Stellar, solar and lunar demonstrators

恒星、太阳、月亮的视运动演示模型

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Goals 目标

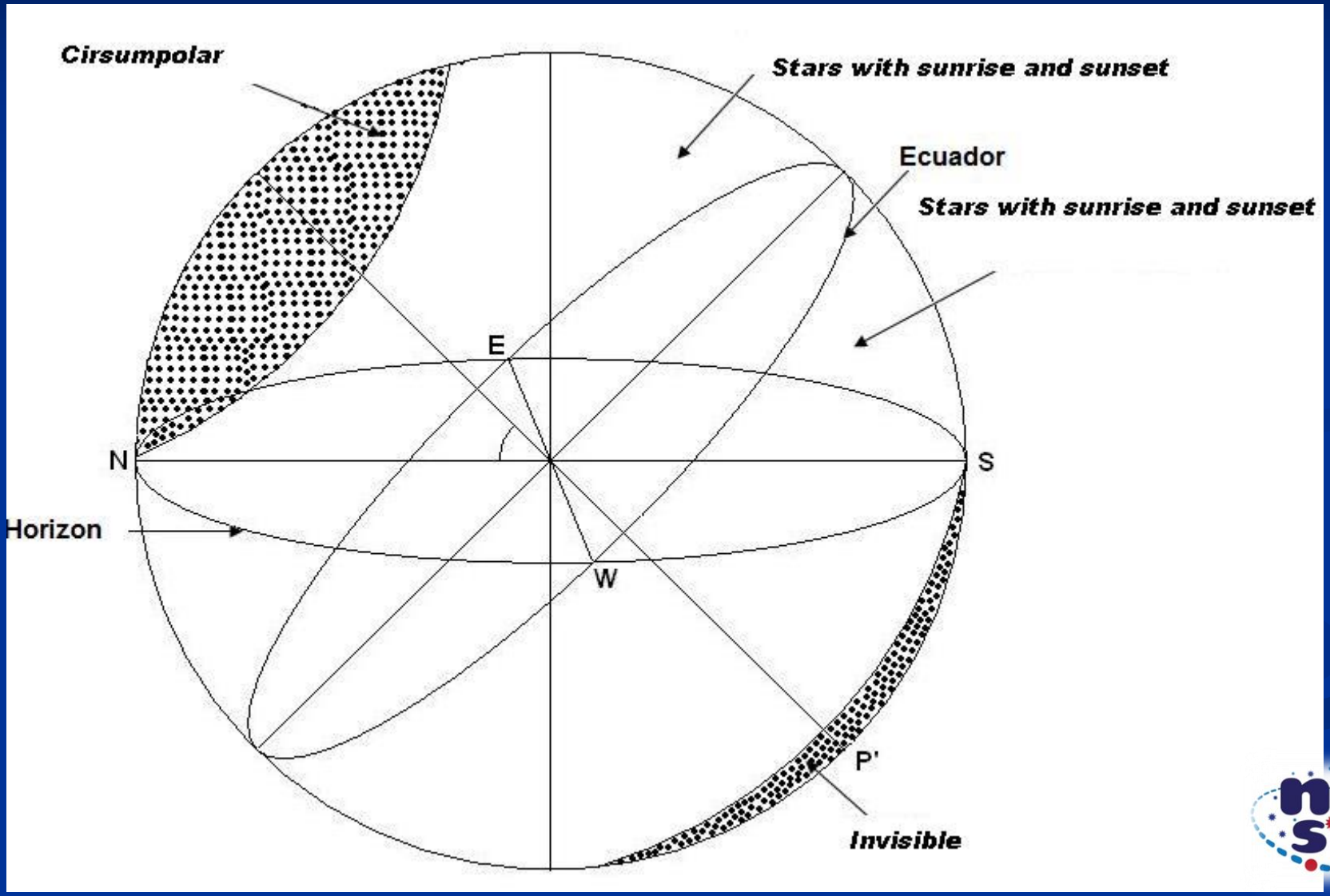
- Understand the apparent motions of stars as seen from different latitudes
- 理解不同纬度的恒星视运动。
- Understand the apparent motions of the Sun as seen from different latitudes
- 理解不同纬度的太阳视运动。
- Understand the Moon's movement and shapes as seen from different latitudes
- 理解不同纬度的月亮视运动与形状。

Activity 1: Stellar demonstrator for showing:
活动1：恒星演示模型

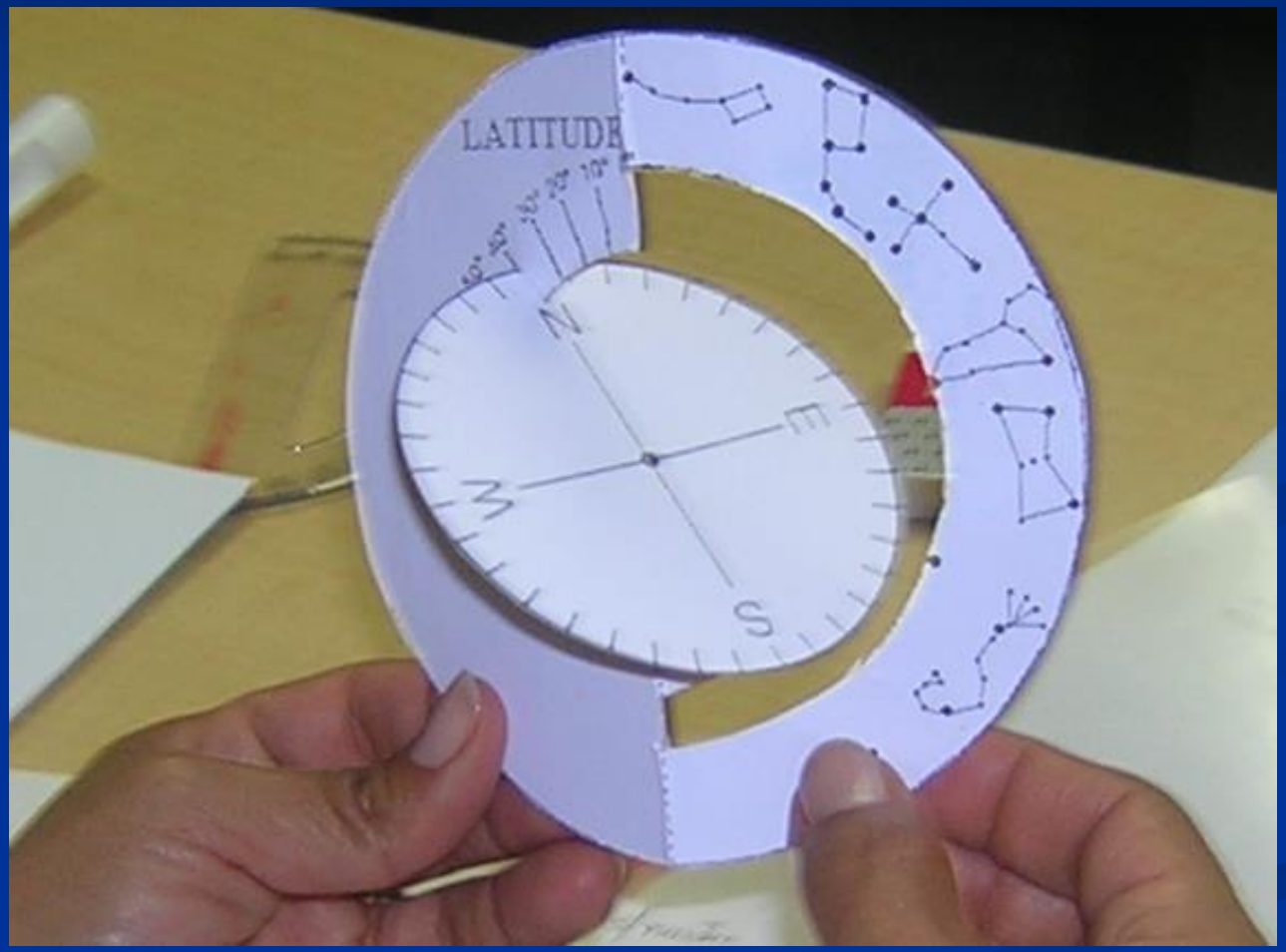
- The paths of the stars in the sky
- 恒星在天空的轨迹
- Circumpolar stars, stars that rise and set and stars that don't rise or set
- 绕极“恒显”星、“东升西落”星和“恒隐”星
- Travel anywhere if you know the latitude (You can build a simulator for each location)
- 去到任何已知纬度的地方（可以模拟任何纬度）

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

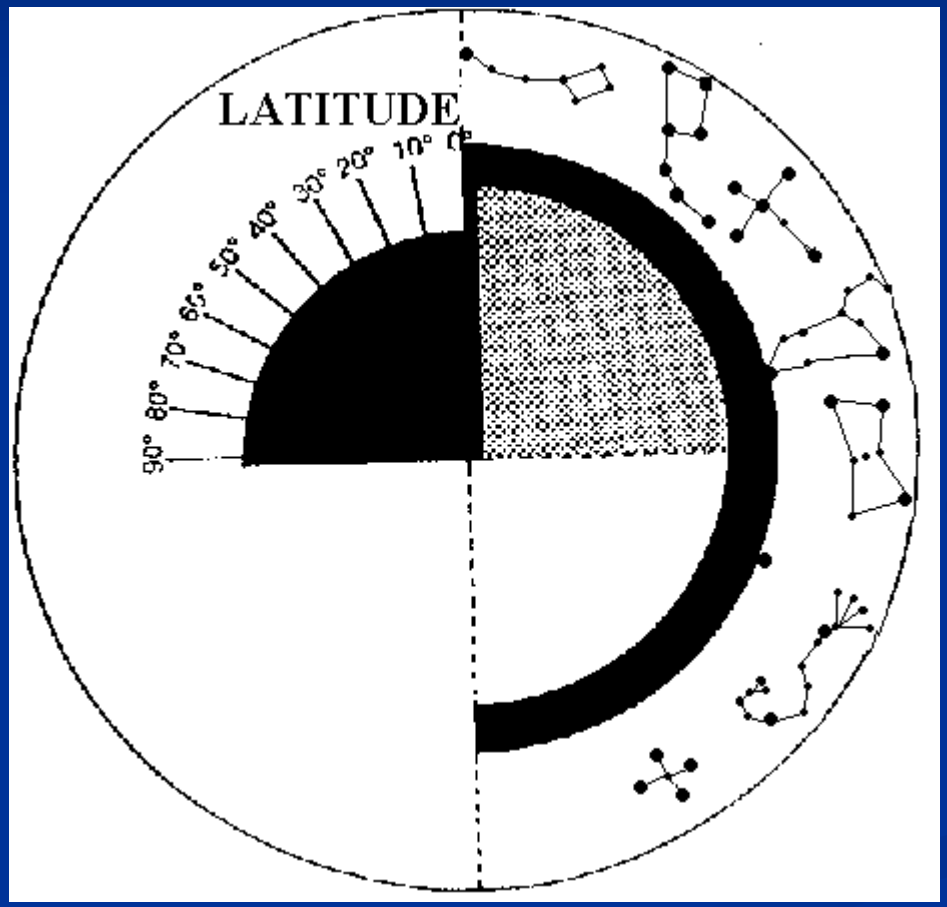
绕极“恒显”星、东升西落星和“恒隐”星

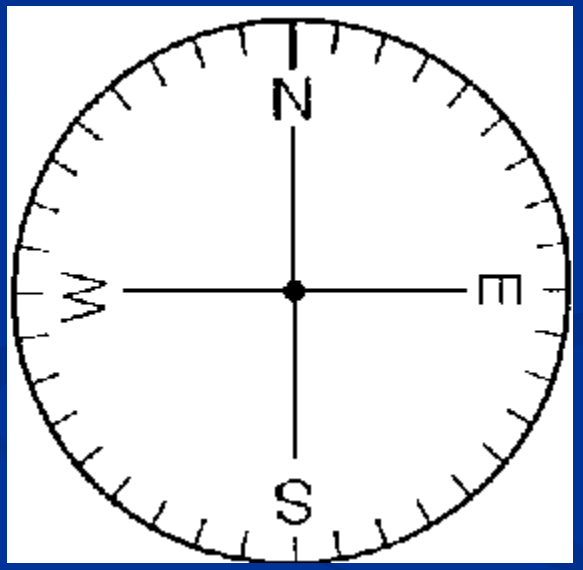


Stellar Demonstrator
恒星演示

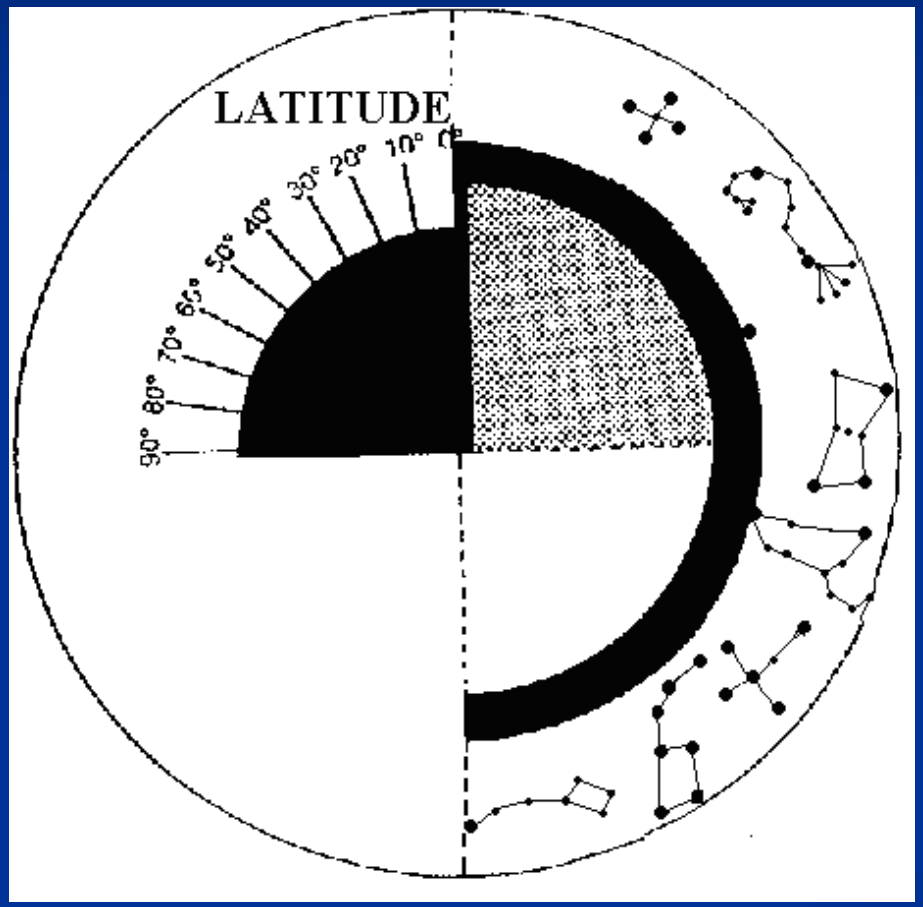


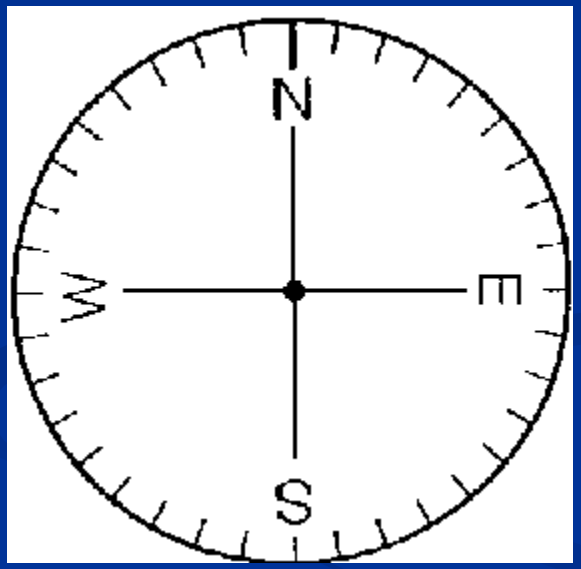
Stellar demonstrator for the Northern Hemisphere
北半球的星空演示





Stellar demonstrator for the Southern Hemisphere
南半球的星空演示

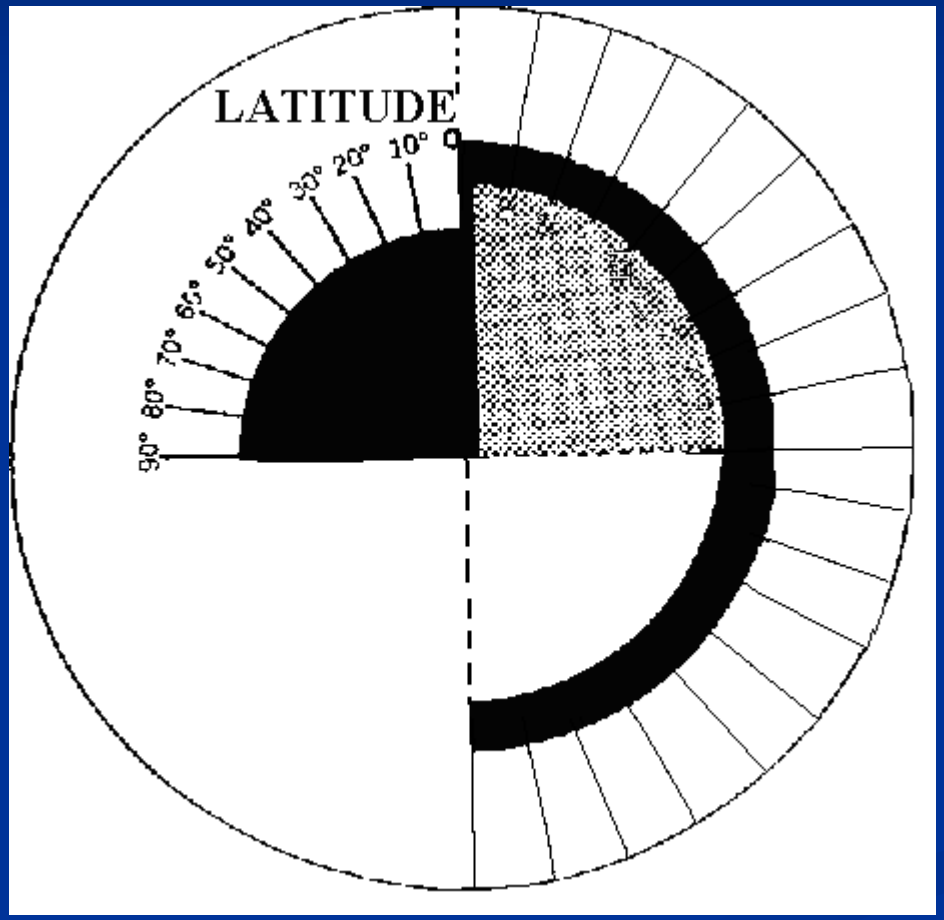


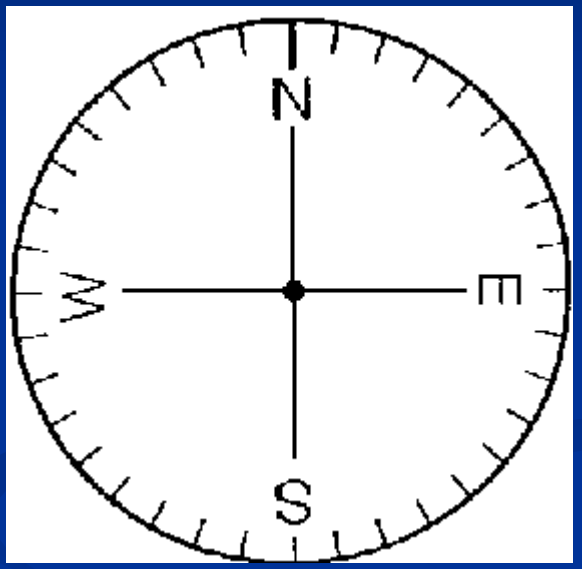


Blank stellar demonstrator

(add desired constellations)

空白的星空演示盘（添加渴望加入的星座）

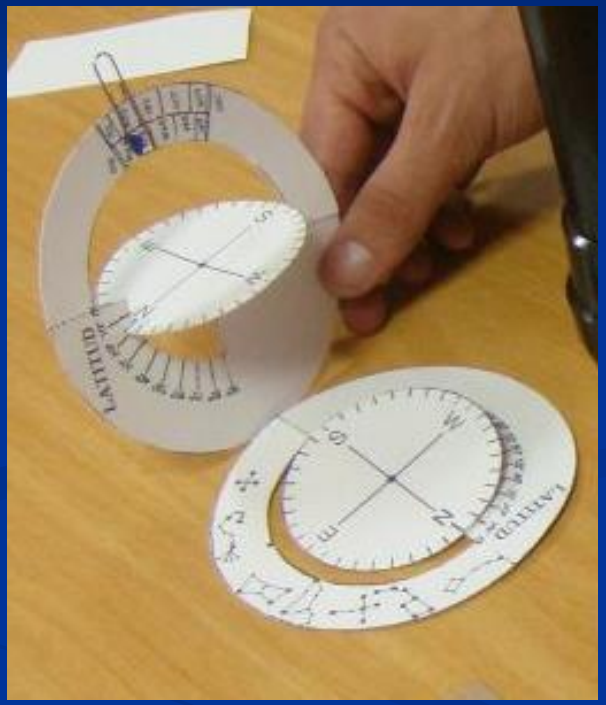




- Spring 春
- Summer 夏
- Autumn 秋
- Winter 冬
- or each month
  或者每个月

Construction
构造

- The explanations given for construction depend on your location:
- 所有的制作方法都基于你的位置：
- Northern hemisphere
- 北半球
- *Southern hemisphere*
- *南半球*



Building instructions - Step 1

制作说明，第一步

- Make a photocopy on heavy-weight paper
- 在纸板上印上图案
- Cut both pieces (the big one and the small one) along the continuous lines
- 沿着实线剪下两片（一大一小）
- Remove the black areas
- 剪去黑色区域
- Fold the main piece along the straight dotted line
- 将主板沿着虚线对折

Building instructions - Step 2

制作说明，第二步

- Cut a small notch above the “N” (Northern hemisphere) in the horizon disk *or the “S” (Southern hemisphere) in the horizon disk*
- 对于北半球，在地平盘的N的位置剪一个小口，口子的大小要足够让纸板穿过去；*对于南半球，在地平盘的S的位置剪。*
- 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.

- 对于北半球，将地平盘的东北象限粘在主板的灰色象限上。W必须准确对准90度纬线。

对于南半球，将地平盘的西南象限粘在主板的灰色象限上。E必须准确对准90度纬线。

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

这一步要非常细心，因为模型的精度就取决于两部分是否正确对齐。

Building instructions - Step 3

制作说明，第三步

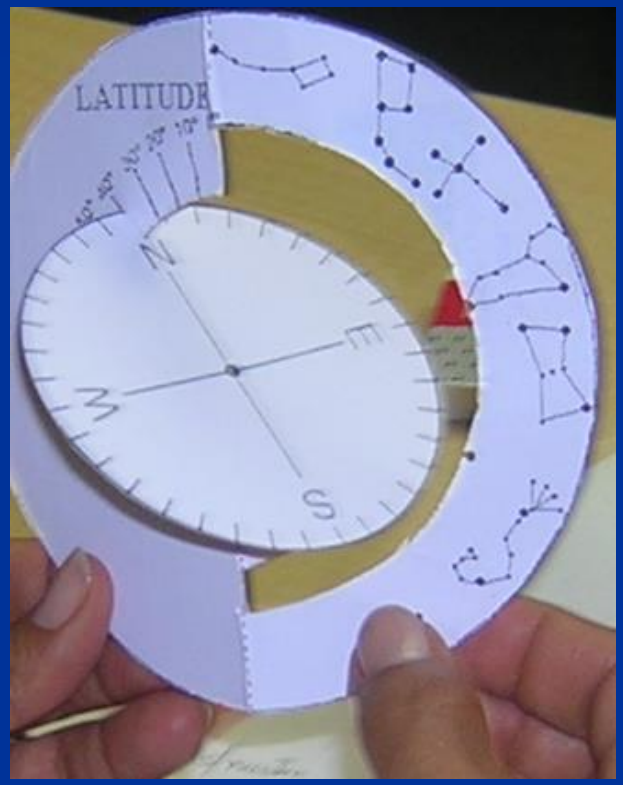
- Fit the incision “N” (Northern hemisphere) into the quadrant over the degrees of latitude

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

- 对于北半球，将N缺口对齐纬度象限

  对于南半球，将S缺口对齐纬度象限
- Hold the horizon disk perpendicular to the latitude degree disk
- 将地平盘垂直于纬度
- Begin to use by setting it for any desired latitude…
- 将其对准希望的纬度，就可以开始使用了

The tilts of stellar paths
天体轨迹的倾角



Lat 70°
Enontekiö
Finland
北纬70°
芬兰

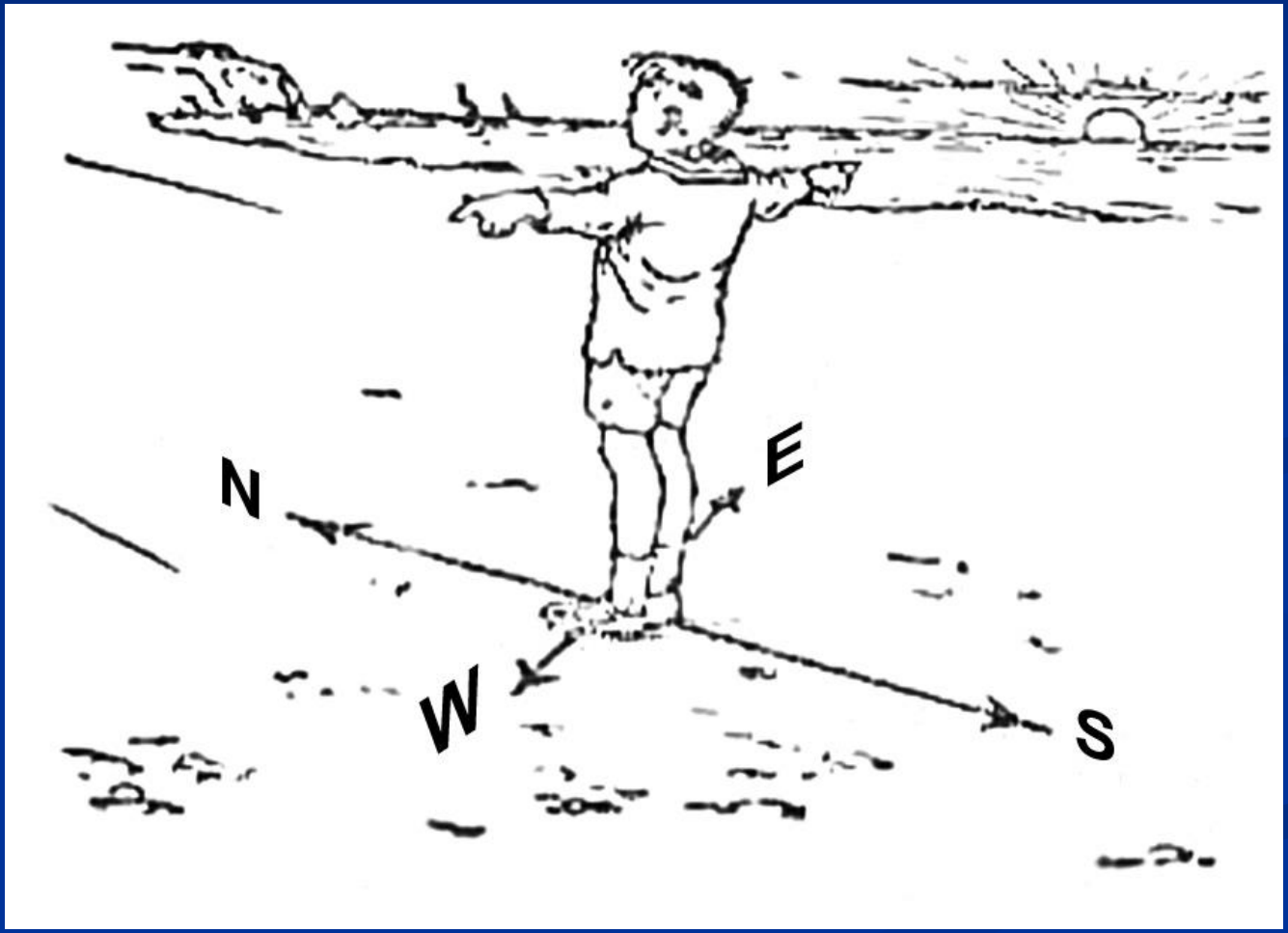
Lat 41°
Montseny
Spain
北纬41°
西班牙

Lat 23°
Matehuala
Mexico
北纬23°
墨西哥

Where is the sunrise?

太阳在哪儿升起？

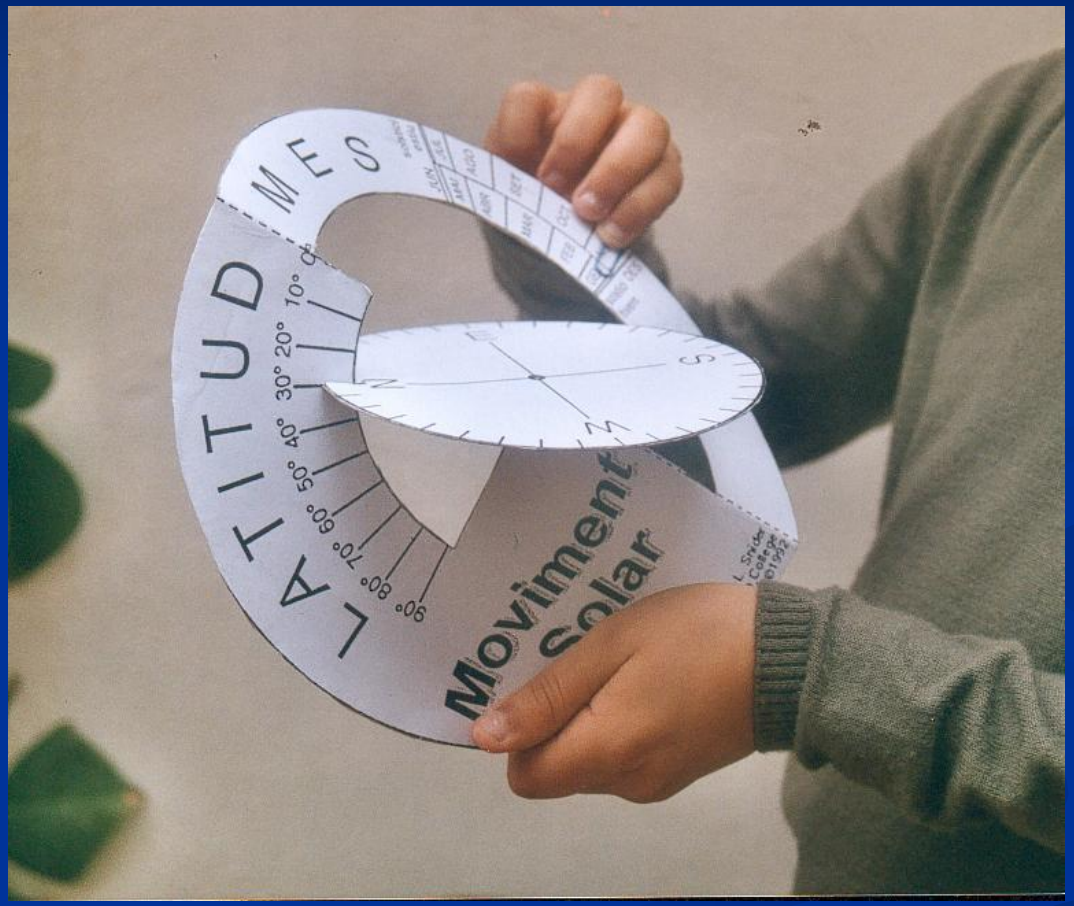
Is this picture correct?
这张图对吗？



The sunrise is always due East and the sunset is always due West.
Is this correct?
日出总在正东，日落总在正西。
这句话对吗？

…with another demonstrator

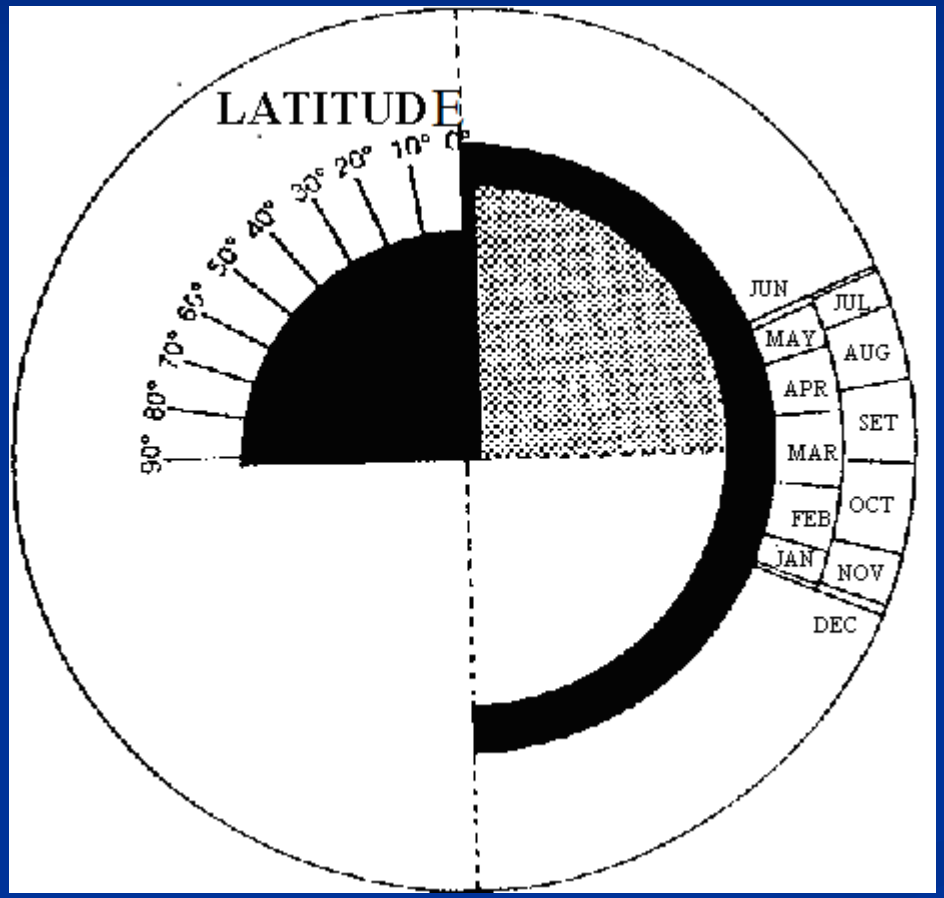
…采用另一个演示模型

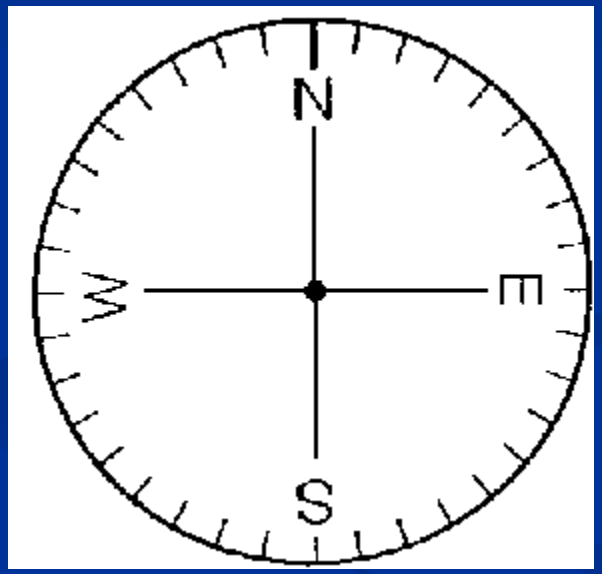


Activity 2: Solar demonstrator for showing:
活动2：太阳演示模型

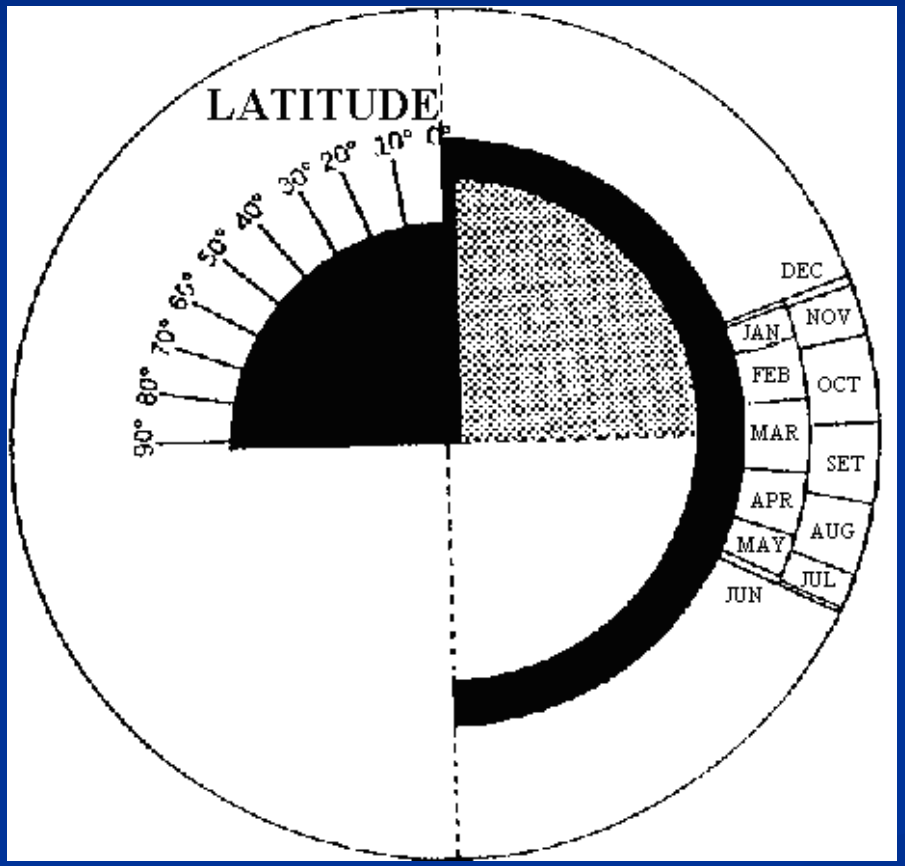
- Daytime solar path
- 白天太阳轨迹
- Annual motion of the Sun
- 太阳周年视运动
- Study risings and settings
- 研究日出和日落
- Midnight Sun
- 午夜的太阳
- Travel anywhere if you know the latitude
- 去到任何已知纬度的地方

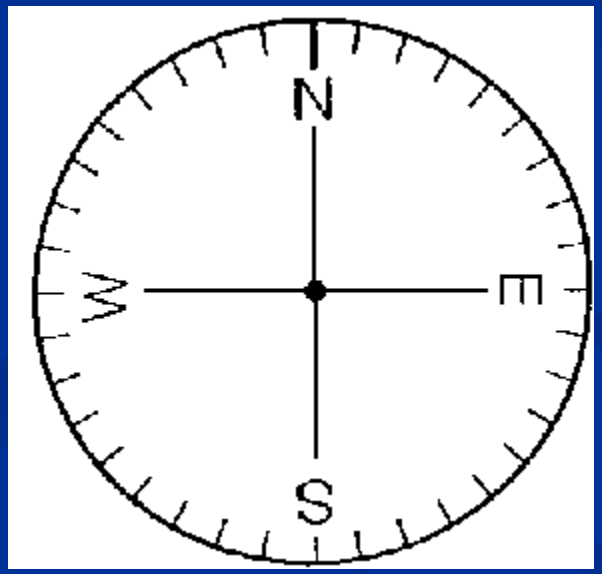
Solar demonstrator - Northern hemisphere
太阳模型　北半球



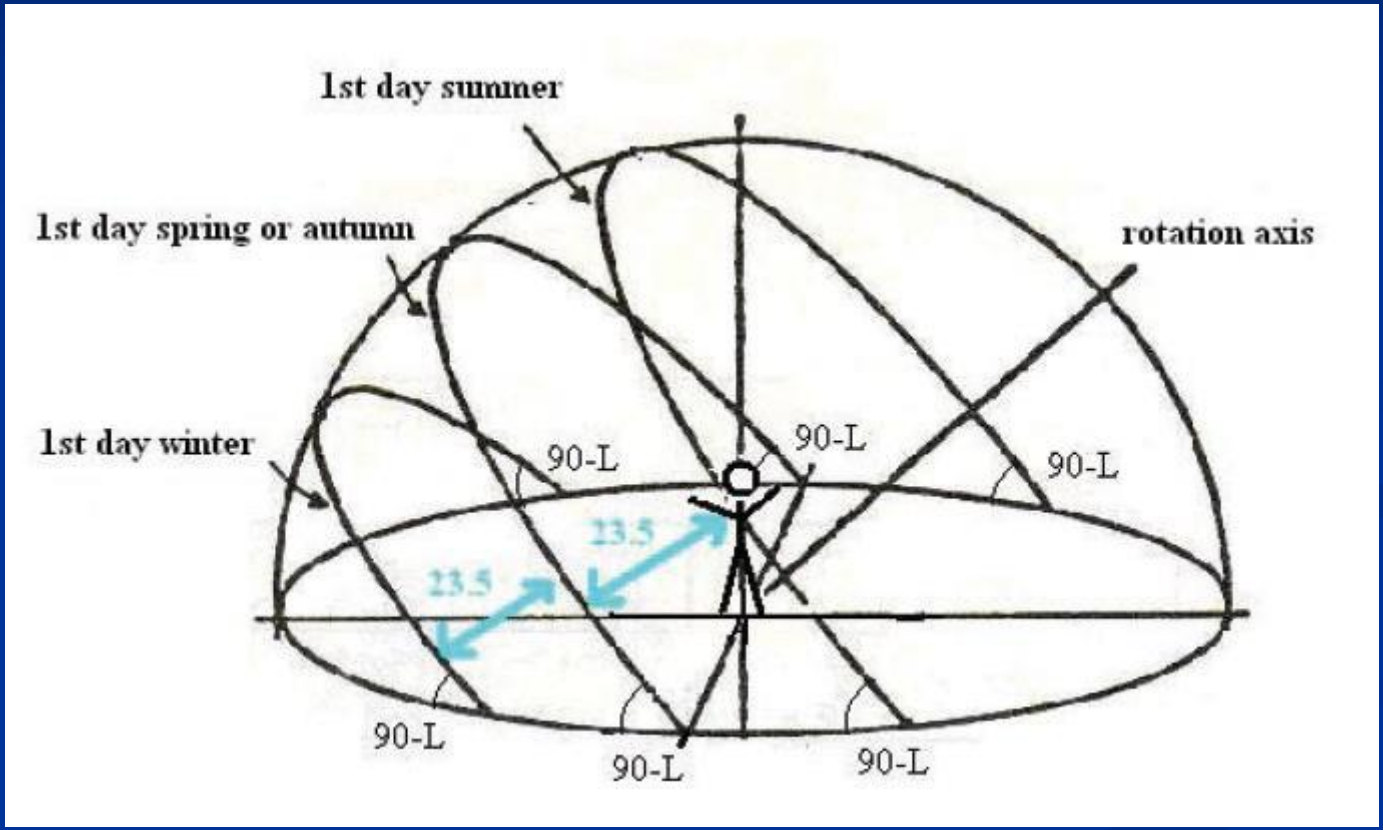


Solar demonstrator - Southern hemisphere
太阳模型　南半球

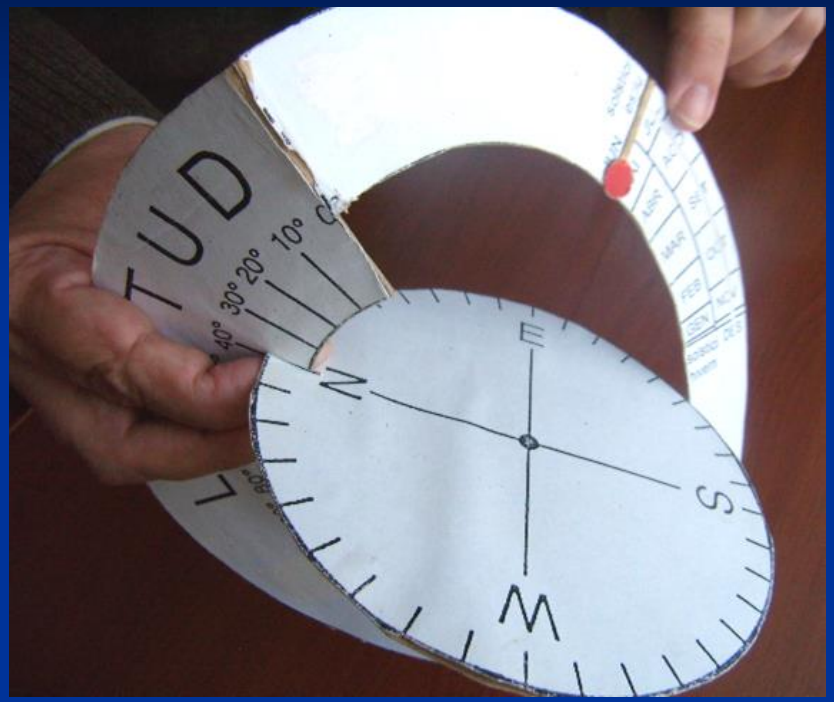


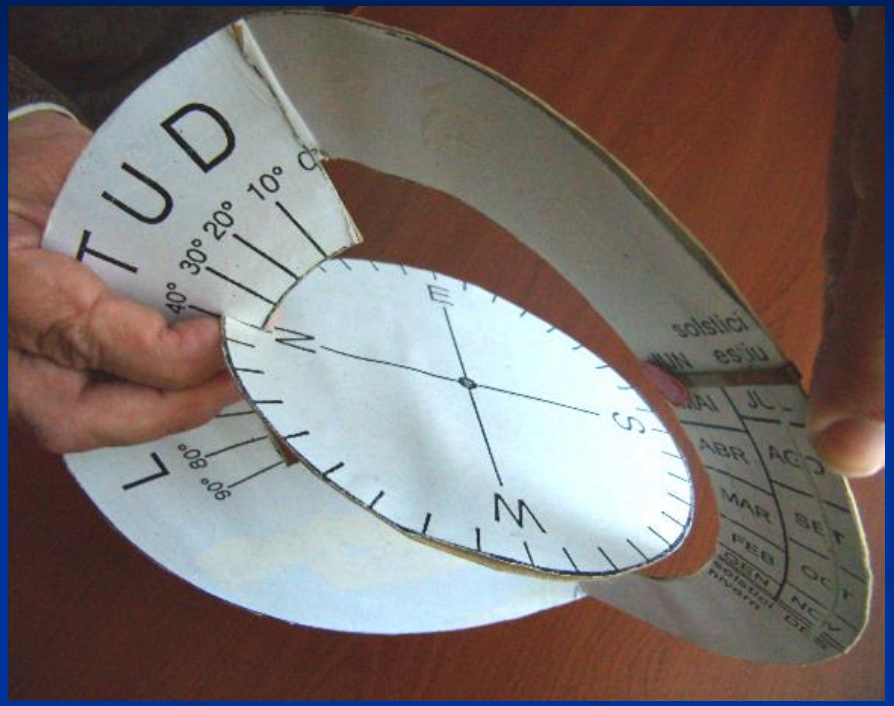


The paths of the Sun
太阳的轨迹



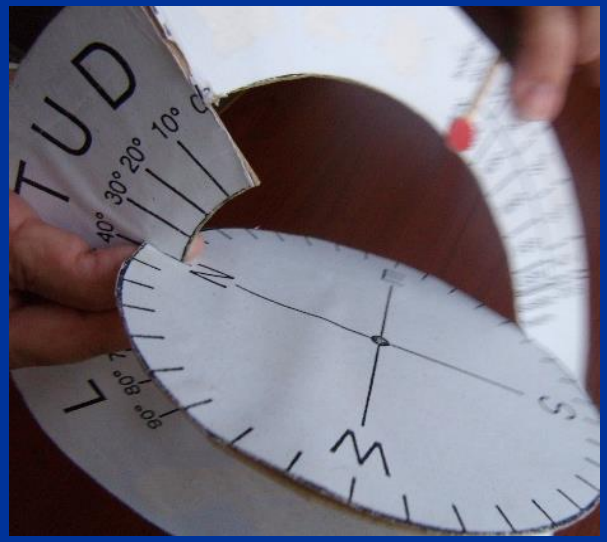
The Sun's path 太阳的轨迹





- Place "N" at proper latitude　将N放在适当的纬度
- Place the marker at required date　将标记置于指定的日期
- Move date "arm" to show Sun's path through a day 移动"日期臂"，展示太阳在一天中的轨迹
- Note the positions of Sunrise and Sunset　记录日出和日落的位置

Slope of the Sun's path
太阳轨迹的倾角



Lat 70º
Enontekiö
Finland
北纬70°
芬兰

Lat 40º
Gandía
Spain
北纬40°
西班牙

Lat 5º
Ladrilleros
Colombia
北纬5°
哥伦比亚

Height of the Solar path
太阳轨迹高度

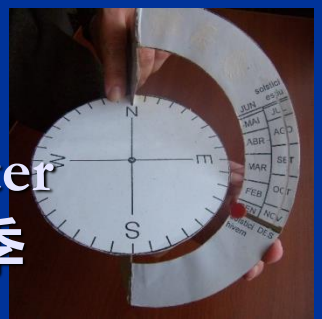
Summer and Winter in Norway
挪威的夏天与冬天

Sunrises and Sunsets in different places
不同地点的日出/日落

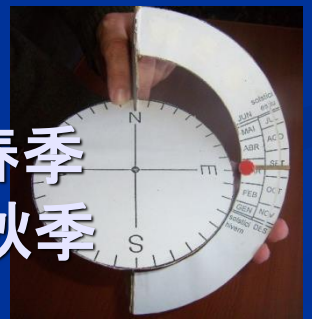
57º Riga, Latvia
北纬57° 拉脱维亚

40º Barcelona, Spain
北纬40° 西班牙

2 º Popayán, Colombia
北纬2° 哥伦比亚



Winter
冬季



spring 春季
autumn秋季

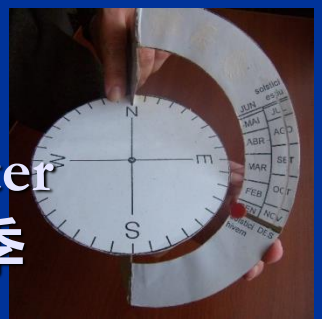
Summer
夏季

Sunrises and Sunsets in different places
不同地点的日出/日落

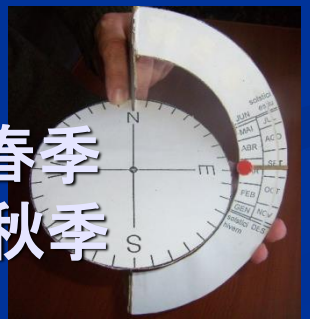
2 º Popayán, Colombia
北纬2° 哥伦比亚

- 19º La Paz, Bolivia
南纬19° 玻利维亚

- 43º Esquel, Argentina
南纬43° 阿根廷



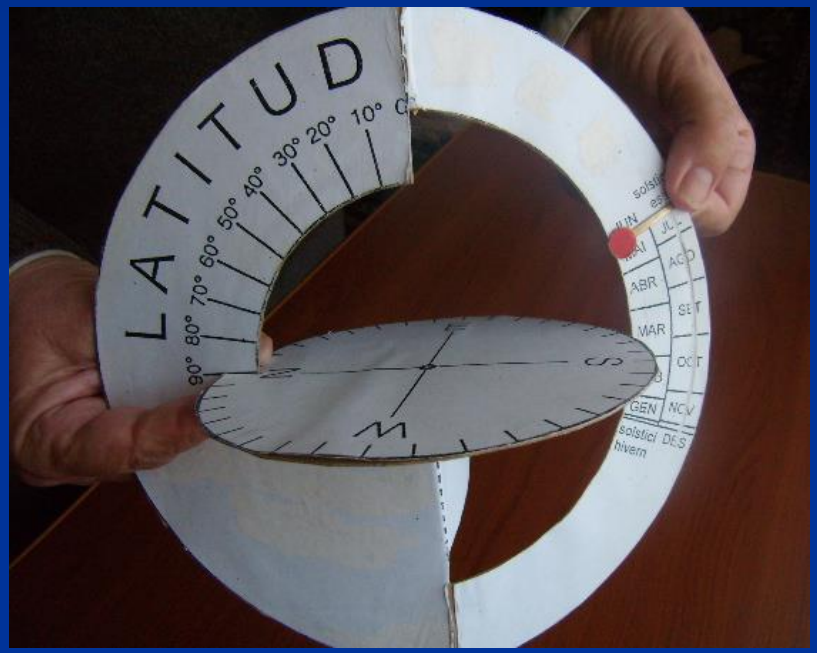
Winter
冬季

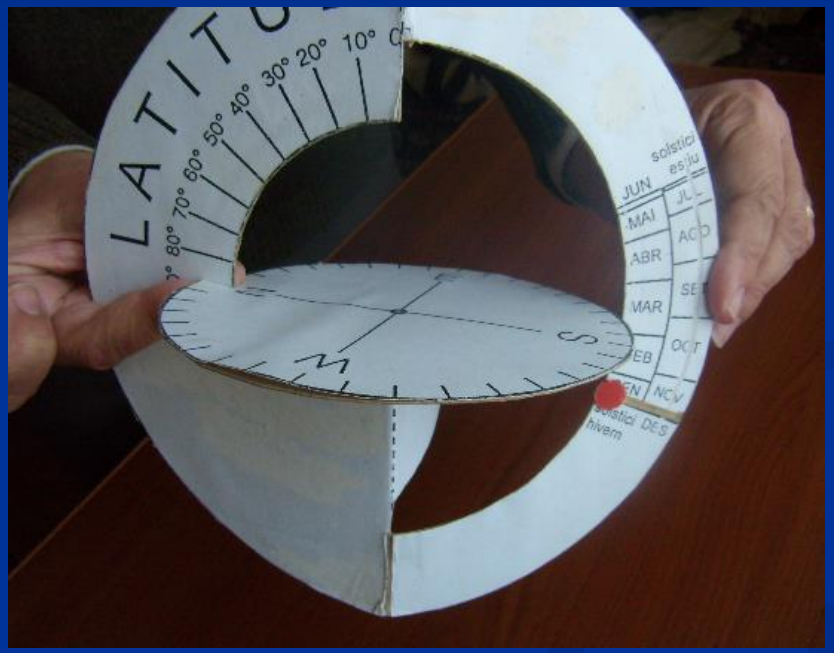


Spring 春季
autumn秋季

Summer
夏季

Polar summer and winter
极地的夏季和冬季

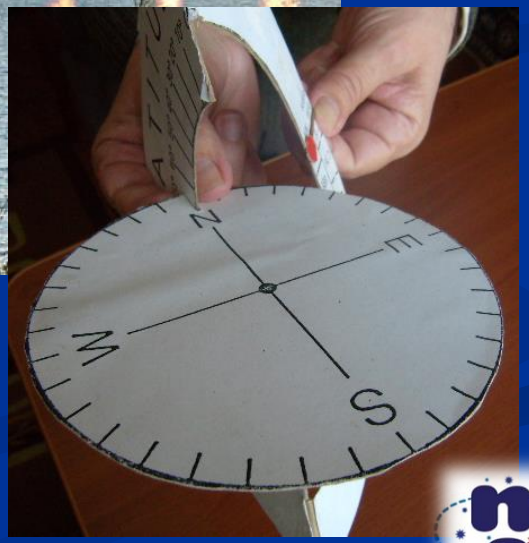




At the poles, the sun is above the horizon for half a year and below it for half a year.

在极点，太阳在地平线上半年，地平线下半年。

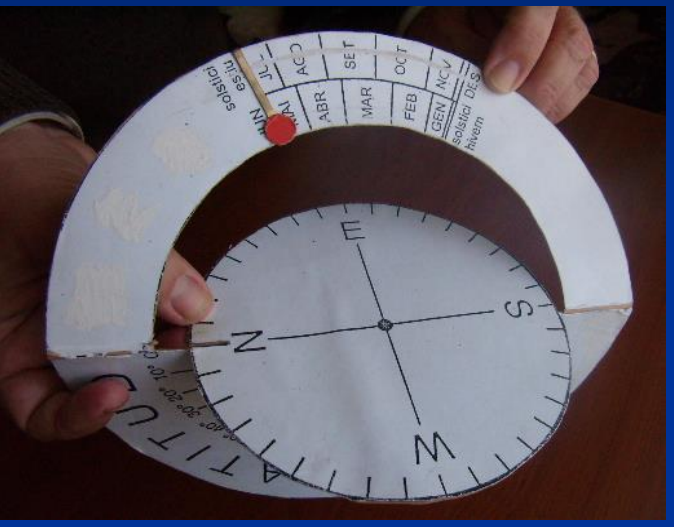
Midnight Sun
午夜的太阳

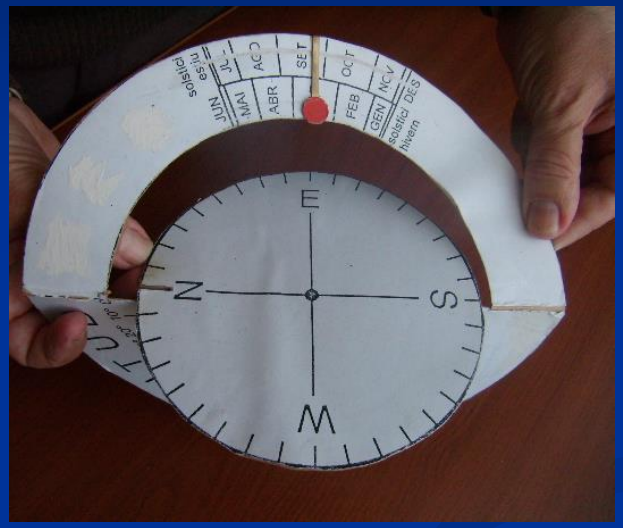


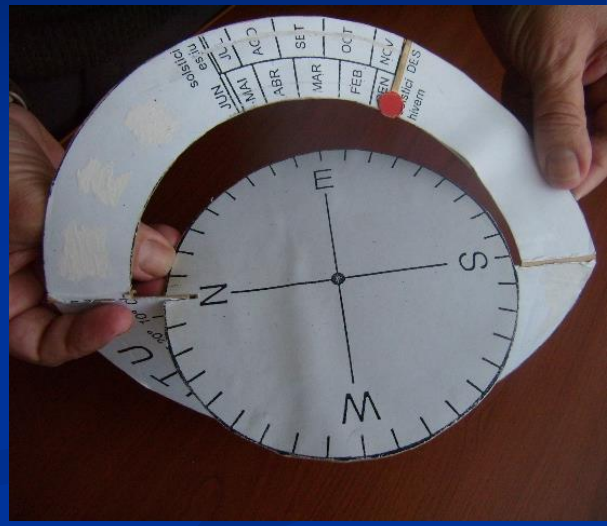
The Sun goes down until it passes the meridian and then begins to rise rather than set below the horizon.

太阳下降到子午线位置后会再次升起而不是落到**地平**线以下。

“Seasons at the equator”
赤道的四季



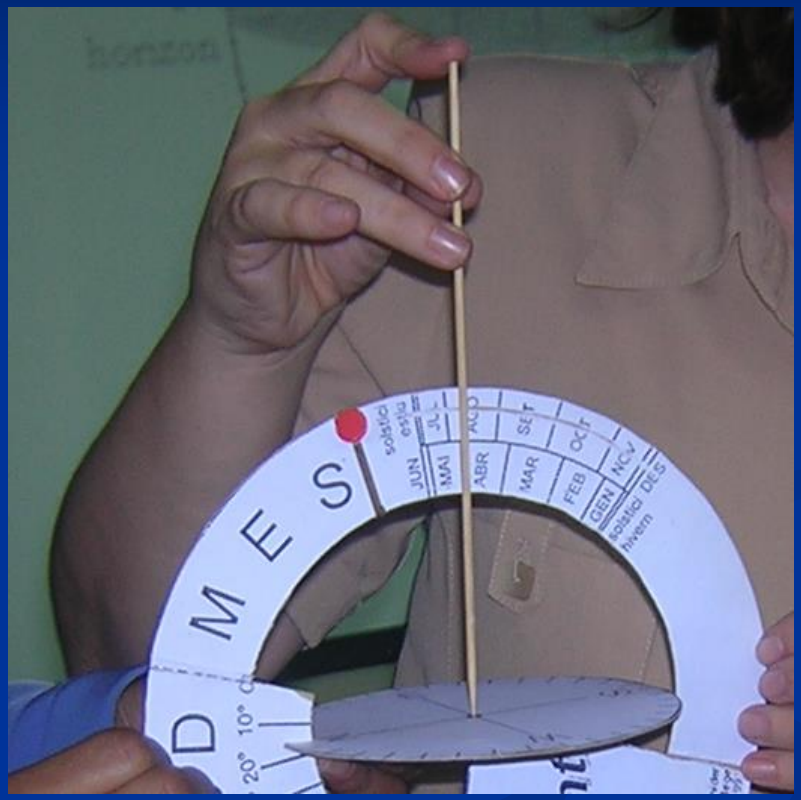




The solar path is always almost perpendicular to the horizon and its length is almost the same throughout the year.

太阳轨迹总是几乎垂直于地平线，轨迹长度在一年中基本相同。

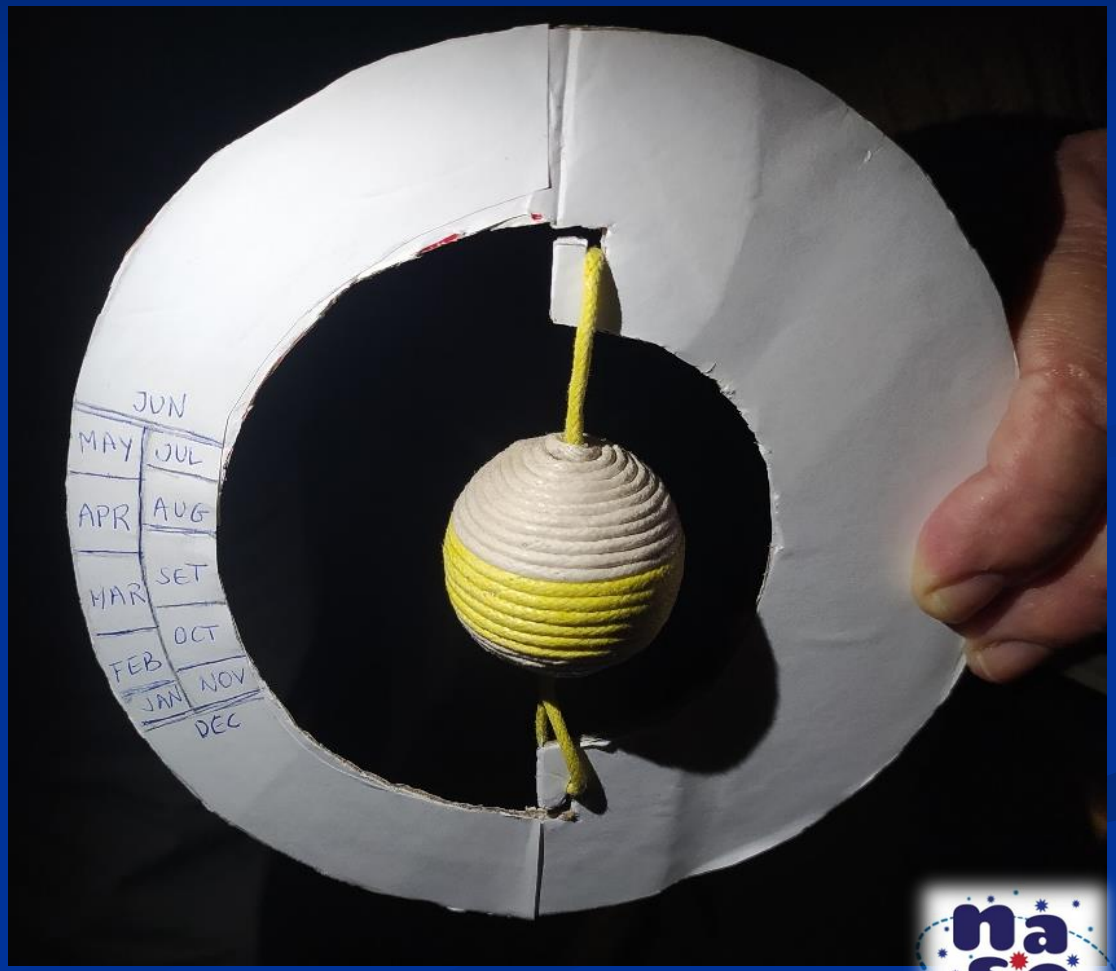
Sun at the Zenith
天顶的太阳



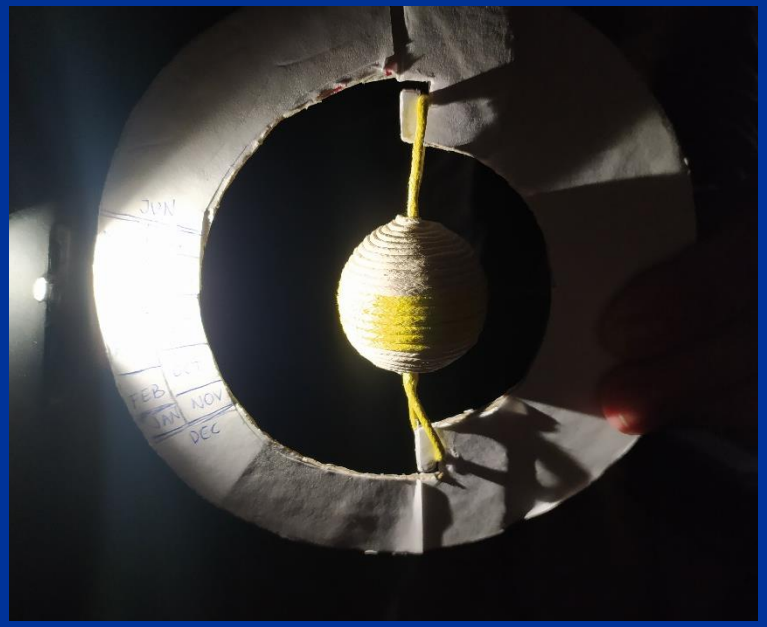
At Solar Noon, your shadow is on your feet.
正午时，影子在脚下。

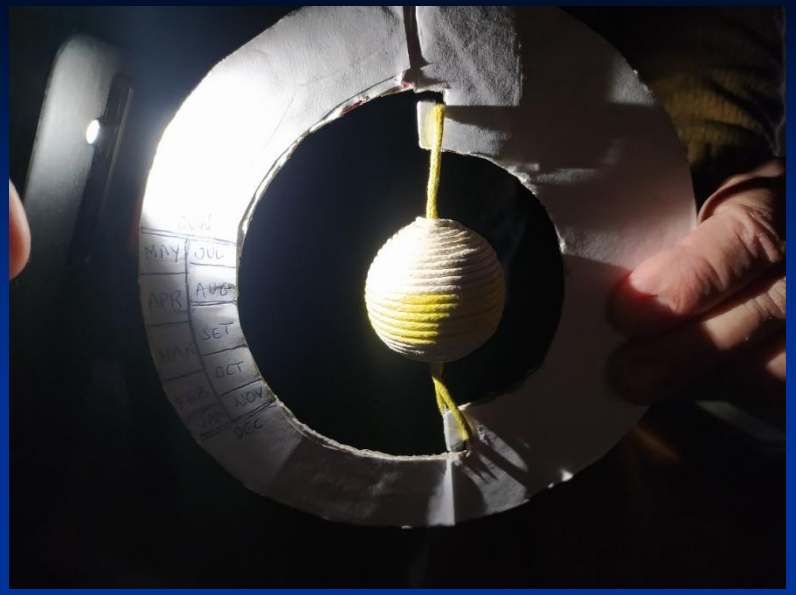
Activity 3: Parallel Earth Demonstrator
活动3：平行地球演示器

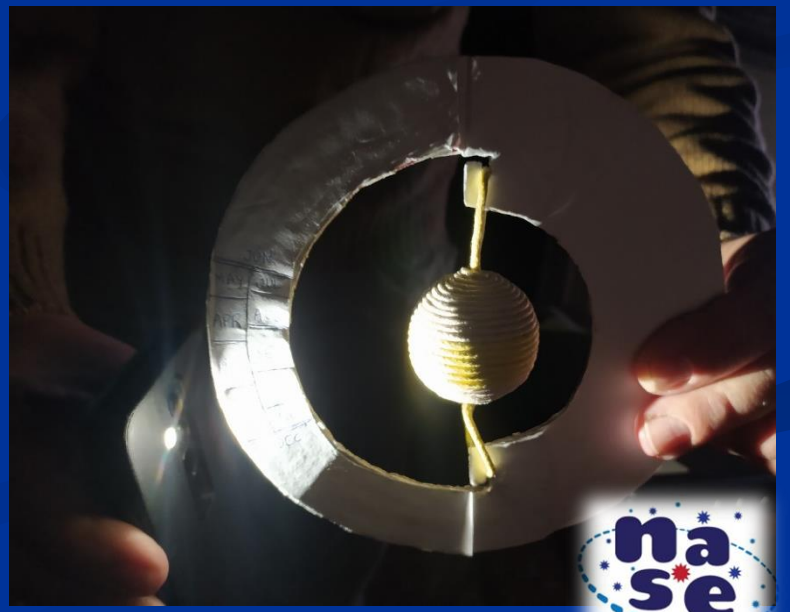
- To explain the position of the Sun when using the Parallel Earth
- 解释使用平行地球时太阳的位置



Activity 3: Parallel Earth Demonstrator





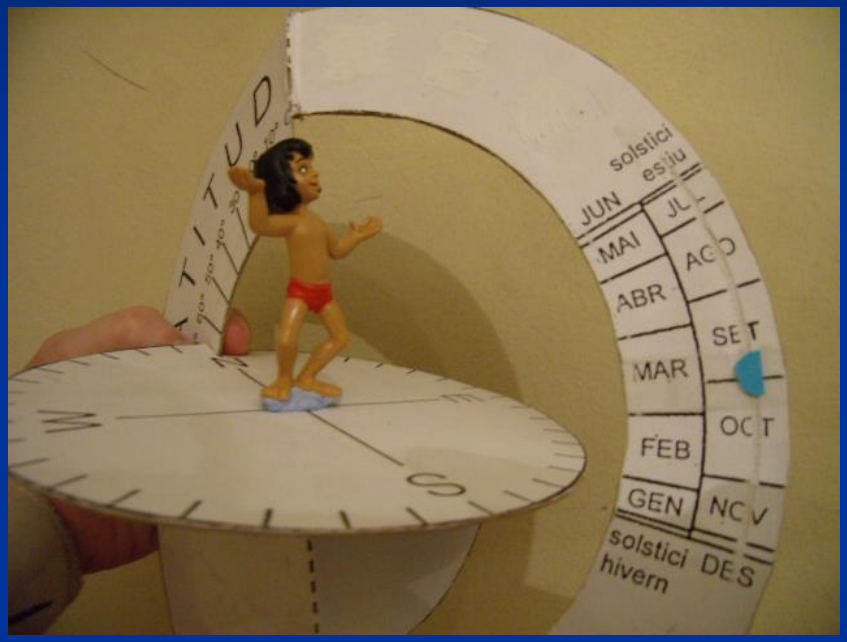


Activity 4: Lunar demonstrator
活动3：月亮演示模型

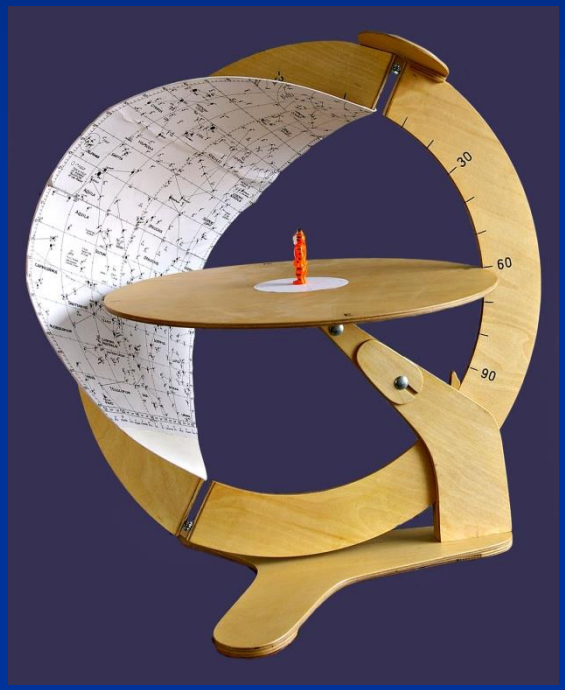
- Why does the Moon smile in some places?
- 为什么月亮在有些地方是笑脸形状？

Why - yes or no….
为什么——是或否…

Activity 4: Lunar demonstrator
活动3：月亮演示模型



XXL demonstrators
超大号模型



Thank you very much

for your attention!

谢谢！