

Bluffer's guide to Saturn

by Colin Johnston, Science Communicator

Ask anyone to draw a picture of a planet and I'll bet they draw a ringed planet like Saturn. This giant world has always stood out from the other worlds of the Solar System thanks to its amazing rings, in astronomy books it was 'The Ringed Planet'. Thirty years ago we discovered Uranus has its own rings. Now we know that all the giant planets have rings, but only Saturn has Rings. The rings of Uranus are dark and murky, Saturn's are dazzling. The rings of Neptune are broken, clumpy and are possibly only temporary features. In contrast Saturn's rings encircle the planet and will be there for a long time to come. Jupiter has wispy rings of dust which would be all but invisible even if you were right beside them (two NASA probes flew past the giant planet without noticing its rings). In contrast the rings of Saturn are so spectacular that Galileo found them as soon as he pointed his first telescope towards them – mind you, genius though he was, he never made sense of what he was seeing!

Where and when can you see this wonder? If you go outside about 8.30 pm in the middle of March, look south west and you will see the constellation of Orion. Twinkling away to his left you should see the twin beacons of Sirius and Procyon (see previous Astronotes for more details on locating these objects). Turn your gaze further left and slightly up from the two stars and you will see two very bright stars, fairly close together. The left and lower of this pair is Regulus (Alpha Leonis), one of the brightest stars in the sky. Its companion to the right is Saturn appearing to the naked eye as a bright, yellowish star. If you want to see the rings, and believe me, you won't regret it; you will need the help of a large pair of binoculars or a telescope. A magnification of at least 20 is required to clearly resolve Saturn's rings for most people. You will also need something to steady the instrument you are using as shaky hands will turn a sharp view of a planet into an annoying squiggle. When

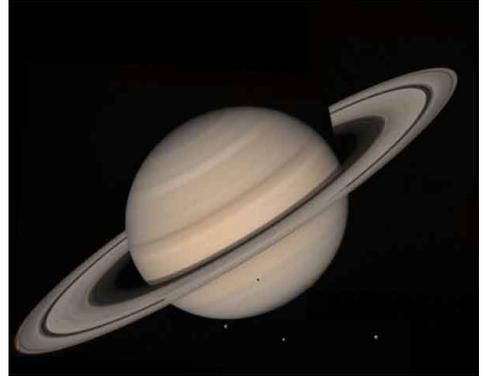


Image Credit: NASA

Lord of the Rings A classic NASA image of Saturn with some of its moons taken by Voyager 2.

you are all set up, you won't get a Hubble Space Telescope-like performance from your binoculars (if you do, tell me please and I'll buy them from you) but you will be able to see the planet as a tiny yet exquisite jewel.

What are you seeing? The planet itself is a pretty bland yellowish cream in colour. Like Jupiter, you are seeing a continuous sea of cloud blanketing the planet. Again like Jupiter, the atmosphere of mostly hydrogen (with a little helium and traces of other gases) is turbulent and wracked with violent storms. However, without a big telescope it is difficult to discern any bands or spots in Saturn's atmosphere as it is hazier than Jupiter's. Probably you will be more intrigued by the rings.

Saturn is a big planet, about nine times as wide as the Earth, so the rings are huge. Let me put them into scale, if Saturn and the rings were moved so that one edge of the rings touched the Earth, then the distance across the rings to the opposite edge would extend more than halfway to the Moon. However they are very thin, being less than one kilometre thick. I don't believe there can be anyone who thinks the rings of Saturn are solid. They are composed of countless particles of water ice (plus a few impurities)

ranging in size from microscopic specks to the size of houses, constantly banging into each other in an orbiting avalanche hurtling around the planet about forty times as fast as a Concorde.

The rings have several dark 'gaps' in them, one called the Cassini Division is particularly prominent. Until Saturn was visited by probes this was thought to be a literal gap in the rings but now we know the rings are a continuous disc which varies in density and colour. In the Cassini Division the particles are greyish and more thinly spread than elsewhere.

What are the rings? They look like the remains of something that has been smashed up. Our best guesses say that is just what they are. Saturn's gleaming ring system is much younger than the planet. How do we know that? Well, the natural debris that drifts around the Solar System is mainly dark-coloured rock and carbon compounds. Over the aeons, some of this must be getting swept up into the rings, darkening them and we can calculate how long this would take. Since the rings are still bright we estimate that they are only a few hundred million years old. Perhaps in those distant days a moon of Saturn was smashed to pieces by an intruding comet creating the rings

Saturn has a lot of moons. At least 56 individual moons have been found, although there may never be an exact number as each orbiting chunk of ice in the rings is technically a moon, and it is difficult to draw a dividing line between a large ring particle and a tiny moon. Most of what we know about the moons comes from the Cassini probe, which is still whirling around the planet. The moons are all chunks of rocky ice, but are very different in appearance from each other. Some, such as Iapetus and Enceladus are odd-looking and one, Hyperion is seriously weird. We'll deal with them another time. Pick of

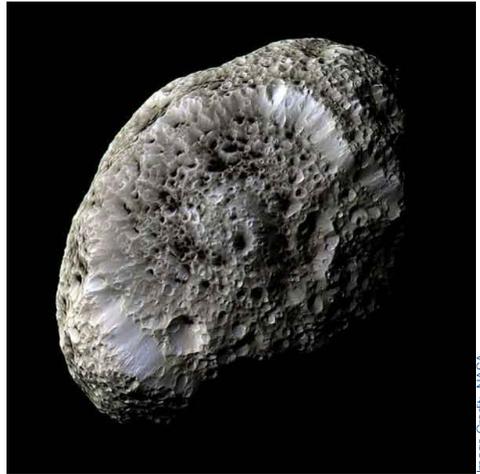


Image Credit: NASA

Hyperion A moon of Saturn with an odd spongy surface.

the bunch, and the only one you are likely to see with a telescope from your garden, is Titan. This is a fascinating world, it is three quarters the size of Mars, and bigger than Mercury. It is covered by a thick atmosphere of mainly nitrogen made murky by natural smog of hydrocarbons. Beneath this brownish-orange pea soup is a landscape with lakes and occasional rivers, occasionally moistened by a light drizzle. Sadly the liquid in the lakes and rain is not water, but liquid ethane and methane. Titan's climate is uninviting, the temperature never rises over a frigid -180°C . The only photograph we have from the surface of Titan was taken by the Huygens spacecraft and shows a desolate, dark sandy plain strewn with whitish boulders and pebbles.

So there you have it, once you have read this article you will know enough to convince everyone that you are an expert on Saturn. All you need to do now is go outside and look!