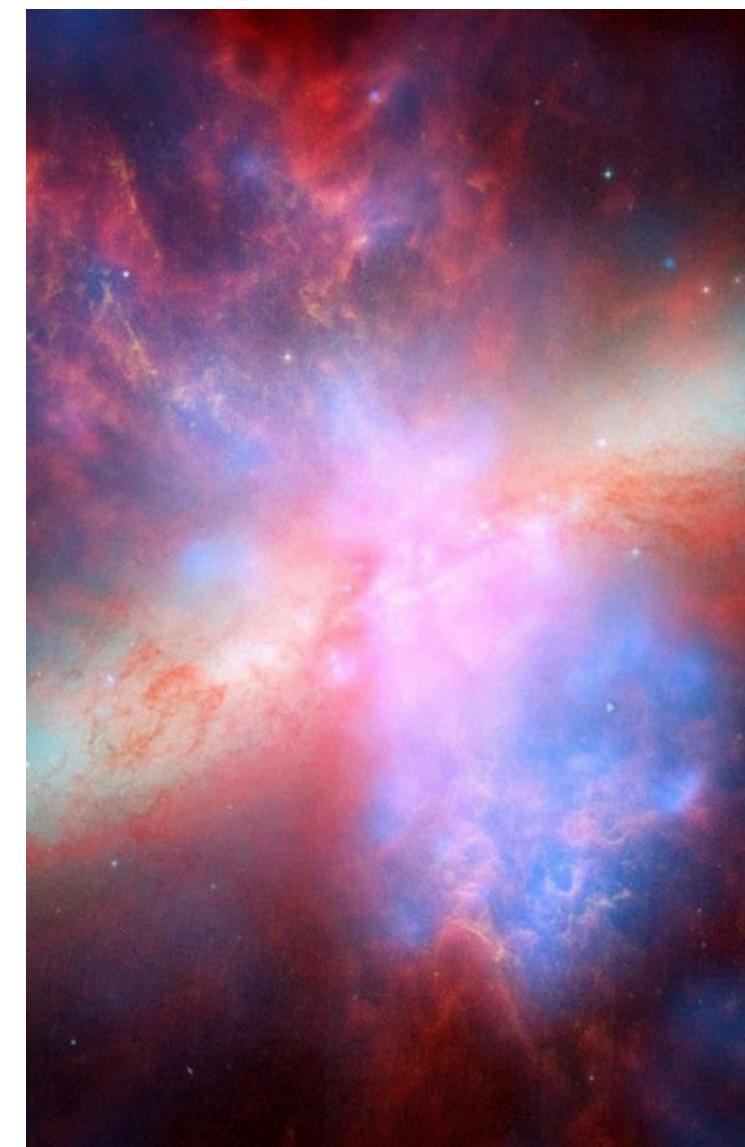
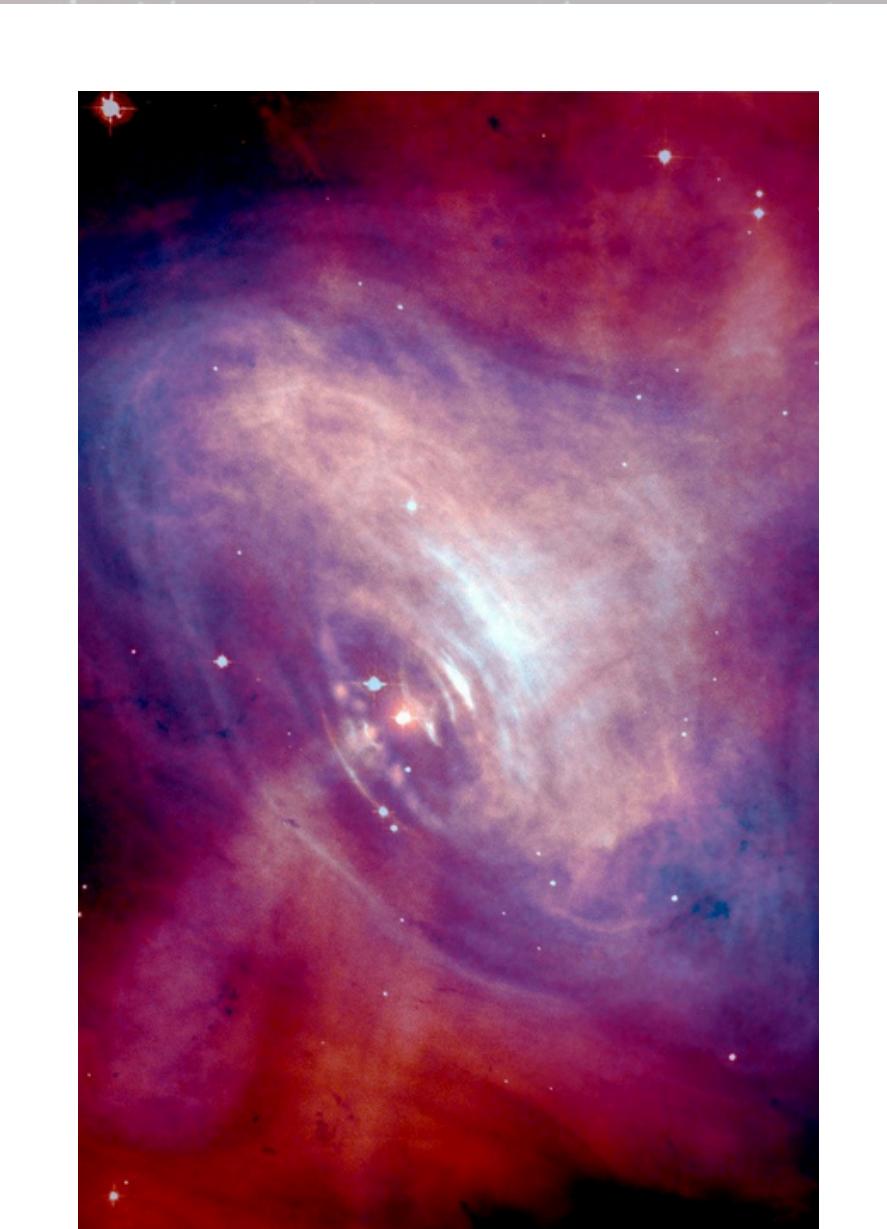
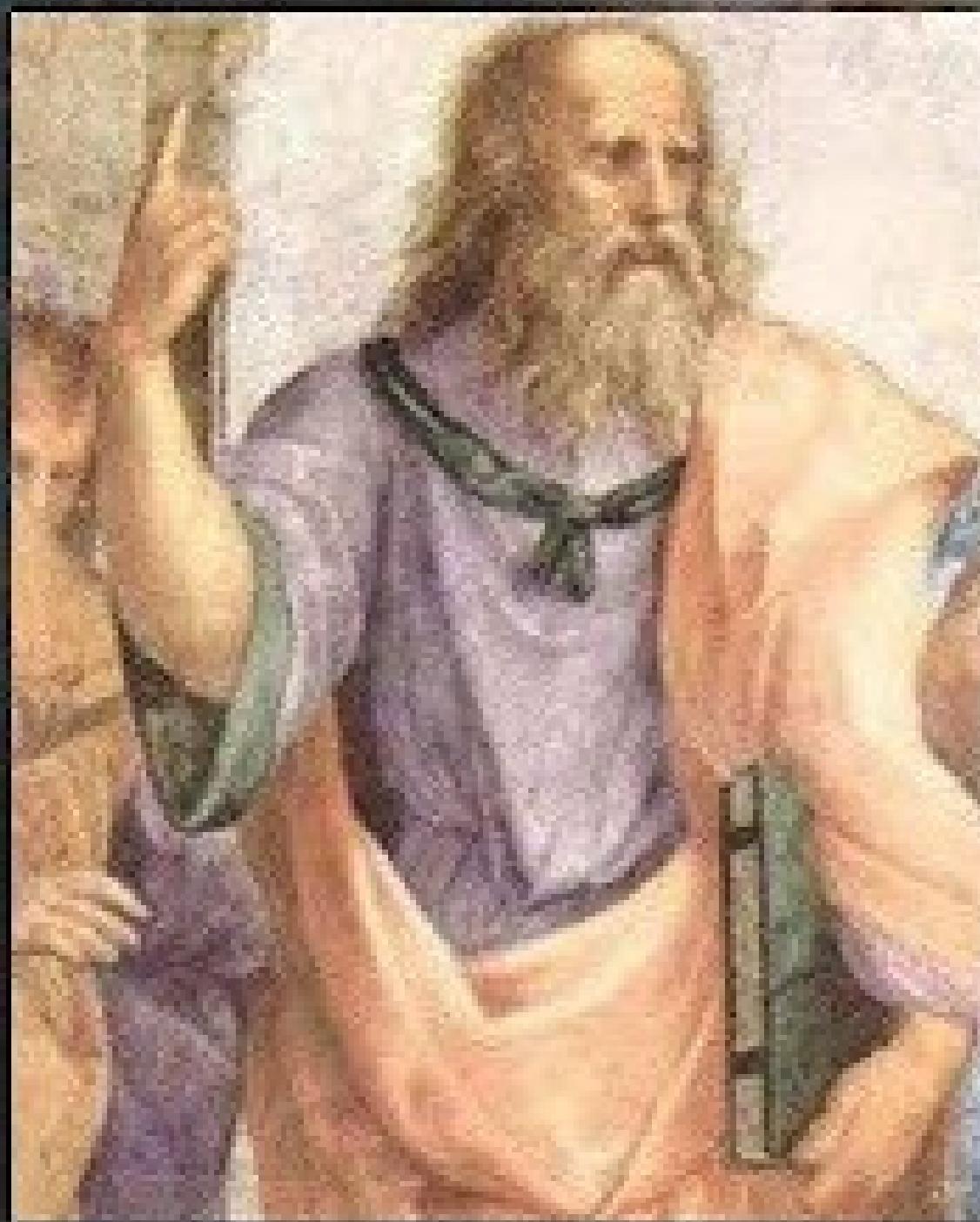


**WELCOME Y2J2!**



# HISTORY OF ASTRONOMY

# Unit 1: Astronomy



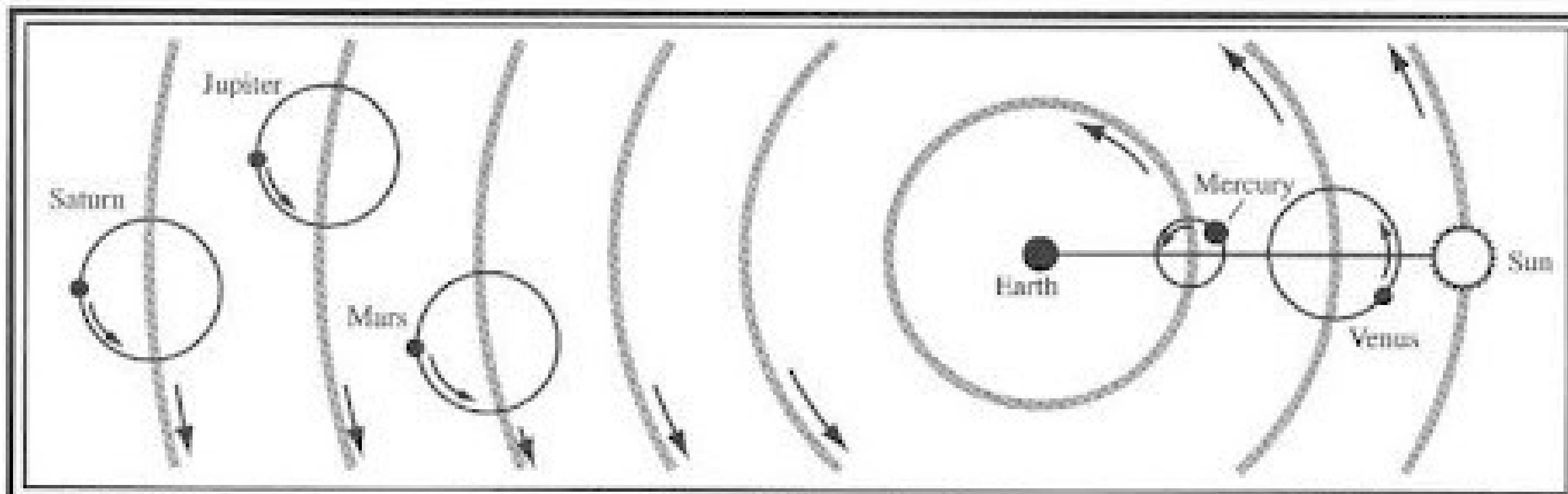
“Astronomy compels  
the soul to look  
upwards and leads us  
from this world to  
another.” – Plato

428 – 348 BCE

# The History of Astronomy

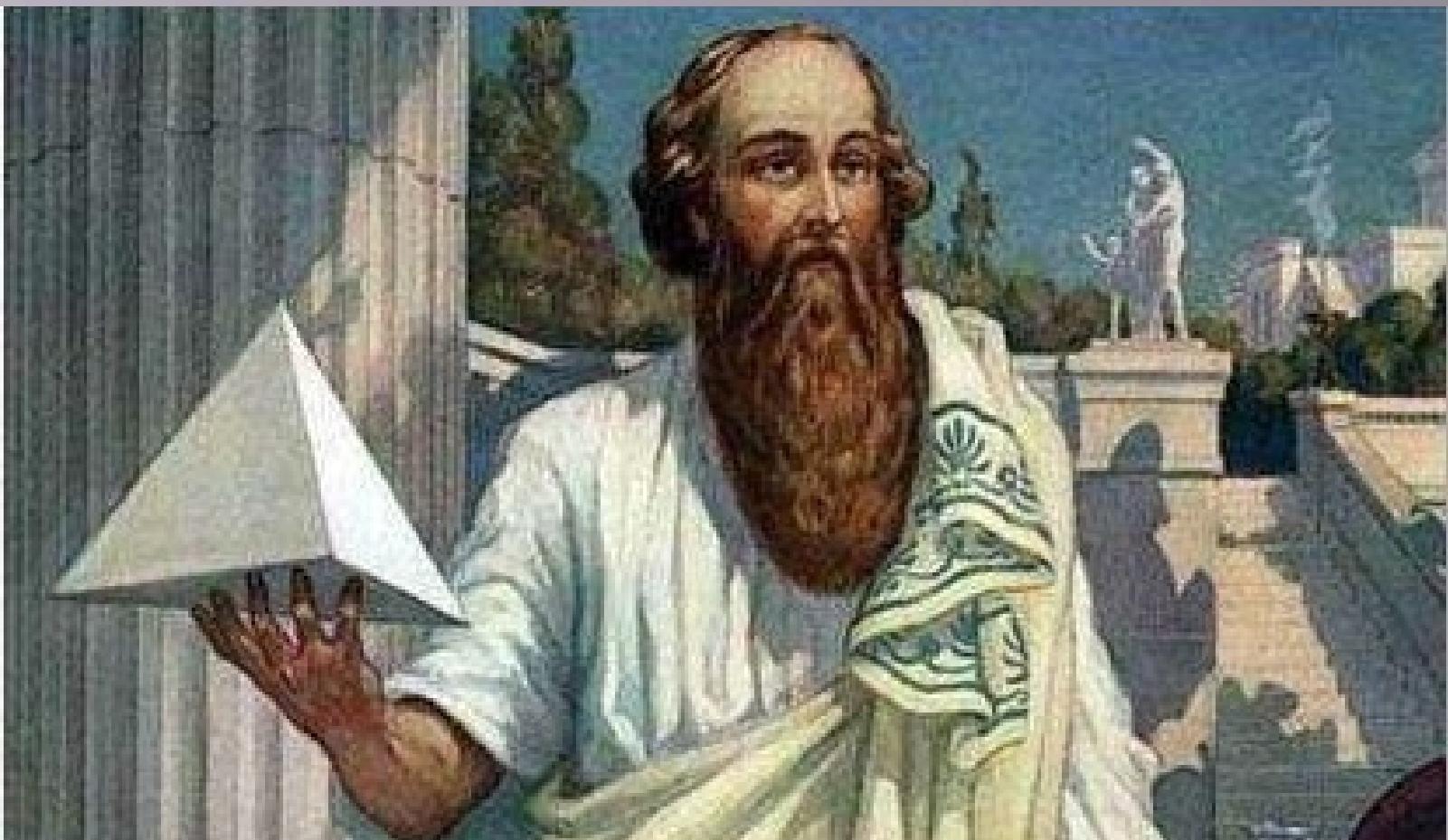
## The Ancient Greeks

- The Astronomy of the ancient Greeks was linked to mathematics, and Greek astronomers sought to create geometrical models that could imitate the appearance of celestial motions.



# Pythagoras

- Pythagoras: 570 - 495BCE
  - He believed that everything was related to mathematics and that through mathematics everything could be predicted and measured in rhythmic patterns or cycles.
  - Pythagoras placed astronomy as one of the four mathematical arts, the others being arithmetic, geometry and music.



- While best known for the Pythagorean Theorem, Pythagoras did have some input into astronomy.
- By the time of Pythagoras, the five planets to the naked eye -Mercury, Venus, Mars, Jupiter and Saturn -had long been identified.
- The word 'planet' is a Greek term meaning 'wanderer', as these bodies move across the sky at different speeds from the stars, which appear fixed in the same positions relative to each other.



- Pythagoras was one of the first to think that the Earth was round, a theory that was finally proved around 330 BCE by Aristotle.
- Many people, up until the mid 1600s CE, still believed the Earth to be flat!



# Aristotle

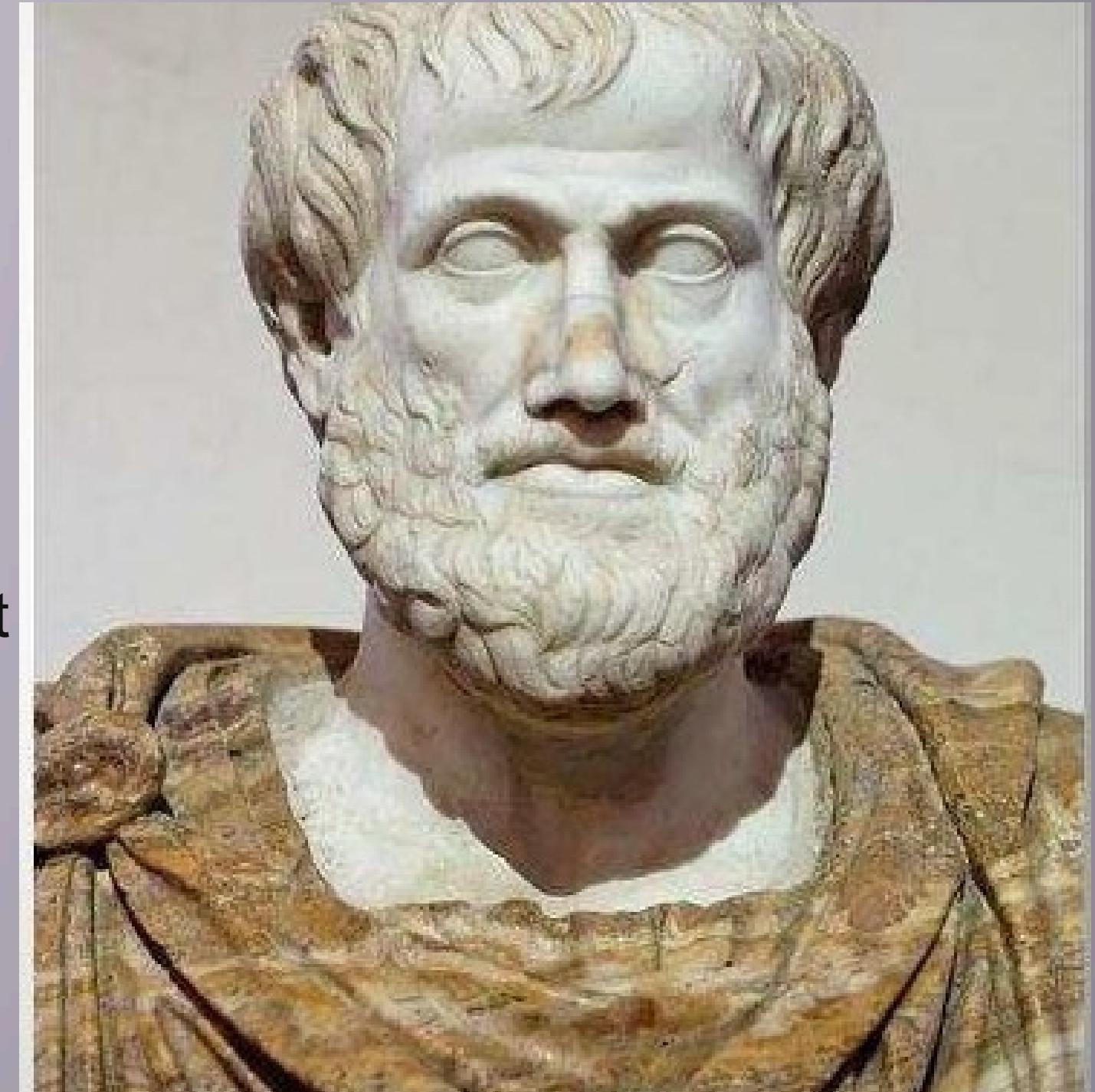
- Aristotle: 384 -322 BCE

The philosopher Plato's most famous student!  
He demonstrated in his writings...

- That he knows we see the moon by the light of the sun.
- How the phases of the moon occur and how eclipses work.
- Observations that support the idea of a spherical earth.
- That he believed the motions of the planets must be circular.

However, Aristotle believed that the Earth was not moving, but at rest.

Using Aristotle's ideas, if the Earth were moving through space, if you tripped, you would not be in contact with the Earth, and so would get left behind in space!



# Ptolemy

- Ptolemy:  
**90-168 CE**
- A citizen of Egypt, Ptolemy was a mathematician, astronomer, and geographer.
- He outlined his geometrical reasoning for a Geocentric View of the Universe.



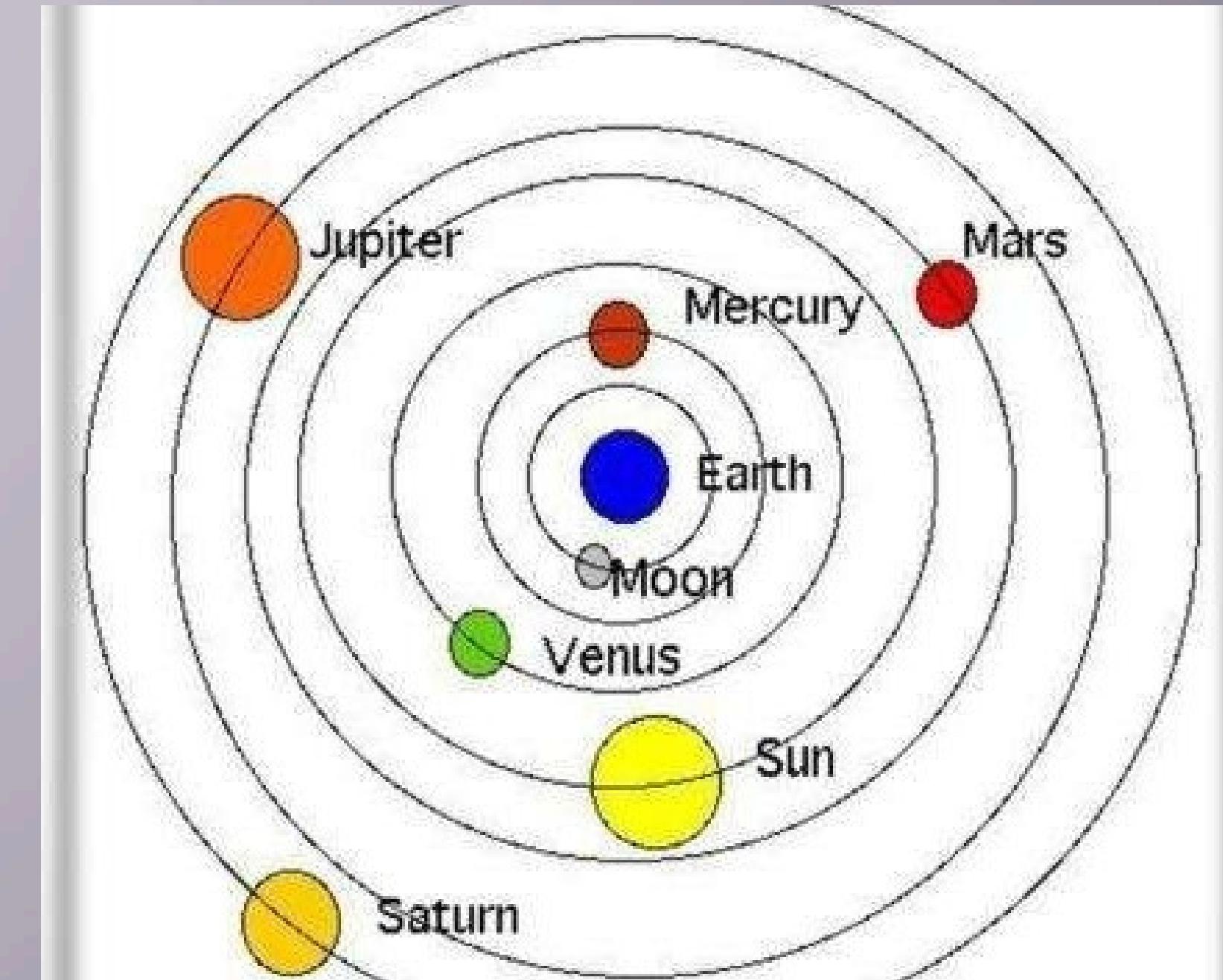
# The Geocentric View

- The Universe, according to Ptolemy, was based on five main points...

1. The celestial realm is spherical.
2. The celestial realm moves in a circle.
3. The Earth is a sphere.
4. The celestial realm orbit is a circle centered on the earth.

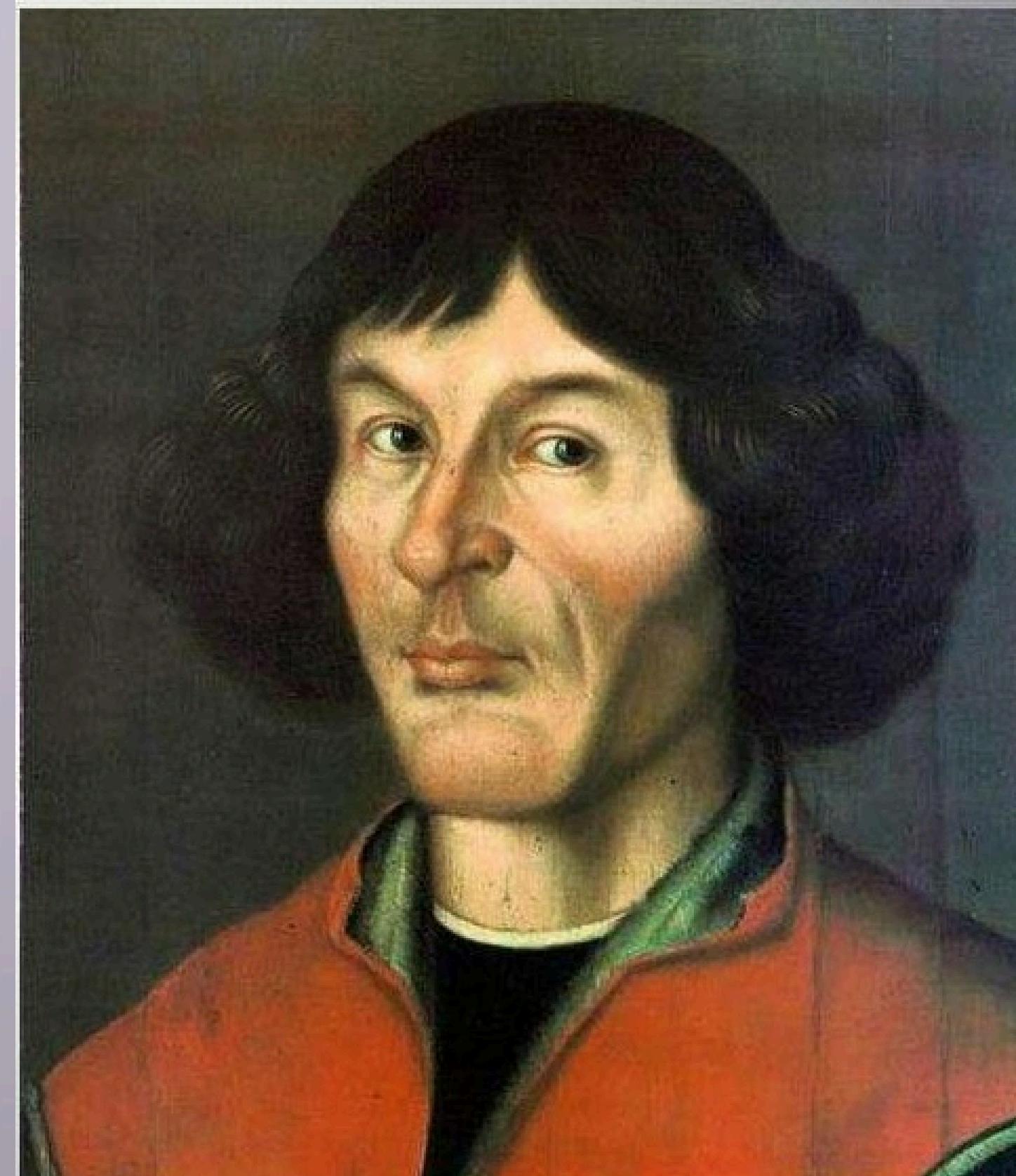
<http://www.polaris.iastate.edu/EveningStar/>

5. Earth does not move.



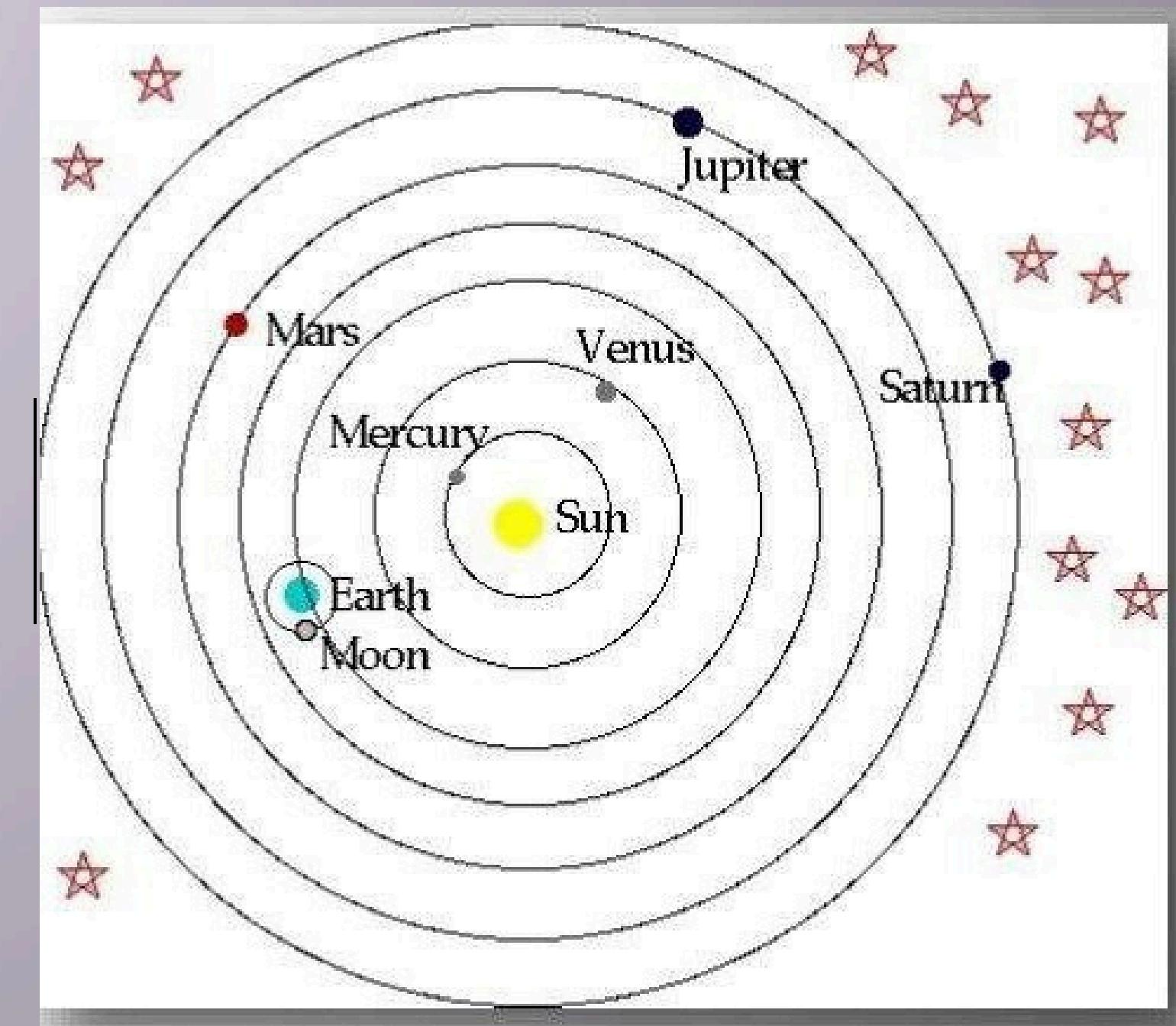
# Copernicus

- Copernicus:  
1473 -1543 CE
  - Introduced a sun centered design of the Universe called the Heliocentric View.
  - Therefore, Ptolemy's astronomy was seriously questioned and eventually overthrown.



# The Heliocentric View

- Copernicus' theory of a system in which the Earth, like all planets, revolved around the sun.
- His book, "On the Revolutions of the Celestial Orbs" was completed in 1530, but it wasn't published until the year he died, 1543.
- It has been suggested that Copernicus knew the publication would incur the wrath of the Catholic church and he didn't want to deal with problems so he didn't publish his theory until he was on his death bed.



# Tycho Brahe

- Tycho Brahe: 1546 - 1601CE  
While attending university to study law and philosophy, he became interested in astronomy and spent most evenings observing the stars.  
Tycho Brahe's major contributions were...
  1. The detection and correction of several serious errors in the standard astronomical tables.
  2. The discovery of a supernova in the constellation of Cassiopeia.
  3. The most complete and accurate observations available without the use of a telescope.Tycho Brahe's fame led to the funding of an astronomical observatory on the island of Van  
He did not accept Copernicus's model of the Universe.



# Kepler

- Kepler: 1571- 1630 CE

Tycho's assistant, Kepler had full access to Tycho's data. He determined that the orbits were not circular but elliptical.

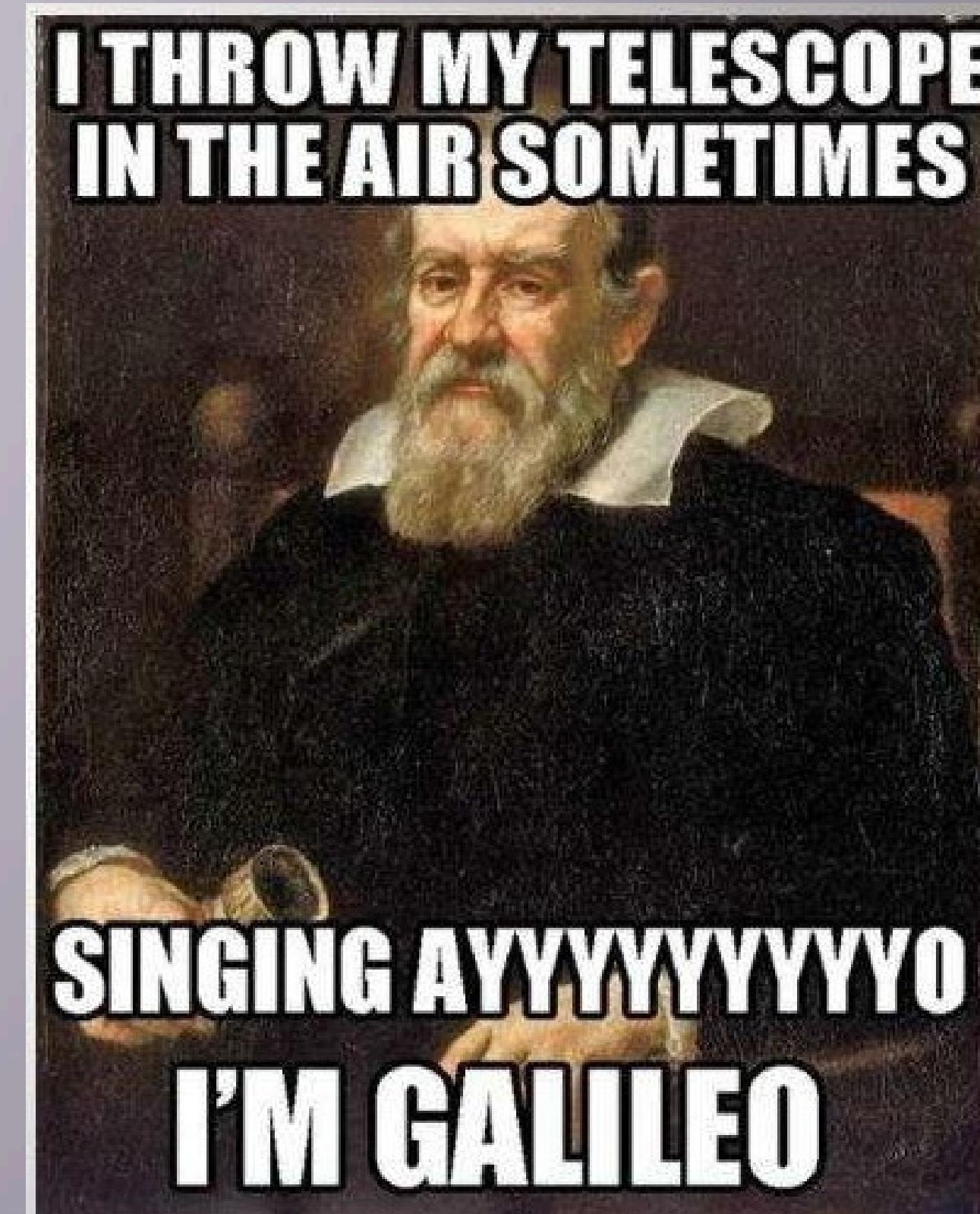
Kepler's Three Laws of Planetary Motion...

- 1.The orbits of the planets are elliptical.
- 2.The earth's orbital speed varies at different times of the year. The earth moves fastest in its orbit when closest to the sun and slowest when farthest away.
- 3Shows the relationship between the size of a planet's orbit radius and its orbital period.

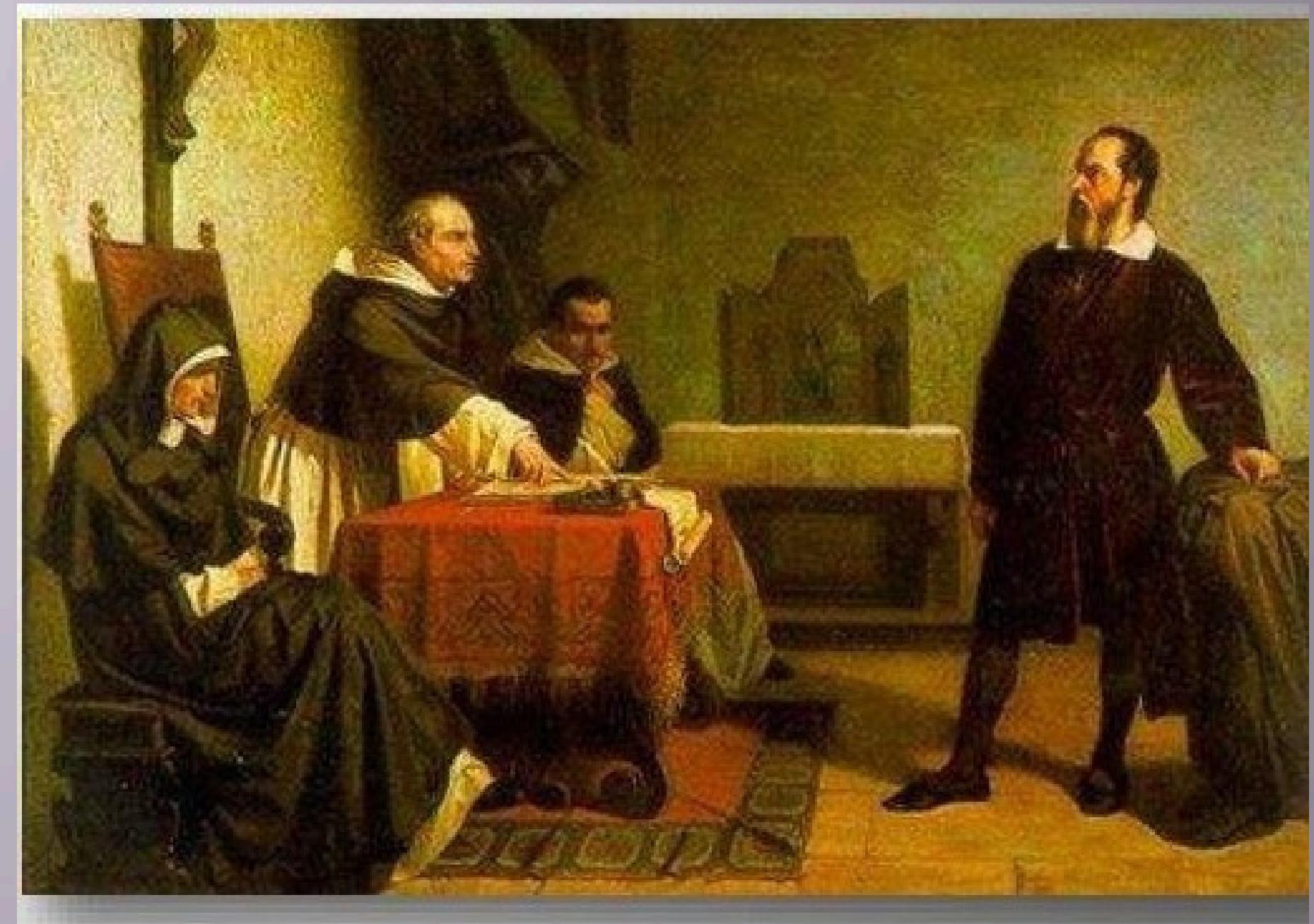


# Galileo

- Galileo: 1564 -1642 CE
  - A key figure in the development of modern astronomy.
  - He provided the crucial observations that proved the Copernican hypothesis.

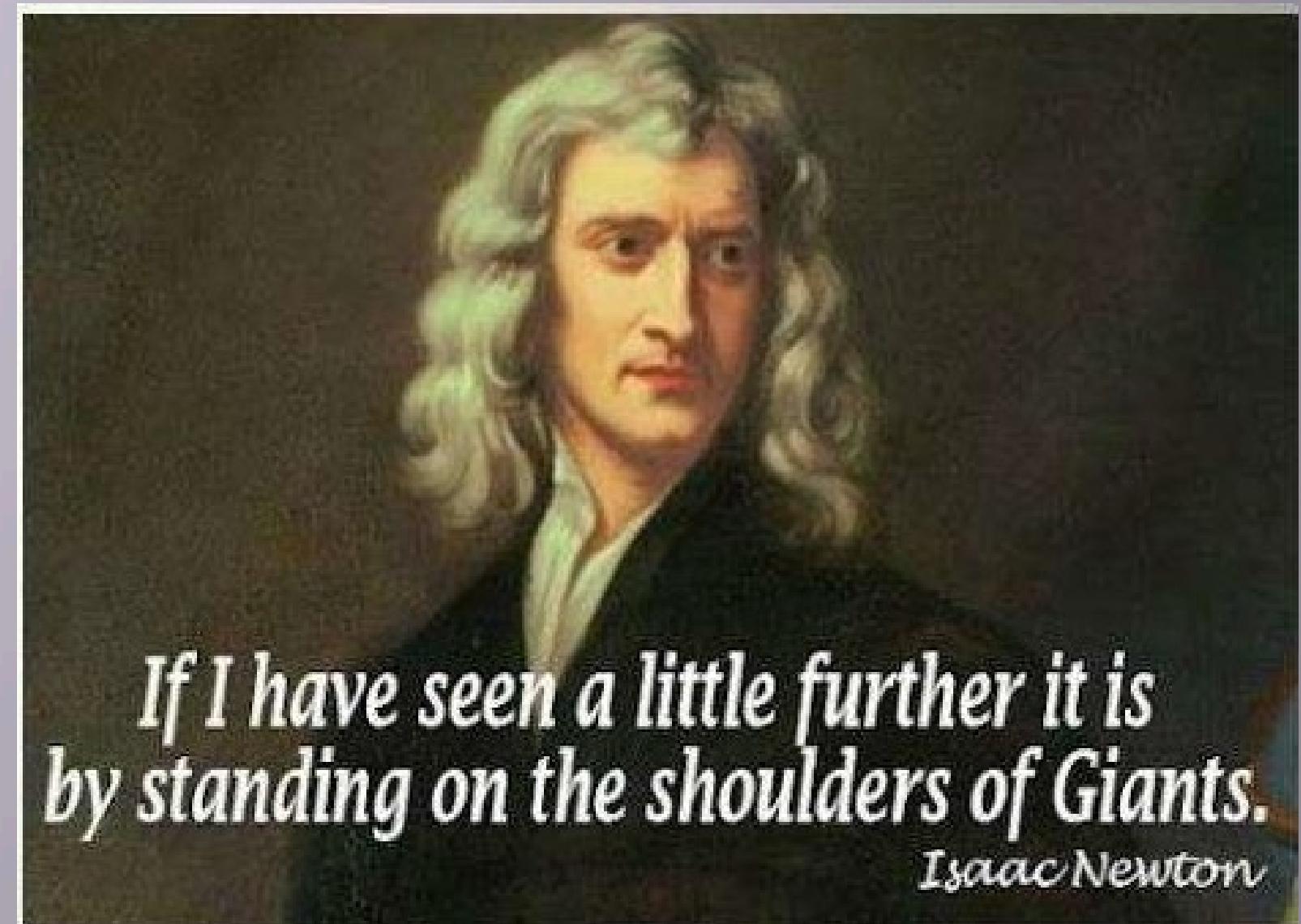


- Galileo used his telescope to show errors in Aristotle's opinion of the universe and the worldview that it supported.
- Galileo's challenge of the Church's authority through his refutation of the Aristotelian concept of the Universe eventually got him in deep trouble!
- Late in his life he was forced, under the threat of torture, to publicly recant his Copernican views and spent his last years under house arrest.



# Sir Isaac Newton

- Isaac Newton: 1642 -1727 CE
  - Built on Galileo's ideas to demonstrate that the laws of motion in the heavens and on Earth were the same.
  - Newton completed the synthesis of astronomy and physics.
  - ~~he~~ gave reasons for corrected Kepler's Laws and came up with three new Laws of Motion based on his idea of the existence of a force called 'Gravity'.



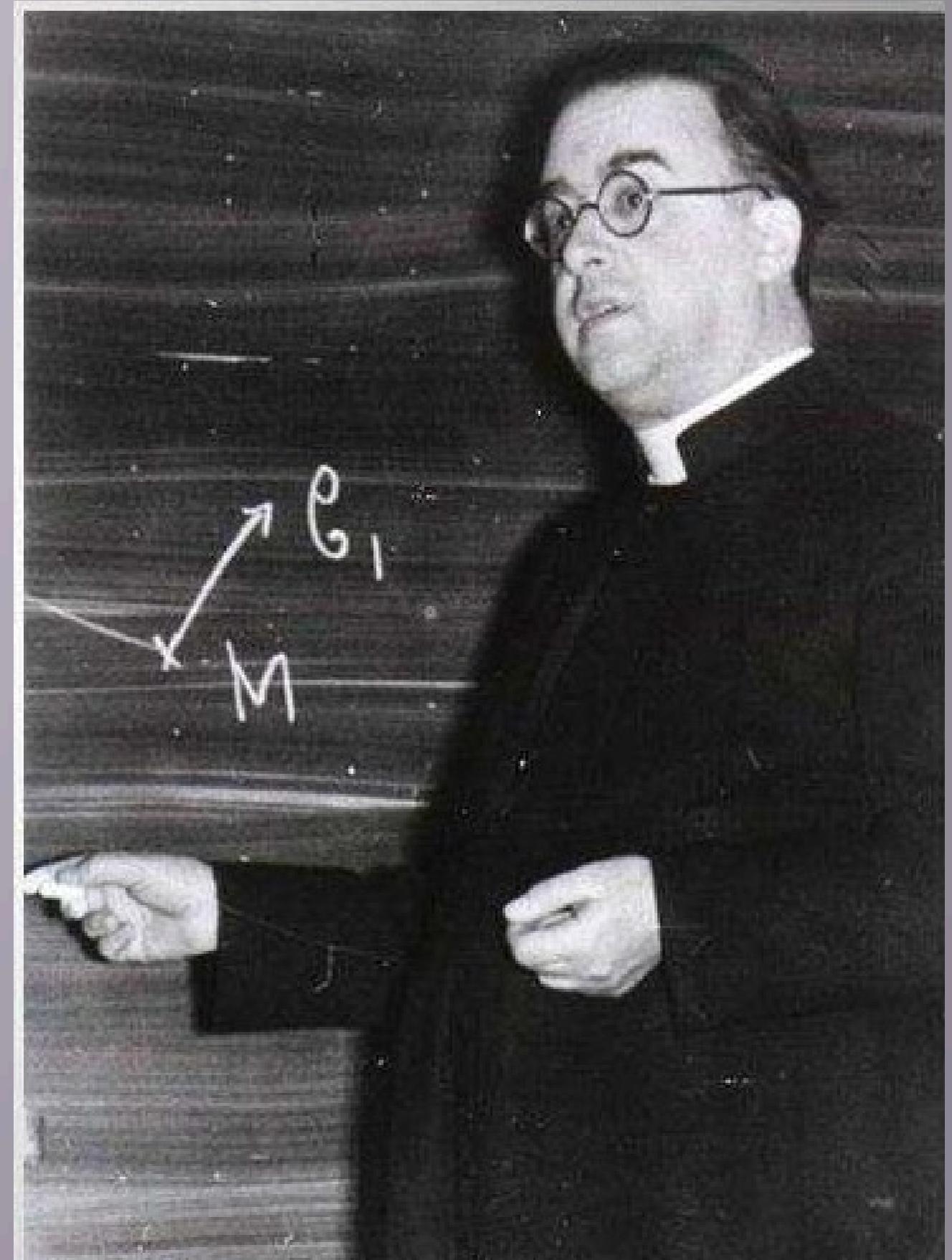
# Edwin Hubble

- Edwin Hubble: 1889 -1953 CE
  - Was able to measure the distance to observed celestial objects.
  - He discovered that the Milky Way was only one of many galaxies.
  - Provided evidence to suggest that most distance galaxies were moving away from us.



# Georges Lemaître

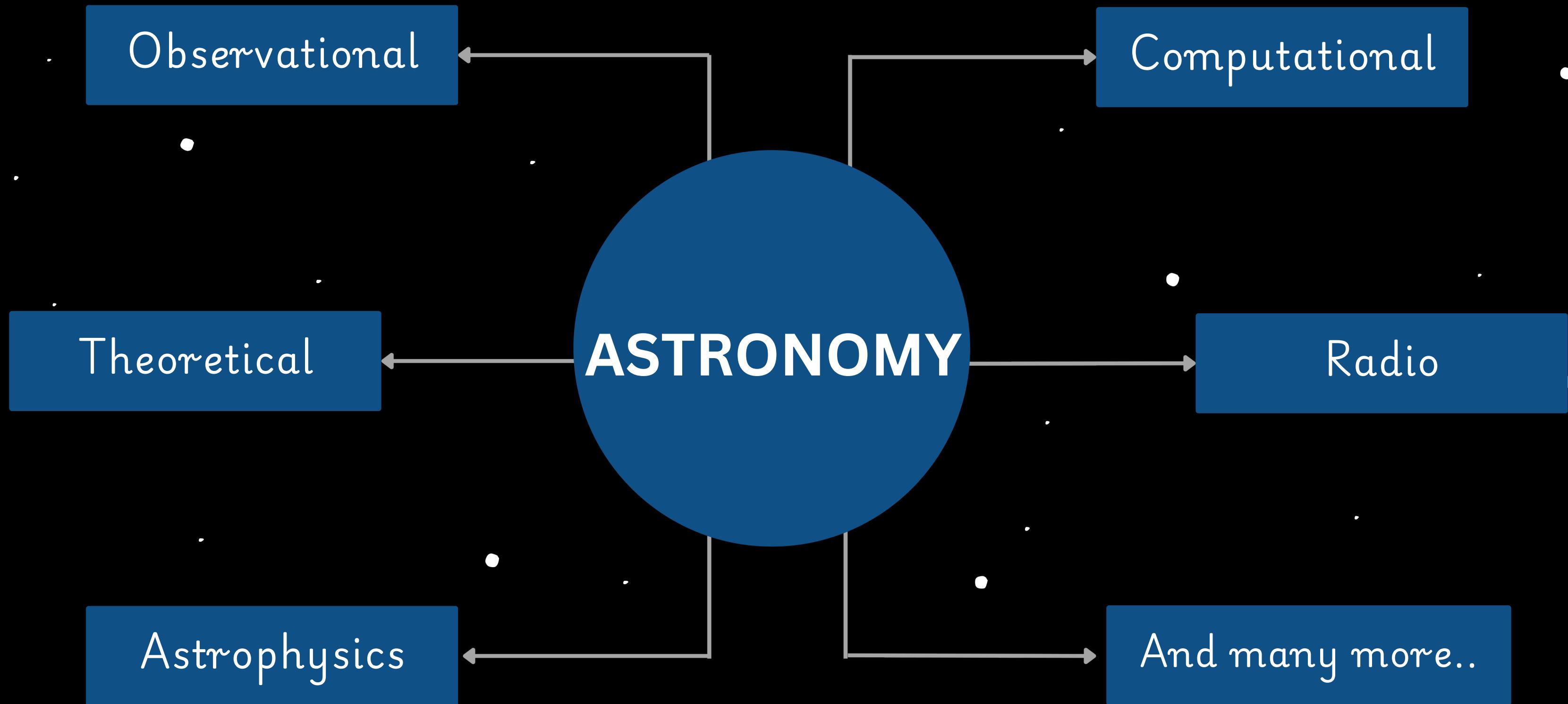
- Georges Lemaître: 1894- 1966 CE
  - A Belgian priest, astronomer and professor of physics.
  - Suggested that the Universe must be expanding.
  - His theory, supported by Hubble's work, suggested that the Universe must have begun as a small, extremely dense point of matter.
  - Lemaître's theory is famously called the "Big Bang Theory".



# In Summary

• • •

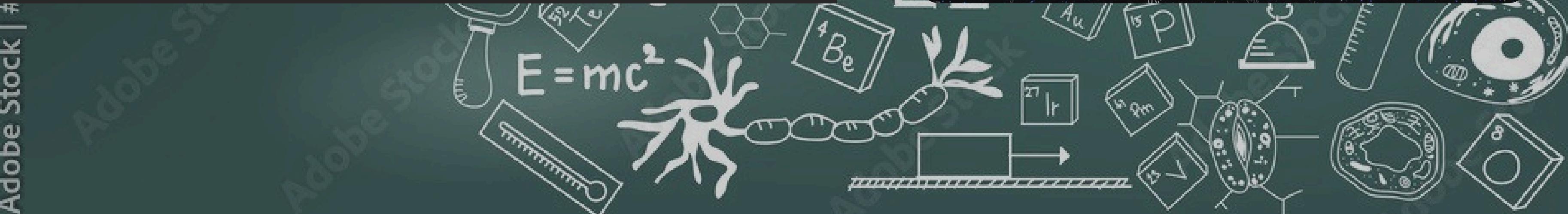
- Pythagoras was one of the first scientists to think that the earth was round.
- Aristotle concludes that the earth does not move and the celestial objects rotate around the earth in circular orbits. Ptolemy designs the Geocentric design of the cosmos to agree with Aristotle's ideas and to provide an explanation of the motion of planets. Copernicus suggests a sun-centered Heliocentric system with the earth being one of the planets that revolve around the sun. Kepler produces his three laws of planetary motion based on Tycho's observations. Newton contributes his three laws of motion and the concept of gravity which provides the reasons for objects following Kepler's laws.
- Hubble provides evidence that the universe is larger than just the Milky Way and also provides evidence that all other galaxies are moving away from our own galaxy. Lemaitre suggests the Big Bang Theory.
- 
-



# Theoretical Astronomy

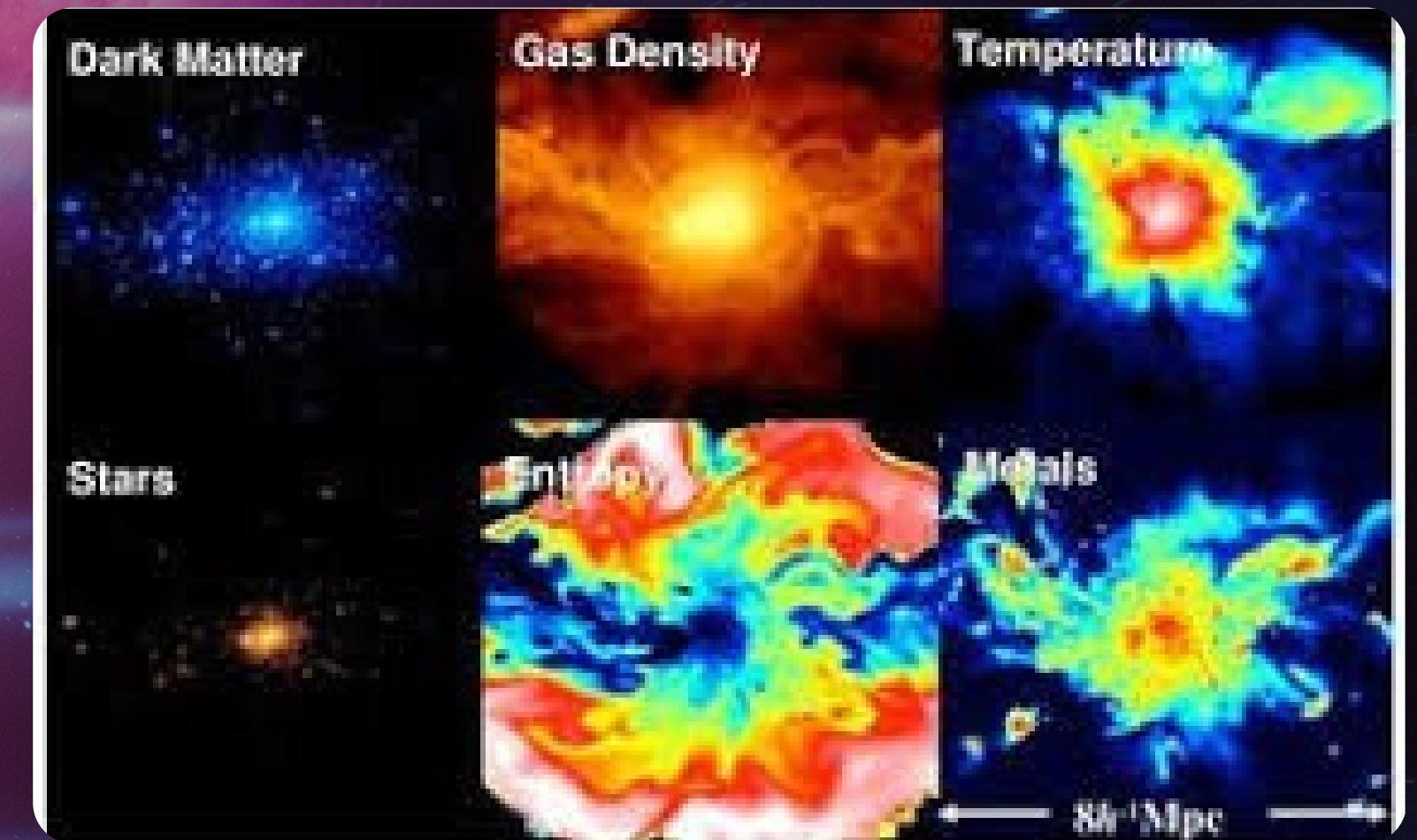


Theoretical astronomy is a branch of astronomy that uses physics and chemistry to create models that explain astronomical phenomena. Theoretical astronomers use analytical models and computational simulations to describe astronomical objects and phenomena.



# Computational Astronomy

- Huge amounts of data to process
- Time Series Analysis Simulations
- for easy understanding Models for analysis Image enhancement
- and pre processing
- 



# Radio Astronomy

Radio astronomy is the study of celestial objects and phenomena by using radio waves. It involves collecting and analyzing data from radio telescopes to gain insights into the universe. Radio astronomers convert the numbers collected by a telescope into pictures. Each number represents information from a specific point in space.



# Observational Astronomy

Observational astronomy is focused on acquiring data from observations of astronomical objects. This data is then analyzed using basic principles of physics.

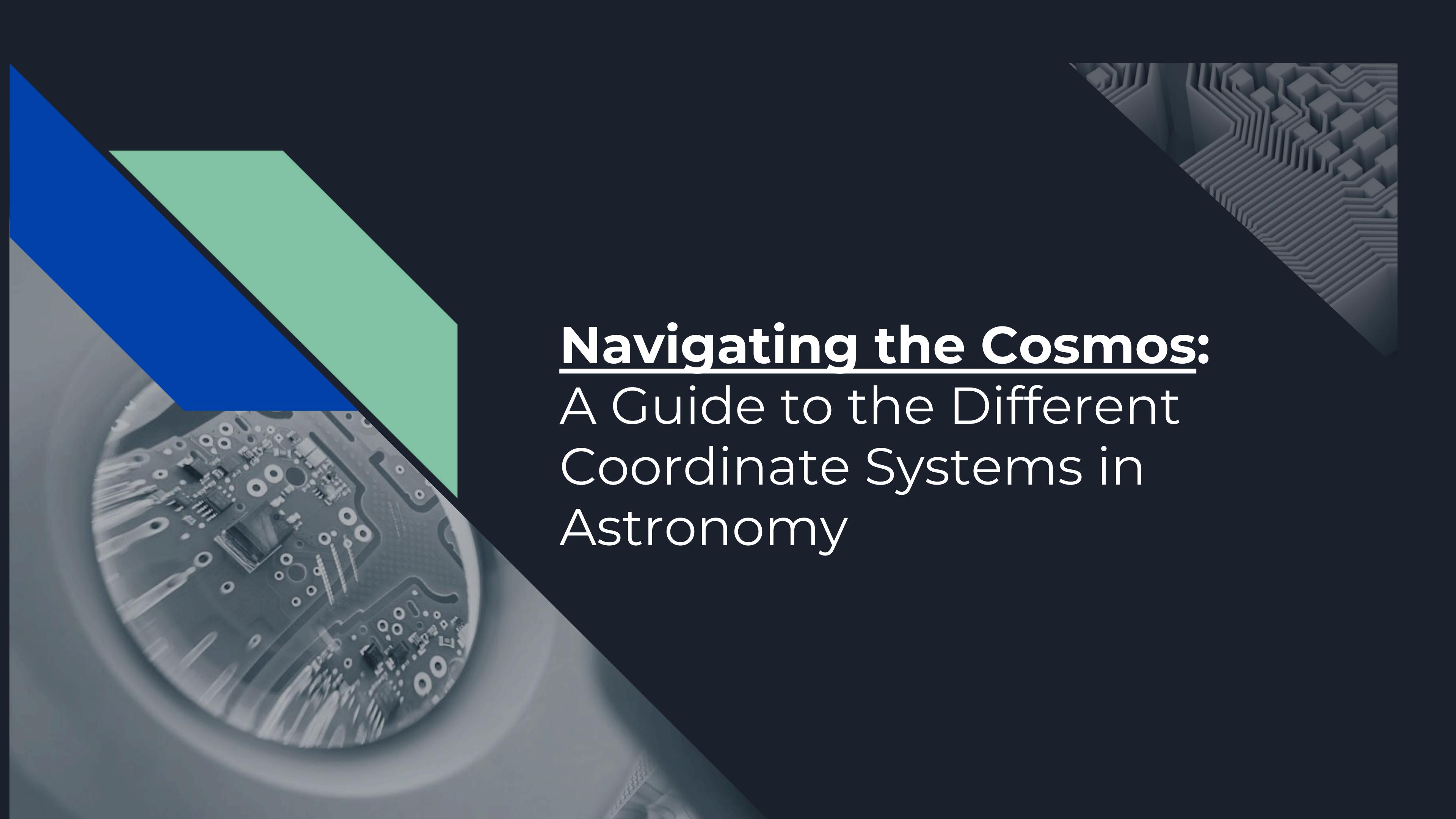


# Observational Astronomy

Observational astronomy is focused on acquiring data from observations of astronomical objects. This data is then analyzed using basic principles of physics.



**Let's dive into some basic concepts of Observational  
Astronomy now**



# Navigating the Cosmos:

## A Guide to the Different Coordinate Systems in Astronomy

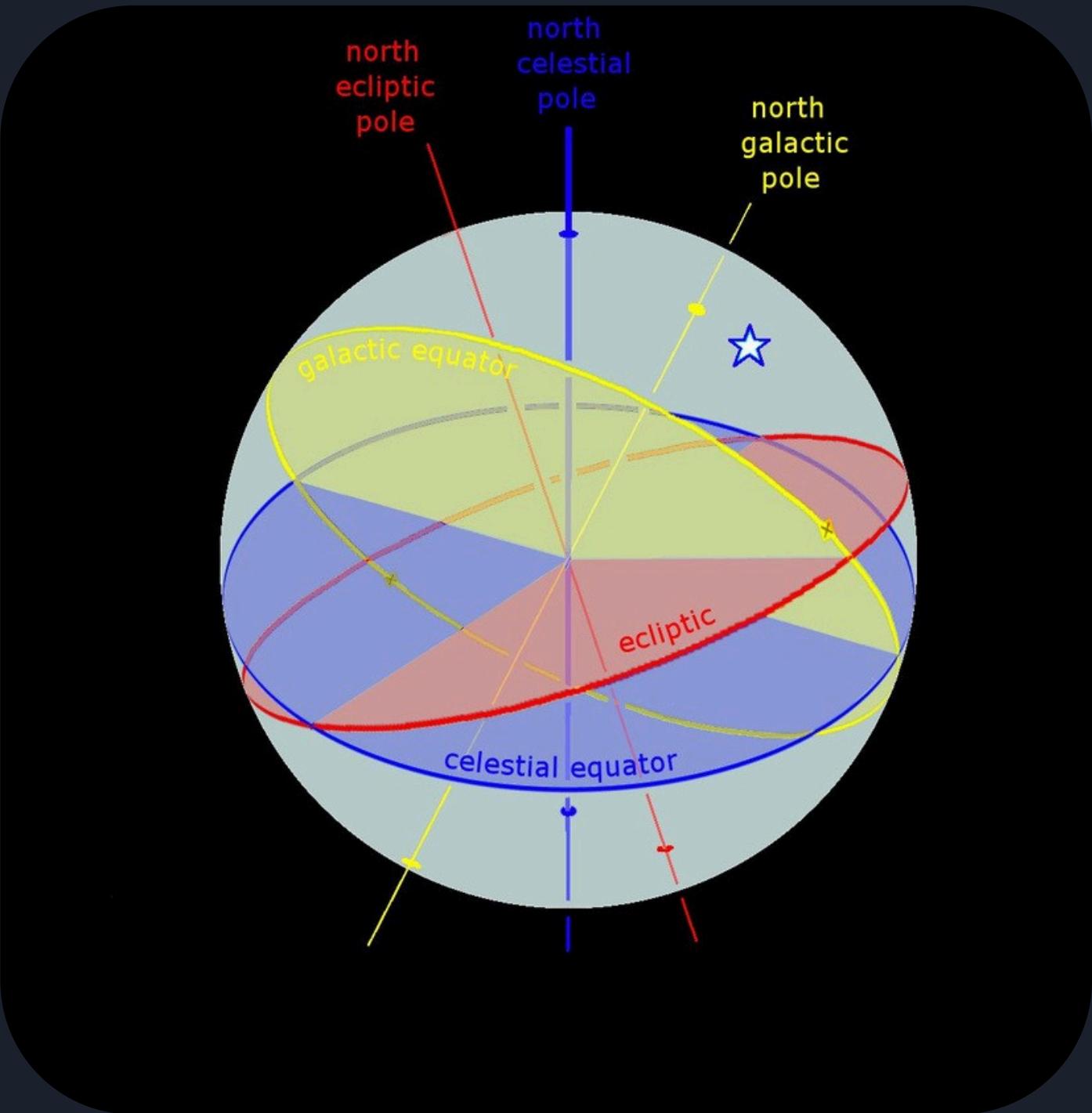
# Contents

- ❖ Coordinate System
- ❖ Reference Frame
- ❖ Types of Coordinate System
- ❖ Equatorial Coordinate System
- ❖ Altitude-Azimuth Coordinate System
- ❖ Ecliptic Coordinate System
- ❖ Galactic Coordinate System
- ❖ Supergalactic Coordinate System

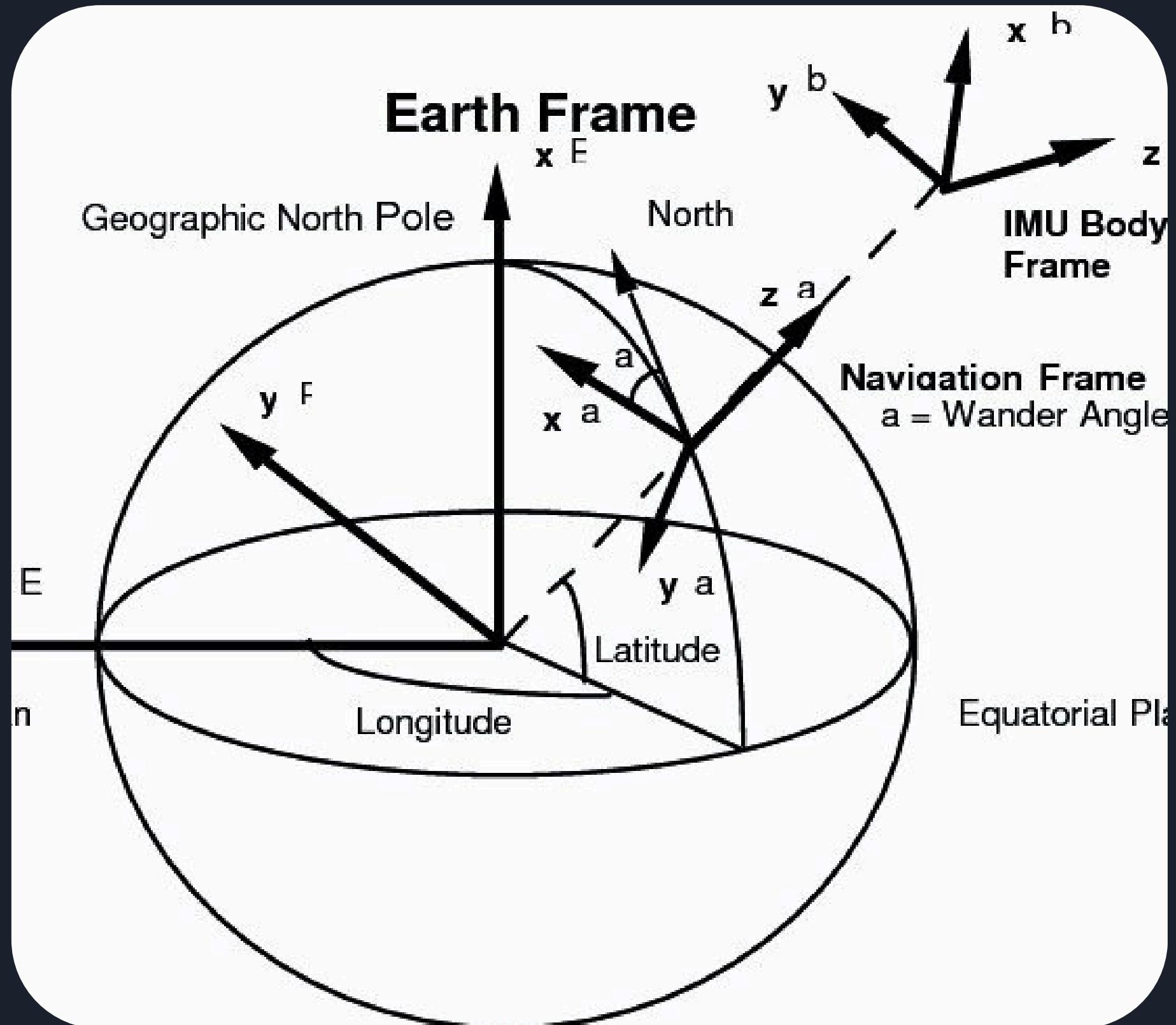
# Geometrical Coordinate System



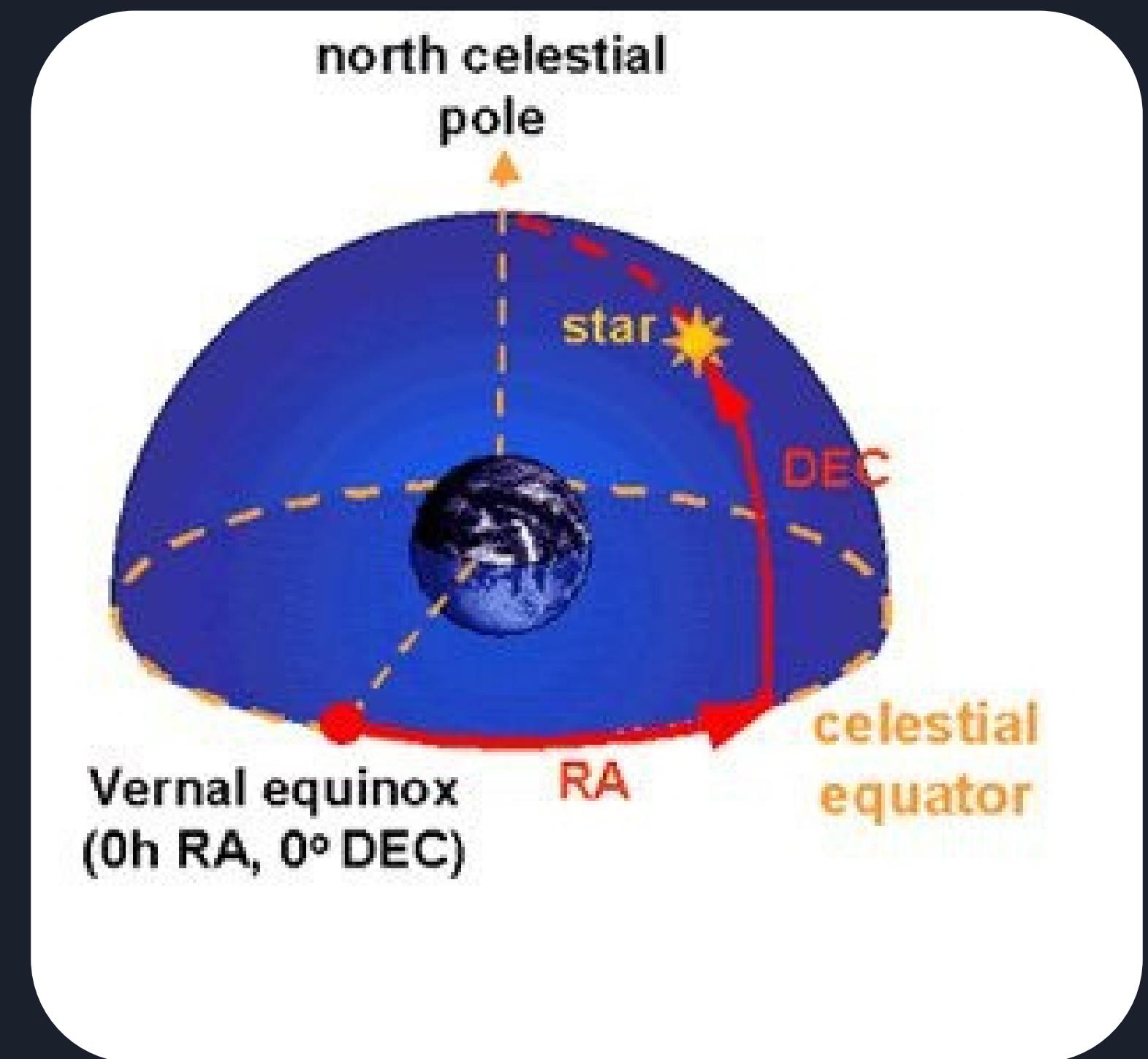
# Astronomical Coordinate System



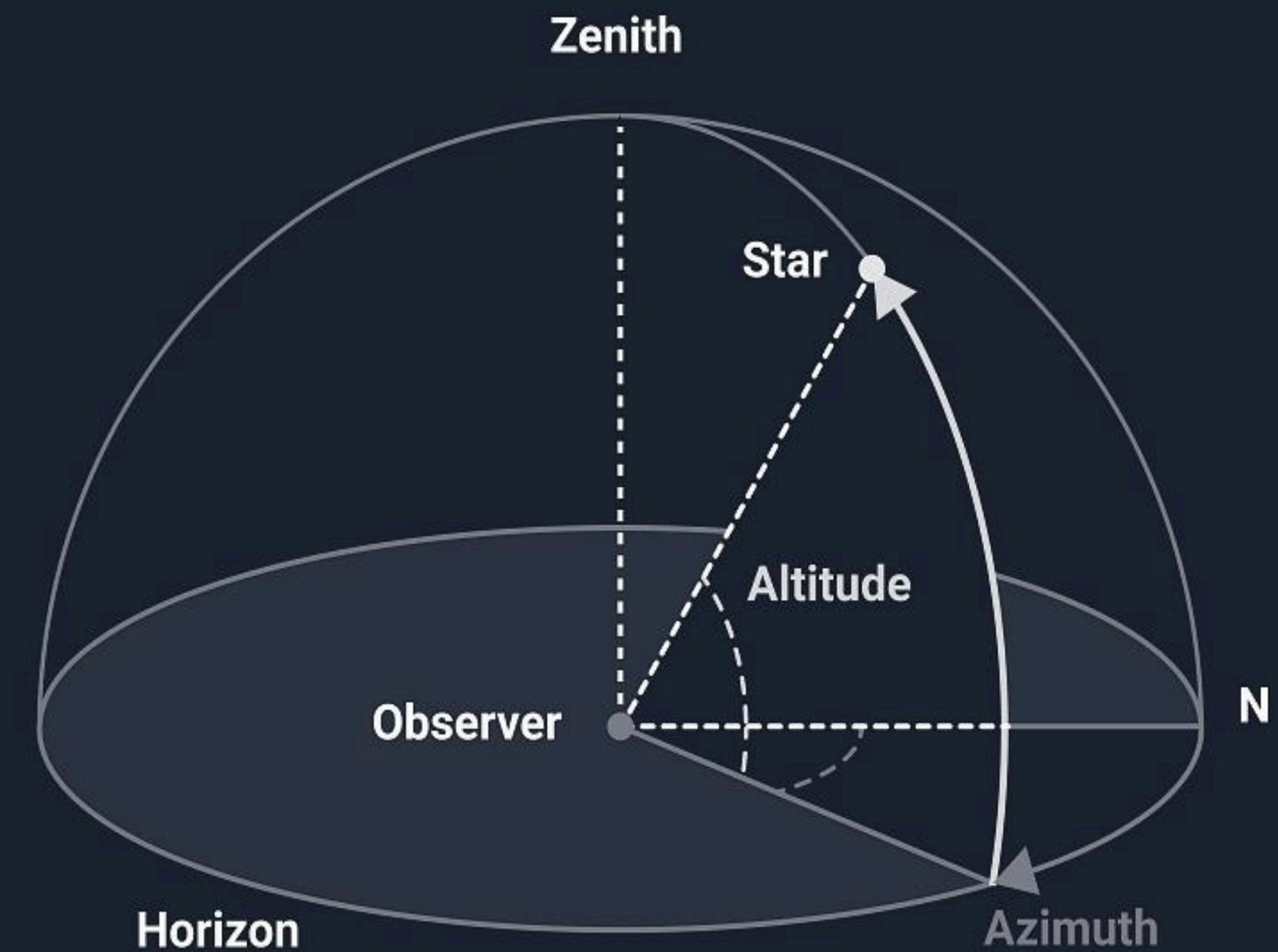
# Reference Frames



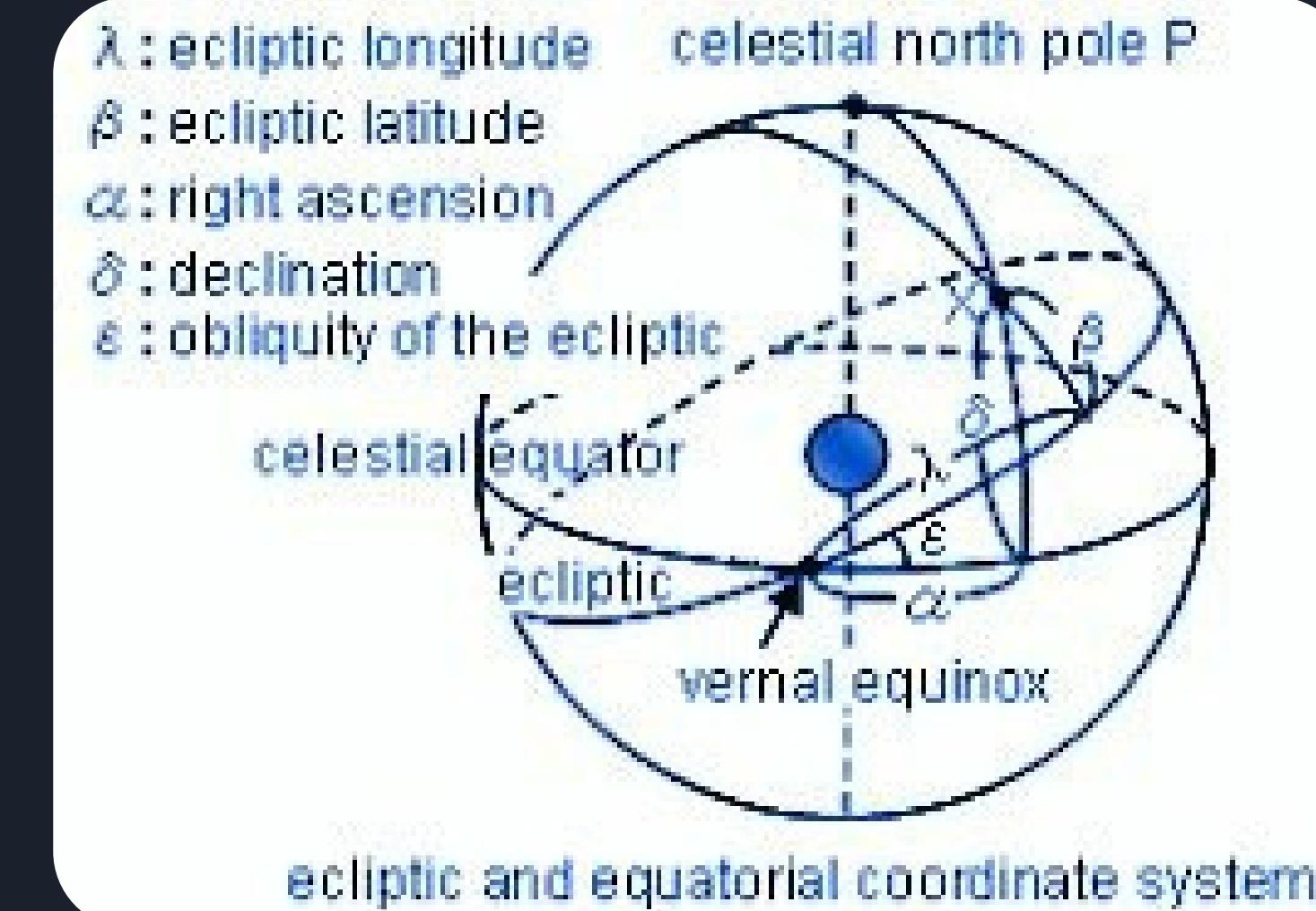
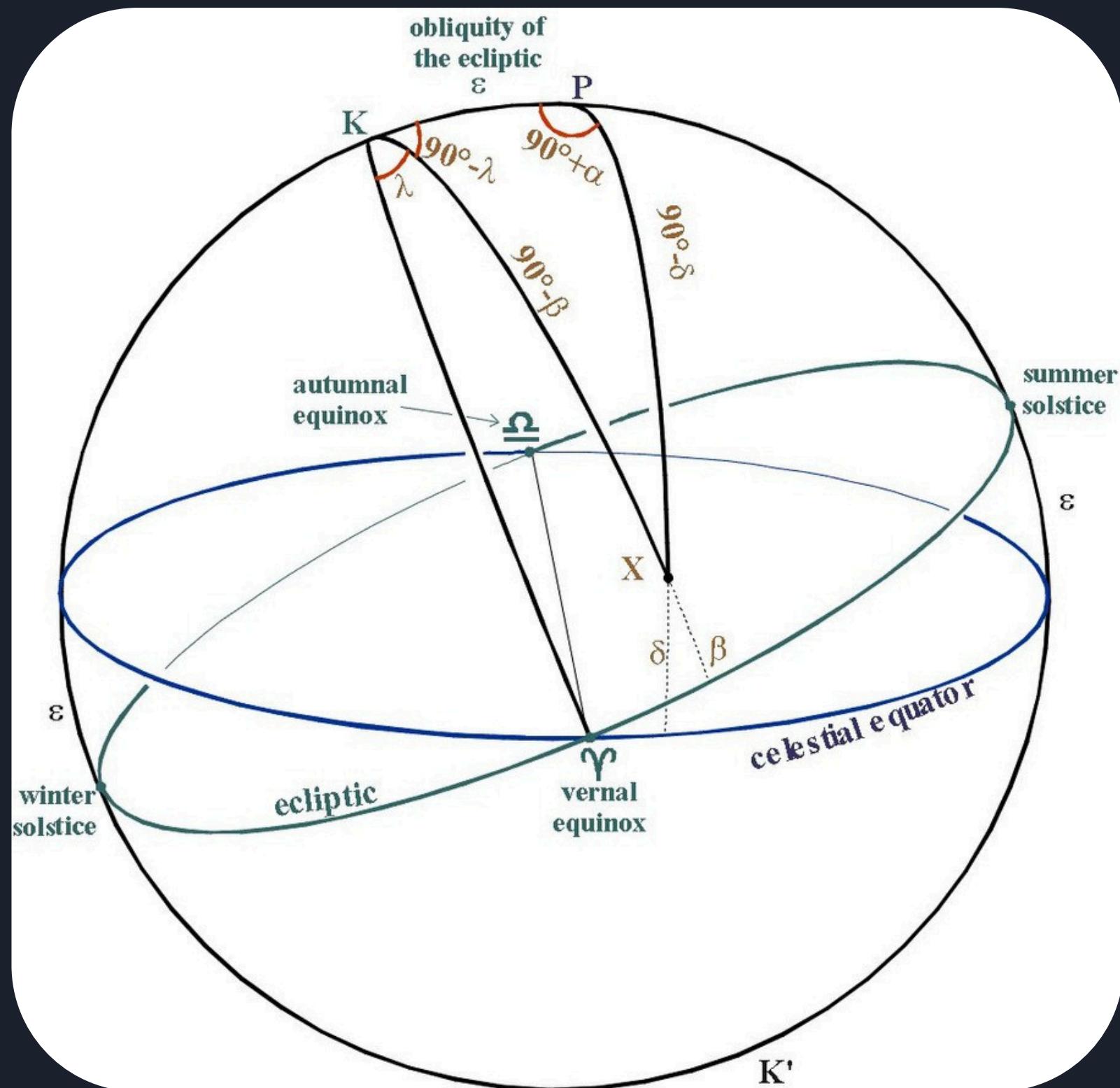
# Equatorial Coordinate System



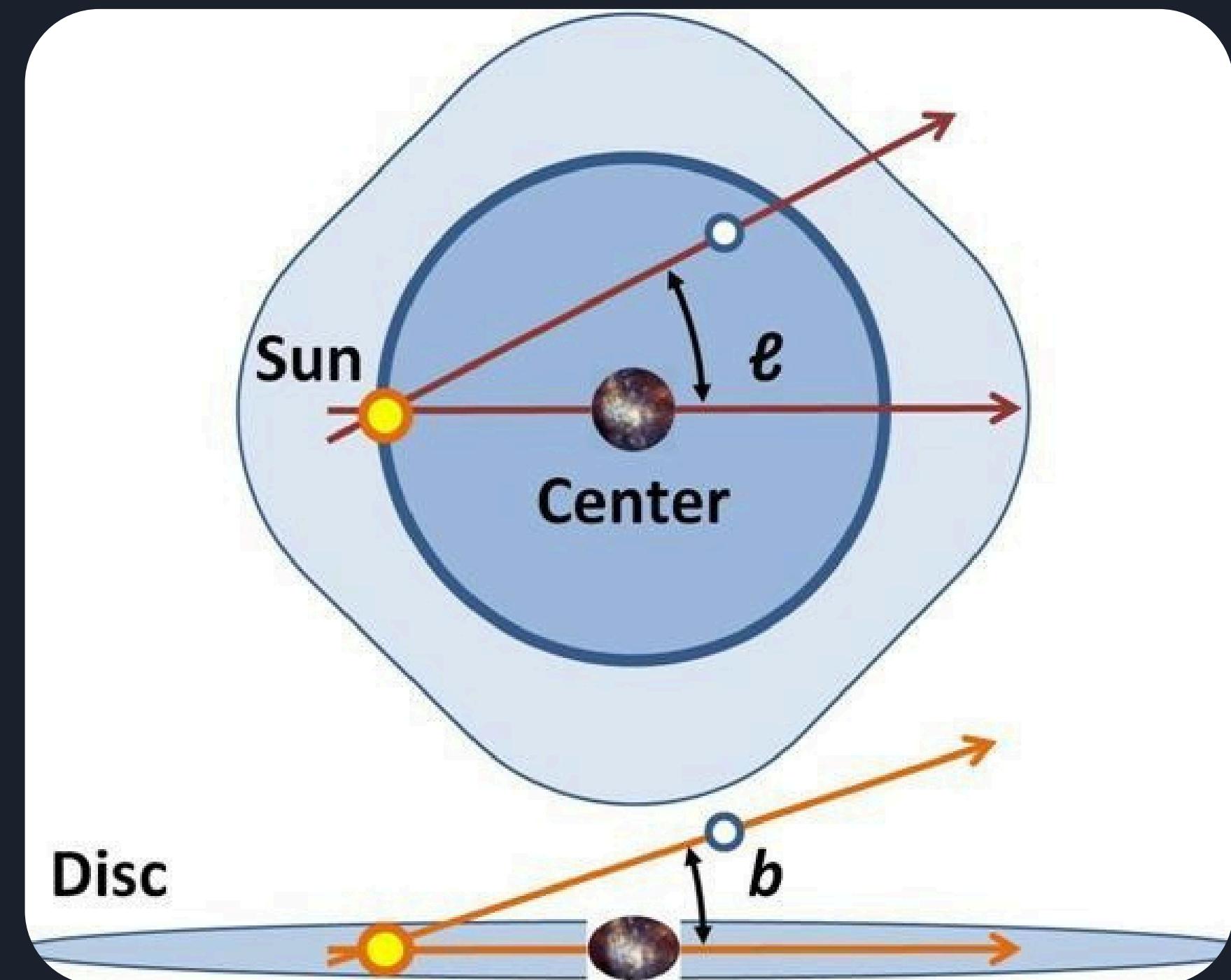
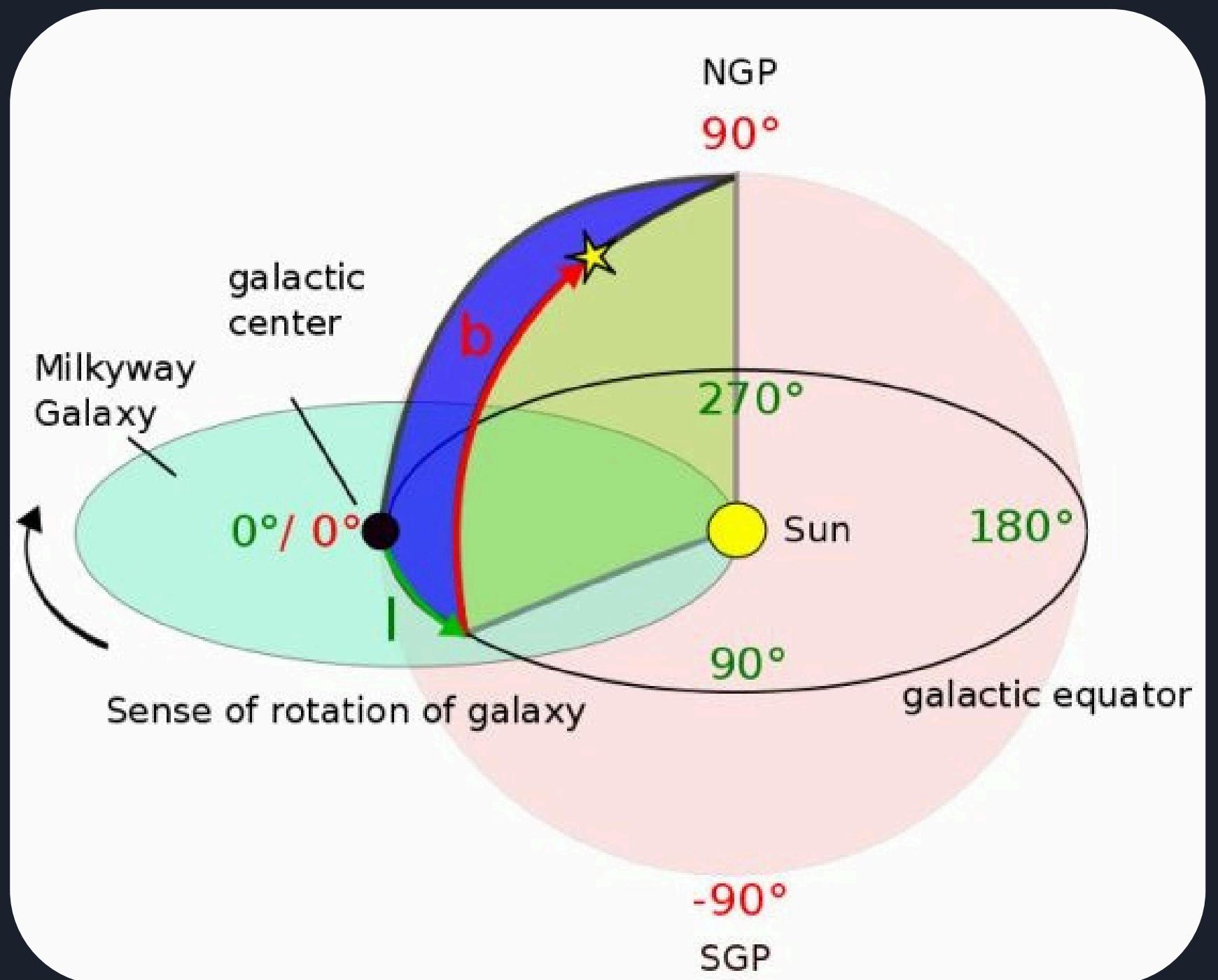
# Alt-Az Coordinate System



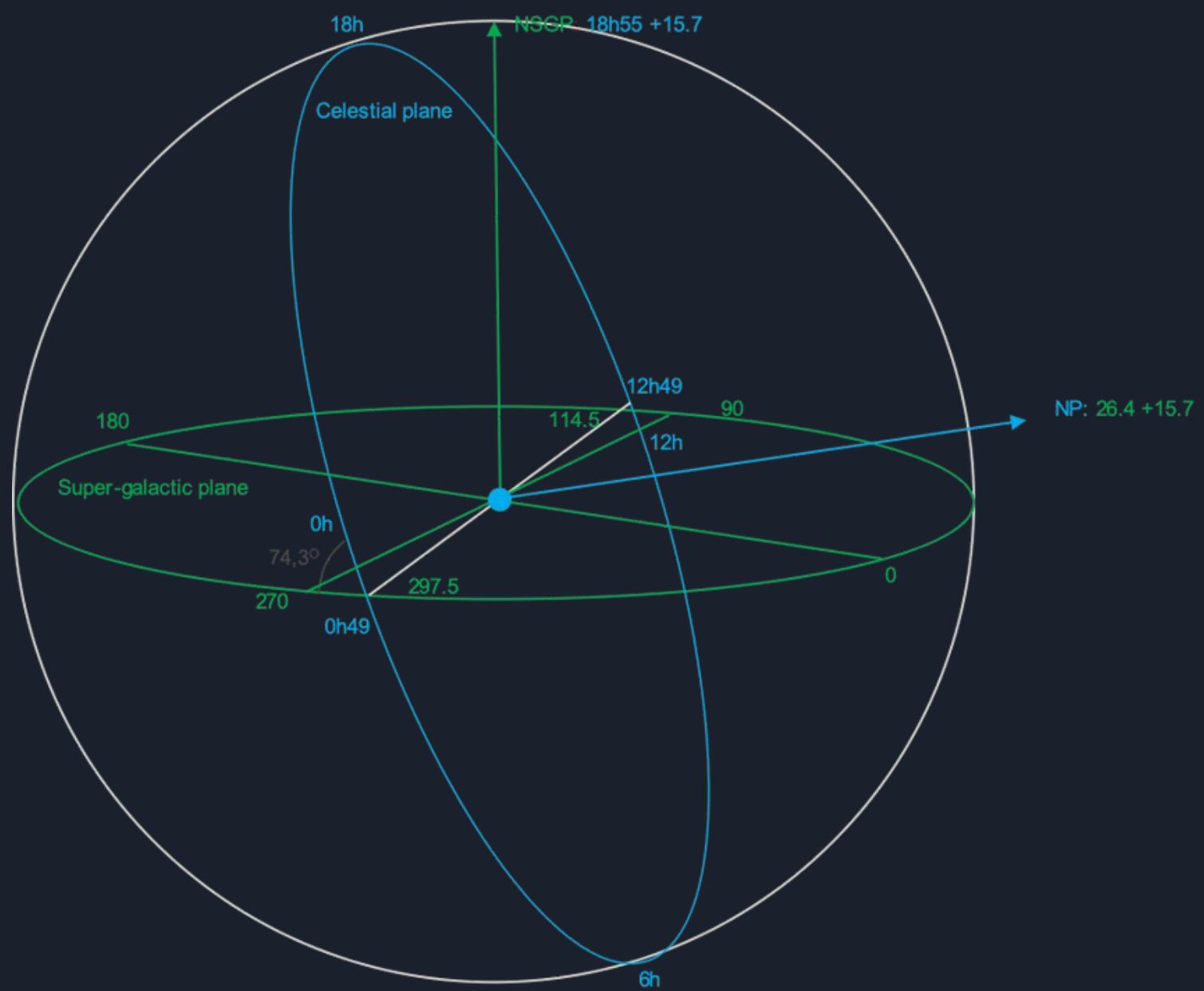
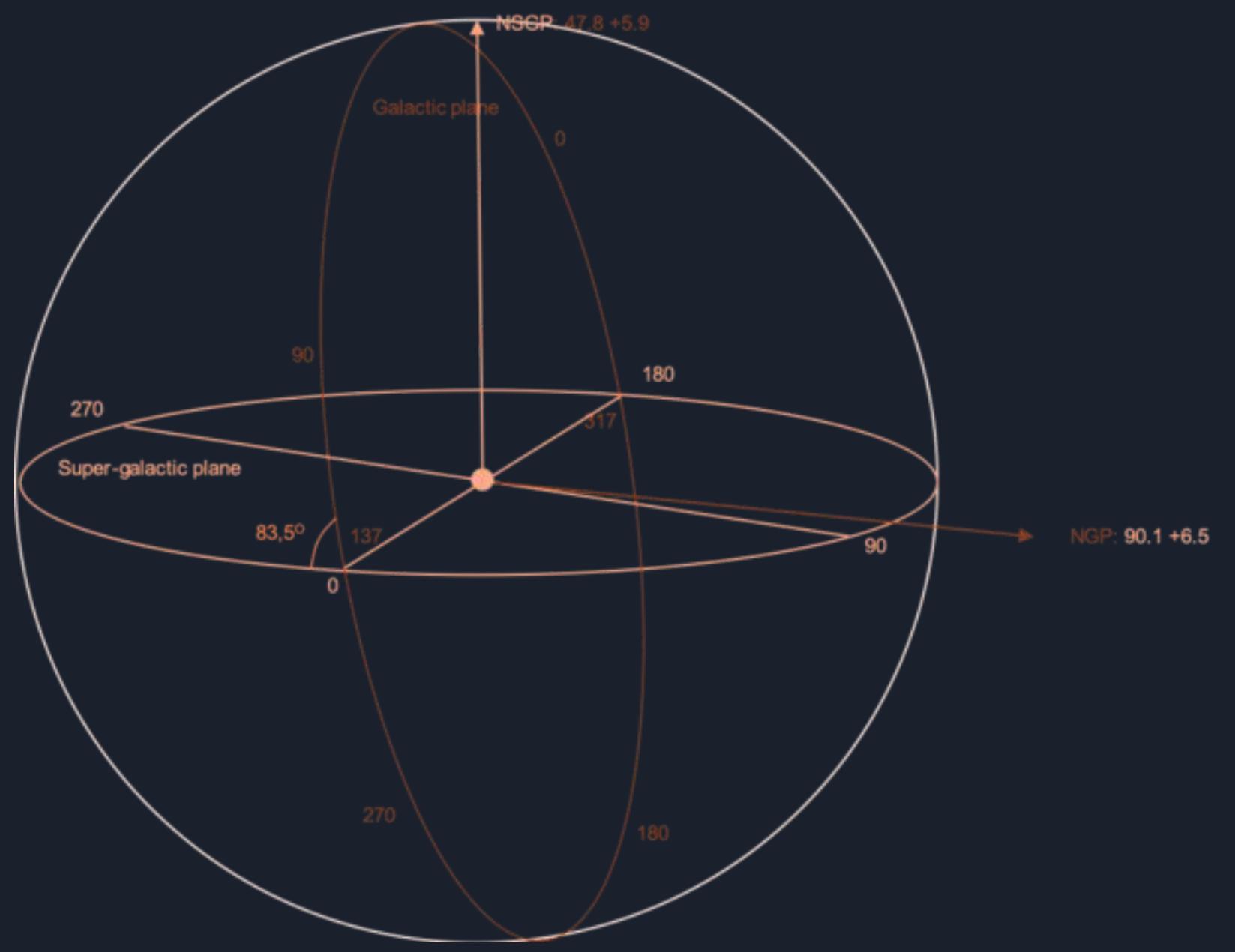
# Ecliptic Coordinate System



# Galactic Coordinate System



# Supergalactic Coordinate System



THANK YOU