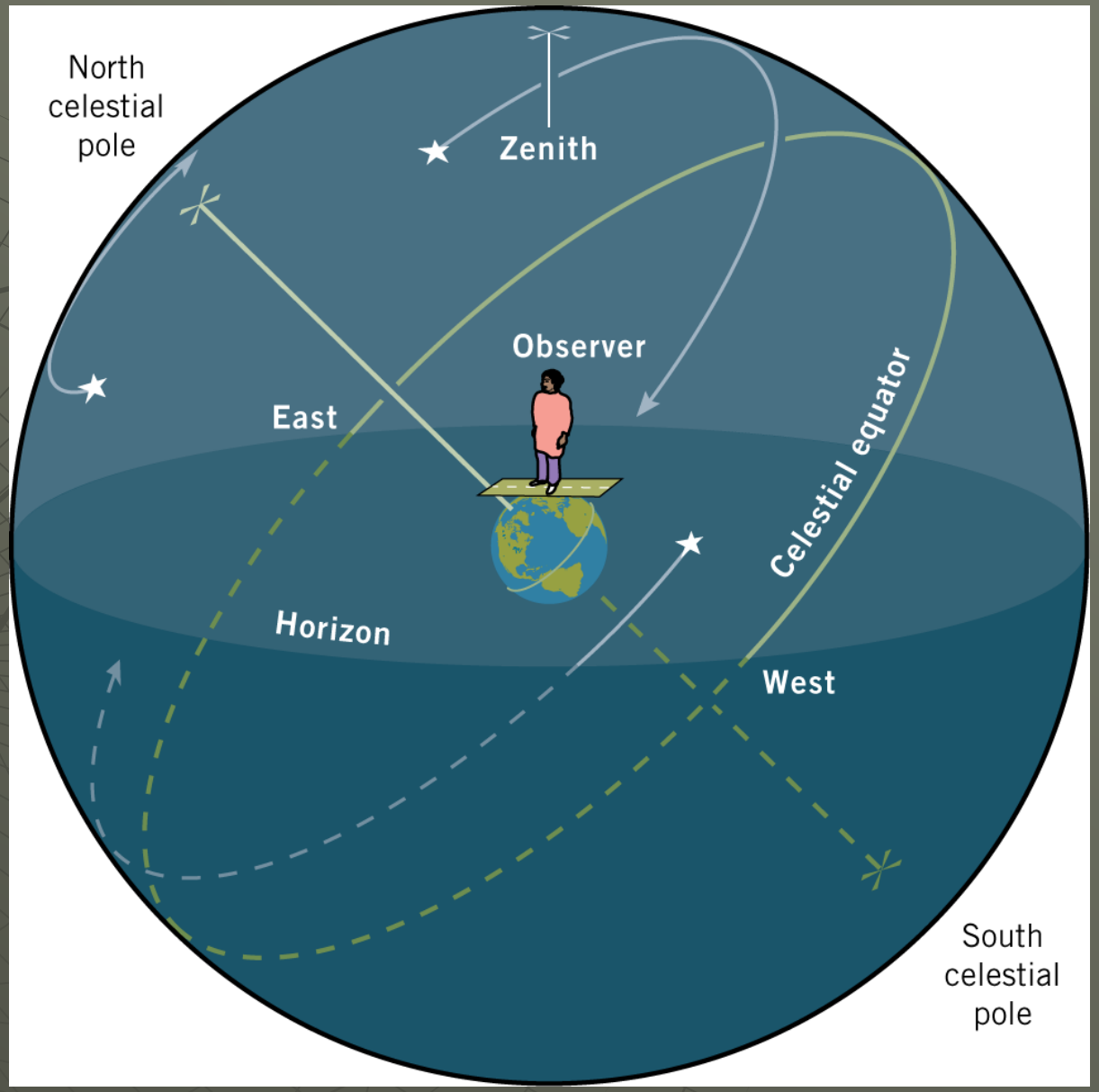
Apparent Motion of the Stars

Objectives:

- Motions from different Earth locations
- How angles on the sky relate to time

Moving Celestial Sphere

- Sky is “up” for any observer
- Stars and planets appear fixed on celestial sphere
- Stars rise in east, set in west

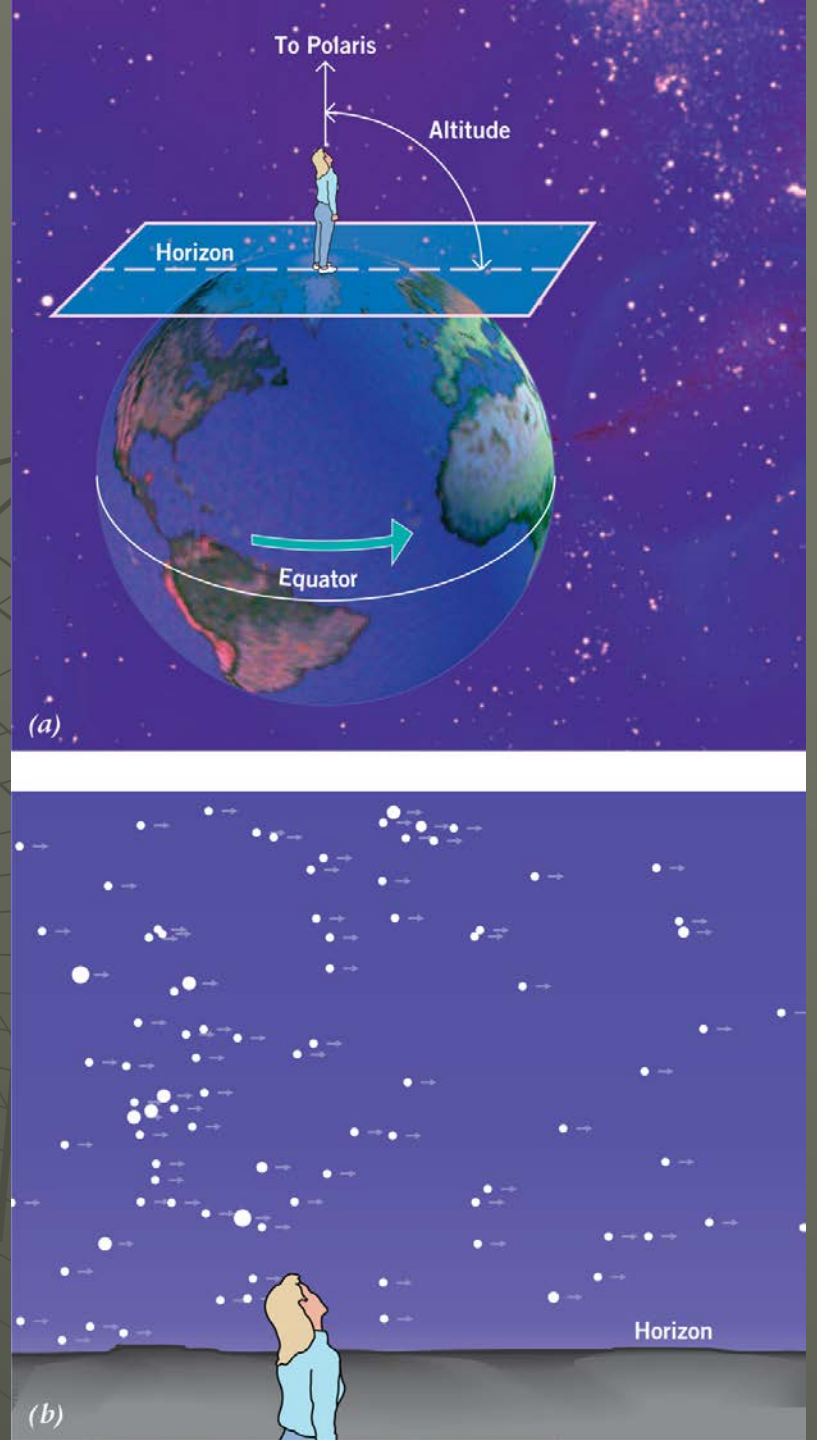


Everything Seems to Rotate Around the Poles!

- The earth is spinning on its axis

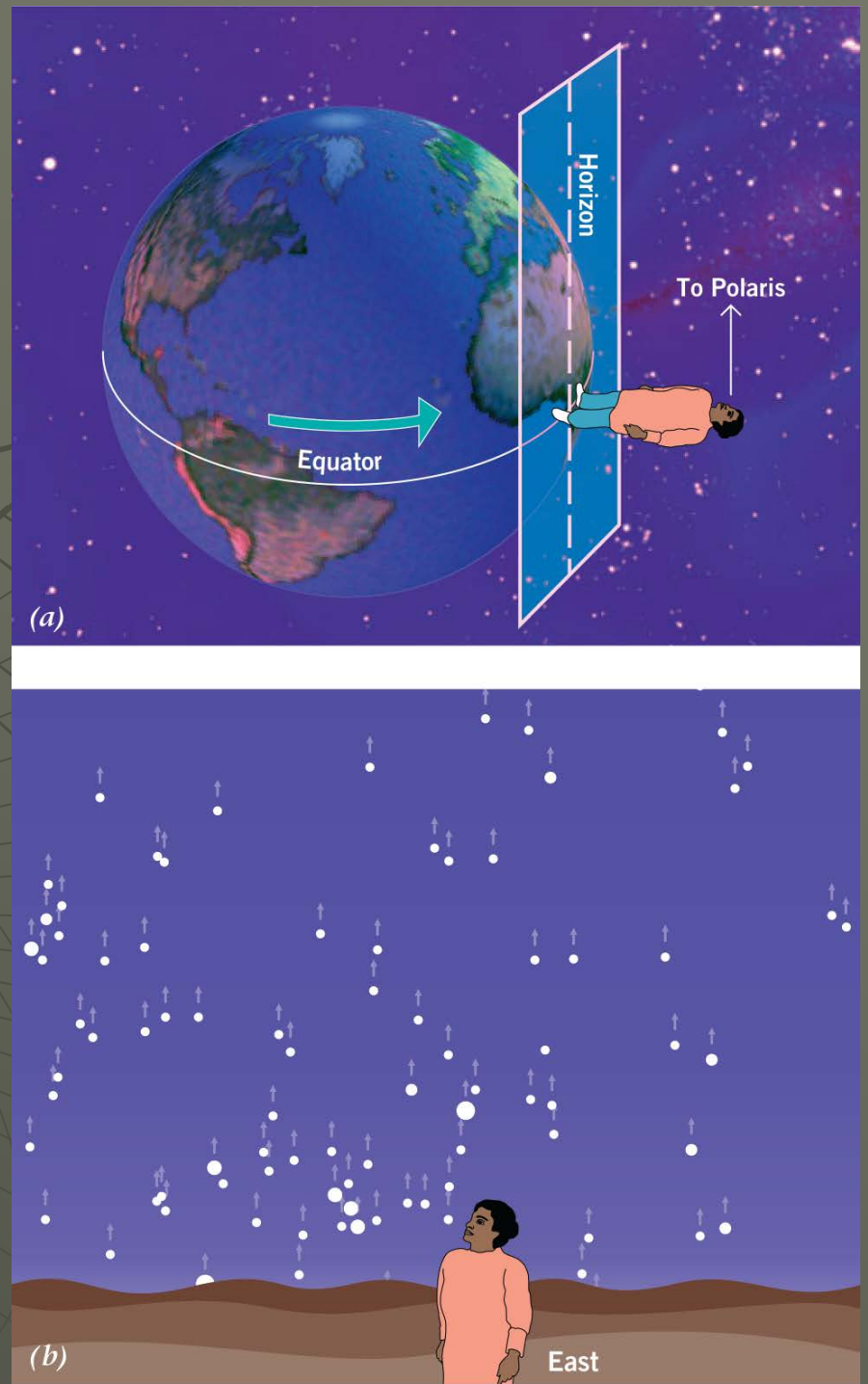
Observer at North Pole

- Altitude of Polaris is 90°
- See only northern half of celestial sphere
- Stars move parallel to horizon, neither rising nor setting
- You're On Earth Mountain!



Observer at Equator

- Altitude of Polaris is 0° (directly on horizon)
- Observer and horizon move with rotating Earth
- Stars appear to rise/set perpendicular to horizon as Earth rotates



In Laramie (and every place in between)…

- More difficult to understand these motions
- Once you start understanding these motions, along with constellations, your enjoyment of the night sky will grow immensely.

Nightly Motion of the Stars (in Laramie…)

Imagine looking toward the East as a star rises above your horizon - what does it do after that?

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- Star and
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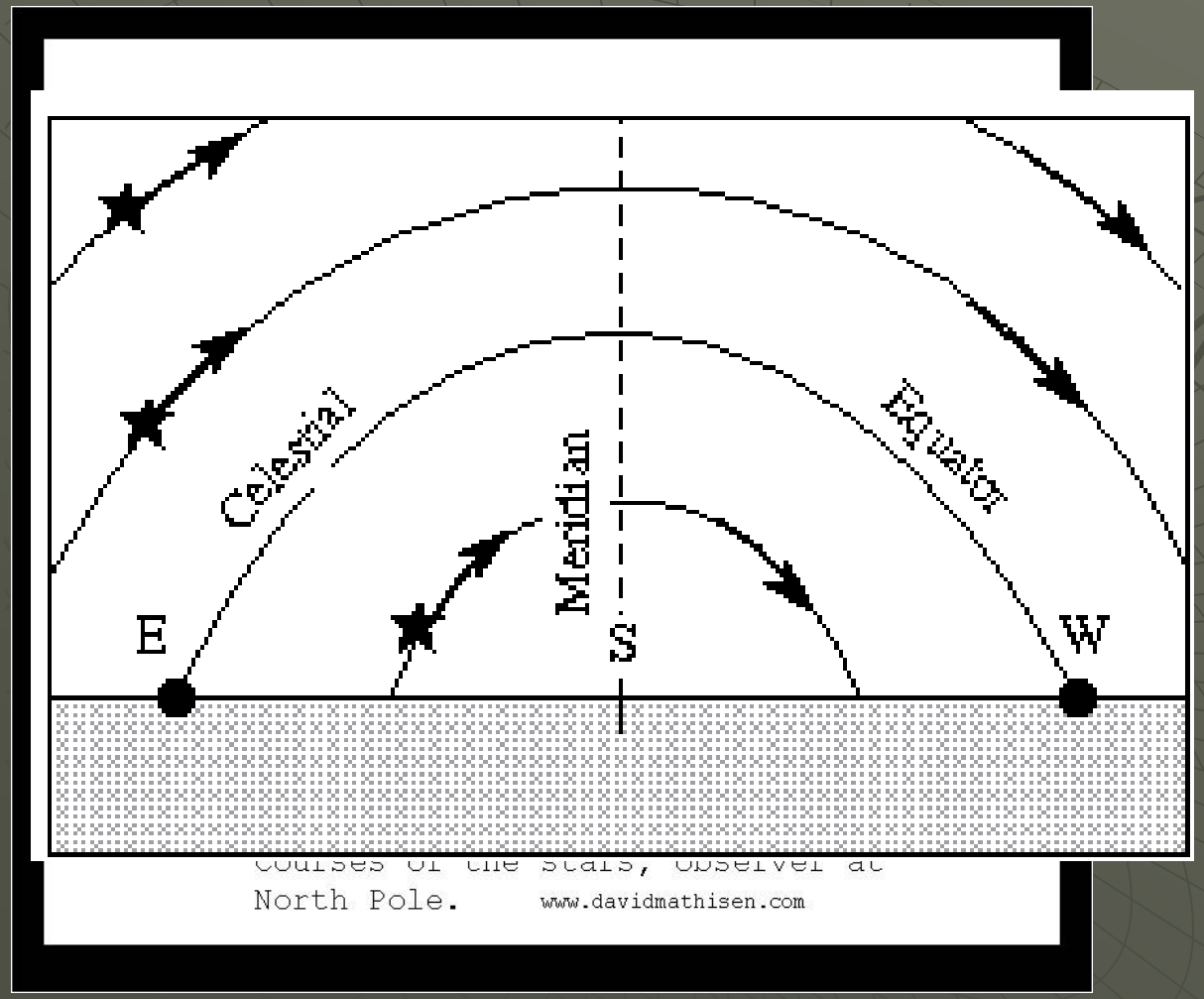
  due E W
- Ima you
  get

Paths of stars…



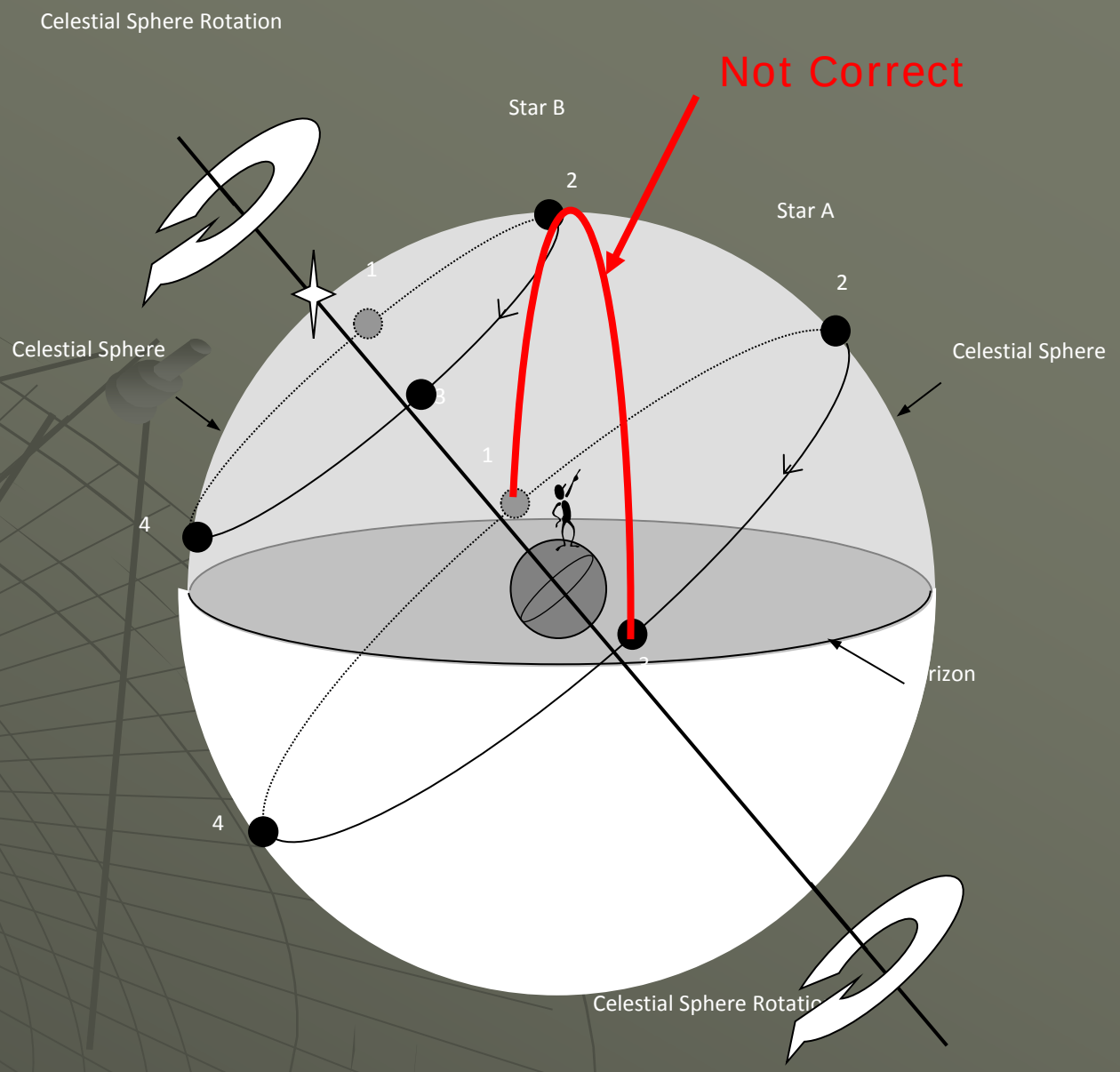


Figure 2

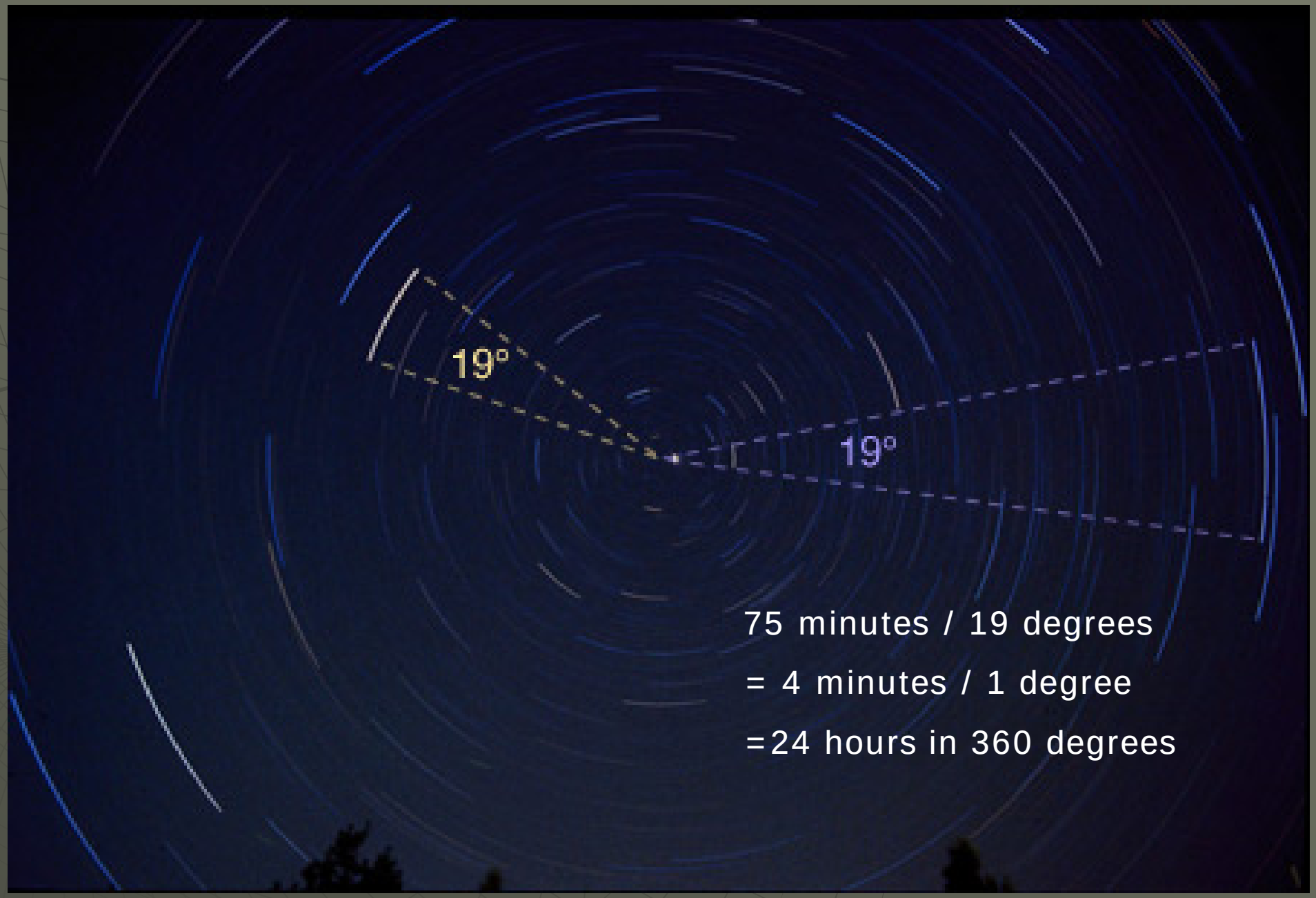
- For
- Star l and to th y.
- Thei ng due

- For
- Star the sky n the nort
- If at a star can

What direction is the camera facing in this picture?
(assume we're in Laramie)

A. North
B. East
C. South
D. West

- How do you measure distances on a moving sphere?
- A: time



75 minutes / 19 degrees

= 4 minutes / 1 degree

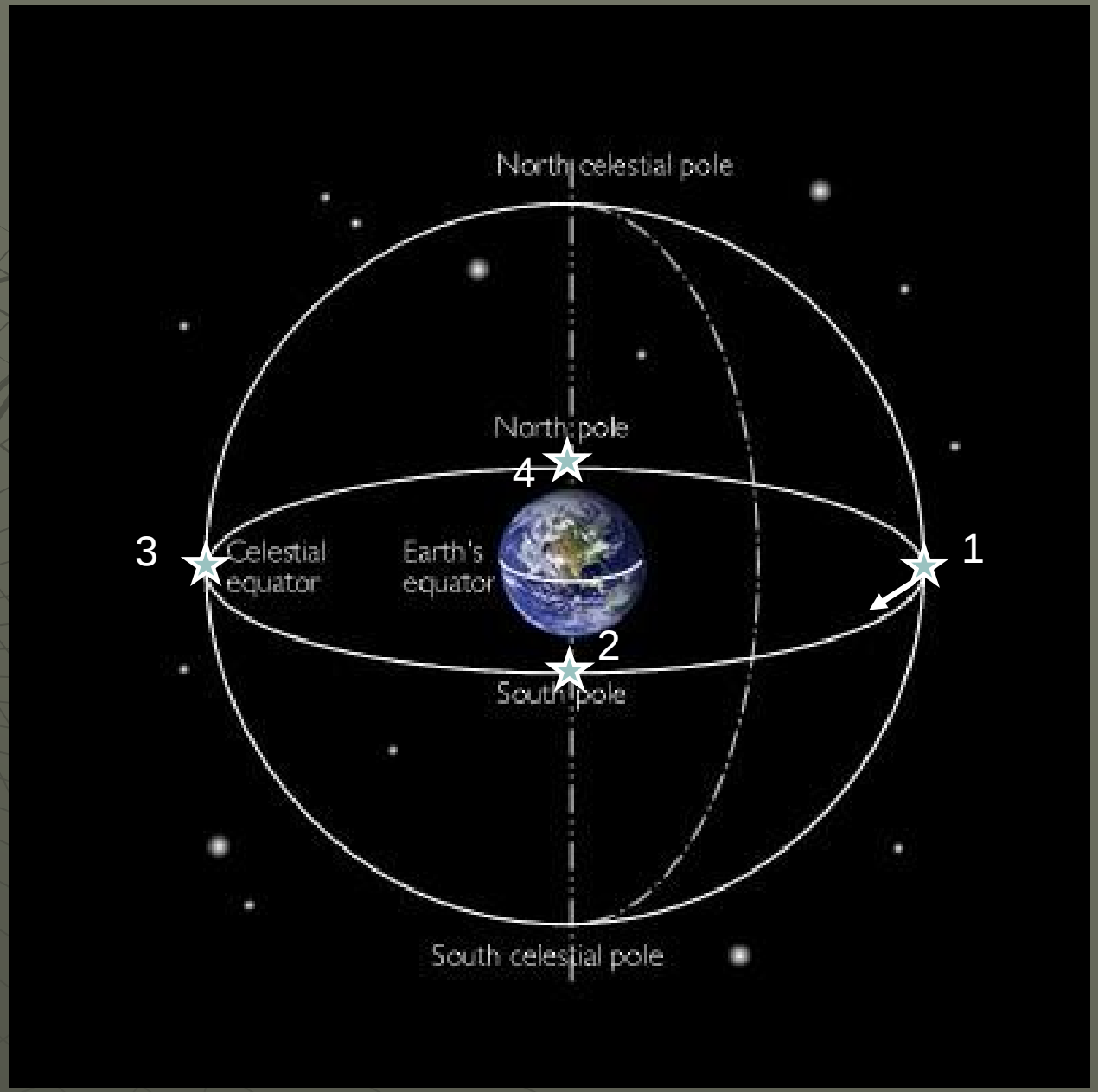
=24 hours in 360 degrees

Calculate Length of Day

- A full circle is 360º; Earth rotates once in 24 hrs
- 360/24=15º per one hour
- Stars move 1º in approximately 4 minutes
- 360º in 24 hours (approximately) = Definition of a Day
- Paving the way for us to all be stressed out about how much we have to do in a day!!!

Easier Way to Think About It

- The Earth makes a full spin every 24 hours
  - From 1 all the way around back to point 1
- Half of that distance
  - 1 to 3 → 12 hours
- We can see half of the night sky
  - Can see a star that rises directly east 12 hours



TPS!

- For a star rising due east, how many hours will this star spend *above the horizon* before it sets in the west?

A. It depends when the sun comes up
B. Less than 12 hours
C. 12 hours
D. More than 12 hours

- For a s his star spend ?

A. Ca
B. Les
C. 12
D. Mo

For a star *rising* in the northeast, how many hours will this star spend *above the horizon* before it sets in the northwest?

A. Can’t say, depends on how far northeast
B. Less than 12 hours
C. 12 hours
D. More than 12 hours

Putting it all together…

LT

- Motion
  - Pg 3-6

TPS: Orion near the western horizon.

- Is Orion rising or setting?

A. Rising
B. Setting
C. Orion is circumpolar
D. Depends on where the photo was taken

TPS: Orion near the western horizon.

- What latitude was the photo taken?

A. 40 N
B. 20 N
C. 20 S
D. 40 S

TPS: Orion near the western horizon.

- How long was the camera exposure time?

A. 1 minute
B. 5 minutes
C. 10 minutes
D. 20 minutes

*Hint: How wide is Orion's belt?