

SkyTalk Specific Object Notes: Saturn

- Saturn is presently visible in the evening sky and it is one of the most beautiful objects to see through a telescope due to its impressive ring system.
 - Saturn is the second largest planet in our solar system. Jupiter has 71% of the mass of the planets, while Saturn has 21%, leaving 8% for all the rest of the planets.
- There are two groups of planets in our solar system. The Earth (with Mercury, Venus, & Mars) belongs to the group of planets known as terrestrial planets. These planets are small, made of hard rocky stuff (high density), have solid surfaces, and are close to the sun. Saturn belongs to the group of planets known as Jovian planets. This group also includes Jupiter, Uranus, and Neptune. They are extremely large, made of gases (low density), don't have solid surfaces, and are found in the outer parts of our solar system.
 - Note that the yellow object in the background is the sun. Even Jupiter, the largest planet, is small compared with the sun.
 - Also note that Pluto is not shown in this diagram. Astronomers no longer consider it a planet – just one of many large iceballs in the outer solar system.
- Jovian Planets also have ring systems and many moons – while Terrestrial planets have no rings and very few moons (only 3 in total).
 - In this image taken in 2005 by the Cassini spacecraft we can see the sun is shining on the rings and casting a shadow on the planet. Tethys, one of Saturn's many moons, is visible.
 - Not only does Saturn have the most substantial ring system, it also has the largest number of moons – 31 and counting.
- Saturn's rings are 270,000 km in diameter, but only about 30 meters thick.
- Saturn's rings are not a solid disk -- rather they are discrete separate rings with large gaps in between. The rings are composed of billions of ice particles each in their own circular orbit around Saturn. The average size of a ring particle is about that of a small boulder. The places where rings are and where they aren't is very dependant upon interactions with Saturn's moons. There are some moons that sweep through the rings and create gaps. There are other places where moons knock the particles back into a ring and actually keep them there. These are known as shepherd moons.
- Saturn has an orbital tilt of 26 degrees, thus as it orbits around the sun our perspective of the rings change considerably. In fact at some times we are seeing them edge-on and they are all but invisible.
- Saturn has one large and very special moon called Titan. We have known that Titan has a thick atmosphere for many years.
- Most of what we have learned recently about Saturn comes from the Cassini space probe that traveled to Saturn in 2004 and still orbits the planet today. In 2005 it released a mini-probe known as Huygens that parachuted down onto the surface of Titan (taking pictures as it descended) and lasted about an hour on the surface.
- Astronomers (and everyone else) are very interested in the question of whether or not there is life in the universe other than on the Earth – and nobody knows the answer to that question. But we know that water was very important in the development of life on the earth. Many scientists speculate that other substances could play this roll of water on other planetary bodies.
 - Titan is very cold and any water there is frozen solid. But Titan is just the right temperature (-170°C) for methane (the primary component of natural gas) to be in liquid form. Huygens took pictures that look like dried up riverbeds and Cassini has taken radar images that look like there are small lakes on Titan. Astronomers are working hard to collect more information on liquid methane on Titan.

SkyTalk Specific Object Notes: Orion Nebula

- The constellation of Orion is presently visible in the evening sky. It is one of the easiest constellations to recognize because of the 2 bright stars for his shoulders, 2 for his knees, and the 3 bright stars of his belt.
 - Orion is a major movie studio, so you may see this pattern at the beginning of movies.
 - This constellation is known as the hunter – and his two hunting dogs (Canis Major and Canis Minor) are nearby. He is fighting Taurus the bull. In many interpretations he is holding a shield in his left hand instead of prey.
- Nebula is the latin word for cloud and there is a well-known object in this constellation known as the Orion Nebula. It is faintly visible with your eye, but becomes quite an impressive object through a telescope. The Orion Nebula is about 1500 light-years away from Earth.
- The Orion Nebula is a very beautiful object through a small telescope – and if you go to any observatory public nights at this time of year they will be showing it.
 - The Nebula is a large cloud of gas – much larger than you can actually see here. The gas is being heated up -- by hot, young stars that have recently formed there – making it glow. Astronomers call such an object an **Emission Nebula**.
- A more powerful telescope such as the Hubble Space Telescope can show even more detail in the Nebula. This particular image uses “false color” – meaning that they cheated to make the picture more colorful.
- Infrared is light that we cannot see with our eyes, but astronomers have instruments out in space that can “see” in infrared light. In this infrared image of Orion, you can see that the Orion Nebula is a small part of a much larger cloud that surrounds the entire constellation.
 - Visible light does a good job of showing hot objects like stars. Infrared does a good job of showing cooler objects, like clouds of gas that are collapsing to form stars (and possibly planets are forming around them). The whole Orion region is a very active region of star formation – stars are forming there today!
- There are other objects of interest nearby. Here is another well-known nebula known as the Horsehead Nebula. In this one, the gas is not glowing from nearby stars. This is called a **Dark Nebula**.
- Orion is the closest region to us where active star formation is occurring.
 - We have talked about how the gas of the Orion Nebula is glowing because of nearby hot, young stars. This is a common connection! Astronomers commonly find hot, young stars near clouds of gas and dust – because stars form out of gravitationally collapsing clouds of gas and dust. That’s where stars come from!
 - Around 1996 the Hubble Space Telescope took images of young stars in Orion that had dark disks of material around them. Astronomers believe that planets may form out of this material. Here are 4 of these very young solar systems in Orion
 - Thus, the clouds around Orion are being actively studied by astronomers to learn about how stars and planets form out of the gas and dust.