Lecture 2 – The Sky and Vocabulary
Read Chapters 1–2
Let’s go over D2L a bit more.
Why Study Astronomy?

• Understand the nature of our Universe
• Understand our place in the Universe
• Understand how things in the Universe Evolve
• Understand where we came from
• Understand where we are going

Bottom line: Seek Understanding
Confirmation Bias

- Let's do a little quiz
Clicker Question

Do you think you know the pattern?

(a) Yes
(b) No
Confirmation Bias (cont’d)

- When you want to test a theory, don’t just look for examples that prove it.
- When you’re considering a plan, think in detail about how it might go wrong.
The Size of the Earth

Diameter = 12,756 km
Earth-Moon Distance

D = 384,401 km = 238,856 miles
Earth-Sun Distance

\[ D = 1.5 \times 10^{13} \text{ cm} \equiv 1 \text{ AU} \]
Solar System

Pluto average distance 39.44 AU
Nearby Stars

D = 1,000,000 AU = 17 ly 1 ly = 63,000 AU 1 pc = 3.26 ly
The Galaxy

D=30 kpc
The Local Group

D=5 Mpc
Clusters of Galaxies

D=500 Mpc
Telescope As A Time Machine

- Nebraska Simulation lookback
Angular Size
Scientific Notation for Small Numbers
Count from the position just to the left of the decimal place always being 0.

\[0.00012 = 1.2 \times 10^{-4}\]

\[320 = 3.2 \times 10^2\]

See the textbook for units and conversions

AU: Astronomical Unit—Mean distance between the earth and sun
Units of Measurement I

- speeds measured in km/s:
  - $1 \text{ km/s} \approx 2200 \text{ miles per hour}$
- light year: about 0.3 parsecs
- Celestial Sphere
Magnitudes: measure of brightness of stars Logarithmic scale that corresponds to the way your eyes perceive variations in brightness. First defined by Hipparchus. Change of 1 magnitude corresponds to a change in brightness by a factor of 2.512. Change of 5 magnitudes corresponds to a change in brightness by a factor of 100. The scale goes the wrong way. Brighter stars have *smaller* magnitudes than dimmer stars. Really bright stars have *negative* magnitudes.
Apparent Magnitudes in Night Sky

-30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30

Apparent magnitude ($m_v$)

Sun
Full moon
Venus at brightest
Sirius
Polaris
Naked eye limit
Hubble Space Telescope

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Modern Constellations

Alpheratz

Andromeda

Great square of Pegasus

Pegasus

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Star Names

The brighter stars in a constellation are usually given Greek letters in order of decreasing brightness.

In Orion β is brighter than α, and κ is brighter than η. Fainter stars do not have Greek letters or names, but if they are located inside the constellation boundaries, they are part of the constellation.

α Orionis is also known as Betelgeuse.

β Orionis is also known as Rigel.

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Projection on the Sky
3-D View

3D Big Dipper
Outline: Where are we headed?

- The earth rotates on its axis once a day
- The earth revolves around the sun once a year
- The moon revolves around the earth once a month
- The other planets revolve around the sun with various periods

THE BIG QUESTION: What does all this motion look like to us sitting in Norman, OK?
Celestial Sphere
View of the Sky Depends on Latitude

Zenith

North celestial pole

Latitude 90°
60 Degrees North
30 Degrees North
Equator
30 Degrees South
Angular Distance in the Sky

Astronomers measure distance across the sky as angles.
Determining Angular Size

- **Tip of Little Finger**: $1°$
- **Middle Three Fingers**: $4°$
- **Full Fist**: $10°$
- **Full Moon**: $0.5°$
- **Sun**: $0.5°$
Rising and Setting
Circumpolar Constellations