

Happy solstice and why it happens

By MANNY LEINZ

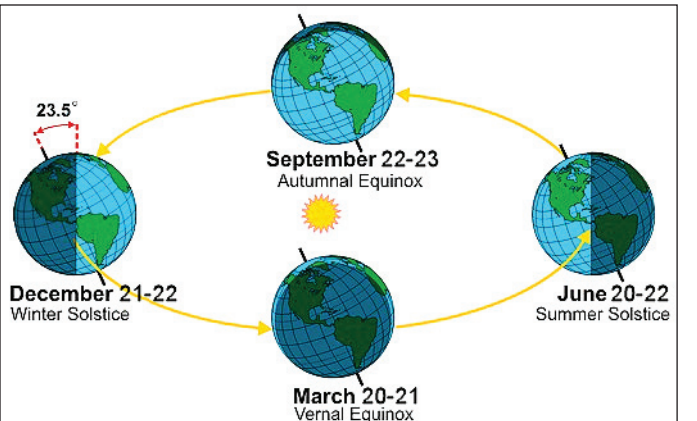
Most of us know that on Dec. 21 we will say good-bye to fall and greet Old Man Winter once again. But have you ever stopped to think why it is that this date was chosen as the beginning of winter, or for that matter why spring begins in March, summer in June and fall in September? The answer lies in the Earth’s delicate dance about the Sun, or more scientifically, how the Earth’s axis of rotation is positioned relative to the Sun at these times. The key to our seasons is that Earth does not spin perfectly upright like a top — if it did, day and night would always be equal in length and there would be no seasons at all. As it happens, our planet’s rotational axis is tilted about 23.5 degrees relative to its orbit around the Sun. During our summer, the Northern Hemisphere tilts toward the Sun; the Sun is higher in the sky, days are longer and so the season is warmer. During winter the Northern Hemisphere tilts away from the Sun; the Sun shines at a lower angle; days are shorter, and so the season is cooler. In the Southern Hemisphere the pattern is exactly reversed — our winter is their summer, our spring is their fall, etc. That first day of winter — Dec. 21st this year – is called the Winter Solstice, the shortest day of the year. On this day the Sun’s altitude at noon will be as low as it ever gets for the entire year. By contrast, on the Summer Solstice, which occurs next on June 21, 2026, the Sun will be at it’s highest noon altitude, and summer begins in the Northern Hemisphere. The word solstice comes from the Latin, meaning “sun standing still,” because for a few days around these dates, the Sun’s position at noon hardly changes at all. So what about the beginning of spring and fall? These are called equinoxes, from the Latin meaning “equal night.” On these dates, the Earth’s axis is tilted neither toward nor away from the Sun; day and night are indeed nearly equal in length and the Sun rises due east and sets due west. The spring, or Vernal equinox, will occur on March 20 next year, and the fall or Autumnal equinox will occur on Sept. 22. If you take a look at the accompanying graphic, you’ll note that the first days of the seasons — the solstices and equinoxes — vary from year to year. Why is that? Simply stated, it is because an Earth year is actually a bit longer than 365 days — 365.256 days, to be more precise. It is for this reason that every four years — a leap year — we add an extra day to the month of February. The extra quarter of a day per year, and the leap year “reset” causes the dates of the solstices and equinoxes to shift around a little bit.

Seasonal confusion

One of the most common misunderstandings about the seasons is the idea that they are caused by Earth moving closer to or farther from the Sun during the year. On average, the Earth is about 93 million miles away from the Sun, but its orbit is slightly elliptical — oval shaped — so we are about 3.4 percent closer to the Sun at perihelion, the closest point, than at aphelion, which is the farthest. But perihelion actually occurs in early January, in the middle of our Northern Hemisphere winter. So, the seasons are actually not driven by distance at all, but rather due to the tilt of the Earth’s axis as previously described. Fun fact: People often say that “the days get longer in the summer” or “the days get shorter in the winter.” But if you think about it, since the first day of summer is the longest day of the year, the days actually get shorter as summer progresses. Similarly, since the first day of winter is the shortest day of the year, the days actually get longer as winter marches toward spring. Its a fun conversation starter for your family Christmas dinner.

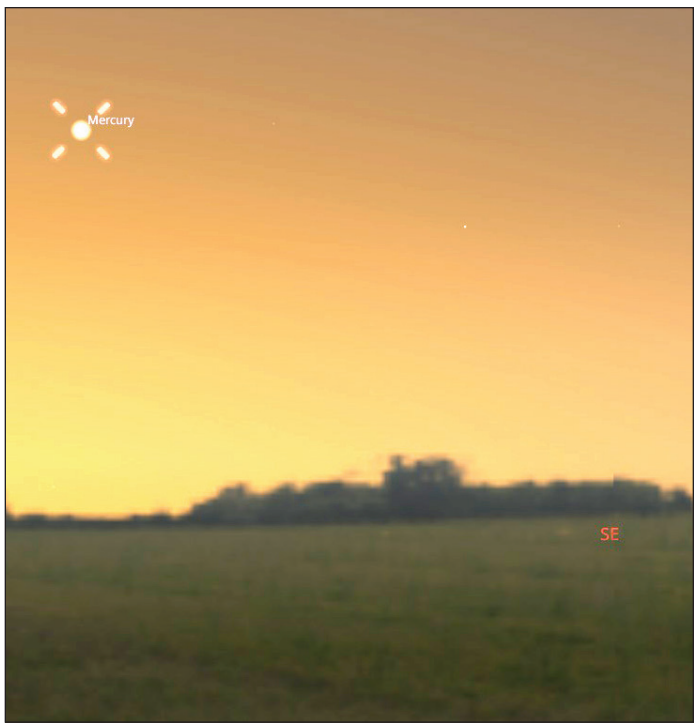
The solstice in times ancient and modern

Long before mechanical clocks or written calendars, people carefully tracked the motion of the Sun. It wasn’t a matter of curiosity; it was a matter of survival. The ability to predict seasons meant knowing when to plant, when to harvest and when to prepare for lean times. Across the world, many ancient structures are aligned precisely to the rising or setting Sun on the solstices. At the 5,000 year old monument in Newgrange, Ireland, a narrow passageway is lit by the rising Sun for only a few days around the winter solstice, filling the chamber with golden light. At the UNESCO World Heritage site Stonehenge in England, giant stones are precisely aligned to the summer solstice sunrise. In Chaco Canyon in the American southwest, spiral petroglyphs are intersected by shafts of sunlight exactly at solstice. These alignments were not accidents. They



Graphic from weather.gov

Our seasons are a result of the tilt of the Earth's axis.



Graphic from stellarium.org

Go out before dawn on Dec. 6 to see Mercury at its best.

Celestial Highlights for December, 2025

Dec 4		The <u>Full Moon</u> rises at 4:17 PM on December 4 th , reaches its highest point in the sky (transit) at 12:11 AM on the 5 th and sets at 8:09 AM. It will be visible all night in the constellation <i>Taurus</i> .
Dec 6		Don't miss this opportunity to see the elusive planet <u>Mercury</u> in the pre-dawn sky. Go out at 6:15 AM – 45 minutes before sunrise – and look 10 degrees (about the span of your fist at arm's length) above the horizon to the southeast. Binoculars will help as the time of sunrise approaches.
Dec 11		The <u>Last Quarter Moon</u> rises in the Constellation <i>Leo</i> at 11:15 PM on December 10 th , reaches its highest point in the sky (transit) at 5:03 AM on the 11 th and sets at 11:44 AM.
Dec 13		Checkout the <u>Geminid Meteor Shower</u> . Go away from bright lights, get a lawn chair and a warm blanket, and give yourself time to let your eyes adapt to the dark – ideally 45 minutes. You can expect to see 10-30 meteors per hour from a dark site. The best times will be after midnight.
Dec 20		Our <u>Milky Way</u> Galaxy is easiest to see around this date of the <u>New Moon</u> . It will be fully dark by 6:18 PM. <u>Jupiter</u> rises at 6:24 PM and will be visible all night in the constellation <i>Gemini</i> . <u>Saturn</u> , in the constellation <i>Aquarius</i> , will be visible in the south and then later in the west before 11:00 PM
Dec 21		Today marks the Winter Solstice, the shortest day of the year and the beginning of the Winter Season.
Dec 26		Look high in the southwest early in the evening, or low to the west by 10:00 PM, to see the waxing crescent <u>Moon</u> less than three degrees (about the span of two fingers at arm's length) to the upper right of <u>Saturn</u> .
Dec 27		The <u>First Quarter Moon</u> rises in the constellation <i>Capricornus</i> at 11:41 AM on December 27 th , reaches its highest point at 6:06 PM and sets at 12:43 AM on the 28 th . <u>Saturn</u> will be visible in the constellation <i>Aquarius</i> until near midnight. <u>Jupiter</u> will rise at 5:52 PM and be visible all night in the constellation <i>Gemini</i> .

reveal a deep attention to the sky and a shared understanding of nature’s cycles.

The solstice also held symbolic meaning. Winter could feel like a season of endings. Food stored months before might run low. Cold and darkness pressed in early. The solstice, however, promised change. Even though the coldest days were still ahead, the return of more sunlight promised better times. Many cultures created festivals centered on fire, feasting and hope. The theme of light returning in darkness is one of the oldest shared human ideas. Even today, we echo these themes. Holiday lights brighten the darkest months. Gatherings and celebrations fill the short days. Many of these customs can be traced to older solstice observances, even though the cultural meanings have shifted over time. Some people today rise before dawn on the solstice to watch the sunrise from a meaningful place. Others visit observatories or planetariums to learn more about the sky and feel connected to the Earth’s movement. It’s a way to stay connected with the ancient and eternal in our hectic modern times.

What’s else is up this month?

Being the innermost planet in the solar system, elusive Mercury never strays far from the Sun. This month, around Dec. 6, is a great opportunity to see the little planet low in the southeastern pre-dawn sky. Saturn is visible in the evening sky all month, setting a little earlier each night. Catch it before 10 p.m. by month’s end. Jupiter is up practically all night, rising before 8 p.m. at the beginning of the month and a little earlier each night thereafter, so it’s a great target all month. Check it out with binoculars and see if you can spot some of its four large moons: Io, Europa, Ganymede and Callisto. Once again this month we are fortunate to have a meteor shower. This time it’s the Geminids, which will reach their maximum on the nights of Dec. 13-14. The peak of the shower is predicted for around midnight on the Dec. 14. Get away from bright lights, grab a lawn chair, a warm blanket and a hot beverage and enjoy the show! I hope you found this article informative as you con-



Graphic from stellarium.org

See Saturn close to the Moon on the night of Dec. 26.

tinue your exploration of the night sky. If you would like to get a night sky chart for this month, checkout <https://skyandtelescope.org/interactive-sky-chart/> or <https://theskylive.com/> for starters. There are also some great free smartphone apps, including Stellarium, SkySafari and SkyView. As always, if you have questions, comments or suggestions for future articles, you can get in touch with me by email at: celestialdeep55@gmail.com. You can find my prior *Gazette* articles on my website at <https://celestialdeep.space/mariposa-gazette/>. If you have a question of general interest, I’ll try to answer it in my next article.

Manny Leinz is a long-time amateur astronomer and night sky photographer. He and his wife live part time in Bootjack where they also have an observatory.

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