

The Equinoxes: East, West, North and South:

In 1530, Nicolas Copernicus (1473-1543) completed and gave to the world his great work *De Revolutionibus*, which asserted that the earth rotated on its axis once daily and traveled around the sun once yearly: a fantastic concept for the times. So fantastic that more than 100 years later, anyone, including notable scholars such as Galileo-Galileo (1564-1642) who dared to support such a theory against the teachings of the Roman Catholic Church was considered a heretic. Galileo was imprisoned and forced to denounce his beliefs while Giordano Bruno (1548-1600) the Italian philosopher was actually burned at the stake by the decree of the Catholic Church for his scientifically based ideas!

The theories of Aristotle (BC, 384-322) and Ptolemy held that the earth was the center of the earth. Its rotation and that of the sun and the moon and the stars fit well with the concept of a superbeing as an outer controlling prime force. These theories were adopted by the Roman Catholic Church and were upheld as dogma until well into the 18th Century when the discovery of the telescope proved just how unscientific these Greek pagan theories actually were.

Regardless of whether the sun rotates around the earth or as is now known, that the earth and its eight sister planets all rotate around the sun, the earth is divided equally on two days of the year into daylight and darkness. These are known as the spring and summer equinoxes. The equinoxes in the months of March and September are the two occasions each year when daylight and nighttime are of equal duration for all locations on Earth not only on the equator where this phenomenon endures year 'round. The word *equinox* derives from Latin for *equal night*.

In the Northern Hemisphere, the March equinox is known as the vernal (spring) equinox and the September equinox is the autumnal (autumn) equinox. In the Southern Hemisphere, these names are transposed.

The time at which the Sun passes through each equinox point can be calculated precisely and the equinox actually occurs at a particular moment. An equinox may occur at different dates at different places on the Earth because of the timezone difference (occurring before midnight in one place and after midnight in the other).

The March equinox usually falls on either March 20 or 21, but may also occur on March 19, which happens next for Universal Time in 2044 at 23:20Z. The September equinox usually occurs on September 22 or 23, but may also occur on September 21, which happens next for Universal Time in 2092 CE at 23:41Z.

Because Earth's orbit is elliptical, the times when the equinoxes fall do not divide the year into equal halves, but into slightly unequal segments.

The equinoxes can also be interpreted as virtual points in the sky. Although, during full daylight, stars other than the Sun are overwhelmed by sunlight, making it hard to see where the Sun is compared to other celestial bodies, the Sun does have a position (as seen from Earth) relative to the other stars. As Earth moves around the Sun, the apparent position of the Sun relative to the other stars moves in a full circle over the period of a

year. This circle is called the ecliptic, and is also the plane of Earth's orbit projected against the whole sky. The other bright planets like Venus, Mars and Saturn, also appear to move along the ecliptic, because their orbits are in a similar plane to Earth's.

Another virtual circle in the sky is the celestial equator, or the projection of the plane of Earth's equator against the whole sky. Because Earth's axis of rotation is tilted relative to the plane of Earth's orbit around the Sun, the celestial equator is inclined to the ecliptic. Twice a year, the Sun, making its progress around the ecliptic, crosses the plane of Earth's equator. These two points are the equinoxes.