



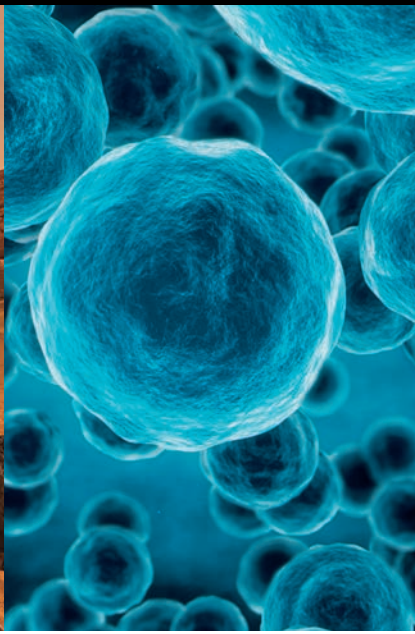
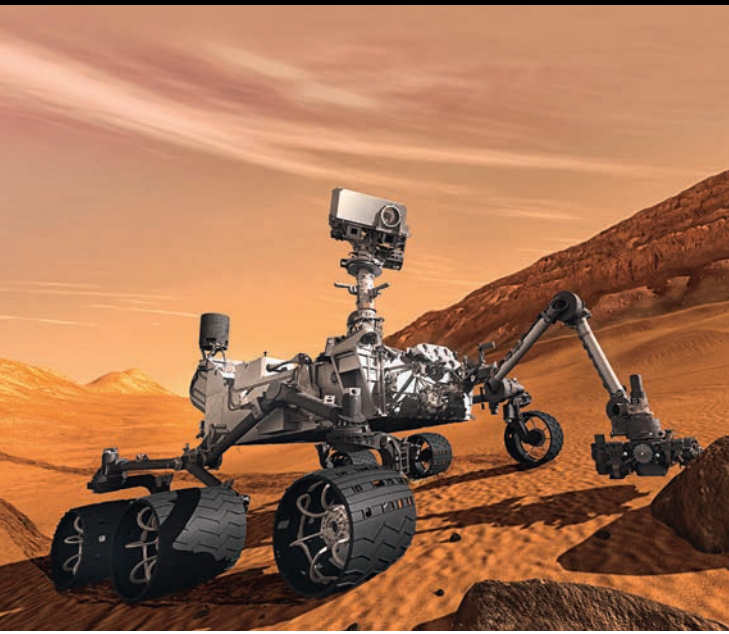
**NATIONAL GEOGRAPHIC**

**ALMANACH**

WAS IST DIE GRÖSSTE BEDROHUNG DER MENSCHLICHEN GESUNDHEIT? UND WIE GEHT MAN DAGEGEN VOR? WO WIRD DIE WELTBEVÖLKERUNG IM JAHR 2050 LEBEN? UND WIE SEHEN DIE STÄDTE DER ZUKUNFT AUS?

Diese und weitere Fragen zu Wissenschaft, Natur, Geschichte und Weltgeographie beantwortet dieser Universalwissensband. Auf gewohnt anspruchsvollem National-Geographic-Niveau: illustriert mit spektakulären Fotos, fesselnden Infografiken und illustrierendem Kartenmaterial.

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**NATIONAL GEOGRAPHIC ALMANACH**



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**NATIONAL GEOGRAPHIC ALMANACH**

AKTUELLE TRENDS DER WISSENSCHAFT

ILLUSTRATIONEN, INFOGRAFIKEN & ZEITLEISTEN

UNIVERSELLES WISSEN & SPEKTAKULÄRE FOTOGRAFIE



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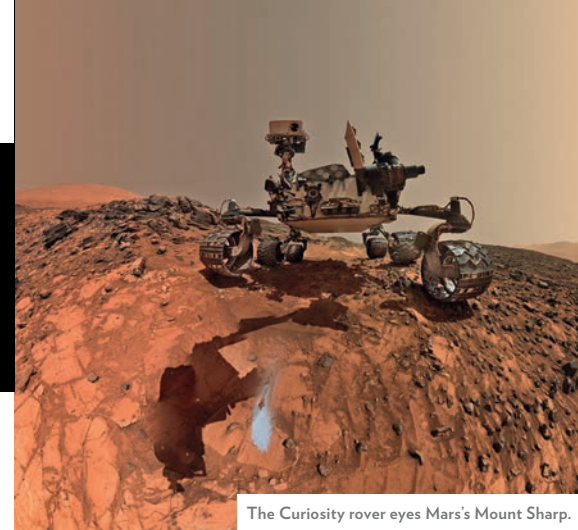
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The Carina Nebula glows some 7,500 light-years away.

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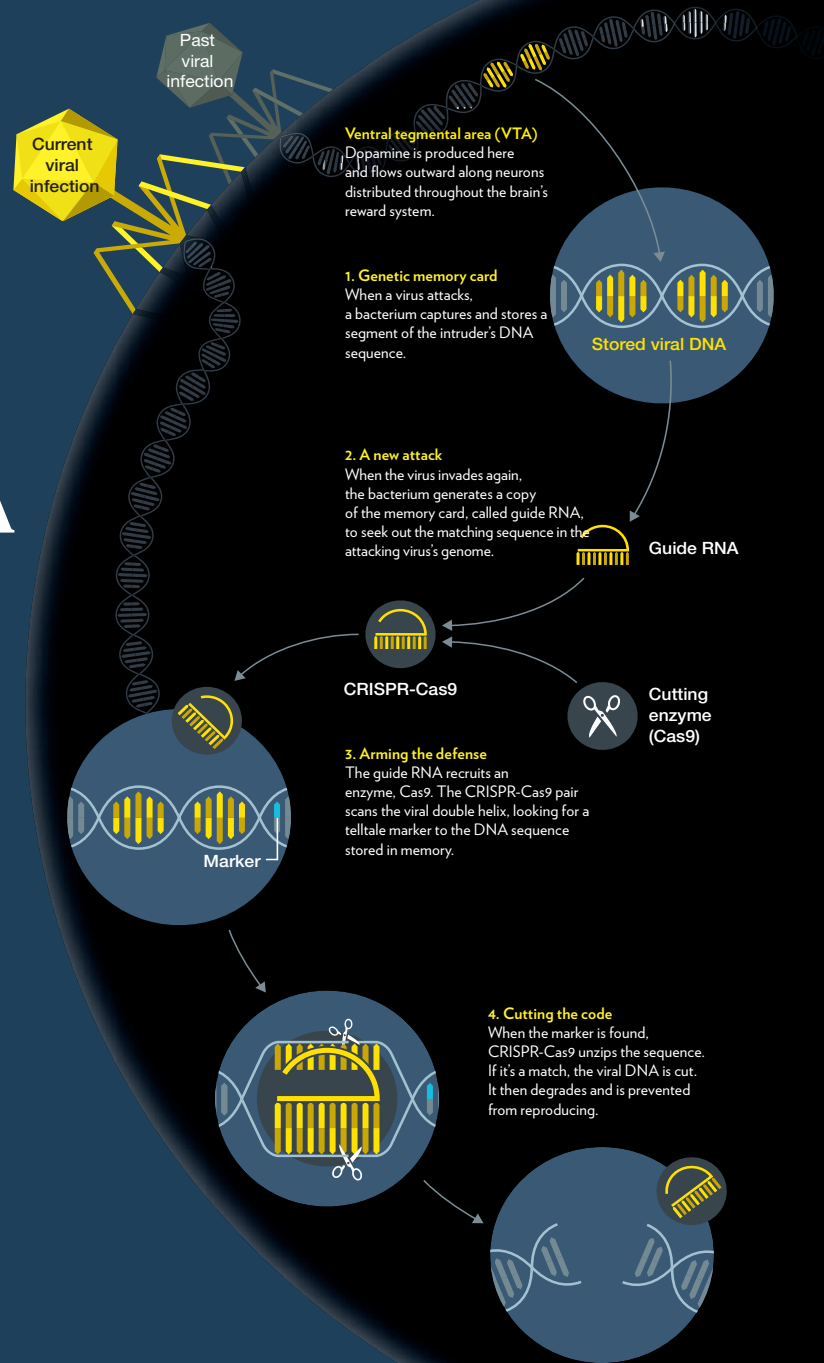
# DNA REVOLUTION

## HOW IT WORKS IN NATURE

Researchers studying how viruses infect bacteria discovered a natural immune system that cuts the invader's DNA.

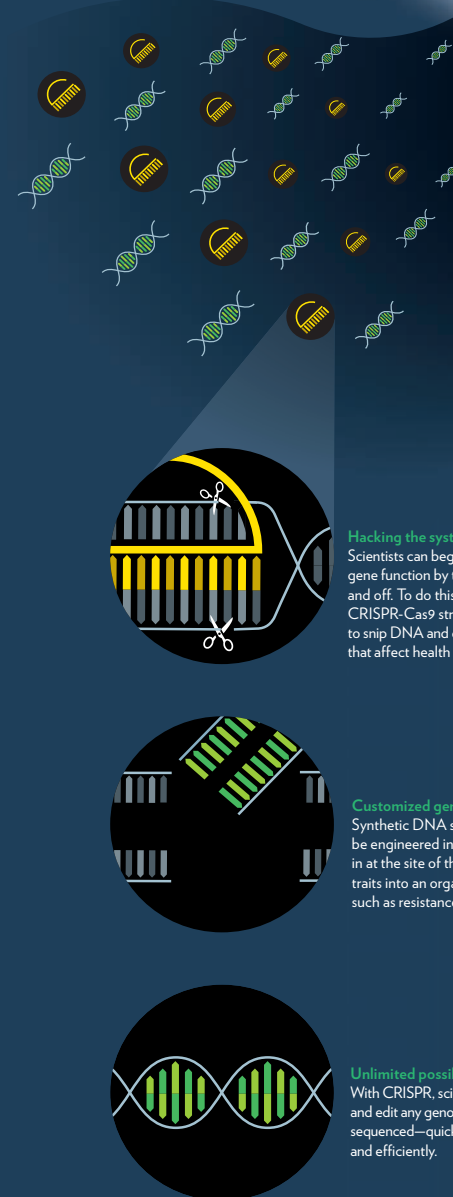
## How to Hack DNA

Some bacteria have evolved a powerful system, called CRISPR, to fight viral infections. When a virus strikes, a bacterium captures and stores a short, identifying sequence of the virus's DNA—a sort of genetic "memory card." If the same virus attacks future generations of the bacteria, they use the memory card to guide a killer enzyme to the identical sequence in the new invader and cut it away. Scientists have co-opted this natural molecular machinery not only to turn off the action of a gene, but also to insert new genetic code into living organisms, including humans. CRISPR has sparked an explosion of research—and a heated ethical debate.



## HOW IT'S HARNESSSED IN THE LAB

Scientists realized they could adapt this mechanism to disable genes or insert DNA into any organism.



**Hacking the system**  
Scientists can begin to understand gene function by turning a gene on and off. To do this, they program CRISPR-Cas9 structures in a lab to snip DNA and disable genes that affect health and crops.

**Customized genomes**  
Synthetic DNA sequences can also be engineered in the lab and spliced in at the site of the cut, introducing desired traits into an organism, such as resistance to a parasite.

**Unlimited possibilities**  
With CRISPR, scientists can alter and edit any genome that has been sequenced—quickly, cheaply, and efficiently.

## APPLICATIONS FOR CRISPR TECHNOLOGY



**Treating Disease**  
Genome-editing technology is revealing which DNA sequences are involved in diseases such as AIDS.



**Altering Ecology**  
The spread of vector-borne illnesses like malaria could be reduced by introducing disease-resistant genes into wild insect populations.



**Transforming Food**  
CRISPR could be used to develop drought-resistant or otherwise hardier crops. CRISPR mushrooms that don't brown have already been approved in the U.S.



**Editing Humans?**  
Experiments with nonviable embryos show that much work will have to be done—and many questions answered—before CRISPR can be used to edit humans.

# EXPLORATION TIME LINE

PREHISTORY      2000 to 1 BC      AD 1 to 1000      1000 to 1500      1500 to 1750      1750 to 1900      1900 to 1950      1950 to PRESENT

■ **80,000 ya\***  
Homo sapiens moves out of Africa.

■ **ca 75,000 ya**  
Modern humans reach Southeast Asia.

■ **ca 65,000 ya**  
Humans reach Australia.

■ **ca 15,000 BC**  
First settlements appear in North America.

■ **ca 8000 BC**  
Dogs help pull sleds over snow.

■ **ca 6300 BC**  
Earliest known boat is made.



■ **ca 2300 BC**  
The earliest known maps are produced in Mesopotamia.

\* years ago

■ **ca 2000 BC**  
Austronesians settle on various islands in the South Pacific.



■ **ca 700 BC**  
Celts are introducing Iron Age technology to Europe.



■ **240 BC**  
Greek mathematician Eratosthenes calculates the circumference of the Earth.

■ **ca 115 BC**  
Early trade agreements form between Chinese and European powers.

■ **150**  
Ptolemy maps the world in his *Geography*.

■ **271**  
A compass is first used in China.



■ **ca 400**  
Polynesian seafarers settle the Hawaiian Islands.

■ **ca 600**  
Silk Road is in full use, with China absorbing influences from the West.



■ **1000**  
Viking longships under the command of Leif Eriksson cross the Atlantic and reach North America.

■ **1050**  
Arab astronomers and navigators introduce the astrolabe to Europe.



■ **1271**  
Marco Polo sets off on a four-year, 7,500-mile journey from Venice, Italy, to Shangdu, China.


■ **1331**  
Arab traveler Ibn Battuta visits East Africa as part of a long voyage through the Islamic world.

■ **1492**  
Christopher Columbus lands on a Caribbean island that he names Hispaniola.

■ **1499**  
Italian navigator Amerigo Vespucci explores the northeast coastline of South America.

■ **1513**  
Ponce de León arrives in today's Florida, first of the Spanish conquistadors in the Americas.

■ **1519**  
Ferdinand Magellan begins his circumnavigation of the globe.

■ **1535**   
Jacques Cartier travels up St. Lawrence River to site of today's Montreal.

■ **1595**  
Gerardus Mercator's first atlas is published.

■ **1607**  
The English establish Jamestown on the James River in North America.

■ **1722**  
The Dutch land on Easter Island.



■ **1768**  
Britain's Capt. James Cook begins exploring the Pacific Ocean.

■ **1799**  
The Rosetta Stone is discovered in Egypt.



■ **1804–1806**  
Lewis and Clark run an expedition across the western territory of what is now the United States.

■ **1841**  
The first wagon trains to cross the Rocky Mountains arrive in California.



■ **1891**  
Construction begins on the Trans-Siberian Railroad.

■ **1901**  
The city of Fairbanks is settled on the Alaskan frontier.

■ **1904**  
Much of Chichén Itzá is discovered, in Mexico.



■ **1909**  
Cmdr. Robert E. Peary and Matthew Henson lead the first expedition to the North Pole.

■ **1937**  
Amelia Earhart disappears during an attempt at a flight around the world.



■ **1946**  
Richard E. Byrd leads an expedition to the South Pole.

■ **1953**  
Edmund Hillary and Tenzing Norgay reach Mount Everest's summit.



■ **1957**  
The U.S.S.R. launches Sputnik 1, setting off a space race with America.

■ **1960**  
Jacques Piccard becomes the first human to visit the Challenger Deep, the deepest point in the ocean.

■ **1969**  
Apollo 11 lands men on the moon.

■ **1990**  
The Hubble Space Telescope is put into operation.



■ **2004**  
NASA's Spirit and Opportunity rovers land on Mars.

# SKIING THROUGH TIME

## SOLVING THE PROBLEM OF SNOW

After the last ice age, Stone Age hunters began strapping long pieces of wood to their feet to travel farther and faster over snow in pursuit of the game that flourished across Europe and Asia. Scientists continue to find evidence of early skiers' presence engraved in rock and preserved in bogs.



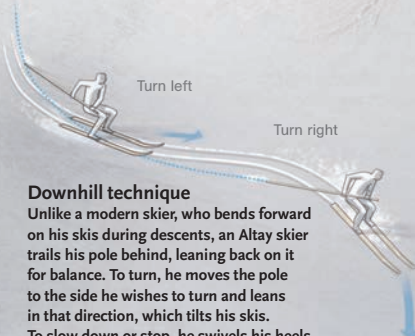
Historians are divided on where skiing was born. Some argue it arose in Scandinavia and northwest Russia, though others point to the Altay region.

### 8000 BC (disputed) Altay, China

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

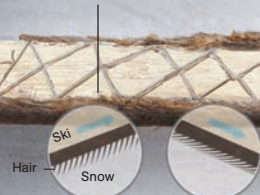
### Downhill technique

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



### Altay skis

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



### 6000 BC Vis, Russia

The oldest ski found to date has an elk head carved on one end that may have functioned as a brake.



### 3200 BC Kalvträsk, Sweden

A long pole with a scoop carved into one end likely served several purposes: steering downhill, shoveling, and as a club for hunting.



### ca AD 750 Kinnula, Finland

Shorter and wider, this intricately carved ski worked well on soft snow in forest terrain.



### ca 1600 Norway

Skiers glided on one long, smooth board coated with tar and pushed forward on a shorter, fur-bottomed one.



### ca 1800 Telemark, Norway

Foreshadowing modern designs, the shape of these skis, wider at the ends and narrow in the middle, improved control and turning.



### ca 1860s Sierra Nevada, United States

Initially, American miners used 10-foot skis to travel in the mountains, and over time they began using longer skis to race each other.



Today Skis continue to evolve, using lighter and stronger materials that increase speed and control.



Depictions based on archaeological and historical records

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

