How Astronomy Shaped The Modern Civilization
&
How To Find Direction Using The Stars

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About me:

I AM TEJA TEPPALA

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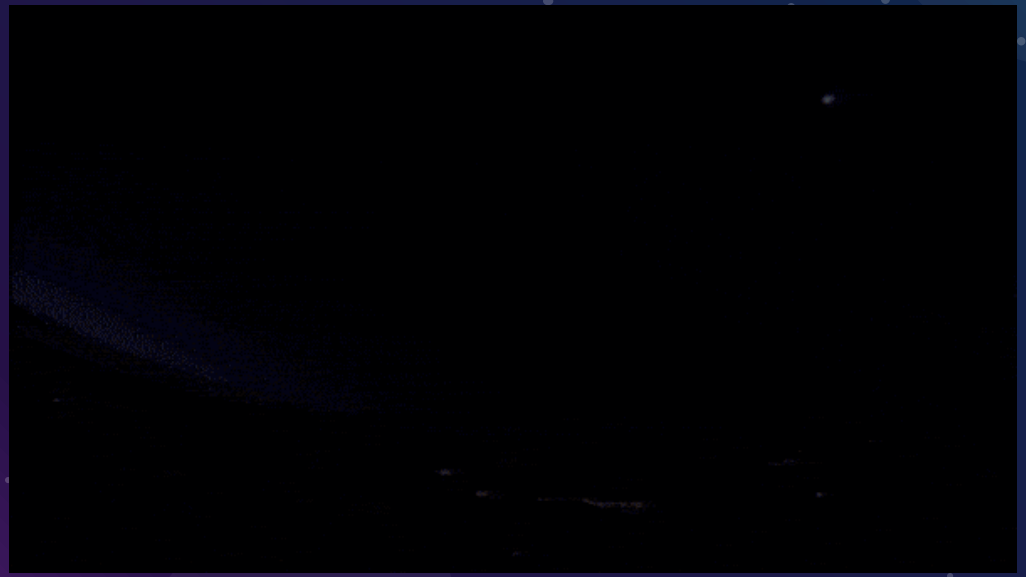
BS – MS in Physics from University of Hyderabad, India.

Currently working on a PhD in Physics/Astrophysics.

I study evolution of galaxies. More specifically, I study what triggers/stops star formation in galaxies.

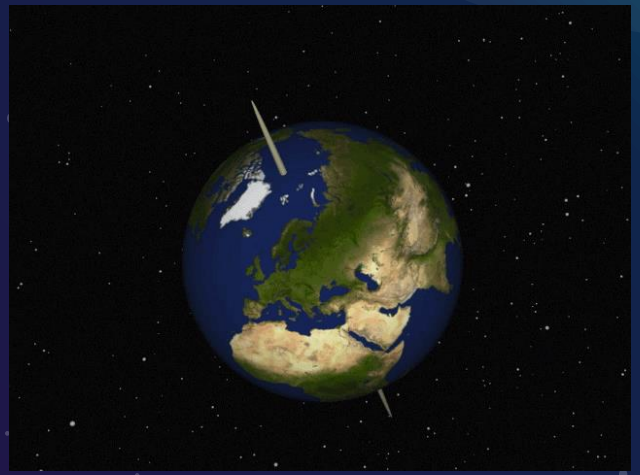
LAWS

Why does the Sun rise and set?



Why does the Sun rise and set?

Answer: The Sun appears to rise and set because the Earth is spinning (rotating) about its own axis!

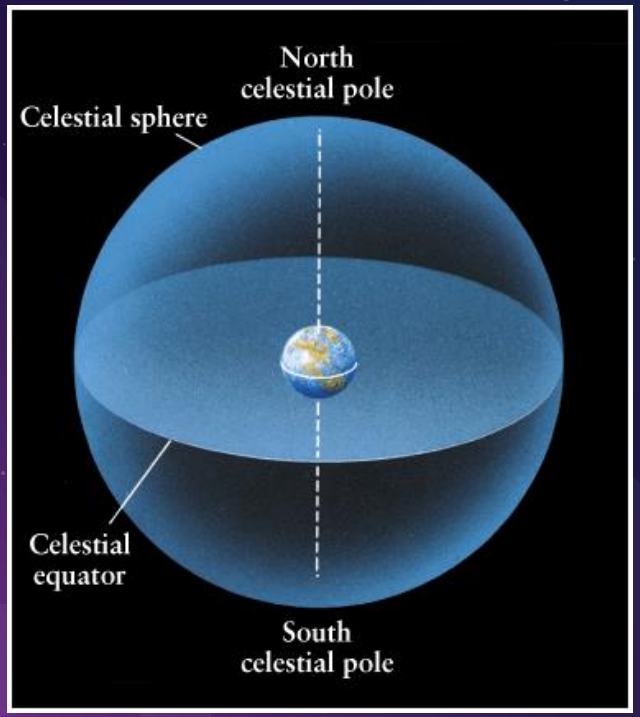


The sky is moving too!

- The Sun is not the only star to rise and set every day.
- From the surface of the Earth, it appears as if the sky is rotating around us.

The sky is moving too!

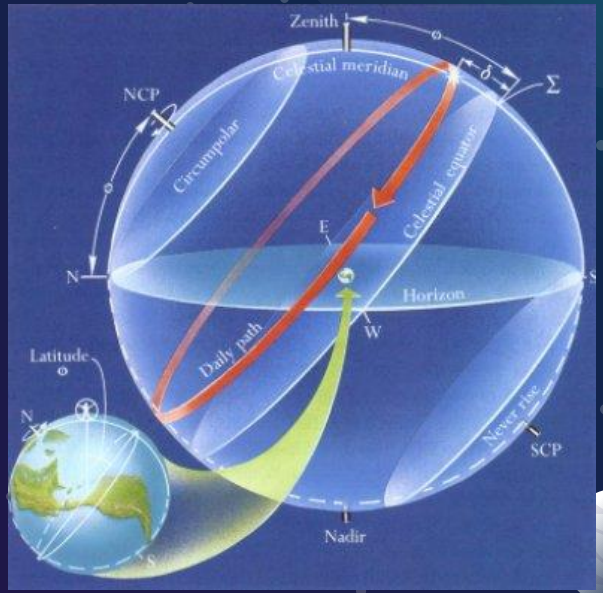
The celestial sphere



- Everything we see in the sky (above the clouds) can be mapped on what we call: “The Celestial Sphere”.
- The equator and poles of the Earth match those of the celestial sphere.

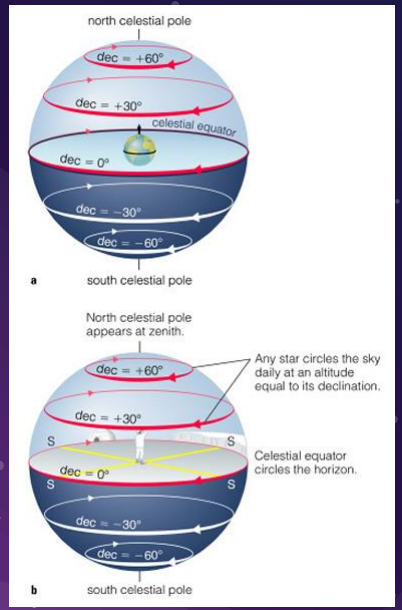
Circumpolar stars

- Depending on your location on the Earth, some stars will never rise and set.
- These stars are called “Circumpolar stars”.

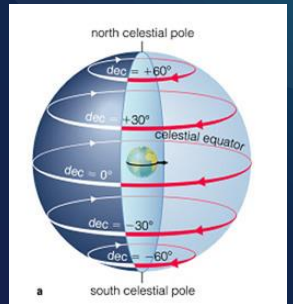


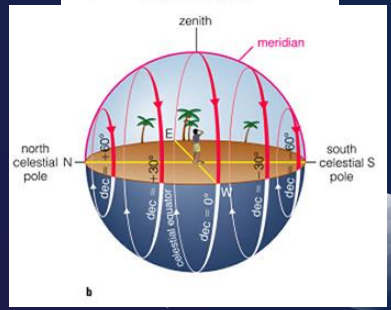
Circumpolar stars

Circumpolar stars



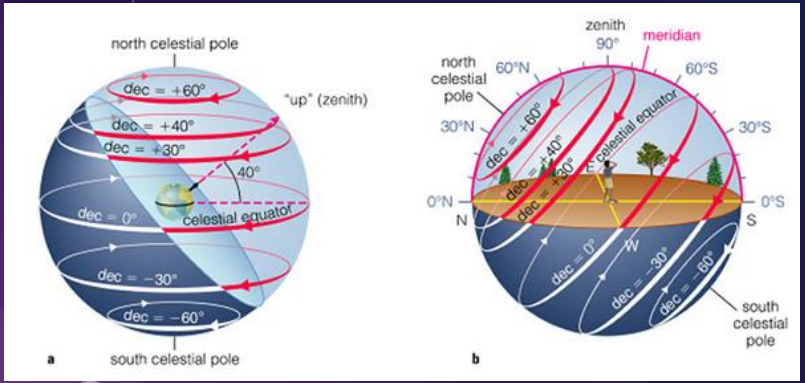
- If you are at the North/South pole, all stars are circumpolar.
- If you are on the equator, none of the stars are circumpolar.

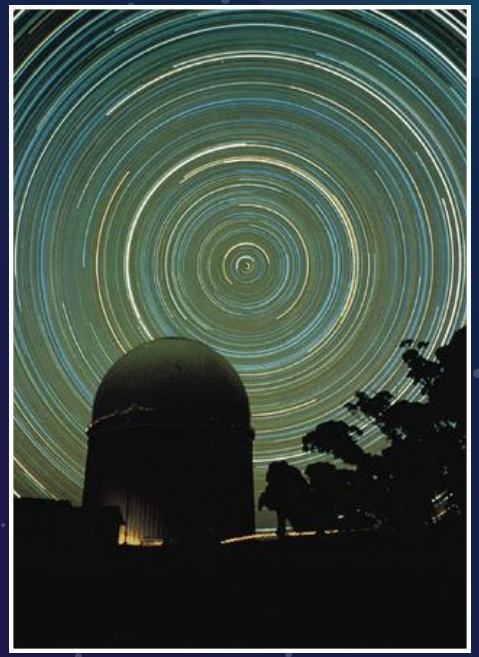




Circumpolar stars

- There is a star which is *nearly* on the North Celestial Pole: **Polaris ("The North Star").**





Constellations!

- Constellations are areas on the celestial sphere in which a group of stars forms a perceived pattern, such as an animal, mythological person, or an object, etc.
- How many constellations are there in the night sky?

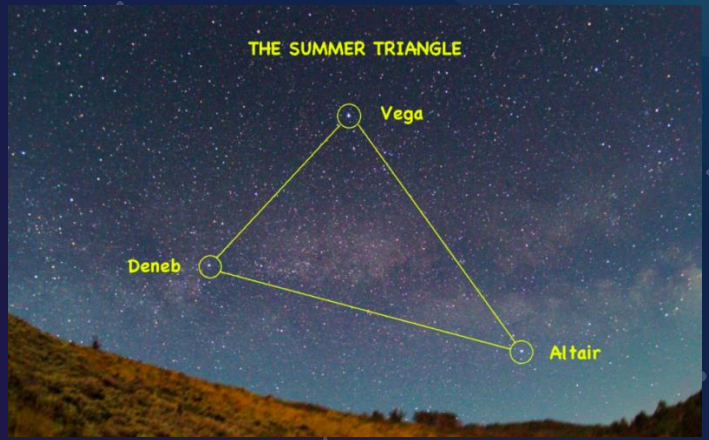
There are 88 constellations!

Using constellations in agriculture:

- People noticed that these patterns are visible only at certain times.
- Before there were proper calendars, these constellations helped determine when to sow, and harvest.

Using constellations in agriculture:

- If one could see the "Summer triangle" overhead, then they could determine that Summer is coming along.



Using constellations in agriculture:

- If the Orion constellation started to become fully visible, they would know winter was coming soon.

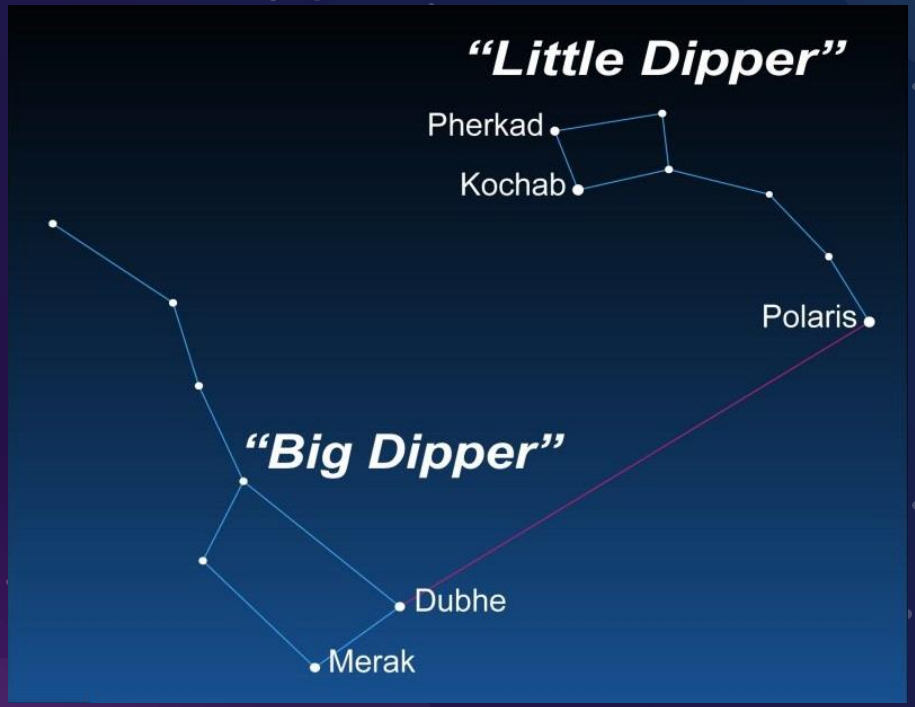
Why was astronomy key to modern civilization?

- This ability to predict seasons led to hunting and gathering being replaced by agriculture...
- ...which in turn led to formation of large societies, cities and kingdoms...
- ...along came the governments, industries and new technologies born out of necessities, and the rest is history!

Using stars for navigating:

Remember Polaris, the “North Star”?

Locating the “North star”

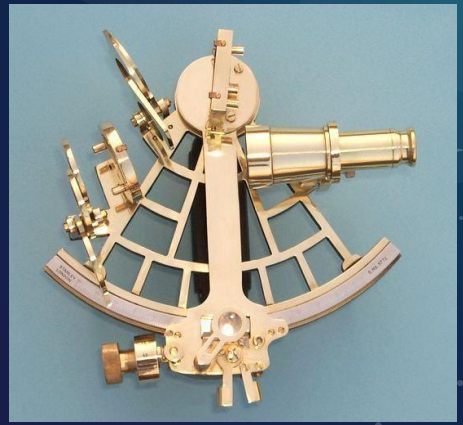


When Big Dipper is obscured, we can use Cassiopeia, on the other side of Polaris:

Added bonus - finding your latitude:

Using stars for navigating:

- Early sea explorers relied on the North Star for directions and staying on course.
- In modern times, 57 navigational stars along with Polaris are used. Their positions are listed in nautical almanacs. A sextant is used for accurate measurement.



Alas, you can't find Polaris once you cross the equator into southern hemisphere!

What to do?

Alas, you can't find Polaris once you cross the equator into southern hemisphere!

What to do?


Flag of Australia

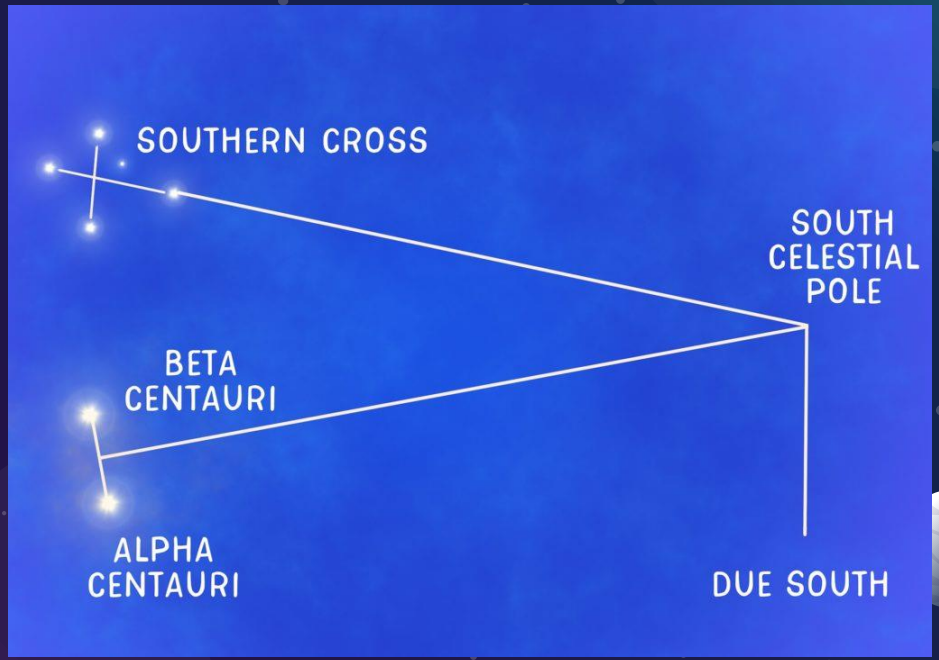

Flag of Brazil


Flag of New Zealand


Flag of Papua New Guinea


Flag of Samoa

We use “Crux”, a.k.a. the “Southern Cross”



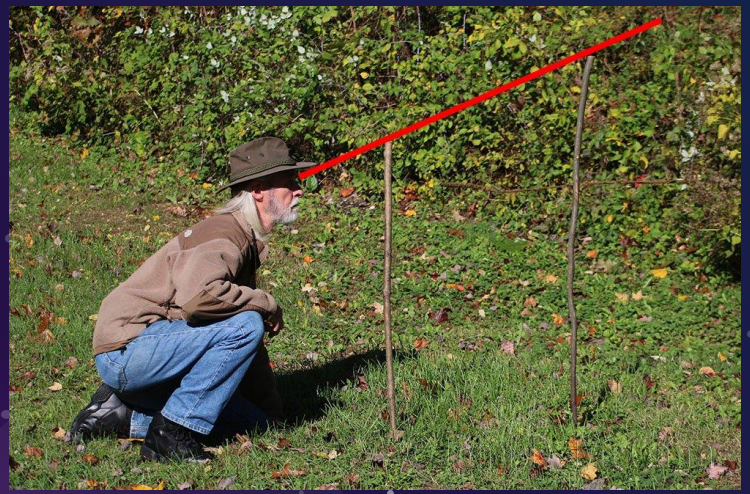
What if you can't find any of these stars?

- (Most of the) stars will always rise in the East and set in the West.

- We can use this motion of stars to find directions!

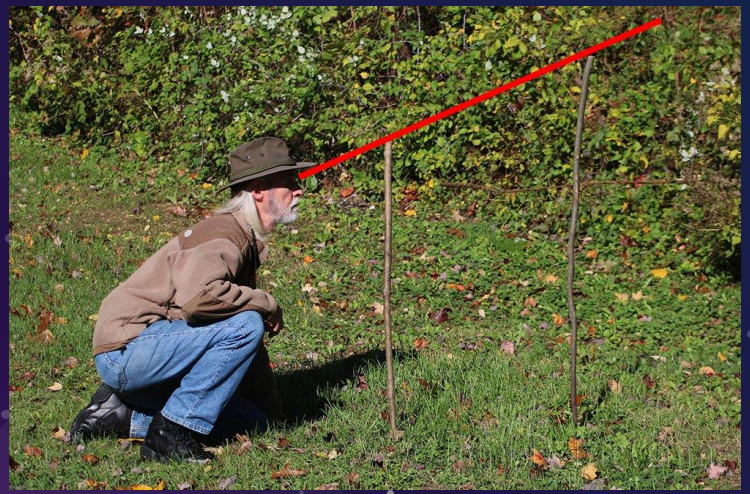
How to do it:

- Drive two stakes to the ground, spaced about a yard apart, with the taller stake behind a smaller one.



How to do it:

- Pick a bright star so that it lines up with the tops of both stakes.



How to do it:

- Now wait for 10-15 minutes and check how the star moved with respect to the tops of the stakes.
- If the star moved up, you are facing East.
- If the star moved down, you are facing West.
- If the star moved to the left, you are facing North.
- If the star moved to the right, you are facing South.

So, there you have it: a brief guide to navigating using stars; wherever you are in the world, you now know how to find North, South, East and West!

Now, go ahead and explore!

Thanks!

ANY QUESTIONS?