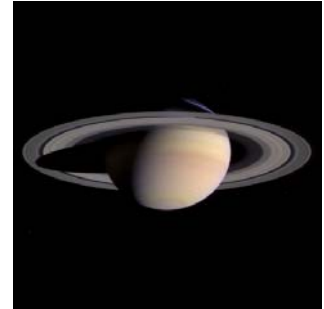


## The 2007 Exploring Space Lectures

# Expedition to the Ringed Planet: Cassini Explores Saturn, Its Rings, and the Fountains of Enceladus

**Carolyn Porco**

**May 8, 2007**

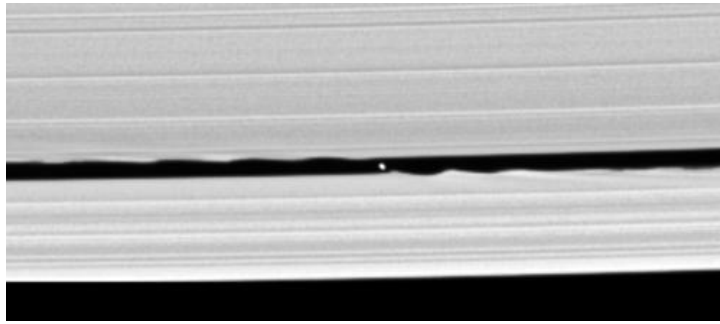


Saturn, with its beautiful ring system, has captivated planetary astronomers for centuries. Galileo's telescope was good enough for him to see mountains on the Moon, spots on the Sun, and to discover four large moons of Jupiter, but the true nature of Saturn's spectacular rings eluded him. He knew something was strange, thinking Saturn somehow had "horns" or "handles," but it remained for Christiaan Huygens, forty-five years later, to discern their true nature as a "flat ring, nowhere touching the planet."

Much has been learned about Saturn from Earth (orbit)-based telescopes, but our knowledge has jumped forward each of the four times to date Saturn has been visited by spacecraft:

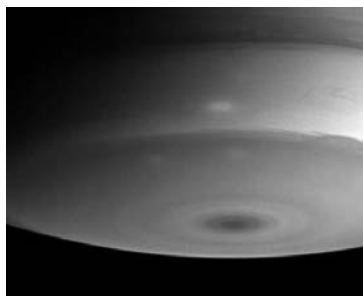
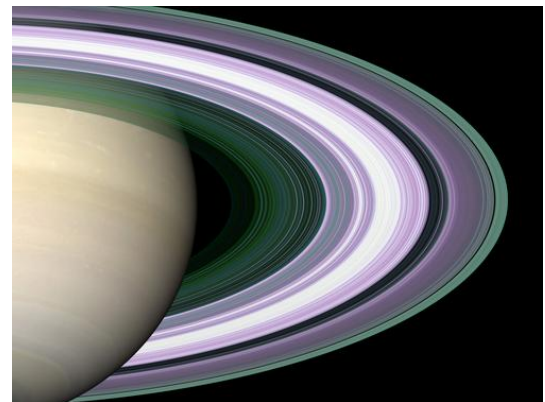
1. *Pioneer 11* flew by Saturn on September 1, 1979
2. *Voyager 1* flew by Saturn on November 12, 1980
3. *Voyager 2* flew by Saturn on August 12, 1981 (both *Voyagers 1* and *2* are still operational!)
4. *Cassini* entered Saturn orbit on July 1, 2004
5. *Huygens* Titan Probe detached from *Cassini* (12/25/04), entered Titan's atmosphere (01/14/05)

*Voyager 2* was built using state-of-the-art technology, circa 1972, the same year the four function "pocket" calculator hit the market. *Voyager* was built by engineers wielding slide rules; imagine how much more sophisticated and capable the *Cassini/Huygens* spacecraft must be!



Saturn's moon, Daphnis, occupies the Keeler Gap, raising wavelike distortions in the adjacent rings. (*Cassini* image PIA 08882)

[In mythology, Daphnis was an extremely attractive son of Apollo (some say Mercury), the demi-god of cattle (of all things), and shares the same Greek root word meaning "laurel tree" as the modern name, Daphne (even though Daphnis was male).]

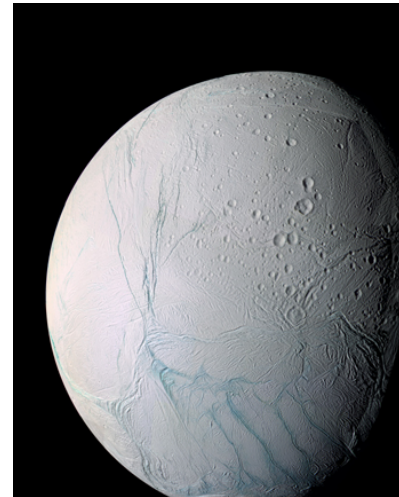
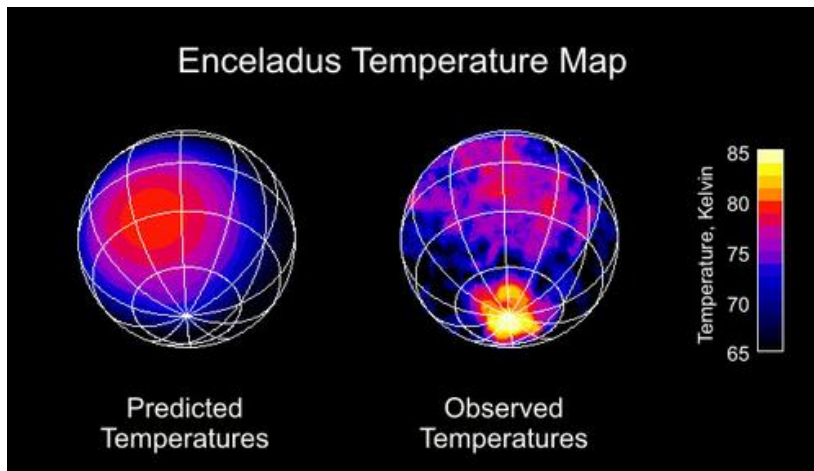


Upper right: This "image" of Saturn's rings is not a photograph. It was constructed from the variation in the strength of radio signals from *Cassini* as it passed behind Saturn (as seen from Earth). Saturn's rings passing in front of a star (an "occultation") produces similarly-useful dimming (and was, in fact, how the rings of Uranus were discovered in Earth-based telescopic data).

Left: *Cassini* image of the South Pole of Saturn, showing several storms in the Saturn atmosphere that are comparable in size to the whole planet Earth. (*Cassini* image PIA 05434)

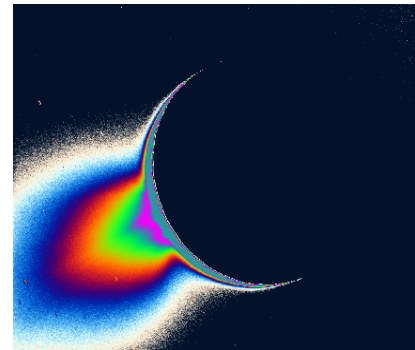


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Above: Before *Cassini* arrived at Saturn, scientists expected the poles of Enceladus to be cold and the spot on Enceladus facing the Sun to be warmer (left side image). What *Cassini* actually saw was a hot spot at the Enceladus South Pole (right side image), likely a region of “volcanic” activity. (*Cassini* image PIA 06432)

Upper right: Voyager images decades ago showed parts of the surface of Enceladus to be smooth, hence, young, implying some sort of resurfacing was ongoing (note the surface to the upper right has been around long enough to collect a lot of craters; the grooved terrain to the lower left is too young to have been cratered heavily). (*Cassini* image PIA 06254)



Right: False-color image of the “Fountains of Enceladus,” geysers-like sprays of water ice, rising from the South Polar region of Enceladus. Earth; Jupiter’s moon, Io; and Neptune’s moon, Triton, all exhibit geyser-like activity. (*Cassini* image PIA 07759)

“Enceladus” was an inspired name choice from mythology. One of the Titans and a son of Uranus and Gaia (Earth), Enceladus were wounded by Athena during the great battle between the Titans and the Olympians. He was buried alive beneath Mt. Etna, where his pained writhing and exhalations resulted in earthquakes and volcanic eruptions. To this day, Greeks occasionally refer to an earthquake poetically as a “strike of Enceladus.” Keeping the analogy going past the bonds of Earth, Dr. Porco’s “Fountains of Enceladus” would be the extra-terrestrial exhalations of a wounded Enceladus, born of Uranus upon the latter’s murder at the hands of his son, Saturn! [“Titan” is the name of Saturn’s largest moon.]



## Our Speaker

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## References

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- Cassini/Huygens* mission website: <http://saturn.jpl.nasa.gov/home>
- CICLOPS website: <http://ciclops.org/index.php?flash=1>