

### Moons of Saturn

Saturn, the sixth planet from the Sun, is home to a vast array of intriguing and unique satellites — 53 plus 9 awaiting official confirmation. Christiaan Huygens discovered the first known moon of Saturn. The year was 1655 and the moon is Titan. Jean-Dominique Cassini made the next four discoveries: Iapetus (1671), Rhea (1672), Dione (1684), and Tethys (1684). Mimas and Enceladus were both discovered by William Herschel in 1789. The next two discoveries came at intervals of 50 or more years — Hyperion (1848) and Phoebe (1898).

As telescopic resolving power improved, Saturn's family of known moons grew. Epimetheus and Janus were discovered in 1966. By the time Cassini-Huygens was launched in 1997, high-resolution imaging techniques used on Earth-based telescopes had added to the moon count. Cassini has discovered six moons and may find more during its mission. Cassini focuses its cameras mainly on objects relatively close to Saturn; the bright rings complicate moon-hunting efforts. Earth-based telescopes focus on the outer part of the Saturn system, and have found a number of moons in the outer regions.

Each of Saturn's moons bears a unique story. Two of the moons orbit within gaps in the main rings. Some, such as Prometheus and Pandora, interact with ring material, shepherding the ring in its orbit. Some small moons are trapped in the same orbits as Tethys or Dione. Janus and Epimetheus occasionally pass close to each other, causing them to periodically exchange orbits. In 2006, Cassini found evidence for a new class of "moonlets" residing within Saturn's rings, sweeping out small gaps in the ring particles. There may be as many as 10 million moonlets within just one of the rings.

Here's a sampling of some of the unique aspects of the moons:

- Titan — At 5,150 kilometers (3,200 miles) across, Titan is the solar system's second-largest moon. Titan hides its surface beneath a thick, nitrogen-rich atmosphere, but Cassini's instruments have revealed that Titan possesses many parallels to Earth — clouds, dunes, mountains, lakes, and rivers. Titan's atmosphere is approximately 95 percent nitrogen with traces of methane. While Earth's atmosphere extends about 60 kilometers (37 miles) into space, Titan's extends nearly 600 kilometers (10 times that of Earth's atmosphere) into space.

- Iapetus has one side as bright as snow and one side as dark as black velvet, with a huge ridge running around most of its dark-side equator.

- Phoebe orbits the planet in a direction opposite that of Saturn's larger moons, as do several of the recently discovered moons.

- Mimas has an enormous crater on one side, the result of an impact that nearly split the moon apart.

- Enceladus displays evidence of active ice volcanism: Cassini observed warm fractures where evaporating ice evidently escapes and forms a huge cloud of water vapor over the south pole.

- Hyperion has an odd flattened shape and rotates chaotically, probably due to a recent collision.

- Pan orbits within the main rings and helps sweep materials out of a narrow space known as the Encke Gap.

- Tethys has a huge rift zone called Ithaca Chasma that runs nearly three-quarters of the way around the moon.

- Four moons orbit in stable places around Saturn called Lagrangian points. These places lie 60 degrees ahead of or behind a larger moon and in the same orbit. Telesto and Calypso occupy the two Lagrangian points of Tethys in its orbit; Helene and Polydeuces occupy the corresponding Lagrangian points of Dione.

- Sixteen of Saturn's moons keep the same face toward the planet as they orbit. Called "tidal locking," this is the same phenomenon that keeps our Moon always facing toward Earth.

In addition to studies of Titan, Cassini continues to gather data about many of the other satellites in an effort to fully understand the nature, formation, and dynamics of Saturn's many intriguing moons.

### FAST FACTS

• Largest Moon of Saturn	Titan
• Titan's Diameter	5,150 km (3,200 mi)
• Closest Moon to Saturn	Pan
• Pan's Distance from Saturn	133,583 km (83,022 mi)

• Fastest Orbit	Pan
• Pan's Orbit Around Saturn	13.8 hours

• Number of Moons Discovered by Voyager (Atlas, Prometheus, Pandora, and Pan)	4
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• Number of Moons Discovered by Cassini (Methone, Pallene, Polydeuces, Daphnis, Anthe, and Aegaeon)	6
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### ABOUT THE IMAGES



**1** Saturn's fourth-largest moon, Dione, is seen through the haze of the planet's largest moon, Titan, against Saturn and its rings.

**2** False color (blue) emphasizes icy walls of fractures on Enceladus.

**3** The Herschel crater on Mimas is a relic of a large impact that nearly destroyed this moon.

**4** Titan's atmosphere makes Saturn's largest moon look like a fuzzy orange ball in this natural-color view.

**5** A false-color view processed to enhance the individual jets spurting ice particles on Enceladus.

**6** This image is a mosaic of images of Phoebe taken by Cassini during its historic close encounter in June 2004.

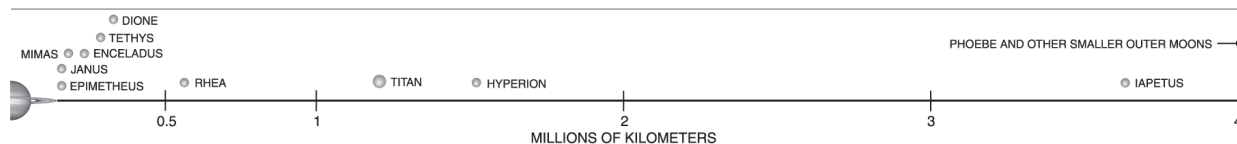
**7** This image of Iapetus, the two-toned moon, shows the bright trailing hemisphere.

**8** Cassini's false-color image of Rhea enhances the slight differences in natural color across the moon's face.

### FOR MORE INFORMATION

[solarsystem.nasa.gov/saturn](http://solarsystem.nasa.gov/saturn)

For the most recent Saturn moon count, visit: [solarsystem.nasa.gov/planets/profile.cfm?Object=Saturn&Display=Moons](http://solarsystem.nasa.gov/planets/profile.cfm?Object=Saturn&Display=Moons)



Some of Saturn's moons are shown at relative distances to the planet.