Comets, Asteroids, and Meteors

October 2, 2002

1) Introduction
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Review

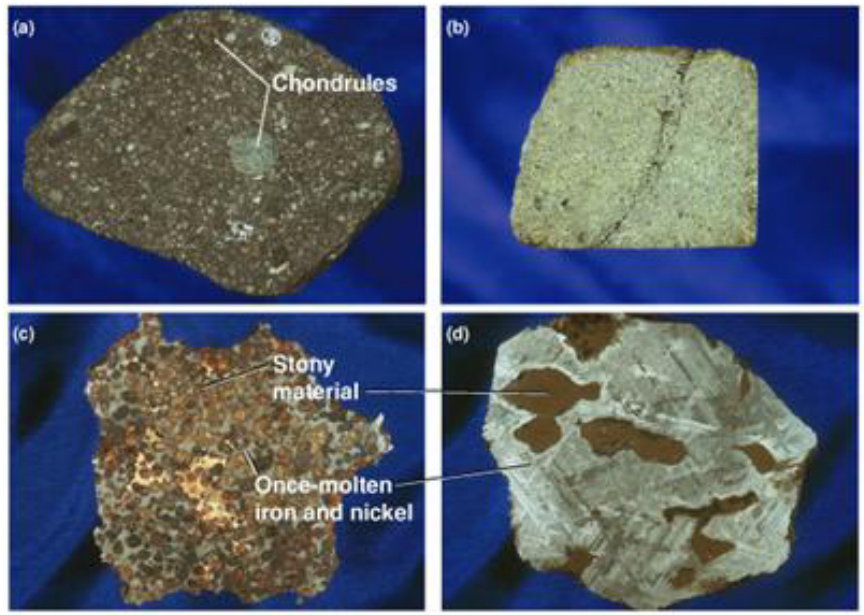
- Moons
  - categorized by geological activity
- Rings
  - Saturn's rings
  - other rings
- Pluto
- Comets, Asteroids and Meteors

Other Bodies

- The solar system contains a number of other small bodies
- Planetesimals from the formation of the Solar System which did not become part of a planet or moon
  - or pieces of a planet or moon which have broken apart
- Comets
  - icy objects from the far outer solar system
- Asteroids
  - rocky planetesimals from the inner solar system
- Meteors
  - pieces of comets or asteroids which fall to Earth

Meteors

- Parts of the Solar System that come to us
  - some of the most studied astronomical objects
- Categories
  - stony meteorites
  - iron meteorites
  - stony-iron meteorites
  - category depends upon source of meteor

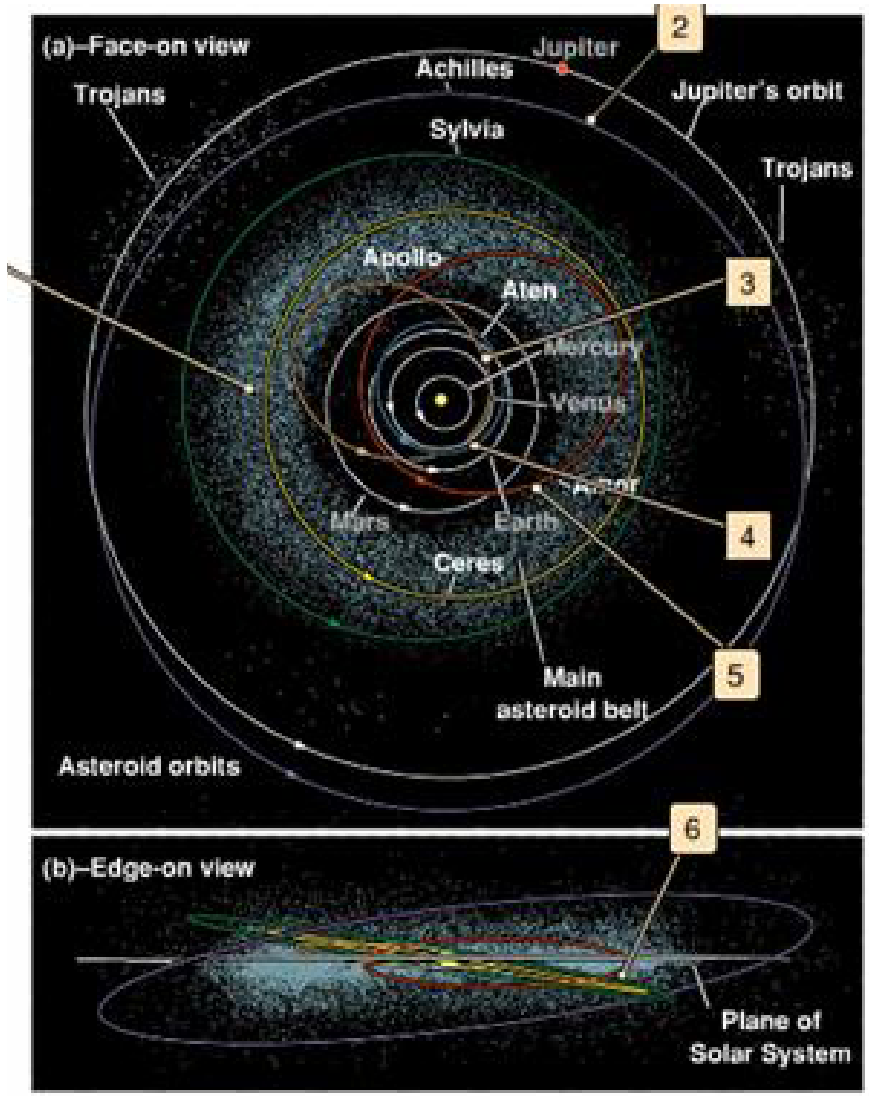


Asteroids

- Classification depends upon formation
- C-type
  - cooled without differentiation
  - snapshot of material of early Solar System
- S-type
  - differentiated – iron core, silicate crust
- M-type
  - iron core without crust

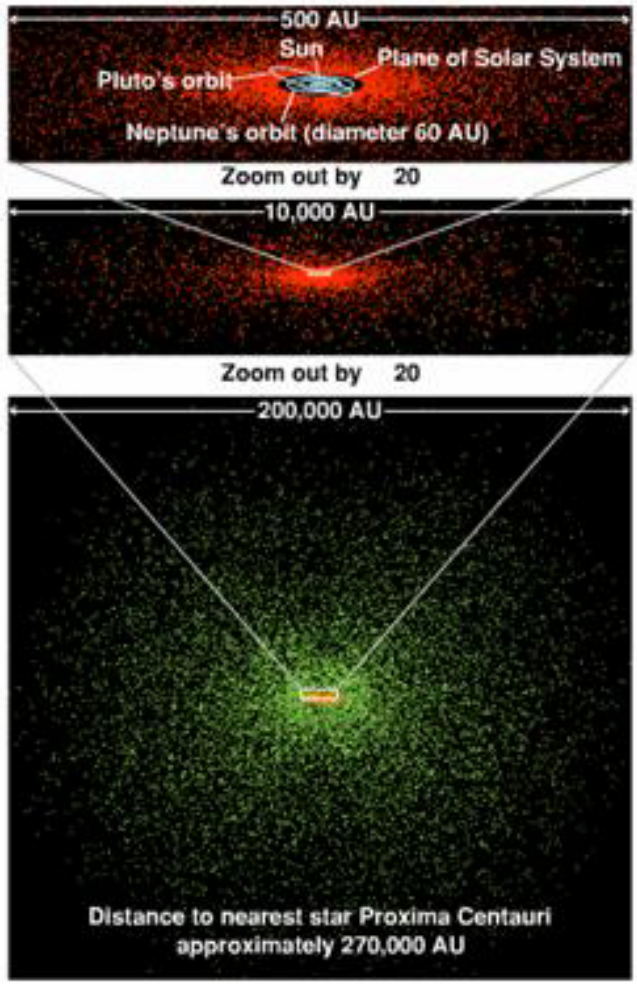
Asteroid Orbits

- Main asteroid belt
  - between Mars and Jupiter
- Orbits vary
  - some asteroids come in closer than Earth
- Asteroids are hard to see
  - we don't know exactly how many asteroids are out there



Outer Regions

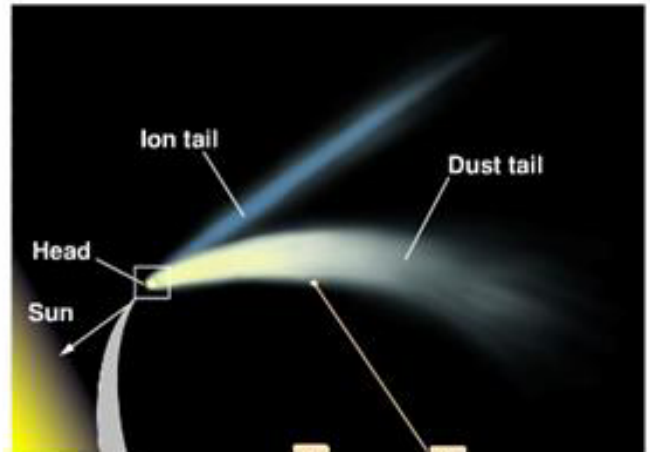
- The Solar System doesn't end with the planets
- Kuiper Belt
  - Kuiper Belt Objects (KBOs)
  - Lie in a plane 30-2000 AU
  - remnants of Solar System formation
- Oort Cloud
  - sphere of objects 2000 – 100000 AU



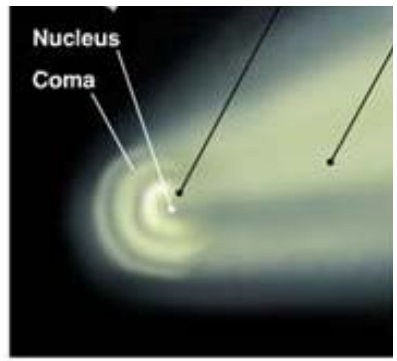
Comets

- Made of icy materials from early in the formation of the Solar System
- Can be seen from their long tails
- Comets in the plane of the planets come from Kuiper Belt
- Comets out of the plane come from Oort Cloud

Anatomy of a Comet



- Core
  - ice and organic materials
- Sunlight converts ice to gas
- Coma
  - cloud of gas surrounding nucleus



- Ion tail
  - charged particles which follow solar wind directly away from the Sun
- Dust tail
  - dust particles which curve away from the Sun
- Both tails always point outward from Sun

Period of a Comet

- Short Period Comet
  - takes less than 200 years to complete orbit
  - generally in plane of Solar System
  - exposed to solar heating many times
- Long Period Comet
  - takes more than 200 years to complete orbit
  - often pristine materials from early Solar System
  - can have very long, bright tails
  - unpredictable arrivals
- About half a dozen new comets observed each year

NEAR Shoemaker

- Near Earth Asteroid Rendezvous
- Shoemaker for Eugene Shoemaker
- Orbited Eros Asteroid for a year
  - studied surface, geology, gravity, magnetic field
- Landed on Eros, Feb. 12, 2001
  - wasn't designed to land
  - continued functioning after landing