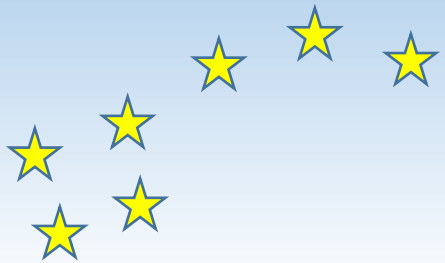


# The Moon

Physical Sciences

Broward College

Prepared for AST 1002

Horizons in Astronomy

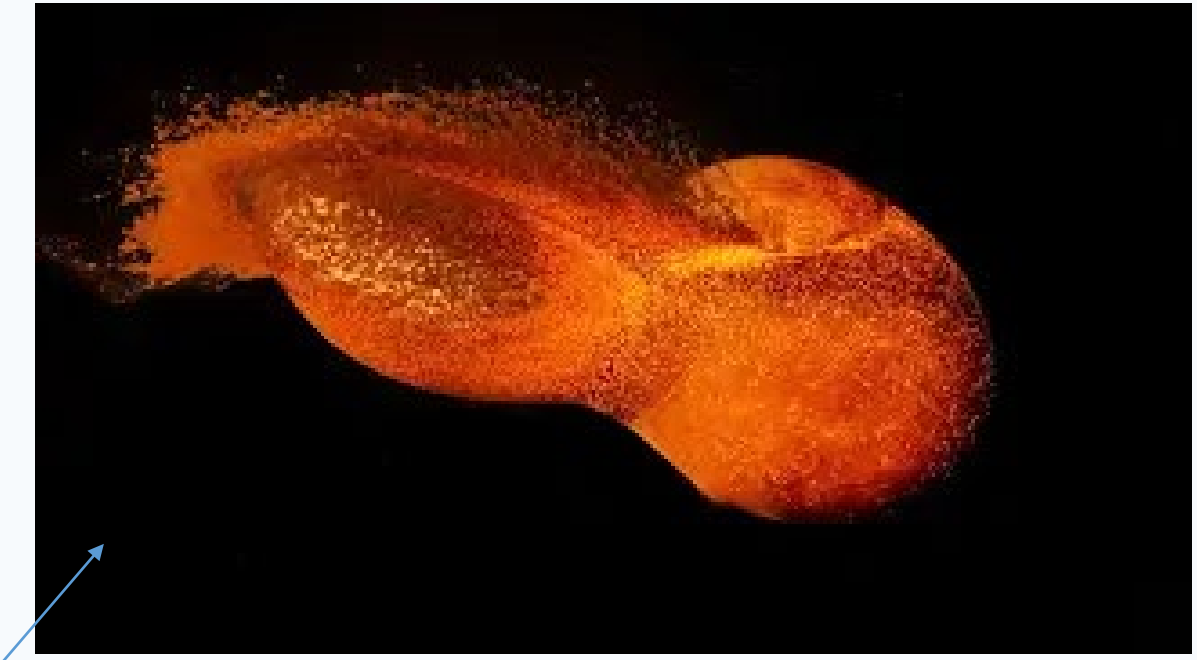
# The Moon's Properties

- Distance: 384,400 km (from Earth)
- Albedo: 0.07
- Size: 3476 km (0.27 $D_E$)
- Mass: 7.35 X $10^{22}$ kg (0.0123 $M_E$)
- Density: 3.36 g/$cm^3$ (0.611 $\rho_E$)

Figure 1. The Moon (Van Werven, 2015)

# Formation of the Moon

- The first theories of the formation of the Moon were capture, accretion, and fission. Capture theory stated the Earth captured the Moon from a rogue orbit. Accretion theory stated the Earth and the Moon formed out the same material at the same time.  Fission theory stated that the Moon was spun off from the Earth.
- The modern theory states that we were hit by a Mars-sized asteroid in the early Solar System and the Moon accreted from the material thrown off by the impact.
- Click on the image to see the impact and the material thrown off by the impact.



# Evolution of the Moon

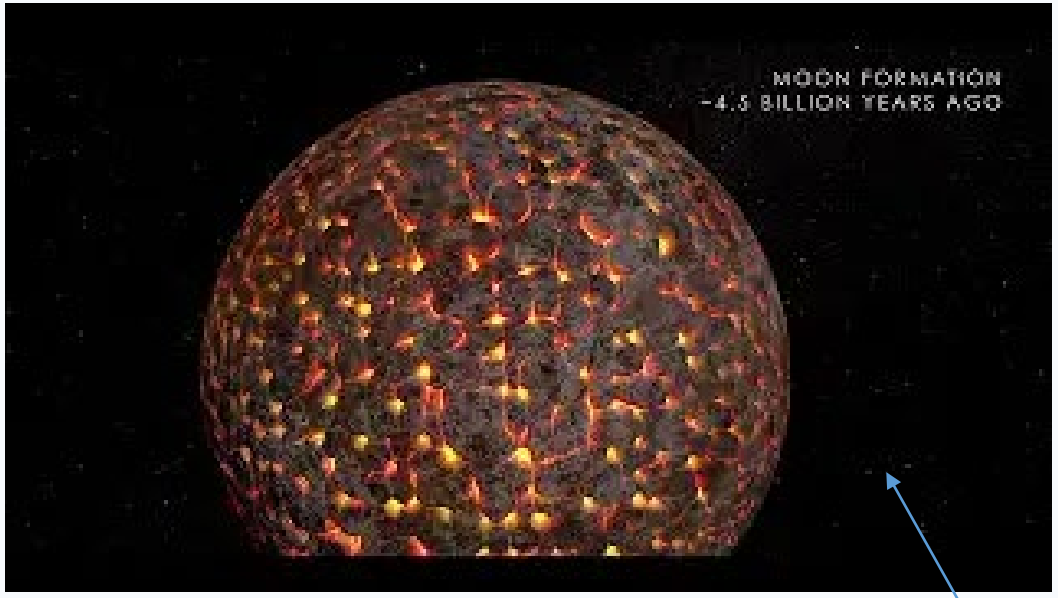
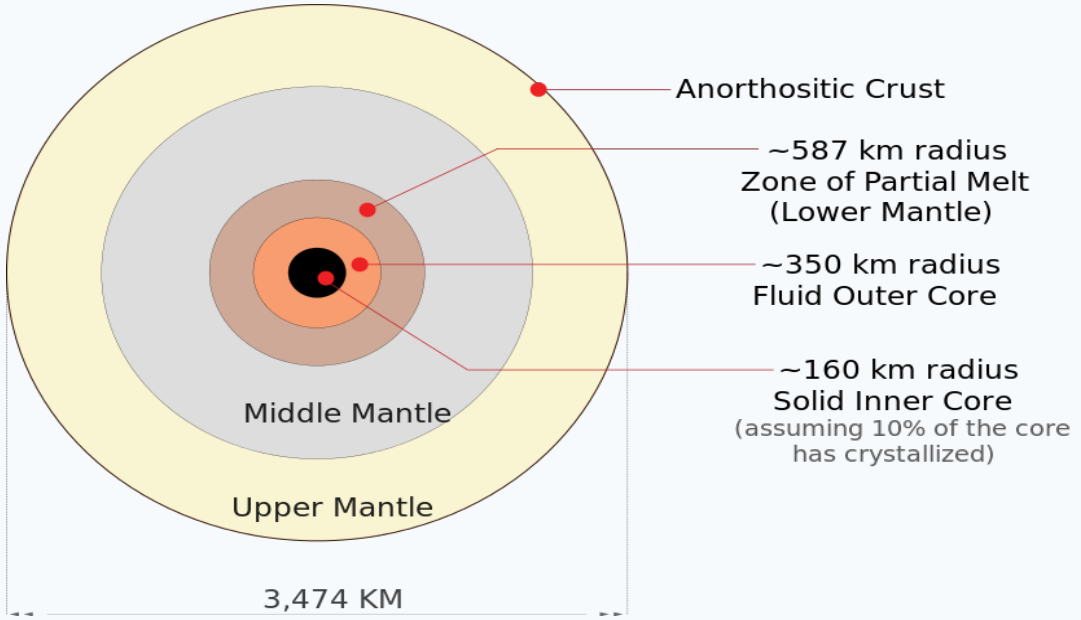



Figure 2. Moon Cross Section (Wiki)




Once the moon formed, it was hit by a large asteroid which nearly tore it apart. Maria formed by cometary impacts. Finally the intercrater highlands formed by multiple small impacts. Click on the image to see the evolution of the moon.

# Solar/Lunar Eclipses

**When the nodes align; there is an eclipse.**

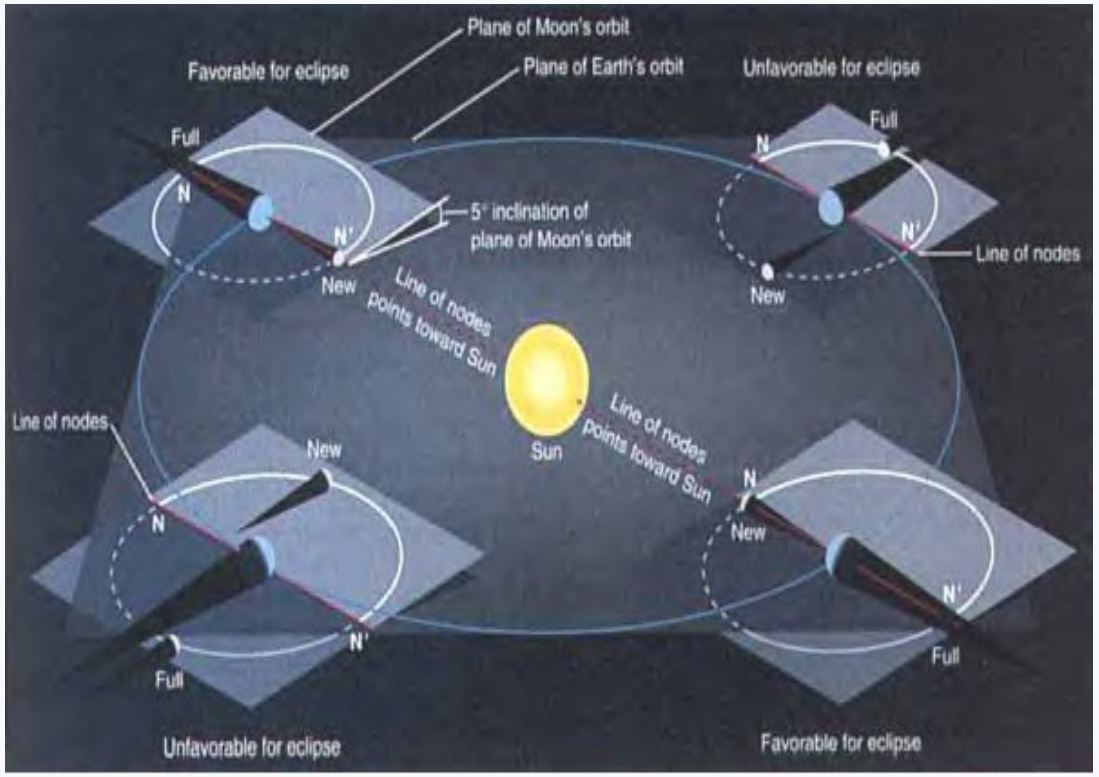



Figure 3. Line of Nodes (Blanco, 2004)

**Types of Eclipses**

| Type | Shadow Location |
|---|---|
| Full | Umbra |
| Annular | Umbra/Penumbra Intersection |
| Partial | Penumbra |

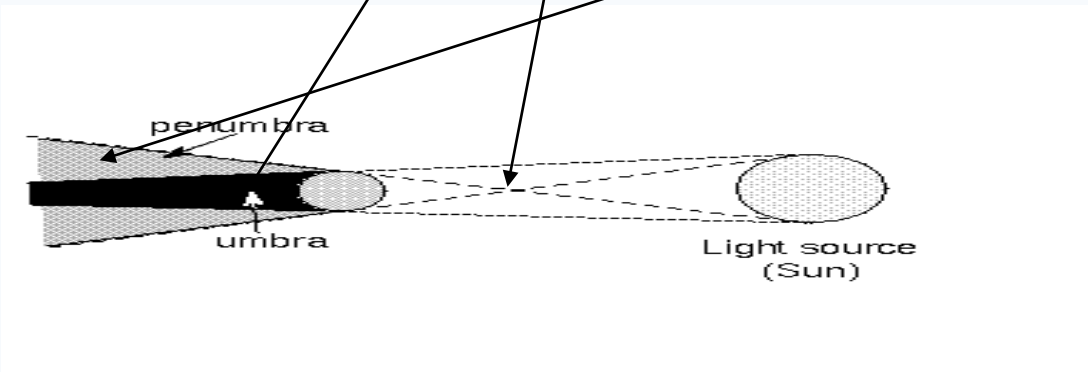



Figure 4. Penumbra/Umbra (Strobel, 2014)

# Eclipses

**Total Lunar Eclipse – Full Phase of the Moon**

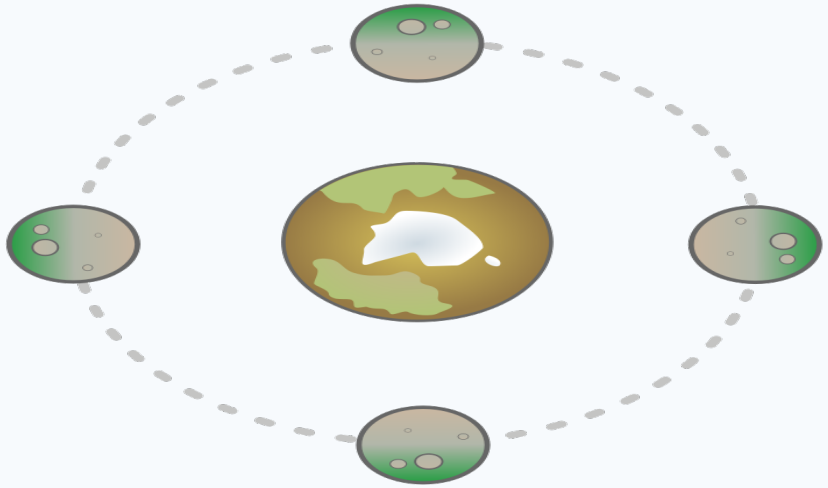
Figure 5. Total Lunar Eclipse (Van Werven, 2015)

**Partial Solar Eclipse – New Phase of the Moon**

Figure 6. Partial Solar Eclipse (Van Werven, 2015)

# Moon Motion's

Figure 7. Tidal Gravitational Locking of the Moon (Wiki)



Since the Moon has the same rotational period as a revolution, the Moon only shows the Earth one face.  We do not observe the far side from Earth. The Moon's gravity affects the water on the Earth which pulls with it as it orbits.  We see four tides (two low and two high tides) per day. When the moon is in certain phases we either see a lower tide (neap) or higher tide (spring).

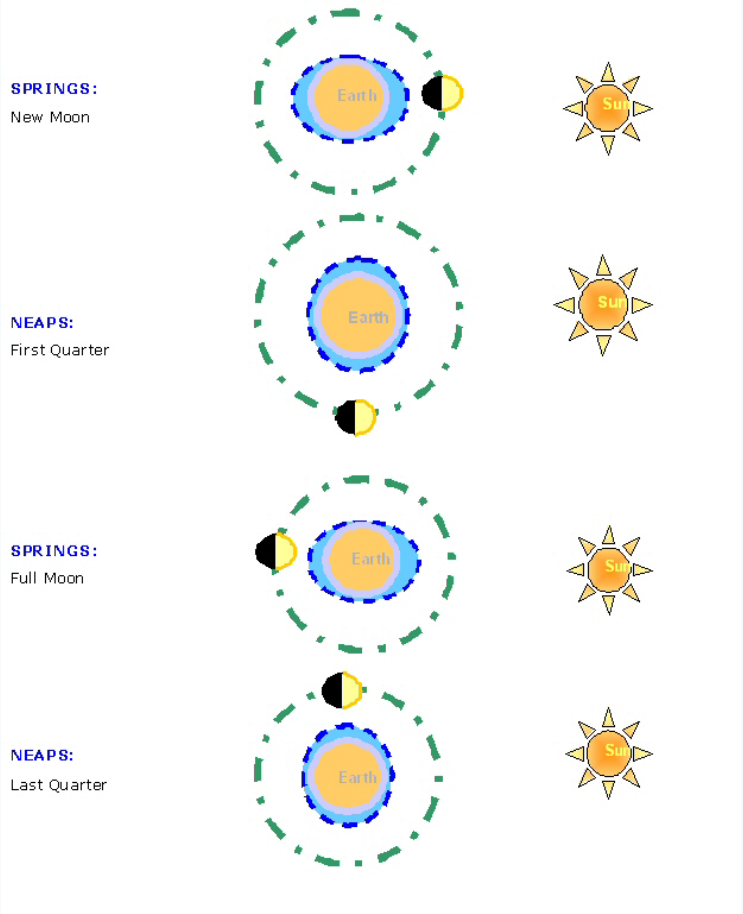



Figure 8. Moon and Tides (Wiki)

# Moon's Geology: Main Features

- Craters
  - Caused by impacts by asteroids or comets
  - Types: Regular, Ray
- Maria
  - Large impact craters that have filled in with lava appearing as a "sea"
- Highlands
  - Large flat areas that are highly impacted with craters
- Mountains
  - Caused by the cooling of the Moon's surface and by ancient volcanoes, usually around Maria or Craters

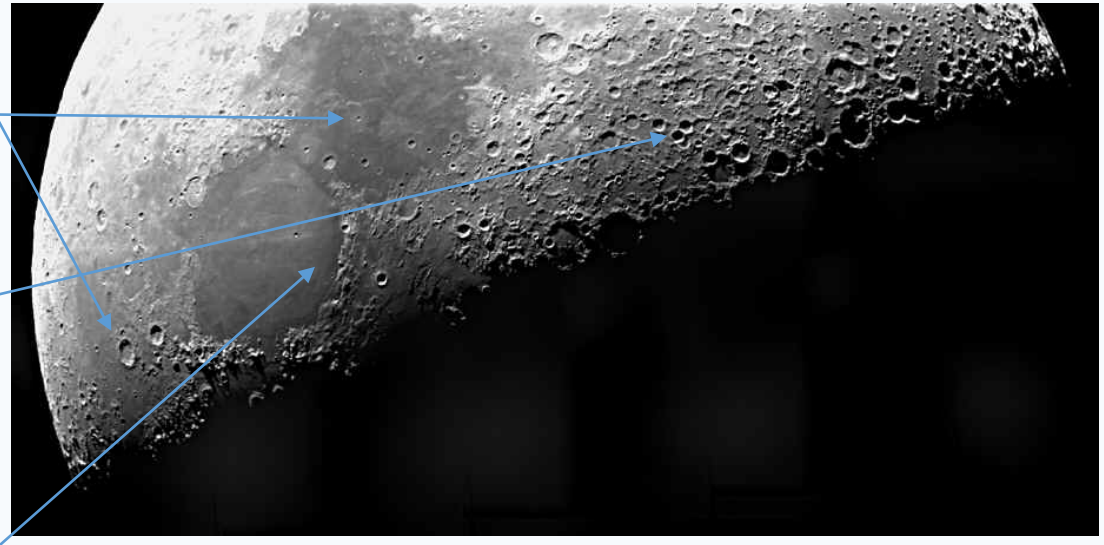


Figure 7. The terminator of the Moon (Van Werven, 2015)

# Moon's Geology: Minor Features

- Riles: Small canyons caused by plutonic and impact processes.
- Ridges: Small mountain regions caused by plutonic and impact processes.
- Scarps: Ancient crater edge.
- Powder fields: Dust fields from lunar impacts
- Volcanic Glass: Volcanic glass from ancient volcanoes.

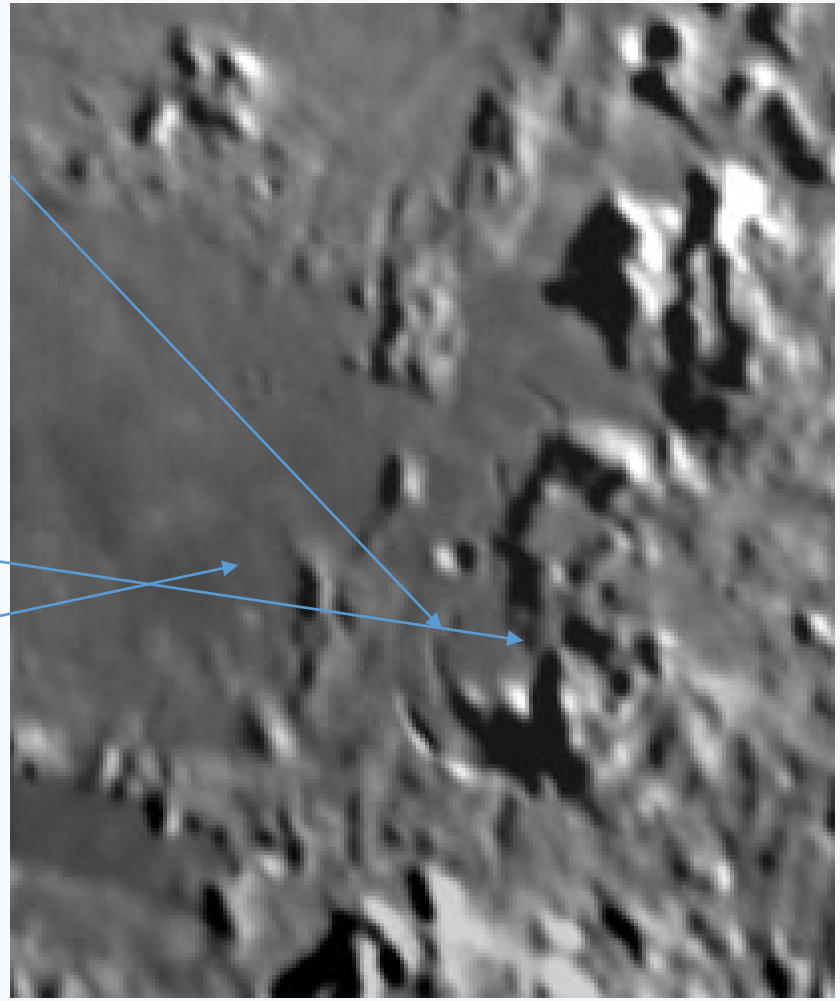


Figure 8. Apollo 15 Landing Site (Van Werven, 2015)

# Book/Course Image References


- Blanco, S. (2004) Retrieved from: http://www.ccs.neu.edu/home/sblanco/astro/moon.html
- Strobel, N. (2014) *Astronomy Notes* Retrieved from: http://www.astronomynotes.com
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