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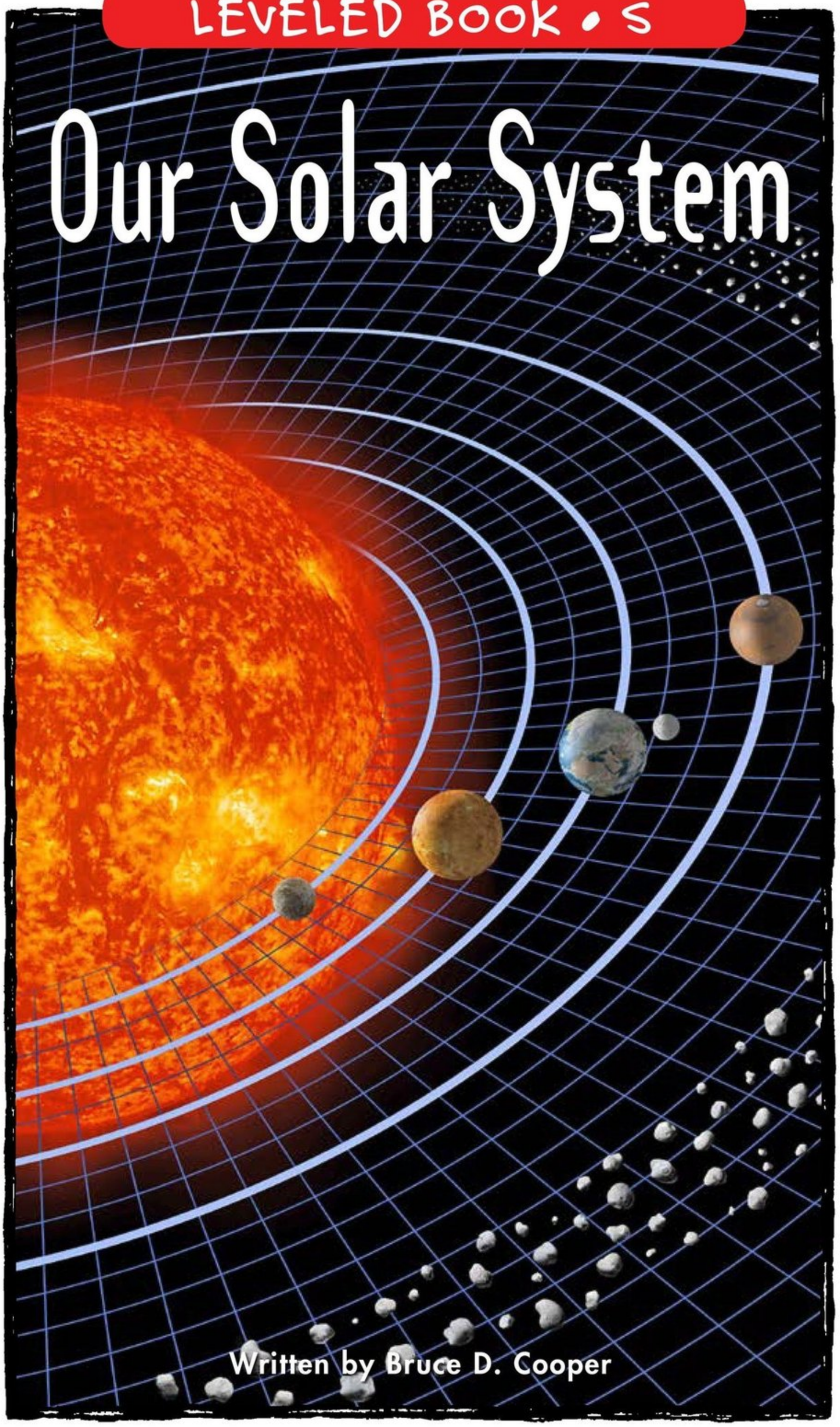
# Our Solar System



Written by Bruce D. Cooper

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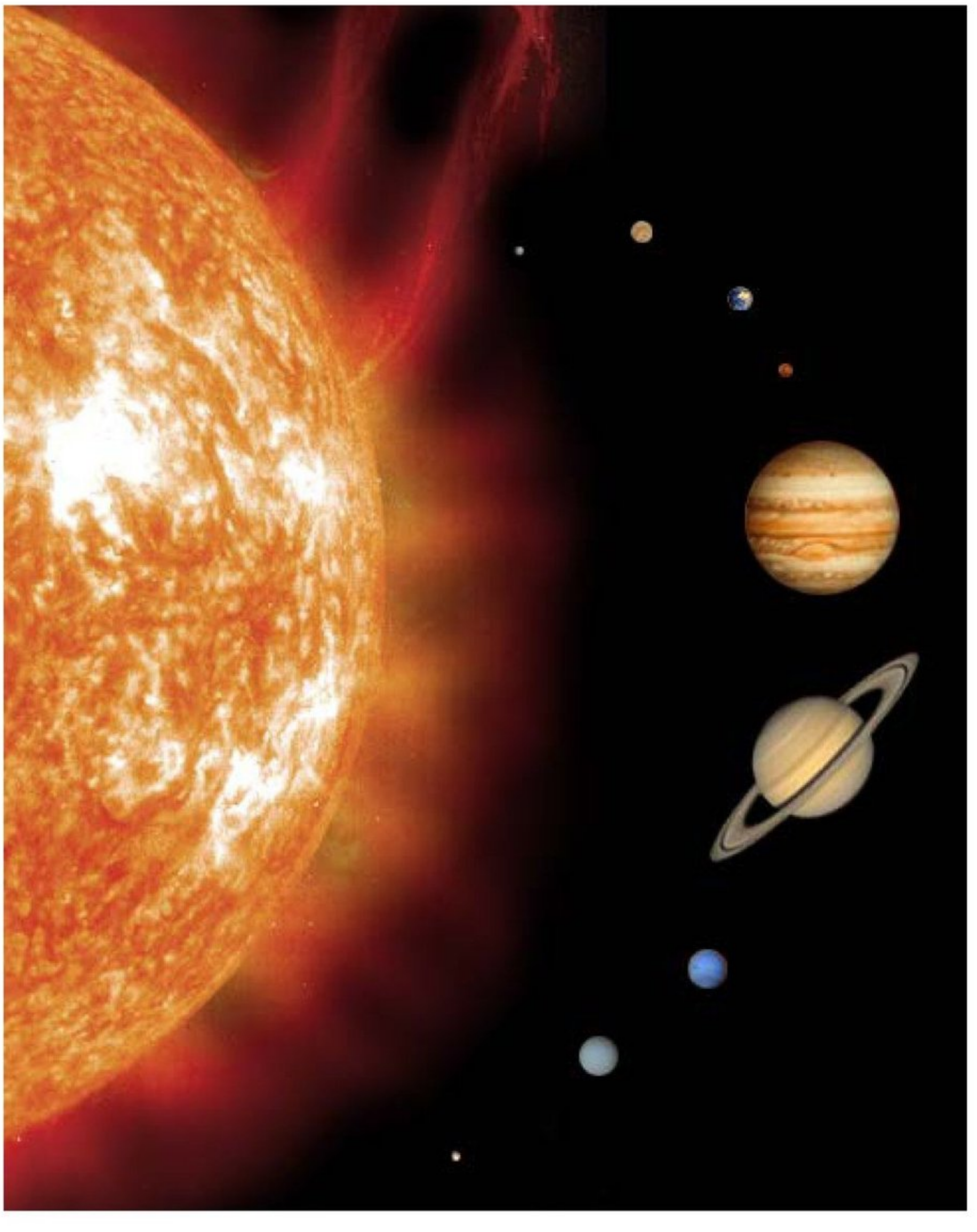

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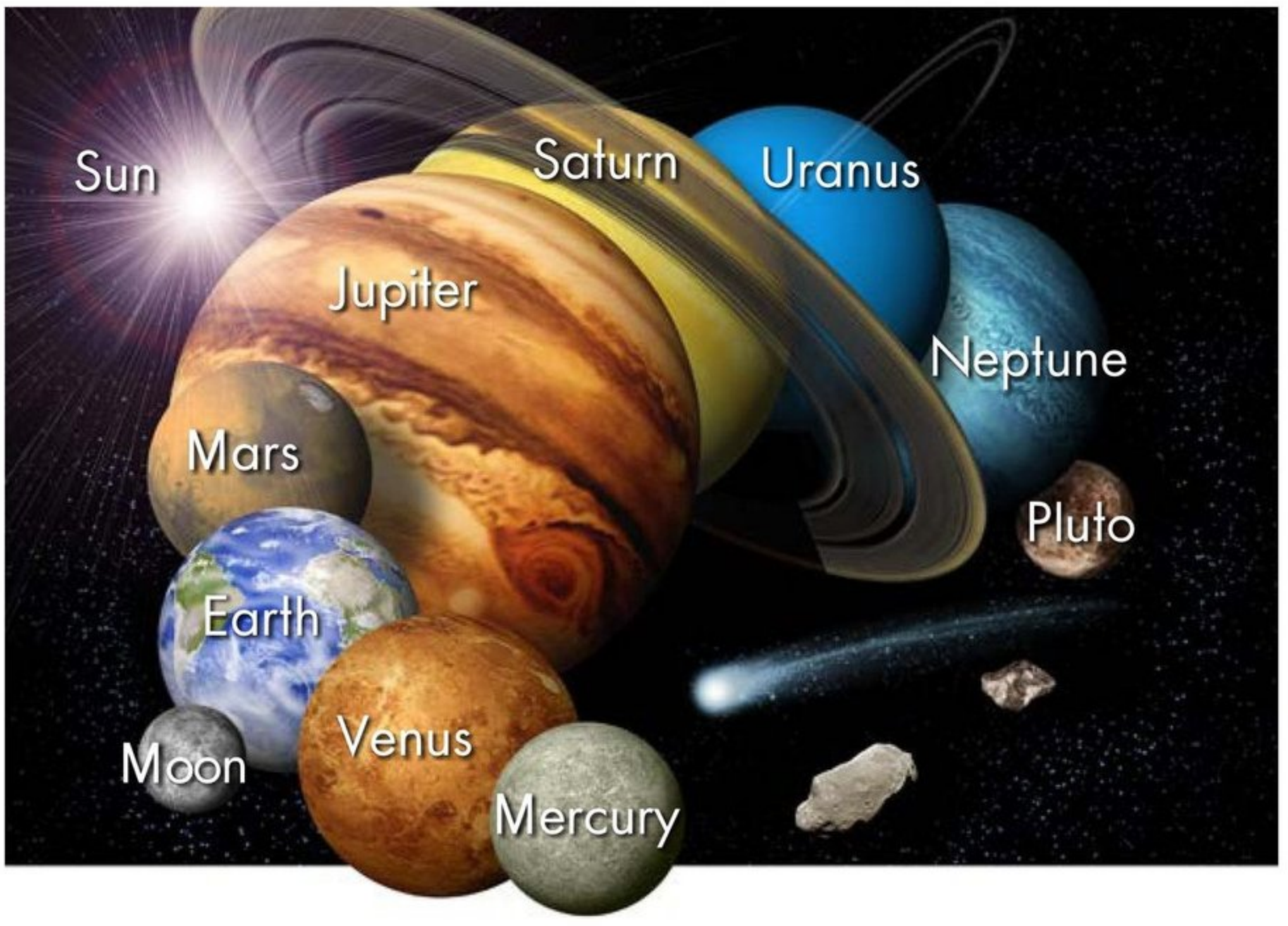
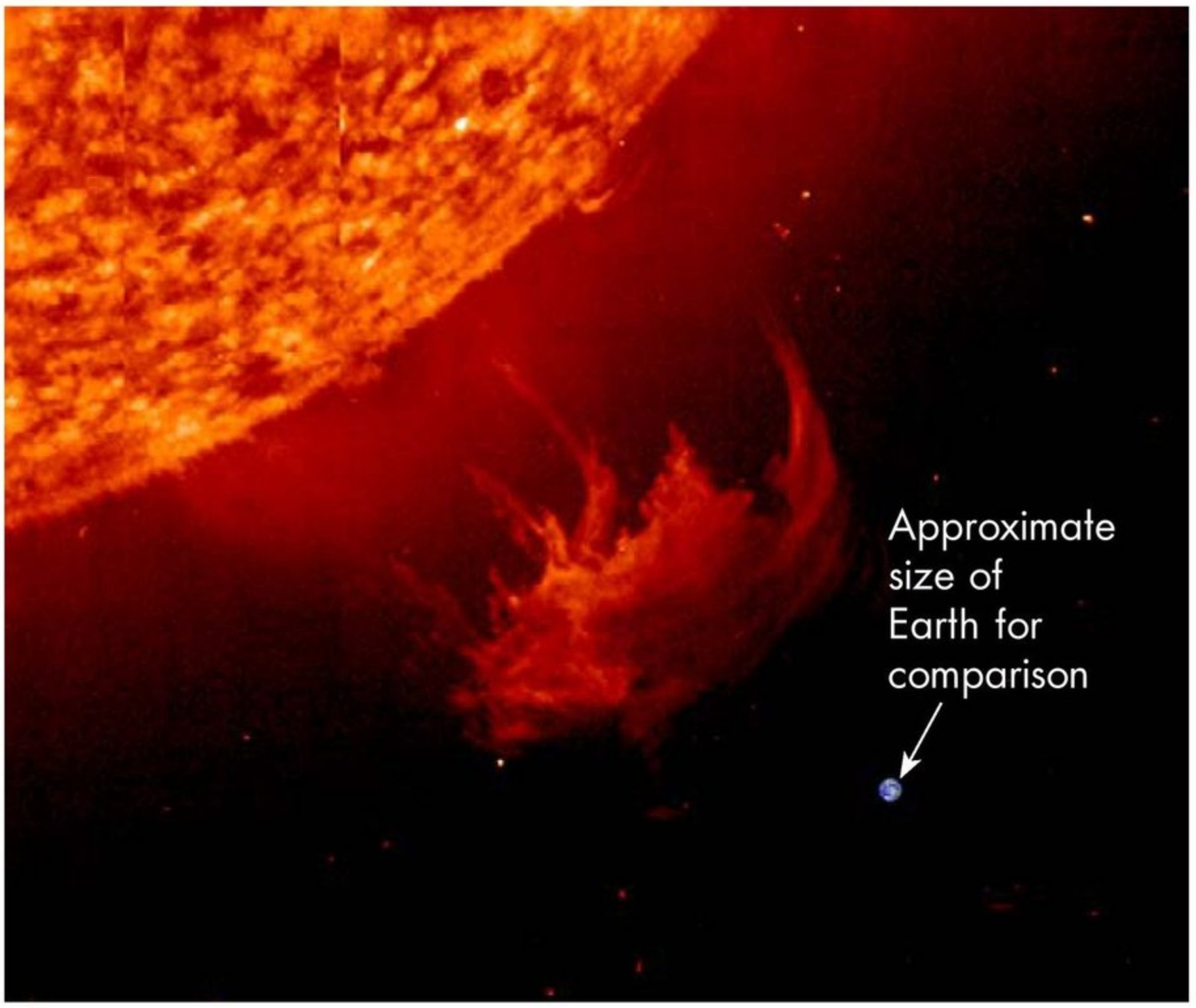
# Table of Contents



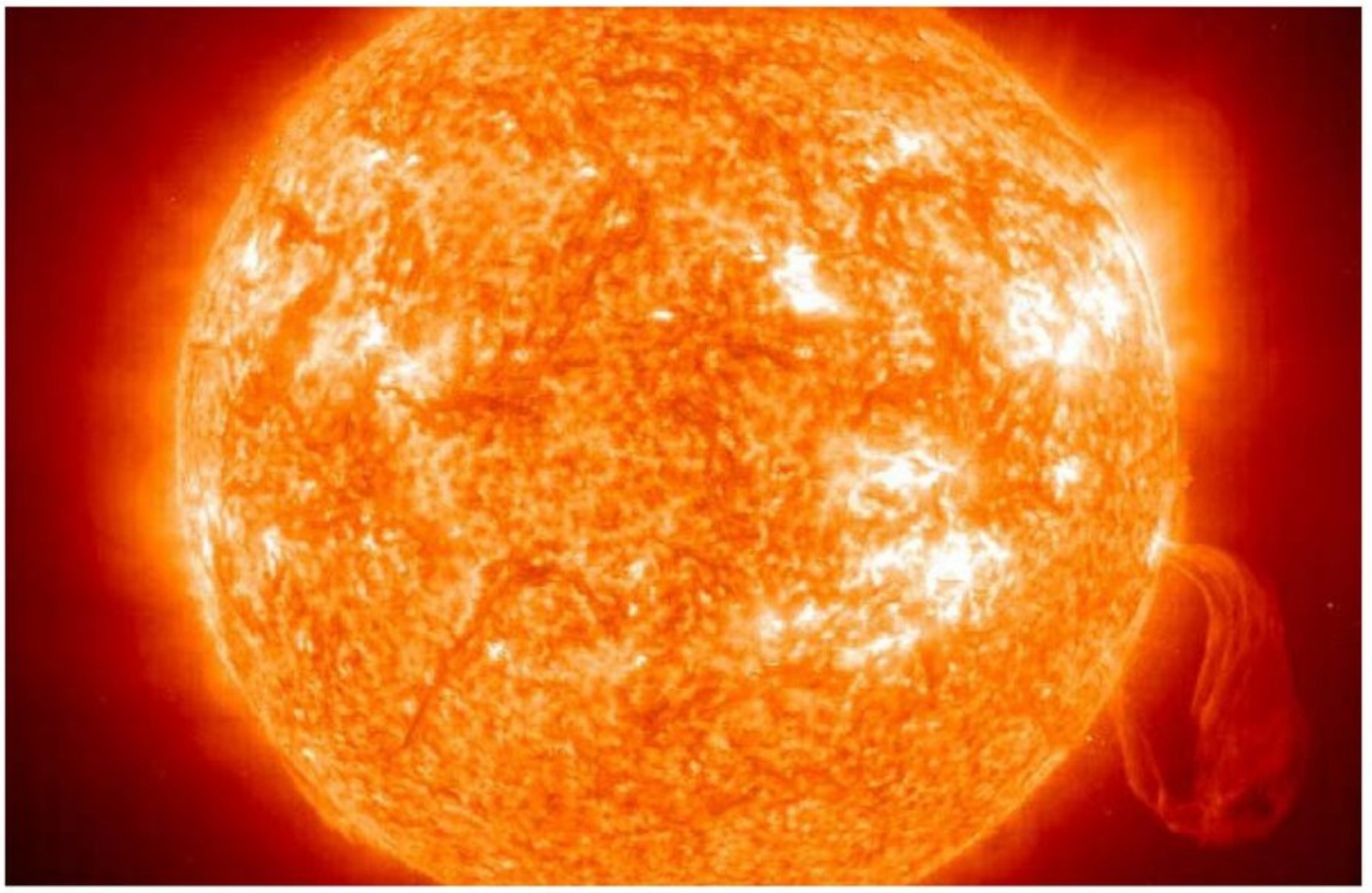

# Introduction

Our Solar System is made up of the Sun, eight official planets, several dwarf planets, and hundreds of planetary satellites, or moons. It also contains comets, asteroids, and clouds of gas. The Sun is the center of the Solar System. Everything else in the Solar System goes around, or **orbits**, the Sun. Mercury, Venus, Earth, and Mars are the inner, rocky planets. They are made of hard materials. The outer planets are Jupiter, Saturn, Uranus, and Neptune. They are known as the gas giants and are made mostly of gases. The outer planets are hundreds of times larger than Earth.

To get an idea of the size of things in our Solar System, imagine that Earth is a grape. If the Earth were the size of a grape, the Moon would be the size of a green pea. The Sun would be as big as a ball that an adult man could stand in. Jupiter, the largest planet, would be the size of a grapefruit, while Saturn, the second largest planet, would be the size of an orange. Uranus and Neptune would be the size of lemons.




The diameter of Earth is approximately 13,000 kilometers (8,100 miles). The Sun's diameter is approximately 1.4 million kilometers (870,000 miles). How many times larger is the Sun's diameter than the Earth's?

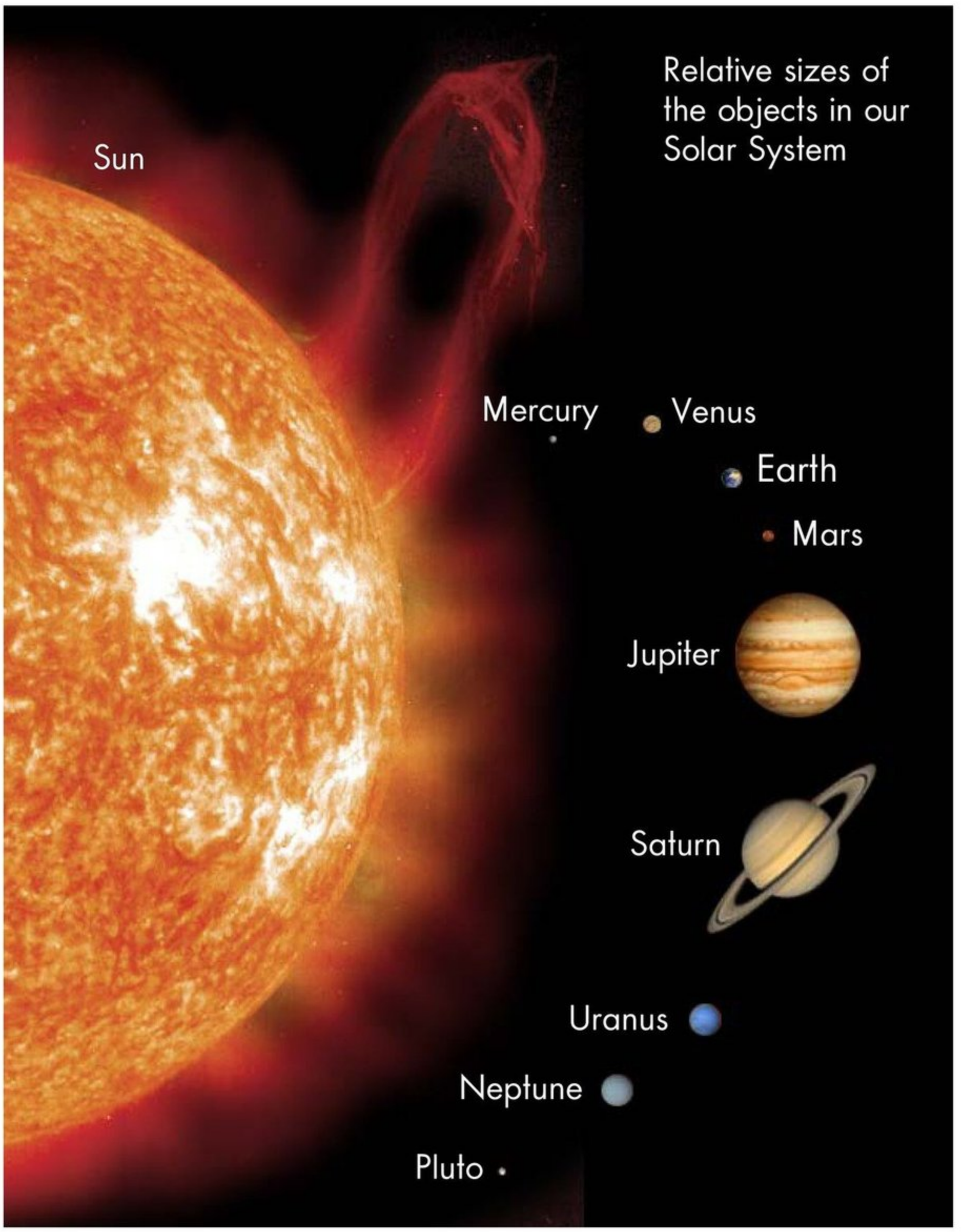


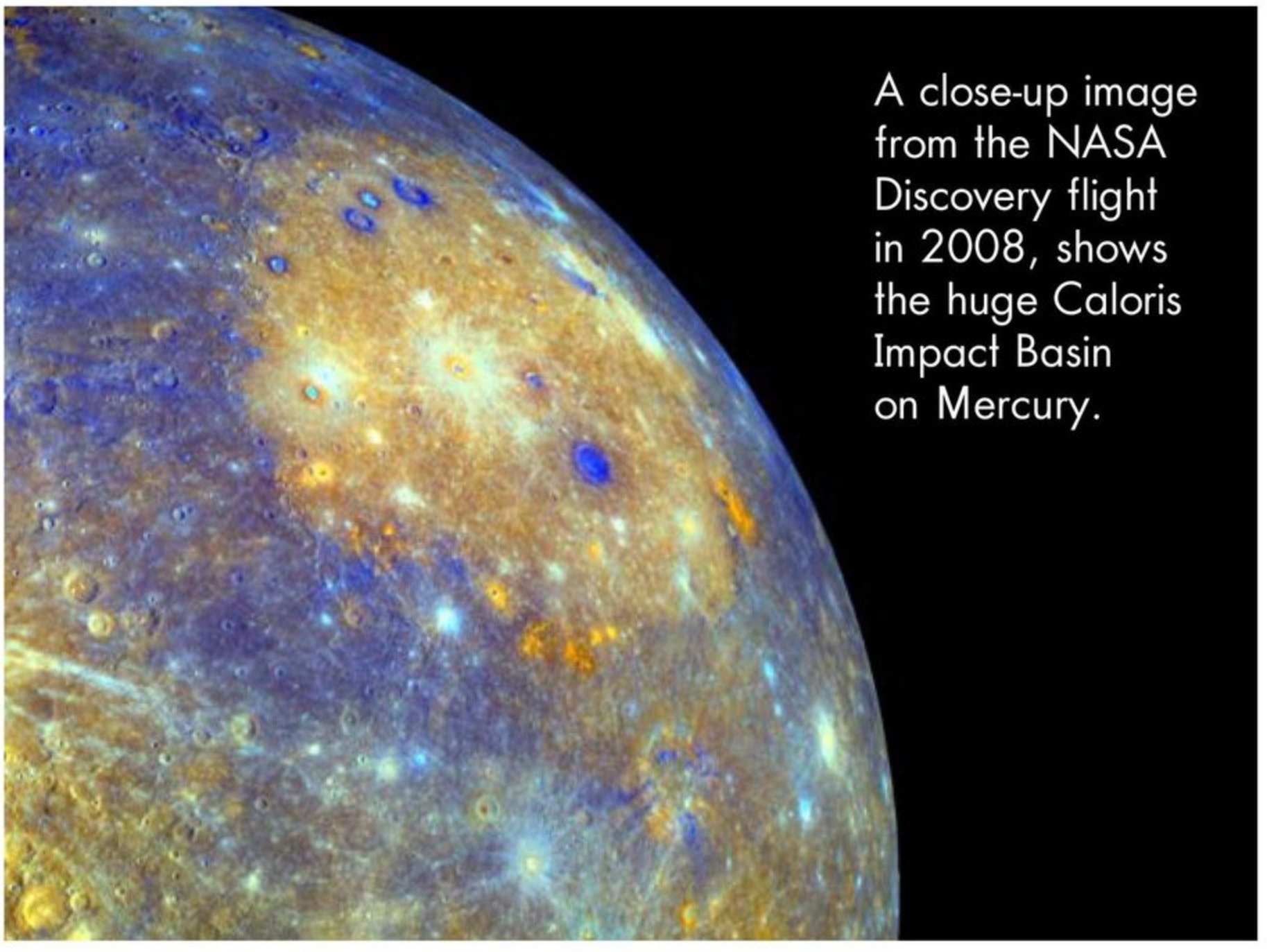
The temperature of the Sun's surface is approximately 6,000 degrees Celsius (10,832 degrees Fahrenheit). The Sun's core is approximately 15,000,000 degrees Celsius (27,000,032 degrees Fahrenheit).

## The Sun

The Sun is a huge ball of burning gas that sends energy far out into the Solar System. The Sun plays a very important part in our daily lives, providing energy that supports all life on Earth. The Sun causes seasons, climate, ocean currents, air circulation, and weather. Without the Sun's energy, plants could not grow and make food. Also, there would be no gas, oil, or coal, which are Earth's **fossil fuels**. Fossil fuels are formed over millions of years from dead plant and animal life.

The Sun is just one of billions of stars. It has been around for about 4.6 billion years. It will keep producing energy for another 5 billion years. Before it dies, it will swell up and swallow many of the inner planets. Then it will shrink into a much smaller ball.

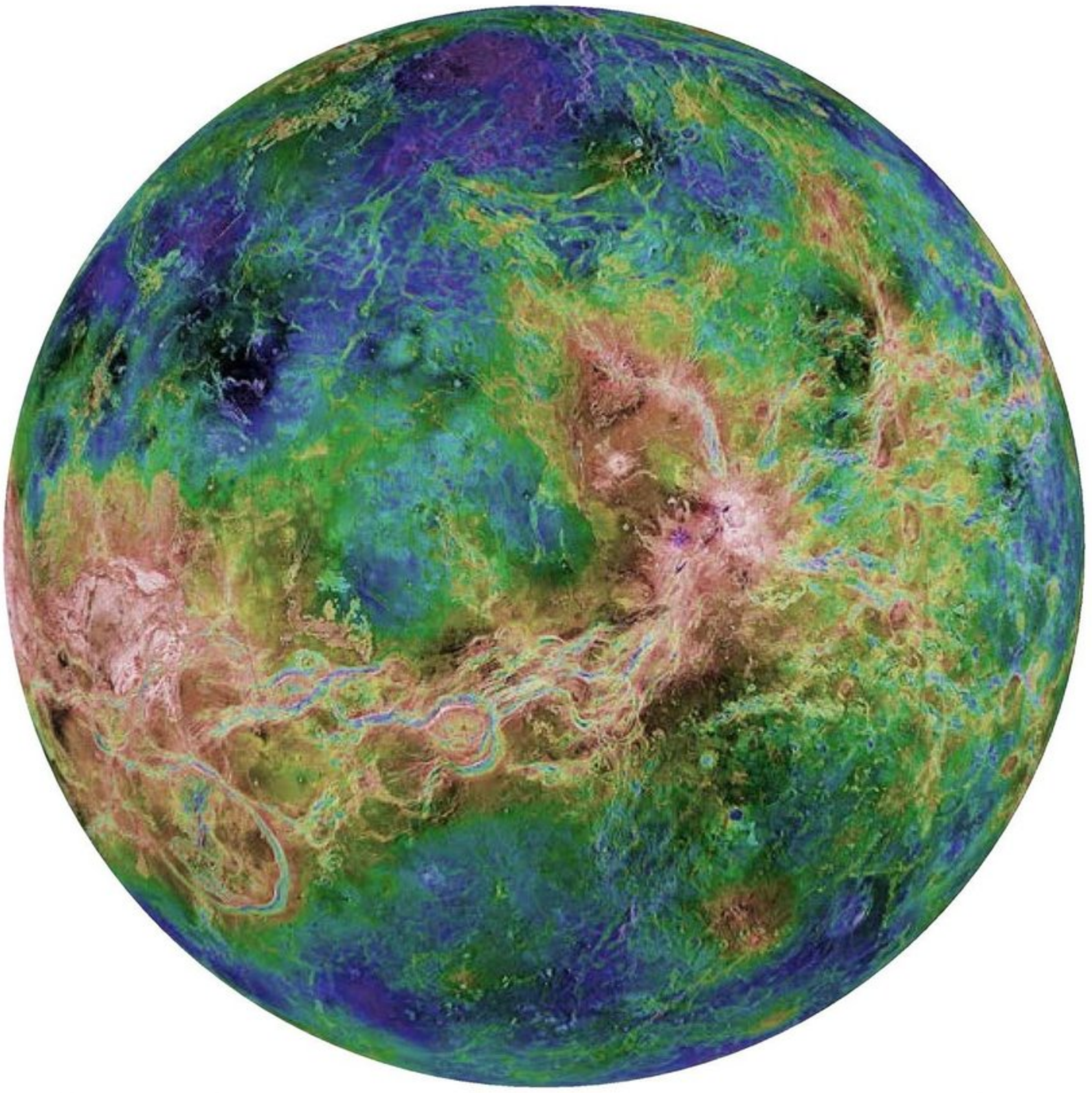




A close-up image from the NASA Discovery flight in 2008, shows the huge Caloris Impact Basin on Mercury.

# Mercury

Mercury is the closest planet to the Sun. It is the smallest planet in our Solar System. It takes only 88 Earth days for Mercury to make a complete **orbit** around the Sun. (For comparison, it takes Earth 365 days, or one year, to orbit the Sun.) Like all other planets, Mercury spins like a top as it goes around the Sun. It spins very slowly. Each spin of a planet is a day on that planet. A day on Mercury is 59 times longer than an Earth day. Because Mercury spins, or rotates, so slowly, it gets very hot during the day and very cold at night.



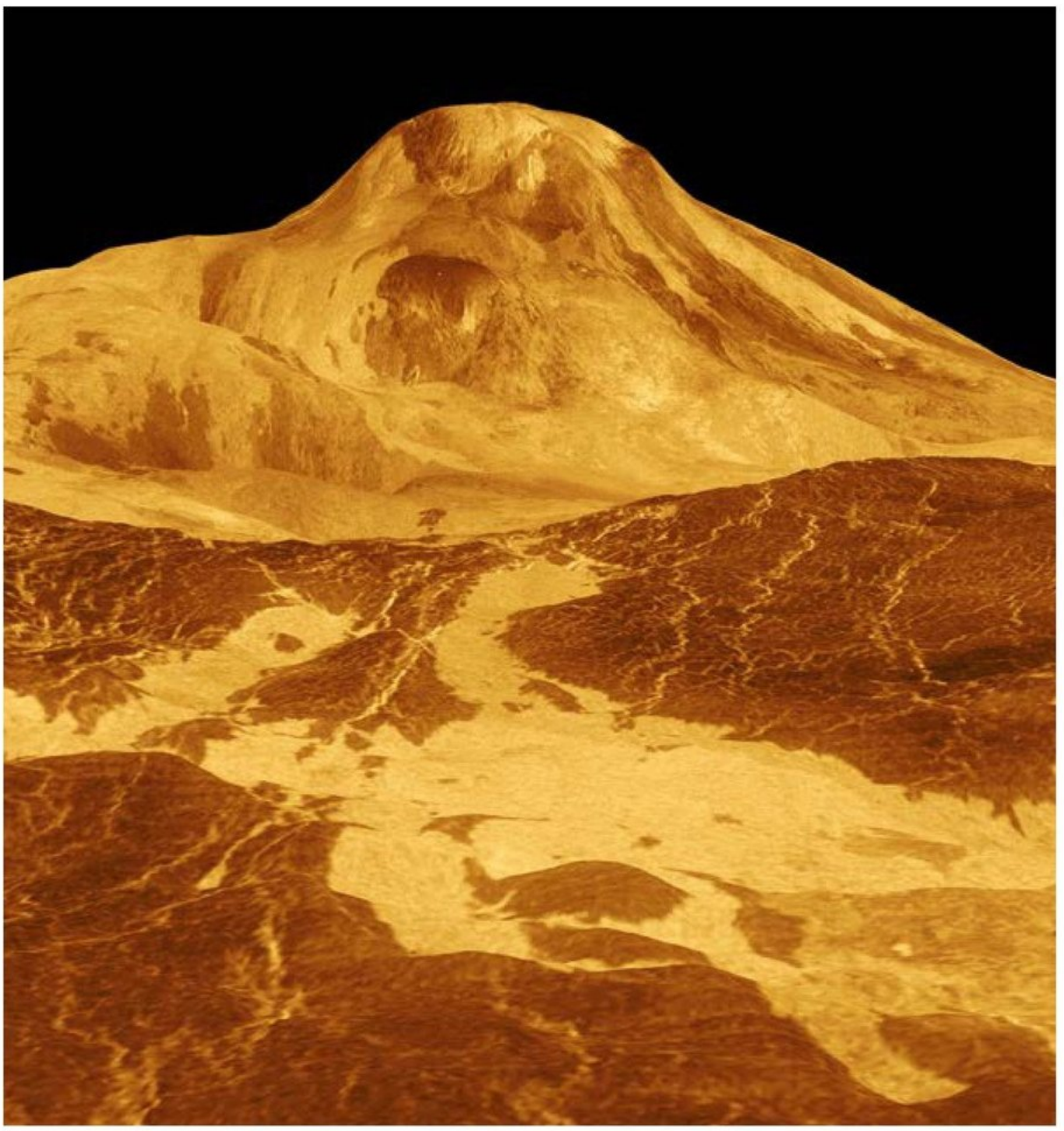
In addition to having air too heavy to breathe, scientists found that Venus rotates backward. This means that on Venus the Sun rises in the west and sets in the east. The colors used on this Magellan-mission image represent different elevations on the surface of Venus.

## Venus

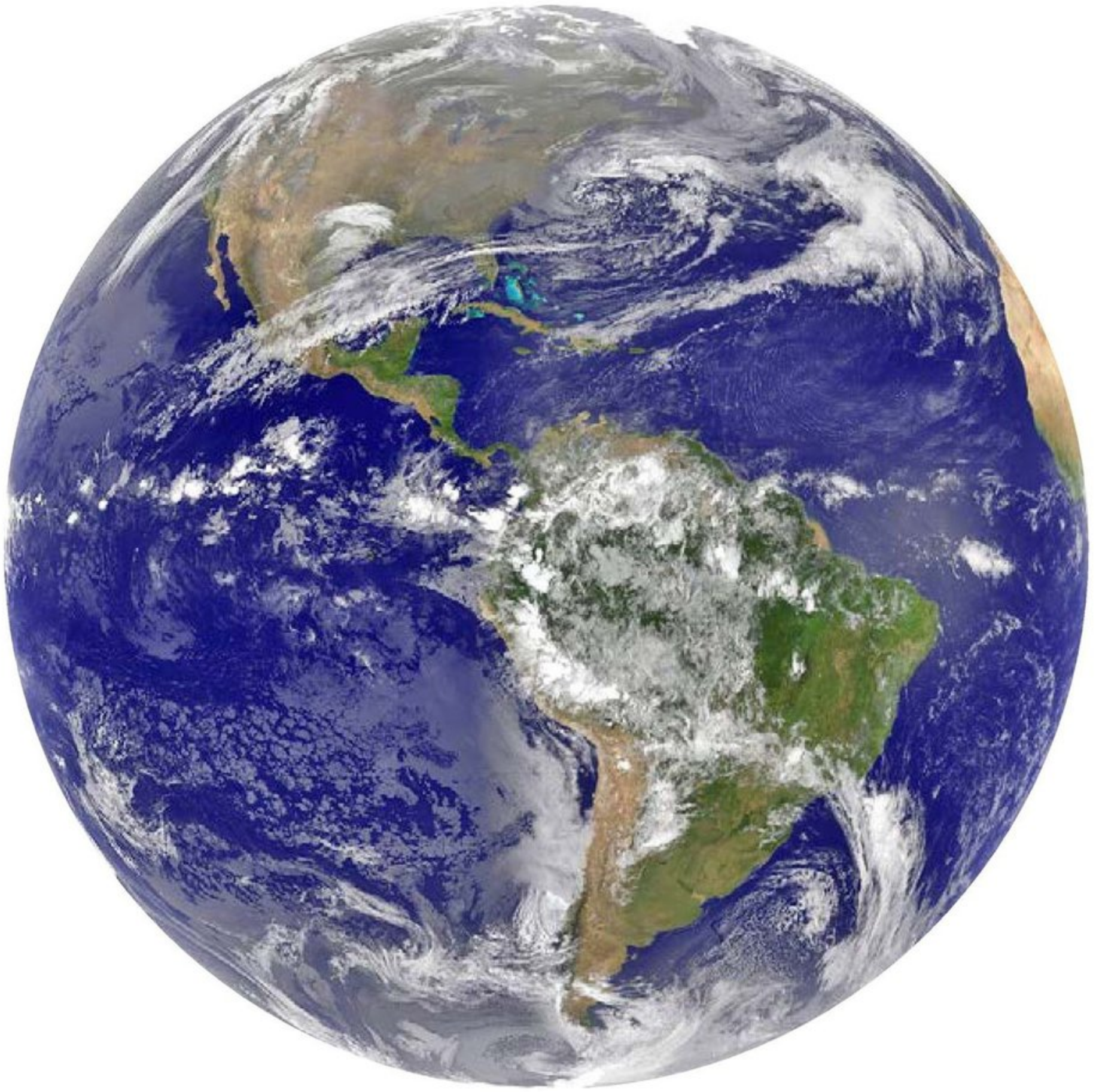
Venus and Earth are similar in size. But Earth and Venus are very different. Venus is covered by layers of clouds that are much thicker than clouds on Earth. These clouds trap most of the Sun's heat. The temperature on Venus gets very, very hot—more than four times hotter than boiling water.

As well as trapping in heat, the clouds of Venus reflect sunlight. This makes Venus one of the brightest objects in the sky. The air pressure on Venus is ninety times greater than that on Earth. For this reason, space probes that land on Venus stop working within a few hours.

Venus rotates even more slowly than Mercury. One day on Venus is equal to 243 Earth days.



Maat Mons, a volcano on Venus, is 8 km (5 mi.) high.
It is very similar to the types of volcanoes found in Hawaii.



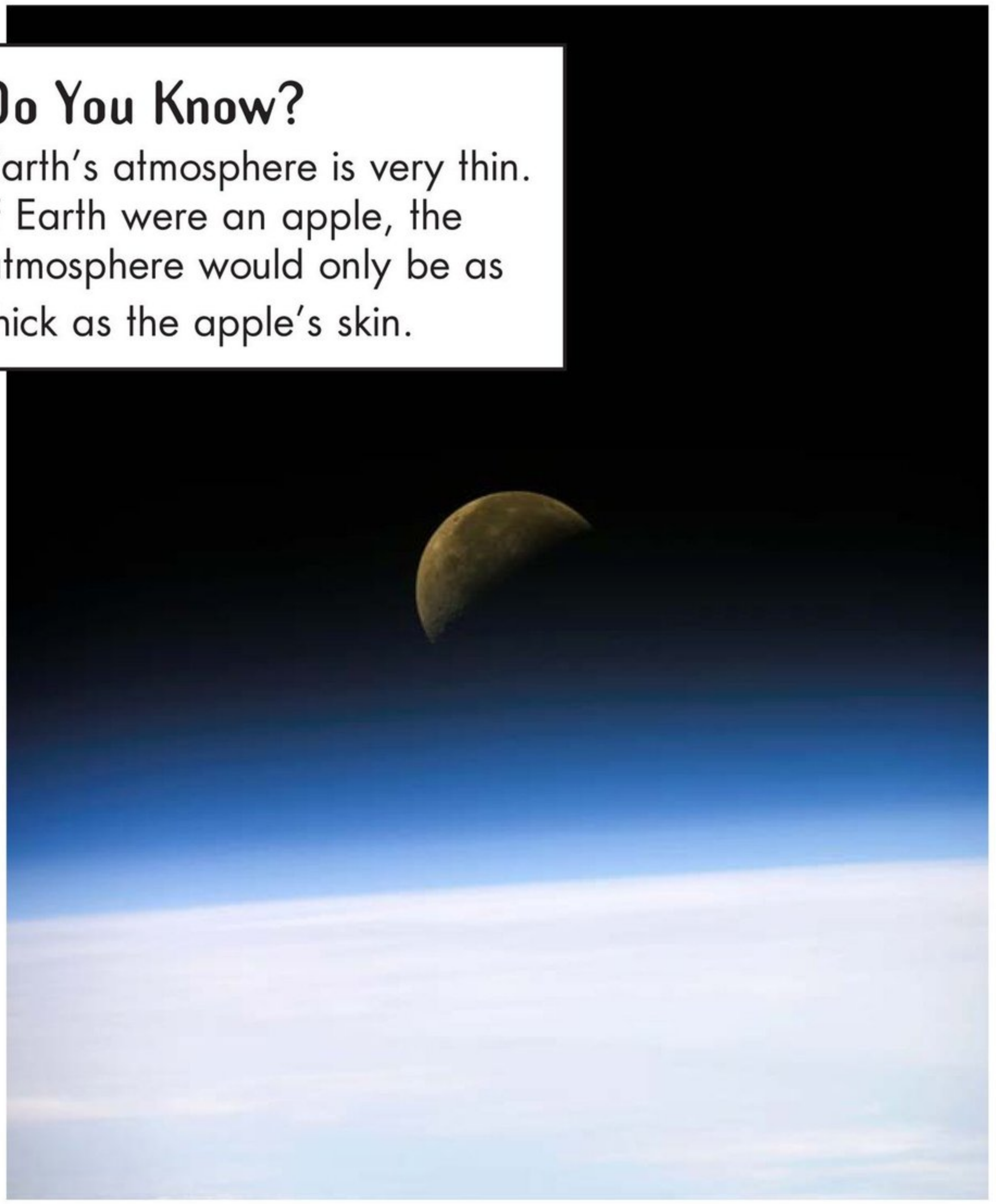
## Earth

Earth is a very special planet because it is our home and also because it is the only planet in our Solar System that can support life. The most important difference between Earth and other planets is the abundance of liquid water. Water covers nearly 70 percent of the Earth. Earth rotates about once every 24 hours (one day). It completes one orbit of the Sun about once every 365 days (one year).

Earth's atmosphere is made up of gases that living things need to stay alive. The **atmosphere** protects us from most of the Sun's harmful rays. It also helps to protect us from meteors by causing them to burn up before reaching Earth's surface. Earth has one natural satellite, the Moon.

## Do You Know?

Earth's atmosphere is very thin. If Earth were an apple, the atmosphere would only be as thick as the apple's skin.



## The Moon

The Moon is about one-fourth the size of Earth. It reflects light from the Sun onto us. Many scientists believe the Moon was originally a part of Earth and was broken off in an enormous space collision. Tests have shown that there is water ice on the Moon's surface. Earth's ocean tides are caused by the **gravitational pull** of the Moon.

## Mars

Mars is the fourth planet from the Sun. It is known as the red planet because of large amounts of rust-colored dust on its surface. Mars is the most Earth-like of all the planets of our Solar System. Mars has seasons similar to our own, and the soil there is similar to the soil on Earth. But there is very little oxygen or water vapor in Mars's atmosphere. The climate on Mars changes widely between seasons. Temperatures on its surface can range from 30° Celsius (86°F) in the summer, to –130° Celsius (–202°F) in the winter.

Mars often has winds that blow up to 200 kilometers per hour (120 mph). These winds cause great dust storms that color the planet's atmosphere pink. There are ice caps on both poles of Mars. The northern one is made up mostly of water that never melts, while the southern pole is made up of carbon dioxide, which changes from solid to gas during the Martian summer. Mars has two small moons, Phobos and Deimos. A year on Mars is almost as long as two Earth years. A day on Mars lasts only one-half hour longer than a day on Earth.



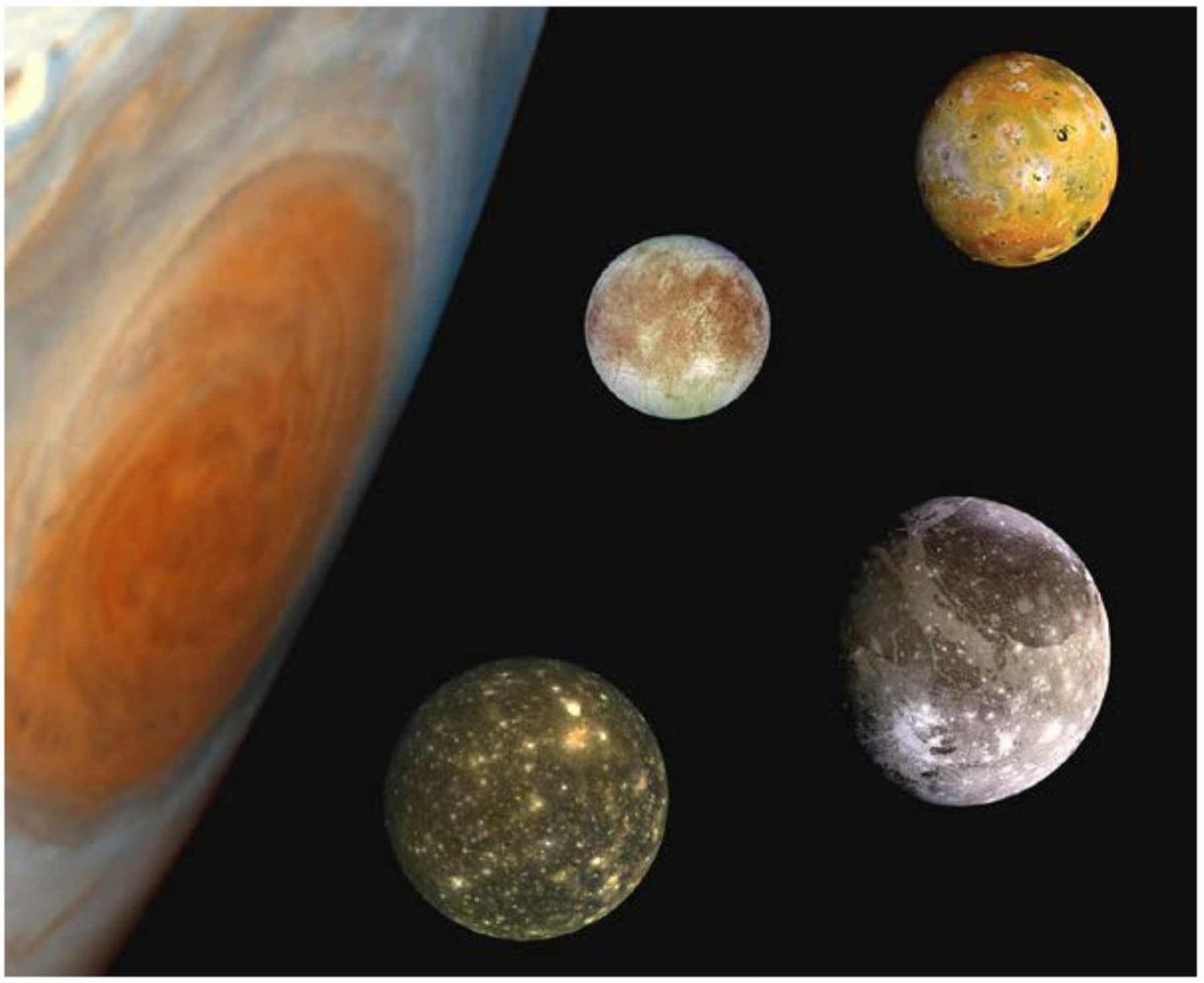
Scientists are studying the gullies at Mars Hale Crater to discover if their changing surface shapes are created by the movement of liquid water.

Jupiter and its moon, Ganymede, photographed April 9, 2007, by the Hubble Space Telescope

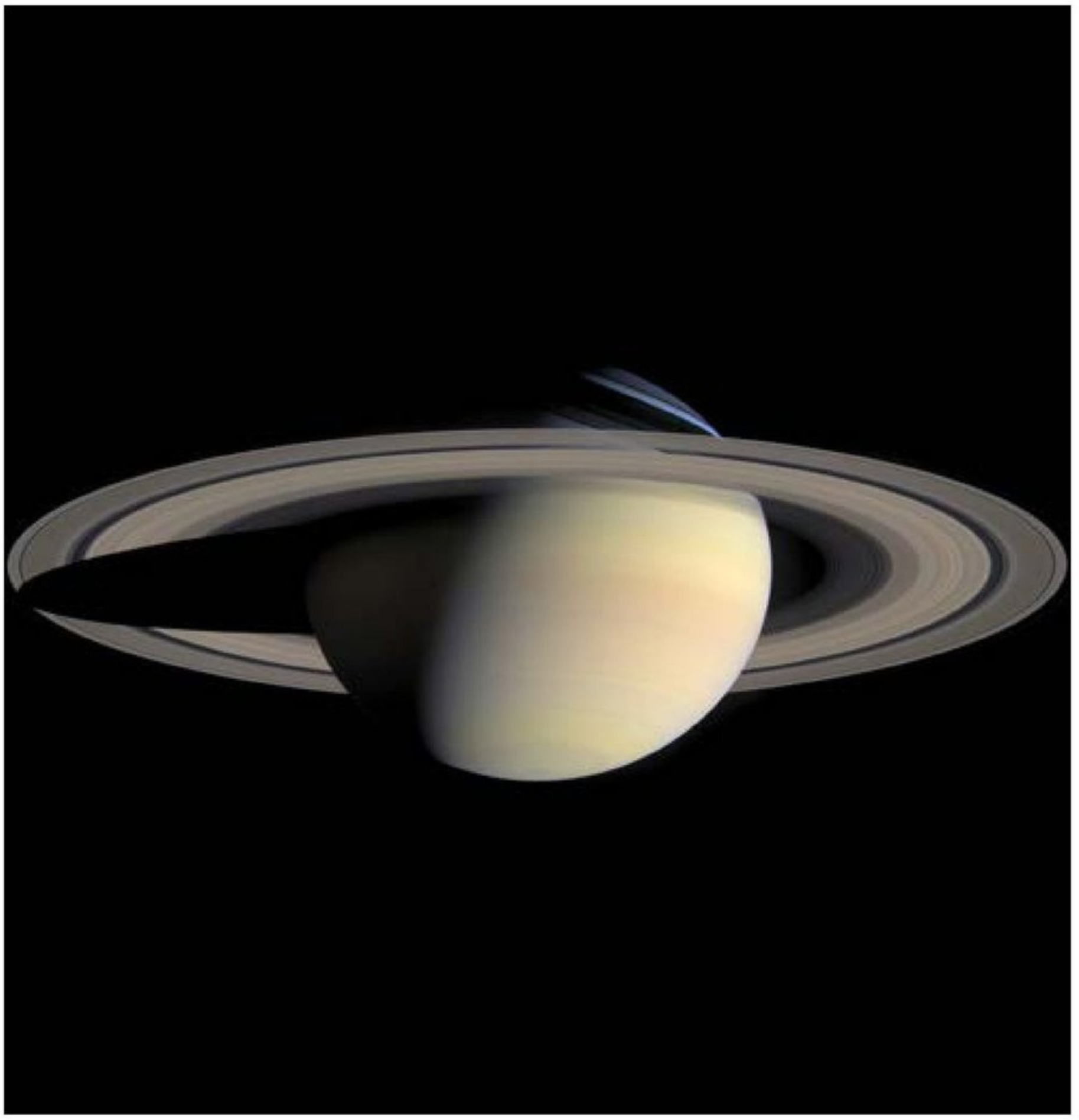
# Jupiter

Jupiter is the largest planet in our Solar System. It is like a star in many ways because it is made up mostly of gas clouds. The clouds of Jupiter form bands that have very high winds and are always very stormy. One gigantic storm rotates counterclockwise at a constant speed of 360 kilometers per hour (225 mph), and acts much like a hurricane. It's called the Great Red Spot. Easily visible, it can be as wide as three times the size of Earth. Jupiter's temperature is very cold at the tops of the clouds. At its core, it is hotter than the surface of the Sun.

In some ways, Jupiter is like a mini-solar system because it is so big and has four large moons and dozens of smaller moons orbiting around it. It also has several thin rings at its equator. Scientists believe that if Jupiter had become larger during its development, it could have become a star instead of a planet. Jupiter spins quite fast for such a large planet. One day on Jupiter is roughly ten hours. It takes Jupiter almost twelve Earth years to complete its orbit around the Sun.



Jupiter's constant dust storm, the Big Red Spot, is highly visible. Shown in their approximate size relationship, Jupiter's four moons are named, top to bottom: Io, Europa, Ganymede and Callisto.

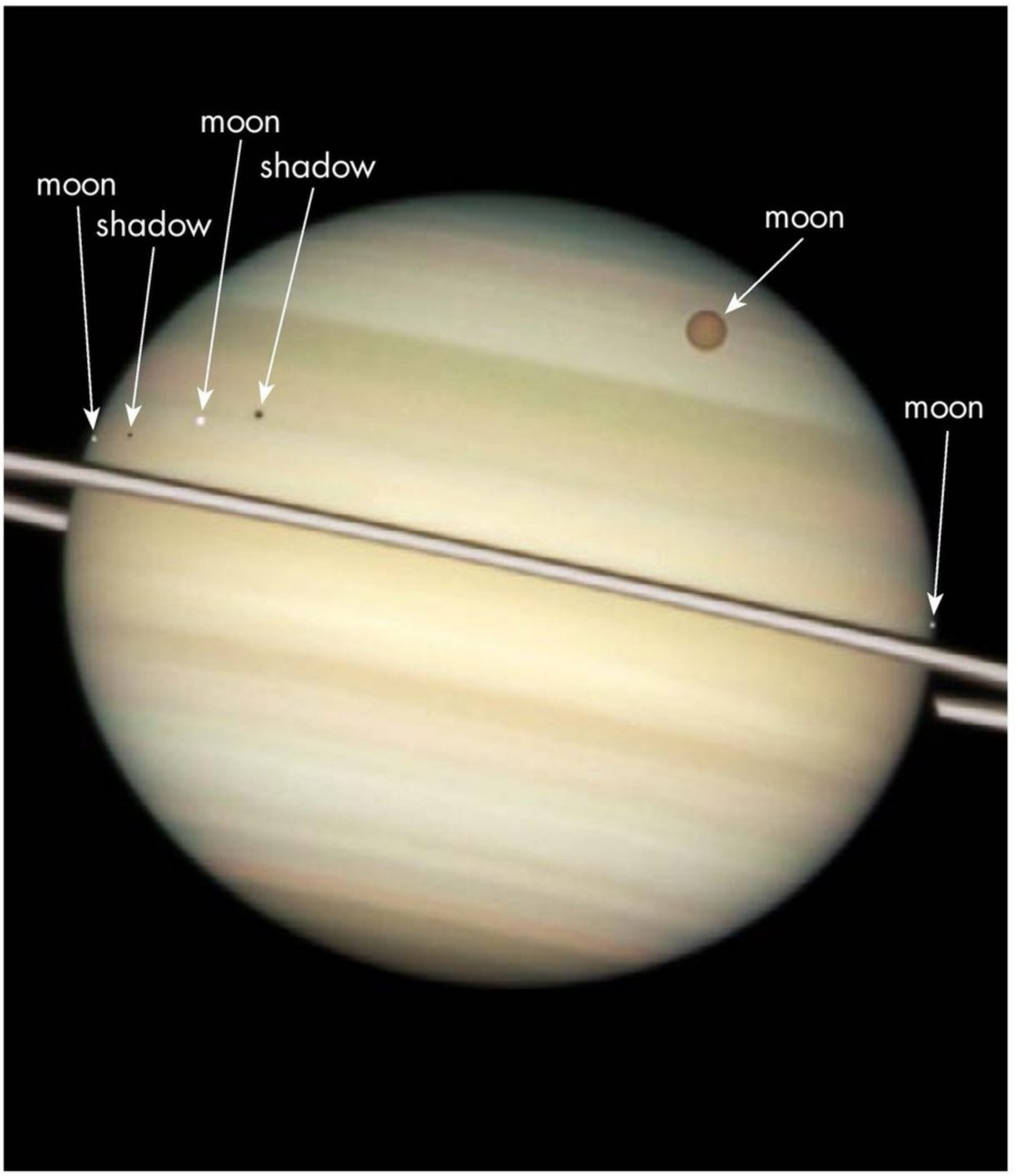


Saturn's spectacular rings are mostly made of water ice. Each ring averages about 30 feet in depth but some bumps and points are more than two miles high.

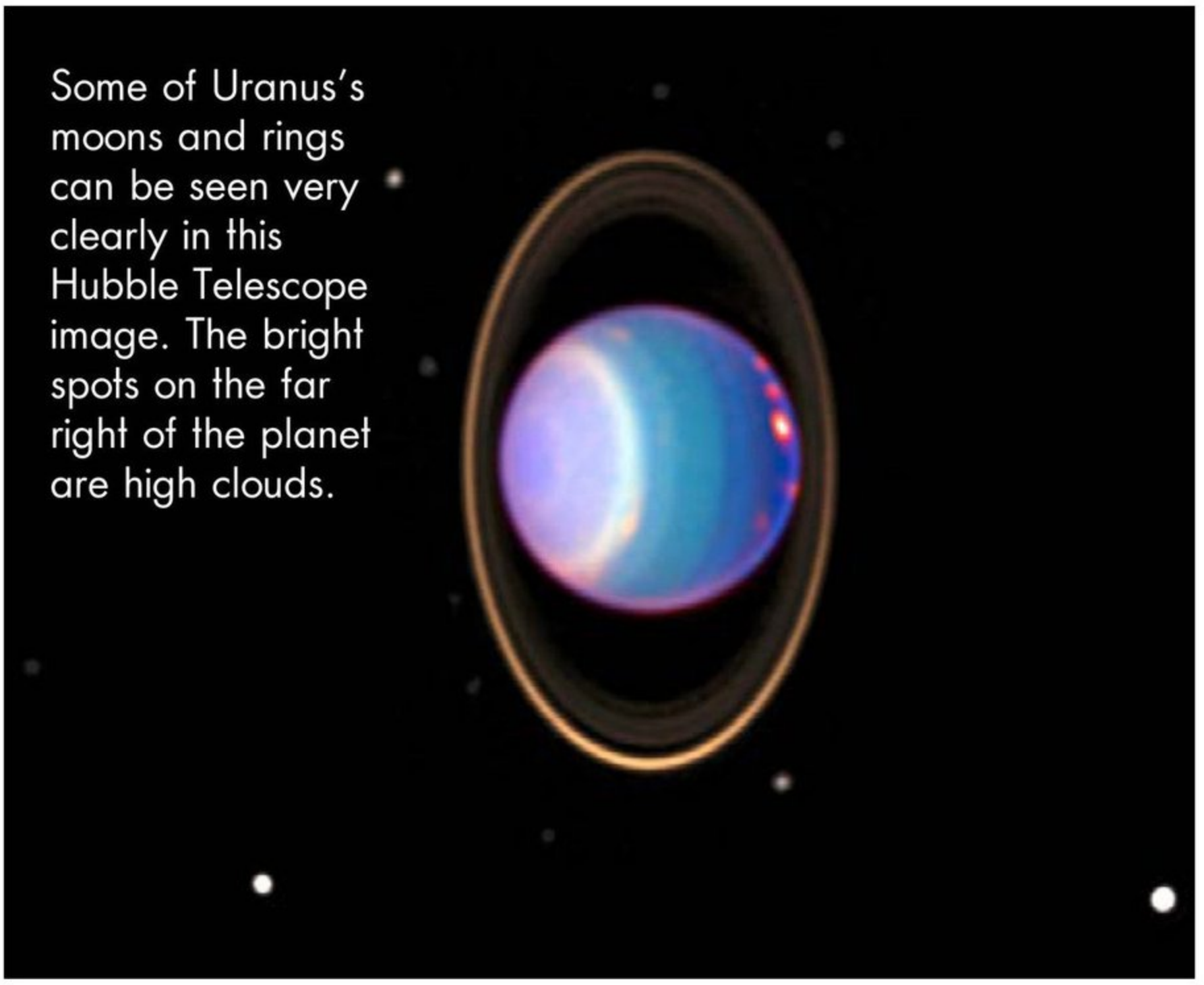
## Saturn

Saturn is the sixth planet of the Solar System. It is easy to recognize because of its large, visible system of rings. The rings are made up of millions of pieces of ice and frozen gases. Saturn also has dozens of small moons that orbit it.

Saturn is also unique for another reason. It weighs little compared to how large it is. Saturn would float if a swimming pool could be made big enough to hold it. Saturn spins very fast, making one day on Saturn ten and one-half hours long.

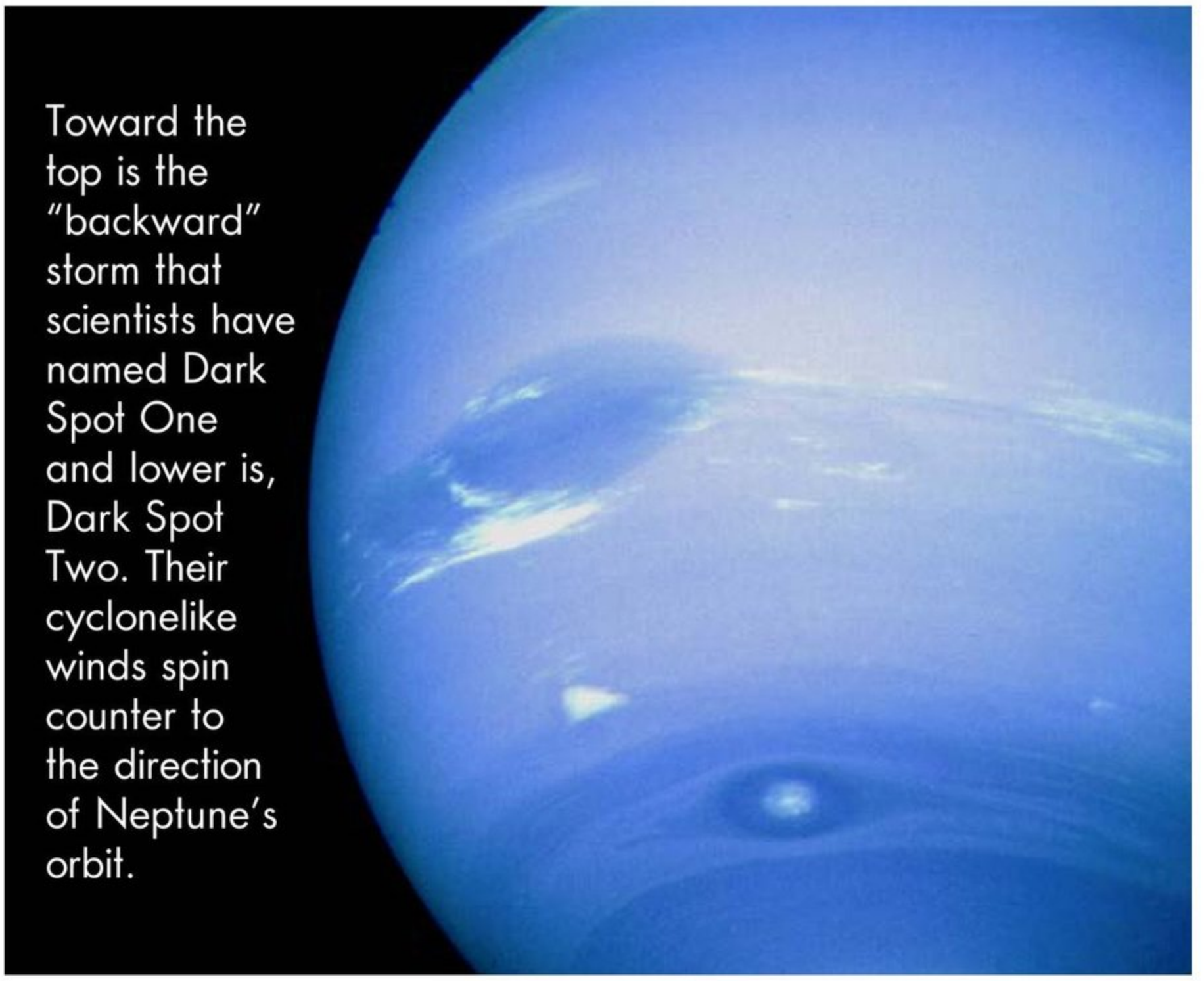



Four moons of Saturn pass in front of the planet. Enceladus and Dione on the far left cast shadows while the larger Titan and the small Mimas at the far right do not.




## Uranus

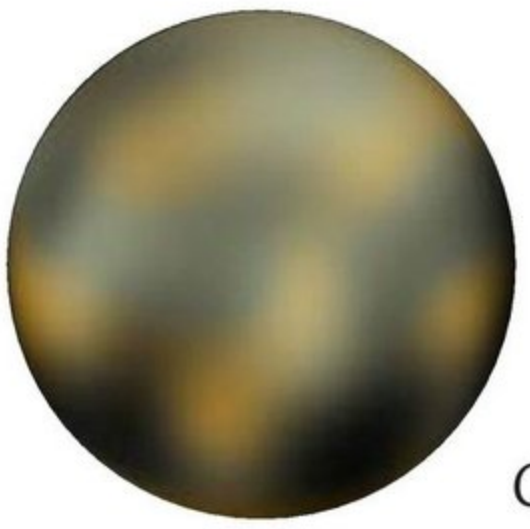
Uranus is the seventh planet of the Solar System and the third largest. It looks blue-green in color because of methane gas in its atmosphere. Uranus seems to roll around the Sun because it is very tilted. Scientists think this might be because it bumped into another planet-sized object long ago. Uranus has at least twenty-seven moons, five of which are large. Scientists have also counted at least thirteen rings. It takes Uranus eighty-one Earth years to go around the Sun.




## Neptune

Neptune is the eighth planet from the Sun. Neptune and Uranus are sometimes called the twin giants because they are so much alike. They are about the same size and color and both are covered with thick clouds. But Neptune's winds are the fastest in the Solar System—reaching 2,000 kilometers per hour (over 1,242 mph). Neptune has one large moon and many smaller moons, plus several visible dust rings. It takes Neptune about 165 Earth years to go around the Sun.

# Pluto and Other Dwarf Planets



Before 2006, the space object called Pluto was the ninth planet of our Solar System. But scientists debated and voted to create a new category called dwarf planets for space objects like Pluto. Dwarf planets orbit the Sun, have nearly round shapes, produce a minimum level of brightness, and are not moons. They also do not have enough gravitational pull to sweep other space objects from their orbit. Scientists began by identifying six official dwarf planets, but some scientists wanted to classify dozens of similar space objects as dwarf planets. Many more space objects could be counted among the dwarf planets as technology makes it easier to identify them.

## What Would You Weigh?

Gravity is different on each planet, and gravity determines how much you weigh.

If you weigh 70 lbs. on Earth, then you would weigh:

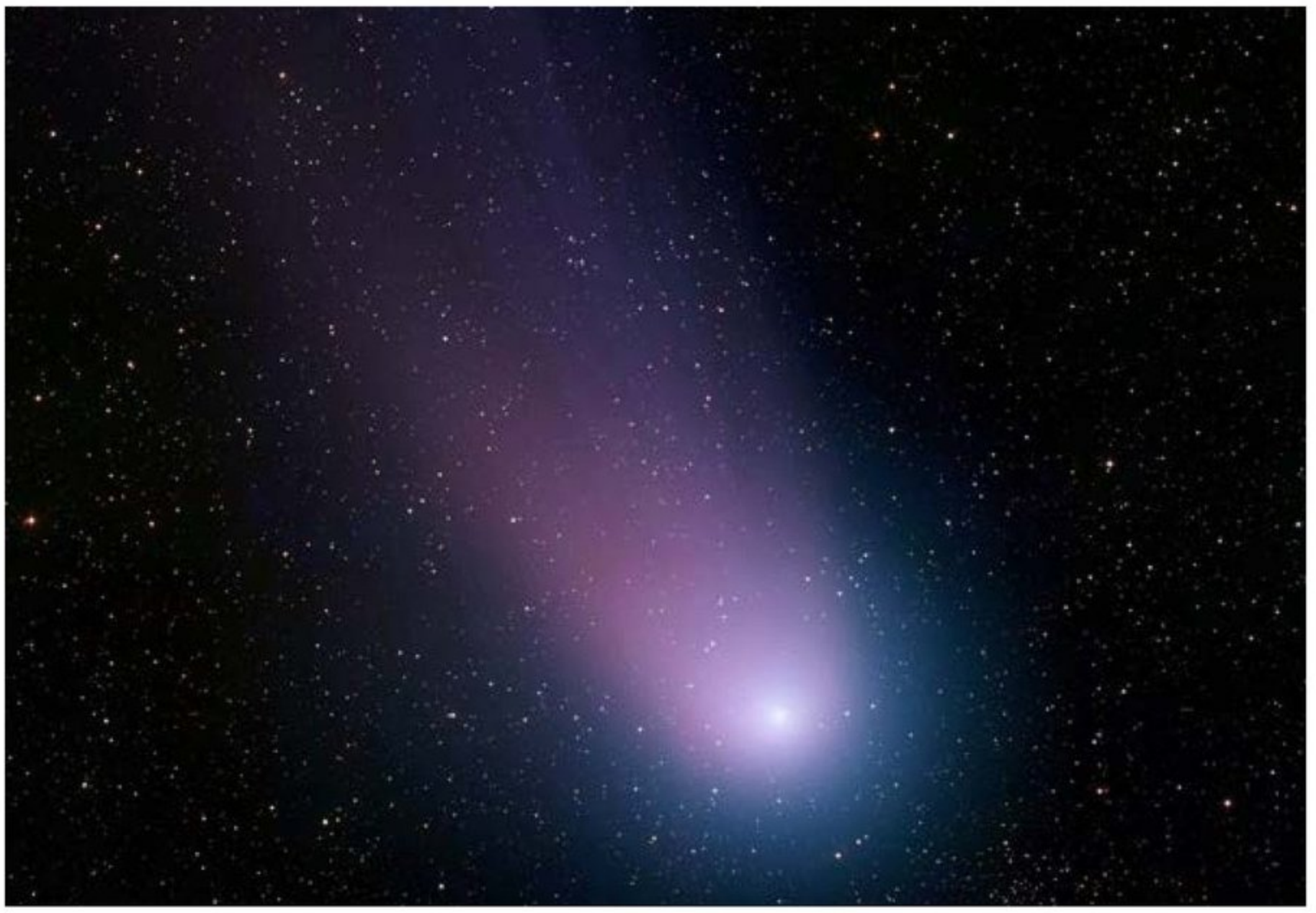
| | |
|---|---|
| On Mercury | 27 lbs. |
| On Venus | 63 lbs. |
| On the Moon | 12 lbs. |
| On Mars | 27 lbs. |
| On Jupiter | 165 lbs. |
| On Saturn | 65 lbs. |
| On Uranus | 62 lbs. |
| On Neptune | 79 lbs. |
| On Pluto | 5 lbs. |

In outer space, you'd weigh nothing!

Satellites monitor impact tests during research into ways to prevent asteroids from colliding with Earth.

## Asteroids

Asteroids are rocky, metallic objects orbiting the Sun. They range in size from a few feet in **diameter** to hundreds of miles in diameter. Most asteroids are found between Mars and Jupiter. Some have orbits that cross the Earth's path, and in the past, some have even crashed into Earth. Asteroids and other smaller objects that enter Earth's atmosphere are called **meteoroids**. If they survive the trip and land on the ground, they are called **meteorites**. If they burn up before landing, they are called **meteors**. Among the best evidence of an asteroid hitting Earth is the Barringer Crater near Winslow, Arizona.



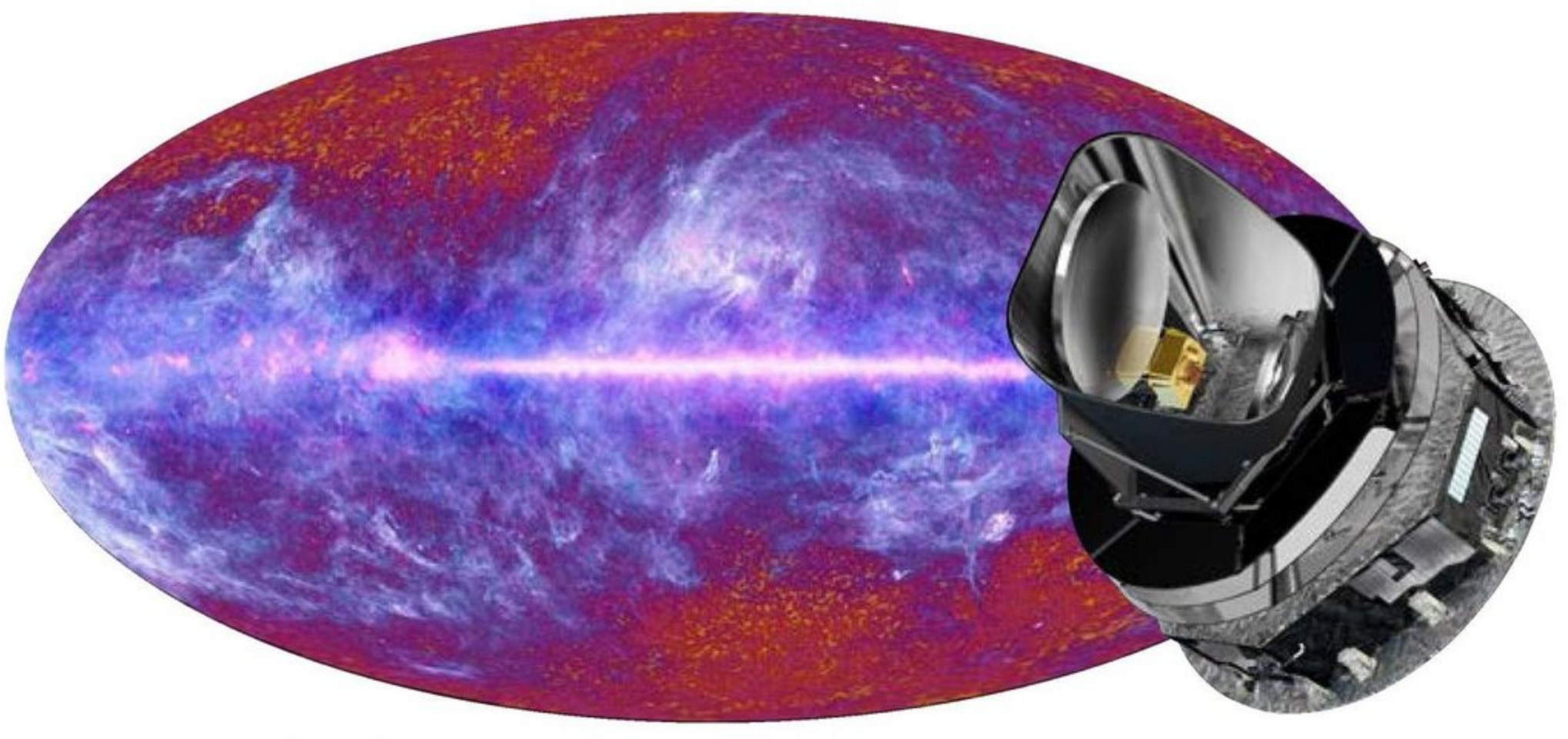
The comet NEAT, photographed by the WIYN telescope at Kitt Peak National Observatory in Arizona, was discovered in 2001 by the Near Earth Asteroid Tracking system.

## Comets

Comets are composed of ice and dust and are like large dirty snowballs in space. They have very oval-shaped orbits. For part of that orbit, they come close to the Sun, and then they swing far out into space. Some comets orbit the Sun in less than 200 years. The most famous of these is Halley's Comet. It returns every seventy-six years. Other comets take thousands of years to complete an orbit. Comet Hyakutake, which passed close to the Earth in 1996, will return in about 9,000 years.

# Conclusion

Humans have always wondered, "what's happening out there in space?" For centuries, we could only guess. New rockets, space probes, satellites, and telescopes show us what's happening in our Solar System every day. These tools have helped scientists to discover new planets, re-count moons, and see stars being born and being swallowed. They have also given us the first full-sky survey map of our universe and a direct view at the Sun. What will they show us next about our Solar System and beyond?



In July 2010, after a year-long mapping mission, the orbiting Planck Telescope of the European Space Agency (ESA) delivered its first full-sky survey of our universe. Planck's mission is to measure radiation left over from the ancient beginnings of our universe so that scientists can study how it was formed. As Planck sweeps the sky, it also measures the temperatures, density of matter, speed, and movement of galaxies.

# Glossary

**atmosphere** *(n.)* a layer of gases surrounding a planet, star, or moon (p. 12)

**diameter** *(n.)* the length of a straight line through the center of an object (p. 23)

**fossil fuels** *(n.)* sources of energy such as coal, oil, and natural gas that were made by the decomposition of plants and animals over millions of years (p. 6)

**gravitational pull** *(n.)* the force of attraction that tends to draw objects together (p. 13)

**meteor** *(n.)* a meteoroid that enters Earth's atmosphere (p. 23)

**meteorite** *(n.)* a meteoroid that actually lands on Earth (p. 23)

**meteoroid** *(n.)* a comet, asteroid, or dust particle floating in space (p. 23)

**orbit** *(n.)* the path of an object revolving around another object (p. 8)

**orbits** *(v.)* to revolve around another object (p. 4)

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