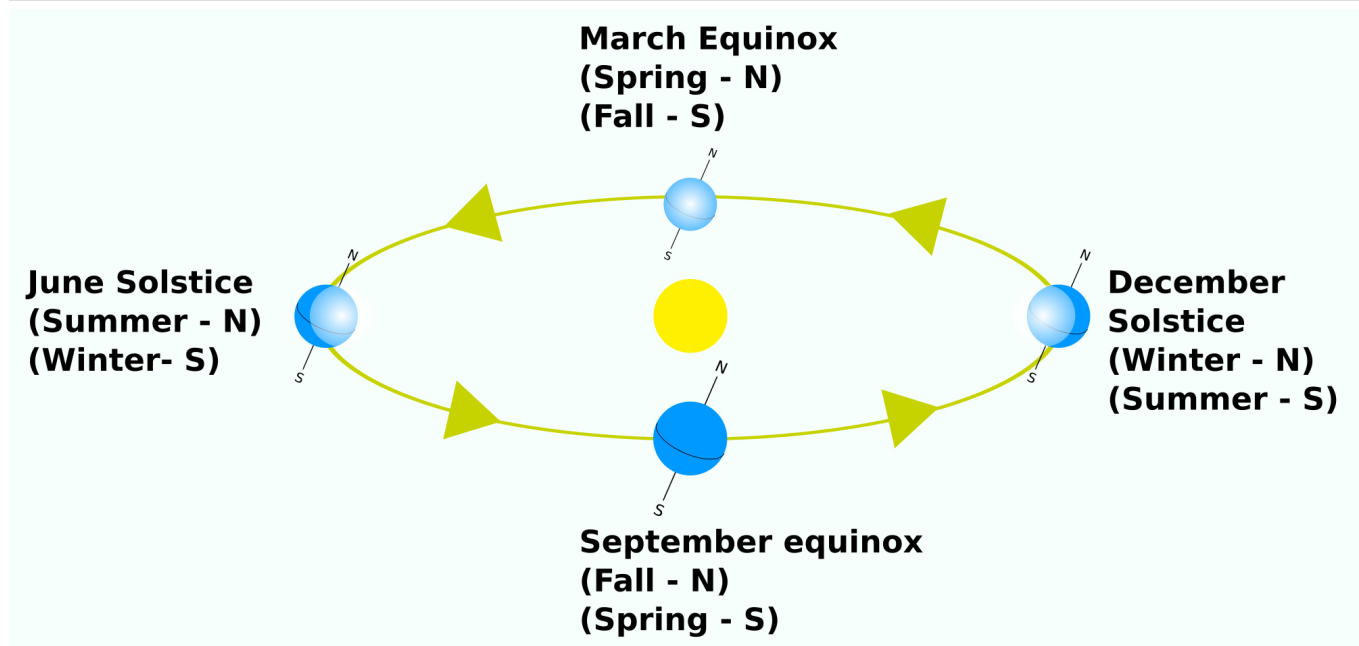


## 3.5: Seasons and Seasonal Changes



Season of the Year IllustratedPublic Domain | Image courtesy of NASA.

The Seasons are the divisions of a year, which are marked by changes in weather and hours of daylight, and hours of darkness. Seasons occur on a planet or moon because the axis of rotation remains tilted in one direction during its orbit about its star; Earth about the Sun. The tilt is relative to the planet's or satellite's orbit. This tilt results in a planet or moon having Seasons. Earth's axis is tilted about  $23\frac{1}{2}^\circ$ , whereas Uranus' axis is tilted about  $98^\circ$ . Seasons have nothing to do with the distance to the star; for example Earth to the Sun. The distance to the Sun is often incorrectly given as the reason Earth experiences seasons. In fact, Earth is closest to the Sun in January, not June.

Seasonal Terminology include:

- **Summer Solstice** – Sun's rays are most direct
- **Winter's Solstice** – Sun's rays are least direct
- **Spring or Vernal Equinox** – Equal day and night, going from shorter to longer days
- **Fall or Autumnal Equinox** – Equal day and night, going from longer to shorter days

At the Equinoxes, the Sun rises due east and sets due west – only at the Equinoxes. An egg will not stand on end because it's the 1st day of spring (or autumn). At the time of summer solstice the day is longer and the night is shorter. This is extreme at far latitudes and creates what is called the midnight Sun. At the time of winter solstice the day is shorter and the night is longer; E=extreme at far latitudes and results in no Sun during part of the winter season!

**Will the Seasons always remain the same?**

No, because the orientation of Earth's axis changes over time. This is called Precession, which is the circular motion of a planet's tilted axis and similar to a top's wobble as it slows down. For astronomical bodies, it is a slow process. Earth takes 26,000 years to complete one precession. What are the effects of precession? The effects are the timing of the Seasons and changes in the Celestial poles. Precession is not a perfect path; a wobble in the precessional motion called Nutation causes a small irregularity in the precession.



Image courtesy Mike Reynolds, Ph. D. of Florida State College of Jacksonville.

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