Moon, Rings, Asteroids, and Comets

The other cool stuff in the Solar System
Outline (with Reading)

• Moons (§14)
• Rings (§12.7)
• Asteroids (§15.3)
• Trans-Neptunian Objects (TNO’s) (§13.3)
  – Kuiper Belt (§13.3)
  – Scattered Disk
  – Oort Cloud & Comets (§15.4-5)
Moons

Phobos and Deimos (Mars)

Rhea and Titan (Saturn)
## Moons

<table>
<thead>
<tr>
<th>Planet</th>
<th>Regular</th>
<th>Irregular</th>
<th>Names (of note)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Venus</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Earth</td>
<td>1*</td>
<td>0</td>
<td>Luna, or “The Moon”</td>
</tr>
<tr>
<td>Mars</td>
<td>0</td>
<td>2</td>
<td>Phobos, Deimos (1871)</td>
</tr>
<tr>
<td>Jupiter</td>
<td>8</td>
<td>58</td>
<td>Io, Europa, Ganymede, Callisto (1610)</td>
</tr>
<tr>
<td>Saturn</td>
<td>24</td>
<td>38</td>
<td>Mimas, Enceladus, Tethys, Dione, Rhea, Titan, Hyperion, Iapetus, Pandora,</td>
</tr>
<tr>
<td>Uranus</td>
<td>18</td>
<td>9</td>
<td>Titania, Oberon (1787), Ariel, Umbriel (1851), Miranda (1948)</td>
</tr>
<tr>
<td>Neptune</td>
<td>6</td>
<td>7</td>
<td>Triton (1846), Naiad, Thalassa, Despina, Galatea, Larissa and Proteus.</td>
</tr>
</tbody>
</table>
Saturn's Moons and Rings

Mimas

Titan
Rings

Roche Limit:

\[ r_{\text{Roche}} = 2.44 \ R \]
“That is no moon...”

It’s within the Roche limit!
Jupiter has Rings!

Jupiter's faint ring system is shown in this color composite as two light orange lines protruding from the left toward Jupiter's limb. This picture was taken in Jupiter's shadow through orange and violet filters. The colorful images of Jupiter's bright limb are evidence of the spacecraft motion during these long exposures. The Voyager 2 spacecraft was at a range of 1,450,000 kilometers (900,000 miles) about two degrees below the plane of the ring. The lower ring image was cut short by Jupiter's shadow on the ring. (NASA/JPL 1999-05-08)
Rings of Uranus and Neptune

Voyager 2 image of Neptune’s rings, 26 August 1989 (NASA/JPL)
Asteroids

The Asteroid Ida and Its Satellite, Dactyl (NASA/JPL)

Asteroid Discovery From 1980 - 2010 (w/C... HD
Identical to the original, but with a credit card attached and...
1 year ago
szyzyg

Asteroids In Resonance With Jupiter HD
This video highlights 2 groups of asteroids that have orbits i...
1 year ago
szyzyg
Comets

Comet West (1975) 2 tails!
Halley’s Comet, April 1986, taken just before dawn from the south shore of Long Island, NY, by E. Myers
Two tails, opposite directions!

Photo of Comet Garradd by César Cantú (2012)

Orbit simulation created on JPL web site by Philip Plait for the Bad Astronomy blog

Earth Distance: 1.347 AU
Sun Distance: 1.731 AU

Feb 18, 2012
Two kinds of comets

- **“Short period”** comets have orbital periods less than 200 years,
- **“Long period”** comets have periods greater than 200 years.

Short period comets have orbits that lie close to the ecliptic plane.

So short period comets are thought to come from the **Kuiper belt**.

Long period comets have orbits that are more evenly distributed in all directions.

So long period comets are thought to come from the **Oort cloud**.
Known Kuiper Belt objects as of January 1, 2000 (green), along with trojans of Jupiter (magenta), and scattered disk or centaur objects (orange)
Trans-Neptunian Objects (TNO’s)
Oort Cloud

hypothesized spherical cloud of comets, at a distance of roughly 50,000 AU