Astronomy for Kids - Saturn

The Solar System's "Lord of the Rings"

Saturn has been a source of wonder and amazement for Earth dwellers since ancient history. This sense of wonder increased in 1610 when Galileo turned his first telescope on this giant planet and was the first person to see Saturn's beautiful ring system.

What Galileo saw, although he didn't see it clearly, was the beautiful system of rings that surround the giant planet. His early telescope wasn't good enough to show details in the rings, so he wasn't quite sure what he was seeing, but he certainly realized that it was something very special. (Saturn was the first planet I ever saw through my telescope and I will never forget how stunning it was to see the rings for the first time.)

The advantage that we have now is that we can see the rings of Saturn using almost any moderately priced telescope. A good telescope allows us to see that there isn't just one ring around Saturn, but that what appears to be one ring through a low powered telescope is revealed as a complicated system of rings through a good telescope.

Saturn Facts

Distance from Sun
Approximately 856 million miles

Number of Moons
At least 30

Diameter
Approximately 86,000 miles

Length of Day
10 hours, 39 minutes

Length of Year
29.5 years

Name
Roman god of agriculture

Visited by
Pioneer 11, Voyager 1, Voyager 2, Cassini (2004)

So Light it Floats!

Saturn is the sixth planet from the Sun and the second-largest planet in our solar system. Only Jupiter is larger. In spite of it's giant size, though, Saturn doesn't weigh very much. In fact, as a whole,Saturn is lighter than water and would float in a bathtub if you had one big enough (of course the water bill would be extremely high).

Another interesting side effect of Saturn's low density is the fact that is actually "flattens out" at it's equator, which you can clearly see in the full-size images of the planet on this page. Saturn's day is only a little more than ten hours long, which means that it rotates very quickly. The combination of it's high rotation speed and low density makes the planet flatten out or "oblate" at its equator.

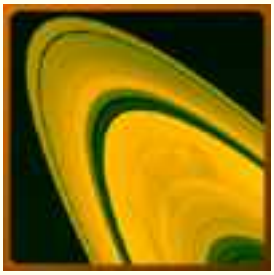
Saturn

A Voyager picture of Saturn

Saturn's Rings

Until the Voyager missions visited Saturn, about all we knew about the rings was that they were exceptionally beautiful and had a large gap in them called the Cassini Division. By the time the Voyager spacecraft left the ringed planet, we knew that the ring system was very complex and was actually made up of many, many separate rings, including one ring that appeared to be "braided". In addition, we had learned that the appearance of the rings could change. One of the more interesting and puzzling features of the rings were what looked like the spokes of a wagon wheel. All in all, although the Voyager missions taught us a lot about Saturn's rings, they also raised even more questions. Hopefully the Cassini mission to Saturn, scheduled to arrive in 2004, will help solve some of the ongoing mysteries about Saturn's system of rings. You can find out more about the rings by clicking on the link at right.

Saturn's Rings



Click here to learn more about Saturn's rings.

Astronomy for Kids - Saturn

The Moons of Saturn

Not only does Saturn have a very large family of moons, second in number only to Jupiter, but the moons have a very wide variety of shapes, sizes and colors. Ranging in size from enigmatic Titan, which is well over 3000 miles in diameter to tiny Pan, which is about twelve miles in diameter, to the even smaller "moonlets" that have yet to be named, Saturn's family members come in a wide assortment of shapes and sizes.

In addition to the wide selection of shapes and sizes, the moons of Saturn also feature a wide selection of colors and geography. Titan, which will be visited by the Cassini mission, is shrouded in thick clouds, while other moons, like Iapetus, have a very mysterious surface. You can find out more about several of Saturn's moons by clicking on link at right.

Saturn's Moons

Click here to learn more about Saturn's moons.

Find Out More About Saturn

Saturn Page at the Nine Planets Site
The Saturn section of the Nine Planets site has more detail about this beautiful ringed world.

Cassini for Kids
NASA's Jet Propulsion Laboratory has a special site just for kids about the Cassini mission to Saturn

The Voyager Mission
The Voyager mission sent back some spectacular images of the ringed planet during it's trip through our solar system

Astronomy for Kids - A Voyager Image of Saturn

A Voyager Image of Saturn

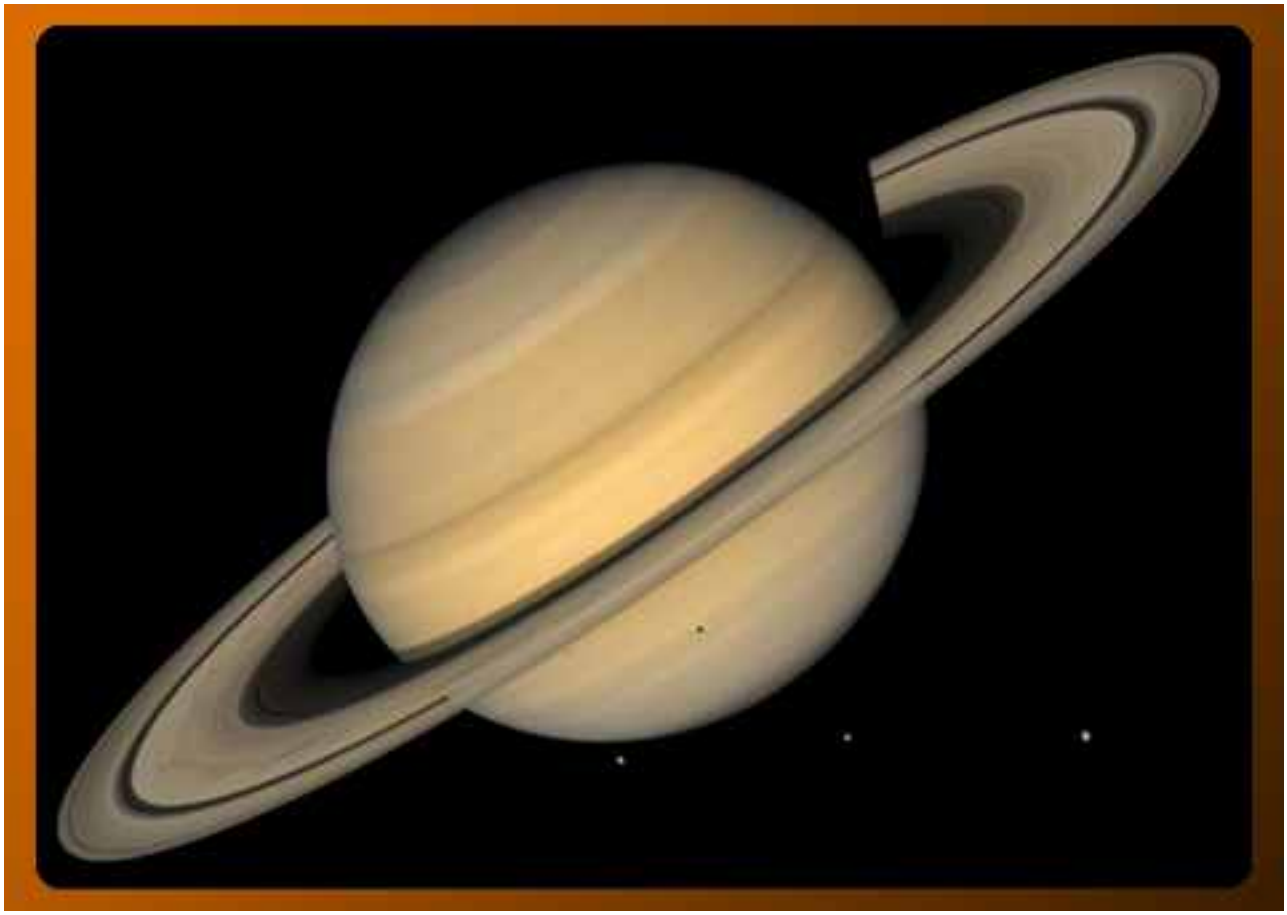


Image courtesy of: NASA, Voyager Mission

The Voyager mission sent back this stunning image of Saturn on it's journey through the solar system. This image clearly shows the planet flattening out at it's equator. You can also see the moons Tethys, Dione and Rhea in this picture.

Astronomy for Kids - The Rings of Saturn

Saturn's Beautiful and Puzzling Rings

Even with a small telescope, you can easily see Saturn and it's rings. With a medium to large sized scope, you can see that rings are not just one ring, but there is at least one division in them. When the Pioneer and Voyager missions visited the ringed planet, we found out that the rings are a complex system of many individual rings, each made up of countless pieces of ice and rock.

Spokes in Saturn's Rings

Among the many pictures the Voyager missions sent back from Saturn was this one showing what appear to be "spokes" in the giant planet's rings. What causes these spokes? How are they formed and why do they seem to appear and disappear? The answer is probably that the gravitational forces of Saturn and its moons are acting together to form the complex patterns that we see in the giant planet's rings. Whatever is causing the rings of Saturn to change the way they do, it is a very beautiful sight to see. Hopefully the Cassini mission will help answer this question and many others we have about this beautiful planet.

Saturn's Rings

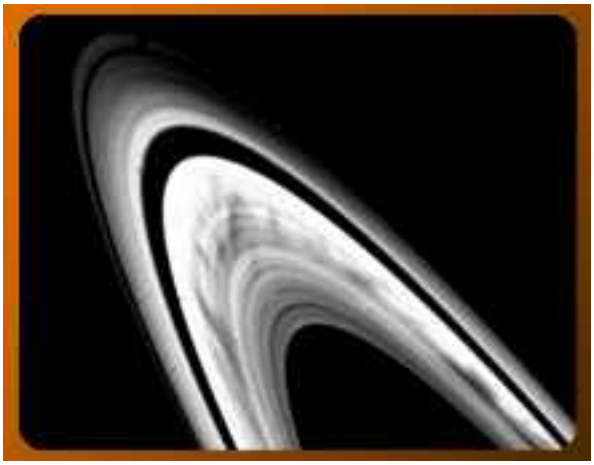


Image courtesy of: Voyager mission

The Ring Divisions

Before the Voyager missions visited Saturn, we didn't know that the rings were made of up countless individual chunks of ice and rock. The rings appeared to be solid when viewing them from Earth. We did know that there were two obvious divisions in the rings that are shown in the picture at the right. The large division is known as the Cassini division, named from the French astronomer Giovanni Cassini, division and is easily seen through a medium sized telescope. The smaller division at the top of the picture is called the Encke division, named for Johann Encke, and is visible through a large telescope.

The Ring Divisions

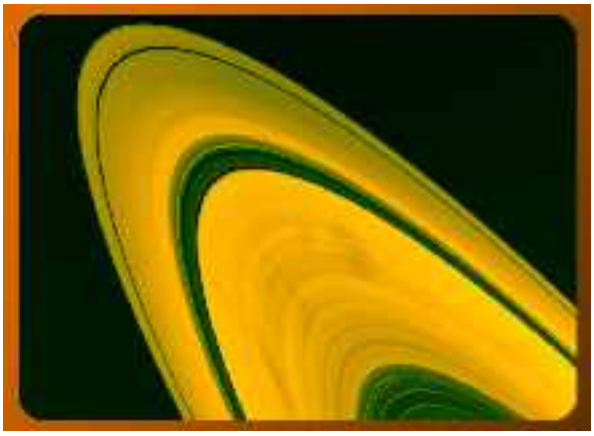


Image courtesy of: Voyager mission

Astronomy for Kids - The Rings of Saturn

Saturn's Changing Rings

Not only does the appearance of Saturn's rings change constantly, but our view of the rings from here on Earth changes as Saturn makes its way around the Sun during the twenty-nine years it takes to complete one orbit around the Sun.

Since Saturn is tilted on its on its axis, our view of the rings changes as the planet makes its way around the Sun.

This series of images that the Hubble Space telescope took from 1996 through 2000 shows how the tilt of the planets affects our view of the rings,

The pictures go from the lowest picture, taken in 1996, to the highest picture, taken in 2000. In 1996, the rings had just passed the point where they were almost edge on and as time passed, we could see more and more of the rings.

This cycle of the rings going from almost invisible to full view and back again takes about fifteen years to complete.

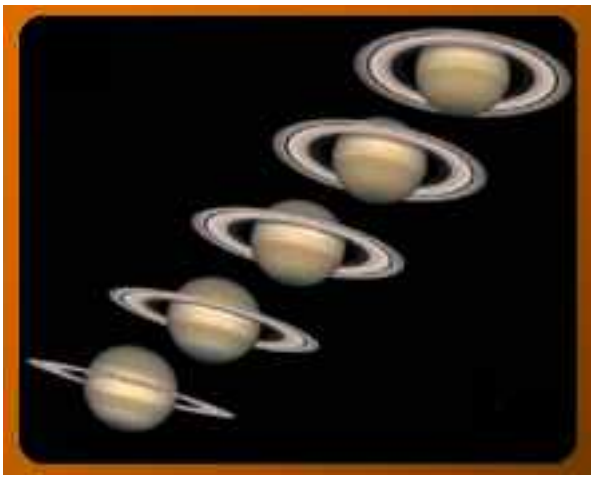


Image courtesy of: Hubble Space Telescope

Saturn's Disappearing Rings

Although Saturn's rings are very wide, over 150,000 miles in diameter, they are very thin, averaging only a few hundred yards thick. The rings are not solid, but are made up of countless numbers of ice chunks and rocks usually smaller than the average pickup truck.

The thinness of Saturn's rings means that every fifteen years, we get a chance to see them almost disappear entirely, as the Hubble Space Telescope image at right, taken in the fall of 1995, shows.

You can see Saturn's moon Titan at the left in the top photograph. The dark spot that appears below the rings in the same picture is the shadow of Titan on the planet.

It's hard for us to imagine how something so large could seem to disappear entirely and then reappear and grow in size as time goes by. It's just another example of the wonders of the universe.

The Rings Disappear!

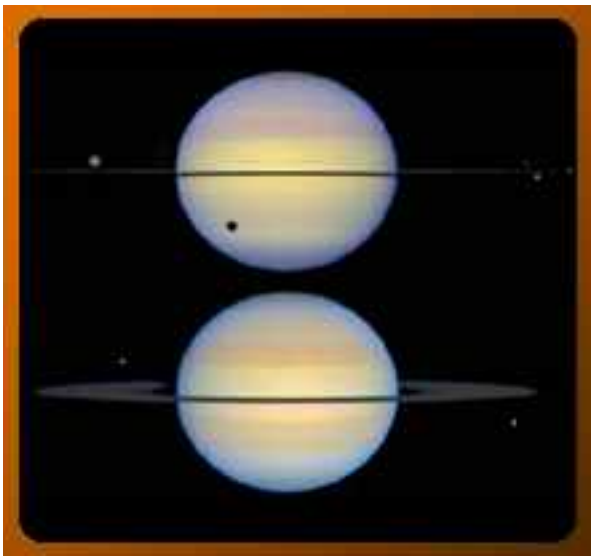


Image courtesy of: Hubble Space Telescope

The "Braided" Ring

One of the most puzzling pictures that the Voyager mission sent back from Saturn is the one that appearsat the right.

How in the world, or universe, can a planet's ring be "braided"? This picture had scientists scratching their

Saturn's Braided Ring

head for years. The theory was that a couple of tiny, undiscovered moons of Saturn were causing the braiding of the ring. It took very careful study of the Voyager pictures to find out that the braiding action is apparently being caused by the two tiny moons Pan amd Prometheus.
It's just one more mystery that scientists hope the Cassini mission will be able to solve.

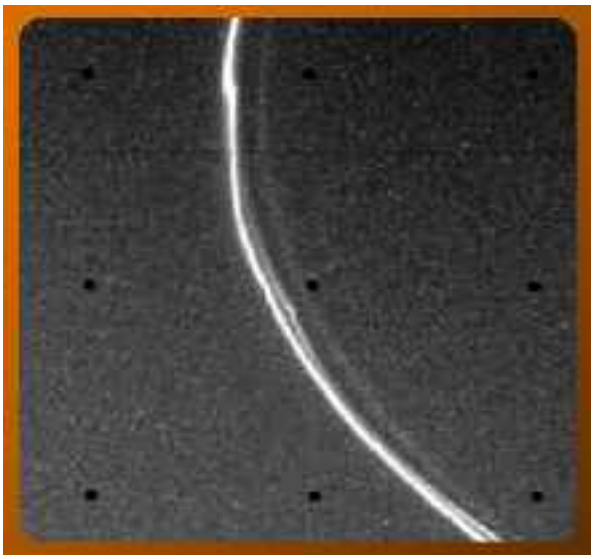


Image courtesy of: Voyager Mission

Astronomy for Kids - The Rings of Saturn

The Biggest Mystery of the Rings

The biggest mystery of Saturn's rings, as well as the rings of the other gas planets in our solar system, is where did they some from?

Are the rings made up of material "left over" after the planet formed, or has the planet gathered up stray ice and rocks with its gravity. This is a process that we don't even begin to understand. Another possibility is that the rings are made up of the remnants of earlier moons that have been destroyed by collisions with other bodies. It is still another example of how much we have to learn about our neighborhood.

Saturn's F Ring

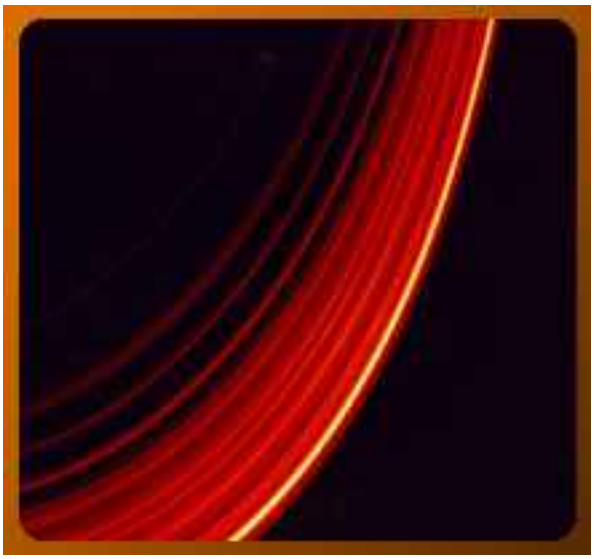


Image courtesy of: Voyager Mission

Astronomy for Kids - The Moons of Saturn

The Saturn's Family of Moons

If you were to take a family portrait of Saturn's moons, you might be tempted to say that it didn't looke like they were related at all. The moons vary widely is both size and appearance, which might make you look at the family portait and wonder if they were even distantly related.

Lucky Mimas

One of Saturn's more interesting moons also appears to be one of its luckiest. The small, only a little over 240 miles in diameter, moon Mimas was the victim of an impact that almost smashed the tiny moon into pieces. The large crater on one end of the moon is almost one-third the size of the entire moon. How did the moon survive such a huge impact without breaking into pieces? There are cracks in the surface of Mimas on the side opposite from the crater that are probably the result of the same impact that caused the large crater.

In addition, scientists also believe that there were earlier impacts that did break the moon into pieces, but over time gravity reassembled the pieces into the moon we see now. Mimas is very lucky indeed to still be in one piece.

Mimas

Image courtesy of: Voyager mission

Icy Tethys

Several of Saturn's moons are made up mostly of water ice and Tethys is one of those moons. The light brown surface of this moon is, relatively speaking, very smooth, tells us that at some time in the distant past the moon probably wasn't frozen solid like it is now.

If you look closely at the picture at right, you can see that while there are many craters on the moon's surface, there aren't nearly as many as there are on other moons in the solar system, including our own Moon. This is one of the clues that have made scientists believe that Tethys has not always been frozen solid.

Tethys is the ninth in the family of Saturnian moons and is a little over six hundred fifty miles in diameter. It orbits Saturn at a distance of a little over 180,000 miles.

Tethys

Image courtesy of: Voyager mission

Astronomy for Kids - The Moons of Saturn

Striped Dione

Dione is another example of how there is no substitute for actually visiting somewhere to see what things are really like. Although the moon Dione was discovered in 1684, all we were able to see from here on Earth was a very tiny speck of light that orbited Saturn. After all, the moon is just over 660 miles in diamater and even a very large telescope can't see any detail in something that small from such a large distance.
Voyager sent back this amazing image of a moon that has a very beautiful pattern of bright diagonal lines crossing one side of the moon. On the other side of the moon, there are lots of craters much like the other moons in the solar system. This is very much a mystery, as you would expect both sides of the moon to have lots of craters. The best guess we have now is that during the period when the craters accumulated, Dione was in an orbit that always had the same side facing outwards, much like our own Moon.

Dione

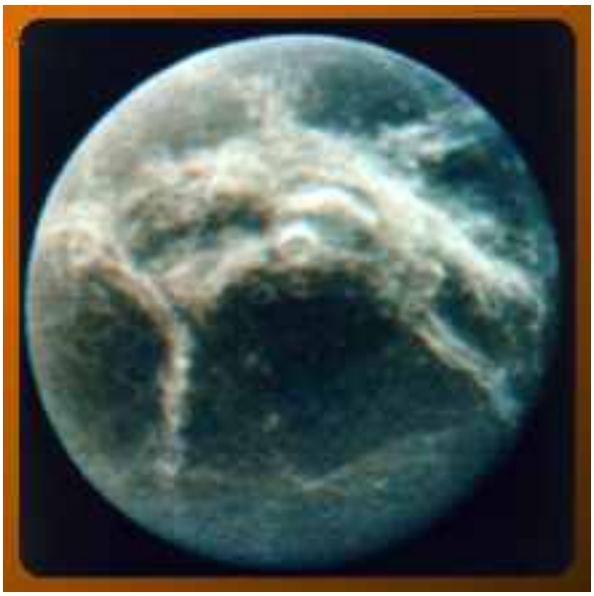


Image courtesy of: Voyager mission

It is another mystery that we may never have a real answer for. The origin of the bright stripes is still another puzzle for us to solve. It could be the result of some kind of eruption along cracks in the surface of the icy moon, but all we have at this point are guesses, and not very good ones at that.

Mysterious Titan

Titan is the largest of Saturn's moons and is one of the largest moons in our solar system. At over 3,000 miles in diameter, it is even larger than the planets Mercury and Pluto. Titan was discovered by the Dutch astronomer Christiaan Huygens in 1655 and has been carefully studied and observed by professional and amateur astronomers ever since. Because of its large size, Titan is easy to see using even a small telescope. In spite of it's large size and easy visibility, though, Titan remains a very mysterious place to those of us here on Earth because it is covered by a thick layer of clouds that we cannot see through.
Not only is the layer of clouds surrounding Titan impossible to see through, it is very dense. The atmospheric pressure, or the weight of the moon's atmosphere, is one and a half times as much as it is here on Earth.

Titan

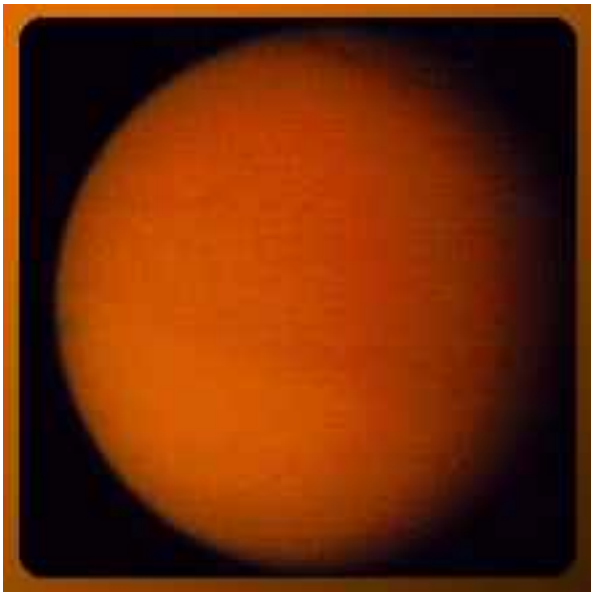


Image courtesy of: Voyager mission

Astronomy for Kids - The Moons of Saturn

The Surface of Titan

Although we cannot see through the thick atmosphere of Titan, the Hubble Space Telescope has been able to give us some tantalyzing clues about what lies underneath the thick cloud blanket. The picture at right, taken with Hubble's infrared camera, shows what appears to be a very large "continent" on the moon in the bright areas of the picture. We aren't sure about what the dark areas are, but they could be liquid oceans of some kind. The surface of the moon is much too cold for the oceans to be water, but there is a possibility that some other liquid could exist on the cold moon.

When the Cassini mission arrives at Saturn, it will drop the Huygens probe on to Titan which will, hopefully, answer some of these questions as well as many others that we have about this very large, mysterious moon.

Titan's Surface

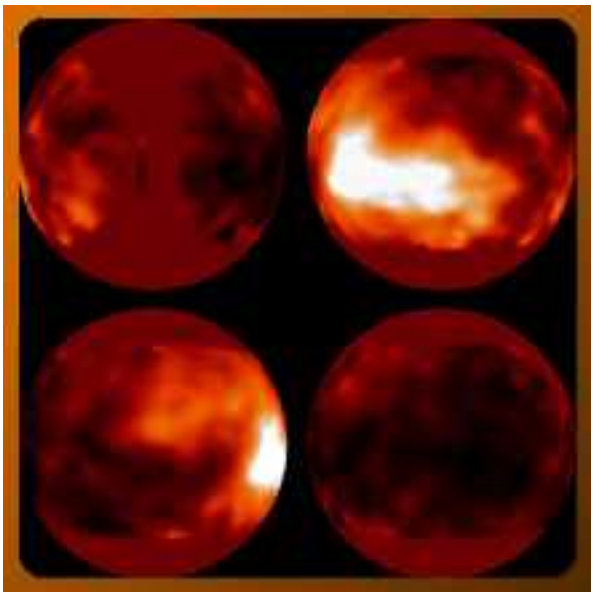


Image courtesy of: Hubble Space Telescope

Calico Iapetus

We mentioned at the top of this section that if you were to take a family portrait of the moons of Saturn that you would wonder if the moons were even distantly related and Iapetus is one of the family members that makes this point very clearly.

One side of this moon, which is a little over nine hundred miles in diamater, is very bright while the other side looks as if it has been left outside in an industrial area for a very long time. The brighter part of Iapetus is probably just the ice that the moon is made of. The darker material, though, is quite a mystery. Theories range from dark material that originates from the moon's interior to debris knocked off neighboring moon Pheobe.

None of these theories are completely satisfactory, though, so we will just have to wait for future missions, like the Cassini spacecraft, and hope that they will provide us with some concrete facts.

Iapetus

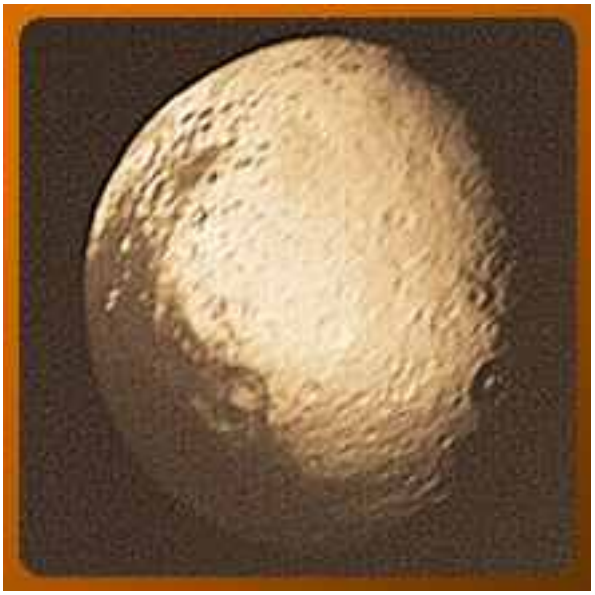


Image courtesy of: Voyager mission