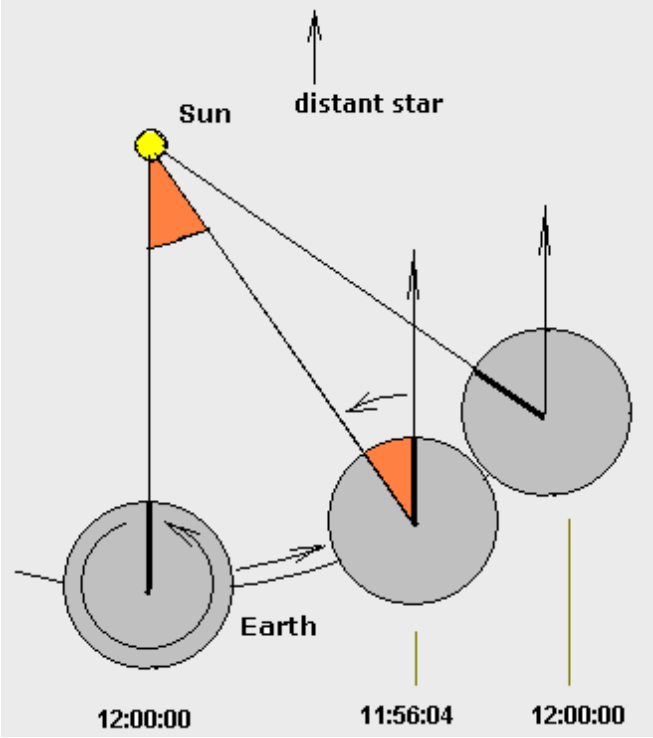
What is sidereal time and why should I care?

An essay by Jack Carlyle

Sidereal time is not as complicated as you may think. Let us look at 'standard' time; we measure it in divisions of the earth rotating on it's axis (ie there are 24 hours per day) and orbiting the sun (ie there are approximately 365 days in a year). Sidereal time is similar to this, except it does not focus on the sun.
As the earth is rotating with respect to the sun, it is also moving around the sun. This means that by the time the earth has rotated a full 360 degrees, the sun is no longer in the same place relative to the earth; therefore the earth must rotate more than 360 degrees to be 'facing' the sun again.
Sidereal time still divides a day into 24 hours, and those hours into 60 minutes, and so on, however rather than using the sun to measure one full rotation of the earth, it uses very distant stars. These stars are so far away, that the earth's orbit around the sun does not significantly change the position of the earth relative to the stars. Therefore, it can be said that for the earth to rotate completely relative to the distant stars, it must rotate 360 degrees.



This therefore means that a sidereal day is slightly shorter than a 'standard' (or solar) day.
So now that we understand the concept of sidereal time, let us examine why such a system would be created.
When measuring time with the solar model, the only object that can be located based on time is the sun; that is to say that at mid-day it will be directly above us, at midnight, directly below, etc. Every other stellar object will appear to 'move' in our sky, relative to the sun. This is due to the earth's orbit, and is linked into how sidereal time works.
Sidereal time is used by astronomers to determine where a certain heavenly body will appear in our sky at any given time. Star positions are described in terms of declination and right ascension, and right ascension is measured in units of sidereal time.
To understand this, one has to first understand the concept of a personal meridian; this is a line which passes through the two celestial poles (ie points in the sky directly above the north and south poles) and directly above the observer's head (their zenith). At the observer's sidereal time, the points on his/her meridian will have a right ascension of that

time. Therefore, if local apparent sidereal time is known, and the right ascension of a particular point in the sky is known, that point can be easily found by simply calculating the position relative to the observer's meridian (remember that there are 24 sidereal hours in 360 degrees).
Therefore, without sidereal time, modern astronomy would not be what it is, and astronomy and astrophysics are arguably at the fore-front of modern science.