

Offered Title: Of Rings, Spokes, and Shepherds

We know about Saturn's rings, of course! We know they are a wonder to observe. But what are they?

Wreckage and debris, but that's not all there is to this story.

Around 4.5 billion years ago Saturn, along with the rest of our solar system, started to take shape. It became the second largest planet.

We really don't know exactly how they formed but one hypothesis is that Saturn's rings came about during Saturn's formation. Its mass attracted and tore apart a lot of outer solar system objects, like comets, asteroids, and newly forming moons. More recent evidence, from the Cassini explorer spacecraft points to a "young" ring system, less than 300 million years. Part of that evidence lies in the lack of ring darkening soot that is expected from the constant barrage of micro meteorites. The rings are exquisitely reflective. In either event, the destruction was total as each object was ground into smaller and smaller particles. How small? As small as dust, but most are around 1 centimeter to 1 meter in diameter (from a marble to a desk), with a few pieces as large as a mountain.

However the rings were formed, they are almost pure water ice, with rocks and other "contaminants" interspersed. The ring's total mass is estimated at around half that of Saturn's little moon Mimas. And get this, the ring's average thickness is 10 meters (about 30 feet). Very thin. Check out Cassini images of the rings edge on. They are almost invisible!

Saturn's rings are really, really wide. From Cassini measurements the estimated width is over 85,000 km (52,000 miles), and that's just the major rings and gaps between them. There are tenuous rings that extend outward for hundreds of thousands, maybe millions of kilometers. While there are gaps in the ring system, there are no empty spaces, just reduced density. Early astronomers thought the major rings were solid but now we know each major ring is composed of hundreds to thousands of ringlets and tiny gaps. Each ringlet has its own period of revolution around Saturn.

Voyager images of the rings from 1980 showed features that looked like spokes. Then they went away for 25 years, reappearing in 2005 and imaged by the Cassini spacecraft. They are thought to be electrostatically charged dust interacting with Saturn's magnetosphere, occurring seasonally.

Then there are shepherds. There are five small moons whose gravitational influence maintains two gaps and two ring's structures. Pan maintains the Encke gap and Daphnis the Keeler gap. Atlas keeps the A ring's edge sharp. Prometheus and Pandora maintain the F ring's structure.

What's in the Sky?

I'll tell you what's not in the sky. The full Moon. Whenever January has two full Moons, February will have none so don't look for a full Moon this month. Oh, and I predict that March will have two full Moons. I'm a psychic, eh?