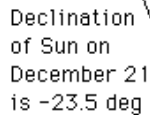


Celestial meridian of a star with
R.A.=20 hours and
Dec.=+45 deg.

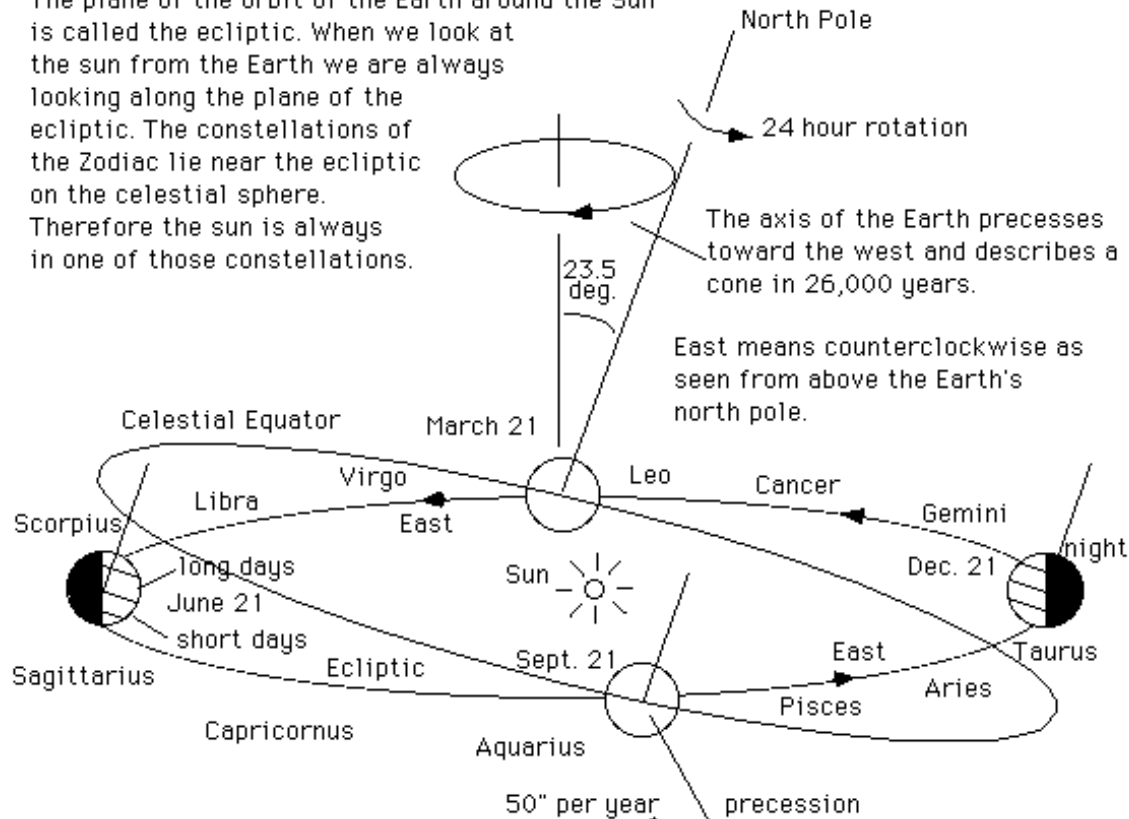
The DECLINATION of a star is the angle DEC from the celestial equator to the star measured along the celestial meridian of the star. 18h



A Celestial meridian is half a great circle (cuts celestial sphere in half) through the north and south celestial poles, analogous to a meridian on Earth. The celestial equator and ecliptic are great circles that intersect at two points. The intersection near the sun's position on March 21 is called the First Point of Aries, or the Vernal Equinox. Its meridian is the prime meridian, analogous to the Greenwich meridian. The analog of longitude in the celestial sphere is RIGHT ASCENSION. Each 15 degrees along the celestial equator is marked as ONE HOUR OF RIGHT ASCENSION, increasing toward the east. As the Earth rotates toward the east, the celestial sphere seems to move from east to west. This motion brings successive hours of right ascension on to your local meridian. Your local sidereal time is the right ascension of your local meridian.

THE YEAR, THE SEASONS, EARTH'S ORBIT

The plane of the orbit of the Earth around the Sun is called the ecliptic. When we look at the sun from the Earth we are always looking along the plane of the ecliptic. The constellations of the Zodiac lie near the ecliptic on the celestial sphere. Therefore the sun is always in one of those constellations.



On June 21 the Earth's northern hemisphere is tilted toward the sun. The days are long and it is the summer solstice. But in June it is winter in the southern hemisphere because that hemisphere is tilted away from the sun. The opposite happens on December, the winter solstice.

At latitudes above 66.5 N (the Arctic circle) the sun does not set in June, but does not rise in December.

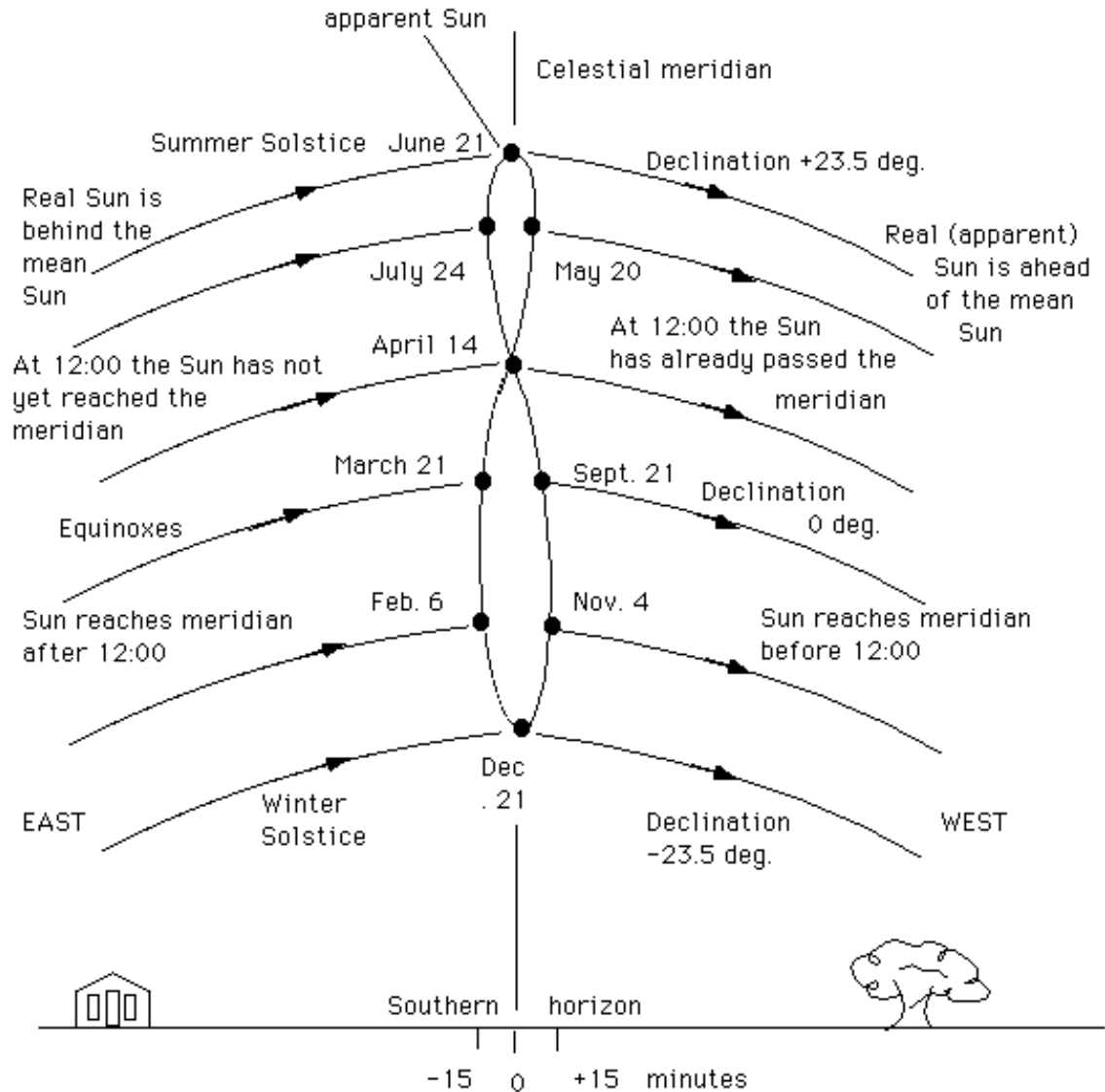
On March 21 (Vernal Equinox) and Sept. 21 (Autumnal Equinox) the Earth's axis is sideways to the sun. The days and nights are equal.

First point of Aries. One of the two places where the plane of the equator cuts the plane of the ecliptic. The sun is seen there near March 21. It is the analog in the celestial sphere of the Greenwich meridian. Due to the precession of the Earth's axis, the first point of Aries is also precessing toward the west at a rate of about 50" of arc per year (26,000 years to go around). This is the precession of the equinoxes.

EQUATION OF TIME

THE ANALEMMA: Photographs of the real (apparent) Sun, from a location at the center of a time zone, at local mean noon, that is at 12:00 noon by the clock.

Clocks are set by the mean Sun, not by the real Sun.



$$\text{Equation of Time} = \text{Apparent Solar time} - \text{Mean Solar Time}$$

When the equation of time = +5 minutes, the real sun passes the celestial meridian at 11:55 a.m. clock time

When the equation of time = -10 minutes, the real Sun passes the celestial meridian at 12:10 p.m. clock time

