THE PLANET SATURN

The magnificent rings of Saturn make this Planet visually unique. Although we now know that all the Gas Giants have ring systems, none are as spectacular as Saturn's.

When Galileo first looked upon Saturn with his 30 power, 1-inch diameter refractor telescope, he thought he saw three orbs, two smaller orbs on opposite sides of a larger one. Galileo's optics were marginal and he had no concept of a Planet surrounded by rings, so he drew what seemed to make the most sense at the time.

In 1980 and 1981, the *Voyager* missions provided close up views of Saturn's rings that answered long-standing questions. The rings were thinner than expected, varying from 33 to 330 feet (10 to 100 meters). They are composed of countless ringlets, made of small chunks of ice, most less than an inch across. The entire ring system, which extends beyond the visible rings, has a diameter of about 596,000 miles (960,000 km).

Why does Saturn have an extensive ring system? This is still a mystery but one thought is that Saturn's rings may represent

Saturn's Brightest Moons

Moon	Average Distance from Planet[1]	Revolution Period[2]	Diameter	Visual Magnitude[3]
ENCELADUS	147,900 miles	1.4 days	311 miles	11.8
	238,000 km		500 km	
TETHYS	183,300 miles	1.9 days	659 miles	10.3
	295,000 km		1,060 km	
DIONE	234,900 miles	2.7 days	699 miles	10.4
	378,000 km		1,120 km	
RHEA	326,800 miles	4.5 days	951 miles	9.7
	526,000 km		1,530 km	
TITAN[4]	758,100 miles	15.9 days	3,200 miles	8.4
	1,221,000 km		5,150 km	

[1]Distance measured from center of Planet. [2]Orbit around Planet. [3]Visual magnitude from Earth at Saturn's closest approach (opposition). The visual limit of a 4-inch telescope is magnitude 12. [4]Titan is the second largest moon in our Solar System and is larger than Mercury and Pluto. Titan is the only moon in the Solar System that has an atmosphere. It is composed of 95% nitrogen and 5% methane.

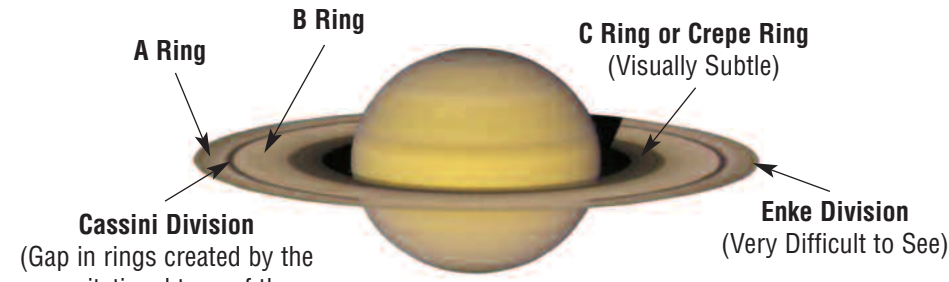
Observing Saturn

the remains of a gravitationally roped-in comet, since the amount of material in the rings is equivalent to a body about 60 miles (97 km) in diameter. The rings are positioned "close" to the Planet where the tidal or gravitational forces of Saturn would tear apart a comet. Ring systems are most likely a natural feature of larger gaseous Planets that can gravitationally capture objects passing by.

Locating Saturn. This yellowish/amber colored Planet is easy to find in the sky with the naked eye because it shines steadily with an average magnitude of 0. See the Planets at Sunrise and Sunset tables (pages 157 to 187) to locate Saturn. The Superior Planet Oppositions table beginning on page 189 indicates when Saturn will appear its brightest and largest in the sky.

Saturn's Moons. Titan, Saturn's largest moon, is also the second largest moon in our Solar System after Jupiter's Ganymede. Titan is easy to see but can appear fairly far away from Saturn. Much closer to Saturn are four moons which can be glimpsed with a small telescope. These moons are much fainter than the Galilean moons of Jupiter and are close to the ring system, resembling little specs of light. Facts about these moons are provided on page 149. When Saturn is visible in the sky, the popular monthly astronomy magazines publish a graph indicating the daily position of the five moons. However, planetarium software programs like *Starry Night* provide positions accurate to the minute.

Rings of Saturn



The diameter of the A Ring is 170,000 miles (273,600 km)

The Rings. Saturn's rings are easily seen in a small telescope with magnification as low as 40x. Higher magnifications will reveal more detail.

When Galileo first observed Saturn in 1610, the rings were visible. But several years later in 1612, the rings were edge-on and could not be seen. This no doubt created a stir and was, to say the least, puzzling. Although Saturn is synonymous with its ring system, these rings do turn edge-on every 14 years and effectively disappear for about a year. This is not the best time to show your friends Saturn because they will not believe that what they are looking at is the ringed Planet.

Orientation of Saturn's Rings

Date	Orientation of Rings
2000 – 2005	Rings Open Southward
January 2009[1]	**Rings Edge-On**
2014 – 2020	Rings Open Northward
July 2024[1]	**Rings Edge-On**
2030 – 2035	Rings Open Southward
April 2039[1]	**Rings Edge-On**
2040 – 2053	Rings Open Northward
April 2054[1]	**Rings Edge-On**

[1]Rings not "visible" for about 4 months before and after these dates.

Why does the orientation of Saturn's rings change so much? First, Saturn and its rings are tilted 25.3° on its axis. Secondly, Earth orbits inside Saturn's orbit. Thirdly, as Saturn orbits the Sun, it keeps its axis pointed in the same direction, just like Earth's. So, as Saturn circles us during its 29 year revolution, it presents a 360° view of the rings. This also displays a "top" view of the rings for one-half of Saturn's revolution and a "bottom" view for the other half.

There are three major divisions in the visible rings, labeled from outermost to innermost A, B and C. Between the A and B rings, there is a 2,900 mile (4,700 km) gap, called the Cassini Division. This gap is visible in small telescopes and most apparent when the rings are opened. The middle B ring is the widest and brightest of the three rings and overwhelms the innermost C ring (known as the "Crepe" ring), making it difficult to see in smaller telescopes.

Cloud Belts. Saturn's cloud belts are not as distinct as Jupiter's. Close up pictures of Saturn by *Voyager 1* and *2* also revealed that the clouds are not as complex. You should, however, be able to see several light colored belts when observing Saturn with a small telescope.