

Universal Gravitation

History of the universe: There has always been wonderment about outer space, and what goes on out there.

Flat Earth Society

- All the stars, sun, and moon are on a sphere rotating around the earth.
- Still around today.

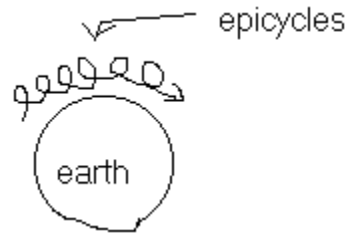
Aristotle

- Earth the center! Everything revolves around it pushed by spirits.

Ptolomy pronounced (Tolomy)

- Earth still the center added “Epicycles” to explain the wandering of planets.

- Still geocentric (earth centered)



Copernicus

- Argued that the world was heliocentric (sun centered), ridiculed because of it.
- Disagreed w/ Aristotle and Church (vs. in Proverbs. “God set earth on its foundations”)

Galileo

- Agreed w/ Copernicus, and was able to offer evidence with his refracting telescope.
- Church made him recant his views which he had published.

Tycho Brahe

- Rich and Arrogant, friends with the king.
- Lost nose in bar fight.
- Got an island given to him to study the stars, Obtained VERY good data, using huge equipment. Pic on pg 156 of text.
- Hired Johannes Kepler to help w/ work and collect data, however refused to let Kepler study the data.

- Was writing book to explain the motion of stars, died before he could finish, asked Kepler to finish for him. This gave Kepler access to the data.
- Brahe's ideas didn't amount to much, He couldn't interpret the data and his system of planetary motion is physically impossible.

Johnnaes Kepler

- Didn't have good life. He was poor, wife left him, kids died.
 - Very Very Very good at math, called the "Human Calculator"
 - W/ Brahe's data came up with good system describing planetary motion. 99% correct –still used for close aprox.
- Kepler's 3 laws of planetary motion
1. Planets move in ellipses, not circles, (egg shape) sun is at one foci.
 2. Planets move faster, when closer to the sun. (Area of arc in equal time intervals)
 3. $T^2/T^2 = r^3/r^3$ for two planets around one sun.

Newton

- Saw apple fall, same gravity that pulls apples provides F_c for the planets in circ. motion.
- Realized that earth provided the force.
- Came up with following equation.

$$F=G \frac{m_1 m_2}{r^2}$$

Cavendish gave G latter
 $G = 6.67 \times 10^{-11} \text{ Nm}^2/\text{kg}^2$

This means ALL masses pull on each other

*Warning label

*Calc force between two students.