Stellar, solar and lunar demonstrators

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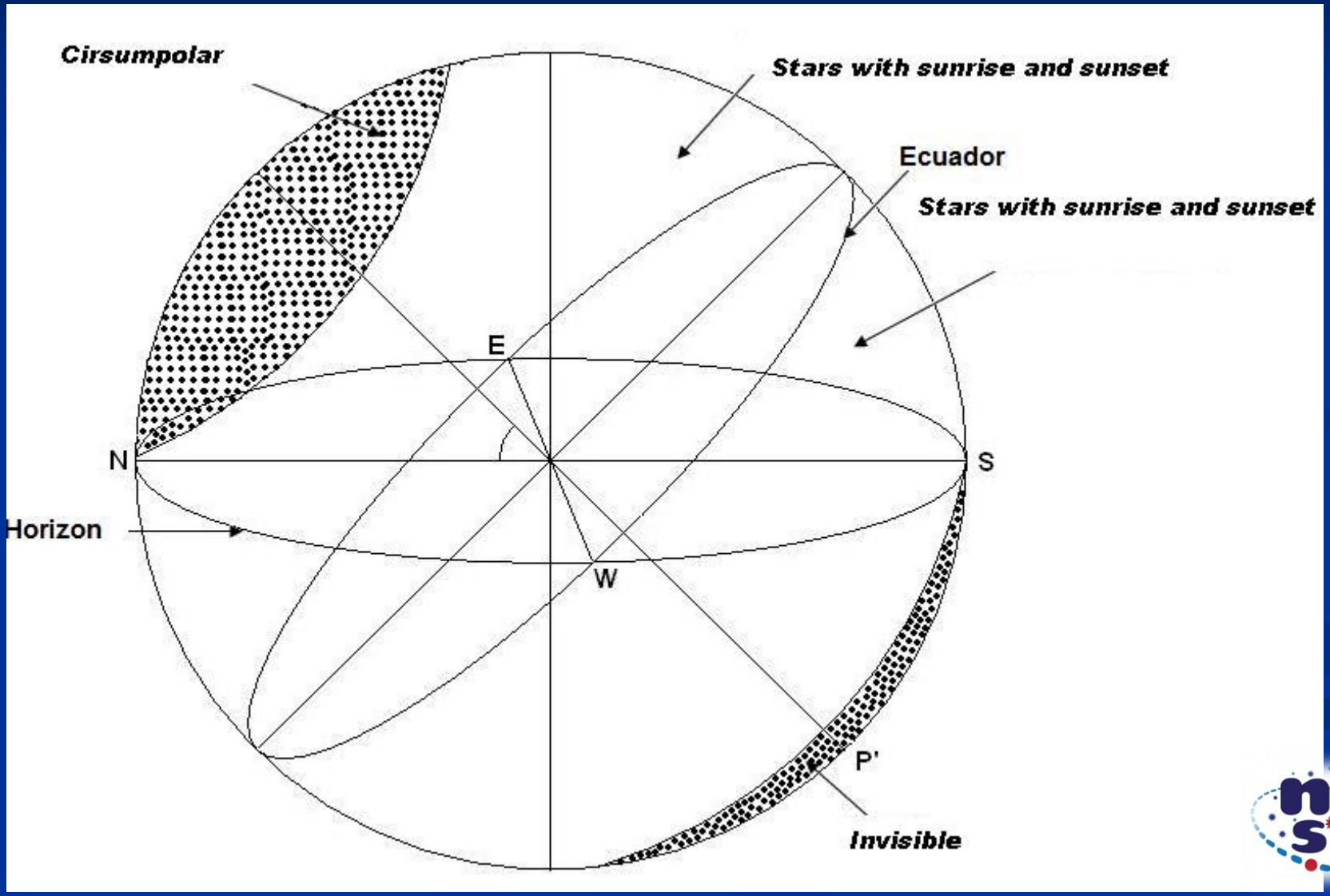
Goals

- Understand the apparent motions of stars as seen from different latitudes
- Understand the apparent motions of the Sun as seen from different latitudes
- Understand the Moon's movement and shapes as seen from different latitudes

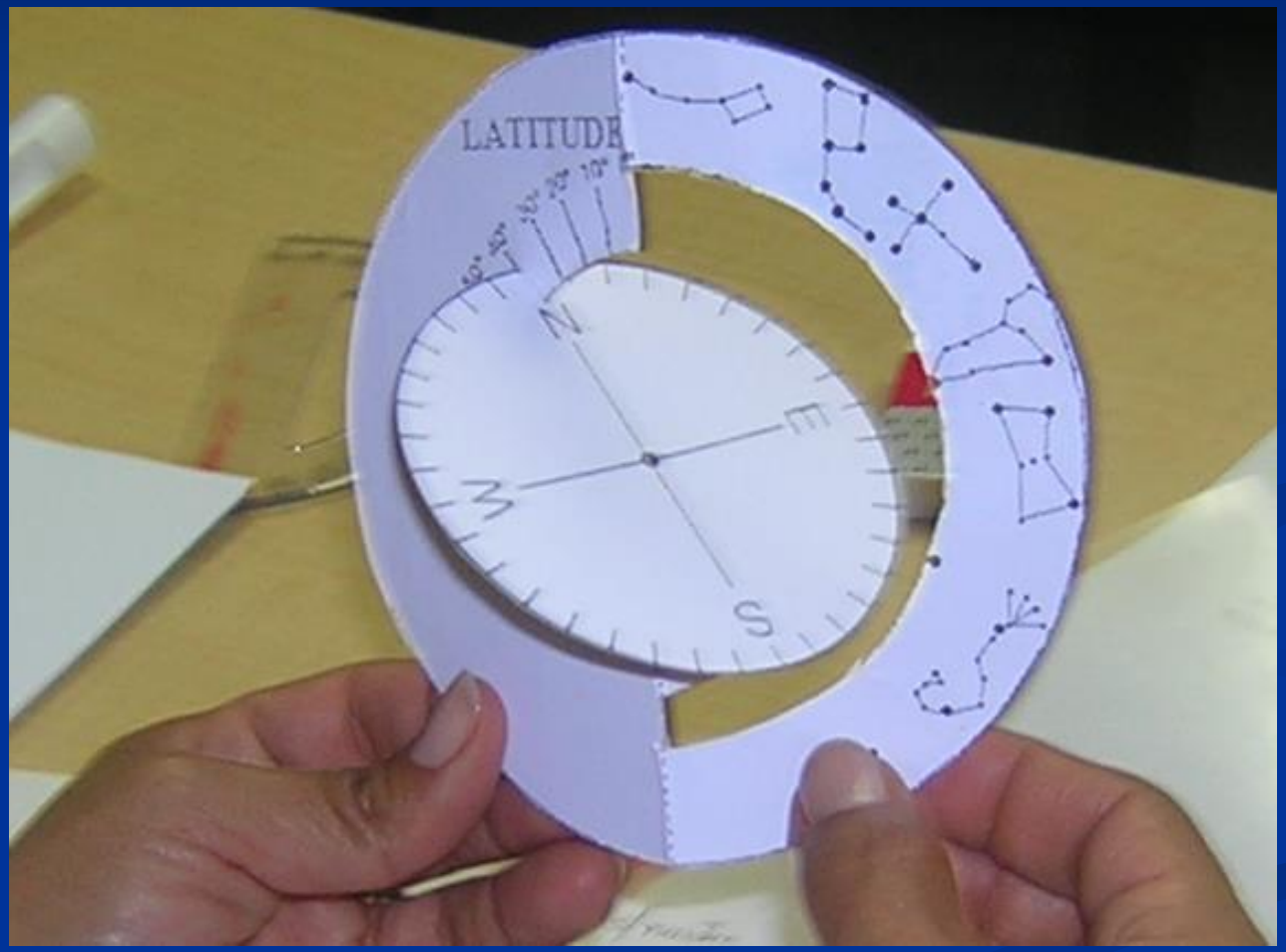
Activity 1: Stellar demonstrator for showing:

- The paths of the stars in the sky
- Circumpolar stars, stars that rise and set and stars that don't rise or set
- Travel anywhere if you know the latitude (You can build a simulator for each location)

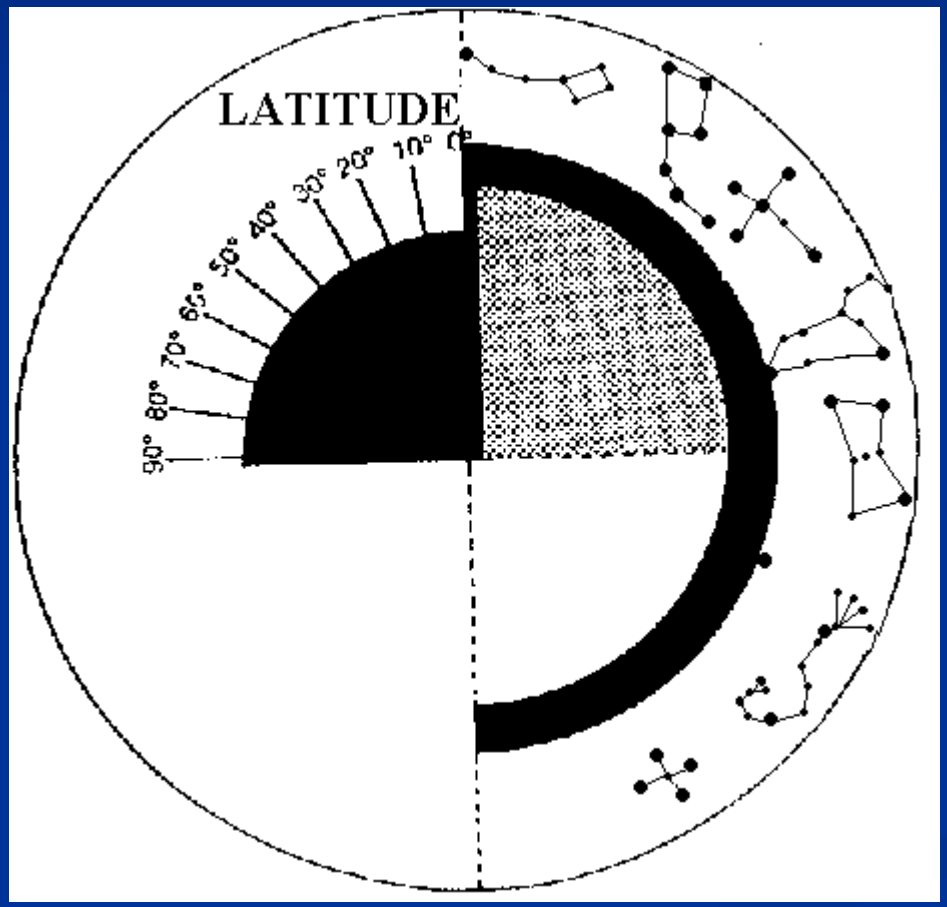
Circumpolar / stars that rise & set / stars that don't rise or set

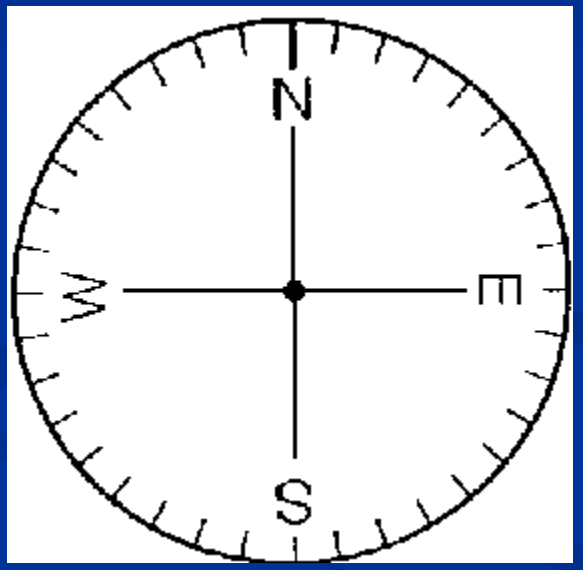


Stellar Demonstrator

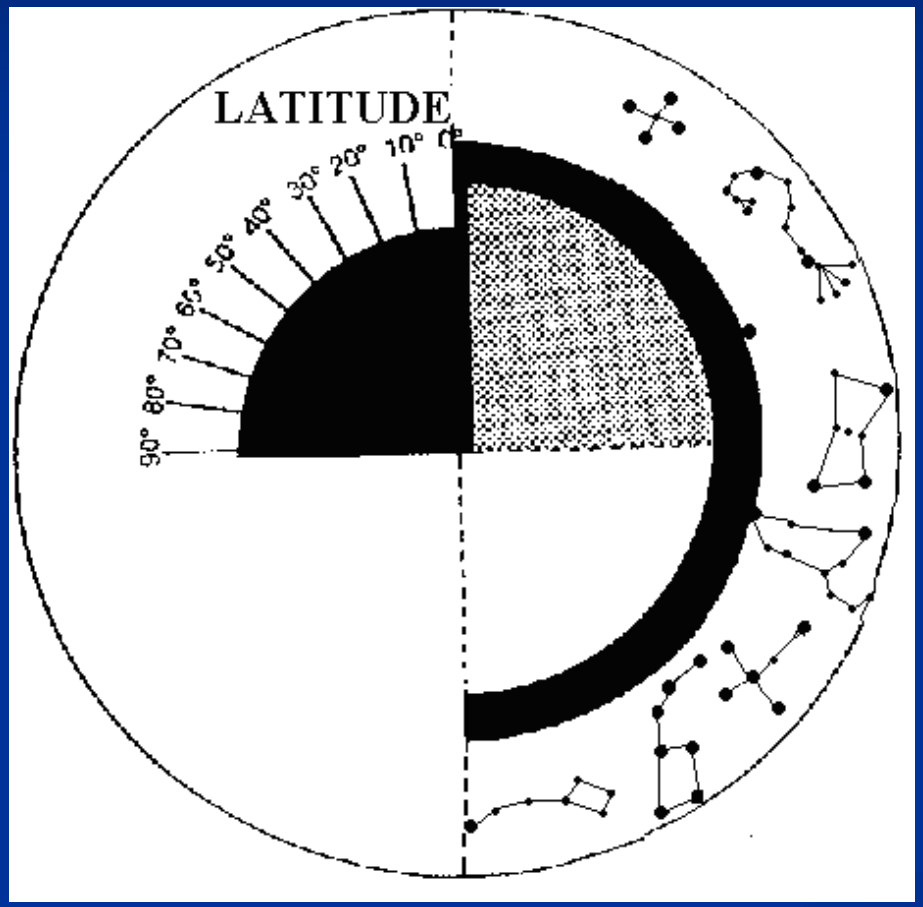


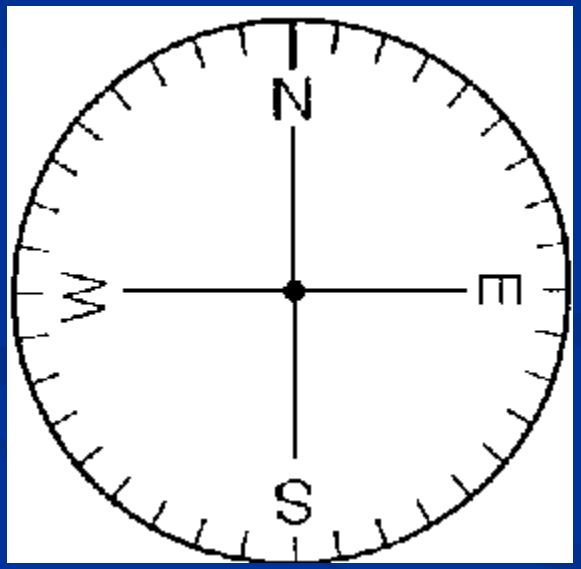
Stellar demonstrator for the Northern Hemisphere





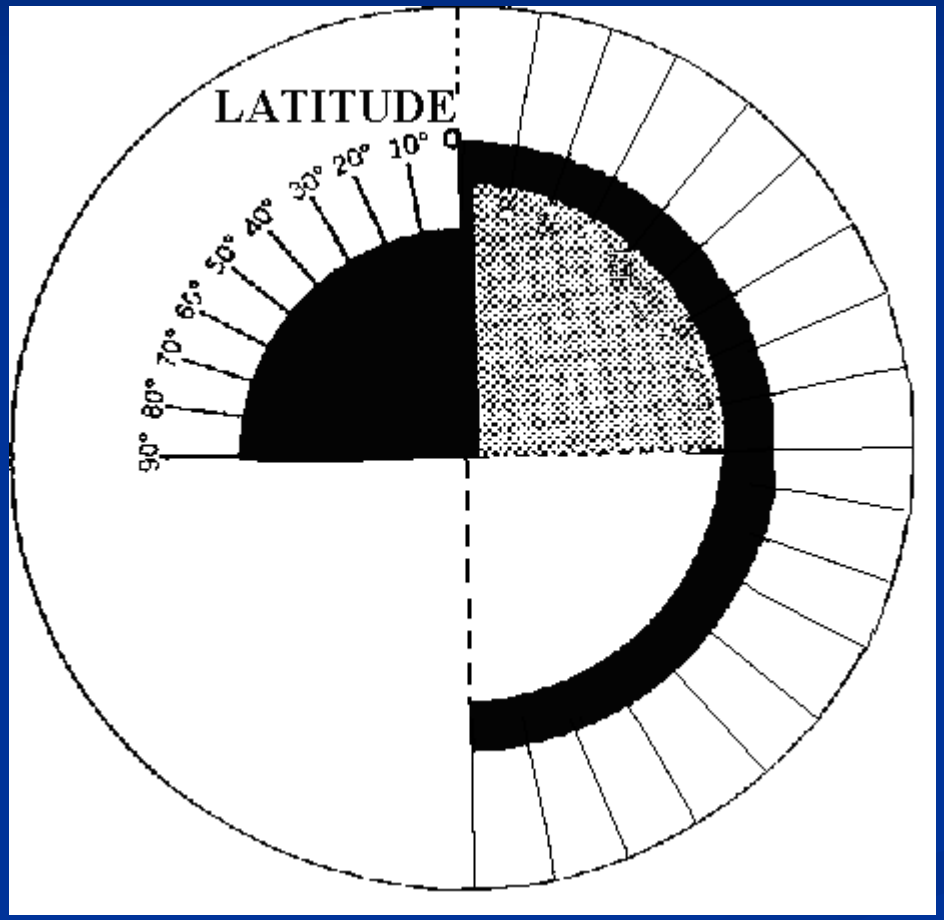
Stellar demonstrator for the Southern Hemisphere

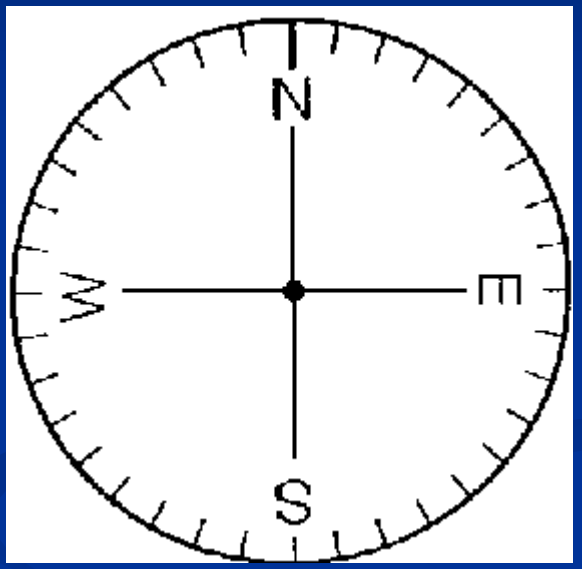




Blank stellar demonstrator

(add desired constellations)

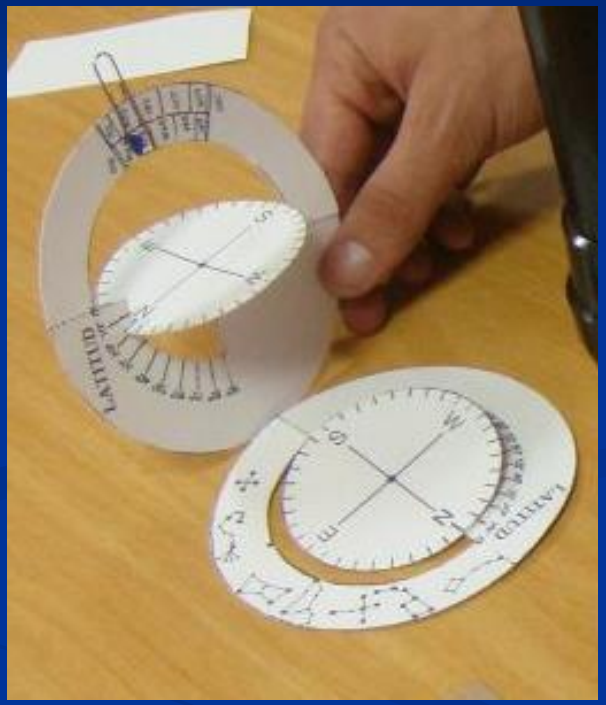




- Spring
- Summer
- Autumn
- Winter
- or each month

Construction

- The explanations given for construction depend on your location:
- Northern hemisphere
- *Southern hemisphere*



Building instructions - Step 1

- Make a photocopy on heavy-weight paper
- Cut both pieces (the big one and the small one) along the continuous lines
- Remove the black areas
- Fold the main piece along the straight dotted line

Building instructions - Step 2

- Cut a small notch above the "N" (Northern hemisphere) in the horizon disk *or the "S" (Southern hemisphere) in the horizon disk*
- Glue the North-East quadrant (Northern hemisphere) of the horizon disk onto the grey quadrant of the main piece. The "W" point must match up with latitude 90º

or the South-West quadrant (Southern hemisphere) of the horizon disk onto the grey quadrant of the main piece. The "E" point must match up with latitude 90º.

Try to be careful in this operation because the accuracy of model depends on the correct alignment of the two parts.

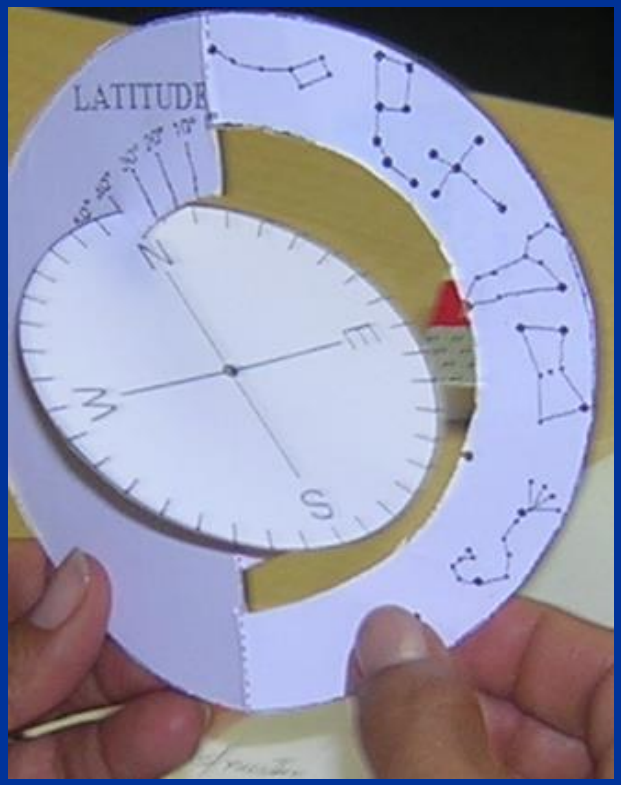
Building instructions - Step 3

- Fit the incision "N" (Northern hemisphere) into the quadrant over the degrees of latitude

or the incision "S" (Southern hemisphere) in the quadrant over the degrees of latitude

- Hold the horizon disk perpendicular to the latitude degree disk
- Begin to use by setting it for any desired latitude…

The tilts of stellar paths



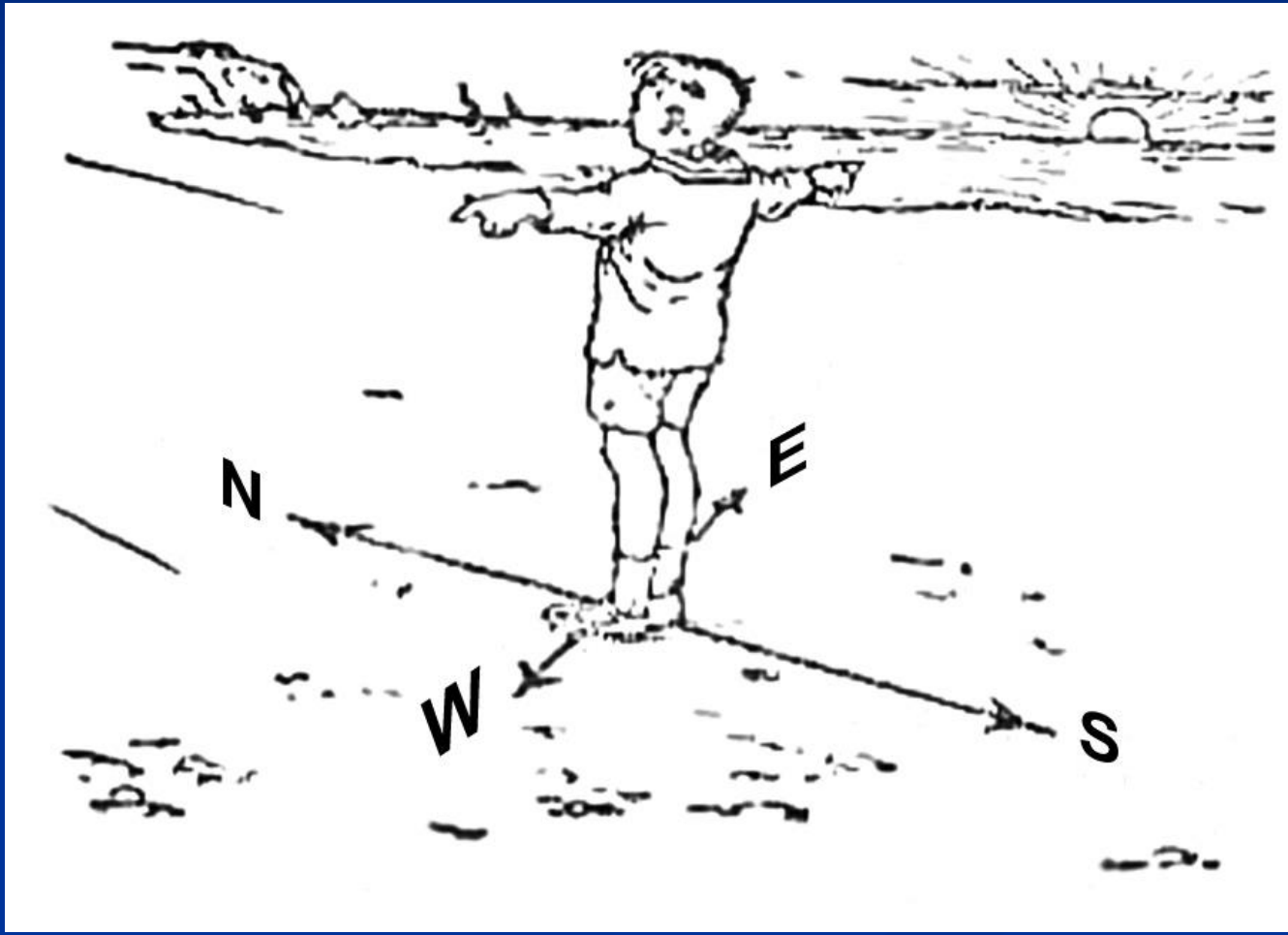
Lat 70º
Enontekiö
Finland

Lat 41º
Montseny
Spain

Lat 23º
Matehuala
Mexico

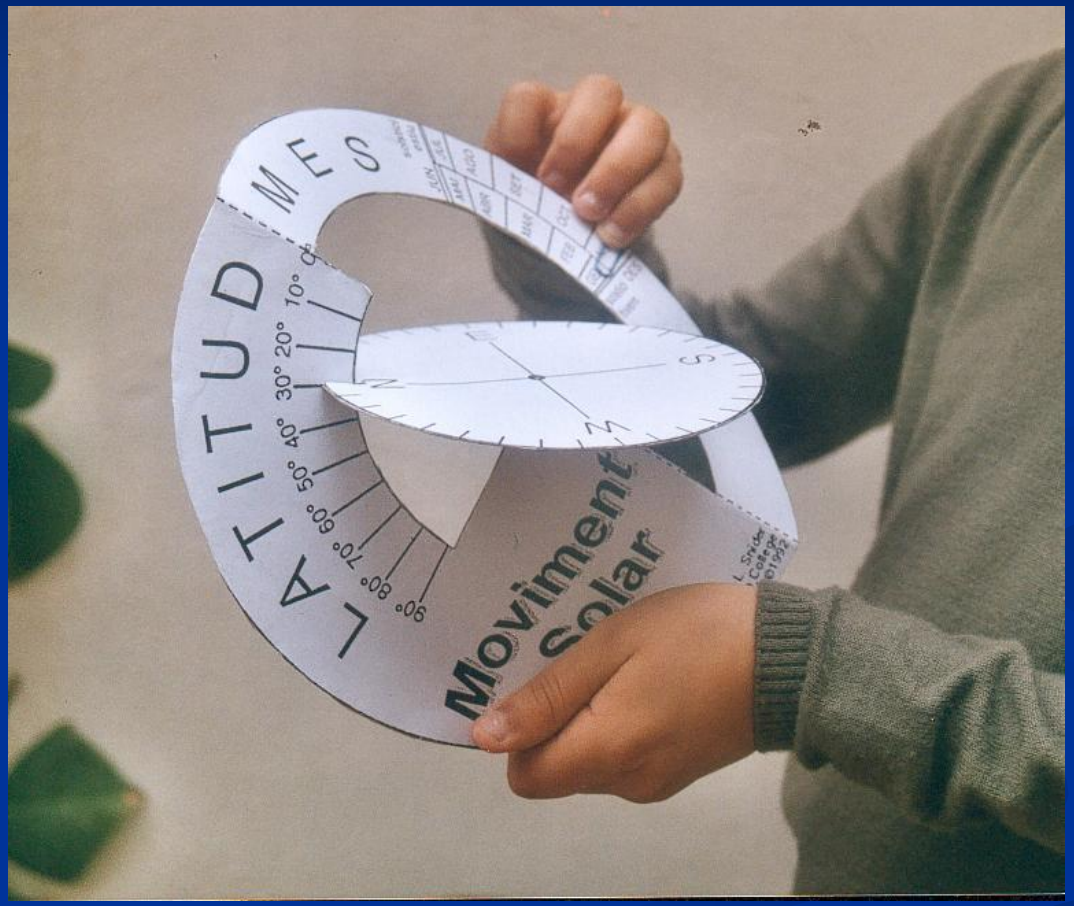
Where is the sunrise?

Is this picture correct?



The sunrise is always due East and the sunset is always due West.
Is this correct?

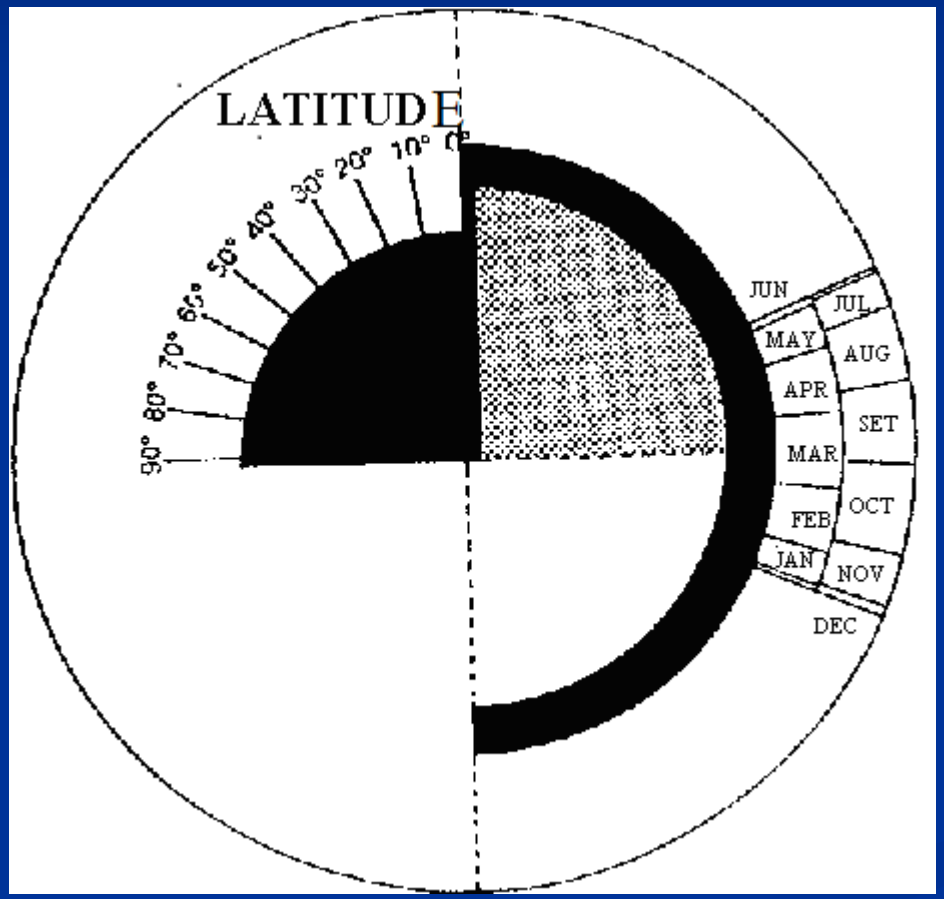
…with another demonstrator

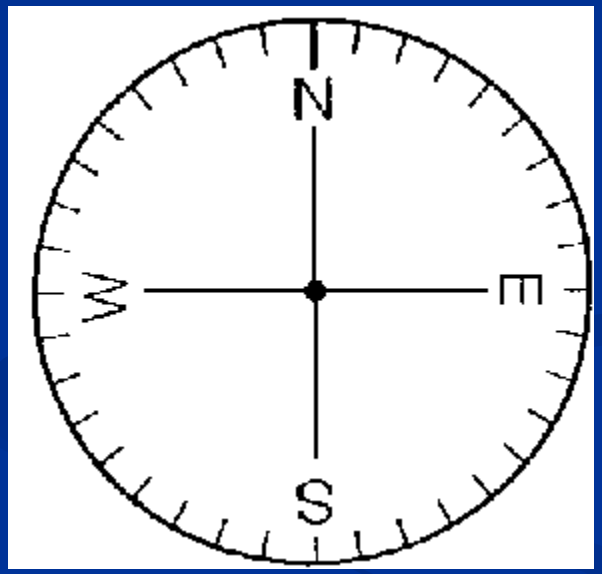


Activity 2: Solar demonstrator for showing:

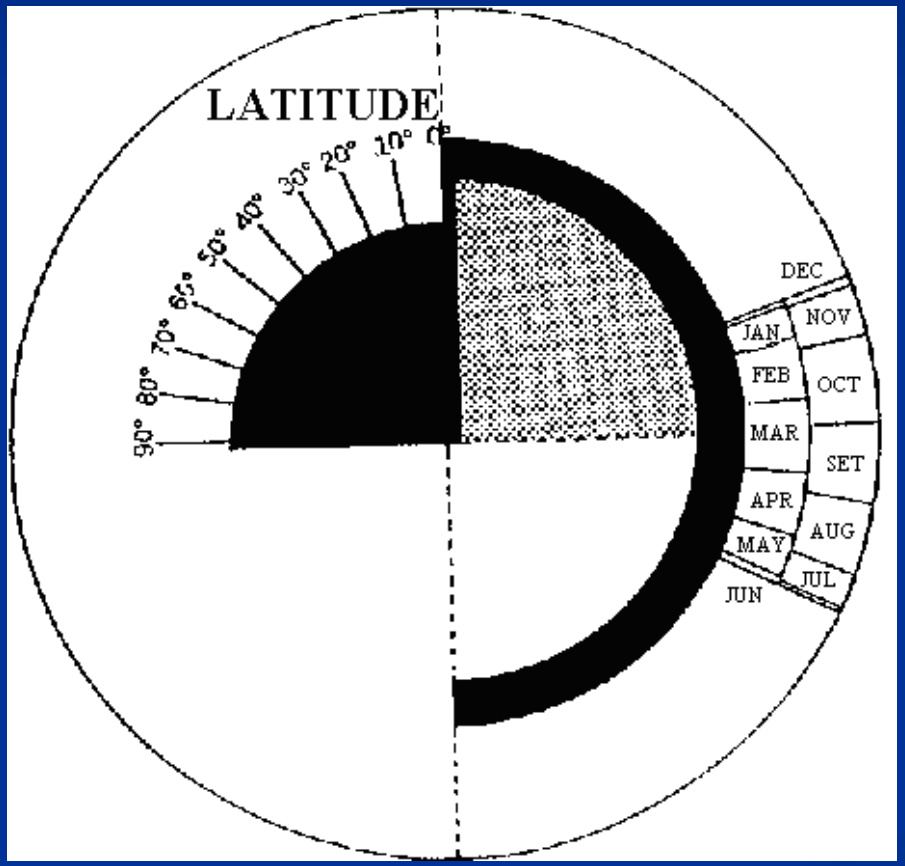
- Daytime solar path
- Annual motion of the Sun
- Study risings and settings
- Midnight Sun
- Travel anywhere if you know the latitude

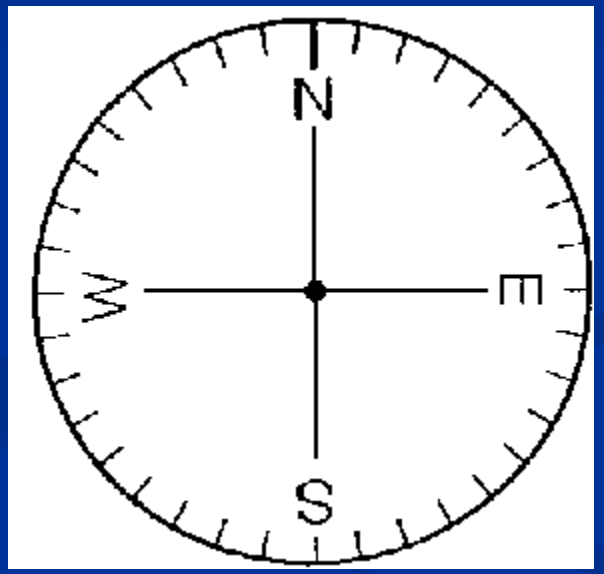
Solar demonstrator - Northern hemisphere



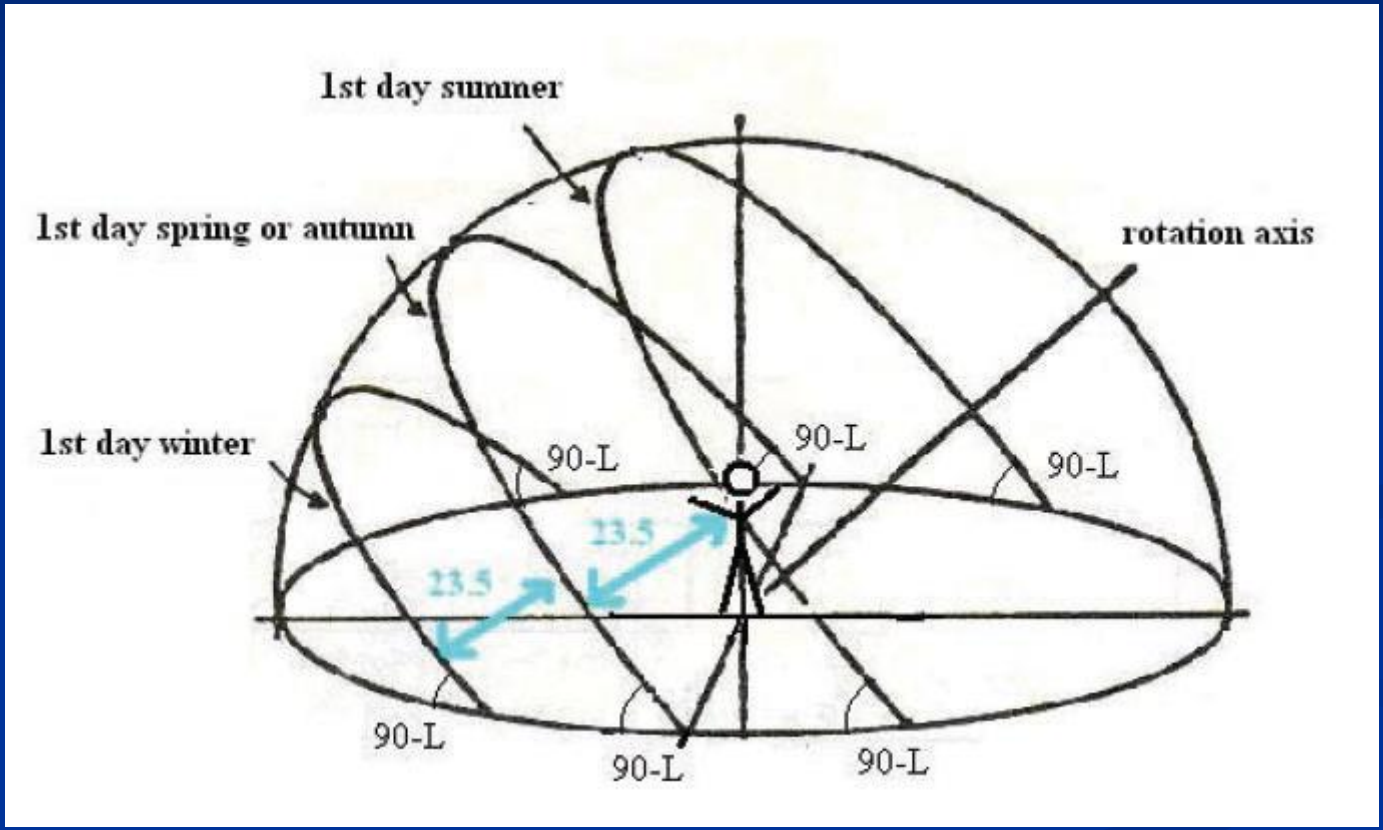


Solar demonstrator - Southern hemisphere

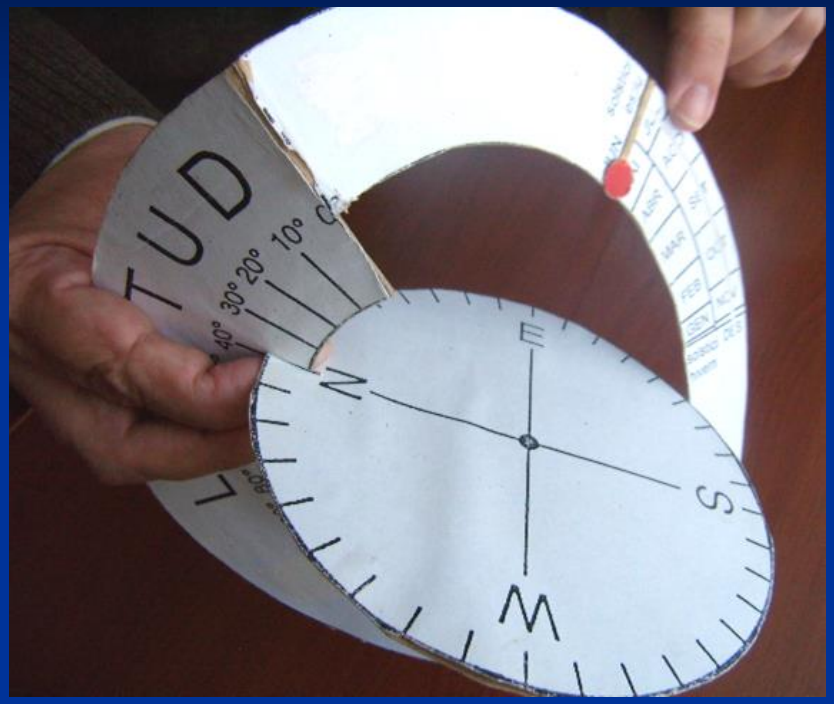


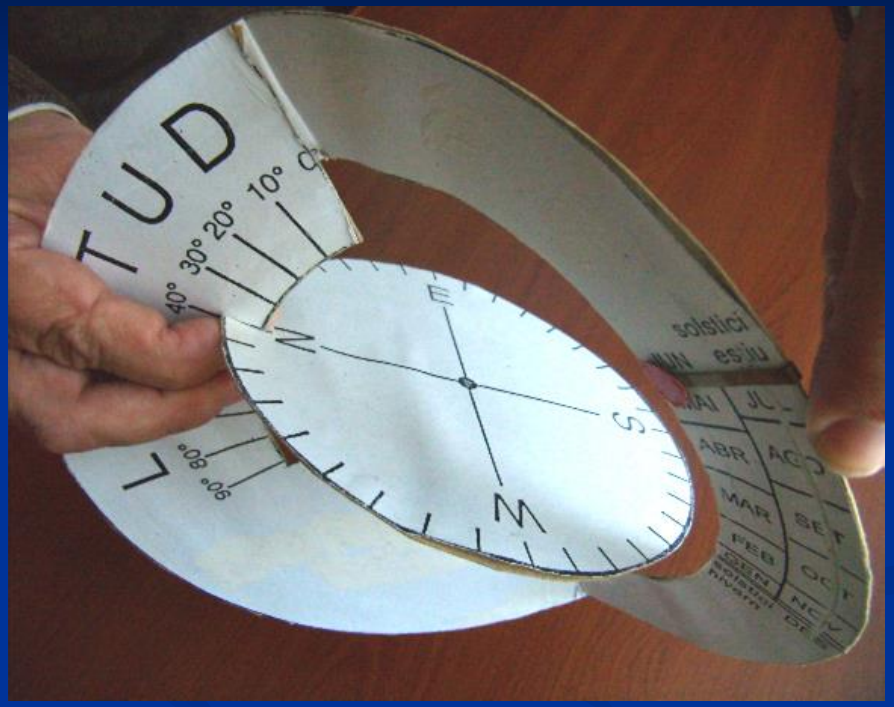


The paths of the Sun



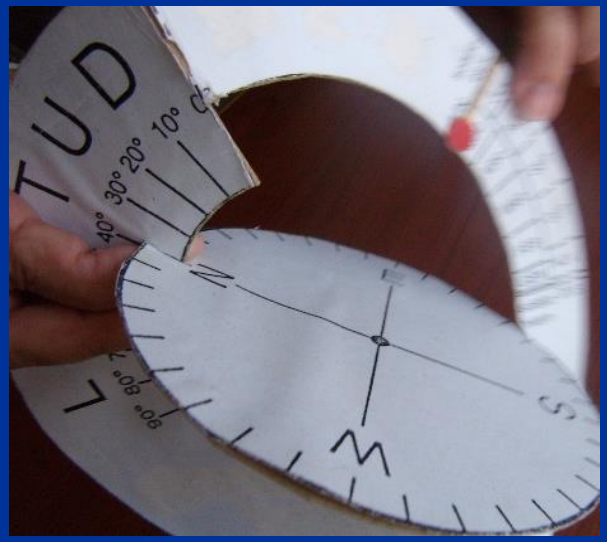
The Sun's path





- Place "N" at proper latitude
- Place the marker at required date
- Move date "arm" to show Sun's path through a day
- Note the positions of Sunrise and Sunset

Slope of the Sun's path



Lat 70º
Enontekiö
Finland

Lat 40º
Gandía
Spain

Lat 5º
Ladrilleros
Colombia

Height of the Solar path

Summer and Winter in Norway

Sunrises and Sunsets in different places

57º Riga, Latvia

40º Barcelona, Spain

2 º Popayán, Colombia

winter

spring
autumn

summer

Sunrises and Sunsets in different places

2 º Popayán, Colombia

- 19º La Paz, Bolivia

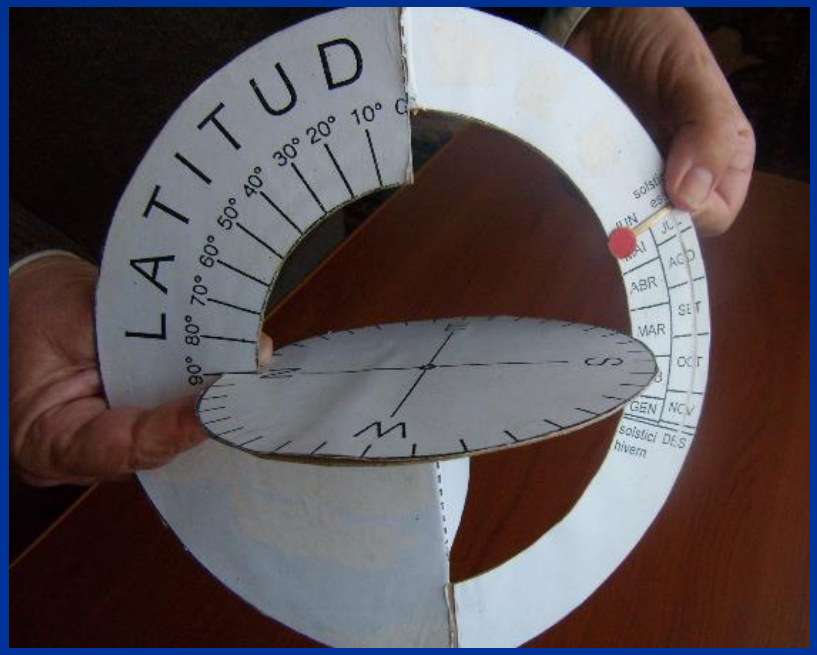
- 43º Esquel, Argentina

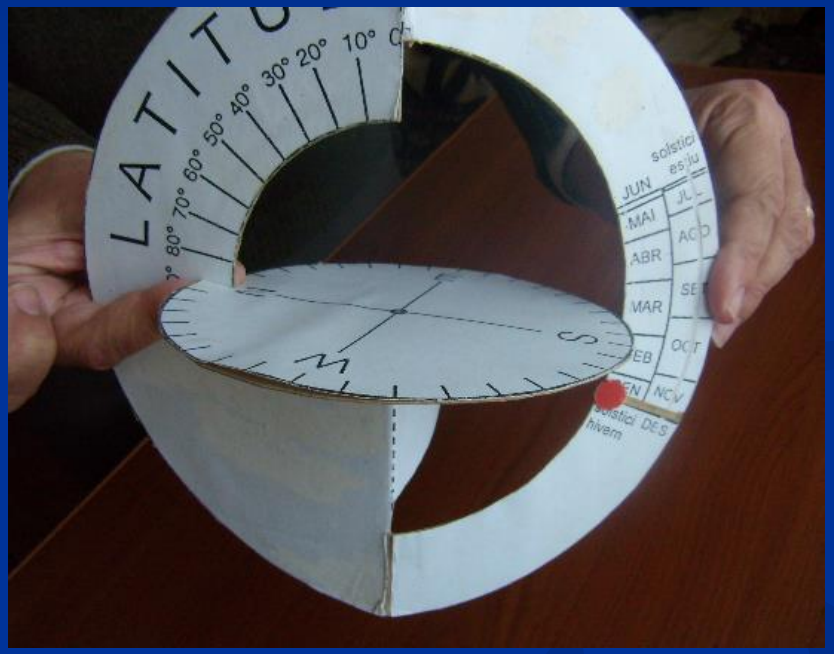
winter

spring
autumn

summer

Polar summer and winter



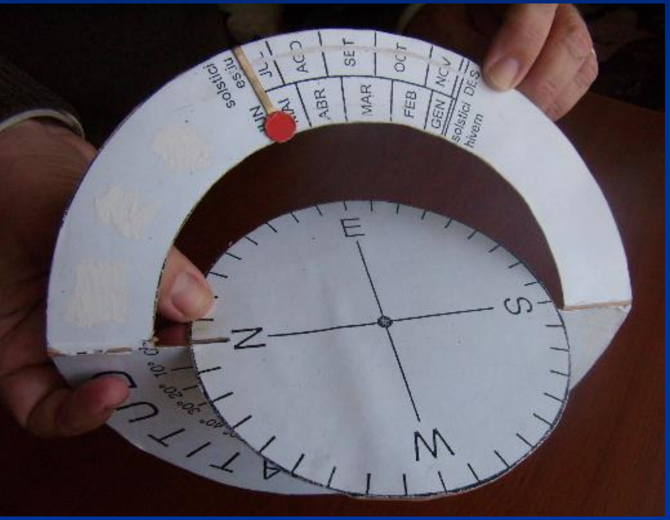


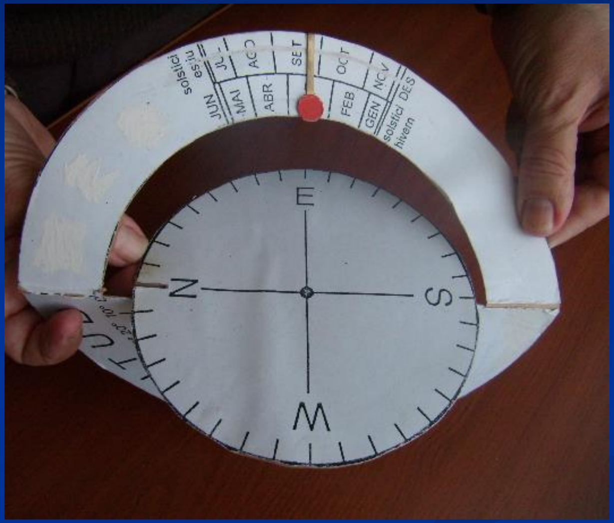
At the poles, the sun is above the horizon for half a year and below it for half a year.

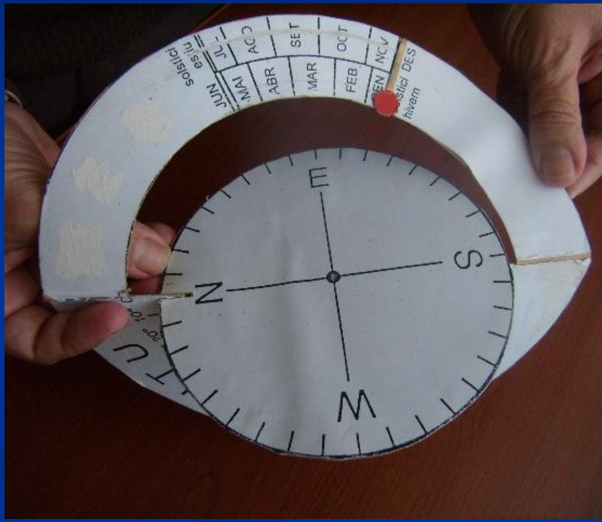
Midnight Sun

The Sun goes down until it passes the meridian and then begins to rise rather than set below the horizon.

“Seasons at the equator”

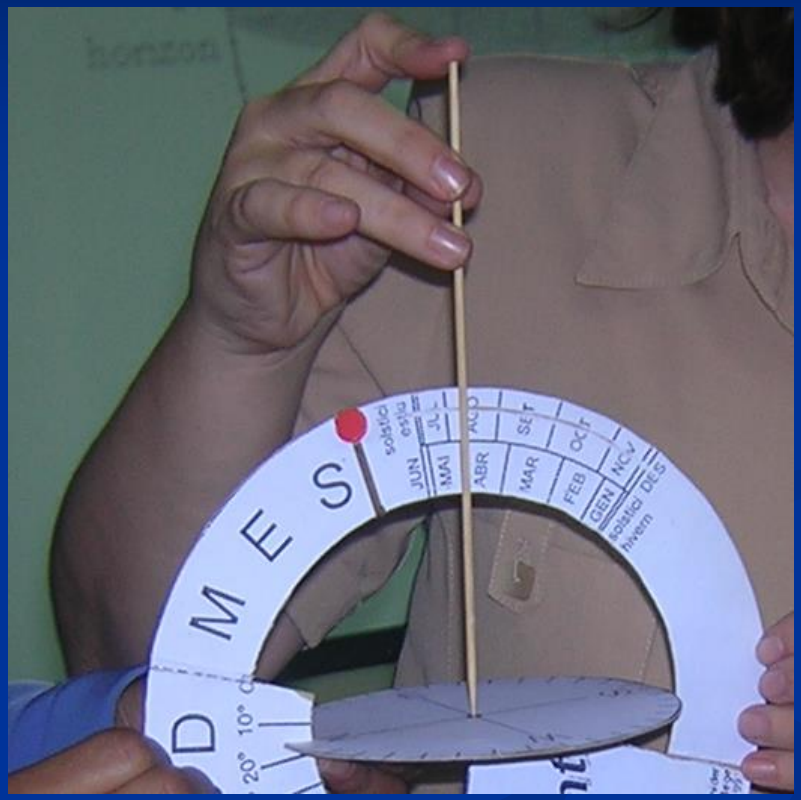






The solar path is always almost perpendicular to the horizon and its length is almost the same throughout the year.

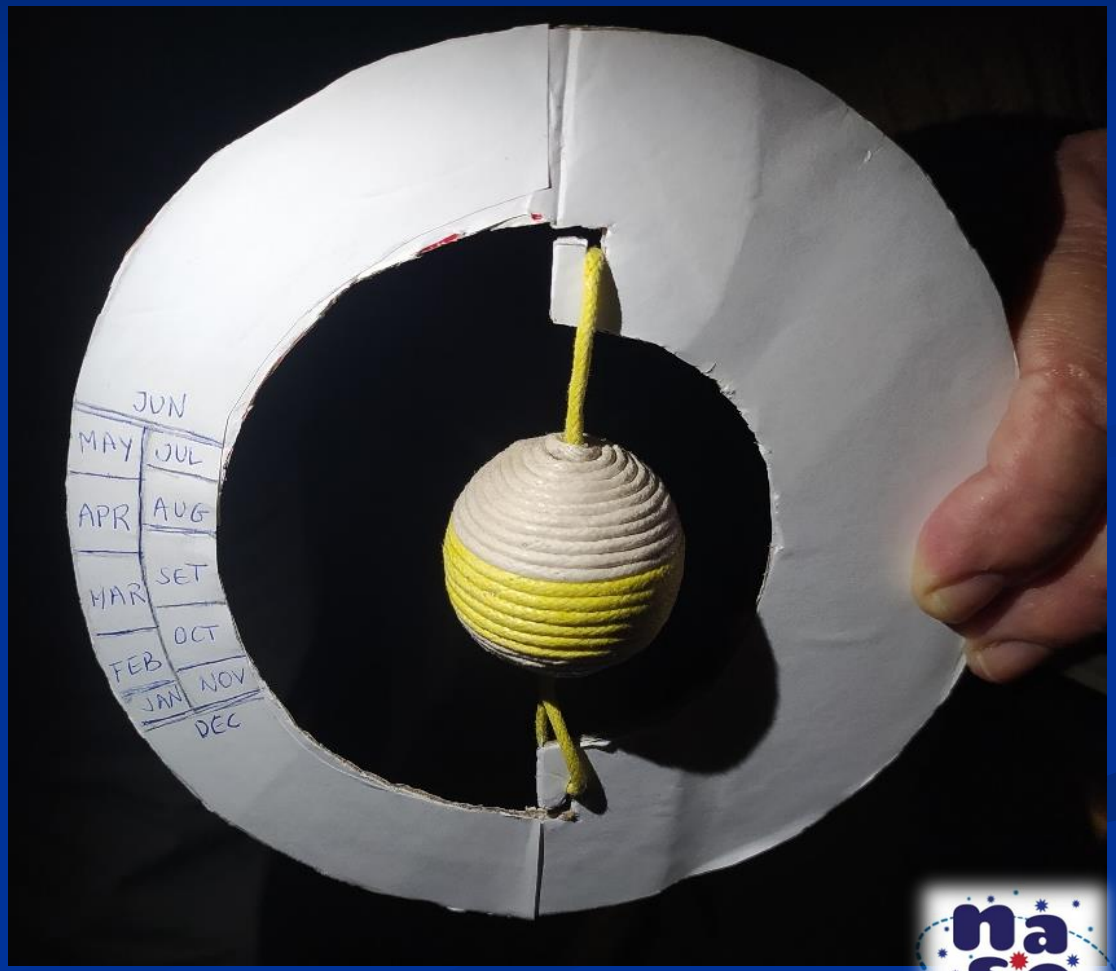
Sun at the Zenith



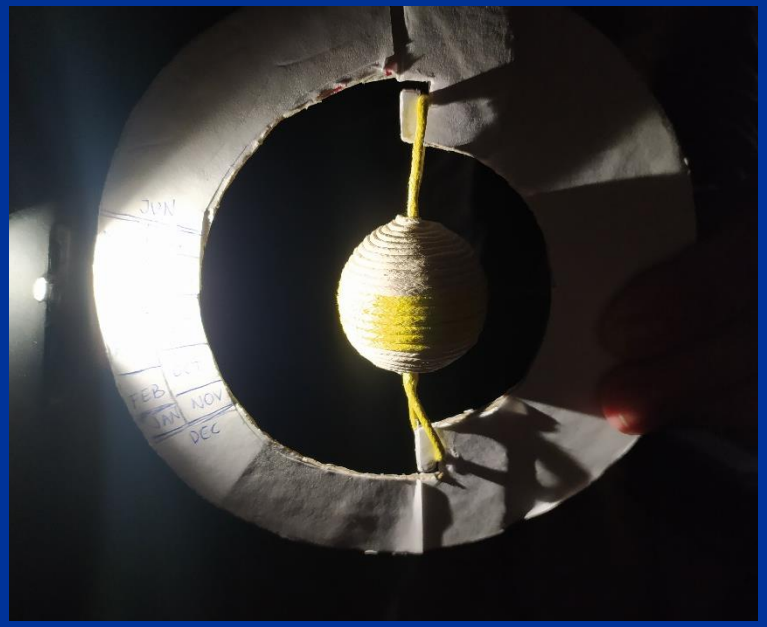
At Solar Noon, your shadow is on your feet.

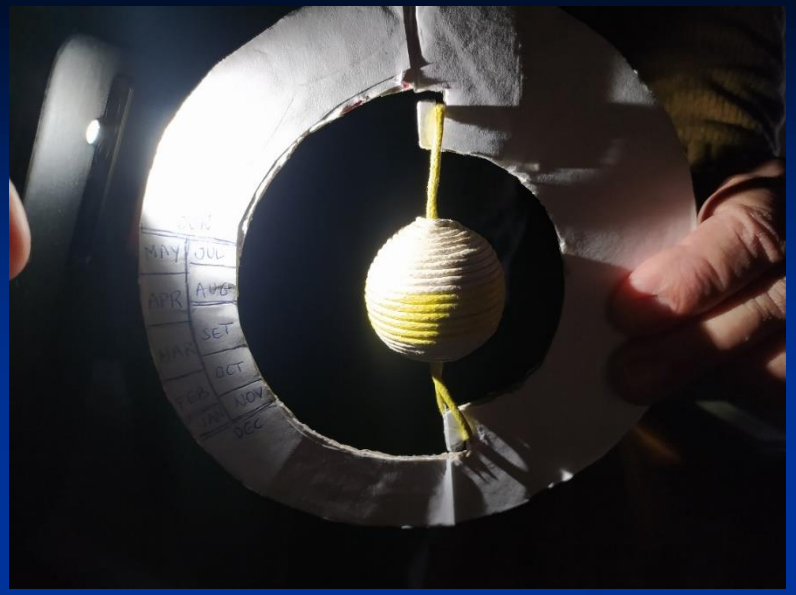
Activity 3: Parallel Earth Demonstrator

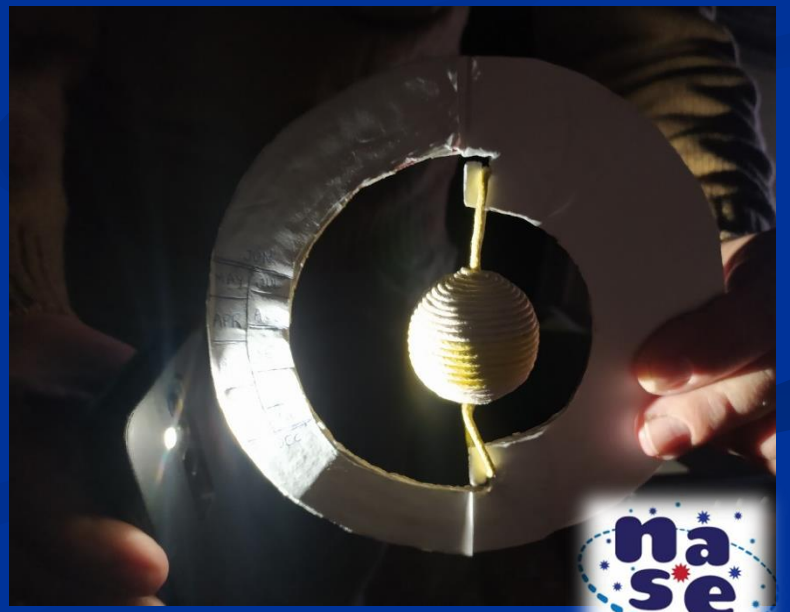
- To explain the position of the Sun when using the Parallel Earth



Activity 3: Parallel Earth Demonstrator





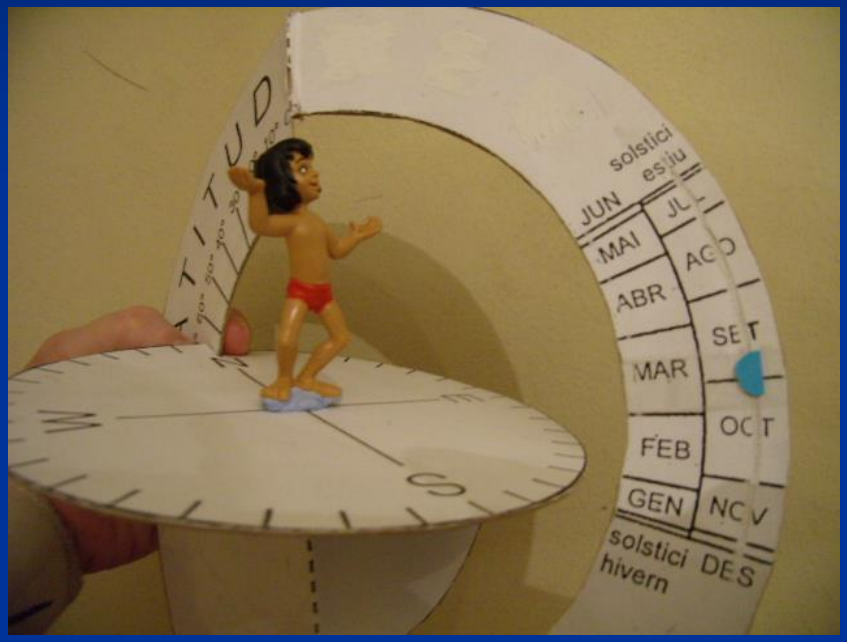


Activity 4: Lunar demonstrator

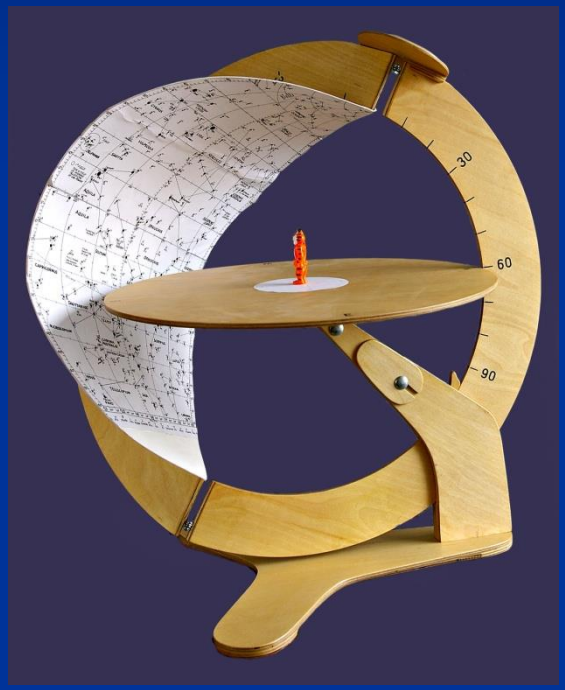
- Why does the Moon smile in some places?

Why - yes or no….

Activity 3: Lunar demonstrator



XXL demonstrators



Thank you very much
for your attention!