Planets: -major (largest) bodies orbiting the Sun
-Earth, 5 visible to naked eye
-2 discovered by telescope

In order from the Sun outward:

Mercury
Venus
Earth
Mars
Jupiter
Saturn

Uranus (discovered 1781)
Neptune (discovered 1846)

* Pluto (1930) – no longer classified as a planet
International Astrophysical Union
Prague, 2006

(1) A "classical planet" is a celestial body that
(a) is in orbit around the Sun,
(b) has sufficient mass for its self-gravity to assume a nearly round shape,
(c) has cleared the neighbourhood around its orbit.

(2) A "dwarf planet" is a celestial body that
(a) is in orbit around the Sun,
(b) has sufficient mass for its self-gravity to assume a nearly round shape,
(c) has not cleared the neighbourhood around its orbit.

(3) All other objects, except satellites, orbiting the Sun shall be referred to collectively as "Small Solar System Bodies".

The IAU further resolves:
Pluto is a "dwarf planet" by the above definition and is recognized as the prototype of a new category of trans-Neptunian objects. This category is to be called "plutonian objects."
Dwarf Planets:
- orbit in a region with similar objects
- not a dominant object
- 10 confirmed, over 60 candidates

http://www.gps.caltech.edu/~mbrown/dps.html
Moons:
- bodies that orbit one of the planets
- over 170 moons in solar system
- 19 major moons (round)
  - two are larger than Mercury
- most are small with irregular shapes
  - several “captured” after formation


NASA list with names: [http://solarsystem.nasa.gov/planets/profile.cfm?Display=Moons](http://solarsystem.nasa.gov/planets/profile.cfm?Display=Moons)
Details of selected moons

Surface of Europa (Jupiter) from Galileo spacecraft

Saturn’s Rings, Titan and Epimetheus

Surface of Titan

Salt water geysers on Enceladus (Saturn)

Enceladus and Rhea
Asteroids:
- Larger "minor" bodies orbiting Sun
- Rocky and iron composition
- Largest <600 miles across (Ceres)
  - Ceres: "dwarf planet"
- Most between Mars & Jupiter
- Smaller ones called
  ➔ Meteoroids
- Ones that burn up in Earth’s atm.
  ➔ Meteors ("Shooting Stars")
- Ones that strike the Earth called
  ➔ Meteorites
**Meteorite Features**

Fusion (or burn) crust

MAC88105 (Antarctica)

(NASA photo S89-38379)

**Meteorite Features**

Widmanstätten pattern:
Gibeon IVA fine octahedrite

Kamacite—light bands
Taenite—dark bands

(photo by New England Meteoritical Services)
Michelle Knapp, 1992
Got paid $59,000 for meteorite and $10,000 for car!
Comets:
- "minor" bodies orbiting the Sun
- composed of frozen gas & dust
- "dirty snowballs"
- form long tail when heated by sun
- have very elliptical orbits
General Properties of Planets

All orbit the sun in the same direction
- follows "right-hand" rule
- also true for most asteroids
- but comets have random orbits

The orbits of the planets are ellipses, according to Kepler's first law, but most are very nearly circular.
Most have nearly circular orbits
- Except Mercury (& Pluto)

<table>
<thead>
<tr>
<th>Planet</th>
<th>distance (A.U.)</th>
<th>Period of revolution</th>
<th>Orbital eccentricity</th>
<th>Inclination (deg)</th>
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<tbody>
<tr>
<td>Mercury</td>
<td>0.387</td>
<td>87.969 d</td>
<td>0.2056</td>
<td>7.005</td>
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<td>Venus</td>
<td>0.723</td>
<td>224.701 d</td>
<td>0.0068</td>
<td>3.3947</td>
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<td>Earth</td>
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<td>365.256 d</td>
<td>0.0167</td>
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<td>1.851</td>
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<td>Jupiter</td>
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<td>11.862 y</td>
<td>0.0484</td>
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<td>29.457 y</td>
<td>0.0542</td>
<td>2.484</td>
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<td>Uranus</td>
<td>19.191</td>
<td>84.011 y</td>
<td>0.0472</td>
<td>0.770</td>
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<td>Neptune</td>
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<td>164.79 y</td>
<td>0.0086</td>
<td>1.769</td>
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<td>Pluto</td>
<td>39.482</td>
<td>247.68 y</td>
<td>0.2488</td>
<td>17.142</td>
</tr>
</tbody>
</table>

Most orbit in the same plane
- along ecliptic plane
- (Except Pluto)
Most have satellites
- Except Mercury, Venus
- some dwarf planets and asteroids have moons

Pluto's moons: Charon, Nix, Hydra

Most rotate in the same direction
- follows "right-hand" rule
- Except Venus, Uranus (& Pluto)
Family portrait from Voyager 1