

## One Moon Coats its Neighbor in Dust

- The trailing face of Saturn's moon Iapetus is ~10 times brighter than its leading face
- For 300 years, astronomers debated whether the cause was *internal* (e.g. eruption of dark material on one face) or *external* (e.g. debris from a nearby impact)
- The discovery of a giant ring around Saturn and close-up Cassini images confirm an *external* cause: dust particles coat one side and drive ice to the other by sublimation



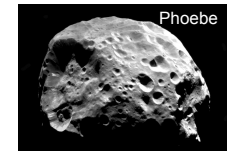
Saturn's moon Iapetus has a dark leading side, while its polar regions and trailing side are bright. The dividing line follows a pattern like the stitching on a baseball.

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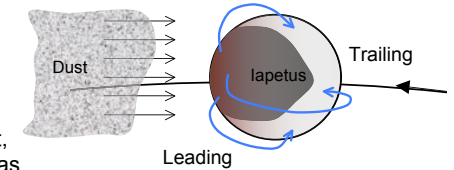
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## A Ring Creates a "Baseball" Moon

- Impactors strike one of several distant dark Saturn moons (such as Phoebe), supplying a ring of dark particles that orbit Saturn 'backwards', like Phoebe
- Sunlight pushes the ~10 micron particles inward over thousands of years
- Particles collide with Iapetus and other inner moons, making their leading face slightly darker
- The darkened ice absorbs more sunlight, warms up, and sublimates, recondensing as bright frost on the trailing side and poles



Dust from backwards-orbiting (captured) Phoebe coats the leading side of Iapetus



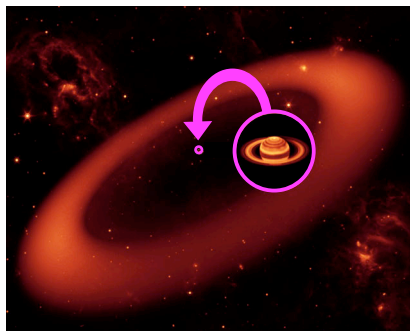
Sun-warmed dust causes sublimation, driving ice to the poles and trailing side

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## The Big Picture

- Planetary moons can be "painted" at a global level by external causes such as dust and even charged particles
- Dark dust and bright ice can segregate on a moon's surface, as sun-warmed dust drives ice to brighter, icier regions
- New telescopes and instruments keep discovering new phenomena: The "Phoebe ring" is the largest and most distant from its parent body



Artist's conception of huge ring around Saturn, discovered at IR wavelengths by the Spitzer Space Telescope. The inset indicates scale by showing an enlarged ground-based IR image of Saturn.

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## For More Information...

### Press

- BBC.com - 10/07/09 - "New ring detected around Saturn"  
<http://news.bbc.co.uk/2/hi/8291905.stm>
- Sky & Telescope - 12/11/09 - "Has Iapetus Finally Been Solved?"  
<http://www.skyandtelescope.com/community/skyblog/newsblog/79066992.html>
- CNN.com - 10/07/09 - "Scientists discover massive ring around Saturn"  
<http://www.cnn.com/2009/TECH/space/10/07/space.saturn.ring/index.html>

### Images

- Slide 1 image courtesy NASA / JPL / Space Science Institute  
<http://photojournal.jpl.nasa.gov/catalog/PIA08234>
- Slide 2 Phoebe image courtesy Cassini Imaging Team / SSI / JPL / ESA / NASA  
<http://apod.nasa.gov/apod/ap060212.html>
- Slide 3 image NASA/JPL-Caltech/Keck  
[http://www.nasa.gov/mission\\_pages/spitzer/multimedia/spitzer-20091007a.html](http://www.nasa.gov/mission_pages/spitzer/multimedia/spitzer-20091007a.html)

### Source Articles (on-campus login may be required to access journals)

- Spencer and Denk, 'Formation of Iapetus' Extreme Albedo Dichotomy by Exogenically Triggered Thermal Ice Migration', *Science*, 327, 10.1126/science.1177132, 2010.  
<http://www.sciencemag.org/cgi/content/full/327/5964/432>
- Verbiscer et al., 'Saturn's largest ring', *Nature*, 461, doi:10.1038/nature08515, 2009.  
<http://www.nature.com/nature/journal/v461/n7267/full/nature08515.html>

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