Ring Systems of the Jovian Planets: Saturn's Rings

All four Jovian planets have **RING SYSTEMS**.

The Saturn ring system is the most impressive: it is easily visible from Earth with a small telescope, and superficially appears like a solid structure.

In fact the rings consist of countless numbers of lumps of ice and rock, ranging in size from ~1cm to 5m in diameter, all independently orbiting Saturn in an incredibly thin plane – believed to be less than 1 kilometre in thickness.

(Compare this with the diameter of the outermost ring – 274000 km. If Saturn's rings were the thickness of a CD, they would still be more than 200m in diameter!)

In 1857 James Clerk Maxwell proved that Saturn's rings couldn't be solid; if they *were* then **tidal forces** would tear them apart. He concluded that the rings were made of 'an indefinite number of unconnected particles'

(see later for more on tidal forces)

Saturn's rings are quite bright; they reflect about 80% of the sunlight that falls on them. Astronomers long suspected that they were made of ice and ice-coated rock, and this was confirmed in the 1970s when **absorption lines** of water were observed in the **spectrum** of light from the rings.

(See A1Y Stellar astrophysics for more on spectra and absorption lines)

Ground-based observations show only the **A**, **B** and **C** rings.

In the 1980s the **Voyager** spacecraft flew past Saturn, and showed that there are thousands of '**ringlets**' – even in the **Cassini Division** (previously believed to be a gap in the ring system).

Voyager also discovered a D ring, (inside the C ring), and very tenuous E, F and G rings outside the A ring, reaching out to about 5 planetary radii.

The F ring shows 'braided' structure, is very narrow, and contains large numbers of ~1μm particles