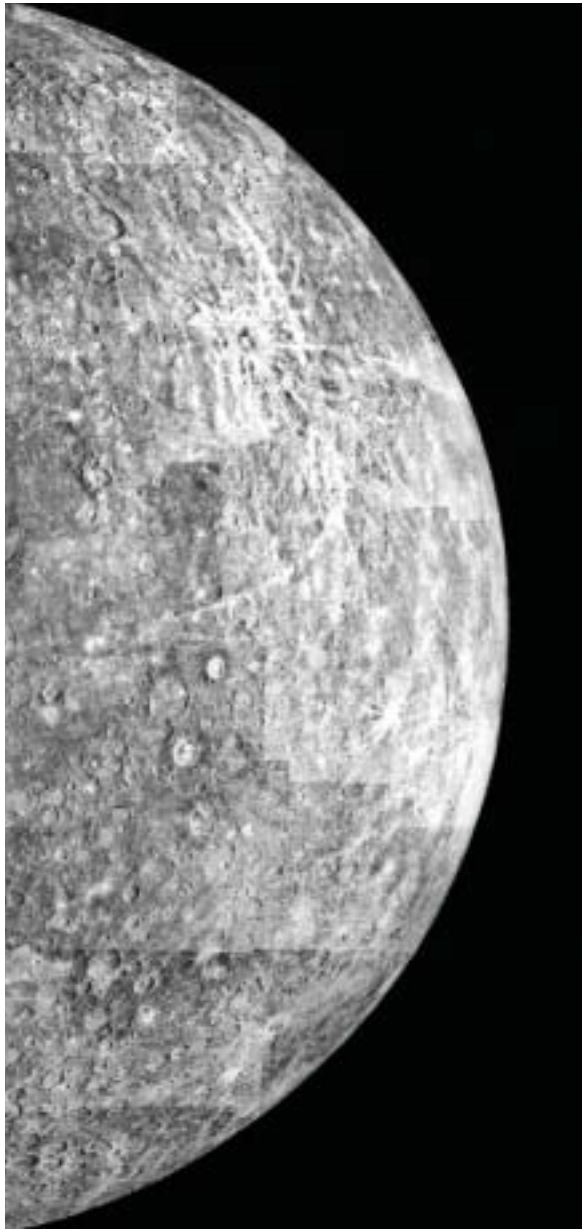
National Aeronautics and
Space Administration

Mercury ☿



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The small and rocky planet **MERCURY** is the closest planet to the Sun; it speeds around the Sun in a wildly elliptical (non-circular) orbit that takes it as close as 47 million km and as far as 70 million km from the Sun. Mercury completes a trip around the Sun every 88 days, speeding through space at nearly 50 km per second, faster than any other planet. Because it is so close to the Sun, temperatures on its surface can reach a scorching 467 degrees Celsius. But because the planet has hardly any atmosphere to keep it warm, nighttime temperatures can drop to a frigid -183 degrees Celsius.

Because Mercury is so close to the Sun, it is hard to see from Earth except during twilight. Until 1965, scientists thought that the same side of Mercury always faced the Sun. Then, astronomers discovered that Mercury completes three rotations for every two orbits around the Sun. If you wanted to stay up for a Mercury day, you'd have to stay up for 176 Earth days!

Like our Moon, Mercury has almost no atmosphere. What little atmosphere exists is made up of atoms blasted off its surface by the solar wind and has less than a million-billionths the pressure of Earth's atmosphere at sea level. It is composed chiefly of oxygen, sodium, and helium. Because of Mercury's extreme surface temperature, these atoms quickly escape into space and are constantly replenished. With no atmosphere to protect the surface, there has been no erosion from wind or water, and meteorites do not burn up due to friction as they do in other planetary atmospheres.

Mercury's surface very much resembles Earth's Moon, scarred by thousands of impact craters resulting from collisions with meteors. While there are areas of smooth terrain, there are also cliffs, some soaring up to a mile high, formed by ancient impacts.

The Caloris Basin, one of the largest features on Mercury, is about 1,300 km in diameter. It was the result of an asteroid impact on the planet's surface early in the solar system's history, the probable cause of the strange surfaces on the opposite side of the planet. Over the next half-billion years, Mercury actually shrank in radius from 2 to 4 km as the planet cooled from its formation. The outer crust, called the lithosphere, was compressed and grew strong enough to prevent the planet's magma from reaching the surface, effectively ending the planet's period of geologic activity. Evidence of Mercury's active past is seen in the smooth plains in the Caloris basin.

Mercury is the second smallest planet in the solar system, larger only than Pluto, the most distant planet in our solar system. If Earth were the size of a baseball, Mercury would be the size of a golf ball. Viewed from Mercury, the Sun would look almost three times as large as it does from Earth. Mercury is the second densest body in the solar system after Earth, with an interior made of a large iron core with a radius of 1,800 to 1,900 km, nearly 75 percent of the planet's diameter and nearly the size of Earth's Moon. Mercury's outer shell, comparable to Earth's outer shell (called the mantle) is only 500 to 600 km thick.

Only one spacecraft has ever visited Mercury: *Mariner 10* in 1974–75. *Mariner 10*'s discovery that Mercury has a very weak magnetic field, similar to but weaker than Earth's, was a major surprise. In 1991, astronomers using radar observations showed that Mercury may have water ice at its north and south poles. The ice exists inside deep craters. The floors of these craters remain in perpetual shadow, so the Sun cannot melt the ice.

NASA is planning a new mission to Mercury called *Mercury Surface, Space Environment, Geochemistry, and Ranging (MESSENGER)*, which will orbit Mercury toward the end of this decade. *MESSENGER* will investigate key science questions using a set of miniaturized instruments: Why is Mercury so dense? What is the geologic history of Mercury? What is the structure of Mercury's core? What is the nature of Mercury's magnetic field? What are the unusual materials at Mercury's poles? What volatiles are important on Mercury?

Fast Facts

Namesake	Messenger of the Roman Gods
Mean Distance from Sun	57.9 million km
Orbital Period	88 days
Orbital Eccentricity	0.206
Orbital Inclination to Ecliptic	7°
Inclination of Equator to Orbit	0°
Rotational Period	58 d 39 m
Diameter	4,879 km
Mass	0.06 of Earth's
Density	5.43 g/cm^3
Gravity	0.38 of Earth's
Atmosphere (primary components)	Oxygen, Sodium, Helium
Temperature Range	-183 ˚C (night) to +467 ˚C (day)
Number of Moons	0
Number of Rings	0

Significant Dates

1610 Italian astronomer Galileo Galilei made first telescopic observation of Mercury.

1631 French astronomer Pierre Gassendi made first telescopic observations of the transit of Mercury across the face of the Sun.

1639 Italian astronomer Giovanni Zupus discovered that Mercury has phases, which is evidence that the planet circles the Sun.

1641 German astronomer Johann Franz Encke made the first mass determination using the gravity effect on the comet Encke.

1889 Italian astronomer Giovanni Schiaparelli produced the first map of Mercury's surface features.

1965 American radio astronomers Gordon Pettengill and Rolf Dyce measured Mercury's rotation period to be about 59 days.

1968 *Surveyor 7* took the first spacecraft picture of Mercury from the lunar surface.

1974 *Mariner 10* made the first flyby within 705 km of Mercury.

1975 *Mariner 10* made its third and final flyby of Mercury at 327 km.

About the Images

(Left and center) Mercury, much like the Moon, presents two totally different faces, one battered (and thus older) and one smoother (and thus younger) *(Mariner 10)*.

(Right, top) Caloris Basin was undoubtedly produced from a tremendous impact. A circular mountain range surrounding the wrinkled terrain at left defines the basin's main rim *(Mariner 10)*.

(Right, bottom) Photomosaic of Mercury's southern hemisphere *(Mariner 10)*.

References

1) *MESSENGER* Mission: *http://sd-www.jhuapl.edu/MESSENGER*
2) Views of the Solar System—Mercury: *http://www.solarviews.com/eng/mercury.htm*
3) NASA Planetary Photojournal: *http://photojournal.jpl.nasa.gov*

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