

Saturn: The ringed planet

Galilean
Nights



United Nations
Educational, Scientific and
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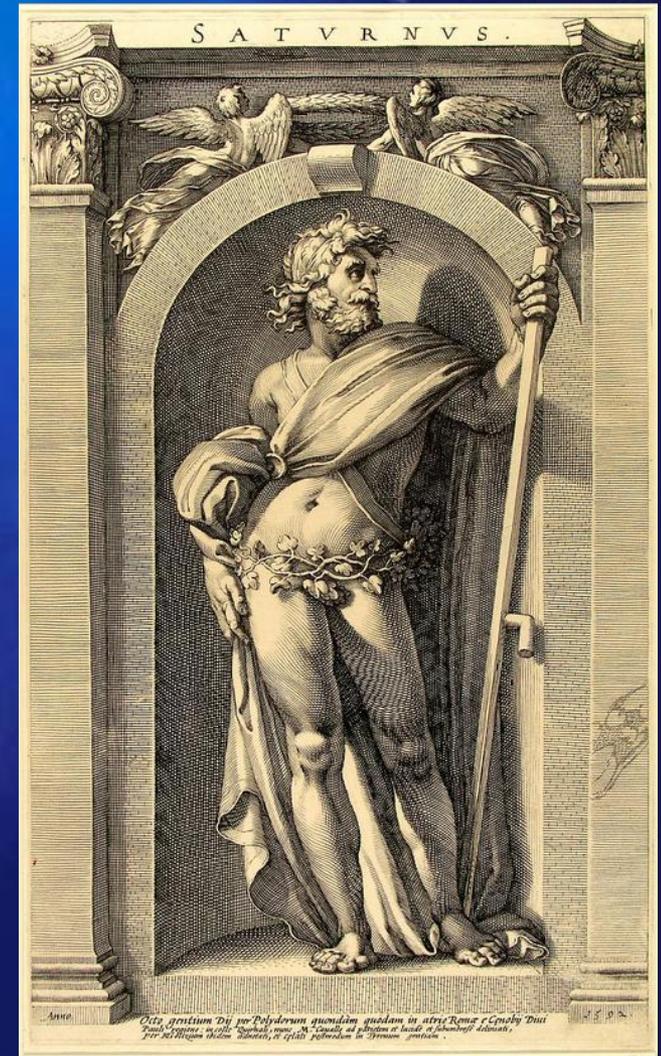


Ancient Times

Saturn was the Roman counterpart of the greek titan Kronos, father of gods like Jupiter (Zeus). He was also the god of agriculture.

The ancient symbol of Saturn resembles a sickle. It is also the alchemical symbol for the element lead.

Saturday was named after Saturn (dies Saturni, or day of Saturn).



Ancient Times

A dark blue and black night sky filled with numerous stars of varying brightness. Several constellations are outlined with thin white lines. In the center of the image, a single star is circled with a blue ring. Below the text, a red letter 'S' is visible.

Saturn has been known since ancient times because it is one of five planets visible with the naked eye.

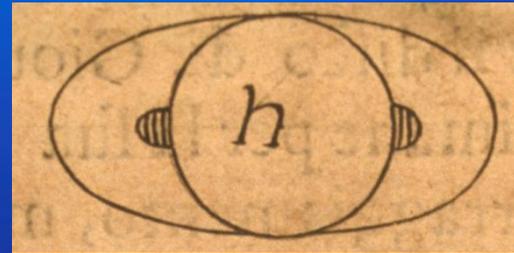
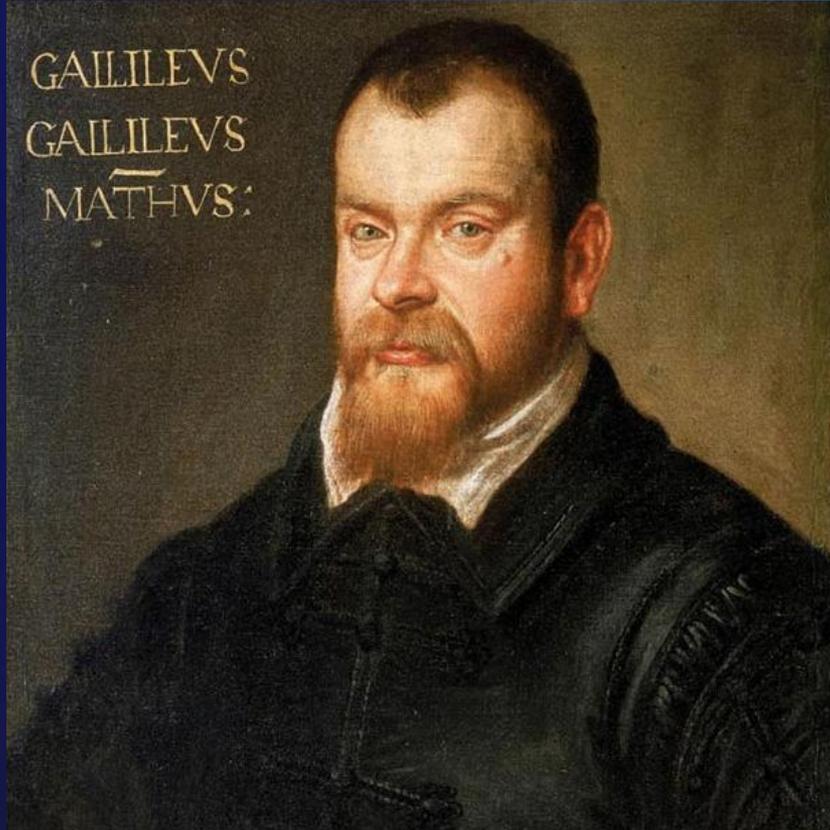
S

Galileo Galilei

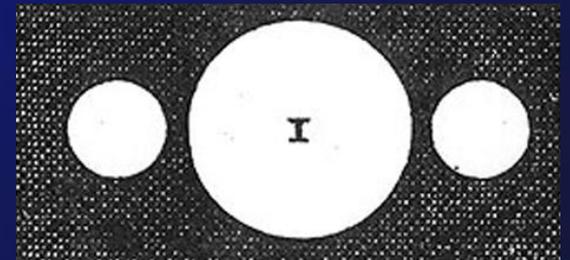
Istituto e Museo di Storia della Scienza, Florence



Galileo first observed the rings of Saturn through his telescope in 1610.



He first described them as “handles”. Later, because of the aberrations in his telescope, he thought they were blurred twin moons.



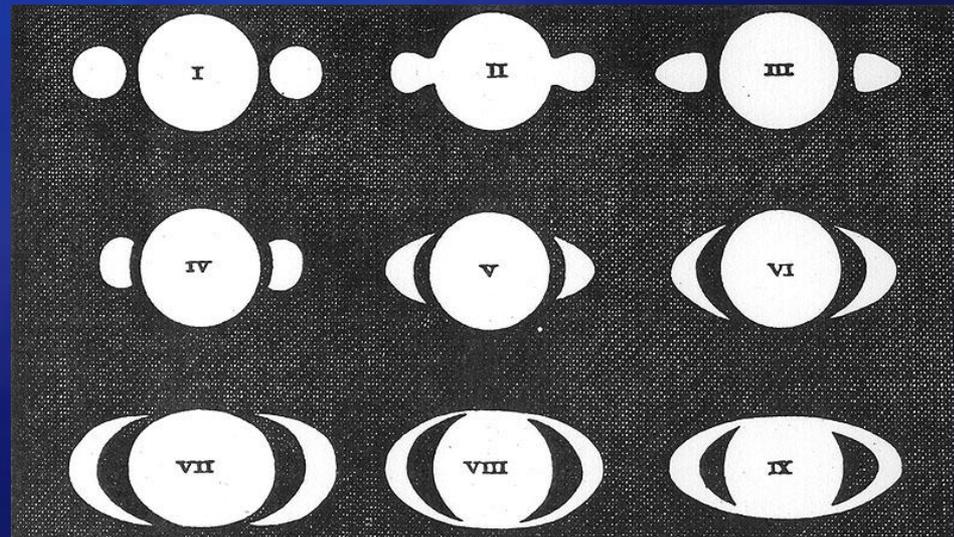
Christiaan Huygens



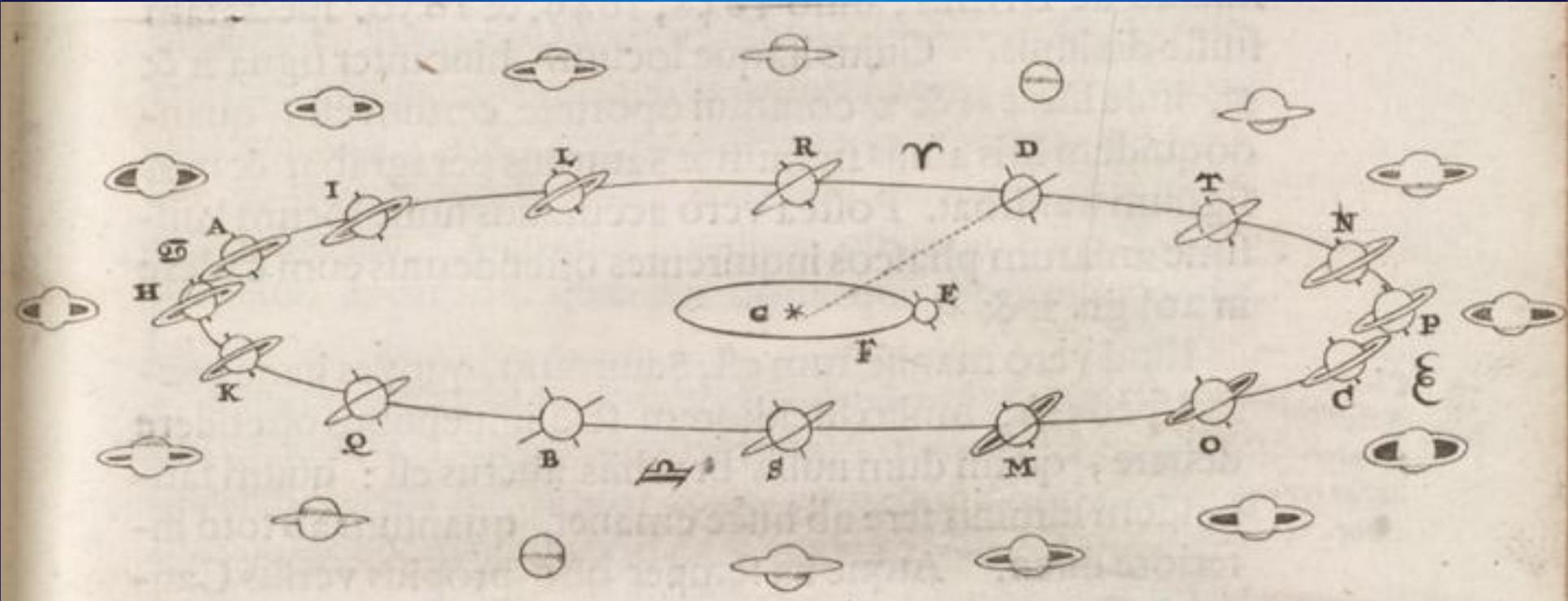
Making his own telescope of far better quality than Galileo's, the Dutch scientist Christiaan Huygens discovered in 1655 the first, and largest, moon of Saturn: Titan.

Now a popular scientific tool, telescopes can be used to observe the rings of Saturn.

The image below shows drawings of Saturn's rings, made by several authors, from Galileo, Scheiner, Hevelius and Huygens, among others.



Christiaan Huygens



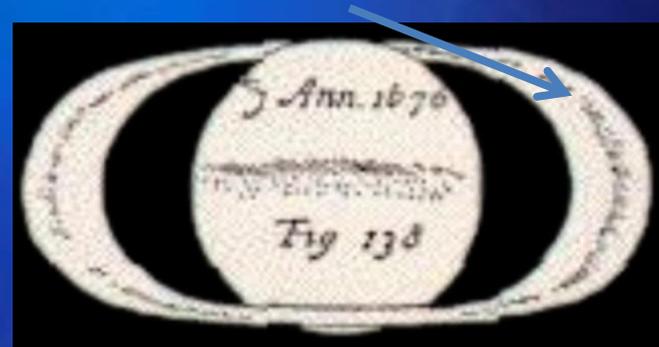
In 1659, Huygens became the first to correctly interpret what Galileo's mysterious "handles" were – a ring system.

He also provided the first theory for the different shapes of the rings, as seen from Earth.

Giovanni Cassini



Giovanni Cassini was contemporary to Huygens. In 1665 he discovered a gap in the rings of Saturn. It is still called the Cassini Division.



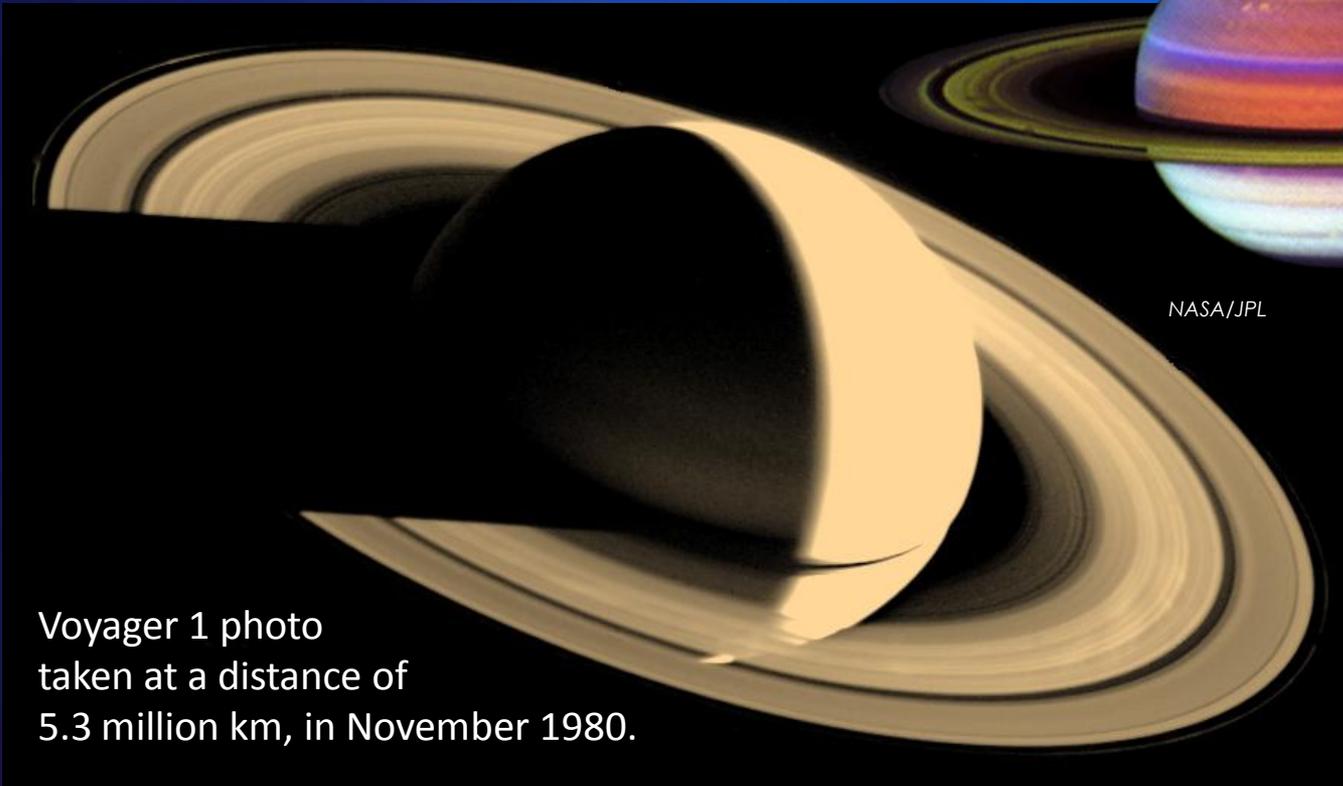
He discovered four moons of Saturn: Iapetus, Rhea, Dione, and Thetys.



Voyager 1 & 2

Voyagers 1 and 2 are spacecraft which have studied Saturn and returned incredible images.

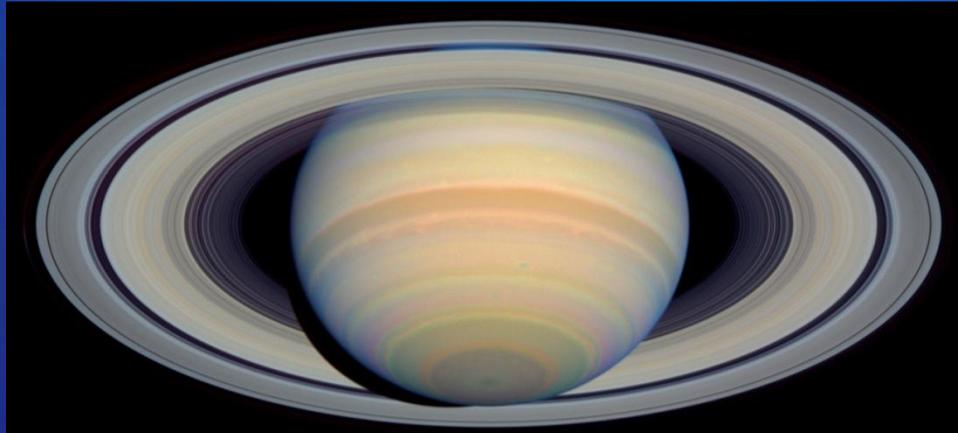
False colour image from Voyager 2 (ultraviolet, violet and green), taken at a distance of 43 million km, in July 1981.



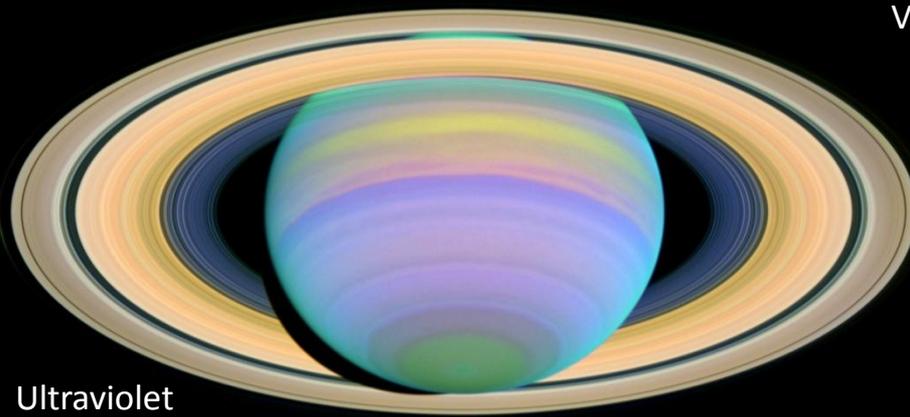
Voyager 1 photo taken at a distance of 5.3 million km, in November 1980.

Multiwavelength Saturn

In September 2003, the Hubble Space Telescope took images of Saturn in ultraviolet, visible, and infrared light:



Visible



Ultraviolet

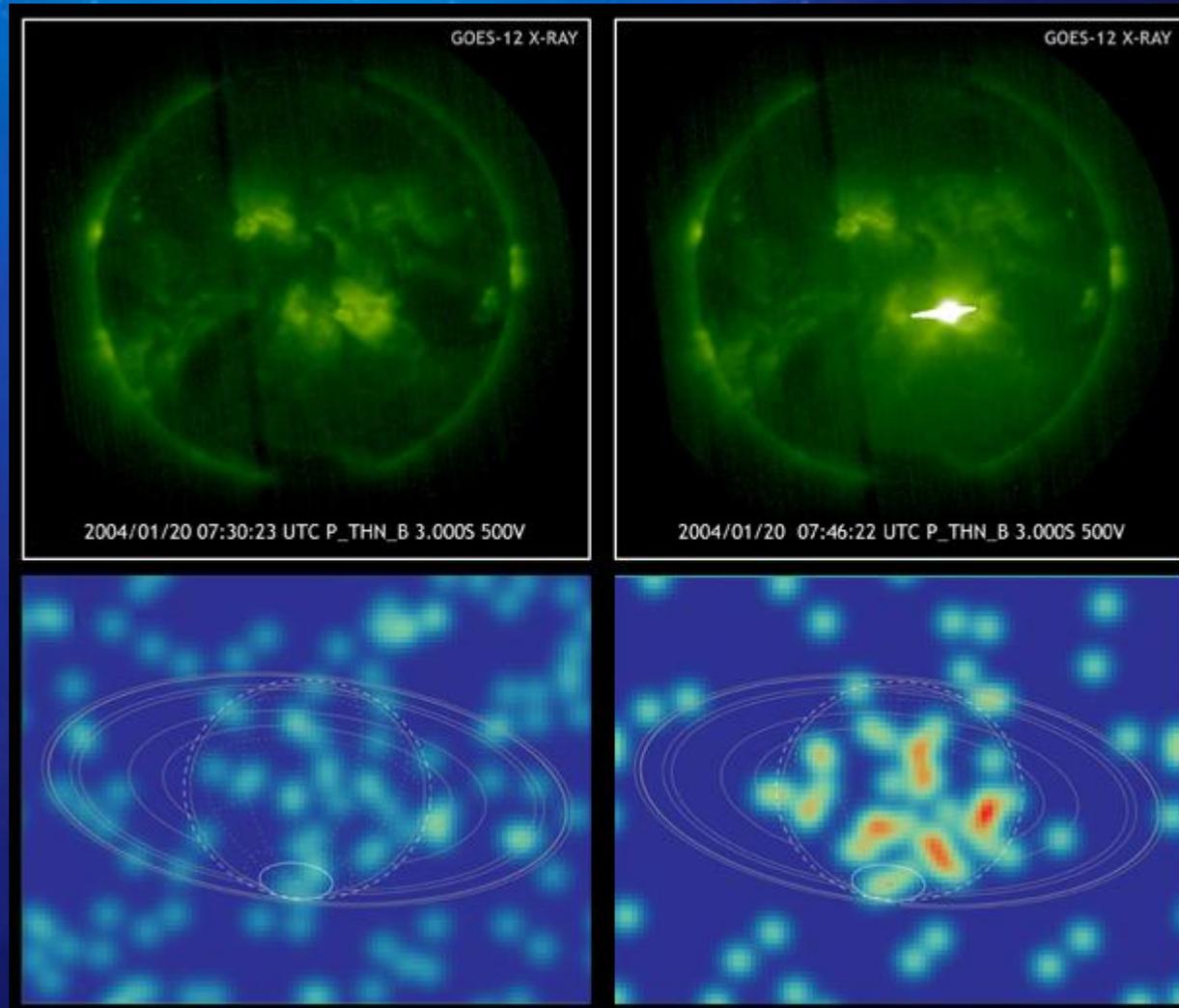


Infrared

Multiwavelength Saturn

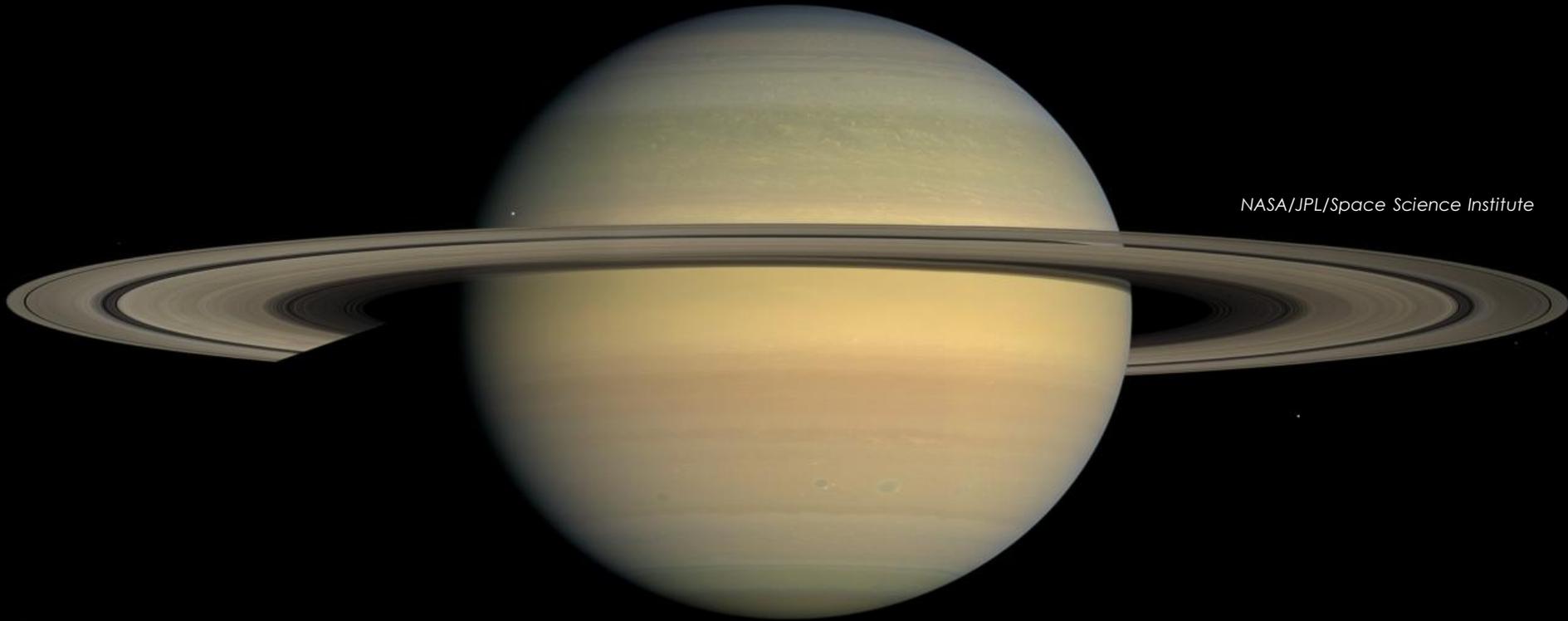
In January 2004, after a solar flare, the Chandra X-ray Observatory looked at Saturn.

After 2 hours and 14 minutes, it detected the X-ray reflection of the flare in Saturn's upper atmosphere.



Cassini/Huygens

On the 1 July 2004, the NASA/ESA mission Cassini/Huygens reached Saturn's orbit, becoming the first "visitor" to Saturn since Voyager 2.

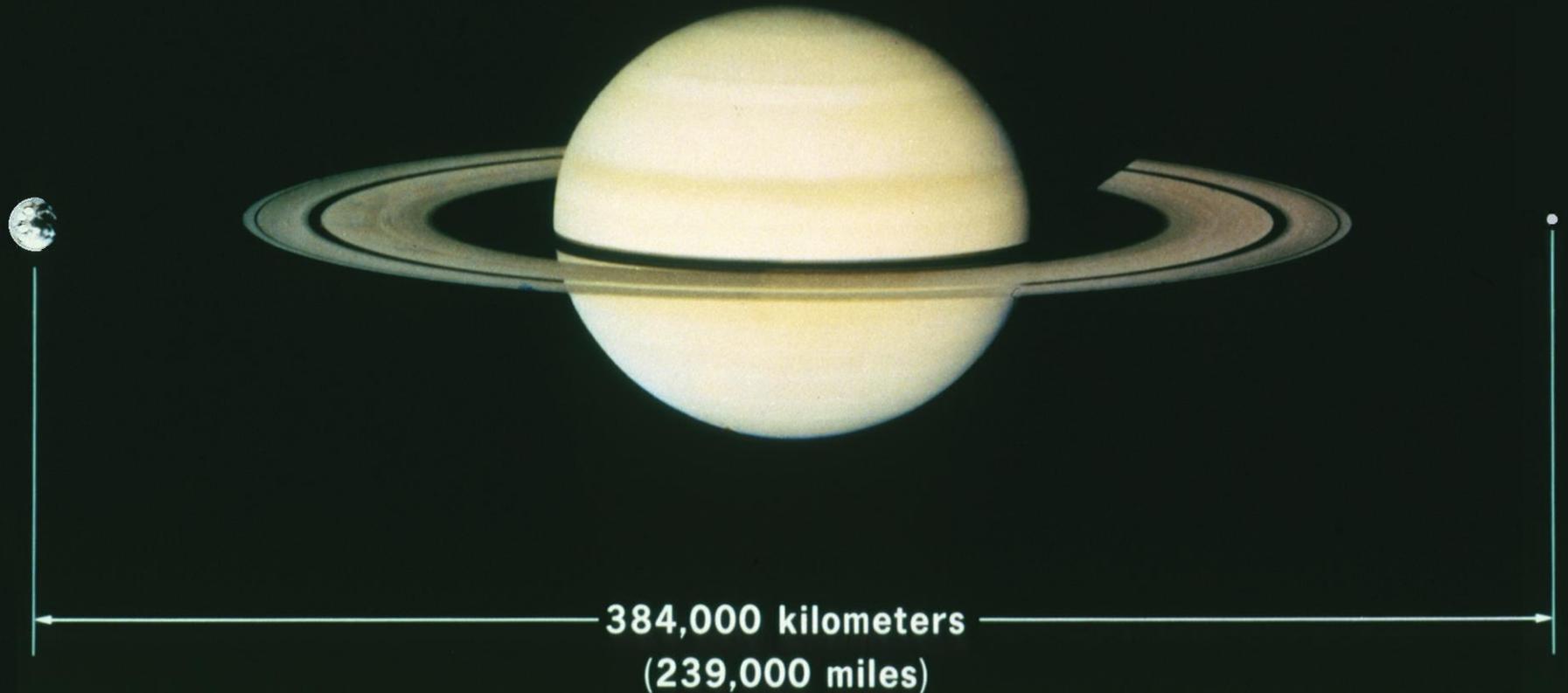


NASA/JPL/Space Science Institute

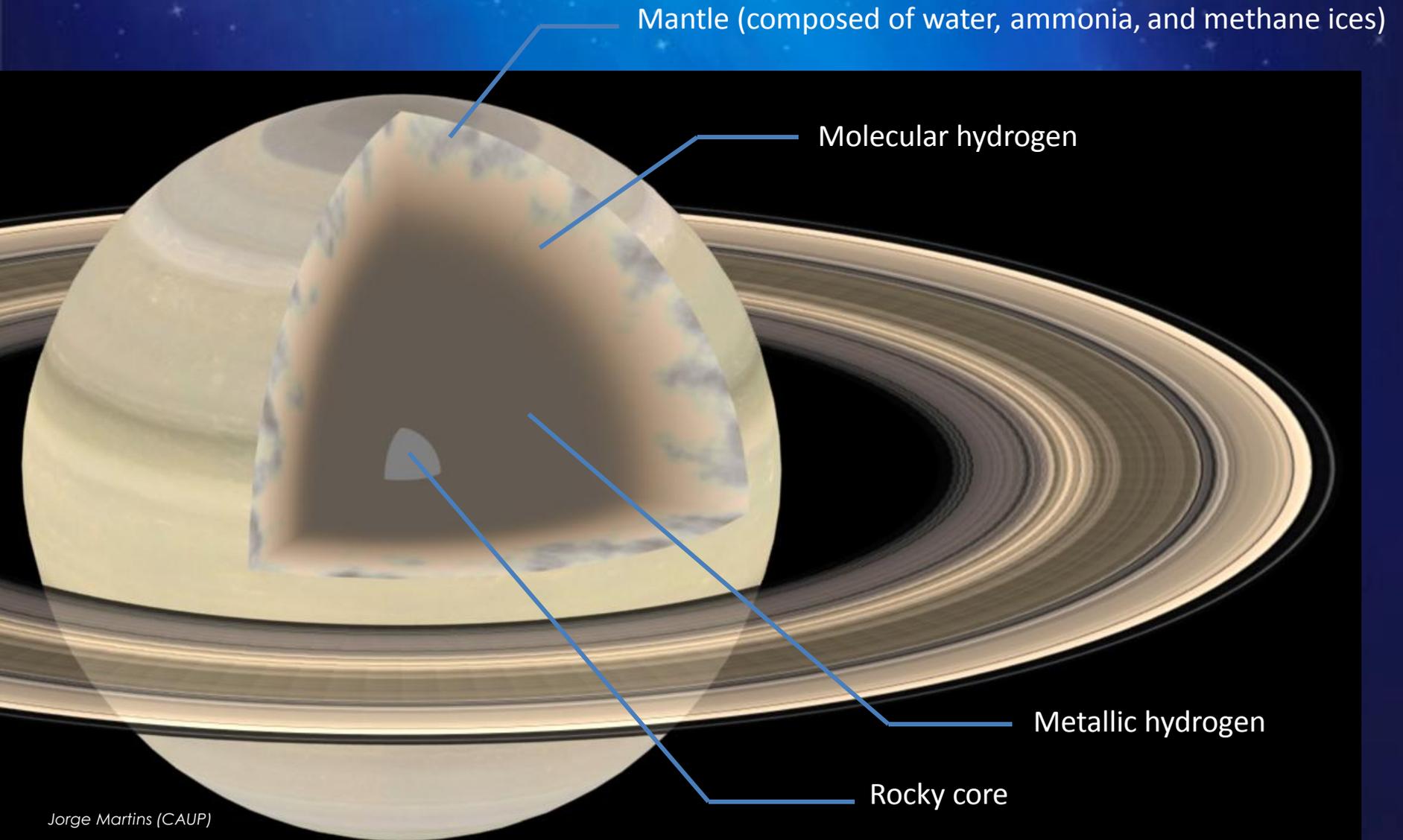
 Huygens was the European Space Agency (ESA) lander , which became the first man-made object to ever land on another moon of the Solar System – Titan.

The size of Saturn

The planet Saturn is so large that it would fit neatly between the Earth and Moon:

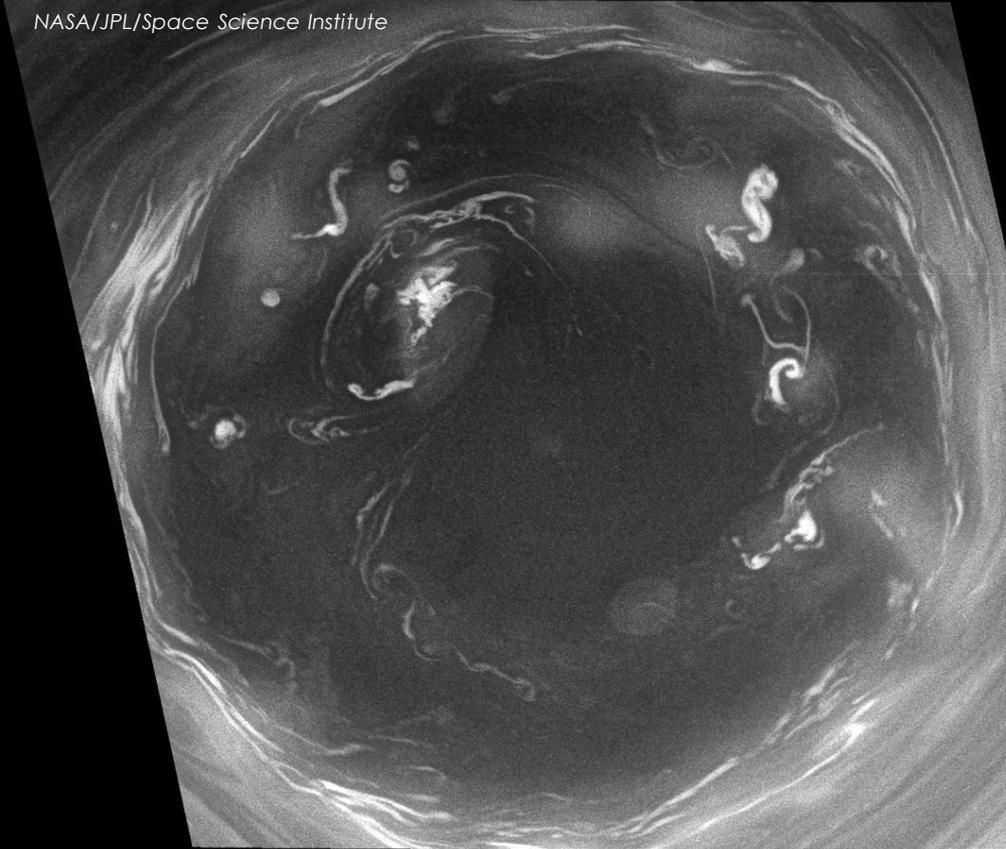


Saturn's inner layers



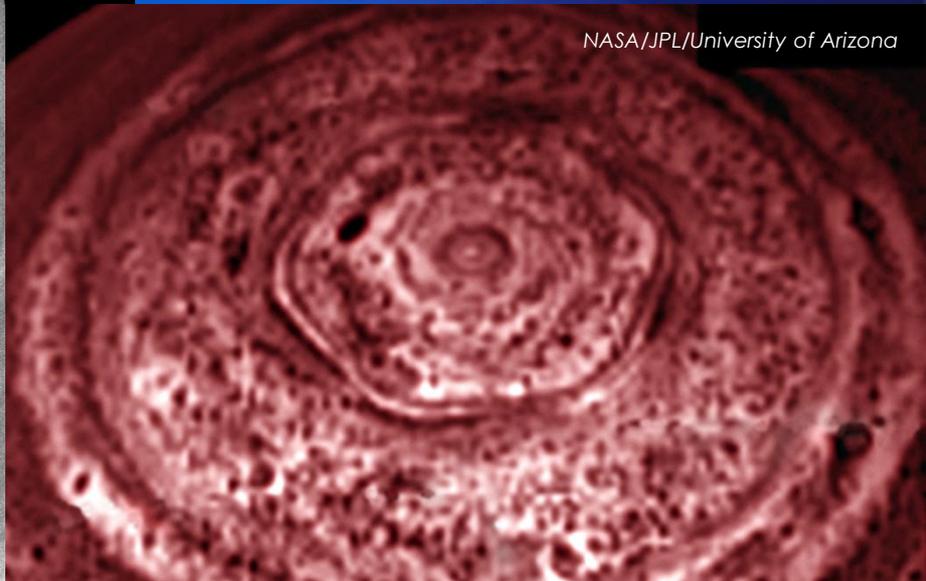
Storms in Saturn

NASA/JPL/Space Science Institute



In the South Pole of Saturn there are several vortexes, which form rings within rings. These are “locked” in the Pole.

NASA/JPL/University of Arizona

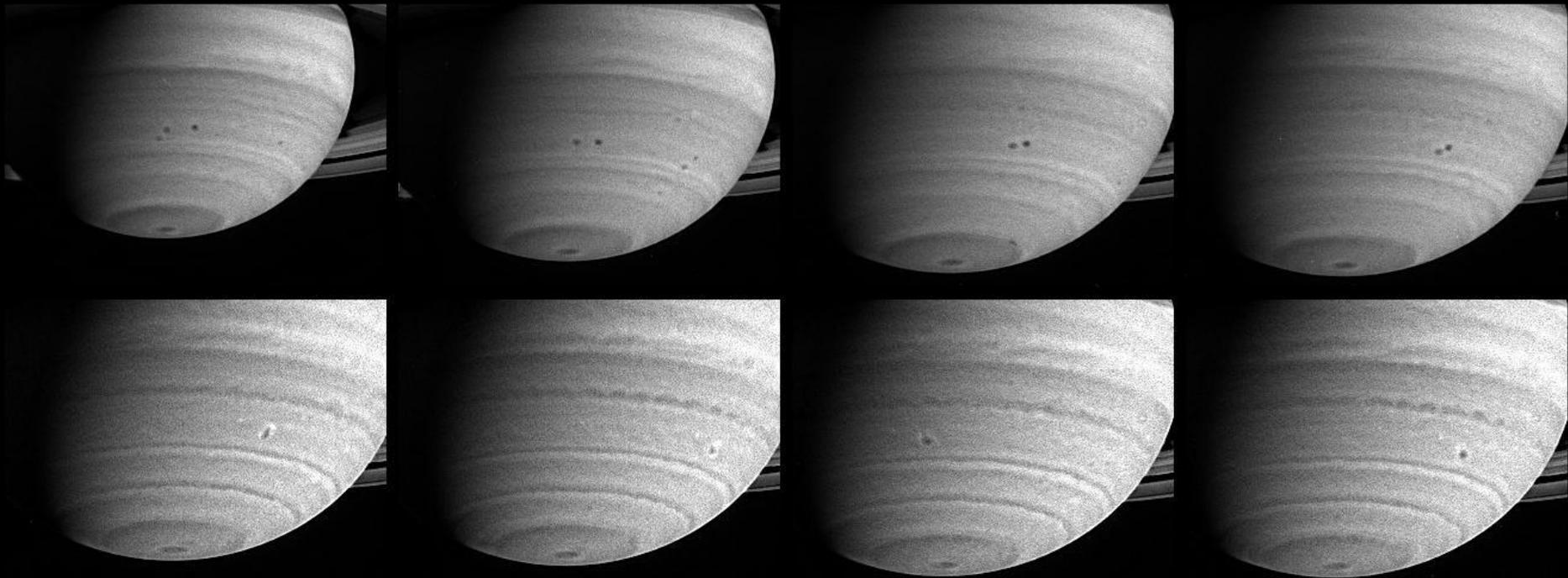


One of the most curious storms is in the North Pole, a hexagon shaped storm, revealed in this infrared image from Cassini. It is a clearing in the clouds, which extends deep below the visible clouds (about 75 km in depth).

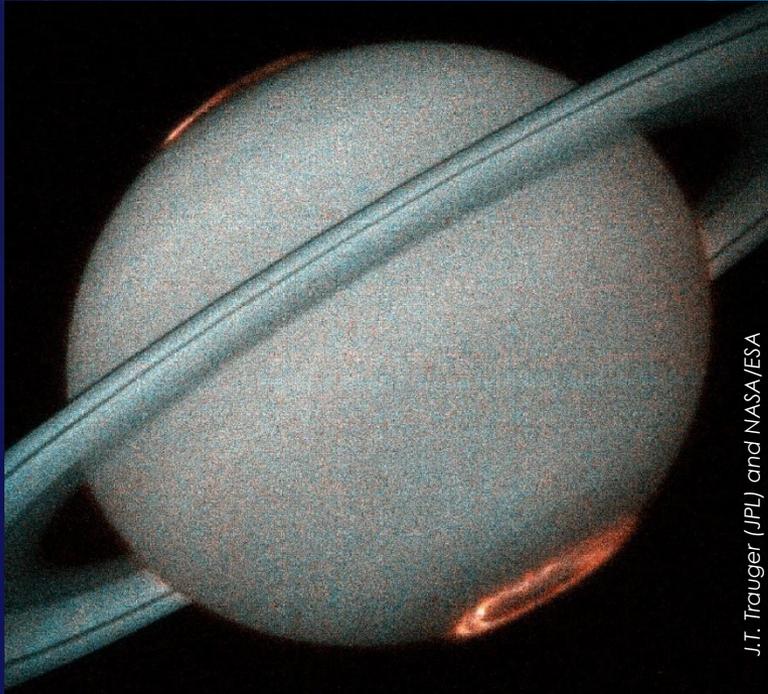
Storms in Saturn

Between February and March 2004, before its arrival at Saturn, Cassini observed the merger of two storms.

The top four frames span 26 days, while the bottom four span only four days.



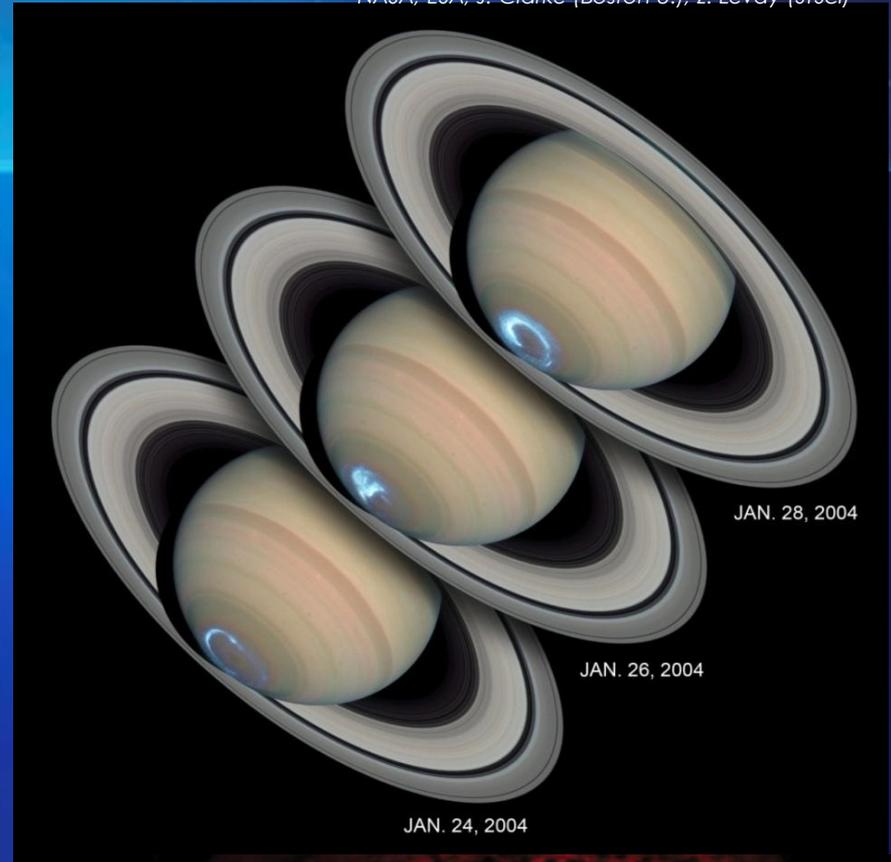
Aurorae



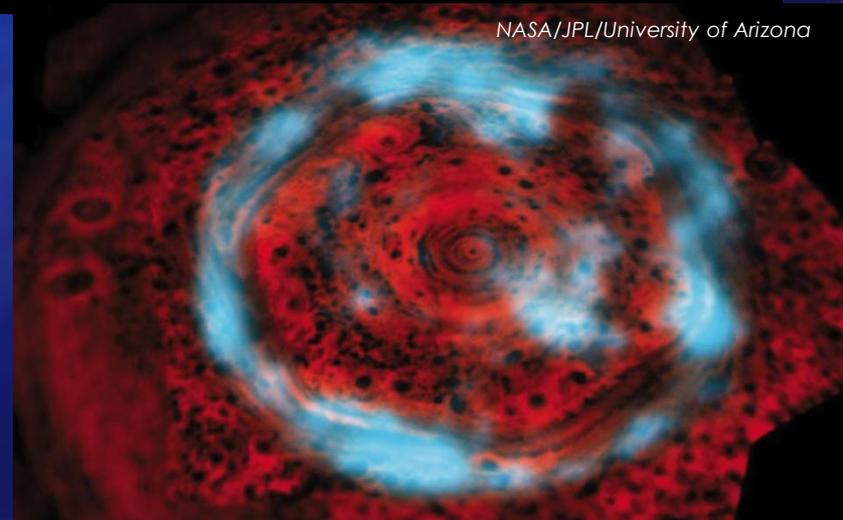
Saturn has a magnetosphere similar to the Earth, which also reacts with solar activity.

One of the most beautiful of these interactions are the aurorae, visible in ultraviolet in these images.

NASA, ESA, J. Clarke (Boston U.), Z. Levay (STScI)

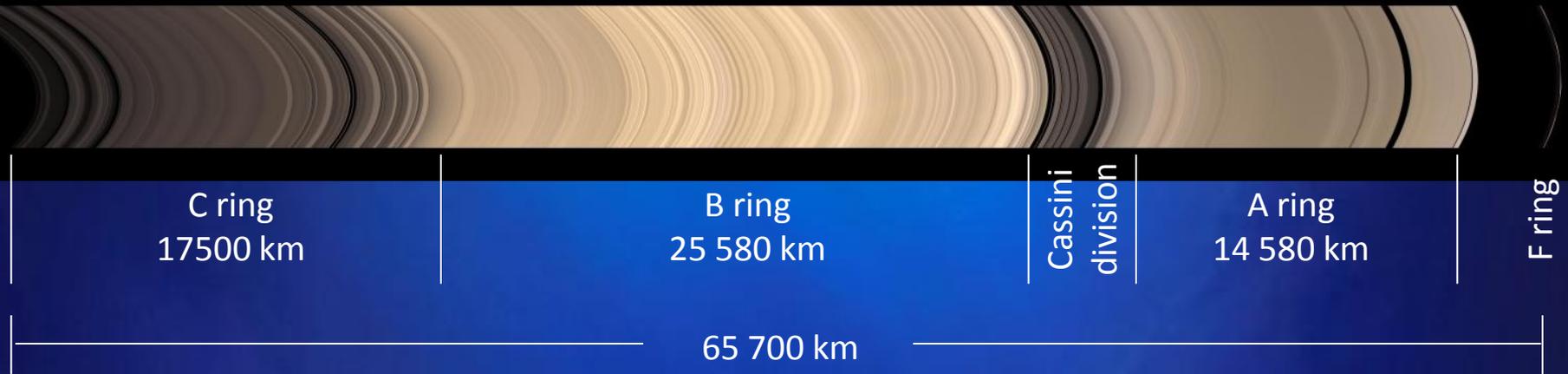


NASA/JPL/University of Arizona



Ring features

NASA/JPL/Space Science Institute



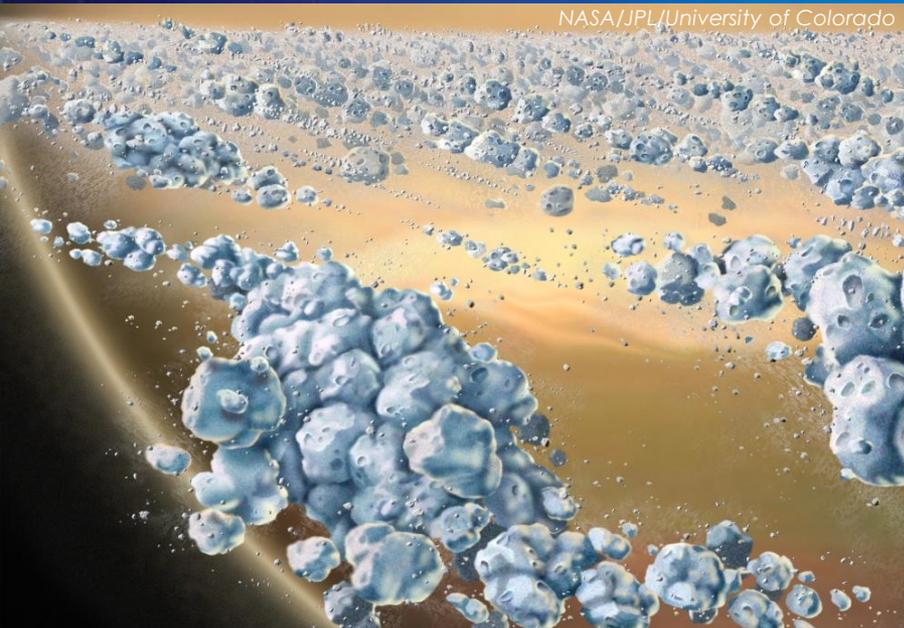
The rings of Saturn are the most prominent and distinctive feature of this planet.

The image above is a mosaic of 45 different images, taken by the Cassini spacecraft on November 2008, and shows their main sections.



NASA/JPL/Space Science Institute

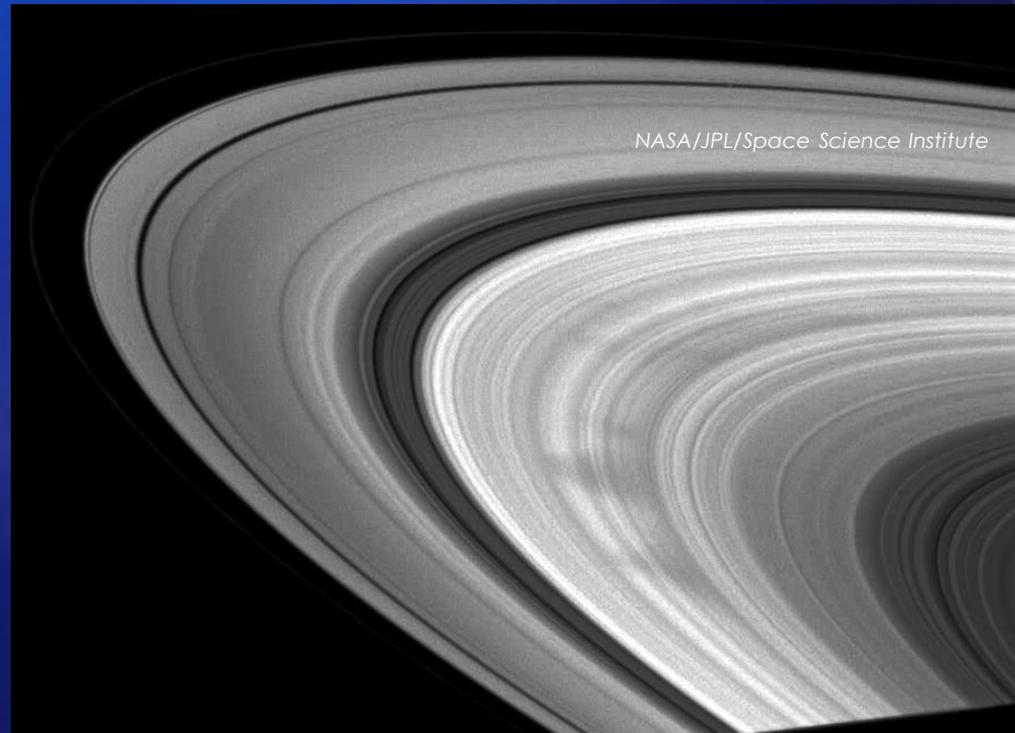
Ring features



Spokes are dark patches seen in the rings, and are thought to be dust particles which scatter sunlight. Depending on the observing angle, they can appear darker (low angles, image below), or brighter (high angles) than the rings.

The rings are formed by elongated clumps of ice, continuously forming, only dispersing when they bump into each other.

The ice in the clumps rarely crashes, rather moving from one clump to the other.



Titan - atmosphere

Titan is the second largest moon in the Solar System, but the only one with a dense atmosphere (mainly methane and nitrogen).

In the upper atmosphere, highly irradiated by ultraviolet radiation from the Sun, methane is transformed into compounds like ethane and acetylene, creating a blue haze.



NASA/JPL/Space Science Institute



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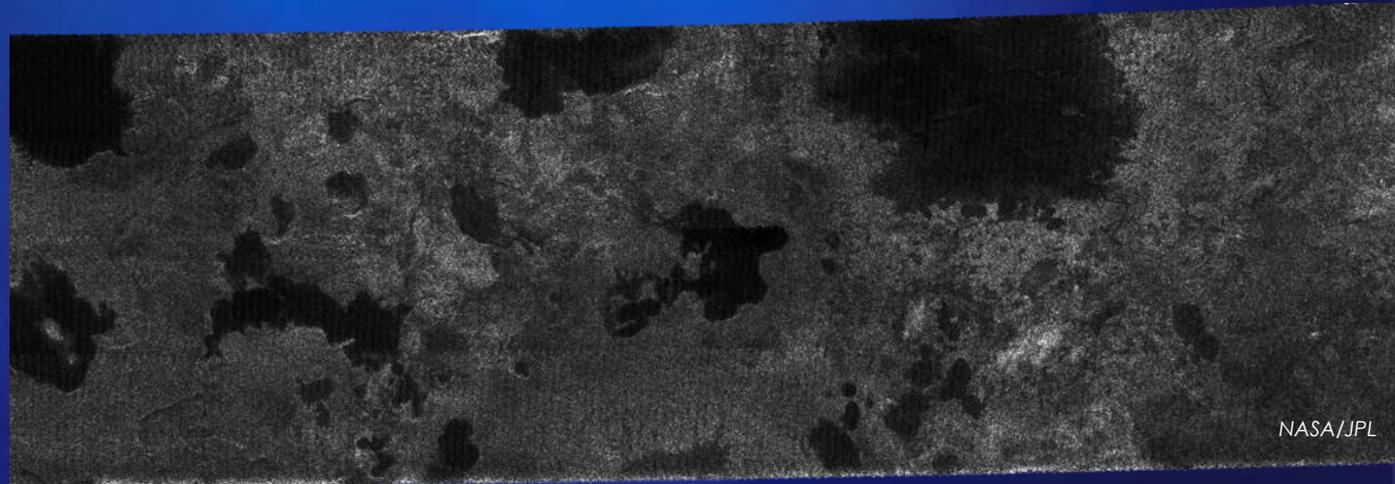
Combining visual and infra-red images, it is possible to see Titan's cloud systems, like this one in the North Pole.

These condensates might be the source of liquid that fill Titan's lakes.

Titan - surface

Titan is the only other moon visited by man-made instruments. On 14 January 2005, ESA's Huygens lander imaged the surface of Titan (left).

The "rocks" in the bottom of the image are small pebbles (4 to 15 cm), about 85 cm away.



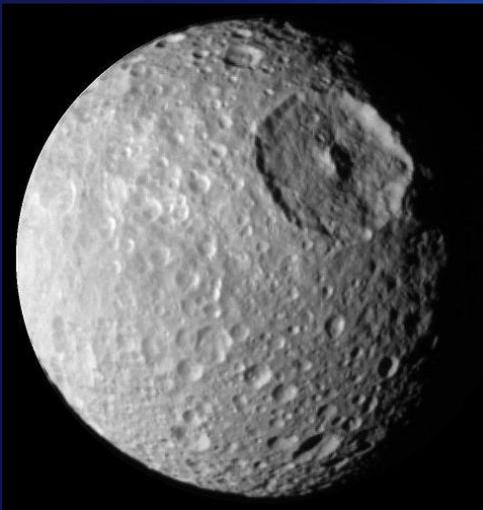
NASA/JPL

Using its radar system, Cassini imaged dark patches in the surface of Titan. The darker the patch, the smoother the surface, implying they are liquid (most likely hydrocarbon lakes of methane and ethane).

Other moons

Saturn has more than 60 known moons. Below are four of them:

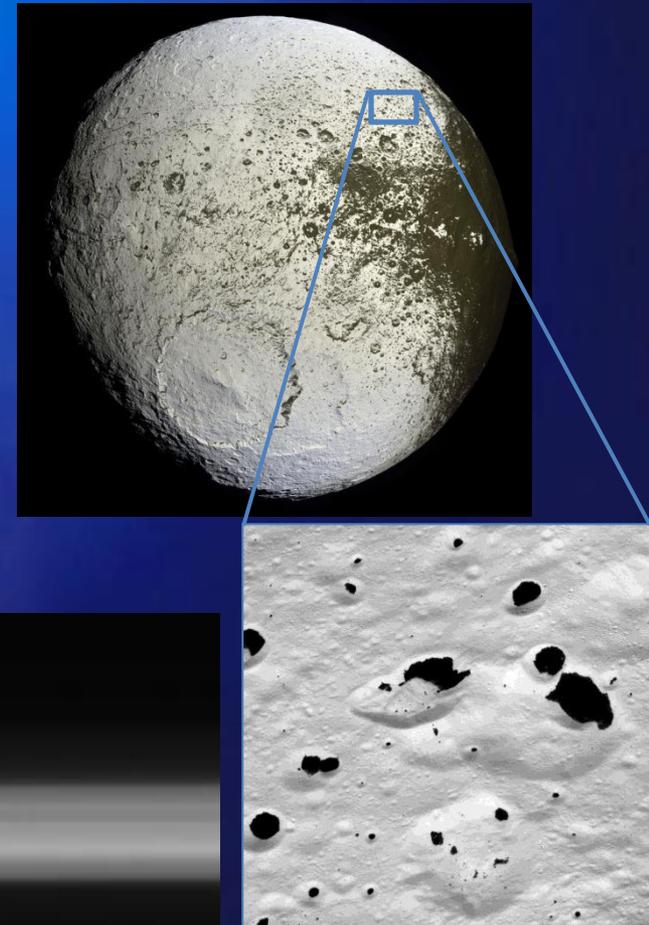
Mimas,
the “Death Star”



Impact pummeled
Hyperion



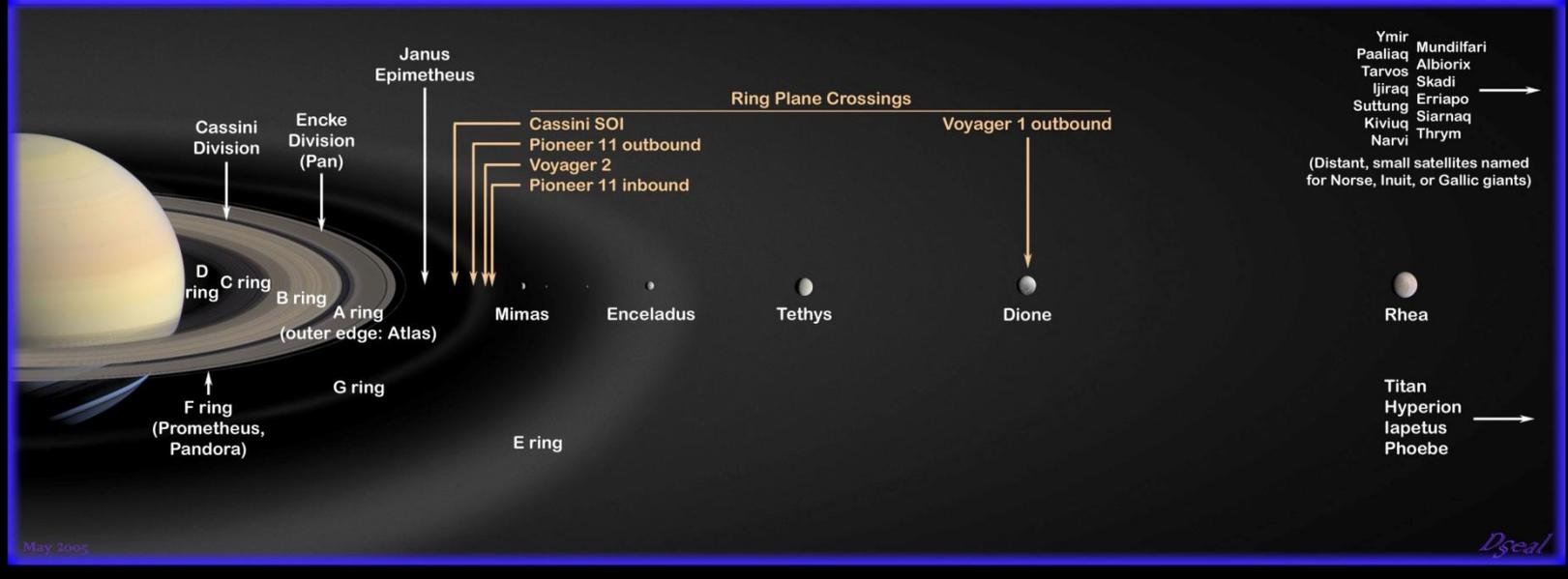
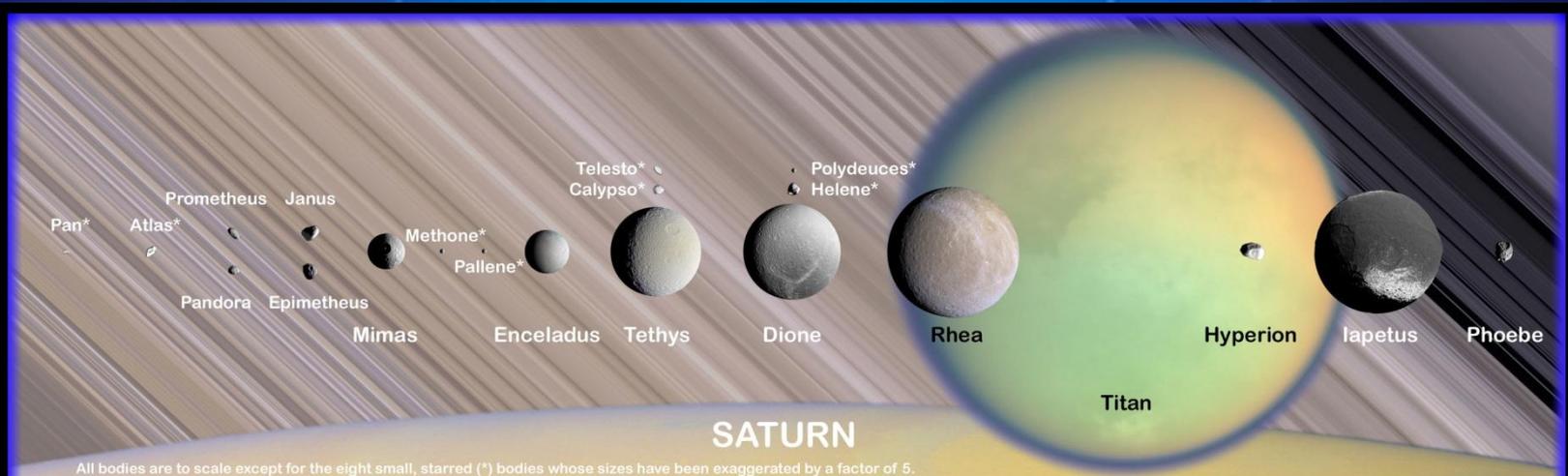
Snowy Iapetus



Pan,
the ring dweller



The Saturnian system to scale





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