

# Chapter 20 - The Solar System

- I. The History of Astronomy
  - A. Geocentric View (geo – earth; centric – centered)
    - 1. Earth believed to be the center of the universe
    - 2. Everything orbited around the Earth while the Earth was still
    - 3. Ptolemy (AD 140) proposed this viewpoint
  - B. Heliocentric View (helio – sun; centric – centered)
    - 1. Sun believed to be the center of the universe
    - 2. Everything orbits around the sun
    - 3. Now know that the sun is only the center of our solar system
    - 4. Copernicus (1500's) first proposed the heliocentric view
    - 5. Galileo (1600's) found proof to support Copernicus
      - a. First to use a telescope to look at the sky
      - b. Saw that the sun rotates on its axis
      - c. Venus went through phases like the moon because of the angle between the sun, moon, and Venus – proof the earth is not the center of the universe
      - d. Jupiter had its own system of objects revolving around it like a little solar system – proof that not everything revolves around the Earth
    - 6. Kepler
      - a. Used math to study the solar system
      - b. Proved planets orbits are elliptical not circular
    - 7. Isaac Newton – determined that two forces act in balance to keep planets orbiting the sun
      - a. Gravity – the force of attraction between objects. Smaller objects in space get pulled toward larger objects
      - b. Inertia – an object in motion will stay in motion unless acted on by an outside force. This force keeps objects moving
      - c. If we lost gravity, we would be flung off into space; if we lost inertia, we would crash towards the sun. They work as a balance.
- II. The Sun
  - A. Basic Stats
    - 1. Contains almost all of the mass of the solar system (99.8%)
    - 2. Made of hydrogen and helium
    - 3. Nuclear fusion provides energy in the sun's core; hydrogen nuclei combine to form helium
    - 4. The sun has enough fuel to last another 5 billion years.
  - B. Layers of the Sun
    - 1. Core – the center of the sun
    - 2. Photosphere – the bottom layer of the sun's atmosphere where light is given off. This is the layer you see in a photo of the sun; photo means light
    - 3. Chromosphere – the middle layer of the atmosphere; its temperature gives the sun its yellow color; chromo means color
    - 4. Corona – the outer atmosphere that can only be seen during a total solar eclipse; it changes shape with storms on the sun
  - C. Features of the sun's surface
    - 1. Sunspots – dark, cooler places on the sun that have magnetic fields
    - 2. Prominences – look like large looping storms on the sun from sunspot to sunspot
    - 3. Solar Flares – sudden, large storms that send solar particles (solar wind) into space; these solar particles cause the auroras and can disable satellites

### III. Solar System

#### A. Formation

1. The solar system formed 4.6 billion years ago
2. Our system formed from clouds of space dust and gas called a nebular and is called the nebular theory
  - a. An exploding star disturbed the gas and dust (nebular)
  - b. The matter began to spin and clump together with most of the matter falling to the center forming the sun
  - c. Gas and dust that did not form the sun and was in orbit further from the center began to clump together to form planets and moons

B. Composition – the solar system is composed of the sun and all objects held by the sun’s gravity. This includes planets, moons, asteroids, comets, and meteors.

#### IV. Planets – all rotate on their axis and revolve around the sun

A. Inner Planets – Mercury, Venus, Earth, and Mars; they are rocky planets with thin atmospheres or no atmosphere

B. Outer Planets – Jupiter, Saturn, Uranus, and Neptune; they have small solid cores but are made mostly of gas

C. Dwarf Planets – do not fit the specifications for a planet; examples are Pluto, Ceres, and Eris

#### V. Comets, Asteroids, and Meteoroids

A. Comets – have very elliptical orbits

1. They come from two areas in the solar system
  - a. Kuiper Belt – just outside Neptune’s orbit; produces short period comets such as Halley’s Comet that returns every 76 years
  - b. Oort Cloud – far out past Pluto; produces long term comets; they can take thousands of years to come around the sun
2. Made of ice, dust, and gas
  - a. Nucleus – icy center
  - b. Coma – evaporating gases
  - c. Tail – streams of gas and dust affected by nearness to the sun

B. Asteroids – rocky material

1. Most are located between Mars and Jupiter in the Asteroid Belt
2. They are important scientifically because they are made of the same material that formed the Earth

C. Meteoroids – rocklike objects in space usually from the asteroid belt but can also be from comet material

1. Called meteors when they hit the Earth’s atmosphere and burn up (“falling star”)
2. Called meteorites when they hit the ground if they did not burn up in the atmosphere
3. Often form craters when they hit moons and planets

#### VI. Mass and Weight

A. Mass – the amount of matter in an object (how much “stuff” it is made of). It does not change based on where you are. You have the same mass on Earth, the moon, and Jupiter.

B. Weight – a measure of the amount of gravitational pull on an object. The higher the gravitation pull (or force) the higher the weight. You weigh less on the moon than you do on Earth, and more on Jupiter than on Earth.