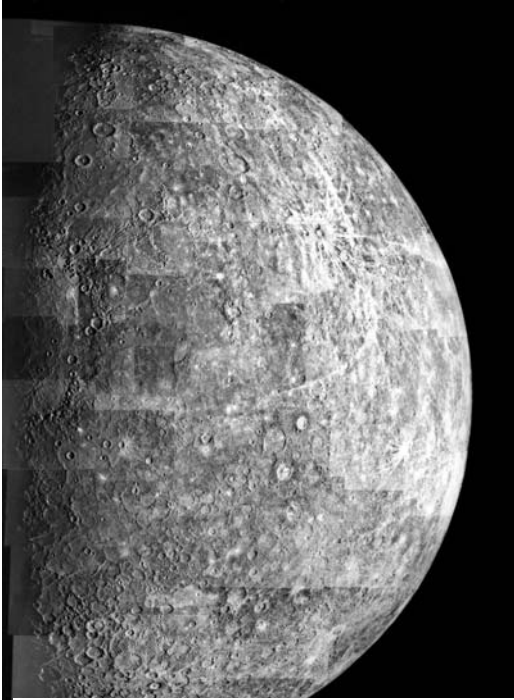


## Facilitator Information

(All you need to know about Mercury to survive the day)



Surface of Mercury revealed by several images collected by the Mariner spacecraft. Image courtesy of NASA/JPL.

### Mercury the Messenger

Mercury is the closest planet to the Sun and is named for the Roman god, Mercury, who was messenger to the other gods. Mercury's surface temperature ranges from 300 degrees below zero Fahrenheit on the side facing away from the Sun and up to above 800 degrees Fahrenheit on the side that is toward the Sun. The low surface gravity and high temperatures have caused any atmospheric gases this planet had to escape.

Mercury is the smallest of the eight planets; Jupiter and Saturn actually have moons that are larger than Mercury! Because of its small size and proximity to the Sun, most of Mercury's properties have only been determined in the last few decades. NASA's new mission to Mercury – the MESSENGER Mission – is helping to reveal many of Mercury's mysteries!

### What is Mercury's orbit like?

Now that Pluto is no longer classified as a planet, Mercury is the planet with the most eccentric orbit and the most tilted with respect to the ecliptic (the plane traced by Earth's orbit around the Sun). Mercury takes 88 days to orbit the Sun. Birthdays on Mercury would come with alarming frequency!

Mercury's rotational and orbital period are connected to each other. The rotation of Mercury (its period of spin on its axis) is exactly 2/3 of its orbital period (revolution around the Sun, or its year), about 59 days. This means that it completes one whole turn on its axis when it has moved 2/3 of the way around the Sun. After another half rotation, it completes an orbit around the Sun. If you lived on Mercury, you would need to wait for two complete orbits around the Sun (two of Mercury's years) to watch from one sunrise to the next.

### What is Mercury like on the inside?

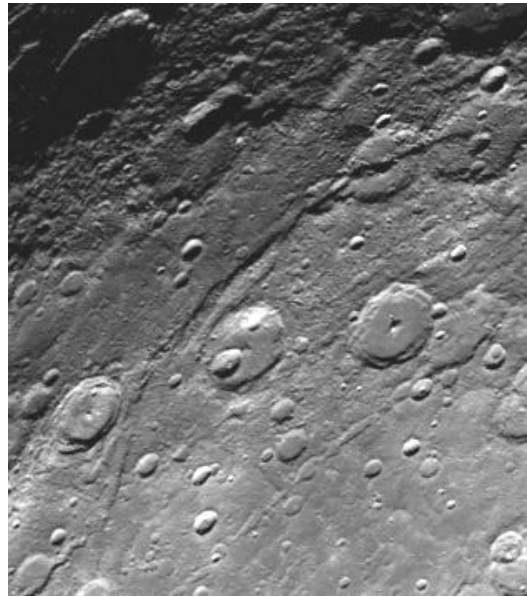
Mercury's interior is deduced from its small size and high density (5.43 g/cm<sup>3</sup>, almost as high as Earth's density), which together require a large metallic core. It is estimated that more than half of Mercury's interior is an iron core, and new evidence indicates that the core is molten. Surrounding the core is a layer of rocky material, the mantle. Mercury has a crust, but the thickness is not known. The MESSENGER Mission will help scientists understand more about Mercury's interior.

### What is on the surface of Mercury?

Much of Mercury's surface is covered by impact craters, caused by asteroids and comets smashing into the surface. Some of these craters have smooth floors, which may be caused by lava flows infilling the crater depression. The Caloris Basin, the largest impact basin on Mercury, measures 1300 kilometers across.

Mercury's surface shows long cliffs, called scarps, that are 20 to 500 kilometers long and a few hundred meters to a kilometer high. Scientists propose that these formed as the planet cooled and shrank – the surface buckled up into these scarps.

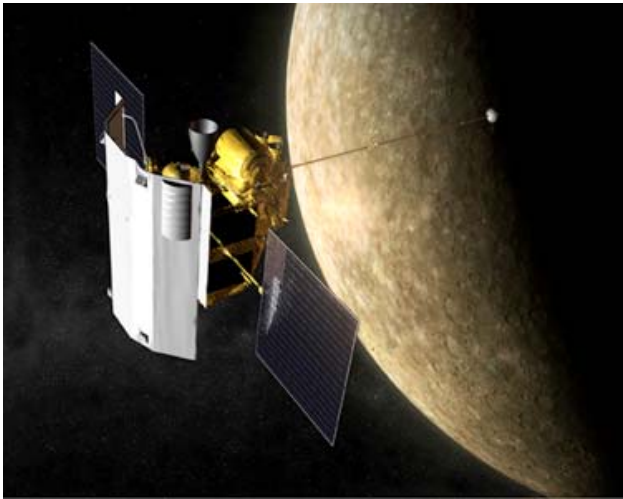
Mercury may have polar ice caps! Earlier missions collected radar images of the polar regions that suggest ice at the poles. MESSENGER will help scientists answer this question.



Imaging from the Mariner spacecraft of the surface of Mercury showing the circular depressions of impact craters. Image courtesy of NASA/JPL/Northwestern University.

### How did Mercury form?

Mercury formed when the Sun and all the planets in our solar system formed – about four and a half *billion* years ago! Not enough is known about Mercury at this time to create a detailed picture of its formation and evolution. Like the other rocky, terrestrial planets in our solar system, Mercury formed by accretion (small pieces of rocky material smashing into each other, with some sticking together, gradually growing into a planet). Like Earth, Venus, and Mars, the interior of Mercury probably differentiated early in its history, causing the separation of the materials that make up the iron-rich core, the rocky middle layer of the mantle, and the rocky outer crust. During its first half a million years, Mercury and the other bodies of the solar system were bombarded by big and small asteroids, creating much of the cratered landscape we see today. **One** theory to explain Mercury's relatively large core is that a giant asteroid smashed into the planet and blew off a large amount of the mantle and crust, leaving behind the core. Today Mercury is geologically inactive, except for infrequent and small asteroid and comet impacts.



Artist's drawing of MESSENGER spacecraft orbiting Mercury. Image courtesy of NASA/Johns Hopkins University Applied Physics Laboratory/Carnegie Institution of Washington

## Missions to Mercury

Until Mariner 10, little was known about Mercury. Even the best telescopic views from Earth showed Mercury as an indistinct object lacking any surface detail. The planet is so close to the Sun that it is usually lost in solar glare. When the planet is visible on Earth's horizon just after Sunset or before dawn, it is obscured by the haze and dust in our atmosphere. Only radar telescopes gave any hint of Mercury's surface conditions prior to the voyage of Mariner 10. But in 1974 the first close-up views of Mercury were obtained by the Mariner 10 spacecraft.

Today, the MESSENGER (MERcury Surface, Space ENVIRONMENT, GEOchemistry, and RANGing) spacecraft is poised to go into orbit

around Mercury in March 2011. MESSENGER will study Mercury from orbit for about one year.

MESSENGER will measure the planet's gravity and its magnetic field, which will help us learn more about Mercury's interior. MESSENGER will also explore the composition of the materials on Mercury's surface, which will help us understand the formation and history of this small planet. Strange as it may seem, some scientists think there may be ice on Mercury, hiding from the intense heat of the nearby Sun in the forever shaded bottoms of large craters near the planet's poles. MESSENGER's instruments will tell us whether water ice is really to be found in this most unlikely location.

MESSENGER is following a roundabout route on its trip to Mercury. In order to save fuel (and to keep the cost of the mission low), the spacecraft will have flown past Earth once, past Venus twice, and past Mercury itself three times before beginning its orbit around Mercury in 2011.