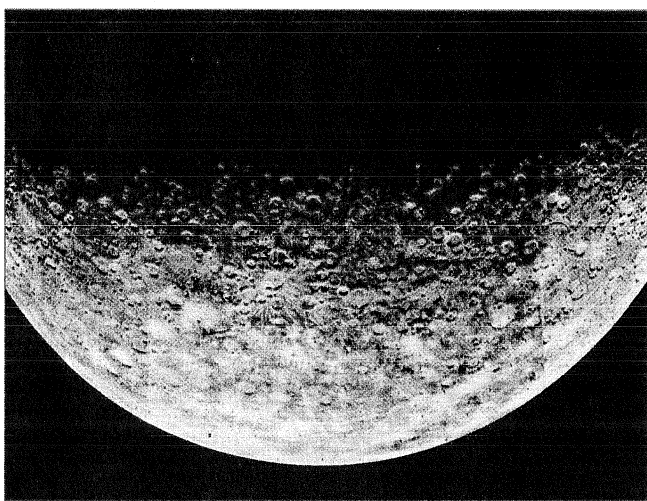


What do we know about Mercury, Venus, and Earth?

Objective

Identify the basic features of the three innermost planets.

Mercury Mercury is the planet closest to the Sun. Of all the planets, Mercury travels the fastest around the Sun. However, it rotates slowly on its axis. This dry, rocky planet has no atmosphere. Temperatures on Mercury range from 430°C during daylight hours to -170°C during Mercury's night. Because Mercury is so close to the Sun, astronomers cannot see it easily from Earth. However, astronomers learned a lot when, in 1974, the space probe *Mariner 10* visited Mercury and sent back photographs. In the 1990s, radar was used to study Mercury's surface. We now know that the surface of Mercury is covered with craters.



▲ **Figure 17-15** Mercury is very similar to Earth's Moon. It has no atmosphere, and its surface is covered with impact craters.

1 **DESCRIBE:** What is Mercury like?

Venus The planet Venus is similar to Earth in size, mass, and density. However, Venus is a very hostile world. Its average temperature is higher than the average temperature of any other known planet. The air pressure on Venus is 90 times more crushing than that of Earth's air at sea level.

Astronomers think these conditions are related to Venus's carbon dioxide atmosphere and thick clouds of sulfuric acid. From Earth, we can only see Venus's cloudtops.

Venus has retrograde rotation. This means that it spins slowly in the opposite direction from most of the other planets.

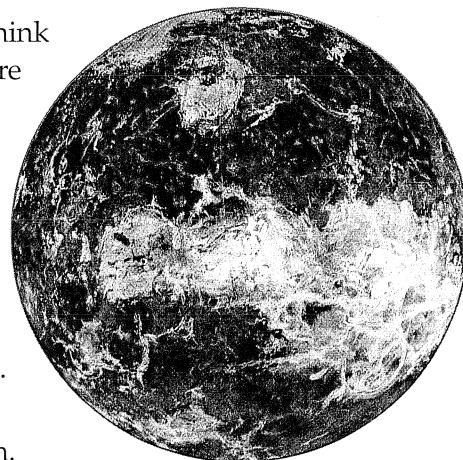
Many space probes have orbited Venus or landed on it. These probes have revealed smooth plains, mountains, and valleys. Like the Moon, Venus goes through phases. We see only varying amounts of its sunlit side.

2 **INFER:** Why was Venus once called Earth's twin?

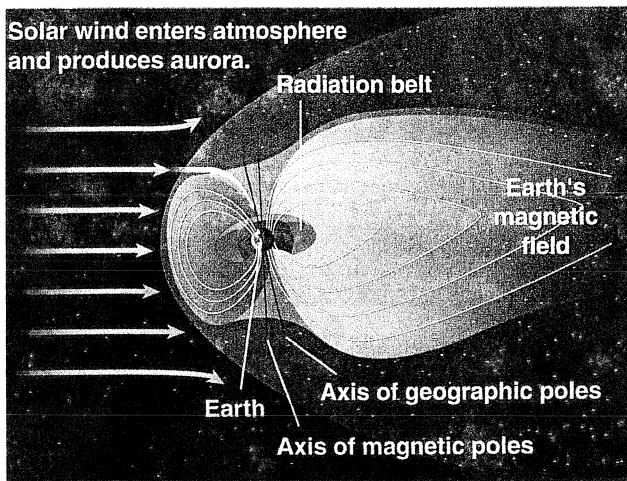
Earth The third planet from the Sun and the fifth largest in the solar system is Earth. Earth is the only planet known to have oceans of liquid water. It is also the only planet known to support life. Life occurs on Earth because of moderate temperatures, an atmosphere containing oxygen, and liquid water.

Earth has a magnetic field around it because of the iron in its core. Electrically charged particles from the Sun, mostly electrons and protons, bounce around in the atmosphere above Earth. They are trapped in Earth's magnetic field.

Occasionally, some of these particles escape from the magnetic field and rain down on Earth. They strike atoms and molecules in the upper atmosphere and cause them to glow. In the Northern Hemisphere, this glow is known as the aurora borealis, or the northern lights. In the southern hemisphere, it is the aurora australis, or southern lights.



▲ **Figure 17-16** The pressure on the surface of Venus, seen here, is equal to that of the pressure on Earth deep down in the ocean.



▲ **Figure 17-17** Charged particles from the Sun are trapped in Earth's magnetic field.

- 3 **LIST:** What conditions make life on Earth possible?

✓ CHECKING CONCEPTS

1. What are the three innermost planets?
2. What does the surface of Mercury look like?
3. What gas in the atmosphere makes the surface of Venus so hot?
4. Which inner planet has liquid water?



Integrating Life Science

TOPICS: origin of life, molecular biology

HOW LIFE ON EARTH BEGAN

Nobody knows for sure how life on Earth began. Scientists think they know when it happened—about 3.5 billion years ago.

Many scientists think that the first living things were certain molecules, or strings of atoms. These molecules floated in water, alongside billions of unattached atoms. As these molecules bumped into other molecules, they traded atoms. Eventually, a chain of atoms came together that could actually make copies of itself using the free-floating atoms.

How can a chain of atoms make copies of itself? It happens all the time, right inside your body. It is how your body grows. Molecules inside your body grab onto atoms to create more molecules. When molecules first did this billions of years ago, they began to show some of the characteristics of living things.

Over time, life forms that were especially good at making copies of themselves outnumbered other life forms. These life forms were our very distant ancestors.

Thinking Critically What parts of your body can make copies of themselves?



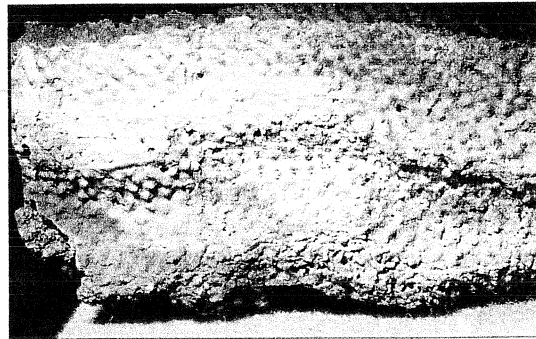
THINKING CRITICALLY

5. **COMPARE:** How is the surface of Mercury similar to the surface of Earth's Moon?
6. **ANALYZE:** Venus has rocks similar to basalt. On Earth, these rocks are usually found near volcanoes. What does this suggest?

Web InfoSearch

More About Venus Sunlight striking the surface of a planet warms the ground. This releases heat radiation. Like glass in a greenhouse, the atmosphere traps some of the heat. In some places, such as on Venus, the heat keeps building up. This is called a runaway greenhouse.

SEARCH: Use the Internet to find out what the temperature is on Venus and why. Could Earth someday become like Venus? How could it? Start your search at www.conceptsandchallenges.com. Use the key search words **runaway greenhouse effect, Venus, planet profile, and carbon dioxide**.



▲ **Figure 17-18** Stromatolites (above) are among the oldest fossils. They were formed in sedimentary rock by blue-green algae.