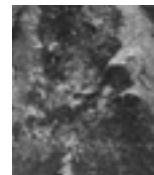
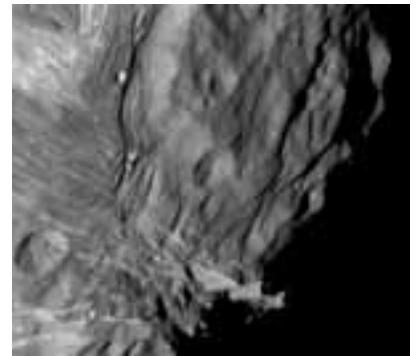


# Moons of the Solar System





Moons come in many shapes, sizes, and types. They are generally solid bodies, and few have atmospheres. Most of the moons probably formed from the discs of gas and dust circulating around planets in the early solar system. As of November 2005, astronomers have found at least 153 moons orbiting planets in our solar system. The moon champion, Jupiter, has a total of 62 known moons, including the largest moon in the solar system, Ganymede. Many of Jupiter's smallest outer moons have highly elliptical orbits and orbit "backwards" (opposite to the spin of the planet). Saturn, Uranus, and Neptune also have some "irregular" moons, which orbit far from their respective planets.

Usually the term "moon" brings to mind a spherical object, like Earth's Moon. The two moons of Mars, Phobos and Deimos, are somewhat different. While both have nearly circular orbits and travel close to the plane of the planet's equator, they are lumpy and dark. Phobos is slowly drawing closer to Mars, and could crash into Mars in 40 or 50 million years, or the planet's gravity might break Phobos apart, creating a thin ring around Mars.

Of the terrestrial (rocky) planets of the inner solar system, neither Mercury nor Venus has any moons at all, Earth has one, and Mars has its two small moons. In the outer solar system, the gas giants (Jupiter, Saturn, Uranus, and Neptune) have many moons. As these planets grew in the early solar system, they were able to capture objects with their large gravitational fields.

Earth's Moon is another story. The Moon probably formed when a large body about the size of Mars collided with Earth, ejecting a lot of material from our planet into orbit. Debris from the early Earth and the impacting body accumulated to form the Moon approximately 4.5 billion years ago (the age of the oldest collected lunar rocks). Twelve American astronauts visited the Moon during the Apollo lunar landings in 1969 to 1972.

Saturn has more than 40 known moons. The chunks of ice and rock in Saturn's rings (and the particles in the rings of the other outer planets) are not considered moons, yet embedded in Saturn's rings are distinct moons. Small "shepherd" moons help keep the rings in line. Saturn's moon Titan, the second largest in the solar system, is the only moon with a thick atmosphere.

Uranus has 27 known moons. The inner moons appear to be about half water ice and half rock. Miranda is the most unusual; its chopped-up appearance shows the scars of impacts of large rocky bodies. Neptune's moon Triton is as big as Pluto, and orbits backwards compared with Neptune's direction of rotation. Neptune has 13 known moons.

Pluto's single moon, Charon, is about half the size of Pluto. Some astronomers think of them as forming a binary, or double, planet system. Like Earth's Moon, Charon may have formed from debris resulting from an early collision of an impactor with Pluto. In October 2005, scientists using the Hubble Space Telescope to study this distant planet announced that Pluto may have two additional moons. The candidate moons are about two to three times as far from Pluto as Charon and roughly 5,000 times fainter than Pluto.

## FAST FACTS

Planet	Moon	Mean Radius (km)	Mean Radius (mi)
Earth	Moon	1,737.4	1,079.6
Mars	Phobos	11.1	6.9
Mars	Deimos	6.2	3.9
Jupiter	Io	1,821.6	1,131.9
Jupiter	Europa	1,560.8	969.8
Jupiter	Callisto	2,410	1,498
Jupiter	Ganymede	2,631	1,635
Saturn	Mimas	198.6	123.4
Saturn	Enceladus	249.4	154.9
Saturn	Tethys	529.9	329.3
Saturn	Dione	560	348
Saturn	Rhea	764	475
Saturn	Titan	2,575	1,600
Saturn	Iapetus	718	446
Uranus	Miranda	235.8	146.5
Uranus	Ariel	578.9	359.7
Uranus	Umbriel	584.7	363.3
Uranus	Titania	788.9	490.2
Uranus	Oberon	761.4	473.1
Neptune	Triton	1,353.4	841
Neptune	Nereid	170	106
Pluto	Charon	600	373

## SIGNIFICANT DATES

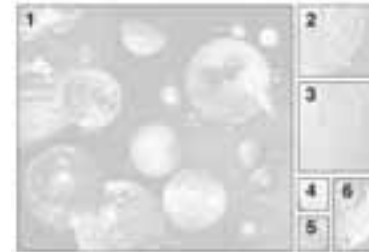
1610 — Galileo Galilei and Simon Marius independently discover four moons orbiting Jupiter. Galileo is credited and the moons are called "Galilean."

1877 — Asaph Hall discovers Mars' moons Phobos and Deimos.  
1969 — Astronaut Neil Armstrong is the first of 12 humans to walk on the surface of the Moon.

1980 — Voyager 1 instruments detect signs of surface features beneath the hazy atmosphere of Saturn's largest moon, Titan.

2000–2005 — Since the beginning of the year 2000, 84 of the 153 known moons of the solar system have been discovered. Jupiter's known moons have increased from 18 to 62. Saturn's known moons have jumped from 18 to 47. Uranus' moon count has gone from 21 to 27, and Neptune's known moons have increased in number from 8 to 13.

## ABOUT THE IMAGES



**1** Selected solar system moons, displaying a variety of surface features, are shown at correct relative sizes to each other and to planet Earth.

**2** Miranda, a moon of Uranus, has many rugged features.

**3** This false-color image of Neptune's moon Triton shows what appear to be volcanic deposits.

**4** This Voyager 1 close-up of Saturn's moon Rhea shows the moon's ancient, cratered surface.

**5** A portion of a Cassini radar image of Saturn's largest moon, Titan, showing the complexity of the surface.

**6** Cassini imaged Saturn's outer moon Phoebe when the spacecraft was inbound for orbit insertion in June 2004.

## FOR MORE INFORMATION

[solarsystem.nasa.gov/index.cfm](http://solarsystem.nasa.gov/index.cfm)