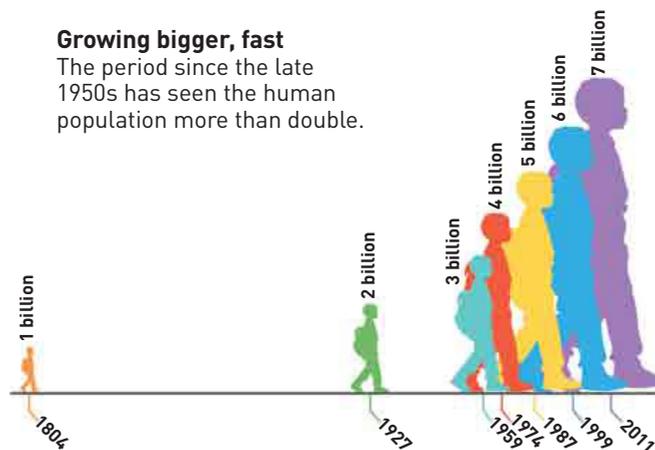


Population

For most of humanity’s existence, the human population grew relatively slowly. For example, in 10,000 BCE, there were only between 1 million and 5 million people on Earth. By 1000 BCE, after farming was invented, the population had increased to about 50 million. Since reaching the 1 billion mark in 1804, during the early Industrial Revolution, the population has expanded much more quickly than ever before.

Growing bigger, fast

The period since the late 1950s has seen the human population more than double.





Agriculture

In 1700 CE, about 7 percent of Earth's land area was used for growing crops and raising farm animals. Today, that figure has risen to around 40 percent.



Pollution

Vehicle exhaust gases, smoke and waste chemicals from factories, and oil spills all poison the environment, threatening plant and animal life.



Conservation

To protect the plant and animal life of unique habitats, many countries set up conservation areas, where no farming, industry, or new settlement can occur.



Using water

We build dams and reservoirs to store water. We need it for drinking, for use in industrial processes, and to irrigate crops and generate electricity.

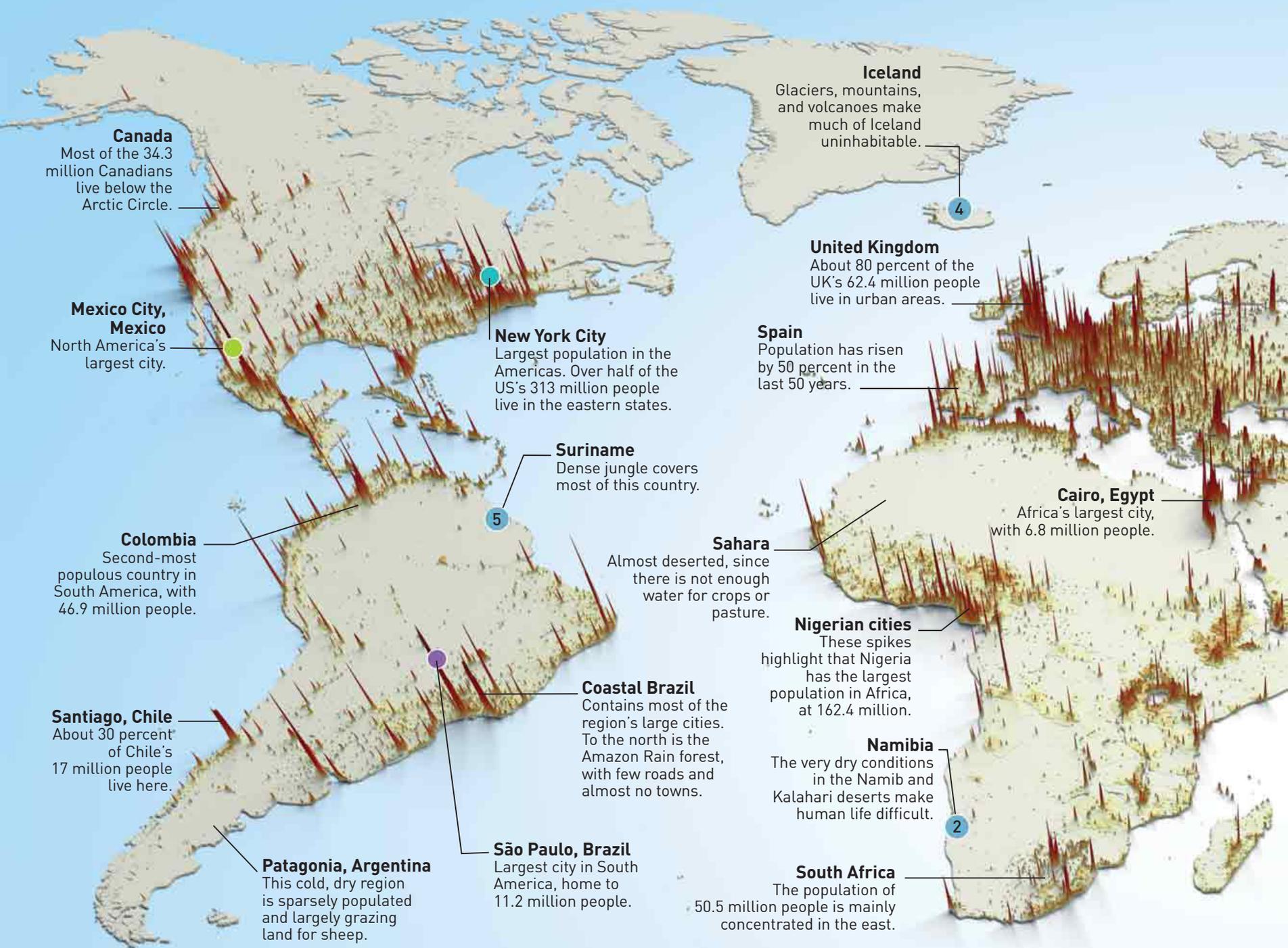


Successful species

Part of the success of humans is down to our ability to use the materials around us to give us protection and shelter. This ability opens up nearly every part of the globe for human living space, no matter how harsh the environment. Even thousands of years ago, the Inuit of the North American Arctic made coats from the fur of caribou and waterproof boots from seal skin. They found a way to live on the meagre resources of the high Arctic.

Inuit boat

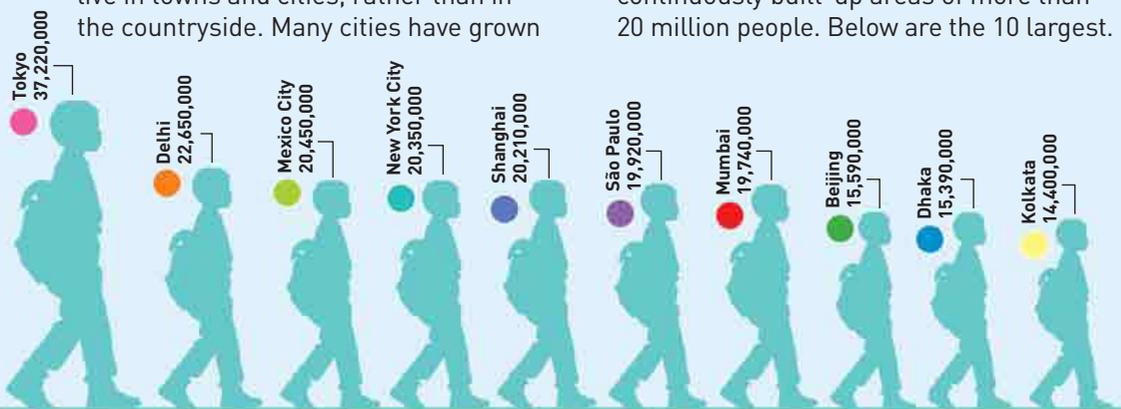
The *umiak* is a type of traditional open boat used by Inuit people. The frame is made of driftwood or whalebone, with a walrus- or seal-skin covering. These boats are still used, since the law allows whale hunting only with traditional Inuit tools.



Biggest cities

More than half the world's people now live in towns and cities, rather than in the countryside. Many cities have grown

quickly and there are now more than 25 continuously built-up areas of more than 20 million people. Below are the 10 largest.



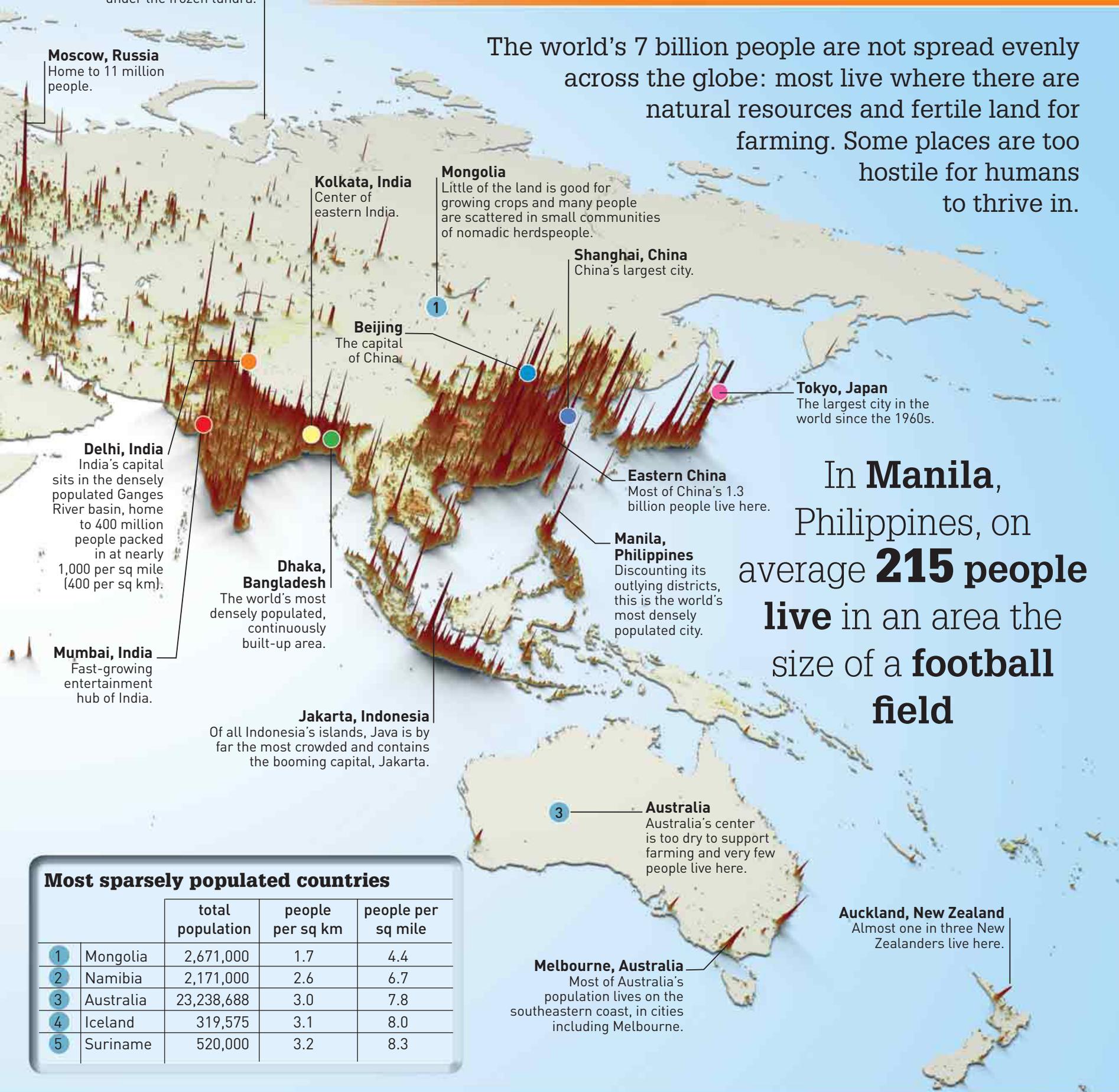
KEY

The map shows population density, or how closely people are packed together. Denser places, such as cities, appear as red mountains.



Where people live

The world's 7 billion people are not spread evenly across the globe: most live where there are natural resources and fertile land for farming. Some places are too hostile for humans to thrive in.



Siberia, Russia
Few people live here, since the climate is too cold to grow crops. Some spikes show the location of cities based around extracting oil and gas from under the frozen tundra.

Moscow, Russia
Home to 11 million people.

Kolkata, India
Center of eastern India.

Mongolia
Little of the land is good for growing crops and many people are scattered in small communities of nomadic herdspeople.

Shanghai, China
China's largest city.

Beijing
The capital of China.

Tokyo, Japan
The largest city in the world since the 1960s.

Delhi, India
India's capital sits in the densely populated Ganges River basin, home to 400 million people packed in at nearly 1,000 per sq mile (400 per sq km).

Eastern China
Most of China's 1.3 billion people live here.

Dhaka, Bangladesh
The world's most densely populated, continuously built-up area.

Manila, Philippines
Discounting its outlying districts, this is the world's most densely populated city.

Mumbai, India
Fast-growing entertainment hub of India.

Jakarta, Indonesia
Of all Indonesia's islands, Java is by far the most crowded and contains the booming capital, Jakarta.

Australia
Australia's center is too dry to support farming and very few people live here.

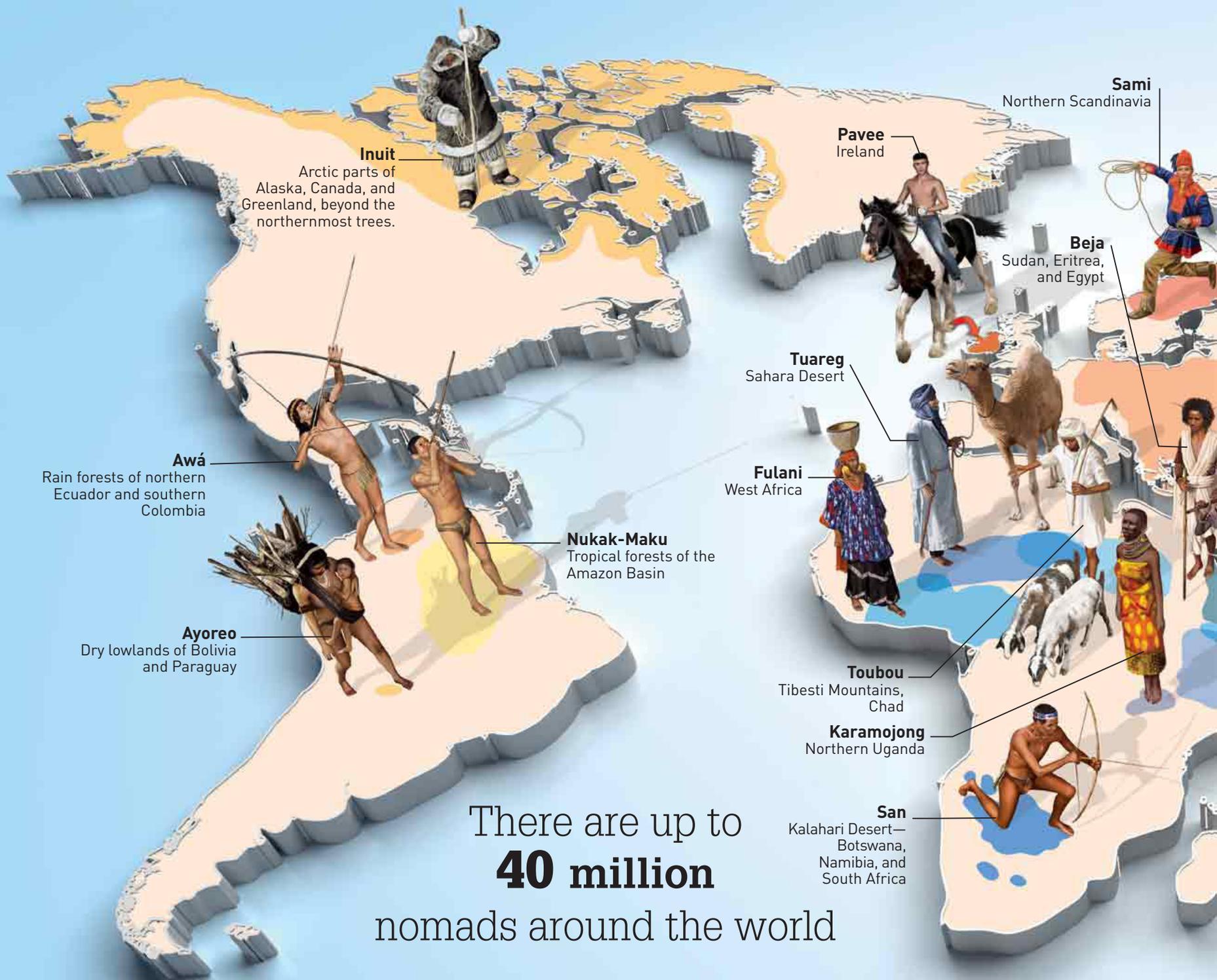
In **Manila**, Philippines, on average **215 people live** in an area the size of a **football field**

Auckland, New Zealand
Almost one in three New Zealanders live here.

Melbourne, Australia
Most of Australia's population lives on the southeastern coast, in cities including Melbourne.

Most sparsely populated countries

		total population	people per sq km	people per sq mile
1	Mongolia	2,671,000	1.7	4.4
2	Namibia	2,171,000	2.6	6.7
3	Australia	23,238,688	3.0	7.8
4	Iceland	319,575	3.1	8.0
5	Suriname	520,000	3.2	8.3



There are up to
40 million
 nomads around the world

Americas

-  **Inuit**
For 4,000 years, the Inuit have roamed the region they call Nunavut, "our land."
-  **Awá**
The Awá speak their own ancient language called Awa Pit.
-  **Nukak-Maku**
The Nukak people are expert hunters who were entirely isolated until 1988.
-  **Ayoreo**
The Ayoreo mix a hunter-gatherer lifestyle with agriculture.

Europe

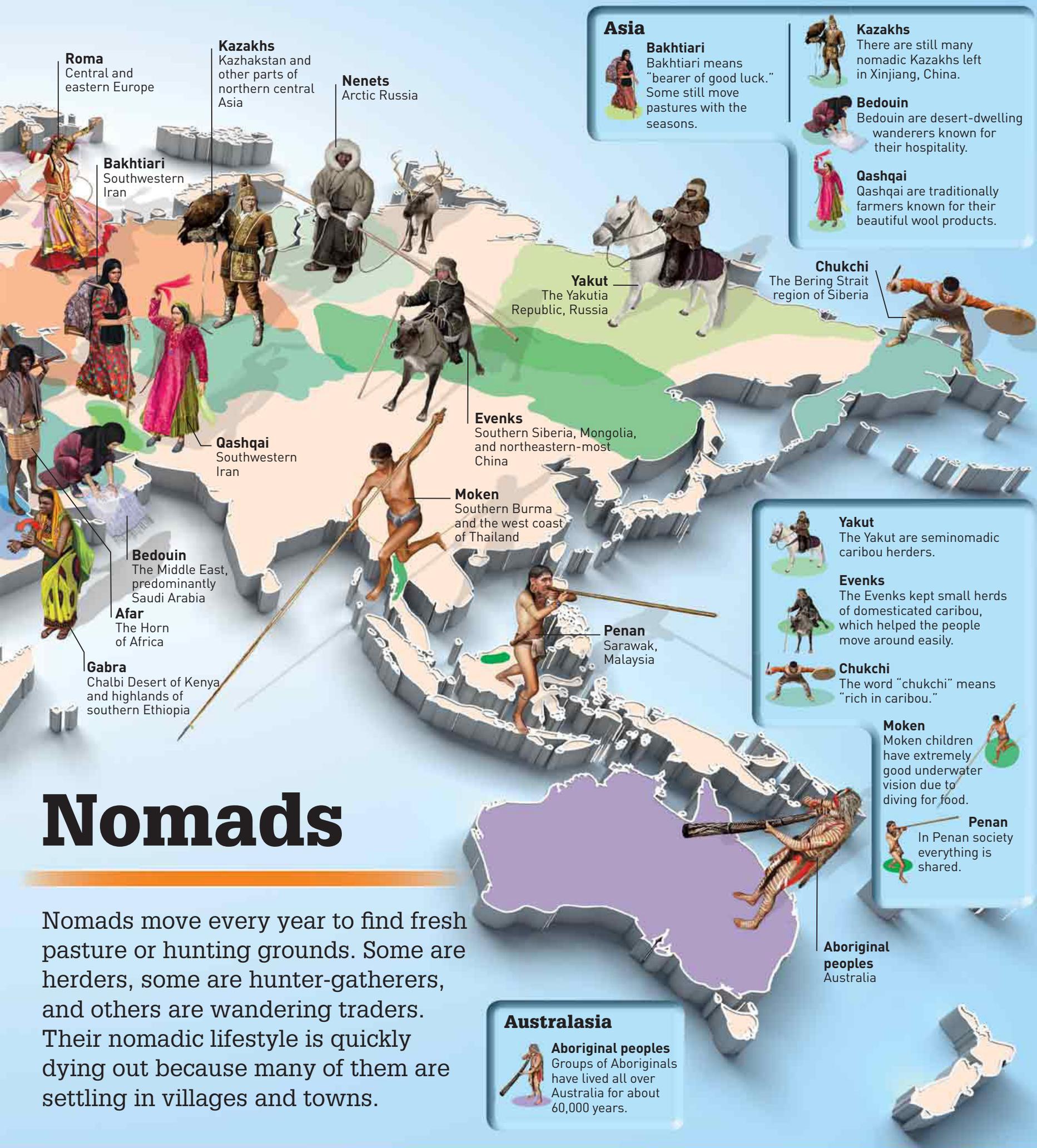
-  **Pavee, or Irish Travelers**
The Pavee have strict moral beliefs laid out in "The Travelers' Code."
-  **Sami**
The Sami caribou herders and fur trappers have existed for over 5,000 years.
-  **Roma**
There are 8–10 million Roma worldwide, mostly in Europe.
-  **Nenets**
Annually, Nenets move huge herds of caribou up to 600 miles (1,000 km).

Africa

-  **Beja**
Only some Beja clans are nomadic.
-  **Tuareg**
In Tuareg culture, men rather than women wear the veil.
-  **Toubou**
The Toubou are divided into two peoples, the Teda and the Daza.
-  **Fulani**
The Fulani traditionally herd goats, sheep, and cattle across large areas of west Africa.
-  **Gabra**
These herders make their dome-shaped houses out of acacia roots and cloth.
-  **Afar**
The Afar live by rivers in the dry season and head for higher ground in the wet season.
-  **Karamojong**
This name means "the old men can walk no farther."
-  **San**
The San are famous for being excellent trackers and hunters.

Nomads

Nomads move every year to find fresh pasture or hunting grounds. Some are herders, some are hunter-gatherers, and others are wandering traders. Their nomadic lifestyle is quickly dying out because many of them are settling in villages and towns.



Roma
Central and eastern Europe

Kazakhs
Kazakhstan and other parts of northern central Asia

Nenets
Arctic Russia

Bakhtiari
Southwestern Iran

Asia

Bakhtiari
Bakhtiari means "bearer of good luck." Some still move pastures with the seasons.

Kazakhs
There are still many nomadic Kazakhs left in Xinjiang, China.

Bedouin
Bedouin are desert-dwelling wanderers known for their hospitality.

Qashqai
Qashqai are traditionally farmers known for their beautiful wool products.

Yakut
The Yakutia Republic, Russia

Chukchi
The Bering Strait region of Siberia

Evenks
Southern Siberia, Mongolia, and northeastern-most China

Qashqai
Southwestern Iran

Bedouin
The Middle East, predominantly Saudi Arabia

Afar
The Horn of Africa

Gabra
Chalbi Desert of Kenya and highlands of southern Ethiopia

Moken
Southern Burma and the west coast of Thailand

Penan
Sarawak, Malaysia

Yakut
The Yakut are seminomadic caribou herders.

Evenks
The Evenks kept small herds of domesticated caribou, which helped the people move around easily.

Chukchi
The word "chukchi" means "rich in caribou."

Moken
Moken children have extremely good underwater vision due to diving for food.

Penan
In Penan society everything is shared.

Aboriginal peoples
Australia

Australasia

Aboriginal peoples
Groups of Aboriginals have lived all over Australia for about 60,000 years.

MEDIAN AGES AROUND THE WORLD

The median age is the age that divides a population into two equal groups, so that half the people are younger than this age and half are older. The lower the median age, the younger the population. The median age for the whole world is 28.4 years.

Years

 14-20	 30-35	 No data
 20-25	 35-40	
 25-30	 40+	

Population pyramids

A population pyramid plots the sizes of age groups within a population. A pyramid showing a young population often shows a country where families are large but where the death rate has recently gone down, possibly due to improved health care. Populations age when people begin to have smaller families.

Canada
Canada's population—median age 40.7—is aging, with around 16 percent over the age of 64.

Greenland
The median age here is 33.5. Over 70 percent of people are age 15-64. Population growth is just 0.4 percent.

United States
The US population's median age is 36.9 years. About 20 percent of people are age 0-14. The population grows by 0.9 percent each year.

United Kingdom
With a median age of 40.5 years, the UK has an aging, but still-growing, population.

Mexico
In Mexico, where 28.2 percent of the population is age 0-14, the median age is 26.7 years.

Morocco
This African country has the third-highest median age, at 26.5, after Tunisia (29.7) and Algeria (27.1).

Guatemala
This is the youngest population in Central America, with a median age of 19.7.

Africa
This is the continent with the youngest population, with a median age of 19.7.

Young and old

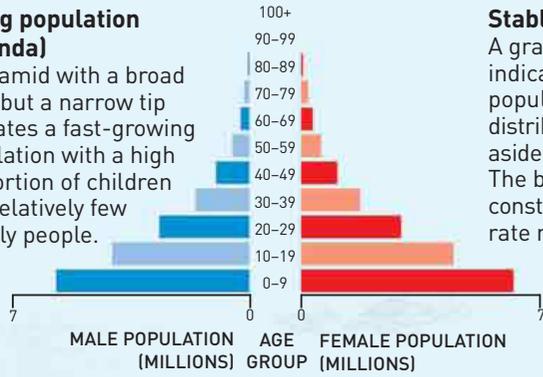
Poorer developing nations tend to have younger, faster-growing populations than wealthier developed countries, whose populations are aging and sometimes even declining.

Guyana
Guyana's median age of 23.6 years is the lowest in South America. About 32 percent of Guyanese are aged 0-14.

Uruguay
This is the country with the highest median age in South America, at 33.7 years.

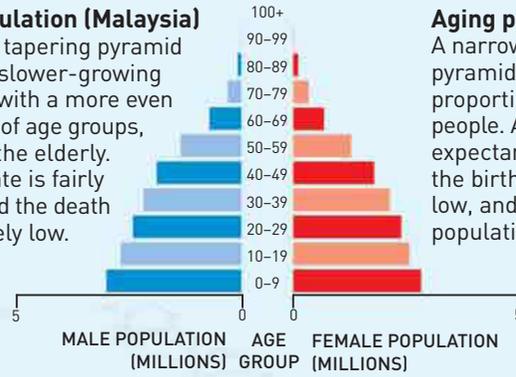
Young population (Uganda)

A pyramid with a broad base but a narrow tip indicates a fast-growing population with a high proportion of children and relatively few elderly people.



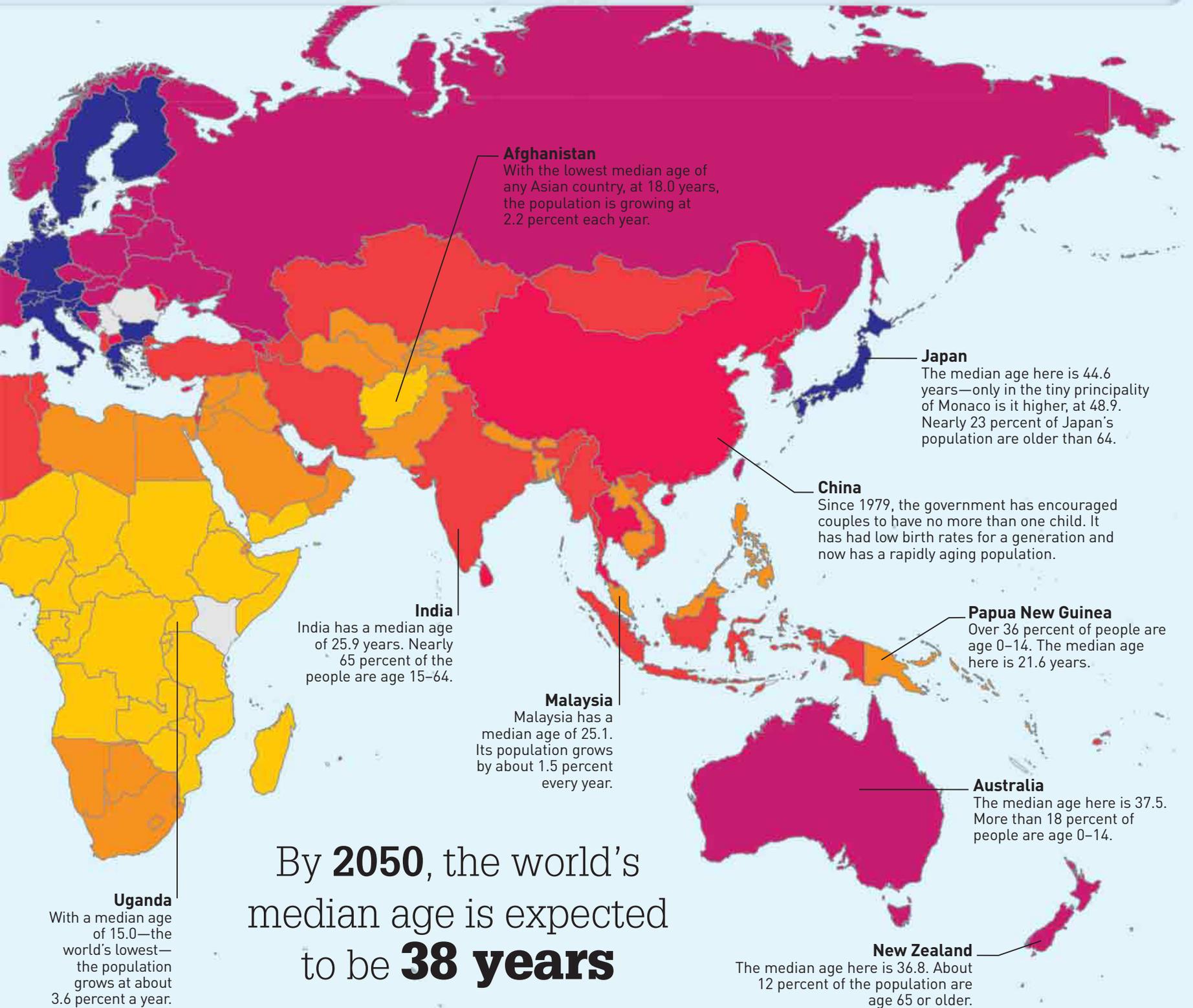
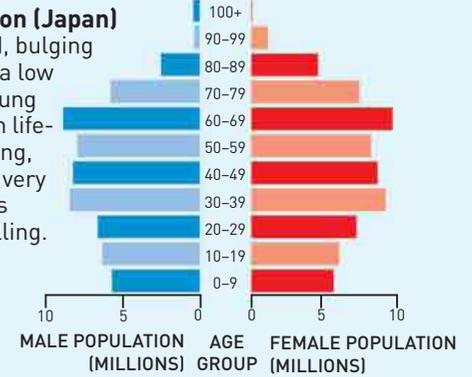
Stable population (Malaysia)

A gradually tapering pyramid indicates a slower-growing population with a more even distribution of age groups, aside from the elderly. The birth rate is fairly constant and the death rate relatively low.



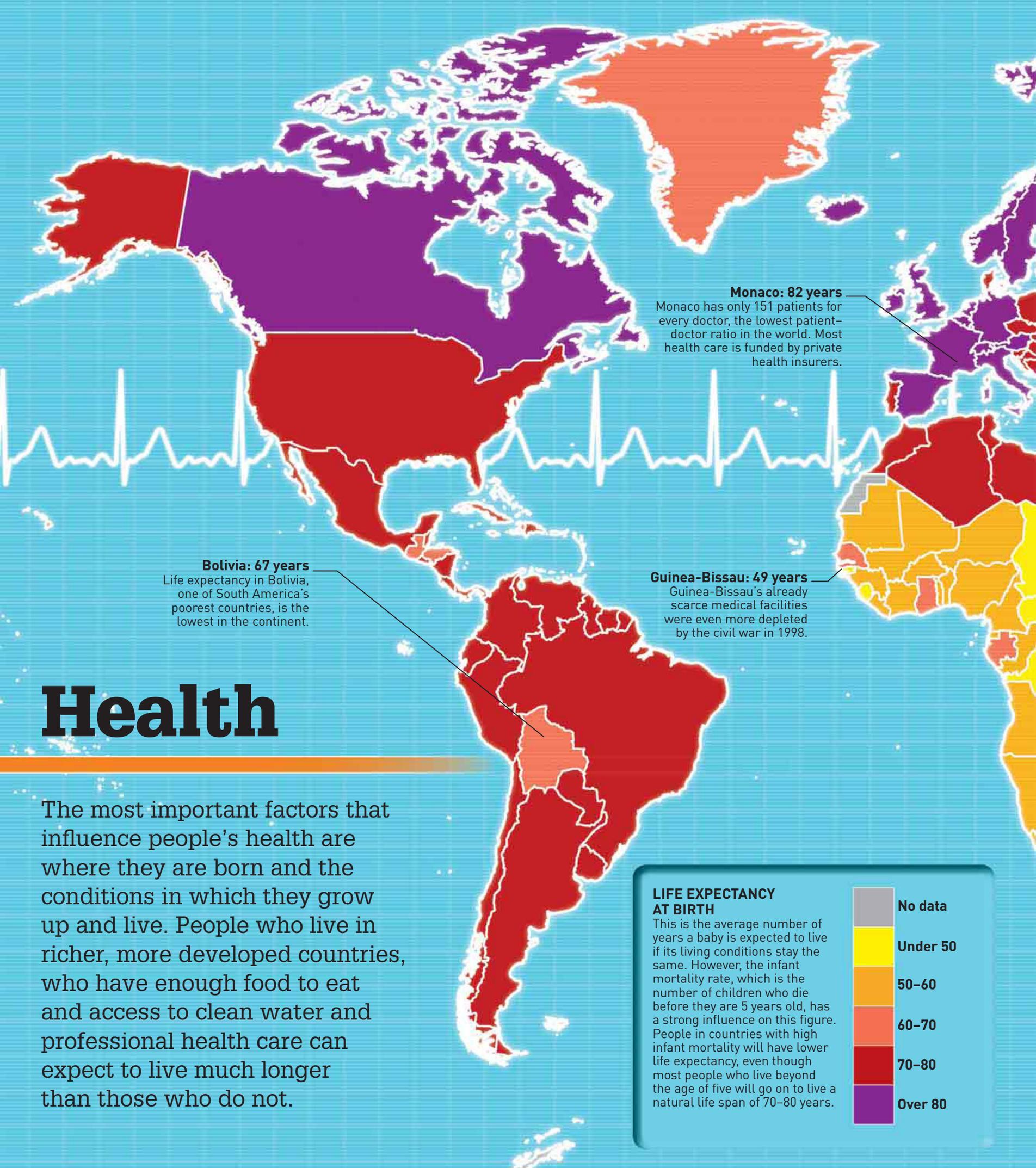
Ageing population (Japan)

A narrow-based, bulging pyramid shows a low proportion of young people. Although life-expectancy is long, the birth rate is very low, and Japan's population is falling.



By **2050**, the world's median age is expected to be **38 years**

Uganda
With a median age of 15.0—the world's lowest—the population grows at about 3.6 percent a year.

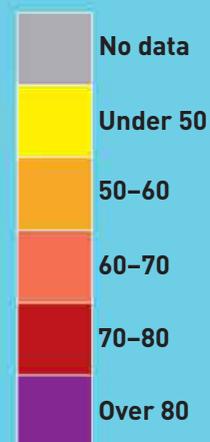


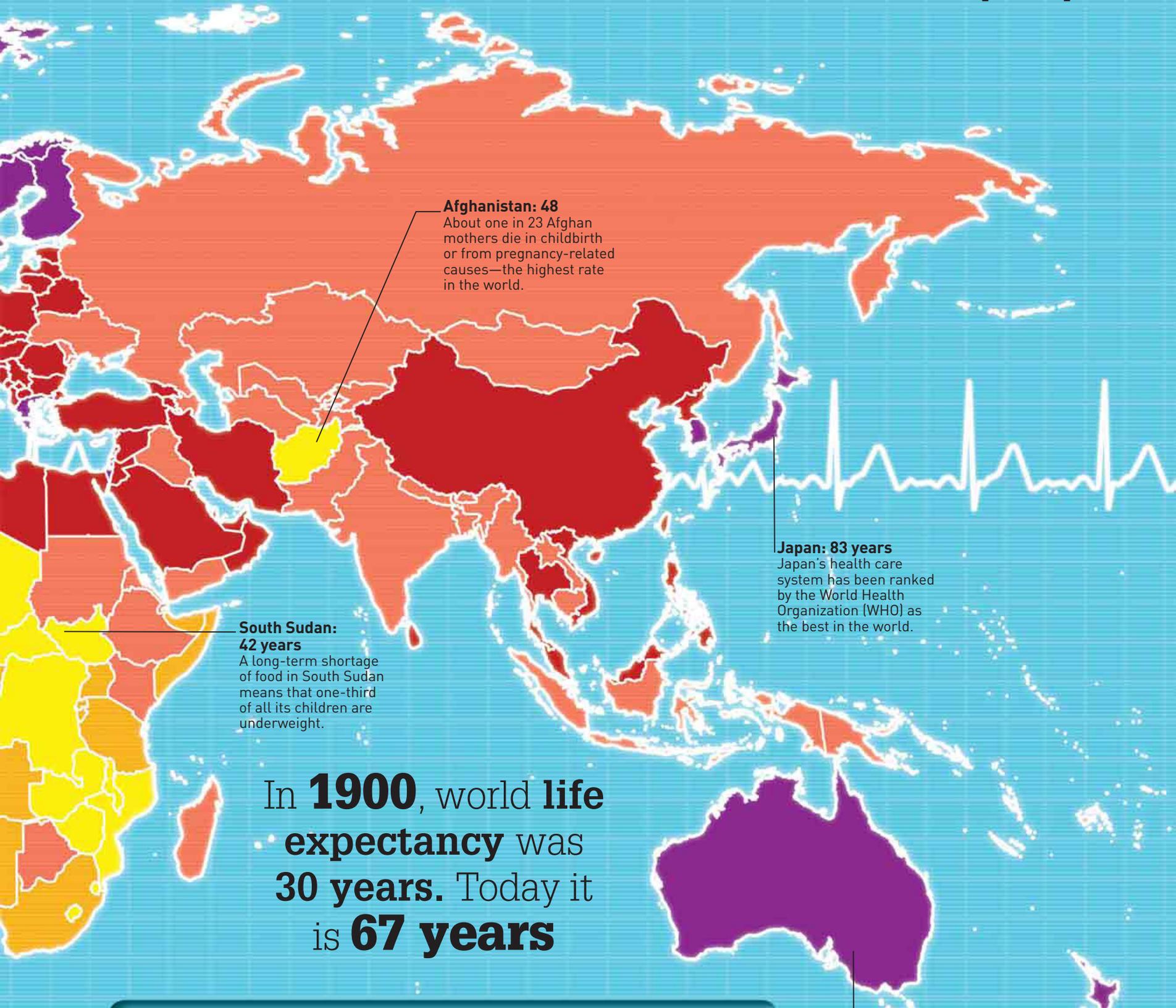
Health

The most important factors that influence people's health are where they are born and the conditions in which they grow up and live. People who live in richer, more developed countries, who have enough food to eat and access to clean water and professional health care can expect to live much longer than those who do not.

LIFE EXPECTANCY AT BIRTH

This is the average number of years a baby is expected to live if its living conditions stay the same. However, the infant mortality rate, which is the number of children who die before they are 5 years old, has a strong influence on this figure. People in countries with high infant mortality will have lower life expectancy, even though most people who live beyond the age of five will go on to live a natural life span of 70-80 years.





Afghanistan: 48
 About one in 23 Afghan mothers die in childbirth or from pregnancy-related causes—the highest rate in the world.

South Sudan: 42 years
 A long-term shortage of food in South Sudan means that one-third of all its children are underweight.

Japan: 83 years
 Japan's health care system has been ranked by the World Health Organization (WHO) as the best in the world.

In **1900**, world **life expectancy** was **30 years**. Today it is **67 years**

Access to medical help

Having good access to doctors and other health care workers is essential in helping people to stay healthy, recover from illness, and live longer. The number of doctors per person in the population has an important effect on life expectancy, but other factors influence people's life span. Bhutan, for instance, has roughly the same number of doctors per head as Malawi, but life expectancy in Bhutan is 63, compared to 47 in Malawi.

PEOPLE PER DOCTOR

Monaco	151
Cuba	170
St. Lucia	204
Belarus	209
Georgia	214
Liberia	34,014
Mozambique	37,313
Niger	41,841
Bhutan	44,248
Malawi	46,296

Australia: 82 years
 Life expectancy among the Aboriginal population of Australia is only 70 years, much lower than the national average.

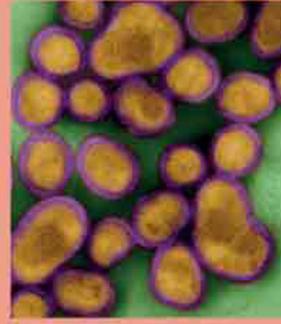
Infecting germs

Infectious diseases are caused by microscopic living organisms, including bacteria and viruses. They live and multiply inside our bodies and can pass from human to human by touch, through blood or saliva, and through the air.



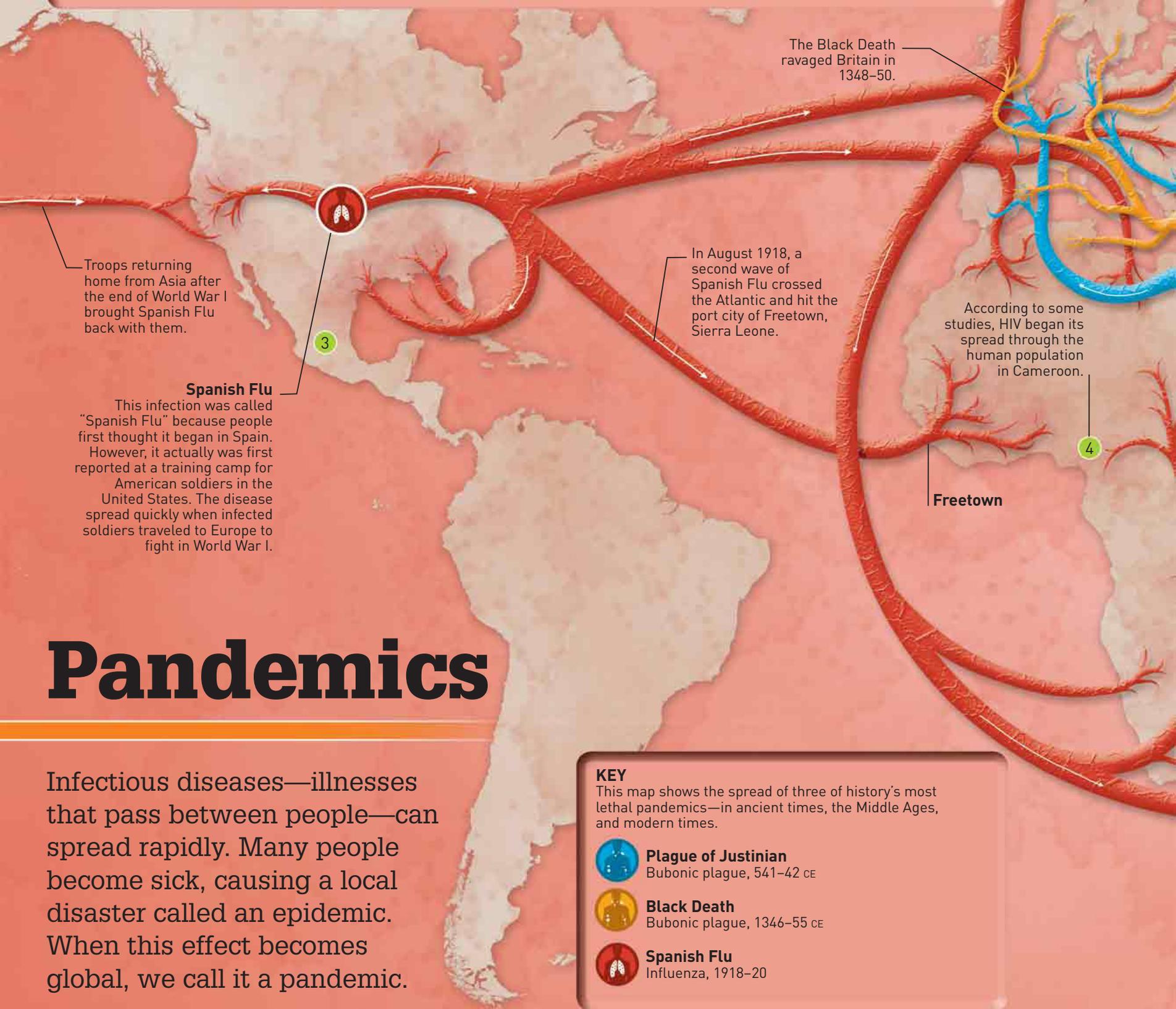
Bubonic plague bacteria

Bacteria are single-celled organisms that multiply by dividing into two again and again. Millions could fit on the head of a pin. Today, many bacterial infections can be treated with antibiotics.



Flu virus

Viruses are very simple organisms far smaller even than bacteria. Viruses spread by invading and taking over cells in the body. Viruses are unharmed by antibiotics, but the body can be fortified against them with a vaccine.



Troops returning home from Asia after the end of World War I brought Spanish Flu back with them.

Spanish Flu

This infection was called "Spanish Flu" because people first thought it began in Spain. However, it actually was first reported at a training camp for American soldiers in the United States. The disease spread quickly when infected soldiers traveled to Europe to fight in World War I.

The Black Death ravaged Britain in 1348-50.

In August 1918, a second wave of Spanish Flu crossed the Atlantic and hit the port city of Freetown, Sierra Leone.

According to some studies, HIV began its spread through the human population in Cameroon.

Pandemics

Infectious diseases—illnesses that pass between people—can spread rapidly. Many people become sick, causing a local disaster called an epidemic. When this effect becomes global, we call it a pandemic.

KEY

This map shows the spread of three of history's most lethal pandemics—in ancient times, the Middle Ages, and modern times.



Plague of Justinian

Bubonic plague, 541-42 CE



Black Death

Bubonic plague, 1346-55 CE



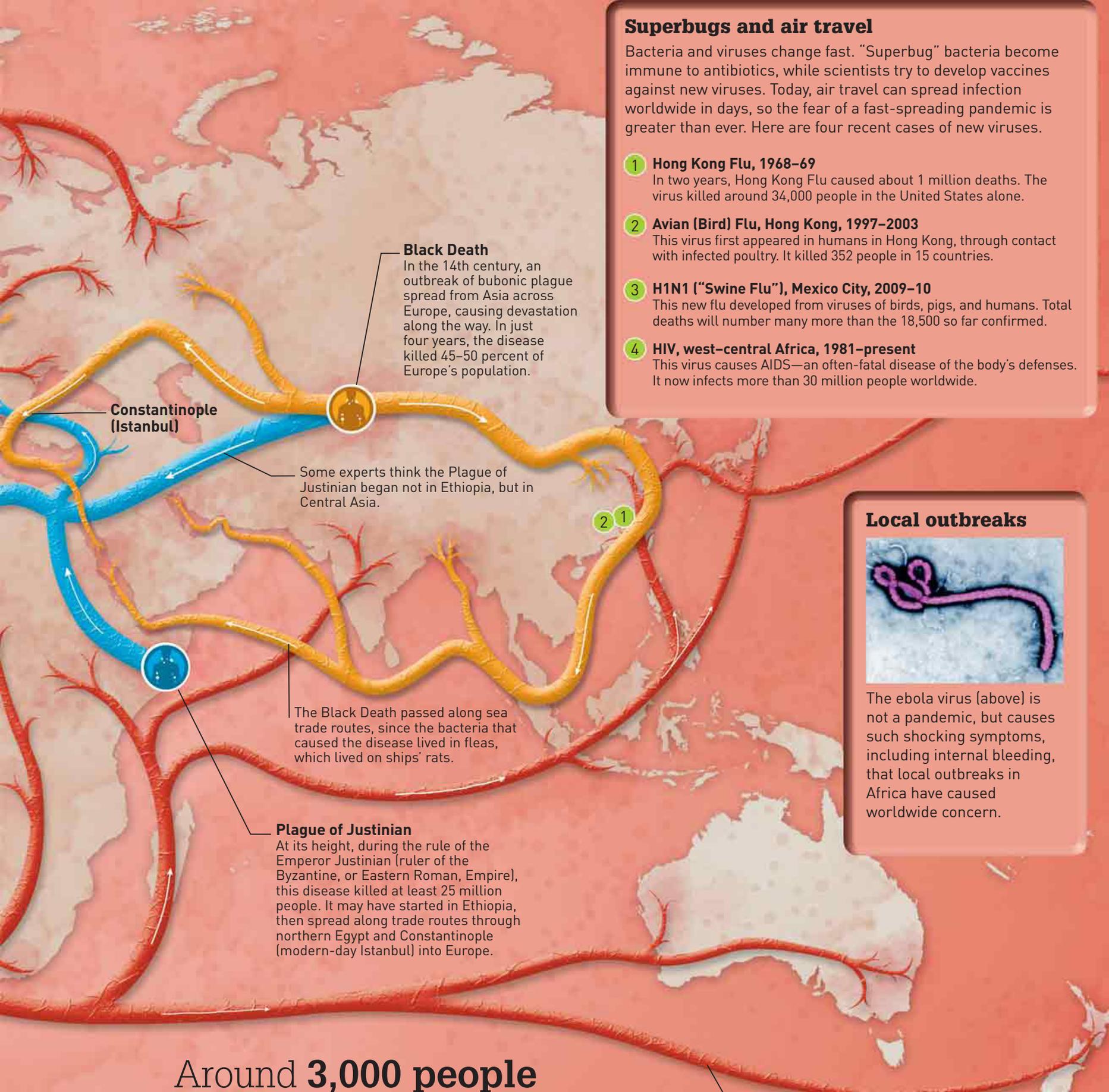
Spanish Flu

Influenza, 1918-20

Superbugs and air travel

Bacteria and viruses change fast. "Superbug" bacteria become immune to antibiotics, while scientists try to develop vaccines against new viruses. Today, air travel can spread infection worldwide in days, so the fear of a fast-spreading pandemic is greater than ever. Here are four recent cases of new viruses.

- 1 **Hong Kong Flu, 1968–69**
In two years, Hong Kong Flu caused about 1 million deaths. The virus killed around 34,000 people in the United States alone.
- 2 **Avian (Bird) Flu, Hong Kong, 1997–2003**
This virus first appeared in humans in Hong Kong, through contact with infected poultry. It killed 352 people in 15 countries.
- 3 **H1N1 ("Swine Flu"), Mexico City, 2009–10**
This new flu developed from viruses of birds, pigs, and humans. Total deaths will number many more than the 18,500 so far confirmed.
- 4 **HIV, west-central Africa, 1981–present**
This virus causes AIDS—an often-fatal disease of the body's defenses. It now infects more than 30 million people worldwide.



Black Death
In the 14th century, an outbreak of bubonic plague spread from Asia across Europe, causing devastation along the way. In just four years, the disease killed 45–50 percent of Europe's population.

Constantinople (Istanbul)

Some experts think the Plague of Justinian began not in Ethiopia, but in Central Asia.

The Black Death passed along sea trade routes, since the bacteria that caused the disease lived in fleas, which lived on ships' rats.

Plague of Justinian
At its height, during the rule of the Emperor Justinian (ruler of the Byzantine, or Eastern Roman, Empire), this disease killed at least 25 million people. It may have started in Ethiopia, then spread along trade routes through northern Egypt and Constantinople (modern-day Istanbul) into Europe.

Local outbreaks



The ebola virus (above) is not a pandemic, but causes such shocking symptoms, including internal bleeding, that local outbreaks in Africa have caused worldwide concern.

Spanish Flu was brought to New Zealand in 1918 by soldiers returning home from fighting in World War I in Europe.

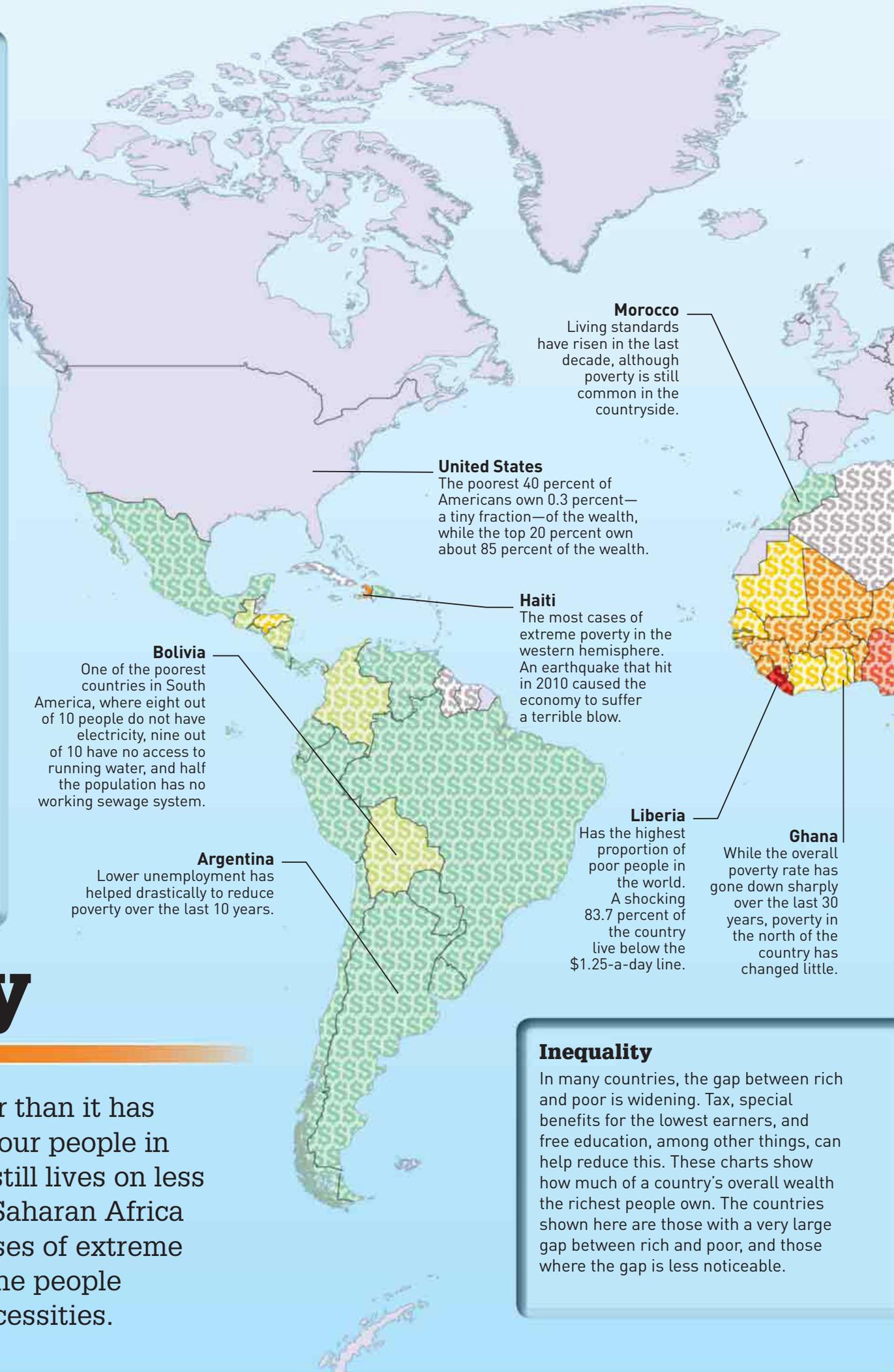
Around **3,000** people still die from **bubonic plague** each year

The poverty line

A poverty line is the minimum level of income thought to be enough for a person to live on. It is the least amount needed to provide basic necessities: food, clothing, health care, and shelter. The cost of living is different around the world, so the poverty line varies from country to country.

PEOPLE ON LESS THAN \$1.25 A DAY

The international extreme poverty line of \$1.25 income a day is a global measure of absolute poverty. In 2010, the World Bank took surveys of poverty levels in 115 countries. The map shows the percentage of each country's people earning less than \$1.25 a day.

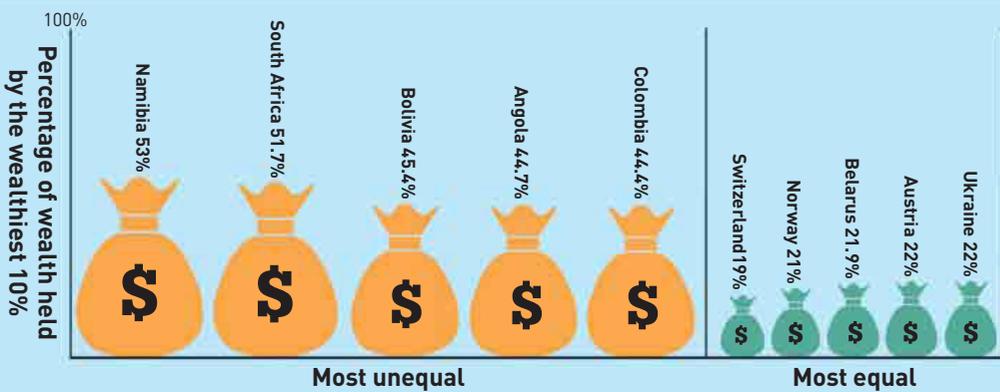
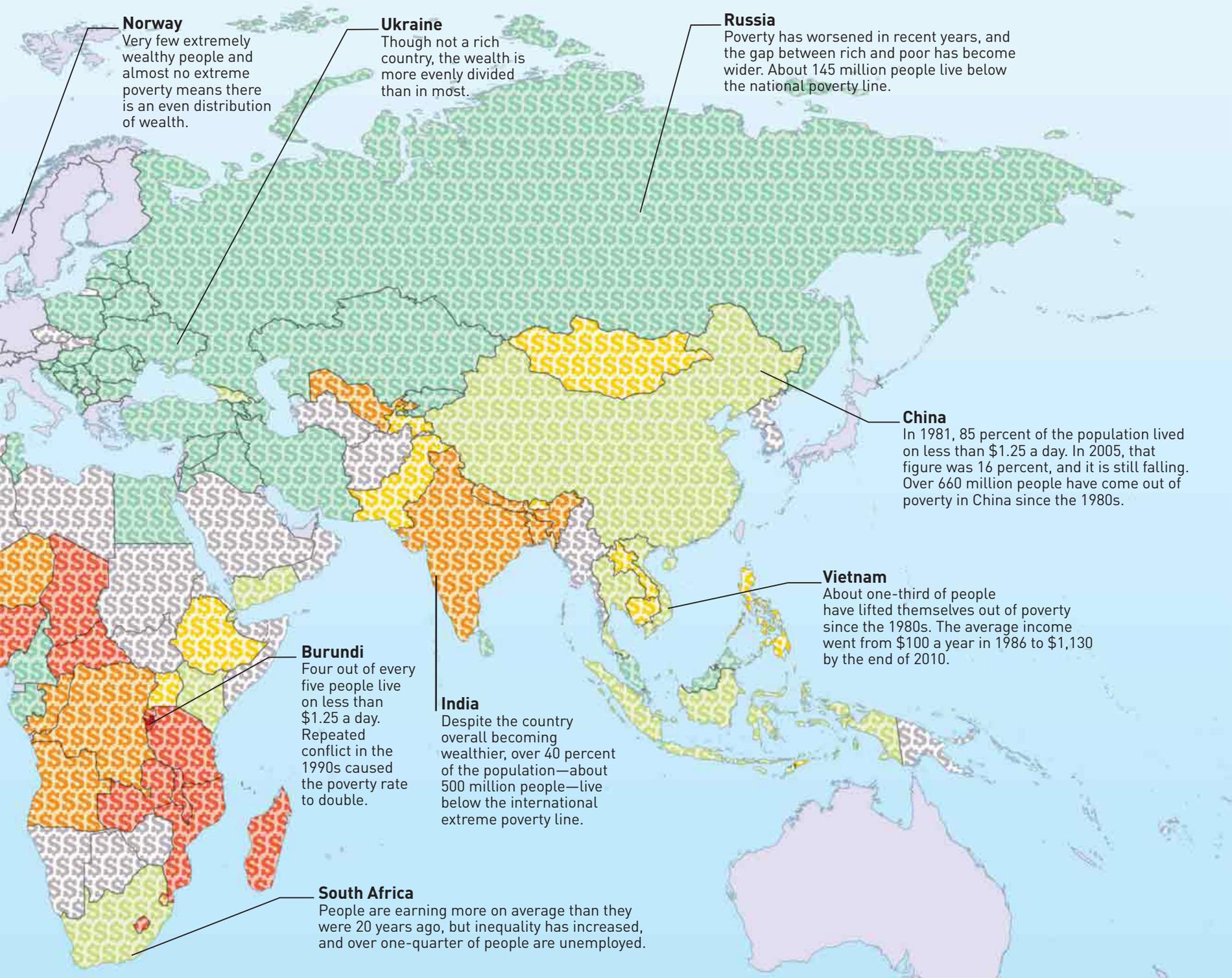


Poverty

Global poverty is lower than it has ever been, but one in four people in the developing world still lives on less than \$1.25 a day. Sub-Saharan Africa has by far the most cases of extreme poverty—almost half the people cannot afford basic necessities.

Inequality

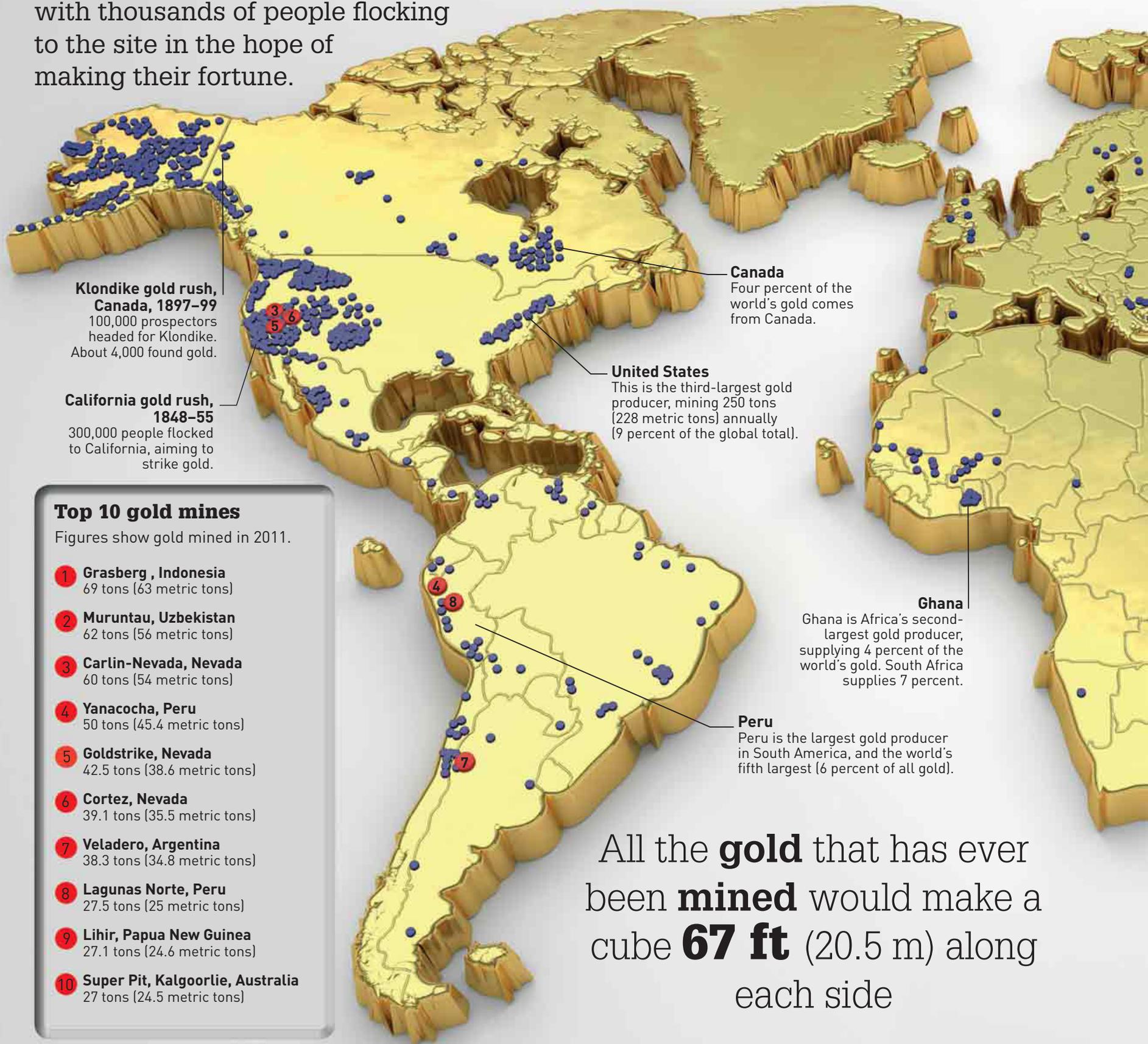
In many countries, the gap between rich and poor is widening. Tax, special benefits for the lowest earners, and free education, among other things, can help reduce this. These charts show how much of a country's overall wealth the richest people own. The countries shown here are those with a very large gap between rich and poor, and those where the gap is less noticeable.



From 1981—2005
500 million
people came out of
extreme **poverty**

The world's gold

Beautiful, rare, and highly prized, gold has been mined since ancient Egyptian times. Sometimes a discovery of gold led to a “gold rush,” with thousands of people flocking to the site in the hope of making their fortune.



Klondike gold rush, Canada, 1897–99
100,000 prospectors headed for Klondike. About 4,000 found gold.

California gold rush, 1848–55
300,000 people flocked to California, aiming to strike gold.

Canada
Four percent of the world's gold comes from Canada.

United States
This is the third-largest gold producer, mining 250 tons (228 metric tons) annually (9 percent of the global total).

Ghana
Ghana is Africa's second-largest gold producer, supplying 4 percent of the world's gold. South Africa supplies 7 percent.

Peru
Peru is the largest gold producer in South America, and the world's fifth largest (6 percent of all gold).

Top 10 gold mines

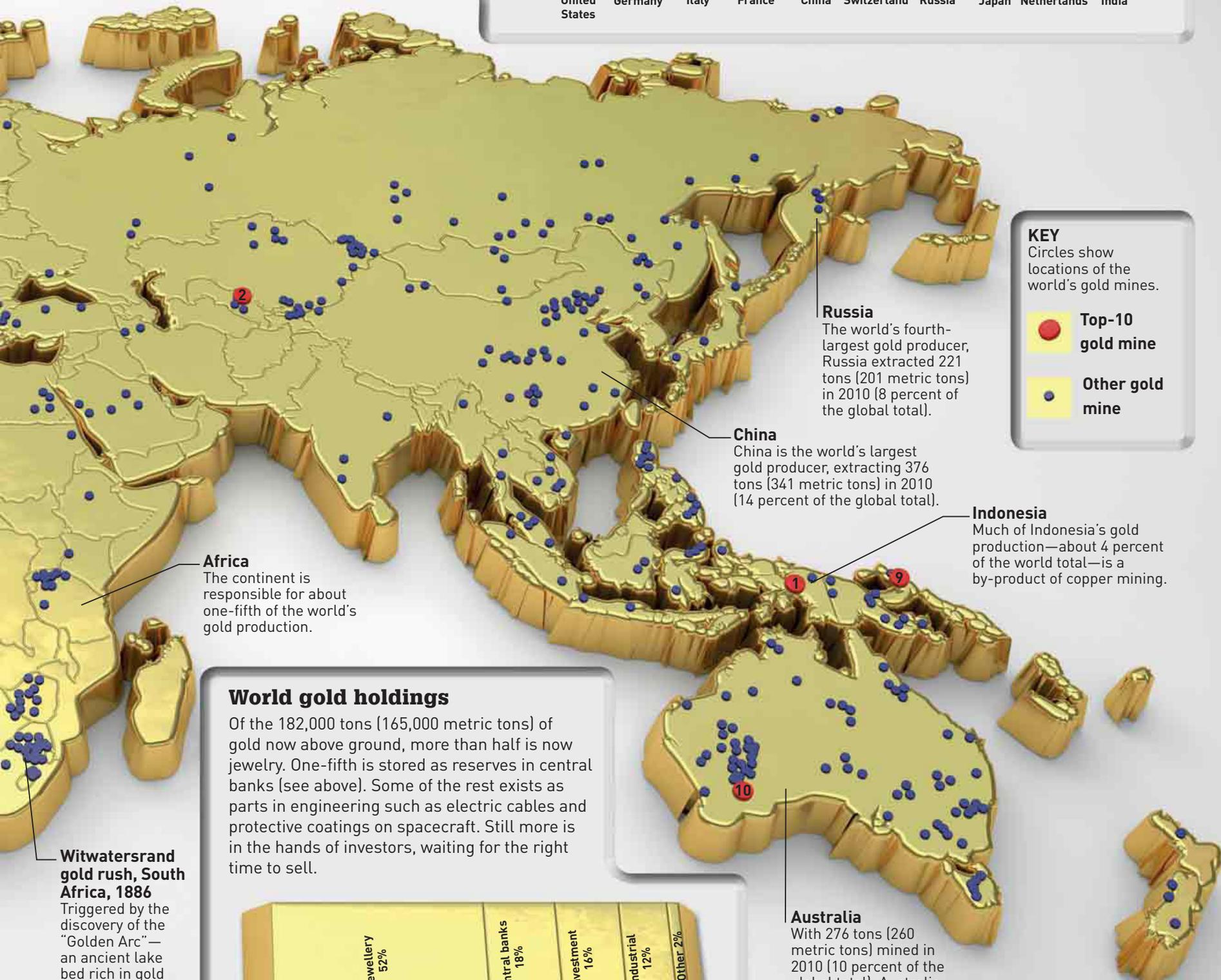
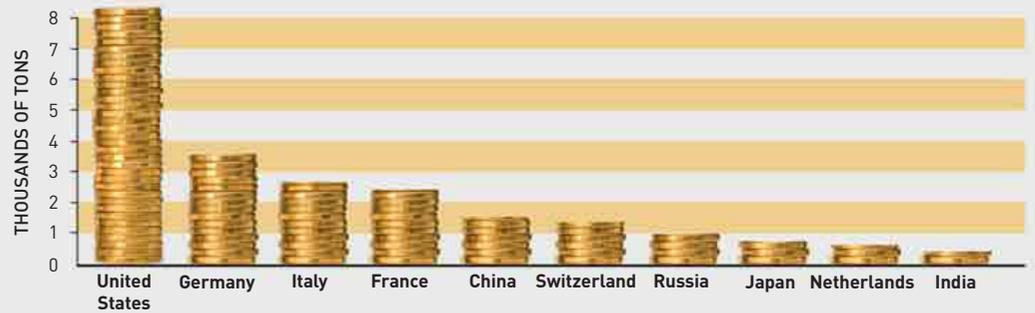
Figures show gold mined in 2011.

- 1 **Grasberg, Indonesia**
69 tons (63 metric tons)
- 2 **Muruntau, Uzbekistan**
62 tons (56 metric tons)
- 3 **Carlin-Nevada, Nevada**
60 tons (54 metric tons)
- 4 **Yanacocha, Peru**
50 tons (45.4 metric tons)
- 5 **Goldstrike, Nevada**
42.5 tons (38.6 metric tons)
- 6 **Cortez, Nevada**
39.1 tons (35.5 metric tons)
- 7 **Veladero, Argentina**
38.3 tons (34.8 metric tons)
- 8 **Lagunas Norte, Peru**
27.5 tons (25 metric tons)
- 9 **Lihir, Papua New Guinea**
27.1 tons (24.6 metric tons)
- 10 **Super Pit, Kalgoorlie, Australia**
27 tons (24.5 metric tons)

All the **gold** that has ever been **mined** would make a cube **67 ft** (20.5 m) along each side

Gold reserves

The central banks of the world's nations store gold to back up their currencies. The Federal Reserve in the US has the largest gold reserves. There are also international gold reserves, such as those held by the International Monetary Fund.



KEY
Circles show locations of the world's gold mines.

- Top-10 gold mine
- Other gold mine

Russia
The world's fourth-largest gold producer, Russia extracted 221 tons (201 metric tons) in 2010 (8 percent of the global total).

China
China is the world's largest gold producer, extracting 376 tons (341 metric tons) in 2010 (14 percent of the global total).

Indonesia
Much of Indonesia's gold production—about 4 percent of the world total—is a by-product of copper mining.

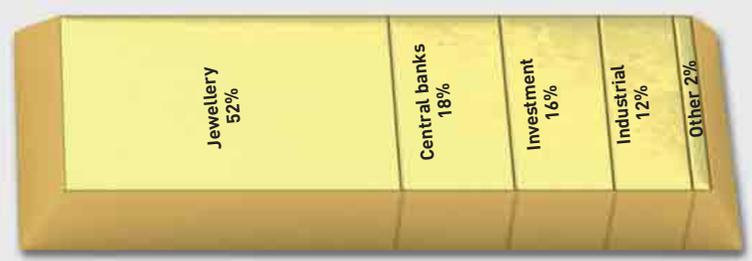
Africa
The continent is responsible for about one-fifth of the world's gold production.

Australia
With 276 tons (260 metric tons) mined in 2010 (10 percent of the global total), Australia is the second-largest gold-producing nation.

Witwatersrand gold rush, South Africa, 1886
Triggered by the discovery of the "Golden Arc"—an ancient lake bed rich in gold deposits that stretches from Johannesburg to Welkom.

World gold holdings

Of the 182,000 tons (165,000 metric tons) of gold now above ground, more than half is now jewelry. One-fifth is stored as reserves in central banks (see above). Some of the rest exists as parts in engineering such as electric cables and protective coatings on spacecraft. Still more is in the hands of investors, waiting for the right time to sell.

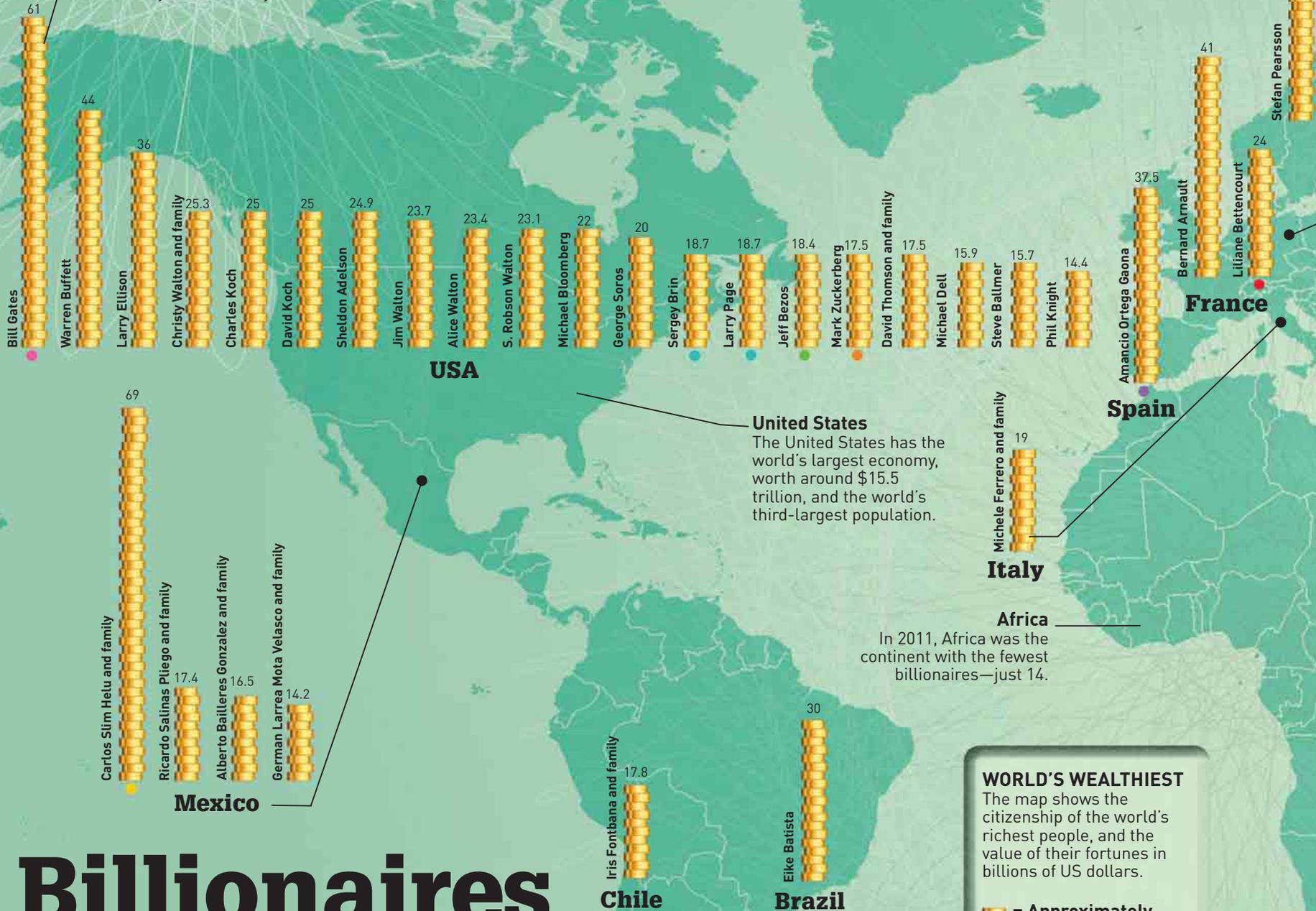


WORLD'S GOLD HOLDINGS

Billionaires

Some billionaires inherit wealth. Others get rich through banking, making or trading goods, or inventing new things. Not surprisingly, billionaires tend to be concentrated in more prosperous nations.

Most billionaires
The United States has over 400 billionaires—more than any other country.



United States
The United States has the world's largest economy, worth around \$15.5 trillion, and the world's third-largest population.

Africa
In 2011, Africa was the continent with the fewest billionaires—just 14.

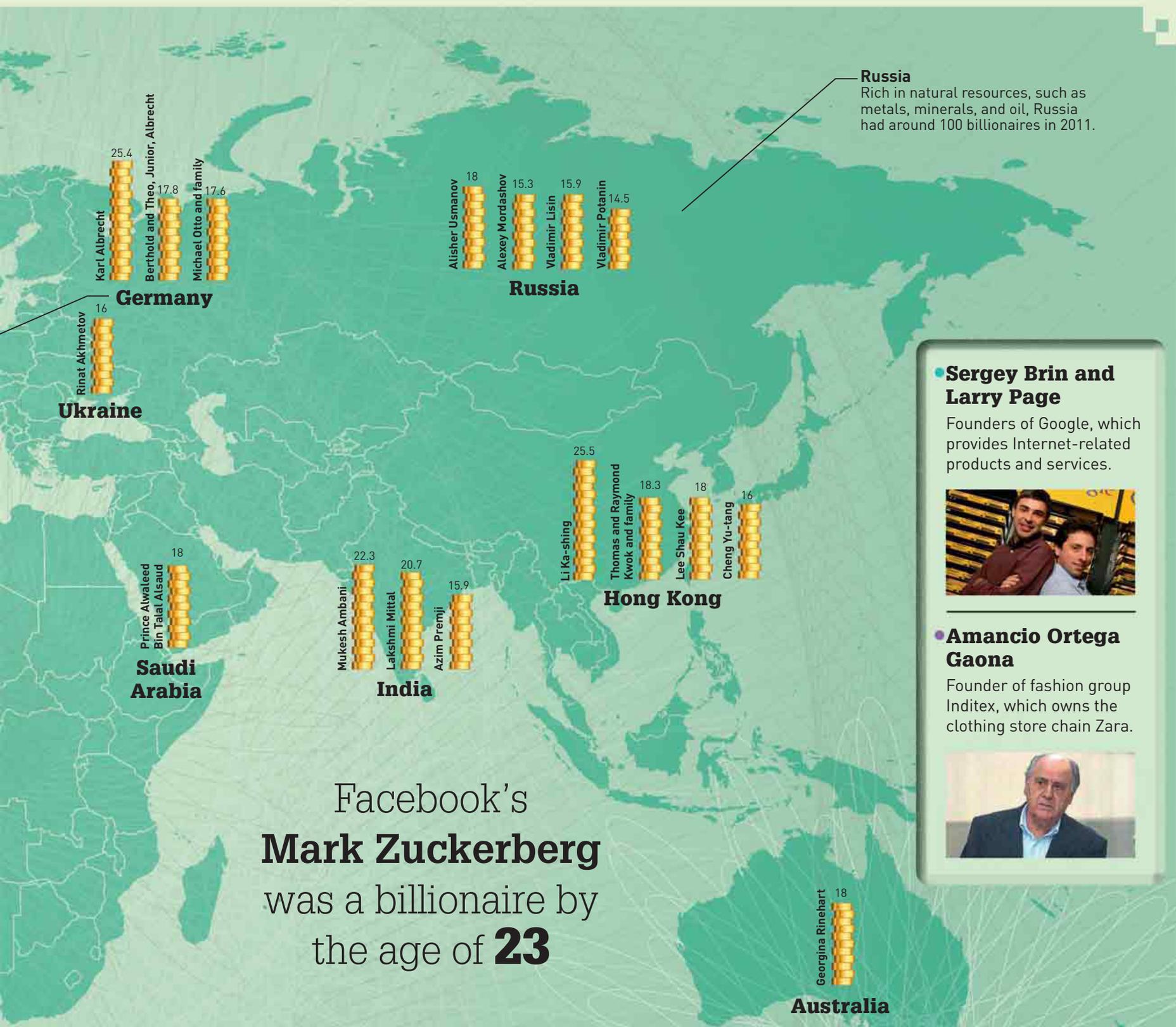
WORLD'S WEALTHIEST
The map shows the citizenship of the world's richest people, and the value of their fortunes in billions of US dollars.
= Approximately \$1.6 billion

● **Bill Gates**
Founded Microsoft software firm in 1975. Now devotes himself to charity work.



● **Liliane Bettencourt**
A principal shareholder in the cosmetics and beauty company L'Oréal.





Russia
Rich in natural resources, such as metals, minerals, and oil, Russia had around 100 billionaires in 2011.

Facebook's **Mark Zuckerberg** was a billionaire by the age of **23**

● **Sergey Brin and Larry Page**

Founders of Google, which provides Internet-related products and services.



● **Amancio Ortega Gaona**

Founder of fashion group Inditex, which owns the clothing store chain Zara.



● **Jeff Bezos**

In 1994, Bezos founded Amazon—now the world's largest online store.



● **Mark Zuckerberg**

Co-founded Facebook social networking site in 2004, while at Harvard.



● **Carlos Slim Helu**

Telecommunications tycoon, and the richest person in the world.



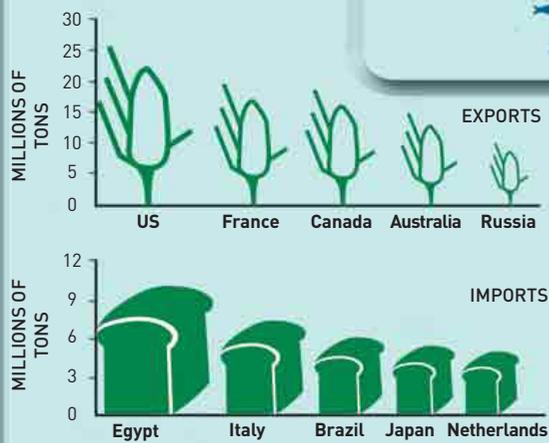
KEY

Animals that are raised to be food for humans are colored brown. Crops and fruits grown in fields and orchards are green. Food from the sea—fish and shellfish—is blue.

- cattle
- corn
- coffee
- goats
- rice
- fruit
- poultry
- sugar cane
- tea
- pigs
- vineyards
- fisheries
- sheep
- wheat

Wheat trade

Wheat is grown on more land than any other crop. The US supplies 25 percent of the world's exports. Egypt grows its own wheat but still imports over 9 million tons per year.



Grand Banks, Newfoundland

Once one of the world's richest fishing areas for fishing, the cod fishery here has collapsed through overfishing.

US grain belt

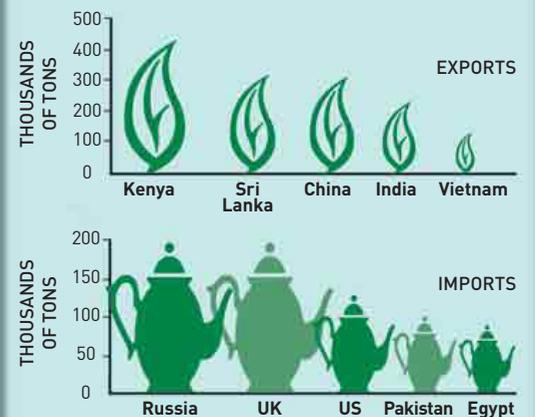
The flat landscape, ideal for large farm machinery, and the deep, fertile soil make the Midwestern region of the US among the best land for growing crops.

Chile-Peru fishing zone

The waters here are the best in the world for fishing because deep ocean currents push nutrients to the surface in a process known as upwelling.

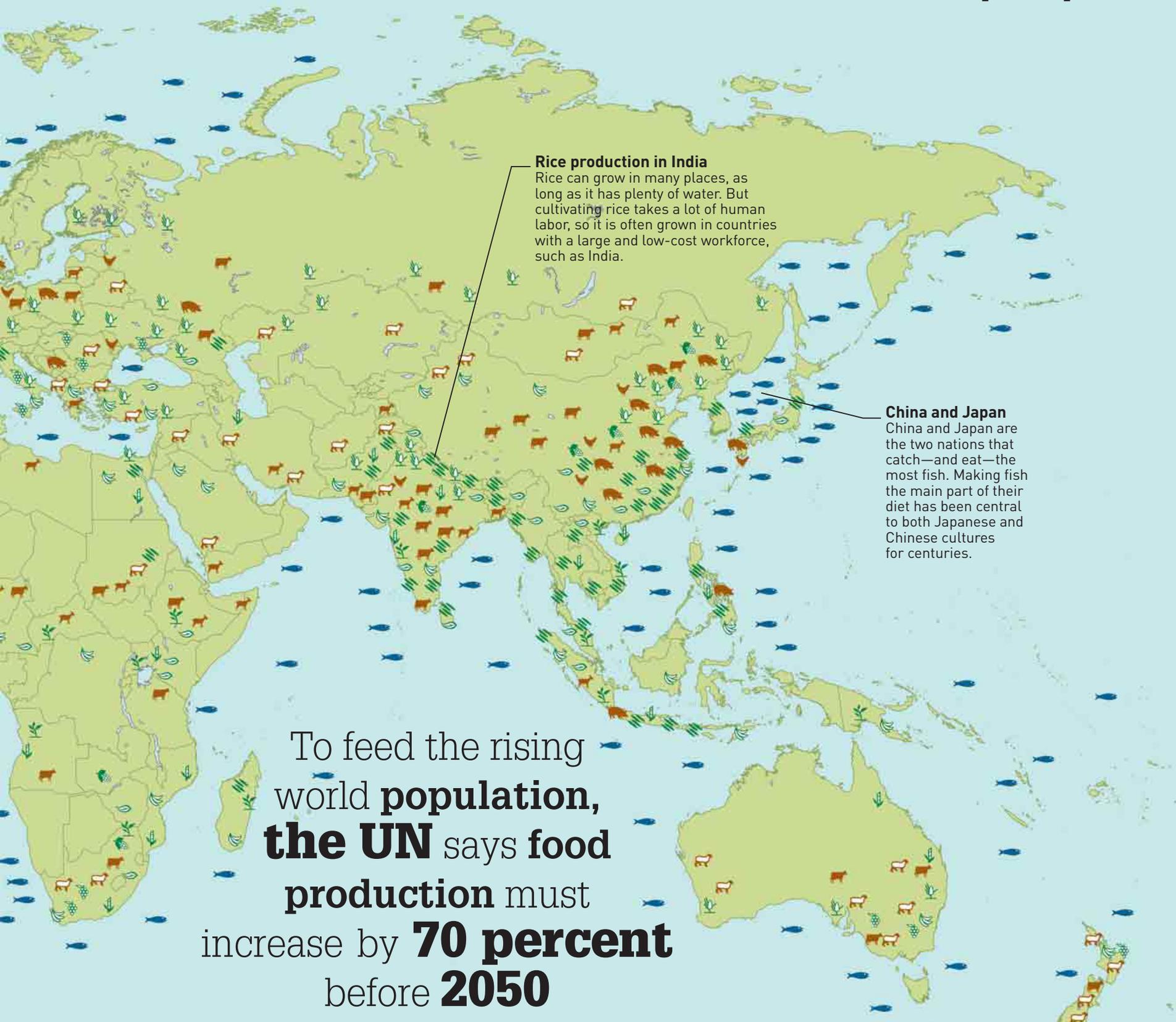
Tea trade

Tea production is Kenya's most important industry, since tea accounts for 70 percent of the money it earns in exports. Kenya exports most of its tea to Pakistan, Egypt, and the UK.



Food production

The food that people produce to eat and sell depends on where they live. They grow fruit and other crops on fertile ground, graze their animals in less accessible areas, and fish where warm currents make sea life plentiful.



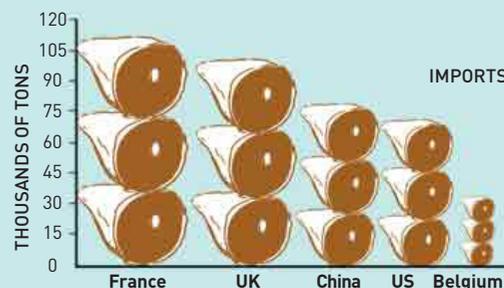
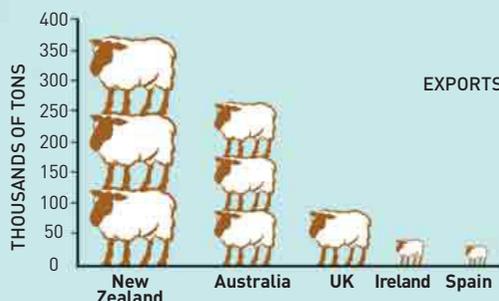
Rice production in India
 Rice can grow in many places, as long as it has plenty of water. But cultivating rice takes a lot of human labor, so it is often grown in countries with a large and low-cost workforce, such as India.

China and Japan
 China and Japan are the two nations that catch—and eat—the most fish. Making fish the main part of their diet has been central to both Japanese and Chinese cultures for centuries.

To feed the rising world population, **the UN** says food production must increase by **70 percent** before **2050**

Sheep meat trade

With 4 million people and over 31 million sheep, it is not surprising that New Zealand exports 90 percent of the meat produced there. Its best customer is the UK, which buys about one-fifth of New Zealand's sheep meat.



Canada

Canada has a lower adult obesity rate than the United States, at about 24 percent. Daily calorie intake is around 3,400 kcal.

United Kingdom

Obesity in the UK is estimated to add an extra \$8 billion each year to the country's health-care costs.

Africa

Africa is the continent with the lowest calorie intake, at 2,550 kcal per day. The global average is 2,830 kcal.

United States

Larger portions and cheap, high-calorie, high-fat fast foods and prepared meals have helped raise daily intake levels to 3,700 kcal. Adult obesity is now around 35 percent.

Cuba

Although Cuba is not a rich country, its citizens are well fed, with a daily intake of about 3,250 kcal.

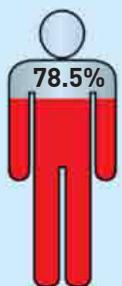
Bolivia

Daily calorie intake for the average adult in Bolivia is around 2,200 kcal.

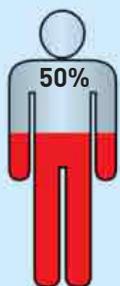
Weight around the world

Pacific island nations such as Nauru, Tonga, and French Polynesia have among the highest obesity levels. This is partly because the islanders now eat mainly cheap, fatty, imported foods, and partly because plumpness traditionally signifies wealth and fertility.

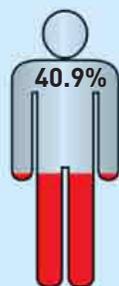
PERCENTAGE OF THE POPULATION CLASSIFIED AS OBESE



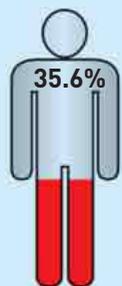
Nauru



Tonga



French Polynesia



Saudi Arabia



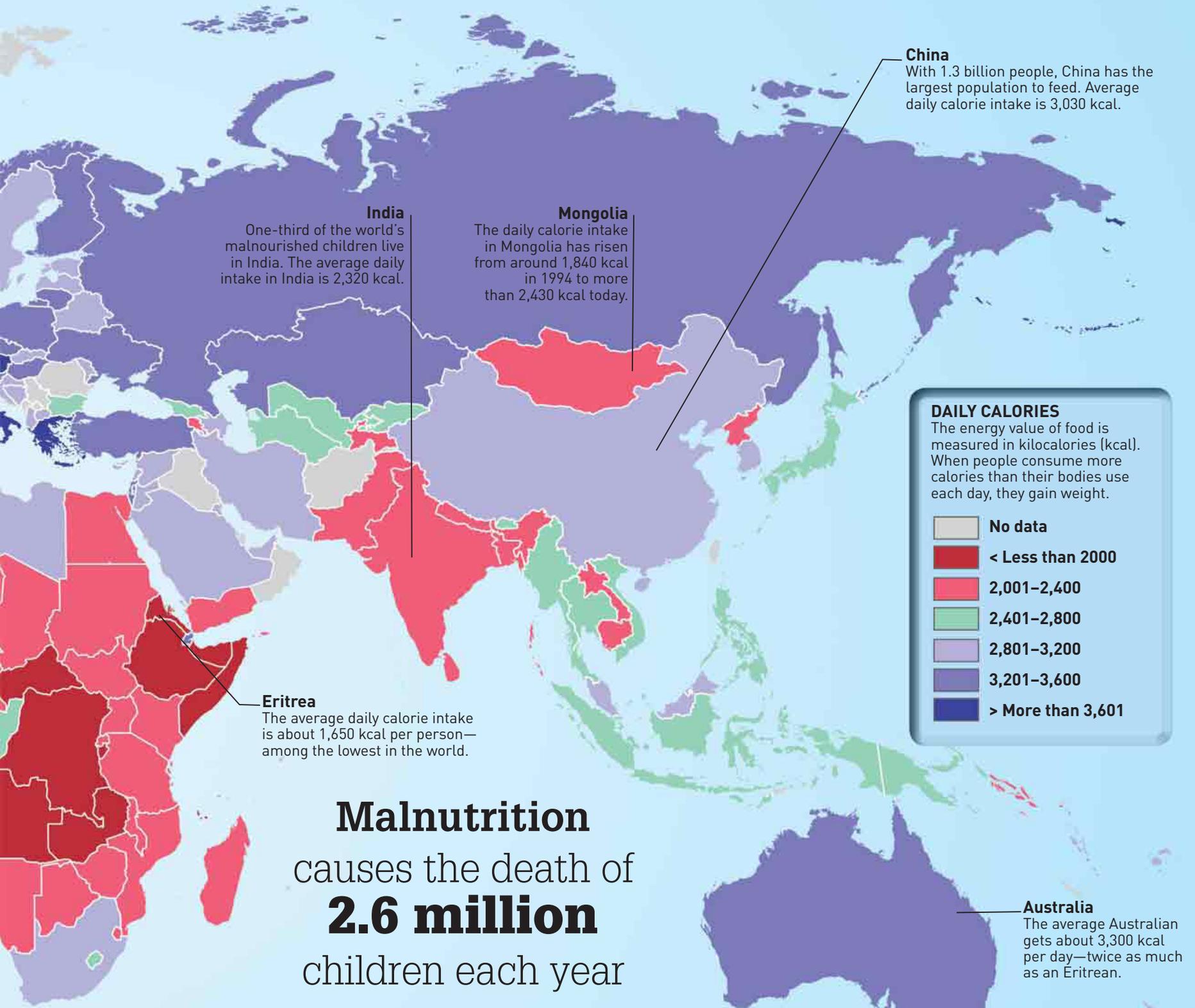
United Arab Emirates



USA

Food intake

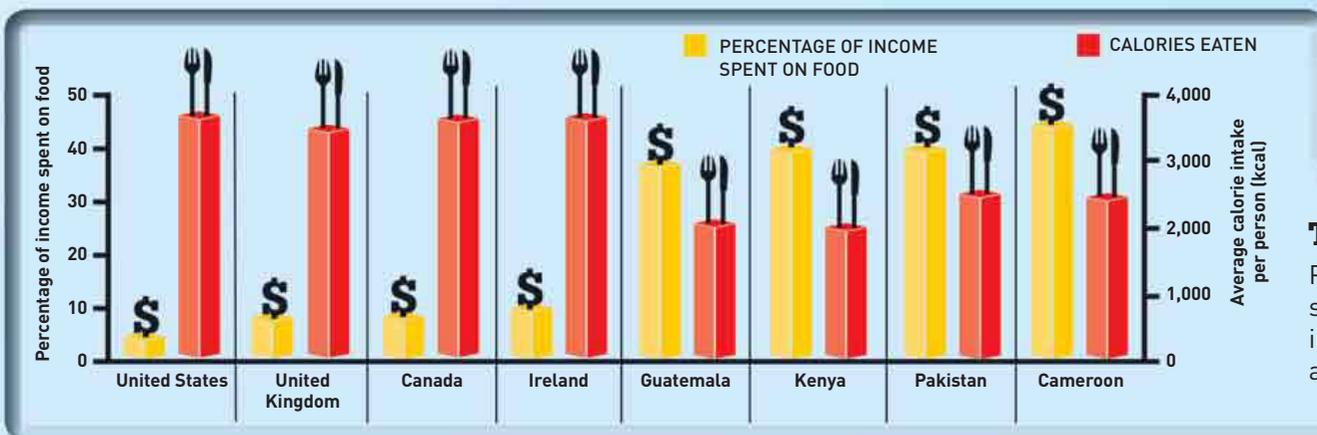
Food and the energy it contains is the fuel for our bodies. Overeating and unhealthy diets can lead to obesity—when a person gains so much weight that it can cause illness and disease



DAILY CALORIES
The energy value of food is measured in kilocalories (kcal). When people consume more calories than their bodies use each day, they gain weight.

- No data
- < 2000
- 2,001–2,400
- 2,401–2,800
- 2,801–3,200
- 3,201–3,600
- > 3,601

Malnutrition
causes the death of
2.6 million
children each year



The cost of food

People in poor countries have to spend a greater proportion of their income on food, so they cannot afford a high-calorie intake.

Canada
As in the US, only 1 percent of people are illiterate.

Europe
Although most countries in Europe have very high literacy rates, over 76 million adults classed as "literate" still lack basic reading and writing skills.

United States
The literacy rate in the US is 99 percent.

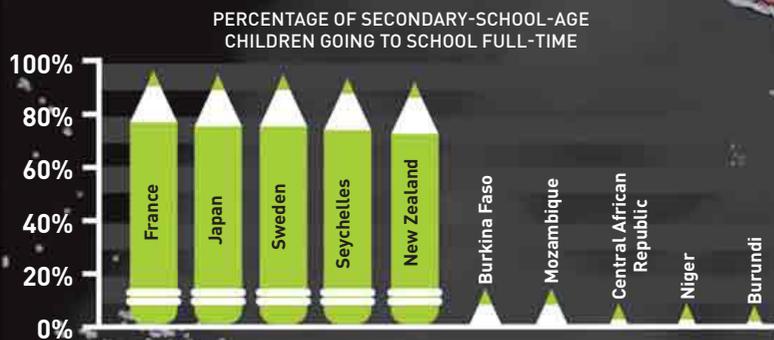
Mauritania
Little more than half of Mauritania's population—57.5 percent—can read and write.

Mali
Just 26.2 percent of people in Mali are literate—the world's lowest literacy rate.

Brazil
Nine out of every 10 Brazilians are literate.

Going to school

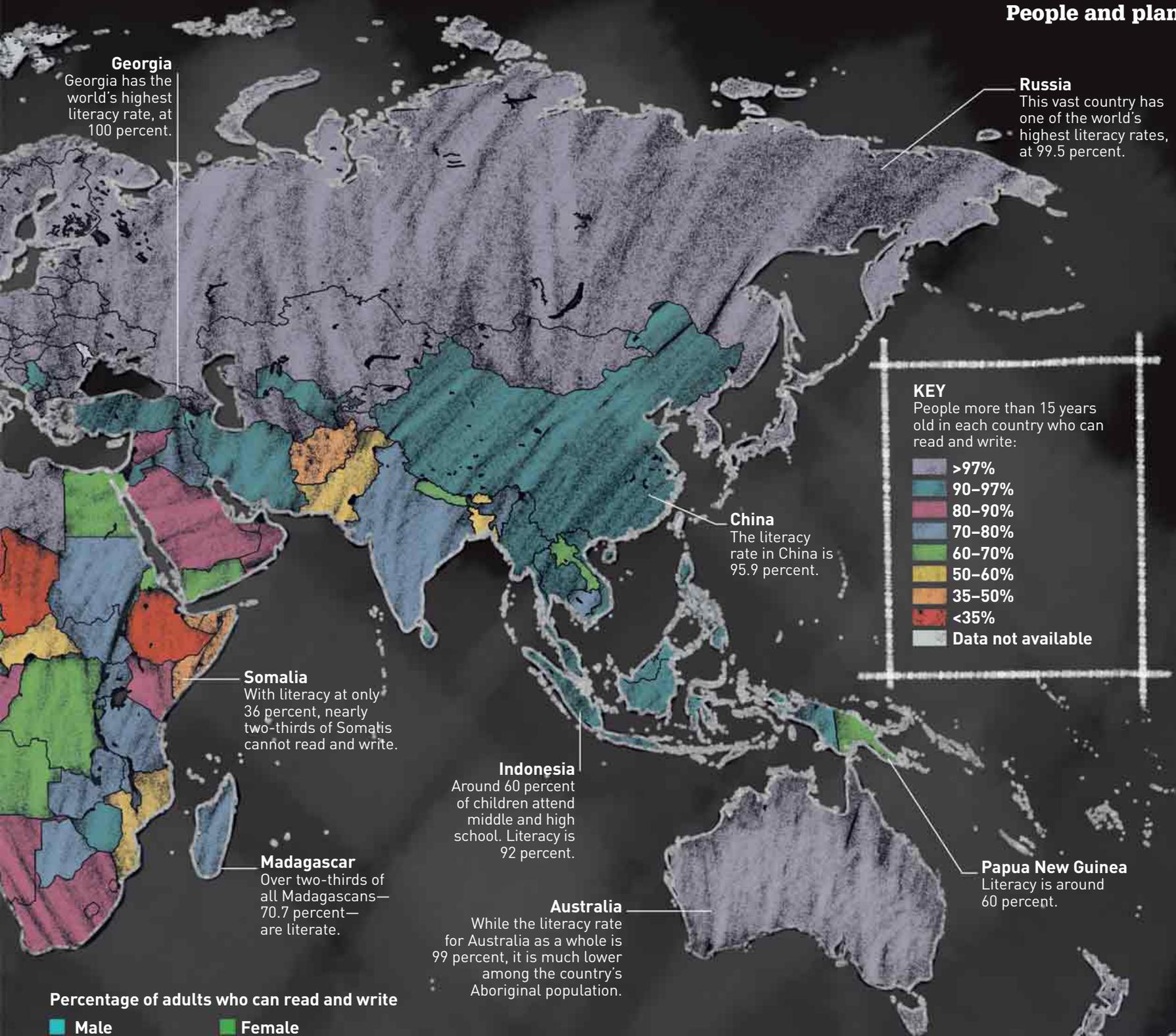
Wealthy nations can afford to provide secondary education (middle school and high school) for all children, but governments in poorer countries cannot offer every child a place. This is particularly true in Africa south of the Sahara. In Burundi, for example, only 9 percent of children go to secondary school.



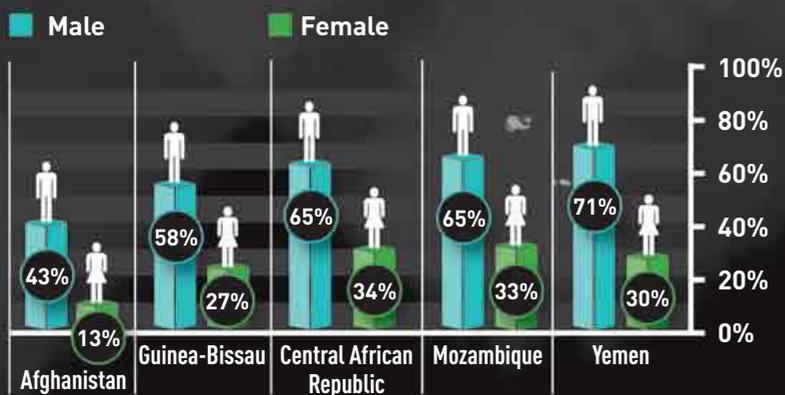
Literacy

Literacy—being able to read and write—is an essential life skill. Being literate makes it easier for people to learn, make the most of their abilities, and get better jobs. High levels of illiteracy make it difficult for nations to develop and become wealthier.

In developing countries, **200 million** people age **15–24** have not completed **elementary school**



Percentage of adults who can read and write



Male-female differences

Of the 774 million illiterate adults around the world in 2010, two-thirds were women. In some countries, girls are discouraged from attending school, leading to wide differences in literacy rates between men and women.

New Zealand
Ninety-nine percent of New Zealanders are literate.

Biggest oil spills

Oil spills—when oil escapes into the environment—cause devastation to wildlife and are difficult and costly to clean up.

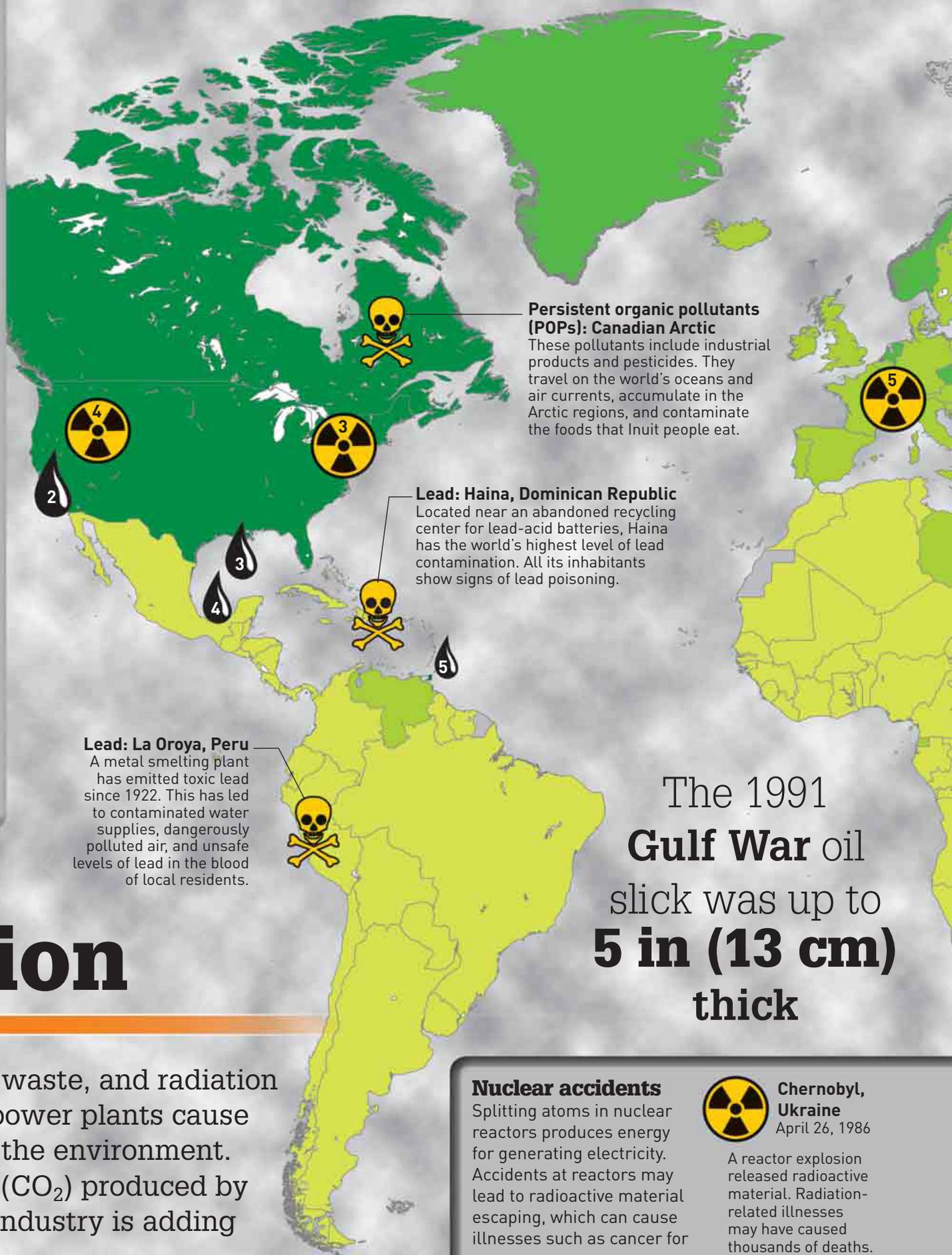
1 Gulf War oil spill, Persian Gulf, 1991
300,000–1,200,000 tons
Iraqi forces opened valves on Kuwaiti oil wells and pipes, causing a 150-mile (250-km) slick.

2 Lakeview gusher, California, 1910–11
1,100,000 tons
An oil well erupted like a geyser, spilling out oil for over a year until it naturally died down.

3 Deepwater Horizon, Gulf of Mexico, 2010
671,000 tons
A deep-sea oil spill occurred when an explosion destroyed the Deepwater Horizon drilling rig.

4 Ixtoc 1 oil spill, Gulf of Mexico, 1979–80
412,000–435,000 tons
The Ixtoc 1 drilling platform collapsed after an explosion. The spill continued for 9 months.

5 Atlantic Empress, Trinidad and Tobago, 1979
260,000 tons
The largest oil spill from a ship. The tanker *Atlantic Empress* hit another ship, killing 26 crew.



Persistent organic pollutants (POPs): Canadian Arctic
These pollutants include industrial products and pesticides. They travel on the world's oceans and air currents, accumulate in the Arctic regions, and contaminate the foods that Inuit people eat.

Lead: Haina, Dominican Republic
Located near an abandoned recycling center for lead-acid batteries, Haina has the world's highest level of lead contamination. All its inhabitants show signs of lead poisoning.

Lead: La Oroya, Peru
A metal smelting plant has emitted toxic lead since 1922. This has led to contaminated water supplies, dangerously polluted air, and unsafe levels of lead in the blood of local residents.

The 1991
Gulf War oil
slick was up to
5 in (13 cm)
thick

Pollution

Oil spills, industrial waste, and radiation leaks from nuclear power plants cause harm to people and the environment. Carbon dioxide gas (CO₂) produced by transportation and industry is adding to global warming.

Nuclear accidents

Splitting atoms in nuclear reactors produces energy for generating electricity. Accidents at reactors may lead to radioactive material escaping, which can cause illnesses such as cancer for many years.



Chernobyl, Ukraine
April 26, 1986

A reactor explosion released radioactive material. Radiation-related illnesses may have caused thousands of deaths.

Chemical waste: Dzerzhinsk, Russia

Chemical weapons were made here until 1998. The town's water contains extreme levels of toxic chemicals. Average life expectancy for the area in 2007 was 45.

Organic chemicals, Sumgayit, Azerbaijan

A town once home to chemical plants that released 109,000 tons of toxic chemicals per year. Cancer rates are up to 51 percent higher than elsewhere in the country.

Nickel ore: Norilsk, Russia

Few trees grow within 30 miles (48 km) of a massive metal-smelting complex in this industrial town, due to acid rain and smog.

Industrial chemicals: Bhopal, India

In 1984, poisonous gas escaped from a pesticide factory, killing 4,000–15,000 people. Thousands continue to suffer and die from illnesses related to the accident.

Air pollution: Linfen, China

Among the world's most polluted cities, Linfen is at the heart of China's coal industry. Soot and coal dust fill the air, raising the risk of bronchitis, pneumonia, and lung cancer in the people.

Mercury: Central Kalimantan, Indonesia

Toxic mercury is used to extract gold from mines in Kalimantan, with about 45 tons of mercury released into the air each year.

Pesticides: Kasaragod, India

20 years of pesticide use on cashew-nut plantations have caused disease and mental illness for a generation of residents.

Tanning wastes: Ranipet, India

Water polluted by waste from a leather-tanning factory stings the skin and causes ulcers.

Lead: Kabwe, Zambia

A once-thriving lead industry has resulted in lead levels in Kabwe's children of 5–10 times the safe limit.

Acid mine drainage: Johannesburg, South Africa

Acidified water flows from old mines into rivers. It contaminates water supplies and crops and harms wildlife.

Carbon dioxide

The map shows how much CO₂ each country produces per person. Wealthy nations tend to produce the most.

Tons of CO₂ per person

-  0–5
-  5–10
-  10–15
-  15–20
-  More than 20
-  No data

 **Fukushima, Japan**
March 11, 2011

An tsunami hit this coastal power plant, triggering explosions. Over 100,000 people had to be evacuated from their homes.

 **Three Mile Island, US**
March 28, 1979

A reactor was damaged when it overheated. The cost of decontaminating the site after the event was \$1 billion.

 **Idaho Falls, US**
January 3, 1961

An explosion at the SL-1 prototype reactor killed three workers—the first in the world to die in a reactor accident.

 **Lucens reactor, Switzerland**
January 21, 1969

Built in a cavern, this reactor leaked radiation. None of the workers was contaminated, but the cavern was sealed to contain the radiation.



Pollution hot spots



KEY

The world's five largest garbage dumps, or landfills, labeled with the amount of waste dumped in them every day.

Puente Hills – Los Angeles
Approximately 10,000 tons per day.

Apex – Las Vegas
Approximately 9,500 tons per day.

Western Pacific Garbage Patch

A lot of discarded litter ends up in rivers, which take it to the ocean, where circular currents called gyres collect it into vast patches in the ocean surface waters. This patch is the largest of these oceanic garbage dumps.

North Atlantic Garbage Patch

The North Atlantic Garbage Patch measures hundreds of miles across. It shifts by as much as 990 miles (1,600 km) north and south with the seasons.

Lagos, Nigeria

Approximately 9,000 tons per day.

Gabon

Less wealthy countries, such as Gabon, produce less garbage because people buy less overall, they buy proportionally more local produce without plastic packaging, and do more recycling.

South Pacific Garbage Patch

So far, the South Pacific Gyre appears to contain less plastic waste than other ocean garbage patches.

South Atlantic Garbage Patch

The first evidence of a South Atlantic Garbage Patch was discovered in 2011. Most plastic particles in ocean garbage patches are too small to be seen with the naked eye.

Top of the recycling table

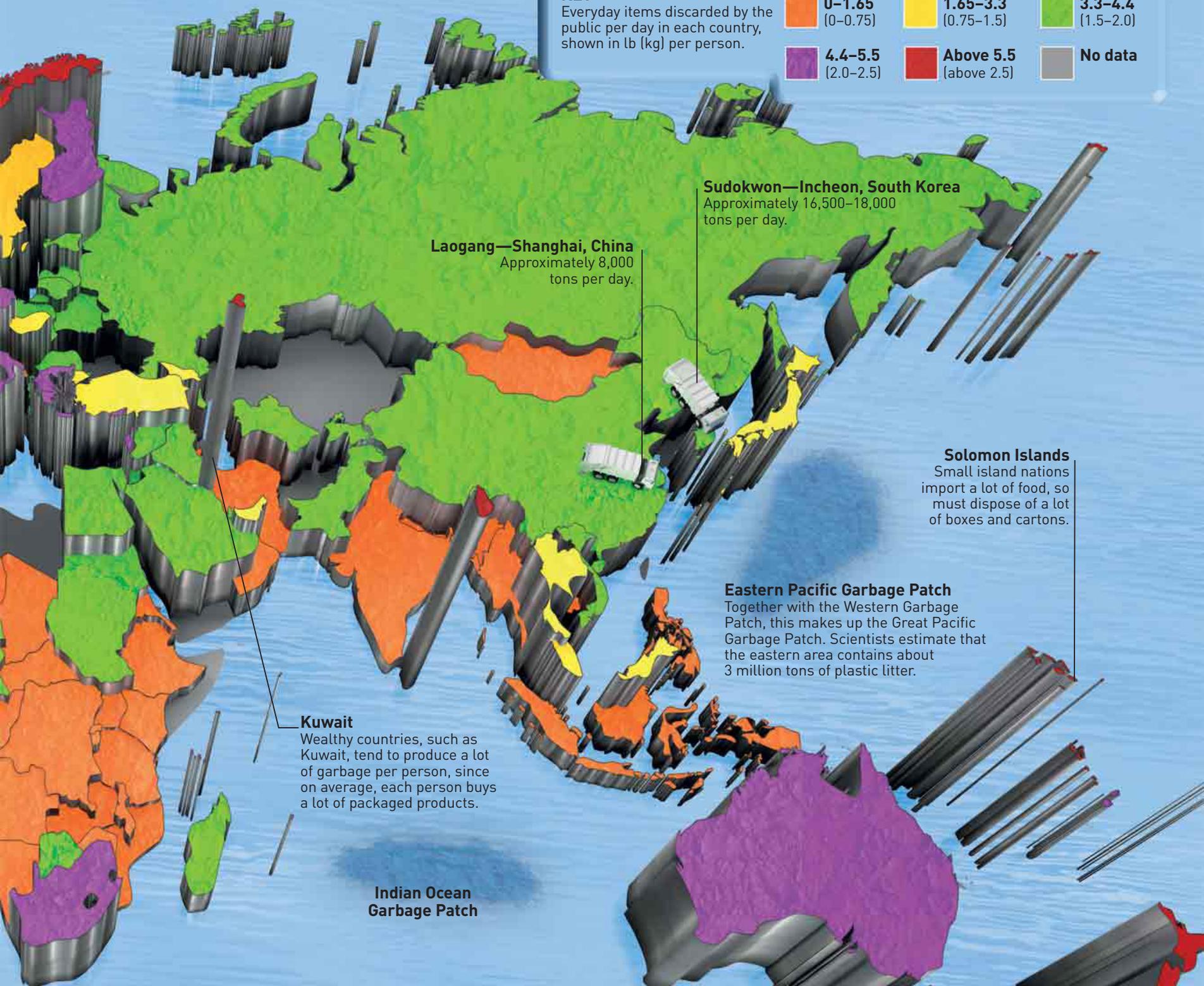
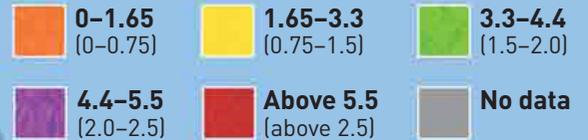
Switzerland is currently the only country that recycles more than half of its waste. Swiss people are committed to recycling but they also have a financial motive—they pay a fee for each bag of garbage that they send to the dump.

Garbage and waste

As living standards improve worldwide and cities grow, so does the amount of garbage that people produce. Most waste goes to garbage dumps, which are expensive, use up a lot of land, and are harmful to the environment. Recycling is one way of helping to stop the global garbage heap from growing any bigger.

KEY

Everyday items discarded by the public per day in each country, shown in lb (kg) per person.



Laogang—Shanghai, China
Approximately 8,000 tons per day.

Sudokwon—Incheon, South Korea
Approximately 16,500-18,000 tons per day.

Solomon Islands
Small island nations import a lot of food, so must dispose of a lot of boxes and cartons.

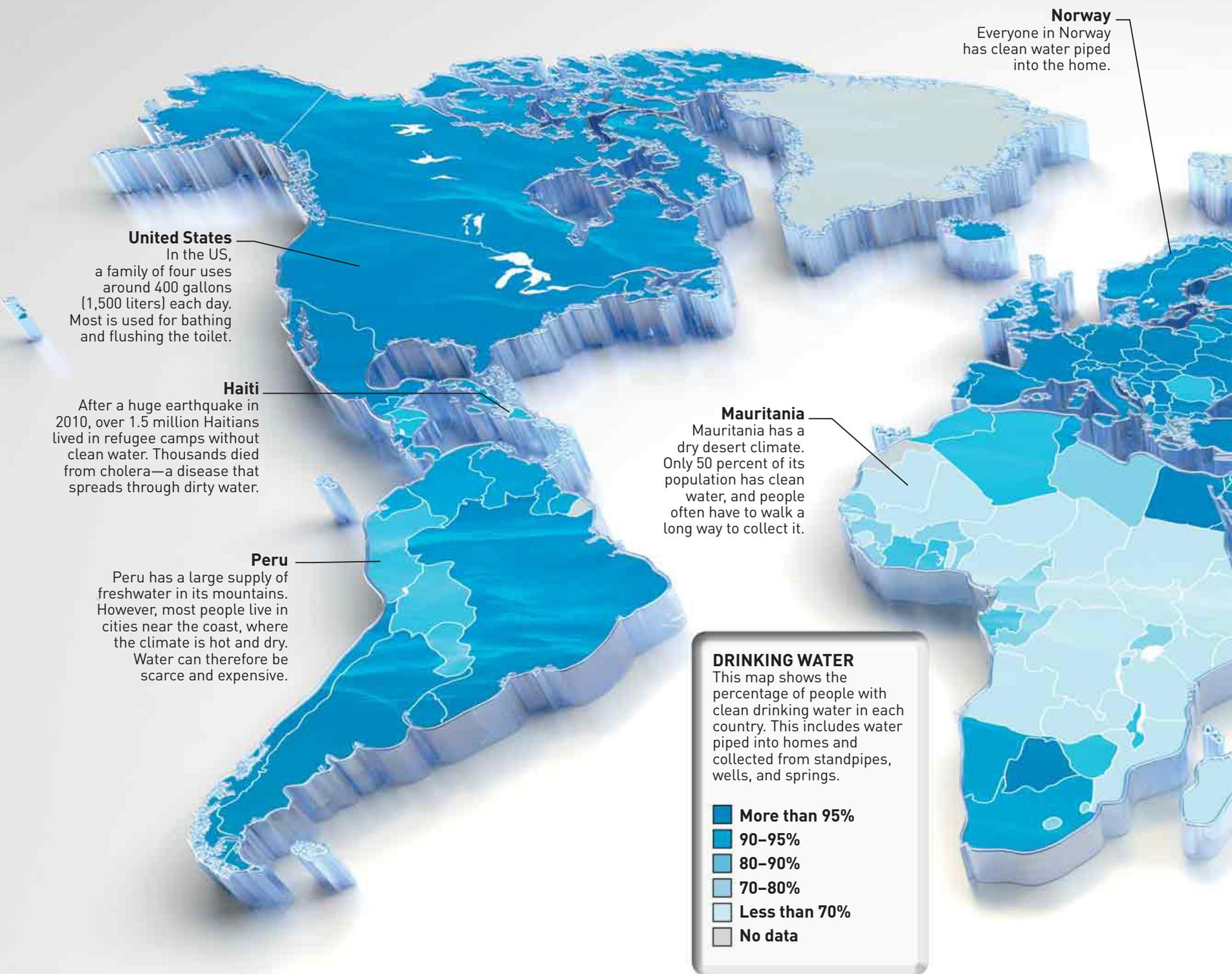
Eastern Pacific Garbage Patch
Together with the Western Garbage Patch, this makes up the Great Pacific Garbage Patch. Scientists estimate that the eastern area contains about 3 million tons of plastic litter.

Kuwait
Wealthy countries, such as Kuwait, tend to produce a lot of garbage per person, since on average, each person buys a lot of packaged products.

Indian Ocean Garbage Patch



A **plastic** bottle in **landfill** can take **450 years** to **biodegrade**, or rot



Clean water

The faucet in your home may give you an instant supply of clean drinking water. However, 90 percent of the world's population gets water from a standpipe or a well. For 783 million people, their sources of water are contaminated and unsafe to drink.

Thirsty crops

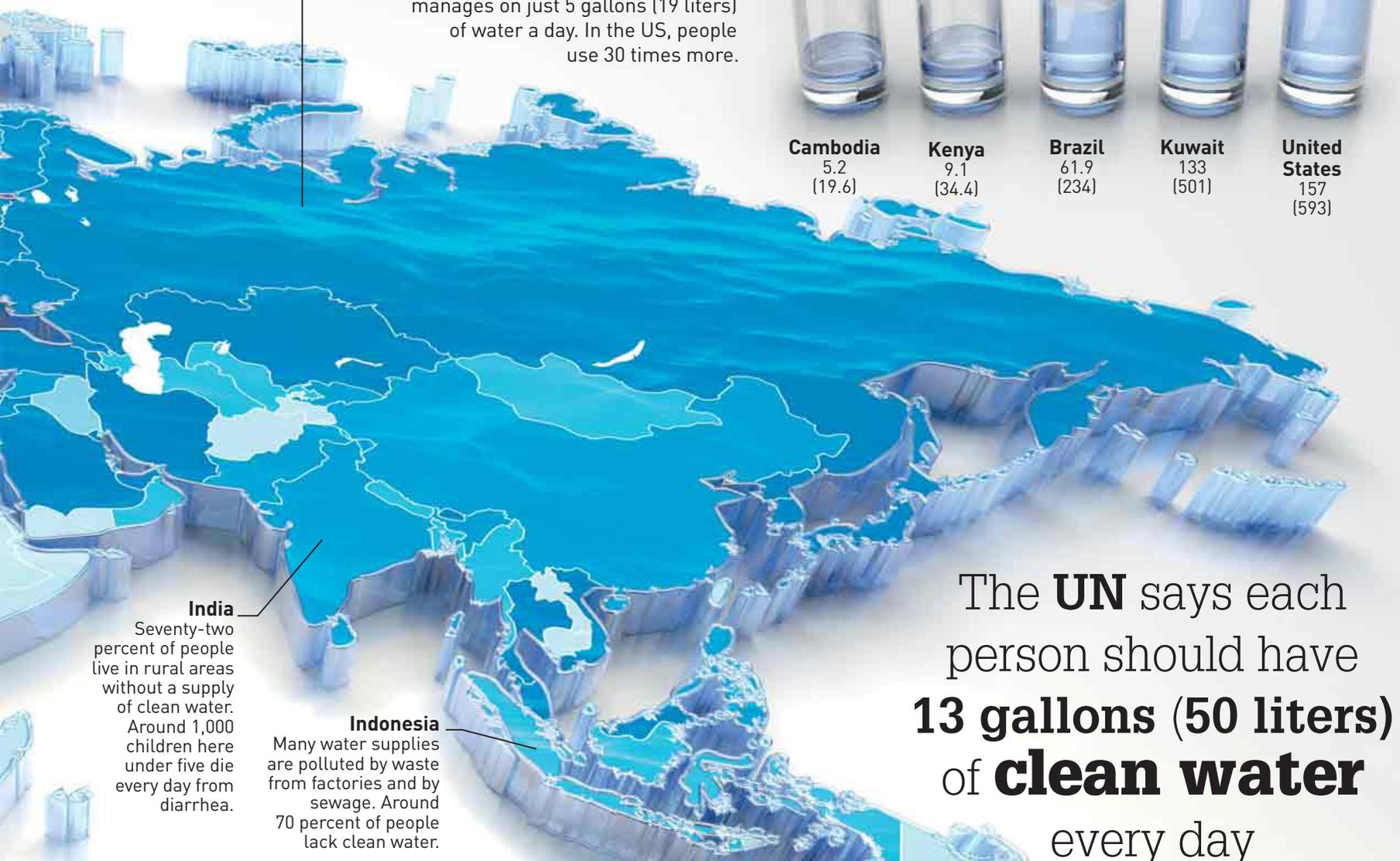
Growing crops in dry climates is by far the thirstiest human activity. It uses much more water than is used in people's homes and dominates water use in many countries. That's why parts of central Asia, where farmers water fields of cotton, top this list of overall water consumers.

Russia

Russia's rivers and lakes provide plentiful water, but the quality of water supplies is not reliable and most people must buy bottled water to drink.

Water use in the home

These glasses show how many of gallons (liters) of water each person uses a day for such things as drinking, washing, cooking, and cleaning. In Cambodia, each person manages on just 5 gallons (19 liters) of water a day. In the US, people use 30 times more.



India

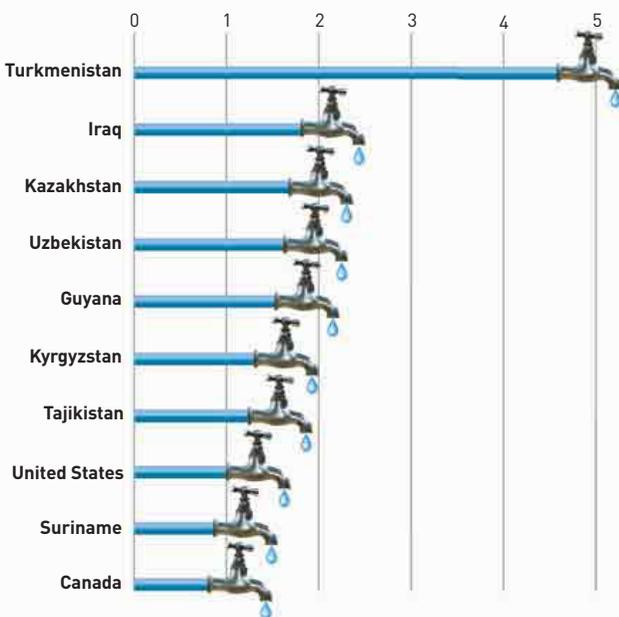
Seventy-two percent of people live in rural areas without a supply of clean water. Around 1,000 children here under five die every day from diarrhea.

Indonesia

Many water supplies are polluted by waste from factories and by sewage. Around 70 percent of people lack clean water.

The **UN** says each person should have **13 gallons (50 liters) of clean water** every day

Total water use (million liters per person per year)



Australia

Recent terrible droughts in this dry country have made Australia rethink its water use. Authorities have begun recycling sewage and encouraging gray water recycling (waste water from bathtubs and washing machines) to "drought-proof" the nation.

Athabasca oil sands, Canada

The enormous Athabasca oil reserves are in the form of oil shale on the land's surface. To get the oil out of oil shale needs huge amounts of water and energy and causes far more environmental destruction per barrel of oil than normal drilling.

North Sea

Contains western Europe's largest oil and natural gas reserves.

How long will supplies last?

Fossil fuels are used up faster all the time, and one day the world's fuel reserves—the fuels remaining in the ground—will run out. Estimates of the size of the fuel reserves go up as well as down, as old reserves are used up and new ones are discovered. Below are the latest estimates of how long they will last.



Texas gas fields

The US is the second-largest producer of gas, behind Russia. Texas provides one-quarter of the US's gas from both onshore and offshore fields.

United States

Americans consume one-fifth of the world's fossil fuel energy.

Trinidad and Tobago

Natural gas consumption per person is the highest in the world, and gas reserves are declining fast.

Venezuela

Has possibly the greatest amount of oil of any single country. Nearly 20 percent of global reserves are found here.

Nigeria

The largest producer of oil in Africa, but conflict and a lack of resources limit production.

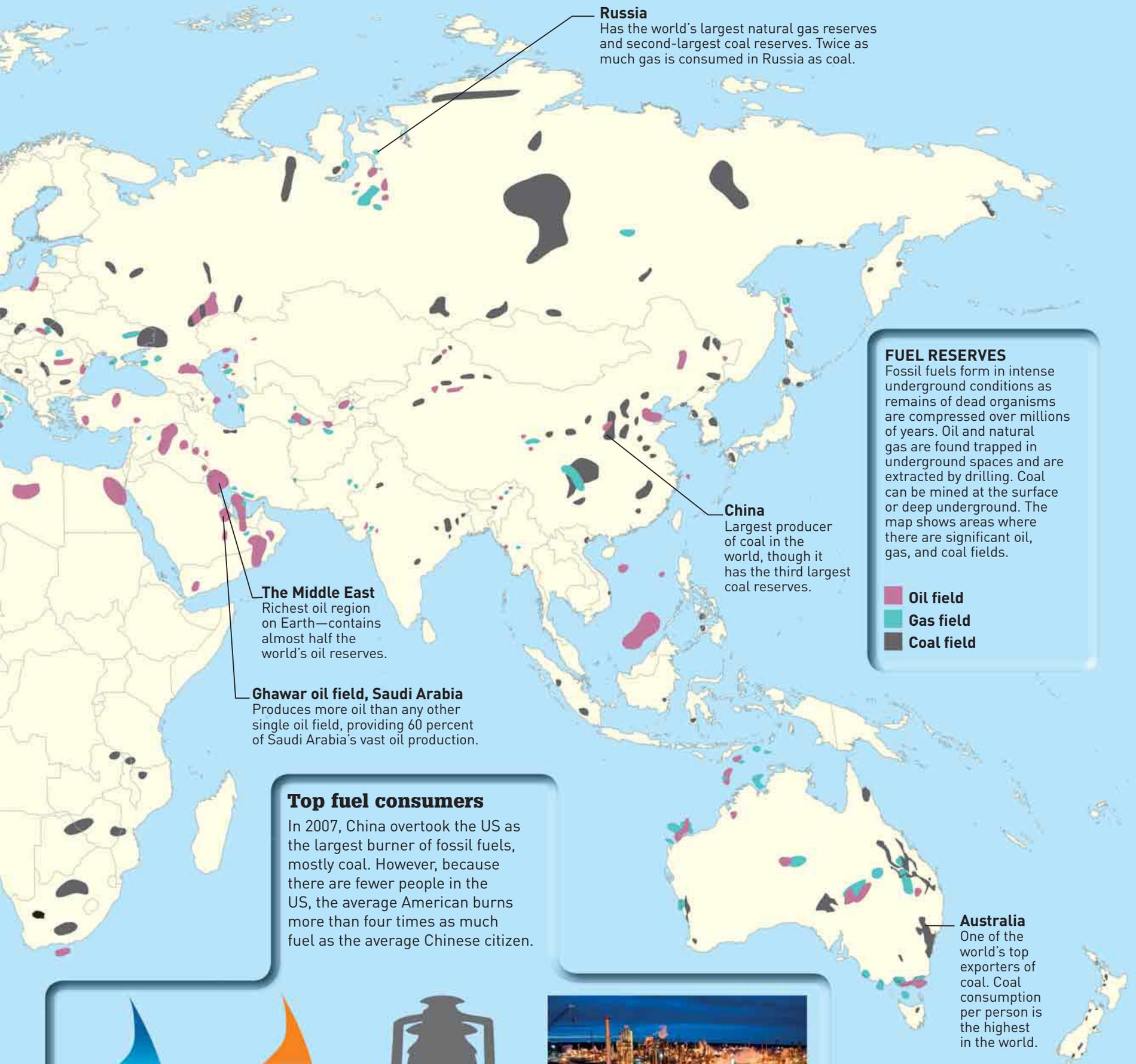
Fossil fuels

Over four-fifths of the world's energy comes from fossil fuels: oil, natural gas, and coal. These are the remains of plants and other life-forms, buried for millions of years. When burned, they release energy, but also waste gases, which pollute the Earth's atmosphere.

Most fossil fuels were formed **300–360 million years ago**

Falkland Islands

Surveys show that around the British-controlled Falkland Islands there may be double the amount of oil as in the North Sea. Argentina claims a right to the islands and to the oil.



Top fuel consumers

In 2007, China overtook the US as the largest burner of fossil fuels, mostly coal. However, because there are fewer people in the US, the average American burns more than four times as much fuel as the average Chinese citizen.



Top gas consumer
United States



Top coal consumer
China



Top oil consumer
United States



Oil refinery, New Orleans, Louisiana

Alternative energy

There are several types of alternative energy, some of which are also renewable (see opposite page).

Wind

Mounted on tall masts, huge rotating blades called wind turbines harness the wind's energy and use it to drive electricity generators.

Solar

The Sun's energy can be used to heat water in homes or to produce high temperatures for electricity generation. Photovoltaic panels convert sunlight directly into electricity.

Nuclear

The nuclei (cores) of atoms are split apart in nuclear power plants, releasing vast amounts of energy. However, the process also creates dangerous nuclear waste.

Geothermal

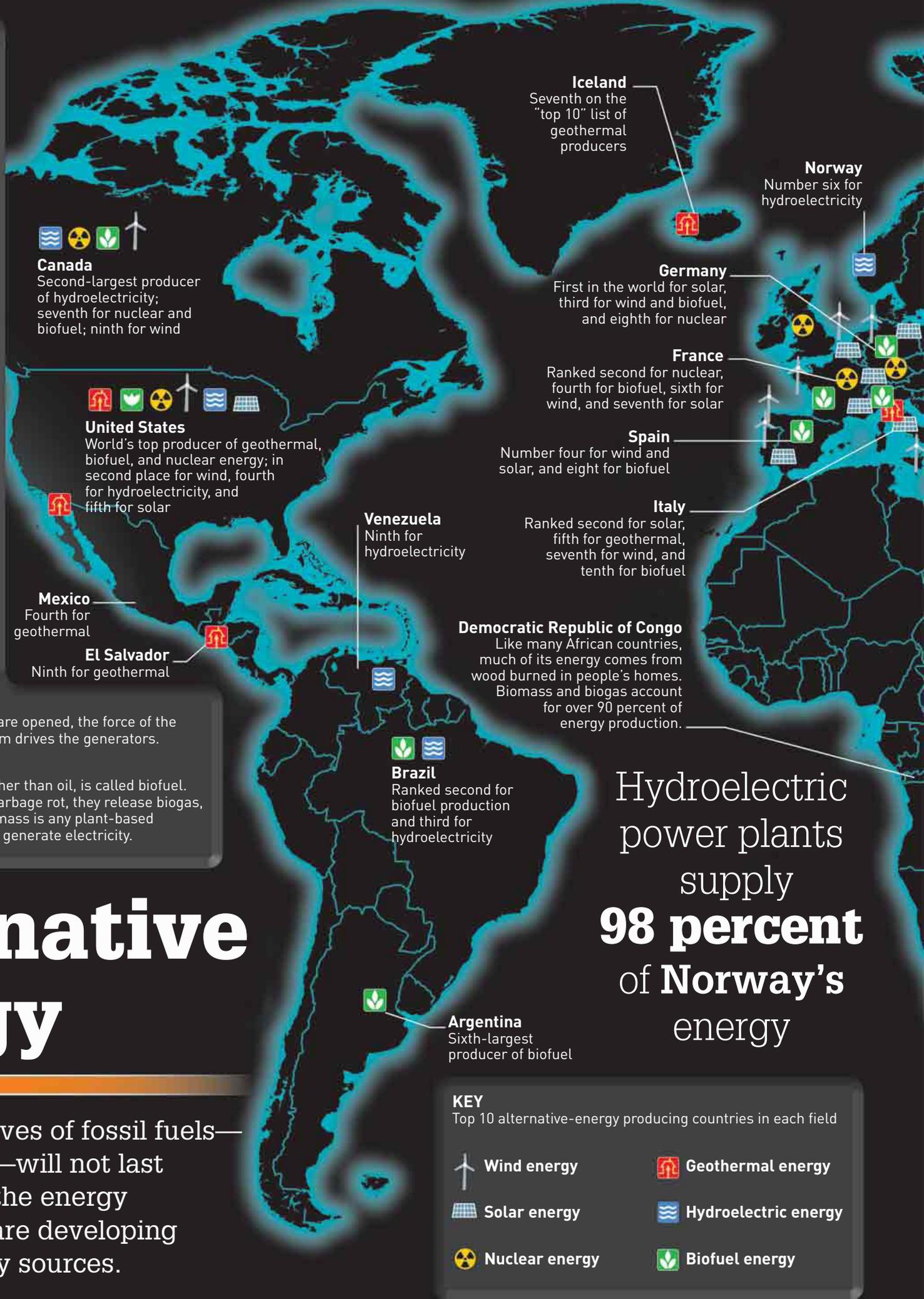
A geothermal power plant taps underground steam or hot water, which it uses to generate electricity or to heat buildings directly.

Hydroelectric

A hydroelectric power plant is a dam with generators built into it. Water builds up behind the dam. When gates in the dam are opened, the force of the falling water passing through them drives the generators.

Biofuel, biogas, and biomass

Liquid fuel made from plants, rather than oil, is called biofuel. When farm waste, sewage, and garbage rot, they release biogas, which can be burned as fuel. Biomass is any plant-based material burned for warmth or to generate electricity.



Alternative energy

The world's reserves of fossil fuels—coal, oil, and gas—will not last forever. To meet the energy shortfall, people are developing alternative energy sources.

Hydroelectric power plants supply **98 percent** of Norway's energy

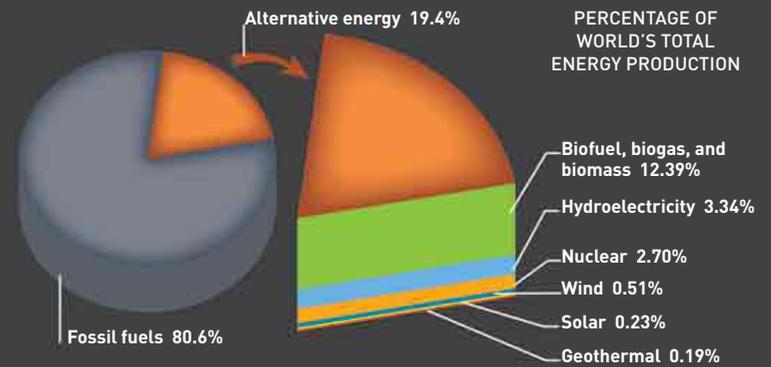
KEY

Top 10 alternative-energy producing countries in each field

- Wind energy
- Solar energy
- Nuclear energy
- Geothermal energy
- Hydroelectric energy
- Biofuel energy

World's energy sources

Fossil fuels supply more than 80 percent of the world's energy. Most of the alternative energy we use comes from bio-sources. No one knows for sure how much oil, coal, and gas is left in the ground, but major new fossil fuel reserves are increasingly hard to find. Many countries are investing heavily in renewable energy.



Sweden
Number 10 for hydroelectricity

Russia
World's fourth-largest nuclear producer and the fifth-largest hydroelectricity nation

Ukraine
Number six for nuclear

China
First in the world for both wind and hydroelectricity, sixth for solar, fifth for biofuel, and ninth for nuclear

South Korea
World's fifth-largest producer of nuclear energy

Japan
A significant producer of solar (third in world), nuclear (third), geothermal (eighth), and hydroelectric (ninth) energy

India
Fourth in the world for wind, seventh for hydroelectricity

Philippines
Second-largest geothermal nation

Kenya
Tenth in the world for geothermal; more than 15 percent of Kenya's energy comes from this source

Thailand
Ranked ninth in the world for biofuel

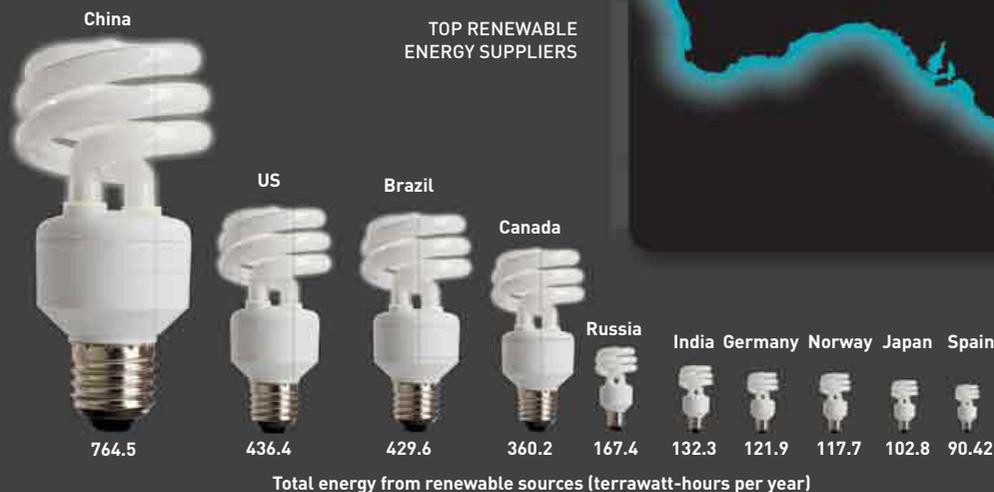
Indonesia
Third in the "top 10" of geothermal countries

Australia
Tenth-largest producer of solar energy

New Zealand
Number six in the world for geothermal

Renewable energy

Once fossil fuels have been burned, they cannot be replaced. Energy from natural sources that are always replenished—such as wind, sunlight, water, geothermal, and biomass—is known as renewable energy. However, not all forms of renewable energy are reliable: the Sun does not shine every day, and the wind does not always blow.



Climate change

Earth's climate has been warming and cooling for millions of years. But in the last century, the planet has been warming rapidly. Most scientists believe that this warming is linked with carbon dioxide and other gases released by human industry. The gases trap outgoing heat in Earth's atmosphere, warming the planet.

Warming oceans

Satellite measurements show that the Southern Ocean is warming by 0.4°F (0.2°C) per decade—much more rapidly than other oceans.

Greenland ice sheet

In an average summer, about 40 percent of Greenland's surface ice sheet melts. At one point in the summer of 2012, NASA scientists observed that 97 percent of the surface was melting.

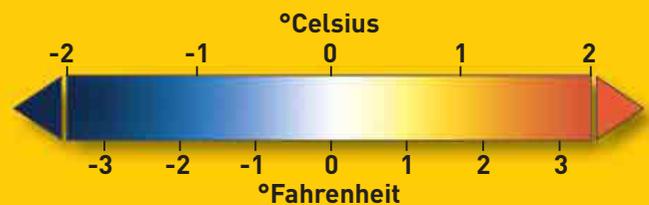
Glacier National Park, Montana

In this center of climate change research, the glaciers have been retreating since the Little Ice Age—a cool period ending in 1850. The shrinking has accelerated recently and experts think it is due to artificial global warming.

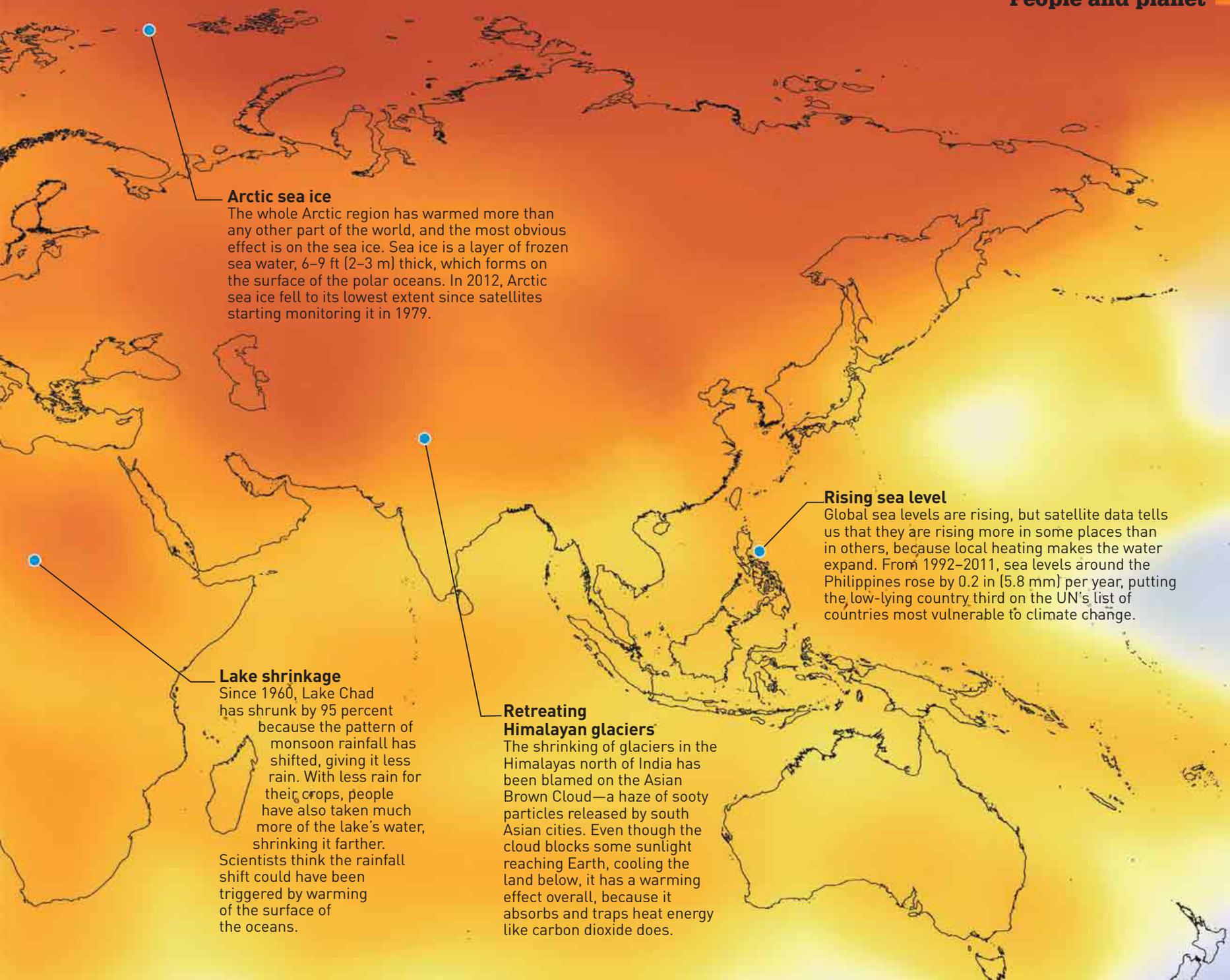
Glacier National Park, US, now has only **27 glaciers.** In **1910,** there were **150**

TEMPERATURE CHANGE

This map, produced by scientists at NASA, shows the 5-year average global temperature for the years 2006-11, compared to temperatures for the years 1951-80. Regions that are hotter in 2006-11 than they were in the earlier period are shaded red. Those that are now colder appear blue.



● Other evidence of climate change



Arctic sea ice

The whole Arctic region has warmed more than any other part of the world, and the most obvious effect is on the sea ice. Sea ice is a layer of frozen sea water, 6–9 ft (2–3 m) thick, which forms on the surface of the polar oceans. In 2012, Arctic sea ice fell to its lowest extent since satellites starting monitoring it in 1979.

Lake shrinkage

Since 1960, Lake Chad has shrunk by 95 percent because the pattern of monsoon rainfall has shifted, giving it less rain. With less rain for their crops, people have also taken much more of the lake's water, shrinking it farther. Scientists think the rainfall shift could have been triggered by warming of the surface of the oceans.

Retreating Himalayan glaciers

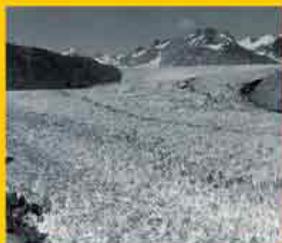
The shrinking of glaciers in the Himalayas north of India has been blamed on the Asian Brown Cloud—a haze of sooty particles released by south Asian cities. Even though the cloud blocks some sunlight reaching Earth, cooling the land below, it has a warming effect overall, because it absorbs and traps heat energy like carbon dioxide does.

Rising sea level

Global sea levels are rising, but satellite data tells us that they are rising more in some places than in others, because local heating makes the water expand. From 1992–2011, sea levels around the Philippines rose by 0.2 in (5.8 mm) per year, putting the low-lying country third on the UN's list of countries most vulnerable to climate change.

Melting glacier

Muir Glacier in Alaska has been shrinking for over 50 years. It has retreated by more than 7 miles (12 km) and is 2,600 ft (800 m) thinner. In 1941, the glacier was surrounded by bare rock, but it is now covered with trees and shrubs.



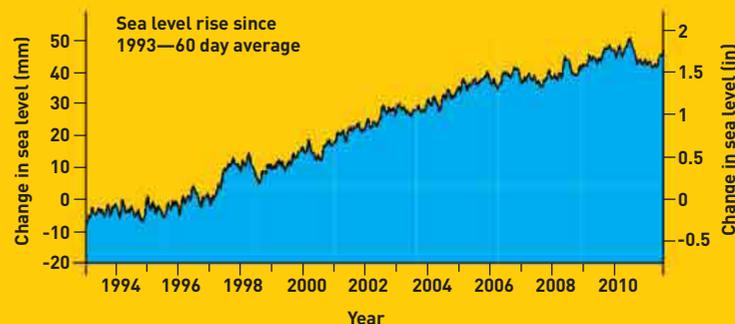
August 13, 1941



August 31, 2004

Global sea level

Since 1993, the global sea level has steadily increased by around 0.1 in (3 mm) per year, as measured by satellite. During the 100-year period before 1993, sea levels rose by an average of only 0.07 in (1.7 mm) every year.



**Kluane/Wrangell-St. Elias/
Glacier Bay/Tatshenshini-Alsek,
Alaska and British Columbia.**
Home to some of the world's most
spectacular glaciers.

**Maud Gulf Migratory
Bird Sanctuary,
Arctic Canada**

Alert, Canada

**Northeast Greenland
National Park**
World's largest protected
area, mostly made up of
the Greenland Ice Sheet.

**Charlie-Gibbs South
Marine Protected Area,
Atlantic Ocean**

**Yellowstone National Park,
Wyoming,**
The first national park in the world,
founded in 1872. The large alpine
meadows and grass prairies
provide ideal habitat for the large
herds of bison living in the park.

Northern Canada
Permafrost (permanently frozen soil)
makes this vast region inaccessible to
people, preserving the Arctic tundra
plains for the wolves and caribou.

Sahara desert
World's largest hot desert.
Supports little human life other
than in scattered oases.

**Aïr and Ténéré
Natural
Reserves,
Niger**

Galápagos Islands

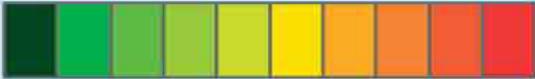
**Jaú National Park,
Amazonas, Brazil**
One of the largest protected
rainforest areas in the world
and the largest in the Amazon
basin. The park includes the
entire Jaú River, where the
water is black from minerals in
dissolved organic matter.

Amazon rainforest
The north and west of this
great forest have few or no
roads and are far from
human impact. Some
areas are flooded to great
depth every year. Some
parts have never been
logged and are "pristine."

WILDERNESS AREAS

The map shows the level of human influence across the world. The colors are based on the "wilderness value," which measures how far any one place is from permanent human settlements, roads, and man-made structures. This measure of remoteness from human development shows how much wilderness is left.

Key



High
wilderness

Low
wilderness



Protected areas of the world

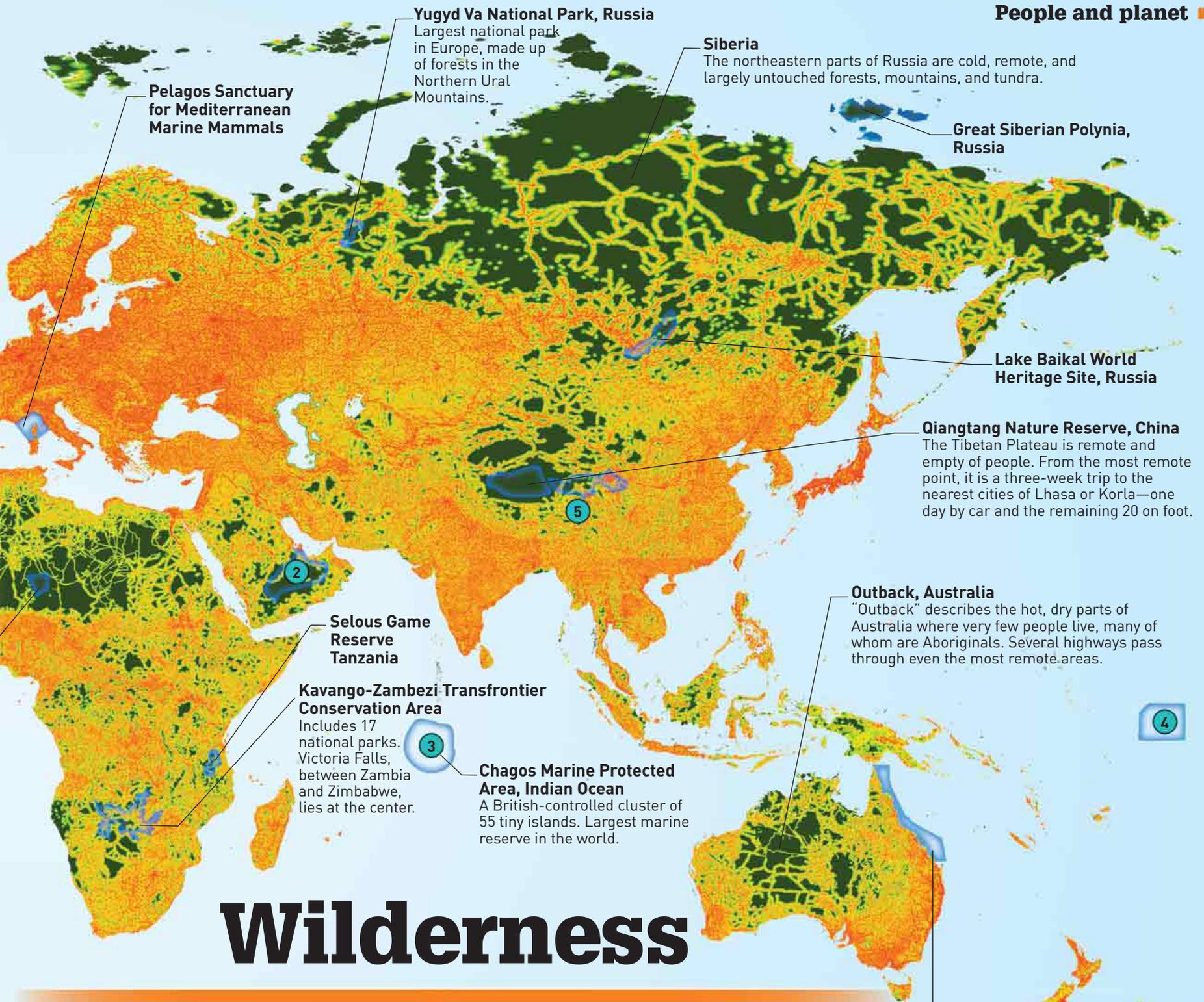
The blue areas on the map show some of the world's protected areas of wilderness. Damaging activities, such as hunting and mining, are usually banned. The areas include wildlife reserves, national parks, marine parks, and more.

Largest protected areas

While legally protected areas cover 12 percent of the world's land, global ocean protection covers just 1.6 percent of the oceans. The world's largest protected area, in Greenland, is three times the size of Italy.

- 1 **Northeast Greenland National Park**
Greenland, 357,916 sq miles (927,000 sq km).
- 2 **Ar-Rub'al-Khali (Empty Quarter)**
Saudi Arabia, 250,966 sq miles (650,000 sq km).
- 3 **Chagos Marine Protected Area**
Indian Ocean, 210,426 sq miles (545,000 sq km).
- 4 **Phoenix Islands**
Central Pacific Ocean, 157,626 sq miles (408,250 sq km).
- 5 **Three Rivers Nature Reserve**
Qinghai province, China. 140,155 sq miles (363,000 sq km).

About **95 percent** of the world's people live on **10 percent** of the land



Yugyd Va National Park, Russia

Largest national park in Europe, made up of forests in the Northern Ural Mountains.

Siberia

The northeastern parts of Russia are cold, remote, and largely untouched forests, mountains, and tundra.

Pelagos Sanctuary for Mediterranean Marine Mammals

Great Siberian Polynia, Russia

Lake Baikal World Heritage Site, Russia

Qiangtang Nature Reserve, China

The Tibetan Plateau is remote and empty of people. From the most remote point, it is a three-week trip to the nearest cities of Lhasa or Korla—one day by car and the remaining 20 on foot.

Selous Game Reserve Tanzania

Kavango-Zambezi Transfrontier Conservation Area

Includes 17 national parks. Victoria Falls, between Zambia and Zimbabwe, lies at the center.

Chagos Marine Protected Area, Indian Ocean

A British-controlled cluster of 55 tiny islands. Largest marine reserve in the world.

Outback, Australia

“Outback” describes the hot, dry parts of Australia where very few people live, many of whom are Aboriginals. Several highways pass through even the most remote areas.

Great Barrier Reef Marine Park, Australia

World’s largest coral reef system.

Wilderness

Wildernesses are the last places that have been largely unchanged by humans. Indigenous peoples sometimes live in these undeveloped areas, where their lifestyles have little impact on the landscape and wildlife.





Engineering and technology

Reaching for the sky
The Burj Khalifa, the world's tallest building, can be seen in the distance in this view of fog-bound Dubai, the largest city in the United Arab Emirates.

Introduction

Engineering and technology enable humans to achieve amazing feats. We build skyscrapers that reach toward the clouds, bridges that span great canyons, and tunnels that pierce mountains and travel under the sea. Our computer networks and transportation systems keep people and places connected. We can even explore other planets.

World in motion

Transportation has shrunk our world. Thanks to jet airliners, highways, and high-speed rail routes, we can go on long-distance journeys that would have been unthinkable just a few decades ago. This transportation revolution began with the invention of the railroad about 200 years ago, and it has continued at high speed ever since.



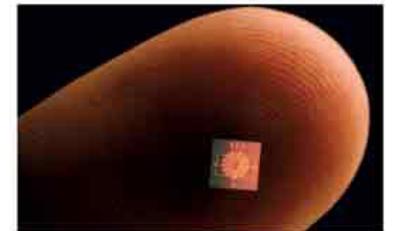
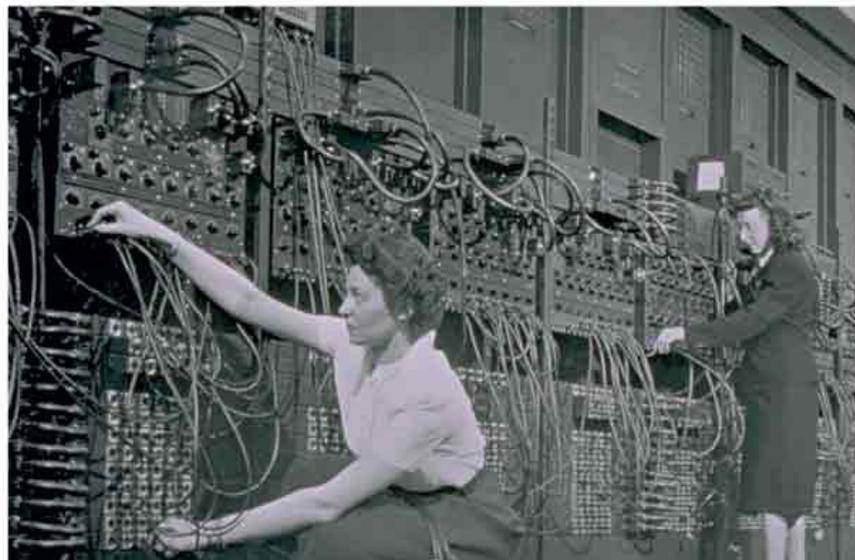
Train collects electricity from power cables suspended above the track.

High-speed electric locomotive

Launched in 1999, the Velaro is now in service in Germany, Spain, China, and Russia. It can reach speeds of more than 250 mph (400 kph). The Velaro is powered by electricity and can pull trains with more than 900 passengers aboard.

Shrinking technology

Few, if any, areas of technology have advanced faster than computing. ENIAC, developed by the US Army in 1946, was the first general-purpose programmable electronic computer. ENIAC contained over 100,000 components. Since then, electronic components have become smaller and smaller. A modern laptop computer is controlled by a tiny microchip that may be etched with more than a billion components.



Modern marvel

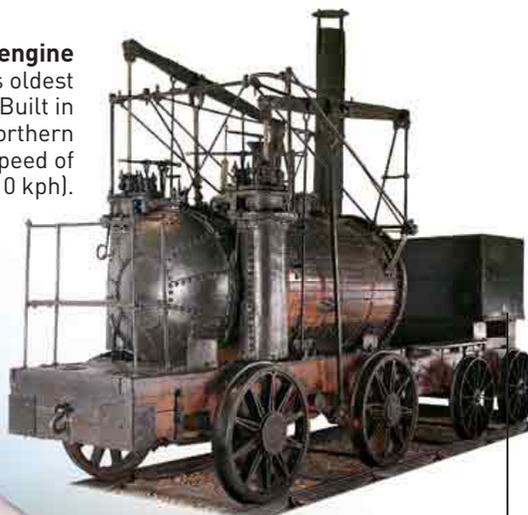
This tiny computer, just 1 mm (0.04 in) square, is implanted into the eye to help people with the disease glaucoma.

Enormous ancestor

ENIAC weighed 30 tons and occupied an entire room. Operators programmed ENIAC by plugging and unplugging cables and adjusting switches.

Early steam engine

Puffing Billy is the world's oldest surviving steam locomotive. Built in 1813 to haul coal in northern England, it had a top speed of about 6 mph (10 kph).



Coal carried in the tender was burned to heat water in the boiler and produce steam to drive the wheels.



Bullet-shaped nose enables locomotive to cut through the air more easily, increasing speed.

Infrastructure

The built and engineered systems that we rely on every day—from sewers and telecommunication networks to power lines, railroads, and roads—are collectively known as infrastructure. Without such systems, our modern way of life would be impossible.

● **First telephone exchange**

The first exchange to connect callers was built in New Haven, Connecticut, in 1878.

● **Intercity railroad**

Opened in 1830, the Manchester to Liverpool route in England was the first intercity railroad.



Ulm–Stuttgart autobahn, 1950

Germany was a pioneer of the highway, or autobahn, in the 1930s. Cars did not clog the roads until much later!

Construction

A steel-and-concrete building revolution began in the late 19th century. Frames made of steel girders allowed taller structures to be built, and the invention of reinforced concrete—concrete with steel rods set into it—introduced an amazingly strong, durable new material. Together, steel and reinforced concrete gave birth to the modern skyscraper, changing the face of the world's cities.

● **Ancient concrete**

The Romans were experts in building with concrete. It was used in the construction of the Colosseum and the Pantheon in Rome.

● **World's oldest skyscraper city?**

Shibam, in Yemen, has about 500 high-rise apartment buildings made of mud brick, most dating from the 16th century.

● **First steel-framed skyscraper**

Completed in 1885, the innovative 10-story Home Insurance Building in Chicago used a steel frame to support the walls.

● **Reinforced first**

The first skyscraper built with reinforced concrete was the 15-story Ingalls Building, in Cincinnati, Ohio, erected in 1903.



Manhattan, then and now

The Brooklyn Bridge span's New York's East River. The view across to Manhattan has changed dramatically since the bridge opened in 1883, and it now bristles with skyscrapers.

In **2011**,
Hartsfield-
Jackson, Atlanta,
averaged **184**
flights
per hour

Top 10 busiest passenger airports 2011

Around 3.2 billion air passengers passed through the world's top 100 airports in 2011—around 998 million in Europe and another 989 million in North America. The world's busiest airport, Hartsfield-Jackson International in Atlanta, Georgia, averaged 252,000 passengers per day in 2011 and handled 923,991 flights during the year.

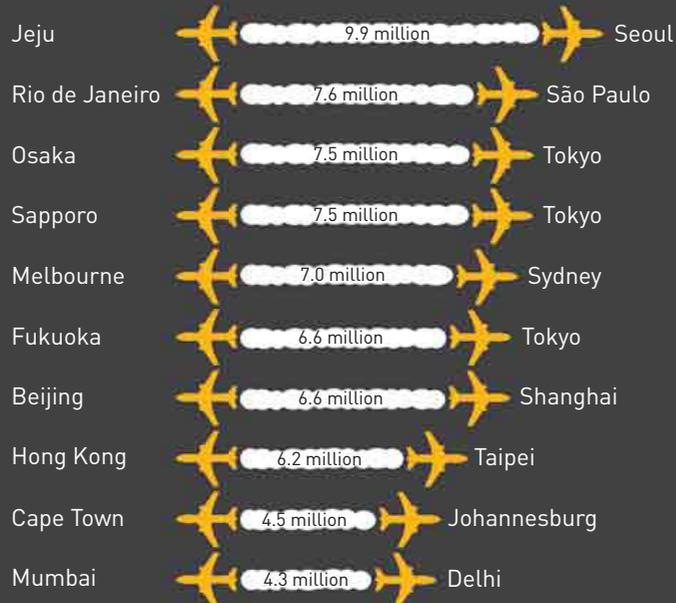
RANK	AIRPORT	PASSENGERS PER YEAR
1	Hartsfield-Jackson Atlanta International, US	92,365,860
2	Beijing Capital International, China	77,403,668
3	London Heathrow, United Kingdom	69,433,565
4	O'Hare International, Chicago, US	66,561,023
5	Tokyo International, Japan	62,263,025
6	Los Angeles International, US	61,848,449
7	Paris Charles de Gaulle, France	60,970,551
8	Dallas Fort Worth International, US	57,806,152
9	Frankfurt, Germany	56,436,255
10	Hong Kong International, China	53,314,213

Air traffic

Air-traffic controllers have a tough job ensuring safe routes, takeoffs, and landings for the thousands of planes that crisscross our skies each day. This map shows nearly 6,000 routes carrying scheduled commercial traffic.



PASSENGERS PER YEAR



Important airline routes

The map of the world's air traffic resembles a vast spider web, with routes connecting the main financial, commercial, and industrial centers and the most populated regions. The chart shows the most popular routes, by passenger numbers, in 2011.

SHIPPING ROUTES

The map shows the main shipping routes of the world and how busy they are. It is based on information from a 2007 study by scientists who used GPS technology to monitor the journeys of 16,363 cargo ships over a year.

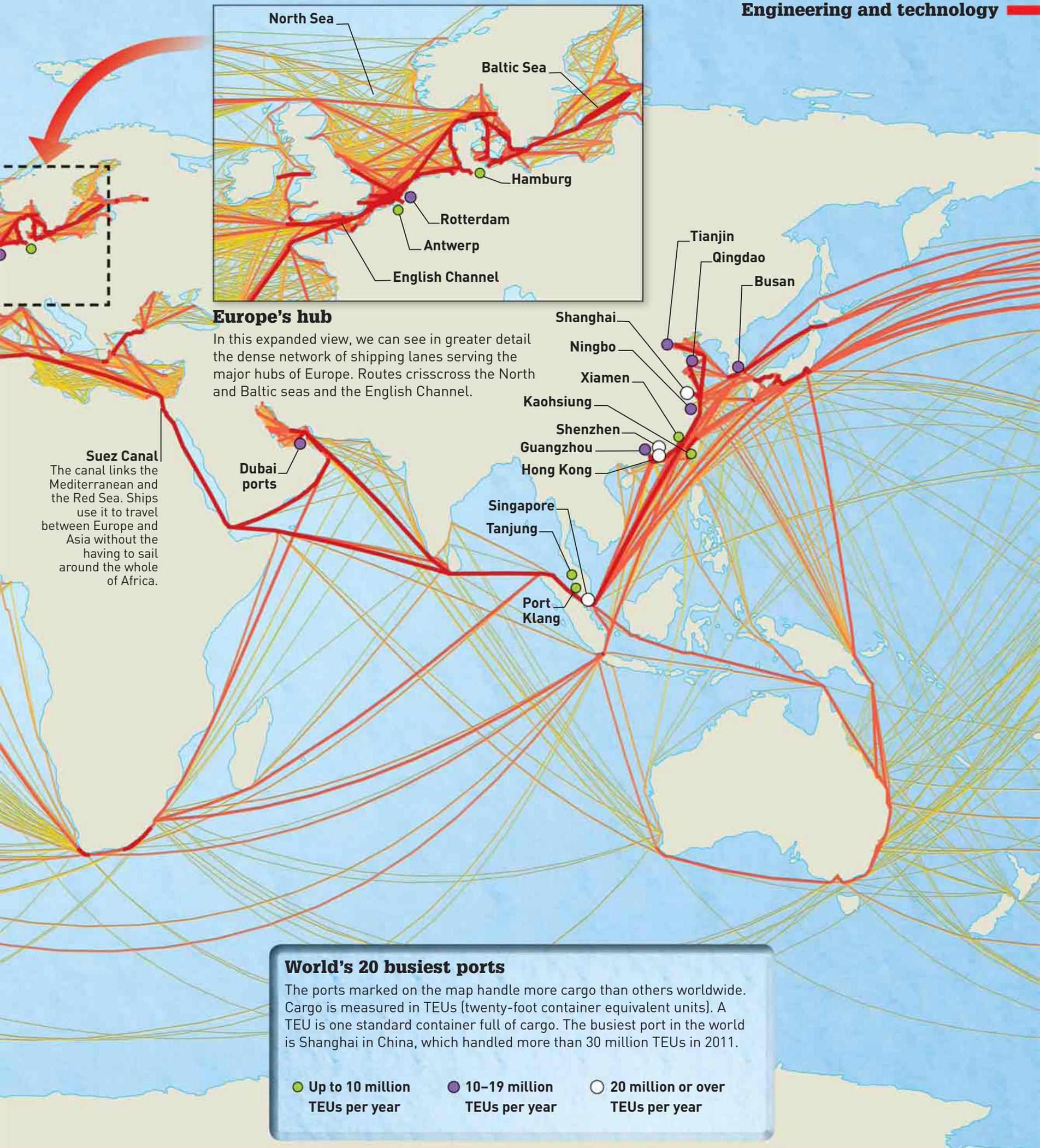
- Over 3,000 journeys
- 1,001–3,000
- 501–1,000
- 101–500
- 25–100
- Fewer than 25



Shipping

Most countries need to sell the goods they produce and buy in the things they need. Shipping plays an essential role in world trade, carrying food, fuel, chemicals, and manufactured goods between markets.

More than **90 percent** of **global trade** is **carried by sea**



Railroads

In the early 19th century, railroads began to change the world radically by opening up new opportunities for travel and trade. Today, with roads gridlocked by traffic, modern railroads are making a comeback.

EN453 (France to Russia)
A trans-European train connecting Paris and Moscow over 2,060 miles (3,315 km).

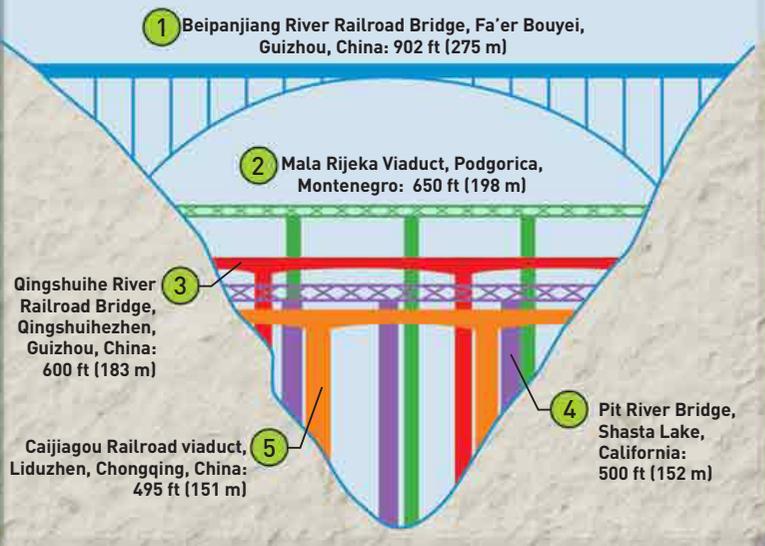
The Canadian (Canada)
Spectacular 2,775-mile (4,466-km) route between Vancouver and Toronto, traveling through mountains, prairies, and lakeland.

California Zephyr (US)
Follows the route of the first US transcontinental railroad (completed in 1869) from San Francisco to Chicago.

Salta to Antofagasta (Chile to Argentina)
At 585 miles (941 km), this is the longest main line in South America.

Highest railroad bridges

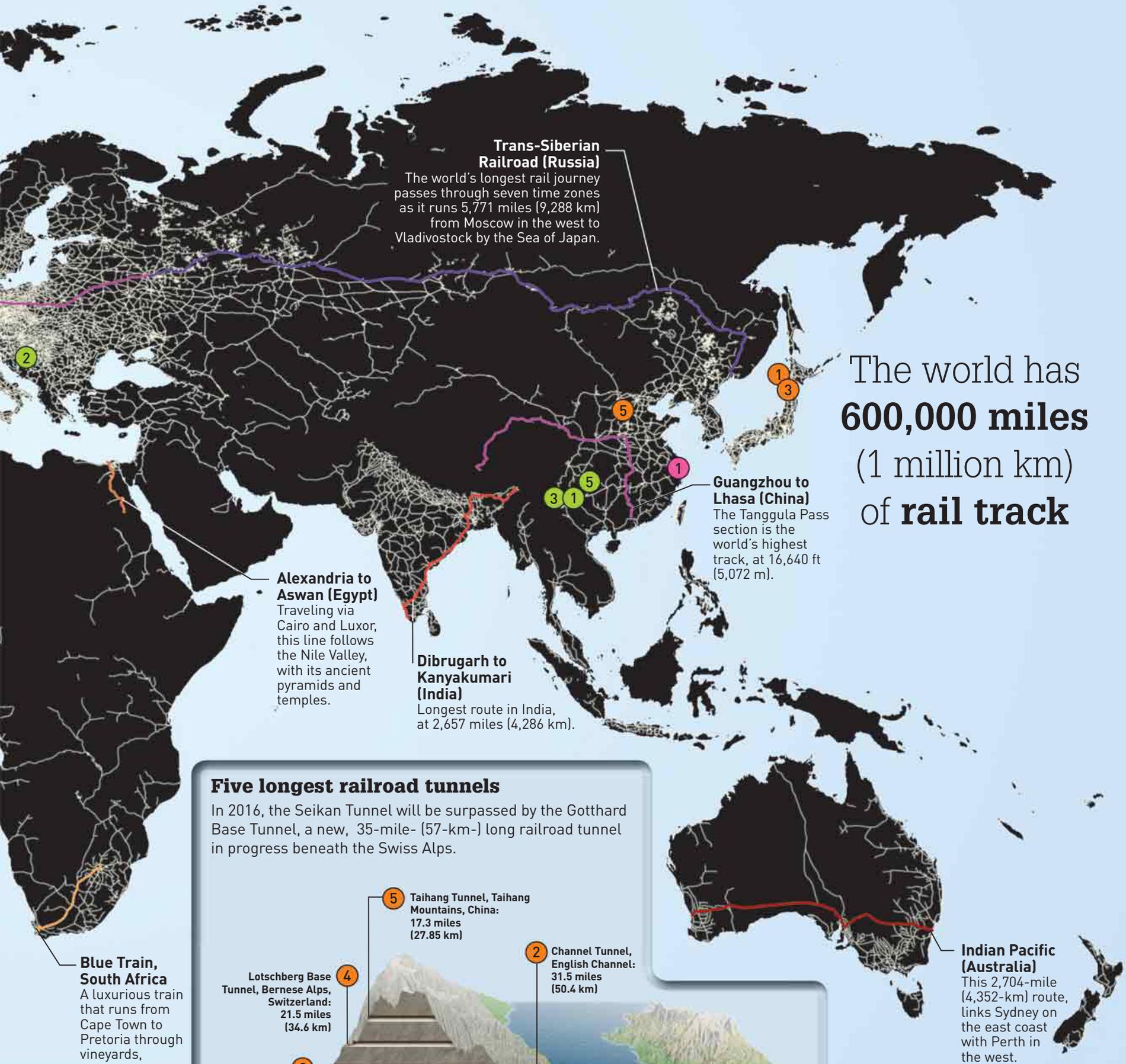
Completed in 2001, the Beipanjiang River Railroad Bridge will lose its title of "world's highest railroad bridge" when India's 1,178-ft- (359-m-) high Chenab River Bridge opens in 2017.



World's fastest trains

Shanghai's Maglev has no wheels but hovers over the track and is propelled by magnets. It runs for just 19 miles (30 km). The other high-speed contenders listed here travel on long-distance routes.





The world has **600,000 miles** (1 million km) of **rail track**

Five longest railroad tunnels

In 2016, the Seikan Tunnel will be surpassed by the Gotthard Base Tunnel, a new, 35-mile- (57-km-) long railroad tunnel in progress beneath the Swiss Alps.



Dempster Highway Extension

An ice road built on the frozen Mackenzie River and Arctic Ocean, it provides a winter route to the isolated community of Tuktoyaktuk.

Mountain roads and passes

1 Trollstigen, Norway

This dramatic road's name means "Trolls' ladder." It has 11 hairpin bends, which wind up the steep mountainside.

2 Stelvio Pass, Italy

One of the highest roads in the Alps, its 60 hairpin bends provide a challenge for both drivers and cyclists.

3 Khardung La, India

This famously high mountain pass in the Ladakh part of Kashmir was built in 1976 and opened to vehicles in 1988.

4 Semo La, Tibet, China

Possibly the highest vehicle-accessible pass in the world, it was reliably measured in 1999 at 18,258 ft (5,565 m).

5 Irohazaka Winding Road

Each of the 48 hairpin turns on this route in Japan is labeled with one of the 48 characters of the Japanese alphabet.

Bonn-Köln Autobahn

Built in 1932, it was the first road designed exclusively for cars, with separate highways and no intersections with other roads.

Cabot Trail

Looping round the northern tip of Cape Breton Island, Nova Scotia and named after 16th-century English explorer, John Cabot.

Tibbit to Contwoyto Winter Road

An ice road built over frozen lakes, it is open for about 10 weeks from late January each year.

Pacific Coast Highway

This world-famous route hugs the California coast from Orange County in the south to the forests of giant redwood trees in the north.

Route 66

A 2,448-mile (3,940-km) road that follows the historic route taken by migrants to California during the Great Depression.

Natchez Trace Parkway

A route used by Native Americans and their animals for thousands of years before the modern road was built.

Darién Gap, Panama

A stretch of rain forest that breaks the Pan-American Highway's route.

Pan-American Highway

About 29,800 miles (48,000 km) long, it runs through 18 countries, from Alaska to the southern tip of Argentina.

Yungas Road, Bolivia

A single-track mountain road heavily used by lorries but with unprotected sheer drops of 1,800 ft (600 m). Up to 300 travelers are killed on the route every year.

World's busiest roads

1 Kings Highway 401, Canada

The busiest highway in North America—more than 440,000 vehicles pass through the Toronto section every day. It is also one of the widest in the world—some sections of the route have 18 lanes.

2 Santa Monica Freeway, US

Runs from the city of Santa Monica to Los Angeles. It was the world's busiest road until 1993, when the Century Freeway was built a few miles to the south. This reduced traffic and congestion on the freeway, although it still carries up to 329,000 vehicles a day.



KINGS HIGHWAY 401, ONTARIO, CANADA

Roads

The planet is now more accessible by road than it has ever been. There are about 120 million miles (193 million km) of road on Earth, from multilane urban highways to seasonal ice roads made from frozen lakes and seas.



Estonian Islands

Ice roads between islands and the mainland are only opened to traffic when the ice is 9 in (22 cm) thick along the whole route.

Siberia

Siberia has few permanent roads, partly because it is so difficult to build stable foundations on the permafrost soil.

Road of Bones

The M56 Kolyma Highway passes through the coldest inhabited places on Earth, with winter temperatures dropping below -58° F (-50° C).

Karakoram Highway

One of the world's highest roads at an altitude of 15,397 ft (4,693 m), it connects China and Pakistan.

The **George Washington Bridge** in New York carries **106 million vehicles every year**

Garden Route

Runs along the South African coast from Cape Town to Port Elizabeth.

Record road bridges

1 Millau Viaduct

This French bridge is the tallest in the world. One mast is 1,125 ft (343 m) tall—taller than the Eiffel Tower.

2 Sidu River Bridge

With the road 1,627 ft (496 m) above the floor of the Sidu River gorge in China, this is the world's highest bridge.

3 Bang Na Expressway

This 34-mile- (55-km-) long six-lane elevated highway in Thailand is the world's longest road bridge.

4 Jiaozhou Bay Bridge

The world's longest road bridge crossing water, it is supported by 5,238 massive concrete pillars.

5 Lake Pontchartrain Causeway

Two parallel bridges 24 miles (38 km) long, near New Orleans, Louisiana.

6 Akashi-Kaikyō Bridge

The world's longest suspension bridge, it has 190,000 miles (300,000 km) of steel cables and connects two Japanese islands.

Great Ocean Road

Following a beautiful seaside route, this road is a memorial to the Australians who died in World War I.

Milford Road

Meanders in the stunning scenery of New Zealand's Milford Sound.

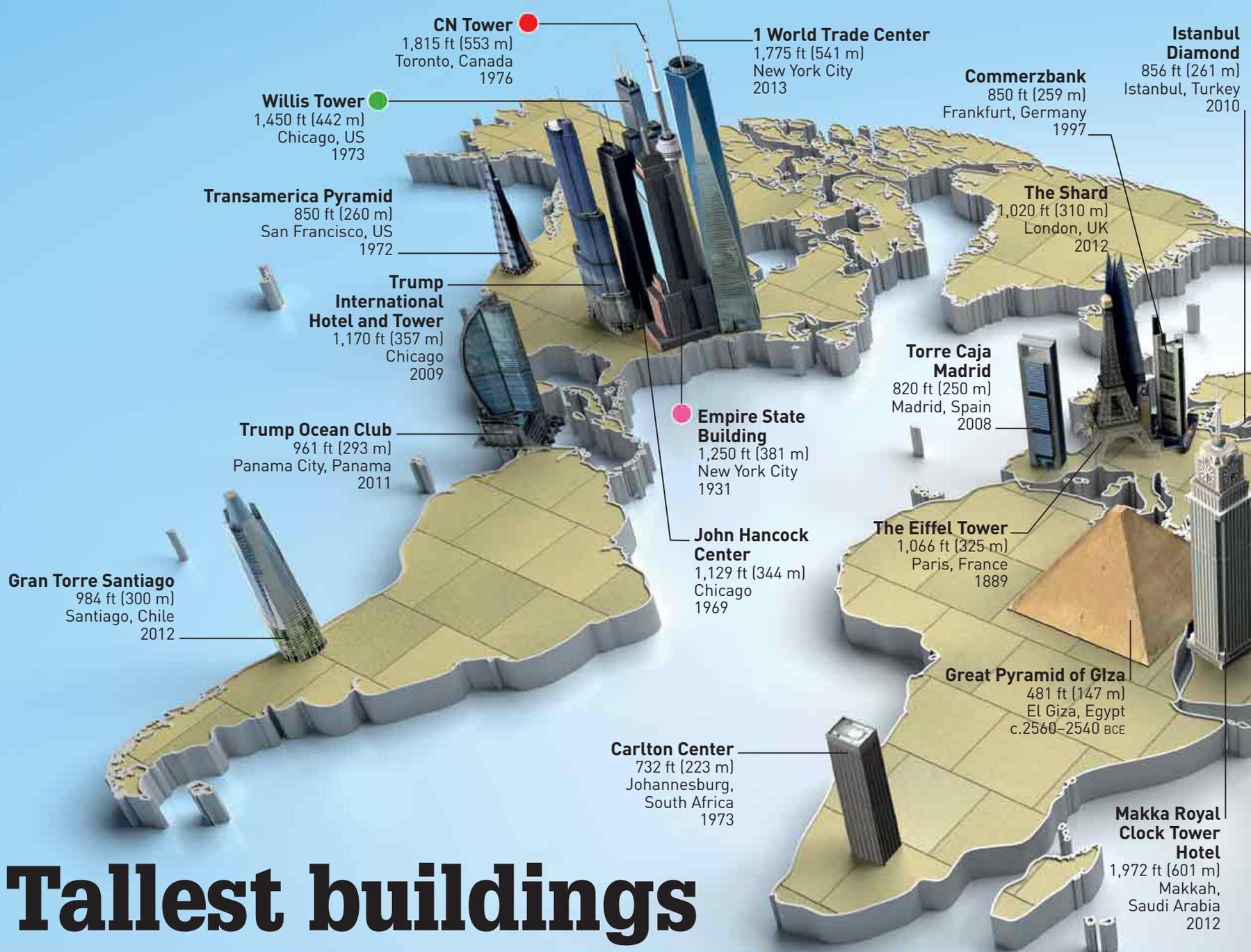


MILLAU VIADUCT, FRANCE

KEY

Roads can be paved (covered stones, brick, concrete, tarmac, or another hard surface), or unpaved. Paving makes a road more durable and weatherproof.

- Famous roads
- Scenic routes
- Ice roads

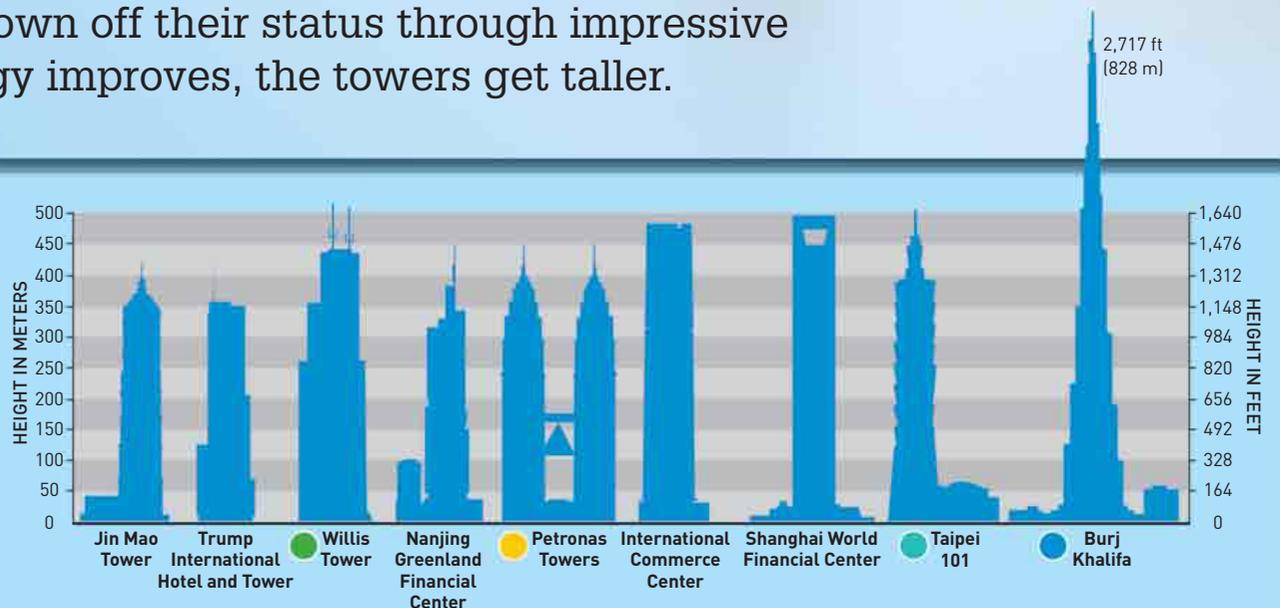


Tallest buildings

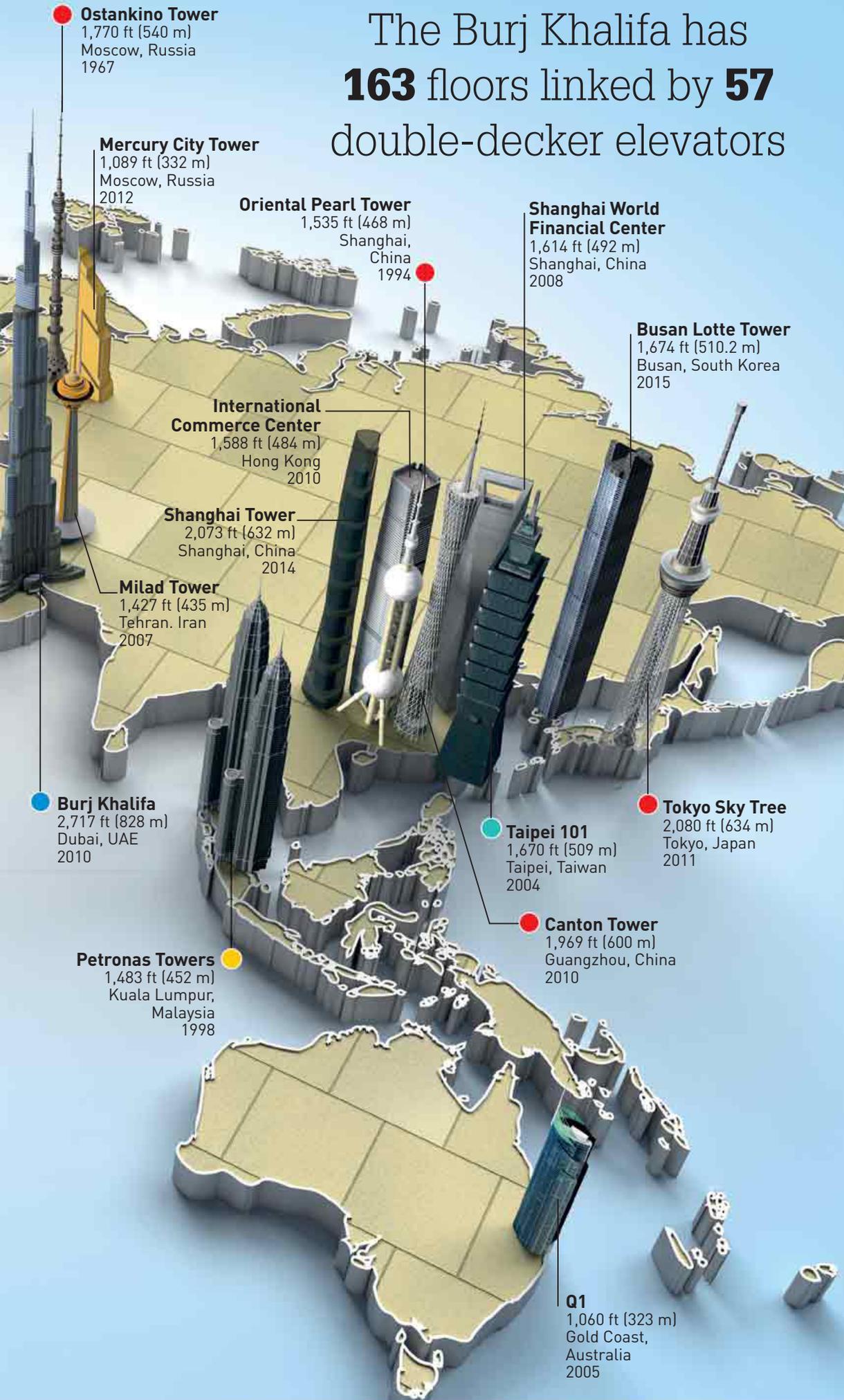
From ancient pyramids to today's hi-tech hotels, powerful people have always shown off their status through impressive buildings. As technology improves, the towers get taller.

Tallest buildings, 2012

To be called a building, a tower must be inhabitable (offices or homes). Buildings do not include "supported structures" such as guyed (tethered) masts. Buildings may be measured to their architectural top, as they are on these pages, or to the tip of any masts or antennas.



The Burj Khalifa has **163** floors linked by **57** double-decker elevators



Unsupported towers

Unlike buildings, these structures don't contain offices, homes, or stores. They are observation and communications towers.

- **Tokyo Sky Tree**
This communications tower overtook the Canton Tower in 2011 to become the world's tallest.
- **Canton Tower**
Canton is the former name of Guangzhou, where this tower was completed in 2010.
- **CN Tower**
More than 2 million people visit this tower's glass-floored observation deck every year.
- **Ostankino Tower**
This broadcasting tower was the world's first free-standing structure over 1,640 ft (500 m) tall.
- **Oriental Pearl Tower**
There are 11 spheres in the design of this TV tower, which has 15 observation levels.

Record-breaking buildings

The record for the tallest building (a structure that must be inhabitable) is a fiercely contested prize. These five have all won it.

- **Burj Khalifa, 2010–present**
This building has broken all records, including the tallest building and tallest unsupported structure.
- **Taipei 101, 2004–10**
The world's tallest building until the Burj Khalifa was built, Taipei 101 has 101 floors above ground.
- **Petronas Towers, 1998–2004**
These office blocks were the tallest buildings until 2004. They are still the tallest twin towers.
- **Willis Tower, 1973–98**
Formerly known as the Sears Tower, this 108-story skyscraper is the US's tallest.
- **Empire State Building, 1931–72**
This was the first building in the world to have more than 100 stories—it has 102. It was the tallest building for 40 years.

Internet connections

The Internet has revolutionized the way we live our lives. At the click of a mouse, we can instantly exchange news, ideas, and images with people on the other side of the world, and we can buy or sell goods without having to leave our homes.

The Internet in a minute

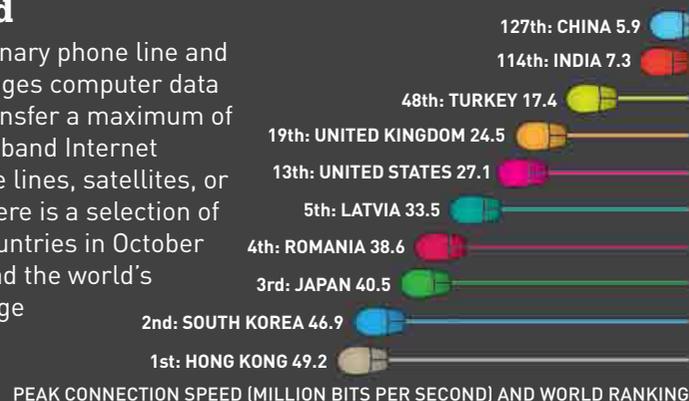
Today, there are as many computers, phones, and other devices connected to the Internet as there are people in the world. As a result, an incredible amount of Internet activity can occur in just one minute.



By **October 2012**,
there were at least
8.47 billion web pages

Internet connection speed

Internet connections that use an ordinary phone line and a device called a modem (which changes computer data into sounds for transmission) can transfer a maximum of 57,344 bits of data per second. Broadband Internet connections provided by digital phone lines, satellites, or fiber-optic cables are much faster. Here is a selection of the broadband speeds in different countries in October 2012. Internet users in Hong Kong had the world's fastest broadband, with a peak average download speed of over 49 million bits per second.



A web of connectivity

The map shows how the world's cities are connected by the Internet—the brighter the area, the more connections there are. Connections are not the same as users. Many people, for example, use a single connection in an Internet café.

— Lines represent Internet connections between cities

Satellites and space junk

The first satellite, Sputnik 1, was launched by the Soviet Union in 1957. Since then, thousands of satellites and millions of other objects have accumulated around Earth, creating a serious hazard for space travel.

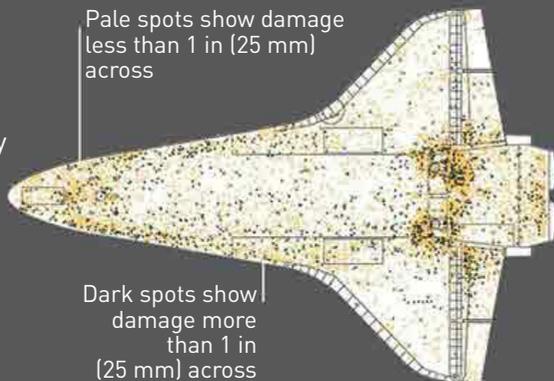
Geosynchronous ring

This ring-shaped concentration of satellites appears more than 22,200 miles (35,000 km) above the Earth's equator. It exists because it is extremely useful for a satellite to "hover" above a point on Earth's turning surface.

High-speed danger

The pattern of spots shows the strikes collected during the entire NASA Space Shuttle program, from 1983–2002. The vast majority of space debris is less than ½ in (1 cm) across and includes specks of solid rocket fuel and flakes of paint. But even dust acts like tiny bullets at speeds of up to 26,000 mph (42,000 kph).

Pale spots show damage less than 1 in (25 mm) across



Dark spots show damage more than 1 in (25 mm) across

At least **10 million** pieces of artificial debris are now in **Earth orbit**

KEY
The image shows 12,000 objects monitored by the ESA Space Debris team by radar and telescopes.

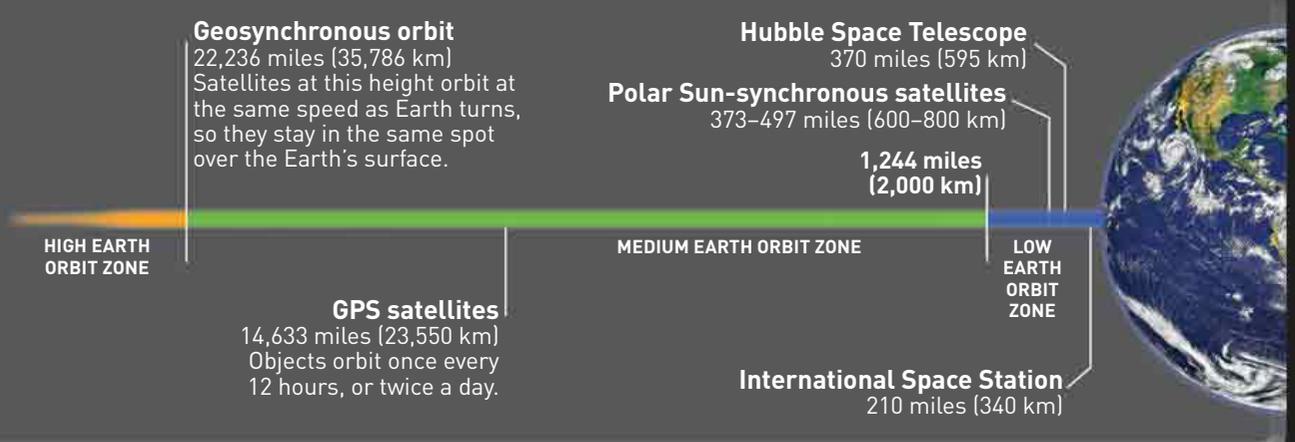
-  **Satellites—mostly dead. Around 950 operational**
-  **Spent rockets**
-  **Mission waste (nuts, gloves, lost items)**
-  **Debris from explosions and collisions**

Low Earth Orbit
This region is full of orbiting spacecraft, but also full of waste material ejected from spacecraft during missions and countless pieces of debris from collisions.

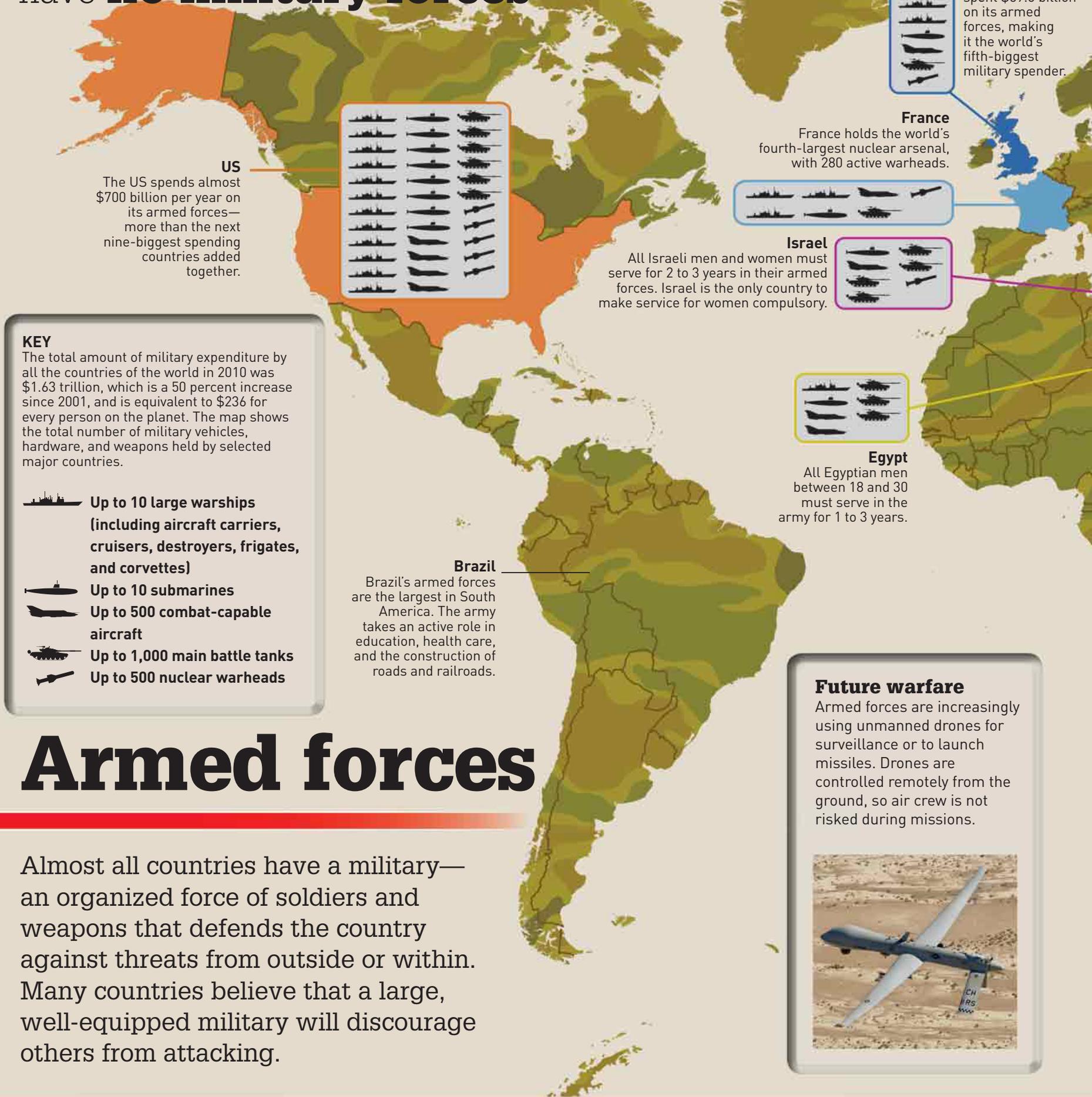
GPS (Global Positioning System) satellite
One of 31 forming a network, the GPS satellites orbit in one of six orbits. Each orbit is at a different angle to ensure they cover the entire surface of Earth. Someone on the ground is in contact with at least six of them at any one time.

How high are satellites?

Most objects launched into space are in Low Earth Orbit (LEO). At the lowest LEOs (100 miles / 160 km) objects circle Earth in 90 minutes at 17,900 mph (28,800 kph). Certain orbits are particularly useful. Image-taking satellites use polar Sun-synchronous orbits, which pass the equator at the same local time on every pass, so the shadows are the same.



A few **countries**, such as **Liechtenstein** and **Costa Rica**, have **no military forces**



US
The US spends almost \$700 billion per year on its armed forces—more than the next nine-biggest spending countries added together.



UK
In 2010, the UK spent \$59.6 billion on its armed forces, making it the world's fifth-biggest military spender.

France
France holds the world's fourth-largest nuclear arsenal, with 280 active warheads.



Israel
All Israeli men and women must serve for 2 to 3 years in their armed forces. Israel is the only country to make service for women compulsory.



Egypt
All Egyptian men between 18 and 30 must serve in the army for 1 to 3 years.



Brazil
Brazil's armed forces are the largest in South America. The army takes an active role in education, health care, and the construction of roads and railroads.

KEY
The total amount of military expenditure by all the countries of the world in 2010 was \$1.63 trillion, which is a 50 percent increase since 2001, and is equivalent to \$236 for every person on the planet. The map shows the total number of military vehicles, hardware, and weapons held by selected major countries.

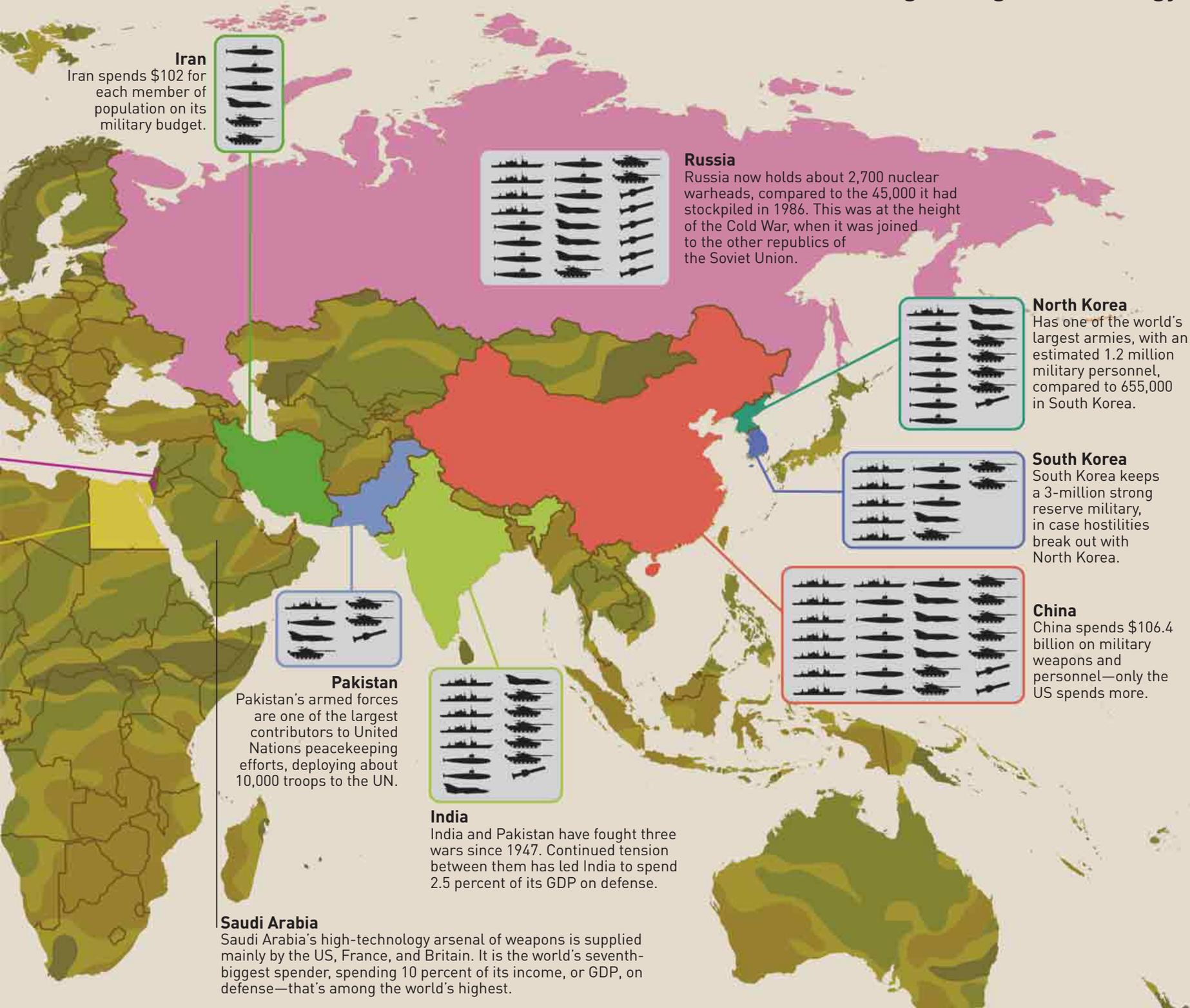
-  Up to 10 large warships (including aircraft carriers, cruisers, destroyers, frigates, and corvettes)
-  Up to 10 submarines
-  Up to 500 combat-capable aircraft
-  Up to 1,000 main battle tanks
-  Up to 500 nuclear warheads

Armed forces

Almost all countries have a military—an organized force of soldiers and weapons that defends the country against threats from outside or within. Many countries believe that a large, well-equipped military will discourage others from attacking.

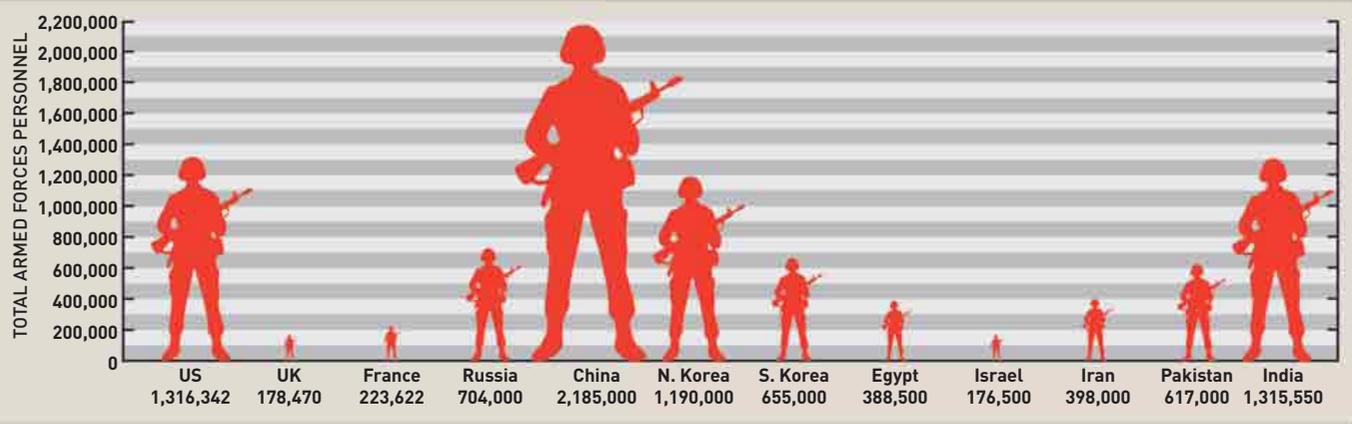
Future warfare
Armed forces are increasingly using unmanned drones for surveillance or to launch missiles. Drones are controlled remotely from the ground, so air crew is not risked during missions.





Military personnel

China commands the world's largest military force of more than 2 million—but this is only just over three in every thousand people. In North Korea, a massive one-fifth of males age 17–54 are in the regular armed forces.



CONTRIBUTES 44 PERCENT OF ITS TOTAL MILITARY SPENDING.





History

Easter Island statues

The giant statues, or *moai*, on this small Pacific island stand up to 33 ft (10 m) tall. They were carved with stone tools, mainly between 1250 and 1500, by the Polynesian people who settled the island.

Introduction

Human history is crammed full of incident, from civilizations rising and falling, as wars are fought and lost, to revolutions sweeping away the past to begin again. There has also been great architecture and many important innovations, from the first stone tools that enabled people to hunt animals to radio telescopes that can “see” into deep space.



c. 200,000 years ago
Modern humans
The *Homo sapiens* species (modern humans) evolves in east Africa.

c. 2.4 million years ago
Earliest tools
The first stone tools are made by *Homo habilis*, an early human species.

c. 100,000 years ago
Jewelry
Early people wear jewelry made from shell beads.

1227
Genghis Khan
At the death of its Mongol leader Genghis Khan, the Mongol Empire stretches across northern Asia.

1095–1272
The Crusades
Nine wars as Christian and Muslim armies fought to control Jerusalem.

1200
Holy Roman Empire
The “superpower” of the Middle Ages, covering much of central Europe.

900
Khmer dominance, Asia
With their capital at Angkor, the Khmers ruled over a large part of Southeast Asia.

1235
Battle of Kirina, Africa
Mandinka forces defeat the Sosso, leading to the birth of the Mali Empire.

1325
Templo Mayor, Mexico
Human sacrifices are made at this temple in the Aztec capital city of Tenochtitlan.

1300
Kanem Empire, Africa
Located north of Lake Chad, Kanem grew powerful and wealthy through its control of trade.

1350
Kingdom of Zimbabwe
The capital of this southern African kingdom was Great Zimbabwe, a stone-walled city.



1949
Chinese Revolution
Led by Mao Zedong, Chinese Communists take power after a long civil war.

1947
Indian Independence
After a largely nonviolent rebellion, India wins its independence from Britain.

1945–1954
First Indochina War
Indochina (Vietnam, Cambodia, and Laos) wins independence from France.

1939–1945
World War II
Allied forces (Britain, France, US, USSR, and others) at war with Germany, Japan, and Italy.

1950–1953
Korean War
Civil war: China and the USSR help North Korea, the United Nations helps South Korea.

1965
Indo-Pakistani War
Conflict between India and Pakistan over the disputed region of Kashmir.

1955–1975
Vietnam War
Communist North Vietnam triumphs over South Vietnam, which is aided by US forces.

1969
Concorde
The world’s first supersonic airliner, the Concorde, flies for the first time.



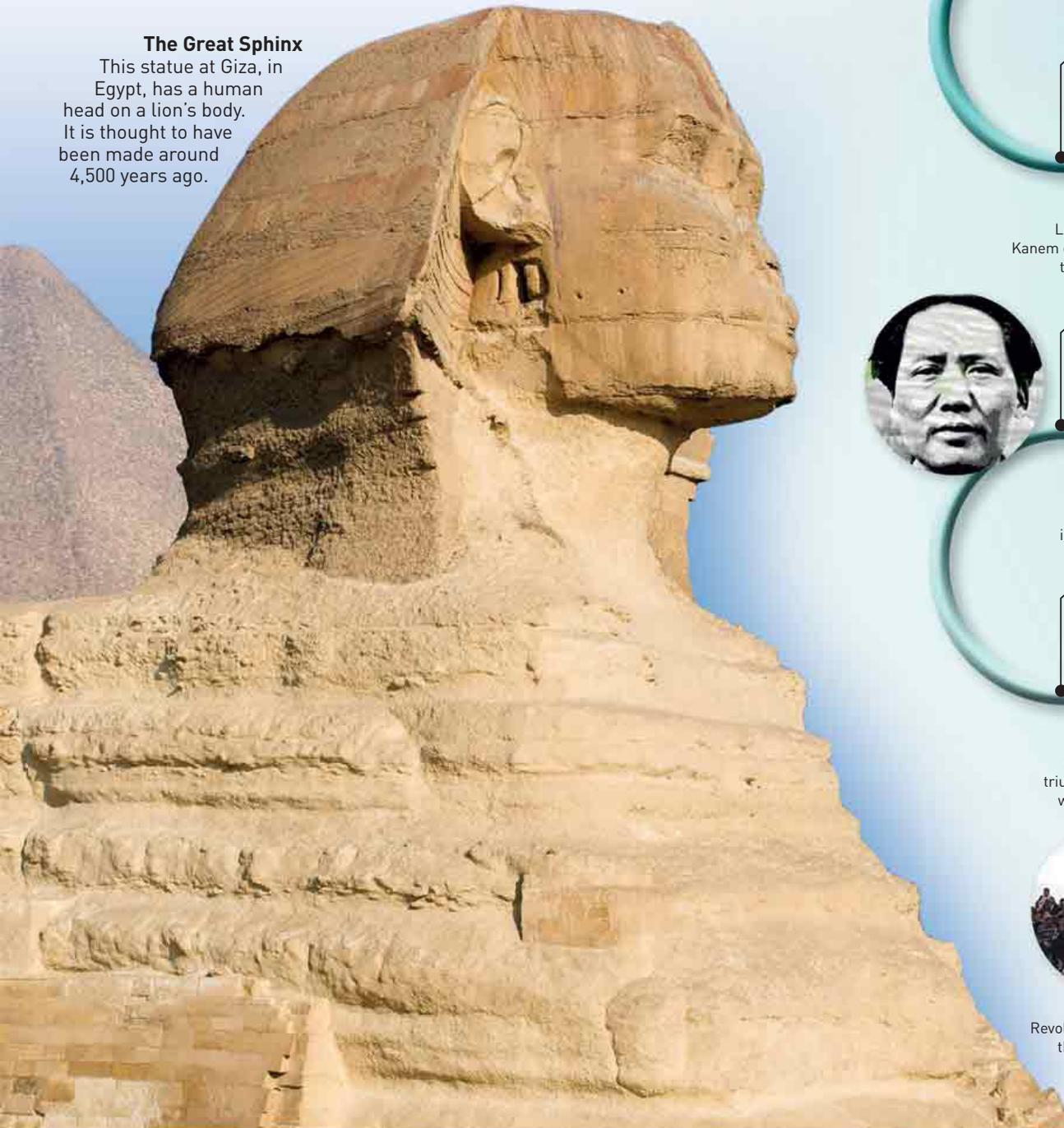
2011
“Arab Spring”
Revolution and protest sweep through Egypt, Libya, and other Arab countries.

2011
World’s longest bridge, China
Completion of the 102.4-mile- (164.8-km-) long Danyang-Kunshan Grand Bridge.

2008
Large Hadron Collider
This huge scientific instrument is designed to detect subatomic particles.

The Great Sphinx

This statue at Giza, in Egypt, has a human head on a lion’s body. It is thought to have been made around 4,500 years ago.



c. 90,000 years ago
Burial rites
People begin burying their dead along with meaningful objects, such as beads.

c. 3200 BCE
Pirámide Mayor, Peru
Built by the Norte Chico civilization at Caral, the most ancient city in the Americas.

1450 BCE
New Kingdom of Egypt
Egypt's empire stretches north to Syria and south to Nubia (modern Sudan).

490 BCE
First Persian Empire
Persia rules territory from the edge of India to Egypt and Greece, linking East with West.

265 BCE
Mauryan Empire, Asia
Under Ashoka, the Mauryan Empire extends over almost all of the Indian subcontinent.

c. 40,000 years ago
First music and art
Music is played on simple flutes, and figurines are carved from stone.

c. 2589–2500 BCE
Pyramids of Giza, Egypt
Vast tombs built for the Egyptian pharaohs Khufu, Khafre, and Menkaure.

c. 700 BCE
Olmec civilization
Mexico's Olmec culture reaches its peak. It will influence the later Mayan and Aztec cultures.

323 BCE
Macedonian Empire
King Alexander the Great of Macedonia rules lands from Greece to the edge of India.

264–146 BCE
Punic Wars
Three wars between Rome and Carthage, North Africa. Rome emerges victorious.

750
Umayyad Caliphate
The second of four great Islamic dynasties, with its capital in Damascus (Syria).

650
Huari Empire, Peru
The highly organized Huari, in Peru, conquer and control much of the Andean region.

c. 300 CE
Mayan culture, Central America
Established by 1000 BCE, Mayan civilization is now at its height. It will last until 1697 CE.

100 CE
Pyramid of the Sun, Mexico
One of two huge stepped pyramids at the center of the city of Teotihuacán.

87 BCE
Han Dynasty, China
A time of prosperity in China and an expansion of territories ruled by China.

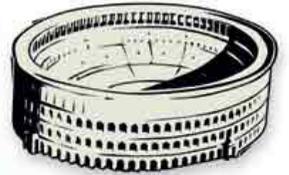
700
Tihuanaco, Peru/Bolivia
This strong state is centered on a bustling city beside Lake Titicaca in the Andes.

555
Byzantine power
Byzantine rule extends over the North Africa and the eastern part of the old Roman Empire.

117 CE
Roman supremacy
Rome now controls much of Europe, North Africa, and the Middle East.

80 CE
Colosseum, Rome
Opening of the stadium in Rome where gladiators fought to the death.

214 BCE
Great Wall of China
Construction begins of this vast defensive wall along China's northern border.



Colosseum, Rome



1450
Machu Picchu, Peru
A secret hilltop city of the Incas, who will dominate northern South America.

1453
Fall of Constantinople
The capital of the Byzantine Empire falls to invading Muslim Ottoman forces.

1500
Songhai power, Africa
The Songhai control the Niger Valley, west to Senegal and east to Agades (modern Niger).

1532
Battle of Cajamarca, Peru
Spanish invaders defeat the Inca forces of Atahualpa, leading to 300 years of Spanish rule.

1683
Battle of Vienna
Ottoman expansion finally halts with a defeat by the Holy Roman Empire.

1500
Ming Dynasty, China
After throwing out the Mongols, China restores its culture and expands its borders.

1519
Aztec rule, Mexico
The Aztecs now rule over 25 million people. In 1521, they are conquered by the Spanish.

1642–1651
English Civil War
Parliamentarians defeat Royalists, leading to the execution of King Charles I.

1690
Mogul Empire, India
Under Aurangzeb, the Islamic Mogul Empire of India is at its most powerful.

1922
Height of British Empire
Britain's empire now covers more than 20 percent of the world's land area.

1914–1918
World War I
Britain, France, the US, and other allies battle Germany, Austria-Hungary, and Turkey.

1880–1902
Boer Wars, Africa
Two wars between Dutch Boer settlers in South Africa and Britain.

1819–1830
South American independence
Independence from Spain for Colombia, Peru, Bolivia, Ecuador, and Venezuela.

1789–1799
French Revolution
Overthrow of the French monarchy in a bloody revolution. France becomes a republic.

1917
Russian Revolution
Revolt against rule by Czar Nicholas II; Russia becomes Communist.

1912
Sinking of the Titanic
Over 1,500 people die when this luxury liner hits an iceberg and sinks.

1861–1865
American Civil War
War between the Southern Confederate states and the Union states of the North.

1799–1815
Napoleonic Era
France, led by Napoleon Bonaparte, is the dominant military power in Europe.

1775–1783
Revolutionary War
With the help of France and other countries, the US wins independence from Britain.

1980
Very Large Array
Completion of this radio astronomy observatory in New Mexico.



1994
End of Apartheid
Equality for black South Africans and end of official segregation policy, Apartheid.

1989–1991
End of Communist bloc
Communist regimes in many countries of Eastern Europe are overthrown.



Sydney Opera House
Opened in 1973, this arts venue in Sydney, Australia, was designed by Danish architect Jørn Utzon.

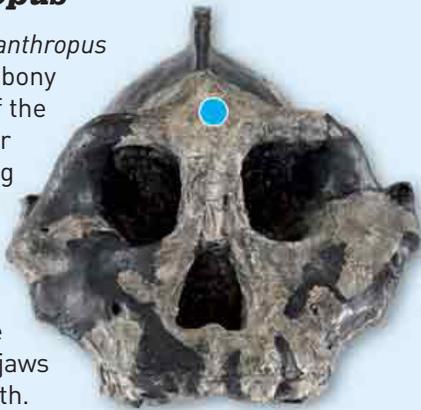
Australopithecus



Australopithecus hominins evolved about 4.2 million years ago in east Africa. Six species are known. One species, called *A. afarensis*, may be the ancestor of humans. Fossils show that it was up to 5 ft (1.5 m) tall and had a relatively small brain. Crucially, it could walk upright.

Paranthropus

The three *Paranthropus* species had a bony crest on top of the skull to anchor strong chewing muscles. *P. boisei* is nicknamed “nutcracker man” because of its massive jaws and cheek teeth.



Neander Valley, Germany

A partial skeleton of *H. neanderthalensis* found in a cave here in 1856 was the first fossil to be identified as human remains.

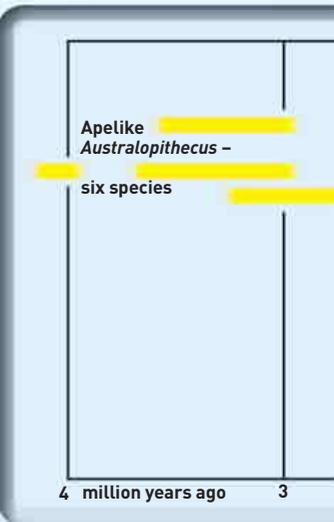
Fossil humans

Fossil discoveries have helped scientists to piece together the story of human evolution. Modern humans—*Homo sapiens*—and their ancestors are called hominins. *Sahelanthropus tchadensis*, the first hominin, was an apelike animal that appeared in Africa about 7 million years ago. Later hominin species left Africa and spread out around the world.

Laetoli, Tanzania
Footprints of at least two *Australopithecus afarensis* individuals were discovered here preserved in volcanic ash.

Olduvai Gorge, Tanzania
Stone tools and fossils of *P. boisei* and *H. habilis* were found here.

South Africa
Finds include *Australopithecus*, *Paranthropus*, *H. habilis*, and *H. sapiens* fossils.





Homo—meet the family



We and our extinct relatives belong to the *Homo* genus. A second Latin word, such as *sapiens*, completes each species' name.

Zhoukoudian Caves, China

Some of the most important fossils of *H. erectus* were found in these limestone caves 30 miles (50 km) from Beijing.

Java, Indonesia

The earliest known human fossils in East Asia—of *Homo erectus*—come from this island.

Flores, Indonesia

H. floresiensis remains are known from just one cave on this island.

Homo habilis
 (2.4–1.6 million years ago)
H. habilis (“Handy man”) is thought to have been the first hominin species to make stone tools.



Homo georgicus
 (1.8 million years ago)
 Known from one fossil site in the country of Georgia, this was likely the first hominin to leave Africa.



Homo ergaster
 (1.9–1.5 million years ago)
 As tall as modern humans and with a similar build, it looked very different from its apelike ancestors.



Homo erectus
 (1.8 million–30,000 years ago)
 Along with *H. ergaster*, *H. erectus* (“Upright man”) is known to have used stone hand-axes.



Homo antecessor
 (1.2 million–500,000 years ago)
 Around 780,000 years ago, *H. antecessor* became the first hominin to reach western Europe.



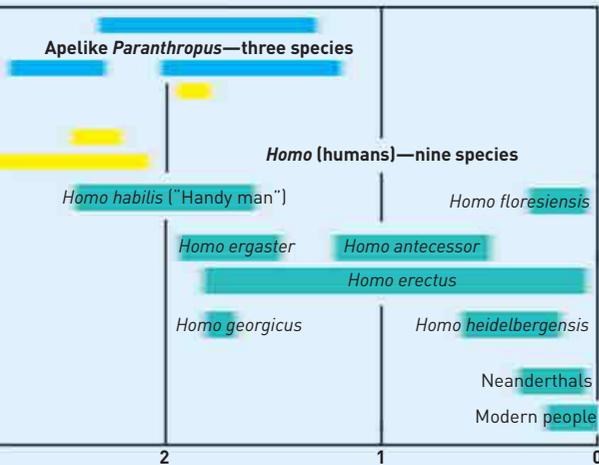
Homo heidelbergensis
 (600,000–200,000 years ago)
 With a big brain and a muscular body, this species could hunt large animals and make complex tools.



Homo floresiensis
 (95,000–17,000 years ago)
 Nicknamed “Hobbit,” *H. floresiensis* was tiny—just over 3 ft 3 in (1 m) tall. It lived until very recently.



***Homo neanderthalensis*, or Neanderthals**
 (350,000–28,000 years ago)
 This successful species was skilled at hunting, buried its dead, and knew how to use pigments.



Family tree

This chart shows the “family tree” of hominins from *Australopithecus* onward. Scientists are still working to understand the relationships between different hominin species.

Prehistoric culture

Music, art, religion, and technology all began so long ago, we can't be certain of exactly when.

There are clues to early culture, however, such as ritual burial sites, which archeologists can date.

Earliest music

Music, like art, is far older than writing, since bone flutes and other musical instruments have been made and played for more than 40,000 years.

◆ Early instrument site

Antler flute, Hohle Fels, Germany, 43,000 years ago

First jewelry

People wore jewelry more than 100,000 years ago in sites as distant as Israel and South Africa.

◆ Early jewelry site



Shell beads, Balzi Rossi, Italy

Changes in stone tools



2.4 million years ago

The earliest tools, called the Oldowan toolkit, were made by an early human species called "Handy Man," or *Homo habilis*, in Africa. Oldowan-style tools in Europe and Asia are much younger, made by later types of humans, including Neanderthals.

● Oldowan site



1.8 million years ago

The Acheulean toolkit of our later ancestors, such as *Homo erectus*, included a new invention—the hand ax, with a finely chiseled edge.

● Acheulean site



300,000 years ago

Moustertian tools spanned the Middle Stone Age (ended around 30,000 BCE) and included lots of specialized shapes for different jobs.

● Moustertian site



12,000 years ago

The earliest stone tools discovered in America are from the 12,000-year-old "Clovis" people.

● Clovis site

Serra de Capivara paintings, Brazil ◆

◆ Cueva de las Manos paintings, Argentina

● Cueva del Milodon, Chile

Wicklow Pipes, Ireland ◆
 Shell bead necklace, Cro-Magnon, France ◆
 Lascaux Caves, France ◆
 Altamira and El Castillo caves, Spain. El Castillo features the oldest known paintings, made 40,000 years ago, possibly by Neanderthals ◆
 Lady of Brassempouy carving, France ◆
 Ivory horse figurine, Lourdes, France ◆
 Shell beads, Grotte des Pigeons, Morocco ◆
 Algerian Sahara ◆

The oldest known clay pots were made in China about 20,000 years ago



Earliest burials

Our ancestors began burying their dead with meaningful objects, such as beads or other decorations, at least 90,000 ago.

◆ Early burial site



Sungir Graves, Russia, 28,000 years ago

Earliest paintings

Humans have painted and carved rock surfaces since at least 40,000 years ago. Some paintings show people dancing and singing.

◆ Early painting site



Inanke Cave, Zimbabwe, 5,000–10,000 years ago

The first sculpture

The earliest known sculpture consists of figurines carved from stone and bone to look like humans and animals. Some date back up to 40,000 years.

◆ Site of artwork

“Lion Man,” Germany, 32,000 years ago



Flutes, Hohle Fels Cave, and Geissenklösterle, Germany

“Lion Man” bone carving, Germany

◆ Sungir Graves, Russia

Carved ivory running lion, Czech Republic

Tata Plaque (mysterious object made by a Neanderthal 100,000 years ago), Hungary

Krapina, Croatia

Chauvet Caves, France

Tbilisi, Georgia

Pechka rock shelter, Armenia

Shanidar Cave, Iraq

Kashafrud, Iran

Riwat, Pakistan

Majuangou, China

Carved bone disc, Xiaogushan, China

Bone flutes, Jiahu, China

Shell beads, Skhul, Israel

Qafzeh, Israel

Gebelein, Egypt

Bhimbetka paintings, India

Bose, China

Isampur, India

Gona, Ethiopia (world’s oldest tools)

Island of Socotra, Yemen

Konso-Gardula, Ethiopia

Omo, Ethiopia

Turkana, Kenya

Lokalalei, Kenya

Olduvai Gorge, Tanzania

Twin Rivers, Zambia

Inanke Cave, Zimbabwe

Sterkfontein, South Africa

Swartkrans, South Africa

“Apollo 11” rock shelter, Namibia

Shell beads, Blombos Cave, South Africa

◆ Kakadu National Park, Australia

Ancient empires

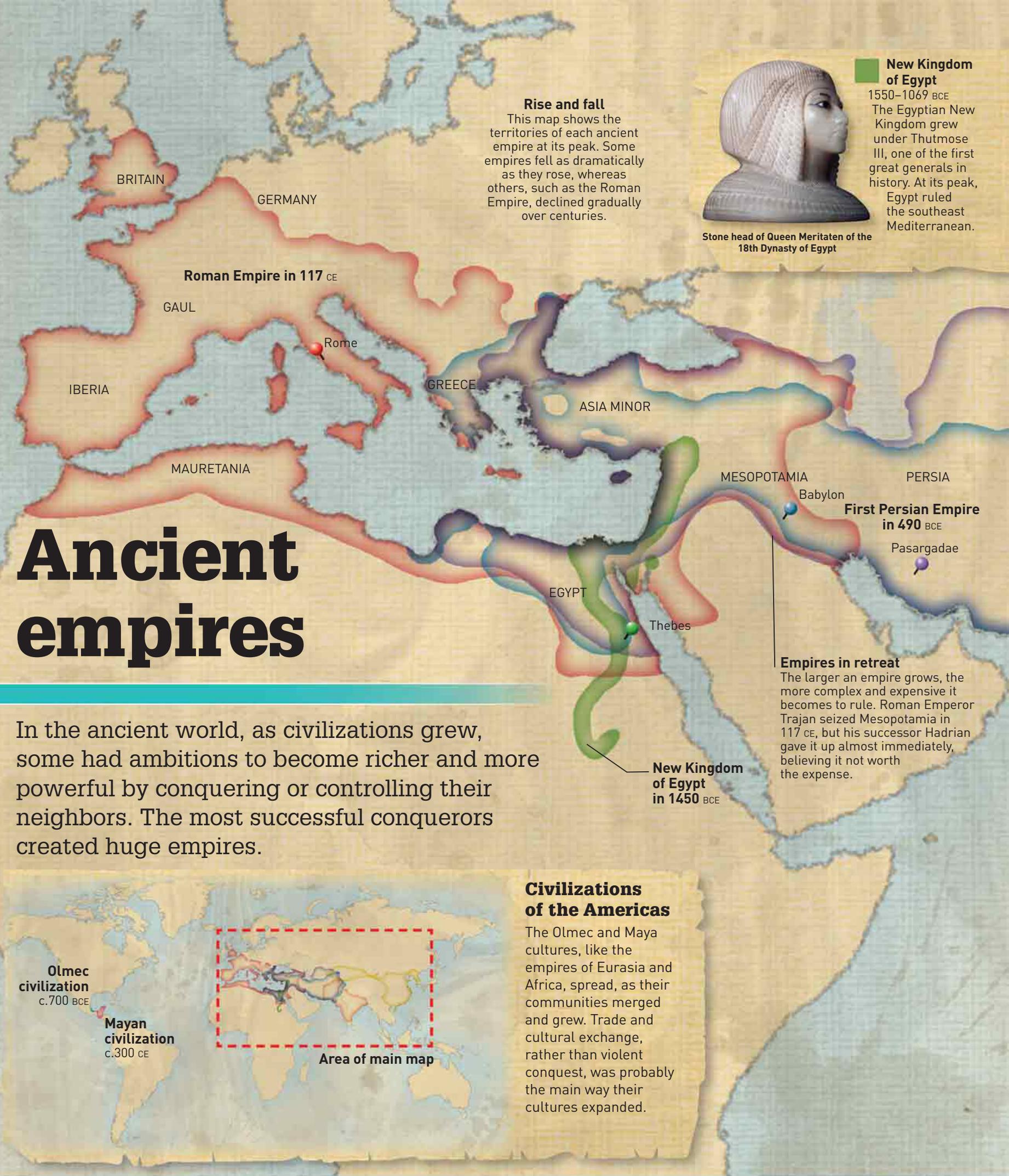
In the ancient world, as civilizations grew, some had ambitions to become richer and more powerful by conquering or controlling their neighbors. The most successful conquerors created huge empires.

Rise and fall
This map shows the territories of each ancient empire at its peak. Some empires fell as dramatically as they rose, whereas others, such as the Roman Empire, declined gradually over centuries.



Stone head of Queen Meritaten of the 18th Dynasty of Egypt

New Kingdom of Egypt
1550–1069 BCE
The Egyptian New Kingdom grew under Thutmose III, one of the first great generals in history. At its peak, Egypt ruled the southeast Mediterranean.



First Persian Empire in 490 BCE

Pasargadae

Empires in retreat

The larger an empire grows, the more complex and expensive it becomes to rule. Roman Emperor Trajan seized Mesopotamia in 117 CE, but his successor Hadrian gave it up almost immediately, believing it not worth the expense.

New Kingdom of Egypt in 1450 BCE

Civilizations of the Americas

The Olmec and Maya cultures, like the empires of Eurasia and Africa, spread, as their communities merged and grew. Trade and cultural exchange, rather than violent conquest, was probably the main way their cultures expanded.

Olmec civilization
c.700 BCE

Mayan civilization
c.300 CE

Area of main map



Olmec stone mask

Olmec civilization
1500–400 BCE
The first major culture in Central America, the Olmecs lived in what is now Mexico. They were expert farmers and traded all over the region. They developed one of the first writing systems in the Americas.



Ornate Persian silver bowl

First Persian Empire
550–336 BCE
Cyrus the Great and his army conquered huge swathes of central Asia and grabbed enormous wealth from the kingdoms they conquered. Cyrus's successor, Darius I, built cities, roads, and even a canal from the Nile River to the Red Sea.



Coin showing Alexander the Great's head

Empire of Alexander the Great
330–323 BCE
Alexander was a general from Macedon, a kingdom north of Greece. At its height, his empire covered most of the world known to Greeks. For centuries after his death, the Greek culture that he introduced continued to dominate the eastern Mediterranean and western Asia.



Alexander the Great won every battle he fought



Mauryan Empire
321–185 BCE
Chandragupta Maurya was the first leader to conquer the whole Indian subcontinent. His son Ashoka became a Buddhist and ruled the empire peacefully for 42 years.

Mauryan figure



Han pot

Han Empire
206–220 CE
The four centuries of Han rule are often called the Golden Age of Ancient China. It was an era of peace and prosperity in which China became a major world power.



Head of Emperor Claudius

Roman Empire
27–476 CE
One of history's most influential civilizations, Rome controlled much of Europe, western Asia, and north Africa. Many roads, aqueducts, and canals built by the Romans are still in use today.



Mayan statuette

Mayan civilization
500–900 CE
One of the most advanced cultures of the ancient world, the Maya developed an accurate yearly calendar based on their sophisticated understanding of astronomy.

Ancient wonders

Ancient Greek travelers and authors such as Herodotus, Antipater, and Philo of Byzantium praised the architectural marvels of the age in their writings. The buildings and statues they described became known as the “Seven Wonders of the World.” Today, we recognize many other amazing structures that architects, masons, and sculptors of the past built with relatively simple tools.



Stonehenge
c.2500 BCE, Wiltshire, England

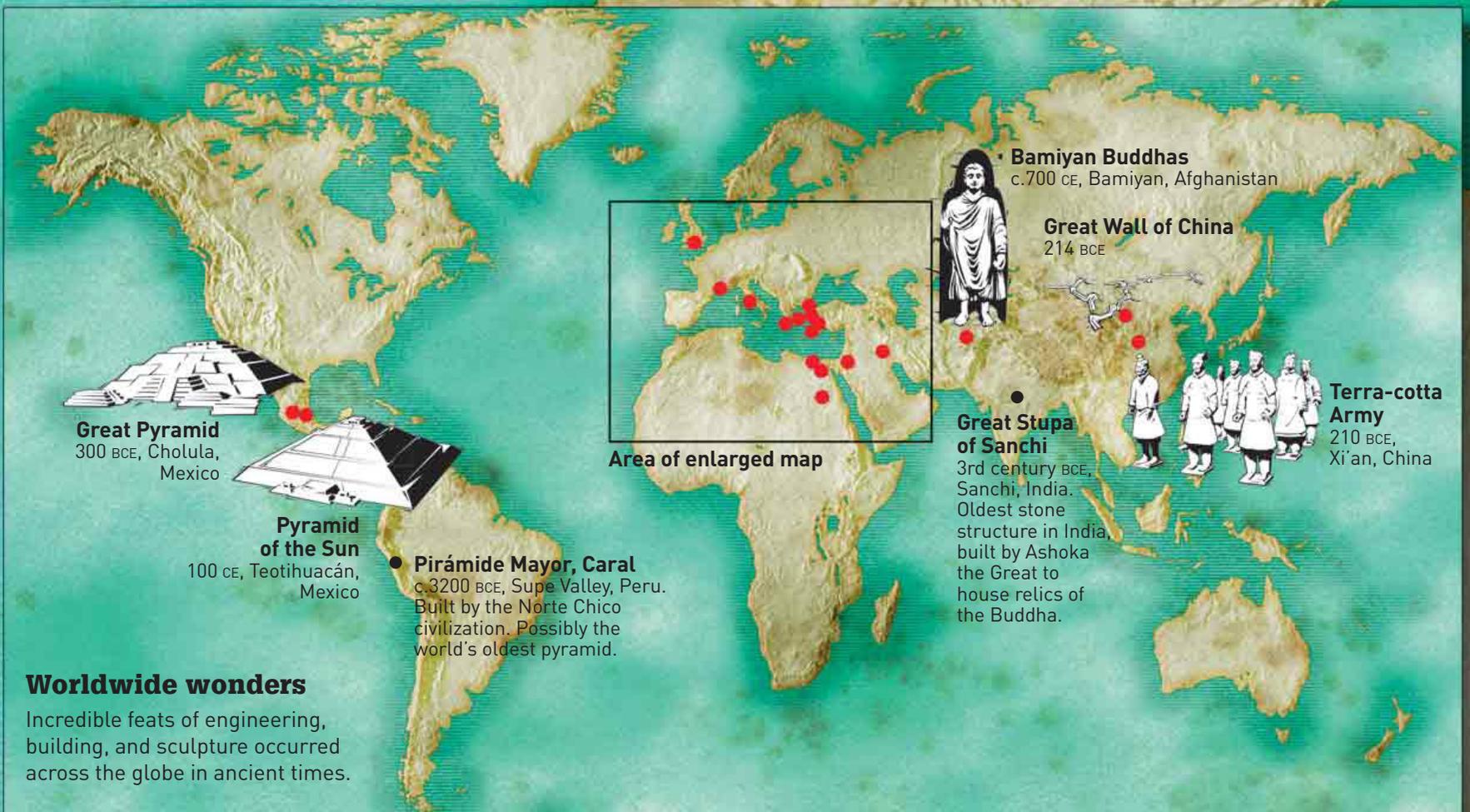
Carnac
c.3200 BCE, Brittany, France.
Stone Age monument of more than 3,000 standing stones.



Pont-du-Gard
19 BCE, Nîmes, France



Colosseum
80 CE, Rome, Italy



Great Pyramid
300 BCE, Cholula, Mexico



Pyramid of the Sun
100 CE, Teotihuacán, Mexico

Pirámide Mayor, Caral
c.3200 BCE, Supe Valley, Peru.
Built by the Norte Chico civilization. Possibly the world's oldest pyramid.



Area of enlarged map



Bamiyan Buddhas
c.700 CE, Bamiyan, Afghanistan

Great Wall of China
214 BCE

Great Stupa of Sanchi

3rd century BCE, Sanchi, India. Oldest stone structure in India, built by Ashoka the Great to house relics of the Buddha.



Terra-cotta Army
210 BCE, Xi'an, China

Worldwide wonders

Incredible feats of engineering, building, and sculpture occurred across the globe in ancient times.

Seven Wonders of the World

Only the pyramids at Giza still stand. Earthquakes destroyed the Hanging Gardens, the Colossus, and the Pharos, flooding and fire ruined the Mausoleum and the Statue of Zeus. The Temple of Artemis was wrecked by the Goths.



Pyramids of Giza

Built as tombs for the pharaohs Khufu, Khafre, and Menkaure.



Hanging Gardens of Babylon

Nebuchadnezzar II built these lush, terraced gardens for his wife, Amytis.



Mausoleum at Halicarnassus

Tomb of Persian governor Mausolos, famed for its size and lavish carvings.



Temple of Artemis

Dedicated to the Greek goddess of hunting, chastity, and childbirth.



Colossus of Rhodes

Vast bronze-and-iron statue, 110 ft (33 m) tall, of the Greek Sun-god Helios.



Pharos of Alexandria

A fire at the top of this huge lighthouse was visible from 30 miles (50 km) away.



Statue of Zeus in Olympia

The sculptor Phidias built this 430 ft (13 m) statue of the king of the gods.



Other ancient wonders

These wonders didn't make the Seven Wonders list, mainly because they were unknown to the Greeks. Some of them were built during later periods.



Colosseum

Stadium where gladiators fought to the death.



Hagia Sofia

Enormous, richly decorated church, later a mosque.



Petra

A city hewn out of rock. Capital of the Nabataeans.



Temples of Abu-Simbel

Two temples built to honor the pharaoh Rameses II.



Pont-du-Gard

Roman aqueduct that carried water to Nîmes.



Acropolis

Greek citadel that includes the Parthenon Temple.



Great Pyramid

World's largest pyramid, now with a church on top.



Pyramid of the Sun

Steep steps up the side led to a temple on the top.



Stonehenge

Prehistoric monument with a circle of enormous stones.



Bamiyan Buddhas

Huge statues chiseled into a cliff; destroyed in 2001.



Great Wall of China

Once ran for 3,889 miles (6,259 km) along China's northern border.



Terra-cotta Army

8,000 life-sized warriors entombed with the first emperor of China.

The **Great Pyramid** of Giza weighs **6.5** million tons



Temples of Abu-Simbel
c.1257 BCE, Abu-Simbel, Egypt

Famous mummies



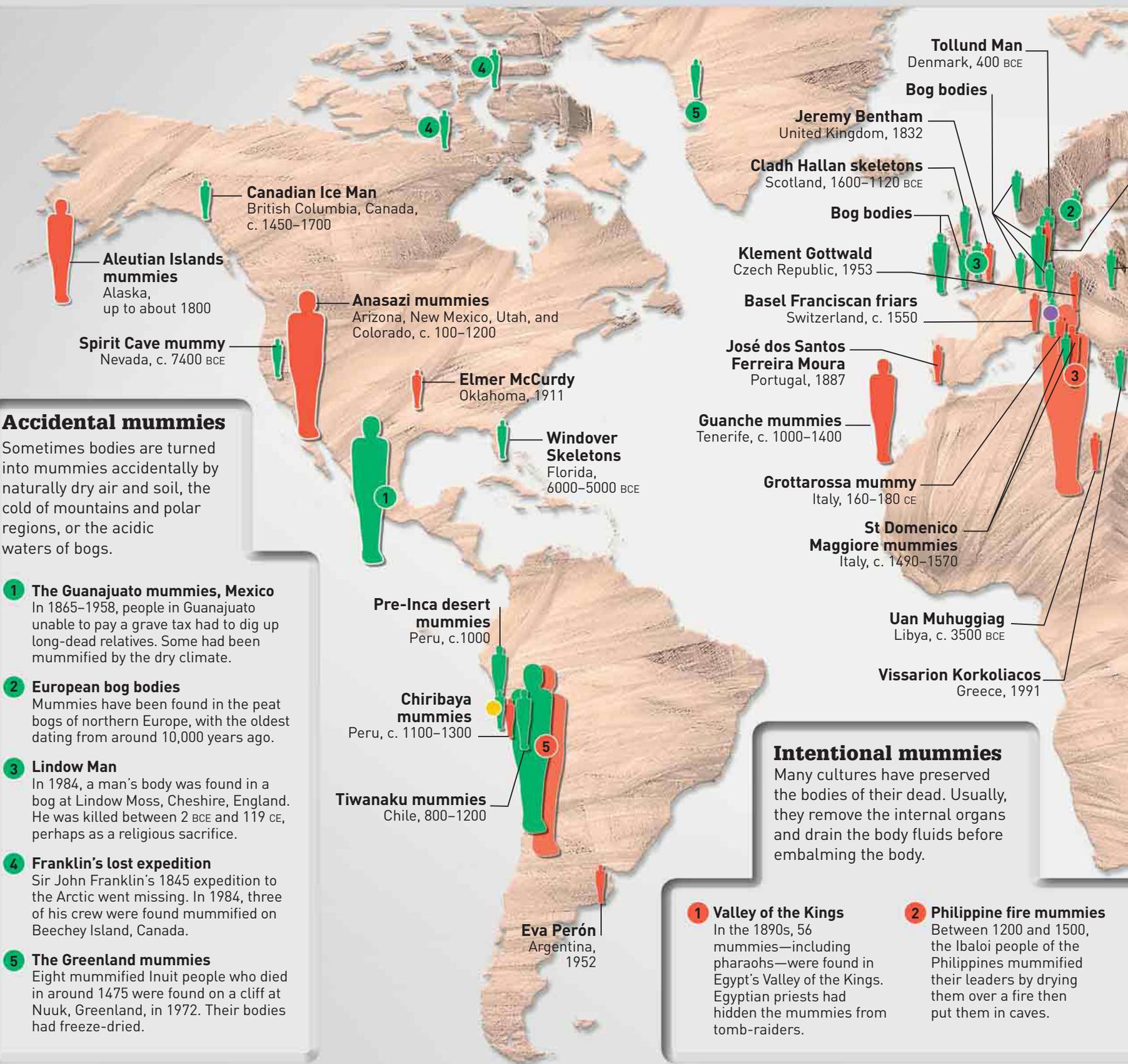
Ötzi the Iceman

Around 5,300 years ago, a traveler died when caught in a snowstorm in the Alps. His body became buried in the snow and then froze. In 1991, the corpse was discovered on top of a glacier.



Pharaoh Tutankhamun

The mummy of Tutankhamun was found in a tomb in the Valley of the Kings in 1922. It wore a gold mask and lay inside a nest of three gold cases. The tomb, which had been sealed for 3,200 years, contained statues, furniture, and jewelry.



Accidental mummies

Sometimes bodies are turned into mummies accidentally by naturally dry air and soil, the cold of mountains and polar regions, or the acidic waters of bogs.

1 The Guanajuato mummies, Mexico

In 1865–1958, people in Guanajuato unable to pay a grave tax had to dig up long-dead relatives. Some had been mummified by the dry climate.

2 European bog bodies

Mummies have been found in the peat bogs of northern Europe, with the oldest dating from around 10,000 years ago.

3 Lindow Man

In 1984, a man's body was found in a bog at Lindow Moss, Cheshire, England. He was killed between 2 BCE and 119 CE, perhaps as a religious sacrifice.

4 Franklin's lost expedition

Sir John Franklin's 1845 expedition to the Arctic went missing. In 1984, three of his crew were found mummified on Beechey Island, Canada.

5 The Greenland mummies

Eight mummified Inuit people who died in around 1475 were found on a cliff at Nuuk, Greenland, in 1972. Their bodies had freeze-dried.

Pre-Inca desert mummies

Peru, c. 1000

Chiribaya mummies

Peru, c. 1100–1300

Tiwanaku mummies

Chile, 800–1200

Eva Perón

Argentina, 1952

Tollund Man

Denmark, 400 BCE

Bog bodies

Jeremy Bentham

United Kingdom, 1832

Cladh Hallan skeletons

Scotland, 1600–1120 BCE

Bog bodies

Klement Gottwald

Czech Republic, 1953

Basel Franciscan friars

Switzerland, c. 1550

José dos Santos Ferreira Moura

Portugal, 1887

Guanche mummies

Tenerife, c. 1000–1400

Grottarossa mummy

Italy, 160–180 CE

St Domenico Maggiore mummies

Italy, c. 1490–1570

Uan Muhuggiag

Libya, c. 3500 BCE

Vissarion Korkoliacos

Greece, 1991

Intentional mummies

Many cultures have preserved the bodies of their dead. Usually, they remove the internal organs and drain the body fluids before embalming the body.

1 Valley of the Kings

In the 1890s, 56 mummies—including pharaohs—were found in Egypt's Valley of the Kings. Egyptian priests had hidden the mummies from tomb-raiders.

2 Philippine fire mummies

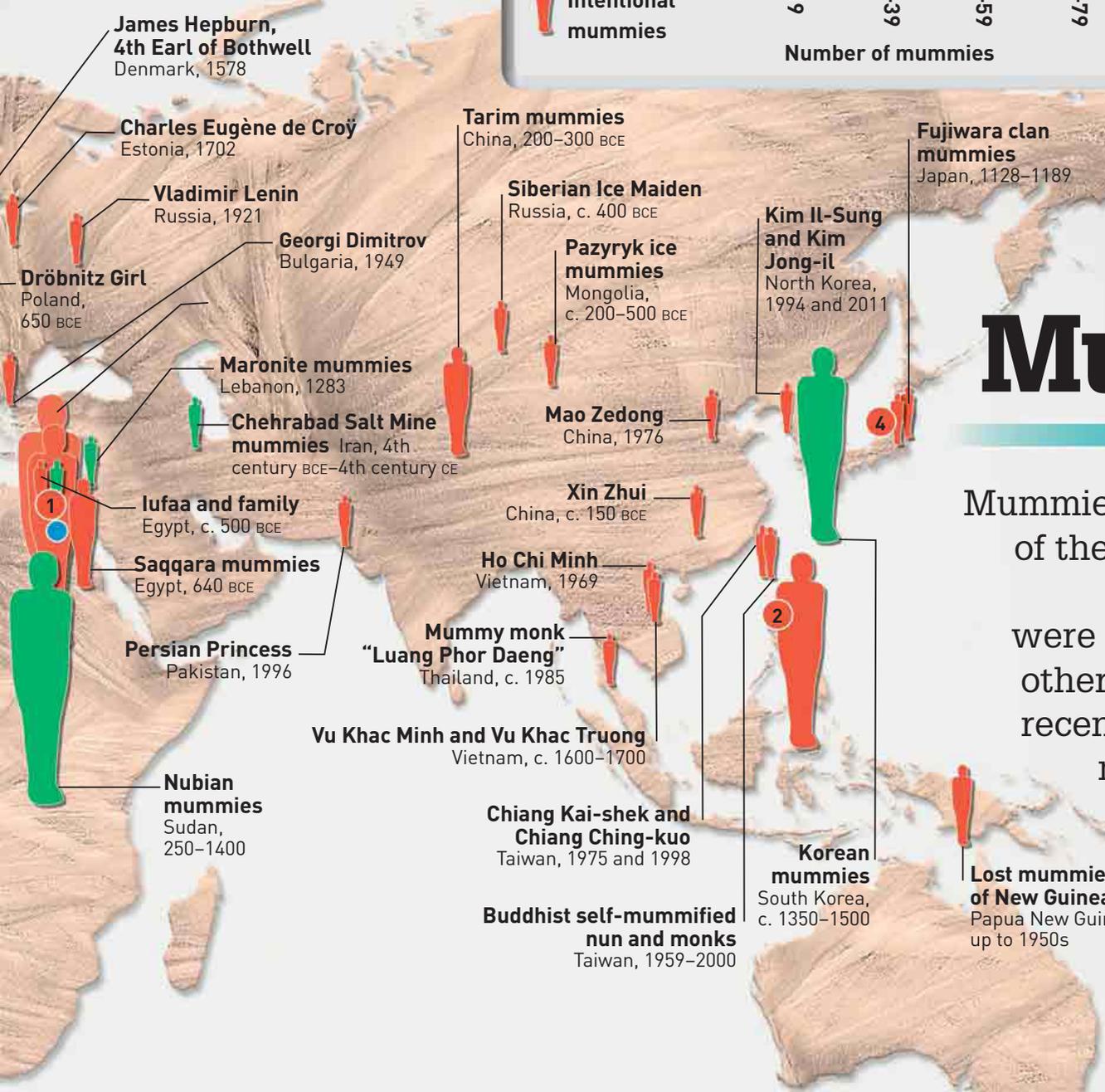
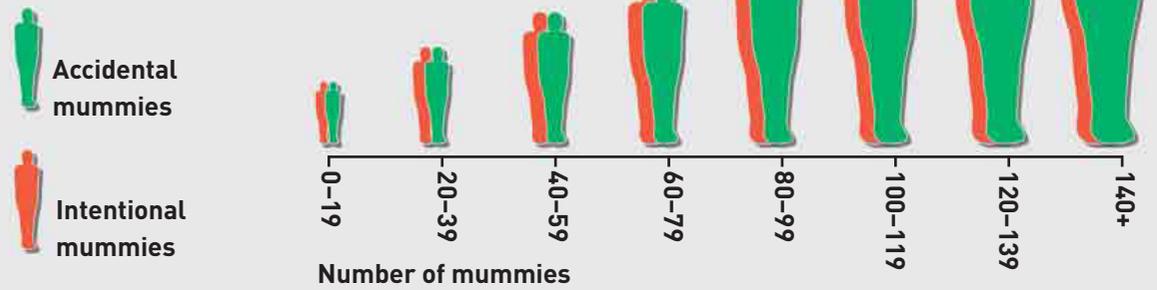
Between 1200 and 1500, the Ibaloi people of the Philippines mummified their leaders by drying them over a fire then put them in caves.

Juanita the Ice Maiden

In 1995, an Inca girl aged 12–14 was found on Mount Ampato, Peru. The discoverers named her Juanita, or the “Ice Maiden.” She was sacrificed to the gods about 500 years ago. The cold had preserved her skin, organs, blood, and stomach contents.

MUMMY DISCOVERIES WORLDWIDE

Some mummies are discovered singly, often in remote locations such as in peat bogs or on high mountains. Other finds involve larger numbers of mummies—for example, in communal graves, tombs, caves, or catacombs.



Mummies

Mummies—the preserved bodies of the dead—have been found the world over. Many were made deliberately, while others formed naturally. More recently, some countries have mummified their leaders.

The Palermo catacombs contain at least **8,000** mummies

- 3 Mummies of Palermo**
In 1599, Christian monks in Palermo, Sicily, began to mummify their dead and stored them in catacombs. Later, rich people paid the monks to mummify their bodies.
- 4 Self-mummified monks**
From 1680–1830, some Buddhist monks in Japan mummified themselves. They starved, drank special tea to make their bodies toxic to maggots, then were sealed alive in a stone tomb.
- 5 Chinchorro mummies**
The Chinchorro, who lived in what is now Chile and Peru, were the first people known to make mummies. Their oldest mummies date from as early as 5000 BCE.

NORTH AMERICA

The Maya and Aztecs built spectacular pyramid-temples. Human sacrifice took place on the Templo Mayor in the Aztec capital Tenochtitlán (now Mexico City).



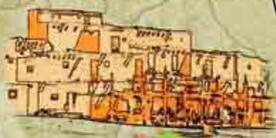
Templo Mayor, Mexico

Parkin Indian Mound
Parkin, Arkansas, 1350

Angel Mounds
Evansville, Indiana, 1000 CE

Cahokia Mounds and Monks Mound
Collinsville, Illinois, 600 CE

Taos Pueblo
New Mexico, between 1000 and 1450



Great Houses of the Chacoan people, Chaco Canyon, New Mexico, 900 CE

Kincaid Mounds
Brookport, Illinois, 1050 CE

Moundville settlement
Alabama, 1000 CE

Templo Mayor
Mexico City, Mexico, first built 1325, rebuilt six times



Ocmulgee Great Temple Mound
Macon, Georgia, 950 CE

El Castillo
Chichen Itza, Mexico, 9th–12th century



Calixtlahuaca
Toluca, Mexico, 1476

Temple of the Inscriptions
Chiapas, Mexico, 683 CE

Cusco and the Koricancha
Vilcabamba, Cusco, Peru, 1430

Machu Picchu
Vilcabamba, Cuzco, Peru, 1450



Isla del Sol
Lake Titicaca, Bolivia, 15th century



El Fuerte de Samaipata
Bolivia, 14th century

Royal Palaces of Abomey
Dahomey (modern Benin), 1695

Sacsayhuamán
Cuzco, Peru, mid-15th century

Moai figures
Easter Island, Chile, 300–1200



Ollantaytambo
Cuzco, Peru, mid-15th century

By the late 1400s, the Incas had a vast empire in western South America. The city of Machu Picchu occupied a remote hilltop at the edge of the empire.

Machu Picchu

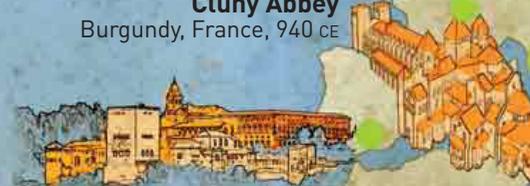


Notre Dame de Paris
Paris, France, 1163–1345

St. Paul's Cathedral (first building)
London, England, 604 CE



Cluny Abbey
Burgundy, France, 940 CE



Alhambra
Granada, Spain, 1350s



Benin Bronzes
Kingdom of Benin (in modern Nigeria), 13th–16th century

Timbuktu
Mali, 12th century



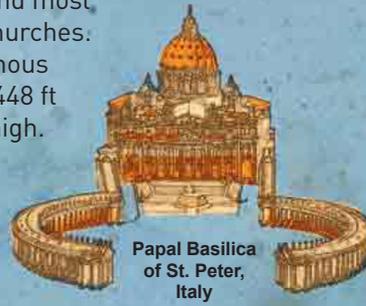
Medieval wonders

“Medieval” means the Middle Ages, which lasted from the 5th century to the end of the 15th century. The period ended when the world became connected by explorers such as Columbus, heralding the start of modern times. Medieval times saw amazing architectural feats worldwide.

SOUTH AMERICA

EUROPE

St. Peter's Basilica, built at the start of the Renaissance, is one of the world's largest and most ornate churches. Its enormous dome is 448 ft (137 m) high.



Papal Basilica of St. Peter, Italy

KEY

Locations and dates of medieval wonders.

 Pictured wonders

 Other wonders

Leaning Tower of Pisa
Italy, 1173–1300



St. Basil's Cathedral
Moscow, Russia, 1555–61

Moscow Kremlin
Moscow, Russia, 1450

Papal Basilica of St. Peter
Vatican City, Rome, Italy, 1506–1626

Imam Reza Shrine
Mashhad, Iran, 818 CE

Taj Mahal
Agra, India, 1642–53

Great Wall of China (Ming Dynasty)
14th century

Kiyomizu Temple
Kyoto, Japan, 798 CE

Ani, Armenian City
Kars Province, Turkey, 5th century CE

Grand Canal
China, 5th to 13th centuries

Porcelain Tower of Nanjing
River Yangtze, Nanking, China, early 15th century, reconstructed 2010

The Great Mosque of Djenné
Djenné, Mali, 1200–1330

Prophet's Mosque (Al-Masjid al-Nabawi)
Medina, Saudi Arabia, 622 CE

The Grand Mosque (Al-Masjid al-Haram)
Mecca, Saudi Arabia, 7th century CE

Konark Sun Temple
India, 13th century



Angkor Wat
Angkor, Cambodia 1113–50

Sigiriya palace
Sri Lanka, 5th century CE

Rock-hewn churches at Lalibela
Ethiopia, 13th century

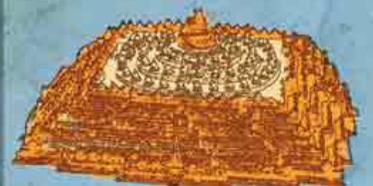


Borobudur
Central Java, Indonesia, 9th century CE

City of Great Zimbabwe
Near Masvingo, Zimbabwe, 11th century

ASIA

The vast Buddhist temple at Borobudur, Java, has six stepped rectangular stories, three circular terraces and is decorated with 2,672 carved panels and 504 statues.



Borobudur

AFRICA

At Lalibela, 11 churches—complete with windows, doors, and roofs—were hewn (cut) into rocky hills. Each is cut from a single block of stone and linked by trenches.



Rock-hewn church at Lalibela

The Leaning Tower of Pisa tilts by **3.97** degrees

Medieval empires

At times between 500 and 1500 CE, one power or another controlled vast parts of Europe and Asia and spread Islam and Christianity across the world as they knew it. Little known to them, African rulers connected large regions for the first time, while empires in the Americas grew in isolation from the rest of the world.



Ottoman battle helmet

Mali Empire
c. 1230–1600
A west African empire that became wealthy through trading gold and developing agriculture along the banks of the Niger.

Asante Empire
1670–1902
A sophisticated and disciplined society. Clever strategies and adoption of western firearms helped bring about military expansion.



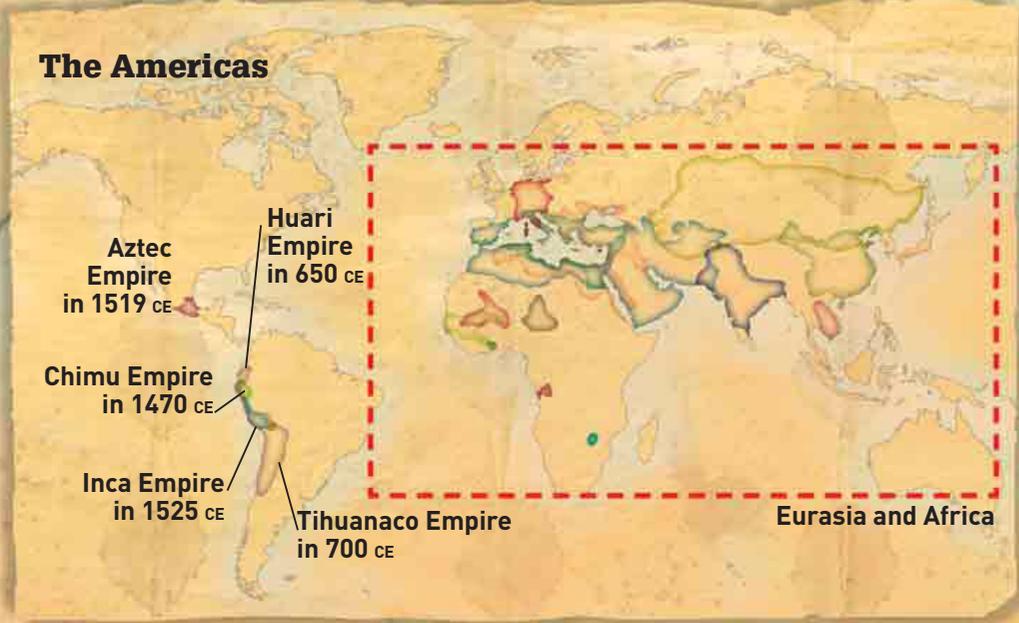
Asante trophy head

Kingdom of Kongo
1390–1914
Ruled by a “manikongo” (king) and divided into six regions. The Atlantic slave trade weakened the empire, and eventually the Portuguese took control.

Kingdom of Zimbabwe
1220–1450
Famous for its capital, Great Zimbabwe, where the elite lived in a stone enclosure. The rulers controlled gold mines and ivory and traded with the Middle East and China.

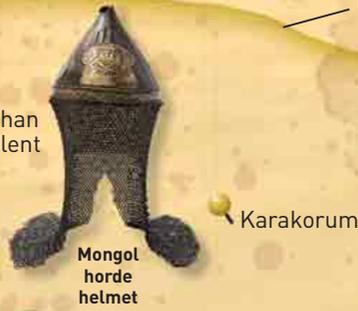


Great Zimbabwe



At its **peak**, the **Mongol Empire** ruled over **100 million** people

Mongol Empire
1206–1368
Founded by Genghis Khan in 1206. Numerous violent conquests led to the largest continuous land empire in history.



Ming China in 1500 CE
Beijing

Ming China
1368–1644
Founded by Zhu Yuanzhang, the leader of an uprising that overthrew the Mongols. A socially stable era during which the Grand Canal and the Great Wall were rebuilt.

Mogul Empire in 1690 CE
Shahjahanabad (Old Delhi)



Khmer Empire in 900 CE
Angkor

Holy Roman Empire
962–1806
One of the longest-lasting empires in history, this was a Christian state with no capital. In 1356 Frankfurt became the home of imperial elections.

Byzantine Empire
518–1453
Evolved from the Eastern Roman Empire. A Christian, Greek-speaking empire that preserved both Roman and Greek cultures.



Mogul Empire
1526–1857
The Moguls brought centralized government, education, and religious tolerance to south Asia.

Khmer Empire
802–1400s
A Hindu and Buddhist empire influenced by Indian culture. Architecture of the empire reached its height with the construction of the temple at the capital, Angkor.

Aztec Empire
1430–1521
From their capital built on artificial islands on a lake, the Aztecs, who called themselves Mexica, conquered most of modern-day Mexico.



Inca Empire
1438–1533
The largest empire of pre-Spanish Americas. Incas worshiped Inti, the Sun-god, and were skilled at building cities high up in the Andes Mountains.

Songhai Empire
1340–1591
Rose up in the wake of the declining Mali Empire. The city of Timbuktu became a center of Islamic learning.



Chimu Empire
c. 1200–1470
Skilled in pottery, textiles, and metalwork. Territory covered coastal regions by the Andes Mountains. Conquered by the rival Inca Empire in 1470.

Umayyad Caliphate
661–750
The second of four great Muslim dynasties of the Arab caliphate, meaning “kingdom.”

Kanem Empire
700–1387
One of the most powerful African empires. The main religion became Islam during the second dynasty under the rule of the Sayfawa.

Huari Empire
500–1100
The first of the New World powers to use large cities to run the empire and to live in, rather than just for religious ceremonies.



Tihuanaco Empire
550–950
Began as a small town on the shores of Lake Titicaca on the border of Peru and Bolivia before rapidly expanding to the surrounding areas.

Ottoman Empire
1299–1922
Sometimes called the “Turkish Empire,” a long-lasting Islamic state with the wealthy city of Constantinople (modern-day Istanbul) as its capital.

Castles

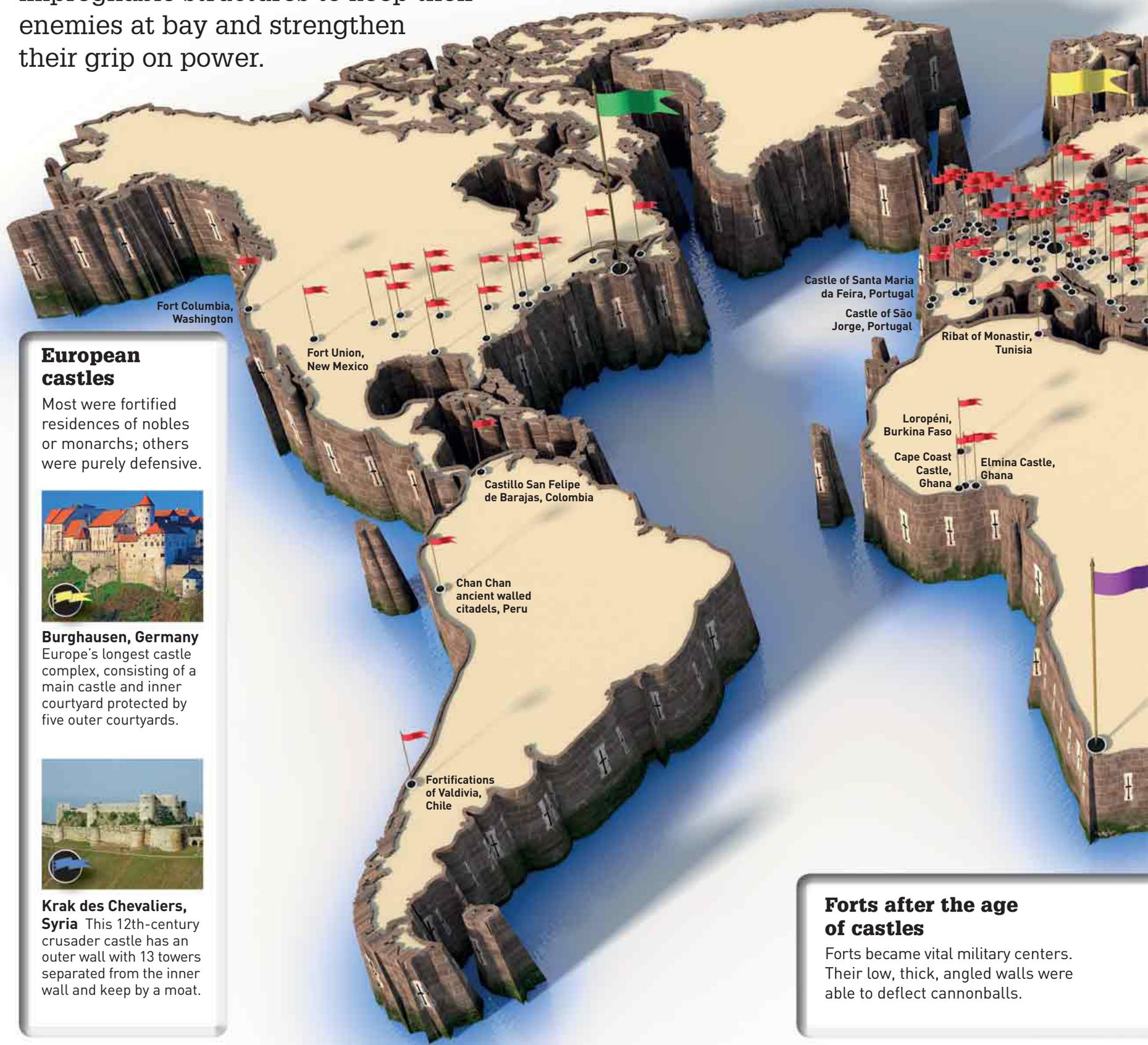
From castles and forts to walled cities, rulers and nations throughout history have tried to build impregnable structures to keep their enemies at bay and strengthen their grip on power.

KEY

Flags pinpoint some of the world's most impressive fortifications.



Selected castles, forts, citadels, and fortified cities



European castles

Most were fortified residences of nobles or monarchs; others were purely defensive.



Burghausen, Germany
Europe's longest castle complex, consisting of a main castle and inner courtyard protected by five outer courtyards.



Krak des Chevaliers, Syria
This 12th-century crusader castle has an outer wall with 13 towers separated from the inner wall and kept by a moat.

Forts after the age of castles

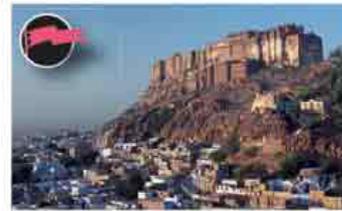
Forts became vital military centers. Their low, thick, angled walls were able to deflect cannonballs.

Asian castles

Castles in Asia reflect local building styles and look different from those in Europe, but they served the same purpose.



Himeji, Japan Originally dating from 1333, Himeji was rebuilt in the 17th century. With a network of 83 buildings protected by 85-ft- (26-m-) high walls and 3 moats, Himeji is Japan's largest castle.



Mehrangarh Fort, India This fort, 400 ft (122 m) above the city of Jodhpur, hides several palaces within its walls. Built by the ruler Rao Jodha in 1459, it is entered through a series of seven gates.



Fortified cities

Cities surrounded by defensive walls, often incorporating a castle or royal residence.



Forbidden City, China

The former imperial palace in Beijing has 980 buildings ringed by a wall and a 171-ft- (52-m-) wide moat.



Great Zimbabwe

Once the capital of the Kingdom of Zimbabwe, the stone walls of this royal city were built without using mortar.

Windsor Castle,
England, has been
a royal residence for
900 years



Fort Independence
This star-shaped fort, completed in 1851, defended the harbor of Boston. Guns were mounted on its five pointed bastions.



Castle of Good Hope, South Africa
A star fort built by the Dutch East India Company in 1666-79 to protect Dutch settlers on the Cape of Good Hope.

PERIOD OF BATTLE

 **WWI and beyond**
1914–

 **Modern revolutionary**
1780–1914

 **Early modern**
1500–1780

 **Medieval**
500–1500

 **Ancient**
Before 500 CE

Yorktown, 1781
French–American victory over the British led to independence for the US.

Waterloo, 1815
Napoleon defeated by a coalition of European nations, marking an end to his domination of Europe.

Vienna, 1683
Holy Roman Empire's defeat of the Ottoman Empire halted the spread of Islam in Europe.

Spanish Armada, 1588
English defeat of a vast Spanish fleet, causing the loss of 63 ships.

Battle of France, 1940
German invasion and occupation of France during World War II.

Algiers, 1957
Campaign of guerrilla warfare against French–Algerian authorities.

Alcazar Quivir, 1578
Morocco and Ottoman Empire defeated the Portuguese Empire. Almost all Portuguese killed or imprisoned.

Bay of Pigs, 1961
CIA-trained force of Cuban exiles tried to invade Cuba and overthrow Communist leader Fidel Castro.

Kirina, 1235
Mandinka forces beat the Sosso king and created the Mali Empire over west Africa.

Riachuelo, Paraguay River, 1865
A naval battle far upriver. Defeat for Paraguay by Brazil (allied with Argentina and Uruguay) during the ruinous Paraguayan War (1864–70).

Carabobo, 1821
Victory for Simón Bolívar's Patriots over the Royalists, who supported Spanish rule. Led to Venezuela's independence.

Cajamarca, 1532
Defeat of the Inca Empire by Spanish conquistadors led to Spanish rule for the next three centuries.

Antietam, 1862
Bloodiest single-day battle in American history, with 23,000 casualties.

The Little Bighorn, 1876
Victory for the Lakota, Northern Cheyenne, and Arapaho peoples over the US Army led by General Custer.

The Alamo, 1836
Texas revolutionaries inflicted heavy losses on Mexican forces storming the Alamo Fort. Mexico won, but Texas gained independence the next year.

Military milestones

Changes in weapon technology have affected how battles are fought. As weapons get deadlier, the two sides in a battle grow farther and farther apart, until today, they sometimes don't meet or glimpse each other at all.

- 1 **Battle of Crécy, 1346**
A key battle in the Hundred Years' War between England and France. New long-range bows made close hand-to-hand combat, and the chivalry that went with it, a thing of the past.
- 2 **The Somme, 1916**
The British and French attacked the German Army during World War I in what was the world's first major tank battle. It was also one of the bloodiest military operations ever.
- 3 **Battle of Britain, 1940**
Between Britain and Germany during World War II, this was the first major campaign fought entirely in the air.
- 4 **Battle of the Coral Sea, 1942**
For the first time, ships in this sea battle never once sighted or directly fired on one another.

The **Ottoman Turks** took Constantinople in 1453 using **cannon** for the **first time** in a major battle

Sieges

Not strictly a battle, a siege is a military blockade of a city or fortress. The goal is to conquer the city by waiting for those inside to surrender. Sometimes, the side laying siege attacks to speed things up.

1 Siege of Carthage 149–146 BCE
One of the longest sieges in history. The Romans surrounded Carthage (in modern Tunisia) and waited three years for its surrender, then enslaved the Carthaginian population.

2 Capture of Jerusalem, 1099
During the Crusader wars between Christians and Muslims, the Muslim defenders of Jerusalem lost control when the Christians built two enormous siege engines (towers on wheels) and scaled the walls.



Austerlitz, 1805
With smaller forces, the French Empire crushed Russia and Austria. One of Napoleon's greatest victories.

Actium, 31 BCE
Rome declared war on Antony and Cleopatra of Egypt. The Roman victory led to the beginning of the Roman Empire.

Thermopylae, 480 BCE
Vastly outnumbered Greek forces held the Persian Emperor Xerxes at bay for a vital 3 days.

Stalingrad, 1942–43
Long siege of this Soviet city caused immense suffering on both sides and eventually led to crippling defeat for Nazi Germany.

Fall of Constantinople, 1453
After a four-month siege, Byzantine Empire fell to the invading Ottoman Empire.

Omdurman, 1898
Small British and Egyptian forces massacred a huge, but ill-equipped, Sudanese Army.

Isandlwana, 1879
Crushing victory for the Zulu nation over the British, despite relying mainly on spears and cowhide shields.

El Alamein, 1942
Major tank battle of World War II. British-led victory over Axis Powers (Italy and Germany).

Kalinga, 262–261 BCE
The Mauryan Empire under Ashoka the Great fought the republic of Kalinga. At least 100,000 Kalingans were killed.

Battle of Phillora, 1965
One of the largest tank battles of the Indo-Pakistani War. Decisive victory for Indian Army.

Surabaya, 1945
Heaviest battle of the Indonesian Revolution against the British and Dutch. Celebrated as Heroes' Day in Indonesia.

Huai-Hai, 1948
Final major fight in Chinese Civil War that led to the Communist takeover of China.

Battle of Incheon, 1950
A clear victory for the United Nations against North Korean forces in the Korean War.

Iwo Jima, 1945
The US captured this island as a way of possibly invading Japan. Over 21,000 Japanese died.

Wuhan, 1938
Soviet and revolutionary Chinese forces totaling 1,100,000 troops and 200 aircraft failed to stop Japan capturing the city.

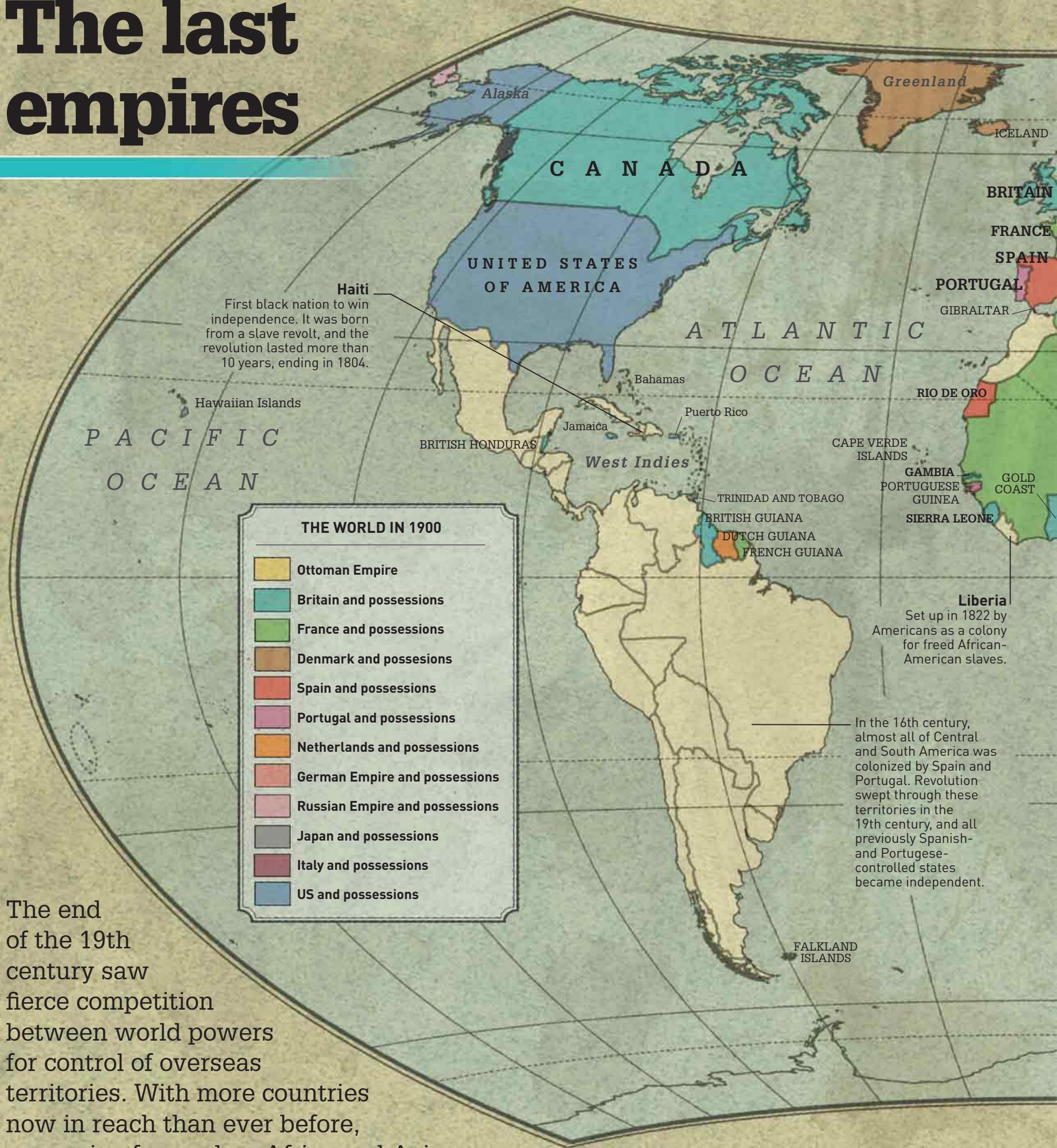
Dien Bien Phu, 1954
Viet Minh communist revolutionaries besieged and defeated the French to end the First Indochina War. The next year began another 20 years of fighting in Vietnam.

Coral Sea, 1942
World War II naval battle between Japan and the US and Australia. The battle was the first time aircraft carriers engaged each other.

Battlegrounds

At one time, armies met in formation on a single field of battle and fought for one to several days. By the 20th century, long-range weapons had changed warfare. Battlefields in places became theatres of war the size of countries.

The last empires



Haiti
 First black nation to win independence. It was born from a slave revolt, and the revolution lasted more than 10 years, ending in 1804.

Liberia
 Set up in 1822 by Americans as a colony for freed African-American slaves.

In the 16th century, almost all of Central and South America was colonized by Spain and Portugal. Revolution swept through these territories in the 19th century, and all previously Spanish- and Portuguese-controlled states became independent.

The end of the 19th century saw fierce competition between world powers for control of overseas territories. With more countries now in reach than ever before, expansion focused on Africa and Asia.

In 1900, Europeans controlled **90 percent** of Africa



Scramble for Africa

The Atlantic slave trade, in which Africans were forcibly sold to people in the Americas, ended in the 1800s. European powers went into Africa to wipe out the trade, but at the same time, took control. Europeans raced each other to claim territory.

- 1871: Germany and Italy are both unified. No more territory available for expansion of empires in Europe.
- 1884–85: Berlin Conference, where European powers decide rules on carving up Africa.
- 1900: Only Liberia and Ethiopia remain non-European. Britain rules 30 percent of Africa's population.

The Great Game

In the 1830s, Britain feared Russia was planning on invading British-ruled India through controlling India's neighbor, Afghanistan. The "Great Game" was the rivalry for power in Asia between the British and Russian empires.

- 1839–42: First Anglo-Afghan War. Terrible defeat at Kabul for the British.
- 1878–80: Second Anglo-Afghan War. Russia is defeated and Britain withdraws but takes control of Afghanistan's foreign affairs.
- 1907: Russia and Britain sign a peace treaty in the face of the German threat of expansion in the Middle East.

At least **1 million** people died in the **1910 Mexican Revolution**

Collapse of Communist bloc

1989: East Germany, Poland, Slovakia, Hungary, Romania, Czech Republic, Slovenia, Croatia, Bosnia-Herzegovina, Montenegro, Kosovo, Albania, FYR Macedonia, Serbia, and Bulgaria



Norway
1905 (from Sweden)

Iceland
1944 (from Denmark)

England
1642–51

Ireland
1922 (from Britain)

Belgium
1830–31 (from Netherlands)

France
1789–99

Spain
1936–39

Portugal
1974

Tunisia
2011

Algeria
1954–62 (from France)

Thirteen colonies of North America
1776 (from Britain)



Cuba
1953–59

1

Mexico
1910–20

Nicaragua
1979–90

Panama
1903 (from Colombia)

Ecuador
1822 (from Spain) and 1830 (from Gran Colombia)

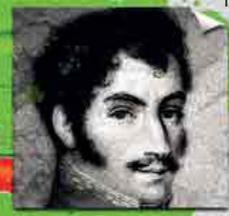
Peru
1824 (from Spain)

Bolivia
1825 (from Spain)

Haiti
1791–1804 (from France)

Venezuela
1823 (from Spain) 1830 (from Gran Colombia)

Colombia
1819 (from Spain)



3



2

Ghana
1957 (from Britain)

Angola
1961–75 (from Portugal)

Namibia
1968–88 (from South Africa)

Famous revolutionaries

Revolutionary leaders are driven by passionate ideals. They inspire people to rise up against governments. Such people are key in organizing effective group action against the authorities.

- 1 **Che Guevara, 1928–67**
Argentinian-born idealist—helped Fidel Castro overthrow Cuban dictator Fulgencio Batista. Now a global symbol of rebellion.
- 2 **Kwame Nkrumah, 1909–72**
Oversaw Ghana's independence from Britain. Ghana was the first in a wave of sub-Saharan African nations to break free of colonial rule.
- 3 **Simón Bolívar, 1783–1830**
Venezuelan politician and general who led Venezuela, Colombia, Ecuador, Peru, and Bolivia to independence. One of South America's most influential leaders.
- 4 **Vladimir Lenin, 1870–1924**
After being exiled to Siberia, Lenin returned to Russia to support and then lead the 1917 revolution.
- 5 **Mao Zedong, 1893–1976**
Founder of the People's Republic of China. Ruthless in bringing about modernization with the "Great Leap Forward" and enforced Communism with the "Cultural Revolution."
- 6 **Mahatma Gandhi, 1869–1948**
Devoted his life to bringing peace to India. Has inspired nonviolence and civil rights movements worldwide.

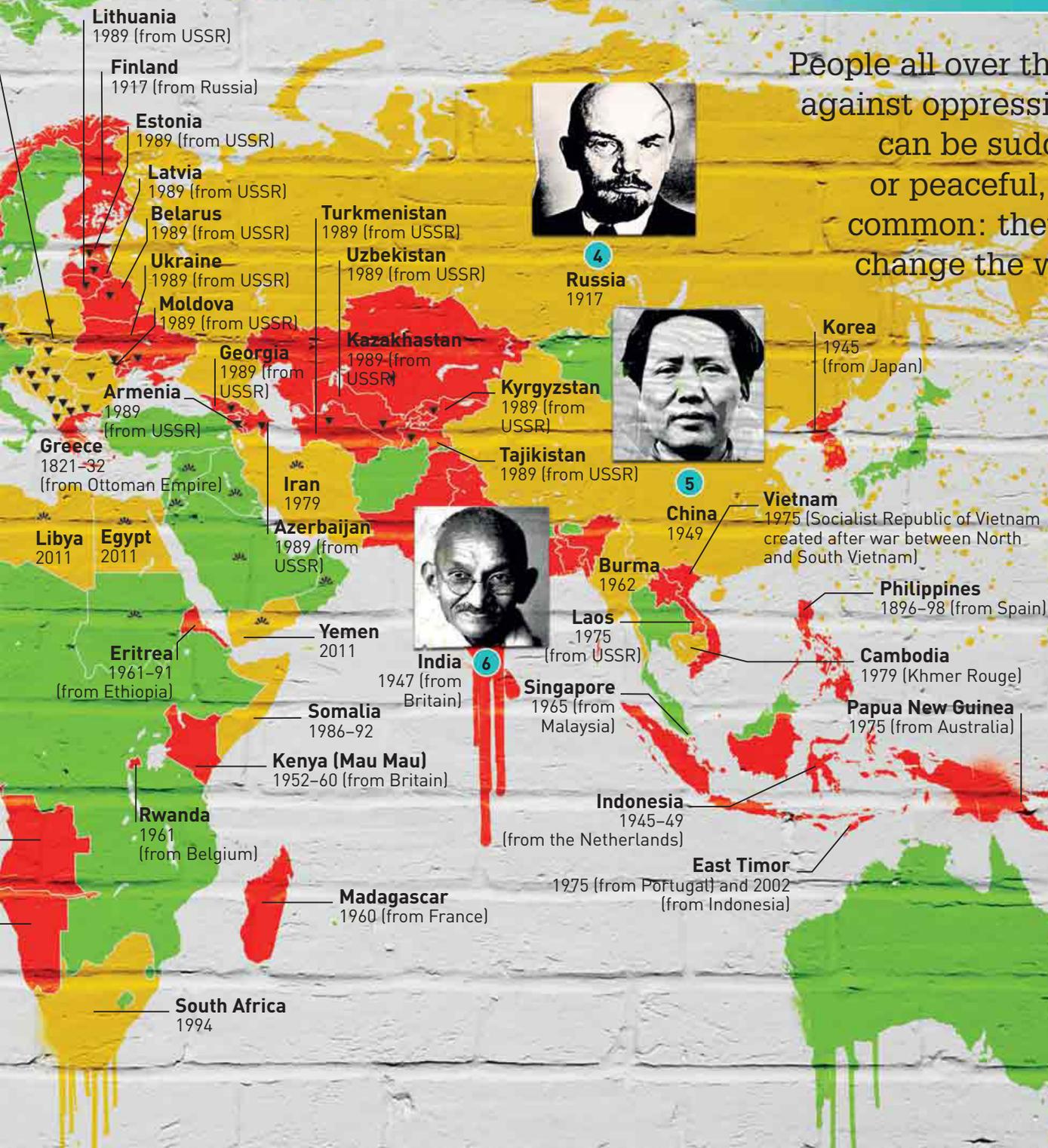
Revolutions and uprisings

Powerful nations that overpower other countries are often met with resistance from the people they conquer. In some cases, this can lead to revolutions. Sometimes a country's own government becomes so unpopular that a revolution occurs.

- **Internal uprising**
Countries that have had internal revolutions
- **Uprising against an outside power**
Countries achieving independence from a foreign ruling power through revolution
- **Countries not involved in revolutions on these pages**

Revolutions

People all over the world have risen up against oppressive rulers. Revolutions can be sudden or lengthy, bloody or peaceful, but have one thing in common: they are all an attempt to change the way a country is ruled.



Collapse of Communism

The USSR was a Communist state that incorporated Russia and 14 other Soviet republics (shown in red on the map). The USSR also had great influence over several other European states that collectively were known as the “Communist bloc” (in yellow on the map). In 1989, revolution spread through all these states, and in 1991 the USSR was dissolved.

▼ Fall of communism

Indicates countries in which Communism collapsed in 1989-91



Arab Spring

The “Arab Spring” revolutions and protests swept through the Arab world in 2011. As the map shows, in some countries rulers were forced out, while in others there were failed uprisings. In many cases, the demonstrations and protests were violent. The Arab Spring was the first uprising

where protestors used social media—online applications such as Facebook and Twitter—to coordinate their actions.

Arab Spring

Indicates countries involved in the Arab Spring

KEY



Major shipwrecks with known coordinates

SS *Islander* (1901)

Its cargo of gold, which some estimate is worth up to \$800 million today, has never been found.

SS *Sultana* (1865)

This river steamer exploded in the Mississippi River with the loss of around 1,700 lives.

5

1

3

4

7

***Medusa* (1816)**

When the *Medusa* sank, 147 crewmen built a life raft, but only 15 survived to be rescued.

HMS *Agamemnon* (1809)

A former command of Admiral Nelson, it struck an uncharted group of rocks in a bay off Uruguay.

Shipwrecks

The beds and shores of the world's seas, lakes, and rivers are littered with shipwrecks. Some are famous either for the huge loss of life they caused or the enormous value of their cargo.



Natural shipwrecks

Sailors battle constantly against the phenomenal forces of nature, and one of the most common causes of shipwrecks is bad weather. Storms and hurricanes batter ships and blow them off course, and fog, rain, or snow reduce visibility. Ice is another big risk. An iceberg can inflict fatal damage to a ship if it collides with one; also ice that builds up on the body of a ship can cause it to become unstable and capsize.

Notorious wrecks

1 RMS Titanic
On April 14, 1912, this ship struck an iceberg and sank two hours and forty minutes later.
Death toll: 1,517

2 USS Arizona
Sunk in the opening minutes of the Japanese attack on the US Navy at Pearl Harbor in 1942.
Death toll: 1,177

3 RMS Lusitania
British liner sunk by a

World War I German submarine in 1915.
Death toll: 1,200

4 Bismarck
German battleship, lost after a hard battle with HMS Hood in May 1941.
Death toll: 2,085

5 Nuestra Señora de Atocha
Spanish galleon, laden with treasure, caught in a hurricane in 1622.
Death toll: 260

6 Wilhelm Gustloff
German passenger ship torpedoed by a Russian submarine in 1945.
Death toll: approx. 9,100

7 HMS Sussex
Royal Navy ship lost in a storm off Gibraltar in 1694, carrying over 10 tons of gold coins.
Death toll: 500

8 MV Doña Paz
Passenger ferry that collided with an oil

tanker off the Philippines in 1987.
Death toll: 4,375

9 HMS Birkenhead
British ship that sank after striking rocks at Danger Point in 1852.
Death toll: 460

10 Batavia
Dutch ship that sank off Australia in 1629, on its maiden voyage.
Death toll: wreck 40; later mutiny 233

Battle of Midway (1942)

US ships *Yorktown* and *Hammann* were lost here, along with four Japanese aircraft carriers and a cruiser, in one of World War II's fiercest naval battles.

Eduard Bohlen (1909)

Ran aground in fog and now lies 400 m (1,300 ft) inland, half-buried in huge sand dunes.

HMS Pandora (1791)

Sank while on a mission to find the HMS *Bounty* and its mutinous crew.

Artificial shipwrecks

Humans can be responsible for shipwrecks in many different ways. War is one of the main causes—missiles, mines, air attacks, and sabotage have all been used to destroy ships. Other factors can be bad design, shoddy construction, or poor maintenance and repairs; navigation errors that cause a ship to run aground or hit other traffic; and overloading cargo so that the vessel tips over.



Golden Gate Bridge

San Francisco, California, 1937. World-famous steel bridge and longest suspension bridge in the world when built.

Boeing Everett Factory

Everett, Washington, 1968. Aircraft assembly building and the largest building in the world.

Hibbing Taconite Company Mine

Hibbing, Minnesota, 1895. World's largest open-pit mine.

Lockheed SR-71 Blackbird

Beale, California, 1964. Fastest manned jet aircraft.

Hoover Dam

Nevada/Arizona, 1936. Largest concrete structure ever built at the time of construction.

WM Keck Observatory

Mauna Kea, Hawaii, 1993 and 1996. Second-largest optical telescopes on Earth.

Very Large Array

Socorro, New Mexico, 1973–80. Astronomical observatory made up of 27 radio antennas arranged in a Y-shape.

Panama Canal

1914. 48 miles (77 km) long. Among the most difficult engineering projects in history.

Itaipu Dam

Brazil/Paraguay, 1984. Largest hydroelectric producer of energy in the world.

San Alfonso del Mar swimming pool

Algarrobo, Chile, 2006. 0.6 mile (1 km) long and 115 ft (35 m) deep. Largest swimming pool in the world.

Great Belt Bridge

Denmark, 1998. Connects islands of Zealand and Funen. World's longest suspension bridge carrying both rail and road traffic.

Bell Rock Lighthouse

Inchcape, Scotland, 1810. Oldest surviving lighthouse.

The Langed Pipeline

2006. Undersea pipeline pumping Norwegian natural gas to Britain.

London Sewage System

Late 19th century. Declared an engineering triumph for diverting raw sewage away from the Thames River.

Channel Tunnel

Folkestone, UK—Calais, France, 1994. International undersea rail tunnel.

Graf Zeppelin

Bilbao, Spain, 1997. Important work of modern architecture.

The Concorde

Sagrada Familia

Barcelona, Spain, 1882–current. Huge church designed by Antoni Gaudí, considered a masterpiece, and still under construction.

Large Hadron Collider

Geneva, Switzerland, 1998–2008. Giant scientific instrument for testing particles.

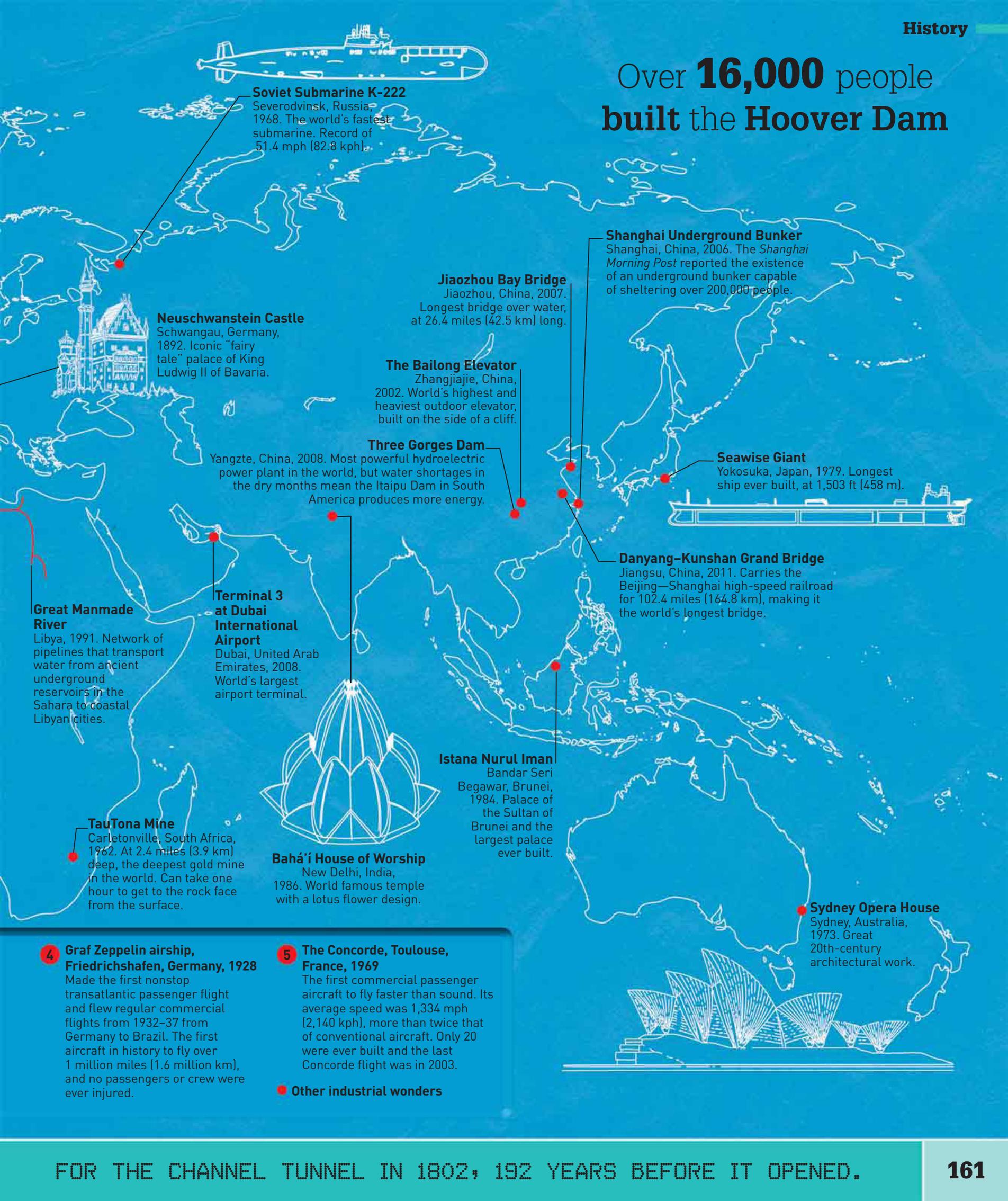
Industrial wonders

The Industrial Revolution of the 18th and 19th centuries saw remarkable advances in technology and materials. This led to extraordinary design and engineering feats, the likes of which had never been seen before.

Industrial pioneers

- 1 First transatlantic cable, Canada—Ireland, 1858**
Cable that transported messages from one end to the other. The first of its kind to be laid across the Atlantic, meaning messages could be received in a matter of minutes.
- 2 Transcontinental Railroad, California—Nebraska, 1869**
Connected the east coast railroads of the US with the Pacific coast for the first time. Considered to be one of the greatest technological feats of the 19th century.
- 3 Home Insurance Building, Chicago, Illinois, 1885**
First ever steel-framed building, and first tall building to be supported by a fireproof metal frame. Although not very tall, the technology used make it the first “skyscraper.”

Over **16,000** people built the Hoover Dam



Soviet Submarine K-222
Severodvinsk, Russia, 1968. The world's fastest submarine. Record of 51.4 mph (82.8 kph).

Neuschwanstein Castle
Schwangau, Germany, 1892. Iconic "fairy tale" palace of King Ludwig II of Bavaria.

Jiaozhou Bay Bridge
Jiaozhou, China, 2007. Longest bridge over water, at 26.4 miles (42.5 km) long.

Shanghai Underground Bunker
Shanghai, China, 2006. The *Shanghai Morning Post* reported the existence of an underground bunker capable of sheltering over 200,000 people.

The Bailong Elevator
Zhangjiajie, China, 2002. World's highest and heaviest outdoor elevator, built on the side of a cliff.

Three Gorges Dam
Yangtze, China, 2008. Most powerful hydroelectric power plant in the world, but water shortages in the dry months mean the Itaipu Dam in South America produces more energy.

Seawise Giant
Yokosuka, Japan, 1979. Longest ship ever built, at 1,503 ft (458 m).

Great Manmade River
Libya, 1991. Network of pipelines that transport water from ancient underground reservoirs in the Sahara to coastal Libyan cities.

Terminal 3 at Dubai International Airport
Dubai, United Arab Emirates, 2008. World's largest airport terminal.

Danyang-Kunshan Grand Bridge
Jiangsu, China, 2011. Carries the Beijing-Shanghai high-speed railroad for 102.4 miles (164.8 km), making it the world's longest bridge.

TauTona Mine
Carletonville, South Africa, 1962. At 2.4 miles (3.9 km) deep, the deepest gold mine in the world. Can take one hour to get to the rock face from the surface.



Bahá'í House of Worship
New Delhi, India, 1986. World famous temple with a lotus flower design.

Istana Nurul Iman
Bandar Seri Begawar, Brunei, 1984. Palace of the Sultan of Brunei and the largest palace ever built.

Sydney Opera House
Sydney, Australia, 1973. Great 20th-century architectural work.



4 Graf Zeppelin airship, Friedrichshafen, Germany, 1928
Made the first nonstop transatlantic passenger flight and flew regular commercial flights from 1932-37 from Germany to Brazil. The first aircraft in history to fly over 1 million miles (1.6 million km), and no passengers or crew were ever injured.

5 The Concorde, Toulouse, France, 1969
The first commercial passenger aircraft to fly faster than sound. Its average speed was 1,334 mph (2,140 kph), more than twice that of conventional aircraft. Only 20 were ever built and the last Concorde flight was in 2003.

● **Other industrial wonders**





Culture

Holi Festival, Jodhpur, India
During the Hindu spring festival of Holi—known as the Festival of Colors—people throw pigments and colored water over each other.

Introduction

The word “culture” is a broad idea and includes the values, beliefs, and behavior of a society, or group of people. Culture includes many things, including customs, language, religion, music, art, food, and clothing. Some points of culture are traditional, having survived virtually unchanged for centuries. Others are short-lived, such as fashion styles and trends in pop music.

Modern culture

Today’s culture is fast-moving and ever-changing, thanks in part to the instant communication offered by the Internet. But long before the Internet, the migration of people around the world began introducing people to cultures different from their own. Global broadcasting then accelerated this effect in the 20th century. The cultural contact often creates a fusion (uniting) of different cultural styles, especially in the fields of music, fashion, and cooking.

Live performances

Huge crowds watch singers, such as Eva Simons (right), perform live, just as they have always done. But today the “live” audience can number many millions, with most watching remotely via radio, TV, and the Internet.



Stadium spectators

For many sports fans, being part of a passionate, noisy, banner-waving stadium crowd makes them feel an important part of the event.

Headdress, called a *kiritam*, varies in size and design, according to the character being portrayed.

Hand gestures

(known as *mudra*) are the dancer’s main way of telling the story.

Noble-hearted characters always have green faces; dark red signifies a treacherous nature.

Kathakali dancer

Indian kathakali dancers enact stories from two epic poems, the *Ramayana* and the *Mahabharata*. Dealing with the constant struggle between good and evil, dances end with the destruction of a demon.

Heroes

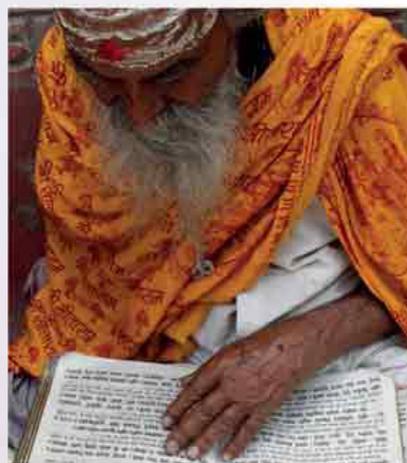
always wear red jackets

Dancer’s skirt

is made up of many layers of white cotton.

Traditional culture

Older people can pass culture on to the next generation, enabling a society's traditions to be preserved for many years. The *Ramayana*, a Hindu poem written in the 5th or 4th century BCE, tells the story of Rama and Sita, and their battle against the demon-king Ravana. Over many generations, the *Ramayana* and its values have been kept alive in India and southern Asia through writing, story telling, painting, sculpture, festivals, music, and dance.



Literature

The *Ramayana* was originally written in Sanskrit, the language of Hinduism and ancient Indian literary texts.



Sculpture

The great warrior Rama, holding his bow, stands next to his wife Sita. Both hold up their right hands in blessing.



Festival

At the Hindu festival of Diwali, people light lamps to commemorate Rama's return from exile and his victory over Ravana.



Painting

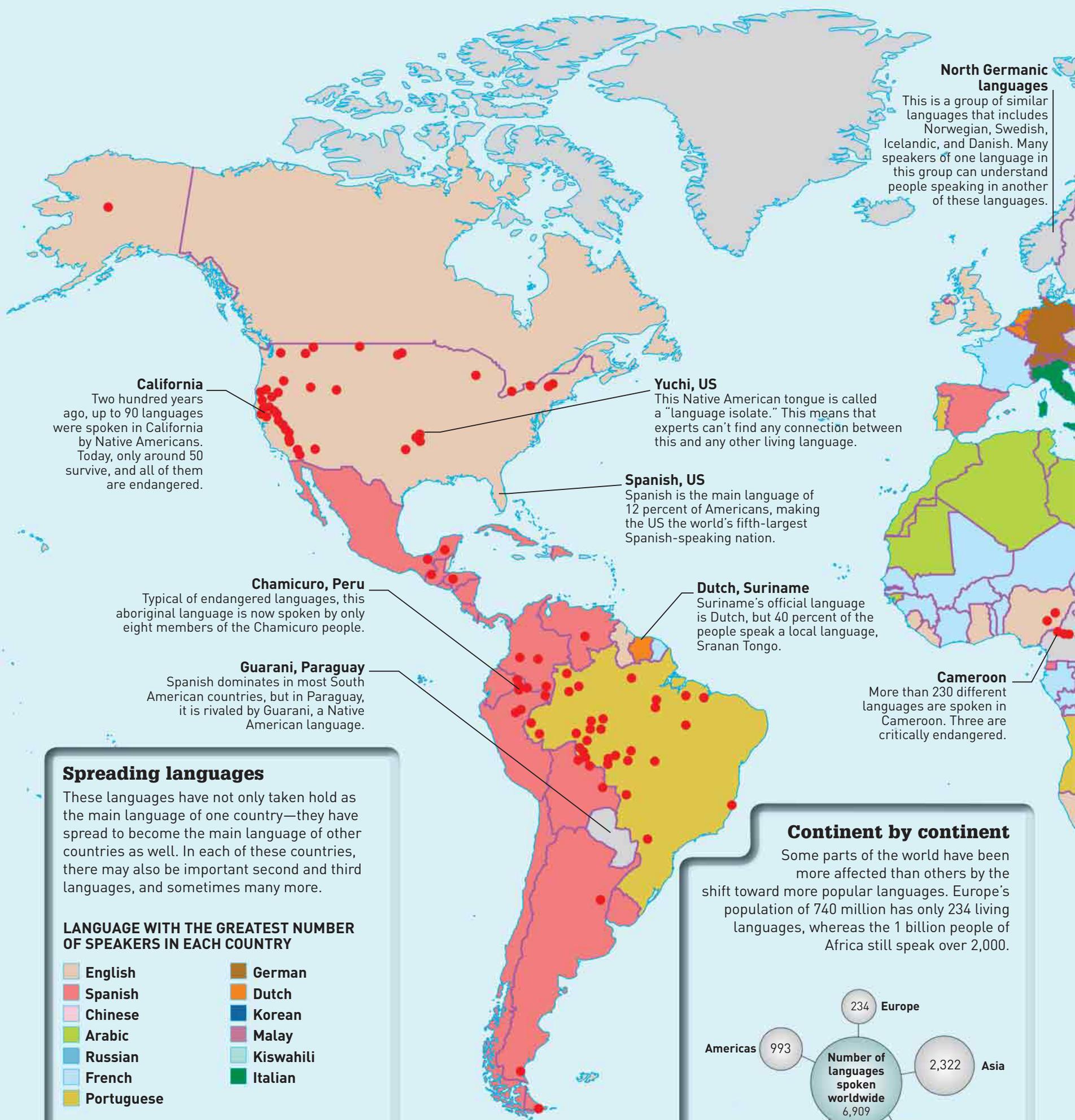
In this scene from the *Ramakien*, a Thai version of the *Ramayana*, the monkey god Hanuman uses his body as a bridge for Rama to cross.



Music

Musicians in Bali, Indonesia, provide accompaniment to kecak dancers, who perform parts of the *Ramayana*.





Spreading languages

These languages have not only taken hold as the main language of one country—they have spread to become the main language of other countries as well. In each of these countries, there may also be important second and third languages, and sometimes many more.

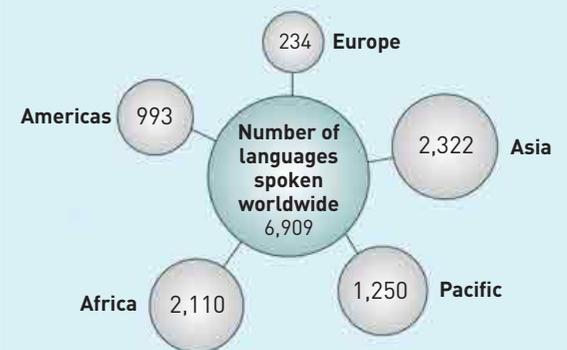
LANGUAGE WITH THE GREATEST NUMBER OF SPEAKERS IN EACH COUNTRY

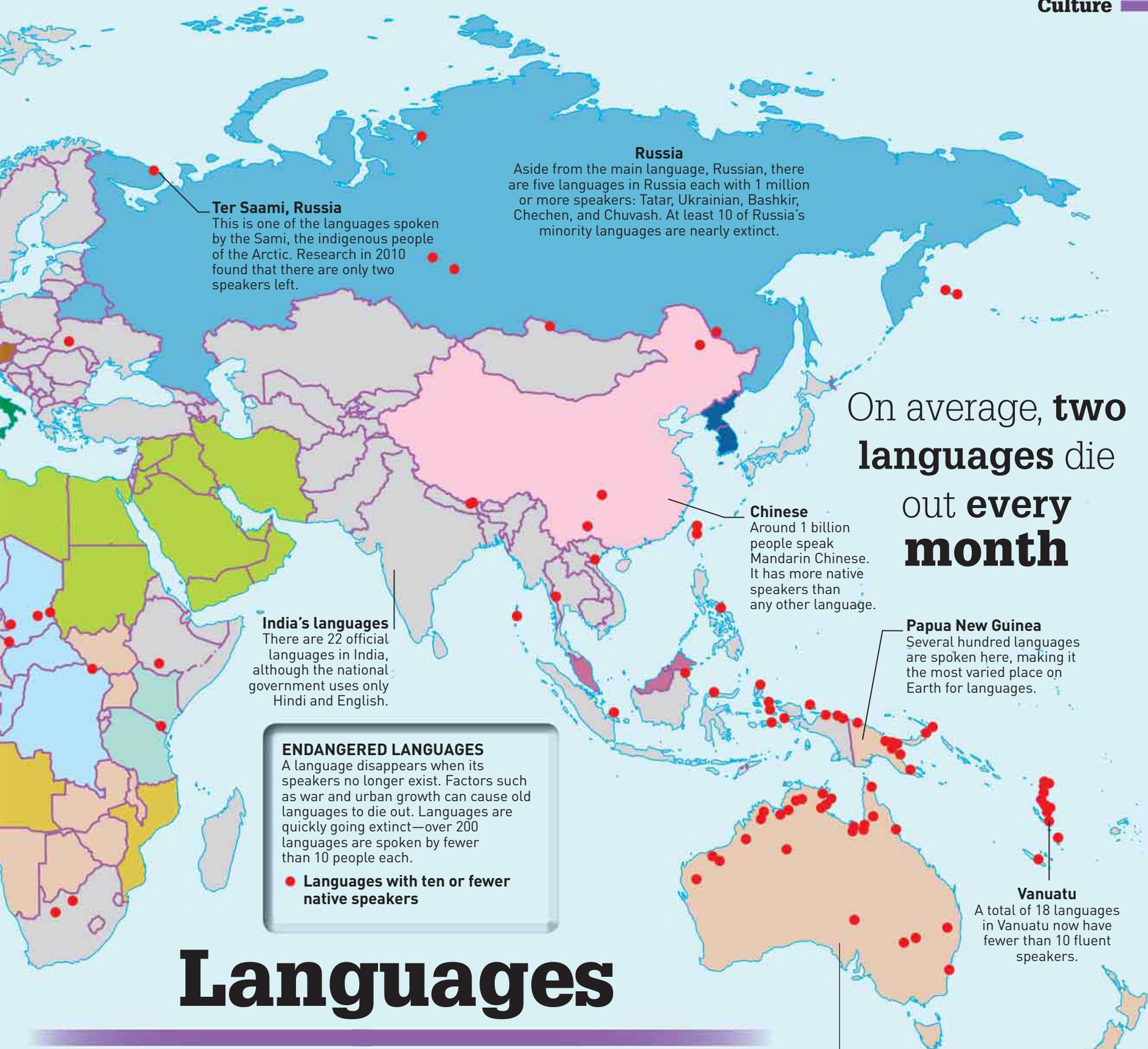
- English
- Spanish
- Chinese
- Arabic
- Russian
- French
- Portuguese
- German
- Dutch
- Korean
- Malay
- Kiswahili
- Italian

Countries with a unique main language
Each of these countries has a main language that is not the main language of any other country.

Continent by continent

Some parts of the world have been more affected than others by the shift toward more popular languages. Europe's population of 740 million has only 234 living languages, whereas the 1 billion people of Africa still speak over 2,000.





Languages

Languages were developed by humans so that they could communicate with each other within their groups. As communities began to interact more, some languages spread and became more widely spoken, whereas others were used less or even died out.

Australia's languages
Almost 400 languages were spoken by Aboriginal people before European settlers arrived. Only about 15 are now spoken by all age groups. Only older people speak the remaining 72, meaning these will quickly die out without help.

MAJORITY RELIGIONS

Each country is colored according to the religion that is most popular there. In many countries, however, millions of people follow religions that are not the majority religion, and many more are not religious at all.

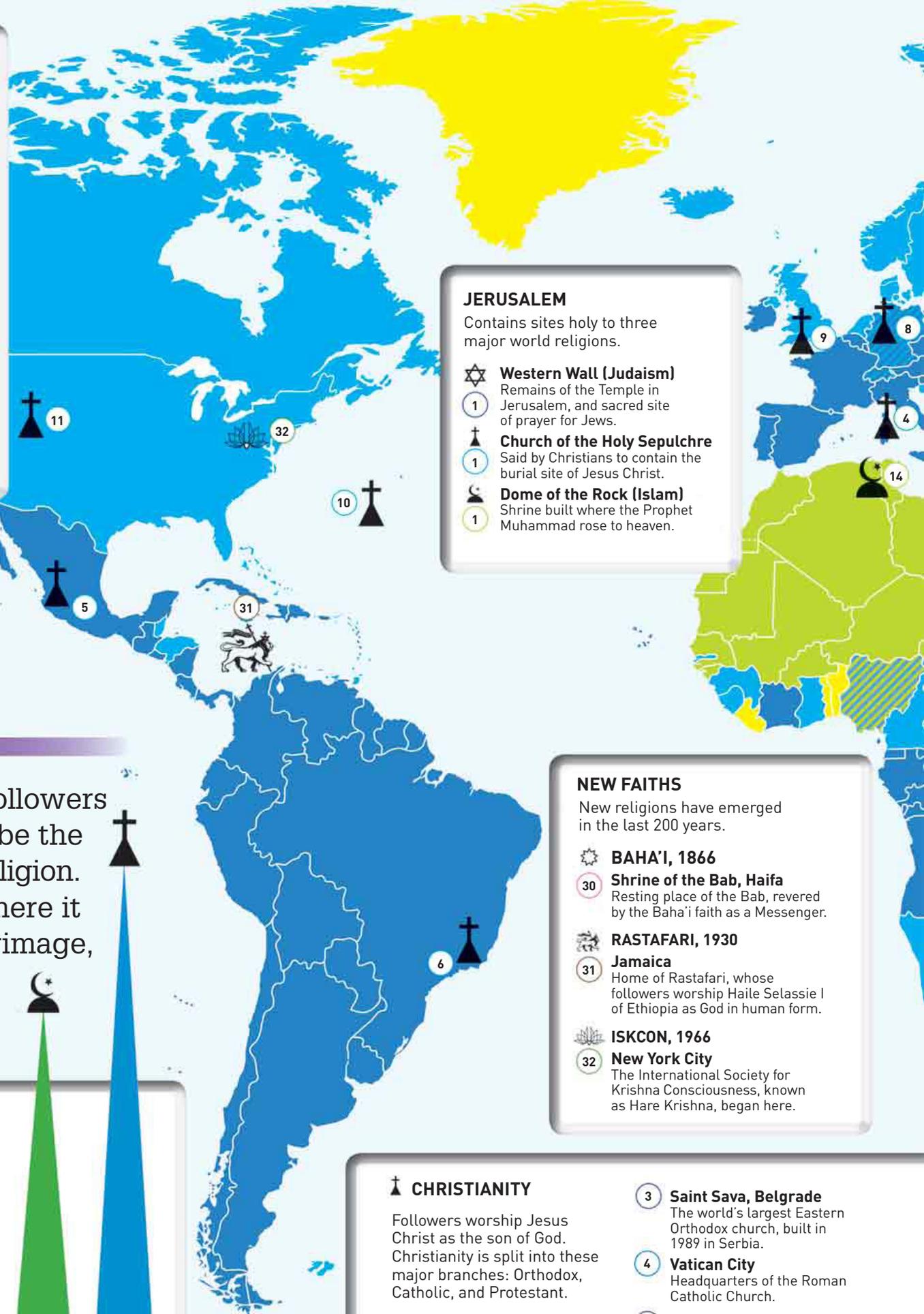
- Judaism
- Orthodox Christianity
- Catholic Christianity
- Protestant Christianity
- Sunni Islam
- Shi'a Islam
- Hinduism
- Chinese traditional religion
- Christianity and native religions
- Buddhism
- Shinto

Holy places

A place that religious followers think of as “holy” may be the spiritual center of the religion. It could be the place where it all began, a site of pilgrimage, or the religion’s official headquarters.

Religious followers

Most of the world’s people identify with a religion, whether or not they take part in religious services. Their beliefs, customs, or ancestors link them to their religious community.



JERUSALEM

Contains sites holy to three major world religions.

- Western Wall (Judaism)**
Remains of the Temple in Jerusalem, and sacred site of prayer for Jews.
- Church of the Holy Sepulchre**
Said by Christians to contain the burial site of Jesus Christ.
- Dome of the Rock (Islam)**
Shrine built where the Prophet Muhammad rose to heaven.

NEW FAITHS

New religions have emerged in the last 200 years.

- BAHA'I, 1866**
Shrine of the Bab, Haifa
Resting place of the Bab, revered by the Baha'i faith as a Messenger.
- RASTAFARI, 1930**
Jamaica
Home of Rastafari, whose followers worship Haile Selassie I of Ethiopia as God in human form.
- ISKCON, 1966**
New York City
The International Society for Krishna Consciousness, known as Hare Krishna, began here.

CHRISTIANITY

Followers worship Jesus Christ as the son of God. Christianity is split into these major branches: Orthodox, Catholic, and Protestant.

- St. Mary of Zion Church**
Heart of the Ethiopian Orthodox Church and said to hold God's 10 Commandments in the Ark of the Covenant.
- Saint Sava, Belgrade**
The world's largest Eastern Orthodox church, built in 1989 in Serbia.
- Vatican City**
Headquarters of the Roman Catholic Church.
- Our Lady of Guadalupe**
Mexico City's famous image of the Virgin Mary and site of a Roman Catholic pilgrimage.



INDIAN RELIGIONS

Many world religions began in India, or, like Zoroastrianism, have taken up home there.

HINDUISM

- 18 **Varanasi**
Holiest Hindu city. Steps lead bathers down to the sacred Ganges River.
- 19 **Dwarka**
Pilgrimage site, holy city, and one of the Char Dam ("four seats") of Hinduism.
- 20 **Ujjain**
One of seven places (also including Dwarka and Varanasi) of "sacred ground."

BUDDHISM

- 21 **Bodh Gaya**
Place where the Buddha, the founder of Buddhism, found enlightenment.
- 22 **Jokhang, Lhasa, Tibet**
The most important and sacred temple in Tibetan Buddhism.
- 23 **Shwedagon Pagoda**
In Yangon, Myanmar, this huge gold-plated building houses relics of the Buddha.

SIKHISM

- 24 **Harmandir Sahib**
Known in English as the Golden Temple of Amritsar and sacred to Sikhs.

JAINISM

- 25 **Pawapuri**
Sacred to the Jain faith, the site where a key teacher achieved enlightenment.

ZOROASTRIANISM

- 26 **Iranshah Atash Behram, Udvada, India**
An important fire temple of the Zoroastrian faith, which began in Persia (Iran).

FAR EASTERN RELIGIONS

Many beliefs coexist in China and Japan. These are the most common.

CONFUCIANISM

- 27 **Dacheng Hall, Qufu**
The largest and oldest temple of the teacher, Confucius.

TAOISM

- 28 **White Cloud Temple**
Headquarters of the Chinese Taoists, Beijing.

SHINTO

- 29 **Izumo Taisha, Japan**
The Japanese emperor's family shrine.

ISLAM

Muslims, followers of Islam, believe in one god and that Muhammad (570–632 CE) is His prophet. This religion split into Sunni and Shi'a faiths early on.

- 12 **Makkah**
Sacred to all Muslims as Muhammad's birthplace.
- 13 **Medinah**
The burial site of Islam's prophet, Muhammad.
- 14 **Kairouan, Tunisia**
Fourth city of Sunni Islam, and seat of Islamic learning.
- 15 **Najaf, Iraq**
Third city of Shi'a Muslims. Features the tomb of their first imam, Imam Ali.
- 16 **Konya, Turkey**
Home of Sufi mystic Rumi, whose followers perform the "Whirling Dervish" dance.
- 17 **Demak Great Mosque**
One of Indonesia's oldest mosques, built in the 15th century.

- 6 **Our Lady of Aparecida, São Paulo, Brazil**
Eight million Catholic pilgrims a year visit this celebrated statue of the Virgin Mary.
- 7 **San Agustin Church, Manila**
The Philippines' oldest church has survived bombs and earthquakes since 1607.
- 8 **All Saint's Church, Germany**
In Wittenberg, Martin Luther began Protestantism by nailing his ideas on the church door.
- 9 **Canterbury Cathedral**
Place of pilgrimage and world center of the Anglican Protestant Church.
- 10 **St. Peter's Church**
The oldest Anglican church outside Britain, in Bermuda.
- 11 **Salt Lake Temple**
Largest center of worship of the Church of Jesus Christ of Latter-day Saints, known as the Mormon Church.

Raft the Salmon River, Idaho

Ride the rapids as you travel through spectacular canyons on the "River of No Return."

Surf at Mavericks, California

Only a select few are prepared to risk the big, wild waves at Mavericks, which can reach 50 ft (15 m).

Gran Cenote, Mexico

Divers can marvel at stalactites and stalagmites in this huge undersea cave formation.

Kauna'oa Bay, Hawaii

In addition to swimming and sunbathing, you can snorkel to investigate local marine life. At night, you can even watch manta rays feeding in the bay.

Galápagos Islands, Ecuador

These isolated islands boast many unique species, including giant tortoises, marine iguanas, and many different types of finch.

Bora Bora, French Polynesia

Just 18 miles (29 km) long, this little island—the remnant of an extinct volcano—has beautiful white sandy beaches in a turquoise lagoon fringed by palm trees.

Hike the Inca Trail, Peru

Hike through mountains and jungles to the wonderfully preserved remains of the Inca city of Machu Picchu. Lost for hundreds of years, this 15th-century settlement was rediscovered in 1911.

Palm Beach, Florida

Loved by millionaires, Palm Beach offers warm water, a fine climate, and bright city lights close at hand.

Bonaire, Caribbean

There are over 80 superb dive sites around this small island, which is home to three species of sea turtle.

Pantanal, Brazil/Bolivia/Paraguay, South America

The world's greatest concentration of jaguars—and much more besides. Over 1,000 bird species, including storks and macaws, and 300 types of mammal such as tapirs and anteaters.

London Eye, UK

At its highest point, 443 ft (135 m) above the ground, the London Eye offers a panoramic view that stretches 25 miles (40 km) to the horizon.

Wiener Riesenrad, Vienna, Austria

Built in 1897, this 213-ft- (65-m-) tall structure was one of the first Ferris wheels ever made.

Skydivers
in freefall reach
125 mph
(200 kph)

KEY

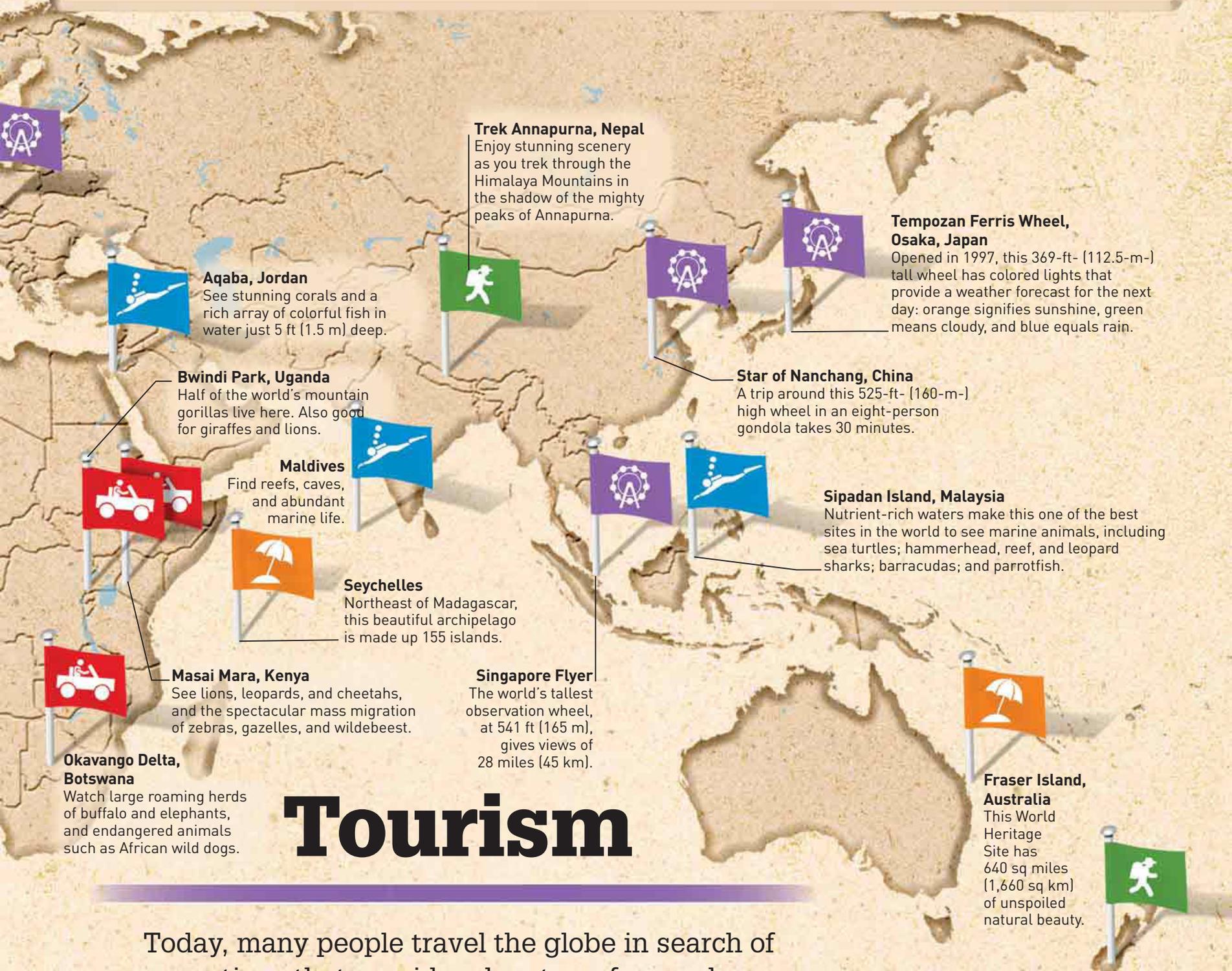
Adventure destinations
If you like your vacations thrill-packed, try these extreme activities, from white-water rafting and skydiving to surfing and trekking in remote regions.

World's top big wheels
Why not take a city break and ride one of the world's amazing observation wheels? Watch the world turn and take in the incredible views from the top.

Best diving and snorkeling sites
Take the plunge and immerse yourself in the magical worlds of coral reefs and undersea caverns. Swim with the fish... but watch out for the venomous ones!

Top 5 Beaches
Relax, stretch out, and catch some rays on a sandy shore somewhere. Can't decide where to go? No worries—we've done the hard work for you and picked the best of the bunch.

Top 5 Safari sites
Get right up close to nature on a safari. See wild animals in their natural habitats, experience incredible animal migrations, and marvel at unique species.



Trek Annapurna, Nepal
Enjoy stunning scenery as you trek through the Himalaya Mountains in the shadow of the mighty peaks of Annapurna.

Aqaba, Jordan
See stunning corals and a rich array of colorful fish in water just 5 ft (1.5 m) deep.

Tempozan Ferris Wheel, Osaka, Japan
Opened in 1997, this 369-ft- (112.5-m-) tall wheel has colored lights that provide a weather forecast for the next day: orange signifies sunshine, green means cloudy, and blue equals rain.

Bwindi Park, Uganda
Half of the world's mountain gorillas live here. Also good for giraffes and lions.

Star of Nanchang, China
A trip around this 525-ft- (160-m-) high wheel in an eight-person gondola takes 30 minutes.

Maldives
Find reefs, caves, and abundant marine life.

Sipadan Island, Malaysia
Nutrient-rich waters make this one of the best sites in the world to see marine animals, including sea turtles; hammerhead, reef, and leopard sharks; barracudas; and parrotfish.

Seychelles
Northeast of Madagascar, this beautiful archipelago is made up 155 islands.

Masai Mara, Kenya
See lions, leopards, and cheetahs, and the spectacular mass migration of zebras, gazelles, and wildebeest.

Singapore Flyer
The world's tallest observation wheel, at 541 ft (165 m), gives views of 28 miles (45 km).

Okavango Delta, Botswana
Watch large roaming herds of buffalo and elephants, and endangered animals such as African wild dogs.

Fraser Island, Australia
This World Heritage Site has 640 sq miles (1,660 sq km) of unspoiled natural beauty.

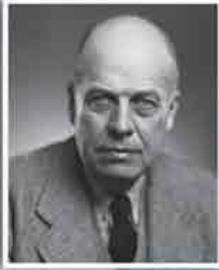
Tourism

Today, many people travel the globe in search of vacations that provide adventure, fun, and an unforgettable glimpse of the world's natural wonders. Here is a selection of the best tourist destinations the world has to offer.

Skydive in Queenstown, New Zealand
Step out of a plane 15,000 ft (4,500 m) above Queenstown and freefall for 60 seconds, until a pull on the ripcord opens your parachute and you float gently to the ground.

Edward Hopper
1882–1967; US.

Hopper painted in the Realist style—a style that tries to show things as they are in real life. Hopper used simple colors and often painted solitary, lonely people.



Andy Warhol
1928–1987, US.

Warhol pioneered Pop Art—the “pop” refers to popular culture. His art used familiar images of famous people and everyday items such as soup cans. Warhol took his inspiration from advertising, TV, and comic strips.



Edvard Munch
1863–1944; Norway.

Munch was an Expressionist artist. Expressionists tried to express feelings in their work, rather than portray people and objects accurately. Munch’s most famous painting is *The Scream* (1893), which shows a person with an agonized expression.



Thomas Gainsborough
1727–88; England.

Founder of the 18th-century British Landscape school, Gainsborough also made portraits. *Mr. and Mrs. Andrews* (1750; right) is an early masterpiece.



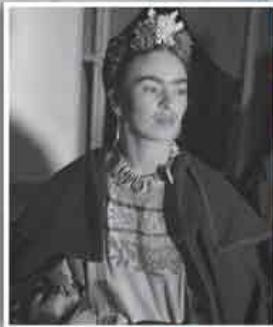
Claude Monet

1840–1926; France. Impressionists such as Monet painted their view of brief moments in time. They often used small, thin, visible brushstrokes.



Frida Kahlo

1907–1954; Mexico. Frida Kahlo began painting after she was badly injured in an accident. She is best known for her self-portraits. Her work used bold, bright colors and was influenced by Mexican folk art.



Pablo Picasso

1881–1973; Spain. Among many other things, this famous artist was one of the founders of Cubism—a style that used shapes to depict people and objects, often showing them from multiple viewpoints at the same time.



Victor Meirelles
1832–1903; Brazil.

Meirelles’ religious and military paintings and depictions of episodes from Brazilian history won him fame and praise in the 19th century. His painting *The First Mass in Brazil* (1861; right) still appears in primary-school history books in Brazil.



Eugène Delacroix

1798–1863; France. Delacroix was one of the Romantics, who stressed imagination and emotion. *Liberty Leading the People* (1830; above) marks the overthrow of Charles X of France in 1830.

Sculpture

15th century–present; Nigeria. The people of the Kingdom of Benin, in what is now Nigeria, sculpted bronze heads and figures. They also made masks out of wood, bronze, and ivory. The tradition continues: on the right is a wooden mask of the late 20th century.



Art

People the world over value art because it allows them to express their emotions and their culture, record history and everyday life, and explore what it means to be human. The works of the world’s great artists often sell for huge sums of money.



Marc Chagall
1904–89; Russia.
Chagall produced Expressionist and Cubist paintings, as well as stained-glass windows. He is known for his paintings of village scenes and of lovers floating in the air.



Yue Minjun
Born 1962; China.
Based in Beijing, Yue Minjun is best known for his oil paintings, which show him frozen with laughter in various poses and in different settings. He has also represented himself in sculptures, watercolor paintings, and prints. He first exhibited his work in 1987; by 2007, he had sold 13 paintings for over \$1 million each.



Tamara de Lempicka
1898–1980; Poland.
In the 1920s and 1930s, de Lempicka was the most famous painter in the Art Deco style, which featured geometric shapes and intense, bright colors. She lived a flamboyant life and associated with the rich and famous.



Caravaggio
1570–1610; Italy.
Caravaggio was one of the Baroque artists who revolutionized art by painting realistic rather than idealized people and scenes. He is one of the most influential painters in art history.

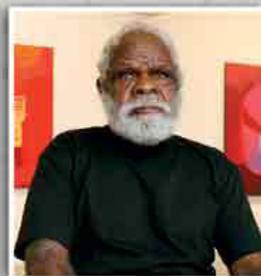


Katsushika Hokusai
1760–1849; Japan.
Hokusai is perhaps the most famous Japanese printmaker. His wood-block prints included landscapes, such as *The Great Wave of Kanagawa* (1831; above), and scenes from everyday life.

Basawan
c.1580–1600; India.
A painter of miniature scenes, Basawan illustrated the *Akbarnama* (right)—the official chronicle of Akbar, the third Mughal Emperor.



Willie Bester
Born 1956; South Africa.
Bester's collages and sculptures use recycled material and objects found in scrap yards and flea markets. His 1992 *Tribute to Biko* (above) commemorates Stephen Biko, who campaigned for racial equality in South Africa.



Yannima Tommy Watson
Born c.1935; Australia.
Despite starting painting only in 2001, when he was in his mid-60s, Tommy Watson rapidly became one of Australia's foremost Aboriginal artists. His paintings relate to the stories of the Dreamtime—the creation period in Aboriginal mythology.

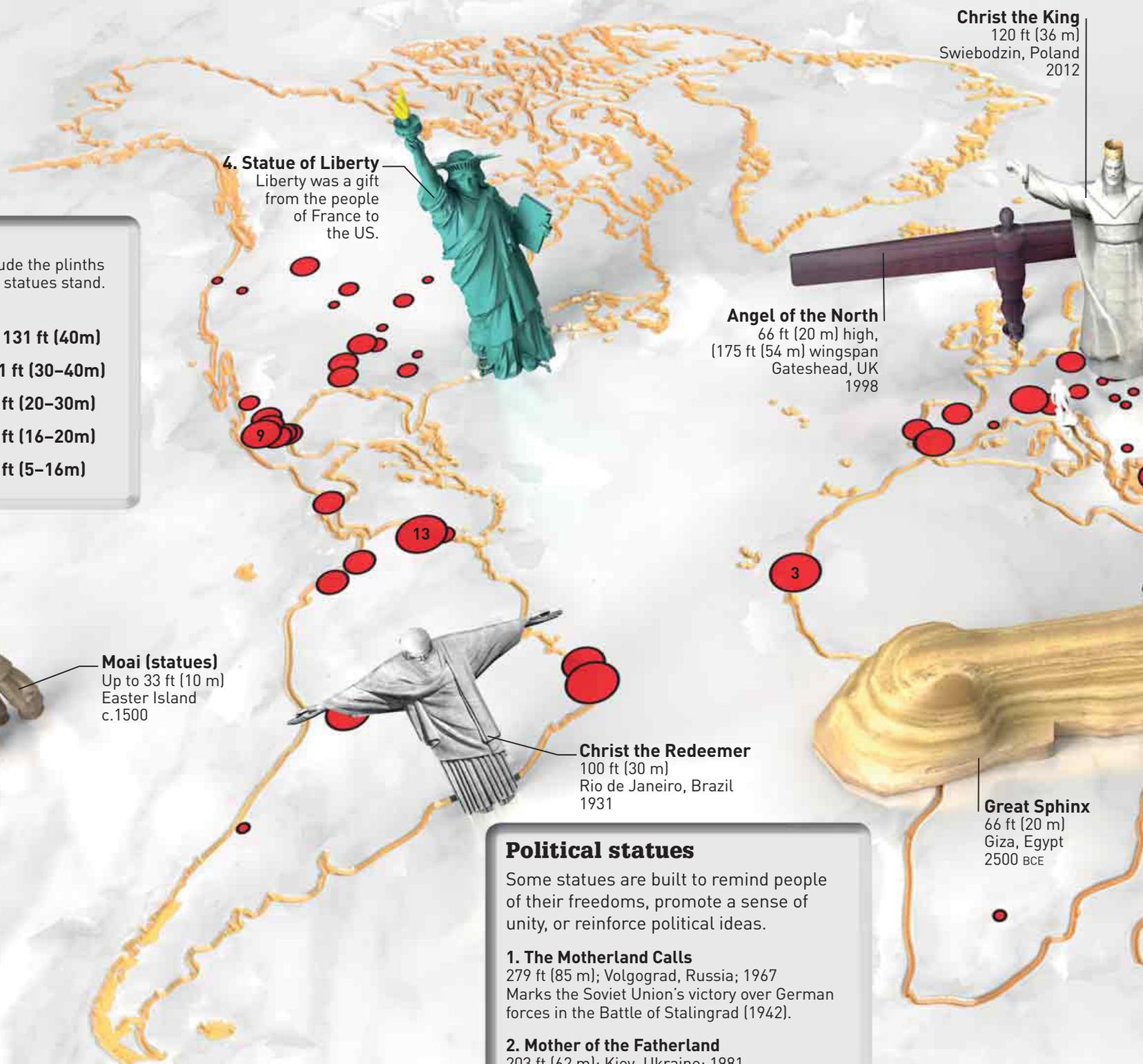
It is estimated that **Picasso** produced about **148,000** works of art during his **lifetime**

Statues

Since ancient times, humans have built grand statues of great rulers, heroic figures, and gods and goddesses. We are still doing it, and statues today are getting bigger and bigger.

KEY
Heights exclude the plinths on which the statues stand.

- Above 131 ft (40m)
- 98–131 ft (30–40m)
- 66–98 ft (20–30m)
- 52–66 ft (16–20m)
- 16–52 ft (5–16m)



4. Statue of Liberty
Liberty was a gift from the people of France to the US.

Christ the King
120 ft (36 m)
Swiebodzin, Poland
2012

Angel of the North
66 ft (20 m) high,
(175 ft (54 m) wingspan
Gateshead, UK
1998

Moai (statues)
Up to 33 ft (10 m)
Easter Island
c.1500

Christ the Redeemer
100 ft (30 m)
Rio de Janeiro, Brazil
1931

Great Sphinx
66 ft (20 m)
Giza, Egypt
2500 BCE

Political statues

Some statues are built to remind people of their freedoms, promote a sense of unity, or reinforce political ideas.

1. The Motherland Calls
279 ft (85 m); Volgograd, Russia; 1967
Marks the Soviet Union's victory over German forces in the Battle of Stalingrad (1942).

2. Mother of the Fatherland
203 ft (62 m); Kiev, Ukraine; 1981
The female statue represents the strength and victory of the Soviet Union in World War II.

3. African Renaissance Monument
161 ft (49 m); Dakar, Senegal; 2010
Africa's tallest statue shows a man gazing out to sea as he holds a woman and child.

4. Statue of Liberty
151 ft (46 m); New York, US; 1886
"Lady Liberty" stands with a torch in one hand and a stone tablet in the other.

5. Juche Tower statues
100 ft (30 m); Pyongyang, North Korea; 1982
Three figures represent a peasant, an industrial worker, and an intellectual.



African Renaissance Monument

The **Angel of the North** has a bigger wingspan than a **Boeing 767** jet



1. The Motherland Calls

The statue beckons fighters to come to the defense of their nation.

Spring Temple Buddha

420 ft (128 m); Lushan, China; 2002
The world's tallest statue. Named after the nearby Tianrui hot spring.

Religious statues

Many religious movements use statues to inspire belief and to aid worship.



Guanyin, Hainan, China

11. Buddha

381 ft (116 m); Monywa, Myanmar; 2008
Depicts the Buddha standing. World's second-tallest statue.

12. Guanyin

354 ft (108 m); Sanya, Hainan, China; 2005
Represents the goddess Guanyin blessing the world.

13. Virgin of Peace

154 ft (47 m) Trujillo, Venezuela; 1983
The Virgin Mary, mother of Jesus, is shown holding a dove of peace in her hand.

14. Shiva

143 ft (44 m); Chitapol, Kathmandu, Nepal; 2012
Hindu god Shiva stands with a trident in his left hand. His right hand offers a blessing.

15. Murugan

141 ft (43 m); Batu Caves, Gombak, Malaysia; 2006
Statue stands by a cave shrine to the Hindu god Murugan.

Historical statues

Nations often use statues to celebrate the most famous people—both real and legendary—from their past.

6. Yan Di and Huang Di

348 ft (106 m); Zhengzhou, China; 2007
Shows the heads of two legendary kings regarded as the early founders of the Chinese nation.

7. Peter the Great

315 ft (96 m); Moscow, Russia; 1997
Erected to celebrate 300 years of the Russian Navy, which was founded by Czar Peter I.

8. Guan Yu

200 ft (61 m); Yucheng, Shanxi, China; 2010
Statue of the general Guan Yu (160–219), later deified as Chinese god of war, at his birthplace.

9. José Maria Morelos

131 ft (40 m); Janitzio, Michoacán, Mexico; 1934
Mexico's rebel leader in the War of Independence (1810–21) is shown with a raised, clenched fist.

10. Genghis Khan

131 ft (40 m) Tsonjin Boldog, Mongolia; 2007
This statue depicts the famous Mongol leader (r.1206–1227) mounted on a horse.



Peter the Great

Tulip Time Festival

Michigan

This festival is held in cities that were founded by the Dutch or had large numbers of Dutch settlers. Tulips line the streets and special tulip gardens are created for the event.

Thanksgiving

US and Canada

This harvest celebration in November (October in Canada) usually involves a turkey dinner. It was first held to give thanks for the harvest of 1621.

Noche de Rábanos

Oaxaca, Mexico

When radishes first were brought to the Americas in the 16th century, market traders made radish sculptures to advertise the new vegetables. The "Night of the Radishes" has celebrated that custom since 1897.

Tapati Festival

Easter Island

Tapati includes dancing, ritual chants, art exhibits, carving competitions, horse and boat races, body-painting, a string figure (*kai-kai*) contest, the selection of a queen, a parade, and *haka pei*—sliding down a steep hillside on banana-tree trunks at high speed.

Inti Raymi Day

Cuzco, Peru

The Festival of the Sun dates back to the Incas. People celebrate the winter solstice and the start of the new year.

Cheese Rolling Festival

Gloucestershire, UK

Contestants chase a roll of cheese down a steep, muddy hill.

Tomatina

Buñol, Valencia

Since 1944, tomato fights have been held on the last Wednesday of August. Over 100 tons of tomatoes are hurled each year!

Festival of the Sahara

Tunisia

A festival celebrating nomadic life and traditions. Events include camel marathons and performances of Bedouin song, dance, and poetry.

Festival-au-Desert

Mali

Three days of traditional Tuareg art, music, and dance. Everyone camps in the desert, with their camels close by.

Carnival



Carnival is marked by parades, such as in Rio de Janeiro, Brazil (left). It comes just before Lent—a time of fasting and avoiding rich foods that leads up to the Christian festival of Easter.

 Major Carnival locations

Festivals

Festivals give people a chance to celebrate their religious and cultural traditions. Above all, they are a great opportunity to throw a party!

Wife-Carrying World Championships

Sonkajärvi, Finland
Male entrants carry their wives over an obstacle course. The winner receives his wife's weight in beer.

Baltai

Tatarstan, Russia
Baltai means "feast of honey." The festival marks the start of the mowing season and is celebrated by decorating a bear with birch leaves.

Chinese New Year

Called the Spring Festival in China, since it marks the end of winter, this festival typically involves street processions with lanterns and Chinese dragons. Families clean their houses to sweep away bad fortune and welcome in the New Year. The festival is celebrated in all countries with significant populations of Chinese people.



Locations with important Chinese New Year celebrations



Ghost Festival, China

Part of "Ghost Month," when the ghosts and spirits of dead ancestors are said to emerge from the underworld.

Boryeong Mud Festival

Boryeong, South Korea
At this messy festival, which dates from 1998, people cover each other in mud. The mud is said to contain minerals that are good for the skin.

Awa Odori

Tokushima, Japan
Awa Odori began in 1586, when Tokushima's residents decided to celebrate their town's new castle. Today, more than 1 million tourists visit to watch performers in traditional dress dance in the streets.

Janmashtami

Mumbai, India
Marks the birthday of the Hindu god Krishna. Boys and men clamber to the top of a pole, trying to smash a clay pot full of curd and spill its contents. Krishna is said to have stolen curd from pots as a boy.

Esala Maha Perahera

Kandy, Sri Lanka
The 10-day "Festival of the Tooth" celebrates the Tooth Relic of the Lord Buddha. Dancers, acrobats, and fire performers gather in Kandy. On the last night, an elegantly dressed elephant carries the tooth.

Bendigo Easter Festival

Bendigo, Australia
Dating from 1871, this is Australia's longest continuously running festival. During the festival's Easter procession, the *Sun Loong*, the longest imperial dragon in the world, dances through the streets of Bendigo.

Incwala

Swaziland
At the "Festival of the first fruits," the king eats pumpkins and other fruits. People dance and sing in his honor and to bring blessings on the harvest.

Prickly Pear Festival

Mandela Bay, South Africa
This is a day for celebrating (and eating!) traditional foods such as ginger beer, pancakes, potjiekos, bunnychow, and fish braai.

World parties

Some festivals draw people from far and wide. They may be messy, such as Tomatina (left), or involve unusual competitions, such as wife-carrying.



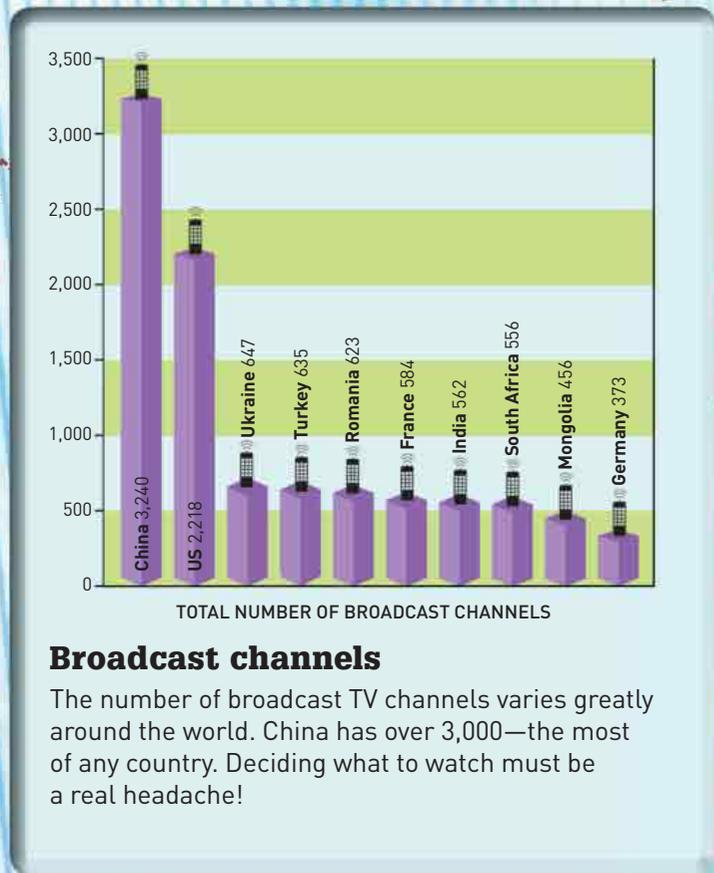
Key world party sites

Te Matatini

New Zealand
A Māori dance festival in which performers come together from all over New Zealand to compete in the national finals. *Te Matatini* means "many faces."

Television

Televisions provide us with entertainment and news 24 hours a day. People also watch TV programs on mobile devices such as laptops, smartphones, and tablets.



Broadcast channels

The number of broadcast TV channels varies greatly around the world. China has over 3,000—the most of any country. Deciding what to watch must be a real headache!

United Kingdom
In a 65-year lifetime, a person in the UK may spend up to 9 years watching television.

United States
Ninety-nine percent of US homes have at least one TV, and 66 percent have three or more TV sets.

French Guiana
There are around 30,000 TV sets serving a population of 173,000.

Ghana
Around 2 million Ghanaian households have a television.

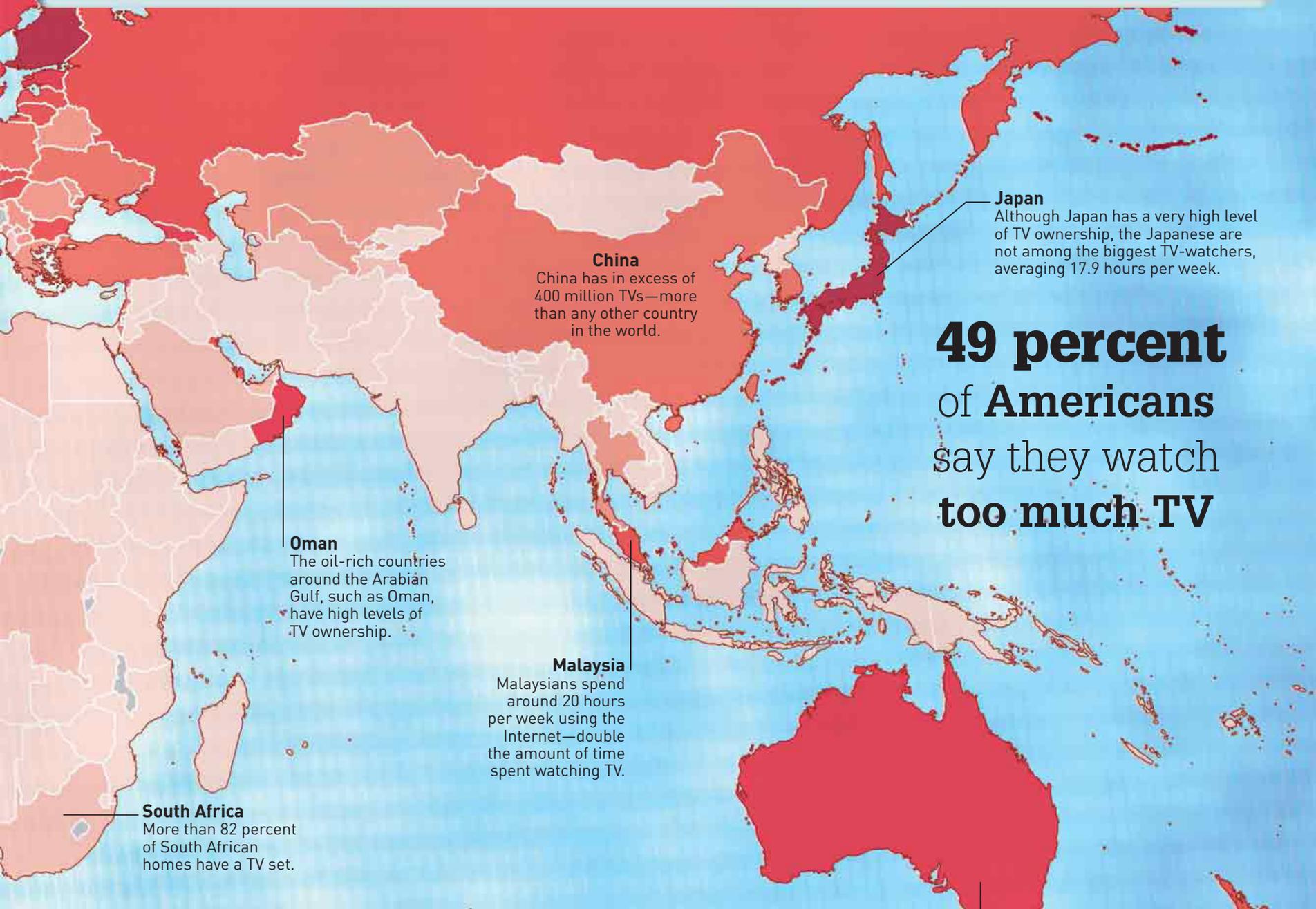
Argentina
Ninety-seven percent of Argentinian homes possess a television.

Falkland Islands
TV ownership is relatively high among the tiny population of about 2,500 islanders.

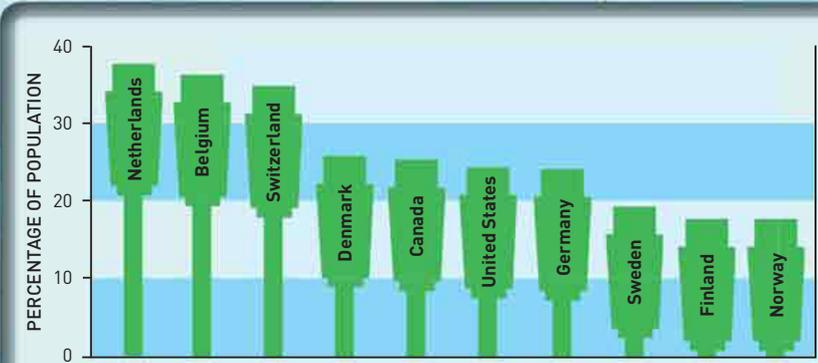


Hours per week

Experts say that watching over 2 hours of TV per day (14 hours per week) can be bad for your health, yet in the US and UK, people watch twice that.



49 percent
of **Americans**
say they watch
too much TV



Cable TV subscribers

“Terrestrial” channels reach your TV via an antenna on your home. Other channels are broadcast by satellite or sent through cables. In rich nations, many people are prepared to pay for the extra channels that cable TV companies provide.

Americas

1 Los Angeles Memorial Coliseum
California. Capacity 93,607; opened 1921

2 Rose Bowl
Pasadena, California. Capacity 92,542; opened 1922

3 Dodgers Stadium
California. Capacity 56,000; opened 1962

4 University of Phoenix Stadium
Arizona. Capacity 63,400; opened 2006

5 Bell Centre
Quebec, Canada. Capacity 21,273; opened 1996

6 Beaver Stadium
Pennsylvania. Capacity 106,572; opened 1960

7 Madison Square Garden
New York City. Capacity 22,292; opened 1968

8 Arthur Ashe Stadium
New York City. Capacity 23,200; opened 1997

9 Ohio Stadium
Ohio. Capacity 102,329; opened 1922

10 Neyland Stadium
Tennessee. Capacity 102,455; opened 1921

11 Sanford Stadium
Georgia. Capacity 92,746; opened 1929

12 Bryant–Denny Stadium
Alabama. Capacity 101,821; opened 1929

13 Tiger Stadium
Louisiana. Capacity 92,542; opened 1924

14 Darrell K. Royal—Texas Memorial Stadium
Texas. Capacity 100,119; opened 1924

Michigan Stadium
Ann Arbor, Michigan. Capacity 114,804; opened 1926. Nicknamed "The Big House," this is the largest stadium in the US. It is home to the University of Michigan Wolverines football team.



Camp Nou
Barcelona, Spain. Capacity 99,354; opened 1957. The biggest stadium in Europe and the world's 11th largest.



KEY

The colors show capacity (numbers of spectators).

- 110,000 upward
- 100,000–109,999
- 90,000–99,999
- 80,000–89,999
- Fewer than 80,000



Estádio Azteca
Mexico City, Mexico. Capacity 105,000; opened 1961. The world's largest soccer stadium, the Azteca is the official home of the Mexican national team. It is the only stadium in the world to have hosted two FIFA World Cup soccer finals.

Estádio do Maracanã

Rio de Janeiro, Brazil. Capacity 82,238; opened 1950. Built for the 1950 soccer FIFA World Cup, the Maracanã was the world's biggest stadium at the time, with room for nearly 200,000 people. Capacity was greatly reduced in the 1990s after part of the stadium collapsed. It is now being renovated in time for the 2014 FIFA World Cup.



Stadiums

Stadiums and arenas are among the largest and most impressive buildings on the planet. They not only enable us to experience the thrills and drama of competition between the best sports players, teams, and athletes, but also host rock concerts and other shows.

Europe

15 Millennium Stadium
Cardiff, UK. Capacity 74,500; opened 1999

16 Wembley Stadium
London, UK. Capacity 90,000; opened 2007

17 Allianz Arena
Munich, Germany. Capacity 69,901; opened 2005

18 Estádio Santiago Bernabéu
Madrid, Spain. Capacity 85,454; opened 1947

The record for the loudest crowd roar of **131.76 decibels** was set at the **Türk Telekom Arena**, Istanbul, Turkey, during a Galatasaray–Fenerbahçe soccer game in 2011

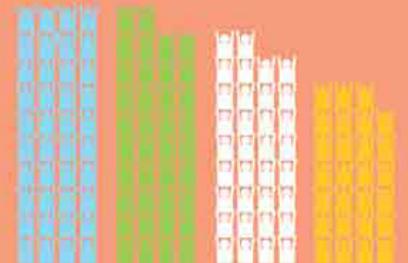
Rungrado May Day Stadium

Pyongyang, North Korea. Capacity 150,000; built 1989. Said to look like a magnolia blossom, the stadium is used for sports and military parades.



Record crowd sizes

Crowds were even larger before the modern safety-conscious era, and standing and overcrowding were common. The largest-ever crowds at sports events are below.



Soccer: 149,415 (plus 20,000 without tickets). Hampton Park, Scotland vs. England, 1937.
 Soccer: 199,854. Maracanã Stadium, Brazil. Brazil vs. Uruguay, World Cup Final, July 1950.
 Wrestling: 190,000. May Day Stadium, North Korea. Pro-Wrestling event, April 1995.
 Soccer: 135,000. Estádio da Luz, Portugal. Benfica vs. Porto, January 1987.

19



20

21

22

23

FNB Stadium (Soccer City)

Johannesburg, South Africa. Capacity 94,736; opened 1989. Nicknamed "The Calabash" because it looks like the African pot of the same name, the FNB is the largest stadium in Africa. It was extensively renovated for soccer's 2010 FIFA World Cup.



Asia

19 Azadi Stadium
Tehran, Iran. Capacity 100,000; opened 1971

20 Salt Lake Stadium
Kolkata, India. Capacity 120,000; built 1984

21 Lumpinee Boxing Stadium
Bangkok, Thailand. Capacity 9,500; opened 1956

22 Beijing National Stadium ("Bird's Nest")
China. Capacity: 80,000; opened 2008

23 Gwangmyeong Velodrome
South Korea. Capacity 30,000; opened 2006



Melbourne Cricket Ground

Victoria, Australia. Capacity 100,018; opened 1854. This stadium holds the record for the highest floodlight towers of any sporting venue. It is known to locals as "The G."

Michigan International Speedway
Brooklyn, Michigan

Chicagoland Speedway
Joliet, Illinois

Indianapolis Motor Speedway
Speedway, Indiana

Iowa Speedway
Newton, Iowa

Bristol Motor Speedway
Bristol, Tennessee

Kansas Speedway
Kansas City, Kansas

Las Vegas Speedway
Las Vegas, Nevada

Auto Club Speedway
Fontana, California

Kentucky Speedway
Sparta, Kentucky

Darlington Raceway
Darlington, South Carolina

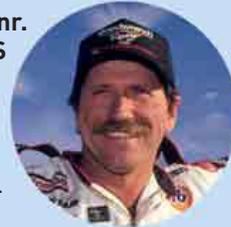
Circuit of the Americas
Austin, Texas

Homestead-Miami Speedway
Homestead, Florida

Great champions

F1 is the pinnacle of "open-wheel" racing and the winner each season is called the world champion. NASCAR remains the top stock-car competition.

Dale Earnhardt Sr.
Nationality: US
Killed while racing at Daytona in 2001, Earnhardt had already won seven NASCAR titles.



Hockenheimring
Hockenheim, Germany

Nürburgring
Nürburg, Germany

Circuit de Spa-Francorchamps
Spa, Belgium

Silverstone Circuit
Silverstone, UK

Autodromo Nazionale Monza
Monza, Italy

Circuit de la Sarthe
Le Mans, France

Circuit de Catalunya
Montmeló, Spain

Valencia Street Circuit
Valencia, Spain

Circuit de Monaco
Monte Carlo, Monaco

Circuit Gilles Villeneuve
Québec, Montreal, Canada

Dover International Speedway
Dover, Delaware

Charlotte Motor Speedway
Concord, North Carolina

Atlanta Motor Speedway
Hampton, Georgia

Daytona International Speedway
Daytona Beach, Florida

Autódromo José Carlos Pace
São Paulo, Brazil

NASCAR Sprint Cup

The Sprint Cup Series is the world's premiere stock-car racing competition. It involves 36 races over 10 months. As in F1, points awarded throughout the series decide the winner.



Car racing

With engines roaring, race cars provide a thrilling spectator sport as they hurtle down the track, weave through chicanes, and hug hairpin bends. The highly tuned Formula 1 cars draw big crowds in many countries. In the United States, stock-car racing is more popular.

Michael Schumacher
Nationality: German

Record seven-time F1 World Champion. Schumacher has won over 90 F1 Grand Prix races—more than any other driver in history.



Ayrton Senna
Nationality: Brazilian

Three-time F1 World Champion. Third-most-successful driver of all time in terms of F1 race wins (41). Died in an accident at the 1994 San Marino Grand Prix.

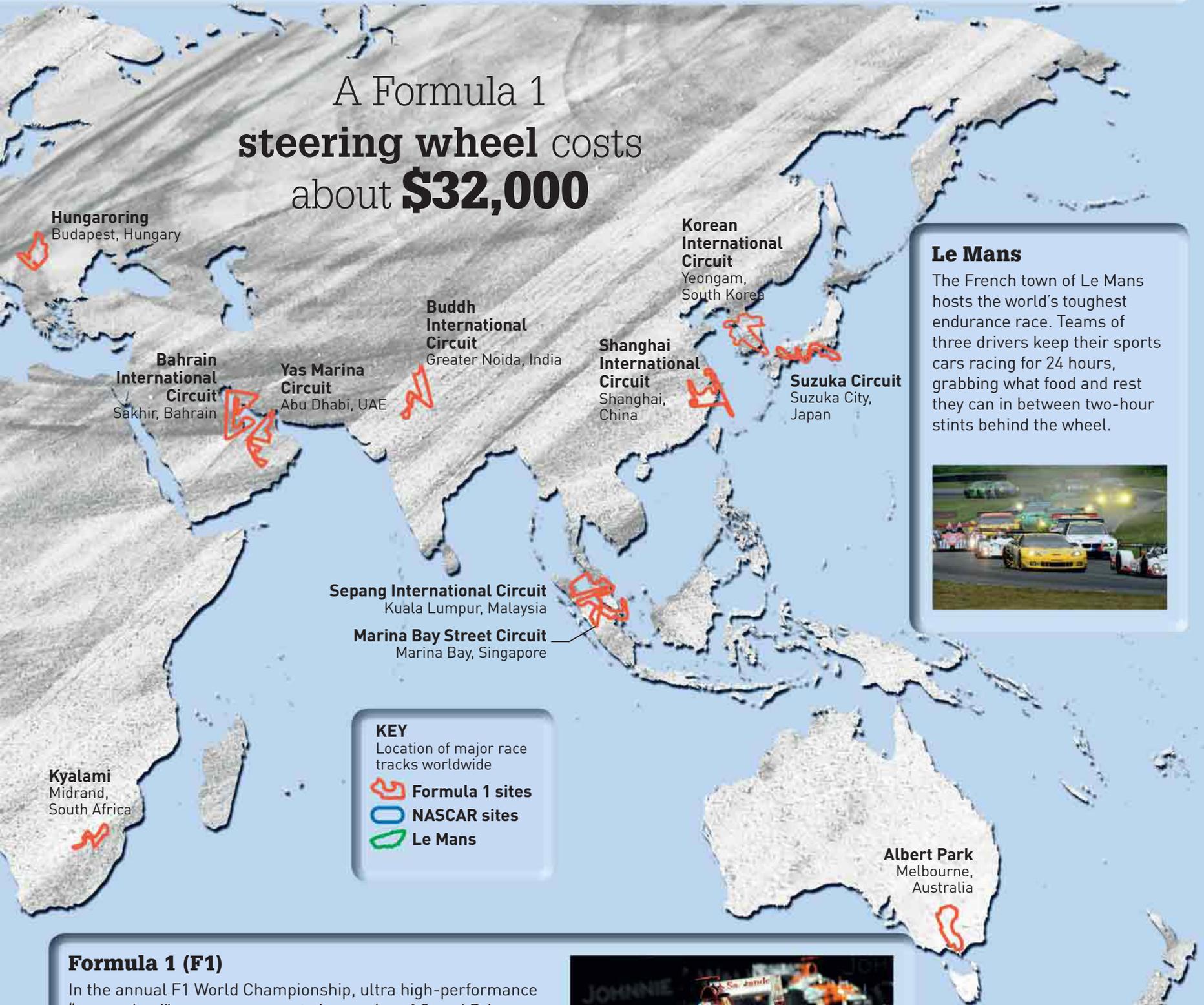


Fernando Alonso
Nationality: Spanish

Became the youngest driver to win back-to-back F1 World Championships (2005 and 2006). In 2012, he passed 30 Grands Prix wins.



A Formula 1 steering wheel costs about **\$32,000**



Le Mans

The French town of Le Mans hosts the world's toughest endurance race. Teams of three drivers keep their sports cars racing for 24 hours, grabbing what food and rest they can in between two-hour stints behind the wheel.



KEY
 Location of major race tracks worldwide

- Formula 1 sites
- NASCAR sites
- Le Mans

Formula 1 (F1)

In the annual F1 World Championship, ultra high-performance "open-wheel" race cars compete in a series of Grand Prix races worldwide. Cars finishing in the top-10 positions in each race win points. At the season's end, trophies are awarded for the driver and manufacturer with the most points.



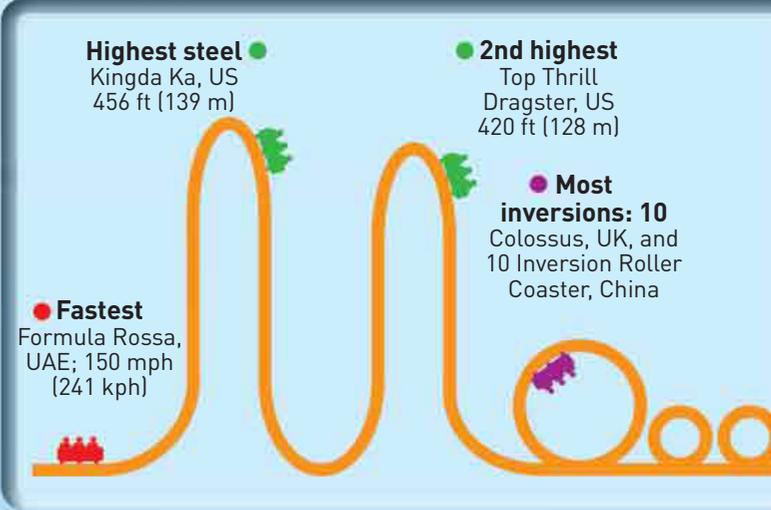


TOP 5
Numbers indicate ranking from 1-5.

Fastest **Highest** **Longest**

Roller coasters

Breakneck speeds, hair-raising twists and turns, stomach-churning drops—roller coasters can satisfy even hardened thrill-seekers. This map shows some of the world's biggest and best coasters.



Flying roller coasters

These roller coasters—such as Manta at SeaWorld, Florida, (right)—make you feel as though you are flying. The cars run on the underside of the track. Riders start in a seated position, but as the ride starts they are rotated to face the ground.



Steel Dragon 2000
Nagashima Spa Land, Japan
95 mph (153 kph)
318 ft (97 m) high
8,133 ft (2,437 m) long

Dinoconda
China Dinosaurs Park, China
80 mph (128 kph)
249 ft (76 m) high
3,471 ft (1,058 m) long

Ten Inversion Roller Coaster
Chimelong Paradise, China
45 mph (72 kph); 100 ft (30 m) high
2,789 ft (850 m) long

Fujiyama
Fuji-Q Highland, Japan
81 mph (130 kph)
260 ft (70 m) high
6,709 ft (2,045 m) long

Takabisha
Fuji-Q Highland, Japan
62 mph (100 kph)
141 ft (43 m) high
3,281 ft (1,000 m) long

Tower of Terror II
Dreamworld, Queensland, Australia; 100 mph (161 kph)
377 ft (114 m) long; 1,235 ft (376 m) high

18 mph

(29 kph): speed of the world's oldest roller coaster, **Leap the Dips**

Roller coaster records

Opened in 1902, the world's oldest roller coaster is the wooden Leap-the-Dips, at Lakemont Park, Pennsylvania. Since then, roller coasters have become taller, longer, faster—and scarier! Today's roller coasters are made of steel. Wood is less flexible than steel, so wooden coasters are less complex and extreme than steel ones.

Steepest drop
Takabisha, Japan
121 degrees

Highest G-force
Tower of Terror, South Africa
6.3G

4-D roller coasters

Fourth-dimension (4-D) coasters, such as China's Dinoconda, give theme parks an extra level of thrills. The seats on a 4-D coaster can rotate forward or backward, so as the riders hurtle along the track they also spin in a full circle. Eejanaika (below) is a 4-D ride at Japan's Fuji-Q Highland theme park.



National flags

NORTH AMERICA



CANADA



UNITED STATES OF AMERICA



MEXICO



BELIZE



COSTA RICA



EL SALVADOR



GUATEMALA



HONDURAS

SOUTH AMERICA



GRENADA



HAITI



JAMAICA



ST KITTS & NEVIS



ST LUCIA



ST VINCENT & THE GRENADINES



TRINIDAD & TOBAGO



COLOMBIA



URUGUAY



CHILE



PARAGUAY



ALGERIA



EGYPT



LIBYA



MOROCCO



TUNISIA



LIBERIA



MALI



MAURITANIA



NIGER



NIGERIA



SENEGAL



SIERRA LEONE



TOGO



BURUNDI



DJIBOUTI



ERITREA



ETHIOPIA



KENYA



RWANDA



SOMALIA



SUDAN



NAMIBIA



SOUTH AFRICA



SWAZILAND



ZAMBIA



ZIMBABWE



COMOROS



MADAGASCAR



MAURITIUS



LUXEMBOURG



NETHERLANDS



GERMANY



FRANCE



MONACO



ANDORRA



PORTUGAL



SPAIN



POLAND



SLOVAKIA



ALBANIA



BOSNIA & HERZEGOVINA



CROATIA



KOSOVO (disputed)



MACEDONIA



MONTENEGRO

ASIA



LATVIA



LITHUANIA



CYPRUS



MALTA



RUSSIAN FEDERATION



ARMENIA



AZERBAIJAN



GEORGIA



TURKEY



QATAR



SAUDI ARABIA



UNITED ARAB EMIRATES



YEMEN



IRAN



KAZAKHSTAN



KYRGYZSTAN



TAJIKISTAN



CHINA



MONGOLIA



NORTH KOREA



SOUTH KOREA



TAIWAN



JAPAN



BURMA (MYANMAR)



CAMBODIA

AUSTRALASIA & OCEANIA



SINGAPORE



MALDIVES



AUSTRALIA



NEW ZEALAND



PAPUA NEW GUINEA



FIJI



SOLOMON ISLANDS



VANUATU

Of all the flags of the world's **196** sovereign states, only **Nepal's** has more than **four** sides



NICARAGUA



PANAMA



ANTIGUA & BARBUDA



BAHAMAS



BARBADOS



CUBA



DOMINICA



DOMINICAN REPUBLIC



GUYANA



SURINAME



VENEZUELA



BOLIVIA



ECUADOR



PERU



BRAZIL



ARGENTINA



BENIN



BURKINA FASO



CAPE VERDE



GAMBIA



GHANA



GUINEA



GUINEA-BISSAU



IVORY COAST



CAMEROON



CENTRAL AFRICAN REPUBLIC



CHAD



CONGO



DEM. REP. CONGO



EQUATORIAL GUINEA



GABON



SÃO TOMÉ & PRÍNCIPE



SOUTH SUDAN



TANZANIA



UGANDA



ANGOLA



BOTSWANA



LESOTHO



MALAWI



MOZAMBIQUE

EUROPE



SEYCHELLES



DENMARK



FINLAND



ICELAND



NORWAY



SWEDEN



IRELAND



UNITED KINGDOM



BELGIUM



ITALY



SAN MARINO



VATICAN CITY



AUSTRIA



LIECHTENSTEIN



SLOVENIA



SWITZERLAND



CZECH REPUBLIC



HUNGARY



SERBIA



BULGARIA



GREECE



MOLDOVA



ROMANIA



UKRAINE



BELARUS



ESTONIA



IRAQ



ISRAEL



JORDAN



LEBANON



SYRIA



BAHRAIN



KUWAIT



OMAN



TURKMENISTAN



UZBEKISTAN



AFGHANISTAN



PAKISTAN



BANGLADESH



BHUTAN



INDIA



NEPAL



SRI LANKA



LAOS



PHILIPPINES



THAILAND



VIETNAM



BRUNEI



INDONESIA



EAST TIMOR



MALAYSIA



MARSHALL ISLANDS



MICRONESIA



NAURU



PALAU



KIRIBATI



TUVALU



TONGA



SAMOA

Index

A

Abu-Simbel 143
Abyssal plains 16
acid rain 99
Acropolis 143
adaptations 42–43
Afghanistan 83, 97, 142, 143, 155
Africa 26, 78, 80, 86, 89, 90, 94, 96, 155
age profile 80–81
agriculture 75, 92–93, 102
air pollution 98–99
air travel 85, 116–17, 160–61
aircraft, military 130–31
airports, busiest 116
Alaska 10, 14, 32, 40–41, 54
Aleutian Trench 9, 16
Alexander the Great 135, 141
algae 64
Algeria 24
Alonso, Fernando 183
alternative energy 74, 106–07
aluminum 100–01
Amazon rain forest 32, 64, 110
Amazon River 20, 21, 56
American Civil War 135, 152
Amoco Cadiz 158–59
Amur-Arquon 20, 21
ancient civilizations 140–43, 152–53
Andes 12, 24, 66–67
Angel of the North 174–75
Angola 87
animals *see* wildlife
Antarctica 7, 26–27, 34–35, 36–37, 55
Antioch 11
ants 60
Apartheid, end of 135
Arab Spring 134, 157
arachnids 48–49, 64
arapaimas 58
architecture
 castles 150–51
 medieval 146–47
 modern era 160–61
 tallest buildings 124–25
Arctic 7, 31, 36, 64, 65, 74, 75
Arctic terns 52–53
Argentina 13, 44, 54, 86, 106, 178
USS *Arizona* 159
armed forces 130–31, 152–53
art 164, 165, 172–75
 prehistoric 135, 138–39
Artemis, Temple of 143
Ashoka, Emperor 152–53
asteroid impact 10, 22
Atacama Desert 34
Atlanta 116
atmosphere 6, 104, 108
Australia
 culture 167, 173, 177, 179, 181

 land 22, 24, 27, 29, 33
 living world 45, 67
 people 77, 83, 89, 92, 95, 97, 103, 107
Australopithecus 136–37
Austria 87, 101
autobahns 115, 122
Aztec Empire 135, 146, 148, 149

B

Baikal, Lake 21
Bali 165
Bamiyan Buddhas 142, 143
Bangladesh 26, 27, 29, 77
Barringer Crater 23
Basawan 173
basins, oceanic 16
Batavia 159
battlegrounds 152–53
beaches 170–71
bees 48, 60, 61
beetles 60, 61
Beijing 76, 77, 116, 117, 151, 181
Belarus 32, 83, 87
Belgium 179
Bester, Willie 173
Bettencourt, Liliane 90
Bezos, Jeff 91
Bhola Cyclone 29
Bhutan 83
big wheels 170–71
billionaires 90–91
biodiversity 64–65
biofuel, biogas, and biomass 106–07
bioluminescence 42
biomes 30–31, 67
biosphere 7, 74
Bird Flu 85
birds 42, 46–53, 68–71
HMS *Birkenhead* 159
Bismarck 159
Black Death 84, 85
blue whales 54–55
bog bodies 144
Bolivar, Simón 156
Bolivia 82, 86, 87, 94, 135, 156
boreal forests 30, 33
Borneo 27, 33, 65
Borobudur, Java 147
boundaries, plate 8–9
boxing 181
Brazil 10, 26, 54, 76, 92, 96, 103, 106, 107, 130, 172, 176, 180, 181, 183
bridges 115, 120, 123, 135, 161
Brin, Sergey 91
Britain, Battle of 152
British Empire 135, 154–55
broadband 127

Brooklyn Bridge 115
bubonic plague 84, 85
Buddhism 168, 169
Burghausen 150
burial sites 135, 139, 144–45
Burj Khalifa 112–13, 124, 125
Burundi 87
butterflies 60, 61, 69, 70
Byzantine Empire 135, 149

C

cable TV 179
Cajamarca, Battle of 135, 152
California 32, 50, 66
calories, daily intake of 94–95
Cambodia 103
Cameroon 95, 166
Canada
 culture 177, 179, 180
 land 22, 24
 living world 44
 people 80, 88, 92, 94, 96, 98, 104, 106, 107, 110
Canary Islands 66
Cape Town 117
car racing 182–83
Caravaggio 173
carbon dioxide 99, 108
cargo 118–19
Carnival 176–77
carnivorous plants 60–61
Carthage, Siege of 153
Castle of Good Hope 151
castles 150–51
Central African Republic 97
Cerro el Cóndor 13
Chagall, Marc 173
Channel Tunnel 160–61
channels, TV 178
chemical pollution 98–99
Chesapeake Bay 23
Chicago 116
Chicxulub 23
Chile 10, 12, 13, 92, 145
Chimborazo, Mount 12
Chimu Empire 148, 149
China
 armed forces 131
 culture 167, 169, 173, 175, 177, 178, 179
 history 134, 137, 142, 143, 151, 156
 land 11, 12, 25, 26
 living world 44–45, 67
 people 77, 81, 87, 89, 93, 95, 97, 99, 101, 105, 107
Chinese New Year 177
Christianity 148, 168–69
Chrysler Building 124
cicadas 60, 61

cities, biggest 76–77
civilizations 134, 140–41, 148–49
climate change 98, 108–09
clothing 164
clouds 6
coal 104–05, 106, 107
coffee 92–93
cold deserts 35
Colombia 15, 87, 135, 156
colonialism 154–55
Colosseum 135, 142–43
Colossus of Rhodes 143
Columbus, Christopher 146
Communism, collapse of 135, 157
computer technology 114, 126–27
Concorde, the 134, 161
concrete 115
Congo-Chambeshi 20
conservation 75, 110–11
Constantinople, Fall of 135, 153
construction 115, 124–25
continental crust 9
continental shelf 17
convection currents 7
convergent boundaries 8
Coordinated Universal Time (UTC) 38
coral/coral reefs 30, 42, 111
Coral Sea, Battle of the 152, 153
core, Earth's 6, 7
cost of living 86–87
Costa Rica 130
craters 22–23
Crécy, Battle of 152
Cretaceous Period 44–45
cricket 181
crocodiles 49, 58–59
crops 92–3
Crusades 134, 153
crust, Earth's 6, 7, 8–9
crustaceans 64
Cuba 66, 83, 94, 152, 156
culture 162–87
 prehistoric 138–39
currencies 89
currents, ocean 18–19
cycling 181
cyclones 28–29

D

Dallas 116
dance 164–65
Darfur 26
day and night 38
deep water currents 19
deforestation 32–33
Delacroix, Eugène 172
Delhi 76, 77, 117
Democratic Republic of Congo 106
Denmark 166, 179

- deserts 4–5, 24, 31, 34–35
 life in 42–43, 64
 nomads 78, 79
 Dhaka 76, 77
 dinosaurs 10, 22, 44–45
 divergent boundaries 8
 diving and snorkeling 70–71
 Diwali 165
 doctors, per capita 83
 Dominican Republic 26, 98
 MV Doña Paz 159
 dragonflies 60
 drones, unmanned 130
 droughts 103
 Dubai 112–13
 dunes 35
- E**
 Earnhardt, Dale Snr. 182
 Earth
 interior of 6
 rotation of 7, 38
 structure of 6–7
 earthquakes 8, 10–11
 East African Rift 8, 15
 East Melanesia 67
 East Pacific Rise 9, 16
 Easter Island 132–33, 174, 176
 ebola virus 85
 Ecuador 12, 135, 156
 education 96–97
 Egypt 24, 53, 92, 130, 131
 ancient 134, 135, 140, 143, 144–45
 El Salvador 106
 Emperor Seamounts 17
 Empire State Building 125
 empires
 ancient 140–41
 colonial 154–55
 medieval 148–49
 endemic hot spots 67
 energy
 alternative 74, 106–07
 resources and consumption 74,
 104–05
 ENIAC 114
 Eritrea 95
 erosion 20
 Ethiopia 67, 155
 Europe, literacy in 96
 Everest, Mount 12, 13, 16
 extinctions 10, 22, 50–51, 68, 69, 70–71
- F**
 Falkland Islands 104, 178
 fashion 164
 fault lines 9
 festivals 162–63, 165, 176–77
 Finland 177, 179
 fish 46, 47
 dangerous 48–49
 river 58–59
 fishing industry 92, 93
 flags 186–87
- flash floods 26
 fleas 50, 61
 flooded savanna 30
 floods 26
 floral kingdoms 62
 flu viruses 84–85
 food
 cooking 164
 cost of 95
 intake 94–95
 production 92–93
 supplies 82
 food chains 47
 footprint, human 74–75
 footprints, dinosaur 45
 Forbidden City, Beijing 151
 forests 30, 32–33, 110–11
 Formula 1 (F1) 182–83
 Fort Independence, Boston 151
 fossil fuels 74, 104–05, 106, 107
 fossils 44–45, 136–37
 France 89, 92, 104, 106, 122, 130,
 131, 154–55, 172, 178, 179
 Frankfurt 116
 French Guiana 178
 French Polynesia 94
 French Revolution 135
 freshwater creatures 56, 58–59
 Fukuoka 117
 fungi 64
- G**
 Gabon 100
 Gainsborough, Thomas 172
 Galápagos Islands 50, 66
 Gamede, Cyclone 29
 Gandhi, Mahatma 156
 Gansu earthquake 11
 garbage 100–01
 garbage patches 19, 100–01
 gas 104–05, 106, 107
 Gates, Bill 90
 gender differences 97
 Genghis Khan 134, 149, 175
 Georgia 83, 97
 geosynchronous orbit 128, 129
 geothermal energy 106–07
 Germany 44, 89, 101, 106, 107, 115,
 136, 151, 154–55, 178, 179, 180,
 183
 Ghana 86, 88, 156, 178
 giant catfish 58–59
 Gibraltar 53
 glaciers 37, 108–09, 110
 global warming 98, 108–09
 gold 88–89
 GPS satellites 129
 Graf Zeppelin airship 161
 grasslands 30, 35
 Great Dying 10, 22
 Great Game 155
 Great Lakes 20
 Great Sphinx 134, 174–75
 Great Stupa of Sanchi 142
 Great Wall of China 135, 142, 143
- great white sharks 48, 56–57
 Great Zimbabwe 134, 148, 151
 Greeks, ancient 142, 143, 153
 Greenland 24, 53, 80, 110
 ice sheet 34, 109
 Greenwich Mean Time (GMT) 38
 Guatemala 14, 80, 95
 Guevara, Che 156
 Guinea-Bissau 82, 97
 Gulf Stream 19
 Gulf War 98
 Guyana 80, 103
 gyres 18, 19, 100
- H**
 habitats
 and adaptations 42–43
 destruction of 68–69
 unusual 66–67
 Hagia Sofia 143
 Haiti 11, 26, 86, 102
 Halincarnassus, Mausoleum at 143
 Han Empire 135, 141
 Hanging Gardens of Babylon 143
 Hawaii 13, 14, 28, 38, 66
 health 82–85, 98–99
 highways 115, 122
 Himalayas 8, 13, 65, 109
 Himeji 151
 Hinduism 168, 169
 history 132–61, 174–75
 HIV/AIDS 85
 Hokusai, Katsushika 173
 Holi Festival 162–63
 Holy Roman Empire 135, 149, 152
Homo genus 134, 136–37
 Hong Kong 116, 117, 127
 Hong Kong Flu 85
 Hoover Dam 161
 Hopper, Edward 172
 Huari Empire 135, 148, 149
 Hubble Space Telescope 129
 humans
 early 136–37
 impact of 74–75
 hurricanes 28–29
 hydroelectric energy 106–07
- I**
 ice 7, 36–37
 ice sheets 36, 37, 108, 110
 icebergs 37, 158
 Iceland 14, 16, 77, 106–07, 166
 impact craters 22–23
 Inca Empire 148, 149
 income, per capita 86–87
 India
 armed forces 131
 culture 162–63, 164–65, 167, 173,
 177, 178, 181
 history 134, 142, 151, 152–53, 157
 land 12, 27, 39
 people 77, 81, 87, 89, 93, 95, 99,
 103, 107
- Indian Ocean 10
 indigenous peoples 78–79, 111
 Indo-Pakistani War 134, 153
 Indochina War, First 134, 153
 Indonesia 14, 15, 89, 97, 99, 103, 107,
 137
 Industrial Revolution 160
 industrial waste/accidents 98–99
 industrial wonders 160–61
 inequality 86–87
 infectious diseases 84–85
 information technology 126–27
 infrastructure 115, 120–23
 Iniki, Hurricane 28
 insects 48–51, 60–61, 64
 International Date Line 38
 International Monetary Fund 89
 International Space Station 129
 International Union for Conservation
 (IUNC) 68
 Internet connections 126–27, 164
 Inuit 75, 78
 invasive species 50–51
 invertebrates 64
 Iran 26, 131, 181
 Iraq 25, 103
 Ireland 95, 179
 Islam 148, 168, 169
 Israel 25, 130, 131
 Italy 89, 92, 106, 154–55, 173, 179
- J**
 Japan
 culture 169, 173, 177, 179
 history 145, 151, 154–55
 land 10, 15, 27, 29, 33
 people 77, 81, 83, 89, 92, 93, 99,
 107
 Jeju 117
 Jerusalem 153, 168
 jewelry, first 135, 138
 Johannesburg 117, 181
 Juanita the Ice Maiden 145
 Judaism 168
 Jurassic Period 44
- K**
 K2 12
 Kahlo, Frida 172
 kakapo (owl parrot) 68–69
 Kalinga, Battle of 152–53
 Kamchatka earthquake 10
 Kanem Empire 134, 149
 Kangchenjunga 12
 Kathakali dancers 164–65
 Katrina, Hurricane 28, 29
 Kazakhstan 103
 Kenna, Hurricane 28
 Kenya 92, 95, 103, 107
 Khmer Empire 149
 Kiribati 38
 Kolkata 76, 77
 Korean War 134, 153
 Krak des Chevaliers 150

Krakatau 14, 15
Kuwait 25, 101, 103
Kyrgyzstan 103

L

Lalibela 147
lakes 6, 20–21, 109
land ice 36
landfill 100, 101
languages 164, 166–67
Large Hadron Collider 134, 160
Le Mans 183
lead pollution 98–99
Leaning Tower of Pisa 147
Lempicka, Tamara de 173
Lenin, Vladimir 156
Lhotse 12
Liberia 83, 86, 155
Liberty, Statue of 174–75
Libya 24
lichens 64
Liechtenstein 130
life on Earth 6, 7, 40–71
life expectancy 82–83
Lindow Man 144
literacy 96–97
literature 165
livestock 92–93
Llullailaco 13
locusts 60
London 116
Los Angeles 72–73, 116
Low Earth Orbit (LEO) 129
RMS *Lusitania* 159
Luxor 24

M

Macedonian Empire 135, 141
Machu Picchu 135, 146
Madagascar 67, 97
Makalu 12
Malawi 83
Malaysia 81, 175, 179
Mali 96, 134, 148, 176
malnutrition 94–95
Malta 53
mammals 46–51, 68–71
mangrove 30
Manila 77
mantle 6, 7
Mao Zedong 134, 156
Marble Bar 24
Mariana Trench 17
marine animals 42, 48–49, 54–57
marine biomes 30
Mars 12–13
Martinique 15
Mauna Kea 13
Mauritania 96, 102
Mauryan Empire 135, 141, 153
Mayan civilization 135, 140, 141, 146
mayflies 60
median age 80–81
medical care 82, 83

medieval age 146–49, 152–53
Mehrangarh Fort, Jodhpur 151
Meirelles, Victor 172
Melbourne 117
mercury, toxic 99
meteorites 22–23
Mexico 24, 28, 54, 66, 76, 80, 98, 106, 142, 144, 172, 175, 176, 180
Mexico City 76, 180
Mid-Atlantic Ridge 8, 14, 16
mid-ocean ridges 16–17
Middle East, oil 105
midges 60, 61
migration
 animals 170–71
 birds 52–53
 human 78–79, 164
 insects 60, 61
 sharks 48, 49
 whales 55
military forces 130–31
minerals 74
mines, gold 88
Ming Dynasty 135, 149
Mississippi–Missouri 20, 26, 56
Mogul Empire 135, 149
mollusks 64
Monaco 82, 83
monarch butterflies 60, 61
Monet, Claude 172
Mongol Empire 134, 149
Mongolia 45, 77, 95, 175, 178
Monica, Cyclone 29
monsoon 27
Morocco 80, 86
mosquitoes 60
moths 60
mountains 6, 12–13, 16–17, 122
Mozambique 83, 97
Mumbai 76, 77, 117
mummies 144–45
Munch, Edvard 172–73
music 135, 138, 164, 165
Myanmar (Burma) 175

N

Namib Desert 4–5, 34
Namibia 4–5, 77, 87
NASCAR sites 182
national parks 110–11
native species 50–51
natural resources 74, 102–05
Nauru 94
Neanderthals 136, 137
Nepal 12, 175, 187
Netherlands 89, 92, 101, 154–55, 179
Nevado de Incahusai 13
Nevado del Ruiz 15
Nevados Ojos de Salado 13
New Caledonia 67
New York City 76, 115, 174
New Zealand 27, 33, 55, 81, 93, 97, 177
nickel 99
Niger 83

Nigeria 100, 104, 172
night and day 38
Nile River 20
Nkrumah, Kwame 156
nomads 78–79
Norte Chico civilization 135
North Korea 131, 174, 181
North Sea 104
Norway 39, 87, 101, 102, 106, 107, 166, 172, 179
Novarupta 14
nuclear energy 106–07
nuclear waste/accidents 98–99
nuclear weapons 130–31
Nuestra Señora de Atocha 159

O

Ob-Irtysh 20–21
obesity 94
ocean floor 6, 16–17
oceanic crust 9
oceans 7
 and climate change 108–09
 conservation 110–11
 currents 18–19, 24–25
 life in 42, 47, 48–49, 54–57
 pollution 19, 98, 100–01
oil
 resources 104–05, 106, 109
 spills 98, 158–59
Olduvai Gorge 136
Olmec civilization 135, 140, 141
Olympus Mons 12–13
Oman 179
Ortega Gaona, Amancio 91
Osaka 117
Ottoman Empire 149, 152–55
Ötzi the Iceman 144

P

Pacific Ring of Fire 14, 15
Page, Larry 91
paintings 139, 165, 172–73
Pakistan 12, 25, 92, 95, 131
Palermo 145
Panama 53
Panama Canal 118, 160
pandemics 84–85
Papua New Guinea 33, 67, 81, 97, 167
Paraguay 166
Paraná 20
Paranthropus 136–37
parasites 50
Paris 27, 116
passengers, air 116–17
passes, mountain 122
Patagonian Desert 34
Pelée, Mont 15
peregrine falcons 46–47
Persian Empire, First 135, 141
Persian Gulf 98
Peru 88, 92, 98, 102, 135, 142, 145, 152, 156, 166, 176

Peru–Chile Trench 9, 16
pesticides 98–99
pests 50–51
Petra 143
Petronas Towers 124, 125
Pharos of Alexandria 143
Philippines 14, 67, 77, 107, 144
Picasso, Pablo 172, 173
Pinatubo, Mount 14
plague 84–85
plants 6, 7, 62–63
 adaptations 42–43
 biodiversity 64–65
 biomes 30–31
 invasive species 50–51
 unique 66–67
plastic waste 100–01
plate tectonics *see* tectonic plates
poison-dart frogs 48–49, 65
Poland 32, 173, 174
polar regions 7, 36–37
 deserts 31, 35
 life in 43
pollution 75, 98–99, 104, 108
Polynesia 66
Pont-du-Gard 142, 143
pop music 164, 180
population
 age profile 80–81
 distribution 76–77, 110–11
 and food supplies 93
 growth 74–75
ports, busiest 119
Portugal 154, 181
pottery 139
poverty 86–87
predators 46–47
prehistory 136–39
Prime Meridian 39
Prince William Sound 10
Puffing Billy 115
pyramids 142–43, 146

R

radioactive waste 98–99
railroads 114–15, 120–21, 160
rain forests 32–33, 43, 64, 65
rainfall 5, 6, 26–27
Ramayana 164–65
rats 50
recycling 74, 100–01, 103
Red List (IUCN) 68
religion 168–69, 175, 176–77
renewable energy 74, 106–07
reptiles 43, 46–51, 58–59
Réunion 27, 29
revolutions 152–53, 156–57
rice production 93
Rio de Janeiro 26, 117, 176, 180
Rio de la Plata 20
rivers 6, 20–21
river monsters 58–59
roads 115, 122–23
Rocky Mountains 12
roller coasters 184–85

- Romania 178
 Romans 115, 135, 141, 153
 Russia
 armed forces 131
 culture 167, 173, 174, 175, 177
 history 135, 154–55, 156, 157
 land 10, 24, 25, 26, 39
 people 87, 89, 91, 92, 97, 99, 103, 105, 107
 Ruwenzori Mountains 13
- S**
 safaris 170–71
 Sahara Desert 34–35, 64, 110
 St. Lucia 83
 St. Peter's Basilica, Rome 147
 salt 19
 San Andreas Fault 9
 Santa Maria volcano 14
 São Paulo 76, 117
 Sapporo 117
 satellites 128–29
 Saudi Arabia 94, 105, 131
 savanna 30
 Schumacher, Michael 183
 Scramble for Africa 155
 sculpture 139, 165, 172, 174–75
 sea ice 36, 109
 sea levels 108–09
 sea transportation 118–19
 seamounts 16–17
 secondary education 96
 seismic waves 10
 semideserts 35
 Senegal 26, 174
 Senna, Ayrton 183
 Seoul 117
 Seven Wonders of the World 142–43
 Shaanxi earthquake 11
 Shanghai 76, 77, 117, 119
 sharks 46, 47, 48, 56–57
 sheep 93
 Shinto 168, 169
 shipping routes 118–19
 shipwrecks 158–59
 shrubland 31
 Sicily 53, 145
 sieges 153
 Sikhism 168, 169
 Singapore 24
 skyscrapers 112–13, 115, 124–25, 160
 slave trade 155
 Slim Helu, Carlos 91
 snakes 43, 46–51
 snow 6, 26–27
 soccer 180–81
 solar energy 74, 106–07
 Solomon Islands 101
 Somalia 25, 97
 Somme, Battle of the 134–35, 152
 Songhai Empire 149
 South Africa 55, 67, 87, 89, 99, 136, 151, 173, 177, 178, 179, 181
 South Korea 101, 131, 177, 181
 South Sudan 26, 83, 123
 space debris 128–29
 Space Shuttle 128
 Spain 106, 107, 154, 166, 172, 176, 177, 180, 183
 Spanish flu 84, 85
 speedway 182
 sperm whales 55
 spiders 48–49
 sport 180–83
 Sri Lanka 55, 67, 177
 stadiums 164, 180–81
 statues 174–75
 steam engines 115
 Stone Age 138–39
 Stonehenge 142, 143
 submarines 130–31
 Sudbury Basin 23
 Suez Canal 119
 Sun, energy from 7
 Sundaland 67
 superbugs 85
 surface currents 18
 Suriname 77, 103, 166
 HMS *Sussex* 159
 swarms 60–61
 Swaziland 82–83, 177
 Sweden 24, 83, 101, 107, 166, 179
 Swine Flu 85
 Switzerland 87, 89, 99, 100–01, 179
 Sydney 117
 Sydney Opera House 135, 161
 Syria 151
- T**
 Taipei 101, 117, 124, 125
 Tajikistan 103
 Tambora 14, 15
 Tangshan earthquake 11
 tanks, battle 130–31
 Tanzania 25, 136
 tea trade 92
 tectonic plates 8–9, 10, 12, 14, 16, 17
 telecommunications 115, 126–27, 160
 television 178–79
 temperate biomes 30, 32
 temperatures 24–25, 108–09
 termites 60
 Terra-cotta Army 142, 143
 Thailand 107, 181
 Thanksgiving 176–77
 time zones 38–39
 Tip, Typhoon 29
 Tipas 13
 RMS *Titanic* 135, 159
 Tiwanaku Empire 148, 149
 Tohoku earthquake 10
 Tokyo 76, 77, 116, 117
 Tonga 94
 tools, early 134, 138
 tourism 170–71
 towers, unsupported 125
 trade 118–19
 trains 114–15, 120
 transform boundaries 8
 transportation 114–23
 trenches, ocean 8, 9, 16–17
 Triassic Period 44
 Trinidad and Tobago 98, 104
 tropical cyclones 28–29
 tropical forests 30, 33, 64, 65
 tsunamis 8
 tundra 31, 35, 78, 110
 Tunisia 24, 176
 tunnels, longest rail 121
 Turkey 11, 178, 181
 Turkmenistan 103
 Tutankhamun 144
- U**
 Uganda 81
 Ukraine 87, 98, 107, 174
 Umayyad Caliphate 135, 149
 United Arab Emirates 94, 112–13
 United Kingdom
 armed forces 130, 131
 culture 172, 174–75, 176, 178, 179, 180, 181
 history 135, 152, 154–55
 people 92, 94, 95
 time zone 38
 United States
 armed forces 130, 131
 culture 166, 172, 176, 178–79, 180, 182
 history 151, 152, 153, 158, 160
 land 23, 24, 26, 28, 38
 living world 44–45
 people 76, 80, 86, 88, 89, 91, 92, 94, 95, 96, 98, 99, 101, 102, 103, 104, 105, 106, 107
 Unzen, Mount 15
 Uruguay 80
 USSR 157
 Uzbekistan 103
- V**
 Valdivia earthquake 10
 Vanuatu 167
 vegetation
 biomes 30–31
 deserts 34–35
 forests 32–33
 wilderness 110–11
 Velaro 114–15
 Venezuela 104, 106, 135, 156, 175
 venom
 animals 48–49, 65
 plants 62–63
 Verkoyansk 24, 25
 vertebrates 64
 Very Large Array 135, 160
 Victoria, Lake 21
 Vienna, Battle of 135, 152
 Vietnam 87, 93, 134
 viruses 84–85
 volcanoes 8, 13, 14–15
 Vredefort impact structure 23
- W**
 Wallacea 67
 warfare 130–31, 152–53
 Warhol, Andy 172
 warships 130–31
 wasps 60
 waste 100–01
 water
 clean 82, 102–03
 human consumption 102, 103
 pollution 98–99
 use of 75, 102
 water cycle 6
 Watson, Yannima Tommy 173
 wealth 75, 86–91
 weapons 130–31
 weather 6
 weevils 64
 weight 94–95
Welwitschia 60–61
 whales 40–41, 46, 47, 54–55
 wheat 92
 wilderness 100–11
 wildlife
 adaptations 42–43
 biodiversity 64–65
 conservation 110–11
 deadly 48–49
 deserts 34–35
 endangered 66, 68–69
 extinct 44–45
 invasive species 50–51
 marine 42, 48–49, 54–57
 predators 46–47
 unique 66–67
 see also specific types
 Wilhelm Gustloff 159
 Willis Tower 124, 125
 wind energy 74, 106–07
 Windsor Castle 151
 world parties 177
 World War I 134–35, 152, 153, 158
 World War II 134, 152, 153, 159
 wrestling 181
- Y**
 Yangtze River 20, 21, 26
 Yellow River 20, 21
 Yemen 97
 Yenisei-Angara-Selenga 20, 21
 Yue Minjun 173
- Z**
 Zambia 99
 Zeus, statue in Olympia 143
 Zhoukoudian Caves 137
 Zhucheng 44, 45
 Zimbabwe 134, 148, 151
 Zoe, Cyclone 29
 Zuckerberg, Mark 91

Acknowledgments

Dorling Kindersley would like to thank: Caitlin Doyle for proofreading, Helen Peters for indexing, Haisam Hussein, Anders Kjellberg, Peter Minister, Martin Sanders, and Surya Sarangi for illustration, Deeksha Miglani and Surbhi N. Kapoor for research, and David Roberts for cartographic assistance.

The publisher would like to thank the following for their kind permission to reproduce their photographs:

(Key: a-above; b-below/bottom; c-center; f-far; l-left; r-right; t-top)

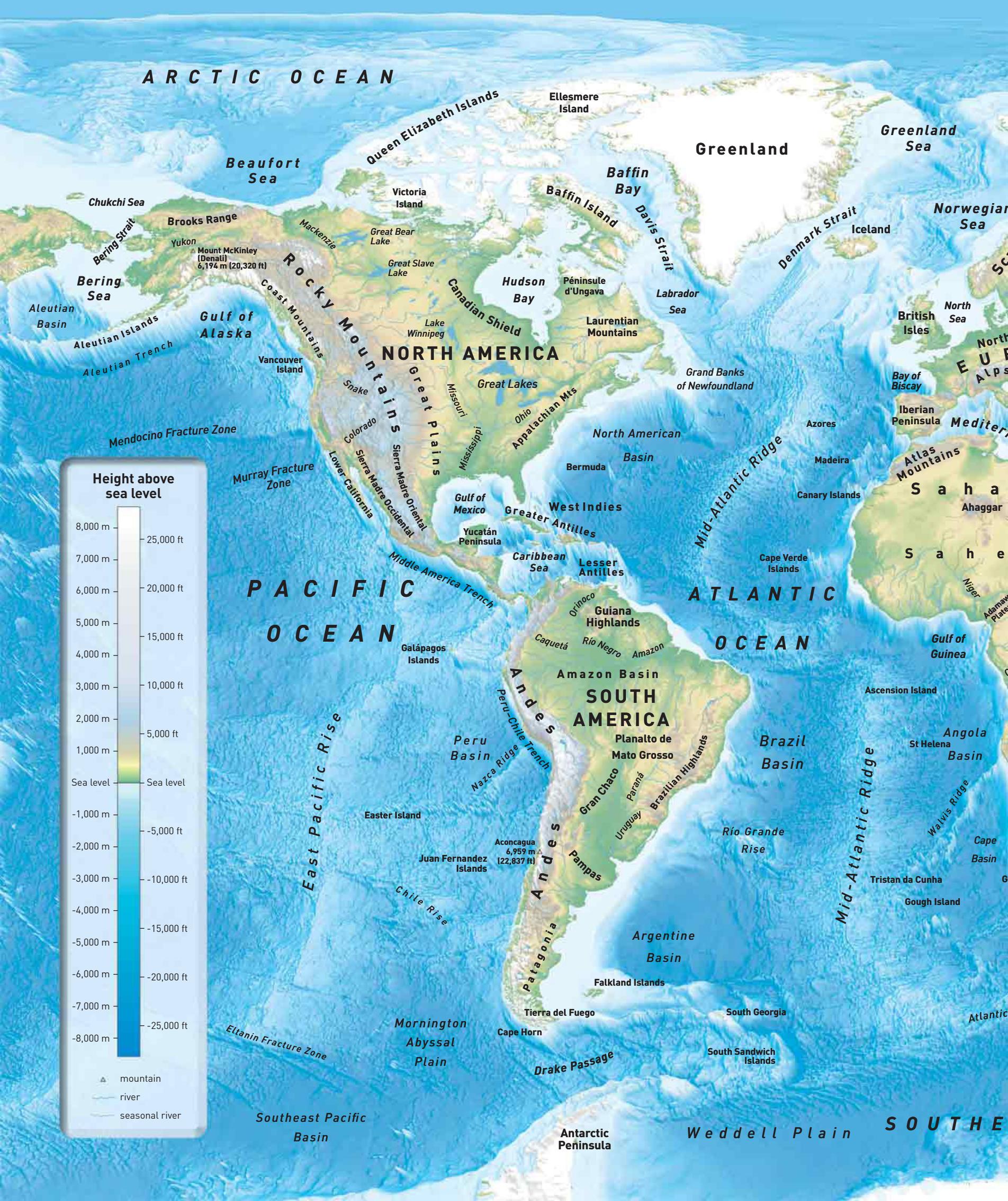
2 Andy Biggs: www.andybiggs.com (tc). **Corbis:** Alaska Stock (tr). **3 Corbis:** Floris Leeuwenberg (ftr); SOPA / Pietro Canali (tl). **Getty Images:** Art Wolfe (tr). **Sebastian Opitz:** (tc). **4–5 Andy Biggs:** www.andybiggs.com. **22 Getty Images:** Mark Garlick (br). **23 Corbis:** Charles & Josette Lenars (cr). **24–25 Robert J. Hijmans:** Hijmans, R.J., S.E. Cameron, J.L. Parra, P.G. Jones and A. Jarvis, 2005. *Very high resolution interpolated climate surfaces for global land areas*. International Journal of Climatology 25: 1965–1978 (base-map data). **26–27 Robert J. Hijmans:** Hijmans, R.J., S.E. Cameron, J.L. Parra, P.G. Jones and A. Jarvis, 2005. *Very high resolution interpolated climate surfaces for global land areas*. International Journal of Climatology 25: 1965–1978 (base-map data). **28–29 Adam Sparkes:** Data of the tropical cyclones projected by Adam Sparkes. Base image: NASA Goddard Space Flight Center Image by Reto Stockli (land surface, shallow water, clouds). Enhancements by Robert Simmon (ocean color, compositing, 3D globes, animation). Data and technical support: MODIS Land Group; MODIS Science Data Support Team; MODIS Atmosphere Group; MODIS Ocean Group. Additional data: USGS EROS Data Center (topography); USGS Terrestrial Remote Sensing Flagstaff Field Center (Antarctica); Defense Meteorological Satellite Program (city lights). **29 NOAA:** (tc). **30 Dorling Kindersley:** Rough Guides (tl, tr). **Shutterstock:** Edwin van Wier (crb). **31 Dreamstime.com:** (tc). **PunchStock:** Digital Vision / Peter Adams (tr). **35 NASA:** Goddard Space Flight Center, image courtesy the NASA Scientific Visualization Studio, (bl). **36 Dorling Kindersley:** Rough Guides / Tim Draper (bl). **Dreamstime.com:** Darryn Schneider (tr). **40–41 Corbis:** Alaska Stock. **42 Alamy Images:** Martin Strmiska (bl). Getty Images: Werner Van Steen (c). **43 NHPA / Photoshot:** Ken Griffiths (cr). **45 Corbis:** Science Faction / Louie Psihoyos (tr). Dorling Kindersley:

Christian Williams (tc). **48 Alamy Images:** National Geographic Image Collection (bl). **Dorling Kindersley:** Courtesy of the Weymouth Sea Life Centre (bc). **49 Dreamstime.com:** Francesco Pacienza (tr). **53 Corbis:** Roger Tidman (bc). **55 Corbis:** Paul Souders (ca). **56 Corbis:** Minden Pictures / Mike Parry (cl); National Geographic Society / Ben Horton (tc). **60 Dorling Kindersley:** Courtesy of the Natural History Museum, London (cra, c). **Getty Images:** Visuals Unlimited, Inc. / Alex Wild (cr). **61 Alamy Images:** Premaphotos (tl). **Corbis:** Visuals Unlimited / Robert & Jean Pollock (tr). **Getty Images:** Mint Images / Frans Lanting (tc). Photoshot: Gerald Cubitt (br). **62–63 Dreamstime.com:** Jezper. **62 Alamy Images:** Tim Gainey (bc); John Glover (br). FLPA: Imagebroker / Ulrich Doering (cb). **Getty Images:** Shanna Baker (clb); Alessandra Sarti (bl). **64 Dorling Kindersley:** Courtesy of Oxford University Museum of Natural History (clb). **64–65 Dr. Clinton N. Jenkins:** Data: IUCN Red List of Threatened Species / www.iucnredlist.org / BirdLife International; Processing: Clinton Jenkins / SavingSpecies.org; Design & Render; Félix Pharand-Deschênes / Globaia.org. **66 Dorling Kindersley:** Rough Guides (cl). **67 Corbis:** Ocean (crb). **Dorling Kindersley:** Roger and Liz Charlwood (crb/New Caledonia). **72–73 Corbis:** SOPA / Pietro Canali. **74–75 Getty Images:** Doug Allan. **75 Corbis:** Aurora Photos / Bridget Besaw (tl); Frank Lukasseck (ftl); Minden Pictures / Ch'ien Lee (tc); John Carnemolla (tr). **76–77 Center for International Earth Science Information Network (CIESIN):** Columbia University; International Food Policy Research Institute (IFPRI); The World Bank; and Centro Internacional de Agricultura Tropical (CIAT). **84 Corbis:** Dennis Kunkel Microscopy, Inc. / Visuals Unlimited (tc); Dr. Dennis Kunkel Microscopy / Visuals Unlimited (tr). **85 Getty Images:** Kallista Images (cr). **89 Dreamstime.com:** Cammeraydave (tr). **90 Corbis:** dpa / Horst Ossinger (br); James Leynse (bc). **91 Corbis:** epa / Justin Lane (bl); Kim Kulish (cra); epa / Mario Guzman (br). **Getty Images:** AFP (cr); (bc). **93 Dreamstime.com:** Kheng Guan Toh (br). **101 Corbis:** Peter Adams (bl). **105 Corbis:** Shuli Hallak (bc). **107 Dreamstime.com:** Milosluz (bc). **108–109 NASA:** Goddard Space Flight Center Scientific Visualization Studio. **109 NASA:** 1941 photo taken by Ulysses William O. Field; 2004 photo taken by Bruce F. Molnia. Courtesy of the Glacier Photograph Collection, National Snow and Ice Data Center / World Data Center for

Glaciology. (bl). **110–111 UNEP-WCMC:** Dataset derived using the Digital Chart of the World 1993 version and methods based on the Australian National Wilderness Inventory (Lesstlie, R. and Maslen, M. 1995. National Wilderness Inventory Handbook. 2nd edn, Australian Heritage Commission. Australian Government Publishing Service, Canberra) (base-map data). **112–113 Sebastian Opitz:** 114–115 Dreamstime.com: Dmitry Mizintsev (c). **114 Corbis:** (bc); Science Faction / Louie Psihoyos (br). **115 Corbis:** Bettmann (crb); Cameron Davidson (br). **Dorling Kindersley:** Courtesy of The Science Museum, London (tc). **Getty Images:** Three Lions (bc). **116–117 Michael Markieta:** www.spatialanalysis.ca. **118–119 Prof. Dr. Bernd Blasius:** Journal of the Royal Society Interface, *The complex network of global cargo ship movements*, p1094, 2010 (base-map data). **122 Getty Images:** Radius Images (bc). **126–127 Chris Harrison:** (base-map). **128–129 ESA. 128 NASA: Columbia Accident Investigation Report, (bc).** **129 ESA: (cra).** **NASA:** Image created by Reto Stockli with the help of Alan Nelson, under the leadership of Fritz Hasle (br). **130 Corbis:** DoD (br). **132–133 Getty Images:** Art Wolfe. **134 Corbis:** Radius Images (bl); Peter Turnley (br). Getty Images: (cr). **135 Corbis:** Sodapix / Bernd Schuler (b). **136–137 Corbis:** W. Cody. **137 Science Photo Library:** MSF / Javier Trueba (crb). **138 akg-images:** Oronoz (clb/Mousterian Tool). **Dorling Kindersley:** The American Museum of Natural History (bl); Natural History Museum, London (cl, clb). **Getty Images:** AFP (tc); De Agostini (tr). **139 akg-images:** Ulmer Museum (bc). **Getty Images:** De Agostini (crb). **141 Dorling Kindersley:** Courtesy of the University Museum of Archaeology and Anthropology, Cambridge (tl); Ancient Art / Judith Miller (bc/Urn); Alan Hills and Barbara Winter / The Trustees of the British Museum (tc); Stephen Dodd / The Trustees of the British Museum (tr). **Getty Images:** De Agostini (bl). **144 Alamy Images:** Ancient Art & Architecture Collection Ltd (tc). **Getty Images:** Copper Age (tl). Rex Features: (tr). **148 Dorling Kindersley:** © The Board of Trustees of the Armouries (tr); The Wallace Collection, London (cb). **149 Dorling Kindersley:** © The Board of Trustees of the Armouries (cla); Lennox Gallery Ltd / Judith Miller (cra); William Jamieson Tribal Art / Judith Miller (bl); Courtesy of the Royal Armouries (tc); The Trustees of the British Museum (cb); Peter Wilson / CONACULTA-INAH-MEX. Authorized reproduction by the Instituto Nacional

de Antropología e Historia (clb). **150 Corbis:** Walter Geiersperger (cl); Robert Harding World Imagery / Michael Jenner (clb). **151 Alamy Images:** Peter Titmuss (bc). **Corbis:** Design Pics / Keith Levit (cra). **Dreamstime.com:** (bl). Getty Images: AFP (cr). **156 Corbis:** Bettmann (cb, cra). **Getty Images:** (c). **157 Corbis:** Bryan Denton (bl); Peter Turnley (cr). Getty Images: AFP (ca); (c); (clb). **159 Dreamstime.com:** (bc). **162–163 Corbis:** Floris Leeuwenberg. **164 Dreamstime.com:** Randy Miramontez (c); Constantin Sava (bl). **165 Alamy Images:** Hemis (br). **Corbis:** Godong / Julian Kumar (tr). **Dreamstime.com:** F9photos (cr); Teptong (crb). **Getty Images:** Philippe Lissac (tc). **172 Alamy Images:** GL Archive (tr); The Art Archive (cb). **Corbis:** Bettmann (cl, cr); Oscar White (cla); The Gallery Collection (crb). **Dorling Kindersley:** Philip Keith Private Collection / Judith Miller (br). Getty Images: De Agostini (cra, cra/ Gainsborough); Stringer / Powell (tc). **172–173 123RF.com.** **173 Corbis:** (cl, cr, cb); Contemporary African Art Collection Limited (clb). **Getty Images:** AFP (bc); (tl, tr); (cla). **174 Corbis:** In Pictures / Barry Lewis (br). **175 Corbis:** JAI / Michele Falzone (cra). **Dorling Kindersley:** Rough Guides (bc); Surya Sankash Sarangi (c). **176 Dorling Kindersley:** Alex Robinson (br). **177 Corbis:** Jose Fuste Raga (bc). **178–179 Dreamstime.com:** Luminis (background image). **180 Alamy Images:** Aerial Archives (cl). **Getty Images:** (ca). **180–181 Getty Images:** AFP (cb); (ca). **181 Corbis:** Arcaid / John Gollings (br). **Getty Images:** (ca). **182 Corbis:** GT Images / George Tiedemann (tr); Icon SMI / Jeff Vest (br). **182–183 Dreamstime.com:** Eugeneseergeev (tyre tracks on the map). **183 Getty Images:** AFP (tr); (tl, tc, cr, bc). **184 Alamy Images:** David Wall (tr). **Dreamstime.com:** Anthony Aneese Totah Jr (c). **Getty Images:** AFP (cl). **185 Alamy Images:** G.P.Bowater (tr); Philip Sayer (tc). Getty Images: AFP (br)

All other images © Dorling Kindersley
For further information see: www.dkimages.com



ARCTIC OCEAN

Beaufort Sea

Queen Elizabeth Islands

Ellesmere Island

Greenland

Greenland Sea

Chukchi Sea

Brooks Range

Mackenzie

Victoria Island

Great Bear Lake

Great Slave Lake

Baffin Bay

Baffin Island

Davis Strait

Denmark Strait

Iceland

Norwegian Sea

Bering Strait

Bering Sea

Yukon

Mount McKinley (Denali)
6,194 m (20,320 ft)

Aleutian Basin

Aleutian Islands

Aleutian Trench

Gulf of Alaska

Vancouver Island

Rocky Mountains

NORTH AMERICA

Canadian Shield

Hudson Bay

Péninsule d'Ungava

Laurentian Mountains

Labrador Sea

Lake Winnipeg

Great Lakes

Ohio

Appalachian Mts

Grand Banks of Newfoundland

Mendocino Fracture Zone

Murray Fracture Zone

Snake

Colorado

Sierra Madre Occidental

Sierra Madre Oriental

Lower California

Missouri

Mississippi

North American Basin

Bermuda Basin

Gulf of Mexico

Yucatán Peninsula

Middle America Trench

Greater Antilles

West Indies

Caribbean Sea

Lesser Antilles

Mid-Atlantic Ridge

Azores

Madeira

Canary Islands

Cape Verde Islands

Atlas Mountains

Sahara

Aggar

Sahel

Niger

Adaman Plateau

PACIFIC OCEAN

ATLANTIC OCEAN

North Sea

British Isles

Bay of Biscay

Iberian Peninsula

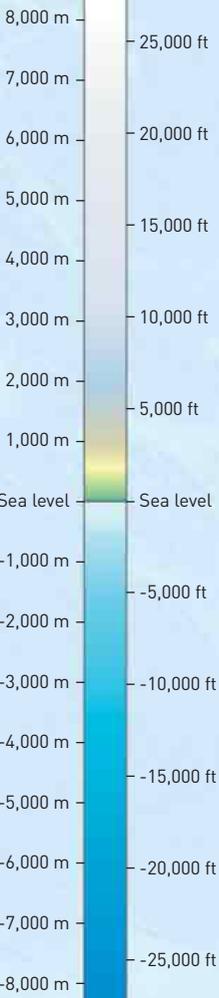
Mediterranean

Alps

Europe

North Atlantic

Height above sea level



- ▲ mountain
- river
- seasonal river

Southeast Pacific Basin

Antarctic Peninsula

Weddell Plain

SOUTHERN OCEAN

Mornington Abyssal Plain

Drake Passage

Río Grande Rise

Brazil Basin

SOUTH AMERICA

Amazon Basin

Planalto de Mato Grosso

Gran Chaco

Paraná

Uruguay

Brazilian Highlands

Andes

Peru-Chile Trench

Nazca Ridge

Peru Basin

Galápagos Islands

Easter Island

Juan Fernandez Islands

Aconcagua
6,959 m (22,837 ft)

Patagonia

Pampas

Tierra del Fuego

Cape Horn

South Georgia

South Sandwich Islands

Falkland Islands

Chile Rise

Mornington Abyssal Plain

Chile Rise

Ascension Island

St Helena

Angola Basin

Walvis Ridge

Cape Basin

Tristan da Cunha

Gough Island

Atlantic

Gulf of Guinea

Atlantic

