

# Our Place in the Universe

History of Astronomy

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Session 1, 28 January, 2016

# Schedule

- Session 1, January 28: History of Astronomy--setting the stage,  
Mitzi Adams
- Session 2, February 4: The Structure and Activity of Our Closest Star,  
Dr. Laurel Rachmeler
- Session 3, February 11: From One End of the Solar System to the Other: Mercury and Saturn,  
Dr. Todd Bradley
- Session 4, February 18: Toward Radiation-Smart Structures and Designs,  
Dr. Nasser Barghouty
- Session 5, February 25: Great Science with the Chandra X-ray Observatory,  
Dr. Martin Weisskopf
- Session 6, March 3: From Dust to Stars and Back Again: Stellar Evolution  
Dr. Doug Swartz
- Session 7, March 10: Gamma-Ray Bursts: Monsters in Our Back Yard  
Dr. Rob Preece

# Our Place in the Universe

## Session 1: History of Astronomy

We often ask ourselves

Who am I?

Why am I here?

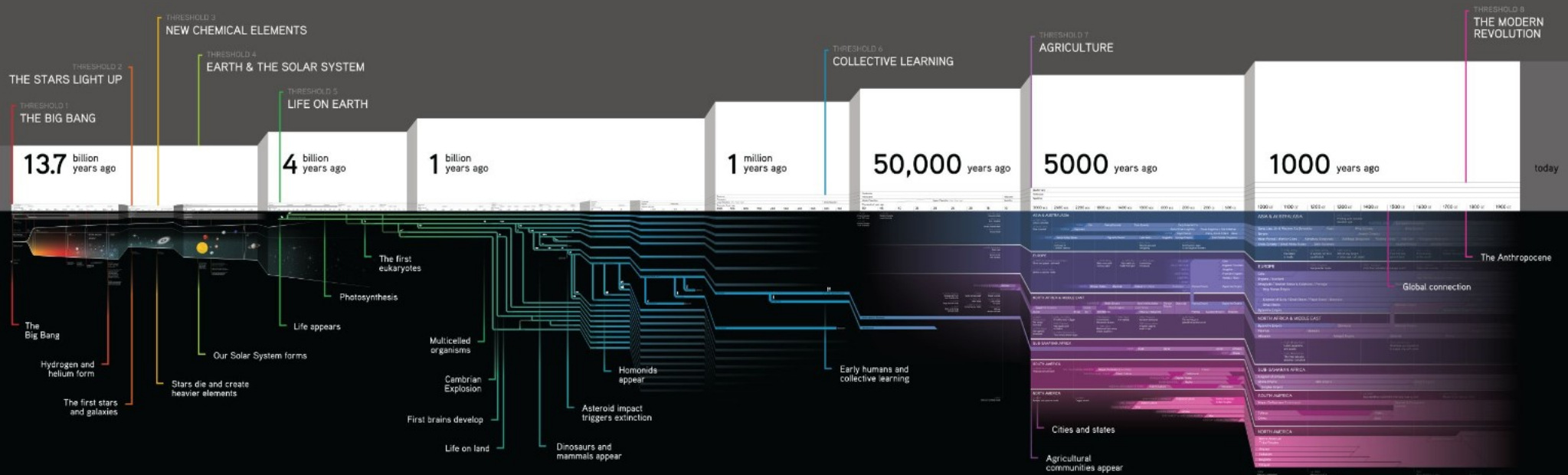
How did I get here?

Let's go back to the beginning of history.

This session includes a very broad overview of a couple of the major ideas of astronomy, along with demonstrations of Earth's motions that

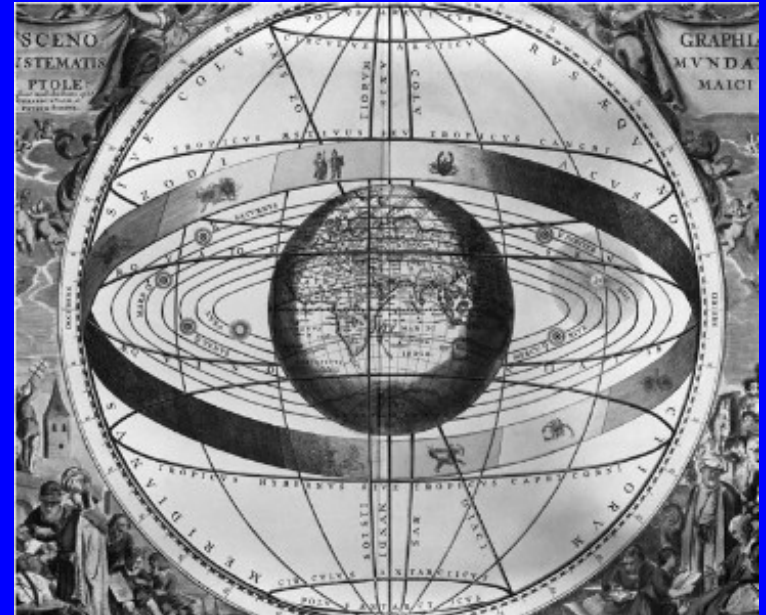
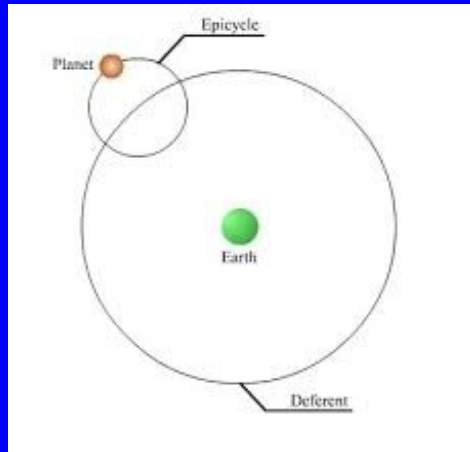
- give rise to the seasons,
- show us the "faces" of Venus (and the Moon)
- result in retrograde motion of the outer planets

# Putting it into Context



# Major Ideas

**Claudius Ptolemy:** Famous for geocentric view of the universe, author of the *Almagest*. c. 150 CE



**Hypatia:** "And in those days there appeared in Alexandria a female philosopher, a pagan named Hypatia, and she was devoted at all times to magic, astrolabes, and instruments of music..." (died: 415 CE)  
John, Bishop of Nikiu, *The Chronicle* (LXXXIV.87-88, 100-103)



# Major Ideas



Copernicus (1543) -- Kepler & Brahe (c. 1615): Developed heliocentric view of the universe. What happened c. 1608?

# Major Ideas



Annie Cannon, Henrietta Leavitt, Georges Lemaître, Edwin Hubble: The Big Bang view of the universe that says, the universe (space and time) began from a “singularity”. Initially, the universe was extremely hot and dense, but it has gradually cooled as it has expanded over 13.8 billion years. c. 1927 CE

# Terms

Olber's Paradox -- Newton - The universe is static and infinite with a random scattering of stars.

**The paradox** - If the universe is infinite with a random scattering of stars, then everywhere we look we must see a star. The sky should be as bright as day!

Occam's Razor -- The most simple explanation is often the correct one.

Kepler's Laws --

Einstein

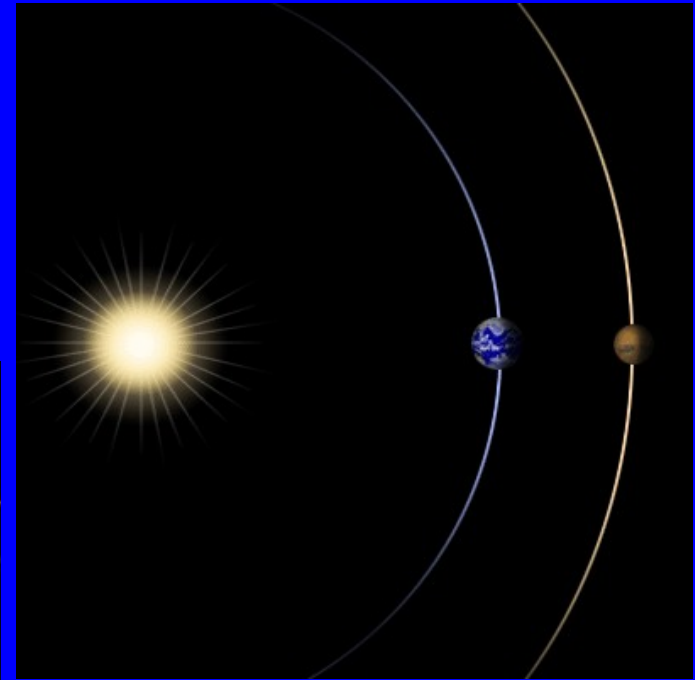
Cosmological Principle -- Universe is homogeneous - every region is the same as every other region, i.e. it doesn't matter where we make measurements from.

Universe is isotropic - universe looks the same in every direction, i.e. no one region has significantly more matter than any other.

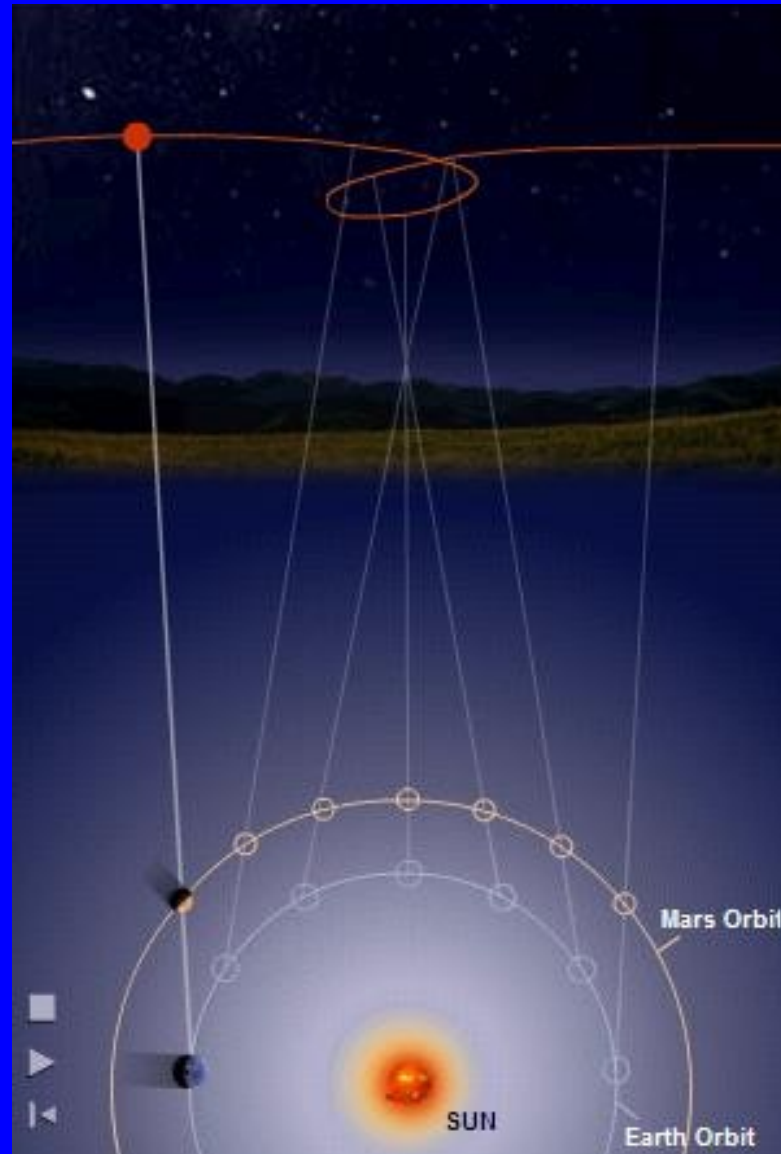


# Terms

Opposition -- For Mars every 26 months  
(1 Martian year)

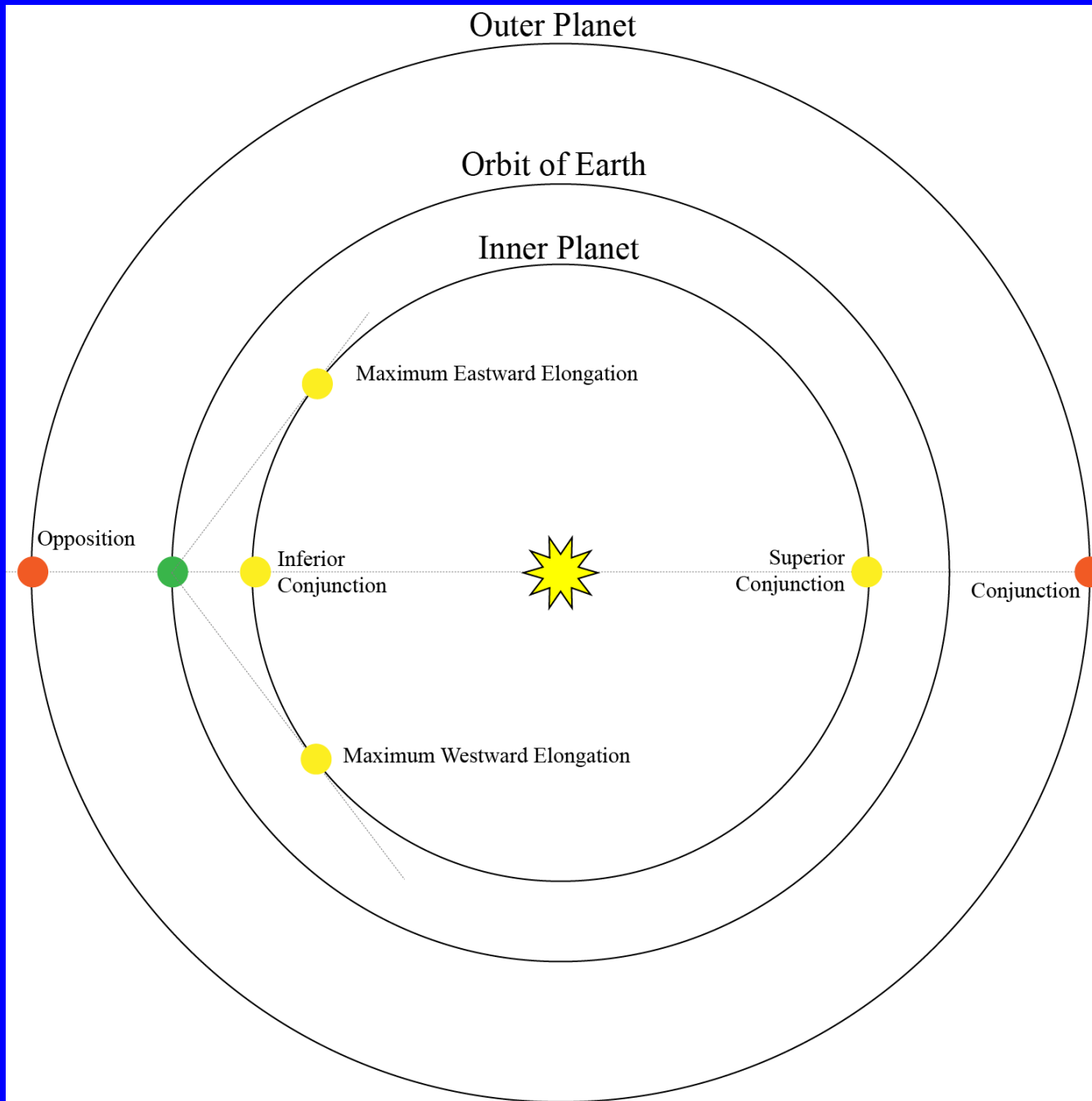


Retrograde Motion

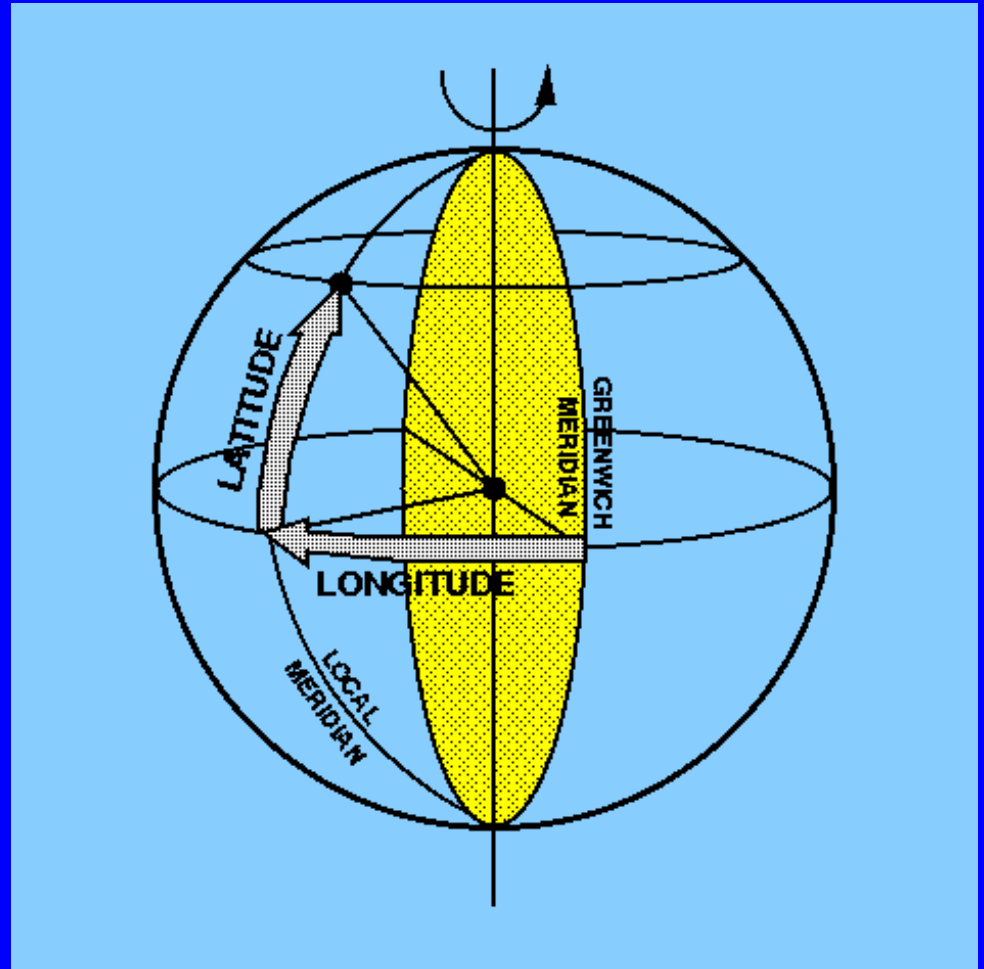
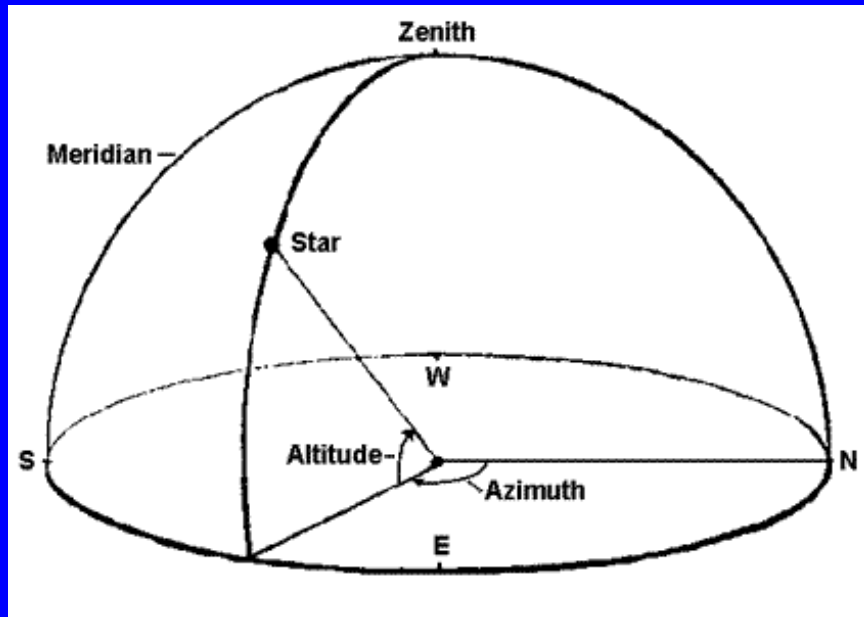


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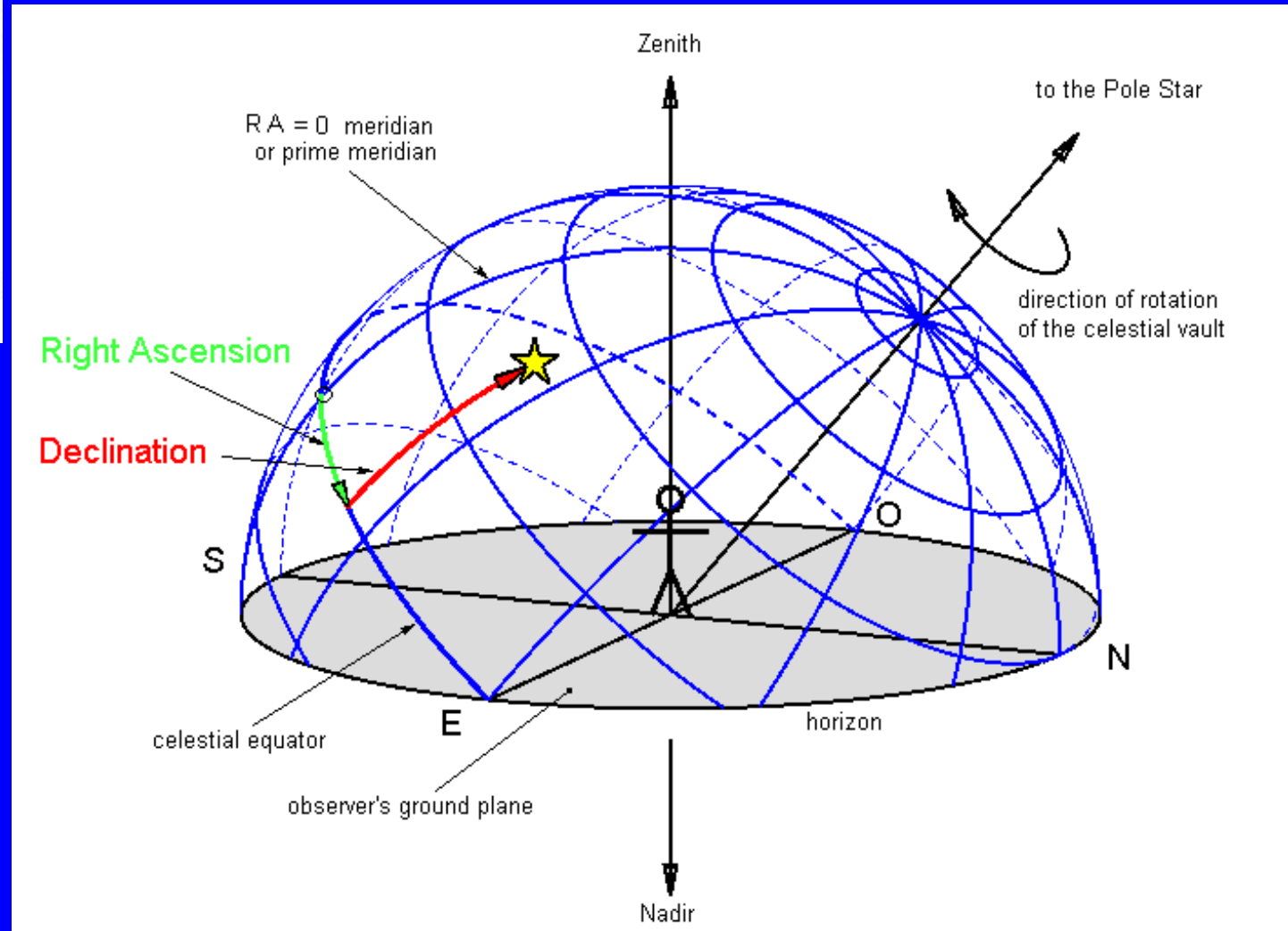
## Conjunction and Opposition



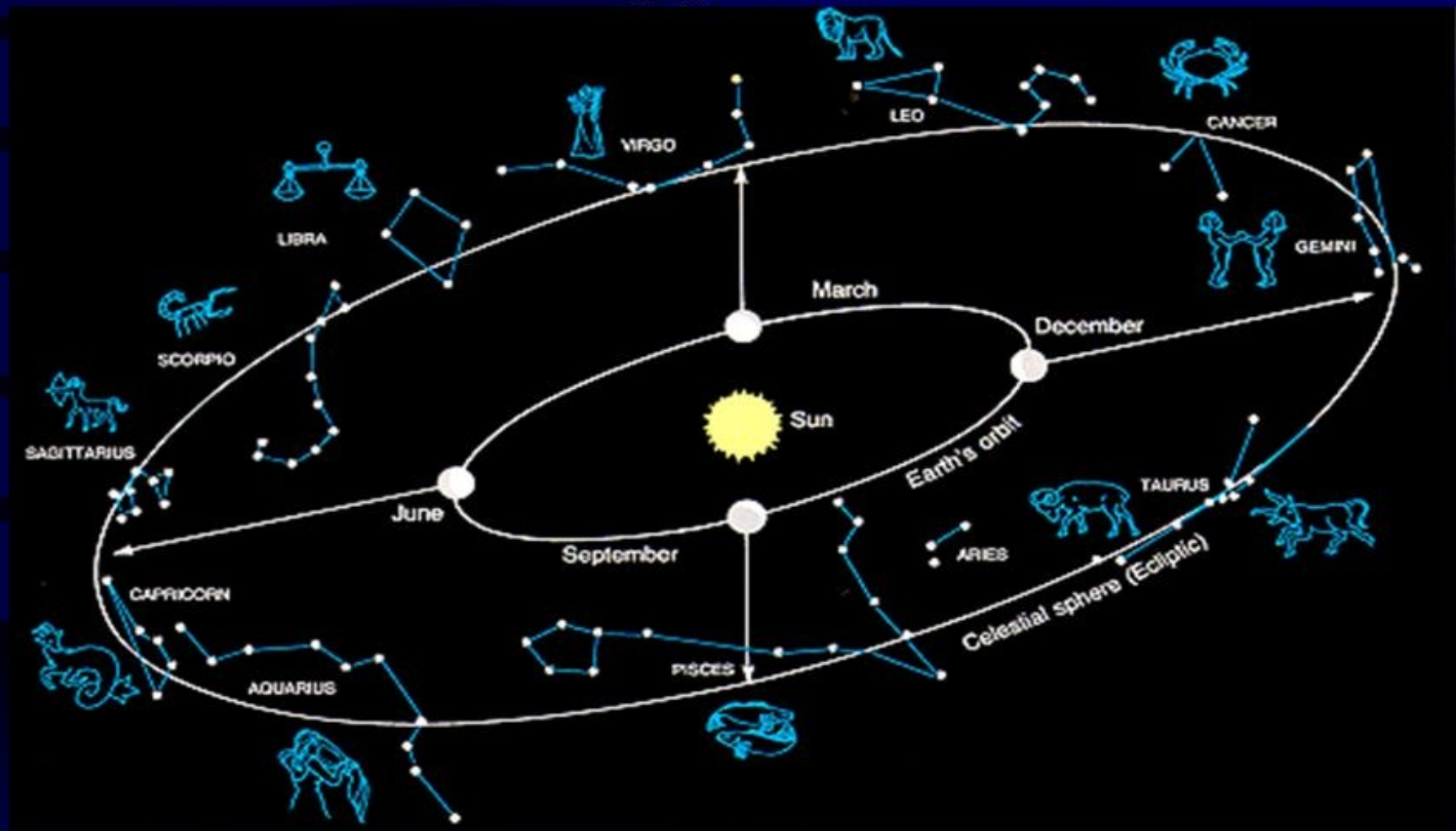
# Coordinate Systems -- The Geocentric Universe



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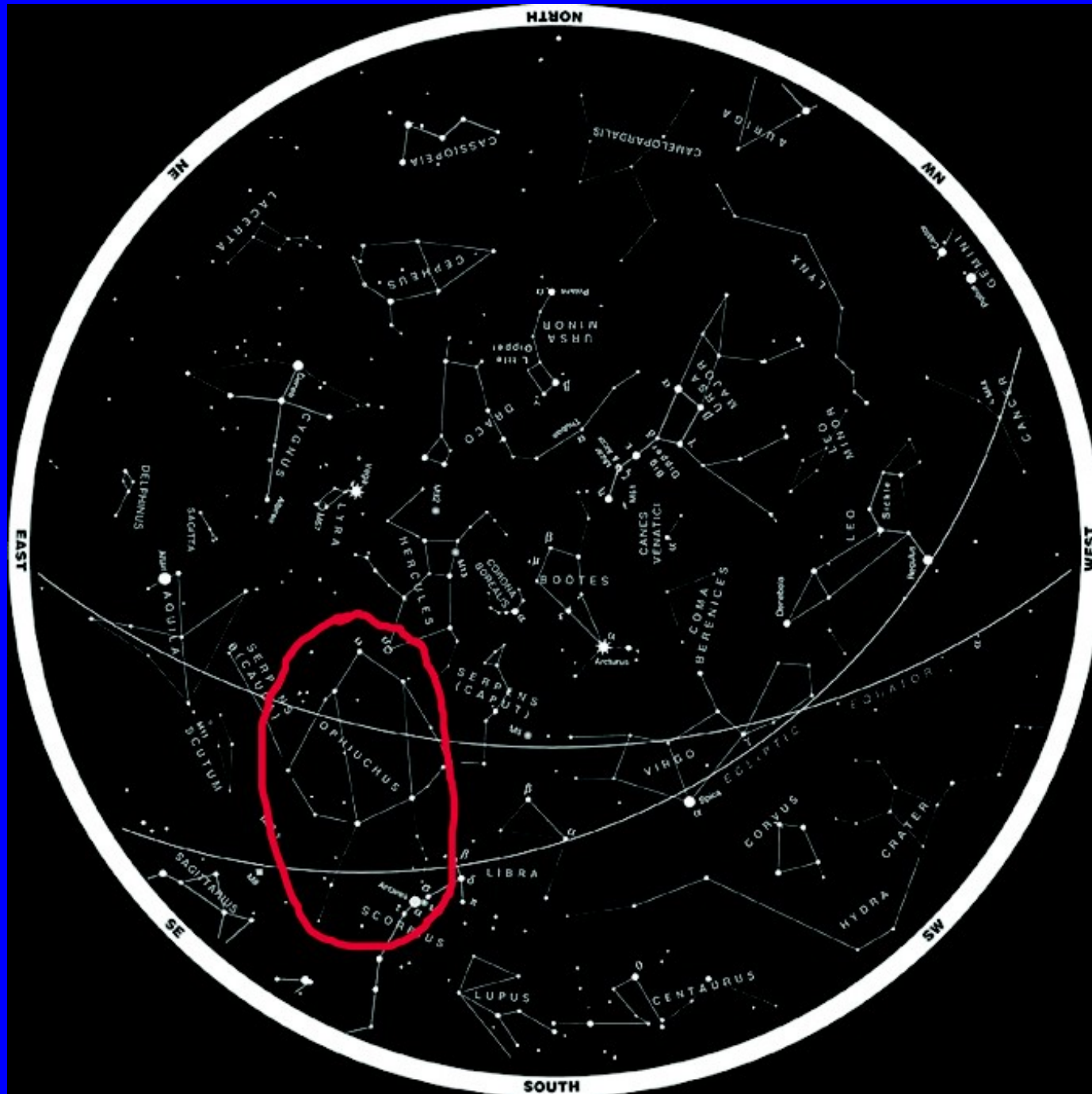
# Sun's Apparent Path



As Earth moves around the Sun, the Sun appears “in front” of the constellations of the ecliptic (Zodiac)

Let's Demonstrate What We Mean

But Wait! The ecliptic passes through Ophiuchus!!



# Your “Real” Sign

Capricorn - Jan 20 to Feb 16

Aquarius - Feb 16 to Mar 11

Pisces - Mar 11 to Apr 18

Aries - Apr 18 to May 13

Taurus - May 13 to Jun 21

Gemini - Jun 21 to Jul 20

Cancer - Jul 20 to Aug 10

Leo - Aug 10 to Sep 16

Virgo - Sep 16 to Oct 30

Libra - Oct 30 to Nov 23

Scorpius - Nov 23 to Nov 29

Ophiuchus - Nov 29 to Dec 17

Sagittarius - Dec 17 to Jan 20



# Phases of Venus



