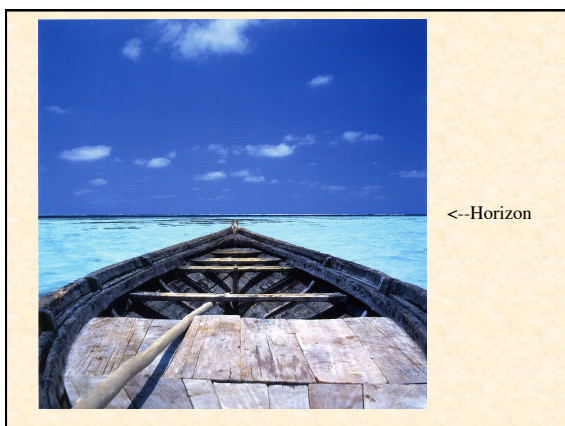


Lec #2: 29 AUG 11 Celestial Geography

- **TODAY: "Celestial Geography"**
 - Describing "location" and "distance" on the sky
 - Spherical Geometry
 - Celestial Coordinate Systems
- **Announcement:** go.cofc.edu/SONG4/
- **Next Week:**
 - Celestial Time Systems
 - Daily, Annual, and Long-Term Motion of the Sky
 - Cataloging Stellar Properties. I. Position

The Sky (viewed from Earth)

- The Sky APPEARS to us as if all the "celestial" bodies (Sun, Moon, planets, stars, etc.) are on the *inside* of a *sphere* (2-Dimensional surface)
- Really, they are distributed in a 3-Dimensional space
 - demo: Orion in 3-D
- We see one *half* of this sphere at any given time
- The Earth blocks out the other half
- The Sky is dark about half the time, when the Sun is "below" the HORIZON
- How does the sky appear when viewed from space?



Our 2-D view of the constellation Orion

The 3-D layout of the stars that appear to us as Orion

Our 2-D view of the constellation Orion

The 3-D layout of the stars that appear to us as Orion

How Do We Know the Earth is Spherical?

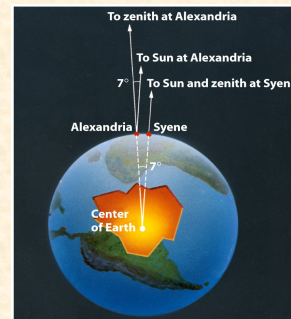
- Columbus?
- Shadows of Earth on Moon?

How Do We Know the Earth is Spherical?

- Can we demonstrate it?
 - If Earth were flat (but stars still a long ways away), everyone would see same sky. Star at zenith would always be at zenith.
 - Azimuth and Elevation would be same for everyone.
- But it's NOT the same for everyone! This has been known for thousands of years!

Ancient astronomers determined that the Earth is Spherical (and they could measure its size)

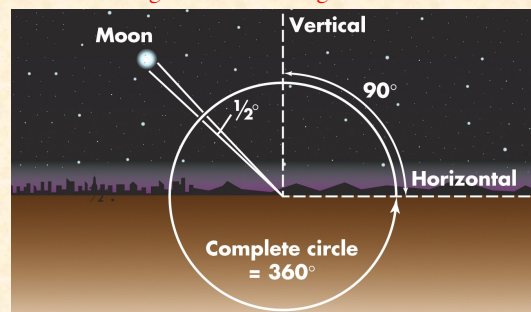
- In the town of Syene, the Sun shone directly down a vertical shafts on the summer solstice
- In Alexandria, the position of the sun was 7° away from vertical (~1/50th of a circle)
- Around 200 B.C., the Greek astronomer Eratosthenes used 50x the distance between Alexandria and Syene to get a circumference of the earth of about 42000 km (the actual is about 40000 kilometers)



Celestial Geography

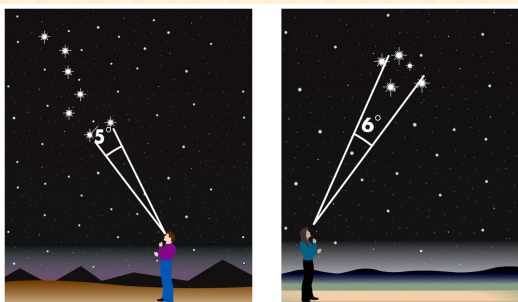
- How can we describe **LOCATION** on the sky
- How can we describe **DISTANCE** between objects on the sky?
- How can we describe **SIZE** of objects on the sky?

Angular Size and Angular Distance



“Angular Size” of Moon : ~1/2 degree

in this example, Moon is about 50 degrees “above the horizon”



Pointer stars in Big Dipper about 5° apart

[so you could fit 10 Full Moons between them!]

Location in the Sky. I. “Local”

- “Alt-Azimuth” Coordinate System
 - depends on your location on Earth (different positions on Earth see same thing but at different altitudes or azimuths and at different times)
- AZIMUTH (aka “heading” or “bearing”)
 - angle measured along the horizon circle
 - same as compass heading
 - measured from north toward the East
 - examples: North=0°, East=90°, South=180°
- ALTITUDE (aka “Elevation”)
 - angle measured up from horizon (0 to 90 degrees)

