



National Aeronautics and
Space Administration

Mercury ♀





Mercury is the planet closest to the Sun. Of all the planets, it has the most elliptical orbit, except for Pluto. Because of its elliptical orbit, Mercury's closest distance to the Sun is only 46 million km while its greatest distance is 70 million km. Another unique aspect of Mercury is its rotational and orbital period. Mercury rotates on its axis once every 58.9 days and circles the Sun once every 87.9 days. As a result Mercury rotates exactly three times around its axis for every two orbits around the Sun. If you wanted to stay up for a solar day on Mercury (sunrise to sunrise), you would be awake for two Mercurian years (a total of 176 Earth days.) Because Mercury is so close to the Sun, its surface temperature has the greatest temperature range of any planet or satellite in the solar system. The surface temperature reaches a maximum of 427° Celsius on the side closest to the Sun, and -183°C on the night side. Mercury's atmosphere is tenuous and like a vacuum. The atmosphere is composed of sodium and potassium, which is probably derived from the surface. While Mercury does have an atmosphere, it does not have satellites.

Physically, Mercury is smaller than any other planet except Pluto, measuring about one-third the size of Earth. However, Mercury's density (5.4 g/cm³) is about the same as Earth's; therefore, scientists assume that the planet has an enormous iron core that composes some 75 percent of Mercury's diameter (42 percent of the volume). The core is surrounded by a rocky mantle and crust only about 600 km thick. Aside from Earth, Mercury is the only terrestrial planet with a magnetic field. Although the magnetic field is considerably weaker than Earth's, its presence is strong evidence that the outer core is fluid at the present time.

To date the only spacecraft to explore Mercury was *Mariner 10* in 1974-75. It imaged about half the planet on its three encounters, so half of the planet is still unexplored. Although the surface of Mercury superficially resembles that of the Moon, there are significant geological differences. Like the Moon, it has heavily cratered upland regions and large areas of smooth plains that surround and fill impact basins. It also has a surface covering of porous, fine-grained soil like the lunar surface. Unlike the Moon, Mercury's heavily cratered uplands contain large regions of gently rolling, smooth plains—the major type of terrain on

the planet. Mercury also has experienced a unique geological history which has resulted in a global system of fractures caused by shrinkage of the planet.

Soon after the planet formed it nearly melted from decay of radioactive elements and the inward migration of iron that formed its enormous core. This led to the expansion of the planet and extensive fracturing of the surface which provided an exit for lava to reach the surface and form the smooth plains within and between the craters. At about the same time and like the other planets, Mercury was subjected to heavy bombardment by asteroidal and cometary debris left over from accretion of the solar system. During this early period of heavy bombardment, the 1300 km diameter

Caloris basin was formed by collision of a gigantic asteroid with Mercury. The strong shock wave produced by the impact traveled through the planet to instantaneously form the hilly, lined terrain on the opposite side of the planet. Afterward, eruption of lava within and surrounding the Caloris, and other large basins formed the smooth plains. Over the next half billion years the core and mantle began to cool, Mercury's radius decreased by about 2 to 4 km, and the crust was subjected to compressive stresses that resulted in a unique global system of fractures. As this occurred, volcanism ceased when compressive stresses in the lithosphere became strong enough to close off magma sources. Since that time, only occasional impacts of comets and asteroids have occurred.

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 Mercury has phases, which is evidence that the planet circle the Sun.
- 1841 - German astronomer, Johann Franz Encke made the first mass determination using 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 the 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 fly-by within 900 km of Mercury.
- 1975 - Third and final fly-by of Mercury by *Mariner 10*.

References

1. *Charting the Planets*, Educational Brief, EB-111, NASA Headquarters, Washington, DC. 12/92.
2. *Our Solar System at a Glance*, Information Summaries, PMS 010-A, Jet Propulsion Laboratory, Pasadena, CA. 6/91.

Fast Facts

Namesake	Messenger of the Roman Gods
Diameter	4878 km
Mean Distance from Sun	57.8 million km
Mass	6/100 the mass of Earth
Density	5.44 g/cc
Surface Temperature	
Maximum Day Side	740° Kelvin (467° C)
Maximum Night Side	90° Kelvin (-183° C)
Rotational Period	58.6 days
Eccentricity of Orbit	0.206
Rotational Period (1 Mercury Day)	58.6 Earth days

About the Image

This false color photomosaic of Mercury is composed of images taken by Mariner 10 as it flew by the planet after the first encounter in March 1974. The image shows the Caloris basin at the left of the terminator surrounded and filled by younger smooth plains deposits. This 1,300 km diameter impact basin formed about 4 billion years ago when a large asteroid or comet struck Mercury. The smooth plains resemble the lunar maria, the smooth, dark lava plains that are concentrated on the Moon's nearside. However, the Mercurian plains display less contrast in reflectivity with heavily crater terrain shown on the right, top and bottom than is seen between the lunar maria (dark) and the lunar highland (light).