

The astronomical sky above Edinburgh and Lothian in December 2023

Winter is coming. More specifically, the winter solstice is coming.

The word 'solstice' derives from the Latin portmanteau Sol (Sun) and sistere (to stand still) as the Sun appears to pause at its lowest point in the winter sky (in the northern hemisphere). The solstice occurs on 22 December at 3:27 am and represents the first day of astronomical winter. In Edinburgh and Lothian the Sun will rise to an altitude of 10.7° at solar noon (12:11 pm local time) on the day itself and you will cast your longest shadow of the year at that time. The shortest day of the year lasts 06:58 (h:m) at our location. More importantly, the evening of 22 December lasts 17:02 (h:m) from sunset through sunrise with 12:16 (h:m) of astronomical dark time (when the Sun is more than 18° below the horizon). Things are topsy-turvy in the southern hemisphere, of course: at their solstice, the Sun will be directly overhead the Tropic of Capricorn at -23.44° latitude and represent the first day of summer.

The Sun starts the month in Ophiuchus and enters Sagittarius on 18 December at 10:44 am. The keen-eyed reader will note that the Sun isn't in Capricornus at the solstice but Sagittarius. This is because the astronomical co-ordinate system is not fixed in space but moves at a rate of approximately 1° every 71.6 years so the constellations appear to shift position (albeit very slowly). In fact, the Sun will

not return to Capricornus for the solstice for another 24,000 years!

Daylight shortens from 07:25 (7.424 hours) on 1 December to 07:03 (7.058 hours) on 31 December so we gain 22 minutes of night time by the end of the month ... but that, also, is not the whole story: we actually gain 28 minutes of night time up to the solstice (when the days get shorter) and then lose 6 minutes afterwards (when the days get longer). But wait, there's more ... the earliest sunset of the year is on 14 December at 3:38 pm and the latest sunrise of the year is on 29 December at 8:44 am.

Lunar apogee (furthest from Earth) occurs on 4 December at 6:42 pm and takes the Moon to 404,306 km away from Earth—around 19,906 km further than average—subtending an angle of 29.5 arcminutes. The Moon enters last quarter on 5 December at 5:49 am in Leo. The new moon appears on 12 December at 11:32 pm in Ophiuchus beginning a new synodic (Lunar) month. Lunar perigee (closest to Earth) on 16 December at 6:45 pm finds the Moon some 367,930 km away from Earth—around 16,470 km closer than average—subtending an angle of 32.5 arcminutes. The first quarter of the new cycle shows up on 19 December at 6:39 pm in Pisces. Late in the month, the full Cold Moon makes an appearance on 27 December at 0:33 am in Gemini.

For the inferior planets, Mercury is a strange cove in December as we can identify 7 events in the attached ephemeris none of which are visible from Edinburgh and Lothian because Mercury remains a stubbornly day-time object! We fare better with Venus which still stands out as the 'morning star' averaging -4.1 mag (over the month) a couple of hours (or more) before sunrise. It crosses over from Virgo at the start of the month (close to the star Spica), then passes through Libra and edges into Scorpio for the new year.

For the superior planets: Mars is unobservable as, like

Mercury, it falls within the Sun's glare all month. Jupiter, around -2.6 mag, is visible all evening, overnight and sets in the pre-dawn in Aries. It returns to a direct orbit from retrograde in the wee hours of Hogmanay. Saturn, around 0.9 mag, has good visibility in Aquarius, and will pass the meridian shortly after astronomical twilight ends and sets before midnight. Uranus, steady at 5.7 mag, remains in the evening, overnight and pre-dawn sky with excellent visibility in Aries. Neptune, south of Pisces' circlet during meridian passing (due south) in the early evening, loses altitude as the month progresses. It does return to a direct orbit on 6 December and reaches eastern quadrature on 17 December at 3:43 am, when the angle between Sun, Earth and planet equals 90°.

There are 3 (2-body) solar system conjunctions (< 5° apart) visible from Edinburgh and Lothian during December. First, Venus will be in conjunction with the waning crescent Moon beginning on 9 December at 5:59 am and approaches closer as the Sun rises but visibility diminishes dramatically. On 17 December at 4:19 pm, Saturn and the Moon will begin a conjunction, getting closer as both set. On the day of the solstice, the Moon and Jupiter will also be exiting conjunction and best viewed after astronomical twilight whilst both are still rising.

There is a Christmas comet for 2023: 62P/Tsuchinshan, a short-period comet discovered in Nanking in 1965, reaches perihelion on 25 December at 2:36 am and could brighten to 9.0 mag. At that magnitude it may be visible with binoculars. Look near the hind-leg of Leo near M65 on our skymap. December also hosts 2 meteor showers: the glorious Geminids and the less than glorious Ursids.

The highly anticipated Geminids, radiant from Gemini (The Twins), are active 4–17 December and peak on 14–15 December for Edinburgh and Lothian. The radiant point is near the star Castor, one of the heads of the Gemini twins. They are viewable after astronomical twilight ends (around 6 pm) for

the next 12 hours and reach high altitude so observability is excellent and they can produce up to 150 meteors per hour! The parent body is not a comet but the asteroid 3200 Phaethon and was the first asteroid discovered by satellite in 1983.

The Ursids, radiant from Ursa Minor (The Little Bear), are a poor show compared to the Geminids but will peak on 22–23 December and are circumpolar so viewable all night. Look near the star Kochab and expect, maybe, 10 shooting stars per hour. The parent comet is 8P/Tuttle discovered in 1858.

Winter is a rewarding time—if the sky is clear, of course—to identify some constellations. The easiest way to do this is using bright stars. Polaris, the pole star, should be easy to spot due north at an altitude above the horizon equal to your latitude, some 55.95° . That should be enough to pick out Ursa Minor (The Little Bear) and this constellation is circumpolar (never sets below the horizon) so is always visible above Edinburgh and Lothian. After you locate Polaris at the time of our skymap, turn around 180° and there should be the highly visible constellation of Orion (The Hunter) easily identified by the 3 stars that line up to make the 'Belt of Orion' plus the outlying stars Betelgeuse and Rigel. Orion is also a useful pointer to other celestial objects. Below Orion's belt is the famous nebula, M42. Follow the belt to intercept the bright star Aldebaran in Taurus (The Bull) and, further along the same path, the 'seven sisters' star cluster known as the Pleiades (M45). Following the belt in the opposite direction leads to Canis Major (The Great Dog) and the sky's brightest star, Sirius (The Dog Star). See if you can spot bright stars in other constellations such as Capella in Auriga (The Charioteer), Procyon in Canis Minor (The Little Dog) and Regulus in Leo (The Lion).

At the time of our skymap, the ecliptic (marked by the dashed green line) hosts Leo (The Lion), Cancer (The Crab), Gemini (The Twins), Taurus (The Bull), Aries (The Ram) and Pisces (The Fishes). Circumpolar constellations—always

above the horizon—include Cassiopeia (The Seated Queen), Draco (The Dragon), Ursa Minor (The Little Bear), Ursa Major (The Great Bear) and Cepheus (The King).

Edinburgh and Lothian Ephemeris

4 December 2:30 pm	Mercury at greatest eastern elongation at 21.3°	Sagittarius
4 December 6:42 pm	Lunar apogee 404,306 km	Leo
5 December 5:49 am	Moon at last quarter	Leo
6 December 12:49 pm	Neptune at stationary direct point	Sagittarius
8 December 3:25 pm	Moon crosses descending node	Virgo
9 December 5:59 am	Venus Moon conjunction, 4.97° degrees, first proximity	Virgo
12 December 11:32 pm	New Moon, Meeus lunation 296	Ophiuchus
13 December 6:39 am	Mercury at stationary retrograde point	Sagittarius
14 December 5:29 am	Moon Mercury conjunction, 4.36° apart	Sagittarius
14 December 6:00 pm	Geminid meteors peak over next 12 hours	Gemini
16 December 6:45 pm	Lunar perigee 367,930 km	Capricorn
17 December 3:43 am	Neptune at eastern quadrature	Pisces
17 December 4:19 pm	Saturn Moon conjunction, 4.96° degrees, first proximity	Aquarius
18 December 10:44 am	Sun leaves Ophiuchus, enters Sagittarius at 0.984 AU	Sagittarius
19 December 6:39 pm	Moon at first quarter	Pisces
20 December 5:23 pm	Mercury perihelion 46,001,199 km	Sagittarius
21 December 1:54 pm	Moon crosses ascending node	Pisces
22 December 3:27 am	December (winter) solstice	Sagittarius
22 December 6:00 pm	Ursid meteors peak over next 12 hours	Ursa Minor
22 December 8:15 pm	Jupiter Moon conjunction, 4.98° degrees, last proximity	Aries
22 December 6:54 pm	Mercury at inferior conjunction	Sagittarius
23 December 2:30 am	Earth Mercury closest approach 101,155,297 km	Sagittarius
25 December 2:36 am	Comet 62P/Tsuchinshan perihelion passage	Leo
27 December 0:33 am	Full (Cold) Moon	Gemini
27 December 9:51 pm	Mercury Mars conjunction, 3.56° apart	Ophiuchus
31 December 2:10 am	Jupiter at stationary direct point	Aries

Edinburgh and Lothian

(55.95°, -3.19°, 10.00m for 16 December 2023 0:00 am)

