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Summary for Tuesday 9/5 class:

The same techniques that humans use for locating places on Earth's surface can be applied to astronomy. The system of using longitude and latitude ages back to two millennia ago, documented by Eratosthenes–a Greek mathematician, geographer, and poet–in the 3rd century B.C.. In relation to astronomy, longitude and latitude relate to polar and azimuthal angles, respectively. During these times, with limited technology, we suspect that ancient sailors looked to the stars for navigation.

Ancient civilizations also seemed to understand that Earth was a spherical shape. Similarly, the concept of a celestial sphere was introduced as an abstract way to represent the apparent motion of stars in the night sky due to Earth's rotation on its axis. In order to find the location of stars and other entities in the sky, two coordinate systems, the horizontal and equatorial, are introduced as well. The horizontal system is a set of circles called 'verticals' which intersect with the Horizon at right angles. The equatorial coordinate system uses right ascension and declination to specify the position of celestial objects.

Additionally, this lecture delves into the consequences of the decline of the Ecliptic. Some of these consequences are the polar caps, yearly changes in the length of both day and night, weather patterns across the globe, wind and ocean currents, cold winters and warm summers, and the rising and setting of the moon.

Summary for Thursday 9/7 class:

There were several ancient civilizations that contributed to early astronomical knowledge. One of these civilizations was Egypt. Ancient Egyptians had a very advanced and complex understanding of astronomy, potentially being responsible for the discovery of variable stars and the calculation of the variable star Algol. The people learned to utilize a 365 day calendar and cleverly relied on star predictions to predict when the Nile river would flood.

Another civilization that had advanced knowledge of astronomy was Mesopotamia. By 1300 BCE, the Babylonians were already creating Star catalogues. They broke down time and angles using systems such as the Sexagesimal system. Another system was introduced by ancient Indian civilizations: Arabic numerals. This civilization also observed heliacal stars and documented the precession of the equinoxes. Also, heliocentric views, meaning views that accepted the sun as a central point, were documented in ancient Indian texts such as Aryabhatiya.

Lastly, ancient Greek civilizations made significant contributions, including the idea that stars are sun-like bodies that lay far away (Anaxogaras). Another greek astronomer, Aristarchus of Samos, introduced a detailed heliocentric model. From this model, we can interpret that he had a thorough comprehension of the vast distances between stars. However, heliocentric views lost favor, especially under the influence of thinkers like Ptolemy, Aristotle, and Plato. The method of using sun angles and shadows to calculate Earth's radius came into fame through Eratosthenes of Cyrene, a renowned Greek polymath.

Physics 125 HW 2:

Problem 1:
circumference of Earth: ~40,000 km
∴ for 1 degree the distance would be
$40{,}000/360 = 111.1\text{ km}$

Problem 2:
at a latitude of 60° the radius of the circle that describes that latitude is smaller than the Earth's radius. The circle's radius is the horizontal component of Earth's radius at that latitude.

$r_{60} = R \times \cos(\text{latitude})$
where R is Earth's radius, ~6371 km.

$r_{60} = 6371 \times \cos(60°) = 6371 \times 0.5 = 3185.5\text{ km}$

The circumference at this latitude (C_{60}) is $2\pi r_{60}$.

$C_{60} = 2 \times 3.14159 \times 3185.5$
$C_{60} = 20{,}037.5\text{ km}$

The distance for 1° in longitude at latitude 60° is:
Dist at 60° lat $= C_{60}/360 = 20{,}037.5\text{ km}/360$
$= 111.3\text{ km}$