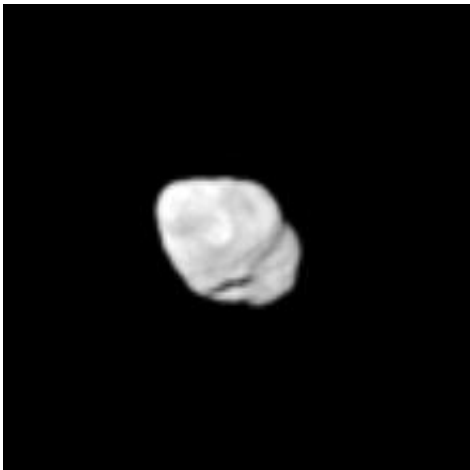


Cassini finds Prometheus a sculptor of Saturn's rings

October 26 2005



New findings from members of the Cassini imaging team show that certain prominent features in Saturn's narrow and contorted F ring can be understood in terms of a simple gravitational interaction with the small moon Prometheus. The results are published in today's issue of the journal *Nature*.

Image: Saturn's shepherd moon Prometheus reveals its elongated, irregular form to Cassini in this image. The moon's long axis points toward Saturn. Prometheus is 102 kilometres (63 miles) across. This view shows the southern part of the moon's anti-Saturn side (the face that always points away from Saturn). Credit: NASA/JPL/Space Science Institute

The F ring is notorious for exhibiting unusual structures, like "knots," "kinks," and "clumps" that continue to puzzle astronomers. Cassini images have shown that the gravitational effect of Prometheus appears to produce regular patterns in the ring, including a series of channels or gores in the tenuous ring material interior to the F ring core, and "streamers" of particles that temporarily link the ring to the moon.

Prometheus is only about 100 kilometers (60 miles) wide and orbits just interior to the F ring. The Cassini imaging scientists' findings show that Prometheus causes the structure as the moon approaches and recedes from the F ring every 14.7 hours, during its orbit of Saturn.

As an example of a satellite that enters a ring on a regular basis, the phenomenon posed unique challenges to the understanding of ring-satellite interactions.

Using Cassini data, the team developed a model that shows the mechanism by which Prometheus, as it recedes from its closest approach to the F ring, gravitationally extracts material from the ring. The affected particles do not escape the F ring region; rather, the changes to their orbits produced by Prometheus cause them to oscillate back and forth across the ring. One orbital period after the encounter, the effect is visible as a dark channel or "gore" in the interior of the F ring, and drape-like structures between the channels – in excellent agreement with Cassini images. In this way, Prometheus leaves its mark on the F ring long after the satellite has moved on.

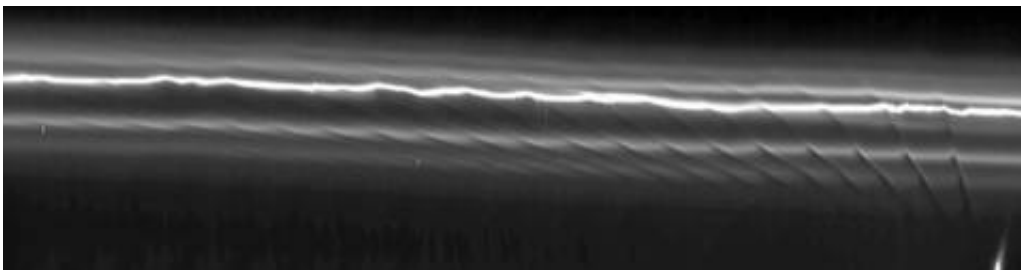


Image: This mosaic of 15 Cassini images of Saturn's F ring shows how the moon Prometheus creates a gore in the ring once every 14.7 hours, as it approaches and recedes from the F ring on its eccentric orbit. Credit: NASA/JPL/Space Science Institute

Dr. Carl Murray from Queen Mary, University of London, lead author of the paper and member of the Cassini Imaging Science Subsystem team said, "As the closer and more massive of the F ring's two shepherding satellites, Prometheus was always the likely culprit for causing changes to this narrow ring. Our model provides a plausible mechanism for the origin of intricate structures detected in the F ring and suggests that streamers, channels and a variety of other phenomena can all be understood in terms of the simple gravitational effect of a satellite on ring particles."

Over time Prometheus is expected to dive deeper into the F ring – with more extreme perturbations – culminating in December 2009 when the two orbits approach their minimum separation.

Dr. Joseph Burns, an imaging team member from Cornell University, Ithaca, N.Y. and also one of the paper's co-authors said, "We're eager to learn what the satellite will do to this narrow, already contorted ring, and in turn whether the ring particles will strike Prometheus, changing its surface."

Murray added, "We see the model we have developed very much as a first step in understanding the processes at work. Ultimately this type of research will help us to understand how planets form and evolve."

The work described in the Nature paper is a collaboration between Cassini imaging scientists at Queen Mary, University of London, Cornell University and the Space Science Institute.

Source: Space Science Institute

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