

What are the other moons in the solar system?

Objective

Compare the moons of the different planets in the solar system.

Key Term

satellite (SAT-uhl-yt): natural or artificial object orbiting another body in space

Natural Satellites A **satellite** is any natural or artificial object that orbits another object in space. People have observed the only natural satellite of Earth, the Moon, since ancient times.

For thousands of years, Earth was believed to be the only planet in the solar system to have a moon. Then, in 1610, Galileo discovered four of the moons of Jupiter. Today, astronomers know that seven of the planets (Earth, Mars, Jupiter, Saturn, Uranus, Neptune, and Pluto) have moons.

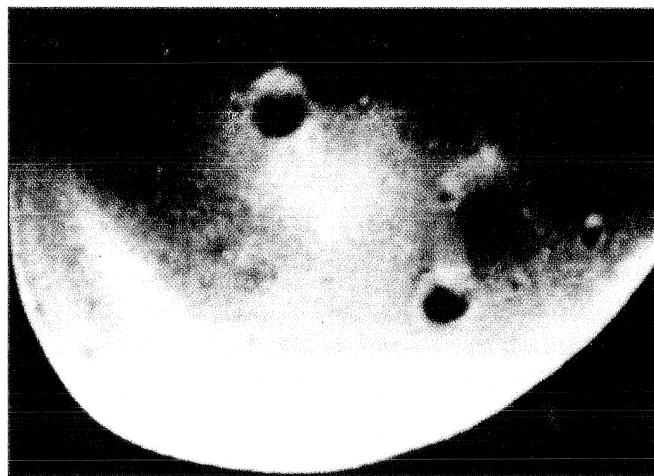
Until the late 1970s, almost all of the known moons had been discovered using Earth-based telescopes. Then, two space probes, called *Voyager 1* and *Voyager 2*, traveled beyond the Asteroid Belt to the outer planets. They sent back to Earth the first detailed, close-up photographs of the many moons that orbited Jupiter, Saturn, Uranus, and Neptune. Together, *Voyagers 1* and *2* discovered at least 35 new moons.

► **DESCRIBE:** What planets have natural satellites?

Moons of the Inner Planets Mercury and Venus are the only planets in the solar system without at least one moon. Earth, like Pluto, has only one moon.

Mars has two moons, named Deimos and Phobos. These were discovered in 1877. They are made of dark, carbon-rich rock. Because of their makeup, both reflect very little light from their surface. Both moons are small and lumpy. Deimos has a peanut shape. Both moons also have many craters. One crater on Phobos is 5 km across.

Both moons orbit close to Mars. Phobos takes less than a Martian day to go once around the planet. Deimos takes a little more than a day.



▲ **Figure 17-11** Mars' moon Deimos is shaped like a peanut.

2 ► **IDENTIFY:** Which of the inner planets have one or more moons?

Moons of the Outer Planets Jupiter has at least 28 known moons. Jupiter and its moons have been described as a mini-solar system.

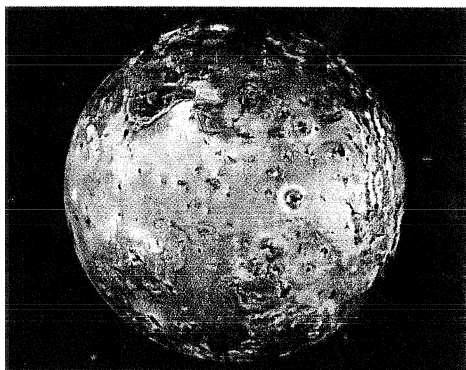
Jupiter's moons are very varied. Some are rocky. Others are icy. The four moons first viewed by Galileo are often referred to as the Galilean moons. They are the largest of Jupiter's moons.

The Galilean moons travel around Jupiter in a nearly circular orbit, almost exactly around the planet's equator. It is possible to track the movements and positions of these moons using a good pair of binoculars.

The Galilean moons played an important role in the history of astronomy. When their orbits were first observed, it was proven that not everything in space revolved around Earth.

In 1995, a space probe, appropriately named *Galileo*, arrived at Jupiter to study the Galilean moons. The largest Galilean moon is Ganymede, followed by Callisto, Io, and Europa. Ganymede is the largest moon in the solar system, with a diameter of 5,268 km. Callisto has a dark, icy

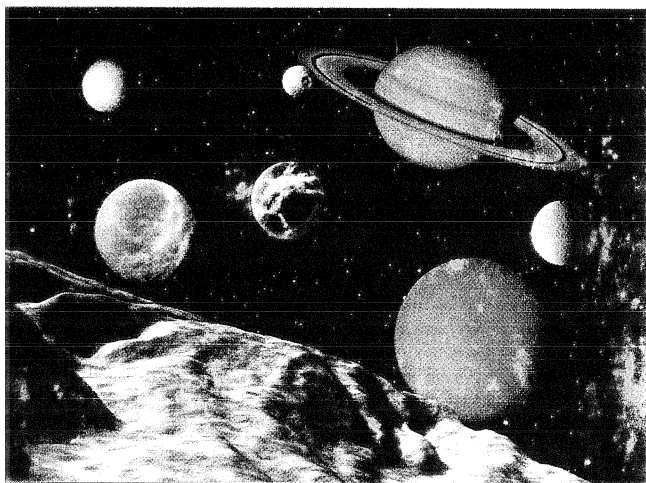
surface with many white craters. Impacts from asteroids and other bodies probably exposed clean ice beneath the dirtier top layer. Io has active volcanoes on it. Europa is covered with ice that may have liquid water below the surface.



◀ **Figure 17-12**
Io is a large, volcanically active moon of Jupiter.

Saturn has 30 known moons. Five of these moons are very large. Saturn's largest moon is Titan. Titan is the second largest moon in the solar system.

Huygens is a probe being sent to Titan by the European Space Agency. It will arrive there in 2004, as part of the *Cassini* mission to Saturn. It will parachute toward the surface and report on conditions beneath the moon's orange clouds.



▲ **Figure 17-13** This is an artist's concept of Saturn and six of its moons as seen from a seventh moon.

Uranus has 21 known moons. Titania is the largest, with Oberon second. The moons of Uranus are very varied. Some have deep canyons and long scars on their surface. Others have large, smooth areas between areas riddled with craters. Miranda may have more types of landforms than any other body in the solar system. Ten of Uranus's moons were discovered by *Voyager 2* in 1986.

Neptune has eight known moons. Only two are visible from Earth. These are Triton and Nereid. Triton, the larger of the two, orbits in the opposite direction from the rest of Neptune's moons. It has the coldest surface in the solar system, at -235°C . Scientists think Triton is covered with frozen nitrogen and methane.

Like Earth, Pluto has only one moon. Pluto's moon is called Charon. It was discovered in 1978. Its surface is probably covered with water ice and impact craters. One theory suggests that Charon is a piece of ice that was knocked off Pluto when another object collided with it. No probes have yet been sent to Pluto or Charon.

3 IDENTIFY: Which outer planet has the most moons?

✓ CHECKING CONCEPTS

Match each planet with its correct moon.

- | | |
|------------|------------|
| 1. Jupiter | a. Charon |
| 2. Mars | b. Triton |
| 3. Uranus | c. Io |
| 4. Pluto | d. Titania |
| 5. Neptune | e. Titan |
| 6. Saturn | f. Phobos |

💡 THINKING CRITICALLY

- SEQUENCE:** List the planets in order from the one with the most moons to the ones with the fewest. Include planets that have no moons.
- INFER:** Why are the four largest moons of Jupiter called the Galilean moons?

BUILDING SCIENCE SKILLS

Researching The names given to moons are chosen by the International Astronomical Union. Newly discovered moons are numbered first, with the year they are discovered, then named later. The names chosen come from many different sources. For example, recently discovered moons of Uranus were named after characters in the plays of Shakespeare. Choose the moons of one planet. Find the source of each moon's name. Write a report of your findings.