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NEW EDITION

DK

WHERE ON EARTH?

GEOGRAPHY AS YOU'VE NEVER SEEN IT BEFORE

DK | Penguin Random House

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For the curious
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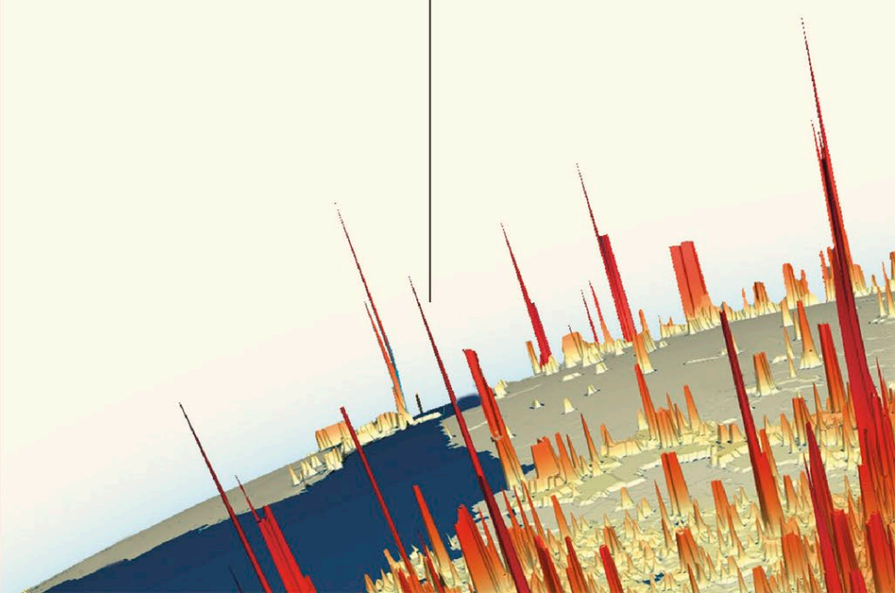

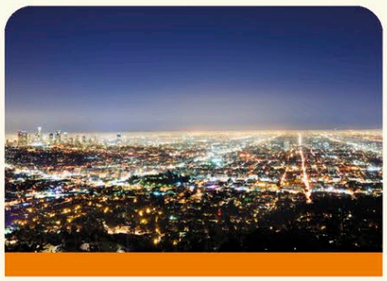

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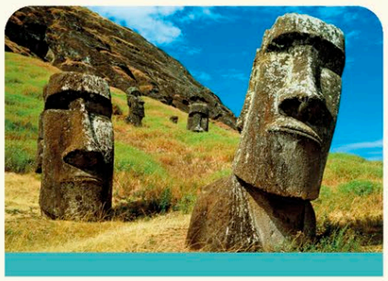

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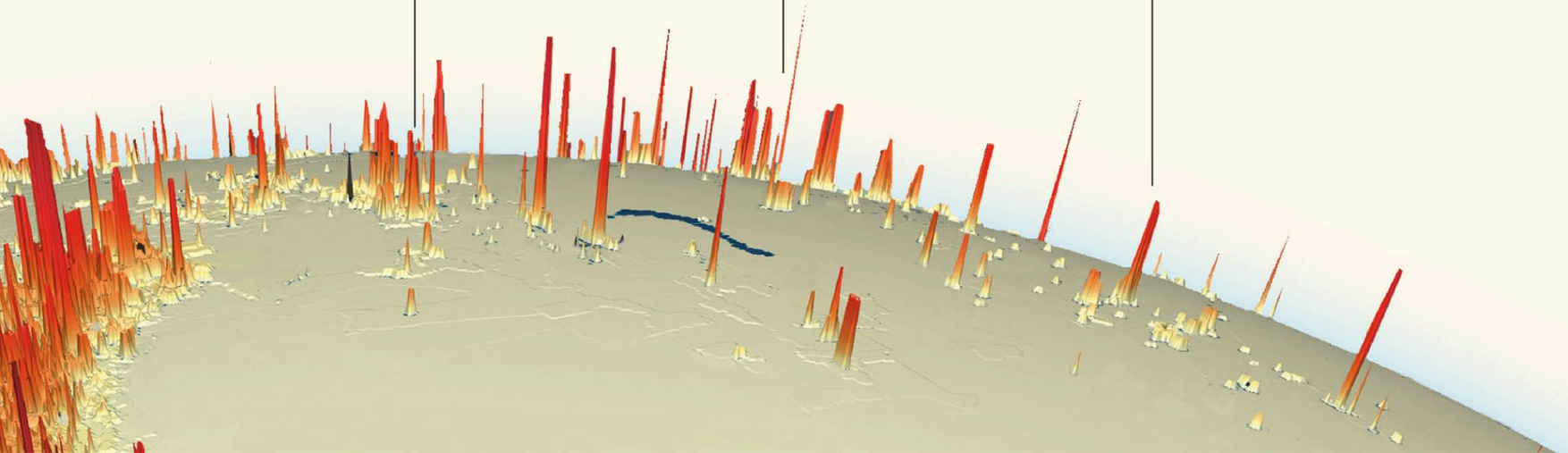


Land, sea, and air

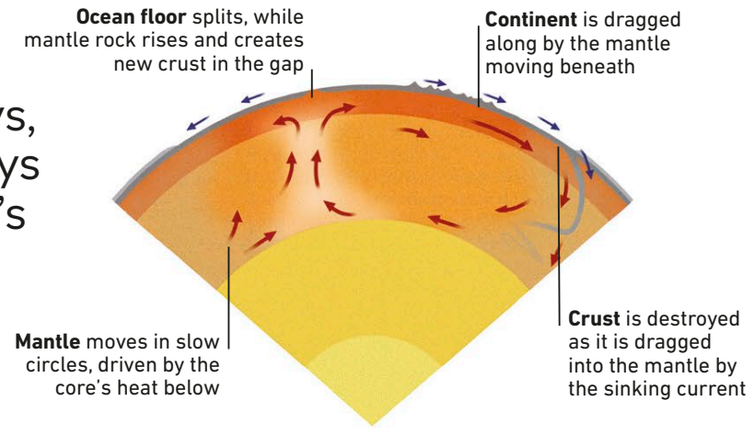
Skeleton Coast, Namibia
The Atlantic Ocean meets the edge of Africa's Namib Desert at the Skeleton Coast. Rainfall here rarely exceeds 0.39 in (10 mm) per year.

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 of this enables Earth's surface to teem with life.

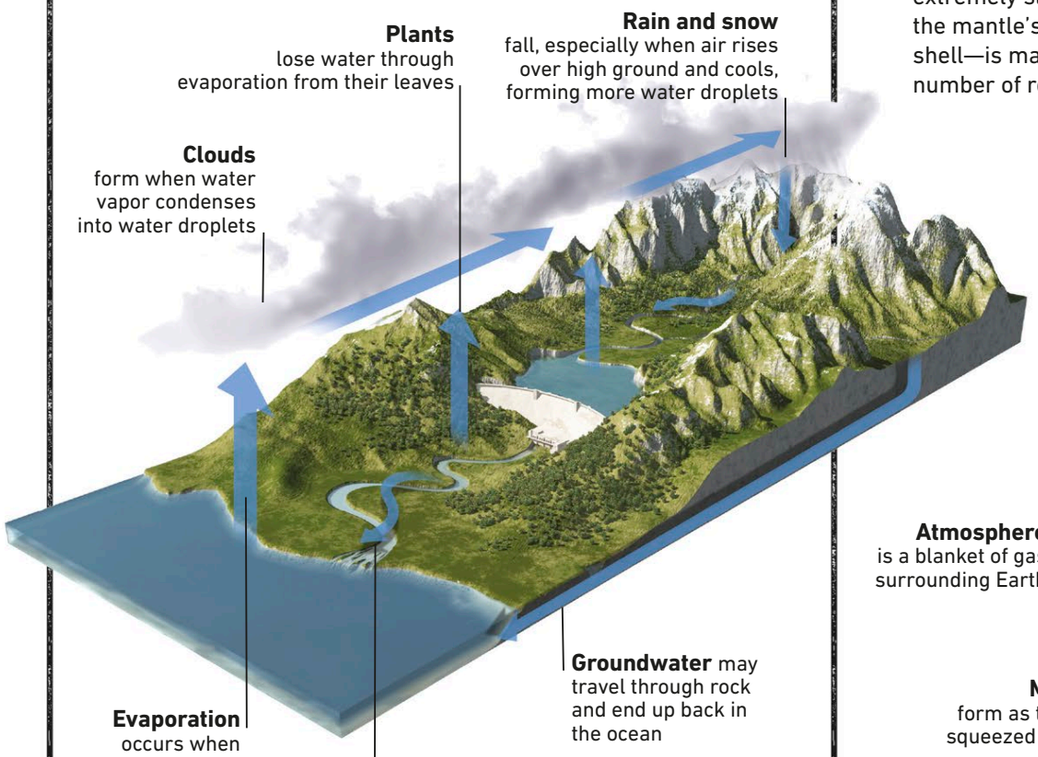
Churning interior

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.



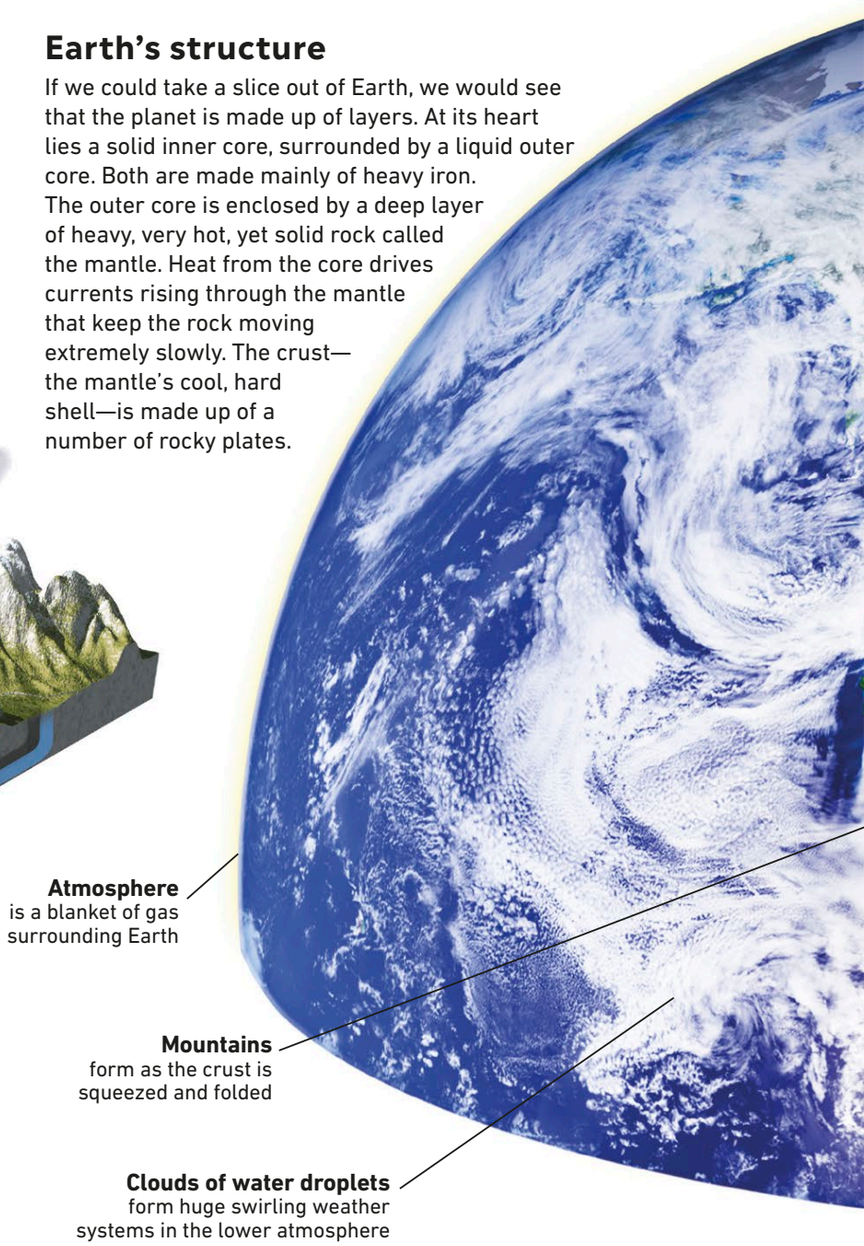
Water cycle

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 rain or snow. 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. It is called groundwater, and it may stay underground or trickle to the sea. This continuous circulation of water is known as the water cycle.



Earth's structure

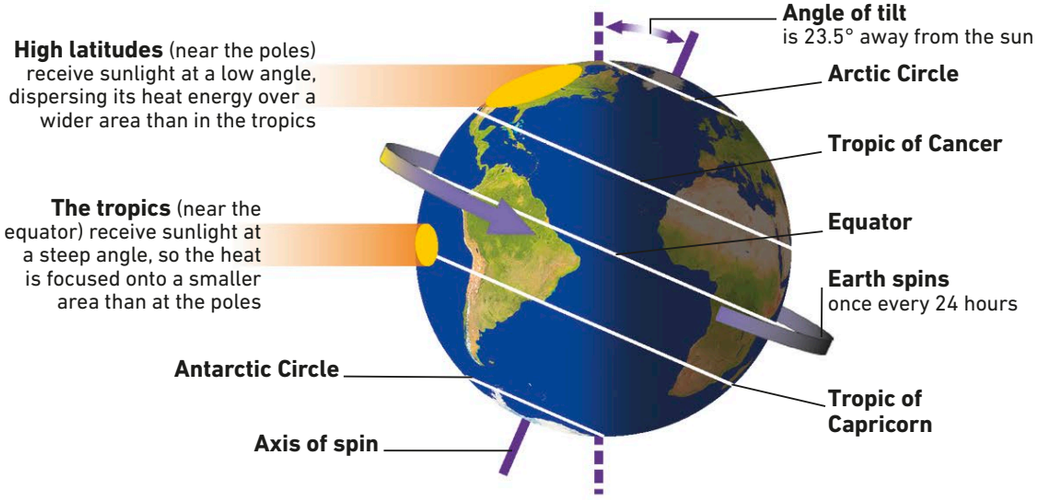
If we could take a slice out of Earth, we would see that the planet is made up of layers. At its heart lies a solid inner core, surrounded by a liquid outer core. Both are made mainly of heavy iron. The outer core is enclosed by a deep layer of heavy, very hot, yet solid rock called the mantle. Heat 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.

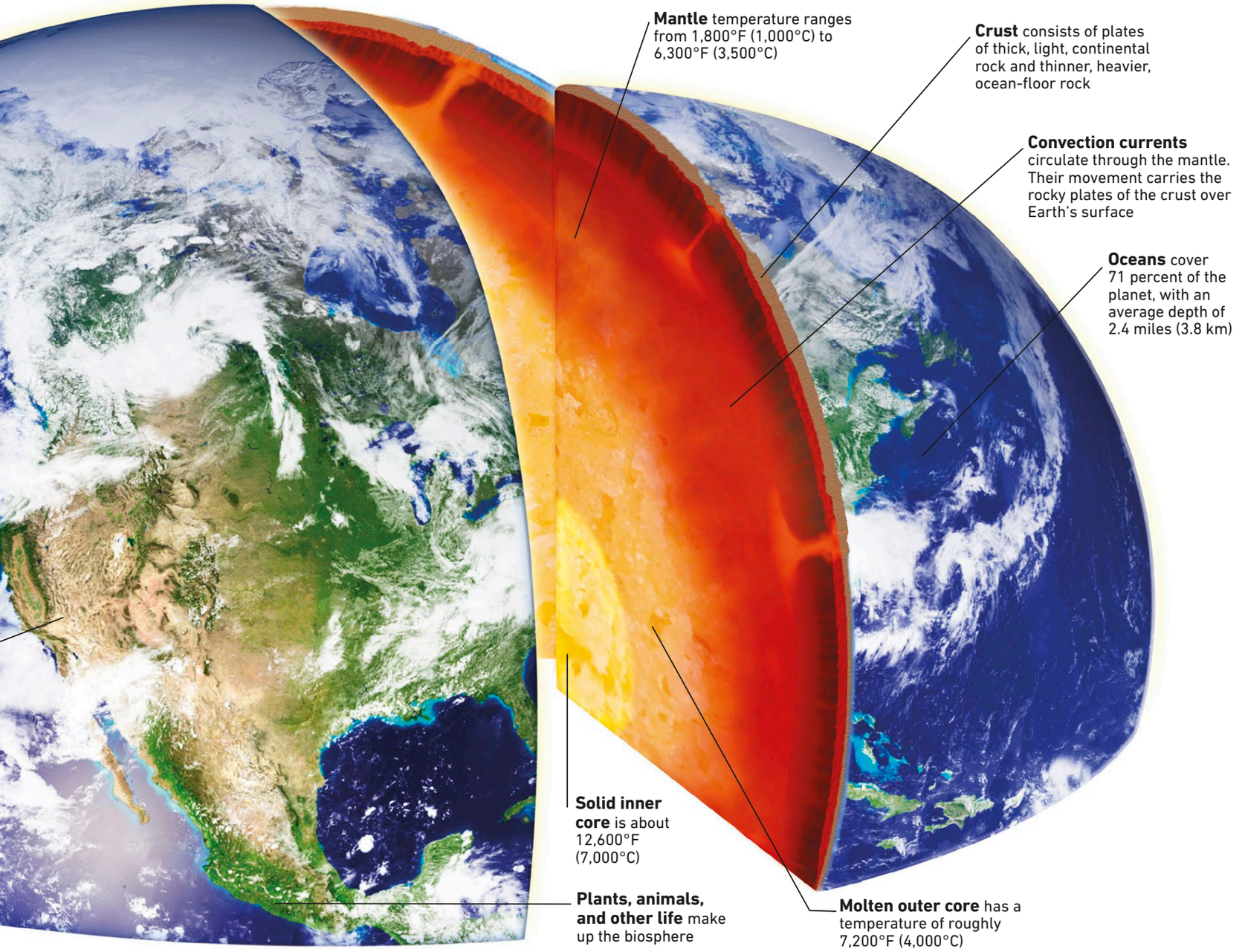


AN AVERAGE WATER MOLECULE SPENDS ABOUT 3,200 YEARS IN THE

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.





OCEAN BEFORE EVAPORATION RELEASES IT INTO THE ATMOSPHERE.

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

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

Eurasian Plate

Caribbean/North American boundary
This transform border is a region of frequent earthquakes, tsunamis, and volcanic eruptions.

African Plate

Indian Plate

Arabian Plate

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

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

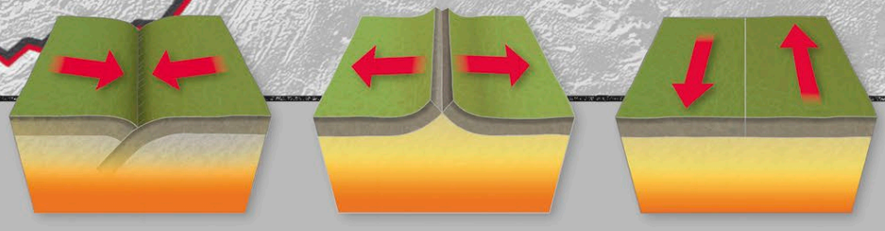
Mid-Atlantic Ridge
The African Plate is moving northeast at about 0.85 in (2.15 cm) per year, creating the Mid-Atlantic Ridge—a chain of volcanic mountains.

South American Plate

Scotia Plate

Types of boundaries

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

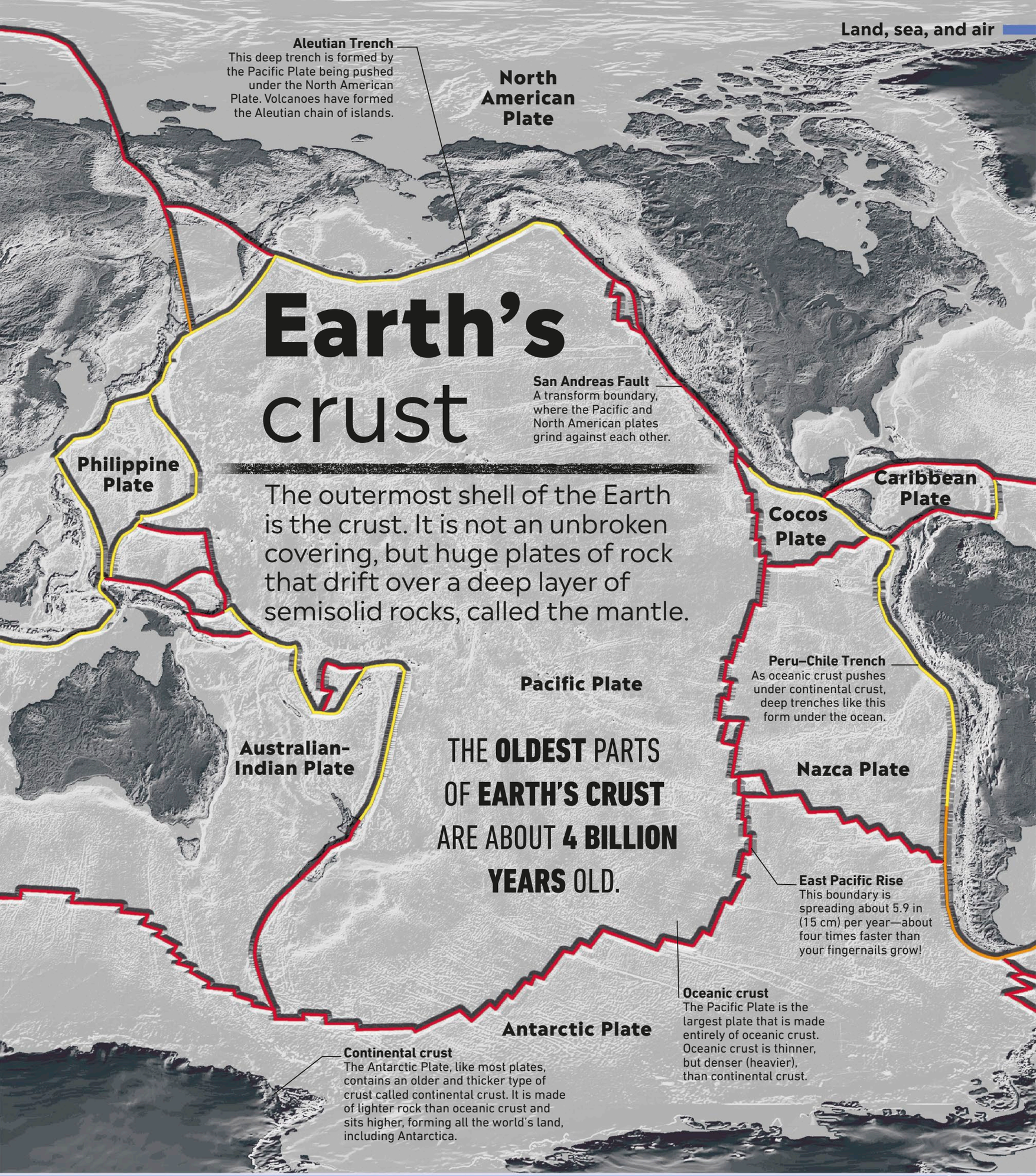


Convergent boundary
Where two plates collide. In some cases, one plate is pushed under the other; this is called subduction.

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.

RELATIVE TO ITS SIZE, THE EARTH'S CRUST IS THINNER THAN THE



SKIN OF AN APPLE. SOME PARTS OF IT ARE ONLY 5 MILES (8 KM) THICK.

Strongest earthquakes since 1900

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.

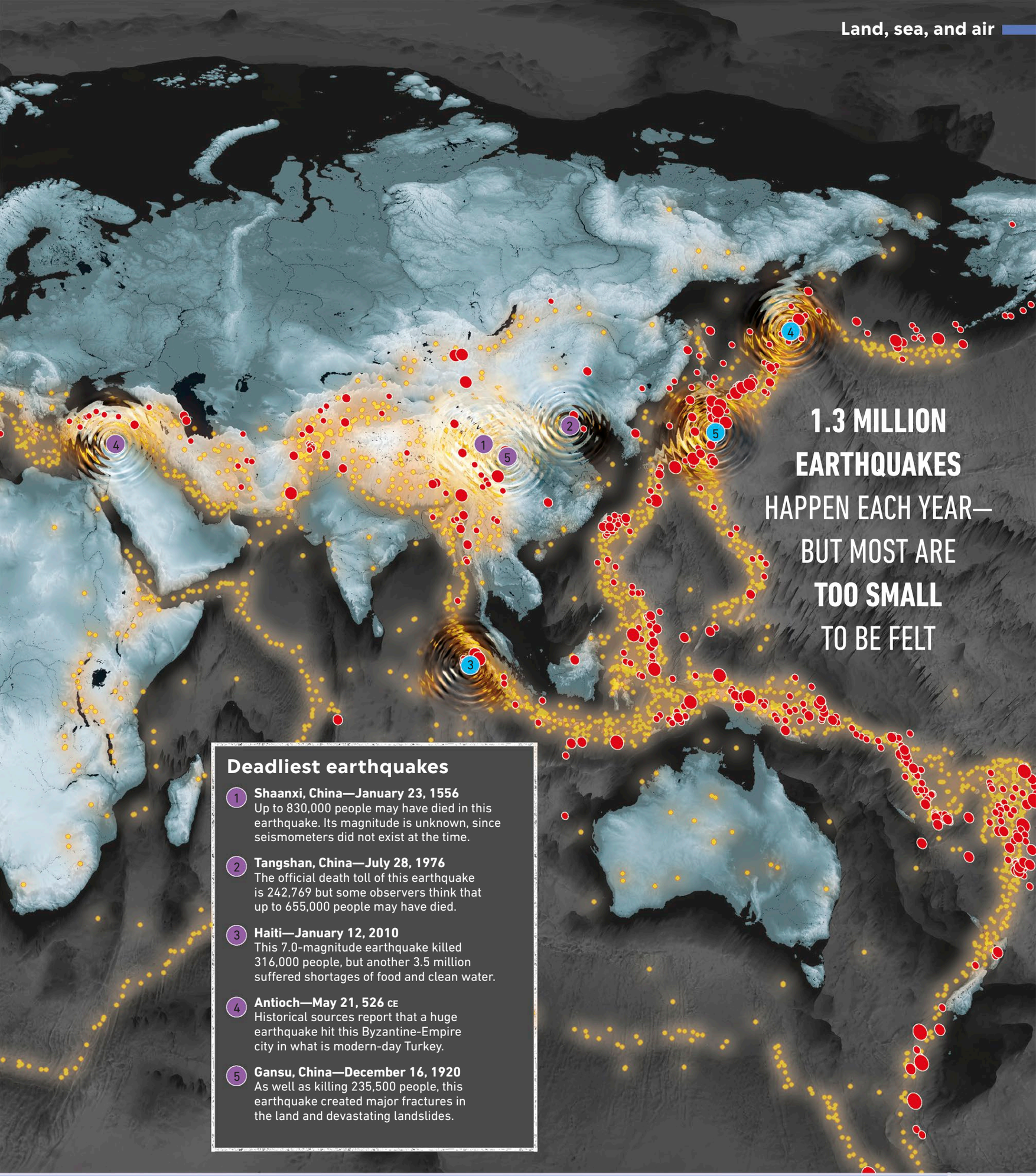
KEY
Earthquakes are marked on this map according to their strength, or magnitude. An earthquake with a magnitude of 9.0 makes ten times larger seismic waves than an 8.0-magnitude earthquake.

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 242,769 but some observers think that up to 655,000 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**
As well as killing 235,500 people, this earthquake created major fractures in the land and devastating landslides.

AGO MAY HAVE CAUSED AN EARTHQUAKE OF MORE THAN 10 MAGNITUDE.

Mountains

Mountains typically form over millions of years, as rock is thrust up as a result of the slow movements of the Earth's tectonic plates. Movements of tectonic plates can also lead to the eruption of magma from under the crust, forming volcanic mountains.

Denali (Mount McKinley)
20,310 ft (6,190 m)
Alaska

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

Mount Whitney
14,505 ft (4,421 m)
California

Mount Rushmore
South Dakota

Mont Blanc
15,774 ft (4,808 m)
France/Italy

Mount Chimborazo
20,549 ft (6,263 m)
Ecuador

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.

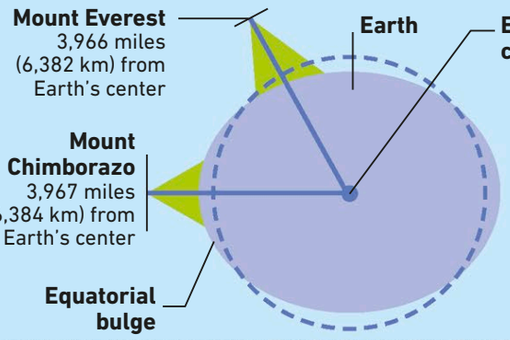
Pico de Orizaba
18,491 ft (5,636 m)
Mexico

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

Brooks Range
Alaska Range
Mackenzie Mountains
Rocky Mountains
Coast Mountains
Laurentian Mountains
Appalachian Mountains
Sierra Nevada
Lower California
Sierra Madre Occidental
Sierra Madre Oriental
Alps
Pyrenees
Scandanavian
Atlas Mountains
Ahaggar
Adamawa Plateau
Cordillera Occidental
Cordillera Oriental
Guiana Highlands
Andes
Planalto de Mato Grosso
Brazilian Highlands

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—by about a mile (2 km).



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**
29,032 ft (8,849 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

Mount Vinson Peak 6,050 ft (4,892 m)
Antarctica's highest summit, which forms the Vinson Massif in combination with five other mountains.

THE TALLEST KNOWN MOUNTAIN ANYWHERE IS OLYMPUS MONS,

Highest volcanoes

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

1 Nevados Ojos del 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

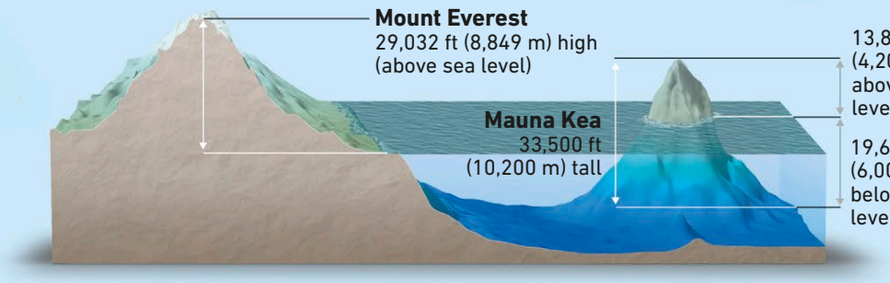
3 Tipas
21,850 ft (6,660 m); Argentina; isolated, little studied; no recent eruptions

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

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.



A VOLCANO ON MARS THAT IS NEARLY 16 MILES (25 KM) HIGH.

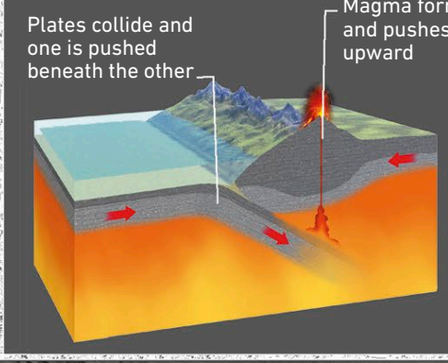
Active Iceland
Iceland has many active volcanoes, since it sits on top of the Mid-Atlantic Ridge, where magma wells up as the seabed splits apart.

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.



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

Volcanoes

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

Largest eruptions since 1800

1. **Tambora, Indonesia, 1815**
Tambora threw so much ash into the atmosphere that global weather was disrupted and temperatures fell.

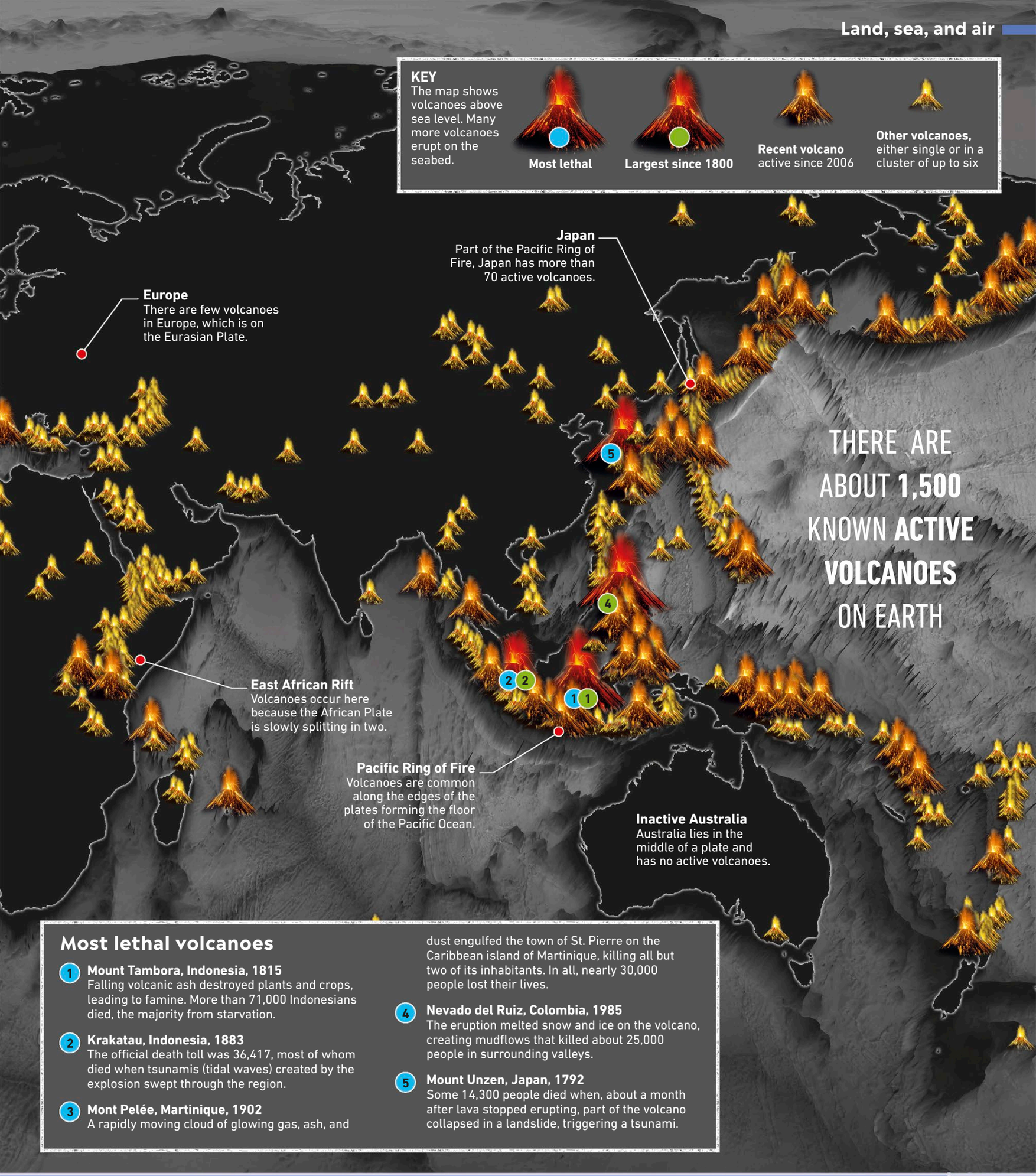
2. **Krakatau, Indonesia, 1883**
The explosion was heard 2,850 miles (4,600 km) away. It destroyed two-thirds of the island of Krakatau.

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 0.6-mile- (1-km-) wide crater. Ash fell in San Francisco 2,500 miles (4,000 km) away.

BETWEEN 50 AND 70 VOLCANOES ERUPT EVERY YEAR, MOSTLY AROUND



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 about 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 26,000–36,000 ft (8,000–11,000 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 often rising to 3,300–13,000 ft (1,000–4,000 m) above the sea-bed. They are volcanoes and many are hot spots 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

Aleutian Trench
This trench forms the border between the Pacific and North American plates. It reaches a depth of 26,604 ft (8,109 m).

Aleutian Trench

Labrador Basin

Reykjanes Ridge

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 one-third of the Earth's surface.

Tufts Plain

Grand Banks of Newfoundland

Biscay Plain

Davidson Seamount

Hatteras Abyssal Plain

Mid-Atlantic Ridge

Great Meteor Seamount

Hawaiian-Emperor Seamount Chain

Texas-Louisiana Shelf

Nares Plain

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.

Cape Verde Basin

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.

Guinea Basin

Basin
The oceans and their vast underwater basins cover about 71 percent of Earth's surface. The basins contain ridges, trenches, and other features of the ocean floor.

Brazil Basin

Angola Basin

East Pacific Rise

Peru-Chile Trench

Peru Basin

Tuamotu Ridge

Sala y Gomez Ridge

Mid-Atlantic Ridge

Namibia Plain

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

Argentine Basin

Cape Basin

Argentine Plain

Patagonian Shelf

Mornington Abyssal Plain

Pacific-Antarctic Ridge

Atlantic-Indian Ridge

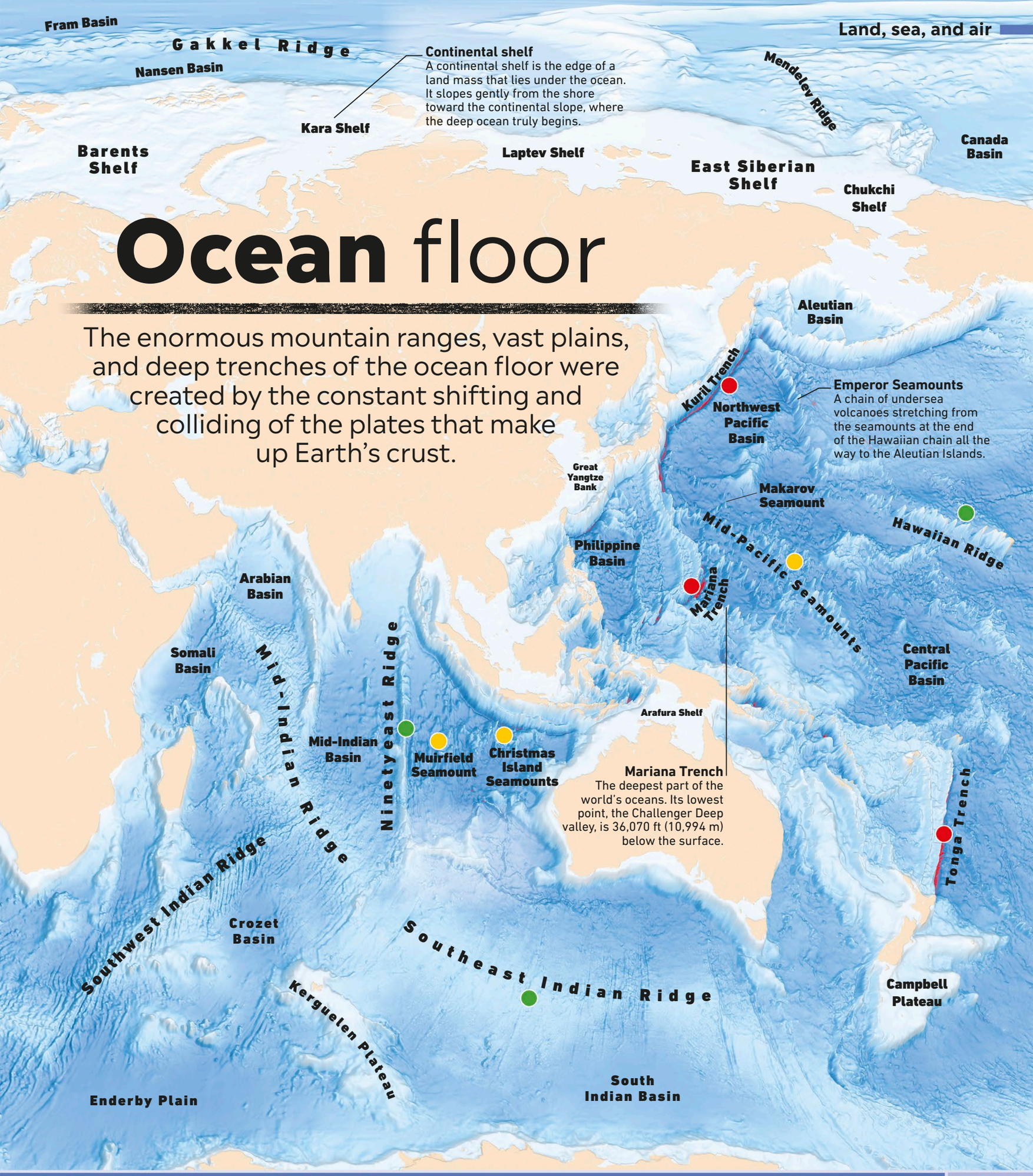
Southeast Pacific Basin

Weddell Plain

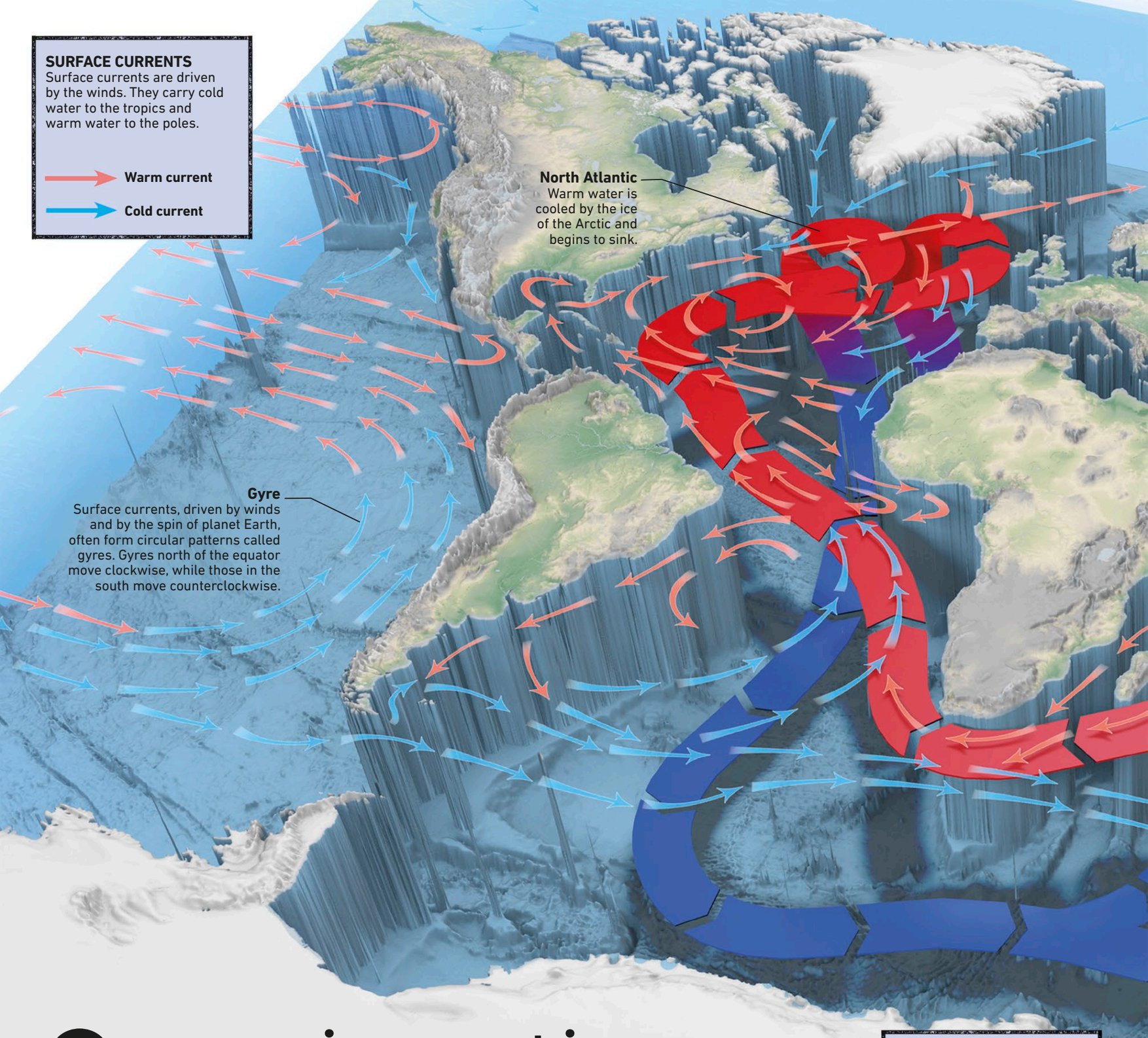
IF MOUNT EVEREST WERE PLACED ON THE DEEPEST PART OF THE OCEAN

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 Earth's crust.



FLOOR, ITS SUMMIT WOULD STILL BE 7,041 FT (2,146 M) UNDER WATER.



Ocean in motion

Ocean waters are constantly moving. Their movements, called currents, are driven by wind and the 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.

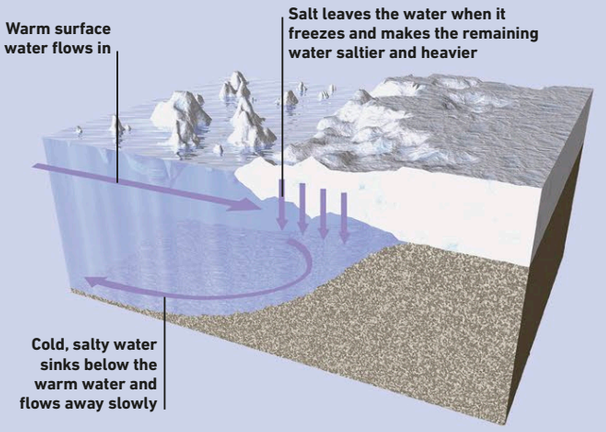
Warm — Cold

IT CAN TAKE UP TO 1,000 YEARS FOR OCEAN CURRENTS TO

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 sea water 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."



Great Pacific Garbage Patch
Plastics and other garbage 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.

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

Friendly floaters

A cargo of plastic ducks lost in the Pacific in 1992 has helped scientists learn more about the speed and direction of ocean currents ever since. Some of the ducks drifted over 17,000 miles (27,500 km).

CARRY WATER FROM THE NORTH ATLANTIC TO THE NORTH PACIFIC.

Rivers

Rivers help to shape the Earth, wearing down mountains, carving valleys, and laying down soil and rocks to form new land. Lakes hold 44 times more of the planet's fresh water than rivers.

Thames
Although only 215 miles (346 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.

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

Great Lakes
The five lakes cover about 95,000 sq miles (245,000 sq km), which is an area larger than the entire UK.

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 than 720 ft (220 m).

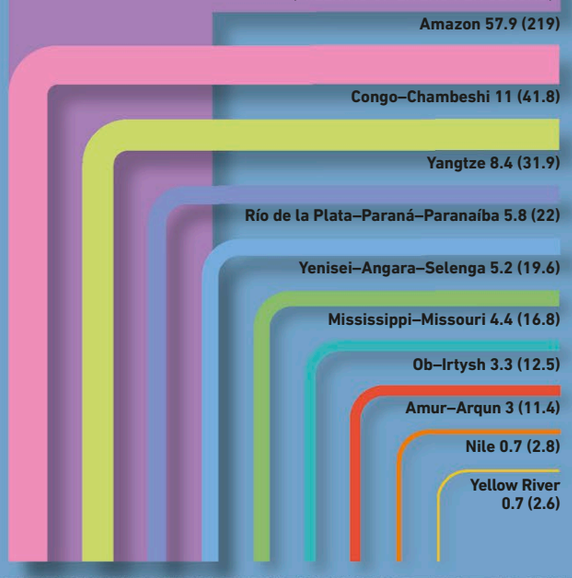
Madeira
The biggest tributary of the Amazon.

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

River volume

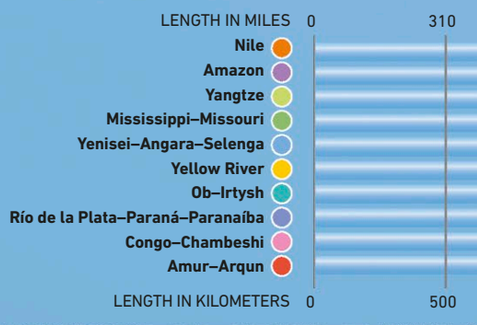
A river's size is measured by its discharge, or volume flow rate. This is the average amount of water that flows into the sea in a given time.

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

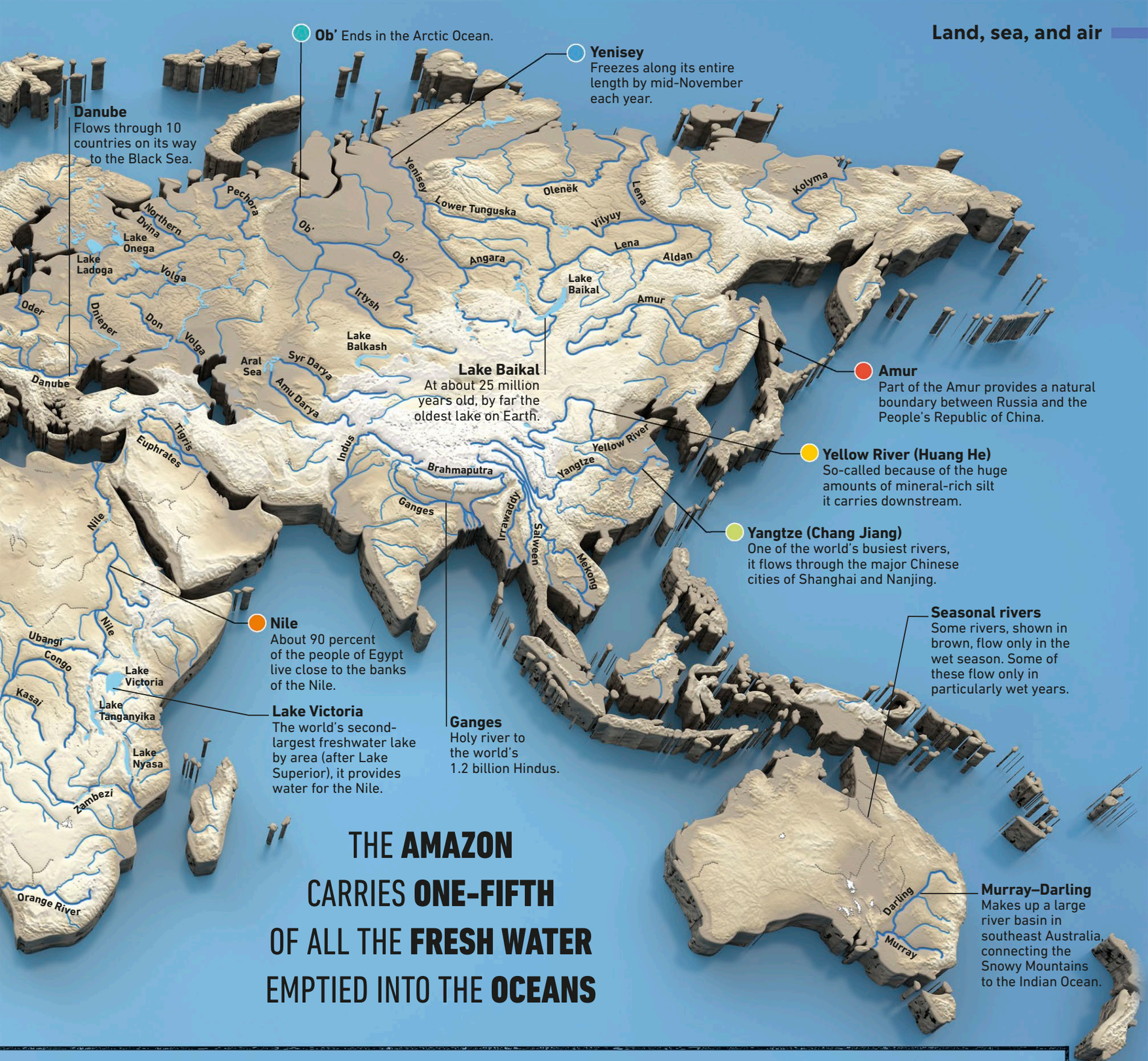


Longest rivers

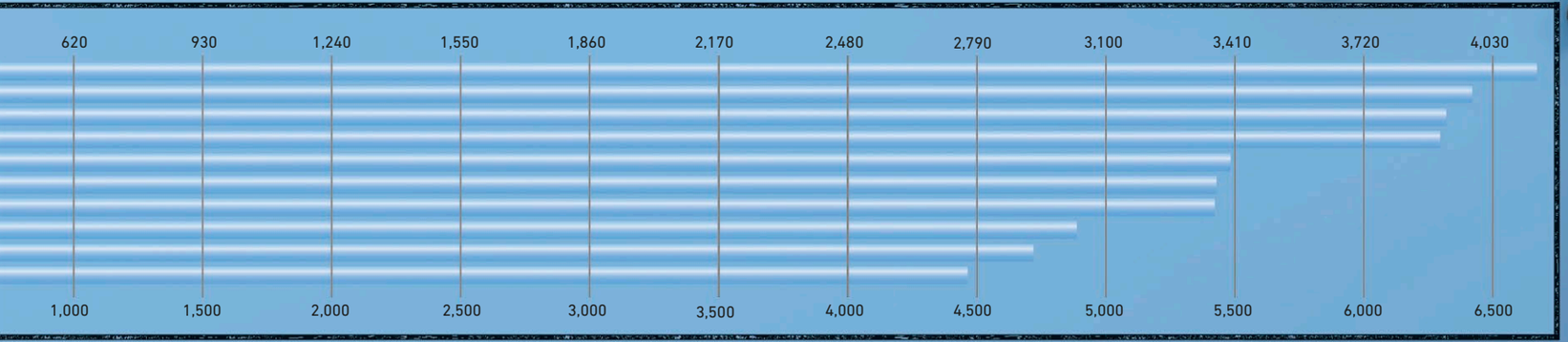
Advances in GPS technology mean that scientists can now measure a river's length much more accurately than they could in the past.



RIVERS ARE EARTH'S MOST POWERFUL FORCE OF EROSION, CARRYING



THE **AMAZON**
CARRIES **ONE-FIFTH**
OF ALL THE **FRESH WATER**
EMPTIED INTO THE **OCEANS**



22 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.

Haughton
Nunavut, Canada

Avak
US. Discovered by scientists looking for oil, this crater has been buried during the last 3 million years by a thin layer of rock.

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." More than 1,000 falls have happened since the 1950s.

Major meteorite falls since 2003

Nicholson
Canada

Steen River
Canada

Deep Bay
Canada

Clearwater East and West
Canada

Carswell
Canada

Saint Martin
Canada

Mistastin
Canada

Beaverhead
US

Eagle Butte
Canada

Manicouagan Canada
The inner part of this 215-million-year-old crater now forms a striking ring-shaped lake 40 miles (70 km) across.

Charlevoix
Canada

Nördlinger
Germany

Rochechouart
France

Manson
US

Montagnais
Canada

Guarda
Portugal

Ames
US

Sudbury Basin
Canada

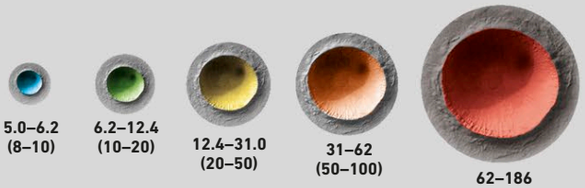
Chesapeake Bay
US

Sierra Madera
US

Chicxulub
Mexico

Bosumtwi
Ghana

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, however, 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)

Serra de Cangalha
Brazil

Araguainha
Brazil

Vista Alegre
Brazil

Vargeão Dome
Brazil

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.

AN ASTEROID HITTING ANTARCTICA 250 MILLION YEARS AGO MAY HAVE

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

Chelyabinsk Meteor
The powerful blast from this asteroid, which broke up over Russia in 2013, was detected by monitoring stations as far away as Antarctica.

Popigai
Russia
This giant crater, 62 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

Keurusselkä
Finland

Lappajärvi
Finland

Kara
Russia

Logancha
Russia

El'Gygytgyn
Russia

Puchezh-Katunki
Russia

Ragozinka
Russia

Karla
Russia

Tunguska Event
Before it hit the ground, a meteroid or comet exploded here in Russia in 1908 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.

Kamensk
Russia

Zhamanshin
Kazakhstan

Boltysh
Ukraine

Karakul
Tajikistan

Tai
China

Dhala
India

Oasis
Libya

Aorounga
Chad

Gweni-Fada
Chad

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.

Luizi
Democratic Republic of Congo

Morokweng
South Africa

Vredefort
South Africa

Greatest impacts

1. **Vredefort impact structure, South Africa**
Made 1.8 billion years ago by a 6-mile (10-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 east coast of the US. The impact made a tsunami so enormous, it may have crossed the Blue Ridge Mountains.

Strangways

Spider

Lawn Hill

Connolly Basin

Amelia Creek

Glikson

Gosse's Bluff

Woodleigh

Shoemaker

Yarrabubba

Tookoonooka

Flaxman

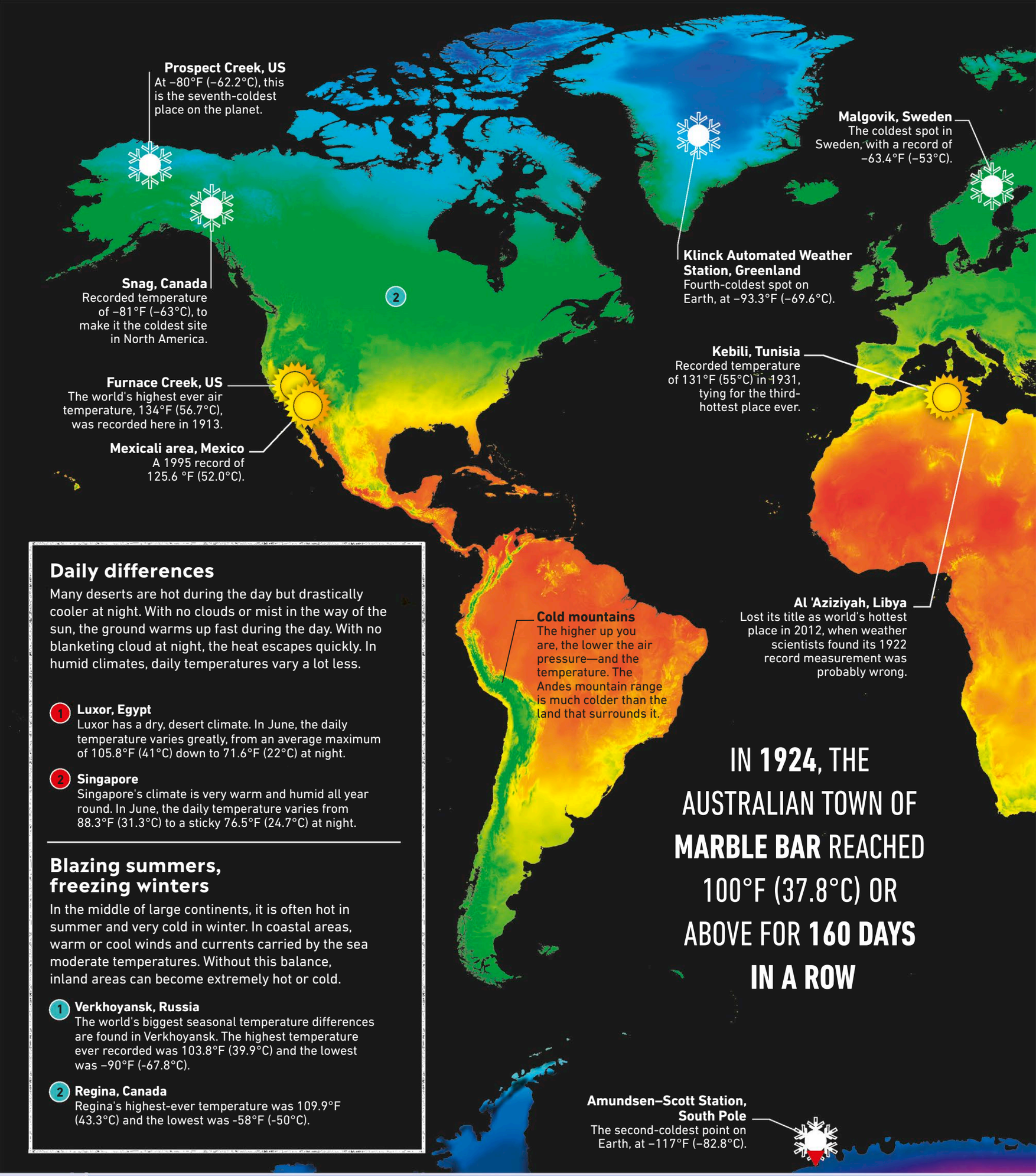
Acraman

Crawford

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

EARTH'S **BIGGEST IMPACT CRATER** IS **180 MILES** (300 KM) WIDE

BEEN TO BLAME FOR KILLING OFF 96 PERCENT OF ALL SEA LIFE.



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 greatly, 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.

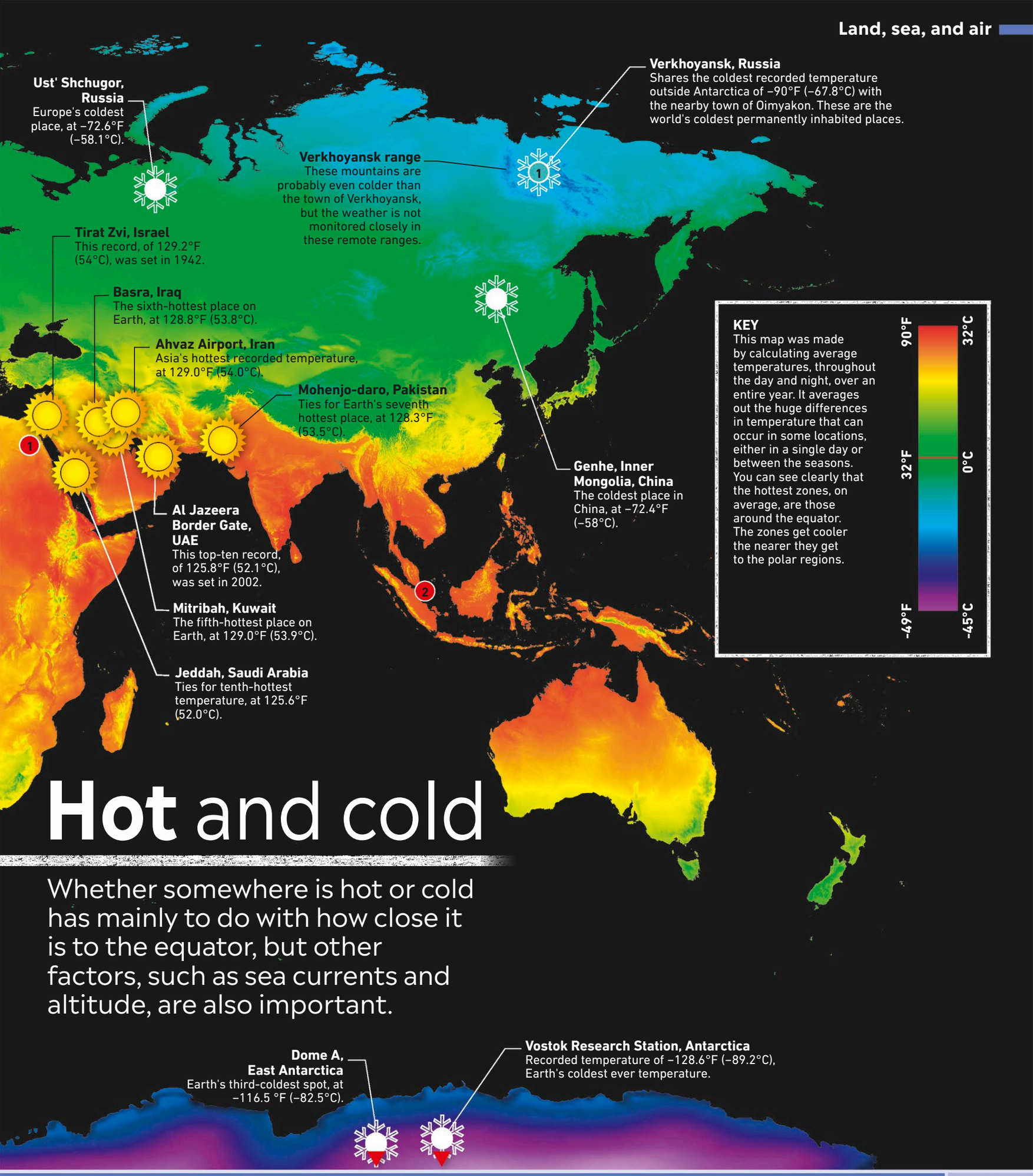
Blazing summers, freezing winters

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).

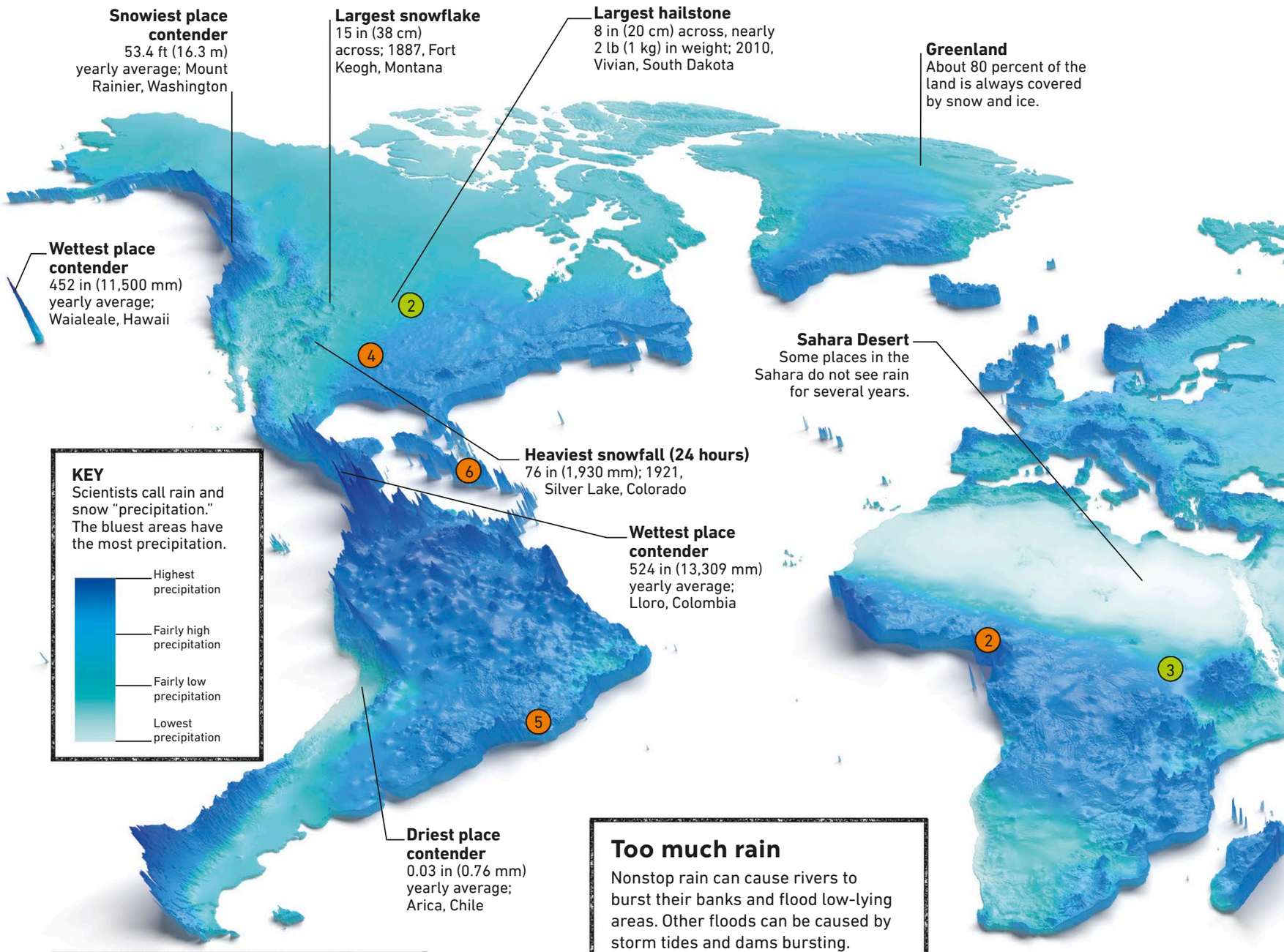
2. **Regina, Canada**
Regina's highest-ever temperature was 109.9°F (43.3°C) and the lowest was -58°F (-50°C).

THE "GULF STREAM" OCEAN CURRENT FROM THE GULF OF MEXICO GIVES



Hot and cold

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



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, US, 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 mudslides and 903 deaths.

6. **Haiti and the Dominican Republic, 2004**
Torrential rains made the Solie River overflow, causing floods and mudslides that destroyed villages and killed more than 2,000 people.

Flash floods

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

1. **Tehran, Iran, 1954**
A flash flood rushed through a gully killing about 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.

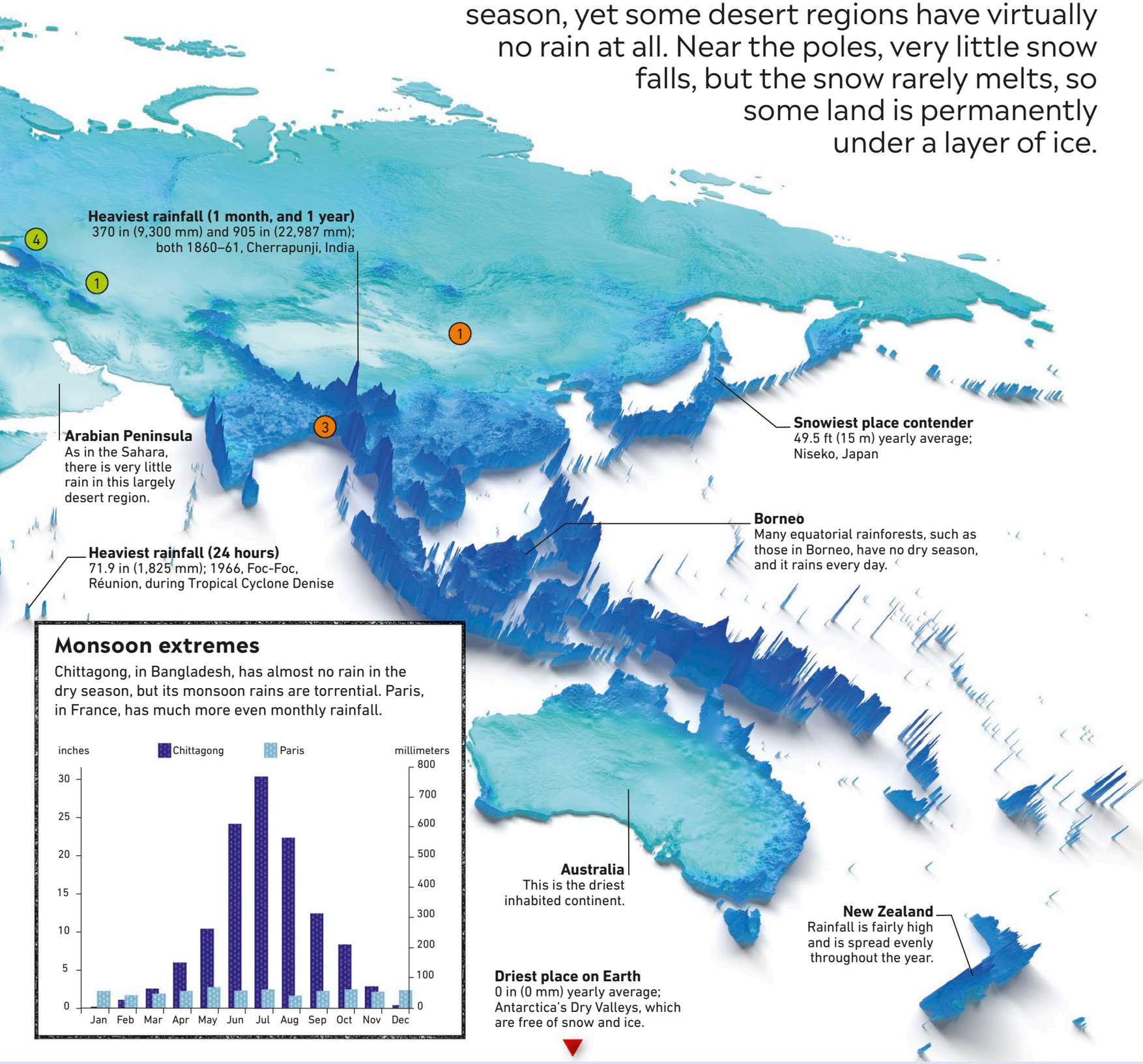
4. **Krasnodarskiy Kray, Russia, 2012**
150 were killed in the worst flooding and landslides in 70 years.

ANTARCTICA'S ICE-FREE DRY VALLEYS, IN THE CONTINENT'S

197 IN
(5,000 MM) OF RAIN MAY FALL IN ONE PLACE DURING INDIA'S **MONSOON** SEASON

Rain and snow

Rainfall varies dramatically with place. Torrential rain drenches southern Asia during the monsoon season, yet 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
49.5 ft (15 m) yearly average; Niseko, Japan

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

Australia
This is the driest inhabited continent.

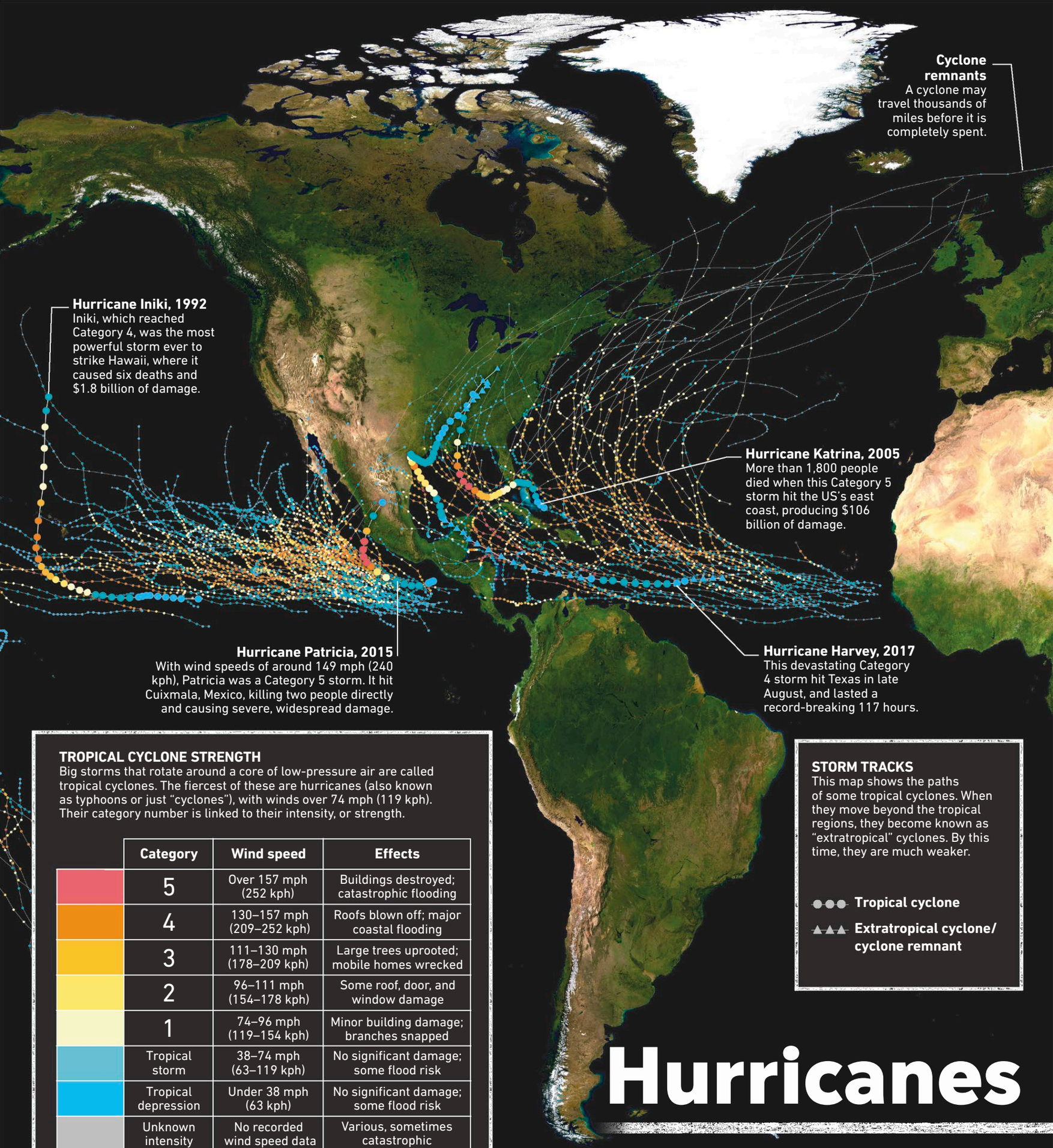
New Zealand
Rainfall is fairly high and is spread evenly throughout the year.

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

Monsoon extremes

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

INTERIOR, HAVE NOT SEEN RAIN FOR MORE THAN 2 MILLION YEARS.



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

TROPICAL CYCLONES ROTATE COUNTERCLOCKWISE IN THE NORTHERN

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 Idai, 2019
This Category 2 storm made landfall near Beira, Mozambique, causing severe flooding and over 1,000 deaths.

Cyclone Marcus, 2018
Marcus was the strongest tropical cyclone to hit Darwin, Australia, since 1974. It caused an estimated $75 million worth of damage.

Cyclone Winston, 2016
Category 5 Winston was the most intense tropical storm ever recorded in the Southern Hemisphere, leaving 44 dead and tens of thousands homeless.

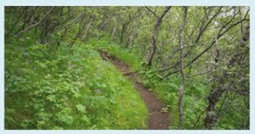
Hurricanes are tropical cyclones—swirling storms that form at sea in tropical regions. Their deadliest feature, causing 90 percent of deaths, is the storm surge, when winds force huge waves ashore that batter and flood the coast.

HEMISPHERE, BUT CLOCKWISE IN THE SOUTHERN HEMISPHERE.

Tropical broad-leaved moist forest
Also known as rainforest, these warm, wet woods support a huge variety of animal and plant life.

Tropical broad-leaved dry 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.



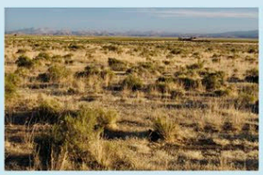
Temperate broad-leaved forest
The most common habitat of northern Europe and home to trees that lose their leaves in winter.

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 land biome on Earth. It is dominated by just a few types of coniferous trees.

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.

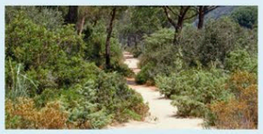
Coral reef
The warm, shallow waters of a reef support a huge variety of life, from sharks to tiny sea horses.

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.

TROPICAL RAINFORESTS COVER ABOUT 6 PERCENT OF THE LAND,



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.

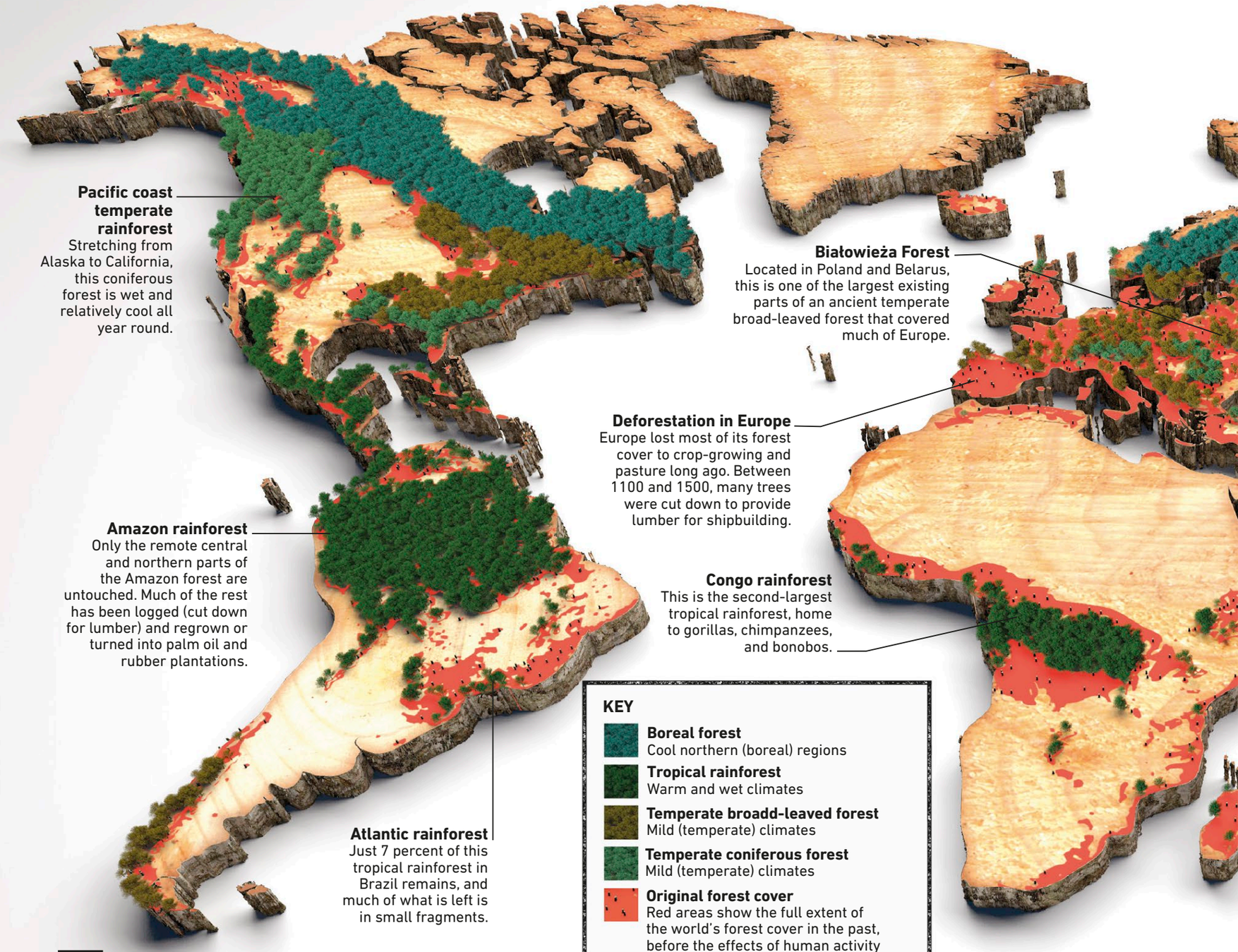
Polar desert
Too cold and dry for almost all plants. Only animals dependent on the sea, such as penguins, can live here.

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.

BUT ARE HOME TO NEARLY HALF OF ALL LIVING THINGS ON EARTH.

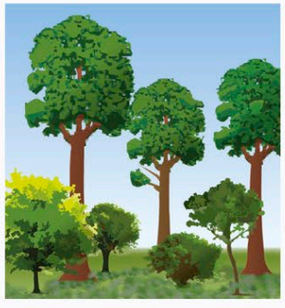


Forests

Forests are vital to life on Earth. They make the air breathable, protect the soil, and preserve fresh water supplies. But they are disappearing—and while efforts are being made to slow deforestation, about 25 million acres are still lost each year.

Types of forests

Forests differ according to climate. Each type of forest has its own distinct collection of trees, forest-floor plants, and animal life. Tropical rainforests are the most diverse—30 percent of all plant and animal species live in the Amazon alone. Some tropical forests are evergreen, while in others the trees lose their leaves in the dry season.



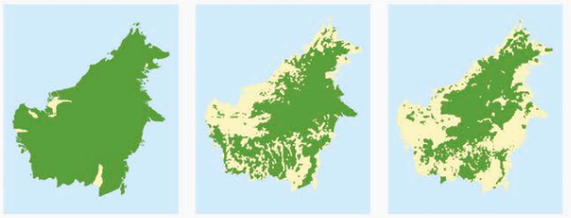
Temperate broad-leaved
Deciduous trees, such as oak and beech. Herbs, ferns, and shrubs on the forest floor.

IN 2019, AN AREA OF TROPICAL RAINFOREST ABOUT THE SIZE OF

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 from 1950 to 2010.



Borneo, 1950 | 1985 | 2010

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

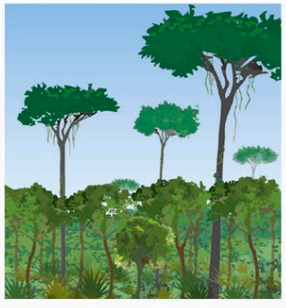
Borneo
Home of most of the world's orangutans, Borneo's rainforest has declined by more than 50 percent since the mid-20th century (see above).

New Guinea
Two-thirds of New Guinea is largely unspoiled rainforest, 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 rainforests full of lush tree ferns.

AT CURRENT RATES OF **LOGGING,** IN **100 YEARS** WE WILL **NO LONGER** HAVE ANY **RAINFORESTS**



Tropical rainforest
As many as 300 tree species per 2.5 acres (hectare). Often rich in forest-floor plants.

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

A FOOTBALL FIELD WAS DESTROYED EVERY SIX SECONDS.

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 vapor.

THE SAHARA TAKES UP 8 PERCENT OF THE EARTH'S LAND

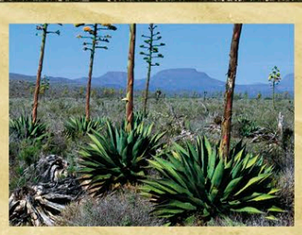
Desert terrain

Deserts range widely in how they look. Soil forms 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.

Saxaul
Short, shrubby tree that grows in the deserts of Asia. Its spongy bark stores water, and it holds onto its water supply, because its tiny leaves lose very little water by evaporation.

Central Asia
The deserts and semideserts here are so dry simply because they are so far from the ocean.

Turpan Depression, China
Low-lying area hotter than the surrounding regions.

Kyzyl Kum
Kazakhstan, Uzbekistan, and Turkmenistan

Karakum
Turkmenistan

Takla Makan
China

Dasht-e Lut
Iran

Gobi Desert
Mongolia and China

Arabian Desert

Thar Desert
Pakistan and India

Thorny devil
This lizard of Australian deserts collects dew on its body at night, then microscopic grooves on its skin channel the water to its mouth.

Great Sandy Desert

Gibson Desert

Simpson Desert

Great Victoria Desert

THE ENTIRE **ANTARCTIC CONTINENT** IS A DESERT—THE **LARGEST** ON **EARTH**

TYPES OF DESERTS

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 have short periods of rain, but no more than 20 in (500 mm) a year.

Cold deserts
Includes the Gobi in Asia and the Atacama in South America. Freezing cold in some seasons but may be very hot at other times.

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 ABOUT THE SAME SIZE AS THE ENTIRE UNITED STATES!

Ice

Ice covers one-tenth of Earth's land surface, mostly in the polar regions. At earlier times in 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.

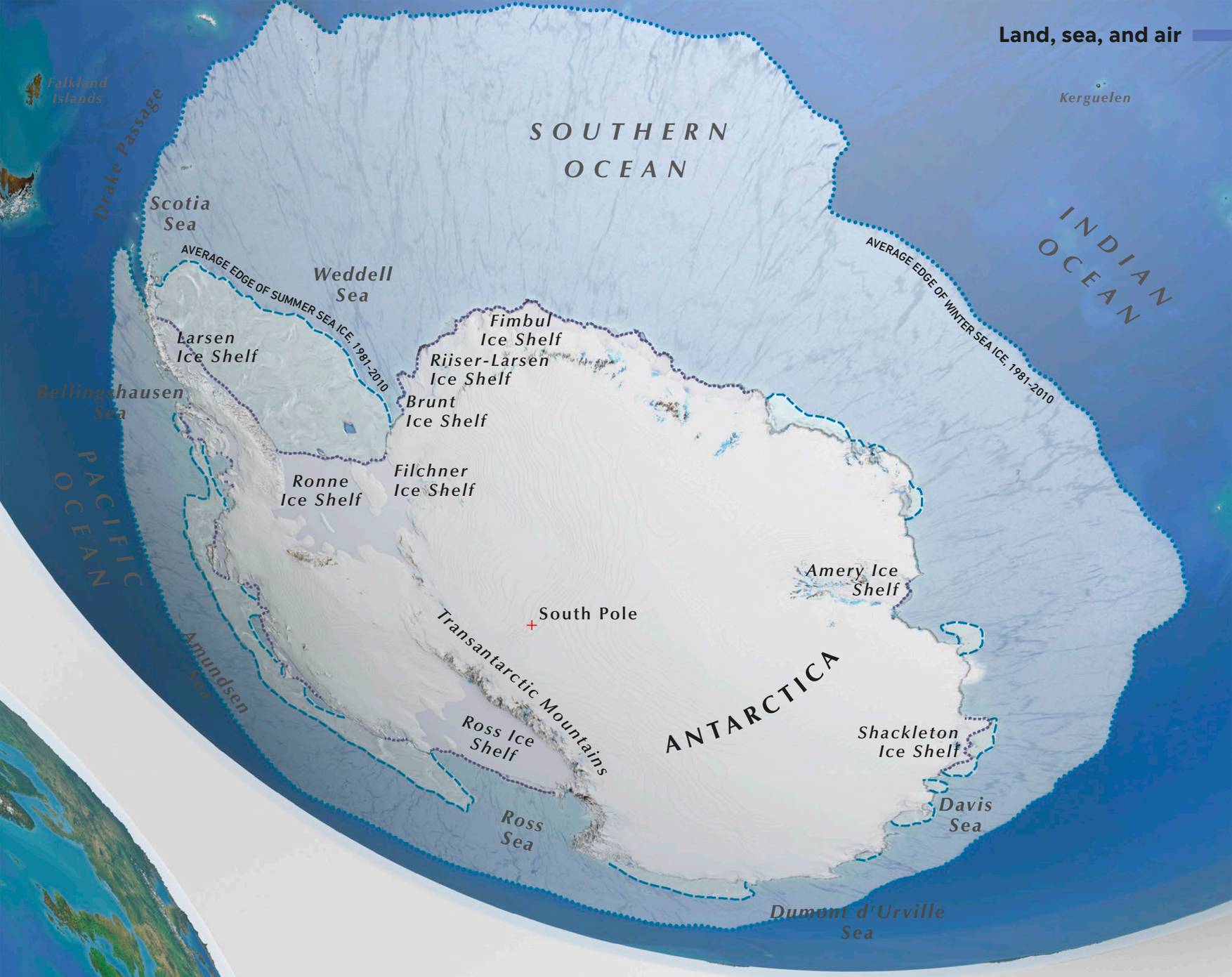
Land ice

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.

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.

THE TALLEST ICEBERG EVER SEEN IN THE NORTH ATLANTIC ROSE 551 FT



Glaciers and ice sheets

Glaciers are bodies of land ice that usually 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.

Glaciers

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 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 the Earth into time zones.

International Date Line
An imaginary line that sets the boundary between one day and the next. Crossing it east to west, you go back one whole day (24 hours), and crossing it west to east, you go forward one day.

Hawaii
Part of the US but thousands of miles from the mainland, Hawaii is UTC-10.

US
A total of five time zones are set on the mainland US, including a separate zone for Alaska.

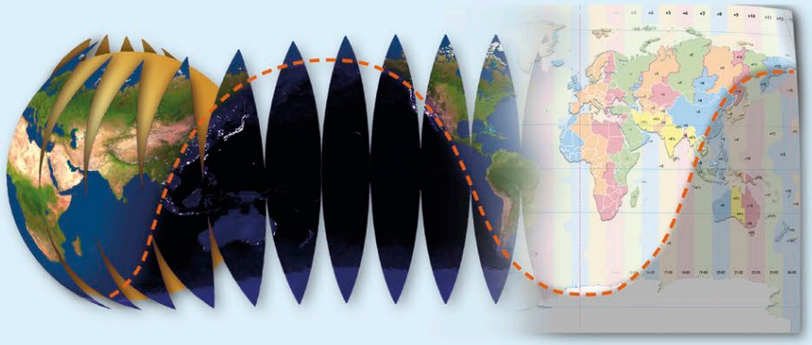
Caroline Island, Kiribati
Eastern Kiribati is in the farthest forward time zone, UTC+14. Caroline Island is its easternmost island and the place where, technically, the sun rises first each day. Now you know where to go to be the first to celebrate the New Year!

SUNRISE

Daylight
During the June solstice (mid-summer in the north), there is more sunlight in the northern hemisphere than the southern due to the tilt of the Earth. At the December solstice (midwinter in the north), when the southern hemisphere tilts toward the sun, this bell shape would be upside down.

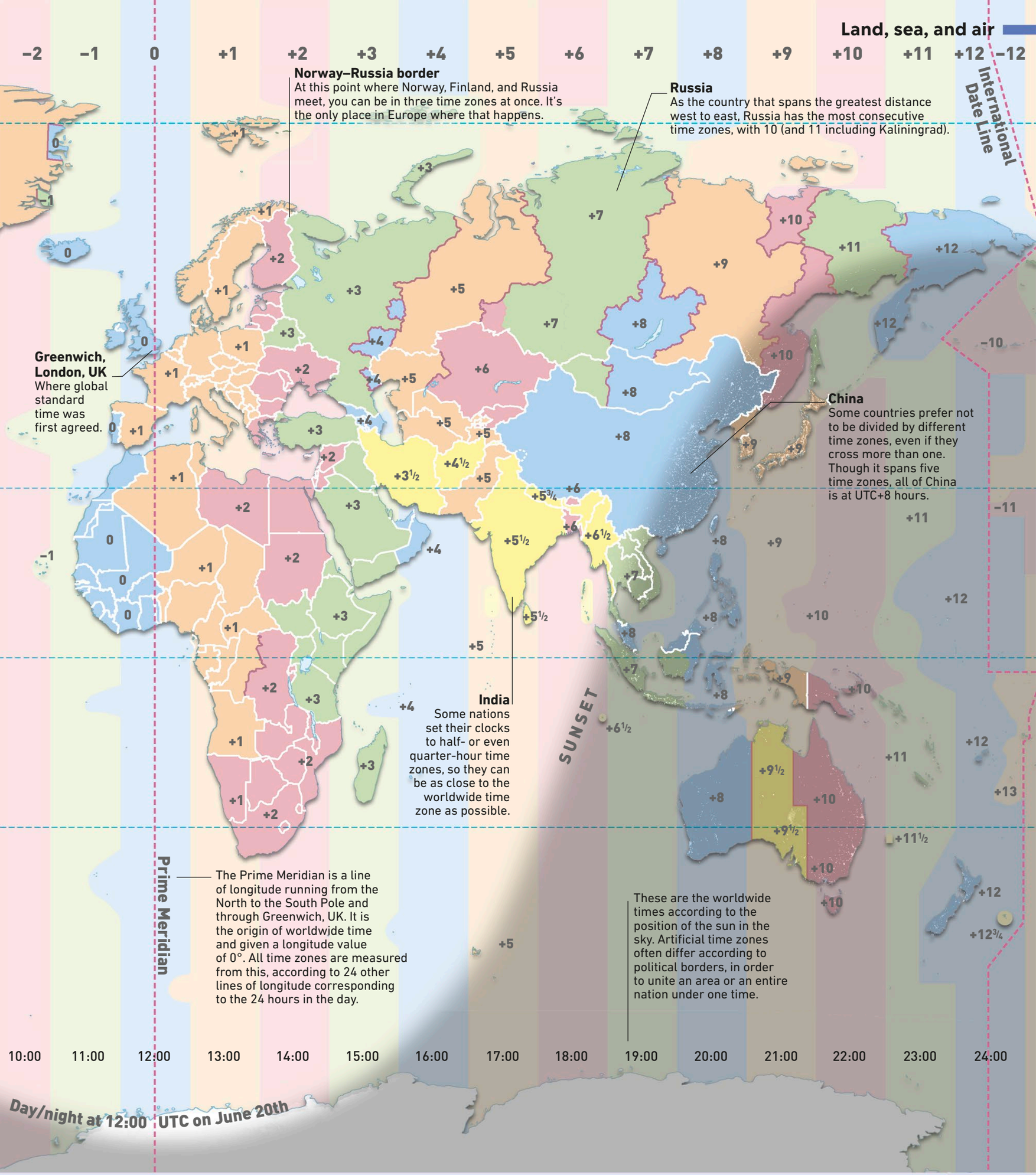
Day and night

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



Northern summer
The Earth is tilted. When the North Pole tilts toward the sun and the South Pole leans away, it is summer in the northern hemisphere (northern half of the world) and winter in the southern hemisphere, as on the main map.

BEFORE TIME ZONES, LOCAL TIME WAS DECIDED BY THE TOWN TIME-



KEEPER, WHO RECORDED 12 PM WHEN THE SUN WAS DIRECTLY OVERHEAD.

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 birdlife. Here are their secrets.

- **Lightweight bones**
  Most bird bones are hollow, reinforced by bony struts.
- **Flight feathers**
  Wing and tail feathers provide lift and steer the bird in fight.
- **Warming feathers**
  Two layers of body feathers keep the bird's skin warm.
- **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

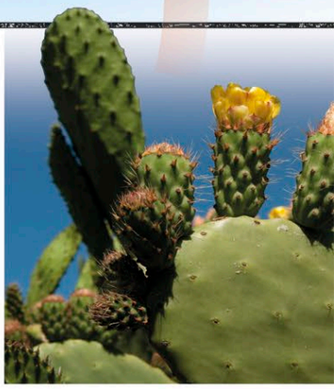
Living in water gives more support than living on land, so many sea creatures survive without strong skeletons. Sea water carries clouds of microscopic life-forms and dead matter, and many sea animals can afford to give up moving from place to place, fix themselves to the seabed, and "filter feed" by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

- **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 a streamlined body, which helps 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.

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

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.



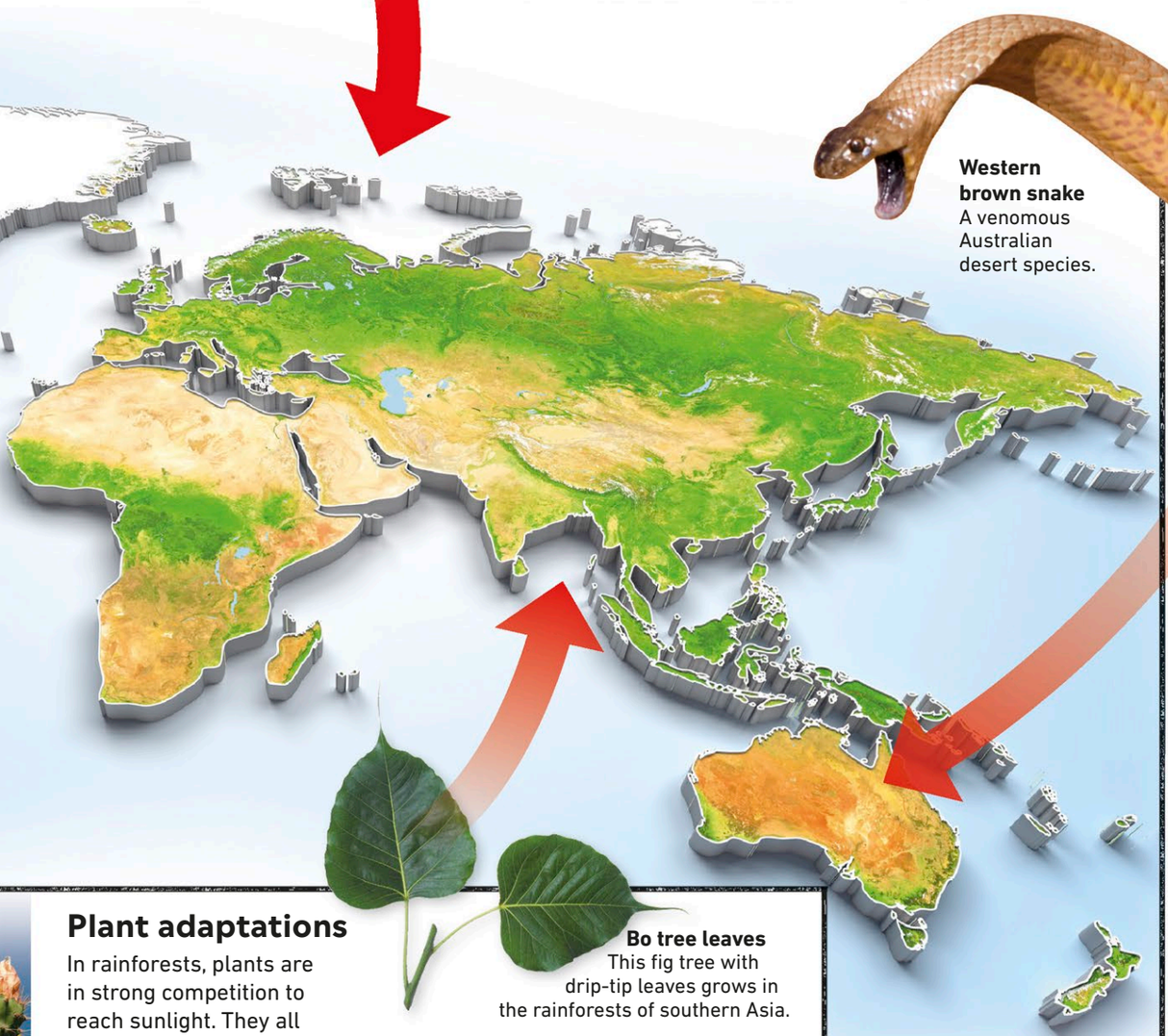
THERE ARE PROBABLY AT LEAST 1 MILLION UNDISCOVERED SPECIES IN

Polar regions

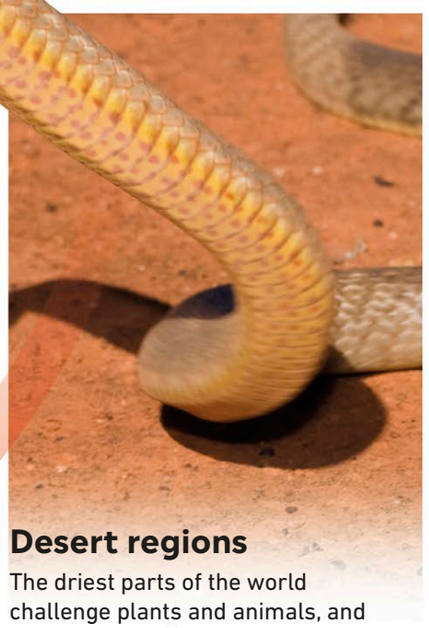
The sea in the Arctic and Antarctic is so cold, fish are in danger of freezing. Above the water it is even colder, and no large, cold-blooded animals exist. Warm-blooded animals—those able to retain body heat—predominate. Polar mammals often have two layers of fur: an underlayer of soft hairs that trap 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 that 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.

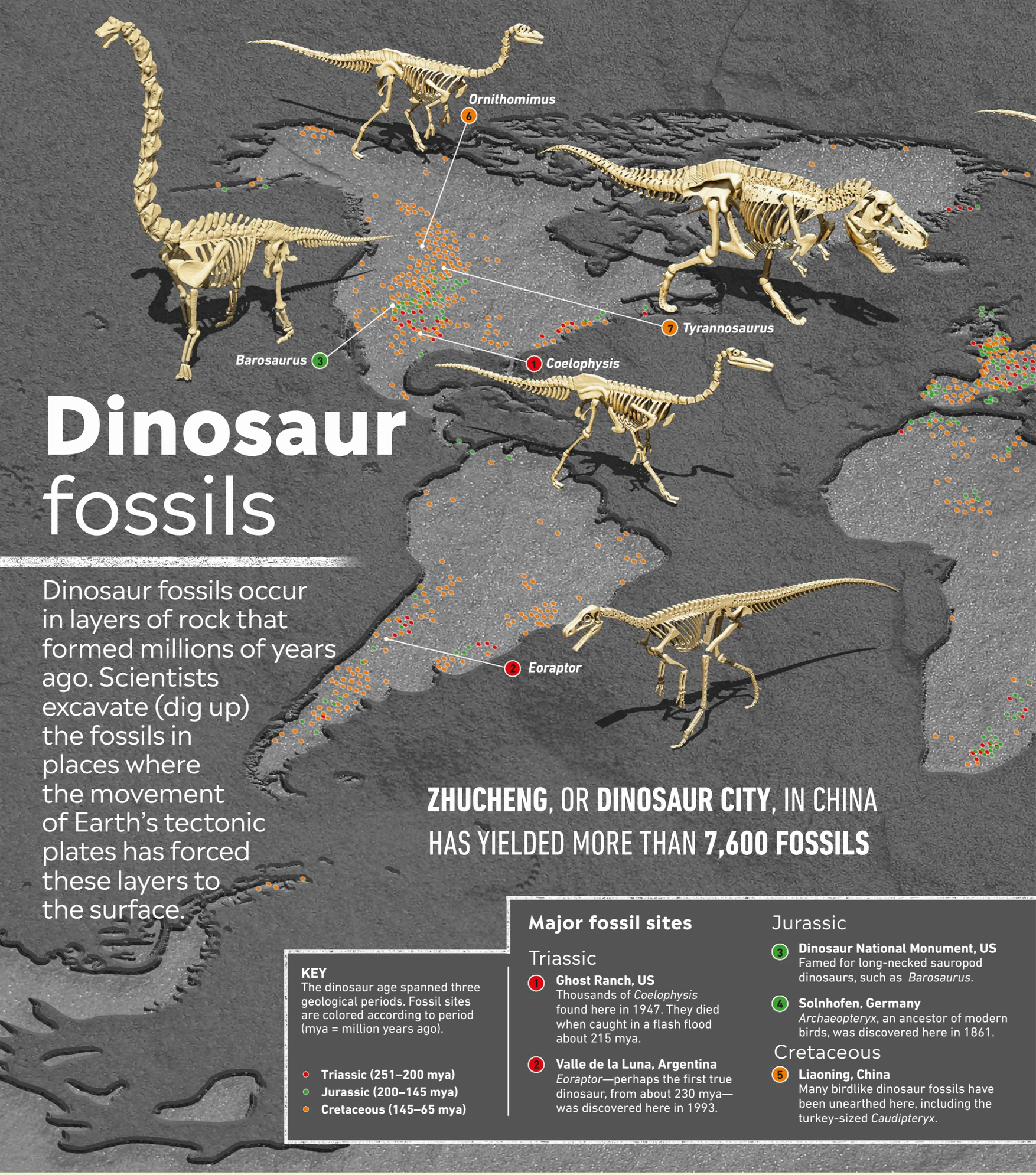
- **Nocturnal lifestyle**
  Many animals are active only at night. Gerbils and jerboas retreat into daytime burrows to stay cool.
- **Large extremities**
  Fennec foxes have huge ears that radiate heat away from the body.
- **Drinking dew**
  Insects and lizards drink dewdrops. Larger desert animals that feed at dawn take in dew as they eat plants.

Plant adaptations

In rainforests, 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 rainforests of southern Asia.

Rainforest plants
To reach the sun, many rainforest plants are specialist climbers, and others are epiphytes, which grow on top of other plants. Many rainforest 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**
Archaeopteryx, an ancestor of modern birds, was discovered here in 1861.

Cretaceous

5. **Liaoning, China**
Many birdlike dinosaur fossils have been unearthed here, including the turkey-sized *Caudipteryx*.

AS WELL AS BONES, NESTS, EGGS, AND TRACKS, FOSSILS INCLUDE

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
Colorado. Hundreds of prints unearthed when building a road.

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

Purgatoire River site
Colorado. Giant sauropod prints left on a lake shore.

4 *Archaeopteryx*

5 *Caudipteryx*

9 *Hadrosaurus*

8 *Protoceratops*

10 *Leaellynasaura*

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 55 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 reindeer.

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 shoal can reduce a deer to bones in minutes.

Africa

7. African rock python
Growing up to 28 ft (8.5 m) long, pythons prey 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 1.25 miles (2 km) away.

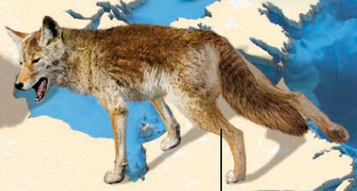
12. Gray wolf
Packs can bring down animals as large as reindeer or musk ox.

10. Polar bear
On land and sea ice within the Arctic Circle

11. Golden eagle
Europe, North America, northern Asia, and Africa

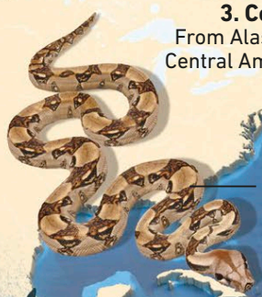
1. Bald eagle
Throughout North America

2. Wolverine
Canada and northern US; Scandinavia and Siberia



3. Coyote
From Alaska to Central America

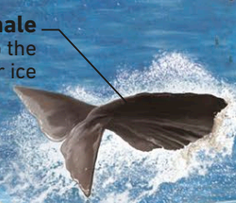
19. Killer whale (orca)
Oceans worldwide



4. Boa constrictor
From Mexico to Argentina

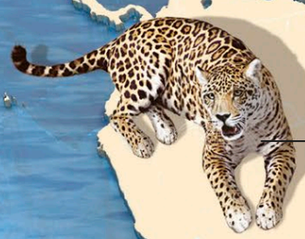
20. Common dolphin
Cool and warm oceans worldwide

18. California sea lion
Pacific coast of North America and the Galápagos Islands

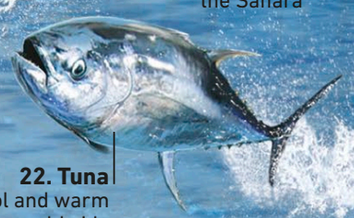


21. Sperm whale
Worldwide, to the edge of the polar ice

7. African rock python
Africa, south of the Sahara



5. Jaguar
Southwestern US to northern Argentina



22. Tuna
Cool and warm oceans worldwide

6. Piranha
North, central, and eastern South America

23. Great white shark
Cool and warm oceans worldwide

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.

WHEN A PEREGRINE FALCON DIVES ON A PIGEON AT FULL SPEED,

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

14. Peregrine falcon
Dives onto prey at 200 mph (320 kph), making it the fastest animal on Earth.

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

16. Tiger
Camouflaged by its stripes, a tiger 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.

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 lions, 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 9,843 ft (3,000 m) deep in search of giant squid.

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

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

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.

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 smaller predators.

A FOOD CHAIN IN THE AFRICAN SAVANNA

Deadly creatures

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

Polar bear
Approaches human settlements, and becomes dangerous, when it is very hungry.

Grizzly bear
Causes 5–10 deaths a year, occasionally attacking humans when surprised or with cubs.

Adder
Britain's only venomous snake, but bites from this viper are rarely fatal.

Honey bees
About 400 vulnerable people die of bee stings each year.

Black bear
Killed two people in the US in 2020 and 29 since 1900. They rarely attack, but often live near humans, so conflicts happen.

Polar bear

Cougar
Cougar attacks have caused 26 deaths in North America between 1890 and 2020.

Great white shark
Humans are the same size as its natural prey—seals. Since 1876, it has killed more than 80 people, more than 10 of those off the coast of California.

Golden poison dart frog
Has the most potent toxin in the animal kingdom.

Tsetse fly
Transmits sleeping sickness, which kills up to 10,000 people a year.

Eastern diamondback rattlesnake
Compared to any other rattlesnake, it has the longest fangs in proportion to its length.

Fer-de-lance
Irritable and fast-moving, this pit viper causes three-quarters of snakebite fatalities in Venezuela.

Electric eel
Multiple shocks can cause breathing or heart failure, or drowning.

Mosquito
Causes more than half a million deaths per year by transmitting malaria.

Banana spider
Also known as the Brazilian wandering spider, the world's most venomous spider lives close to humans and often hides in banana plants.

Africanized bees
Aggressive hybrids known as "killer bees." More likely to sting but no more venomous than other honey bees.

Anaconda
Can weigh as much as a heavyweight boxer and occasionally attacks humans.

South American rattlesnake
Venom attacks human nervous system more strongly than that of other rattlesnakes.

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.

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

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

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

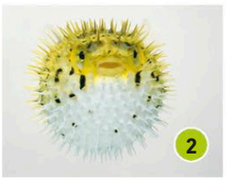
ANIMAL TOXINS ARE USEFUL. SCIENTISTS HAVE ADAPTED THE

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.

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

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

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

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

Common krait
Most venomous land snake in Asia.

Malayan pit viper
Responsible for 700 snakebites annually in Malaysia.

Pufferfish
Eaten as *fugu* in Japan and *bok-uh* in Korea, but some parts highly poisonous. Accidents happen when untrained people catch and eat the fish.

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

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

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

Saltwater crocodile
Makes frequent fatal attacks on humans in New Guinea, the Solomon Islands, and Indonesia.

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.

Asian cobra
Responsible for more human deaths than any other snake.

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

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

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

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

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

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

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

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

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

How the aliens invade

Stowaways

Fleas and other parasites can hitch a ride via 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, large numbers of 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

Racoon
Since its introduction, has devastated the seabird population of Canada's Scott Islands.

Zebra mussel
Traveled from the Caspian Sea to the Great Lakes of North America in the ballast water of ships.

Common starling
European native bird released in New York City in 1890 by homesick English settler Eugene Schieffelin.

Stoat
Introduced to islands off Denmark and the Netherlands, it eradicated the native water voles.

Gray squirrel
This US import to Britain competes for habitat with the native red squirrel.

Japanese knotweed
Dense thickets of this weed crowd out native plant life on riverbanks and roadsides in Europe.

Rainbow trout
In California, this fish has endangered the Sierra Nevada yellow-legged frog.

Gypsy moth
This European native costs about $870 million each year in damage to US trees.

Chinese mitten crab
A burrowing species that threatens the US fishery industry by eating bait and trapped fish.

Velvet tree
Known as the "purple plague of Hawaii," it threatens native rainforest plant species.

Flowerpot snake
Emigrated to the US from Africa and Asia by stowing away in the soil of exported pot plants.

Feral pig
In Mexico's Revillagigedo Islands, this former farm animal preys on the endangered Townsend's shearwater bird.

American bullfrog
Native to North America, it is now a resident of more than 40 countries.

Fire ant
Threatens tortoises on the Galápagos Islands by eating hatchlings and attacking adults.

Red-vented bulbul
A major agricultural pest in Tahiti, it feeds on fruit and vegetable crops.

Feral goat
Has caused serious damage to native vegetation on the Galápagos Islands.

Africanized honey bee
Specially bred for survival in the tropics, this "killer bee" turned out to be too aggressive and unpredictable for beekeepers.

ABOUT
90 PERCENT
OF THE WORLD'S **ISLANDS**
HAVE NOW BEEN
INVADED BY RATS

Red Deer
Introduced from Europe to provide sportspeople with game.

House mouse
With no predators on Gough Island, non-native mice have grown to three times their usual size.

INVASIVE SPECIES HAVE PLAYED A PART IN ALMOST HALF OF THE

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 defense. The invading aliens can wipe out native species by preying on them or out-competing them.

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

"Warty" comb jellyfish
A recent arrival via tankers from the US, it peaked at more than 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.

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, millions of red land crabs have been killed by these invaders.

Brown rat
A threat to island-nesting seabirds everywhere, it was eradicated from seven islands in Fiji in 2010.

Polynesian rat (kiore)
Stowed away with Māori settlers. Eats nesting seabirds.

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

Common brushtail possum
First brought to New Zealand to establish a fur trade.

Dromedary camel
Originally brought in for transport, there are now 1.1 million feral ("gone wild") camels in Australia.

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 invasive weed—for instance, by introducing the cactus moth, whose caterpillars eat it.

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

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

Wasps
Have reached plague proportions in the beech forests of the South Island.

ANIMAL EXTINCTIONS THAT HAVE OCCURRED IN THE LAST 400 YEARS.

Bird migration

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

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

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.

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-cheeked 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.

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 from Mexico to 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.

IN A LIFETIME THAT CAN SPAN MORE THAN 30 YEARS, AN ARCTIC

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

Barn 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.

4

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.

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.

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.

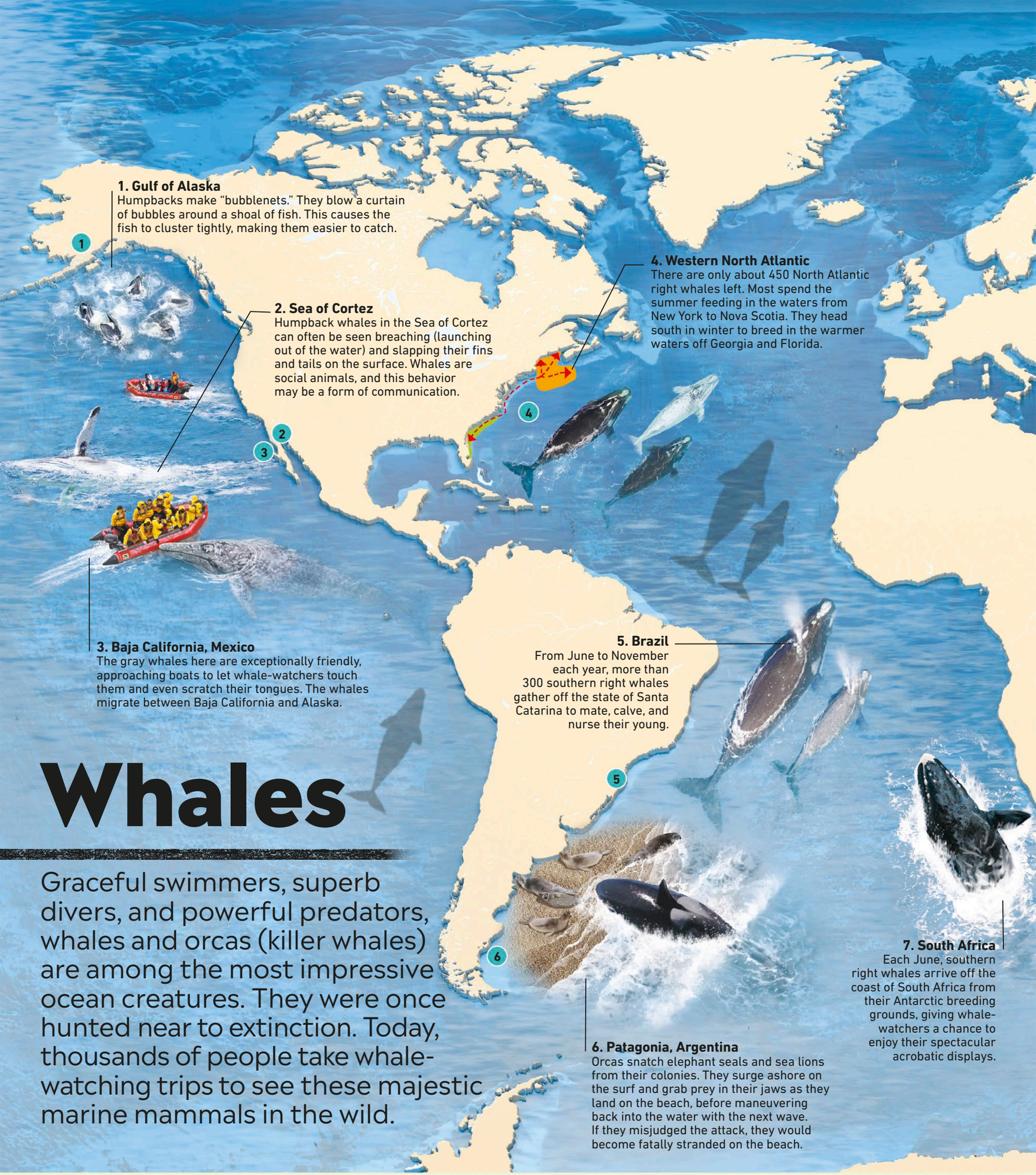
1. **Panama**
About 3 million birds of prey use this land bridge between North and South America.

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.

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



1. Gulf of Alaska
Humpbacks make "bubblenets." They blow a curtain of bubbles around a shoal 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.

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.

4. Western North Atlantic
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.

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 (killer whales) 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.

THE BLUE WHALE IS THE LARGEST ANIMAL EVER TO HAVE LIVED

1 MILLION SPERM WHALES WERE KILLED BEFORE HUNTING THEM WAS BANNED IN 1981

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**

10. Northwest Pacific
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.

ON EARTH. ITS TONGUE ALONE CAN WEIGH AS MUCH AS AN ELEPHANT!

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 sea.

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 she reached depths of up to 3,200 ft (980 m).

Nicole's route was tracked using an electronic tag fitted 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 sea, 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 seas, it swims open-mouthed, filtering plankton from the water.

Great white shark
Found in the majority of the world's seas, the great white has made the most recorded attacks on humans. It can swim at more than 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 shark
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.

A GREAT WHITE SHARK'S SUPERB SENSE OF SMELL CAN DETECT TINY

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.

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

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.

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 eellike body, this frilled shark looks very different than 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 sharks, the piked dogfish is now threatened as a result of overfishing. It gathers in shoals by the thousand.

DROPS OF BLOOD IN THE WATER FROM 3 MILES (5 KM) AWAY.

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 stun 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
The adult fish relies on air-breathing, not gills, to get oxygen. 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 salt water. Extra-large beluga no longer exist due to persistent overfishing and poaching of the species.

A LARGE **CROCODILE** CAN GO FOR MORE THAN **1 YEAR** BETWEEN **MEALS**

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

Columbia

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

Mississippi

American paddlefish 2
7 ft (2.2 m)
Mississippi River

Redtail catfish 5
4.3 ft (1.3 m)
Essequibo River

Spectacled caiman 6
8.2 ft (2.5 m)
Essequibo River

Electric eel 4
6.7 ft (2 m)
Orinoco River

Orinoco

Essequibo

Amazon

Arapaima 7
8.2 ft (2.5 m)
Amazon River

Amazon river dolphin 8
8.2 ft (2.5 m)
Amazon River

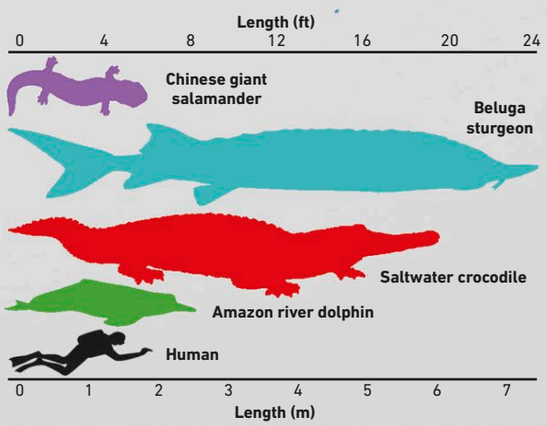
Marbled lungfish 11
6.6 ft (2 m)
River Nile

Congo

Goliath tigerfish 12
4.9 ft (1.5 m)
Congo 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 is especially so these days, since most are overfished and several are critically endangered.



Australasia

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

23. Freshwater crocodile
Much smaller than its saltwater relative, it will not attack humans unless provoked.

IN ANCIENT JAPANESE FOLKLORE, A GIANT CATFISH, NAMAZU,

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, it 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. Gavial
An endangered crocodilian with a long, thin snout, good for catching fish. Rarely grows 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 Russian Far East.

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

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

Wels catfish
9.8 ft (3 m)
River Danube

Beluga sturgeon
24 ft (7.2 m)
Black Sea

Giant devil catfish
6.6 ft (2 m)
Great Kali River

Wallago
7.9 ft (2.4 m)
Rivers of Southeast Asia

Chinese giant salamander
6.6 ft (2 m)
Mekong River

Kaluga
18.6 ft (5.6 m)
Amur River

Taimen
6.9 ft (2.1 m)
Amur River

Giant pangasius
9.8 ft (3 m)
Mekong River

Gavial
23 ft (7 m)
Chambal River

Nile perch
6 ft (1.8 m)
Nile River

Giant freshwater stingray
16 ft (4.9 m)
Chao Phraya

Freshwater crocodile
13 ft (4 m)
Northern Australia

Saltwater crocodile
20 ft (6 m)
Northern Australia

Danube
Black Sea
Caspian Sea
Nile
Nile
Great Kali
Chambal
Yangtze
Mekong
Chao Phraya
Amur

River monsters

Hiding in the muddy waters of the world's greatest rivers are some of the largest and most ferocious freshwater creatures in existence. Many can grow larger than an adult human—and some are man-eaters.

KEY
River monsters belong to different groups.

- Fish
- Mammal
- Reptile
- Amphibian

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.

Mayflies
Shortest adult life.
Mayflies spend most of their lives as water-living 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.

Maricopa harvester ant
Most venomous.
12 stings can kill a rat.

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

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.
Weighs up to 3.5 oz (100 g).

Swarming insects

1. **Asian ladybug**
Swarm through Oregon in the fall, looking for somewhere to hibernate for the winter.

2. **Army cutworm 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 entire 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. 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 thousands when forming new colonies.

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 of 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.

AT ANY ONE TIME, THERE ARE AN ESTIMATED 10 QUINTILLION

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
Every year, by instinct alone, 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, which is 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 3.3–5 ft (1–1.5 m) away.

Flea
Longest jumper.
Can jump more than 200 times its body length.

SCIENTISTS ESTIMATE
4–20 MILLION
TYPES OF **INSECTS** HAVE
YET TO BE **DISCOVERED**

Chan's megastick
Longest.
22.3 in (56.7 cm).
Only six specimens have ever been found, all on the island of Borneo.

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.

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

Giant weta
Heaviest.
Weighs up to 2.5 oz (70 g)—heavier than a sparrow.

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

Insects

We know of more than 1 million different types of insects, 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, including the seeds inside 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.

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

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

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

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

Resurrection fern
Southeast 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.

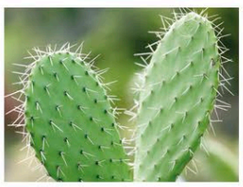
Sensitive plant
Central and South America. A type of Mimosa and one of the few plants capable of rapid movement. The leaves fold and droop when touched. They reopen after a few minutes.

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 (above).

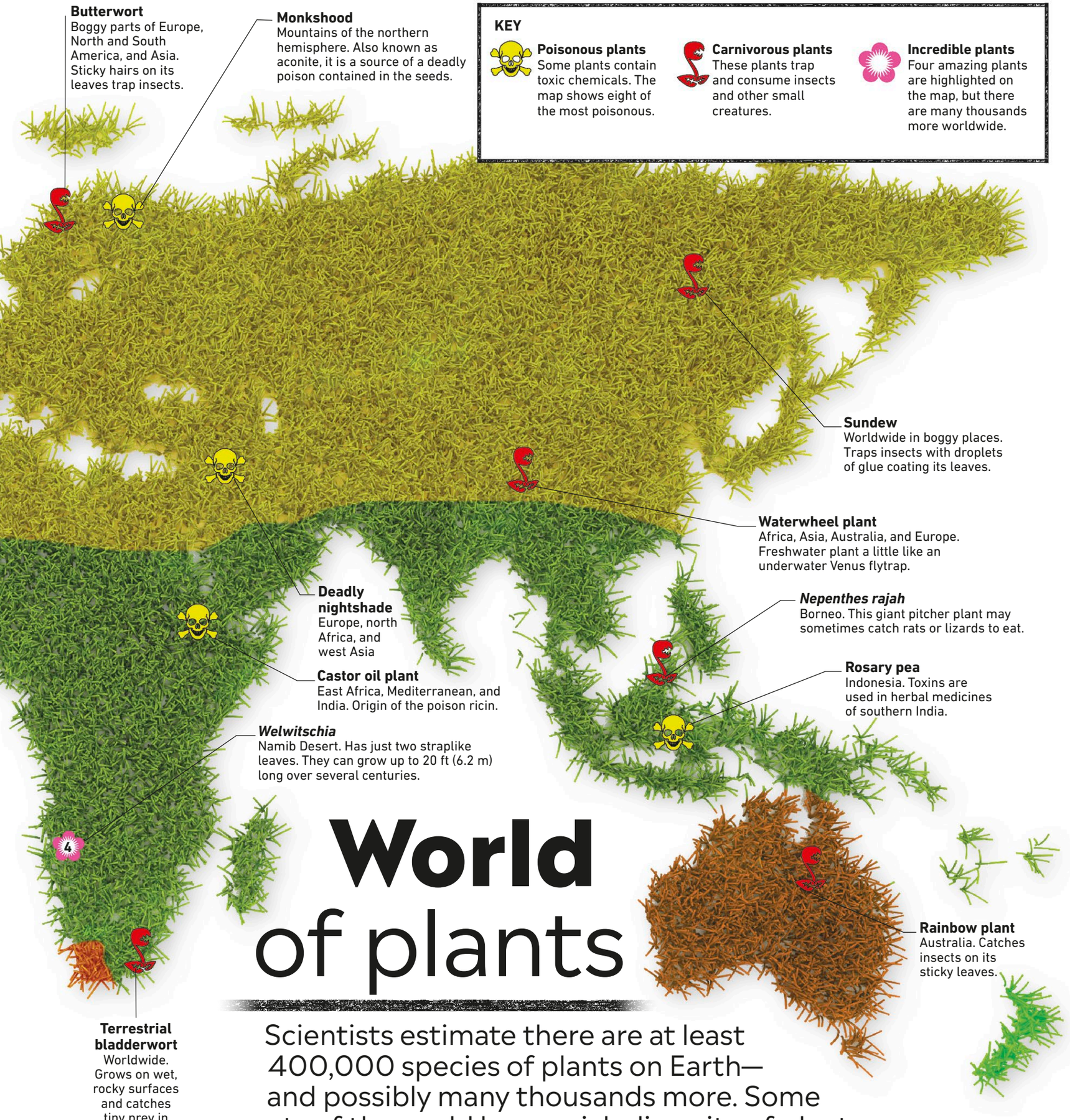
Palaeotropical kingdom
Most of Africa, southern Asia, and Polynesia. Umbrella thorn acacias (above) and baobab trees are native plants.

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 about 9,000 plant types, including the king protea (above).

THE LIFESPAN OF THE WEIRD WELWITSCHIA IS THOUGHT TO BE UP TO



World of plants

Scientists estimate there are at least 400,000 species of plants 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.

1,500 YEARS, BUT IN THAT TIME IT GROWS ONLY TWO GIANT LEAVES.

Biodiversity

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

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 KNOWN 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, shrimps, 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

Barren Arctic
Plants grow very slowly in the cold Canadian Arctic, so there is not a lot of food to go round. 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 most diverse 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
What remains of the rainforest region in Brazil is not only rich in species. Because it is isolated from other rainforests, 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 birds. 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)

SCIENTISTS ESTIMATE THAT GLOBAL BIODIVERSITY HAS FALLEN TO 84.6

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 rainforest 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 rainforest.

Himalayas and Hundu Kush
This mountainous region is home to 25,000 plant species, or nearly 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 rainforests 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

PERCENT OF ITS LEVEL BEFORE PEOPLE CHANGED THE LANDSCAPE.

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 has 500 species of unique fruit flies, 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 amphibians, 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 in patches of habitat in Morocco and Algeria.

Canary Islands
Rich in endemic plants, the Canary Islands off Africa gave their name to the bird that lives only here and on nearby Atlantic islands—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 rainforest is cut off from the Amazon rainforest, 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**

NEARLY 7 PERCENT OF THE WORLD'S PLANTS ARE UNIQUE TO THE

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. In these hot spots of unique plants, scientists tend to find lots of endemic animals, too.

Region rich in endemic species

BIOMES

- Tropical dry broad-leaved forest
- Tropical moist broad-leaved forest
- Steppe
- Arctic tundra
- Tropical coniferous forest
- Boreal forest
- Mountain grasslands and shrublands
- Polar desert
- Temperate broad-leaved forest
- Savanna
- Mediterranean shrublands
- Mangroves
- Temperate coniferous forest
- Flooded savanna
- Desert and dry shrublands

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.

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

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

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

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.

East Melanesia
This string of islands has 3,000 endemic plant species and spectacular birdwing and swallowtail butterflies. This is a Ulysses swallowtail.

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

Sri lanka and Western Ghats
This hot spot is home to 5,000 species of flowering plants, 139 mammal species, 508 birds, and 179 amphibian species.

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.

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

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

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.

TROPICAL ANDES, WHICH COVER ONLY 0.8 PERCENT OF THE LAND AREA.

Maui parrotbill
In danger because of the loss of its forest habitat—only about 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.

MORE THAN 7,000 ANIMAL SPECIES ARE CRITICALLY ENDANGERED

In the red

Animals on the Red List—a list kept by the IUCN (International Union for the Conservation of Nature)—are in varying levels of endangerment. Those that are "critically endangered" may soon die out completely in the wild.

Vaquita This porpoise is the world's most endangered sea mammal; scientists estimate only about 10 are left.

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. Numbers are increasing due to conservation.

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 rock-dwelling 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 go extinct in 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 drugs to help them work longer.

Bactrian camel
Fewer than 1,000 survive in the wild.

Irrawaddy river shark
As no one has seen this species for many years, it may be extinct in the wild.

Sumatran orangutan
Just 15,000 of this species are left, since their forest is being cut down.

Endangered animals

Our world has thousands of species, or kinds, of animals. 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

Attenborough's long-beaked echidna
New Guinea

Woylie
Western Australia

Southern bluefin tuna
Throughout southern oceans

Kakapo
Islands off the coast of New Zealand

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

Kakapo (owl parrot)
These giant, flightless parrots were hunted by the first humans to settle in New Zealand. Today, only about 200 survive.

Javan rhinoceros
Today, only about 50 adults survive in the remaining rainforest 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
This marsupial has recently declined dramatically and fewer than 5,000 survive in the wild.

KAKAPO—EVERY BIRD IS PROTECTED, AND EACH ONE HAS A NAME!

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, as its flesh reportedly tasted horrible!

Pinta Island tortoise
The last tortoise on this Galápagos island, 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
River dolphin that died out when its 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.

Passenger pigeon
Extinct by 1914

Xerces blue butterfly
Extinct by 1943

Laysan rail
Extinct by 1944

Golden toad
Last seen in 1989

Pinta Island tortoise
Extinct in 2012

Red-bellied gracile opossum
Last seen in 1962

Falkland Island wolf
Presumed extinct in 1876

Labrador duck
Extinct by 1878

Great auk
Last one killed in 1852

Quagga
Extinct by 1883

Elephant bird
(Madagascar)
Extinct since 17th century

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 about 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 domestic animals arriving on the island of Mauritius.

Australasia

Lesser bilby
Probably wiped out by cats and foxes.

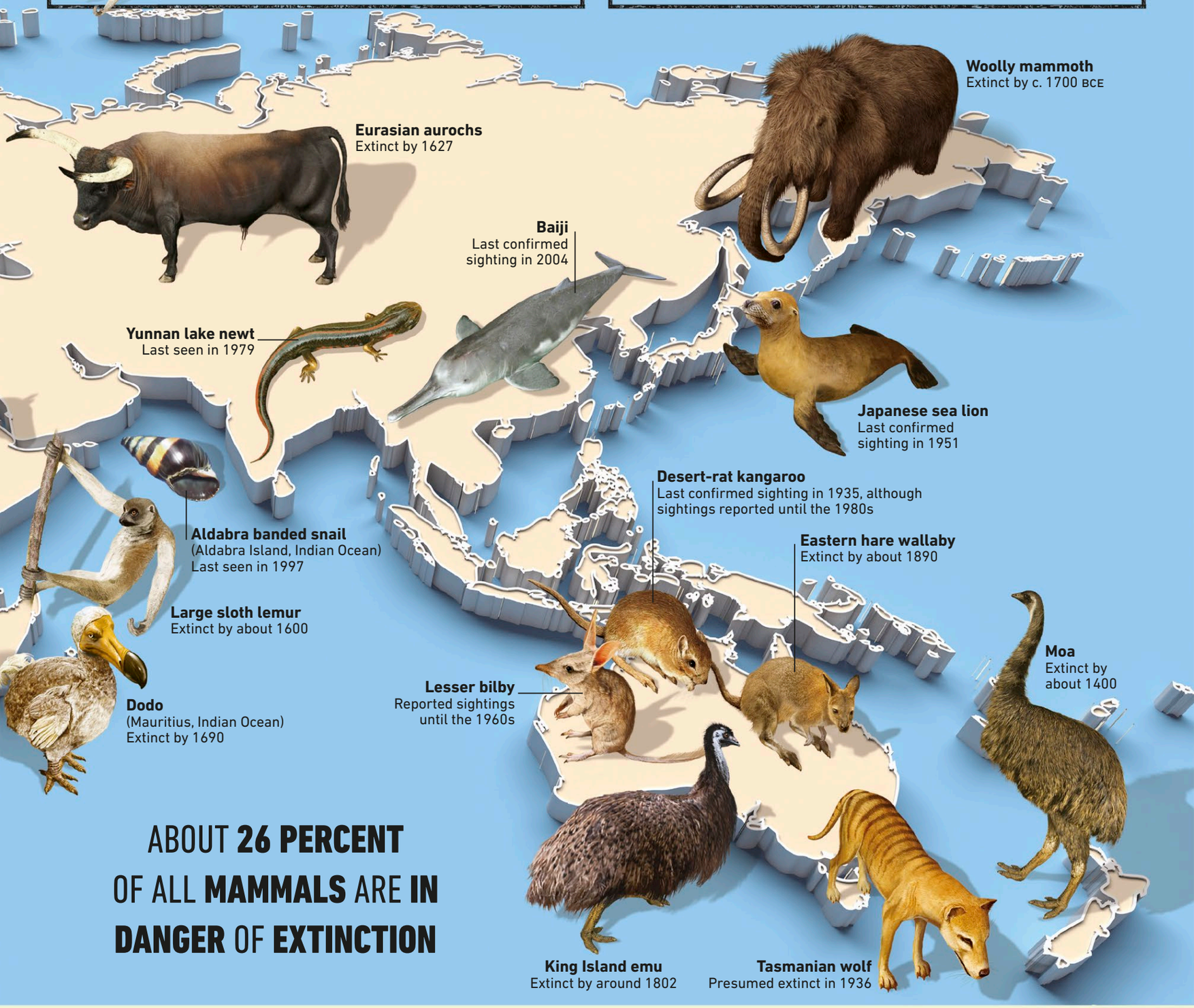
Eastern hare wallaby
Extinction was partly due to the introduction of cats, which hunted them.

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

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

Tasmanian wolf
Hunted and trapped by human settlers in Tasmania—its last hiding place.

Moa
Victims of overhunting and loss of habitat.



ABOUT **26 PERCENT** OF ALL **MAMMALS** ARE **IN DANGER** OF **EXTINCTION**

TIMES FASTER THAN THE NATURAL EXTINCTION RATE.

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.

Renewable 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.

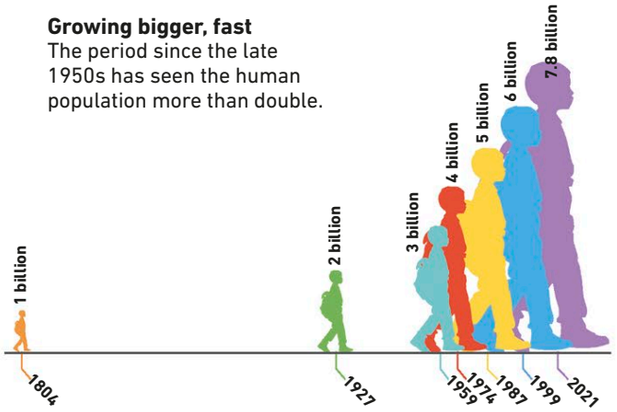
Natural resources

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, they cannot be replaced. Burning these fuels also damages Earth's atmosphere and is contributing to global warming.

Population

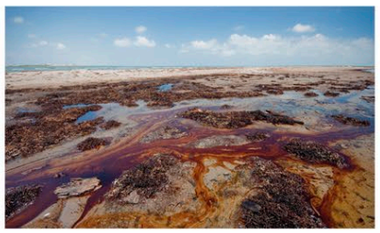
For most of humanity's existence, the human population grew relatively slowly. In 10,000 BCE, there were only 1–5 million people on Earth. By 1000 BCE, after farming was invented, the population had increased to about 50 million. Since reaching the 1 billion mark in 1804, during the early Industrial 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.



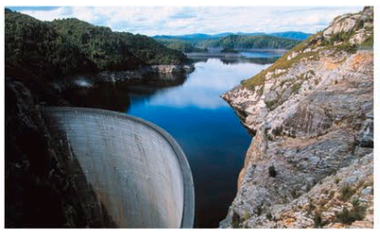
SINCE 1965, THE WORLD'S POPULATION HAS

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 about 50 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.



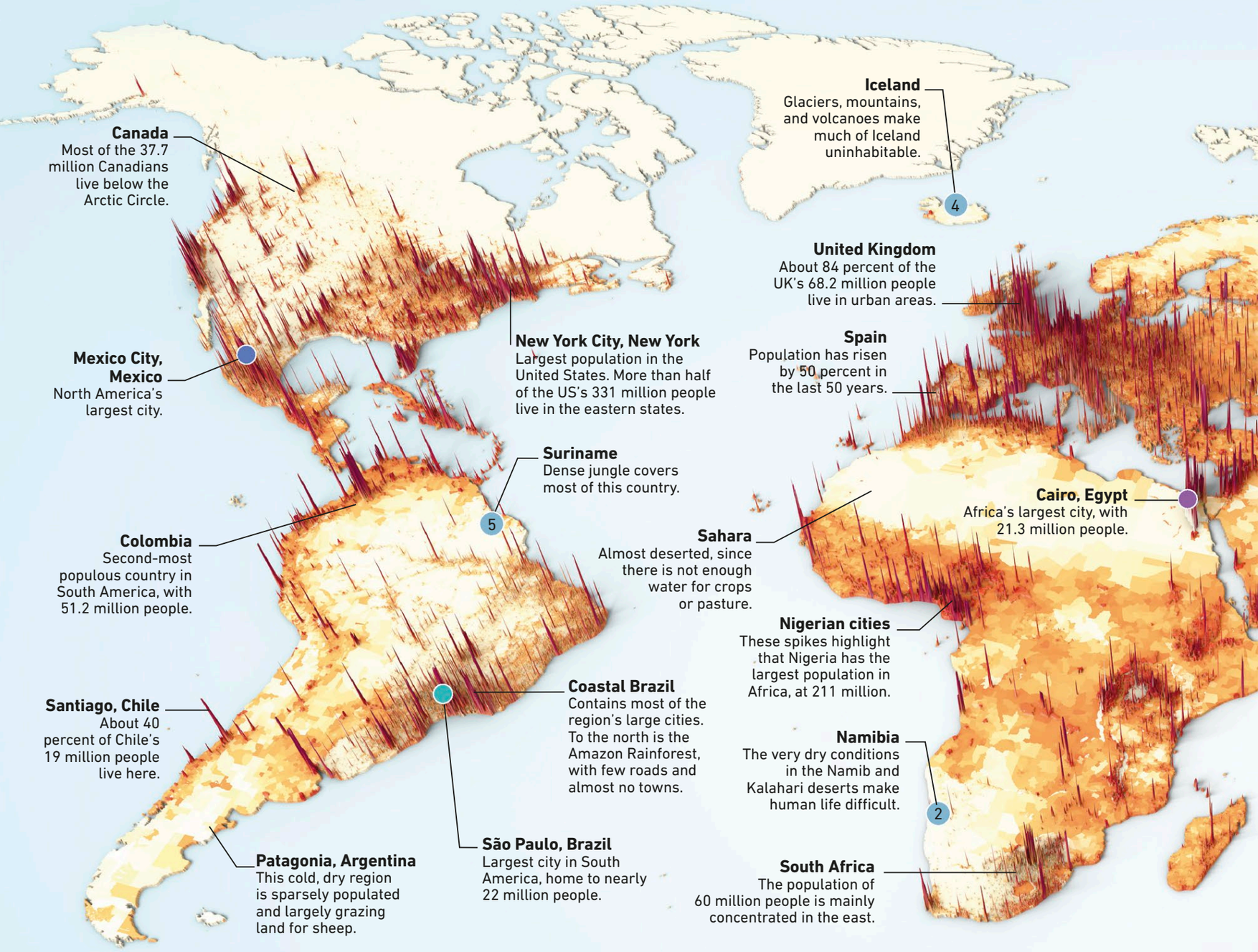
Using water
We build dams and reservoirs to store water. We need it for drinking, for use in industrial processes, and to irrigate crops and generate electricity.

Successful species

Part of the success of humans is due 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 (reindeer) and waterproof boots from seal skin. They found a way to live on the meager resources of the high Arctic.

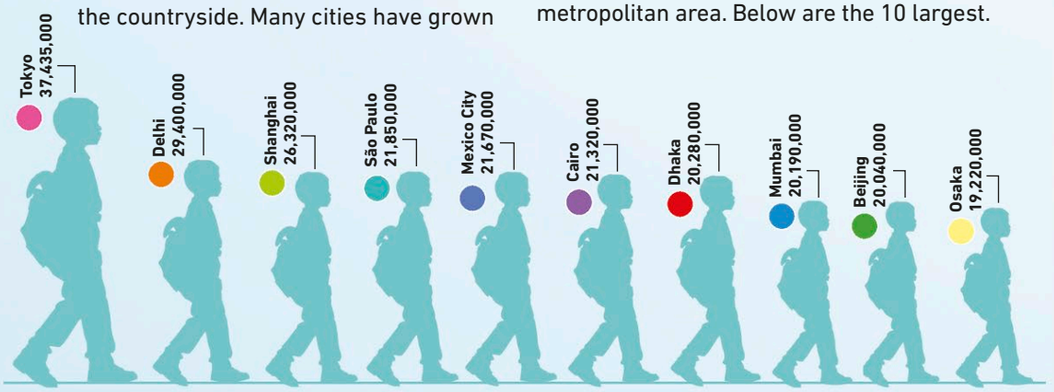
Inuit boat
The *umiak* is a type of traditional open boat used by Inuit people. The frame is made of driftwood or whalebone, with a walrus- or seal-skin covering. These boats are still used, since the law allows whale hunting only with traditional Inuit tools.

DOUBLED, BUT ITS WEALTH HAS MULIPLIED BY SEVEN.



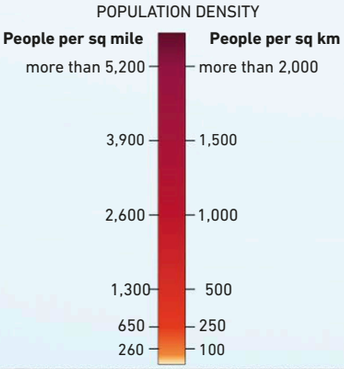
Biggest cities

More than half the world's people now live in towns and cities, rather than in the countryside. Many cities have grown quickly and have been dubbed "megacities," with more than 10 million people in a metropolitan area. 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.



IN 1800, THE WORLD'S POPULATION WAS LESS THAN 1 BILLION PEOPLE.

Where people live

The world's 7.8 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.

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 12.5 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.

Osaka, Japan
The second-largest city in Japan.

Delhi, India
India's capital sits in the densely populated Ganges River basin, home to 650 million people packed in at nearly 1,000 per sq mile (400 per sq km).

Eastern China
Most of China's 1.4 billion people live here.

Manila, Philippines
Not including its outlying districts, this is the world's most densely populated city.

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

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.

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

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

IN **MANILA**, PHILIPPINES, ON AVERAGE **296 PEOPLE LIVE** IN AN AREA THE SIZE OF A **SOCCER PITCH**

Most sparsely populated countries

		total population	people per sq mile	people per sq km
1	Mongolia	3,278,000	5.5	2.1
2	Namibia	2,541,000	8.0	3.1
3	Australia	25,500,000	8.6	3.3
4	Iceland	341,000	8.8	3.4
5	Suriname	587,000	9.7	3.8

ESTIMATES SUGGEST IT WILL BE CLOSE TO 10 BILLION BY 2060.

Inuit
Arctic parts of Alaska, Canada, and Greenland, beyond the northernmost trees.

Sami
Northern Scandinavia and Finland

Pavee
Ireland

Beja
Sudan, Eritrea, and Egypt

Tuareg
Sahara Desert

Awá
Rainforests of northern Ecuador and southern Colombia

Fulani
West Africa

Nukak-Maku
Tropical forests of the Amazon Basin

Ayoreo
Dry lowlands of Bolivia and Paraguay

Toubou
Tibesti mountains, Chad

Karamojong
Northern Uganda

San
Kalahari Desert—Botswana, Namibia, and South Africa

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 reindeer herders and fur trappers have existed for over 5,000 years.

Roma
There are 2–5 million Roma worldwide, mostly in Europe.

Nenets
Every year, Nenets move huge herds of reindeer up to 620 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 further."

San
The San are famous for being excellent trackers and hunters.

MOST NOMADS LIVE IN DESERT, STEPPE, OR TUNDRA—DRY PLACES THAT

Nomads

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

Roma
Central and eastern Europe

Kazakhs
Kazhakstan and other parts of northern central Asia

Nenets
Arctic Russia

Bakhtiari
Southwestern Iran

Qashqai
Southwestern Iran

Evenks
Southern Siberia, Mongolia, and northeasternmost China

Yakut
The Yakutia Republic, Russia

Chukchi
The Bering Strait region of Siberia

Moken
Southern Burma and the west coast of Thailand

Bedouin
The Middle East, predominantly Saudi Arabia

Afar
The Horn of Africa

Gabra
Chalbi Desert of Kenya and highlands of southern Ethiopia

Penan
Sarawak, Malaysia

Aboriginal peoples
Australia

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 Yakut are seminomadic reindeer herders.

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

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

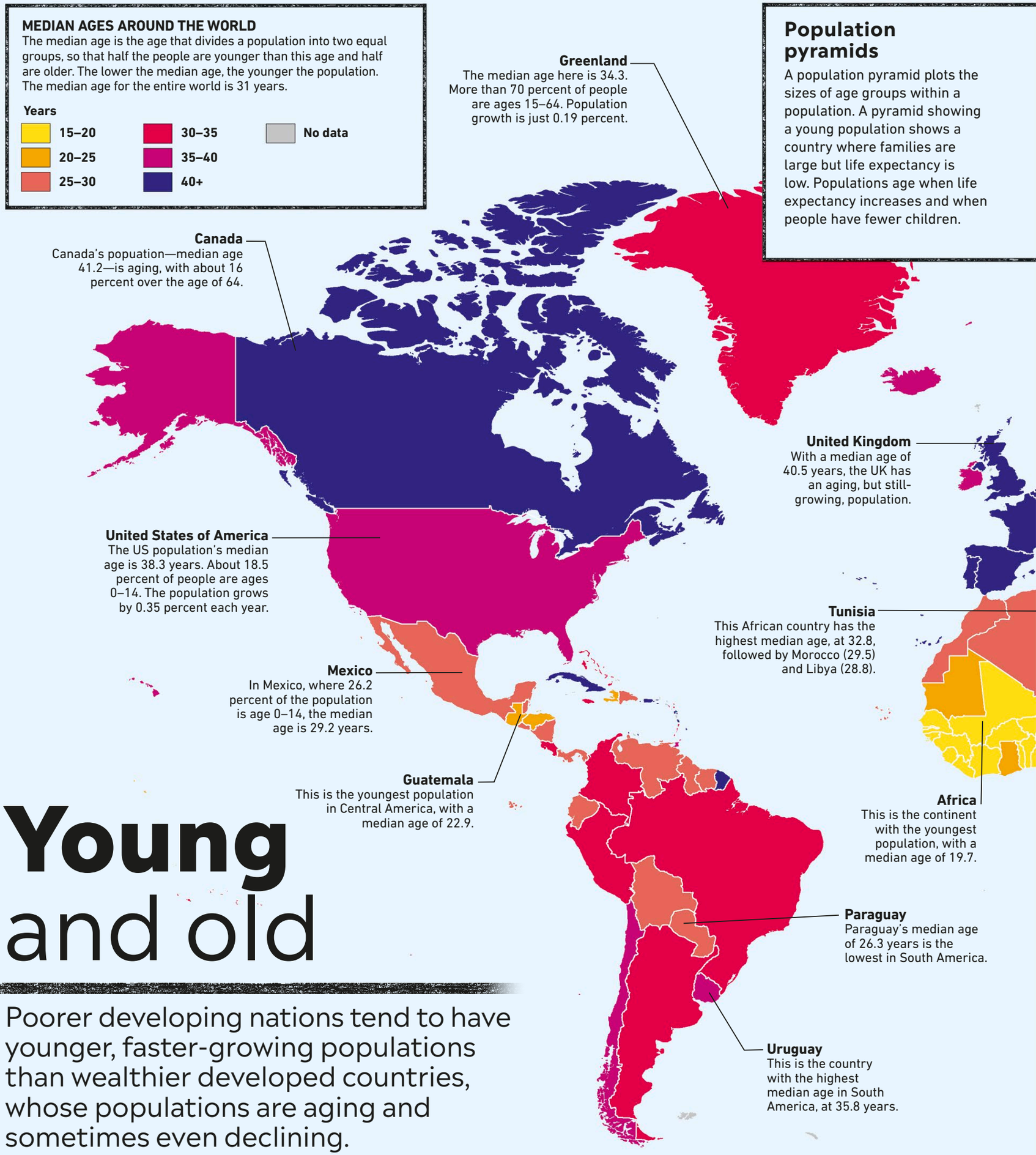
Moken
Moken children have extremely good underwater vision due to diving for food.

Penan
In Penan society everything is shared.

Australasia

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

DON'T PROVIDE ENOUGH FOOD FOR PEOPLE TO STAY ALL YEAR ROUND.

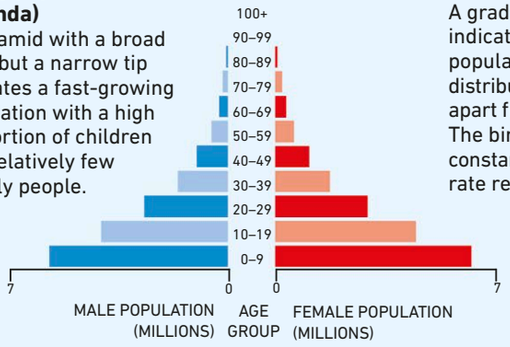


Young and old

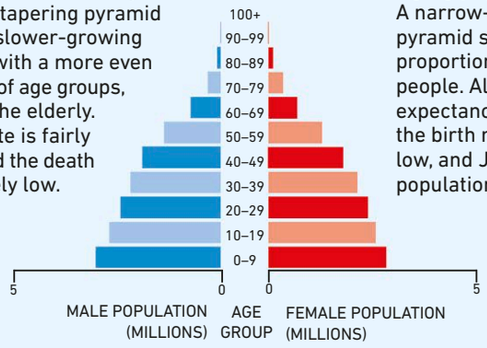
Poorer developing nations tend to have younger, faster-growing populations than wealthier developed countries, whose populations are aging and sometimes even declining.

BY 2050, ABOUT 16 PERCENT OF THE WORLD'S POPULATION WILL

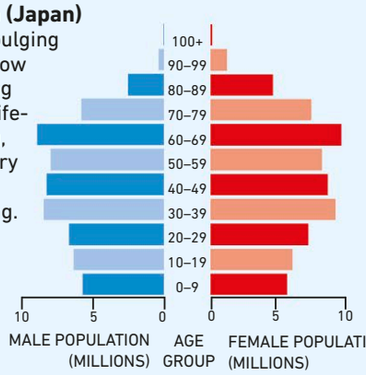
Young population (Uganda)
A pyramid with a broad base but a narrow tip indicates a fast-growing population with a high proportion of children and relatively few elderly people.



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



Aging 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.



Afghanistan
With the lowest median age of any Asian country, at 18.4 years, the population is growing at 2.3 percent each year.

Japan
The median age here is 48.4 years—only in the tiny principality of Monaco is it higher, at 55.4. Nearly 28 percent of Japan's population are older than 64.

China
After more than three decades during which the government encouraged couples to have no more than one child, China now has a quickly aging population.

India
India has a median age of 28.4 years. Nearly 68 percent of the people are ages 15–64.

Papua New Guinea
Over 35 percent of people are ages 0–14. The median age here is 22.4 years.

Malaysia
Malaysia has a median age of 30.3. Its population grows by about 0.4 percent every year.

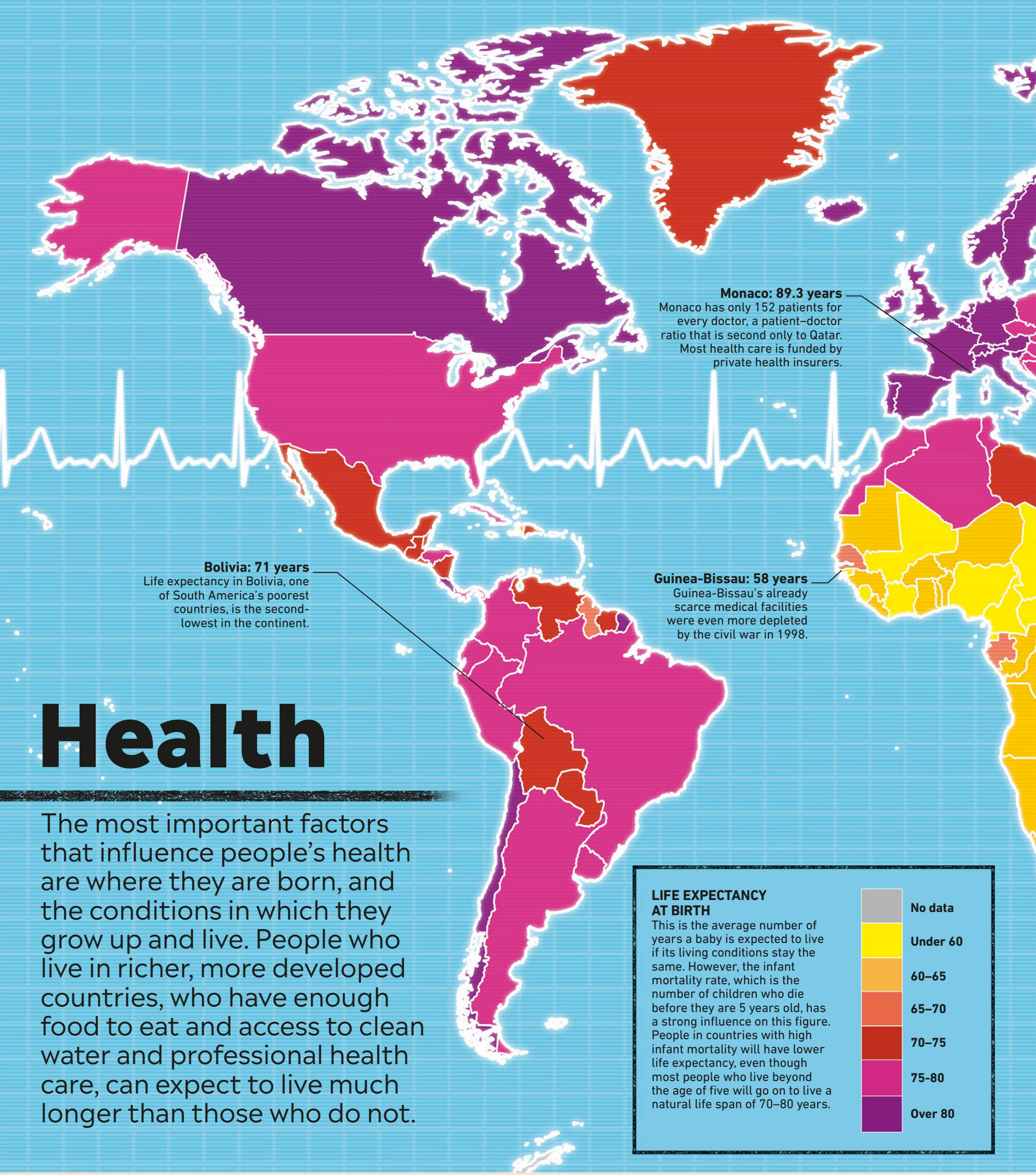
Australia
The median age here is 37.9. More than 19 percent of people are ages 0–14.

Niger
The median age here is 15.2—the lowest in the world.

New Zealand
The median age here is 38.0. About 15 percent of the population are age 65 or older.

BY **2050**, THE WORLD'S MEDIAN AGE IS EXPECTED TO BE **38 YEARS**

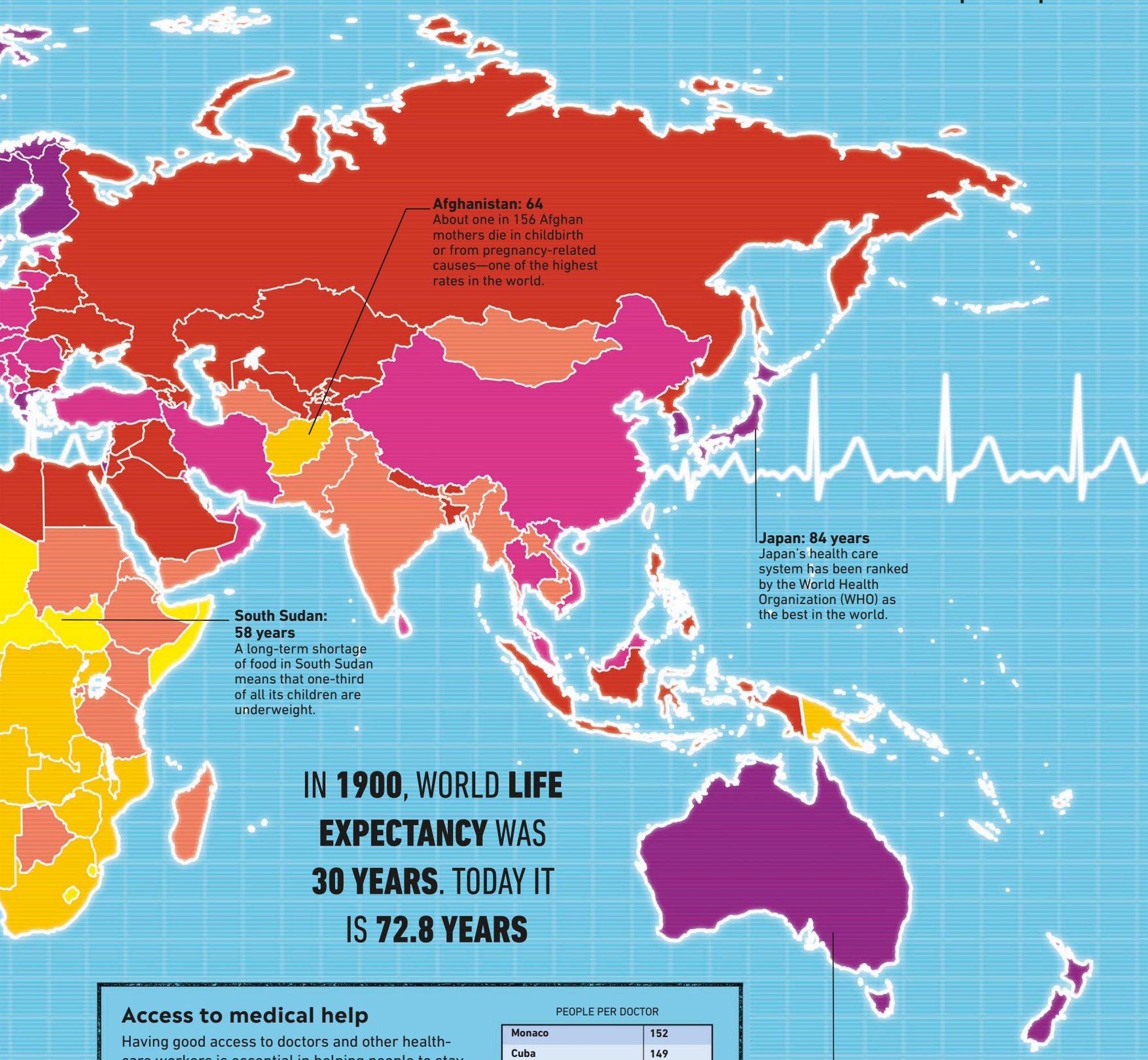
BE AGE 65 OR OVER, COMPARED WITH 7.6 PERCENT IN 2010.



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.

A CHILD BORN IN ESWATINI IS NEARLY 30 TIMES MORE LIKELY



Afghanistan: 64
About one in 156 Afghan mothers die in childbirth or from pregnancy-related causes—one of the highest rates in the world.

Japan: 84 years
Japan's health care system has been ranked by the World Health Organization (WHO) as the best in the world.

South Sudan: 58 years
A long-term shortage of food in South Sudan means that one-third of all its children are underweight.

Australia: 83 years
Life expectancy among the Aboriginal population of Australia is only 73.6 years, much lower than the national average.

IN **1900**, WORLD **LIFE EXPECTANCY** WAS **30 YEARS**. TODAY IT IS **72.8 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. Monaco, for instance, has roughly the same number of doctors per head as Cuba, but life expectancy in Monaco is over ten years longer than that in Cuba.

	PEOPLE PER DOCTOR
Monaco	152
Cuba	149
St Lucia	204
Belarus	254
Georgia	234
Liberia	15,000
Mozambique	33,300
Niger	50,000
Bhutan	3,846
Malawi	50,000

TO DIE BEFORE THE AGE OF FIVE THAN A CHILD BORN IN SWEDEN.

Pandemics

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

Infecting germs

Many infectious diseases are caused by microscopic living organisms. 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. They 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.

The Black Death ravaged Britain in 1348–50.

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

3

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. It is estimated to have killed 20–50 million people.

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

Freetown

4

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

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

SPANISH FLU MAY HAVE KILLED UP TO 50 MILLION PEOPLE.

Superbugs and new viruses

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 five recent cases of new viruses.

1. **Hong Kong Flu, 1968–69**
In 2 years, Hong Kong Flu caused about 1 million deaths. The virus killed about 34,000 people in the United States alone.

2. **Avian (Bird) Flu, Hong Kong, 1997–present**
This virus first appeared in humans in Hong Kong, through contact with infected poultry. It has killed hundreds of people since then.

3. **H1N1 ("Swine Flu"), Mexico City, 2009–10**
This new flu developed from viruses of birds, pigs, and humans. Up to 575,400 people died in the first year of this pandemic.

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. It caused some 50 million deaths—about half in Europe, where 25 percent of the population was killed.

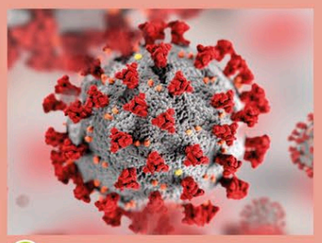
Constantinople (Istanbul)

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.

COVID-19



5. **Dec 2019–present**
First identified in Wuhan, China, in late 2019, this fast-spreading virus can cause severe respiratory problems; up to 2.6 million deaths were reported in the first year of the pandemic. Vaccines have now been developed to help protect against the disease.

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

UP TO **2,000 PEOPLE** STILL SUFFER FROM **PLAGUE** EACH YEAR

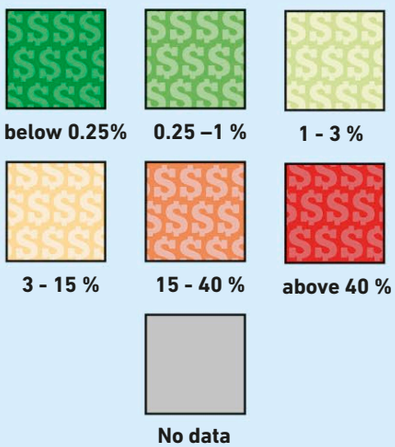
THAT'S MORE THAN THE TOTAL NUMBER OF DEATHS DURING WORLD WAR I.

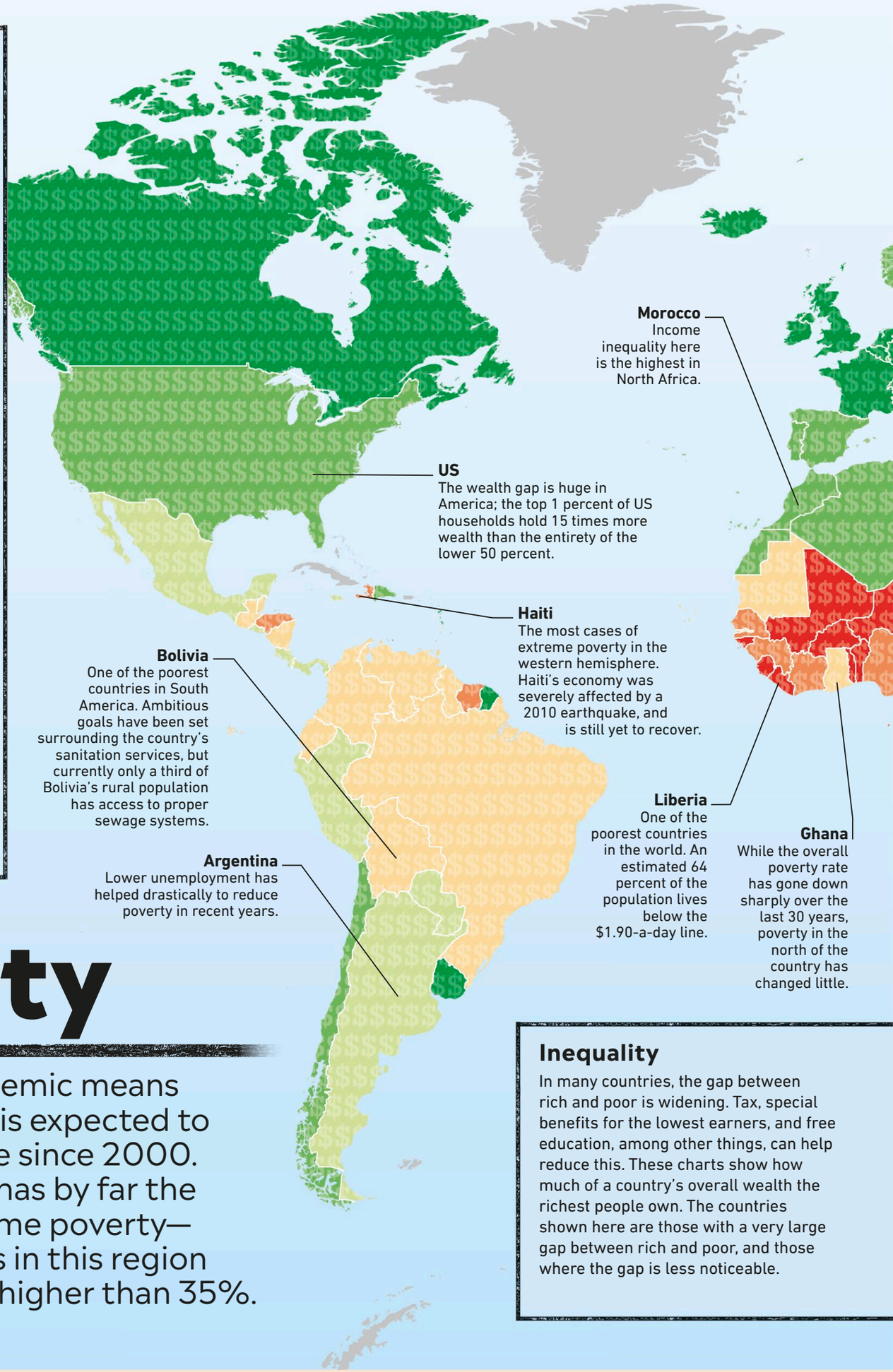
The poverty line

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 $1.90 A DAY

The international extreme poverty line of $1.90 income a day is a global measure of absolute poverty. This amount was set by the World Bank in 2015, and will be updated when necessary to reflect the cost of living. The map shows the percentage of each country's people earning less than $1.90 a day.





US
The wealth gap is huge in America; the top 1 percent of US households hold 15 times more wealth than the entirety of the lower 50 percent.

Morocco
Income inequality here is the highest in North Africa.

Haiti
The most cases of extreme poverty in the western hemisphere. Haiti's economy was severely affected by a 2010 earthquake, and is still yet to recover.

Bolivia
One of the poorest countries in South America. Ambitious goals have been set surrounding the country's sanitation services, but currently only a third of Bolivia's rural population has access to proper sewage systems.

Argentina
Lower unemployment has helped drastically to reduce poverty in recent years.

Liberia
One of the poorest countries in the world. An estimated 64 percent of the population lives below the $1.90-a-day line.

Ghana
While the overall poverty rate has gone down sharply over the last 30 years, poverty in the north of the country has changed little.

Poverty

The COVID-19 pandemic means that global poverty is expected to rise for the first time since 2000. Sub-Saharan Africa has by far the most cases of extreme poverty—half of the countries in this region have a poverty rate higher than 35%.

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.

MORE THAN 24% OF THE WORLD'S POPULATION LIVED ON LESS THAN

Norway
Very few extremely wealthy people and almost no extreme poverty means there is an even distribution of wealth.

Ukraine
Overtook Moldova in 2018 as the poorest country in Europe—although up to half of Ukraine's economy likely goes unreported.

Russia
Despite its overall wealth, the country still has a significant gap between the rich and the poor. About 19 million people live below the national poverty line.

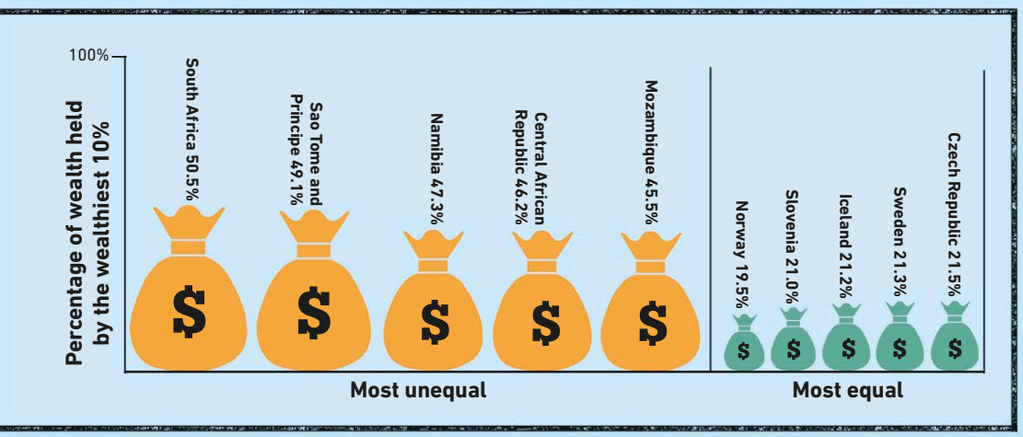
China
In 1981, 85 percent of the population lived on less than $1.25 a day (the extreme poverty rate at that time). In 2005, that figure was 16 percent, and it is still falling. More than 746 million people have come out of poverty in China since 1990.

Vietnam
Significant numbers have lifted themselves out of poverty in Vietnam since the 1980s. The average income went from $100 a year in 1986 to $2,235 by the end of 2019.

Burundi
Nearly four out of every five people live on less than $1.90 a day. Repeated conflict in the 1990s caused the poverty rate to double.

India
Despite the country overall becoming wealthier, India has the highest proportion of extreme poor in the world.

South Africa
People are earning more on average than they were 20 years ago, but inequality has increased, and over one-quarter of people are unemployed.

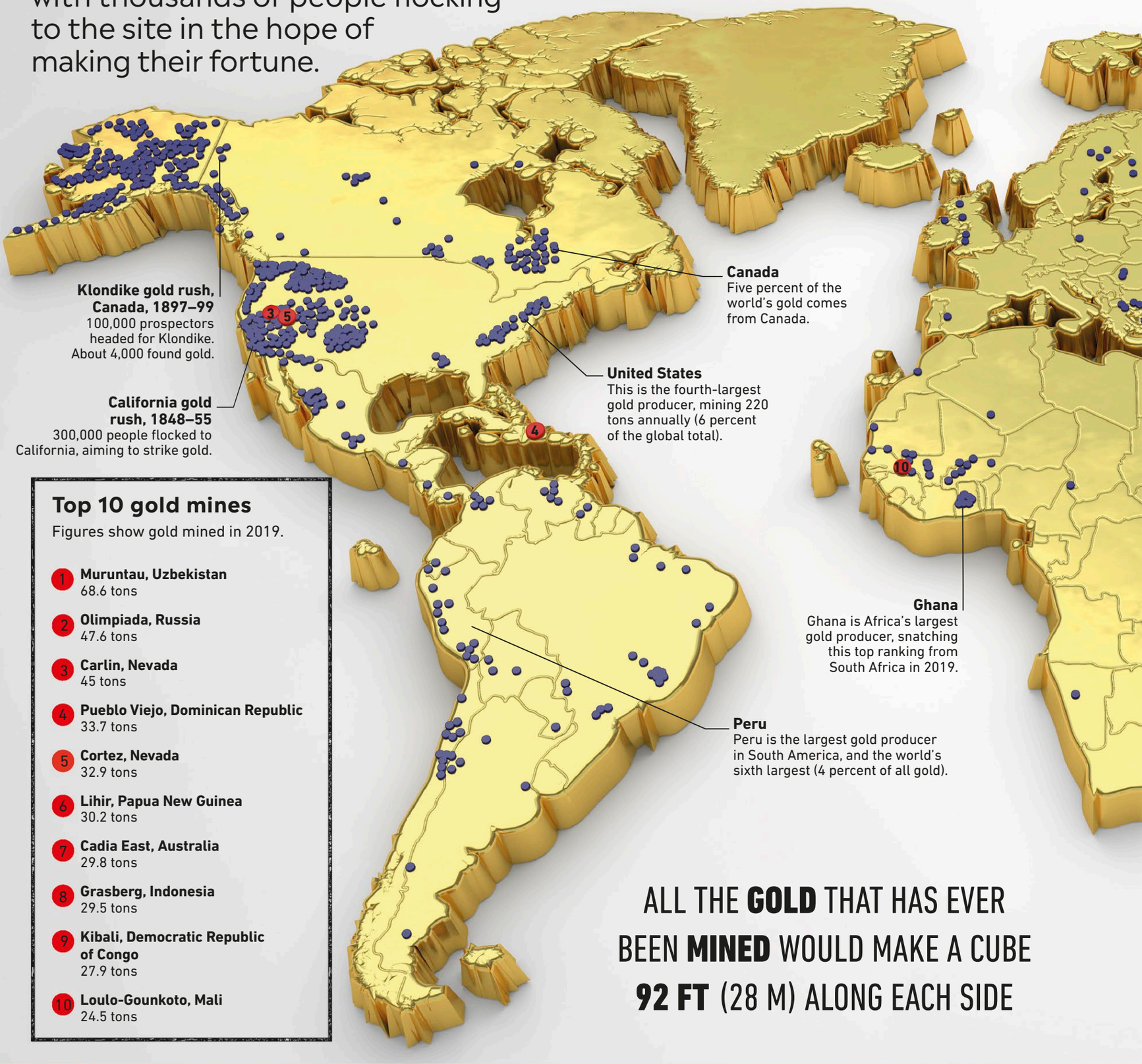


THE DISRUPTION OF **COVID-19** COULD PUSH UP TO **150 MILLION PEOPLE** INTO EXTREME **POVERTY** BY THE END OF 2021

$3.20 A DAY IN 2017, AND 43.6% LIVED ON LESS THAN $5.50 A DAY.

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

United States
This is the fourth-largest gold producer, mining 220 tons annually (6 percent of the global total).

Ghana
Ghana is Africa's largest gold producer, snatching this top ranking from South Africa in 2019.

Peru
Peru is the largest gold producer in South America, and the world's sixth largest (4 percent of all gold).

Top 10 gold mines

Figures show gold mined in 2019.

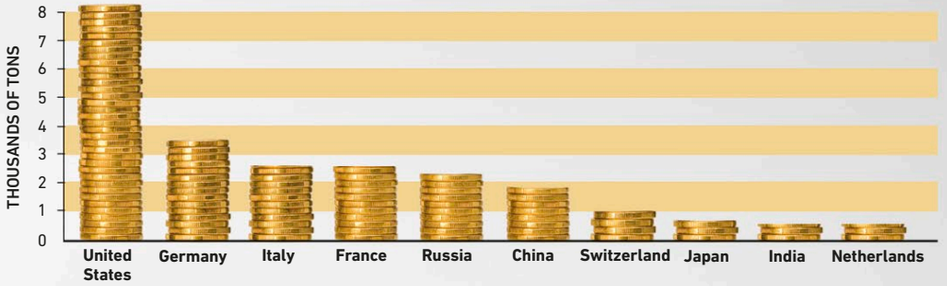
1. **Muruntau, Uzbekistan** 68.6 tons
2. **Olimpiada, Russia** 47.6 tons
3. **Carlin, Nevada** 45 tons
4. **Pueblo Viejo, Dominican Republic** 33.7 tons
5. **Cortez, Nevada** 32.9 tons
6. **Lihir, Papua New Guinea** 30.2 tons
7. **Cadia East, Australia** 29.8 tons
8. **Grasberg, Indonesia** 29.5 tons
9. **Kibali, Democratic Republic of Congo** 27.9 tons
10. **Loulo-Gounkoto, Mali** 24.5 tons

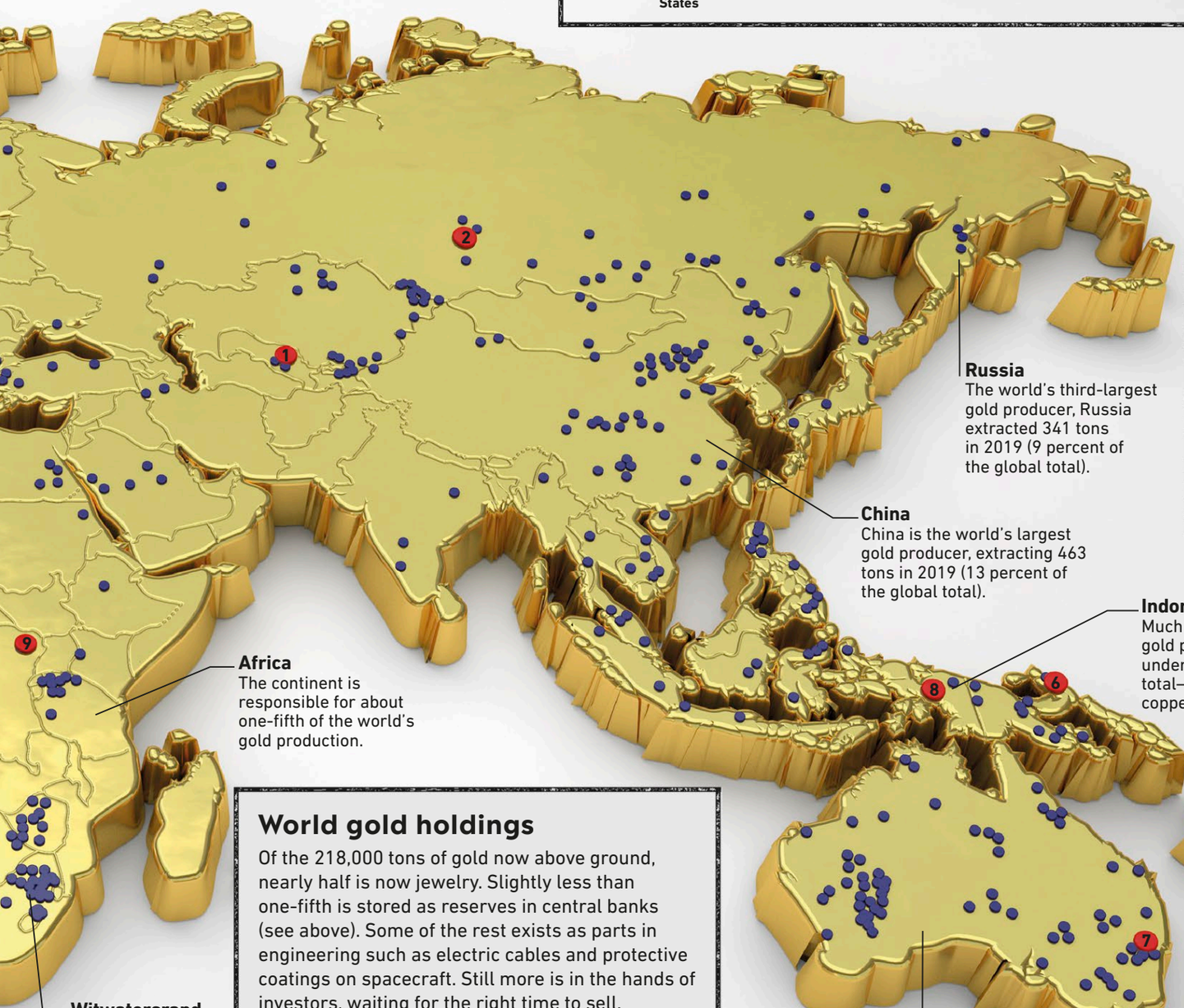
ALL THE **GOLD** THAT HAS EVER BEEN **MINED** WOULD MAKE A CUBE **92 FT** (28 M) ALONG EACH SIDE

FOUND IN AUSTRALIA IN 1869, "WELCOME STRANGER" WAS THE BIGGEST

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 third-largest gold producer, Russia extracted 341 tons in 2019 (9 percent of the global total).

China
China is the world's largest gold producer, extracting 463 tons in 2019 (13 percent of the global total).

Indonesia
Much of Indonesia's gold production—just under 5 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.

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 218,000 tons of gold now above ground, nearly half is now jewelry. Slightly less than 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

Australia
With 364 tons mined in 2019 (10 percent of the global total), Australia is the second-largest gold-producing nation.

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 US has about 800 billionaires—more than any other country.

United States
The US has the world's largest economy, worth around $20.8 trillion, and the world's third-largest population.

Africa
In 2021, Africa was the continent with the fewest billionaires—just 18.

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 $4.5 billion USD

US
- Jeff Bezos 179.3
- Elon Musk 155
- Bill Gates 127.5
- Mark Zuckerberg 103.3
- Warren Buffett 97.6
- Larry Ellison 93.4
- Larry Page 88.7
- Sergey Brin 86
- Steve Ballmer 70.1
- Alice Walton 64.1
- Jim Walton 62.5
- Rob Walton 61.7
- Michael Bloomberg 59
- MacKenzie Scott 53.9
- Phil Knight and family 49.8
- Daniel Gilbert 49.7
- Michael Dell 46.5
- Charles Koch 46.4
- Julia Koch and family 46.4
- John Mars 31.3

Sweden
- Stefan Persson 21.4

France
- Bernard Arnault and family 157.9
- Françoise Bettencourt Meyers and family 76.1

Spain
- Amancio Ortega Gaona 77.4

Italy
- Giovanni Ferrero 34.8

Nigeria
- Aliko Dangote 11.7

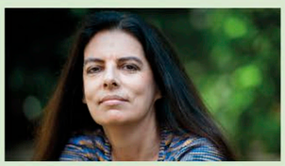
Mexico
- Carlos Slim Helu and family 64.8
- German Larrea Mota Velasco and family 27.2
- Ricardo Salinas Pliego and family 13.3
- Alberto Bailleres Gonzalez and family 9.3

Chile
- Iris Fontbona and family 23.1

Brazil
- Jorge Paulo Lemann and family 17.5

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

Françoise Bettencourt Meyers
A principal shareholder in the beauty company L'Oréal.



SINCE 1994, THE BILL AND MELINDA GATES FOUNDATION HAS GIVEN

Russia
Rich in natural resources, such as metals, minerals, and oil, Russia had about 100 billionaires in 2021.

Germany
- Beate Heister and Karl Albrecht Jr: 39.2
- Dieter Schwarz: 36.6
- SUSnne Klatten: 28.6

Russia
- Alexey Mordashov and family: 29.3
- Vladimir Lisin: 26.8
- Vladimir Potanin: 26.6
- Leonid Mikhelson: 25.7

Ukraine
- Rinat Akhmetov: 7.6

Saudi Arabia
- Prince Alwaleed bin Talal Al-Saud: 14.3

India
- Mukesh Ambani: 77.9
- Gautam Adani: 53.8
- Shiv Nadar: 24

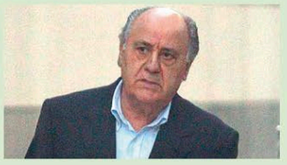
Hong Kong
- Li Ka-shing: 33.8
- Lee Shau Kee: 31.7
- Robin Zeng: 27.6
- Xu Hang: 19.3

Australia
- Gina Rinehart: 23.5

FACEBOOK'S **MARK ZUCKERBERG** WAS A BILLIONAIRE BY THE AGE OF **23**

Elon Musk
The controversial CEO of both electric car company Tesla and aerospace tech firm SpaceX.

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



Jeff Bezos
Founder of online retailer Amazon, and the richest person in the world.

Mark Zuckerberg
Cofounded Facebook social networking site in 2004, while in college.

Aliko Dangote
The wealthiest person in Africa, thanks to his cement production company.

MORE THAN 45.5 BILLION DOLLARS TO CHARITABLE CAUSES.

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
- goats
- poultry
- pigs
- sheep
- corn
- rice
- sugarcane
- vineyards
- wheat
- coffee
- fruit
- tea
- fisheries

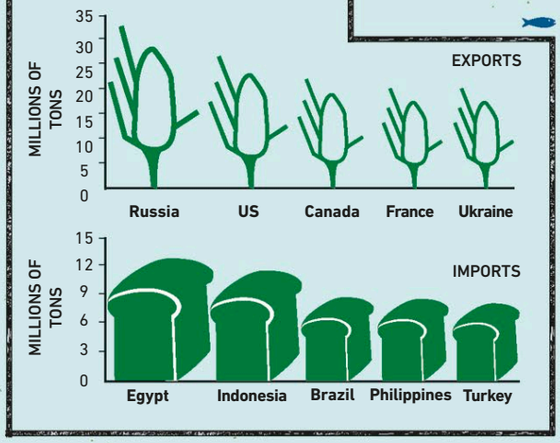
Grand Banks, Newfoundland
Once one of the world's richest fishing areas, the cod fishery here has collapsed through overfishing.

US grain belt
The flat landscape, ideal for large farm machinery, and the deep, fertile soil make the Midwest 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.

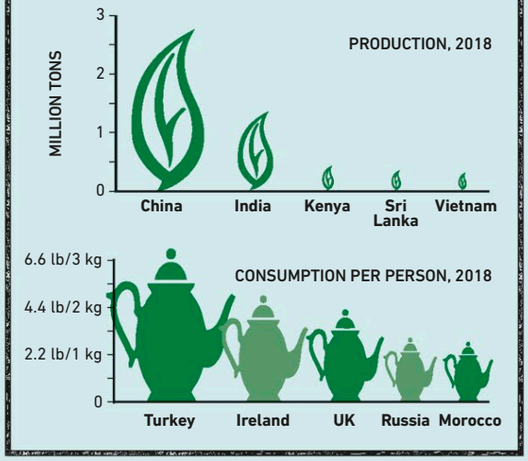
Wheat trade

Wheat is grown on more land than any other crop. Russia supplied 18 percent of the world's exports in 2019. Egypt grows its own wheat but still imports some 13 million tons per year.



Tea trade

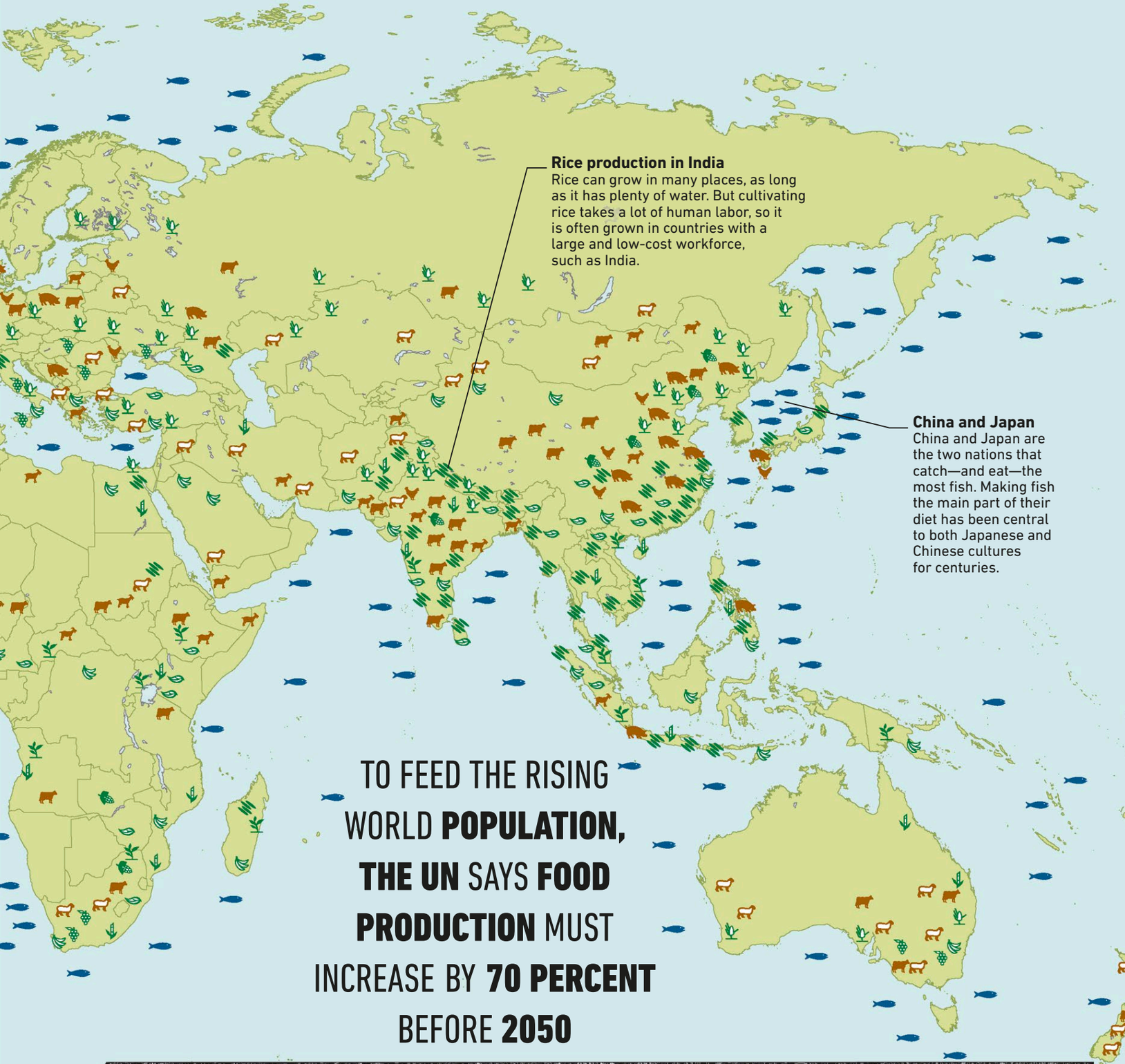
China is the world's leading producer of tea, with about 40 percent of the global total. Turkey has the strongest thirst for tea, with everyone drinking between five and ten cups a day.



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.

BRAZIL PRODUCES ONE-THIRD OF THE WORLD'S COFFEE SUPPLY, NEARLY



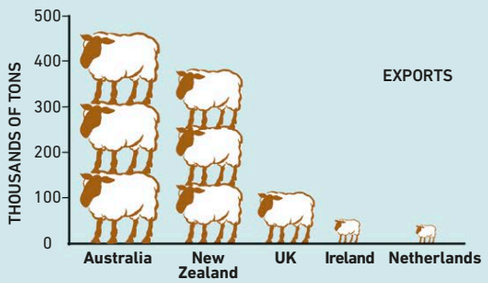
Rice production in India
Rice can grow in many places, as long as it has plenty of water. But cultivating rice takes a lot of human labor, so it is often grown in countries with a large and low-cost workforce, such as India.

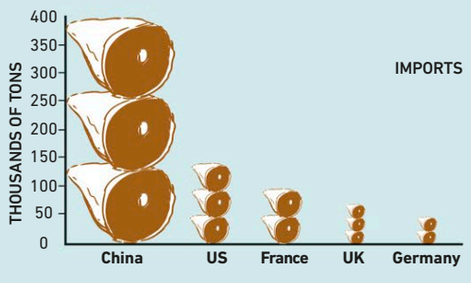
China and Japan
China and Japan are the two nations that catch—and eat—the most fish. Making fish the main part of their diet has been central to both Japanese and Chinese cultures for centuries.

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 more than 31 million sheep, it is not surprising that New Zealand exports 90 percent of the meat produced there. China imported over 50 percent of its sheep meat from New Zealand in 2019, making it ANew Zealand's best customer.





TWICE AS MUCH AS THE SECOND-BIGGEST PRODUCER, VIETNAM.

Canada
Canada has a lower adult obesity rate than the United States, at about 27.7 percent. Daily calorie intake is around 3,530 kcal.

United Kingdom
Obesity in the UK is estimated to add an extra $8.4 billion each year to the country's national health-care costs.

Africa
Africa is the continent with the lowest calorie intake, at 2,550 kcal per day. The global average is 2,870 kcal.

United States
Larger portions and cheap, high-calorie, high-fat fast foods and ready meals have helped raise average daily intake levels to 3,800 kcal. Adult obesity is now about 39.6 percent.

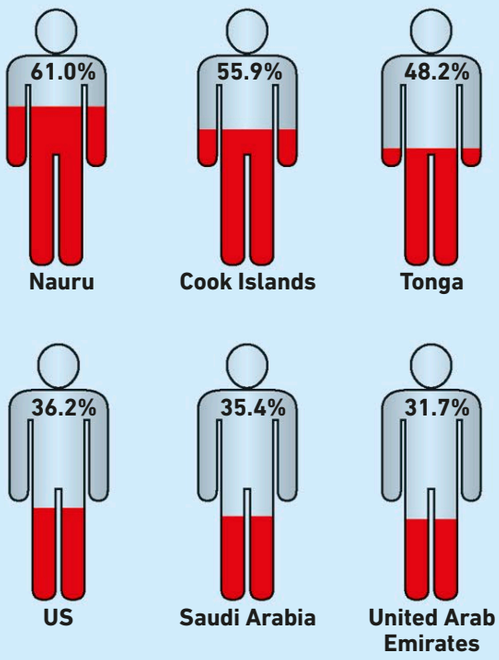
Cuba
Although Cuba is not a rich country, its citizens are well fed, with a daily intake of about 3,420 kcal.

Bolivia
Daily calorie intake for the average adult in Bolivia is around 2,100 kcal.

Weight around the world

Pacific island nations such as Nauru, the Cook Islands, and Tonga 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 CLASSED AS OBESE



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.

IN 2019, THERE WERE 690 MILLION UNDERNOURISHED PEOPLE IN

China
With 1.4 billion people, China has the largest population to feed. Average daily calorie intake is 2,990 kcal.

India
One third of the world's malnourished children live in India. The average daily intake in India is 2,360 kcal.

Mongolia
The daily calorie intake in Mongolia has risen from about 1,840 kcal in 1994 to more than 2,240 kcal today.

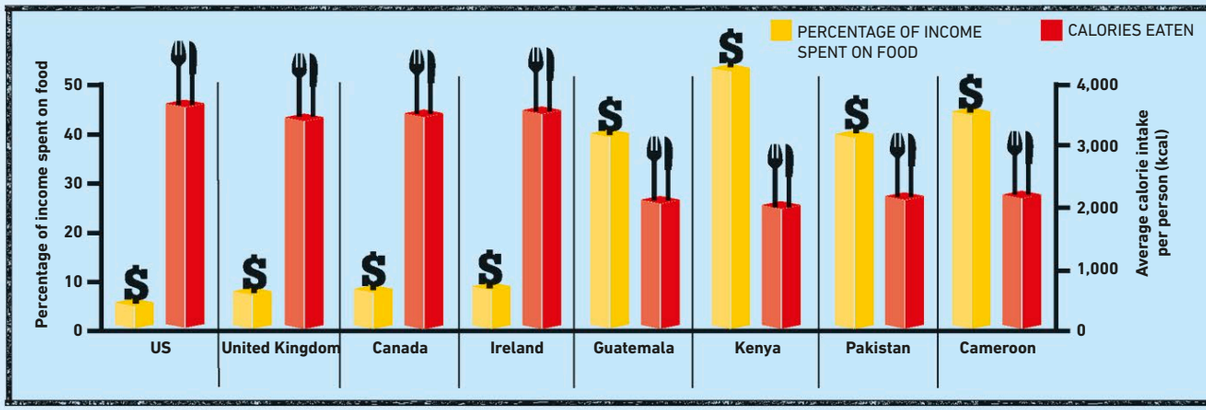
DAILY INTAKE
Daily kilocalorie (kcal) consumption per person.

- Below 2000
- 2000 - 2400
- 2400 - 2800
- 2800 - 3200
- 3200 - 3600
- Above 3600
- No data

Eritrea
The average daily calorie intake is about 1,590 kcal per person—among the lowest in the world.

Australia
The average Australian gets about 3,220 kcal per day—more than twice as much as an Eritrean.

MALNUTRITION CAUSES THE DEATH OF **3.1 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.

THE WORLD—THAT'S 8.9 PERCENT OF THE TOTAL POPULATION.

Canada
About 16 percent of Canadians struggle to pass basic literary tests.

Europe
Although most countries in Europe have very high literacy rates, more than 55 million adults classed as "literate" still lack basic reading and writing skills.

United States
About 21 percent of adults in the US are classed as "functionally illiterate."

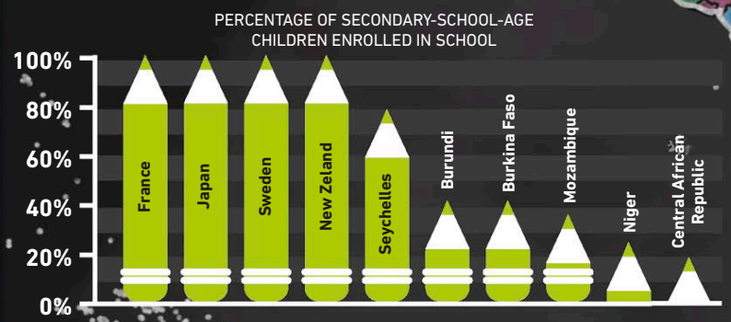
Mauritania
Little more than half of Mauritania's population—52.1 percent—can read and write.

Chad
Just 23.3 percent of people in Chad are literate—the world's lowest literacy rate.

Brazil
Just over nine out of every ten Brazilians are literate.

Going to secondary school

Wealthy nations can afford to provide secondary education 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 Niger, for example, only 24 percent of children go to secondary school.



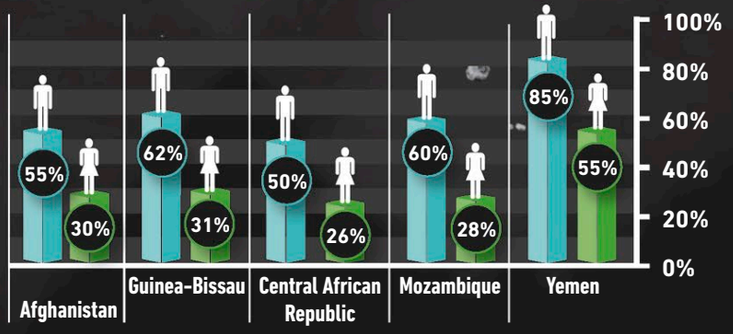
Literacy

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 AGES **15–24** HAVE NOT COMPLETED **PRIMARY SCHOOL**

ABOUT 61 MILLION PRIMARY-AGE CHILDREN WORLDWIDE WERE RECEIVING

Percentage of adults who can read and write



Male-female differences

Of the 781 million illiterate adults around the world in 2010, nearly two-thirds were women. In some countries, girls are discouraged from attending school, leading to wide differences in literacy rates between men and women.

Pollution

Oil spills, industrial waste, and radiation leaks from nuclear power stations cause harm to people and the environment. Carbon dioxide gas (CO_2) produced by transportation and industry is adding to global warming.

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**
330,000–1,322,000 tons
Iraqi forces opened valves on Kuwaiti oil wells and pipes, causing a 100-mile (160-km) slick.

2. **Lakeview gusher, California 1910-11**
1,212,000 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**
740,000 tons
A deep-sea oil spill occurred when an explosion destroyed the Deepwater Horizon drillling rig.

4. **Ixtoc 1 oil spill, Gulf of Mexico, USA, 1979–80**
454,000–480,000 tons
The Ixtoc 1 drilling platform collapsed after an explosion. The spill continued for 9 months.

5. ***Atlantic Empress*, Trinidad and Tobago, 1979**
287,000 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.

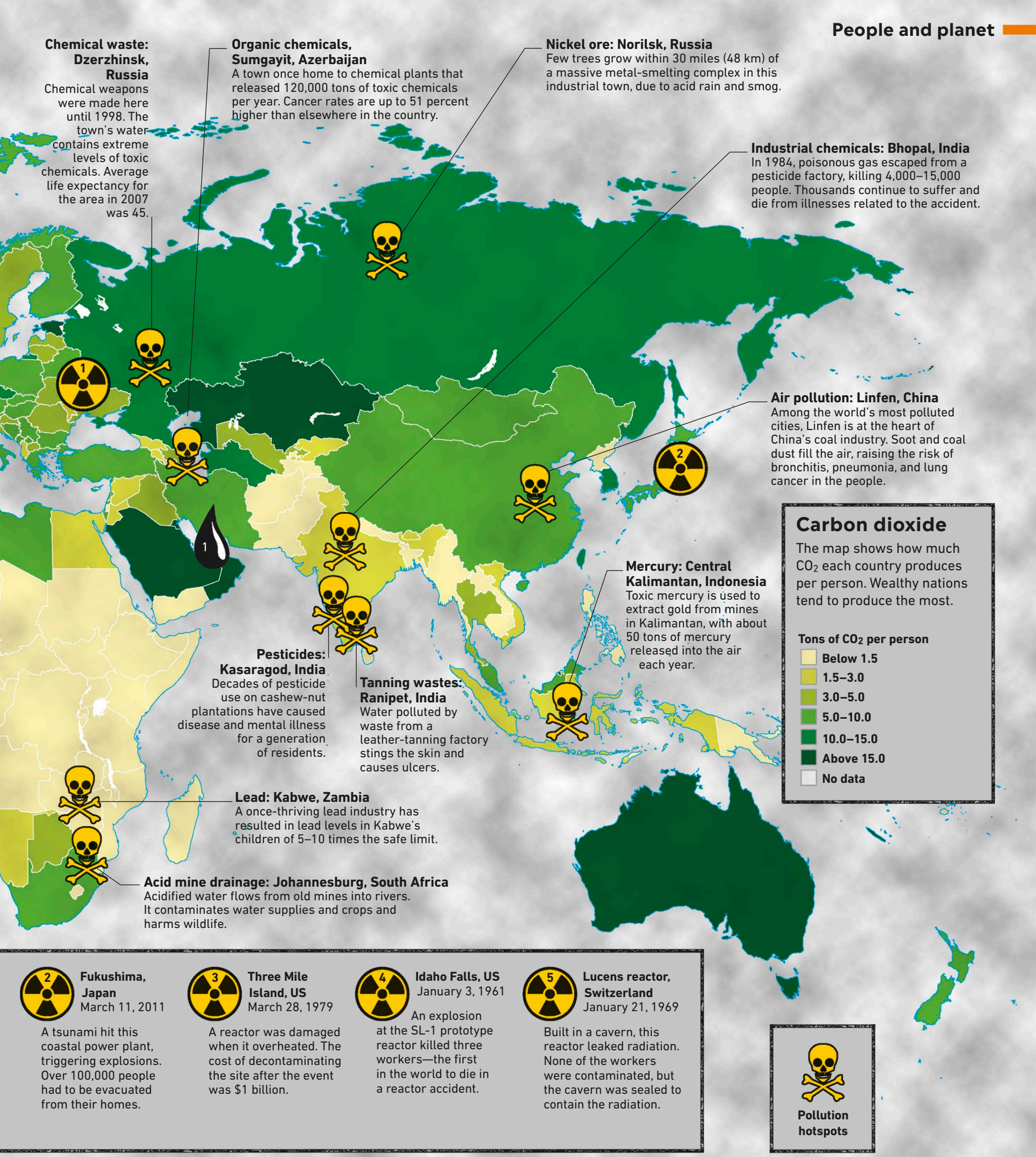
Lead: La Oroya, Peru
A metal smelting plant has emitted toxic lead since 1922. This has led to contaminated water supplies, dangerously polluted air, and unsafe levels of lead in the blood of local residents.

THE 1991 **GULF WAR** OIL SLICK WAS UP TO **5 IN (13 CM) THICK**

Nuclear accidents

Splitting atoms in nuclear reactors produces energy for generating electricity. Accidents at reactors may lead to radioactive material escaping, which can cause illness such as cancer for many years.

1. **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 120,000 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 50 tons of mercury released into the air each year.

Pesticides: Kasaragod, India
Decades 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 CO_2 each country produces per person. Wealthy nations tend to produce the most.

Tons of CO_2 per person

- Below 1.5
- 1.5–3.0
- 3.0–5.0
- 5.0–10.0
- 10.0–15.0
- Above 15.0
- No data

2 Fukushima, Japan
March 11, 2011
A tsunami hit this coastal power plant, triggering explosions. Over 100,000 people had to be evacuated from their homes.

3 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.

4 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.

5 Lucens reactor, Switzerland
January 21, 1969
Built in a cavern, this reactor leaked radiation. None of the workers were contaminated, but the cavern was sealed to contain the radiation.

Pollution hotspots

FOR 240,000 YEARS—LONGER THAN MODERN HUMANS HAVE EXISTED!

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.

Top of the recycling table
Only a handful of countries currently recycle more than half their waste; Germany tops this list, recycling 56.1% of all waste in 2019. This figure is a rapid increase from 1991, when the country recycled only 3% of its garbage.

RECYCLING ONE ALUMINIUM CAN SAVES ENOUGH ENERGY TO BURN A

KEY
Everyday items discarded by the public per day in each country, shown in lb (kg) per person.

- **0–1.1** (0–0.5)
- **1.1–1.65** (0.5–0.75)
- **1.65–2.75** (0.75–1.25)
- **2.75–4.4** (1.25–2)
- **Above 4.4** (above 2)
- **No data**

Laogang—Shanghai, China
Approximately 11,000 tons per day.

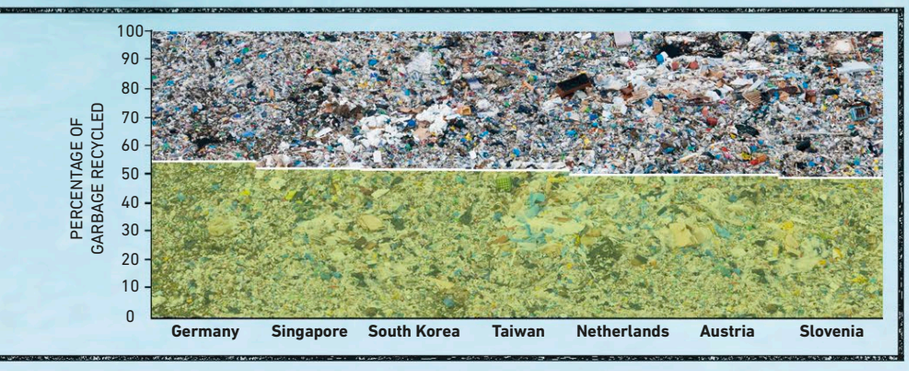
Sudokwon—Incheon, South Korea
Approximately 20,000-22,000 tons per day.

Moldova
Moldova dumps more than 1 million tons of waste into the ground each year—with only 10 percent of this being sorted and recycled.

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 3.3 million tons of plastic litter.

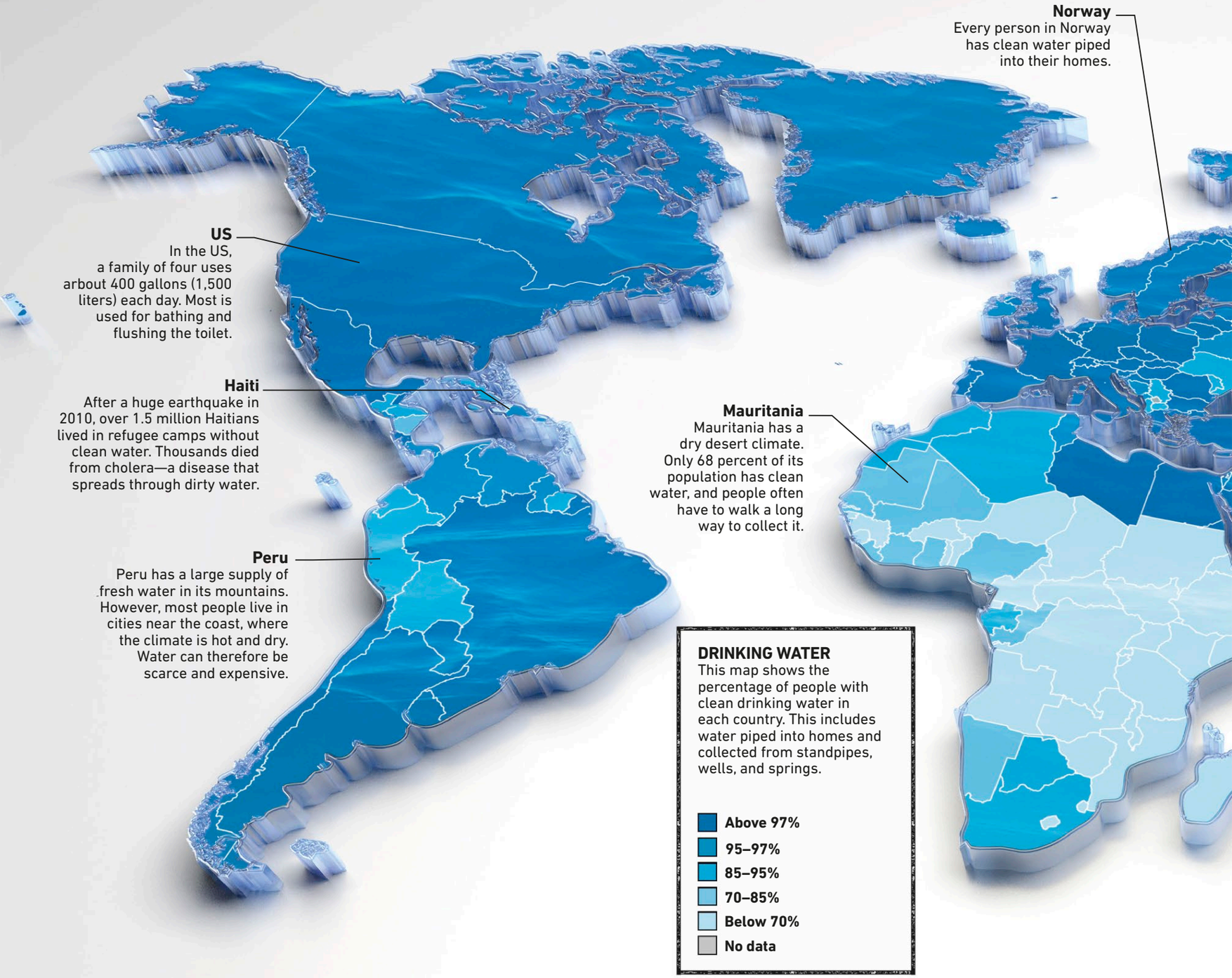
Australia
In 2019 only 12% of Australian household plastic was recycled, but the next year the government announced a $190 million budget for new recycling infrastructure.

Indian Ocean Garbage Patch



A **PLASTIC** BOTTLE IN **LANDFILL** CAN TAKE **450 YEARS** TO **BIODEGRADE**, OR ROT

LIGHT BULB FOR ALMOST 4 HOURS, OR A TELEVISION FOR 3 HOURS.



Clean water

The tap in your home may give you an instant supply of clean drinking water. However, millions of people around the world must get their water from a standpipe or a well. For one in three 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.

IN DEVELOPING COUNTRIES, 70 PERCENT OF INDUSTRIAL WASTE IS

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

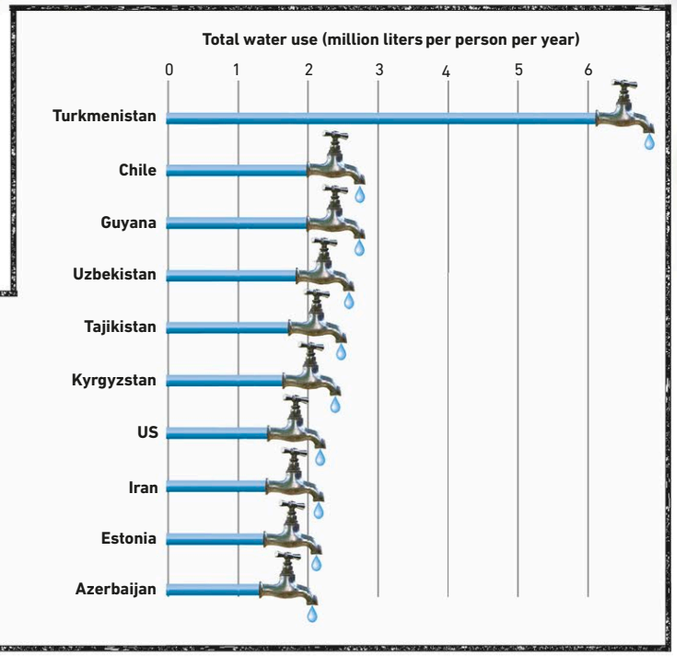
These glasses show how many of gallons (liters) of water each person uses a day for such things as drinking, washing, cooking, and cleaning. In Cambodia, each person manages on just 5 gallons (19 liters) of water a day. In the US, people use 30 times more.

Cambodia	Kenya	Brazil	Kuwait	USA
5.2 (19.6)	9.1 (34.4)	61.9 (234)	133 (501)	157 (593)

India
Nineteen percent of the world's population without clean water access live in India. About 850 children here under the age of five die every day from diarrhea.

Indonesia
Many water supplies are polluted by waste from factories and by sewage. About 70 percent of people lack clean water.

THE **UN** SAYS EACH PERSON SHOULD HAVE **13 GALLONS (50 LITERS)** OF **CLEAN WATER** EVERY DAY



Australia
A history of terrible droughts caused Australia rethink its water use. Measures include recycling sewage and encouraging gray water recycling (waste water from baths and washing machines), in an attempt to "drought-proof" the nation.

DUMPED UNTREATED INTO RIVERS, WHERE IT POLLUTES USABLE WATER.

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.

France
France has only small oil reserves and prefers to focus on nuclear power production.

US
Americans consume about 16% 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.

Texas gas fields
The US is the world's largest producer of gas. Texas provides almost one-quarter of the US's gas from both onshore and offshore fields.

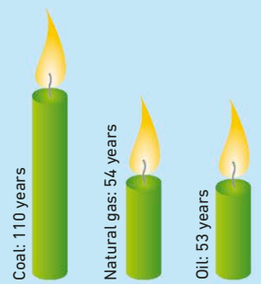
Venezuela
Has possibly the greatest amount of oil of any single country. Over 17 percent of global reserves are found here.

Nigeria
The largest producer of oil in Africa, but conflict and a lack of resources limit production.

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.

How long left?

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.



2021 supply estimates

Fossil fuels

More than 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 atmosphere.

MOST **FOSSIL FUELS** WERE FORMED **300–360 MILLION YEARS** AGO

FROM THE LATE 2ND CENTURY CE, THE ROMANS IN BRITAIN MINED

Russia
Has the world's largest natural gas reserves and second-largest coal reserves. Three times as much gas is consumed in Russia as coal.

China
Largest producer of coal in the world, though it has the fourth-largest coal reserves.

The Middle East
Richest oil region on Earth—contains almost half the world's oil reserves.

Ghawar oil field, Saudi Arabia
Produces more oil than any other single oil field, contributing more than half of Saudi Arabia's vast oil production since 1938.

Australia
One of the world's top exporters of coal. Coal consumption per person is the highest in the world.

FUEL RESERVES
Fossil fuels form in intense underground conditions as remains of dead organisms are compressed over millions of years. Oil and natural gas are found trapped in underground spaces and are extracted by drilling. Coal can be mined at the surface or deep underground. The map shows areas where there are significant oil, gas, and coal fields.

- Oil field
- Gas field
- Coal field

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 twice 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

COAL ON A LARGE SCALE TO HEAT HOUSES THROUGH UNDERFLOOR PIPES.

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 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.

Iceland
Ninth on the "top 10" list of geothermal producers

Norway
Number six for hydroelectricity

Canada
Fourth-largest producer of hydroelectricity; sixth for nuclear; ninth for wind

Germany
First in the world for solar, third for wind, fourth for biofuel, and eighth for nuclear

France
Ranked second for nuclear, fifth for biofuel, seventh for wind, and ninth for solar

US
World's top producer of geothermal, biofuel, and nuclear energy; in second place for wind and hydroelectricity; and fifth for solar

Spain
Number five for wind and ten for biofuel

Italy
Ranked fourth for solar, seventh for geothermal, and tenth for wind

Venezuela
Eighth for hydroelectricity

Mexico
Sixth for geothermal

El Salvador
Ninth for geothermal

Brazil
Ranked second for electricity production by biofuel, third for hydroelectricity, and eighth for wind

Argentina
Seventh-largest producer of electricity from biofuel

HYDROELECTRIC POWER PLANTS SUPPLY **90 PERCENT** OF **NORWAY'S** ENERGY

Alternative energy

Burning fossil fuels—coal, oil, and gas—creates a lot of pollution. People are developing alternative, cleaner energy sources, and some are renewable—they never run out.

KEY
Top 10 alternative-energy producing countries in each field

- Wind energy
- Geothermal energy
- Solar energy
- Hydroelectric energy
- Nuclear energy
- Biofuel energy

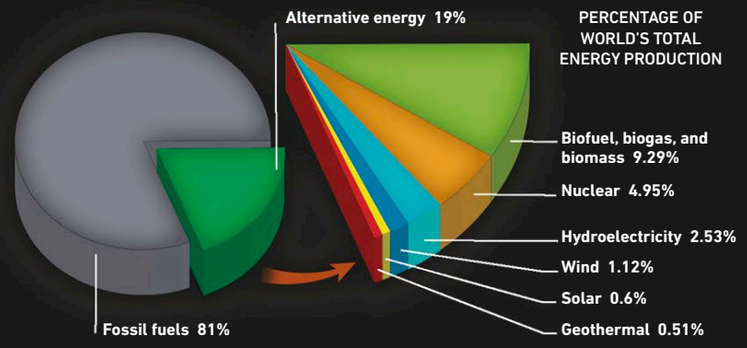
ICELAND IS A VOLCANIC ISLAND. CURRENTLY, ABOUT 90 PERCENT

Sweden
Number nine for both nuclear and hydroelectricity

Russia
World's fourth-largest nuclear producer and the fifth-largest hydroelectricity nation

Ukraine
Number seven for nuclear

World's energy sources
Fossil fuels supply about 80 percent of the world's energy. Most of the alternative energy we use comes from bio-sources. Nobody knows for sure how much oil, coal, and gas is left in the ground, so many countries are investing heavily in renewable energy.



China
First in the world for both wind and hydroelectricity, second for solar, third for nuclear, and sixth for biofuel

South Korea
World's fifth-largest producer of nuclear energy and tenth for solar

Japan
A significant producer of solar (third in world), geothermal, and hydroelectric (both tenth) energy

India
Fourth in the world for wind, sixth for solar, and seventh for hydroelectricity

Philippines
Third-largest geothermal nation

Kenya
Eighth in the world for geothermal; more than 50 percent of Kenya's energy comes from this source

Thailand
Ranked eighth in the world for biofuel

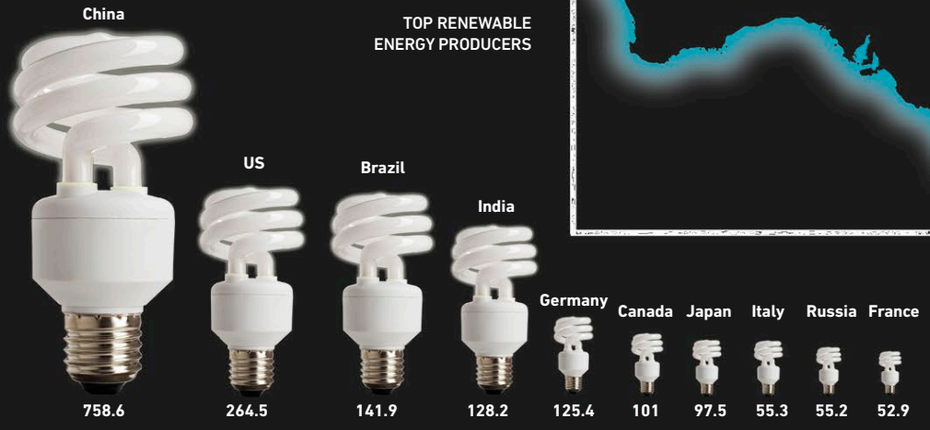
Indonesia
Second in the top 10 of geothermal countries

Australia
Eighth-largest producer of solar energy

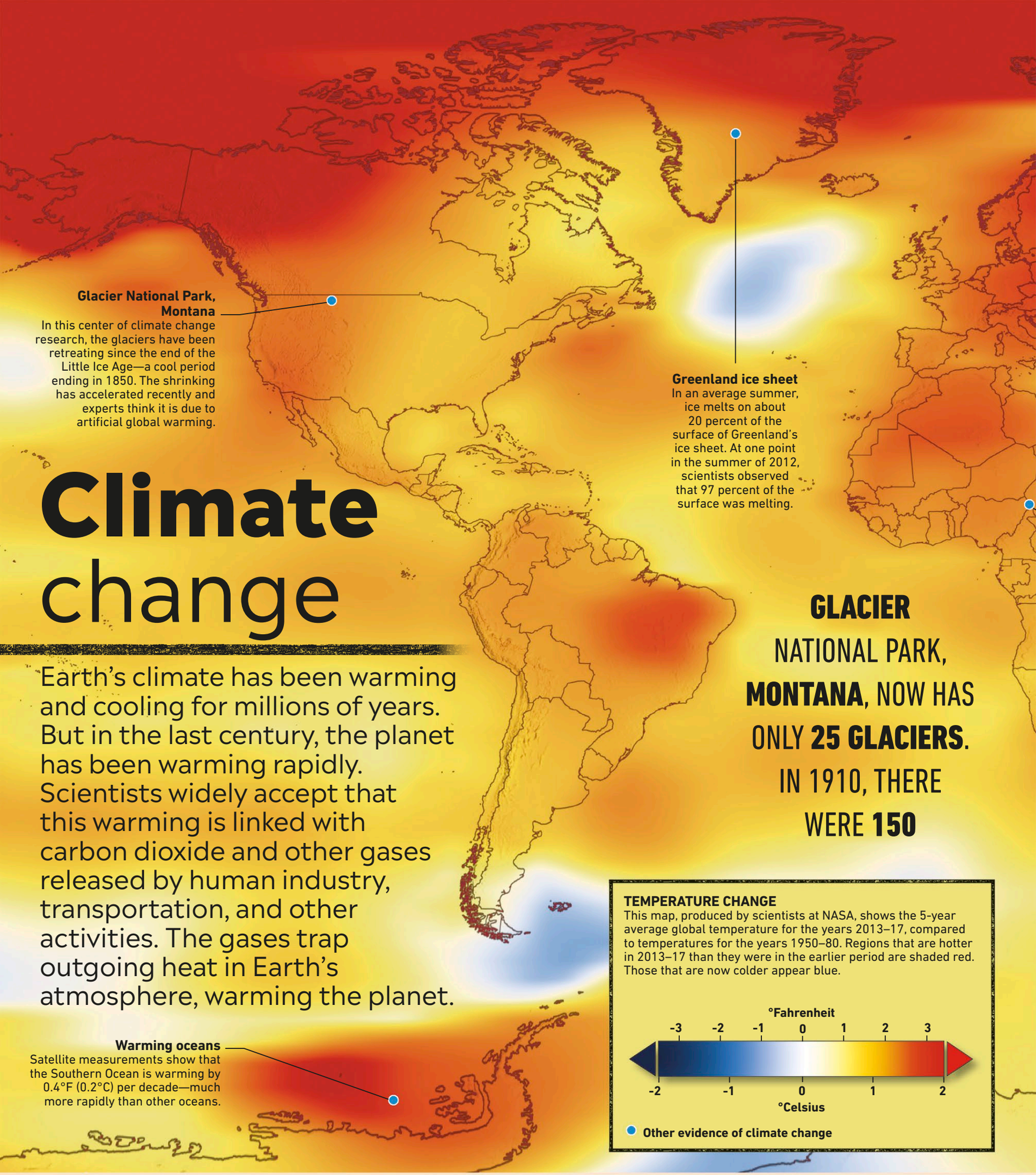
New Zealand
Number five in the world for geothermal

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. Most countries are making an effort to increase their usage of this; here are the top 10 producers of renewable energy in 2019.



OF ALL ITS HOUSEHOLDS ARE HEATED BY GEOTHERMAL POWER.



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. Scientists widely accept that this warming is linked with carbon dioxide and other gases released by human industry, transportation, and other activities. The gases trap outgoing heat in Earth's atmosphere, warming the planet.

GLACIER NATIONAL PARK, **MONTANA**, NOW HAS ONLY **25 GLACIERS**. IN 1910, THERE WERE **150**

ALL SEVEN OF THE YEARS FROM 2014 TO 2020 RANK AS THE

Arctic sea ice
The entire Arctic region has warmed more during the past decades 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, typically 9 ft (3 m) thick, which forms on the surface of the polar oceans. In 2020, Arctic sea ice fell to its second-lowest extent since satellites starting monitoring it in 1979.

Rising sea level
Global sea levels are rising, but satellite data tells us that this is happening more in some places than others. Sea levels around the Philippines, for example, are rising at almost three times the global average, causing the low-lying country to rank on the UN's list of countries most vulnerable to climate change.

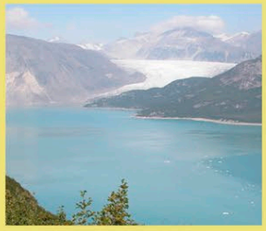
Lake shrinkage
Since 1960, Lake Chad has shrunk by 90 percent because the pattern of monsoon rainfall has shifted, giving it less rain. With less rain for their crops, people have also taken much more of the lake's water, shrinking it further. Scientists think the rainfall shift could have been triggered 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.

Melting glacier

Muir Glacier in Alaska has been shrinking for more than 80 years. It has retreated by more than 7 miles (12 km) and is 2,600 ft (800 m) thinner—this shrinkage is shown in the photos below. The glacier is now out of sight from this angle.

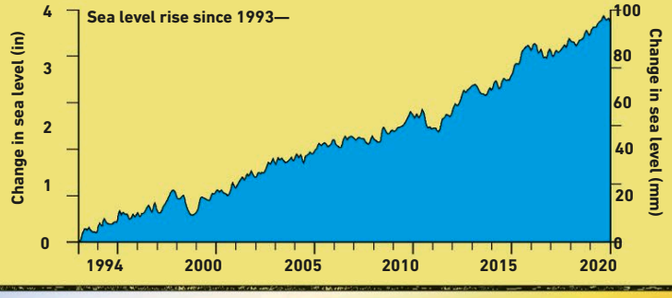
August 13, 1941

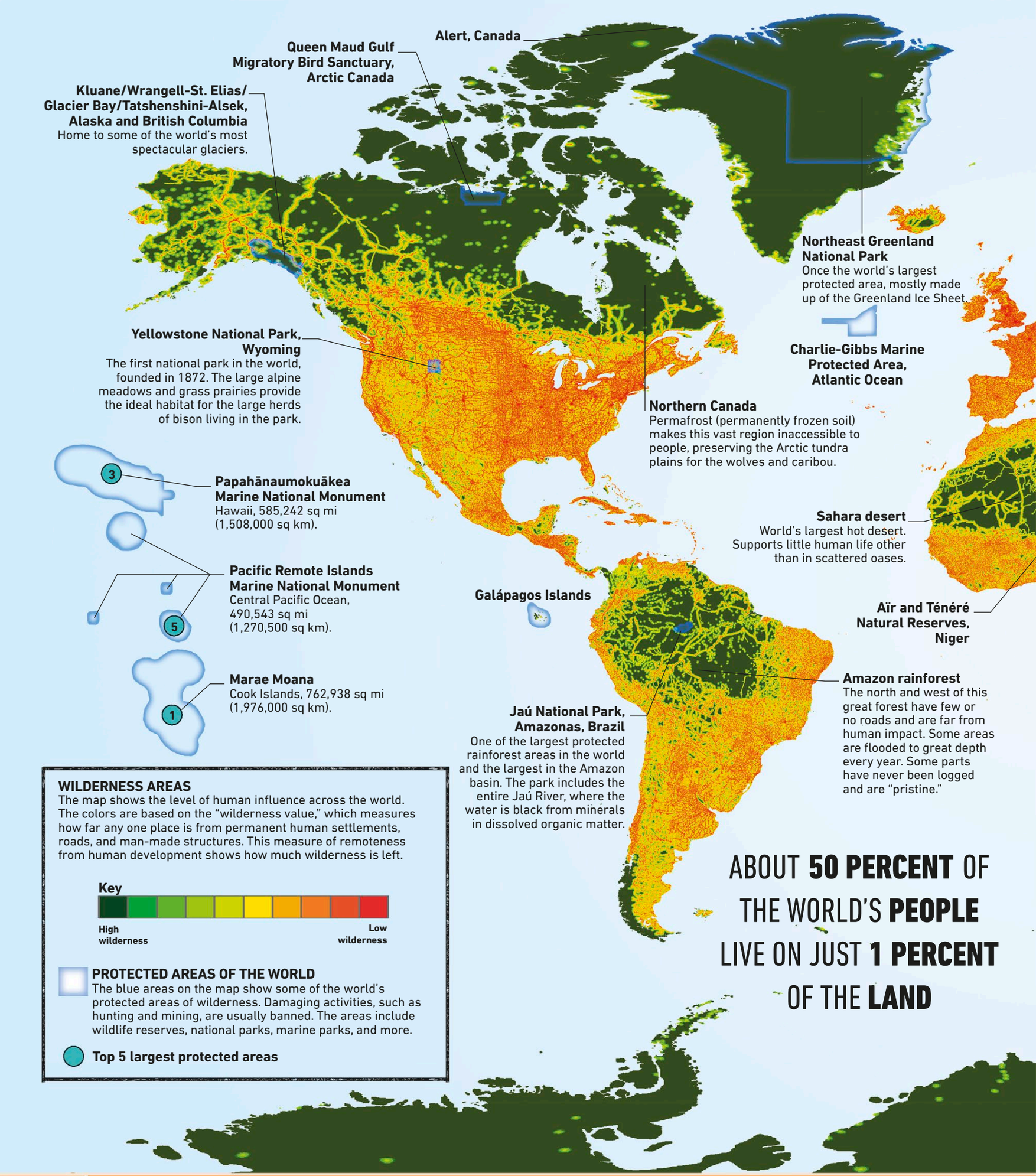


August 31, 2004

Global sea level

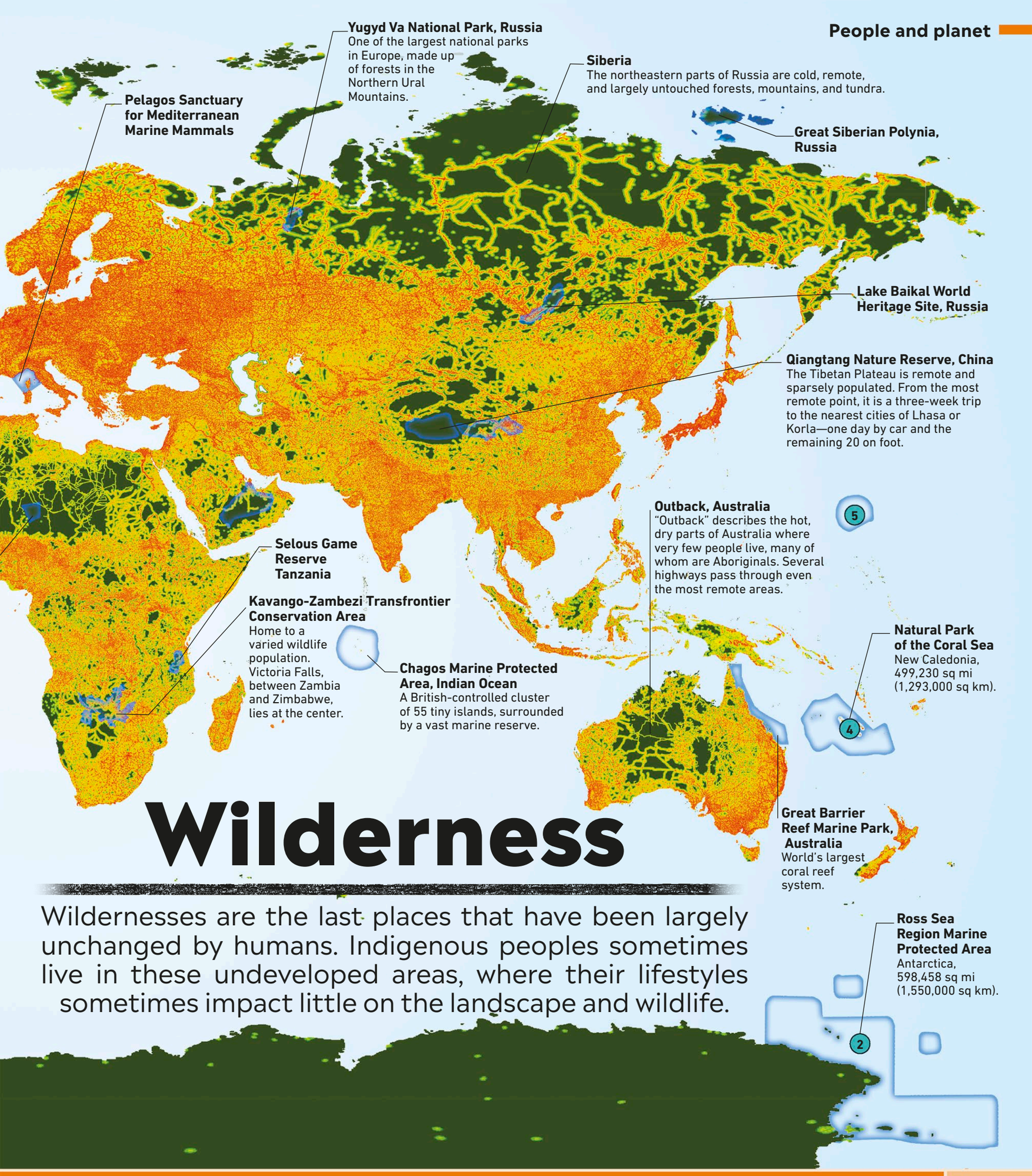
Since 1993, the global sea level has steadily increased by about 0.1 in (3 mm) per year, as measured by satellite. During the 100-year period before 1993, sea levels rose by an average of only 0.07 in (1.7 mm) every year.





ABOUT **50 PERCENT** OF THE WORLD'S **PEOPLE** LIVE ON JUST **1 PERCENT** OF THE **LAND**

AT 508 MILES (817 KM) FROM THE POLE, ALERT, CANADA, IS



Wilderness

Wildernesses are the last places that have been largely unchanged by humans. Indigenous peoples sometimes live in these undeveloped areas, where their lifestyles sometimes impact little on the landscape and wildlife.

THE EARTH'S MOST NORTHERLY PERMANENTLY INHABITED PLACE.

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

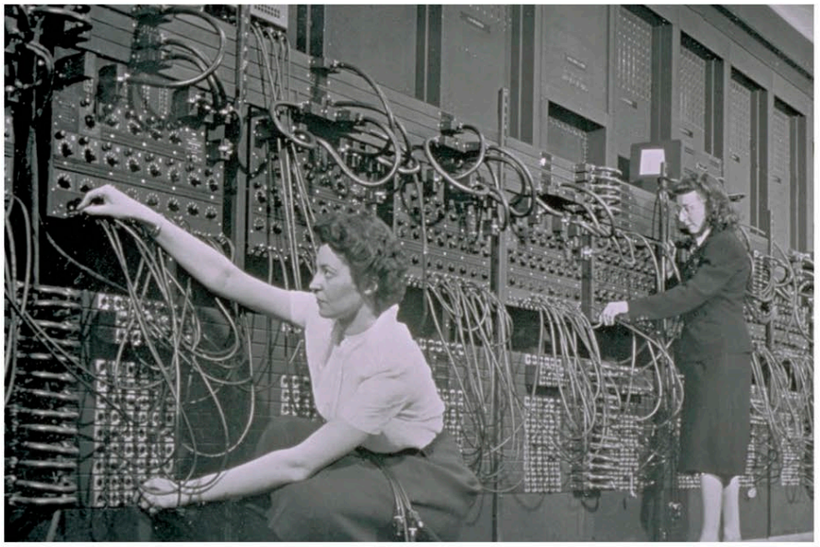
Transportation has shrunk our world. Thanks to jet airliners, superhighways, and high-speed rail routes, we can go on long-distance journeys that would have been unthinkable just a few decades ago. This transportation revolution began with the invention of the railroad at the start of the 19th century, and it has continued at speed ever since.

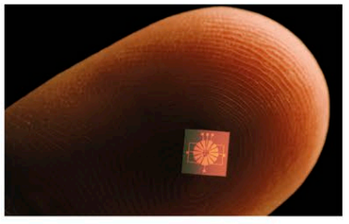
Train collects electricity from power cables suspended above the track.

High-speed electric locomotive
Launched in 1999, the Velaro is now in service in Germany, Spain, France, the UK, China, Russia, Belgium, Turkey, and the Netherlands. It is powered by electricity and can reach speeds of more than 218 mph (350 kph).

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 more than 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 0.04 in (1 mm) square, is implanted into the eye to help people with the disease glaucoma.

Enormous ancestor
ENIAC weighed 33 tons and occupied an entire room. Operators programmed ENIAC by plugging and unplugging cables and adjusting switches.

FUGAKU WAS CROWNED THE WORLD'S FASTEST COMPUTER IN 2020, AND

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).

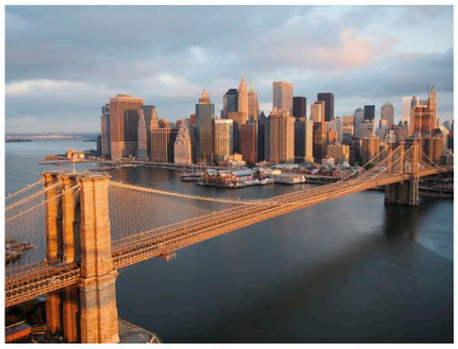
Coal carried in the tender was burned to heat water in the boiler and produce steam to drive the wheels.

Bullet-shaped nose enables locomotive to cut through the air more easily, increasing speed.

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 skycraper 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, Illinois, 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.



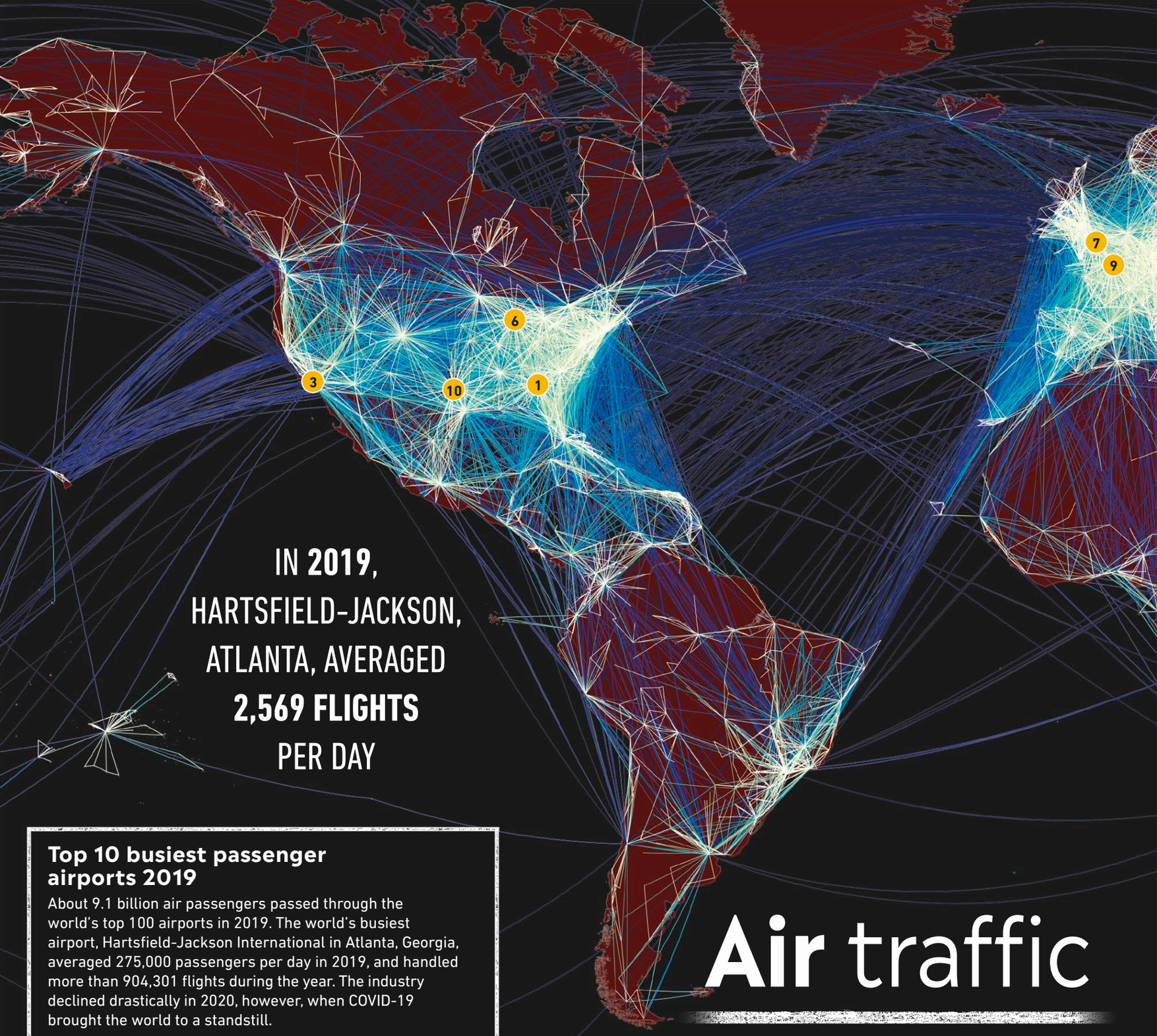
Manhattan, then and now
The Brooklyn Bridge spans New York's East River. The view across to Manhattan Island has changed dramatically since the bridge opened in 1883, and it now bristles with skyscrapers.

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 commercial 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 freeway, or autobahn, in the 1930s. Cars did not clog the roads until much later!



IN **2019**, HARTSFIELD-JACKSON, ATLANTA, AVERAGED **2,569 FLIGHTS** PER DAY

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.

Top 10 busiest passenger airports 2019

About 9.1 billion air passengers passed through the world's top 100 airports in 2019. The world's busiest airport, Hartsfield-Jackson International in Atlanta, Georgia, averaged 275,000 passengers per day in 2019, and handled more than 904,301 flights during the year. The industry declined drastically in 2020, however, when COVID-19 brought the world to a standstill.

RANK	AIRPORT	PASSENGERS PER YEAR
1	Hartsfield–Jackson Atlanta International, US	110,531,300
2	Beijing Capital International, China	100,011,438
3	Los Angeles International, US	88,068,013
4	Dubai International, Dubai	86,396,757
5	Tokyo International, Japan	85,505,054
6	O'Hare International, Chicago, US	84,649,115
7	London Heathrow, United Kingdom	80,888,305
8	Shanghai Pudong International, China	76,153,455
9	Paris Charles de Gaulle, France	76,150,009
10	Dallas Fort Worth International, US	75,066,956

WORLDWIDE, THERE WERE 38.3 MILLION FLIGHT DEPARTURES

PASSENGERS PER YEAR

Jeju	13.4 million	Seoul
Melbourne	9.1 million	Sydney
Sapporo	8.7 million	Tokyo
Fukuoka	7.9 million	Tokyo
Mumbai	7.1 million	Delhi
Beijing	6.8 million	Shanghai
Hanoi	6.8 million	Ho Chi Minh City
Hong Kong	6.7 million	Taiwan
Jakarta	5.3 million	Surabaya
Tokyo	5.3 million	Okinawa

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 2017.

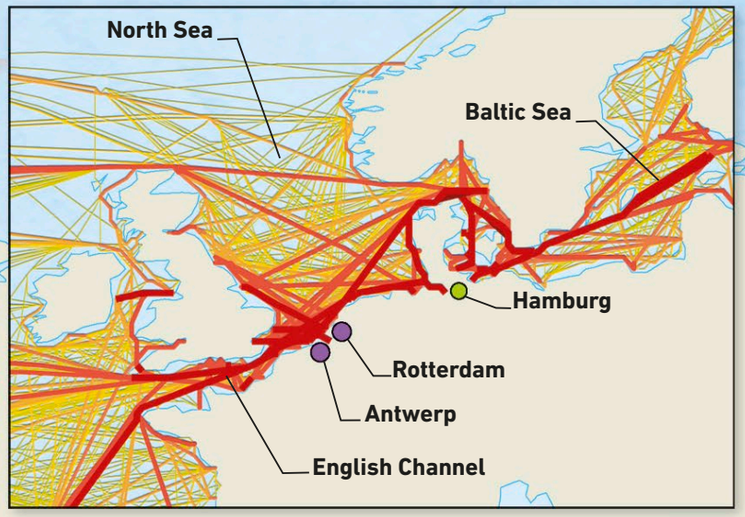
IN 2019, IT IS PREDICTED THAT THERE WILL BE 51.71 MILLION IN 2030.

Shipping

Most countries need to sell the goods they produce and import the things they need. Shipping plays an essential role in world trade, carrying food, fuel, chemicals, and manufactured goods between markets.

MORE THAN **80 PERCENT** OF **GLOBAL TRADE** IS **CARRIED** BY **SEA**

MOVING CARGO BY SHIP IS ABOUT TWICE AS ENERGY EFFICIENT



Europe's hub

In this expanded view, we can see in greater detail the dense network of shipping lanes serving the major hubs of Europe. Routes criss-cross the North and Baltic seas and the English Channel.

Suez Canal
The canal links the Mediterranean and the Red Sea. Ships use it to travel between Europe and Asia without the having to sail around all of Africa.

Dubai ports

Shanghai
Ningbo
Xiamen
Kaohsiung
Shenzhen
Guangzhou
Hong Kong
Tianjin
Qingdao
Dalian
Busan
Singapore
Port Klang
Tanjung

INDIAN OCEAN

PACIFIC OCEAN

World's 20 busiest ports

The ports marked on the map handle more cargo than others worldwide. Cargo is measured in TEUs (twenty-foot container equivalent units). A TEU is one standard container full of cargo. The busiest port in the world is Shanghai in China, which handled more than 43 million TEUs in 2019.

- Up to 10 million TEUs per year
- 10–19 million TEUs per year
- 20 million or more TEUs per year

THAN BY RAIL AND FIVE TIMES MORE SO THAN BY ROAD.

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).

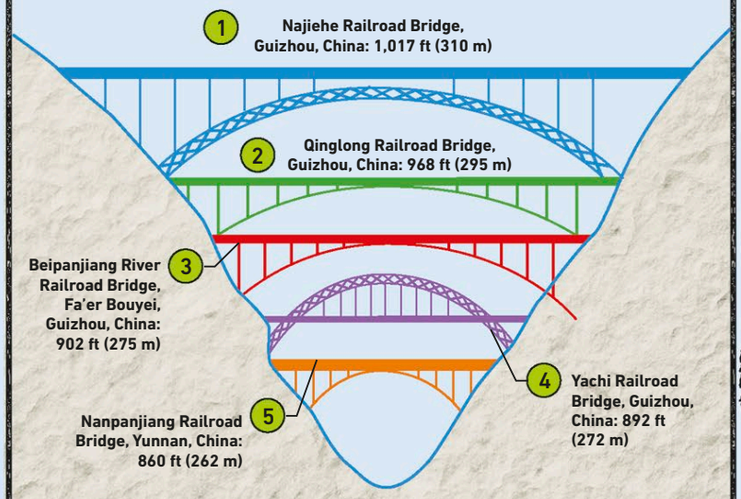
The Canadian (Canada)
Spectacular 2,775-mile (4,466-km) route between Vancouver and Toronto, traveling through mountains, prairies, and lakeland.

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.

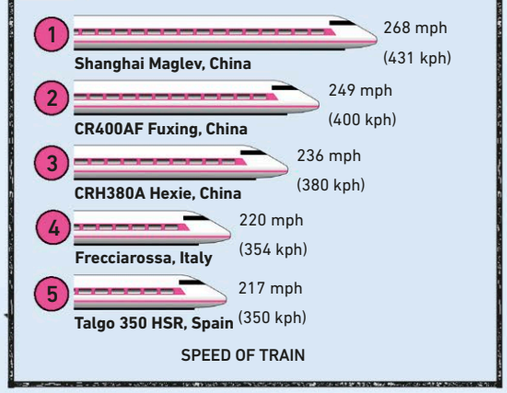
Highest railroad bridges

The Najiehe Railroad Bridge, which opened in late 2016, will lose its title of "world's highest railroad bridge" when India's 1,178-ft- (359-m-) high Chenab River Bridge is finished in 2022.



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'S FIRST HIGH-SPEED RAIL SYSTEM OPENED IN JAPAN

Trans-Siberian Railroad (Russia)
The world's longest rail journey passes through seven time zones as it runs 5,771 miles (9,288 km) from Moscow in the west to Vladivostock on the Pacific coast.

Guangzhou to Lhasa (China)
The Tanggula Pass section is the world's highest track, at 16,640 ft (5,072 m).

THE WORLD HAS **620,000 MILES** (1 MILLION KM) OF **RAIL TRACK**

Alexandria to Aswan (Egypt)
Traveling via Cairo and Luxor, this line follows the Nile Valley, with its ancient pyramids and temples.

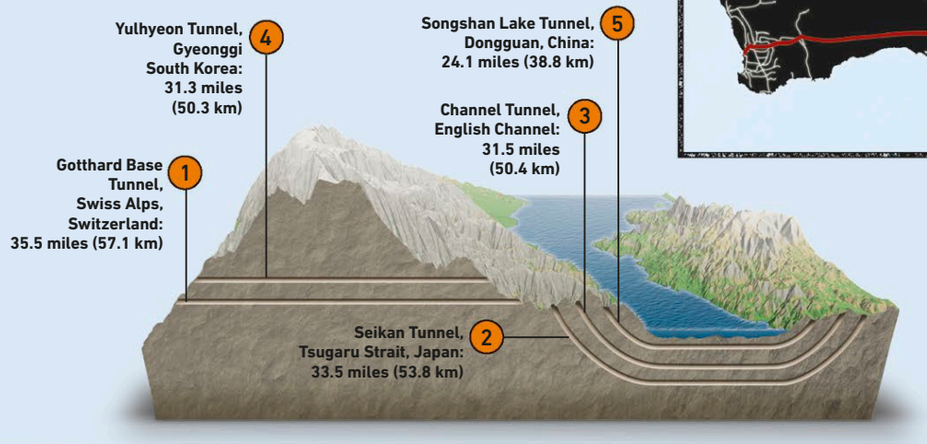
Dibrugarh to Kanyakumari (India)
Longest route in India, at 4,286 km (2,657 miles).

Blue Train, South Africa
A luxurious train that runs from Cape Town to Pretoria through vineyards, mountains, and the arid landscape of the Karoo.

Indian Pacific (Australia)
This 2,704-mile (4,352-km) route, links Sydney on the east coast with Perth in the west.

Five longest railroad tunnels

In 2016, the Gotthard Base Tunnel—a 35-mile- (57-km-) long tunnel that travels beneath the Swiss Alps—surpassed the Seikan Tunnel to become the world's longest railroad tunnel.



IN 1964 AND IS KNOWN AS THE SHINKANSEN, OR "BULLET TRAIN."

Roads

The planet is now more accessible by road than it has ever been. There are about 65 million miles (104 million km) of roads on Earth, from multilane urban freeways to seasonal ice roads made from frozen lakes and seas.

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 bicyclers.

3 Khardung La, India
This famously high mountain pass in the Ladakh part of Kashmir was built in 1976 and opened to motor 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.

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.

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.

Bonn-Köln Autobahn
Built in 1932, it was the first road designed exclusively for cars, with divided lanes and no intersections with other roads.

Cabot Trail
Looping around the northern tip of Cape Breton Island, Nova Scotia, and named after 16th-century Italian explorer, John Cabot.

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 rainforest 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 trucks but with unprotected sheer drops of 1,970 ft (600 m). Up to 300 travelers are killed on the route every year.

World's busiest roads

1 Ontario 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 Interstate 405, California
Runs north from the city of Irvine in Orange County to San Fernando, a route that is known as the northern segment of the San Diego Freeway. This freeway is the busiest and most congested in the US, carrying up to 379,000 vehicles a day.

HIGHWAY 401, ONTARIO, CANADA

FRANCE HAS NEARLY 620,000 MILES (1 MILLION KM) OF PAVED ROADS.

Estonian Islands
Ice roads between islands and the mainland are only opened to traffic when the ice is 8.7 in (22 cm) thick along the entire 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).

THE **GEORGE WASHINGTON BRIDGE** IN NEW YORK CARRIES 104 MILLION **VEHICLES EVERY YEAR**

Karakoram Highway
One of the world's highest roads at an altitude of 15,397 ft (4,693 m), it connects China and Pakistan.

Milford Road
Meanders through the stunning scenery of New Zealand's Milford Sound.

Garden Route
Runs along the South African coast from Cape Town to Port Elizabeth.

Great Ocean Road
Following a beautiful seaside route, this road is a memorial to the Australians who died in World War I.

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 Beipanjiang Bridge
With the road 1,850 ft (565 m) above the Beipan River Canyon 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.

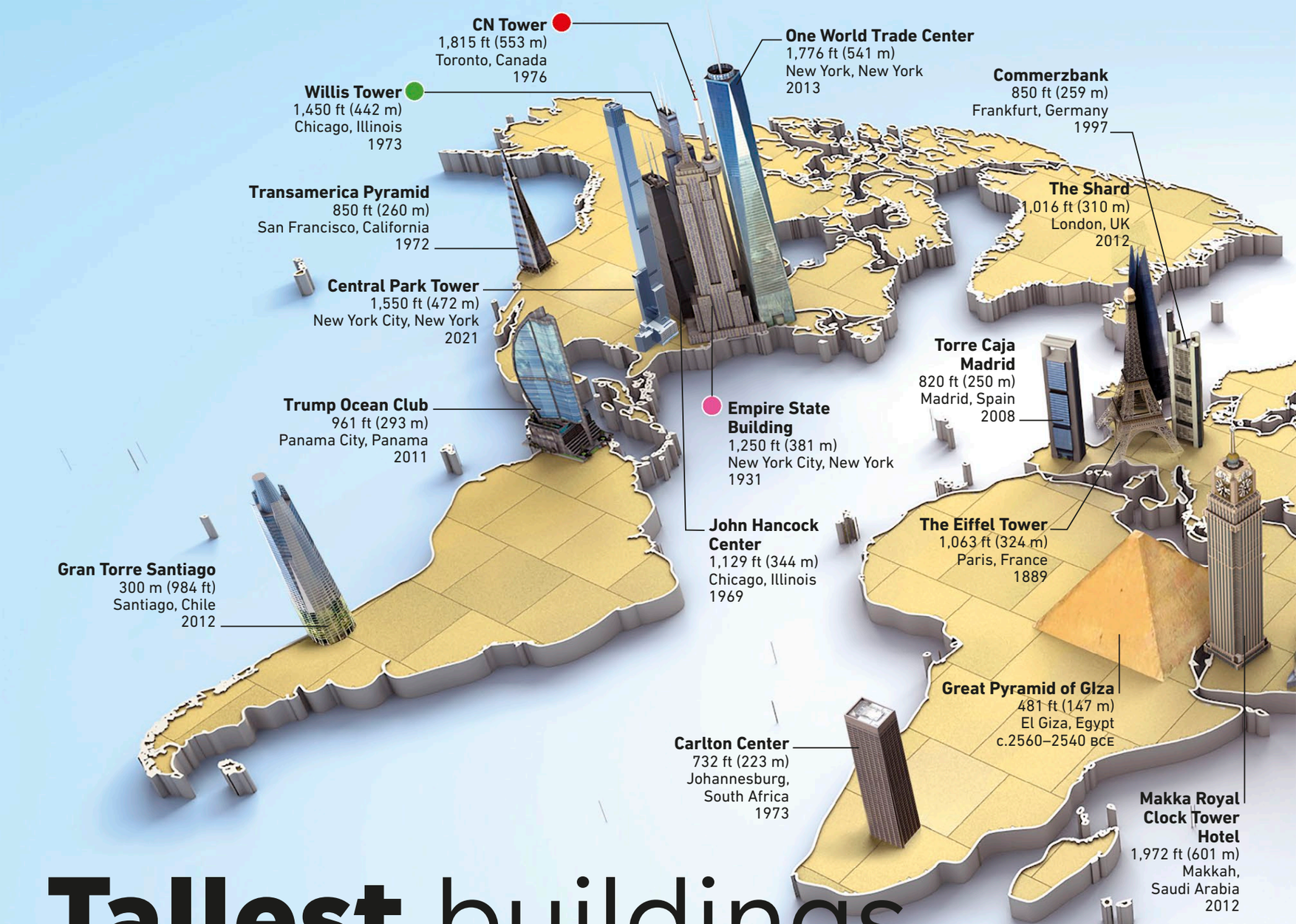
6 Akashi-Kaikyō Bridge
The world's longest suspension bridge, it has 190,000 mi (300,000 km) of steel cables and connects two Japanese islands.


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**

SOUTH SUDAN IS THE SAME SIZE, BUT HAS JUST 186 MILES (300 KM).

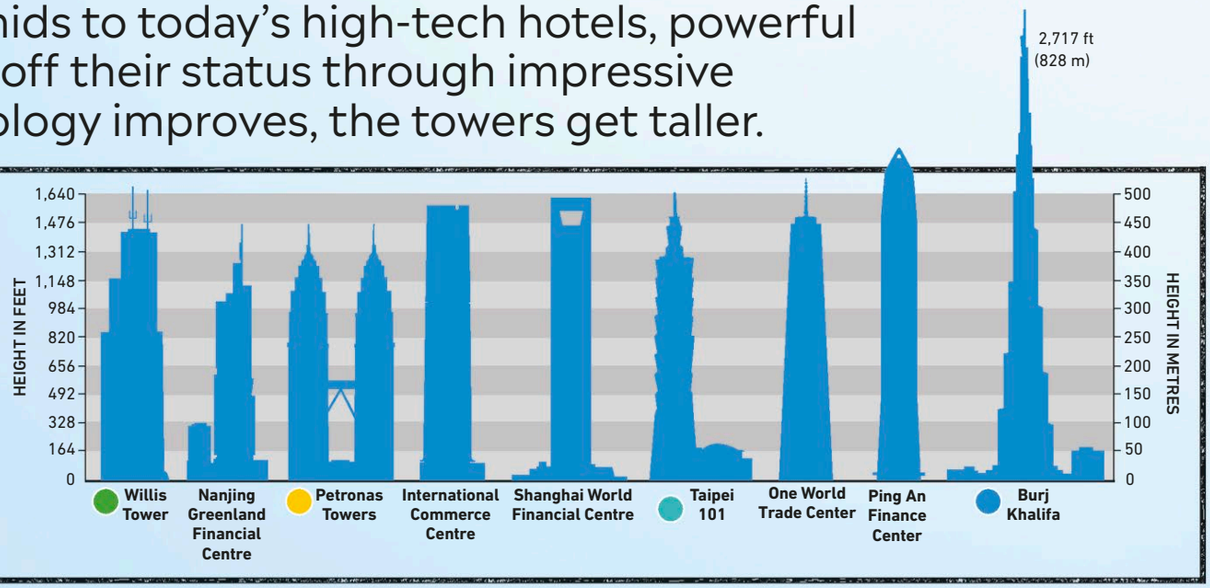


Tallest buildings

From ancient pyramids to today's high-tech hotels, powerful people have shown off their status through impressive buildings. As technology improves, the towers get taller.

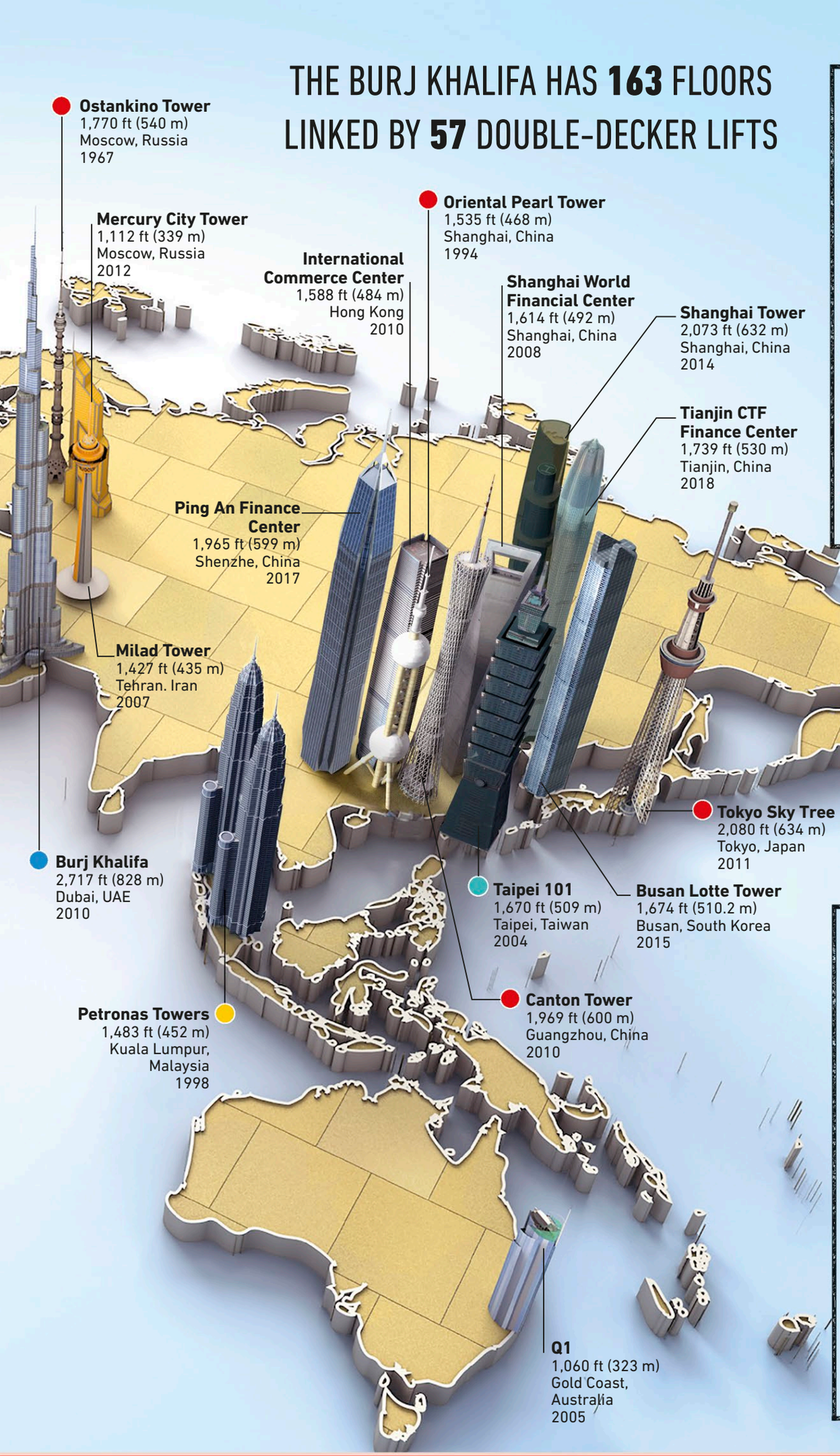
Big buildings

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 on these pages, or to the tip of any masts or aerials. Here are some of the world's tallest.



NEW YORK'S CHRYSLER BUILDING WAS THE WORLD'S TALLEST FOR JUST

THE BURJ KHALIFA HAS **163** FLOORS LINKED BY **57** DOUBLE-DECKER LIFTS



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 towers above Chicago.
- **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.

ONE YEAR, UNTIL THE EMPIRE STATE BUILDING WAS FINISHED IN 1931.

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

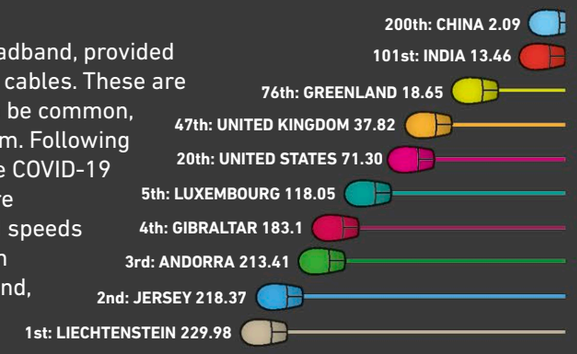
Today, there are more than three times as many computers, phones, and other devices connected to the Internet as there are people in the world. As a result, an incredible amount of Internet activity can occur in just one minute.

THERE ARE 4.54 BILLION INTERNET USERS

BY **OCTOBER 2012,**
THERE WERE AT LEAST
10 BILLION WEB PAGES

Internet connection speed

Nowadays, most Internet connections are broadband, provided by digital phone lines, satellites, or fiber-optic cables. These are much faster than the connections that used to be common, provided via ordinary phone lines and a modem. Following the huge rise of working from home due to the COVID-19 pandemic, Internet speed has never been more important. Here is a selection of the download speeds in different countries in 2020. Internet users in Liechtenstein had the world's fastest broadband, with an average peak download speed of just under 230 megabits per second.



PEAK CONNECTION SPEED (MEGABITS PER SECOND) AND WORLD RANKING

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

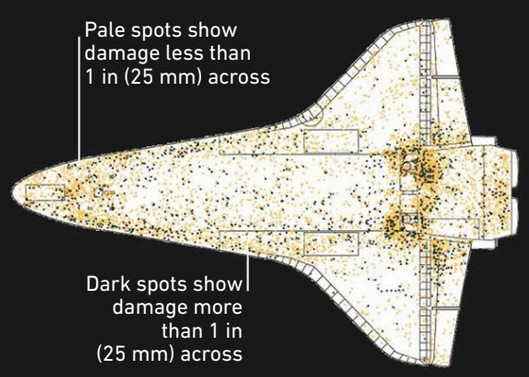
Satellites and space junk

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 (35,700 km) above 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 0.5 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).



ASTRONAUT EDWARD WHITE'S GLOVE, LOST DURING THE FIRST AMERICAN

AT LEAST **10 MILLION** PIECES OF ARTIFICIAL DEBRIS ARE NOW IN **EARTH ORBIT**

KEY
The image shows 22,300 objects monitored by the ESA Space Debris team by radar and telescopes.

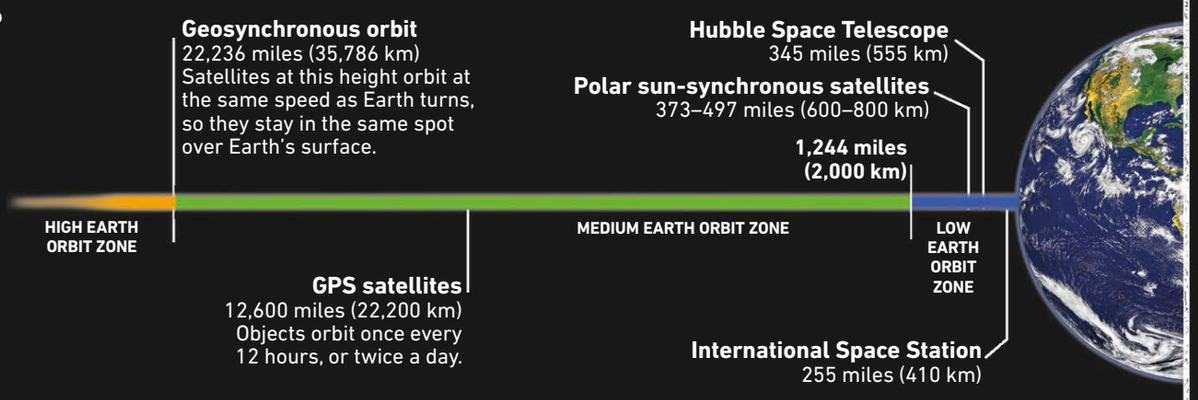
- **Satellites—mostly dead. About 2,300 operational**
- **Spent rockets**
- **Mission waste (nuts, gloves, lost items)**
- **Debris from explosions and collisions**

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 (99 miles / 160 km) objects circle Earth in 87 minutes at 17,470 mph (28,100 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.



SPACE WALK IN 1965, ORBITED FOR A MONTH AT 17,000 MPH (28,000 KPH).

A FEW **COUNTRIES,** SUCH AS **LIECHTENSTEIN** AND **COSTA RICA,** HAVE **NO MILITARY FORCES**

USA
The USA spends almost $934 billion per year on its armed forces—more than the next seven-biggest spending countries added together.

UK
In 2010, the UK spent $56 billion on its armed forces, making it the world's fifth-biggest military spender.

France
France holds the world's third-largest nuclear arsenal, with 300 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 mandatory.

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 $1.83 trillion, which is equivalent to $235 for every person on the planet—almost double what was spent per capita in 2001. 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**

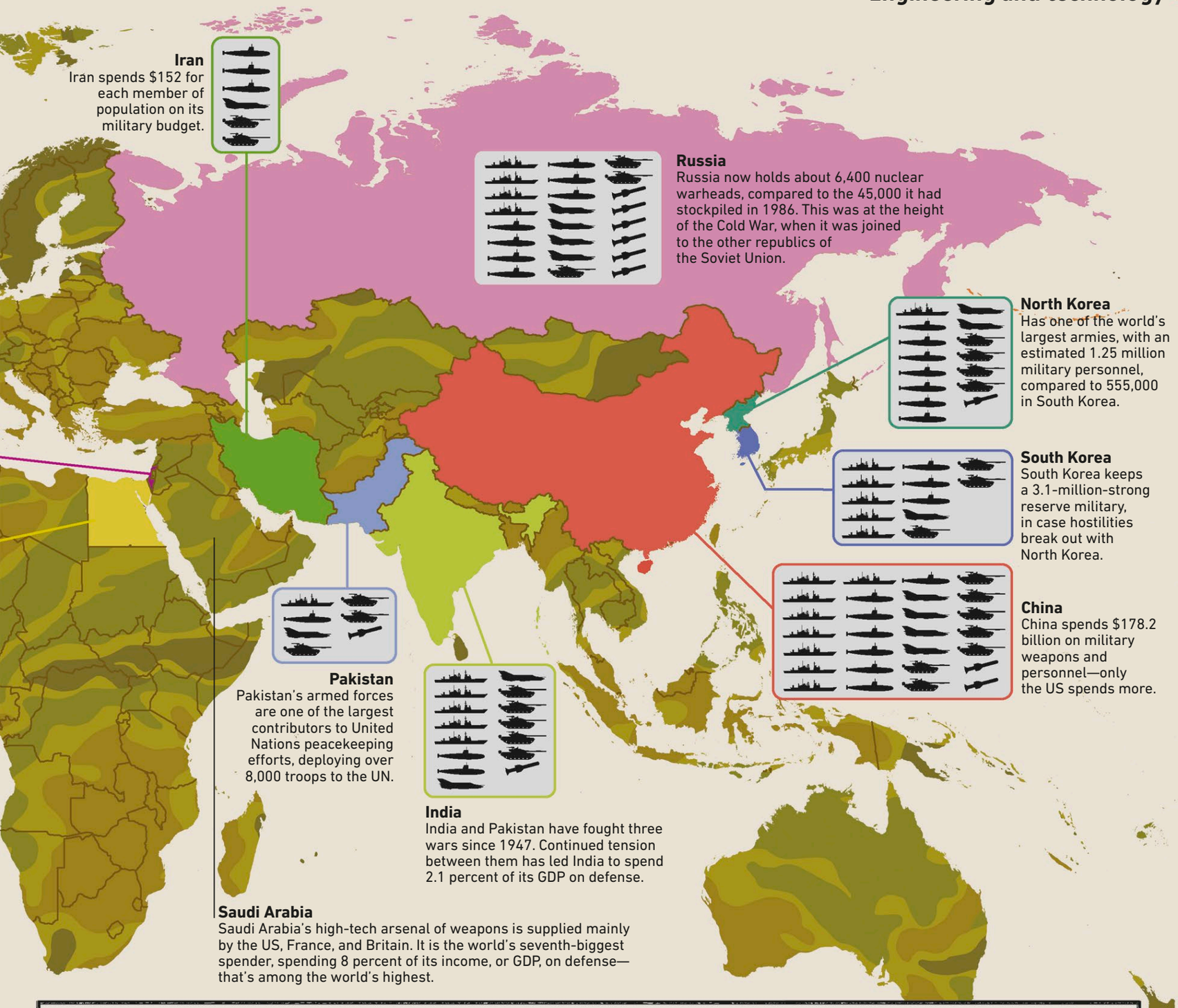
Armed forces

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.

Sky-high 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.

THE US HAS 4 PERCENT OF THE WORLD'S POPULATION BUT



Iran
Iran spends $152 for each member of population on its military budget.

Russia
Russia now holds about 6,400 nuclear warheads, compared to the 45,000 it had stockpiled in 1986. This was at the height of the Cold War, when it was joined to the other republics of the Soviet Union.

North Korea
Has one of the world's largest armies, with an estimated 1.25 million military personnel, compared to 555,000 in South Korea.

South Korea
South Korea keeps a 3.1-million-strong reserve military, in case hostilities break out with North Korea.

China
China spends $178.2 billion on military weapons and personnel—only the US spends more.

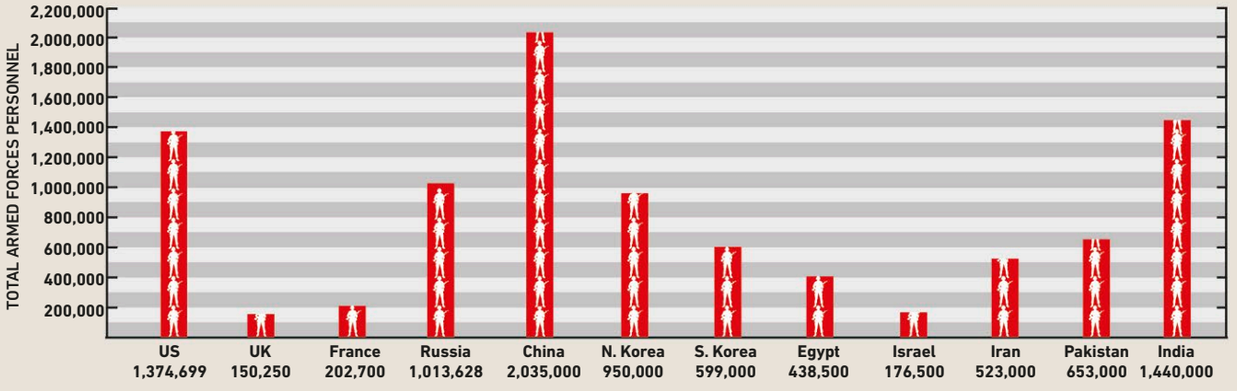
Pakistan
Pakistan's armed forces are one of the largest contributors to United Nations peacekeeping efforts, deploying over 8,000 troops to the UN.

India
India and Pakistan have fought three wars since 1947. Continued tension between them has led India to spend 2.1 percent of its GDP on defense.

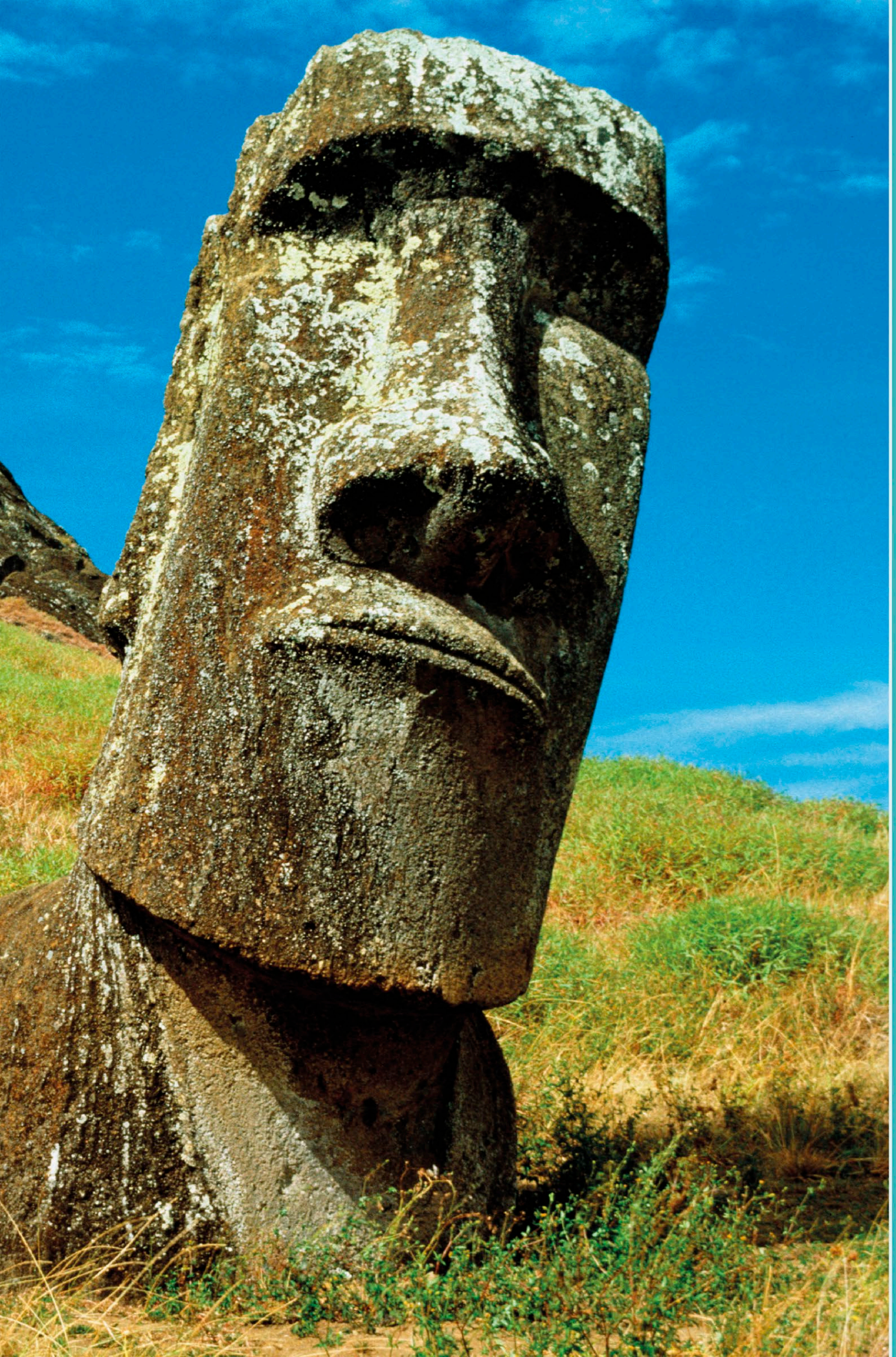
Saudi Arabia
Saudi Arabia's high-tech arsenal of weapons is supplied mainly by the US, France, and Britain. It is the world's seventh-biggest spender, spending 8 percent of its income, or GDP, on defense—that's among the world's highest.

Military personnel

China commands the world's largest active military force of more than 2 million—but this is only one-and-a-half soldiers in every thousand people. In North Korea, a massive one-fifth of males ages 17–54 are in the regular armed forces.



CONTRIBUTES 38 PERCENT OF ITS TOTAL MILITARY SPENDING.

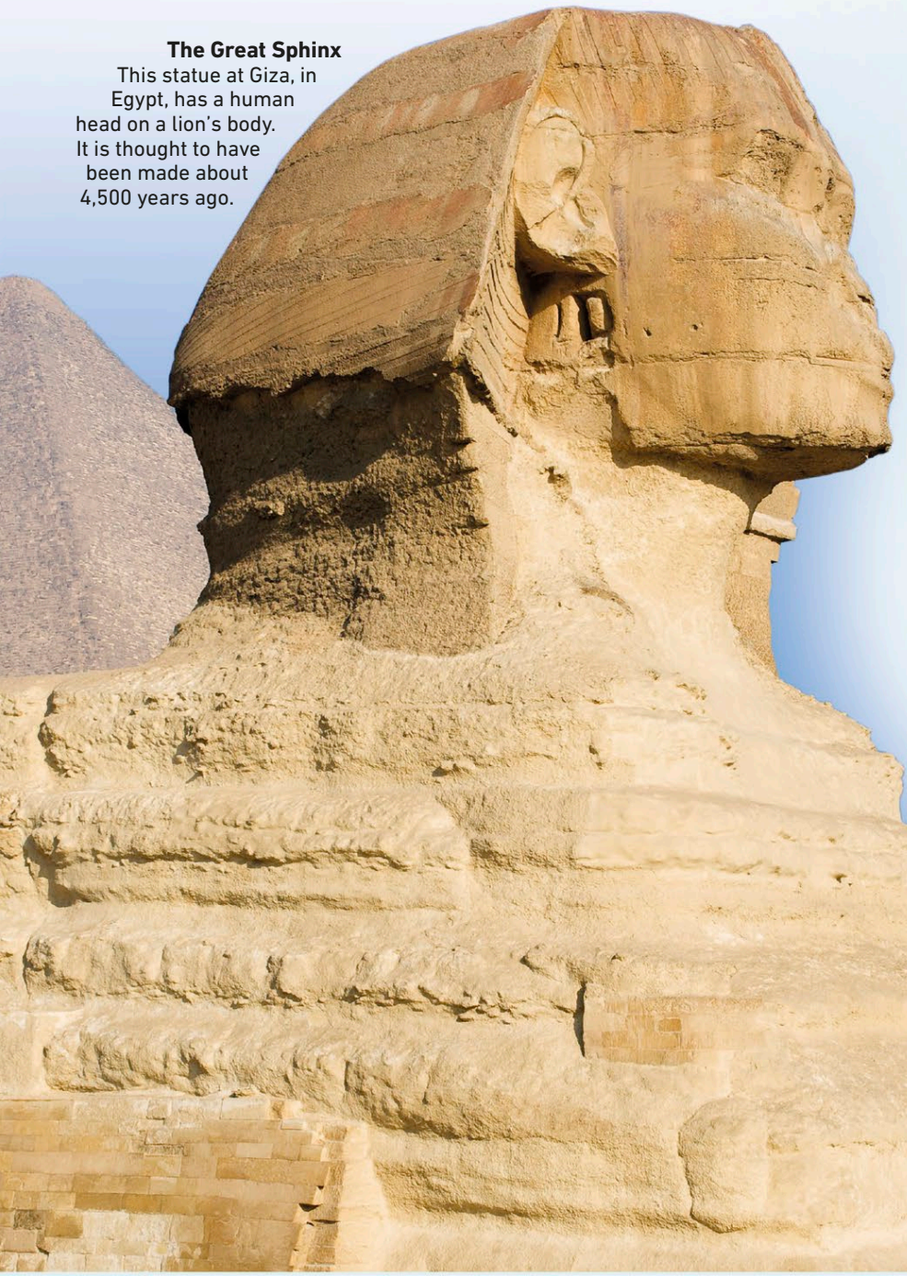


History

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 incidents, 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.



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 about 4,500 years ago.

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
Christian and Muslim armies fight nine wars to control Jerusalem.

1200
Holy Roman Empire
This "superpower" of the Middle Ages covers much of central Europe.

900
Khmer dominance, Asia
With their capital at Angkor, the Khmers rule 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 grow powerful and wealthy through its control of trade.

1350
Kingdom of Zimbabwe
The capital of this southern African kingdom is 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.

1945–54
First Indochina War
Indochina (Vietnam, Cambodia, and Laos) wins independence from France.

1939–45
World War II
Allied forces (Britain, France, the US, USSR, and others) at war with Germany, Japan, and Italy.

1950–53
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.

1955–75
Vietnam War
Communist North Vietnam triumphs over South Vietnam, which is aided by US forces.

1969
Concorde
The world's first supersonic airliner, Concorde, flies for the first time.

2011
World's longest bridge, China
Completion of the 102.4-mile-(164.8-km-) long Danyang-Kunshan Grand Bridge.

2020
COVID-19
Outbreak of a newly discovered coronavirus causes a global pandemic, with up to 2.6 million deaths in the first year.

2011
"Arab Spring"
Revolution and protest sweep through Egypt, Libya, and other Arab countries.

IN ALL THE YEARS OF HUMAN HISTORY, SMALLPOX IS THE

c.90,000 years ago
Burial rites
People begin burying their dead along with meaningful objects such as beads.

c.40,000 years ago
First music and art
Music is played on simple flutes, and figurines are carved from stone.

c.3200 BCE
Pirámide Mayor, Peru
Built by the Norte Chico civilization at Caral, the most ancient city in the Americas.

c.2589–2500 BCE
Pyramids of Giza, Egypt
Vast tombs are built for the Egyptian pharaohs Khufu, Khafre, and Menkaure.

1450 BCE
New Kingdom of Egypt
Egypt's empire stretches north to Syria and south to Nubia (modern Sudan).

c.700 BCE
Olmec civilization
Mexico's Olmec culture reaches its peak. It will influence the later Mayan and Aztec cultures.

490 BCE
First Persian Empire
Persia rules territory from the edge of India to Egypt and Greece, linking East with West.

323 BCE
Macedonian Empire
King Alexander the Great of Macedonia rules lands from Greece to the edge of India.

265 BCE
Mauryan Empire, Asia
Under Ashoka, the Mauryan Empire extends over almost all of the Indian subcontinent.

264–146 BCE
Punic Wars
Three wars erupt 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).

700
Tihuanaco, Peru/Bolivia
This strong state is centered on a bustling city beside Lake Titicaca in the Andes.

650
Huari Empire, Peru
The highly organized Huari, in Peru, conquer and control much of the Andean region.

555
Byzantine power
Byzantine rule extends over North Africa and the eastern part of the old Roman Empire.

c.300 CE
Mayan culture, Central America
Established by 1000 BCE, Mayan civilization is now at its height. It will last until 1697 CE.

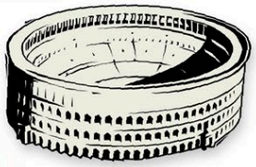
117 CE
Roman supremacy
Rome now controls much of Europe, north Africa, and the Middle East.

100 CE
Pyramid of the Sun, Mexico
One of two huge stepped pyramids is built in the city of Teotihuacán.

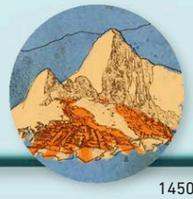
80 CE
Colosseum, Rome
Opening of the stadium in Rome where gladiators fought to the death.

87 BCE
Han Dynasty, China
A time of prosperity in China and an expansion of territories ruled by China.

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
Ming Dynasty, China
After throwing out the Mongols, China restores its culture and expands its borders.

1500
Songhai power, Africa
The Songhai control the Niger Valley, west to Senegal and east to Agades (modern Niger).

1519
Aztec rule, Mexico
The Aztecs now rule more than 25 million people. In 1521, they are conquered by the Spanish.

1532
Battle of Cajamarca, Peru
Spanish invaders defeat the Inca forces of Atahualpa, leading to 300 years of Spanish rule.

1642–51
English Civil War
Parliamentarians defeat Royalists, leading to the execution of King Charles I.

1683
Battle of Vienna
Ottoman expansion finally halts with a defeat by the Holy Roman Empire.

1690
Mughal Empire, India
Under Aurangzeb, the Islamic Mughal 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.

1917
Russian Revolution
Revolt against rule by Tsar Nicholas II; Russia becomes Communist.

1914–18
World War I
Britain, France, the US, and other allies battle Germany, Austria-Hungary, and Turkey.

1912
Sinking of the *Titanic*
More than 1,500 people die when this luxury liner hits an iceberg and sinks.

1880–1902
Boer Wars, Africa
Two wars are fought between Dutch Boer settlers in South Africa and Britain.

1861–65
American Civil War
War between the southern Confederate states and the Union states of the north.

1819–30
South American independence
Independence from Spain for Colombia, Peru, Bolivia, Ecuador, and Venezuela.

1799–1815
Napoleonic era
France, led by Napoleon Bonaparte, is the dominant military power in Europe.

1789–99
French Revolution
Overthrow of the French monarchy in a bloody revolution. France becomes a republic.

1775–83
American Revolutionary War
With the help of France and other countries, the US wins independence from Britain.

1980
Very Large Array
In New Mexico, this giant radio astronomy observatory is completed.

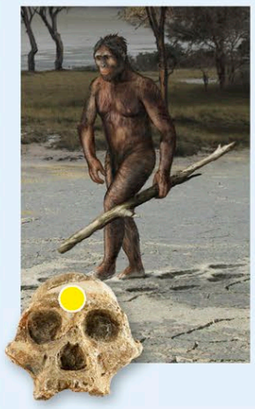
1994
End of Apartheid
South Africa's official segregation policy, Apartheid, ends and equality is reached for Black South Africans.

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.

ONLY VIRUS TO BE ERADICATED THROUGH VACCINATION.

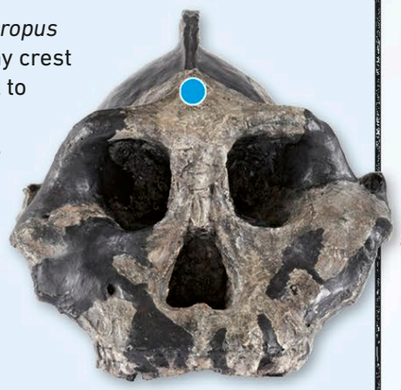
Australopithecus



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.

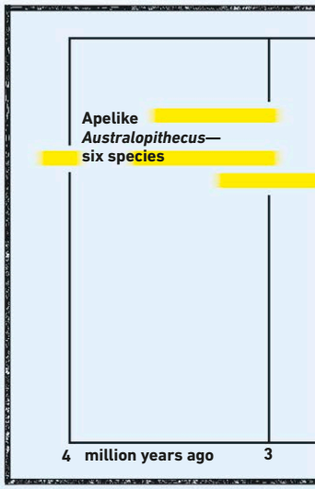


Neander Valley, Germany
A partial skeleton of *H. neanderthalensis* found in a cave here in 1856 was the first fossil to be identified as human remains.

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.



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.

HOMO SAPIENS EVOLVED ABOUT 200,000 YEARS AGO. THE EARLIEST

Zhoukoudian Caves, China
Some of the most important fossils of *H. erectus* were found in these limestone caves 30 miles (50 km) from Beijing.

Flores, Indonesia
H. floresiensis remains are known from just one cave on this island.

Java, Indonesia
The earliest known human fossils in East Asia—of *Homo erectus*—come from this island.

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.

Homo habilis
(2.4–1.4 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 only from a single fossil site in Georgia, this may have been 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 than its apelike ancestors.

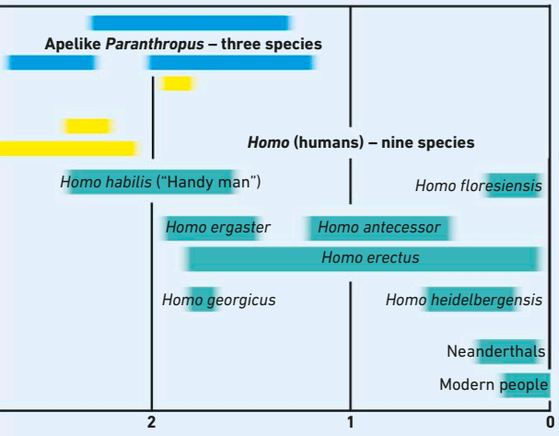
Homo erectus
(1.8 million–200,000 years ago)
Along with *H. ergaster*, *H. erectus* ("Upright man") is known to have used stone hand-axes.

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
(600,000–250,000 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
(200,000–30,000 years ago)
This successful species was skilled at hunting, made and used stone tools, and buried its dead.



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.

KNOWN FOSSILS, FROM ETHIOPIA, ARE 195,000 YEARS OLD.

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 archaeologists can date.

Earliest music

Music, like art, is much 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

East Wenatchee, Washington, US

Walker, Minnesota, US

Horseshoe Canyon paintings, Utah, US

Cactus Hill, Virginia, US

Clovis, New Mexico, US

Salado, Texas, US

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 40,800 years ago, possibly by Neanderthals

Lady of Brassempouy carving, France

Ivory horse figurine, Lourdes, France

Shell beads, Grotte des Pidgeons, Morocco

Algerian Sahara

Serra de Capivara paintings, Brazil

Cueva de las Manos paintings, Argentina

Cueva del Milodon, Chile

Changes in stone tools

2.4 million years ago
The earliest tools, called the Oldowan tool kit, 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 tool kit of our later ancestors, such as *Homo erectus*, included a new invention—the hand ax, with a finely chiseled edge.

● Acheulean site

200,000 years ago
Mousterian tools spanned the Middle Stone Age (ended around 40,000 BCE) and included lots of specialized shapes for different jobs.

● Mousterian site

13,000 years ago
The earliest stone tools discovered in America are from the 13,000-year-old "Clovis" people.

● Clovis site

THE FIRST KNOWN SEWING NEEDLE DATES BACK ABOUT 25,000 YEARS.

THE **OLDEST KNOWN CLAY POTS** WERE MADE IN **CHINA** ABOUT **20,000** YEARS AGO

Flutes, Hohle Fels Cave, and Geissenklösterle, Germany

Bisovava, Russia

"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

Tbilisi, Georgia

Balzi Rossi caves, Italy

Pechka rock shelter, Armenia

Majuangou, China

Carved bone disk, Xiaogushan, China

Shanidar Cave, Iraq

Kashafrud, Iran

Riwat, Pakistan

Bone flutes, Jiahu, China

Qafzeh, Israel

Shell beads, Skhūl, Israel

Chauvet Cave, France

Bhimbetka paintings, India

Gebelein, Egypt

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

Kakadu National Park, Australia

Inanke Cave, Zimbabwe

Sterkfontein, South Africa

Swartkrans, South Africa

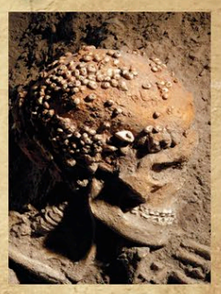
"Apollo 11" rock shelter, Namibia

Shell beads, Blombos Cave, South Africa

Earliest burials

Our ancestors began burying their dead with significant objects, such as beads or other decorations, at least 100,000 years ago.

◆ Early burial site



Skull with shells, 25,000 years ago, Balzi Rossi, Italy

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, 40,000 years ago

IT WAS MADE OF BONE AND USED TO SEW TOGETHER ANIMAL HIDES.

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.

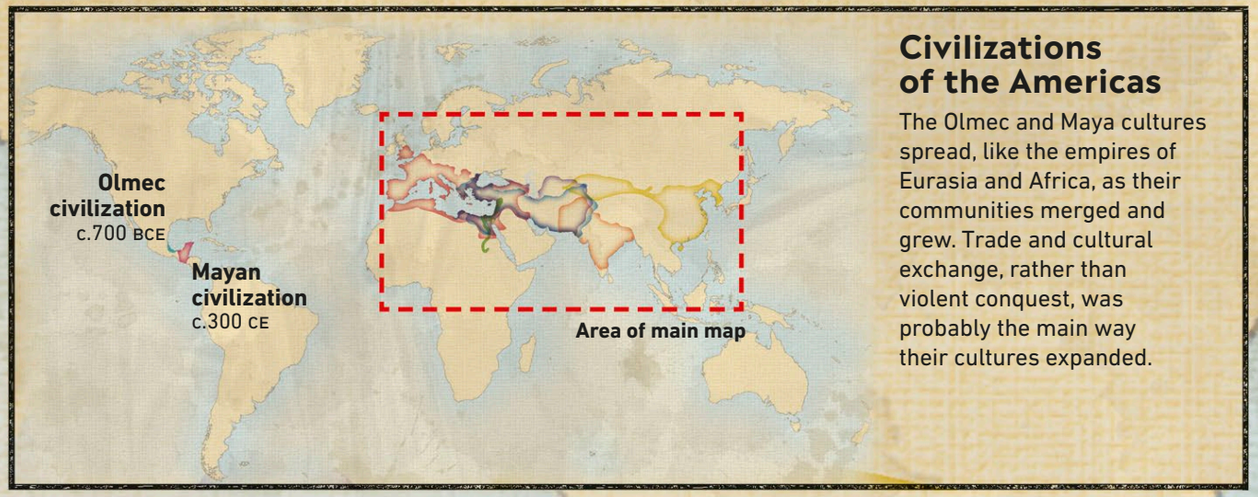
Rise and fall
This map shows the territories of each ancient empire at its peak. Some empires fell as dramatically as they rose, whereas others, such as the Roman Empire, declined gradually over centuries.

BRITAIN
GERMANY
Roman Empire in 117 CE
GAUL
Rome
IBERIA
GREECE
ASIA MINOR
MAURETANIA
MESOPOTAMIA
PERSIA
Babylon
First Persian Empire in 490 BCE
Pasargadae
EGYPT
Thebes
New Kingdom of Egypt in 1450 BCE

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.

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.



Civilizations of the Americas

The Olmec and Maya cultures spread, like the empires of Eurasia and Africa, as their communities merged and grew. Trade and cultural exchange, rather than violent conquest, was probably the main way their cultures expanded.

AT ITS HEIGHT, THE HAN EMPIRE OF CHINA RULED 60 MILLION PEOPLE,

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.

BACTRIA

Empire of Alexander the Great in 323 BCE

The Silk Road
This trading route from China to Rome was vitally important to both empires. Merchants used it to trade Chinese silk for glass, linen, and gold from the West.

Han Chinese Empire in 87 BCE

Chang'an

CHINA

INDIA

Pataliputra

Mauryan Empire in 265 BCE

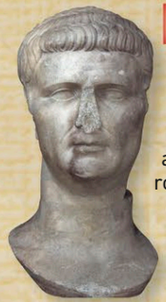
ALEXANDER THE GREAT WON EVERY BATTLE HE FOUGHT

Mauryan figure

Mauryan Empire
321–185 BCE
Chandragupta Maurya was the first leader to conquer the entire Indian subcontinent. His son Ashoka became a Buddhist and ruled the empire peacefully for 42 years.

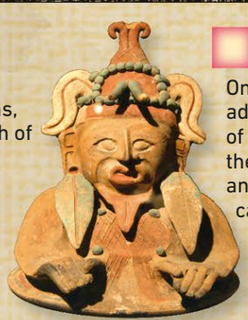
Han pot

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 BCE–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.

MORE THAN ONE-QUARTER OF THE WORLD'S POPULATION AT THE TIME.

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.

Worldwide wonders

Incredible feats of engineering, building, and sculpture occurred across the globe in ancient times.

THE COLOSSEUM IN ROME COULD HOLD MORE THAN 50,000 SPECTATORS.

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 Mausolus, 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, 105 ft (32 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 43-ft (13-m) statue of the king of the gods.

Hagia Sofia
532–537 CE, Istanbul, Turkey

Acropolis
5th century BCE, Athens, Greece

Temple of Artemis
Reconstructed in c.550 BCE, Ephesus, Turkey

Mausoleum at Halicarnassus
351 BCE, Bodrum, Turkey

Statue of Zeus
430 BCE, Olympus, Greece

Colossus of Rhodes
292–280 BCE, Rhodes, Greece

Pharos of Alexandria
c.280 BCE, Alexandria, Egypt

Pyramids of Giza
c.2589–2500 BCE, Cairo, Egypt

Petra
4th century BCE, Jordan

Hanging Gardens of Babylon
c.600 BCE, Hillah, central Iraq

Temples of Abu-Simbel
c.1257 BCE, Abu-Simbel, Egypt

THE **GREAT PYRAMID** OF GIZA COULD WEIGH AS MUCH AS **716** MILLION TONS

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.

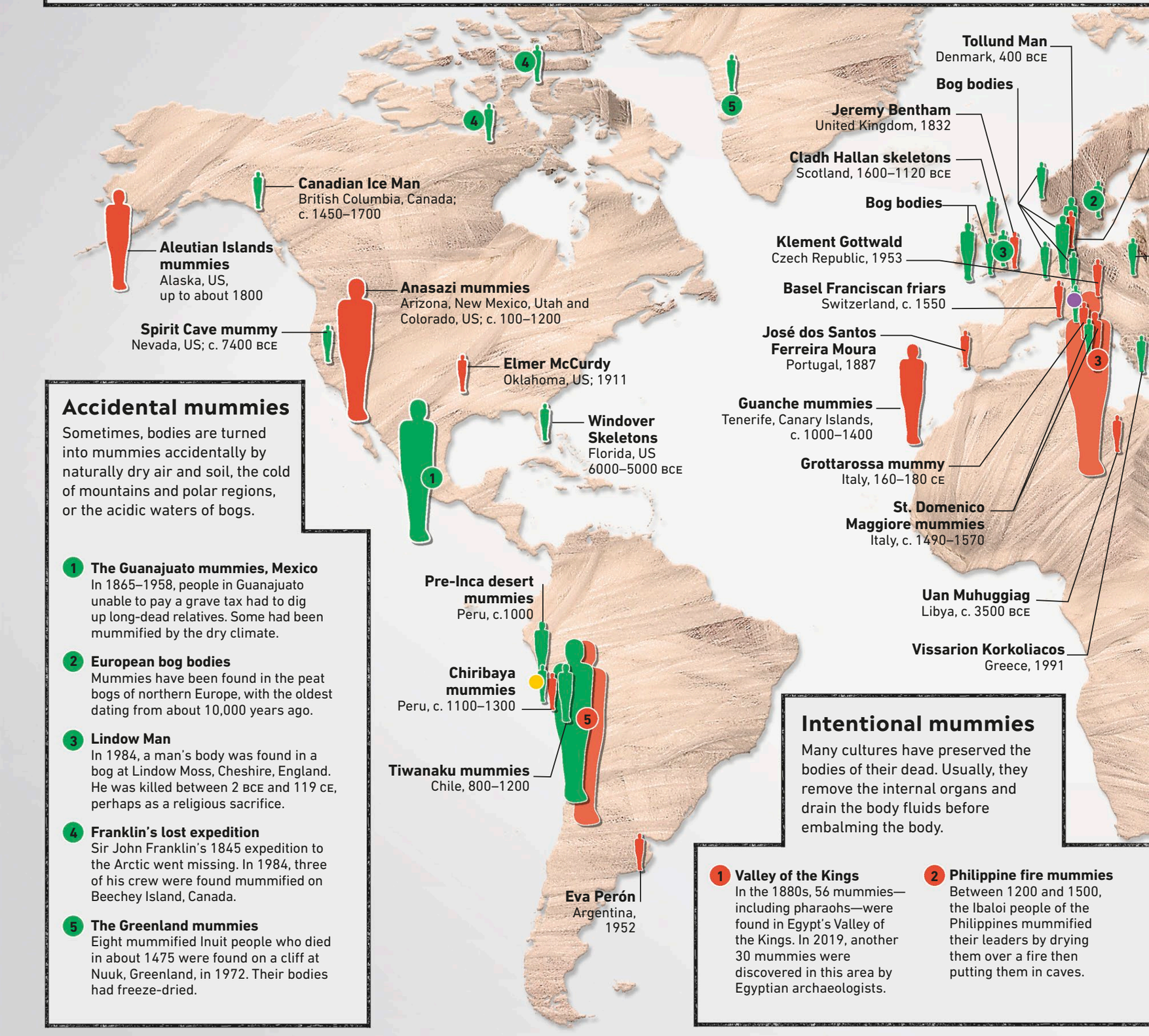
Terracotta Army
8,000 life-size warriors entombed with the first emperor of China.

Aksum Stelae
A group of memorial obelisks carved from huge blocks of stone.

Famous mummies

Ötzi the Iceman
About 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 about 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 about 1475 were found on a cliff at Nuuk, Greenland, in 1972. Their bodies had freeze-dried.

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.

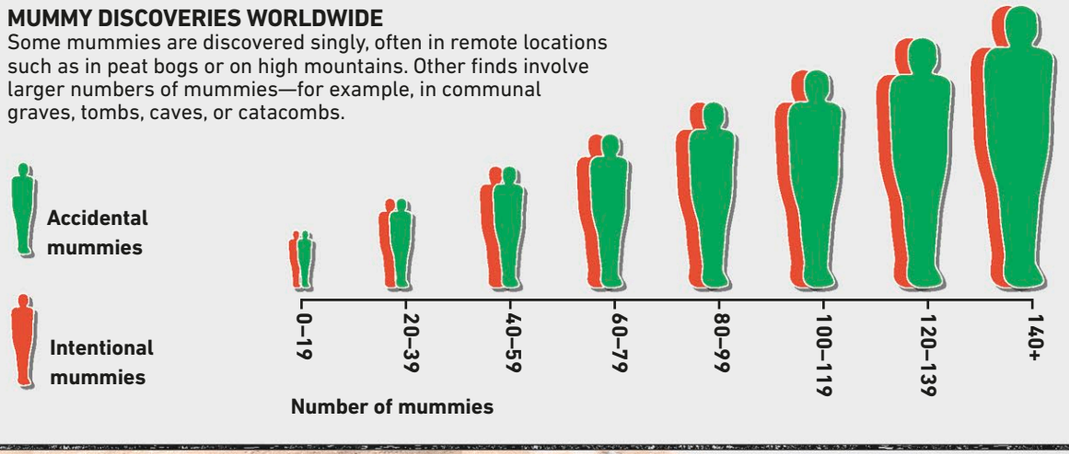
1. **Valley of the Kings**
In the 1880s, 56 mummies—including pharaohs—were found in Egypt's Valley of the Kings. In 2019, another 30 mummies were discovered in this area by Egyptian archaeologists.

2. **Philippine fire mummies**
Between 1200 and 1500, the Ibaloi people of the Philippines mummified their leaders by drying them over a fire then putting them in caves.

WHEN EGYPTIAN EMBALMERS PREPARED A PHARAOH'S BODY FOR

Juanita the Ice Maiden
In 1995, an Inca girl aged 11–15 was found on Mount Ampato, Peru. The discoverers named her Juanita, or the "Ice Maiden." She was sacrificed to the gods about 530 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.

James Hepburn, 4th Earl of Bothwell
Denmark, 1578

Charles Eugène de Croÿ
Estonia, 1702

Vladimir Lenin
Russia, 1924

Georgi Dimitrov
Bulgaria, 1949

Dröbnitz Girl
Poland, 650 BCE

Valley of the Golden Mummies Egypt, 332 BCE–395 CE

Maronite mummies
Lebanon, 1283

Chehrabad Salt Mine mummies Iran, 4th century BCE–4th century CE

Tarim mummies
China, 1800–200 BCE

Siberian Ice Maiden
Russia, c. 400 BCE

Pazyryk ice mummies
Mongolia, c. 700–200 BCE

Fujiwara clan mummies
Japan, 1128–1189

Kim Il-Sung and Kim Jong-il
North Korea, 1994 and 2011

Mao Zedong
China, 1976

Xin Zhui
China, c. 150 BCE

Ho Chi Minh
Vietnam, 1969

Mummy monk "Luang Phor Daeng"
Thailand, c. 1985

Vu Khac Minh and Vu Khac Truong
Vietnam, c. 1600–1700

Chiang Kai-shek and Chiang Ching-kuo
Taiwan, 1975 and 1988

Buddhist self-mummified nun and monks
Taiwan, 1680–1830,

Korean mummies
South Korea, c. 1350–1500

Lost mummies of New Guinea
Papua New Guinea, up to 1950s

Iufaa and family
Egypt, c.500 BCE

Saqqara mummies
Egypt, 640 BCE

Nubian mummies
Sudan, 250–1400

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 body toxic to maggots, and then were sealed alive in a stone tomb.

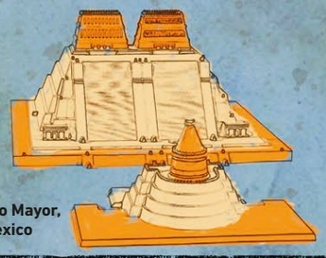
5 Chinchorro mummies
The Chinchorro, who lived in what is now Chile and Peru, were the first people known to make mummies. Their oldest mummies date from as early as 5000 BCE.

THE PALERMO **CATACOMBS** CONTAIN ABOUT **8,000 MUMMIES**

Medieval wonders

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

Angel Mounds
Evansville, Indiana, 1000 CE

Cahokia Mounds and Monks Mound
Collinsville, Illinois, 600–1400 CE

Parkin Indian Mound
Parkin, Arkansas, 1350

Taos Pueblo
New Mexico, between late 1200s and mid-1500s

Great Houses of the Chacoan people,
Chaco Canyon, New Mexico, between 900 CE and 1150 CE

Kincaid Mounds
Brookport, Illinois, 1050–1400 CE

Moundville settlement
Alabama, 1000–1450 CE

Ocmulgee Great Temple Mound
Macon, Georgia, 950–1150 CE

Templo Mayor
Mexico City, Mexico, first built 1325, rebuilt six times

El Castillo
Chichen Itza, Mexico, 9th–12th century

Calixtlahuaca
Toluca, Mexico, 1100–1520 CE

Temple of the Inscriptions
Chiapas, Mexico, 683 CE

Cusco and the Koricancha
Vilcabamba, Cusco, Peru, between 1200s and 1532

Machu Picchu
Vilcabamba, Cuzco, Peru, 1450

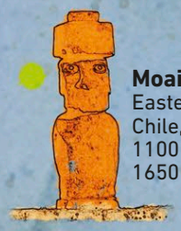
Isla del Sol
Lake Titicaca, Bolivia, 15th century

El Fuerte de Samaipata
Bolivia, 14th century

Sacsayhuamán
Cuzco, Peru, between early 1400s and mid-1500s

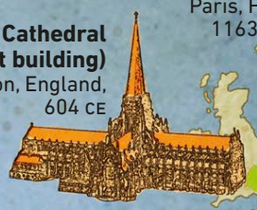
Ollantaytambo
Cuzco, Peru, mid-15th century

Moai figures
Easter Island, Chile, between 1100 CE and 1650 CE

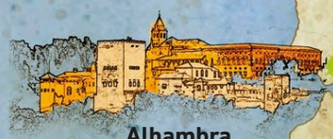


Notre Dame de Paris
Paris, France, 1163–1345

St. Paul's Cathedral (first building)
London, England, 604 CE



Cluny Abbey
Burgundy, France, 910 CE



Alhambra
Granada, Spain, 14th century

Benin Bronzes
Kingdom of Benin (in modern Nigeria), 13th–16th century

Timbuktu
Mali, 12th century

Royal Palaces of Abomey
Dahomey (modern Benin), 1695

South America

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

"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.

DJENNÉ'S GREAT MOSQUE, THE WORLD'S LARGEST MUD-BRICK BUILDING,

South America

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 453 ft (138 m) high.

Papal Basilica of St. Peter, Italy

KEY
Locations and dates of medieval wonders.

- Pictured wonders
- Other wonders

Leaning Tower of Pisa
Italy, 1173–1372

St. Basil's Cathedral
Moscow, Russia, 1555–61

Moscow Kremlin
Moscow, Russia,1485–1495

Papal Basilica of St. Peter
Vatican City, Rome, Italy, 1506–1626

Imam Reza Shrine
Mashhad, Iran, 818 CE

Taj Mahal
Agra, India, 1632–48

Great Wall of China (Ming Dynasty)
14th century

Ani, Armenian City
Kars Province, Turkey, 5th century CE

Grand Canal
China, 5th to 15th centuries

Kiyomizu Temple
Kyoto, Japan, 798 CE

Porcelain Tower of Nanjing
River Yangtze, Nanking, China, early 15th century, reconstructed 2010

Prophet's Mosque (Al-Masjid al-Nabawi)
Medina, Saudi Arabia, 622 CE

The Great Mosque of Djenné
Djenné, Mali, 1200–1330

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

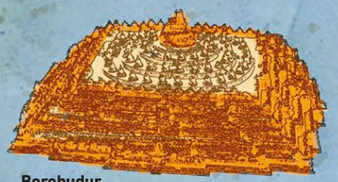
Rock-hewn churches at Lalibela
Ethiopia, 13th century

Borobudur
Central Java, Indonesia, 9th century CE

City of Great Zimbabwe
Near Masvingo, Zimbabwe, 11th century

Asia

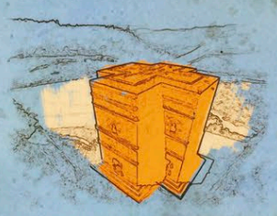
The vast Buddhist temple at Borobudur, Java, has six stepped rectangular stories, three circular terraces, and is decorated with 2,672 carved panels and 504 statues.



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 **3.99** DEGREES

IS BUILT ON A PLAFTFORM TO PREVENT DAMAGE FROM RIVER FLOODS.

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 joined up large regions for the first time, while empires in the Americas grew in isolation from the rest of the world.

Ottoman battle helmet

Holy Roman Empire in 1200 CE

Frankfurt

Byzantine Empire in 555 CE

Ottoman Empire in 1683 CE

Istanbul

Constantinople

Damascus

Umayyad Caliphate in 750 CE

Songhai Empire in 1500 CE

Mali Empire in 1350 CE

Gao

Koumbi Saleh

Ka-ba (Kangaba)

Kanem Empire in 1300 CE

Njimi

Mali Empire
c. 1230–1600
A west African empire that became wealthy through trading gold and developing agriculture along the banks of the Niger.

Ancient Ghana
500s-1076
The kingdom of Ghana grew rich on gold mined from its valley and exported along the trans-Saharan trade routes. It was conquered by Berbers in 1076.

Asante Empire in 1750 CE

Kumasi

Asante Empire
1670–1902
A sophisticated and disciplined society. Clever strategies and adoption of western firearms helped bring about military expansion.

Asante trophy head

Ethiopian Empire
1137-1974
In about 1200, the ruling Zagew dynasty of this Christian empire carved churches straight into the rocky ground in the town of Lalibela.

São Salvador (M'banza-Kongo)

Kingdom of Kongo in 1625 CE

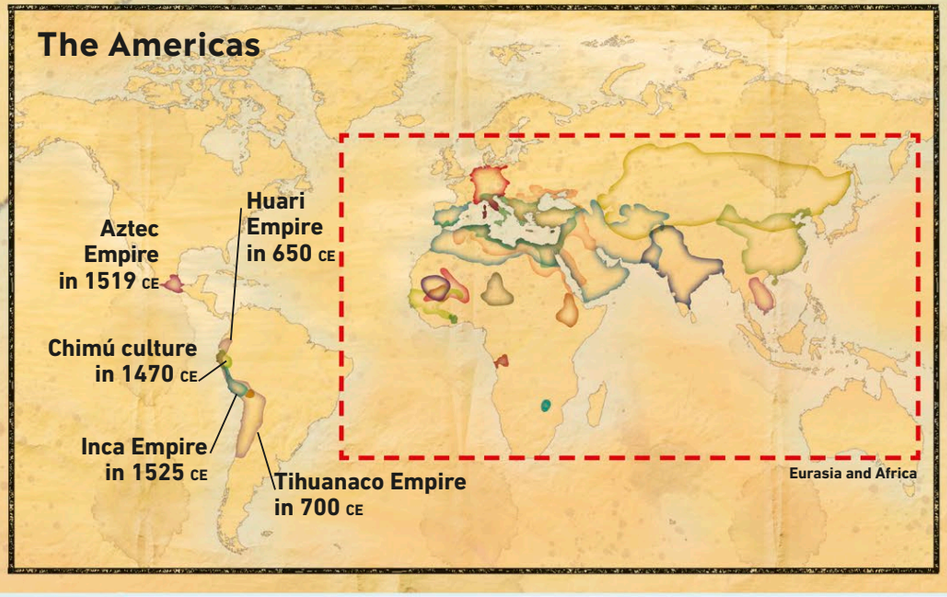
Kingdom of Kongo
1390–1914
Ruled by a "manikongo" (king) and divided into six regions. The Atlantic slave trade weakened the empire, and eventually the Portuguese took control.

Kingdom of Zimbabwe 1350 CE

Great Zimbabwe

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.

The Americas



THE AZTECS SACRIFICED TENS OF THOUSANDS OF THEIR OWN

AT ITS **PEAK**, THE **MONGOL EMPIRE** RULED OVER **100 MILLION** PEOPLE

Mongol Empire in 1227 CE

Mongol Empire
1206–1368
Founded by Genghis Khan in 1206. Numerous violent conquests led to the largest continuous land empire in history.


Mongol horde helmet

Karakorum

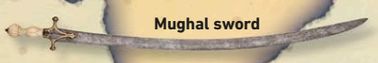
Ming China in 1500 CE

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.

Mughal Empire in 1690 CE

Shahjahanabad (Old Delhi)


Mughal sword

Angkor

Khmer Empire in 900 CE

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
330–1453
Evolved from the Eastern Roman Empire. A Christian, Greek-speaking empire that preserved both Roman and Greek cultures.


Byzantine necklace pendant

Mughal Empire
1526–1857
The Mughals 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.


Statue of Aztec god of death

Aztec Empire
1428–1521
From their capital built on artificial islands on a lake, the Aztecs, who called themselves Mexica, conquered most of modern-day Mexico.

Inca Empire
1438–1536
The largest empire of pre-Spanish Americas. Incas worshipped Inti, the sun-god, and were skilled at building cities high up in the Andes mountains.


Songhai coin

Songhai Empire
1375–1591
Rose up in the wake of the declining Mali Empire. The city of Timbuktu became a center of Islamic learning.

Chimú culture
c.850–1470
Skilled in pottery, textiles, and metalwork. Territory covered coastal regions by the Andes mountains. Conquered by the rival Inca Empire in 1470.

Umayyad Caliphate
661–1031
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 wooden figure

Huari Empire
540–1100
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
400–950
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.

PEOPLE AND ENEMY PRISONERS EACH YEAR TO APPEASE THE GODS.

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

Fort Columbia, Washington, US

Fort Union, New Mexico, US

Castillo San Felipe de Barajas, Colombia

Chan Chan ancient walled citadels, Peru

Fortifications of Valdivia, Chile

Castle of Santa Maria da Feira, Portugal

Castle of São Jorge, Portugal

Ribat of Monastir, Tunisia

Loropéni, Burkina Faso

Cape Coast Castle, Ghana

Elmina Castle, Ghana

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 keep by a moat.

Coastal prisons
These two castles on Ghana's coast have a dark history: they served as fortified links along the slave trade route during the 16th century.

Forts after the age of castles

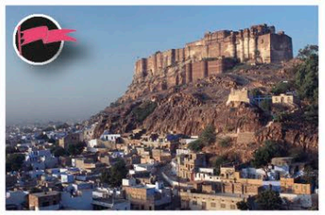
Forts became vital military centers. Their low, thick, angled walls were able to deflect cannonballs.

THE OTTOMAN TURKS BESIEGED THE FORTIFIED TOWN OF CANDIA,

Asian castles

Castles in Asia reflect local building styles and look different than those in Europe, but they served the same purpose.

Himeji, Japan Built as a fort in 1333, Himeji was then rebuilt several times between the 14th and 17th centuries. It has 83 buildings protected by 85-ft- (26-m-) high walls and 3 moats, and is Japan's largest castle.

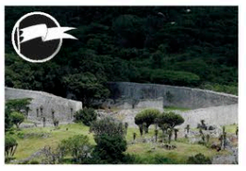


Mehrangarh Fort, India This fort, 400 ft (122 m) above the city of Jodhpur, hides several palaces within its walls. Built by the ruler Rao Jodha in 1459, it is entered through a series of seven gates.

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.

Moscow Kremlin, Russia

Kirkuk citadel, Iraq

Uqair, Saudi Arabia

Rohtas Fort, Pakistan

Bam citadel, Iran

Gyantse fortress, Tibet, China

Wan Ping fortress

Tuon Cheng fortress, China

Fort Glanville

Fort Queenscliff

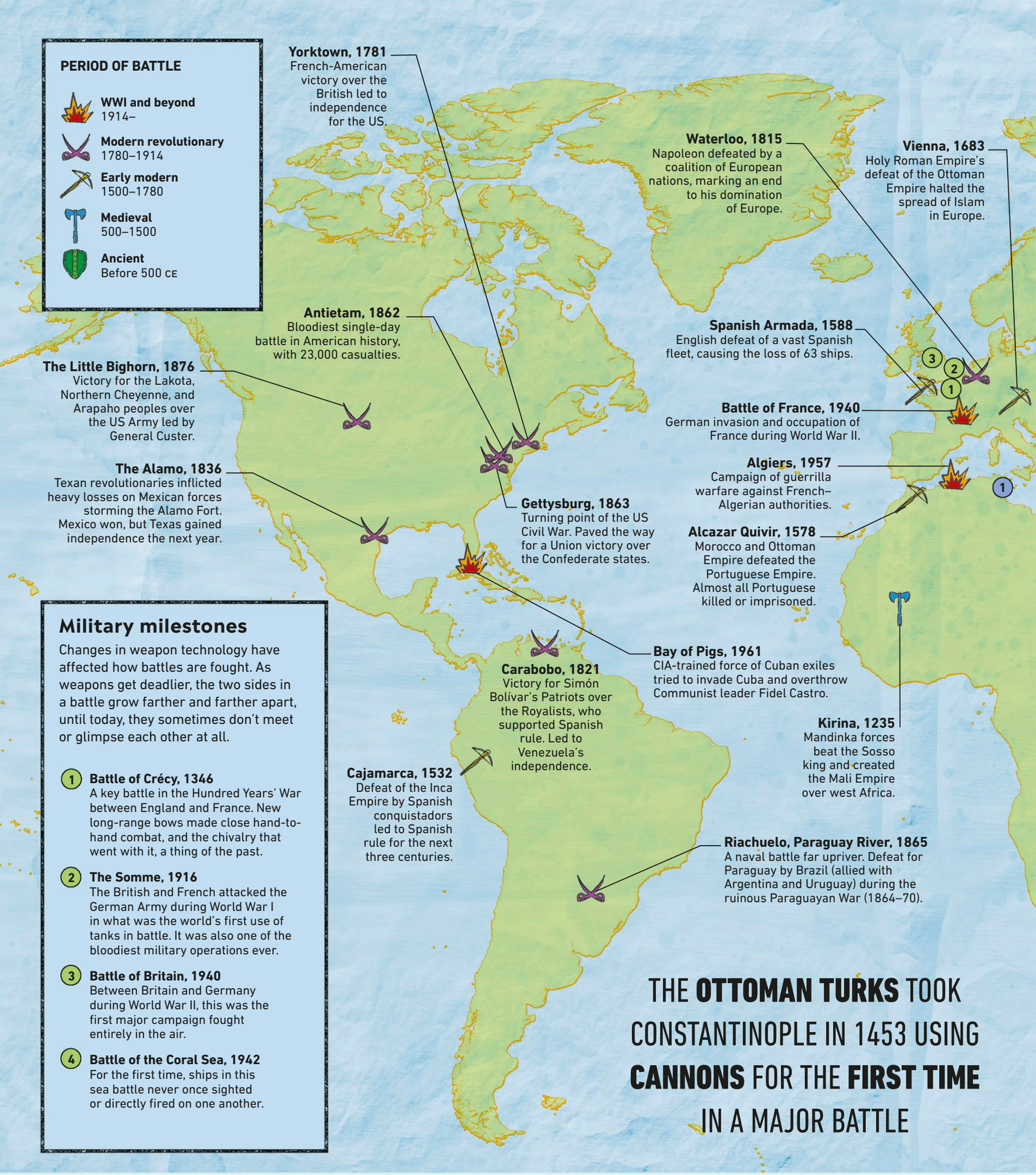
Fort Denison

WINDSOR CASTLE, ENGLAND, HAS BEEN A ROYAL RESIDENCE FOR **900** YEARS

Fort Independence, US 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.

CRETE, FOR OVER 21 YEARS BEFORE IT SURRENDERED IN 1669.



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 use of tanks in 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 **CANNONS** FOR THE **FIRST TIME** IN A MAJOR BATTLE

AFTER THE BLOODY BATTLE OF KALINGA, INDIAN EMPEROR ASHOKA

Sieges

Not strictly a battle, a siege is a military blockade of a city or fortress. The aim 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 3 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 4-month siege, Byzantine Empire fell to the invading Ottoman Empire.

Badger Mouth, 1211
Mongol ruler Genghis Khan's victory over the Jin Dynasty of China. One of history's bloodiest battles.

Huai-Hai, 1948
Final major fight in Chinese Civil War that led to the Communist takeover of China.

Battle of Inchon, 1950
A clear victory for the United Nations against North Korean forces in the Korean War.

Battle of Phillora, 1965
One of the largest tank battles of the Indo-Pakistani War. Decisive victory for Indian Army.

Iwo Jima, 1945
The US captured this island as a way of possibly invading Japan. More than 21,000 Japanese died.

Wuhan, 1938
Soviet and revolutionary Chinese forces totaling 1,100,000 troops and 200 aircraft failed to stop Japan from capturing the city.

Omdurman, 1898
Small British and Egyptian forces massacred a huge, but ill-equipped, Sudanese Army.

El Alamein, 1942
Major tank battle of World War II. British-led victory over Axis Powers (Italy and Germany).

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.

Kalinga, 262–261 BCE
The Mauryan Empire under Ashoka the Great fought the republic of Kalinga. At least 100,000 Kalingans were killed.

Isandlwana, 1879
Crushing victory for the Zulu nation over the British, despite relying mainly on spears and cowhide shields.

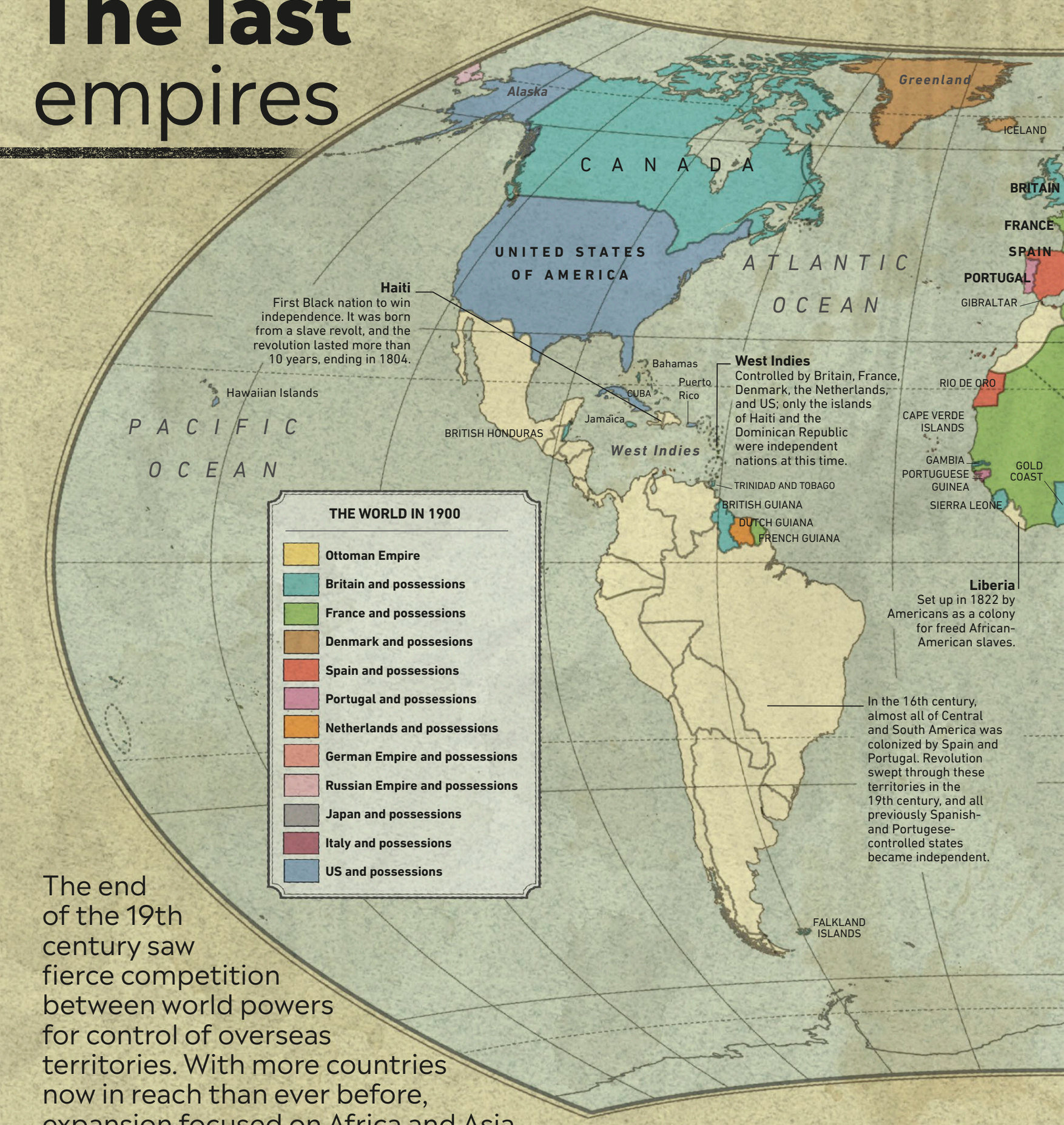
Surabaya, 1945
Heaviest battle of the Indonesian Revolution against the British and Dutch. Celebrated as Heroes' Day in Indonesia.

4 **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 theaters of war the size of countries.

The last empires



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.

AT ITS HEIGHT IN 1922, THE BRITISH EMPIRE CONTROLLED

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 mid-19th century. European powers colonized Africa for economic, political, and religious reasons, scrambling to claim territory before their rivals.

- **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 a handful of regions are still independent states. 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.

ALMOST ONE-QUARTER OF THE WORLD'S POPULATION AND LAND.

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

Tunisia
2011

Portugal
1974

Algeria
1954–62
(from France)

Thirteen colonies of North America
1776 (from Britain)

Cuba
1953–59

Mexico
1910–20

1

Haiti
1791–1804 (from France)

Nicaragua
1979–90

Venezuela
1823 (from Spain)
1830 (from Gran Colombia)

Panama
1903 (from Colombia)

Equador
1822 (from Spain) and
1830 (from Gran Colombia)

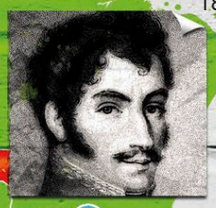
Colombia
1819 (from Spain)

2

Ghana
1957 (from Britain)

Peru
1824 (from Spain)

Angola
1961–75
(from Portugal)



Bolivia
1825 (from Spain)

3

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 Bolivar, 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 with no involvement in the revolutions listed on these pages

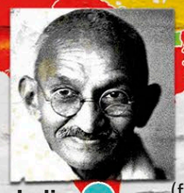
THE AMERICAN REVOLUTION OF 1776 GAVE HOPE TO POVERTY-

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.

4 **Russia**
1917

5 **China**
1949



6 **India**
1947 (from Britain)

Lithuania
1989 (from USSR)

Finland
1917 (from Russia)

Estonia
1989 (from USSR)

Latvia
1989 (from USSR)

Belarus
1989 (from USSR)

Ukraine
1989 (from USSR)

Moldova
1989 (from USSR)

Turkmenistan
1989 (from USSR)

Uzbekistan
1989 (from USSR)

Kazakhstan
1989 (from USSR)

Georgia
1989 (from USSR)

Armenia
1989 (from USSR)

Kyrgyzstan
1989 (from USSR)

Tajikistan
1989 (from USSR)

Greece
1821–32 (from Ottoman Empire)

Iraq
2014–17

Iran
1979

Afghanistan
1996

Libya
2011

Egypt
2011

Syria
From 2011

Azerbaijan
1989 (from USSR)

Eritrea
1961–91 (from Ethiopia)

Yemen
2011

South Sudan
2011 (from Sudan)

Somalia
1986–92

Democratic Republic of the Congo
1997

Kenya (Mau Mau)
1952–60 (from Britain)

Rwanda
1961 (from Belgium)

Madagascar
1960 (from France)

South Africa
1994

Korea
1945 (from Japan)

Vietnam
1975 (Socialist Republic of Vietnam created after war between North and South Vietnam)

Myanmar (Burma)
1962

Laos
1975 (from USSR)

Philippines
1896–98 (from Spain)

Cambodia
1979 (Khmer Rouge)

Singapore
1965 (from Malaysia)

Papua New Guinea
1975 (from Australia)

Indonesia
1945–49 (from the Netherlands)

East Timor
1975 (from Portugal) and 2002 (from Indonesia)

Collapse of Communism

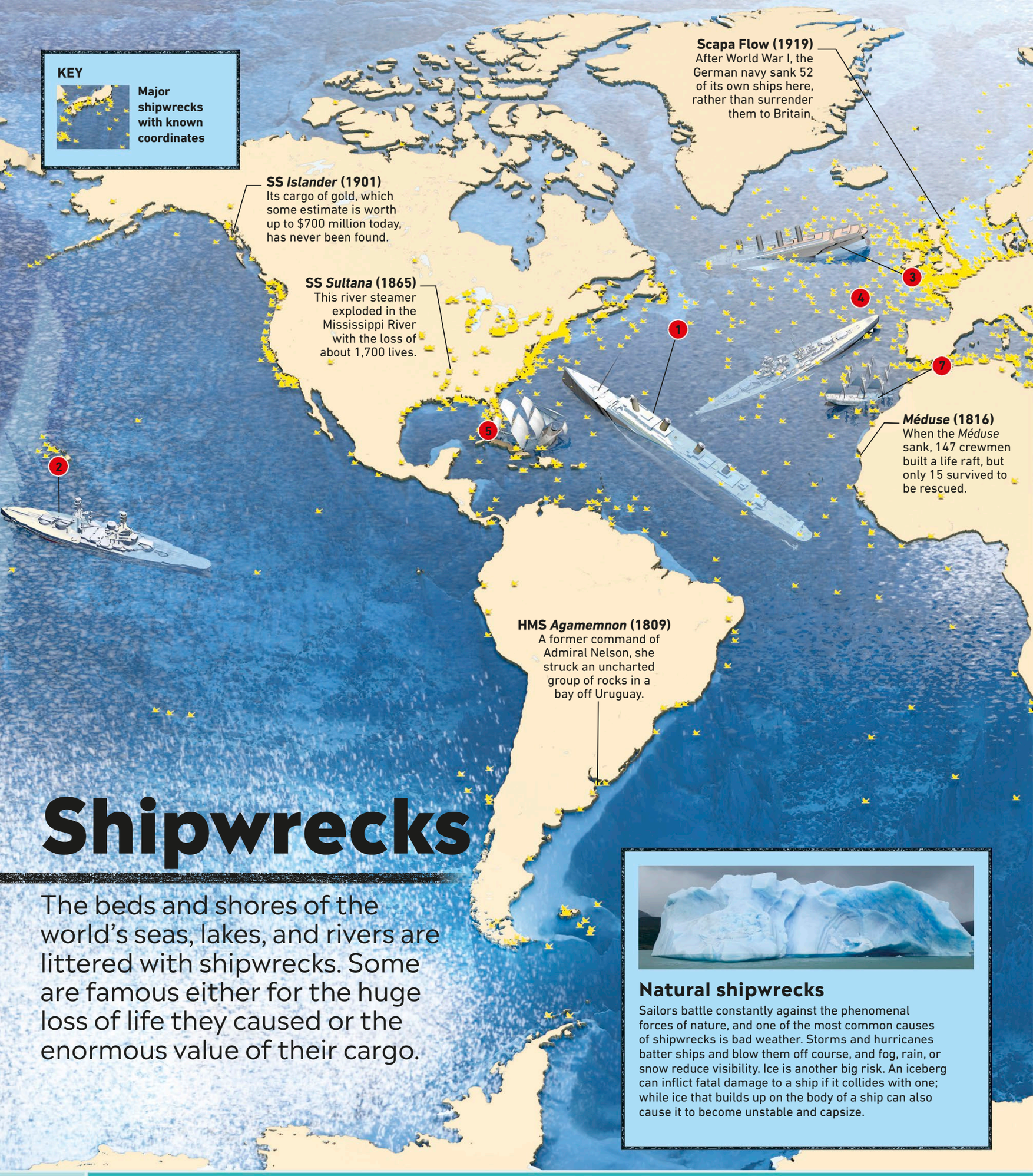
The USSR was a Communist state that incorporated Russia and 14 other Soviet republics (some of the red areas on the map). The USSR also had great influence over several other European states that collectively were known as the "Communist bloc" (some of the yellow map areas). In 1989, revolution spread 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. The Arab Spring was the first uprising where protestors used social media to coordinate their actions. Not all of the movements were successful, however; the uprising in Tunisia led to a number of improvements, but many of the other countries are still marked by unrest.

Arab Spring
Indicates countries involved in the Arab Spring



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; while ice that builds up on the body of a ship can also cause it to become unstable and capsize.

ONE OF THE WORLD'S LARGEST WRECKS IS THE AMOCO CADIZ, WHICH

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 battling the British Royal Navy 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 11 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

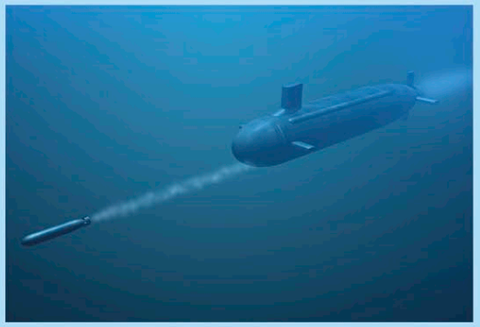
Battle of Midway (1942)
US ships *Yorktown* and *Hammann* were lost here, along with four Japanese aircraft carriers and a cruiser, in one of World War II's fiercest naval battles.

***Eduard Bohlen* (1909)**
Ran aground in fog and now lies 1,300 ft (400 m) inland, half-buried in huge sand dunes.

HMS *Pandora* (1791)
Sank while on a mission to find the HMS *Bounty* and her mutinous crew.

Man-made 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.



SANK IN 1978, SPILLING MORE THAN 220,000 TONS OF CRUDE OIL.

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.

Great Belt Fixed Link
Denmark, 1997. Connects islands of Zealand and Funen. Comprises two bridges and a railroad tunnel.

Bell Rock Lighthouse
Inchcape, Scotland, 1810. Oldest surviving lighthouse at sea.

The Langeled Pipeline
2006. Undersea pipeline pumping Norwegian natural gas to Britain.

London Sewage System
Late 19th century. Declared an engineering triumph for successfully diverting raw sewage away from the Thames.

Hibbing Taconite Company Mine
Hibbing, Minnesota, 1895. One of the world's largest iron ore mines.

Lockheed SR-71 Blackbird
Beale, California, 1964. Fastest manned jet aircraft.

Channel Tunnel
Folkestone, UK—Calais, France, 1994. International undersea train tunnel.

Guggenheim Museum
New York, New York, 1959. Architectural and design feat.

Graf Zeppelin

Hoover Dam
Nevada/Arizona, 1936. Largest concrete structure ever built at the time of construction.

Guggenheim Museum
Bilbao, Spain, 1997. Important work of modern architecture.

Sagrada Familia
Barcelona, Spain, 1882–current. Huge church designed by Antoni Gaudí, considered a masterpiece, and still under construction.

WM Keck Observatory
Mauna Kea, Hawaii, 1993 and 1996. Second-largest optical telescopes on Earth.

Concorde

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.

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.

Itaipu Dam
Brazil/Paraguay, 1984. The second-largest dam in the world.

San Alfonso del Mar swimming pool
Algarrobo, Chile, 2006. 0.6 mile (1 km) long and 115 ft (35 m) deep. Second-largest swimming pool in the world.

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 made it the first "skyscraper."

FRENCH ENGINEER ALBERT MATHIEU PUT FORWARD A PROPOSAL

MORE THAN **21,000** 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).

Shanghai Underground Bunker
Shanghai, China, 2006. The *Shanghai Morning Post* reported the existence of an underground bunker capable of sheltering more than 200,000 people.

Jiaozhou Bay Bridge
Jiaozhou, China, 2007. This bridge spans a vast distance over water, at 26.4 miles (42.5 km) long.

Neuschwanstein Castle
Schwangau, Germany, 1892. Iconic "fairy tale" palace of King Ludwig II of Bavaria.

The Bailong Elevator
Zhangjiajie, China, 2002. World's highest and heaviest outdoor elevator, built on the side of a cliff.

Three Gorges Dam
Yangzte, China, 2008. Most powerful hydroelectric power station 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).

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.

Great Man-made 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.

Istana Nurul Iman
Bandar Seri Begawar, Brunei, 1984. Palace of the Sultan of Brunei and the largest residential palace ever built.

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.

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 more than 1 million miles (1.6 million km), and no passengers or crew were ever injured.

5 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 Beyoncé (right), perform live, just as they have always done. But today the "live" audience can number many millions, with most following remotely via Internet-based platforms like YouTube or Spotify.

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 *Mahabarata*. Dealing with the constant struggle between good and evil, dances end with the destruction of a demon.

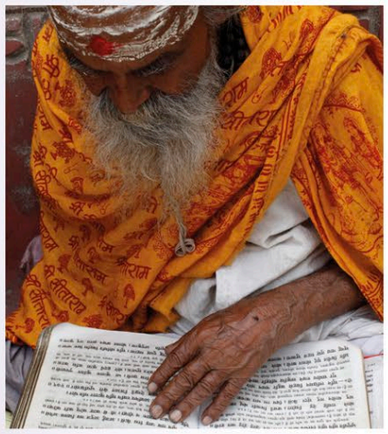
Heroes always wear red jackets

Dancer's skirt is made up of many layers of white cotton.

DRAGON DANCES ARE TRADITIONAL PERFORMANCES IN CHINESE

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.

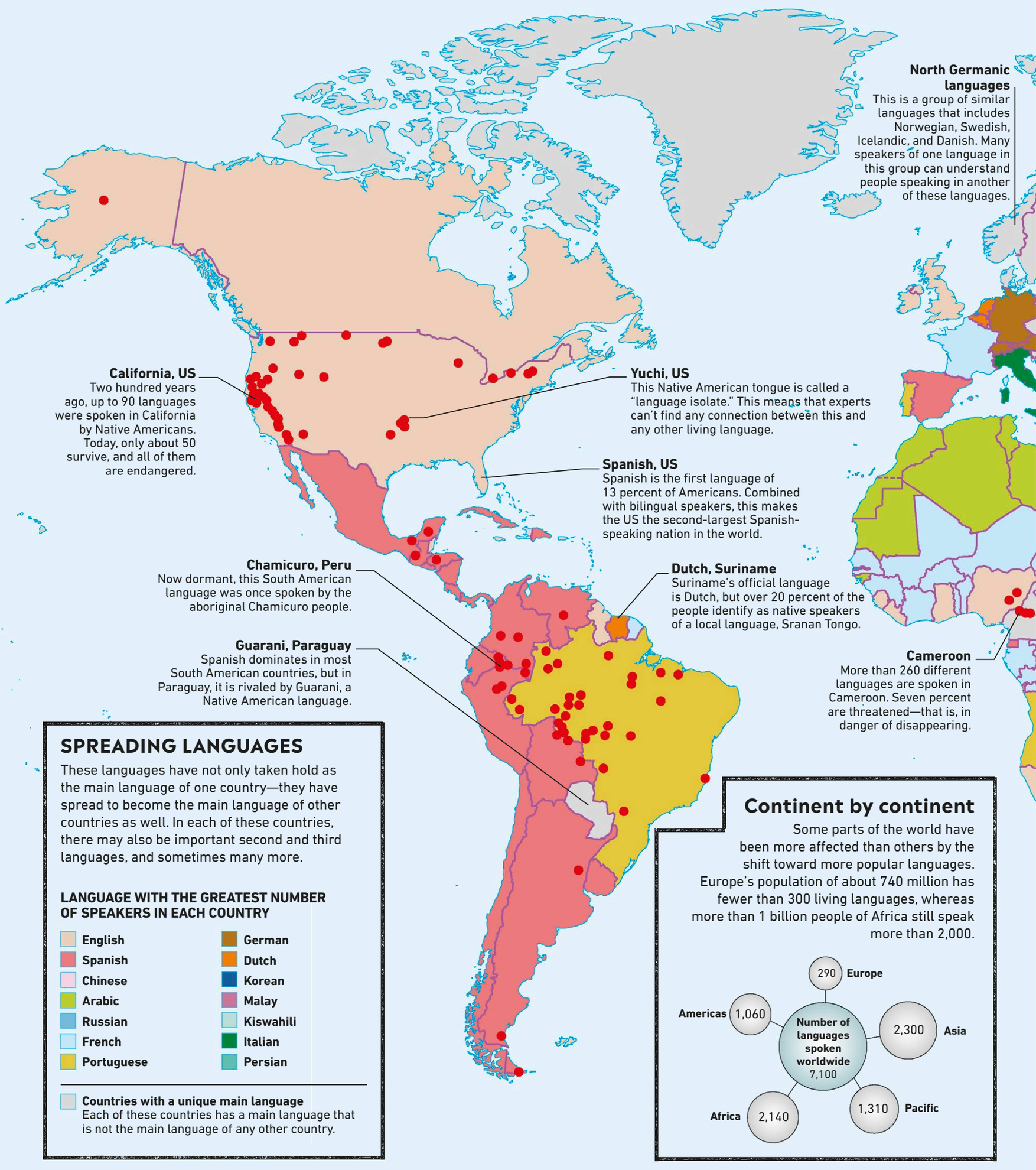
Sculpture
The great warrior Rama, holding his bow, stands next to his wife Sita. Both hold up their right hands in blessing.

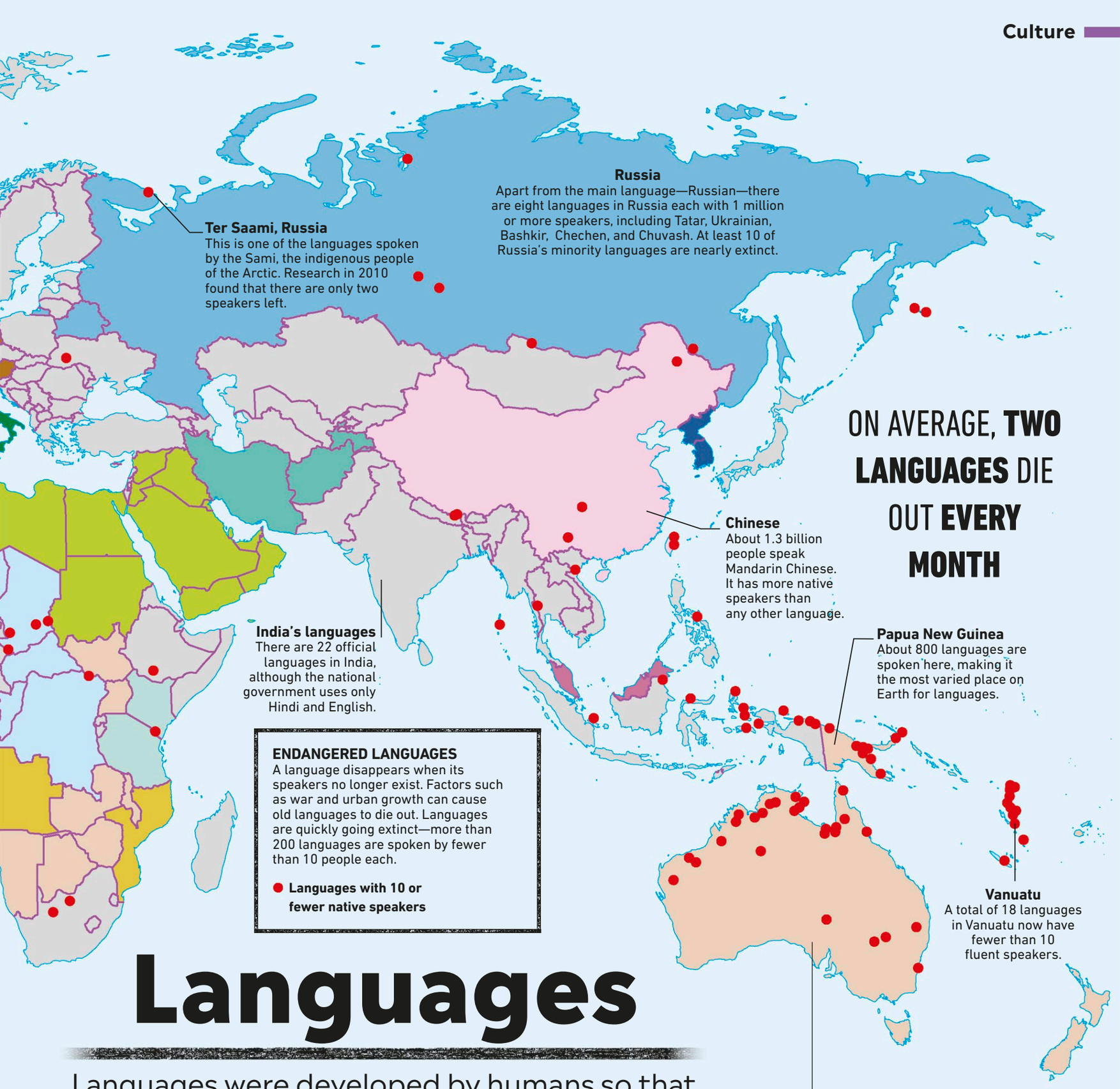
Festival
At the Hindu festival of Diwali, people light lamps to commemorate Rama's return from exile and his victory over Ravana.

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*.

CULTURE, BELIEVED TO DRIVE AWAY EVIL SPIRITS AND BRING GOOD LUCK.

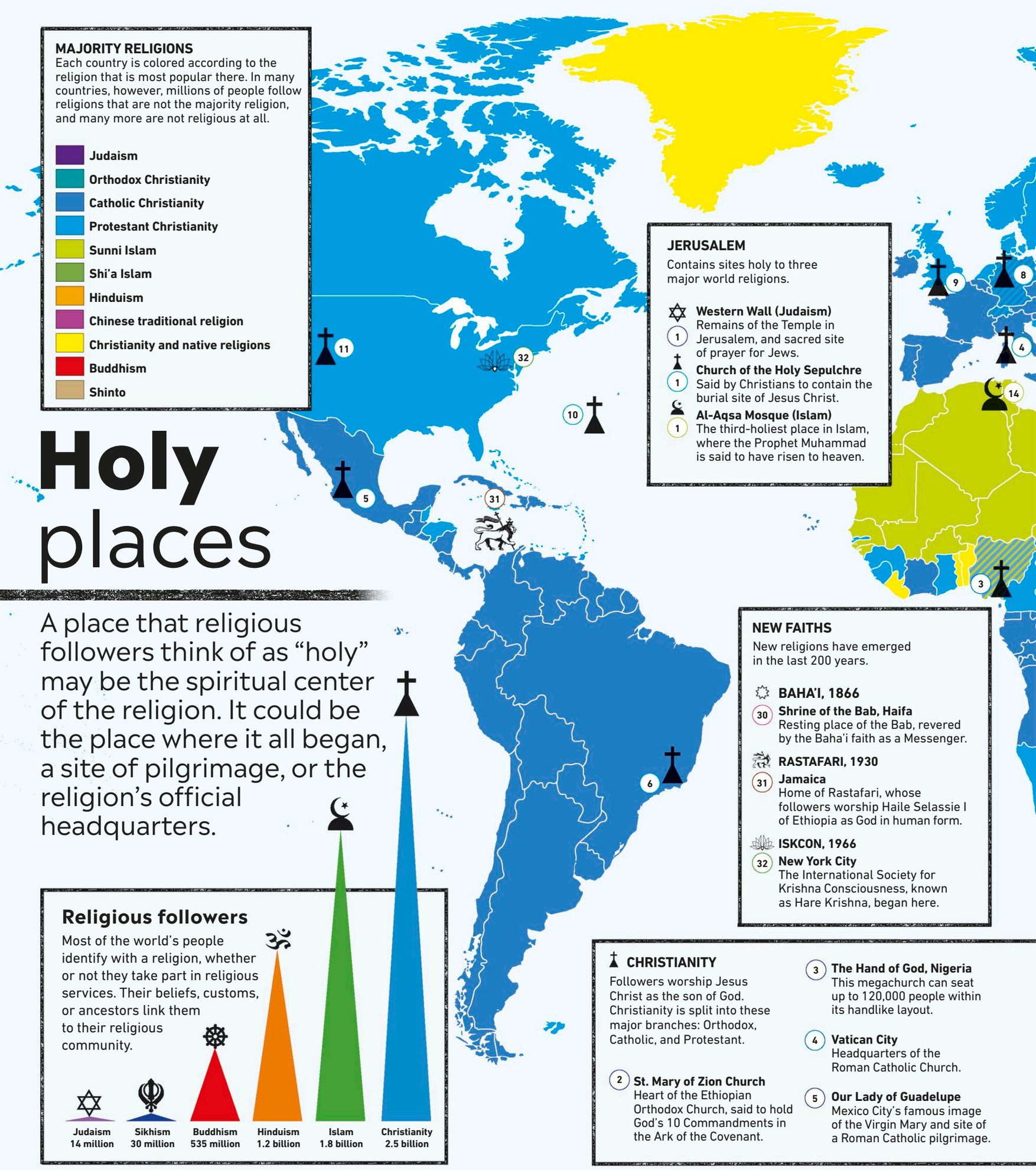

North Germanic languages
This is a group of similar languages that includes Norwegian, Swedish, Icelandic, and Danish. Many speakers of one language in this group can understand people speaking in another of these languages.
California, US
Two hundred years ago, up to 90 languages were spoken in California by Native Americans. Today, only about 50 survive, and all of them are endangered.
Yuchi, US
This Native American tongue is called a "language isolate." This means that experts can't find any connection between this and any other living language.
Spanish, US
Spanish is the first language of 13 percent of Americans. Combined with bilingual speakers, this makes the US the second-largest Spanish-speaking nation in the world.
Chamicuro, Peru
Now dormant, this South American language was once spoken by the aboriginal Chamicuro people.
Dutch, Suriname
Suriname's official language is Dutch, but over 20 percent of the people identify as native speakers of a local language, Sranan Tongo.
Guarani, Paraguay
Spanish dominates in most South American countries, but in Paraguay, it is rivaled by Guarani, a Native American language.
Cameroon
More than 260 different languages are spoken in Cameroon. Seven percent are threatened—that is, in danger of disappearing.
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
Persian
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 about 740 million has fewer than 300 living languages, whereas more than 1 billion people of Africa still speak more than 2,000.
290 Europe
Americas 1,060
Number of languages spoken worldwide 7,100
2,300 Asia
Africa 2,140
1,310 Pacific



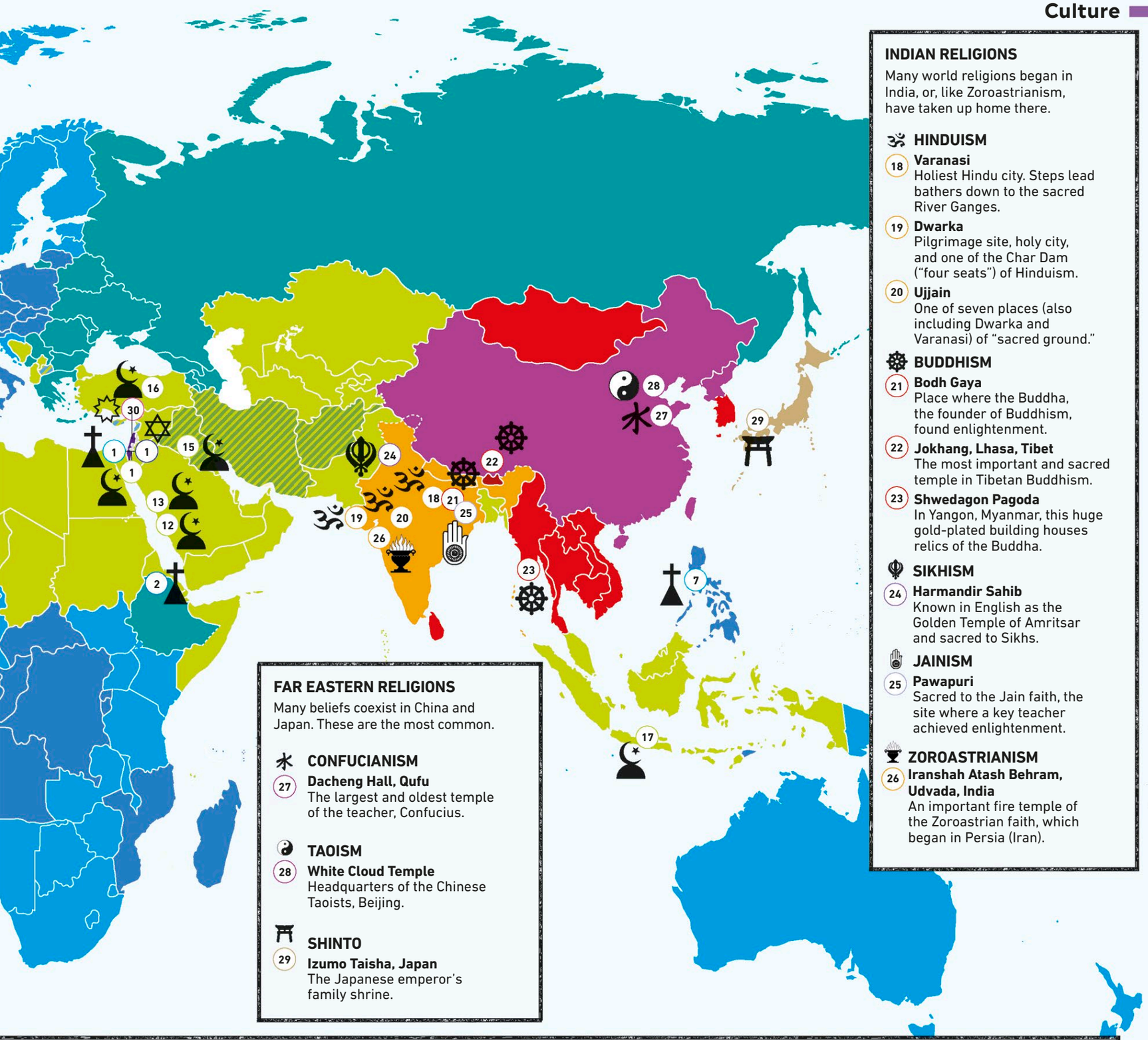
Languages

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.

HAVE FEWER THAN 1,000 SPEAKERS LEFT.



ALMOST 220 MILLION HINDUS TRAVELED TO PRAYAGRAJ, INDIA, IN



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 River Ganges.

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.

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, dating from 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.

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.

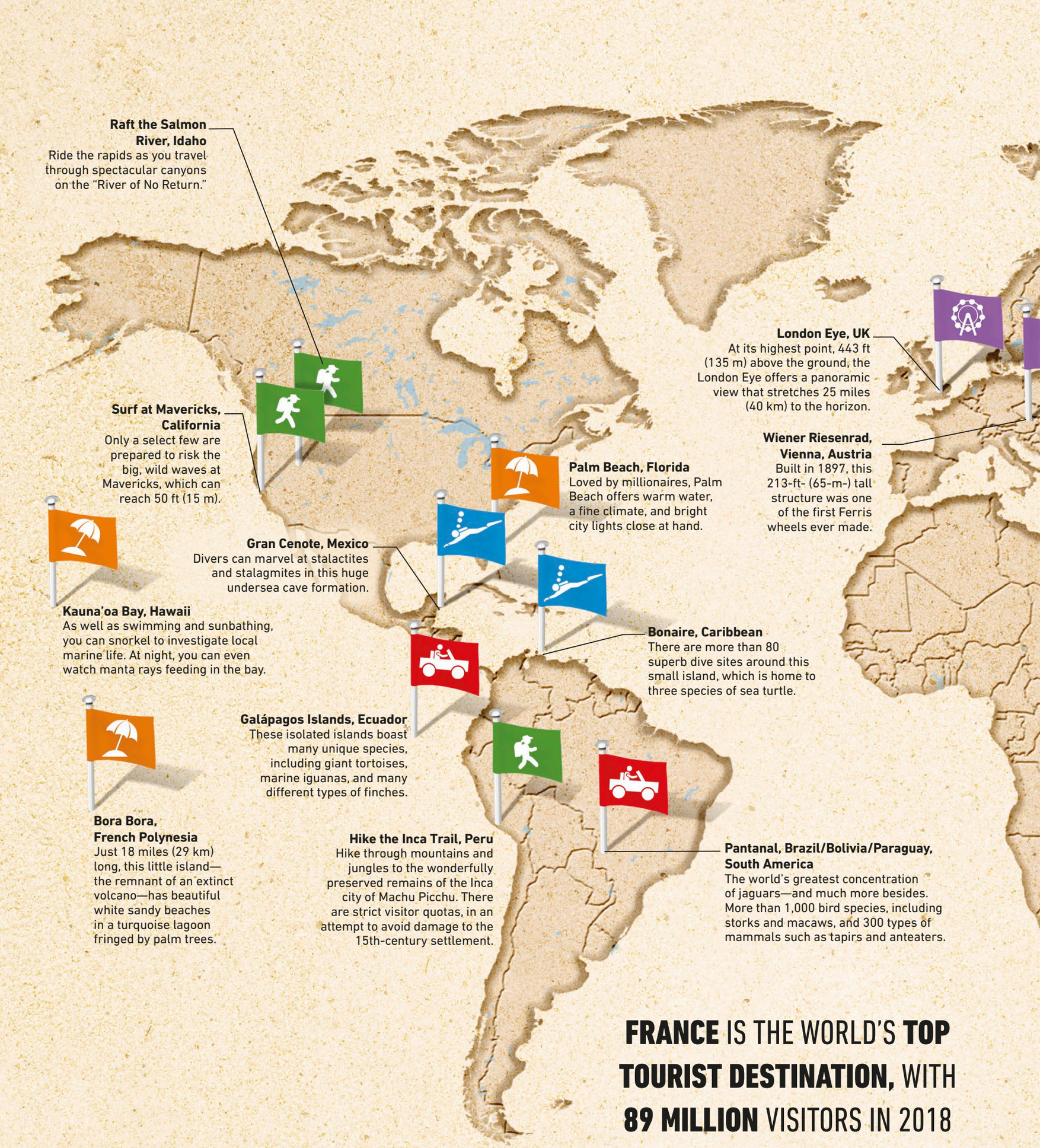
14 Kairouan, Tunisia
Fourth city of Sunni Islam, and seat of Islamic learning.

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.

2019 FOR THE KUMBH MELA FESTIVAL, HELD EVERY FOUR YEARS.



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).

Kauna'oa Bay, Hawaii
As well as swimming and sunbathing, you can snorkel to investigate local marine life. At night, you can even watch manta rays feeding in the bay.

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.

Gran Cenote, Mexico
Divers can marvel at stalactites and stalagmites in this huge undersea cave formation.

Palm Beach, Florida
Loved by millionaires, Palm Beach offers warm water, a fine climate, and bright city lights close at hand.

Galápagos Islands, Ecuador
These isolated islands boast many unique species, including giant tortoises, marine iguanas, and many different types of finches.

Hike the Inca Trail, Peru
Hike through mountains and jungles to the wonderfully preserved remains of the Inca city of Machu Picchu. There are strict visitor quotas, in an attempt to avoid damage to the 15th-century settlement.

Bonaire, Caribbean
There are more than 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. More than 1,000 bird species, including storks and macaws, and 300 types of mammals 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.

FRANCE IS THE WORLD'S **TOP TOURIST DESTINATION,** WITH **89 MILLION** VISITORS IN 2018

ABOUT 1.5 MILLION WILDEBEEST MIGRATE THROUGH KENYA'S MASAI

KEY

Adventure destinations
These spots are for those who like their holidays thrill-packed, offering extreme activities such as white-water rafting, skydiving, 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. Be careful not to touch the coral, though, as it's easily damaged.

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.

Aqaba, Jordan
See stunning corals and a rich array of colorful fish in water just 5 ft (1.5 m) deep.

Trek Annapurna, Nepal
Enjoy stunning scenery as you trek through the Himalaya mountains in the shadow of the mighty peaks of Annapurna.

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.

Star of Nanchang, China
A trip round this 525-ft- (160-m-) high wheel in an eight-person gondola takes 30 minutes.

Bwindi Park, Uganda
Half of the world's mountain gorillas live here. Also good for giraffes and lions.

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
One of the world's tallest observation wheels, at 541 ft (165 m), which gives views of 28 miles (45 km).

Okavango Delta, Botswana
Watch large roaming herds of buffaloes 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.

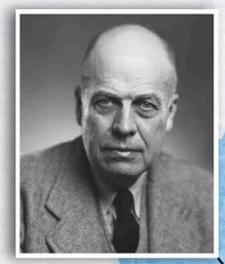
Skydive in Queenstown, New Zealand
Step out of a plane 15,000 ft (4,500 m) above Queenstown and freefall for 60 seconds, until a pull on the ripcord opens your parachute and you float gently to the ground.

Tourism

Traveling can offer adventure, fun, and an unforgettable glimpse of the world's natural wonders—but it's important to consider the environmental impact of tourism, too. In 2020, the industry was severely affected by the COVID-19 pandemic.

MARA, ALONG WITH 500,000 ZEBRA, GAZELLE, AND ELAND.

Edward Hopper
1882–1967; US.
Hopper painted in the Realist style, which tries to show things as they are in real life. Hopper used simple colors and often painted solitary, lonely-looking people.



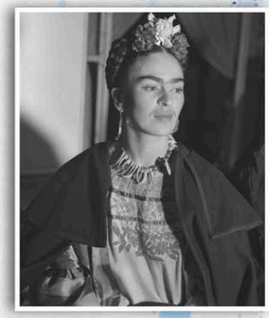
Andy Warhol
1928–1987; US.
Warhol pioneered Pop Art—the "pop" refers to popular culture. His art used familiar images of famous people and everyday items such as soup cans. Warhol took his inspiration from advertising, TV, and comic strips.

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.

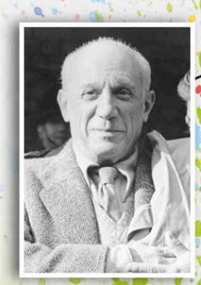
Thomas Gainsborough
1727–88; England.
Founder of the 18th-century British Landscape school, Gainsborough also made portraits. *Mr. and Mrs. Andrews* (1750; right) is an early masterpiece.

Claude Monet
1840–1926; France.
Impressionists such as Monet painted their view of brief moments in time.

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 a founder 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* (1860; 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
13th century–present; Nigeria.
The people of the Kingdom of Benin, in what is now Nigeria, sculptured 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.

IN NOVEMBER 2017, LEONARDO DA VINCI'S "SALVATOR MUNDI" WAS AUCTIONED

Marc Chagall
1887–1985; Russia.
Chagall produced Expressionist and Cubist paintings, and also 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 more than $1 million each.

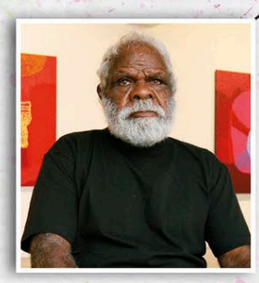
Tamara de Lempicka
1898–1980; Poland.
In the 1920s and 1930s, de Lempicka was the most famous painter in the Art Deco style, which featured geometric shapes and intense, bright colors. She lived a flamboyant life and associated with the rich and famous.

Caravaggio
1571–1610; 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 seascapes, such as *The Great Wave off 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.

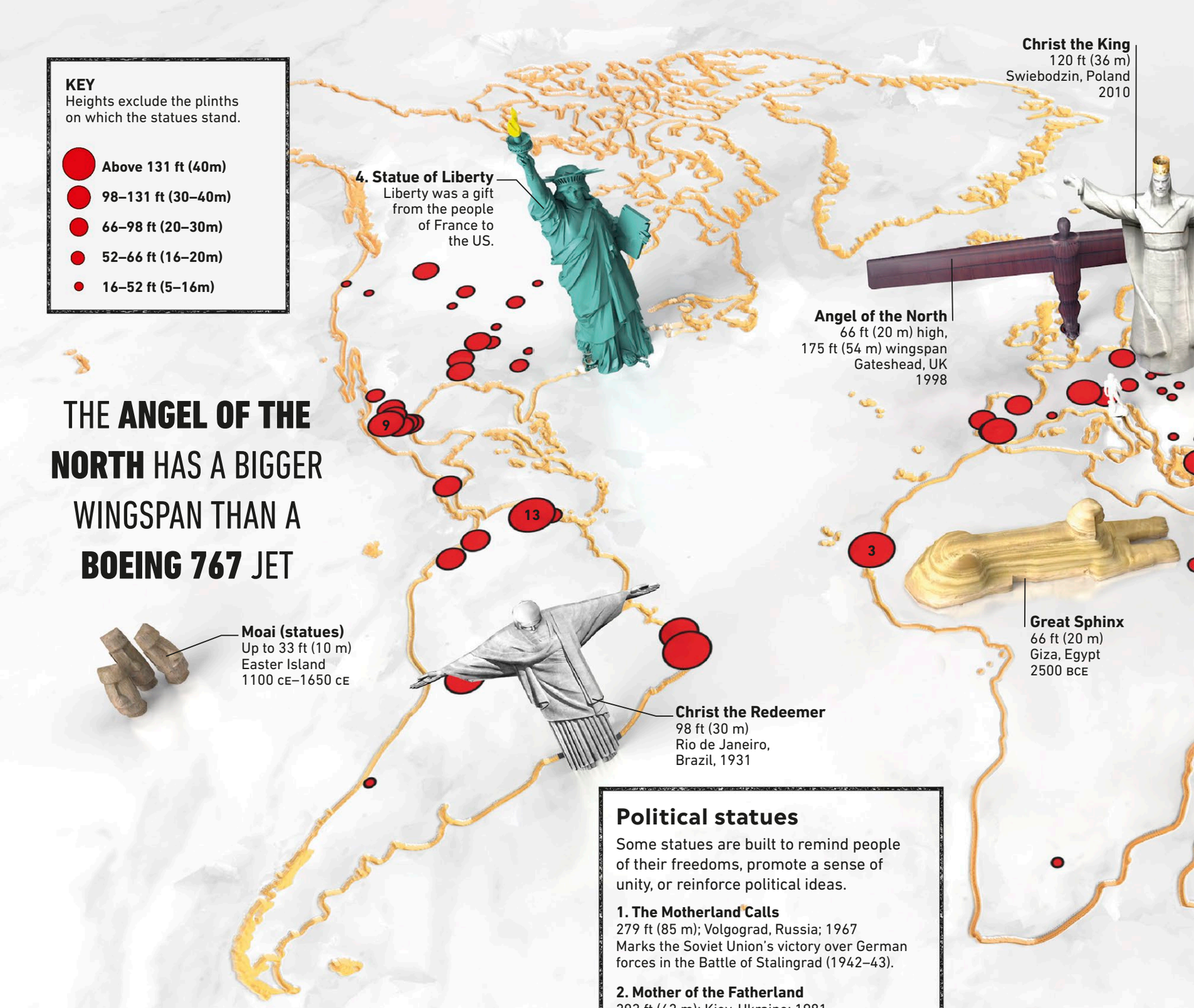
Willie Bester
Born 1956; South Africa.
Bester's collages and sculptures use recycled material and objects found in scrapyards and flea markets. His 1992 *Tribute to Biko* (above) commemorates Stephen Biko, who campaigned for racial equality in South Africa.



Yannima Tommy Watson
1935–2017; 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**

FOR $450 MILLION, MAKING IT THE MOST EXPENSIVE PAINTING EVER SOLD.



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.

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 (1942–43).

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
98 ft (30 m); Pyongyang, North Korea; 1982
Three figures represent a peasant, an industrial worker, and an intellectual.


African Renaissance Monument

THE STATUE OF LIBERTY IN NEW YORK CONTAINS

1. The Motherland Calls
The statue beckons fighters to come to the defense of their nation.

The Statue of Unity
597 ft (182 m)
Gujurat, India; 2018
The world's tallest statue, depicting India's first Deputy Prime Minister.

Spring Temple Buddha
420 ft (128 m)
Lushan, China; 2002
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 third-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 famous people from their past. If a controversial figure has been chosen, this can lead to the statue being defaced or even toppled by the public.

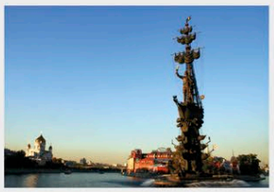
6. Yan Di and Huang Di
348 ft (106 m); Zhengzhou, China; 2007
Shows the heads of two legendary kings regarded as the early founders of the Chinese nation.

7. Peter the Great
315 ft (96 m); Moscow, Russia; 1997
Erected to celebrate 300 years of the Russian Navy, which Tsar Peter I founded.

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), fist clenched.

10. Genghis Khan
131 ft (40 m); Tsonjin Boldog, Mongolia; 2007
This statue depicts the famous Mongol leader (ruled 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.

Vancouver, Canada

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.

Toronto, Canada

San Francisco, California

New York, New York

Mardi Gras, New Orleans, Louisiana

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.

Cuba

Haiti

Jamaica

Barranquilla, Colombia

Mazatenango, Guatemala

Trinidad

Panama

French Guiana

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.

Ambato, Ecuador

Cajamarca, Peru

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.

Coastal cities, Brazil

Oruro, Bolivia

Montevideo, Uruguay

Cologne, Germany

Binche, Belgium

Notting Hill London, UK

Cheese Rolling Festival
Gloucestershire, UK
Contestants chase a wheel of cheese down a steep, muddy hill.

Tomatina
Buñol, Valencia
Since 1944, tomato fights have been held on the last Wednesday of August. More than 110 tons of tomatoes are hurled each year!

Venice, Italy

Ovar, Portugal

Malta

Festival of the Sahara
Tunisia
A festival celebrating nomadic life and traditions. Events include camel marathons and performances of Bedouin song, dance, and poetry.

Madeira

Santa Cruz, Tenerife

Cape Verde Islands

Festival-au-Desert
Mali
Three days of traditional Tuareg art, music, and dance. Everyone camps in the desert, with their camels close by.

Festivals

Festivals give people a chance to celebrate their religious and cultural traditions. Above all, they are a great opportunity to throw a party!

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

MORE THAN 45 MILLION TURKEYS ARE EATEN ON THANKSGIVING DAY

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

Rijeka, Croatia

Patras, Greece

Limassol, Cyprus

Ghost Festival, *China*
Part of "Ghost Month," when the ghosts and spirits of dead ancestors are said to emerge from the underworld.

Beijing

Boryeong Mud Festival
Boryeong, South Korea
At this mucky festival, which dates from 1998, people cover each other in mud. The mud is said to contain minerals that are good for the skin.

Asakusa district, Tokyo

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.

Kolkata, India

Goa, India

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.

Philippines

Singapore

Indonesia

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.

Mauritius

Sydney, Australia

Incwala
Eswatini
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 can also watch content on mobile devices such as laptops, smartphones, and tablets.

United Kingdom
In a 65-year lifetime, a person in the UK may spend more than 9.5 years watching television.

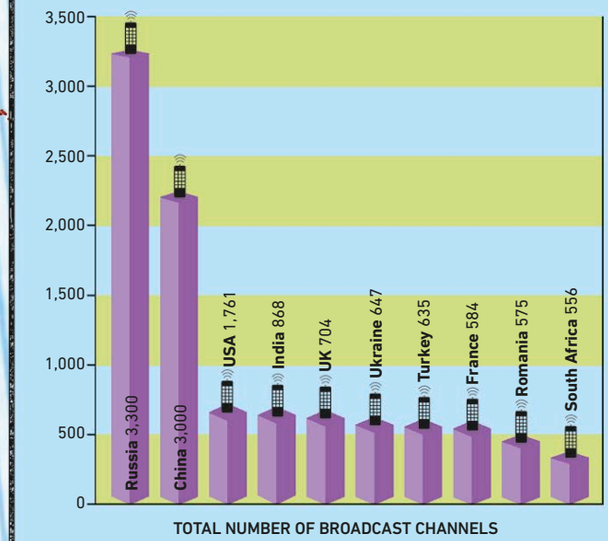
United States
Ninety-six percent of US homes have at least one TV, and 39 percent have three or more TV sets.

French Guiana
There are about 30,000 TV sets serving a population of 294,000.

Ghana
About 60 percent of Ghanaian households have a television.

Argentina
More than 99 percent of Argentinian homes possess a television.

Falkland Islands
TV ownership is relatively high among the tiny population of about 2,500 islanders.



Broadcast channels

The number of broadcast TV channels varies greatly around the world. Russia has more than 3,000—the most of any country. Deciding what to watch must be a real headache!

COLOR TELEVISIONS PER 10 PEOPLE

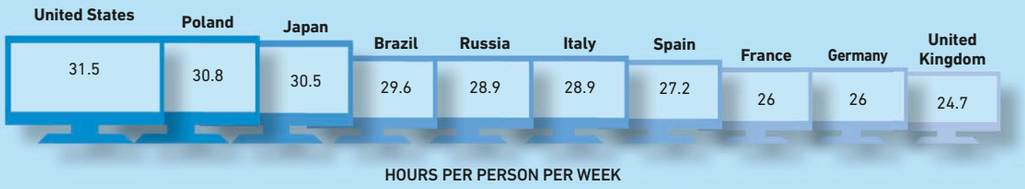
There are more than 1.5 billion TVs around the world, but they are not distributed equally among the nations.

- Less than 1
- 1–2
- 2–3
- 3–4
- 4–5
- 5–6
- 6–7
- 7 or more
- Data not available

SURVEYS SUGGEST THAT 72 PERCENT OF AMERICANS

Hours per week

Experts say that watching more than 2 hours of TV per day (14 hours per week) can be bad for your health, yet in many countries, people watch twice that.



China
China has in excess of 400 million TVs—more than any other country in the world.

Japan
With a very high level of TV ownership, the Japanese rank third among the biggest TV-watchers, averaging 30.5 hours per week.

49 PERCENT OF AMERICANS SAY THEY WATCH TOO MUCH TV

Oman
The oil-rich countries around the Arabian Gulf, such as Oman, have high levels of TV ownership.

Malaysia
Malaysians spend significantly more time using the Internet every week than they do watching TV.

South Africa
More than 85 percent of South African homes have a TV set.

Australia
In 2017, Australian homes had an average of 6.4 screens per household.

Content streaming

"Terrestrial" channels reach your TV via an aerial on your home, while extra channels can be broadcast by satellite or sent through cables. Paying for cable TV has become steadily less popular with the rise of television streaming services such as Netflix, however, which involve playing video content over an Internet connection. Since the content isn't live, viewers can choose exactly what they want to watch, and when. In 2020, the streaming subscription market grew by a massive 37 percent.

REGULARLY WATCH TELEVISION WHILE EATING DINNER.

Americas

1 Los Angeles Memorial Coliseum
California, US. Capacity 93,607; opened 1921

2 Rose Bowl
Pasadena, California, US. Capacity 92,542; opened 1922

3 Dodgers Stadium
California, US. Capacity 56,000; opened 1962

4 Estadio Monumental "U"
Lima, Peru. Capacity 80,093; opened 2000

5 Bell Center
Montreal, Canada. Capacity 21,273; opened 1996

6 Beaver Stadium
Pennsylvania, US. Capacity 106,572; opened 1960

7 Madison Square Garden
New York, US. Capacity 22,292; opened 1968

8 Arthur Ashe Stadium
New York, US. Capacity 23,200; opened 1997

9 Ohio Stadium
Ohio, US. Capacity 102,329; opened 1922

10 Neyland Stadium
Tennessee, US. Capacity 102,455; opened 1921

11 Sanford Stadium
Georgia, US. Capacity 92,746; opened 1929

12 Bryant–Denny Stadium
Alabama, US. Capacity 101,821; opened 1929

13 Tiger Stadium
Louisiana, US. Capacity 92,542; opened 1924

14 Darrell K. Royal—Texas Memorial Stadium Texas, US. 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 Michigan Wolverines American football team.

Estádio Azteca
Mexico City, Mexico. Capacity 87,523; opened 1961. This huge soccer stadium is the official home of the Mexican national team. The Azteca and the Estádio Maracanã are the only stadiums in the world to have hosted two FIFA World Cup soccer finals.

KEY
The colors show capacity (numbers of spectators).

- 110,000 and above
- 100,000–109,999
- 90,000–99,999
- 80,000–89,999
- Fewer than 80,000

Camp Nou
Barcelona, Spain. Capacity 99,354; opened 1957.The largest stadium in Europe and 12th largest in the world.

Estádio do Maracanã
Rio de Janeiro, Brazil. Capacity 82,238; opened 1950. Built for the 1950 football FIFA World Cup, the Maracanã was the world's largest 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 served as the venue for the opening and closing ceremonies of the 2016 Summer Olympics and Paralympics.

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 pop 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

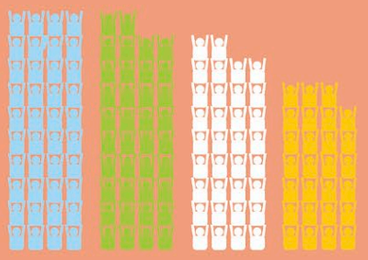
THE LARGEST EVER "MEXICAN WAVE" INVOLVED 157,574 PEOPLE AT

THE RECORD FOR THE LOUDEST CROWD ROAR OF **142.2 DECIBELS** WAS SET AT **ARROWHEAD STADIUM**, KANSAS CITY, MISSOURI, DURING A FOOTBALL GAME IN 2014

Rungrado May Day Stadium
Pyongyang, North Korea. Capacity 150,000; opened 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: 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: 149,415 (plus 20,000 without tickets). Hampden Park, Scotland. Scotland vs England, 1937.

Soccer: 135,000. Estádio da Luz, Portugal. Benfica vs Porto, January 1987.

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. The stadium played host to the 2010 FIFA World Cup.

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."

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

Motor 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.

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

Circuit of the Americas
Austin, Texas

Atlanta Motor Speedway
Hampton, Georgia

Autódromo Hermanos Rodríguez Mexico City, Mexico

Circuit Gilles Villeneuve Montreal, Québec, Canada

Dover International Speedway
Dover, Delaware

Charlotte Motor Speedway
Concord, North Carolina

Darlington Raceway
Darlington, South Carolina

Daytona International Speedway
Daytona Beach, Florida

Homestead–Miami Speedway
Homestead, Florida

Autódromo José Carlos Pace
São Paulo, Brazil

Red Bull Ring
Spielberg bei Knittelfeld, Austria

Circuit Zandvoort
Zandvoort, Netherlands

Circuit de Spa-Francorchamps
Spa, Belgium

Silverstone Circuit
Silverstone, UK

Circuit de la Sarthe
Le Mans, France

Circuit Paul Ricard
Le Castellet, France

Algarve International Circuit
Portimão, Portugal

Circuit de Catalunya
Montmeló, Spain

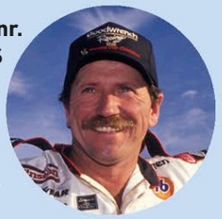
Circuit de Monaco
Monte Carlo, Monaco

Autodromo Nazionale Monza
Monza, Italy

Autodromo Internazionale Enzo e Dino Ferrari
Imola, Italy

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 Snr.
Nationality: US
Killed while racing at Daytona in 2001, Earnhardt had already won seven NASCAR titles.

NASCAR Sprint Cup

The Sprint Cup Series is the world's premier stock-car racing competition. It involves 36 races over 10 months. As in F1, points awarded throughout the series decide the winner.

ORDINARY CAR TYRES HAVE A LIFE OF 16,000 KM (10,000 MILES),

Michael Schumacher
Nationality: German
Seven-time F1 World Champion with 91 Grand Prix wins. He suffered a severe skiing accident in 2013 and has been receiving treatment ever since.

Ayrton Senna
Nationality: Brazilian
Three-time F1 World Champion. Fifth-most-successful driver of all time in terms of F1 race wins (41). Died in an accident at the 1994 San Marino Grand Prix.

Lewis Hamilton
Nationality: British
Jointly tied with Shumacher for the most World Championship titles, and holds the record outright for the most ever F1 wins.

A FORMULA 1 **STEERING WHEEL** COSTS ABOUT **$32,000**

Hungaroring
Budapest, Hungary

Sochi Autodrom
Sochi, Russia

Baku City Circuit
Baku, Azerbaijan

Bahrain International Circuit
Sakhir, Bahrain

Yas Marina Circuit
Abu Dhabi, UAE

Jeddah Street Circuit
Jeddah, Saudi Arabia

Shanghai International Circuit
Shanghai, China

Suzuka Circuit
Suzuka City, Japan

Marina Bay Street Circuit
Marina Bay, Singapore

Albert Park
Melbourne, Australia

KEY
Location of major race tracks worldwide

- **Formula 1 sites for 2021 season**
- **NASCAR sites**
- **Le Mans**

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 between two-hour stints behind the wheel.

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.

BUT FORMULA 1 TYRES LAST A MAXIMUM OF 200 KM (125 MILES).

Leviathan
Canada's Wonderland, Ontario
92 mph (148 kph)
306 ft (93 m) high
5,486 ft (1,672 m) long

Top Thrill Dragster
Cedar Point, Ohio
120 mph (193 kph); 420 ft (128 m) high
2,800 ft (853 m) long

Intimidator 305
Kings Dominion, Virginia
90 mph (145 kph)
305 ft (93 m) high
5,100ft (1,554 m) long

Colossus
Thorpe Park, England
45 mph (72 kph);
100 ft (30 m) high
2,789 ft (850m) long

Millennium Force
Cedar Point, Ohio
93 mph (150 kph)
310 ft (94 m) high
6,595 ft (2,010 m) long

Superman: Escape from Krypton
Six Flags Magic Mountain, California
100 mph (161 kph)
415 ft (126 m) high
1,235 ft (376 m) long

Vortex
Carowinds, North Carolina
50 mph (80 kph)
90 ft (27m) high
2,040 ft (622 m) long

Fury 325,
Carowinds, North Carolina
95 mph (153 kph)
325 ft (99 m) high
6,602 ft (2,012 m) long

Alpengeist
Busch Gardens, Florida
67 mph (107 kph)
195 ft (59 m) high
3,828 ft (1,148 m) long

Apocalypse,
Six Flags America, Maryland
55 mph (89 kph)
100 ft (30 m) high
2,900 ft (884 m) long

Red Force,
Ferrari Land, Spain
112 mph (180 kph)
367 ft (112 m) high
2,890 ft (880 m) long

Kingda Ka
Six Flags Great Adventure, New Jersey
128 mph (206 kph)
456 ft (139 m) high
3,118 ft (950 m) long

Ultimate
Lightwater Valley, UK
50 mph (80 kph)
107 ft (33 m) high
7,442 ft (2,268 m) long

Montezum
Hopi Hari, Brazil
64 mph (103 kph)
139 ft (42 m) high
3,380 ft (1,030 m) long

Colossos
Heide-Park, Soltau, Germany
75 mph (102 kph)
197 ft (60 m) high
4,409 ft (1,344 m) long

Tower of Terror
Gold Reef City, South Africa
59 mph (95 kph)
112 ft (34 m) high
328 ft (100 m) long

Kingda Ka

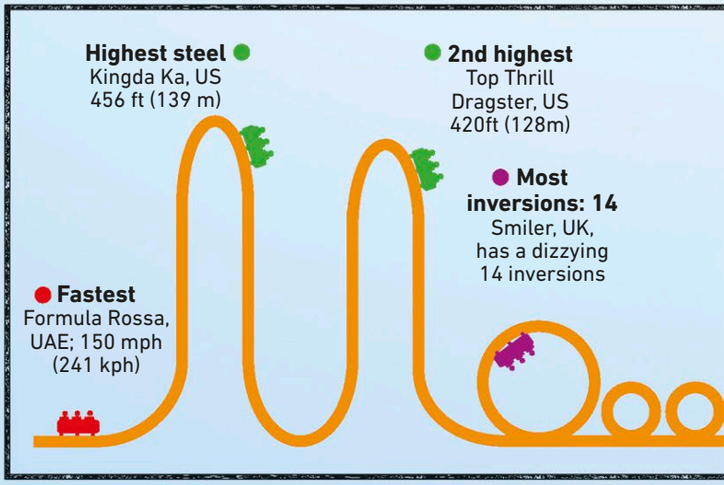
This ride goes from 0-128 mph (206 kph) in 3.5 seconds, catapulting riders as high as a 45-story building.

ROLLER COASTERS AROUND THE WORLD
Numbers indicate ranking from 1-5.

Fastest · Highest · Longest · Unranked

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.



SIX FLAGS MAGIC MOUNTAIN PARK, AT VALENCIA, CALIFORNIA,

Flying roller coasters

These coasters—such as Manta at SeaWorld in 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

Formula Rossa
Ferrari World, UAE
150 mph (241 kph)
171 ft (52 m) high
6,791 ft (2,070 m) long

Do-Dodonpa
Fuji-Q Highland, Japan
107 mph (172 kph); 171 ft (52 m) high;
3,901 ft (1,189 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

DC Rivals Hypercoaster
Warner Bros. Movie World, Queensland, Australia; 71.5 mph (115 kph); 4,593 ft (1,400 m) long; 202 ft (61.6 m) high

18 MPH
(29 KPH): SPEED OF THE WORLD'S OLDEST COASTER,
LEAP THE DIPS

Roller coaster records

Opened in 1902, the world's oldest coaster is the wooden Leap-the-Dips, at Lakemont Park, Pennsylvania. Since then, coasters have become taller, longer, faster—and scarier! Today's coasters are usually made of steel. Wood is less flexible than steel, so wooden coasters tend to be less complex and extreme than steel ones.

Steepest drop
TMNT Shellraiser, US 121.5 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.

HAS 19 ROLLER COASTERS—MORE THAN ANY OTHER THEME PARK.

National flags

NORTH AMERICA


CANADA


UNITED STATES OF AMERICA


MEXICO


BELIZE


COSTA RICA


EL SALVADOR


GUATEMALA


HONDURAS


GRENADA


HAITI


JAMAICA


ST KITTS & NEVIS


ST LUCIA


ST VINCENT & THE GRENADINES


TRINIDAD & TOBAGO

SOUTH AMERICA


COLOMBIA


URUGUAY


CHILE


PARAGUAY

AFRICA


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

ESWATINI
(formerly SWAZILAND)

ZAMBIA

ZIMBABWE

COMOROS

MADAGASCAR

MAURITIUS

LUXEMBOURG

NETHERLANDS

GERMANY

FRANCE

MONACO

ANDORRA

PORTUGAL

SPAIN

POLAND

SLOVAKIA

ALBANIA

BOSNIA & HERZEGOVINA

CROATIA

KOSOVO (disputed)

NORTH MACEDONIA

MONTENEGRO

ASIA

LATVIA

LITHUANIA

CYPRUS

MALTA

RUSIA

ARMENIA

AZERBAIJAN

GEORGIA

TURKEY

QATAR

SAUDI ARABIA

UNITED ARAB EMIRATES

YEMEN

IRAN

KAZAKHSTAN

KYRGYZSTAN

TAJIKISTAN

CHINA

MONGOLIA

NORTH KOREA

SOUTH KOREA

TAIWAN

JAPAN

MYANMAR (BURMA)

CAMBODIA

AUSTRALASIA & OCEANIA

SINGAPORE

MALDIVES

AUSTRALIA

NEW ZEALAND

PAPUA NEW GUINEA

FIJI

SOLOMON ISLANDS

VANUATU

A SOVEREIGN STATE IS A COUNTRY INDEPENDENT OF OTHER STATES, AND

OF ALL THE FLAGS OF THE WORLD'S **195 SOVEREIGN STATES**, ONLY **NEPAL'S** HAS MORE THAN **FOUR SIDES**

WITH ITS OWN GOVERNMENT SYSTEM AND A PERMANENT POPULATION.

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