UNIT 3

THE SUN - EARTH – MOON SYSTEM

Our Satellite

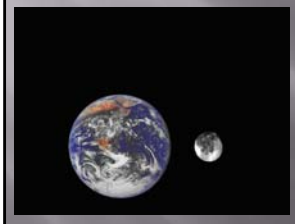
Our Satellite

- Our moon is unique among the over 100 currently known moons in the solar system.
- It is the largest moon relative to its host planet, and it orbits very close to Earth, following an elliptical path about 240,000 miles away.

Our Satellite

- The diameter of the moon is 400 times smaller than that of our sun, but the moon is 400 times closer to Earth than the sun is.
- This relationship leads to a remarkable result: the moon is almost exactly the same angular size as the sun in the sky.
- This fact makes the Earth-moon-sun partnership dynamically unique in the solar system.

Our Satellite

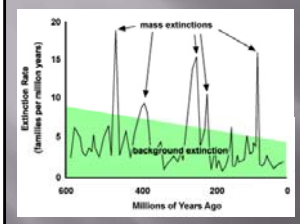


- Some useful numbers and ratios to remember regarding the moon:
- 1. The moon is about one-fourth the diameter of Earth.
- 2. Since Earth has a diameter of 8,000 miles, and the distance between Earth and the moon is 240,000 miles, the moon is 30 Earth diameters away from us.

Our Satellite

- The moon was created by a collision of a Mars-sized body with Earth about 4 billion years ago.

Our Satellite



- Because of its relatively large size in comparison to Earth, it is thought that the moon has absorbed some of the large incoming meteors destined to strike our planet.
- In a sense, the moon has acted as a shield, preventing several additional mass extinctions from occurring in our past.

Our Satellite

- It has large, smooth areas that we call "seas" or "maria."
- These are the result of large meteor impacts being filled in by molten material that formed a dark rock called basalt early in moon's history.

Our Satellite

- Other areas of the moon, the rocky highland areas, appear lighter because they are composed of anorthosite, a rock much like the granite we find on Earth.

Our Satellite

- The moon has no atmosphere and has been geologically inactive for billions of years.

New Moon

- When **none** of the side of the moon facing earth is illuminated it is called a "new moon"

Synodic Period

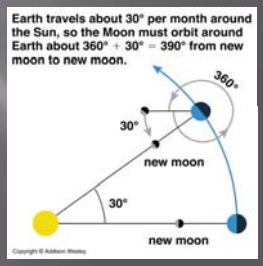
- The Moon reflects the light of the Sun. It has no light of its own.
- It takes 29.5 days from New Moon to New Moon.
- Since the Sun makes the Moon shine, this is the synodic or Sun-referenced period

Sidereal Period

- When measured against the stars, it only takes 27.3 days for the moon to revolve around the Earth.
- This is called the sidereal or star-referenced period.

Synodic vs Sidereal

- The difference in the two periods is caused by the Earth's revolution around the Sun.
- The Moon has to "catch up" because the Earth has moved relative to the Sun during the Moon's revolution.



Rotation vs Revolution

- Rotation
  - Around an axis
  - Causes day/night
  - Causes motion of stars at night
  - Causes one side of Moon to always face Earth
- Revolution
  - In orbit
  - Moon around Earth
  - Earth around Sun
  - Years
  - Causes Phases of Moon

Universal Gravitation

- Gravity holds planets and moons in Orbit
- Theorized by Isaac Newton
  - $F_g = G\frac{m_1 m_2}{r^2}$