

Planetary Rings

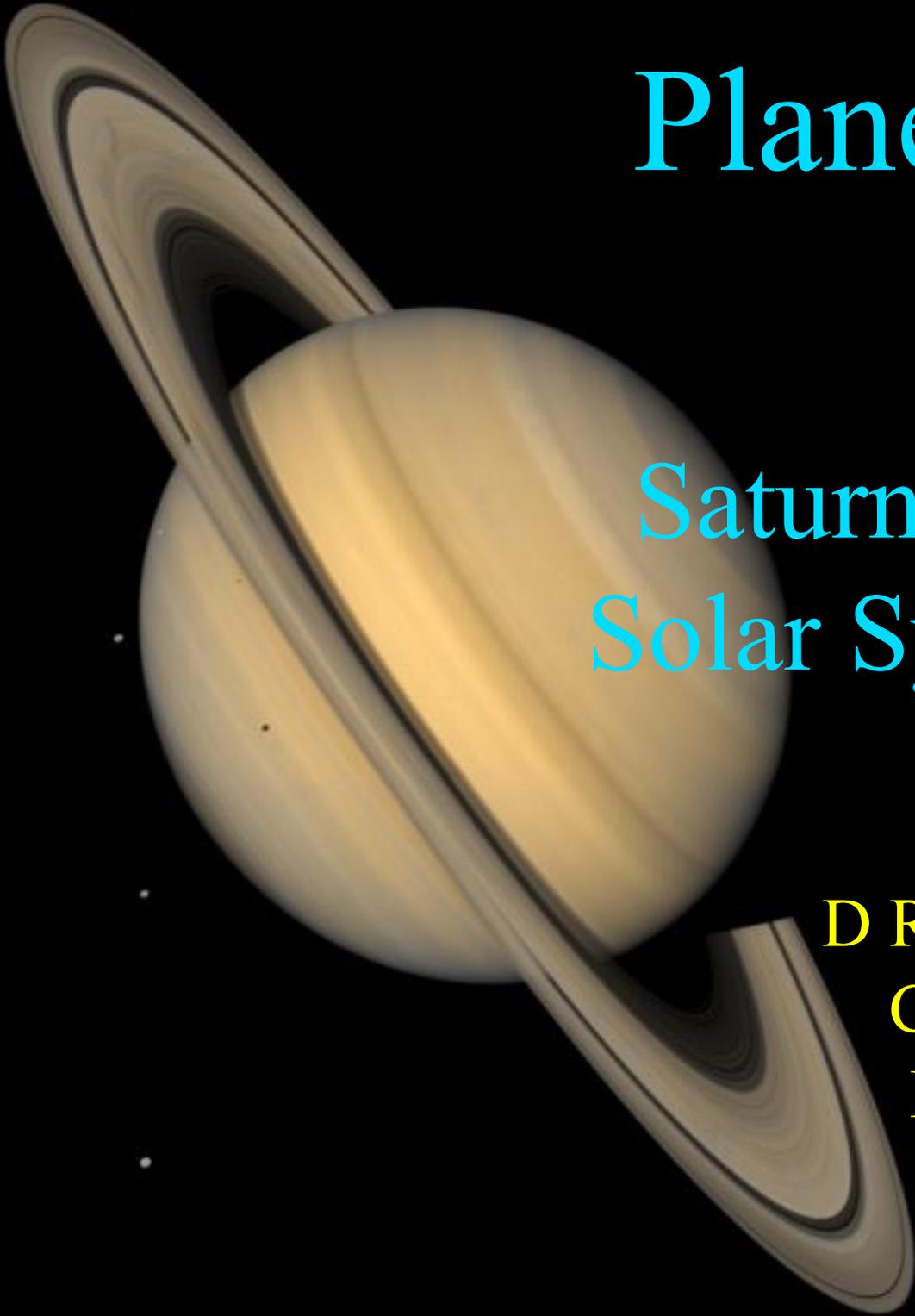
Saturn's Rings are the
Solar System Archetype

D Ring (innermost)

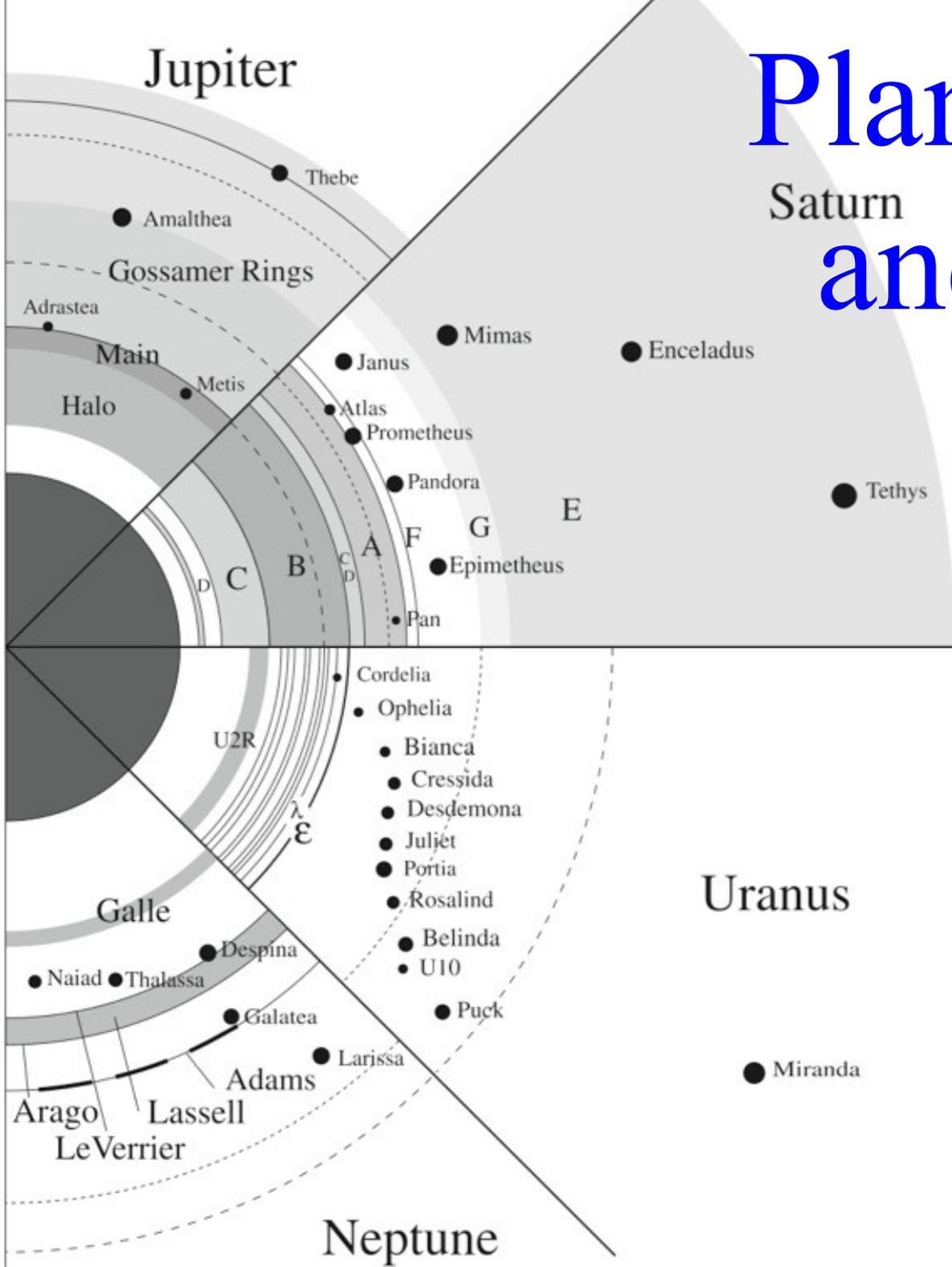
C Ring (dark)

B Ring (brightest)

A Ring (outermost)



Planetary Rings and Satellites



The systems are scaled to a common planetary radius.

Dotted line is the **Roche Limit** - inside it is difficult for satellites to form (Tides are too large), outside it is hard for a ring to exist.

Dashed line is **Synchronous Orbit** - satellites inside are pulled in by Tides; satellites outside are pushed away.

Planetary Rings

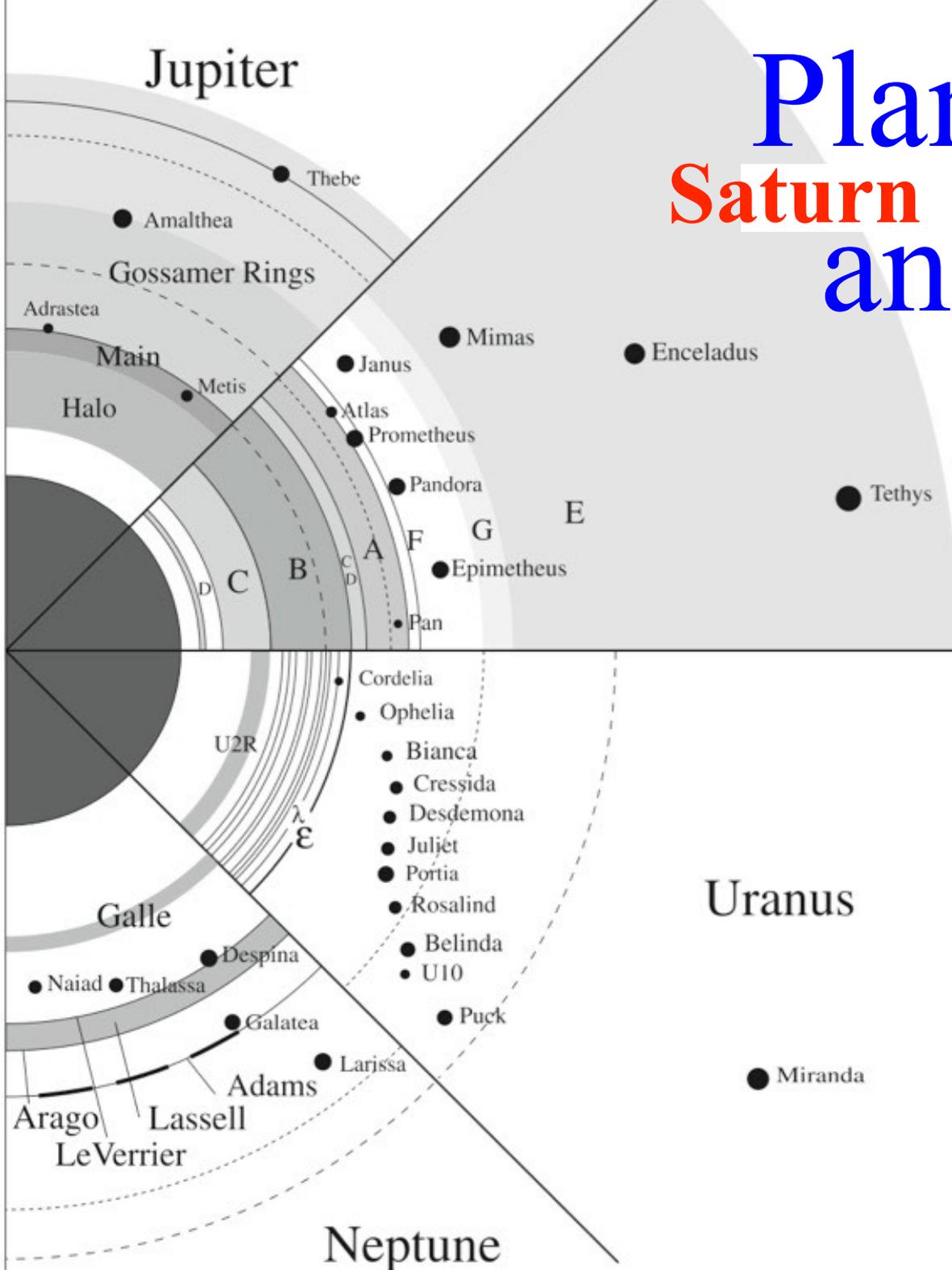
Saturn

and Satellites

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Saturn's Broad Rings

A Cassini spacecraft image of Saturn's rings, showing the D, C, B, A, and F rings. The rings are curved and show various textures and colors, from dark to light. The labels are placed near their respective rings.

D Ring

C Ring

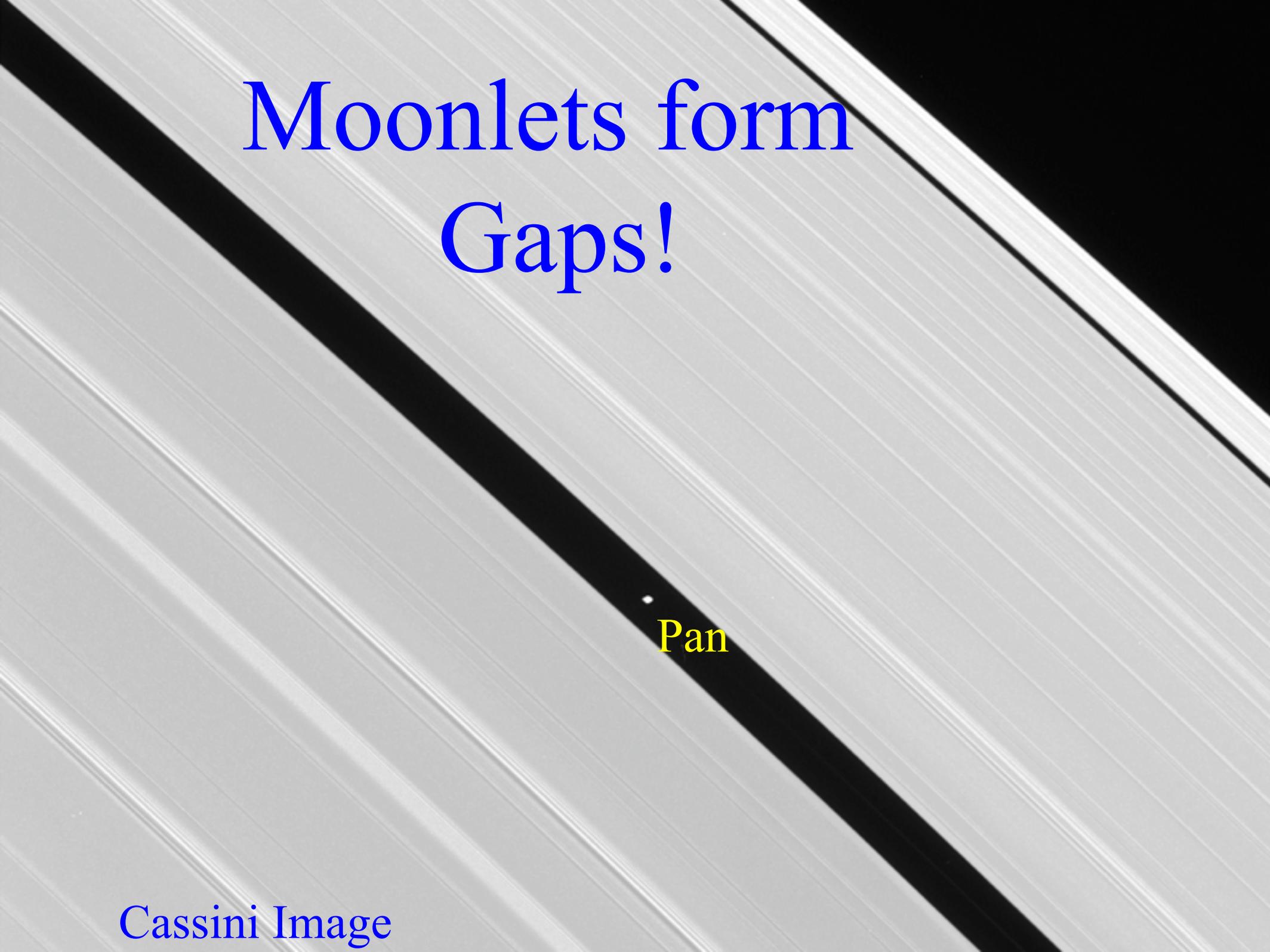
B Ring

A Ring

Cassini Image

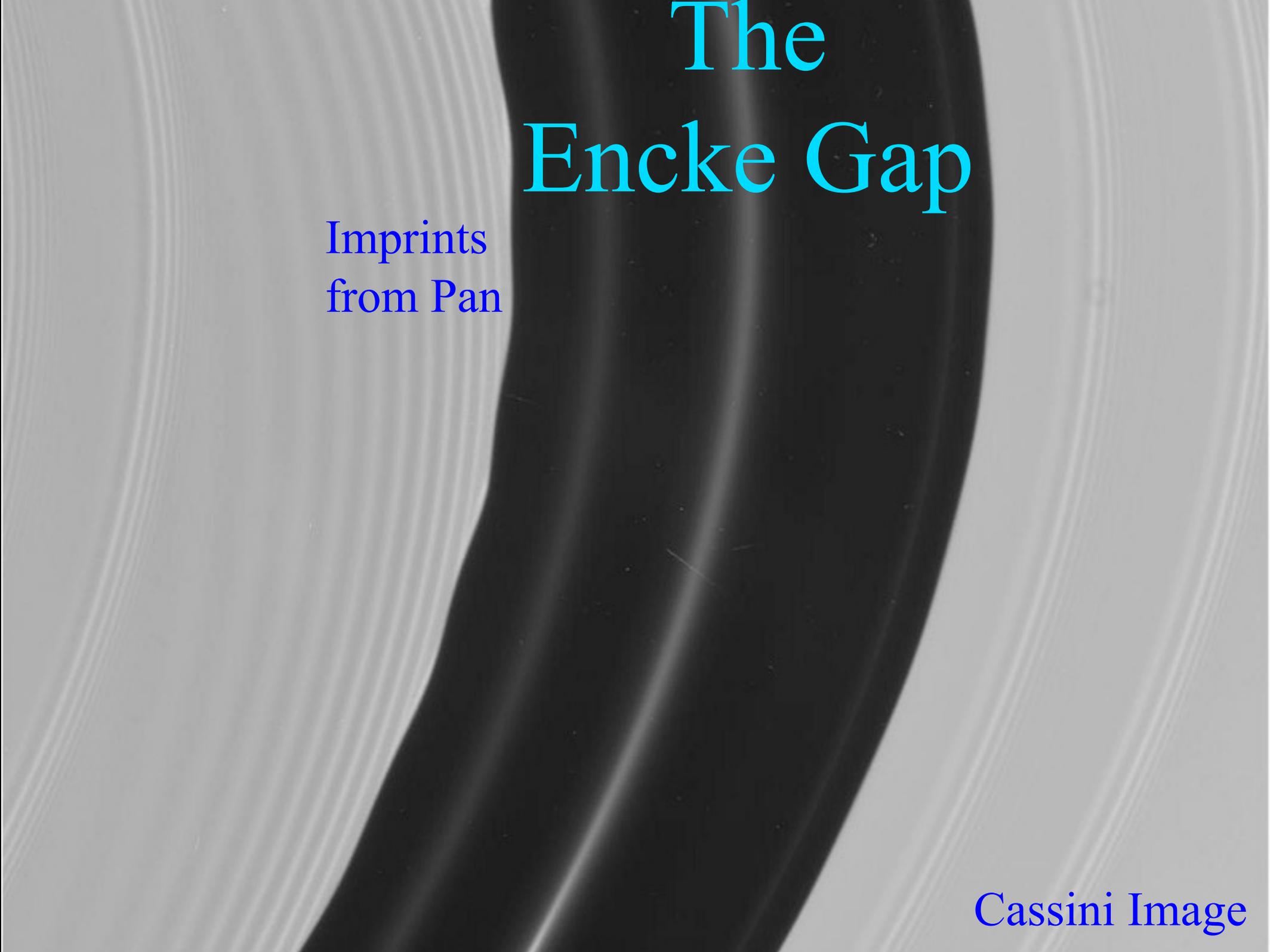
F Ring

Moonlets form Gaps!

A grayscale image of Saturn's rings, showing a prominent gap. A small, bright white dot is visible within the gap, labeled with the name 'Pan' in yellow text. The rings are composed of numerous thin, parallel bands of varying brightness, creating a complex, layered appearance. The gap is a dark, well-defined region where the ring material is absent.

Pan

Cassini Image

A grayscale image of Saturn's rings, showing a prominent dark gap (the Encke Gap) in the center. The rings are composed of many thin, parallel bands. The text is overlaid on the image.

The Encke Gap

Imprints
from Pan

Cassini Image

A Resonance with Mimas creates the Cassini Division between the A and B Rings.

Mimas

Tethys

Dione

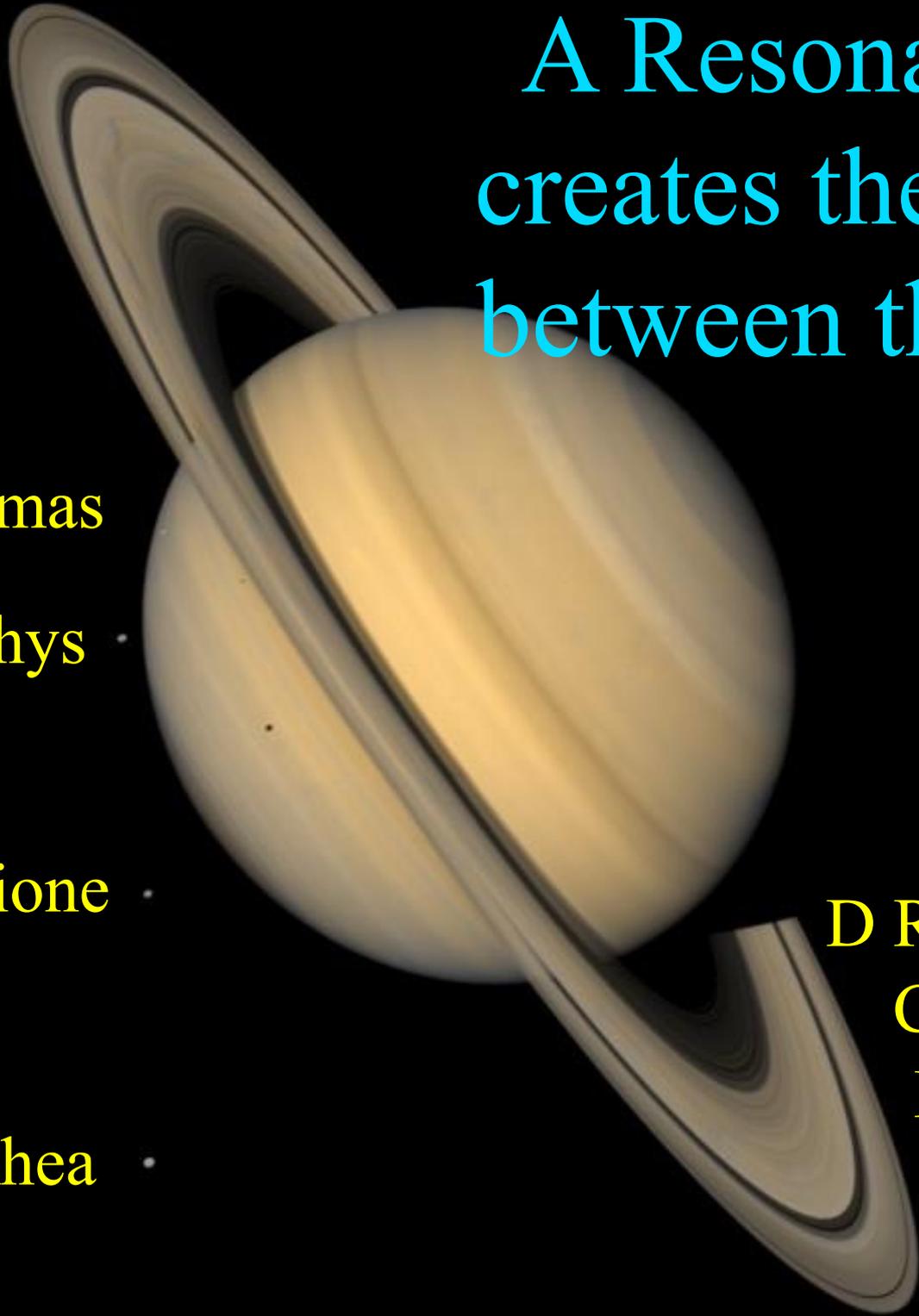
Rhea

D Ring (innermost)

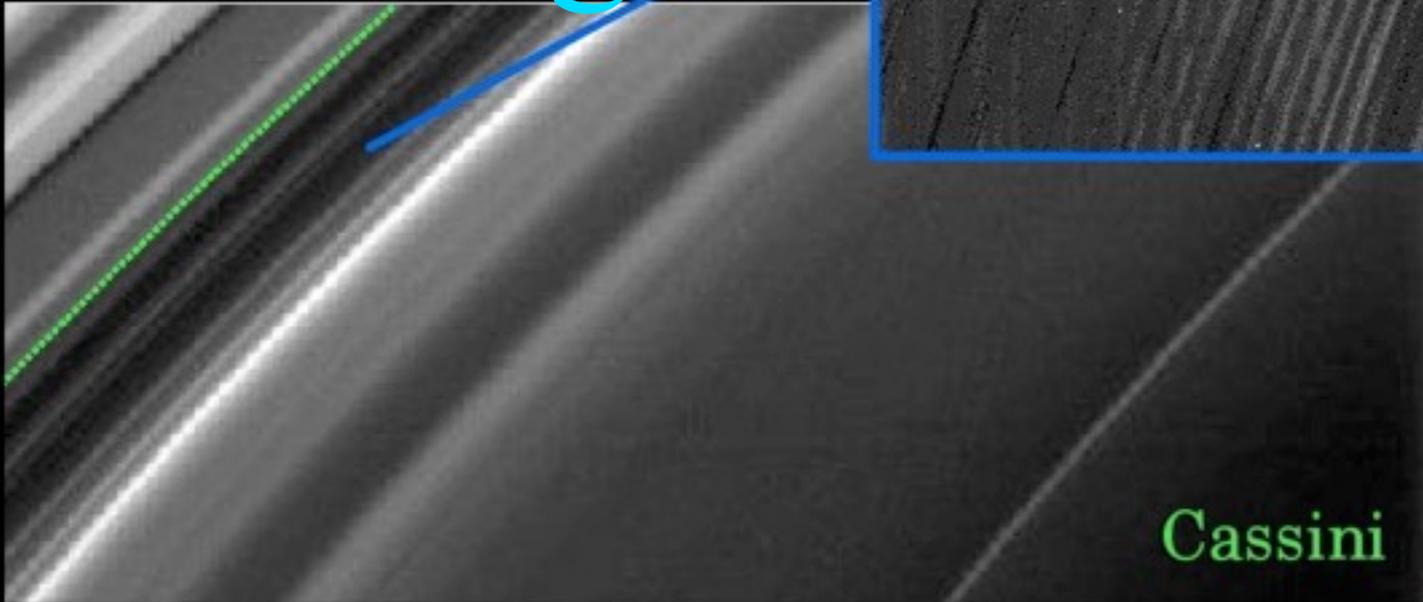
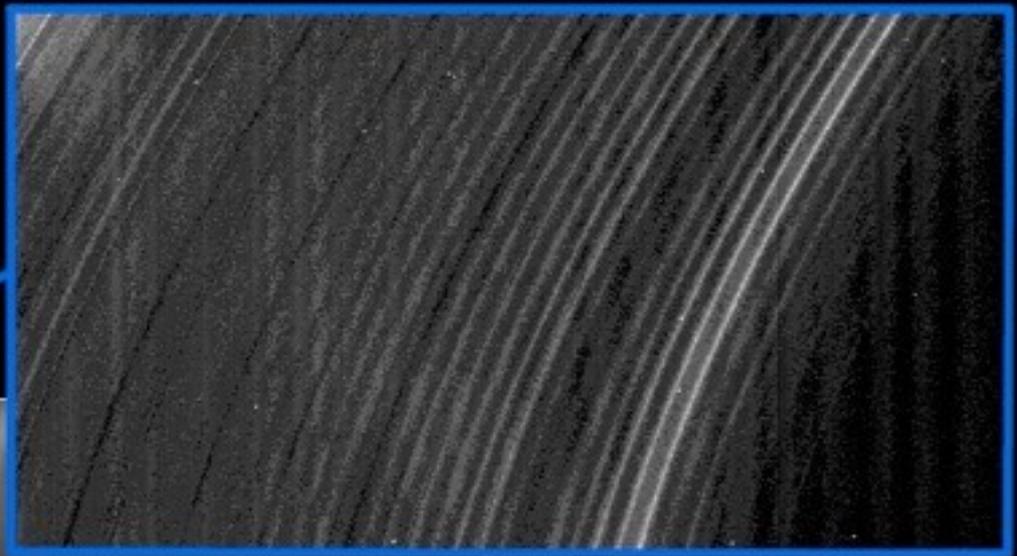
C Ring (dark)

B Ring (brightest)

A Ring (outermost)



Saturn's D Ring



Cassini

Weird Spiral
Structure!



Voyager

Saturn's F Ring

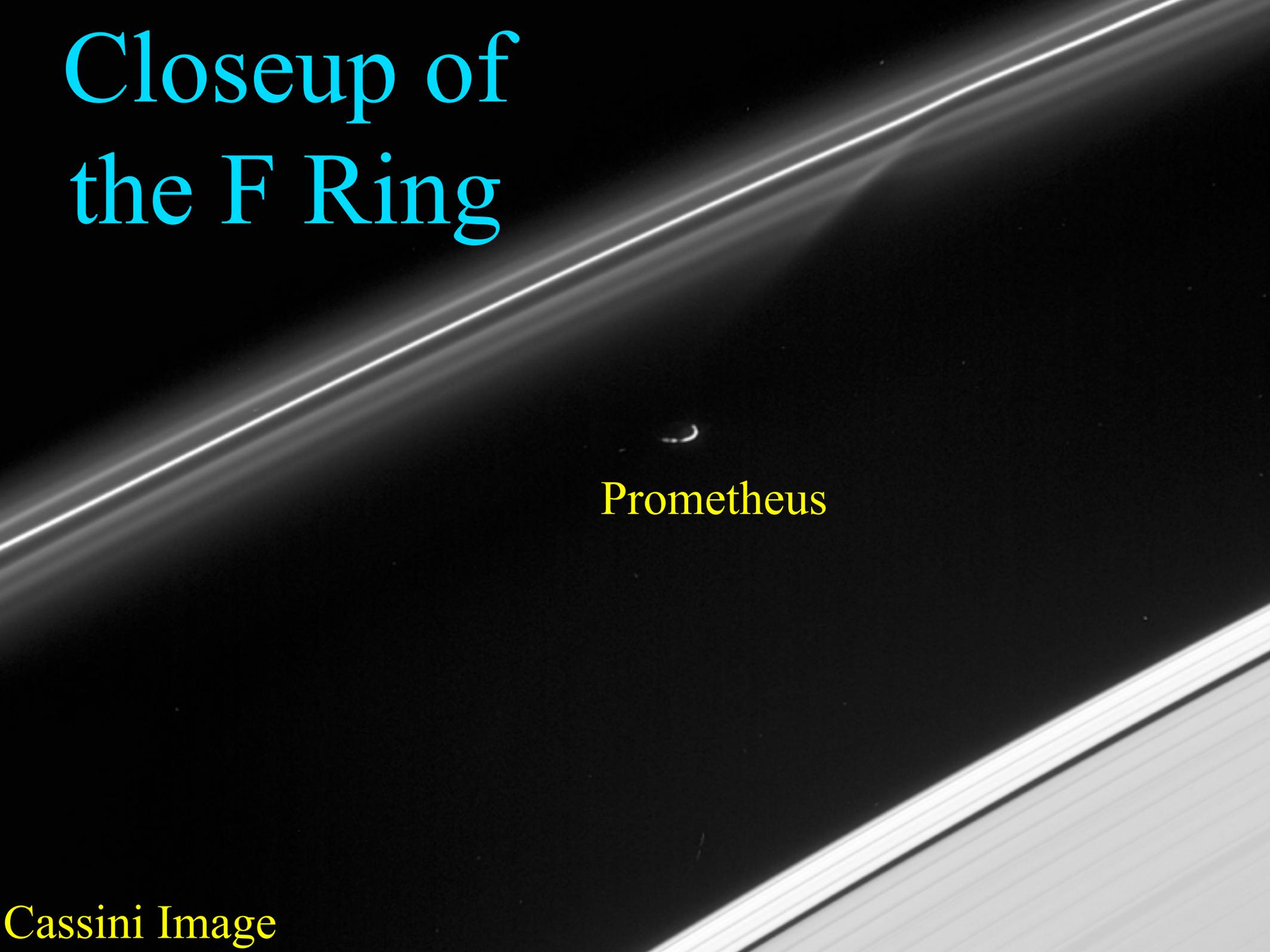
A detailed view of Saturn's F Ring, showing its complex structure of four strands and dark gaps. The ring is set against a dark background, with the planet's edge visible on the left.

Prometheus

4 strands,
dark “slices”

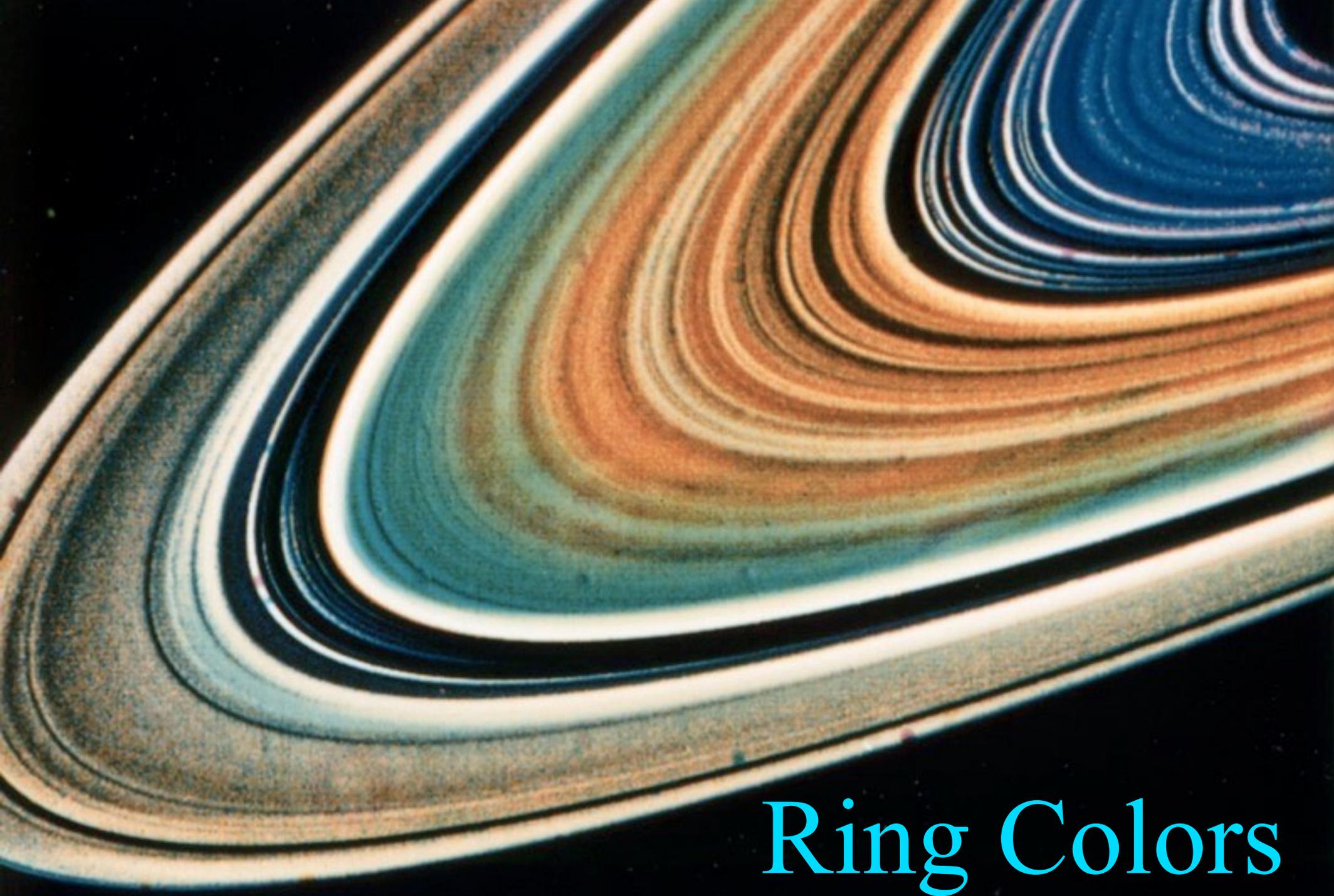
Cassini Image

Closeup of the F Ring

A close-up photograph of Saturn's F Ring, showing its complex structure of multiple narrow, parallel bands. The ring is illuminated from the right, creating a bright, glowing edge. In the center of the frame, the moon Prometheus is visible as a small, crescent-shaped object. The background is the dark, black void of space.

Prometheus

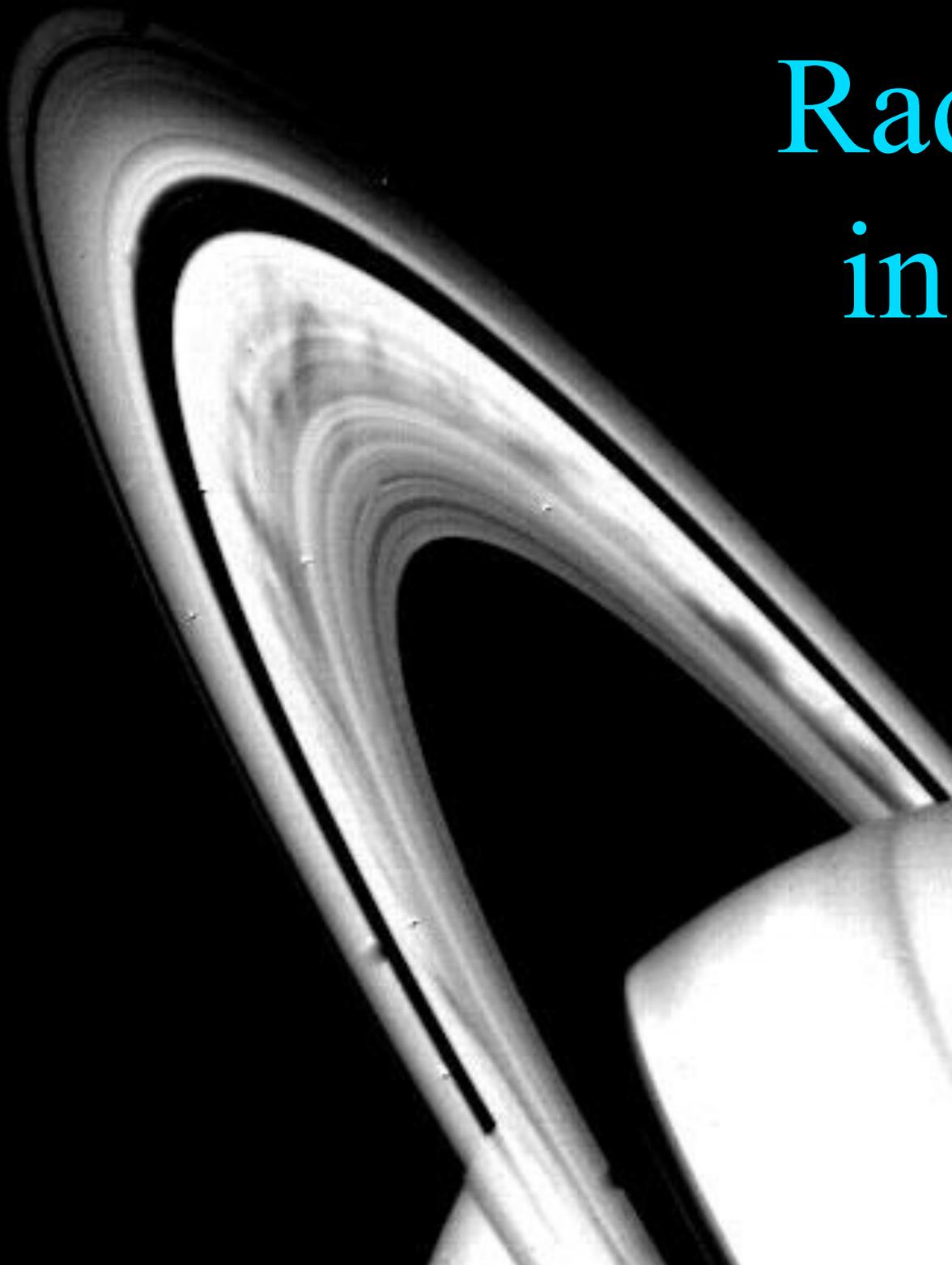
Cassini Image



Ring Colors

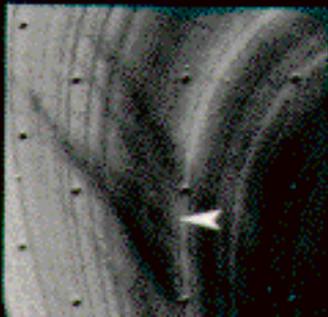
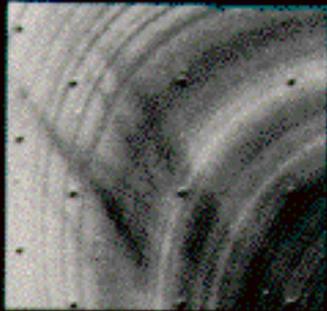
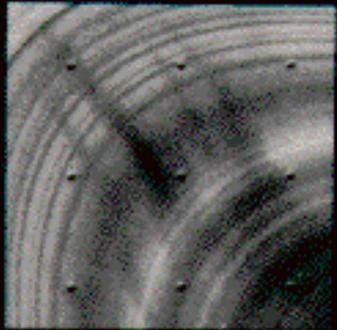
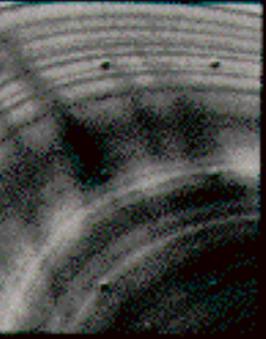
Voyager Image

Radial Spokes in the Rings



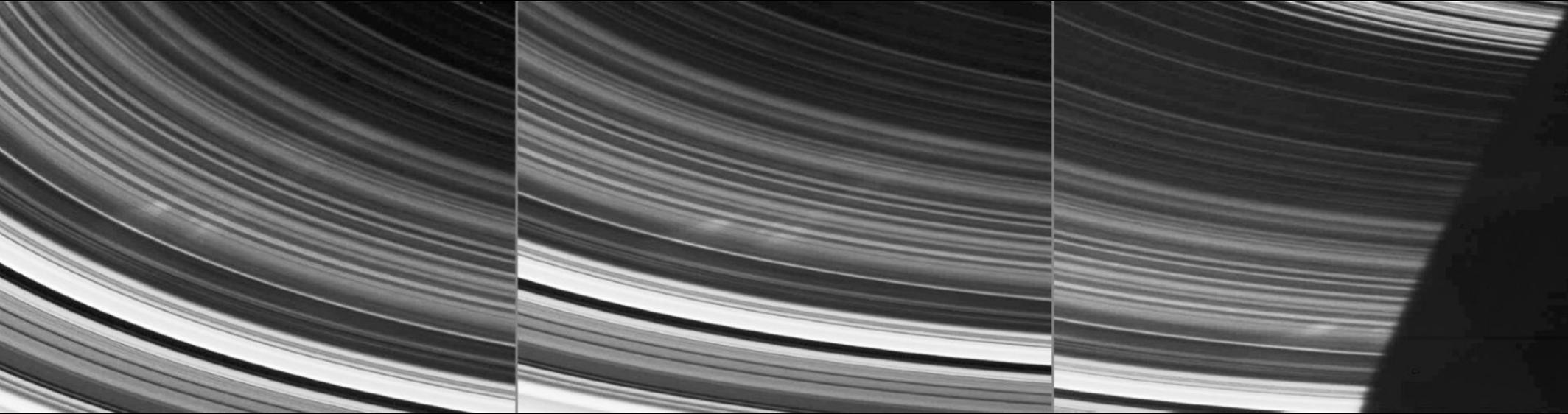
Voyager Image

Dark Spokes on the Sunlit Side of the Rings



Voyager
Image

Bright Spokes on the Dark Side of the Rings

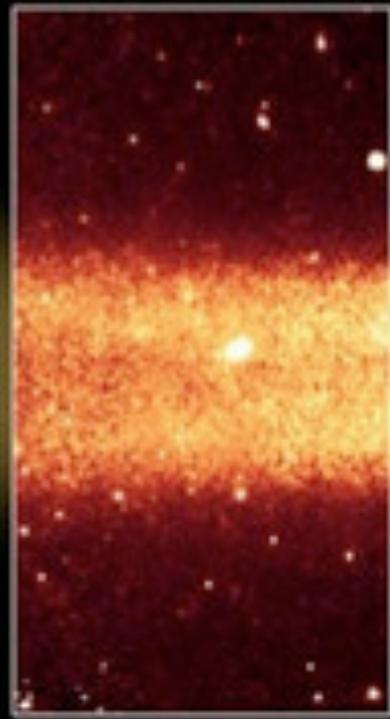


Cassini Image

Waves in the A Ring Driven by Resonances

Cassini Image

The Phoebe Ring



Dust Ring



Saturn

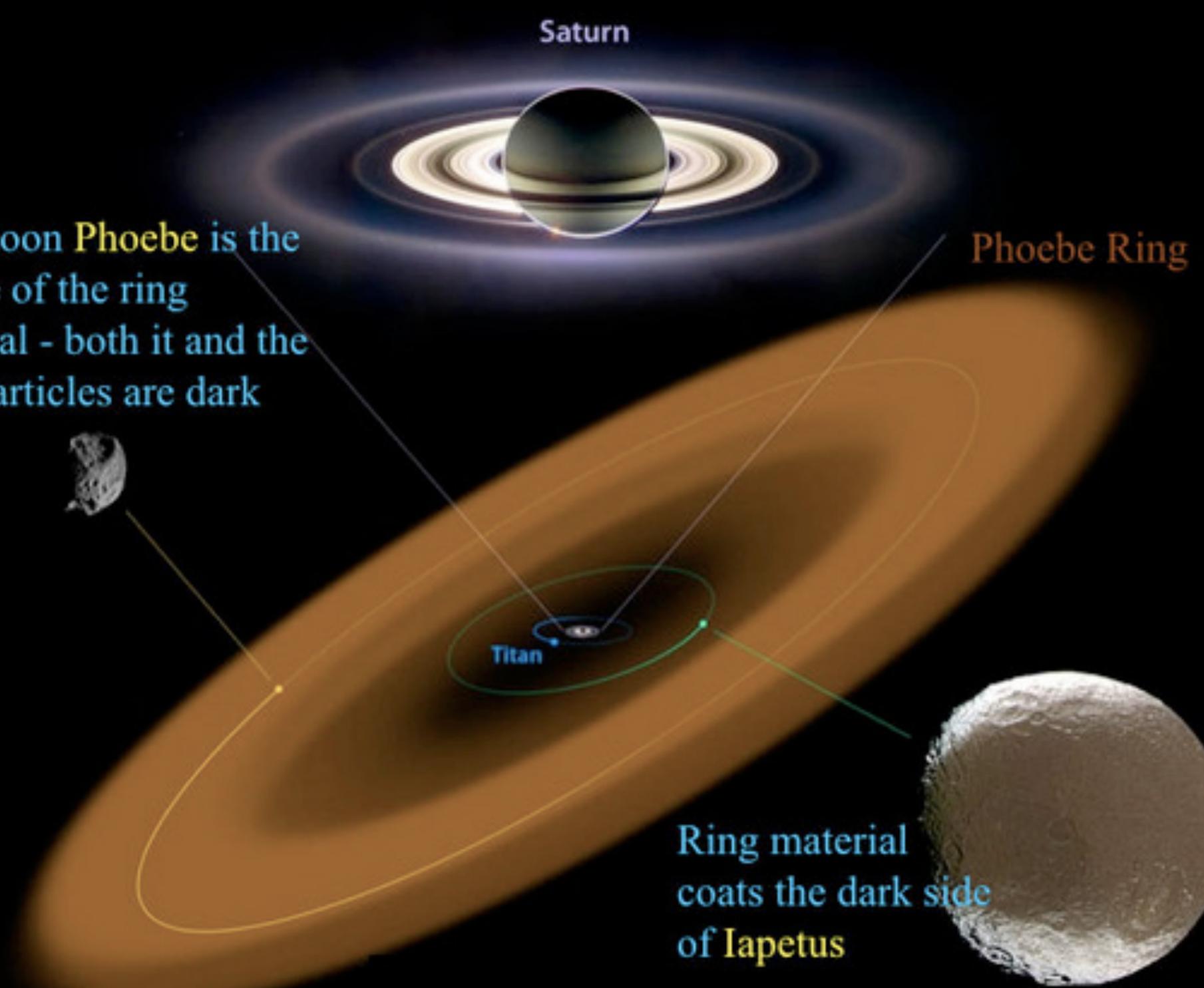
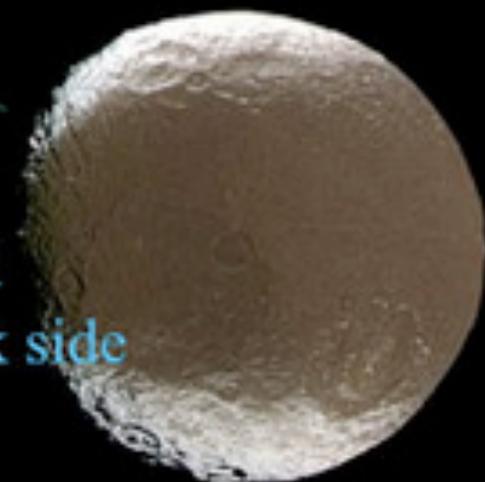
The moon **Phoebe** is the source of the ring material - both it and the ring particles are dark

Phoebe Ring



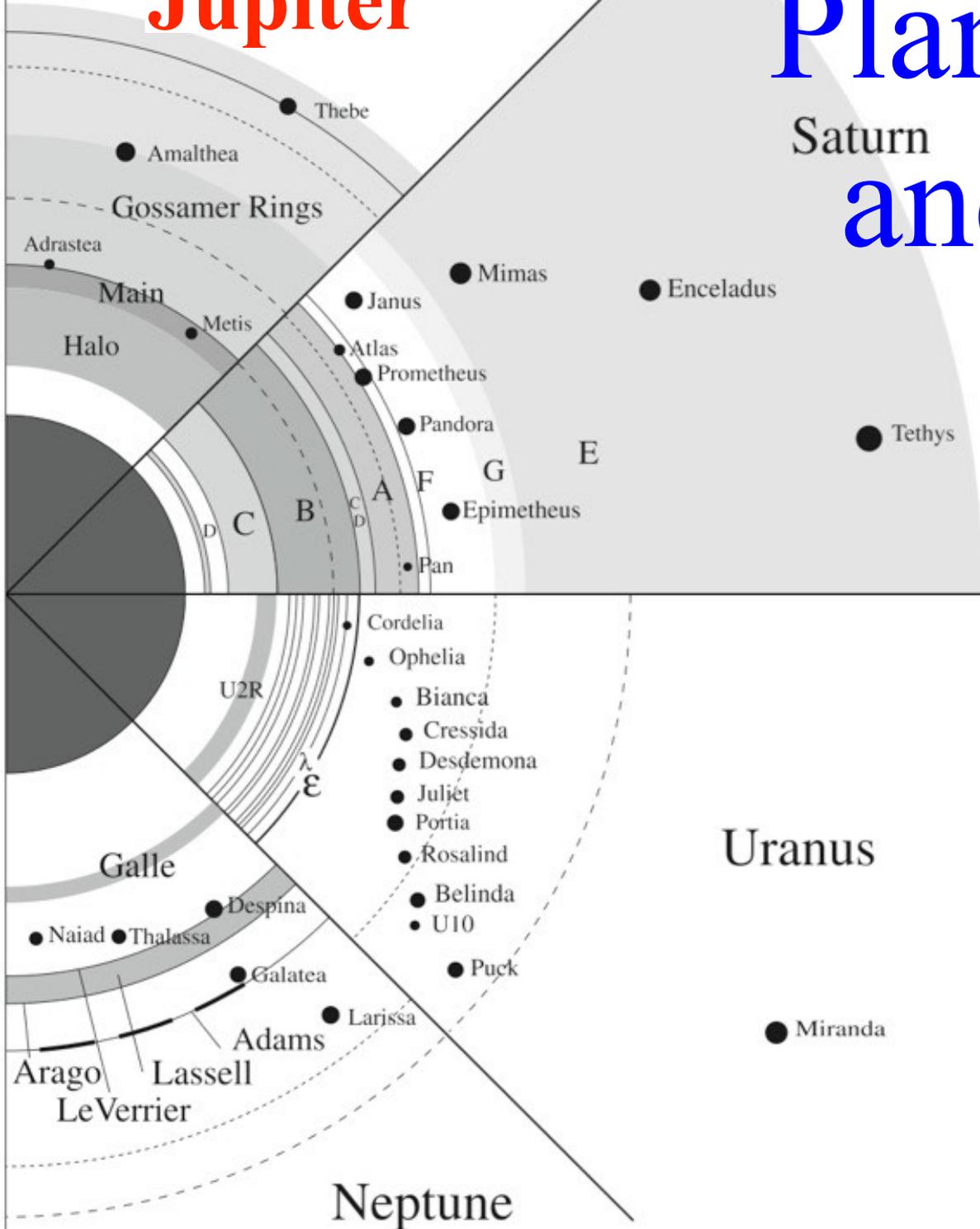
Titan

Ring material coats the dark side of **Iapetus**



Jupiter

Planetary Rings and Satellites



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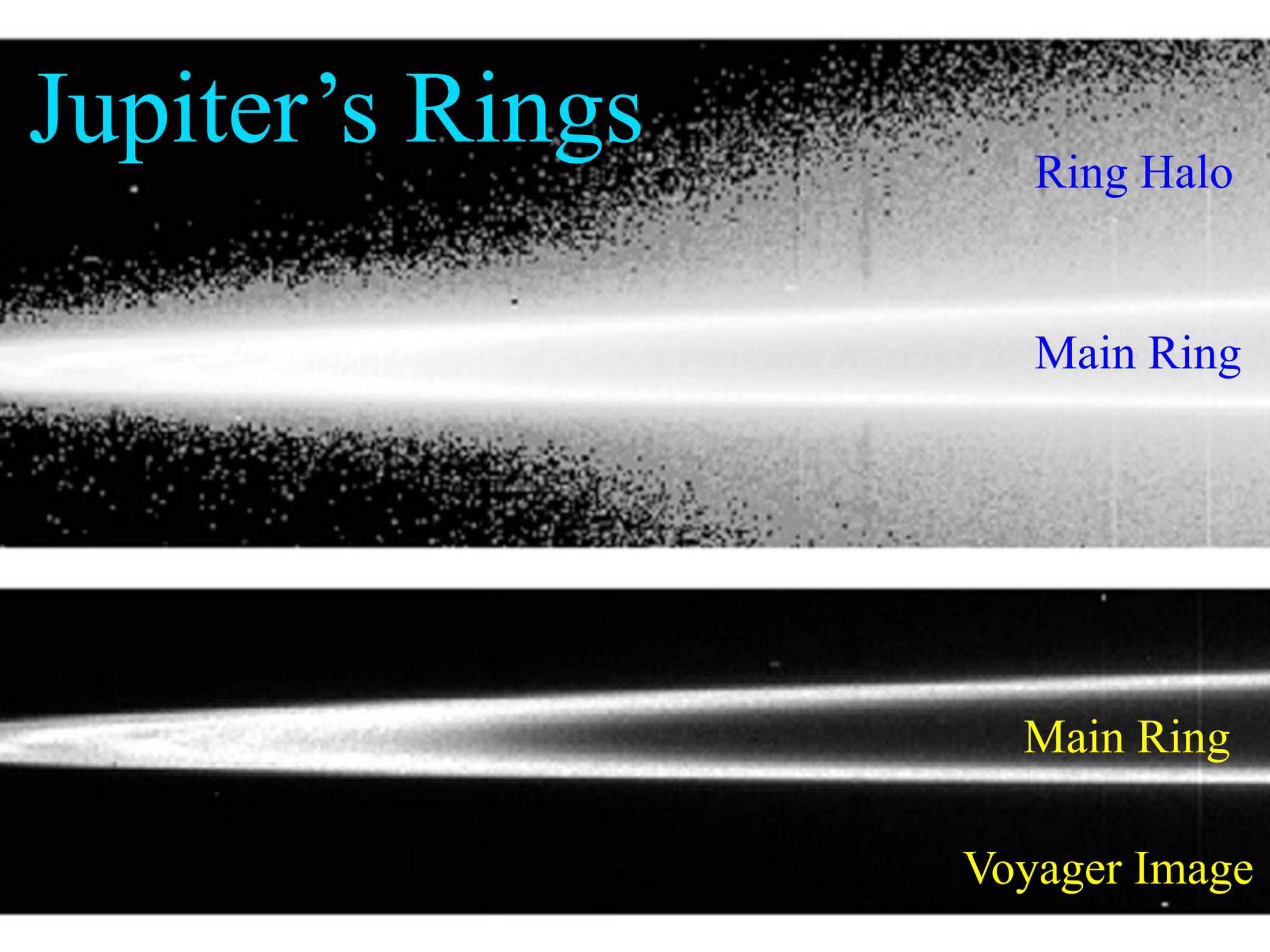
Planetary Rings: Jupiter

Looking toward
the Sun from
Jupiter's shadow



Voyager Image

Jupiter's Rings



Ring Halo

Main Ring

Main Ring

Voyager Image

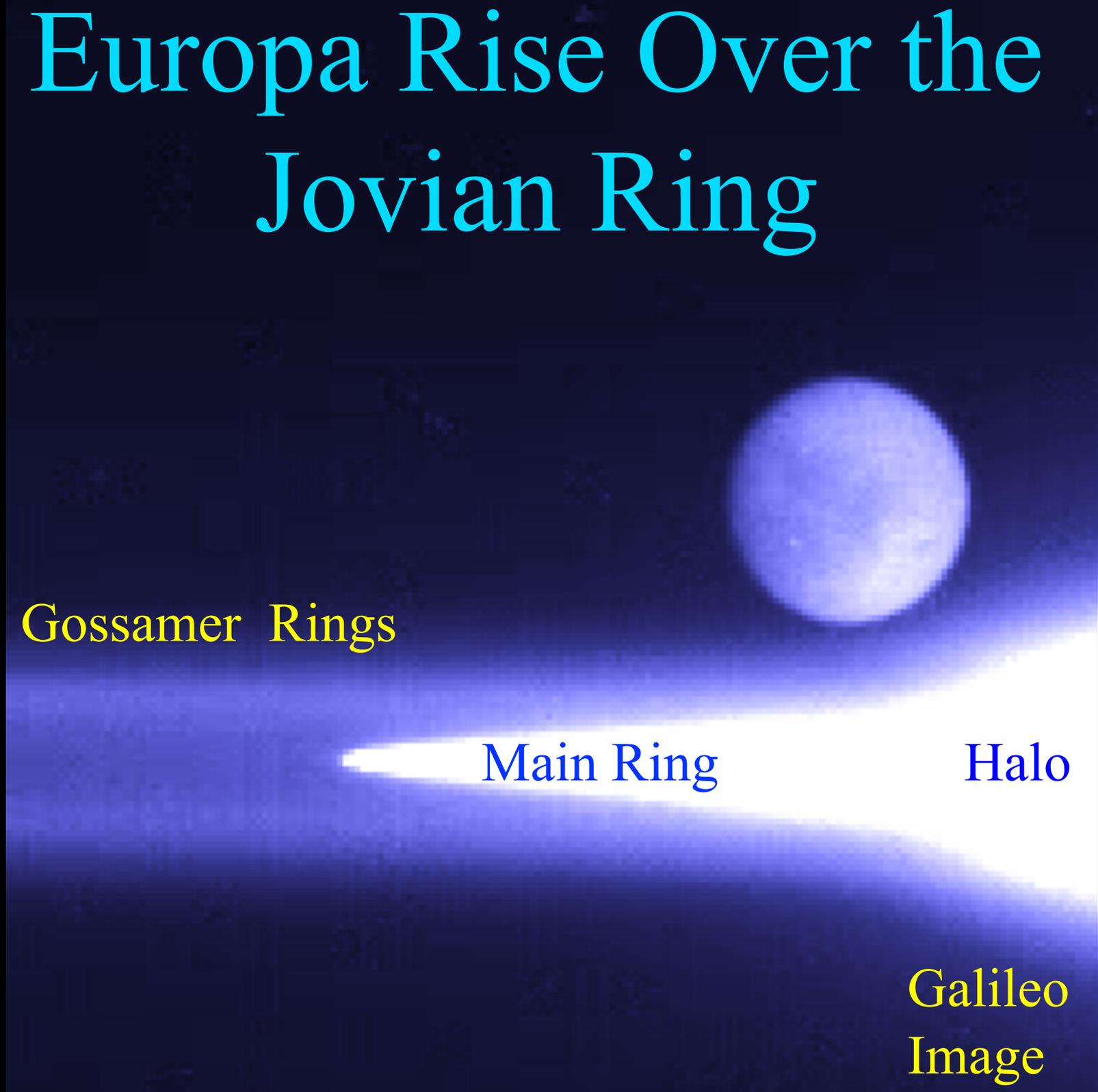
Europa Rise Over the Jovian Ring

Gossamer Rings

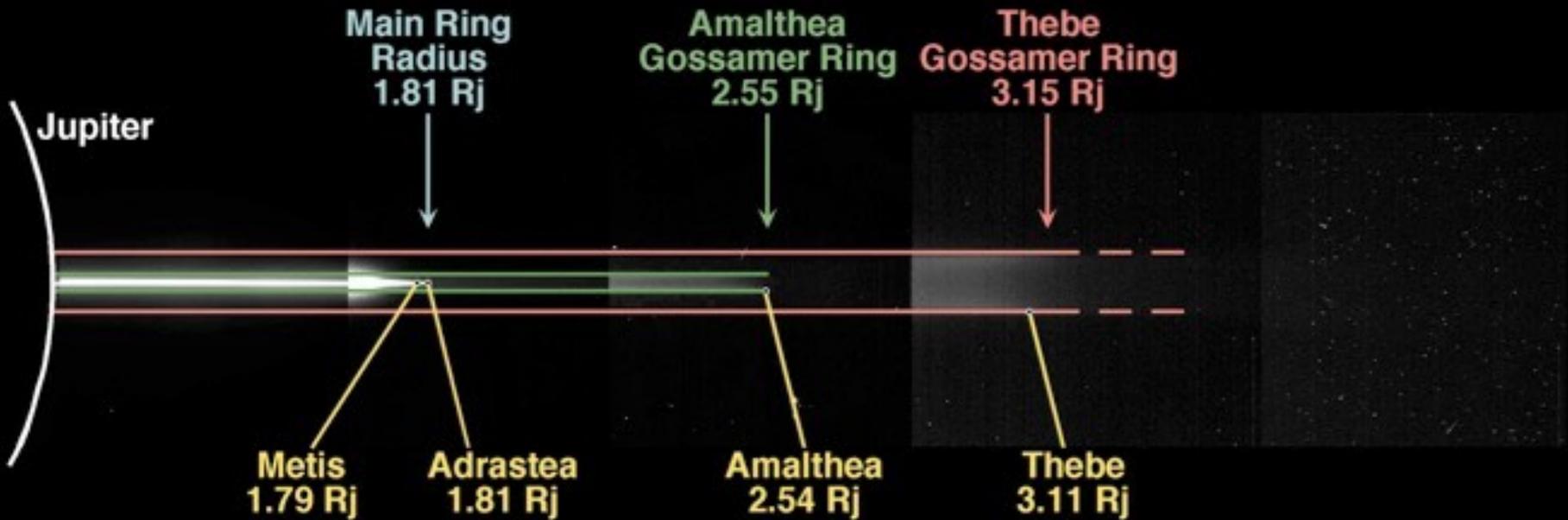
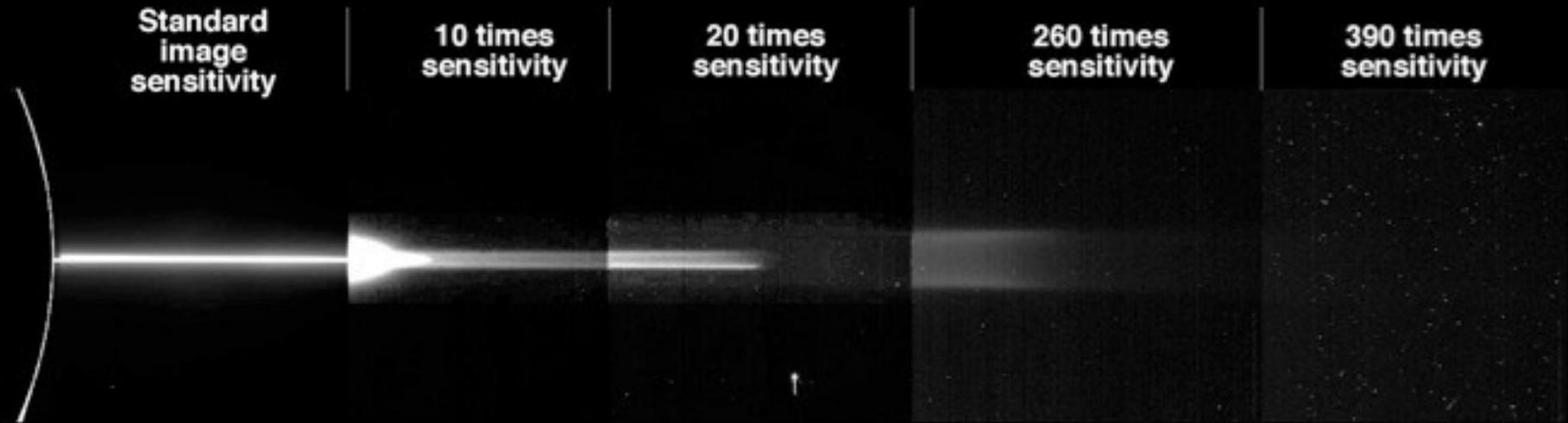
Main Ring

Halo

Galileo
Image



Jupiter's Rings from Galileo



● = Earth for scale

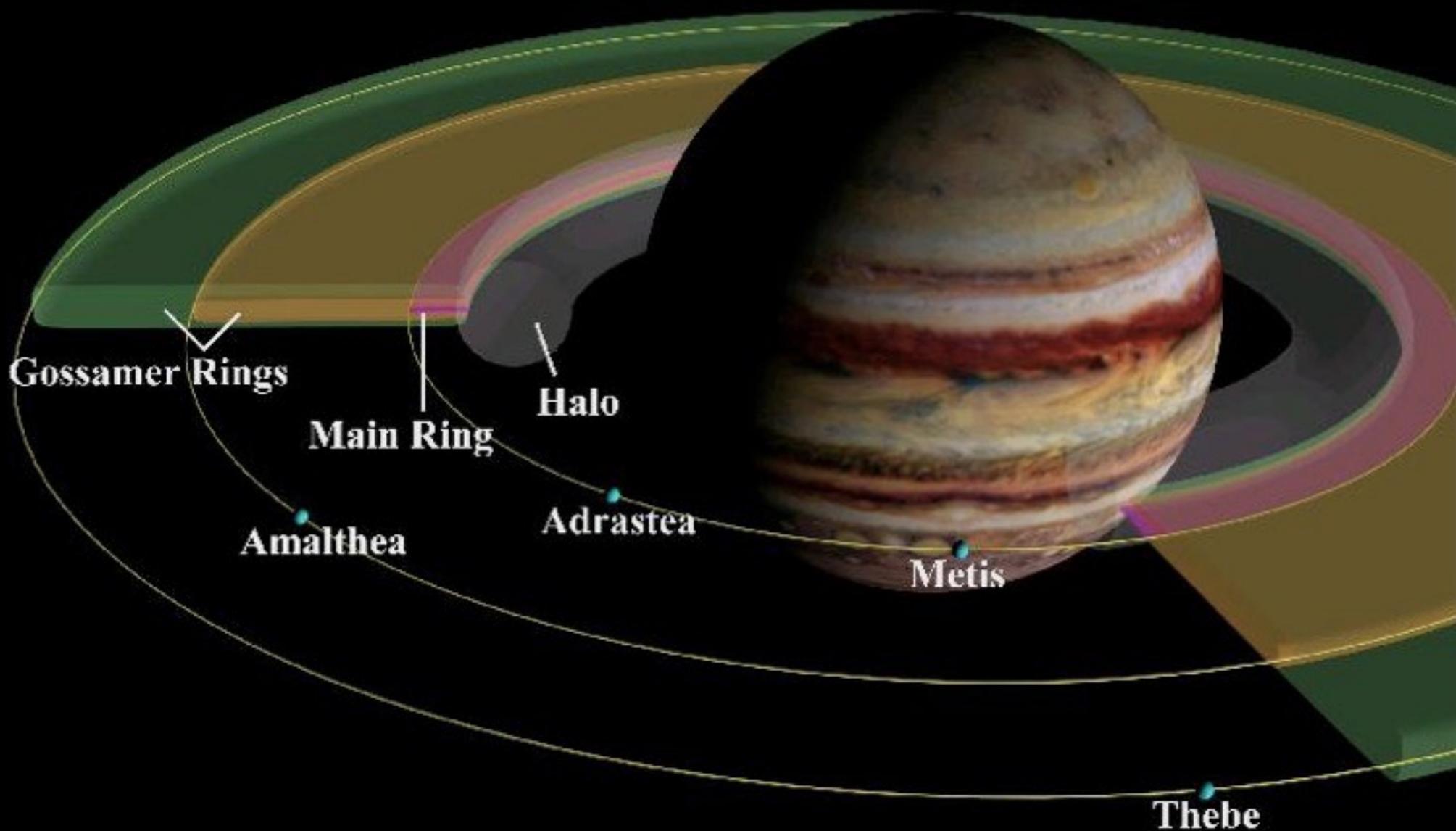
Galileo Image

Jupiter and Rings



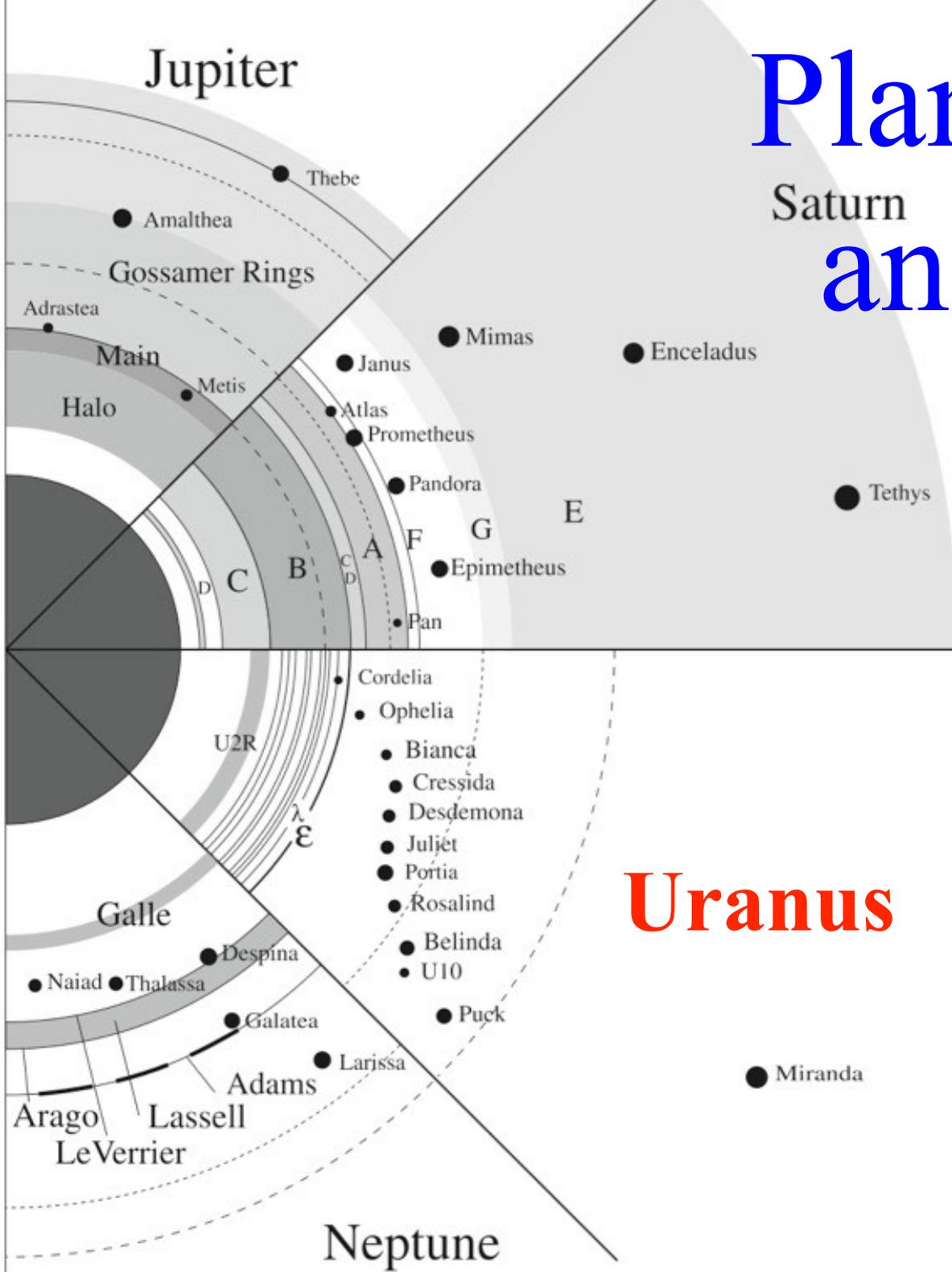
JWST Image

Components of Jupiter's Rings



Moons are Sources of Ring Material

Planetary Rings and Satellites



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Uranus

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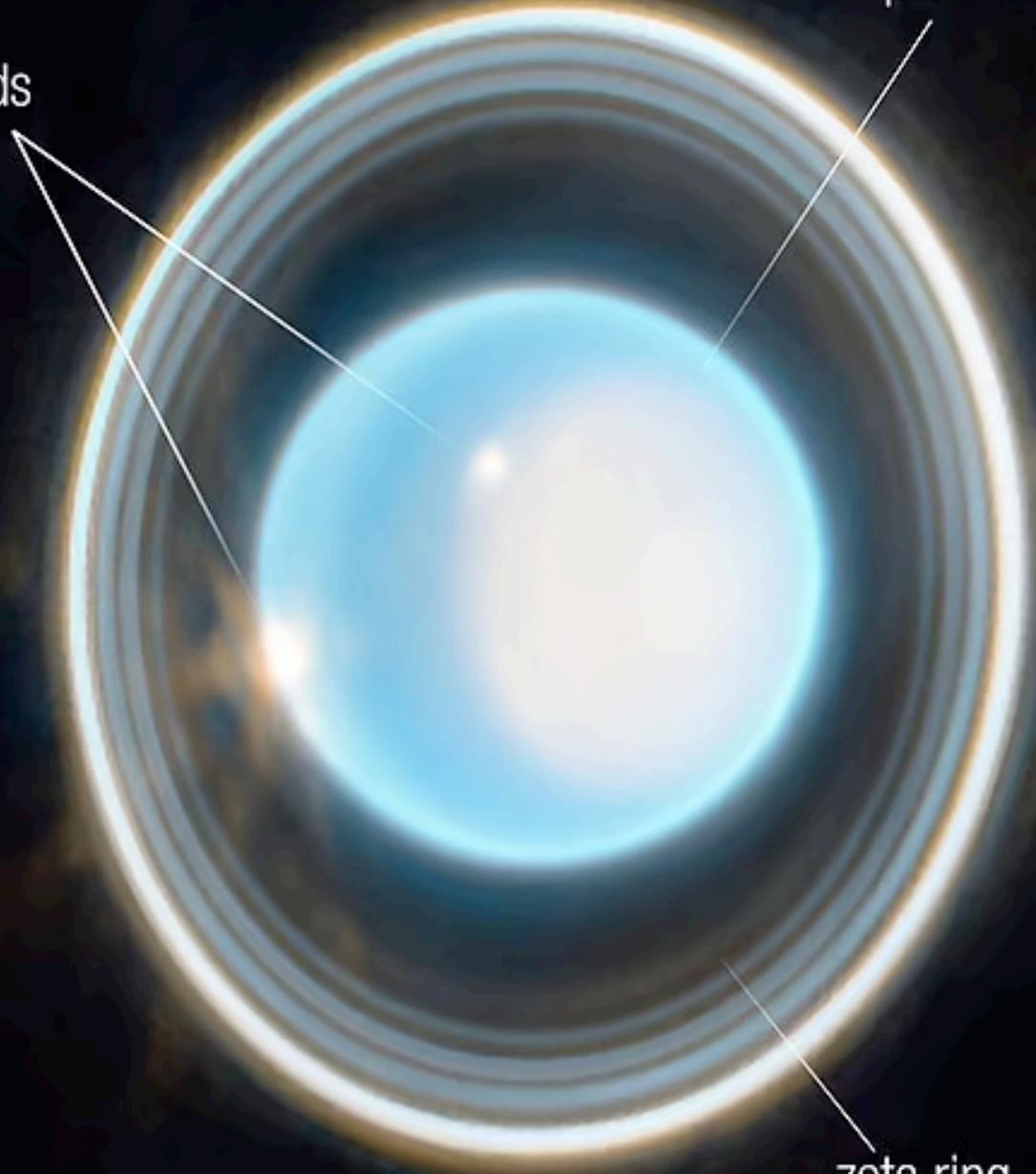
Uranian Rings



Hubble Space
Telescope Image

clouds

polar cap



zeta ring

**JWST
Image**

Uranian Rings

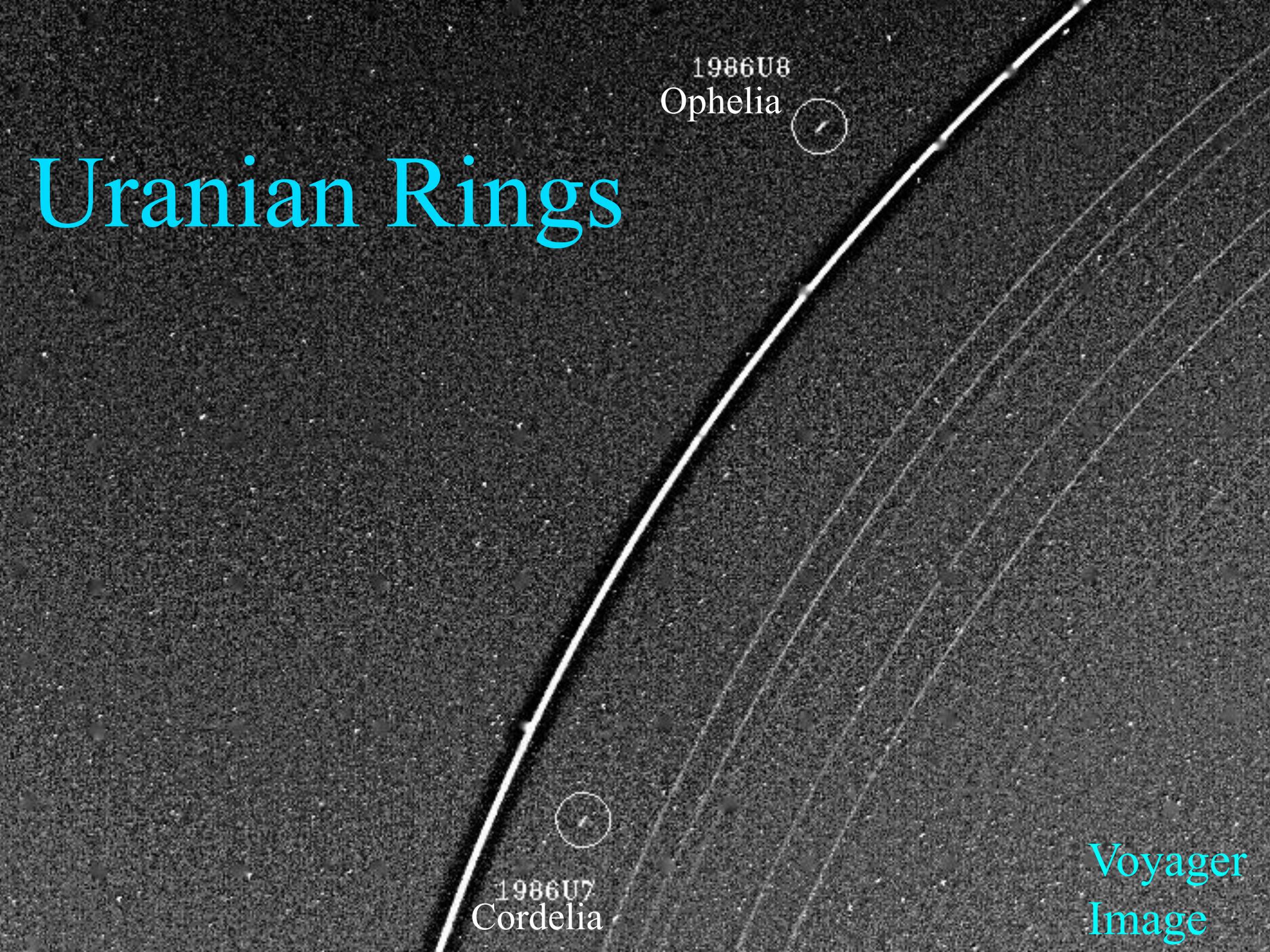
1986U8
Ophelia



1986U7
Cordelia



Voyager
Image



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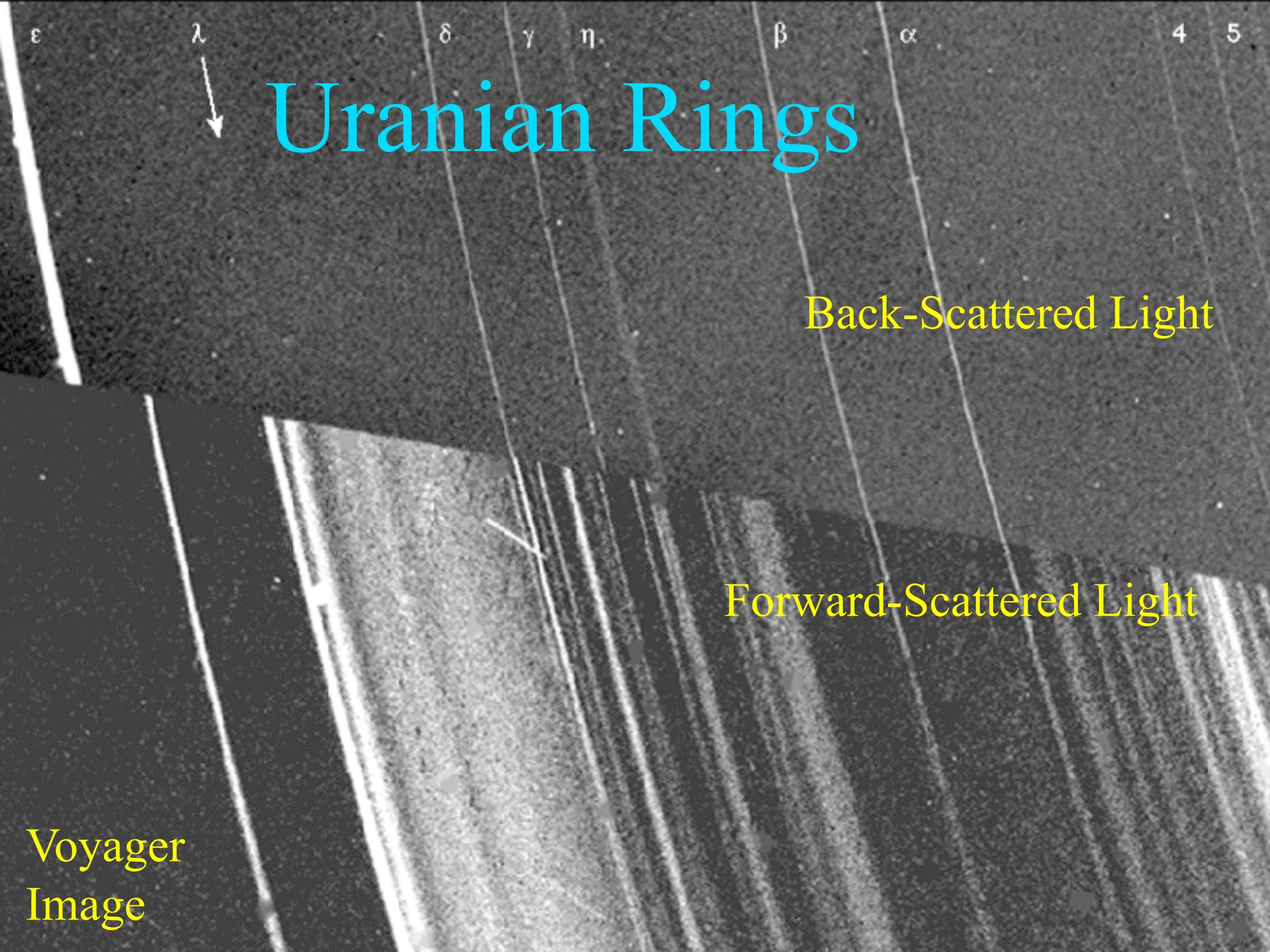
Uranian Rings



Back-Scattered Light

Forward-Scattered Light

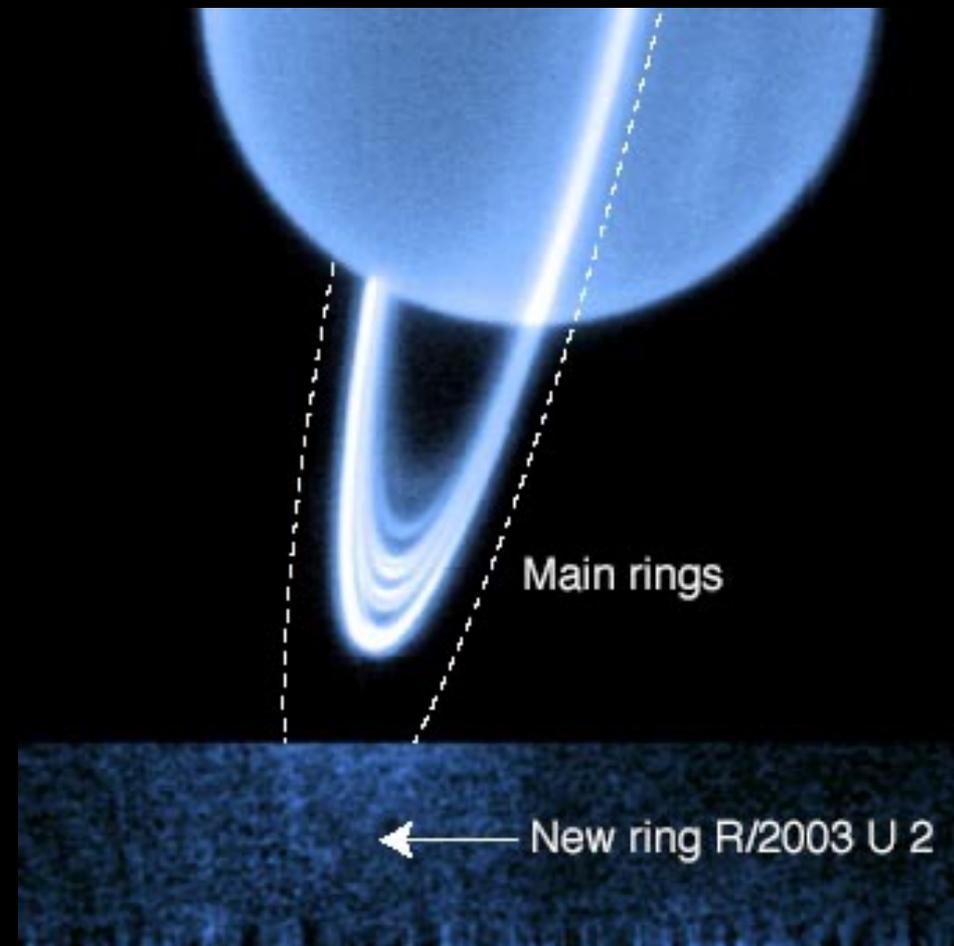
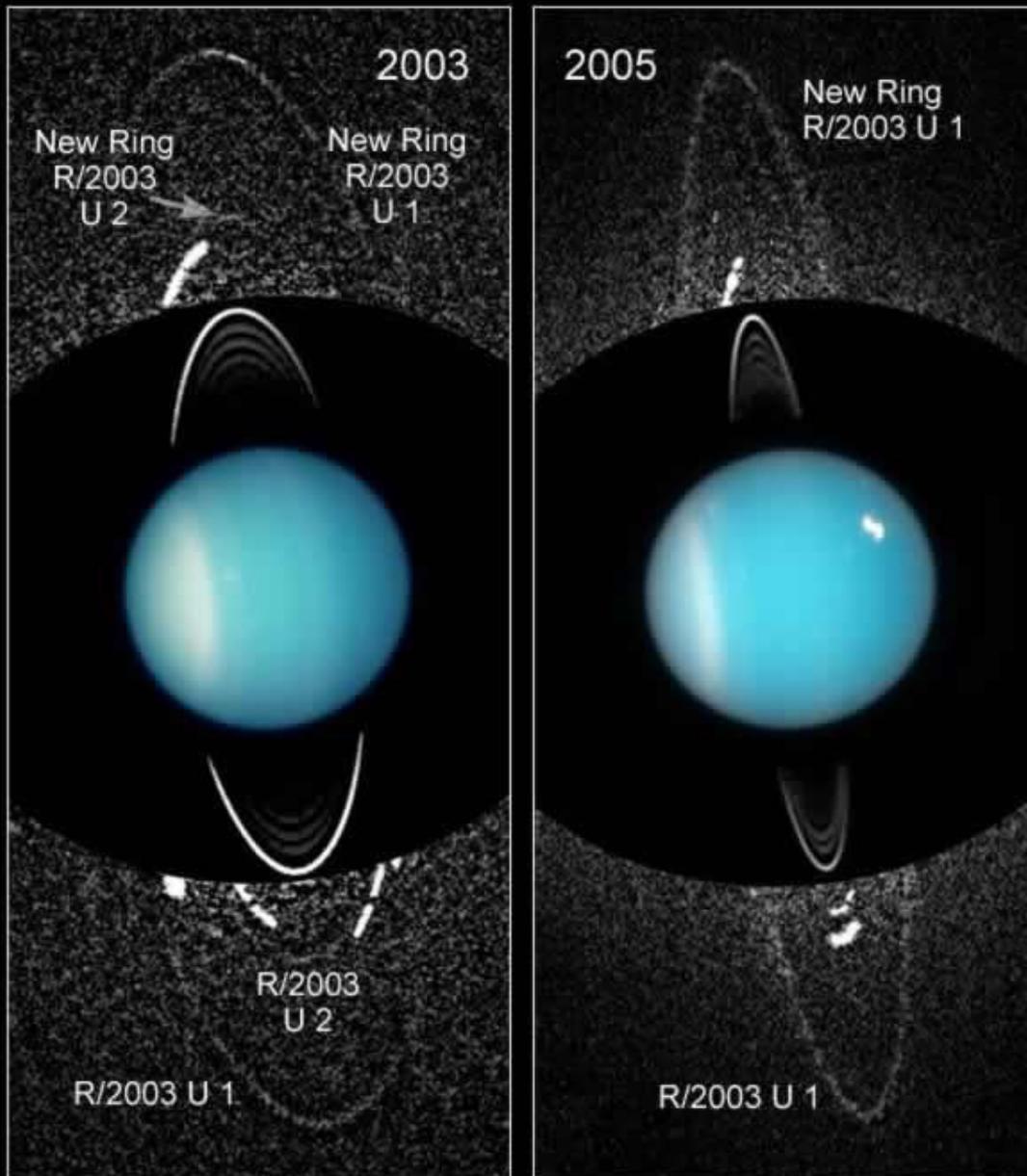
Voyager
Image



Hubble Space
Telescope

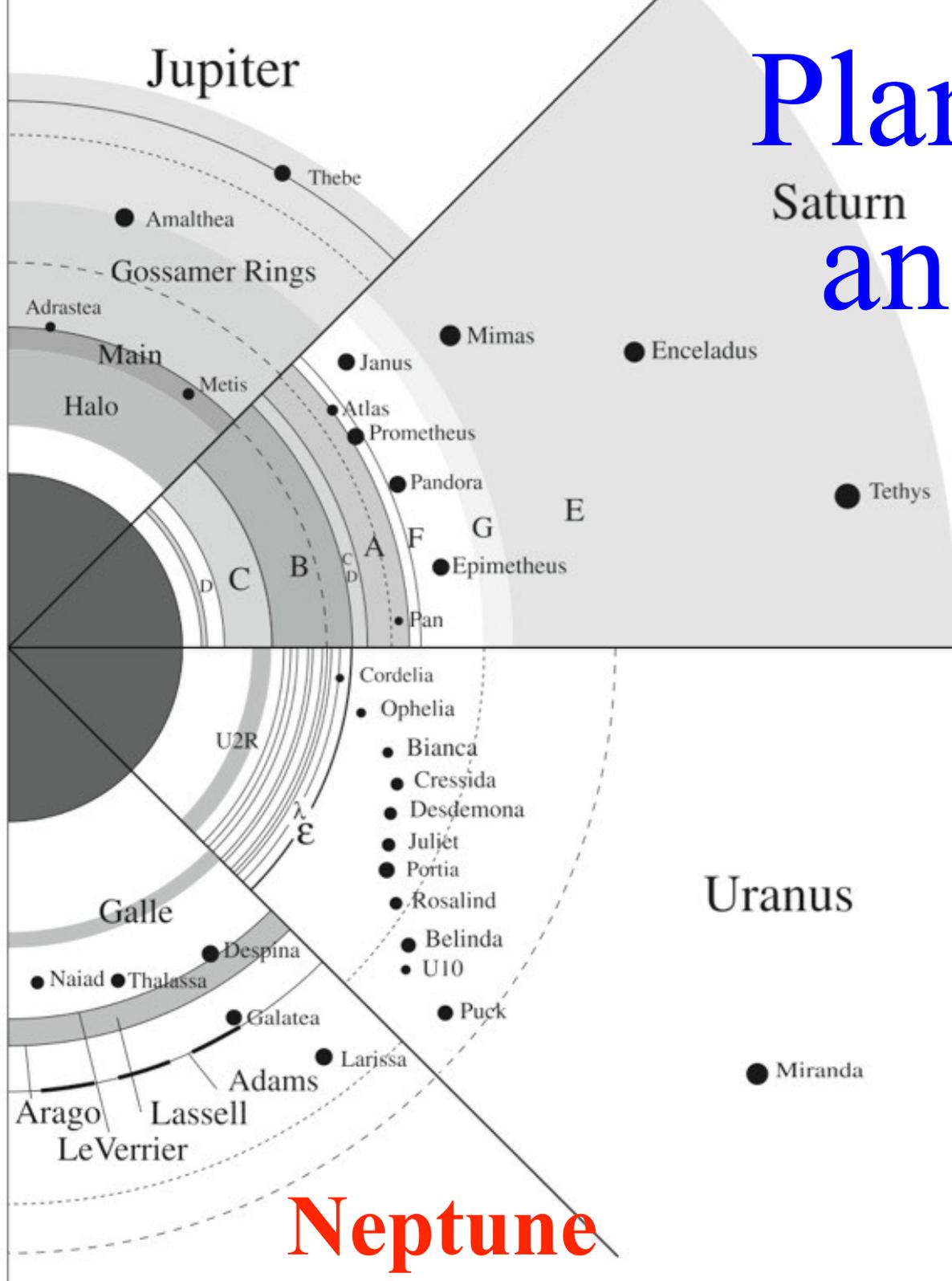
Uranian Rings

Uranus ■ HST ACS/HRC



Keck Telescope

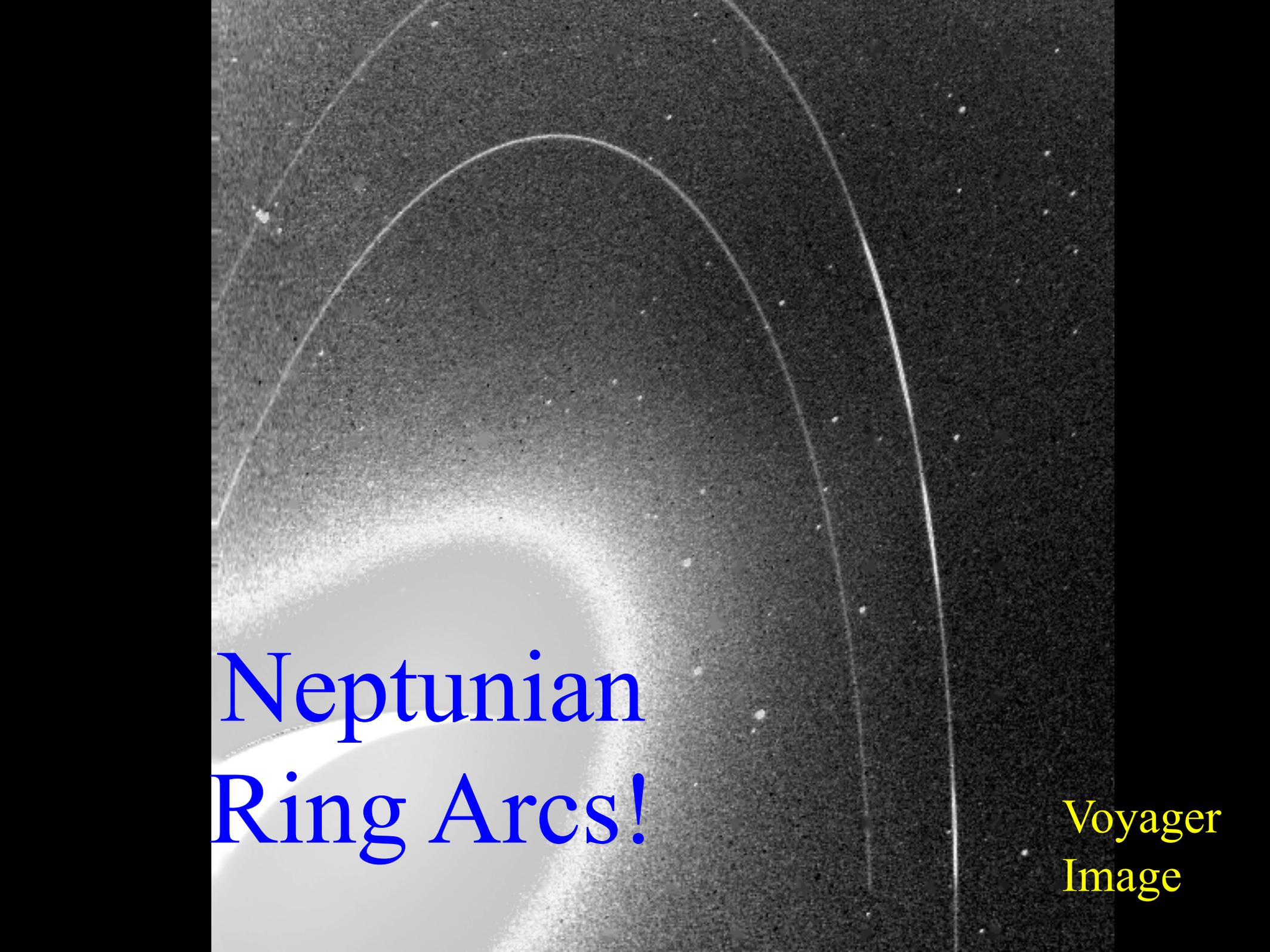
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A black and white photograph of Neptune's ring system. The planet's bright, hazy disk is visible at the bottom left. Two distinct, dark, curved arcs of the rings are seen against the dark background of space. The arcs are roughly parallel to each other and curve away from the planet. The background is filled with numerous small, bright stars.

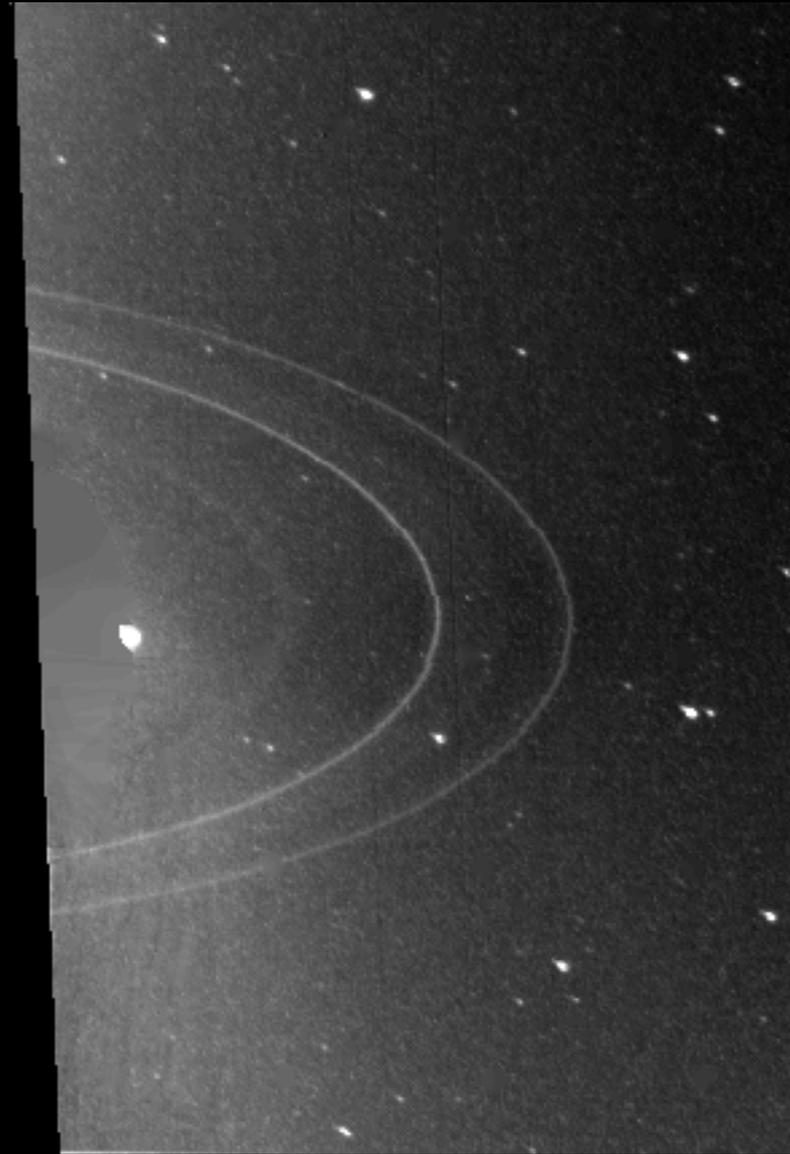
Neptunian Ring Arcs!

Voyager
Image

Neptunian Rings



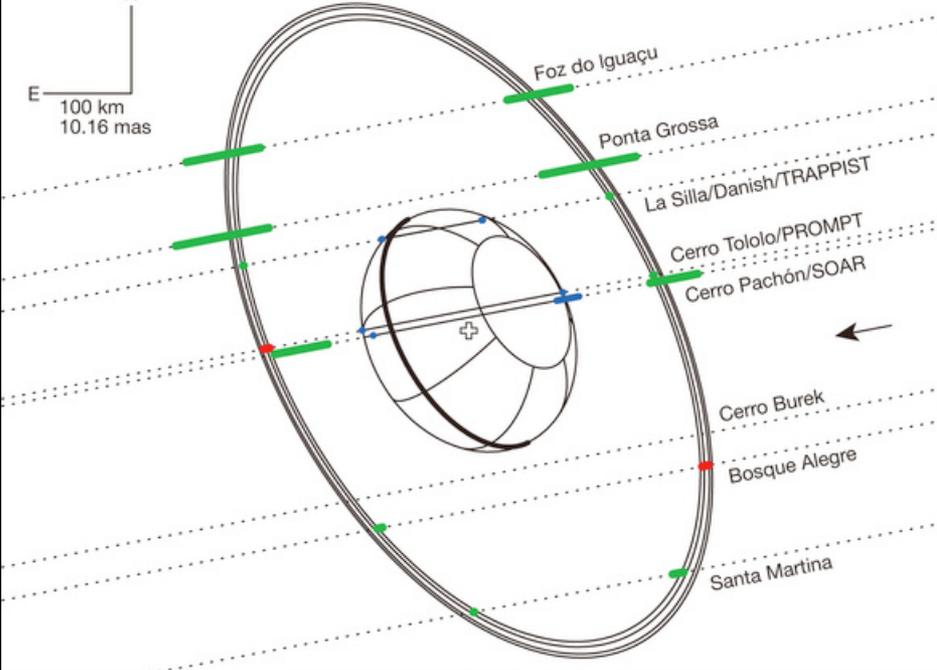
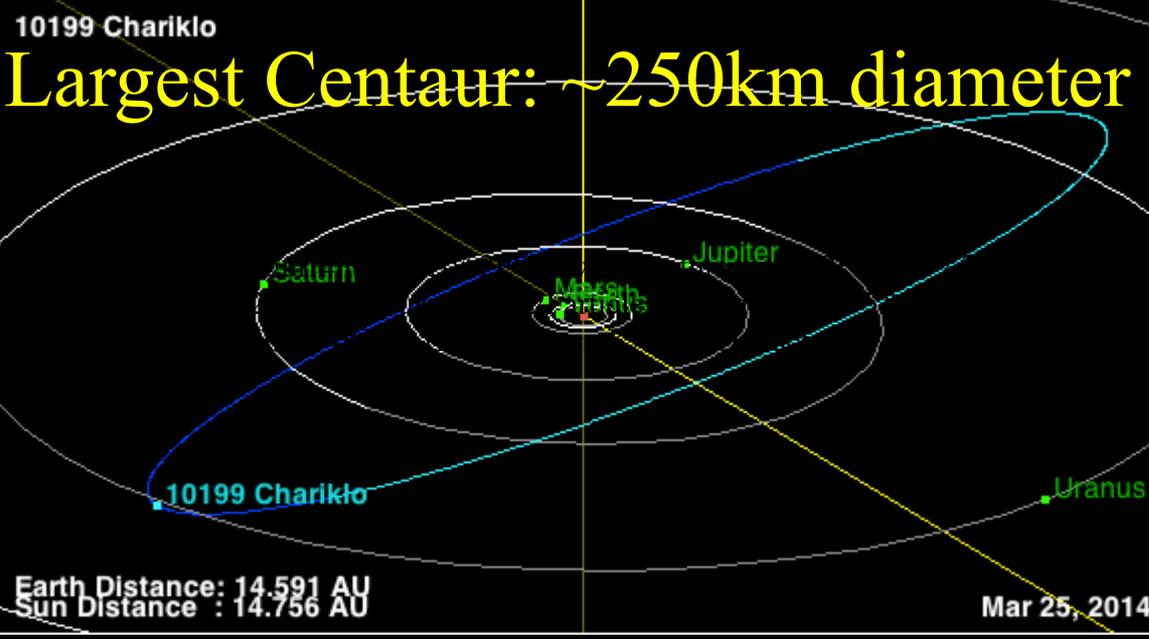
Four narrow
rings visible



Voyager
Image



JWST
Image



Ring Around the Centaur

Two narrow rings visible



Discovery:
March 26, 2014