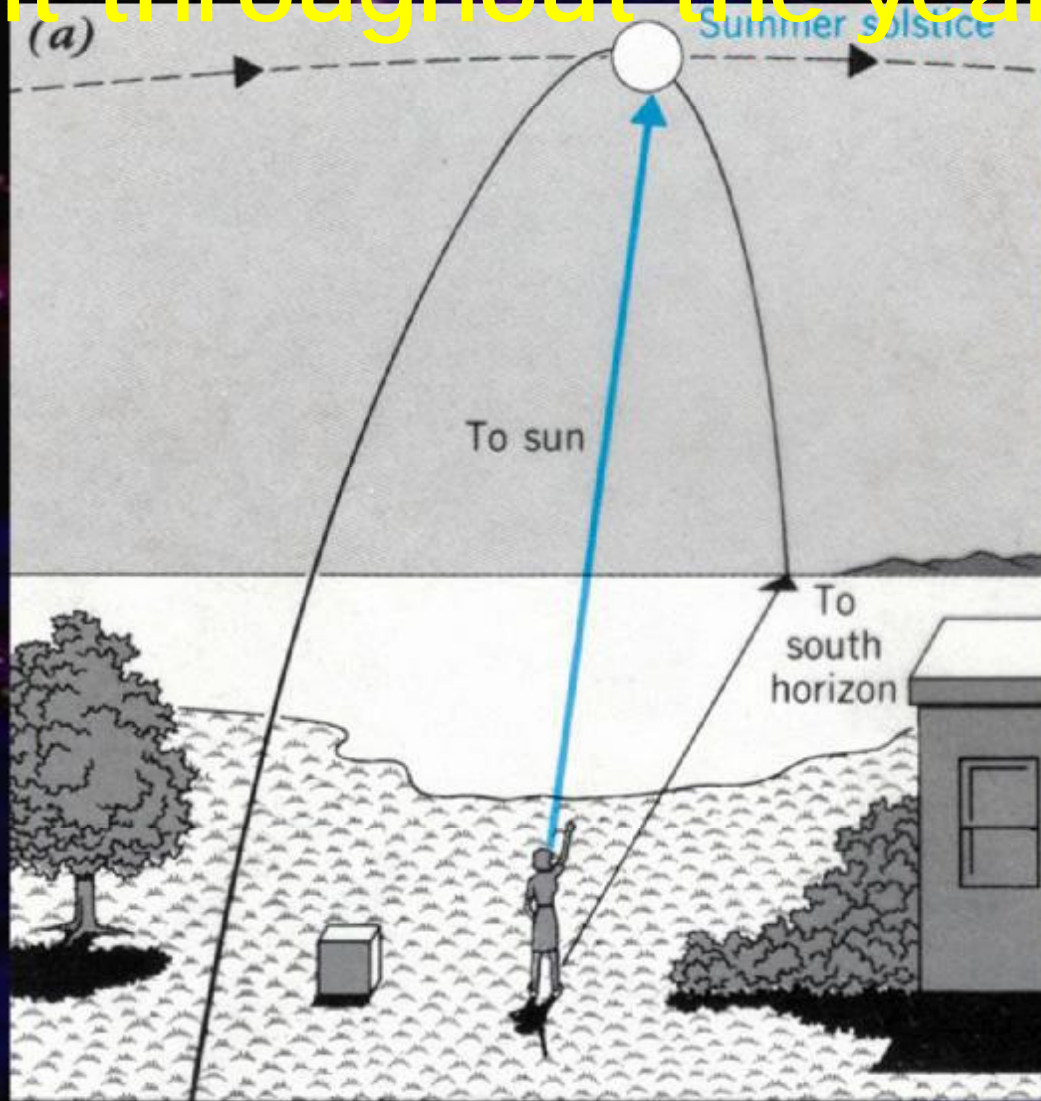
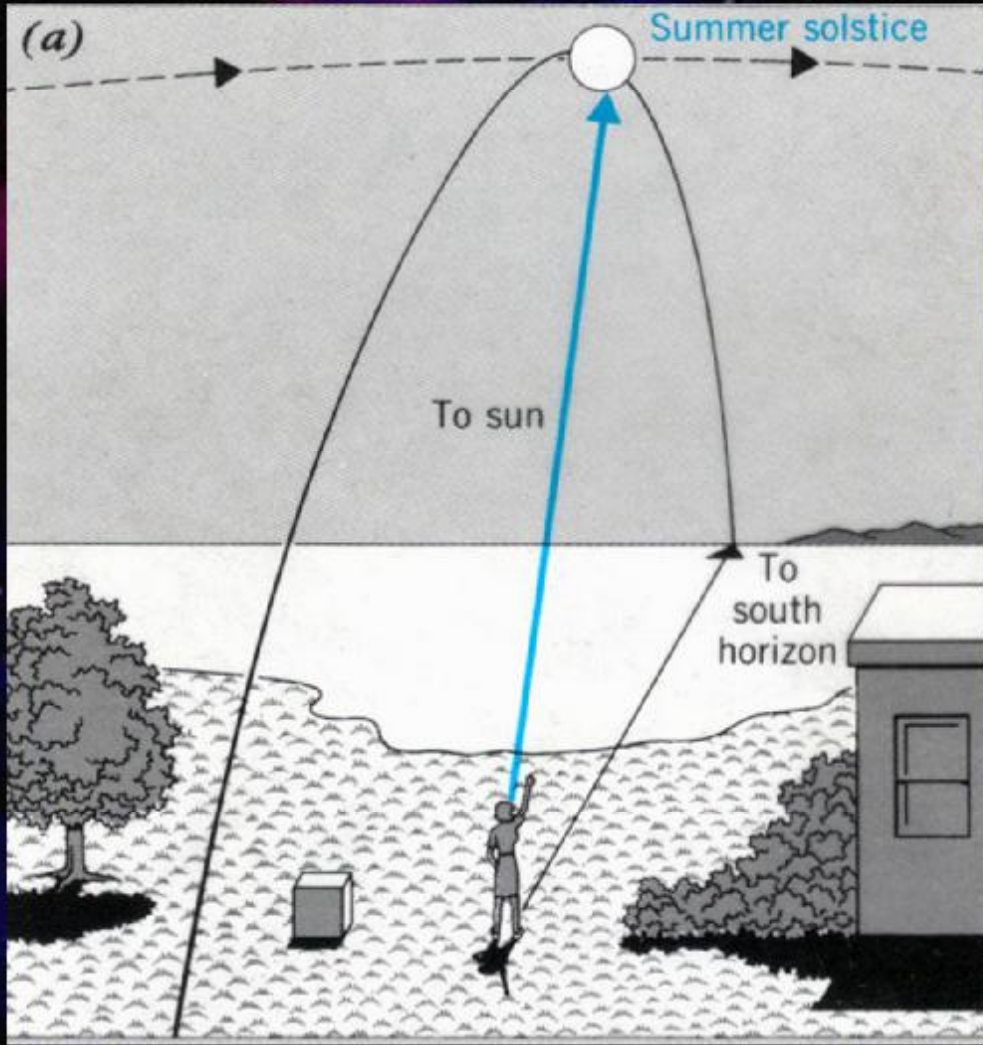
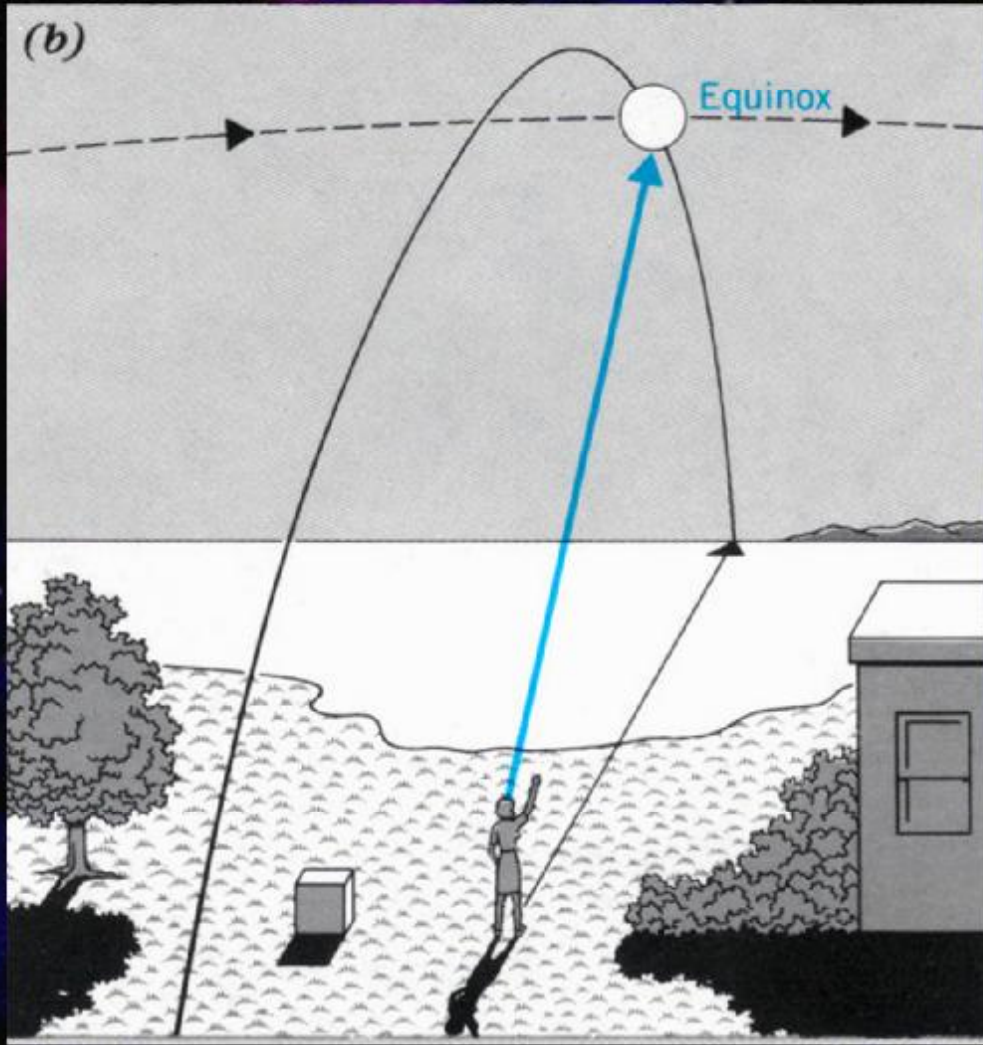
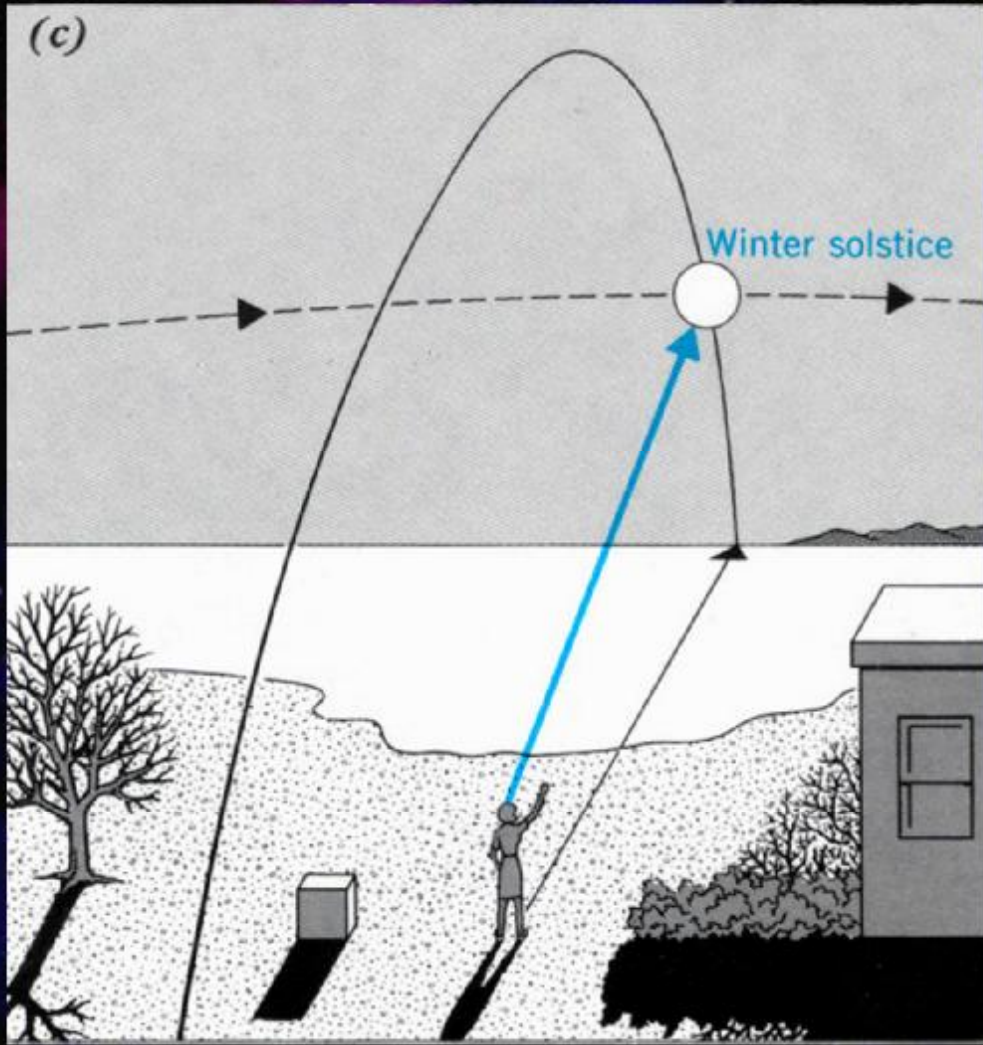


2. The height of the Sun at noon is different throughout the year.

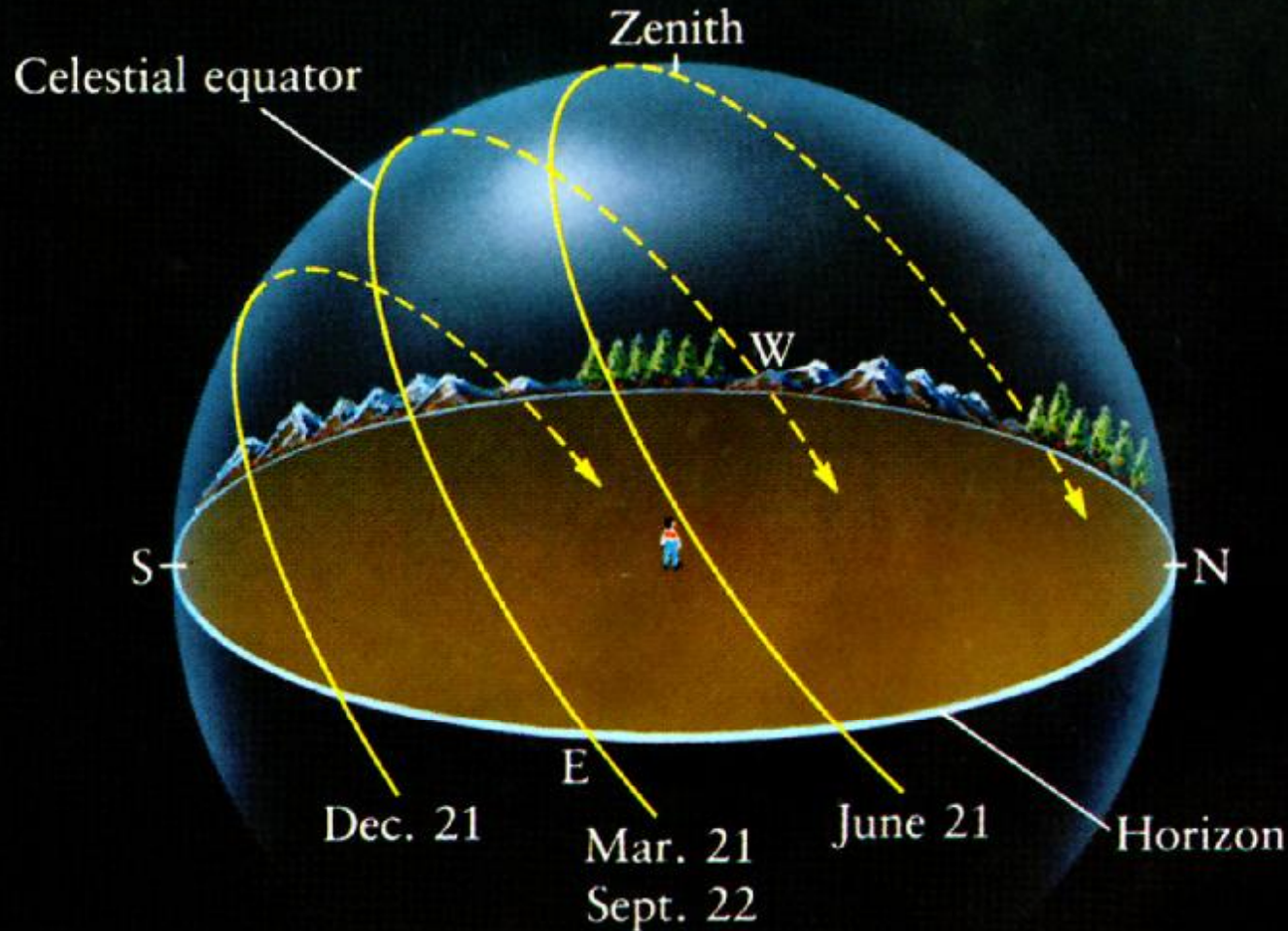




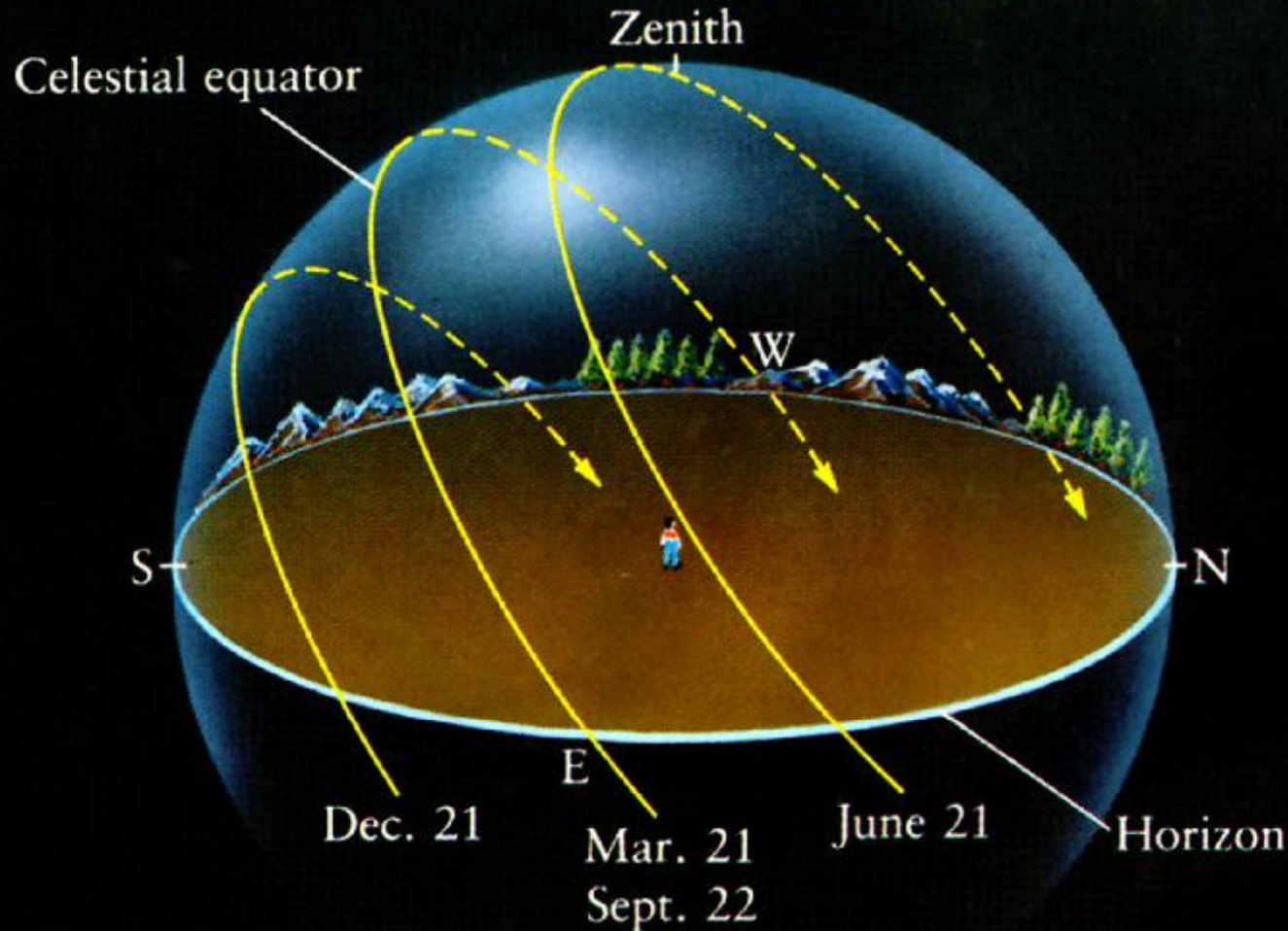




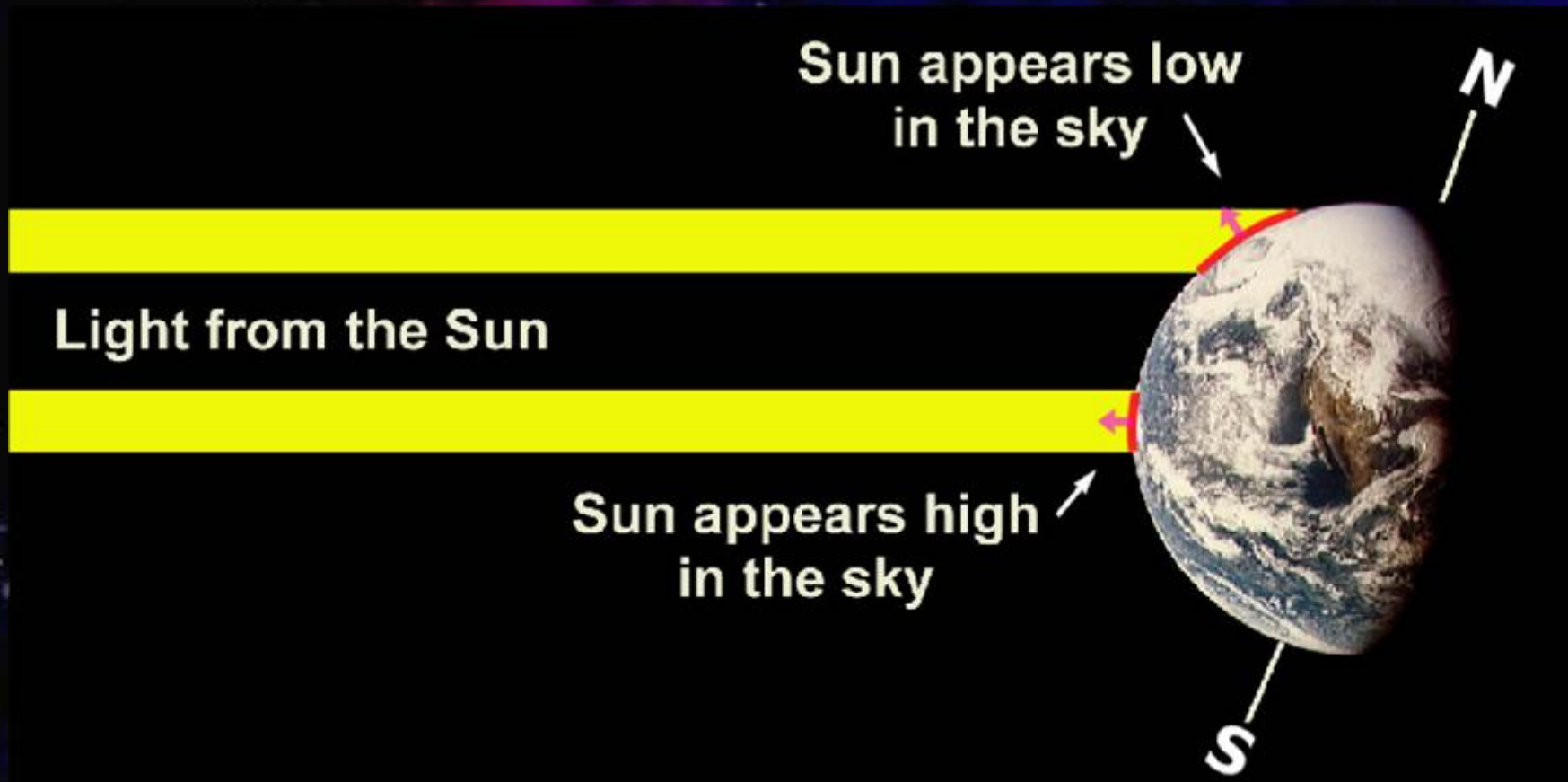
3. The size of the Sun's path across the sky is different throughout the year.

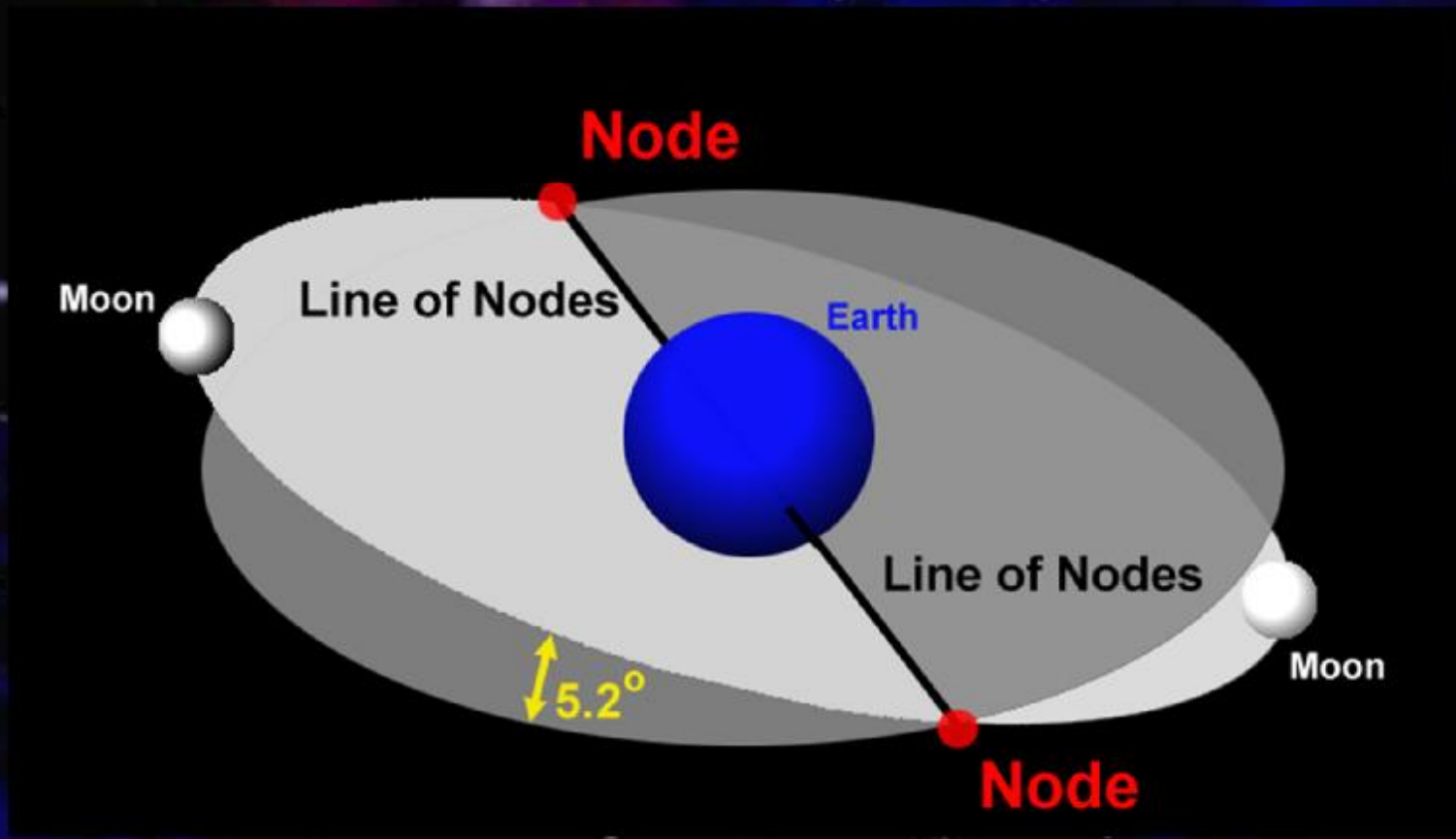


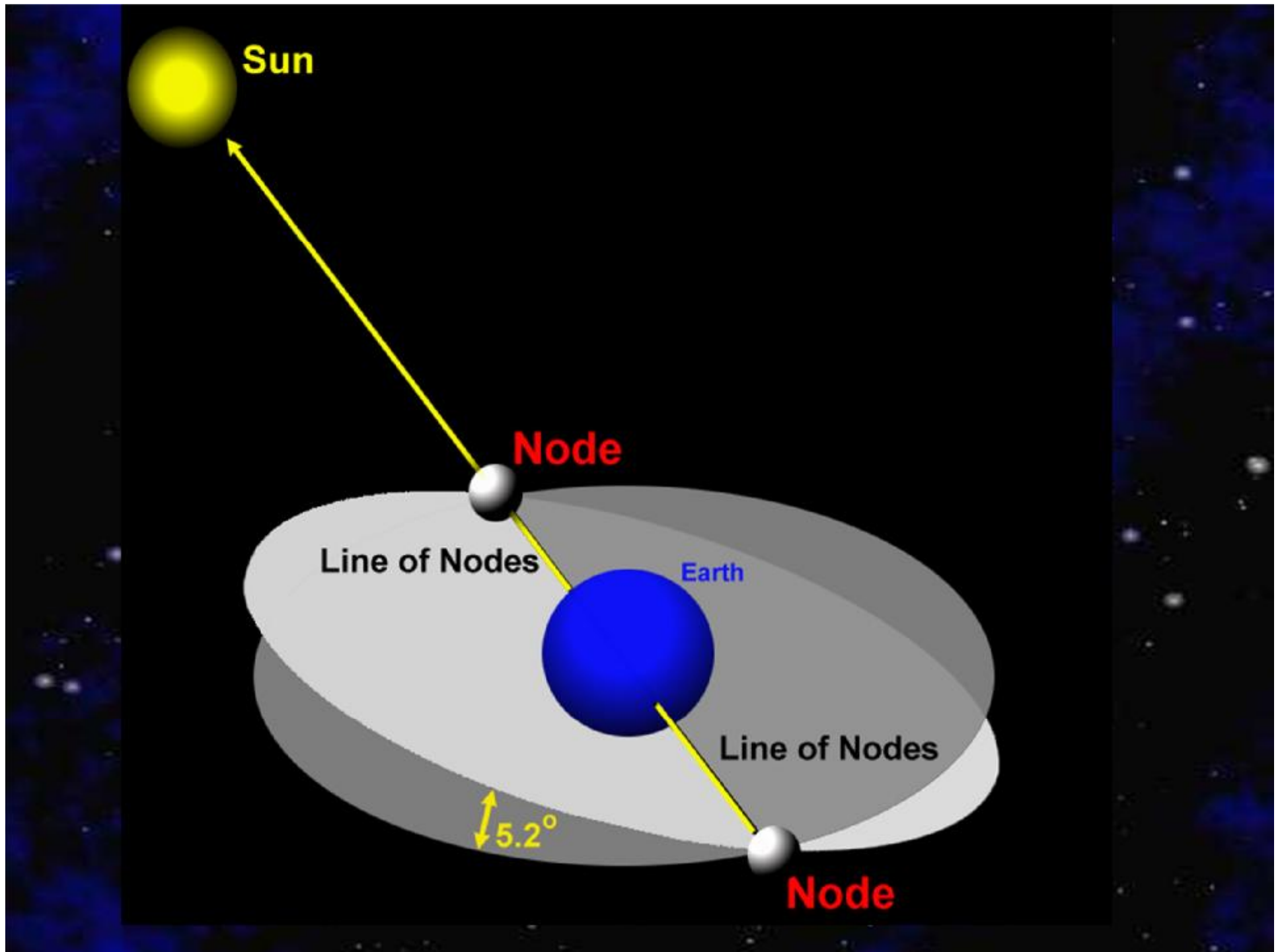
4. The length of daylight compared to the length of night changes each day.



The intensity of sunlight striking the Earth varies with location:







THE HISTORY OF ASTRONOMY

"It is therefore impossible that reason not previously instructed should imagine anything other than that the Earth is a kind of vast house with the vault of the sky placed on top of it; it is motionless and within it the Sun being so small passes from one region to another, like a bird wandering through the air."

-Johannes Kepler

"Our ancestors were eager to understand the world but had not quite stumbled upon the method."

- Carl Sagan

THE HISTORY OF ASTRONOMY

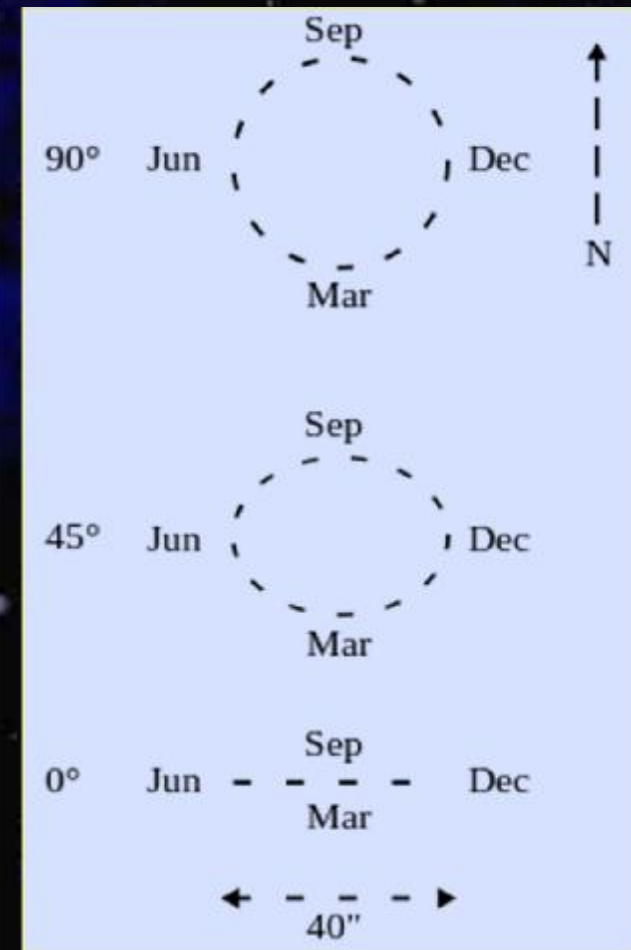
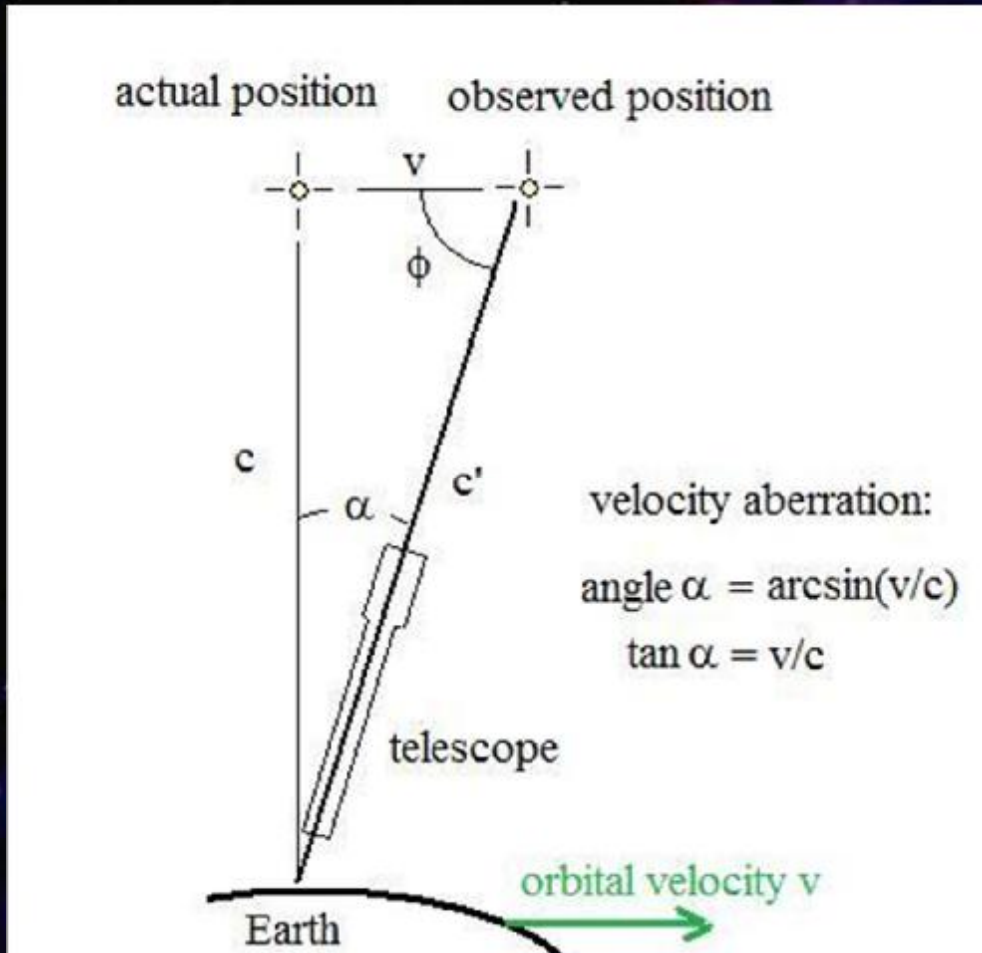
"The history of astronomy is a history of the displacement of man from the center of everything"

-Dale Mais

Does the Earth rotate??



Does the Earth rotate??



The Greeks had it right!

The earth is a sphere-diameter was measured

The earth was NOT at the center of the Universe
The sun was at the center.

Speculated about nature of atom, life on other
planets

GEOCENTRIC COSMOLOGY

- n All celestial bodies revolve around the Earth. Therefore, the Earth must be the center of the Universe.
- n Result of apparent motions of celestial bodies within the celestial sphere.



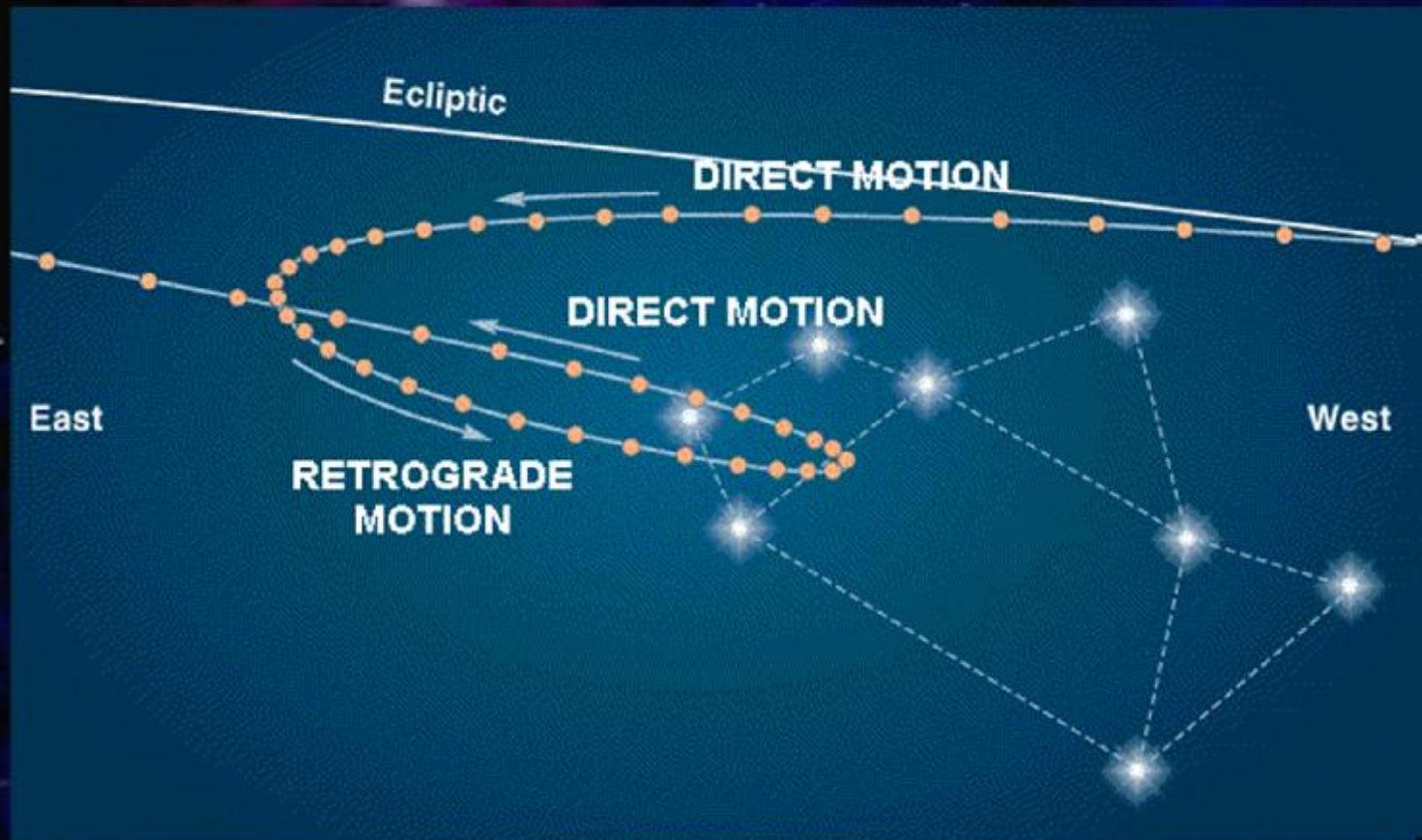
planetos

"planetos" -or- "planets"

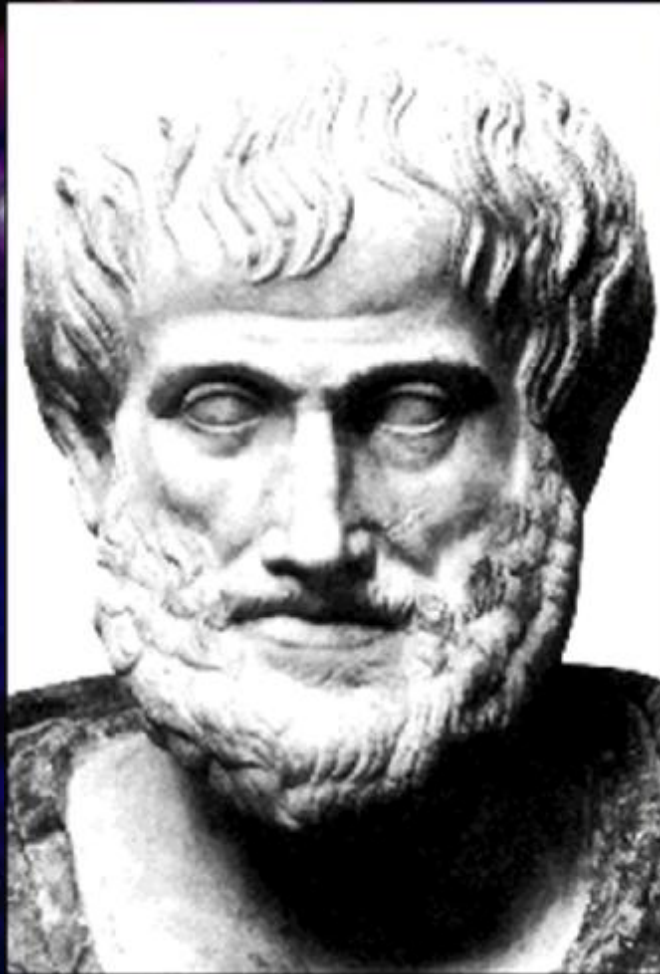
Greek for "wanderers"

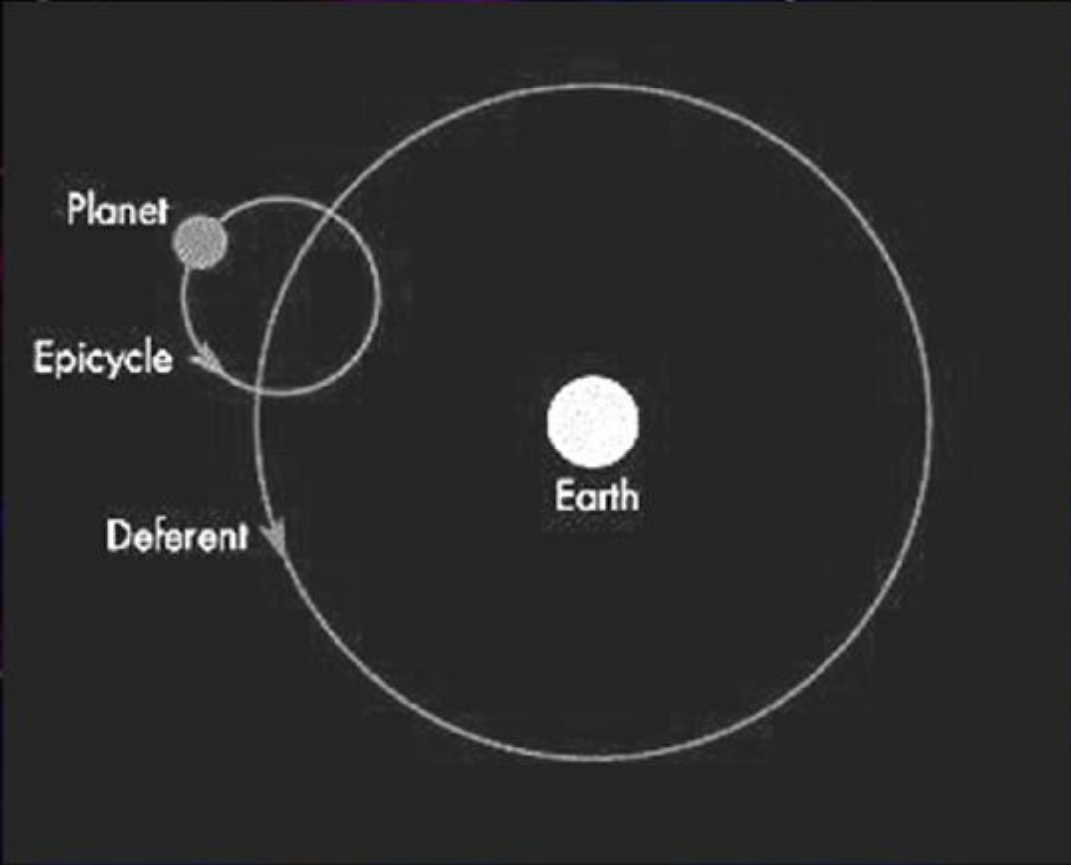


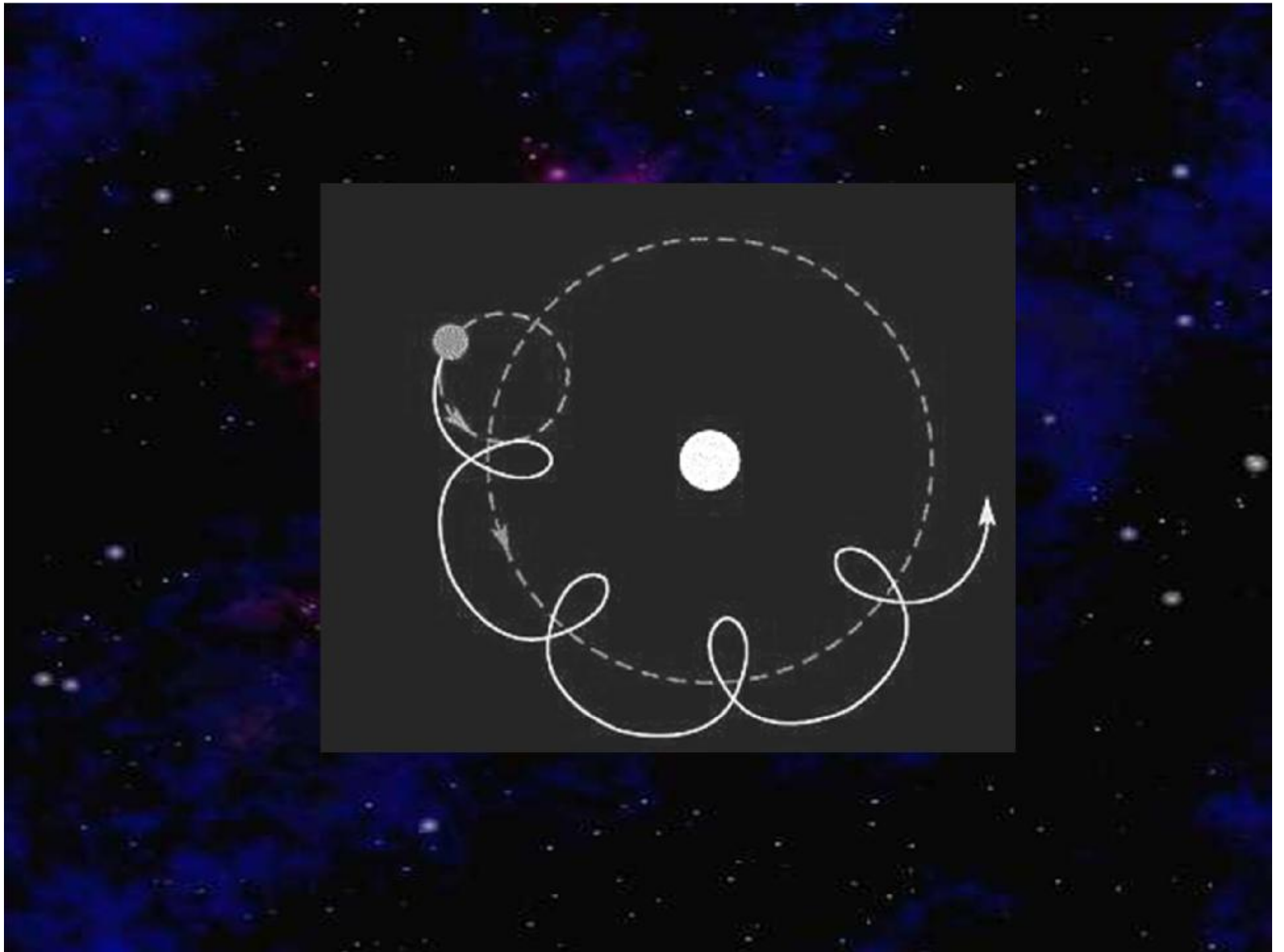
Observed motions of the planets:



Aristotle (~350 B.C.)



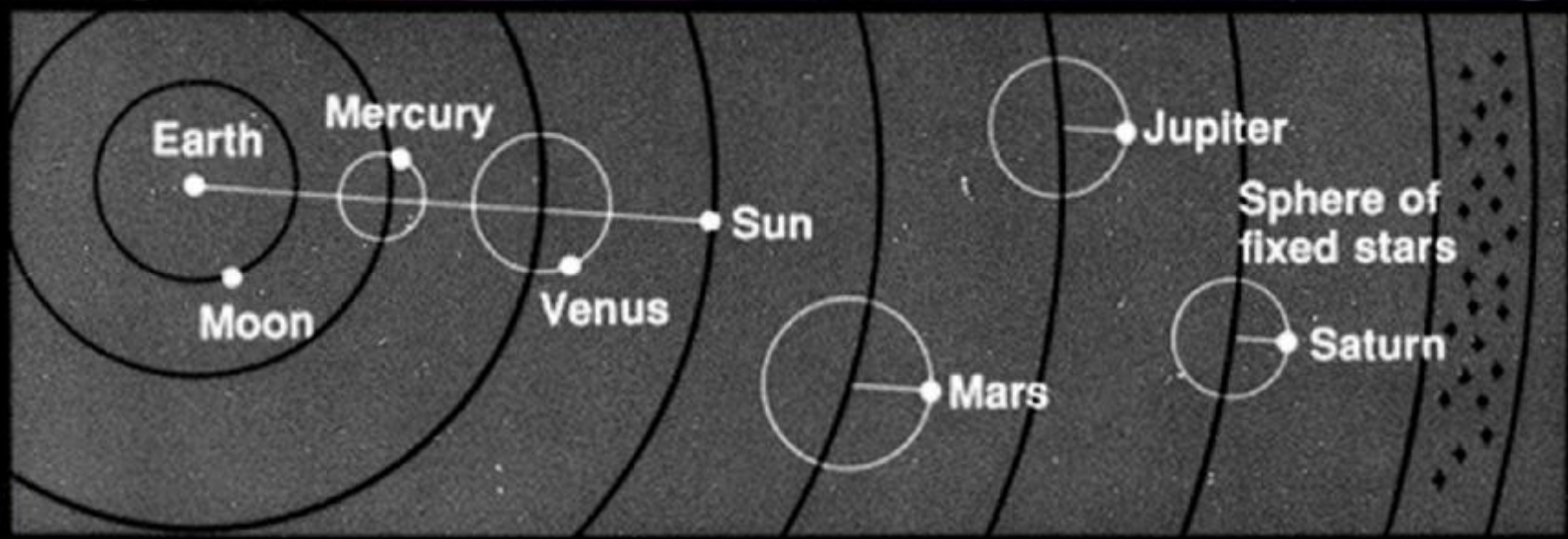




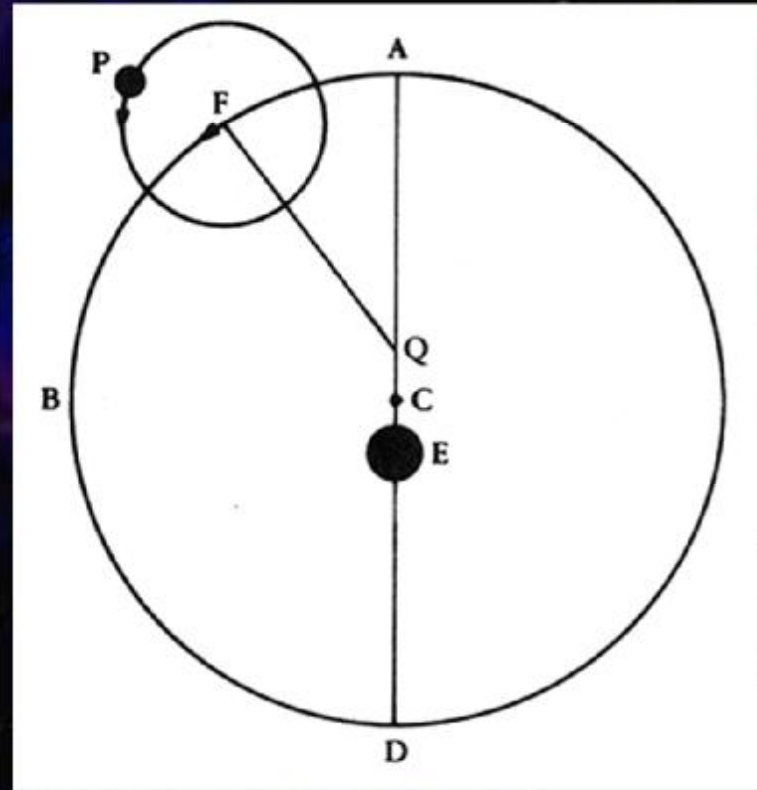
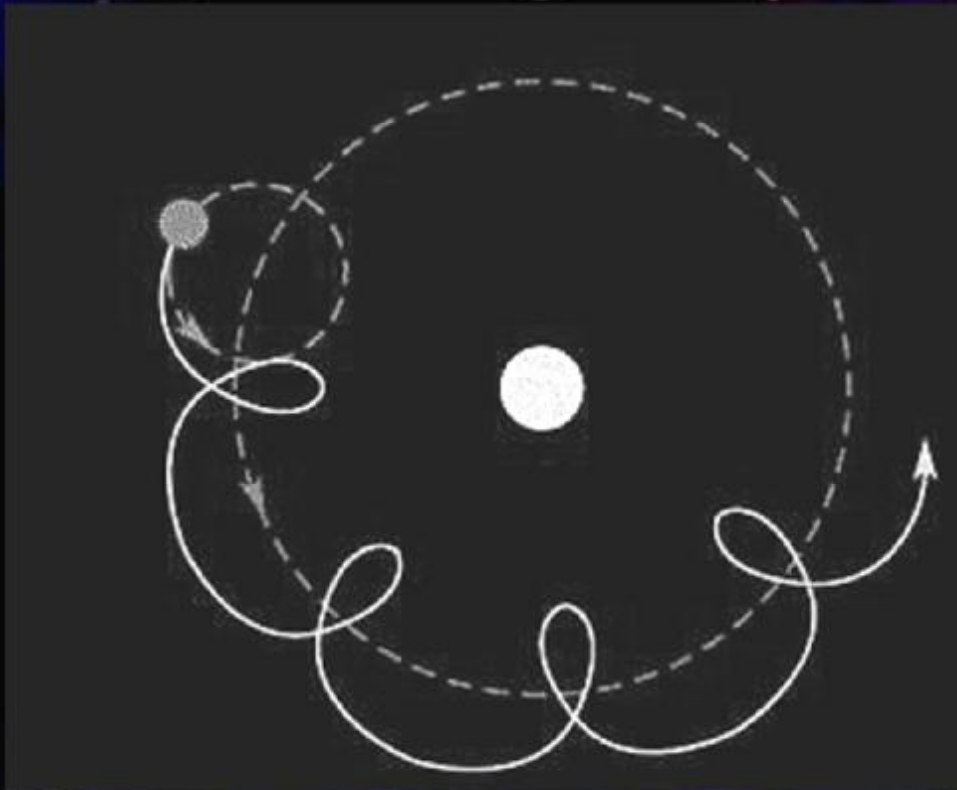
Claudius Ptolemeus (~100 A.D.)



The Ptolemaic System:



Still, the predictive power was limited

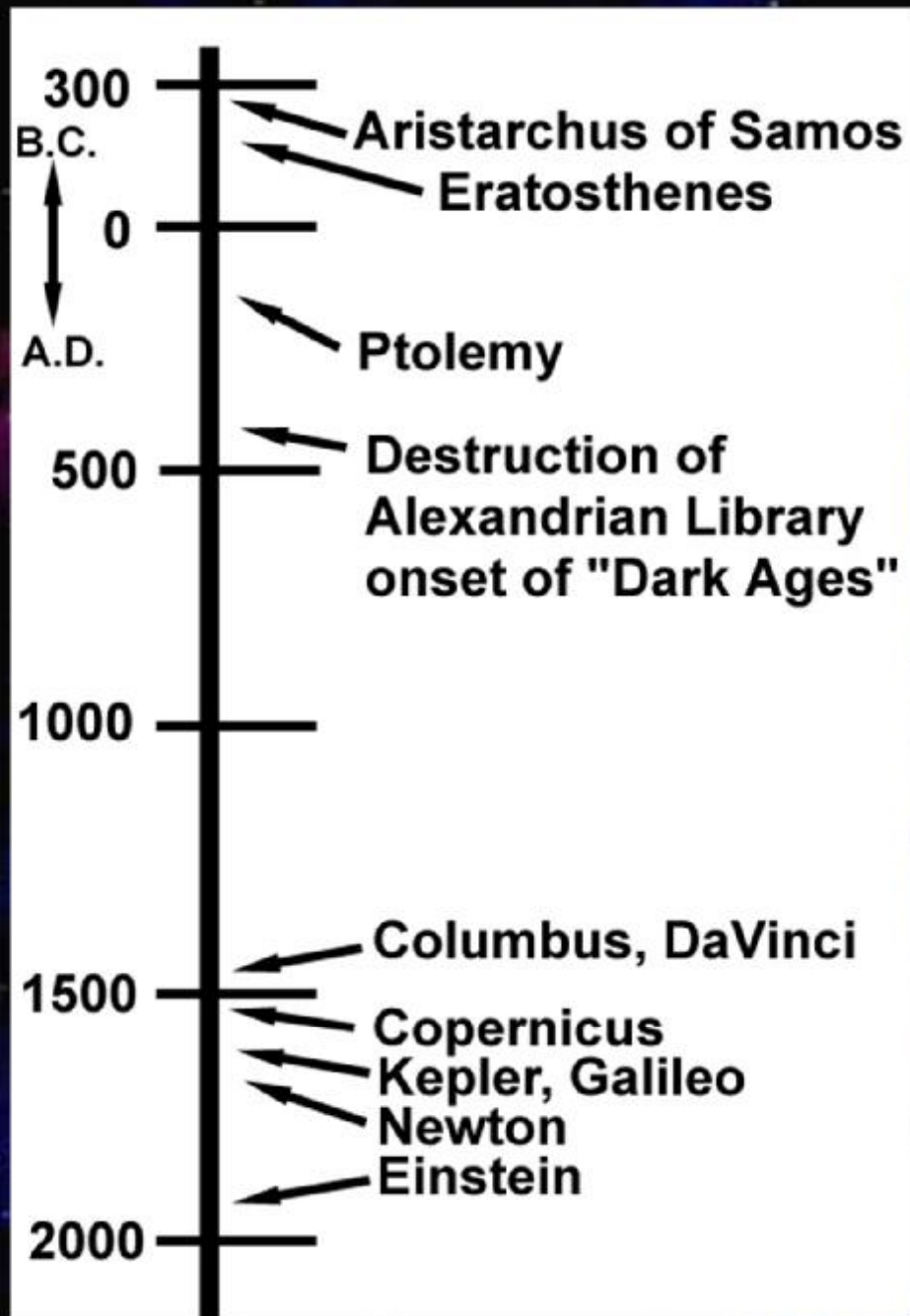


Rules of the Ptolemeic System:

- n The Earth is the center of the Universe.
- n All celestial bodies revolve around the Earth.
- n All celestial bodies are perfect and unchanging.
- n All celestial bodies exhibit uniform circular motion.



THE ASTRONOMICAL REVOLUTION



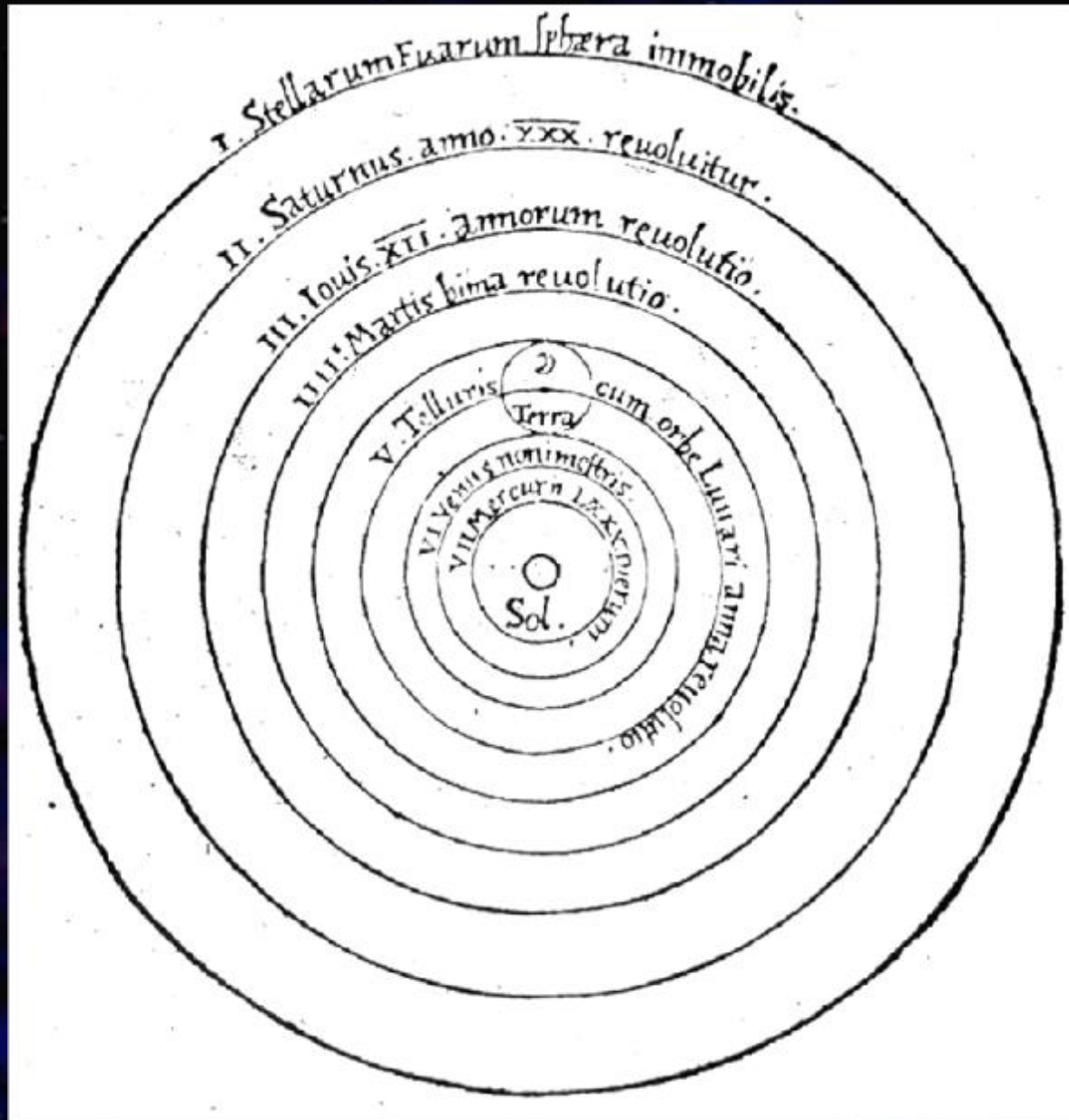
HELIOCENTRIC COSMOLOGY

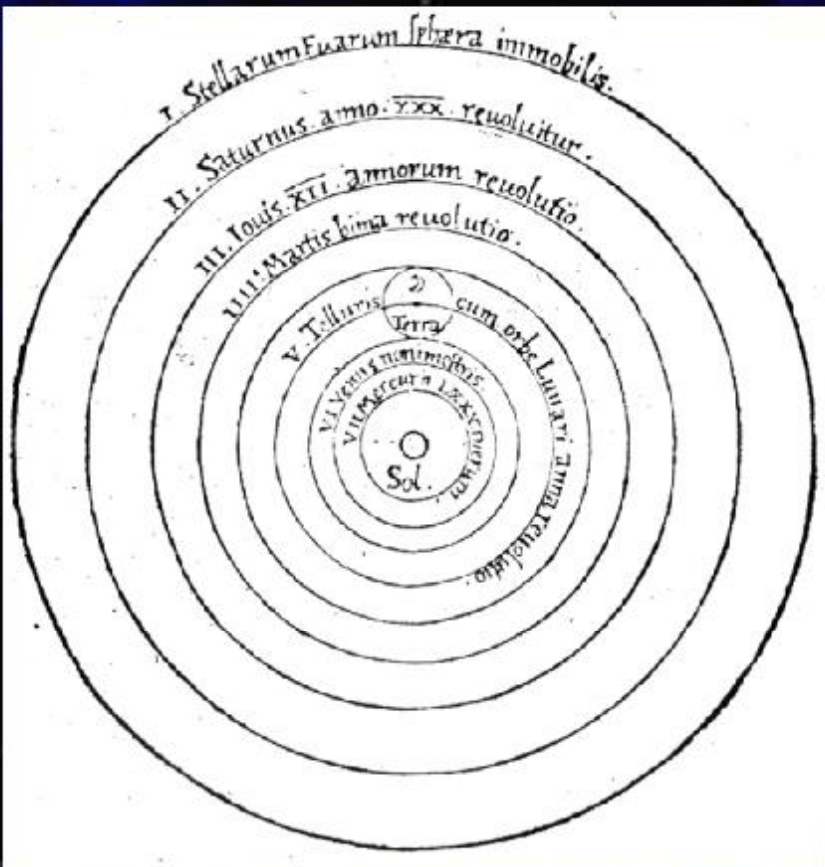
- n The SUN is the center of the solar system and Universe. All planets, including the Earth, move around the Sun.

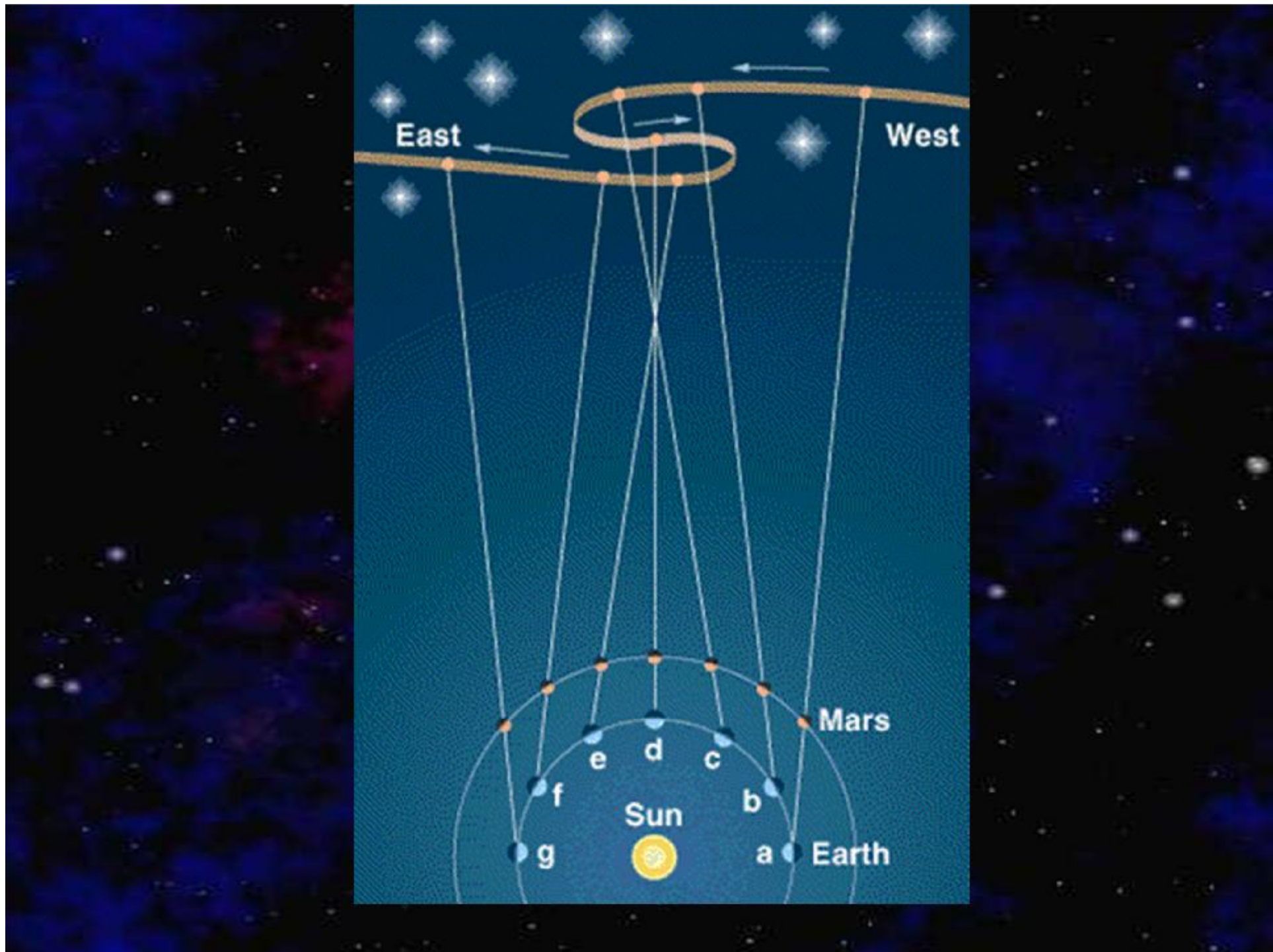
Nicholas Copernicus (1473 – 1543)

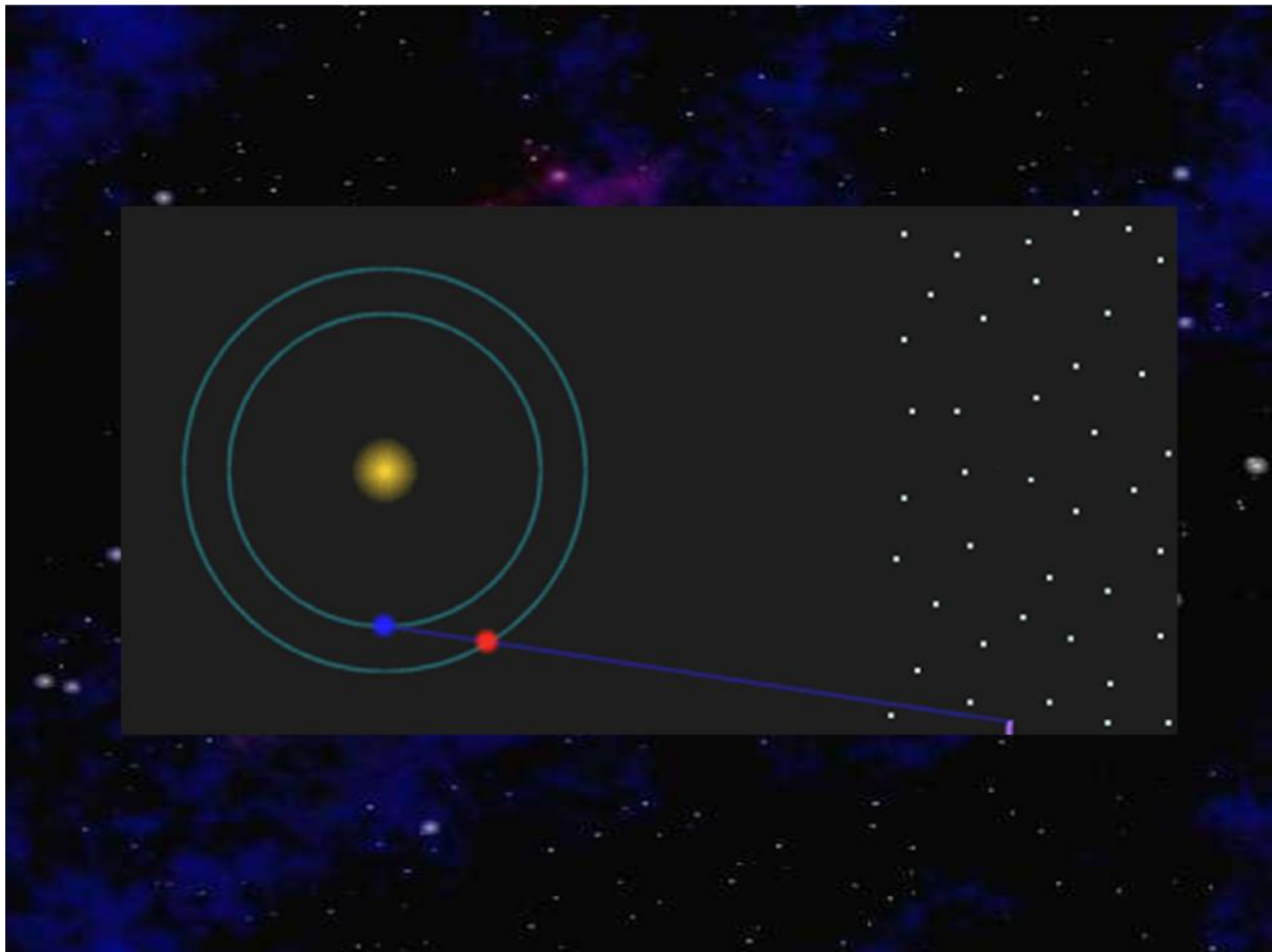


The Copernican Model (1543):







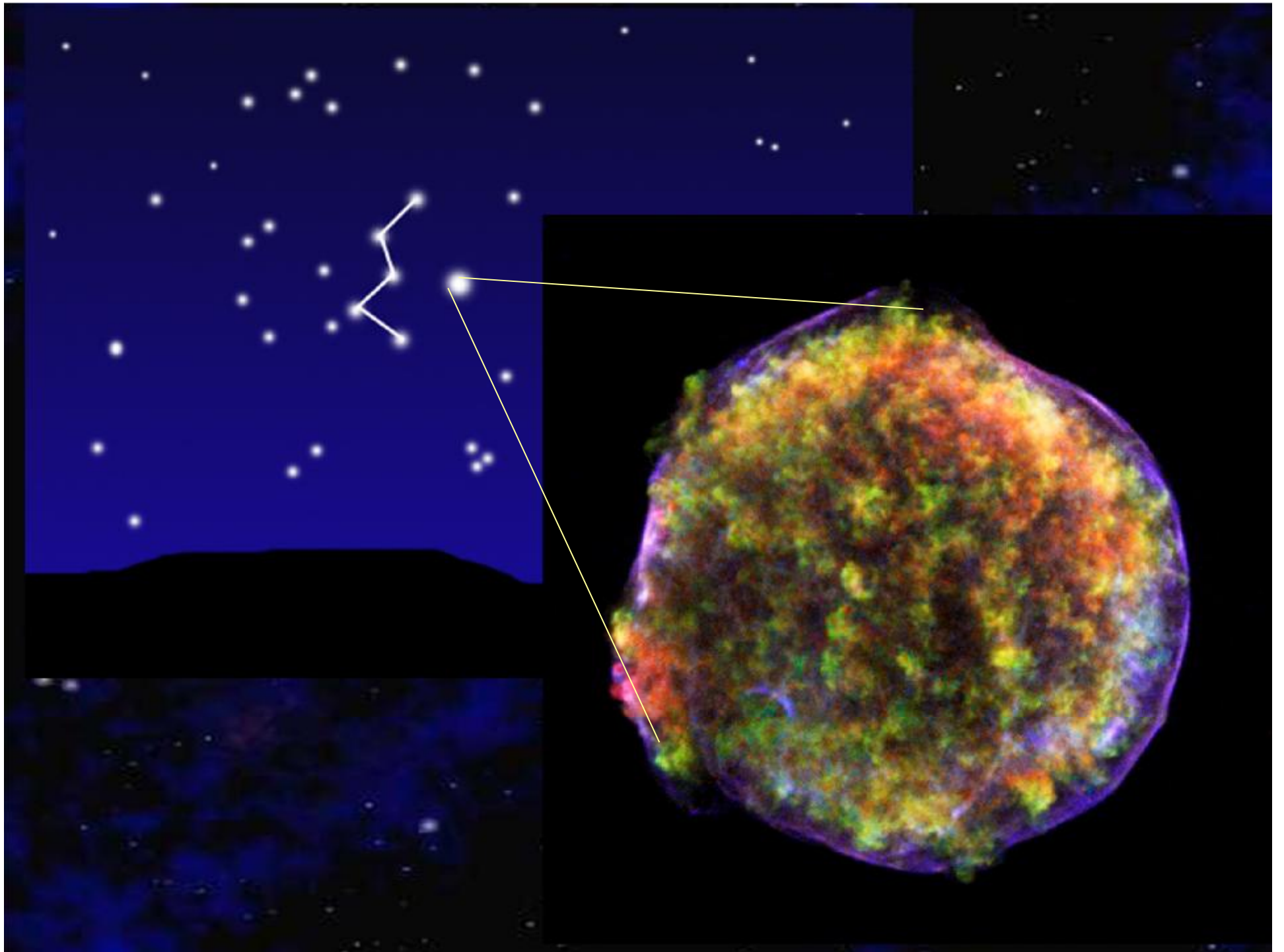


Andreas Osiander

“...declare that the fundamental principles laid down in this book are merely abstract hypotheses convenient for the purposes of calculation only”

Tycho Brahe (1547 – 1601)

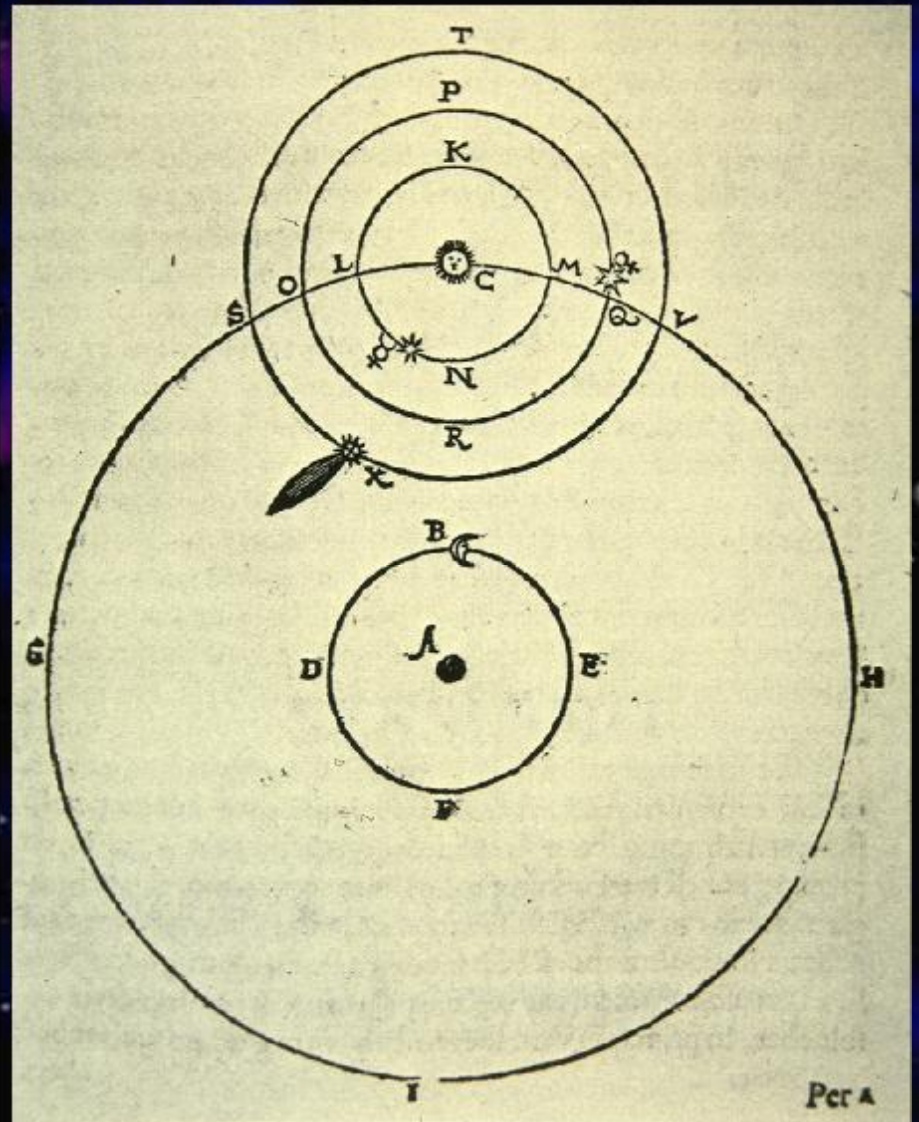




Uraniborg (1577 – 1597)

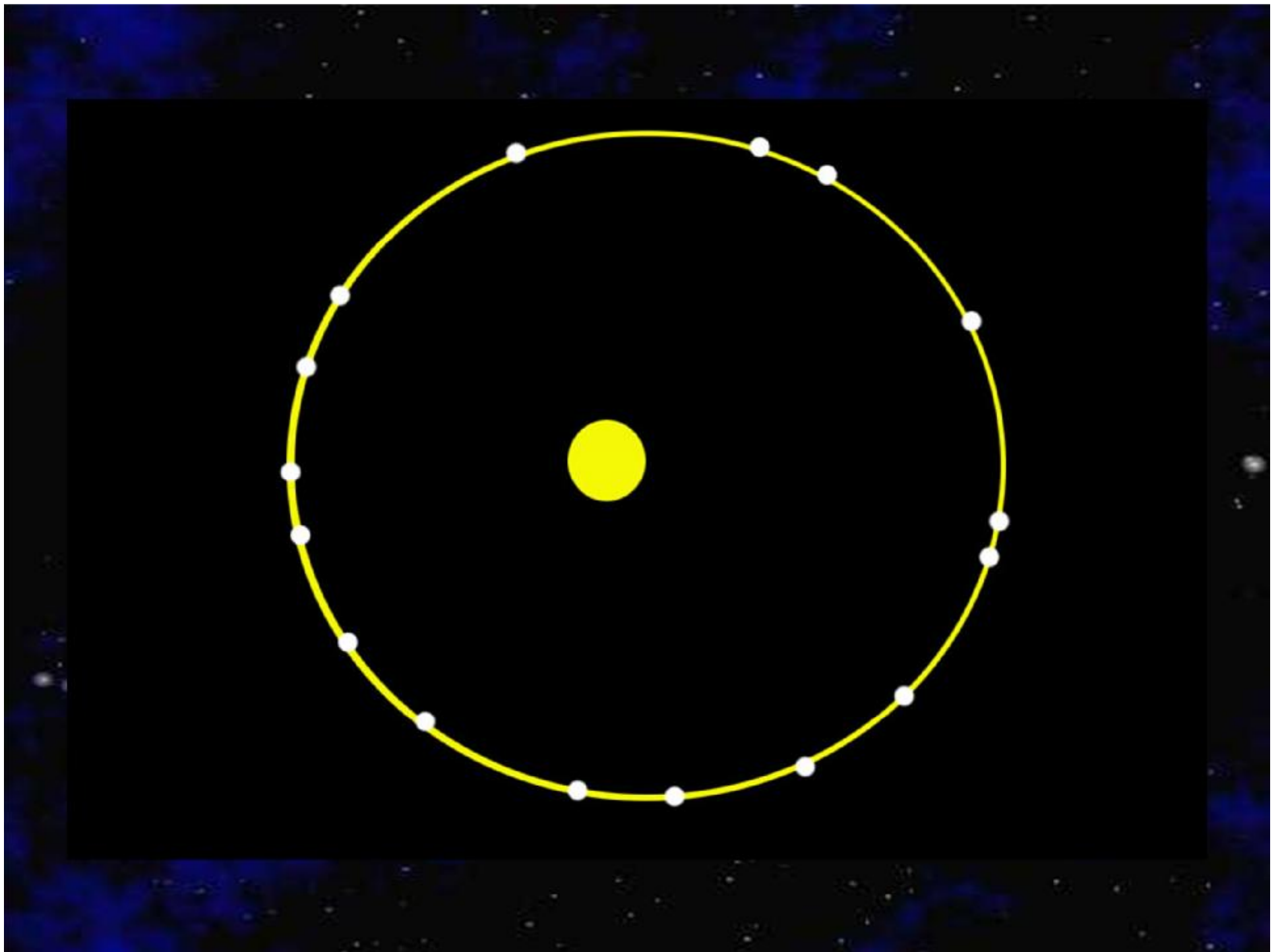


Uraniborg (1577 – 1597)



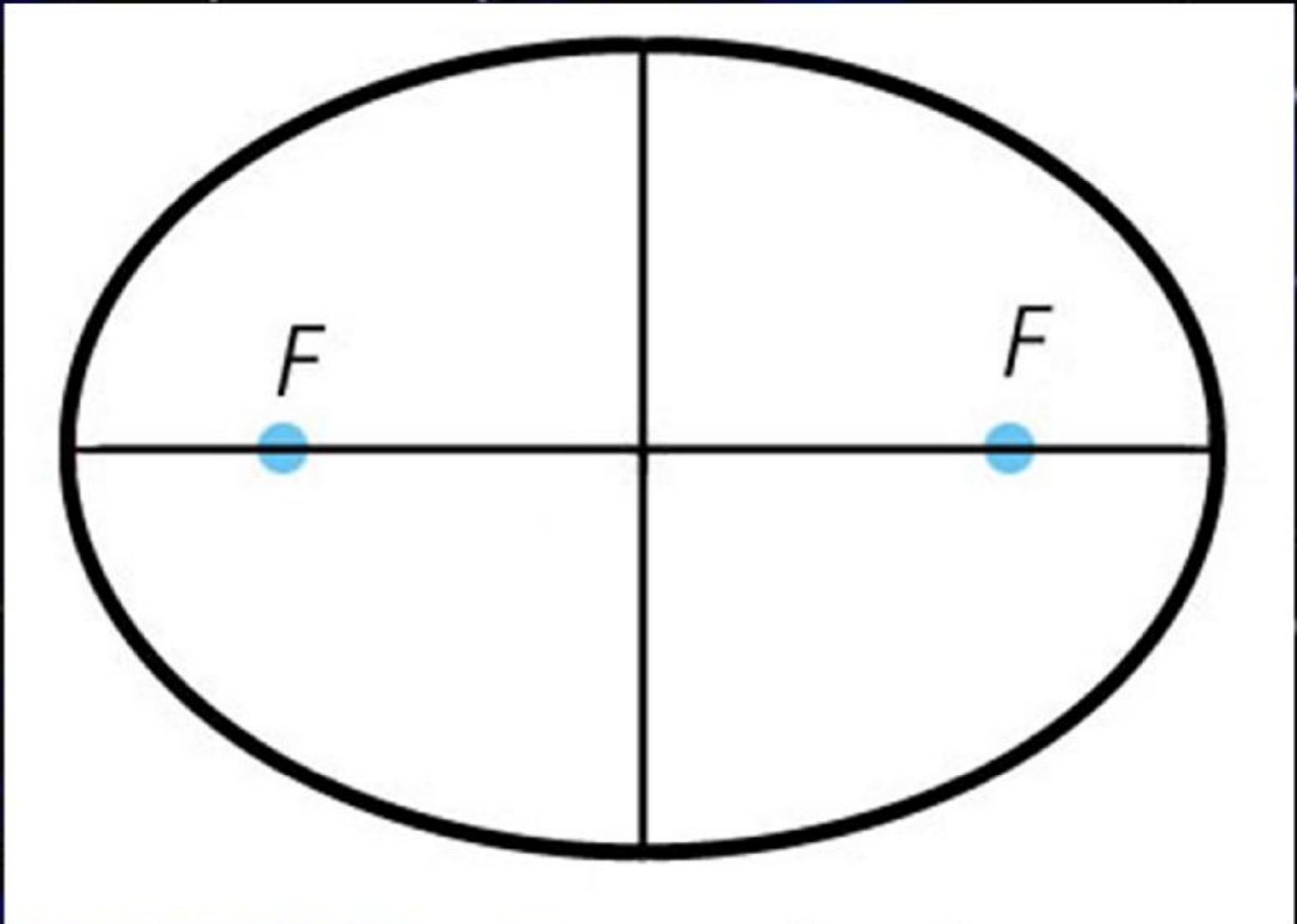


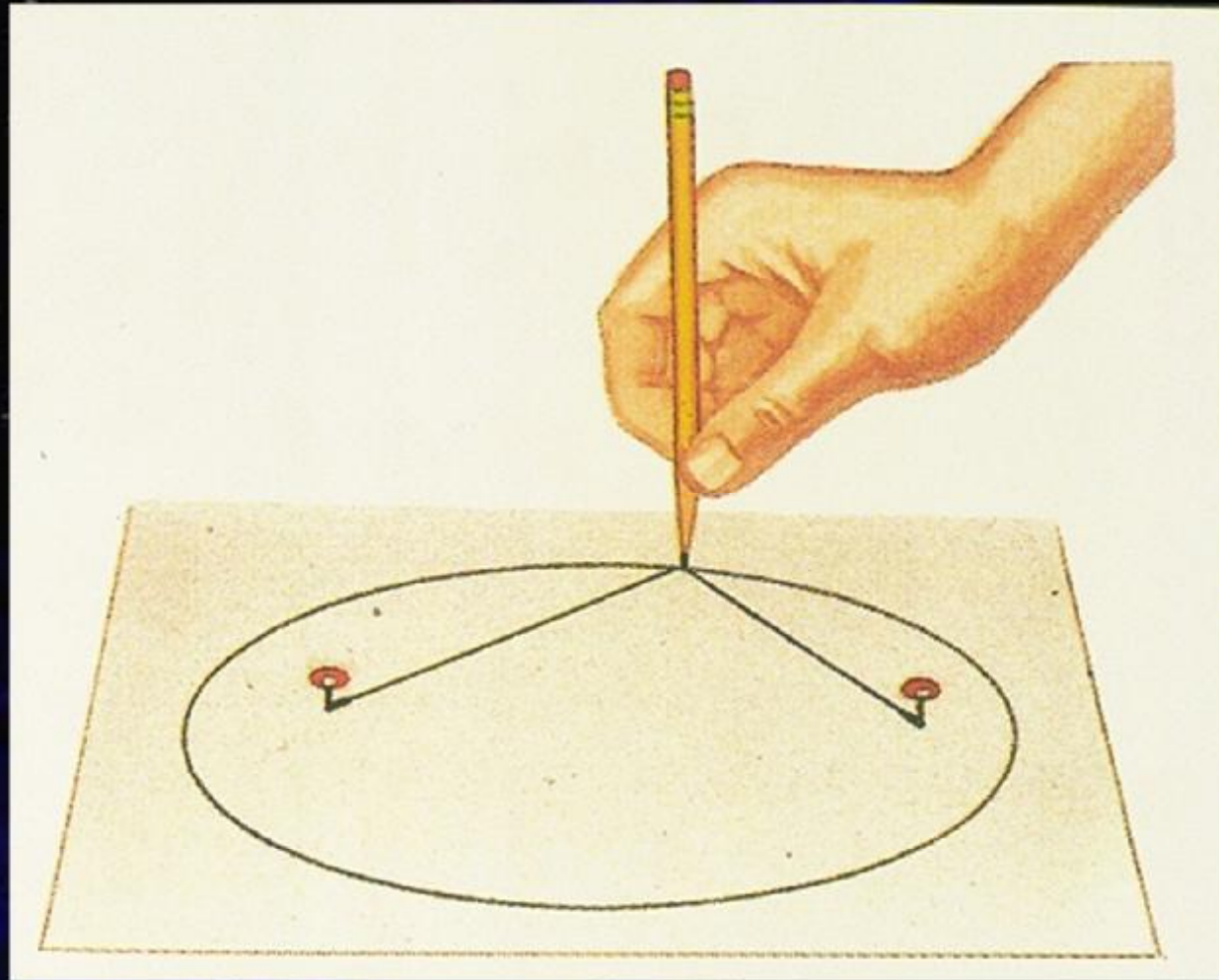
Kepler's Laws of Planetary Motion



Kepler's 1st Law:

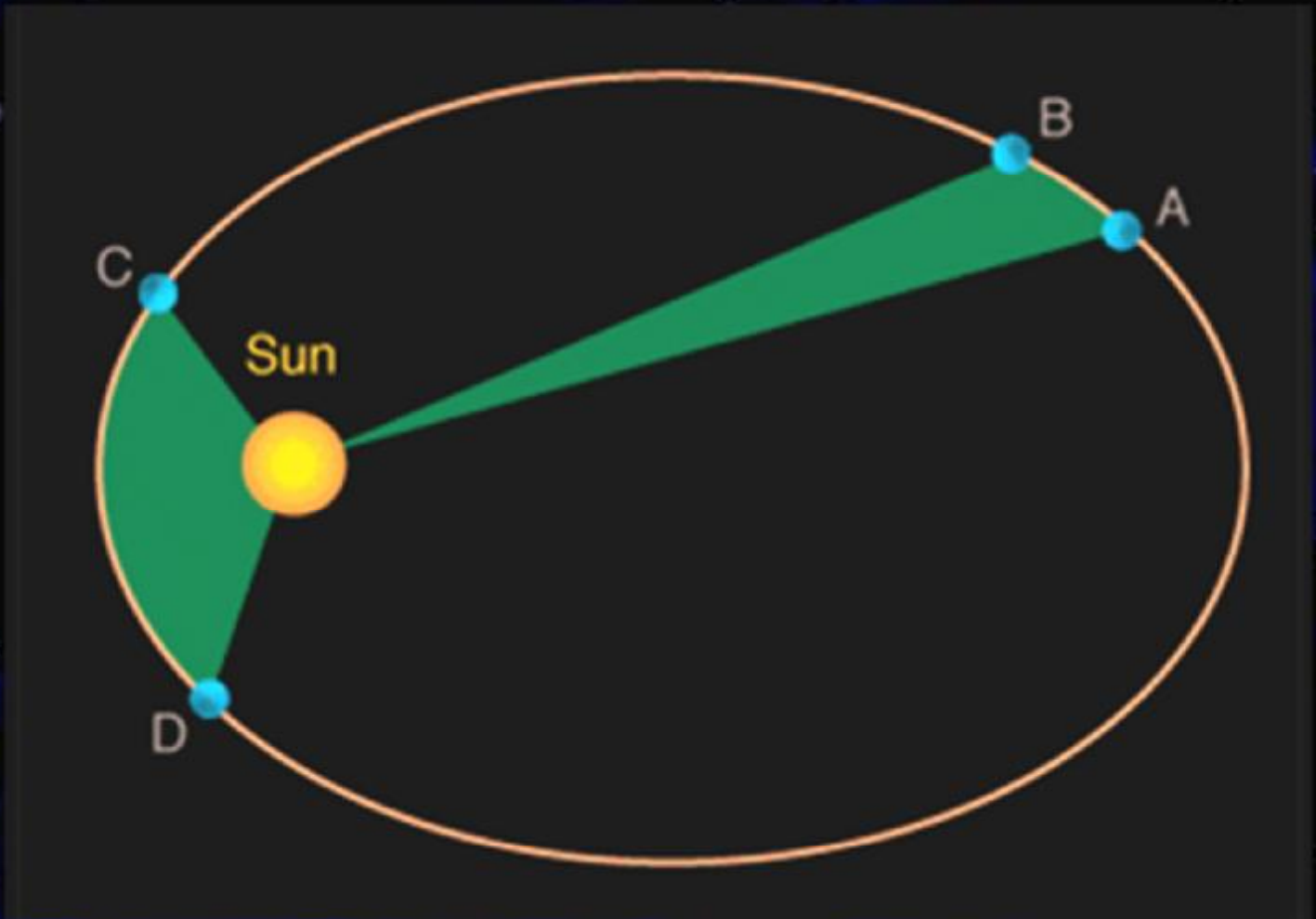
“The orbit of a planet about the Sun is an ellipse with the Sun at one *focus*”

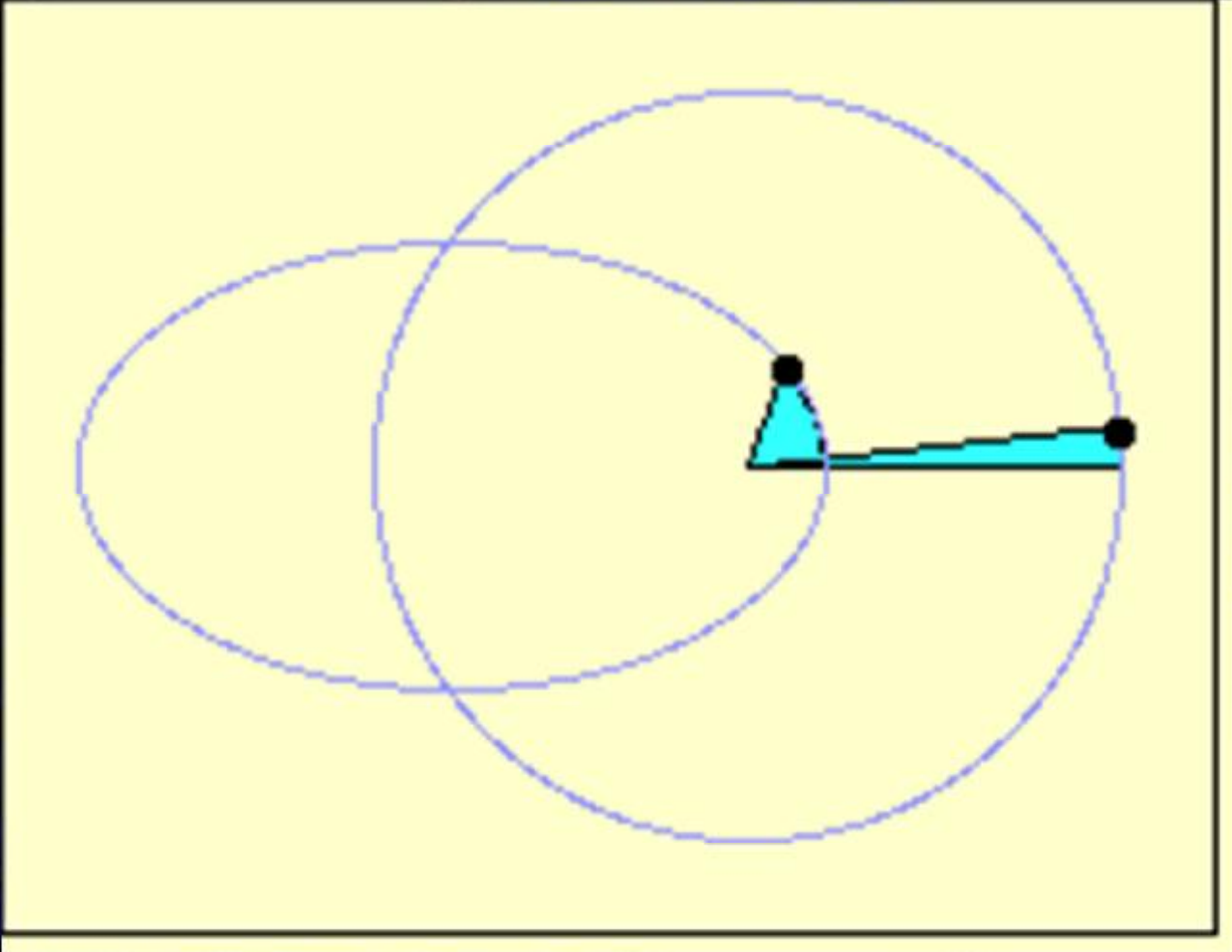




Kepler's 2nd Law:

"A line joining a planet and the Sun sweeps out equal areas in equal intervals of time."





Kepler's 3rd Law:

"The squares of the sidereal periods of the planets are proportional to the cubes of their semi-major axes."



Semi-major axis

The diagram shows an ellipse with a thick black outline. A horizontal line passes through the center, representing the major axis. A vertical line also passes through the center, representing the minor axis. Two small blue dots are placed on the major axis, one on each side of the center, representing the foci. The segment of the major axis extending from the center to the left focus is highlighted in red. The text "Semi-major axis" is written in bold black font above this red segment.

Kepler's 3rd Law:

"The squares of the sidereal periods of the planets are proportional to the cubes of their semi-major axes."

$$P^2 = d^3$$

n P = Orbital Period measured in Earth years

n d = Orbital distance measured in A.U.'s

n Example: Jupiter

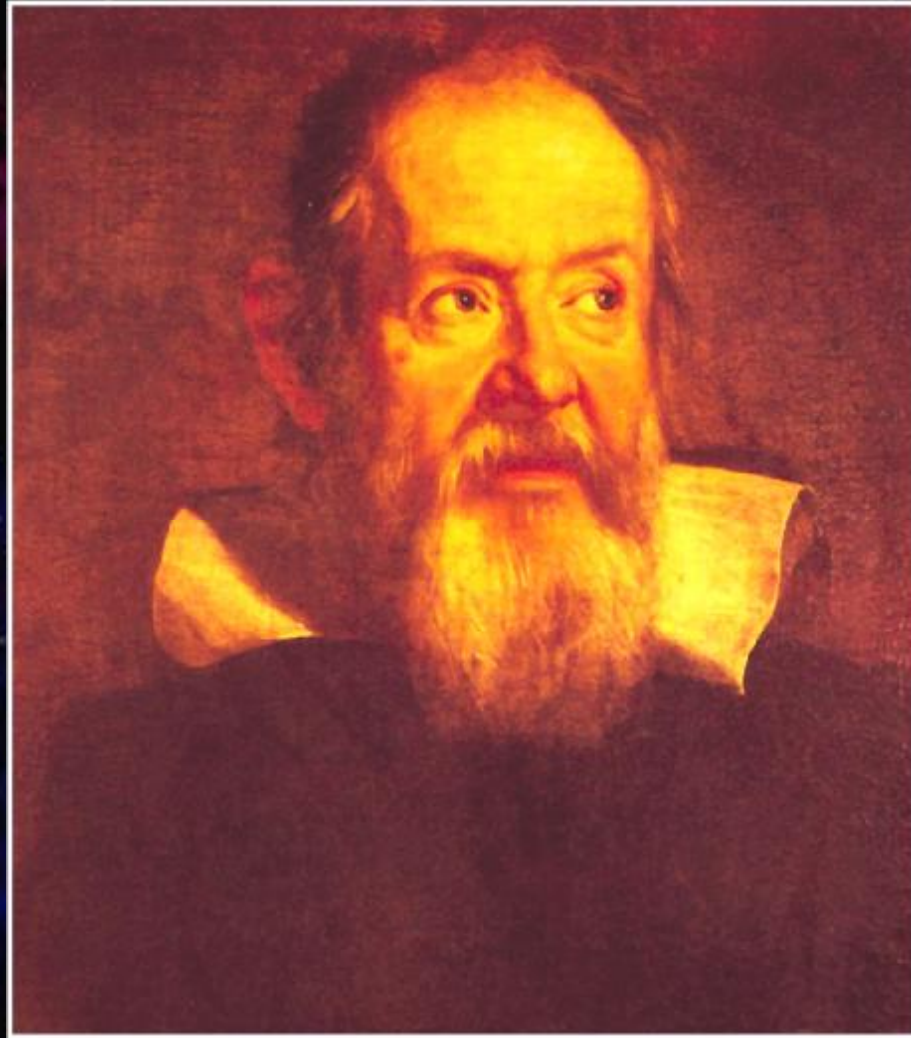
$$P = 11.86 \text{ years}$$

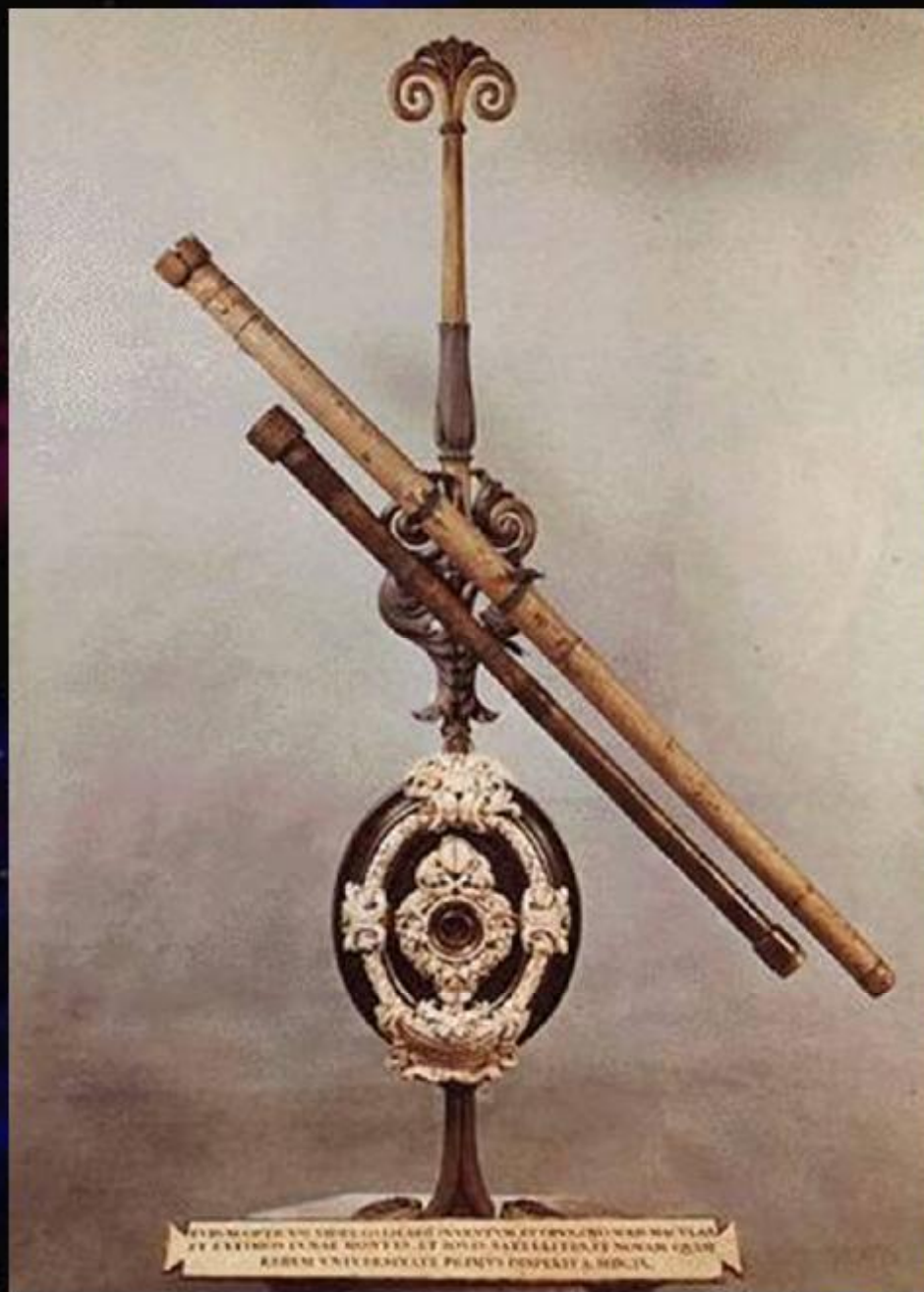
$$P^2 = 140.6$$

$$d = 5.2 \text{ A.U.}$$

$$d^3 = 140.6$$

Galileo Galilei (1564 – 1642)

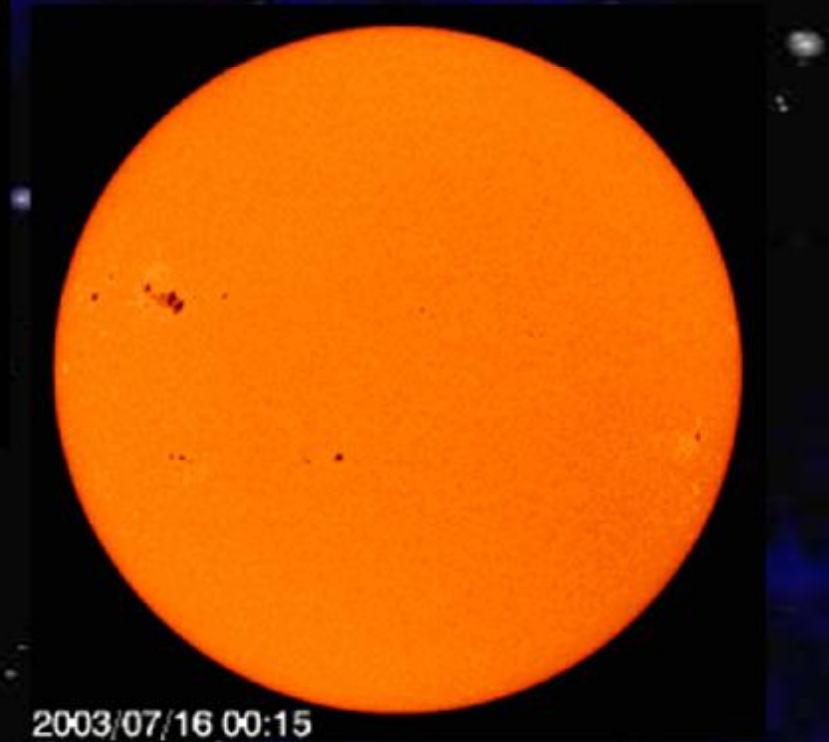
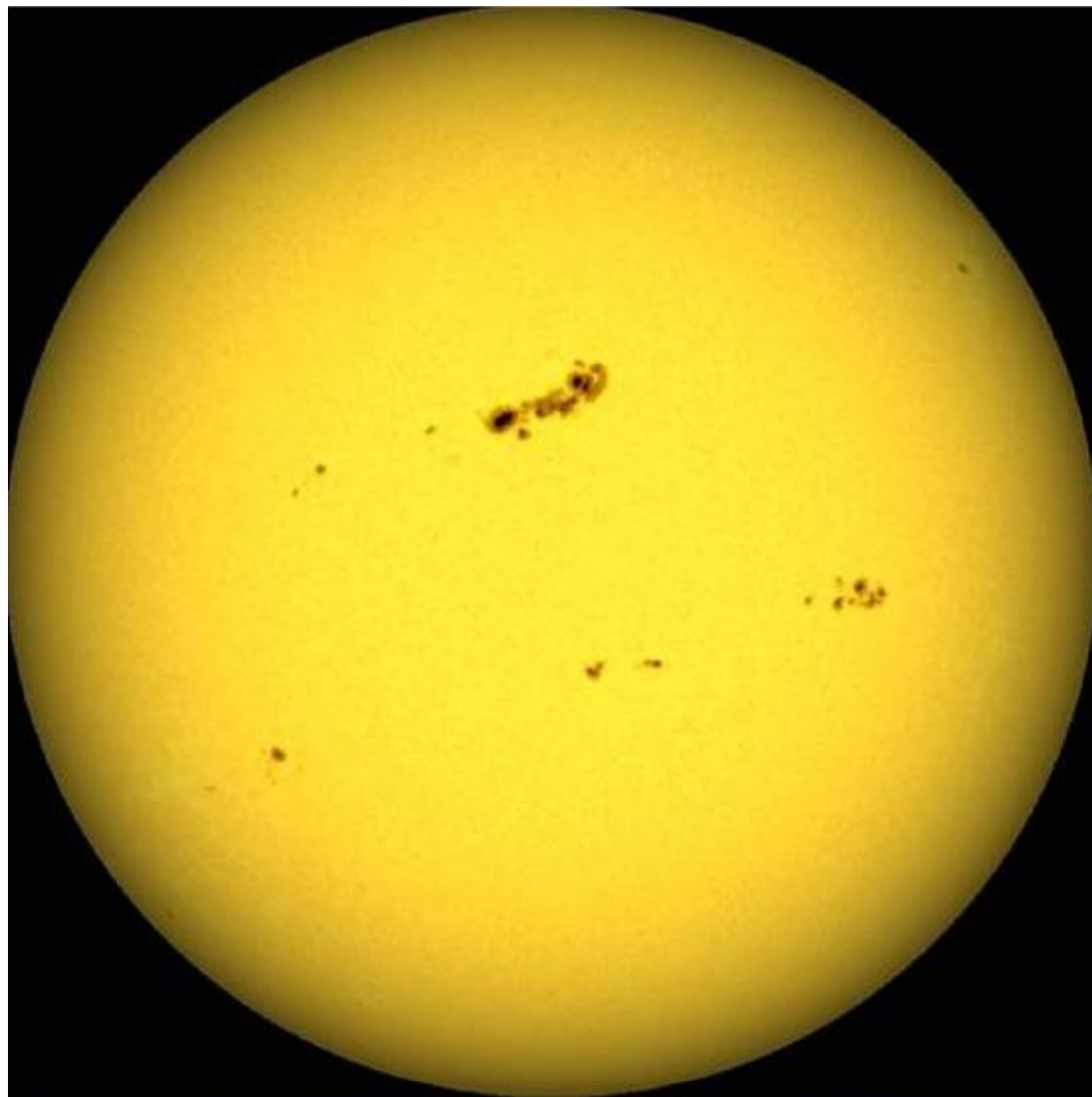




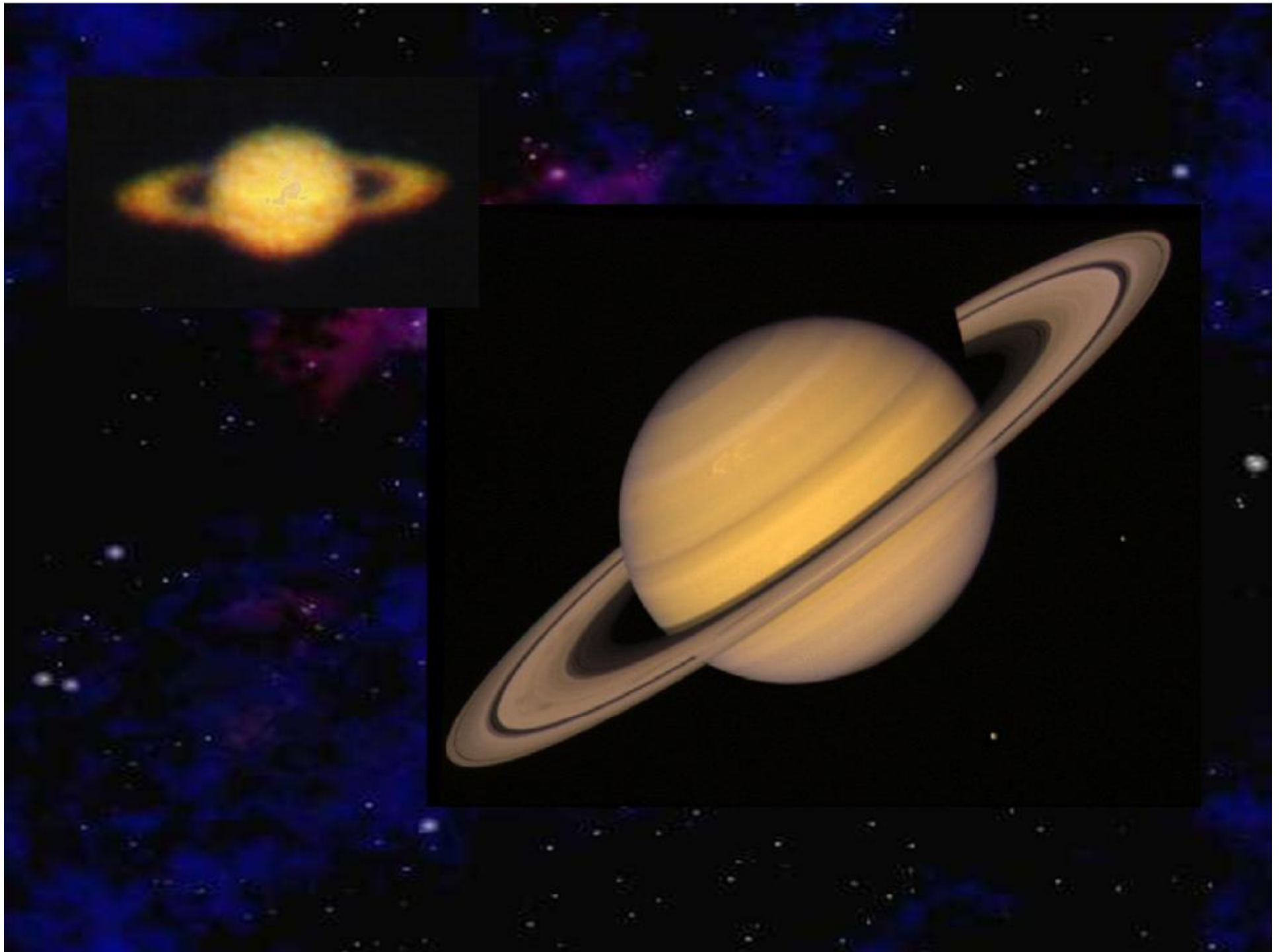
EXDUM OPTER ANTIQVVM COLLEGIUM INVENITVM ET PAVLVS IN ORDINE SVV VLAM
ET EXISTENS IN NAE MONYTES ET ROSETI SAKELLETON, ET NOMAM QVAM
REDEM VNIERSITATE PAVLVS PAVLVS A. MDCLX.

2,8



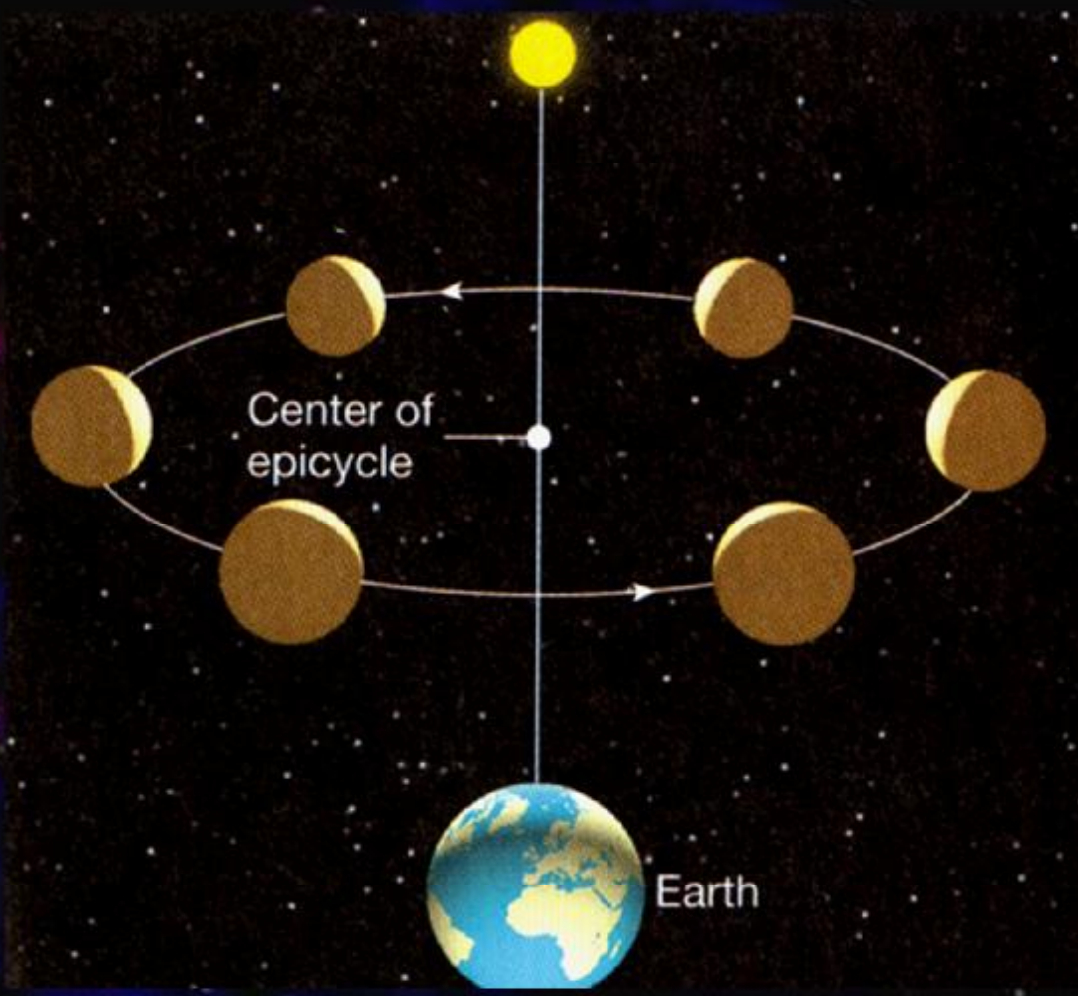


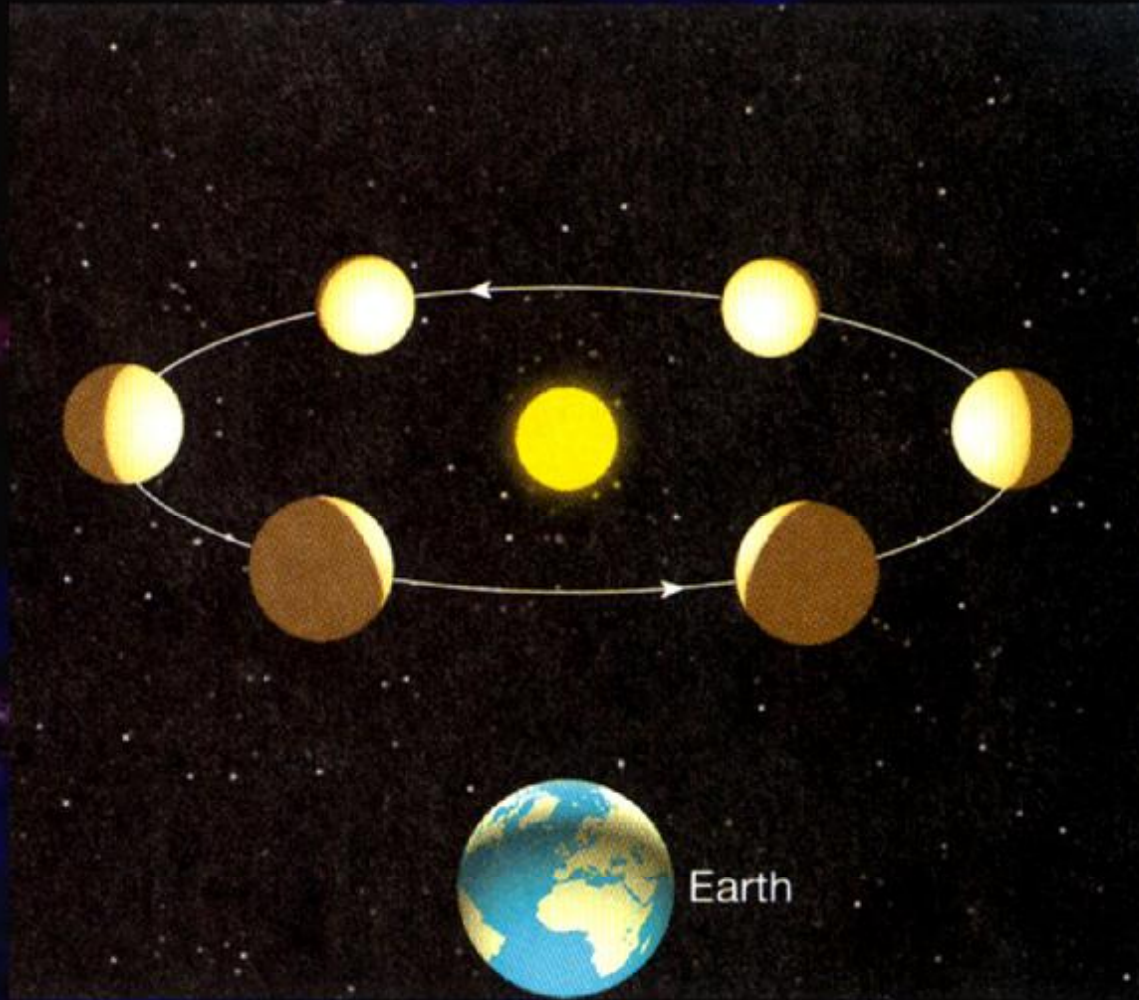
2003/07/16 00:15













Observations Jupiter
1870

2d. Jovis
marc H. 12

○ **

30. marc

** ○ *

2. Jovis

○ ** *

3. marc

○ * *

3. Ho. s.

* ○ *

4. marc

* ○ **

6. marc

** ○ *

8. marc H. 13.

* * * ○

10. marc

* * * ○ *

11.

* * ○ *

12. H. 4 wegg.

* ○ *

13. marc

* ** ○ *

14. Marc

* * * ○ *

15.

* * ○

16. Clavis H.

* ○ * * *

17. Clavis H.

* ○ * *



Siderius Nuncius (1610)

