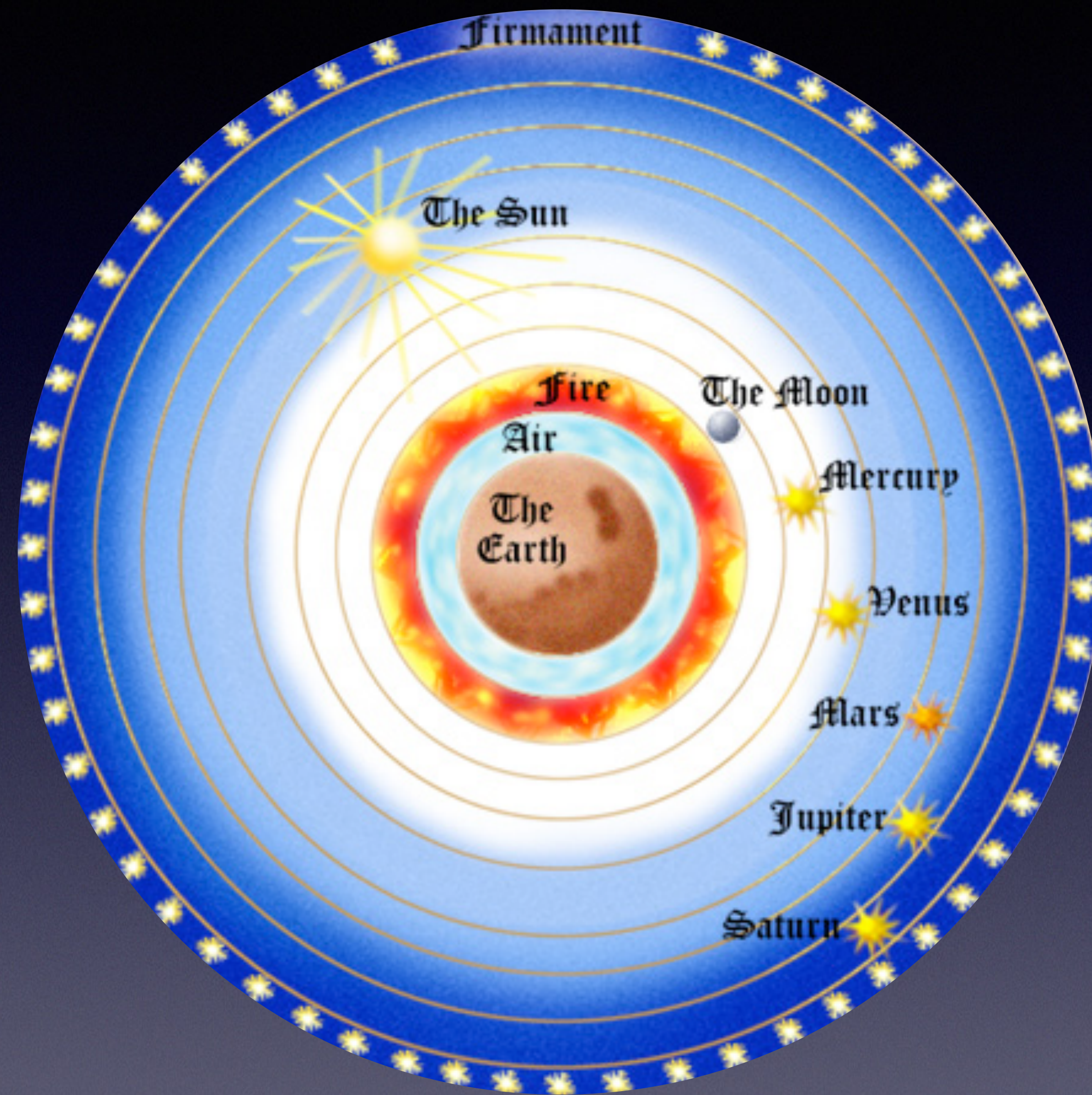


# Apparent to Actual Motions

How do celestial objects appear to move across the sky  
and how do they actually move across the sky?

# Apparent Motions

- Geocentric Universe - idea that Earth was at the center of the solar system
  - Also called the Ptolemaic System
  - Stars all rotate around the Earth on a single large sphere at  $15^\circ/\text{hour}$
  - Planets travel on smaller spheres around their own larger sphere in epicycles



Geocentric Universe

# Apparent Motions

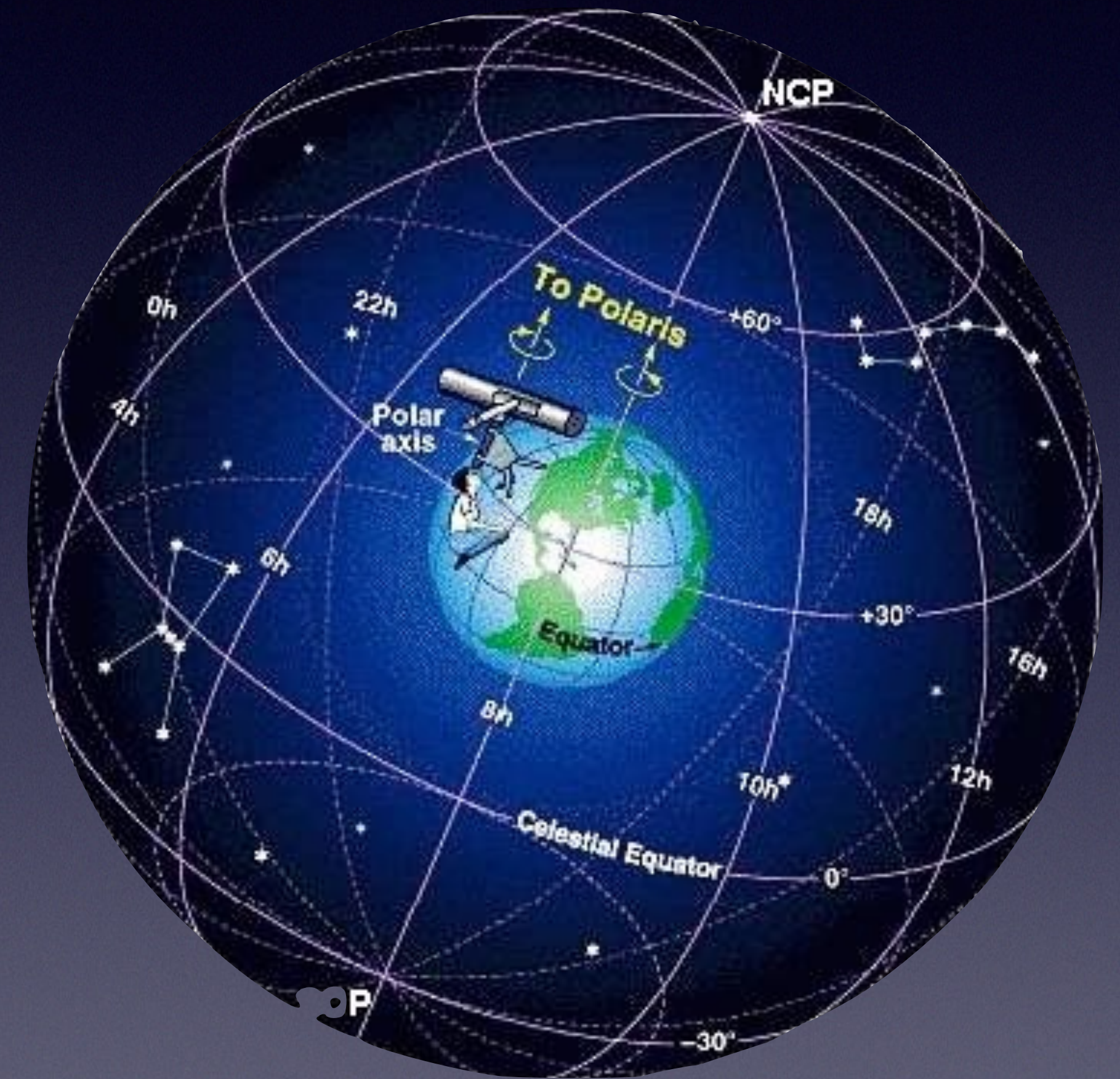
- Problems with the Geocentric Model:
  - Locations of the planets could not accurately be predicted
  - Changes in the apparent diameter of the Moon and Sun could not be explained

# Apparent Motions

- Apparent Motion - the way in which celestial objects appear to move across the sky

# Apparent Motions

- Celestial Sphere - the visible portion of the sky that celestial objects appear to travel on
- Celestial Object - any of the natural objects that can be seen in the sky



# Apparent Motions

- Horizon - the edge of the visible portion of the celestial sphere
- Zenith - highest point on the celestial sphere which is directly over the observer



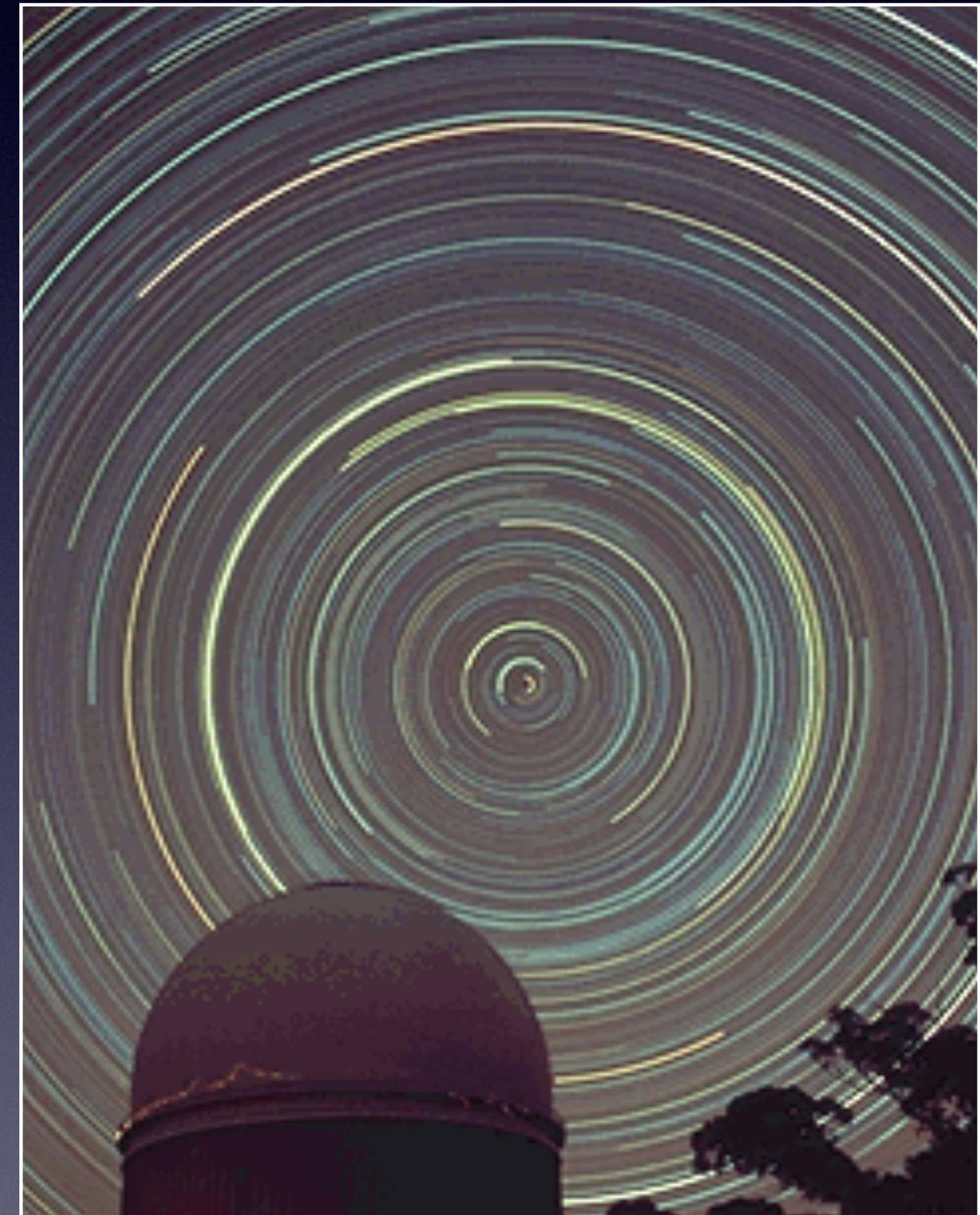
# Apparent Motions

- All objects [except Polaris] appear to move across the celestial sphere from east to west at  $15^\circ/\text{hour}$  or  $360^\circ/24$  hours



# Apparent Motions

- Star Trails - long exposure photos of stars as they appear to move across the sky
- Circumpolar Stars - stars that move around a polar star
- Polar Star - star directly above the North or South Pole



# Apparent Motions

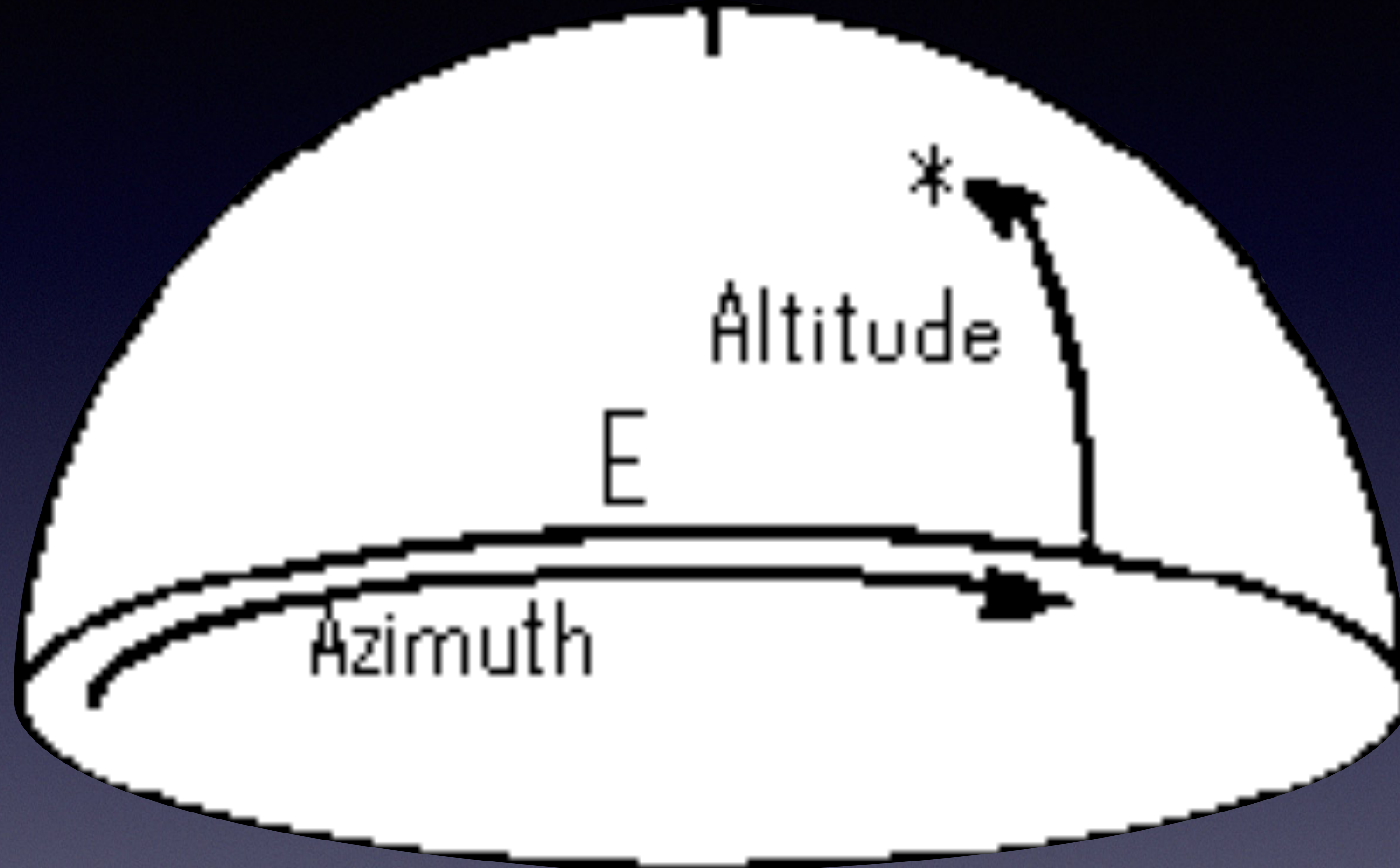




*Photo Credit: Dan Carroll  
Location: Maine*

# Apparent Motions

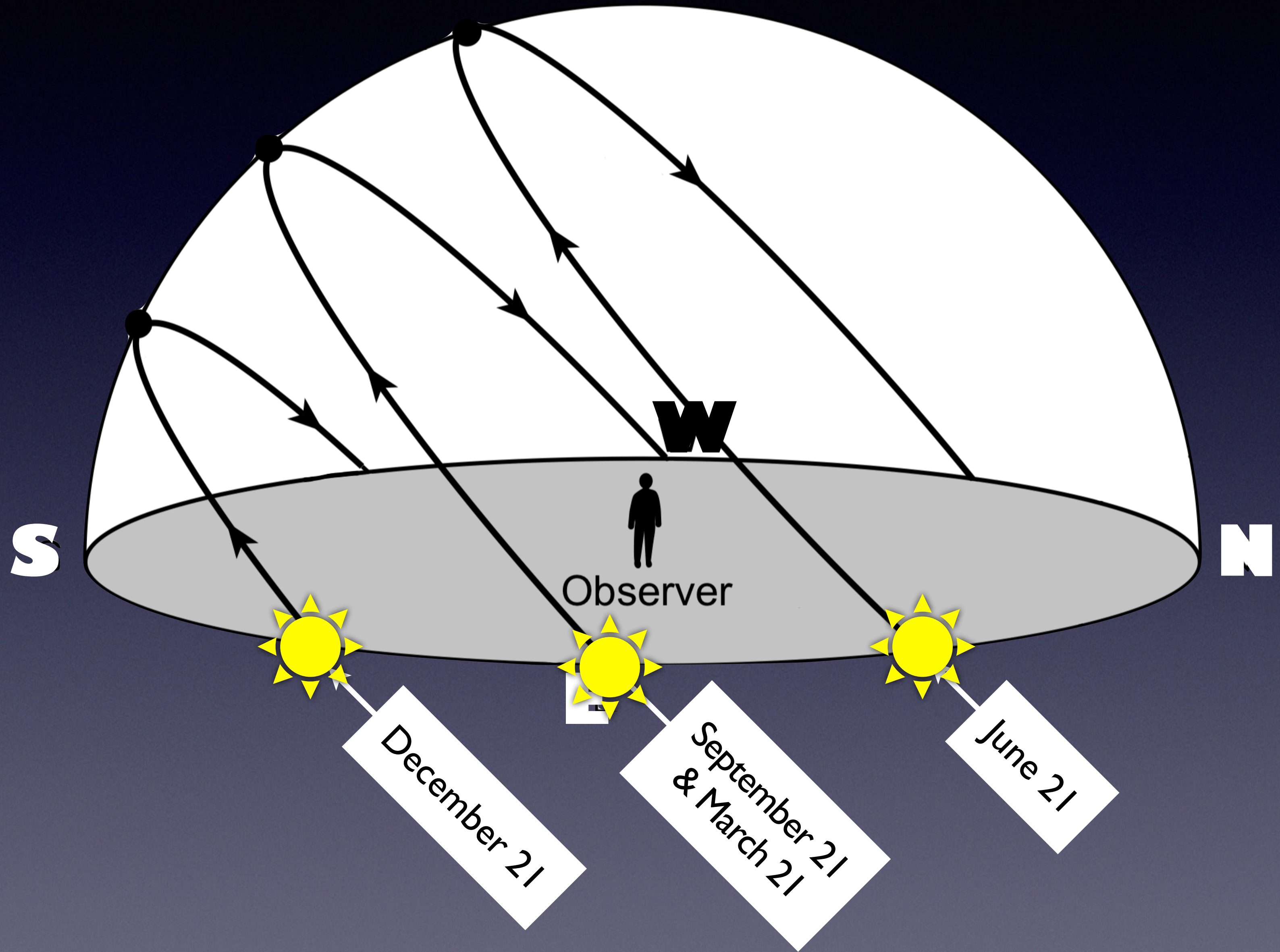
- Locating positions on the celestial sphere:
  - Altitude - angular distance above the horizon [ $0^\circ$  to  $90^\circ$ ]
  - Azimuth - angular distance along the horizon measured from due north [ $0^\circ$  to  $360^\circ$ ]



Altitude and Azimuth

# Apparent Motions

- The Sun's path changes throughout the seasons
  - The greater the Sun's path the increased amount of daylight hours an area receives
  - The shorter the Sun's path the decreased amount of daylight hours an area received



# Apparent Motions

- What's Charlie's approximate latitude if this photo was taken at noon on June 21?







22° N

22° N



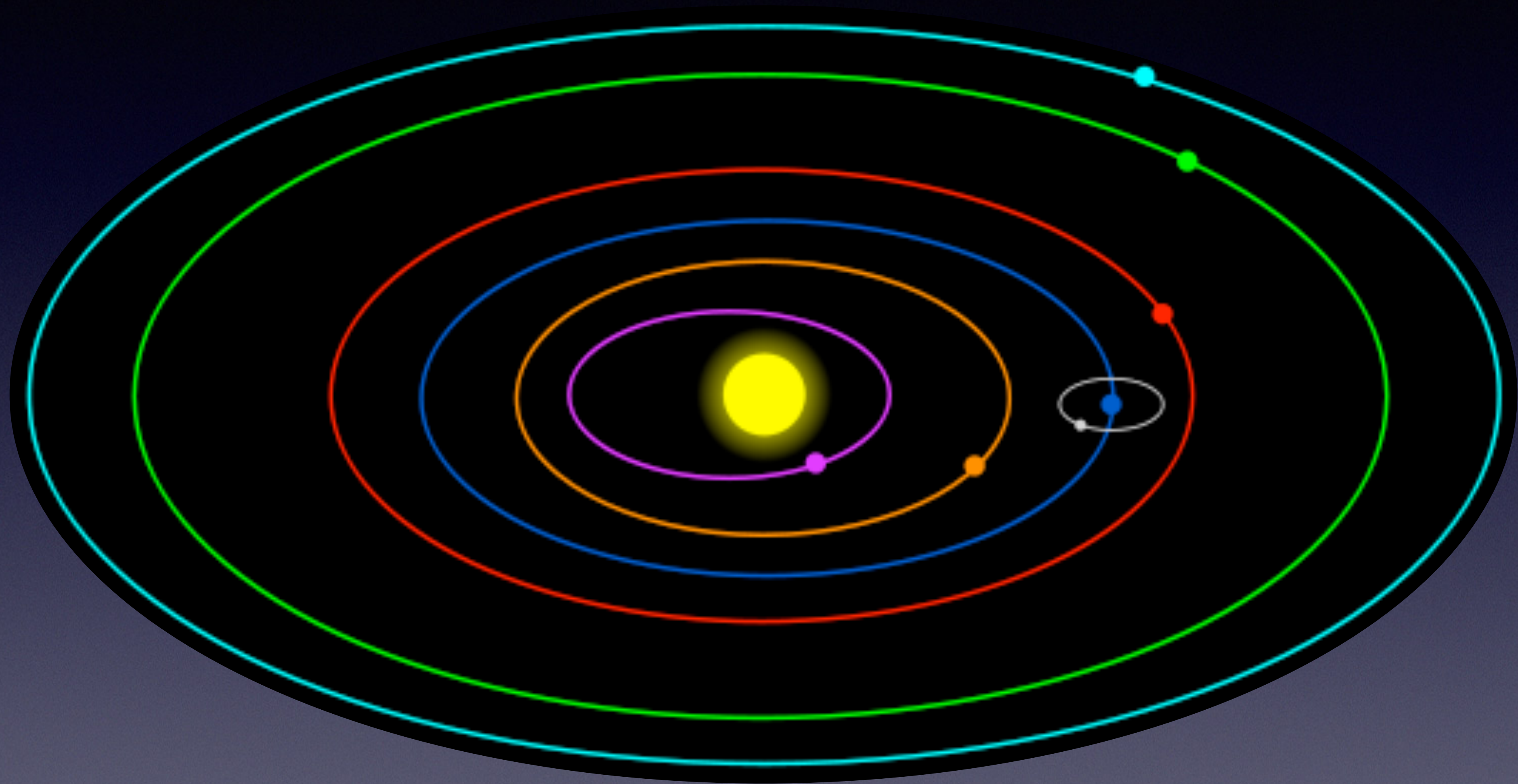
Nicolaus Copernicus  
1473 – 1543

# Copernicus



# Actual Motions

- Heliocentric Model - current model of the solar system where the Sun is at the center
  - Also called the Copernican Model
  - Planet revolve around the Sun in circular paths



Heliocentric Model Universe

[earthtoleigh.com](http://earthtoleigh.com)