Chapter 8
Moons, Rings, and Plutoids

Ring Origins and Roche’s Limit

Saturn Roche Limit for Icy Moon
134,000 km

138,000 km

$r_{\text{Roche}} = 2.4 \left( \frac{r_{\text{planet}}}{r_{\text{moon}}} \right)^{1/3} r_{\text{plane}}$
Figure 8.20 Shepherd Moons

Small moons (or very large ring particles) that orbit in or near rings. They gravitationally “herd” ring particles and affect the rings.

Pan found in Encke’s Gap

F-Ring Prometheus followed by Pandora
Rings particles bump into each other, break apart, and disappear.

All rings around Gas Giants in the Solar system should be less than 50 million years old.

Saturn’s rings may be as young as 100,000 years, and the result of a major collision with an icy moon.
Dione Cassini

Tethys Cassini

Hyperion Cassini
Investigators suspect the domed feature detailed above is an ice volcano, or cryovolcano, seen in infrared light -- possibly erupting a slurry of methane, ammonia, and water ice.
Differentiation

Chemicals with different densities “separate out”. More dense sinks to the center and less dense rises towards the surface.
Dwarf Planets

- Defined by complicated rules that many astronomers don’t like.
- Things may change, but currently there are only a few, including:
  - Pluto
  - Eris (like Pluto but bigger)
  - Largest Asteroid

Chapter 9
The Sun