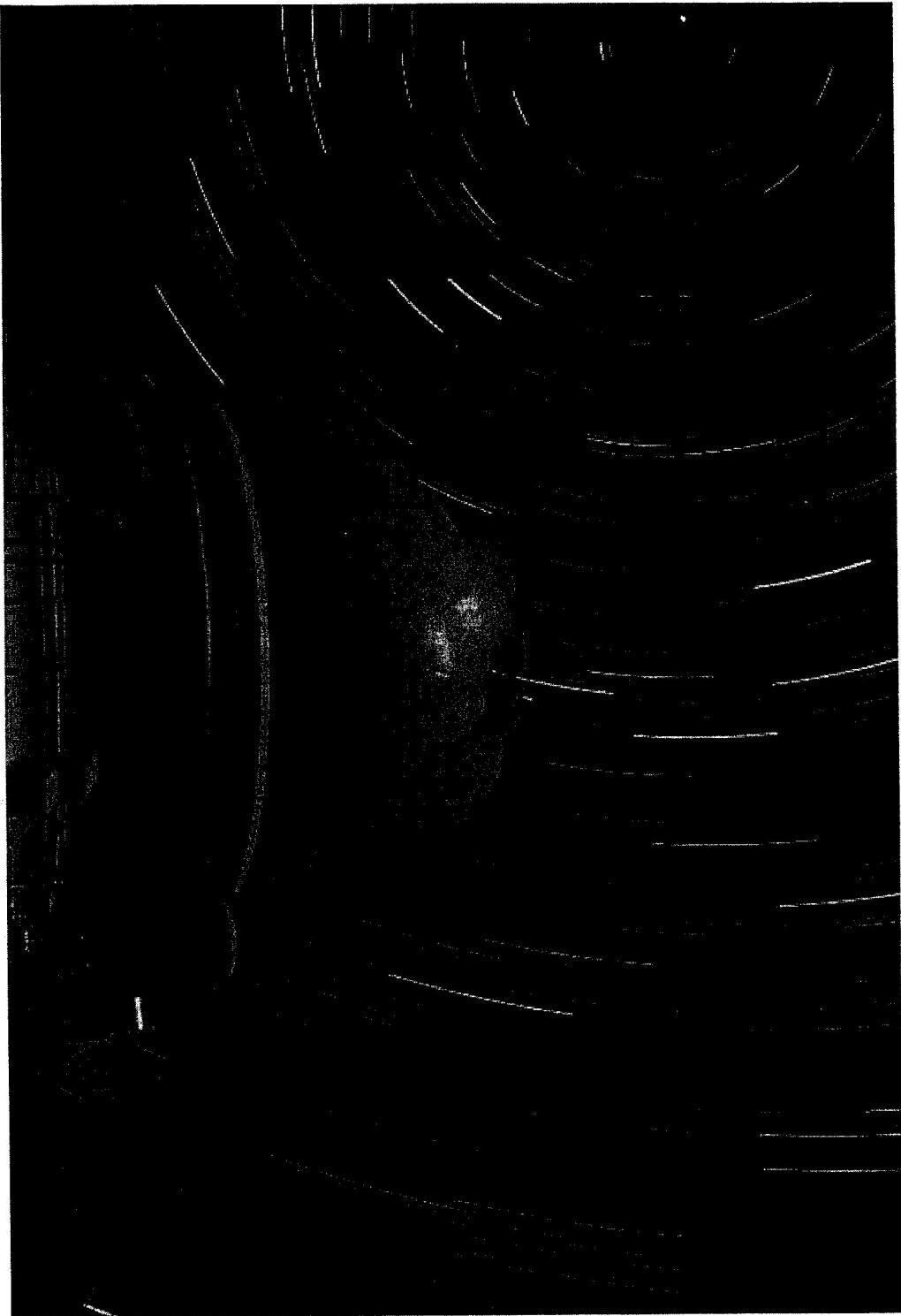


Measuring the Sky

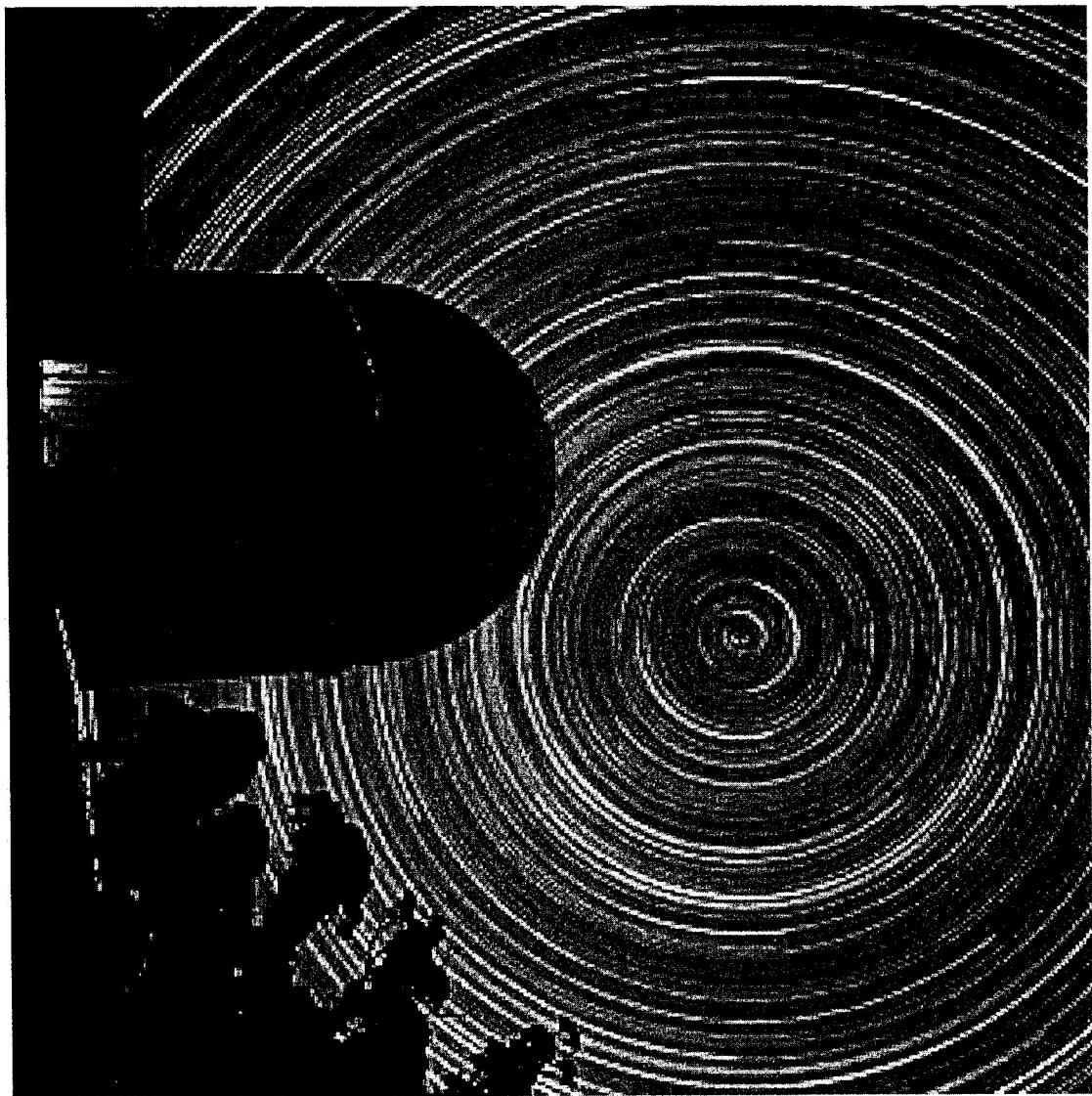
- ① When you look in the Sky you see STARS
- When you watch it through the whole night, you see the stars revolve around the north star
 - See Slides 1 + 2, + 3 + 4
- Recall Basic Facts of Earth / Sun / orbit
 - Earth revolves once per day
 - In winter the axis of the earth is pointed away from sun
 - The earth spins according to a right hand rule
 - What are the summer & winter solstices and equinox

Motion of the Stars in the Sky



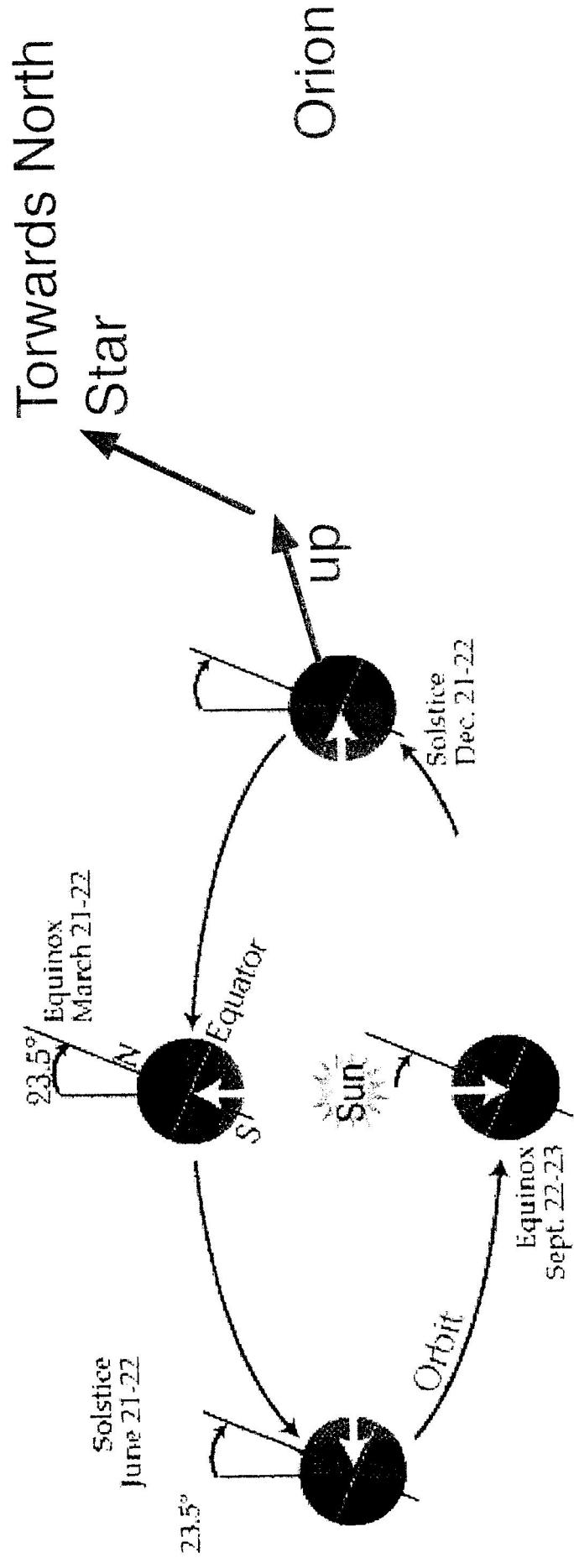
Center is the north star

Motion of the Stars in the Sky



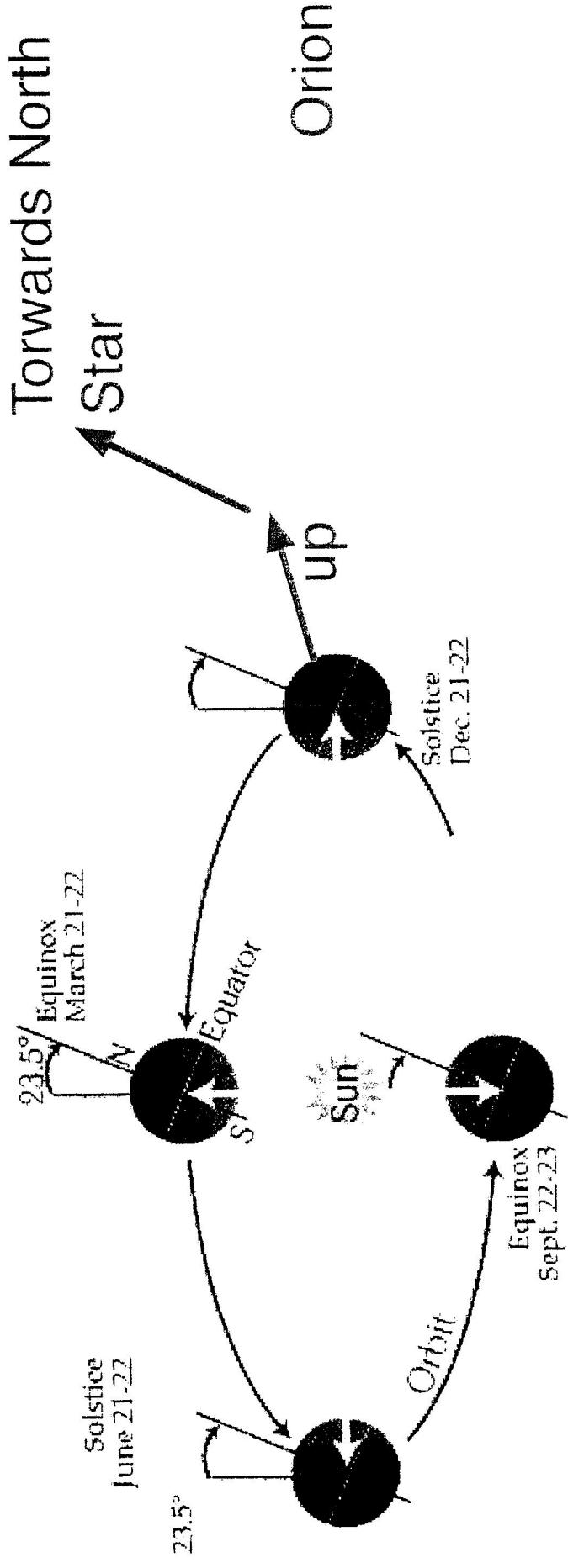
Center is the north star

What are we seeing?



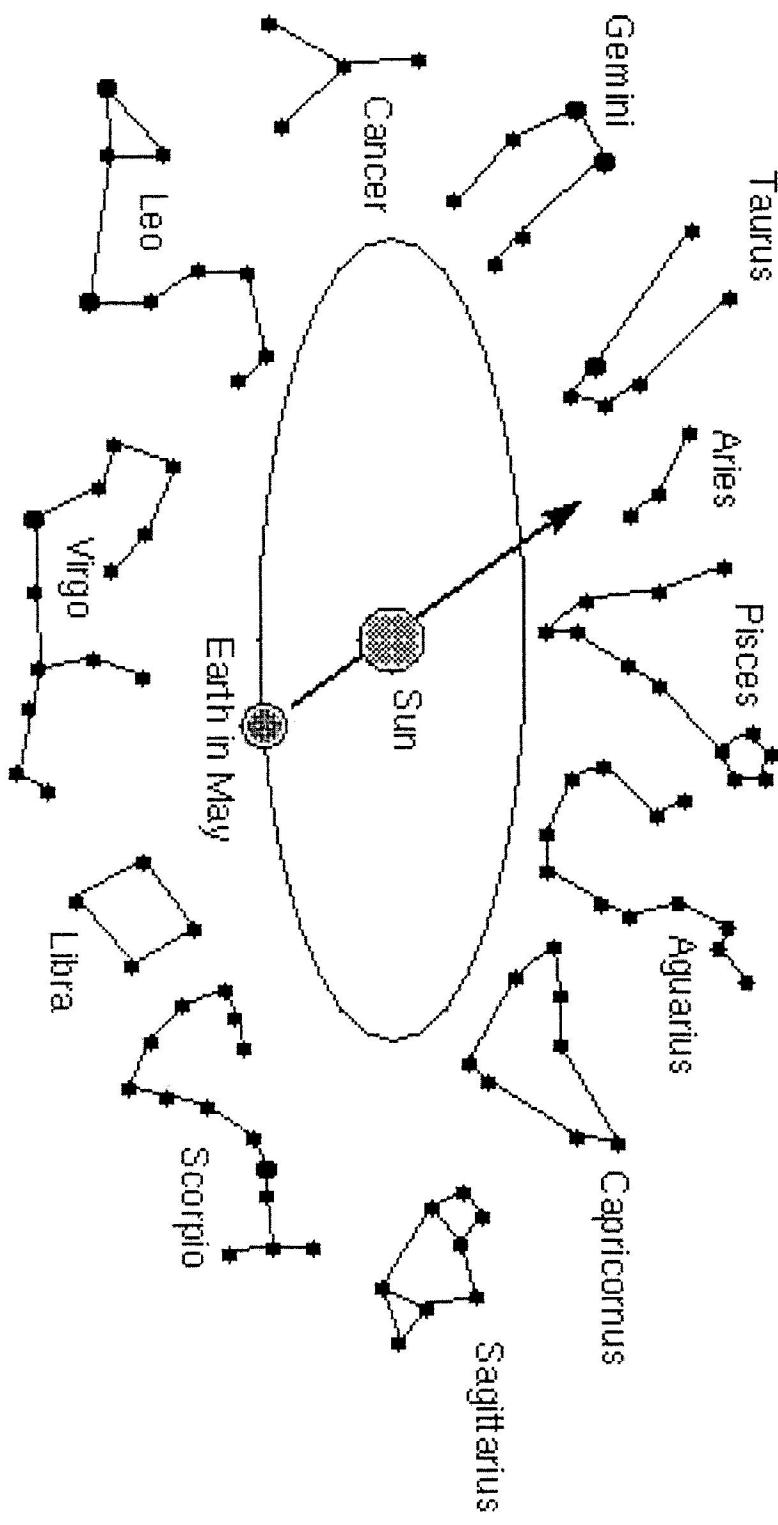
We are looking along the axis of the earth while looking at the north star

What are we seeing?



Why can't we see Orion in the Summer

In general see different constellations at different times



The twelve zodiac signs ("houses") are the constellations that you see overhead at
"midnight" at different times of the year

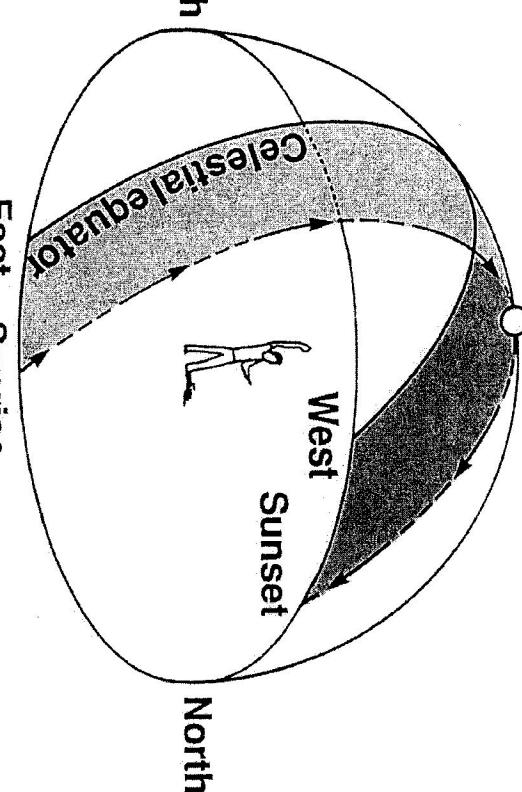
The Ecliptic is the sun's trajectory – Shown in northern hemisphere

Noon sun

West
Sunset

South

East
Sunrise



a Summer Solstice

Noon sun

Sunset
West

South

Sunrise
East

Sunrise
East

Sunrise
East

North

Sunrise
East

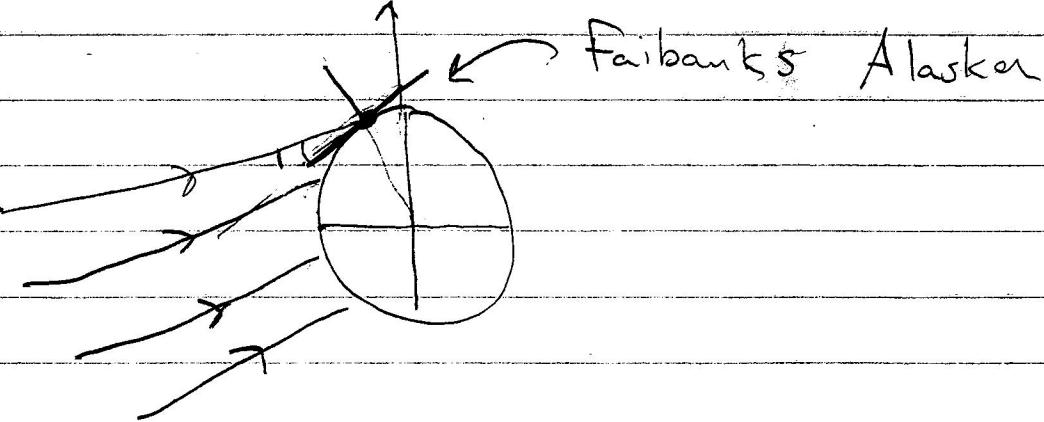
Sunrise
East

Sunrise
East

b Winter Solstice

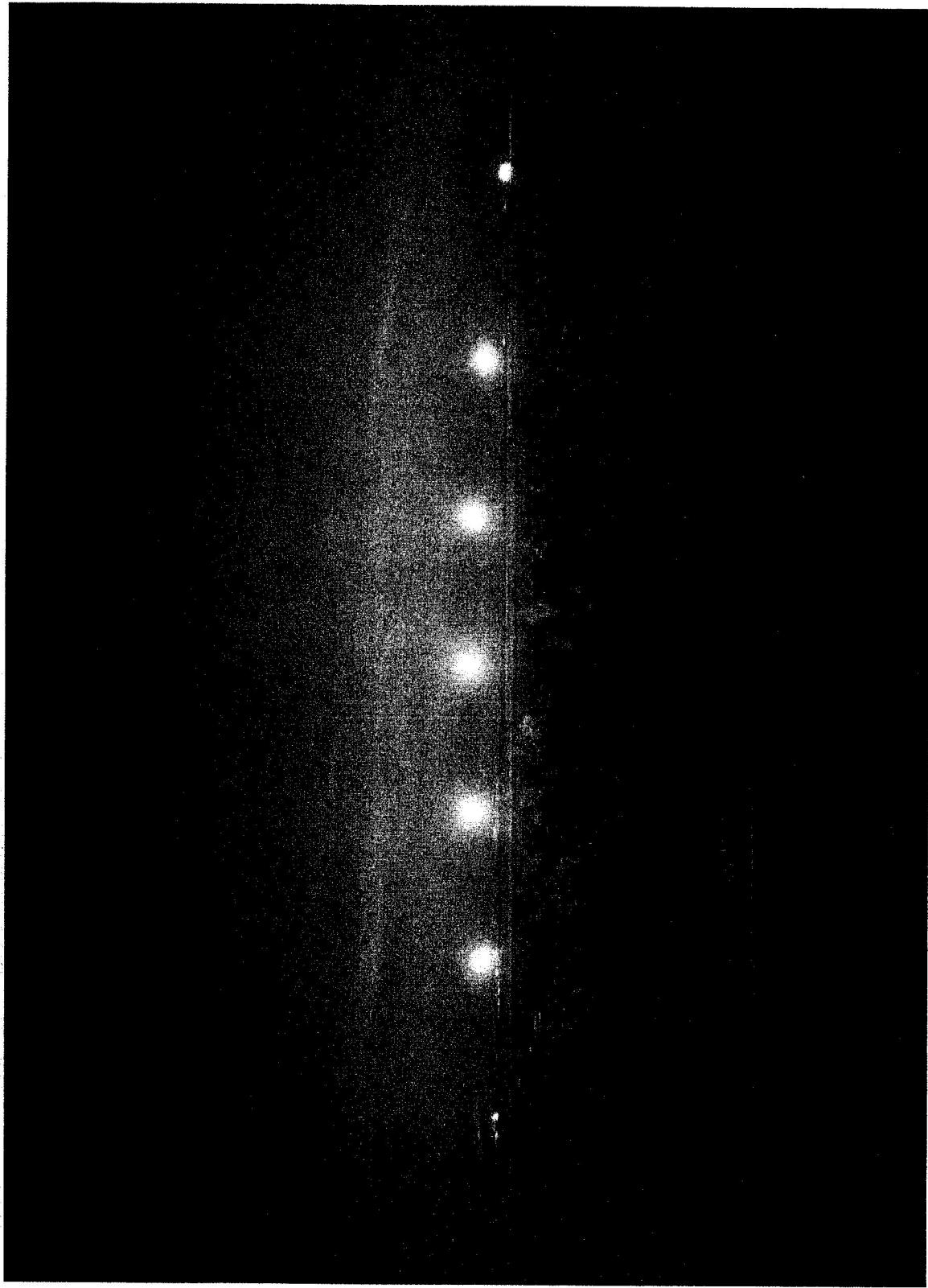
②

You see the Sun

- The sun rises in the east and sets in the west
- So if you face the north star you see the "Ecliptic"
 - the arc of the sun
- But Every Day the sun's path changes a little bit.
- Look at the picture from Alaska:


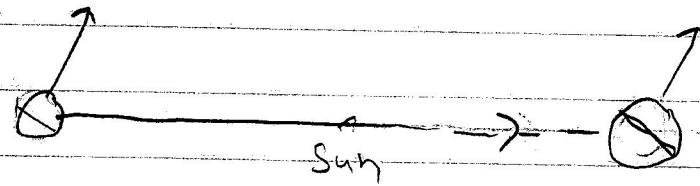
The diagram shows a side view of the Earth with its axis tilted. A vertical arrow points upwards from the North Pole. A horizontal line represents the ecliptic. From the Sun's perspective, the ecliptic appears to move from the upper left towards the lower right across the sky. Four curved arrows point from the text 'Winter Solstice From Fairbank's Alaska' to different parts of the diagram: one arrow points to the upper left, another to the upper right, one to the lower left, and one to the lower right, all indicating the path of the sun's apparent motion.
- Winter Solstice From Fairbank's Alaska

The Winter Solstice in Fairbanks Alaska

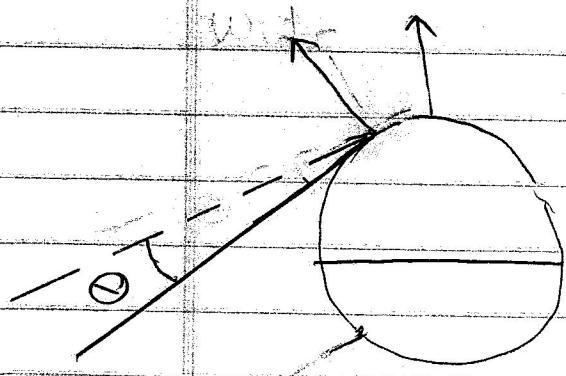
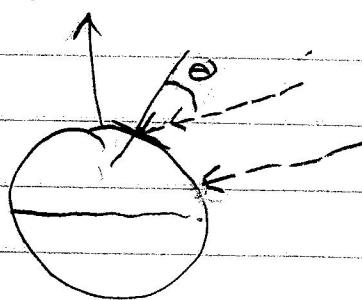


Picture

Summer



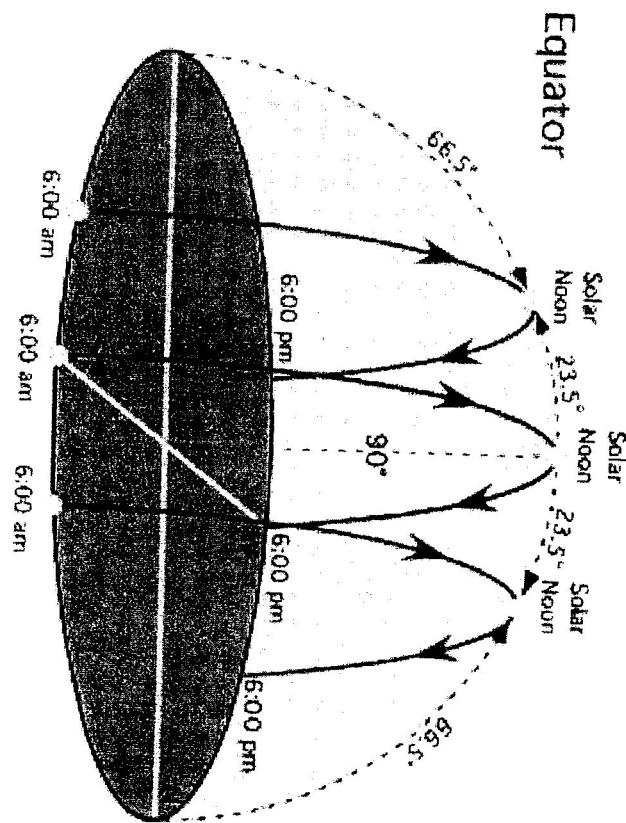
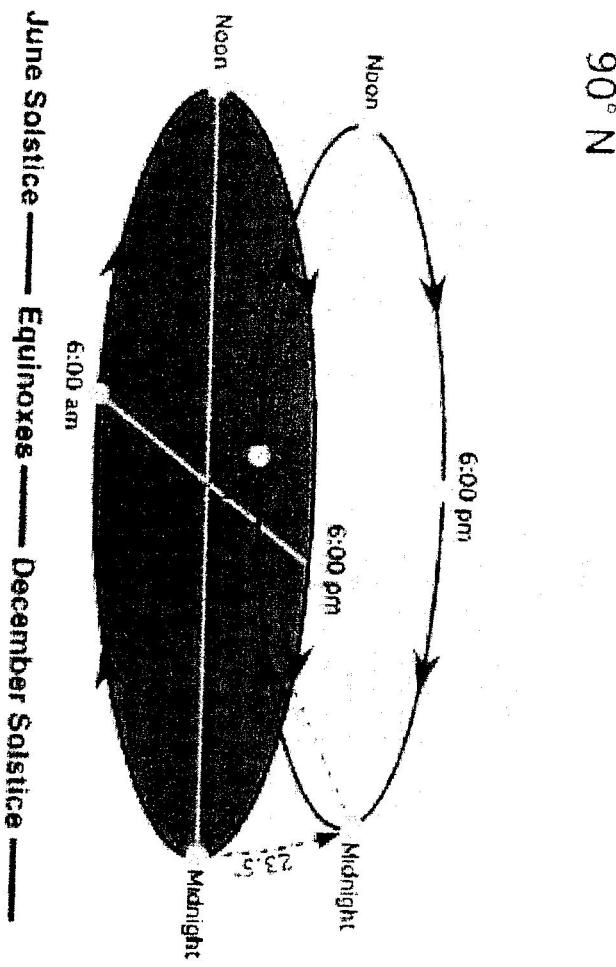
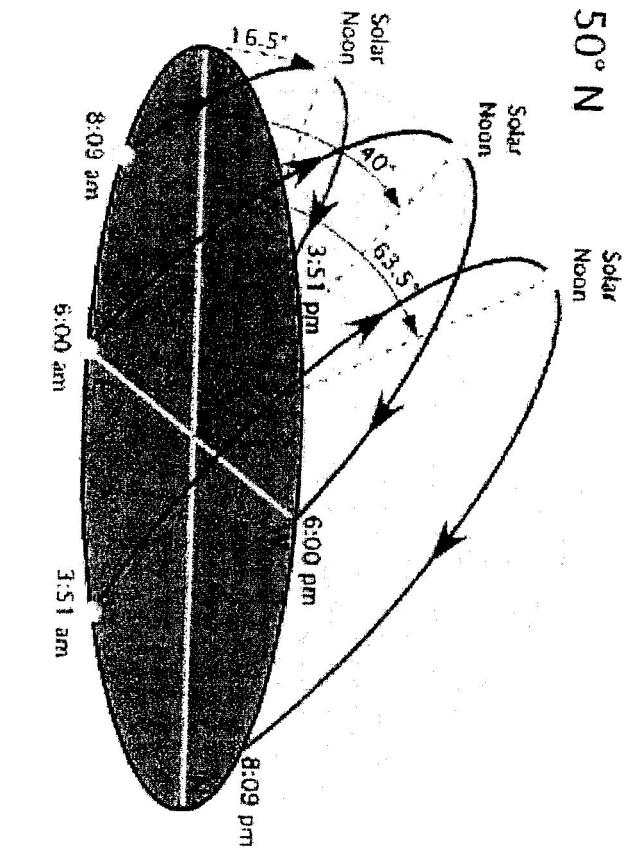
Winter
in Alaska



Questions

- ① What is the trajectory of the sun at the equator during the equinox
- ② What about the north pole?
- ③ What is the trajectory at the equator of the June Solstice and December Solstice?
and December Solstice?
- ④ During the summer solstice at high noon the sun is directly overhead what is this place? The tropic of cancer

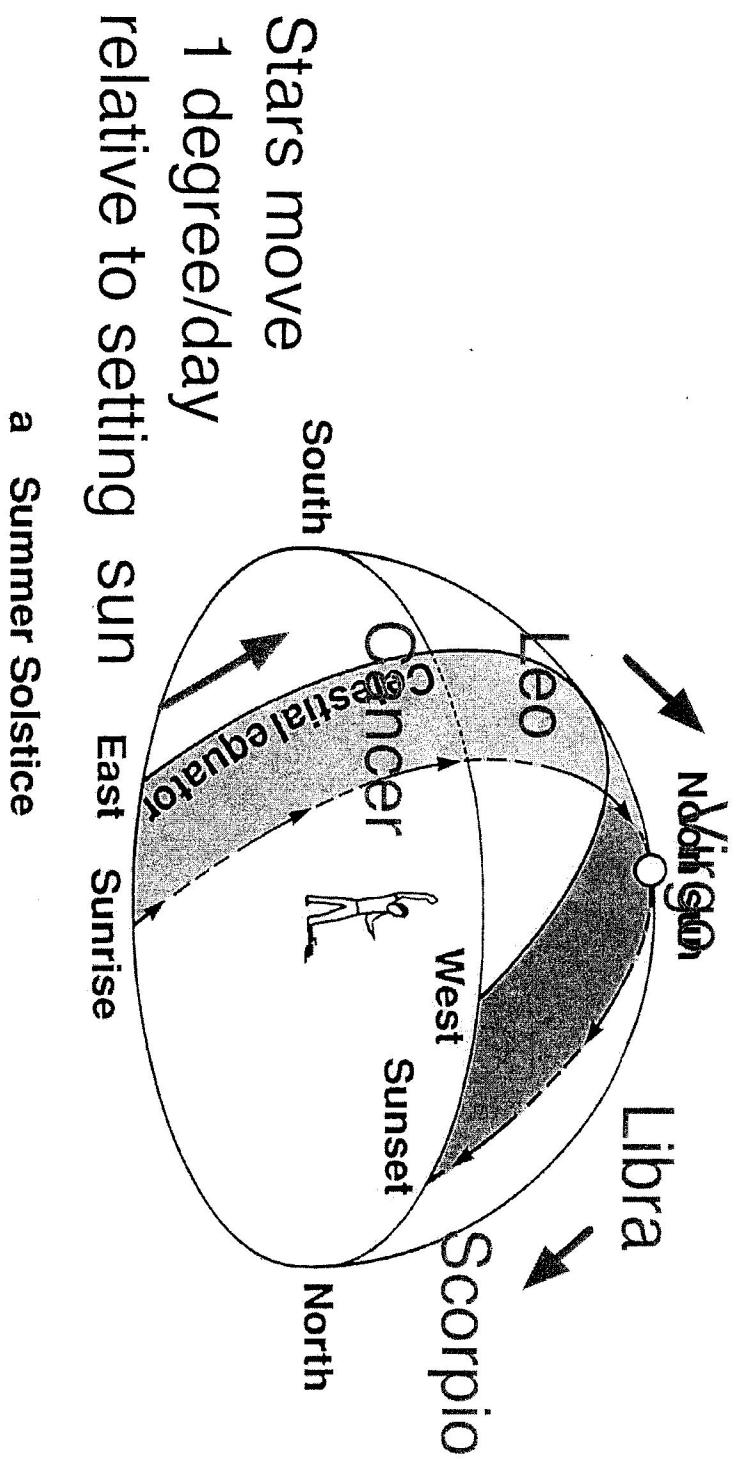
Answer to Questions



June Solstice — Equinoxes — December Solstice —

At night, you see the zodiac constellations in the ecliptic

The zodiac constellations at "midnight" in summer in the ecliptic



The sun moves relative to the signs *west to east* during the year

The zodiac signs move in the ecliptic *east to west* (at sunset) during the year