

I hope you found my previous article on Orbit of interest, and which gave an insight into the activities of the Mars Rover, Curiosity and its findings. If you have any comments or further information please feel free to advise the Editor or any of the Committee Members. Feedback is always very welcome.

Anyway for this edition I have decided to start a series on the Moons of Saturn.

Saturn has 62 moons all of which have been identified with confirmed orbits around the giant planet. 53 of these moons have been named but only 13 have diameters larger than 50 kilometres.

In 1847, John Herschel suggested that Saturn's Moons should be named after 'Saturn', the mythological figure associated with the Roman god of agriculture and harvest. At that time only seven moons were known and they were named after Titans and giants, in mythology, the brothers and sisters to Cronus, the Greek equivalent to Saturn.

We will start with Titan, the largest of Saturn's moons; Titan was actually discovered by Christiaan Huygens in 1655 using a 57mm (2.2in) refracting telescope of his own design.

Titan is the only natural satellite around any planet that is known to have a dense atmosphere. Besides Earth, it is the only object where evidence of surface liquid has been discovered. This has proved to be exciting as it is a possible analogue of ancient earth and could lead to the discovery of the origins of life here.

Titan's diameter is half as much bigger than the Earth's natural satellite, the Moon, and it is 80% more massive. Next to Ganymede, Jupiter's largest Moon, Titan is the second largest moon in the entire Solar system and larger by volume than the planet Mercury.

NASA and the European Space agency have sent the Cassini Probe to Saturn and there has been extensive study of Titan and results from these studies are continuing to produce very exciting information.

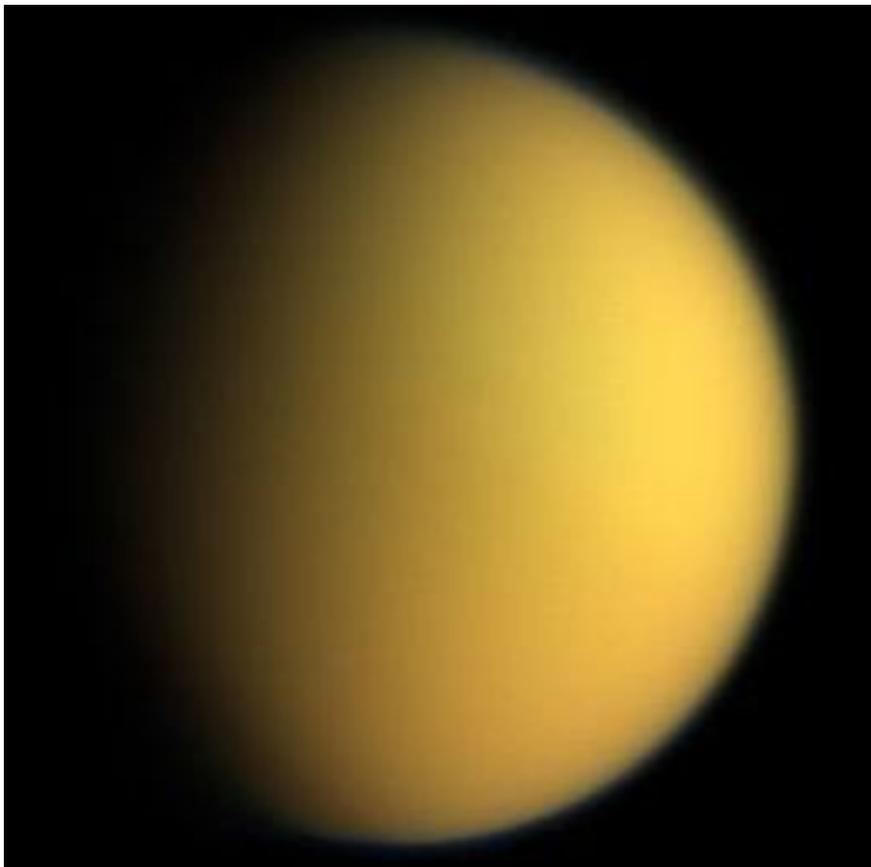


Fig 1. Titan taken from the Cassini probe.

So what information has been gathered so far about Titan? The table below shows size, mass and orbital information when compared to our own Moon. As can be seen, the orbital period is 16 days which means that at the distance from the parent planet, Titan's orbital speed is much faster than our Moon giving rise to a full moon every 16 days. Perhaps werewolves are more predominant on Saturn!!

Name	Diameter (km)	Mass (kg)	Orbital radius (km)	Orbital period (days)
Titan	5,150 (148% Moon) (75% Mars)	1,350×10 ²⁰ (180% Moon)	1,221,870 (318% Moon)	16 (60% Moon)

Fig 2 Table of relative distances and masses

Titan is known to have nitrogen rich Earth-like atmosphere and landscapes which include hydrocarbon lakes and dry river networks. Titan comprises more than 96% of the mass of the other moons in orbit around the planet. The six other larger moons constitute about 4%, while the remaining 55 small moons comprise of only 0.04% of mass. So Titan is a very significant moon of Saturn. The figure below provides an impression of Titan's mass against the other large moons of Saturn.

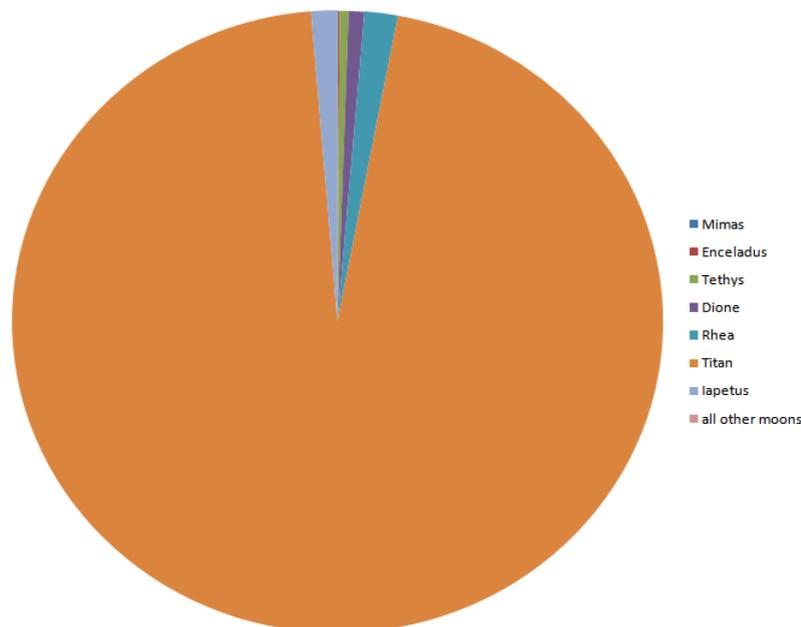


Fig 3 Moon Mass Comparison

Titan comprises primarily of water-ice and rocky material. As with Venus the dense atmosphere made study of the moon very difficult. However, following the arrival of the Cassini Probe in 2004, a much clearer picture of the surface emerged. Only very recently, one of the project scientists has developed a method of eliminating noise from the radar returns, which has enhanced the study of this moon. The Cassini probe included the descent of the Huygens probe to the surface which returned video of the surface for several hours after landing.

We now have evidence that liquid hydrocarbon lakes exist on the polar regions of the Titan. The surface is generally smooth with some impact craters and even mountains and cry volcanoes have been discovered.

The atmosphere of Titan is mainly nitrogen and the formation of methane and ethane clouds creates nitrogen rich smog all over the surface. There is wind and rain on this moon albeit the rain comprises of liquid methane at temperatures close to Absolute zero. There are earth-like features on Titan such as dunes, rivers, lakes and seas which will be of liquid methane and ethane with seasonal weather patterns similar to that on Earth. With its liquid and nitrogen atmosphere, Titan's methane cycle can be compared to Earth's water cycle, however at much lower temperatures. As recently as September 2014, NASA has reported that the oceans within the subsurface may be as salty as the Dead Sea on Earth.

With that thought we should be quite excited about the prospect of discovering some of the secrets of ancient Earth life and perhaps the origins of ourselves. The Cassini Website from NASA is worth following and I recommend it for your review.

Jay Nair