



## Earth-centred Universe

- ★ The *fixed stars* appear on the *celestial sphere*
  - ⊕ Earth rotates in one *sidereal day*
- ★ The *solar day* is longer by about 4 minutes →
  - ⊕ scattered sunlight obscures the stars by day
- ★ The *constellations* are historical
  - ⊕ learn to recognise: *Ursa Major, Ursa Minor, Cassiopeia, Pegasus, Auriga, Gemini, Orion, Taurus*

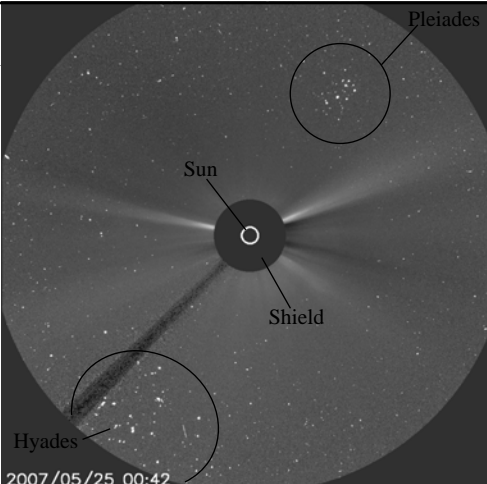


## Sun's Motion in the Sky

- ★ The Sun moves West to East against the background of stars



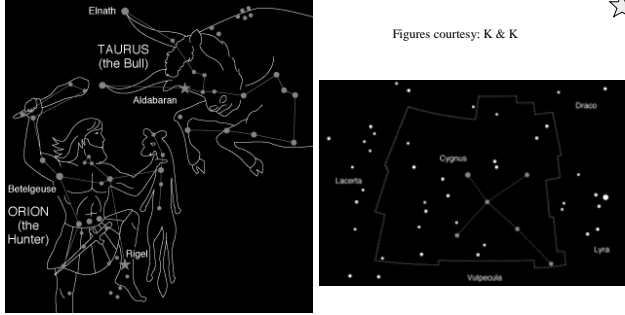
- ★ Compared to the stars, the Sun takes on average 3 min 56.5 sec **extra** to go round once
- ★ The Sun does not travel quite at a constant speed, making the actual length of a solar day vary throughout the year



- ★ Above the atmosphere: stars seen near the Sun by the SOHO probe
- ★ Sun in Taurus

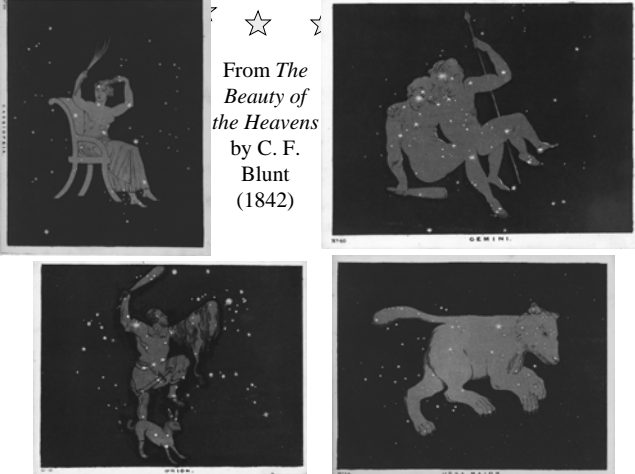
Image:  
[http://sohowww.nascom.nasa.gov/data/realtime/javagif/gifs/20070525\\_0042\\_c3.gif](http://sohowww.nascom.nasa.gov/data/realtime/javagif/gifs/20070525_0042_c3.gif)

## Constellations



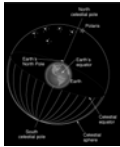
Figures courtesy: K & K

From *The Beauty of the Heavens*  
by C. F. Blunt (1842)



## The Celestial Sphere

- ★ The celestial sphere rotates anti-clockwise looking north
- ★ Its fixed points are the *north celestial pole* and the *south celestial pole*
- ★ All the stars on the *celestial equator* are above the Earth's equator
- ★ How high in the sky is the pole star? It is as high as your latitude on the Earth



# Motion of the Sky

(animated)

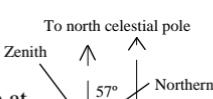
A diagram illustrating the relationship between Earth and the Celestial Sphere. Earth is shown as a small sphere at the center, with its North Pole and Equator labeled. The Celestial Sphere is a larger sphere centered on Earth, with its North Pole labeled as the North Celestial Pole (near Polaris) and its Equator labeled as the Celestial Equator. The South Celestial Pole is also labeled. The diagram shows how the Celestial Sphere's axes are tilted relative to Earth's axes.

Courtesy: K & K

Courtesy: K & K

## Pole Star above the Horizon

- The **latitude** of Aberdeen is the angle at the centre of the Earth shown in the diagram as  $57^\circ$**


- The **pole star** is the same angle above the northern horizon as your latitude. Sketch for Aberdeen**

The diagram shows a circle representing Earth with a vertical line for the Equator and a horizontal line for the Northern horizon. The center is labeled 'Centre'. A point 'A' is on the Northern horizon. A line from the Centre to A is horizontal. A line from the Centre to the Zenith is vertical. A line from A to the Zenith is at an angle of  $57^\circ$ . A line from the Zenith to the Northern horizon is also at an angle of  $57^\circ$ . The text 'To north celestial pole' is at the top with an upward arrow.

# Constellations on the Ecliptic

The Sun moves around a circular path across the stars called the **ecliptic**

*Fig. 1-11*

[illegible]

*animation* →

# Sun's Path along the Ecliptic

*(animated)*

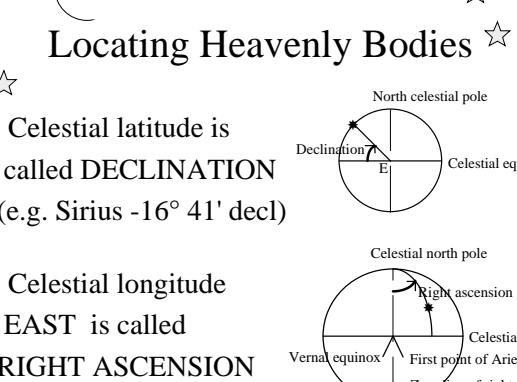
The diagram is divided into two parts. The top part shows a celestial sphere with a horizontal line representing the ecliptic. A curved path, representing the Sun's path, is shown above and below the ecliptic. The path is labeled with the four cardinal points of the ecliptic: Vernal Equinox, Summer Solstice, Autumnal Equinox, and Winter Solstice. The bottom part shows a 3D perspective of Earth, represented by a sphere, with its axis tilted. The axis is labeled with the four cardinal points of the ecliptic: Vernal Equinox, Summer Solstice, Autumnal Equinox, and Winter Solstice. The Earth's axis is tilted at an angle, and the path of the Sun is shown as a curved line above and below the Earth's horizon.

Courtesy: K & K

Courtesy: K & K

# Locating Heavenly Bodies

- ★ Celestial latitude is called DECLINATION (e.g. Sirius  $-16^{\circ} 41'$  decl)
- ★ Celestial longitude EAST is called RIGHT ASCENSION (e.g. Sirius 06h 44m RA)



The diagram illustrates the celestial sphere with two coordinate systems. The top sphere shows the North celestial pole at the top, the Celestial equator as a horizontal line, and the Vernal equinox as a point on the equator. A star is shown in the upper left quadrant, and an arc labeled 'Declination' measures its angular distance from the equator. The bottom sphere shows the Celestial north pole at the top, the Celestial equator as a horizontal line, and the Vernal equinox as a point on the equator. A star is shown in the upper right quadrant, and an arc labeled 'Right ascension' measures its angular distance from the vernal equinox along the equator. The 'First point of Aries' is marked at the vernal equinox, and the 'Zero line of right ascension' is indicated below it.

The diagram shows a circle representing the celestial sphere. A vertical line passes through the center, with the top point labeled 'Celestial north pole'. A horizontal line passes through the center, labeled 'Celestial equator'. The intersection of these two lines on the left is labeled 'Vernal equinox'. The intersection on the right is labeled 'First point of Aries  $\Upsilon$ '. A curved line starts from the 'First point of Aries' and goes towards the 'Celestial north pole', labeled 'Zero line of right ascension'. A point on this curve is marked with a star and labeled 'Right ascension'.

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## Epicycles for Mercury &☆ Venus

A diagram of the geocentric model of the universe. The Earth is at the center. The Moon orbits the Earth. The Sun orbits the Earth in a large circle. The planets (Mercury, Venus, Mars, Jupiter, Saturn) orbit the Sun in smaller circles.

Figure 1 is a map showing the locations of the six stations used in the study. The stations are marked with dots and labeled with their names and dates: August 9, March 19, February 11, April 24, July 4, and May 29. The map includes a scale bar from 0° to 20° East to West.

Retrograde loop end  
Retrograde loop start  
Eastward

Moon - monday

Mercury - wednesday (mercredi)

Saturn - saturday

Jupiter - thursday (jeudi)

Mars - tuesday (mardi)

Sun - sunday

Venus - friday (vendredi)