



# *Celestial Calendar 2021*



Giving you the low down on what's up in  
astronomy & spaceflight for the year ahead

# Welcome

Welcome to the **Irish Astronomical Society's** calendar of the celestial sights during the year ahead.

Our own *Sky-High 2021* ([irishastrosoc.org](http://irishastrosoc.org)) or *The BAA Handbook* ([www.britaastro.org](http://www.britaastro.org)) also expand coverage of the year. Subscribing to a monthly magazine too will inform you of any transient events. Guides such as Paul Money's *Nightscenes 2021*; *Stargazing 2021* published by Philips; or *Night Sky 2021* published by Collins; may be picked up online or in bookstores. The *Yearbook of Astronomy*, which is produced by White Owl, is edited by Brian Jones and features guest articles as well as monthly sky notes. It too can be ordered online.

The Irish Federation of Astronomical Societies ([www.irishastronomy.org](http://www.irishastronomy.org)); the British Astronomical Association ([britaastro.org](http://britaastro.org)); or the Society for Popular Astronomy ([www.popastro.com](http://www.popastro.com)); will have details of nearby clubs if you wish to contact like-minded enthusiasts, seek out advice, or learn about upcoming events. Local clubs can provide speakers to visit schools, or organise observing nights, so do get in touch with them.

It's been an extraordinary 2020 globally, with the COVID-19 pandemic sadly leading to a large loss of life and a major impact on everyone's day-to-day. Many star parties, club meetings, conferences, and scientific events were postponed, and at time of writing we are still unsure of all their rescheduled dates. Therefore, the calendar this year lists only some that have been confirmed - they may be hosted virtually or in-person.

Comments, queries, or notifications of any errors/omissions can sent to John Flannery at [aurorawatcher@gmail.com](mailto:aurorawatcher@gmail.com)  [@theskybyeye](https://twitter.com/theskybyeye)

## Photos and Copyright

This calendar can be shared provided there is no commercial gain. A nominal fee may be charged solely to cover any print costs. Copyright for the photos is with the various photographers. The majority of the images commemorate Messier drawing up the first draft of his famed catalogue 250 years ago.

Cover pic is of IAS member Ben Sugarman viewing comet NEOWISE & NLCs the night of July 10/11 from Howth Head, Dublin. JF

## Words to know

**AU** One astronomical unit is simply the mean Earth-Sun distance, or roughly 149, 597, 870.691 km.

**Angular size** The Sun and Moon have the same apparent diameter in the sky, or a half degree ( $\frac{1}{2}^\circ$ ) across. Degrees are sub-divided into 60 arc-minutes (60') with each made up of 60 arc-seconds (60"). This allows us to measure sky angles or the apparent size of a celestial object. See [www.timeanddate.com/astronomy/](http://www.timeanddate.com/astronomy/)

**Conjunction** Mercury and Venus reach inferior conjunction when directly between Earth and the Sun, and superior conjunction when they pass behind the Sun. The other planets can only be at superior conjunction. A conjunction (or *appulse*) also describes when two or more celestial objects are near each other on the sky.

**Easter Sunday** is generally taken as the first Sunday after the first Full Moon after the Spring Equinox. The calculation is slightly more complex than this but it's a useful rule of thumb. This year it's on April 4<sup>th</sup>.

**Eclipse** Generally is when the Moon hides the Sun or the Moon passes through the Earth's shadow cast in space. Eclipses can take place of Jupiter's 4 main moons, or they can hide each other, as they do this year.

**Elongation** Mercury and Venus seem to swing from one side of the Sun to the other but viewed from Earth they never get further away than a position known as greatest elongation. This is the point at which they turn the curve of their orbit to dive back sunward. The other planets can lie anywhere in the zodiacal band.

**Greek alphabet** Used to designate the brightest stars in a constellation - though  $\alpha$  (alpha) isn't always the brightest. See [www.skyandtelescope.com/astronomy-resources/names-of-the-stars](http://www.skyandtelescope.com/astronomy-resources/names-of-the-stars)

**Libration** is an apparent "nodding" of the lunar disk that sometimes lets us peer a little beyond its edge. This is when features near the lunar limb are favourably placed to view. The calendar lists opportunities in 2021.

**Magnitude** of an object refers to its brightness, not to its size. The scale of magnitudes is a logarithmic one. The lower the magnitude number, the greater the brightness. The apparent brightness of a star depends on its true brightness and distance. A superscript <sup>m</sup> is used to denote magnitude in some of the calendar boxes. See [www.skyandtelescope.com/astronomy-resources/the-stellar-magnitude-system](http://www.skyandtelescope.com/astronomy-resources/the-stellar-magnitude-system)

**Meteor** Popularly termed a "shooting star", it's the flash of light from a small dust particle or pebble vaporising due to friction on entering our atmosphere. At certain times during the year the Earth ploughs through a trail of particles shed by comets and on these occasions we get a meteor shower. The number seen is generally

lower than the often-quoted theoretical ZHR value as that depends on sky conditions. See [www.imo.net](http://www.imo.net)

**NLCs**, or **Noctilucent Clouds** form in the cold air at altitudes of about 80km and are the highest occurring clouds seen. They can be observed during the summer months low on the northern skyline about 90 mins after sunset or before sunrise. See [www.nightskyhunter.com/Noctilucent%20Clouds.html](http://www.nightskyhunter.com/Noctilucent%20Clouds.html)

**Occultations** are when the Moon briefly passes in front of a star or planet. Disappearance at the Moon's limb can be quite sudden due to the lack of a lunar atmosphere. An asteroid may occult a star but these are generally only telescopic events (see [www.asteroidoccultation.com](http://www.asteroidoccultation.com) for these).

**Opposition** When the outer planets are in opposition they are opposite the Sun to us and are due south at local midnight. Mars, Jupiter and Saturn may be seen right throughout the night when at opposition.

**Perihelion** and **Aphelion** are the points of an objects orbit when it is closest or furthest from the Sun. For the Earth, those points vary from approximately 147 million km in January to 152 million km in July.

**Planet phases** Venus and Mercury show phases like the Moon. Mars can look gibbous, i.e. not quite full. Jupiter and Saturn can show very slightly less than full at **quadrature**, a position in an outer planet's orbit equivalent to that of the First & Last Quarter Moon. It makes a right angle with the Sun from our perspective.

**Retrograde** and **Prograde** motion is a consequence of the outer planets lying further from the Sun than us. Because they orbit more slowly, at opposition Earth can overtake an outer planet causing its apparent movement against the stars to grind to a halt, move back to the right, halt, & then resume direct (prograde) motion.

**Supermoon** is a (non-official) term for the year's biggest full moons. Our Moon's elliptical orbit means each full moon's apparent size varies. The closest full moon this year falls on May 26th while the most distant on December 19th is about 13% smaller than May's. See [www.timeanddate.com/astronomy/moon](http://www.timeanddate.com/astronomy/moon)

**Twilight** Civil Twilight ends after sunset (& begins before sunrise) when the Sun has reached 6° below the local horizon. Nautical twilight is when the Sun is 12° below, while astronomical twilight, when the sky is truly dark, occurs when it is 18° below. The sky is never truly dark during the summer months at our latitude.

**Zodiac** A band of constellations which cuts the sky in half that lies to either side of the ecliptic, and through which the Sun, Moon, & planets move. The **ecliptic** is our orbital plane projected on to the celestial sphere.

# The year ahead

## Eclipses

Four eclipses occur during 2021 - one total solar, one annular solar, a total lunar eclipse, and a partial lunar eclipse. The annular solar eclipse on June 10 is partial from Ireland and the UK, while we will see the initial stages of the partial lunar eclipse on the morning of Nov 19th. Comprehensive details of events for your location can be derived from [www.timeanddate.com/eclipse/2021](http://www.timeanddate.com/eclipse/2021)

Great care should be taken if you try observe the partial eclipse on June 10th. The only suitable method of viewing it for the general observer is by projecting the Sun's image onto a piece of white card using a telescope or pair of binoculars (leave the cap on one of the objectives at the front). Eclipse glasses let you see it with the unaided eye - discard them though if the filters appear damaged.

## Comets

Only a handful of comets are expected to get brighter than magnitude 10 when at perihelion this year. However, we can hope for another NeoWISE, an unexpected discovery that put on an excellent show in the summer of 2020. A list of upcoming comets is at [www.aerith.net/comet/future-n.html](http://www.aerith.net/comet/future-n.html)

[C/2020 M3 \(ATLAS\)](#) was brightest at the end of 2020 but remains brighter than mag. 10 during the early part of January when it is near Capella in Auriga.

[67P/Churyumov-Gerasimenko](#) was the target of investigation by the Philae lander and Rosetta spacecraft. The comet can be found in the evening sky in October when it is magnitude 10. It passes through Taurus, then Gemini, and moves into Cancer at the end of November.

[19P/Borrelly](#) is at perihelion in January 2022 but it should be picked up from Ireland and the UK towards the end of the second week of December when it is low in the SSE in Sculptor and moving into Cetus around time of the winter solstice. The comet should be about magnitude 9 to 8.5 then.

## Asteroids

Orbiting the Sun between Mars and Jupiter are innumerable rocky bodies ranging in size from hundreds of kilometres in diameter to small boulders. These are the minor planets, or asteroids. Close approaches of asteroids to deep-sky objects are at [www.minorplanet.info/ObsGuides/Appulses/DSOAppulses.htm](http://www.minorplanet.info/ObsGuides/Appulses/DSOAppulses.htm)

Opposition dates are listed for all asteroids getting brighter than 10<sup>m</sup>. You can find details for near-Earth flybys at [minorplanetcenter.net/daily-minor-planet](http://minorplanetcenter.net/daily-minor-planet)

## Meteors

A meteor shower is named for the constellation in which the radiant, or point of origin of the meteors, appears to lie. The suffix "id" means "child of". The date given for a shower is the expected date of the maximum. A shower's period of visibility may extend a few days either side of maximum — though much lower rates may be recorded. The Perseids (waxing crescent Moon this year) and the Geminids (waxing gibbous moon) are the richest displays, then closely followed by the sharp peaked Quadrantids (waning gibbous moon) in early January. The meteor observer's year is summarised at [www.imo.net/resources/calendar](http://www.imo.net/resources/calendar)

## Spaceflight

Mission details are up-to-date at time of publication. However, check out [en.wikipedia.org/wiki/2021\\_in\\_spaceflight](http://en.wikipedia.org/wiki/2021_in_spaceflight) or [spaceflightnow.com/launch-schedule](http://spaceflightnow.com/launch-schedule) for details of any changes.

The key astronomical mission this year is launch of the long-delayed *James Webb Space Telescope* at the end of October. The endeavour to complete the instrument has been complex and expensive, but the potential for new insights to be gleaned from the telescope once operational is enormous.

### Return to the Moon

NASA also plan a test flight of the powerful Space Launch System to test their next generation launcher for crewed flight to the Moon and beyond. This particular mission will send the Orion capsule around the Moon. CAPSTONE, a small cubesat, is a demo to test potential orbits for the planned Lunar Gateway, and may be launched in February.

March sees India launch their lunar lander and rover *Chandrayaan-3*. The mission will likely test some technologies for a proposed joint mission with the Japanese in 2024 to the lunar south pole. That region is the target for *Luna 25*, the Roscosmos mission that is part of the very long running Luna programme. It is scheduled to launch in October. A couple of commercially built landers are also due to be sent to the Moon's surface this year.

### Solar system exploration

Missions by three space agencies make Mars orbit in February, where both China and NASA will land rovers on the Martian surface. Europe's ExoMars will now head to Mars in 2022.

Small bodies of the solar system are the target of *DART* and *Lucy*, and in the case of the former it is an asteroid impactor which is designed to evaluate the possibility of redirecting an asteroid after a high velocity strike. A smaller cubesat will be deployed prior to the encounter in order to observe the impact and the results. The Lucy mission will visit one main belt asteroid and six of the Jupiter Trojans that orbit 60° ahead of the planet. The first flyby is April 2025 of the main belt object (52246) Donaldjohanson, with the Trojans reached in 2027.

### Human spaceflight

China is due to launch the core *Tianhe* component of its space station along with the *Wentian* lab module. Two dedicated construction missions will be under taken during 2021 by the crews of Shenzhou 12 and 13. There may be further flights also of the country's robotic space plane, the launch of which surprised followers of global space programmes in 2020. India's *Gaganyaan* is scheduled to have a crewed flight at the end of 2021 - it can carry up to three astronauts.

Boeing's *Starliner* vehicle should make a test flight this year and this will be closely followed by a crewed mission to the ISS. SpaceX continue fulfilling their NASA contract to ferry crew, while some seats will be occupied by private paying passengers such as the potential Axiom-1 mission with actor Tom Cruise.

## Useful web sites

[www.eso.org](http://www.eso.org) and [hubblesite.org](http://hubblesite.org)

[www.skymaps.com](http://www.skymaps.com) - charts you can download  
[stellarium.org](http://stellarium.org) - excellent planetarium software  
[earthsky.org/astronomy-essentials](http://earthsky.org/astronomy-essentials) - sky guide  
[www.timeanddate.com](http://www.timeanddate.com) - general sky data

### News, Articles, and Spaceflight

[www.heavens-above.com](http://www.heavens-above.com) - satellite predictions  
[spaceflightnow.com](http://spaceflightnow.com) & [www.astronomynow.com](http://www.astronomynow.com)  
[www.skyatnightmagazine.com](http://www.skyatnightmagazine.com)  
[en.wikipedia.org/wiki/2021\\_in\\_spaceflight](http://en.wikipedia.org/wiki/2021_in_spaceflight)  
[www.universetoday.com](http://www.universetoday.com) - astronomy & space

### The Sun, Aurora, and Eclipses

[www.spaceweather.com](http://www.spaceweather.com) - transitory events/alerts  
[eclipse.gsfc.nasa.gov/eclipse.html](http://eclipse.gsfc.nasa.gov/eclipse.html) - eclipses  
[www.atoptics.co.uk](http://www.atoptics.co.uk) - atmospheric optics

### The Moon and Planets

[solarsystem.nasa.gov/planets](http://solarsystem.nasa.gov/planets)  
[www.popastro.com/moonwatch/moon\\_guide/about.php](http://www.popastro.com/moonwatch/moon_guide/about.php)

### Comets and Meteors

[www.imo.net](http://www.imo.net) - International Meteor Organisation  
[www.ast.cam.ac.uk/~jds](http://www.ast.cam.ac.uk/~jds) - BAA comet section

### Forums and photography

[www.irishastronomy.org](http://www.irishastronomy.org) or  
[boards.ie/vbulletin/forumdisplay.php?f=267](http://boards.ie/vbulletin/forumdisplay.php?f=267)  
[www.stargazerslounge.com](http://www.stargazerslounge.com) (UK-based)  
[www.cloudynights.com](http://www.cloudynights.com) (US-based)  
[www.stephencheatleyphotography.co.uk](http://www.stephencheatleyphotography.co.uk)  
[photographingspace.com](http://photographingspace.com) & [nightsskypix.com](http://nightsskypix.com)

### Gear

[www.calgary.rasc.ca/downloads/](http://www.calgary.rasc.ca/downloads/) - tips leaflets  
[www.astrobuysell.com](http://www.astrobuysell.com) - UK Astro Buy & Sell  
[www.ktctelescopes.ie](http://www.ktctelescopes.ie) - Stephen Kershaw (IRL)  
[www.northdowntelescopes.co.uk](http://www.northdowntelescopes.co.uk) - Andy McCrea

## Time in the 2021 calendar

Except when noted, times in the calendar are in Universal Time (UT). This is the 24-hour system starting at mean midnight as measured at Greenwich. It is the same as Greenwich Mean Time (GMT). To translate UT into Summer Time just add one hour. For IRL/UK, Summer Time in 2021 begins on **March 28th** at 01:00 when the clocks go forward one hour, and ends on **October 31st** at 02:00 when clocks go back one hour (remember, "Spring forward, Fall back"). Interesting articles are at [www.rmg.co.uk/explore/astronomy-and-time/time-facts](http://www.rmg.co.uk/explore/astronomy-and-time/time-facts) and [www.timeanddate.com/time](http://www.timeanddate.com/time)



# January 2021

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
				1  New Year's Day  PM: Moon close to M44	2  PM: Moon is in the Sickle of Leo  Earth is at perihelion, 0.98325 AU from Sun	3  Quadrantid meteor shower peak at 15h
4  Boeing Starliner launch to the ISS  Bank Holiday (Scotland)	5  Mars crosses into Aries	6 09h 37m  7  Orthodox Christmas Day		8	9  PM: Mercury, Jupiter & Saturn within a 5° circle	10  PM: Mercury 1½° from Saturn - use binoculars  1946: radar bounced off the Moon by the US Army
11  AM: Venus is near a thin crescent Moon  PM: Mercury is 1½° from Jupiter, but low	12  Mars is 1 AU from Earth and receding	13 05h 00m  14  Orthodox New Year  Uranus stationary, prograde motion resumes  PM: Mercury 4½° to the Moon's right, with Jupiter	15	16  Orion now rising in E one hour after sunset	17	
18  Martin L. King Jr. (US)	19  FQ Moon tomorrow is the smallest of 2021 (29' 32")	20 21h 02m  21  Sun crosses into Capricornus  PM: Mars is 1½° from Uranus in Aries	21  PM: Mars 6½° to Moon's upper right  15 Eunomia (8.4 <sup>m</sup> ) at opposition in Cancer	22  Carrington solar rotation # 2240 begins	23  Moon lies between the Hyades & the Pleiades	24  Mercury at greatest elongation (18° 34' E)  Saturn solar conjunction
25  Burns Night (Scotland)	26	27  Venus is < 1° from more distant & far fainter Pluto	28 19h 16m  29  PM: Moon is in the Sickle of Leo  Jupiter solar conjunction	30  1995: discovery of comet Hyakutake  9.7 <sup>m</sup> (29) Amphitrite is 2' from the galaxy M105	31  1971: Apollo 14 launched	

## The planets this month

Evening - Mercury, Jupiter, Saturn, & Mars

Morning - Venus

**Mercury** is low in the south-western evening sky from the second week of January. Mid-month it sets nearly 1½ hours after the Sun and is 8° up at the end of civil twilight on the 24th when at greatest elongation east.

**Venus** rises 1½ hours before the Sun at the beginning of January but that interval rapidly diminishes and we lose sight of the planet soon after the 21st. We then do not see it again until April.

**Mars** sets just after 2am and crosses into Aries from Pisces on the 5th. Mars lies in the same binocular field as Uranus during the second half of January.

**Jupiter** is a bright evening sky object in Capricornus but is soon swallowed by the sunset glow. It will be lost to view near the end of the month.

**Saturn** can also be found in Capricornus but slips into the solar glare around mid-month.

The Crab Nebula (M1) in Taurus marks the location of a supernova explosion which was observed by Chinese astronomers in 1054. The tangled filaments visible in this image are the remains of the exploded star, which are still expanding outwards at about 1500 km/s.

The Crab's heart contains a pulsar, the small, dense, corpse of the original star that caused the supernova. It is now only about 20 km in diameter and rotates around its axis 30 times every second.

Data from the Wide Field Imager on the MPG/ESO 2.2-metre telescope at ESO's La Silla Observatory in Chile was used to make this image. Credit: ESO/Manu Majias.



# February 2021

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
1  Imbolc (Celtic) Mars at E quadrature Cygnus NG-15 to ISS	2  Ground Hog Day	3  1921: R.A. Alpher, American cosmologist	4 17h 37m   biggest LQ Moon of the year (32' 15")	5	6  three similarly bright orange sparks - Betelgeuse, Aldebaran & Mars - are in the S to SW sky following sunset	7
8  Mercury is at inferior conjunction	9	10  Venus & Jupiter are ~ 0.1° apart on the 11th but from IRL/UK they rise < 20 mins before the Sun	11 19h 06m   Chinese New Year (the Year of the Ox)	12	13	14  Valentine's Day
15  Galileo Day President's Day (US)	16  1771: Messier drafts the 1st version of his catalog	17  Sun crosses into Aquarius 1996: NEAR launch	18  PM: Mars 5½° to Moon's upper left	19 18h 47m   PM: Moon between the Hyades & the Pleiades	20  Venus at aphelion Parker Solar Probe Venus gravity assist	21
22  1996: STS-75 (Columbia launch)	23  29 Amphitrite (9.0 <sup>m</sup> ) at opposition in Leo AM: Mercury & Saturn 4° apart but v. low down	24  Mars moves into Taurus	25  AM: Moon occults 4.7 <sup>m</sup> γ Cancri when near M44	26  PM: Moon is in the Sickle of Leo 1971: Kosmos 398 - test of Soviet LK lunar lander	27 08h 17m   PM: Mars within 3° of the Pleiades	28

## The planets this month

*Evening* - Mercury (first week only), and Mars

*Morning* - Mercury from second half of Feb, Jupiter, and Saturn

*Not visible* - Venus

**Mercury** can be tracked low in the south-western evening sky up to the end of the first week of February. It then switches to the morning sky for the second half of the month where you will find it 3° above the south-eastern horizon at the beginning of civil twilight on the 28th.

**Mars** continues its slow fade but is still not setting until just before 2am. The planet moves into Taurus on the 24th and ends February close to the Pleiades star cluster.

**Jupiter** emerges into the morning sky after conjunction but is still a tough catch as it is only 1° up at the beginning of civil twilight at the end of the month.

**Saturn** also becomes a morning sky object this month. It should be easily seen low in the southeast during the last week of February when it rises an hour or so before the Sun.

Bright, frosty polar caps, and clouds above a vivid, rust-colored landscape reveal Mars as a dynamic seasonal planet in this NASA Hubble Space Telescope view taken on 2016 May 12, when Mars was 80 million km from Earth. The Hubble image reveals details as small as 32 to 40 kilometres across.

The large, dark region at far right is Syrtis Major Planitia, one of the first features to have identified on the surface of the planet by 17th century observers. Christiaan Huygens used this feature to measure the rotation rate of Mars. (A Martian day is about 24 hours and 37 minutes.) Today we know that Syrtis Major is an ancient, inactive shield volcano. Late-afternoon clouds surround its summit in this view. Credit: Hubble Heritage Team/STScI

Missions from the UAE, NASA, and Chinese Space Agency arrive at Mars this month. China's *Tiawan-1* will be inserted into orbit on Feb 11th. The onboard rover will touch down two months later and will perform chemical analysis of the soil along with surface radar observations, while the orbiter will study the Martian atmosphere and produce surface maps.

The US *Perseverance* rover lands on Feb 18th in the 49 km diameter Jezero crater. It is designed for astrobiological & geological studies of the area. The rover will also cache material for a possible future Mars sample-return mission.

The UAE's *Al-Amal (Hope)* makes Mars orbit on Feb 15th to study the Martian atmosphere and climate over two years.



# March 2021

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
1  India plan launch their <i>Chandrayaan-3</i> lunar lander/rover this month  St. David's Day (Wales)	2  <i>OSIRIS-REx</i> to depart asteroid Benu & start Earth return trip in March	3  World Wildlife Day	4  PM: Mars 2½° from the Pleiades	5  AM: Mercury & Jupiter < ½° apart but are low  1621: Thomas Street, Cork-born astronomer	6 01h 30m   Mercury at greatest elongation (27° 16' W)	7
8  4 Vesta (6 <sup>m</sup> .0) at opposition in Leo	9  2011: Shuttle <i>Discovery's</i> final landing (STS-133)	10	11  Neptune is at solar conjunction	12  SpaceX <i>ISS</i> logistics	13 10h 21m   optimal Messier Marathon weekend Sun crosses into Pisces	14  Pi Day start of DST (US) Mothering Sunday PM: lunar crescent is just 32.6 hours old
15  look for earthshine on tonight's slender Moon	16	17  St. Patrick's Day (IRL/NIRL)	18  1871: Reginald Daly	19  PM: Mars is 2¼° above the Moon Progress 78P <i>ISS</i> supply	20  Vernal Equinox, 09h 38m	21 14h 40m   PM: contrast 1.2 <sup>m</sup> Mars & 0.85 <sup>m</sup> Aldebaran when they are 7° apart tonight
22  1996: <i>Atlantis</i> launch - 1st <i>Mir</i> docking mission	23  World Meteorological Day	24	25  PM: Moon is in the Sickle of Leo	26  Venus is at superior conjunction	27  Earth Hour	28 18h 48m   start of daylight saving time (IRL/UK) Supermoon (362170 km)
29  Festival of Holi	30  SpaceX <i>Crew-2</i> launch	31  Mars near the cluster NGC 1746 in Taurus				

## The planets this month

*Evening* - Mars

*Morning* - Mercury for the first week, Jupiter, and Saturn

*Not visible* - Venus

**Mercury** gets too close to the Sun to be seen after the first week of March. Up to then you can spy it low in the southeast prior to sunrise.

**Mars** glides across Taurus this month and is visible up to around 1:30am. The planet's disk is now only half as wide as at the start of the year. Martin J. Powell notes that on March 14th the distance between Earth and Mars is the same as that between the Sun and Mars (1.5980 AU or 239 million km) - see [www.nakedeyeplanets.com](http://www.nakedeyeplanets.com)

**Jupiter** rises 45 minutes before the Sun at the beginning of March and is up an hour beforehand by the 31st. Try catch it close to Mercury on the morning of the 5th.

**Saturn** rises an hour before the Sun on the 1st but tacks an extra half hour onto that time by the end of the month..

This dramatic image of the galaxy M 83 was captured by the Wide Field Imager at ESO's La Silla Observatory, located high in the dry desert mountains of the Chilean Atacama Desert.

Messier 83 lies roughly 15 million light-years away towards the huge southern constellation of Hydra (the sea serpent). It stretches over 40 000 light-years, making it roughly 2.5 times smaller than our own Milky Way. However, in some respects, Messier 83 is quite similar to our own galaxy.

Both the Milky Way and Messier 83 possess a bar across their nucleus, the dense spherical conglomeration of stars seen at the centre of the galaxies. Credit: ESO



# April 2021

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
			1 Mars near the cluster NGC 1746 in Taurus AM: Saturn < 1' from 5.8 <sup>m</sup> star 19 Capricorni Expedition 65/66 crew due to launch to the ISS	2 AM: Jupiter occults the 5.9 <sup>m</sup> star 44 Capricorni	3 Orion's Belt now sets around midnight (BST)	4 10h 02m  Easter Sunday
5 Easter Monday (bank holiday IRL/UK)	6 AM: Saturn 5½° to upper left of Moon	7 9 Metis (9.5 <sup>m</sup> ) at opposition in Virgo AM: Jupiter 5½° to upper left of Moon	8 ULA Atlas V launch incl. UV astronomy and space weather satellites	9	10 following the waning lunar crescent these mornings can be magical	11
12 02h 31m  Yuri's Night	13 Ramadan starts PM: Mars bisects a line joining zeta & beta Tauri	14	15 PM: Moon between the Hyades & the Pleiades	16 AM: Jupiter < 1' from 5 <sup>m</sup> mu Cap - planet seems to have an extra "moon"	17 PM: Mars 3¼° to lower right of Moon	18 lunar X & V should be visible tomorrow
19 Mercury is at superior conjunction Sun crosses into Aries 1971: first space station, Salyut 1, launch (USSR)	20 06h 59m  European Robotic Arm & Nauka launch to the ISS	21 westernmost lunar libration of 2021 (10.1°)	22 Earth Day Lyrid meteor shower peak, 13h Mars max declination N	23 Tianwen-1 landing on Mars St. George's Day (ENG)	24 National Day of Spaceflight (China)	25 Mars moves into Gemini PM: Mercury & Venus ~1° apart, but very low
26 Jupiter moves into Aquarius PM: Mars v. close to M35 cluster in Gemini	27 03h 31m  Supermoon (357615 km)	28	29 PM: Mercury ends April about 5° from M45	30 Uranus is at solar conjunction		

## The planets this month

*Evening* - Mercury from last week of April, Venus at the end of April. Mars

*Morning* - Jupiter and Saturn

**Mercury** is an evening object the last week or so of April and passes within 1° of Venus on the 25th when both are low in the WNW. Mercury improves on its altitude slightly each day up to the end of the month.

**Venus** returns to the evening sky and is setting 45 minutes after the Sun on the 30th.

**Mars** hangs around until the early hours – especially with summer time now in effect. It has now faded a little more to magnitude 1.7 but is still a reasonably bright object.

**Jupiter** rises around two hours before the Sun throughout the month. The planet is extremely close to 44 Capricorni (magnitude 5.9) on the 2nd but a predicted occultation of the star by Jupiter is after sunrise from here.

**Saturn**, in Capricornus, rises 1½ hours before the Sun on the 1st with that interval doubling by the end of April.

The famous early-type spiral galaxy Messier 104 is widely known as the "Sombrero" due to its particular shape. It is located in Virgo & lies at a distance of about 50 million light-years.

Messier 104 is the 104th object in the famous catalogue of nebulae by French astronomer Charles Messier (1730 - 1817). It was not included in the first two editions but Messier soon after added it by hand in his personal copy as a "very faint nebula".

This galaxy is notable for its dominant nuclear bulge, composed mostly of mature stars, and its nearly edge-on disc comprising stars, gas, and intricately structured dust. A large number of small and slightly diffuse sources can be seen as a swarm in the halo of Messier 104. Most of these are globular clusters, similar to those found in our own Galaxy. Credit: ESO/ P. Barthel



# May 2021

Monday

Tuesday

Wednesday

Thursday

Friday

Saturday

Sunday

The Leo Triplet is a gathering of three magnificent galaxies in one field of view. They are NGC 3628 (left), M66 (bottom right), and M65 (top right). All three are large spiral galaxies but they look dissimilar because their galactic disks are tilted at different angles to our line of sight. NGC 3628 is seen edge-on, with obscuring dust lanes cutting across its plane.

Gravitational interactions between galaxies in the group have warped the disk of NGC 3628 and the drawn out the spiral arms of M66. Credit: ESO

3 19h 50m  May Day (IRL/UK) Saturn W quadrature	4 Star Wars Day AM: Moon between Jupiter and Saturn PM: Mercury 2° from M45	5	6 η Aquarids peak at 03h	7 Space Day	8 1971: <i>Mariner 8</i> , US Mars mission (failed)	9 Mother's Day (US) PM: Venus 4½° from the Pleiades but v. low
10 SpaceX <i>ISS</i> logistics 1971: <i>Kosmos 419</i> , a USSR Mars probe (failed)	11 19h 00m  furthest NM of 2021	12 PM: Moon is very low with Venus 2° above it	13 Eid-ul-Fitr (Muslim) PM: Mercury 2¾° to upper right of Moon	14 Spring Astronomy Day takes place tomorrow...	15 PM: Mars 4½° to upper left of Moon Sun crosses into Taurus	16
17 Mercury at greatest elongation (22° 01' E)	18 Saturn maximum declination North	19 19h 13m  PM: Moon in Sickle of Leo, close to Regulus 1971: <i>Mars 2</i> -- failed during landing on Mars	20	21 Jupiter at W quadrature	22	23 Saturn stationary, begins to retrograde
24 IRL/UK noctilucent cloud season begins late May	25 Towel Day	26 11h 14m  biggest FM of 2021 (33' 26") and a total lunar eclipse (not from IRL/UK)	27 comet 7P/Pons-Winnecke at perihelion	28 PM: Venus and Mercury ½° apart 1971: <i>Mars 3</i> - lander lasted 110 secs (USSR)	29	30 1971: <i>Mariner 9</i> launch, NASA mission to Mars
						31 Monday Spring Holiday (UK) & Memorial Day (US) AM: Saturn 5° upper left of the Moon as they rise

## The planets this month

Evening - Mercury, Venus, and Mars

Morning - Jupiter and Saturn

**Mercury** can be seen almost to the end of May in the evening sky and soars 10° above the northwest skyline on the 12th when setting around two hours after the Sun.

**Venus** remains quite low above the northwest horizon but its brilliance catches the eye. It sets 1½ hours after the Sun at the end of the month

**Mars** continues to dwindle in size for telescope users and sets around 1am BST at the end of May. The planet sits at the tip of an isosceles triangle with Castor and Pollux in Gemini on the 17th but is now dimmer than the two stars.

**Jupiter** rises two hours before the Sun at the beginning of May and three hours beforehand by the 31st.

**Saturn** rises around 1:30am BST at the end of the month. Telescope users see the northern aspect of the rings tipped a little under 17° earthward, their minimum for the year.



# June 2021

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday																																
	1  AM: Jupiter 7½° to upper left of Moon  northernmost lunar libration of 2021 (10°)	2 07h 24m  first crewed <i>Starliner</i> flight test this month	3  PM: Venus v. close to M35 but will be low	4	5  World Environment Day	6  1971: <i>Soyuz 11</i> launch (crew died during return)																																
7  Bank Holiday (IRL)	8  World Oceans Day  3 Juno (10.1 <sup>m</sup> ) reaches opposition in Ophiuchus	9  Mars moves into Cancer  Vesta in a 1° circle with M65, M66, & NGC 3628	10 10h 53m  annular solar eclipse (partial from IRL/UK)	11  Mercury is at inferior conjunction  PM: Venus is 4½° to upper left of 35-hr Moon	12  Venus at perihelion	13  PM: Mars 2° to lower left of Moon																																
14	15  PM: Moon is in the Sickle of Leo	16  Jupiter max decl. N  libration tips M. Crisium very close to the E limb	17  earliest sunrise, 03h 56m from Dublin	18 03h 54m	19  PM: Moon near Spica	20  Father's Day (IRL/UK/US)  5 Astraea (10.6 <sup>m</sup> ) at opposition in Sagittarius																																
21  Jupiter stationary, begins to retrograde  summer solstice, 3h 33m	22  Sun crosses into Gemini	23  PM: Mars lies within M44 (use binoculars)	24 18h 40m  latest sunset, 20h 57m from Dublin	25	26  Neptune stationary, begins to retrograde  PM: Saturn 8¼° upper left of Moon as it rises	27  1971: <i>N-1</i> rocket launch attempted by the USSR																																
28  PM: Jupiter 5° above the Moon as they rise	29	30  Asteroid Day  PM: Venus & Mars 7½° apart either side of M44	<p>Circumstances for a number of cities are given for the partial solar eclipse on June 10. <a href="#">Add</a> 1 hour to times for BST. The amount of the Sun's disk obscured is a percent. Local details at <a href="http://astro.ukho.gov.uk/eclipse/0232021/">astro.ukho.gov.uk/eclipse/0232021/</a></p> <table border="1"> <thead> <tr> <th></th> <th>Begins</th> <th>Maximum</th> <th>Ends</th> </tr> </thead> <tbody> <tr> <td>Cork</td> <td>08h 56m</td> <td>10h 03m (27.8%)</td> <td>11h 15m</td> </tr> <tr> <td>Dublin</td> <td>09h 01m</td> <td>10h 08m (28.6%)</td> <td>11h 21m</td> </tr> <tr> <td>Galway</td> <td>08h 57m</td> <td>10h 05m (30.9%)</td> <td>11h 18m</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th></th> <th>Begins</th> <th>Maximum</th> <th>Ends</th> </tr> </thead> <tbody> <tr> <td>Belfast</td> <td>09h 03m</td> <td>10h 11m (30.7%)</td> <td>11h 25m</td> </tr> <tr> <td>Glasgow</td> <td>09h 06m</td> <td>10h 16m (31.8%)</td> <td>11h 30m</td> </tr> <tr> <td>London</td> <td>09h 08m</td> <td>10h 13m (19.9%)</td> <td>11h 22m</td> </tr> </tbody> </table>					Begins	Maximum	Ends	Cork	08h 56m	10h 03m (27.8%)	11h 15m	Dublin	09h 01m	10h 08m (28.6%)	11h 21m	Galway	08h 57m	10h 05m (30.9%)	11h 18m		Begins	Maximum	Ends	Belfast	09h 03m	10h 11m (30.7%)	11h 25m	Glasgow	09h 06m	10h 16m (31.8%)	11h 30m	London	09h 08m	10h 13m (19.9%)	11h 22m
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## The sky this month

Evening - Venus and Mars

Morning - Jupiter and Saturn

Not visible - Mercury

**Venus** continues to dominate the evening sky despite its low altitude. It does not set until 1½ hours after the Sun all month. Telescope users will note the planet's phase is almost full.

**Mars** is now quite low in the dusk but its eastward pace keeps it out of the solar glare a little longer. The planet has now dimmed to magnitude 1.8 and sets roughly three hours after the Sun for most of June. It passes in front of the Beehive star cluster (M44) in Cancer on the 23rd and 24th.

**Jupiter** (magnitude -2.5) rises around 2am BST at the beginning of June and is up just after midnight at the end of the month. It will dominate the southern sky during the brief dark this time of year.

**Saturn** (magnitude 0.5), in Capricornus, rises at 12:30am BST on June 1st but is visible a little after 11:30pm by the end of June.

The end to another beautiful day in Dublin, as the sun slips towards the horizon. The glitter path on the water adds to the scene, while a faint sun pillar can be traced rising vertically. Pillars can form when ice crystals floating horizontally each act as tiny mirrors to reflect a very bright light source.

Taken from the East Pier in Dun Laoghaire by the calendar author using an iPhone 5S with a pair of sunglasses acting as a filter.



# July 2021

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
			1 23h 29m 	2	3	4
					PM: Venus on M44's edge, with Mars nearby	Mercury at greatest elongation (21° 33' W) Independence Day (US)
5	6	7	8	9 01h 17m 	10	11
Earth aphelion, 22h distance 1.0167 AU Independence Day holiday in the USA	AM: Moon between the Hyades & the Pleiades		AM: Mercury 3° lower right of the Moon and very near to zeta Tauri		PM: gap between Mars and Venus is now ~ 2°	Mars moves into Leo PM: lunar crescent 7° right of Venus & Mars.
12	13	14	15	16	17 10h 11m 	18
Battle of the Boyne (NIRL) PM: Moon now 5° upper left of Venus and Mars	PM: Venus & Mars are closest, ½° apart 15P/Finlay at perihelion Mars aphelion, 1.665 AU	scope users can contrast the tints of Venus & Mars in a low-power eyepiece	6 Hebe (8.4 <sup>m</sup> ) at opposition in Aquila		Pluto (14.3 <sup>m</sup> ) is at opposition	1921: John Glenn (first US astronaut to orbit the Earth)
19	20	21	22	23	24 02h 37m 	25
		PM: Venus 1.1° from Regulus in Leo Sun crosses into Cancer	DART launch - planned asteroid redirecting test	Summer Olympics in Japan until Aug 8th	PM: Saturn 5° above Full Moon as they rise	PM: Jupiter 6° to upper left of Moon
26	27	28	29	30	31 13h 16m 	
12 Victoria (8.7 <sup>m</sup> ) at opposition in Aquila 1971: Apollo 15 launched		S delta Aquarid meteor shower maximum at 03h	PM: Mars near Regulus but the two are very low	Juno end of mission (Jupiter orbiting probe) α Capricornid meteor shower maximum at 06h		

## The sky this month

*Evening* - Venus, Mars, Jupiter, and Saturn

*Morning* - Mercury, Jupiter, and Saturn

**Mercury** is fairly low in the morning sky at the beginning of July, but is best picked up towards the end of the second week of the month as its altitude improves. It remains on view to the start of the last week of July but is difficult to see then.

**Venus** is low in the evening twilight all month and sets 1½ hours after the Sun. Binoculars show Venus skirting M44 on the 3rd.

**Mars** (magnitude 1.8) is setting about an hour after the Sun. It has a dramatic encounter with much brighter Venus mid-month.

**Jupiter** (magnitude -2.7) rises late evening and is visible throughout most of the night. An app like Gas Giants (iOS) or Moons of Jupiter (Android) will let you follow the changing aspect of the Galilean moons daily.

**Saturn** (magnitude 0.3) rises slightly earlier than Jupiter these evenings and its slightly yellowish tint is unmistakable.

Celestial visitor comet NeoWISE seen over Dublin Bay on the night of 2020 July 10/11 when an incredibly bright display of NLCs (noctilucent clouds) also developed.

The comet was a fine sight throughout the month of July, and was considered to be the best comet visible for northern hemisphere observers since Hale-Bopp graced our skies in 1997. NeoWISE next returns to the inner solar system in 6800 years.

Picture taken from the summit of Dalkey Hill by the calendar author with the general view looking northeast over the Bay. Earlier in the night he viewed the comet from Howth Head.



# August 2021

Monday

Tuesday

Wednesday

Thursday

Friday

Saturday

Sunday

Steadily mounted binoculars will let you spot Saturn's largest satellite Titan. The moon orbits Saturn in about 16 days and appears like a magnitude 8 "star" lying around five ring-widths from the planet when Titan is at eastern (E) or western (W) elongation. A scope is required to see the rest of the brighter other moons. These are Rhea (maximum magnitude 9.7), the enigmatic Iapetus (varies from 10m to 12m), Themys (10.3m) and Dione (10.4m).

2 Saturn (0.2 <sup>m</sup> ) is at opposition <a href="#">Bank Holiday</a> (IRL/Scot)	3	4 PM: Vesta v. close to NGC 4527 in Leo	5 Orion's Belt steeply sloped to E horizon 1 hour before sunrise	6	7 AM: Lunar crescent is 33 hours from New	8 13h 50m  Solar Orbiter Venus gravity assist
9 PM: lunar crescent is just 30.7 hours old	10 <a href="#">Muharram</a> / Islamic New Year PM: Moon near Venus tonight and tomorrow	11 BepiColombo Venus gravity assist Sun crosses into Leo	12 Perseid meteor shower peak, 19h SpaceX Crew-3 launch	13	14 Qixi Festival (Chinese)	15 15h 20m  Jupiter without a visible Galilean moon, but it will be in daylight for IRL/UK biggest FQ Moon of 2021
16 PM: the Moon lies directly above Antares	17	18 Mars has made 1 lap of the zodiac since its last conjunction in 2018 Progress 79P /ISS supply	19 Jupiter moves into Capricornus 1871: Orville Wright, US aviation pioneer	20 Jupiter (-2.9 <sup>m</sup> ) is at opposition Uranus stationary, begins to retrograde PM: Moon 4° from Saturn	21 PM: Jupiter 7° to upper left of Moon	22 12h 02m  seasonal Blue Moon 89 Julia (8.9 <sup>m</sup> ) reaches opposition in Aquarius
23 around now, you'll see the "Rolling Sun of Croagh Patrick" phenomenon from the Boheh Stone, Mayo	24	25 summer begins in N. hemisphere of Mars	26	27 Venus probably lost to view the next day or two	28 8P/Tuttle at perihelion	29 PM: Moon between the Hyades & the Pleiades
30 07h 13m  <a href="#">Bank Holiday</a> (UK except Scot) smallest LQ Moon of the year (29' 34")	31 1821: W. Usherwood, took 1 <sup>st</sup> photo of a comet					

## The sky this month

*Evening* - Venus and Mars (to mid-month), Jupiter, and Saturn

*Morning* - Jupiter and Saturn

*Not visible* - Mercury

**Venus** is a bright lamp low in the western sky these evenings & sets an hour after the Sun.

**Mars** is setting only 40 minutes after the Sun mid-month so will likely be lost to view for us around this time.

**Jupiter** (magnitude -2.9) is at opposition on the 20th in Capricornus when it rises around 9pm BST and is visible throughout the night. A telescope reveals the gas giant's turbulent atmosphere

**Saturn** (magnitude 0.2) is also at opposition this month, but on the 2nd in Capricornus when it can be seen from 8:15pm BST. Its largest moon Titan can be seen in steadily held binoculars.

The 4-day old Moon sets late evening on August 12th and so will not interfere with maximum of the **Perseid** meteor shower.

The Lagoon Nebula (M8) lies in Sagittarius and can be seen with the unaided eye from a dark site. Binoculars also show the open cluster NGC 6530 nested within the nebula. These stars were physically born here and are classed as OB-type.

A sprinkling of brighter stars may be seen towards the western edge. One of these, 9 Sagittarii, is believed to be one of the most luminous stars in the Galaxy and pumps out as much energy as 1.5 million Suns in just one second.

This image was taken with the 67-million-pixel Wide Field Imager attached to the MPG/ESO 2.2-metre telescope at the La Silla Observatory in Chile. The image covers an area eight times larger than that of the Full Moon. Credit: ESO



# September 2021

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
		1 Aurigid meteor shower peak, 03h	2 1971: <i>Luna-18</i> launch (lunar sample attempt)	3	4 AM: waning Moon near M44, the Beehive cluster	5 AM: lunar crescent near the Sickle of Leo
6 Labor Day (US) AM: lunar crescent is 19.1 hours from New Mars moves into Virgo	7 00h 52m  Rosh Hashanah, Jewish Year 5782	8	9 PM: Moon near Venus in WSW but they are low	10	11 2 Pallas (8.5 <sup>m</sup> ) at opposition in Pisces	12
13 20h 39m  <i>Dream Chaser Demo 1</i> flight to the ISS with the <i>Prichal</i> module (on 14th)	14 Neptune (7.6 <sup>m</sup> ) is at opposition Mercury at greatest elongation (26° 46' E)	15 IXPE x-ray astronomy satellite to be launched	16 PM: Saturn 6½° to upper left of Moon	17 Sun crosses into Virgo 6P/d'Arrest at perihelion	18 PM: Jupiter 8° to upper right of Moon Mars crosses celestial equator, going N to S	19 moonlight pours out of the Water Jar asterism in Aquarius tonight
20 23h 55m  tonight's Full Moon is the Harvest Moon Mars furthest from Earth (2.638 AU \ 394.6m km)	21	22 autumn equinox, 19h 22m	23	24 Neptune is < 2' from a 6.3 <sup>m</sup> star SAO 146736	25 PM: Moon to Pleiades lower right as they rise	26
27	28 1971: <i>Luna-19</i> launch (Soviet lunar orbiter)	29 01h 57m 	30			

## The sky this month

*Evening* - Mercury (mid-month), Venus, Jupiter, and Saturn

*Morning* - Jupiter and Saturn

*Not visible* - Mars

**Mercury** should be visible mid-month in the evening sky when at greatest elongation and setting 45 minutes after the Sun. Look for the elusive planet fairly low in the WSW and well to the lower right of Venus.

**Venus** hangs above the western skyline for an hour after sunset. The disk is 68% illuminated mid-month for telescope users and is slowly growing less fat while also swelling in apparent size.

**Jupiter** (magnitude -2.8) can be seen in the eastern sky after sunset and is on view until the early hours.

**Saturn** (magnitude 0.4) is similarly already up in the east as night falls, but sets not long after 1pm BST at the end of the month.

**Neptune** (magnitude 7.8) is at opposition on the 14th in eastern Aquarius and not far from magnitude 4.2 Phi. Binoculars are sufficient to spot the ice giant when used with a chart of the planet's location.

The Dumbbell Nebula, or M27, is considered to be one of the best planetary nebulae for binocular observers. It is near Gamma Sagittae and shows as a lovely puff of light set in an attractive star field. With larger binoculars you may see a hint of the "applecore" shape of the nebula.

Planetary nebulae are the outer layers shed by stars near the end of their life cycle. At this phase in their life, such stars may lose up to half their original mass. Strong stellar winds blowing from their surface shock previously ejected material and the high-energy radiation causes these shells to glow. Credit NASA, ESA, and the Digitized Sky Survey 2



# October 2021

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
				1  <i>Luna-25</i> lunar lander launch (Roscosmos)	2  <i>BepiColumbo</i> first Mercury gravity assist	3  Venus at aphelion  <i>AM</i> : Moon in Leo's Sickle where it occults $\eta$ Leonis
4  World Space Week	5  Expedition 67/68 crew launch to <i>ISS</i>  <i>AM</i> : lunar crescent is 28.5 hours from New	6 11h 05m 	7  <i>PM</i> : lunar crescent is just 31 hours old	8  Draconid meteor shower peak, 19h  Mars solar conjunction	9  Mercury at inferior conjunction  <i>PM</i> : Venus is 2¼° to lower left of the Moon	10  S Taurid meteor shower peak, 12h
11  Saturn stationary, prograde motion resumes  Nova-C lunar mission	12	13 03h 25m 	14  NASA's <i>Lucy</i> mission to Jupiter's trojans due to launch this Saturday	15  <i>PM</i> : Jupiter 6° to upper right of Moon	16  International Observe the Moon Night and the Hamilton Walk, Dunsink  <i>PSP</i> Venus gravity assist	17  Eris at opposition  <i>PM</i> : Venus currently lies within 2° of Antares
18  Jupiter stationary, prograde motion resumes	19  <i>The Prophet's Birthday</i> (Muslim)	20 14h 57m 	21  Orionid meteor shower peak, 11h	22	23  <i>PM</i> : Moon between the Hyades & the Pleiades	24
25  <i>Bank Holiday</i> (IRL)  1671: discovery of Saturn's moon Iapetus  Mercury is at greatest elongation (18° 24' W)	26	27  Venus currently near 3.3 <sup>m</sup> theta Ophiuchi	28 20h 05m 	29  Venus at greatest elongation (47° 03' E)	30 14h 49m 	31  DST ends (IRL/UK)  James Webb Space Telescope to launch  Samhain / Dark Matter Day

## The sky this month

*Evening* - Venus, Jupiter, and Saturn

*Morning* - Mercury second half of the month

*Not visible* - Mars

**Mercury** moves into the morning sky after inferior conjunction on the 9th and should be picked up around October 15th. However, your best change of spotting the fleet-footed world is towards the end of the month as it gains in height daily and rapidly brightens then too.

**Venus** is at greatest eastern elongation on the 29th and brightens a little in the evening sky. The main changes will require a scope though as the phase narrows from 62% illuminated on the 1st to 48% lit by Halloween.

**Mars** rises 50 minutes before the Sun at the end of October but is still too deep in the dawn glow to be visible.

**Jupiter** and **Saturn** are stationary this month and then go prograde. Jupiter is setting at midnight at the end of October while Saturn slips from view even earlier – it dips below the horizon by 10:30pm on the 31st.

Poised above the rooftops during Autumn evenings is the lovely Pleiades star cluster. Also known as the Seven Sisters and catalogued as number 45 in Messier's famous list, most people see the six brightest stars under a moderate sky. Binoculars show a stunning view with many steely-blue glints scattered across the field.

Well over a thousand stars are members of this swarm which lies 444 light years away. The tendrils of wispy gas threaded through the cluster are actually an interstellar cloud that the Pleiades have encountered. Their own embryonic material dispersed long ago.

Photo by IAS member John Dolan. Visit [www.imageorion.com](http://www.imageorion.com) for more details.



# November 2021

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
<p>1</p> <p>NASA's <i>Space Launch System</i> due to make its maiden flight this month</p> <p>Sun crosses into Libra</p>	<p>2</p> <p>AM: Mercury 4¼° from Spica</p> <p>67P/Churyumov-Gerasimenko perihelion</p>	<p>3</p> <p>AM: lunar crescent is 37.8 hours from New. Mercury 6° to lower left</p>	<p>4</p> <p>21h 15m </p> <p>Diwali/Deepavali</p> <p>AM: Moon 2° from Mars when 14½ hrs from New</p>	<p>5</p> <p>Uranus (5.7<sup>m</sup>) is at opposition</p> <p>PM: Venus 3½° below M8, the Lagoon Nebula</p>	<p>6</p> <p>PM: lunar crescent is now 43.9 hours old</p>	<p>7</p> <p>DST ends in US</p> <p>1996: <i>Mars Global Surveyor</i> launched</p>
<p>8</p> <p>PM: Venus 7° to lower right of Moon</p>	<p>9</p>	<p>10</p> <p>AM: Mercury and Mars are 1° apart</p> <p>PM: Saturn 5° to upper right of Moon</p>	<p>11</p> <p>12h 46m </p> <p>PM: Jupiter 5° above the Moon</p> <p>Veterans Day (US)</p>	<p>12</p> <p>N Taurid meteor shower peak, 11h</p> <p>Mars moves into Libra</p> <p>favourable libration at W lunar limb for M. Crisium</p>	<p>13</p> <p>PM: 1 Ceres (7.3<sup>m</sup>) &amp; Aldebaran ~½° apart</p>	<p>14</p> <p>Remembrance Sunday</p>
<p>15</p> <p>Jupiter at E quadrature</p>	<p>16</p> <p>1996: <i>Mars 96</i> (failed to reach Earth orbit)</p>	<p>17</p> <p>Leonid meteor shower peak, 10h</p> <p>Progress 78P /SS supply</p>	<p>18</p> <p>1821: Franz Brünnow, 4th Director at Dunsink</p>	<p>19</p> <p>08h 58m </p> <p>partial lunar eclipse visible from IRL/UK</p> <p>PM: Moon between the Hyades &amp; the Pleiades</p>	<p>20</p>	<p>21</p> <p>α Monocerotids shower peak, 17h</p>
<p>22</p> <p>AM: Mars 3.5' from 2.8<sup>m</sup> alpha<sup>2</sup> Librae</p>	<p>23</p>	<p>24</p> <p>Sun moves into Scorpius</p>	<p>25</p> <p>Thanksgiving Day (US)</p>	<p>26</p> <p><i>Solar Orbiter</i> Earth gravity assist</p> <p>PM: Moon in the Sickle of Leo, above Regulus</p>	<p>27</p> <p>12h 28m </p> <p>1 Ceres (7<sup>m</sup>) at opposition in Taurus</p> <p>favourable libration tips the lunar S Pole into view</p>	<p>28</p>
<p>29</p> <p>Mercury is at superior conjunction</p> <p>favourable libration for Mare Orientale region</p>	<p>30</p> <p>Sun crosses into Ophiuchus</p> <p>St Andrew's Day (SCO)</p>	<p>The Moon's disk is almost wholly immersed in the Earth's umbra for the lunar eclipse of Nov 19th. But it is still only a partial. From Ireland and the UK we can only see the initial stages of the event before moonset that morning.</p> <p>The Moon passes south of Earth's shadow so the northern part of the disk is more dimmed. The penumbral eclipse begins at 06h 02m but it will be an hour before any darkening is noticeable. The partial begins at 07h 18m, with moonset 40 minutes later at Dublin. Greatest eclipse is 09h 03m. See <a href="https://eclipsewise.com/lunar/lunar.html">eclipsewise.com/lunar/lunar.html</a> and <a href="https://timeanddate.com">timeanddate.com</a> for timings.</p>				

## The sky this month

*Evening* - Mercury to mid-month, Venus, Jupiter, and Saturn

*Morning* - Mars

**Mercury** is visible in the morning sky up to around mid-month but is best seen in the first week when the planet rises nearly two hours before the Sun and glimmers at mag. -0.8.

**Venus** is a brilliant "star" in the southwest these evenings and sets 2½ hours after the Sun on the 30th.

**Mars** (magnitude 1.6) gradually pulls clear of the solar glare in the morning sky and rises 1½ hours before the Sun by the end of the month.

**Jupiter** (magnitude -2.4) is at eastern quadrature on the 15th when the planet's disk looks slightly gibbous. It is an evening sky object setting at midnight on the 1st and by 10:30pm at the end of November.

**Saturn** (mag. 0.7) also graces Capricornus these evening and can be seen to 10:30pm at the beginning of the month but only until 9pm on the 30th.

**Uranus** (magnitude 5.6) is at opposition on the 5th in the southern part of Aries.

A **partial lunar eclipse** on the morning of the 19th is in progress at moonset from here so we only see the initial stages of the event.

IAS member John Dolan took this detailed image of the Great Nebula in Orion, which is catalogued as M42. This is a region of star birth and deep photographs of Orion show the whole constellation is wreathed in gas and dust. The central region of M42 is illuminated by stars newly hatched in this stellar nursery. The nebula is visible to the unaided eye as a misty "star" in the Sword slung from Orion's Belt. Binoculars easily show a bright patch of light that has a very pale green tint.



# December 2021

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
		1 Neptune stationary, prograde motion resumes	2 crewed <i>Starliner</i> mission planned to <i>ISS</i> this month	3 AM: Mars 4¼° upper right of lunar crescent 23.4 hours from New	4 07h 43m  total solar eclipse (not from IRL/UK) & closest New Moon of the year	5
6 St Nicholas Day PM: Venus 6¼° to upper left of Moon	7 PM: Saturn 8° to upper left of Moon	8 Venus is at greatest brilliancy on Dec. 9th planned Soyuz MS-20 space tourist flight to <i>ISS</i>	9 PM: Jupiter 6½° to upper right of Moon favourable libration at W lunar limb for M. Crisium	10 Human Rights Day	11 01h 36m  the First and Last Quarter moon is only 8% as bright as the Full Moon	12
13 earliest sunset at Dublin, 16h 06m	14 Geminid meteor shower peak, 07h 1971: first CME identified on data from the OSO 7	15 Jupiter moves into Aquarius Carrington rotation number 2252 begins	16 Mars moves into Scorpius 5.5 <sup>m</sup> star occulted by the asteroid 11395 1998 <sub>XN77</sub> for parts of Ireland & UK	17 PM: Moon is not far from the Hyades & Aldebaran	18	19 04h 36m  smallest Full Moon of the year (29' 27")
20	21 winter solstice, 16h 00m	22 Ursid meteor shower peak, 15h	23 Mercury now becoming visible in the evening sky	24 PM: Moon is in the Sickle of Leo Christmas Eve (Federal Holiday, US)	25 Mars moves into Ophiuchus <b>Christmas Day</b>	26 Boxing Day / St Stephen's Day
27 02h 24m  <b>Bank Holiday</b> in lieu of 25th AM: Mars 4¼° to upper left of Antares 1571: Johannes Kepler	28 <b>Bank Holiday</b> in lieu of 26th PM: Mercury and Venus are 4½° apart	29	30 latest sunrise, at Dublin, 08h 40m	31 AM: Mars 7° to Moon's lower left New Year's Eve (Federal Holiday, US)		

## The sky this month

*Evening* - Mercury (at end of Dec.), Venus, Jupiter, and Saturn

*Morning* - Mars

**Mercury** may be spotted low in the south-west evening sky during the last few days of December when it sets about 1½ hours after the Sun.

**Venus** rises to greatest brilliancy in the evening sky this month as its phase slims to a thin crescent. It sets 2½ hours after the Sun to begin with, but gradually slips from view earlier as the month progresses.

**Mars** (magnitude 1.6) rises roughly an hour before the Sun all month and will be still somewhat low as twilight brightens. The disk only measures less than 4 arc-seconds so is too small to make out any surface detail.

**Jupiter** (mag. -2.2) and **Saturn** (mag. 0.7) both set a few hours after the Sun on these evenings, and remain a fine sight through the telescope during December.

The gibbous moon doesn't set until just after 3am on the night of the **Geminids** peak on December 13/14 and so will wash out all but the brighter meteors.

This colour image of the region known as NGC 2264 — an area of sky that includes the sparkling blue baubles of the Christmas Tree star cluster and the Cone Nebula — was created from data taken through four different filters with the Wide Field Imager at ESO's La Silla Observatory, 2400 m high in the Atacama Desert of Chile in the foothills of the Andes. The picture shows a region about 30 light-years across. Credit: ESO

2021 rise/set times for the Sun and planets at Dublin (www.timeanddate.com gives day-by-day detail for your location)

Mth	Day	Sun				Mer					Ven					Mars					Jup				Sat			
		B/CT	Rise	Set	E/CT	Rise	Set	Mag.	D"	Ph.	Rise	Set	Mag.	D"	Ph.	Rise	Set	Mag.	D"	Ph.	Rise	Set	Mag.	D"	Rise	Set	Mag.	D"
Jan	01	07:58	08:41	16:17	17:00	09:25	16:38	-1.0	4.84	0.979	07:11	14:51	-3.9	10.70	0.941	12:14	02:29	-0.2	10.42	0.891	09:54	18:08	-2.0	32.89	09:50	18:01	0.6	15.25
Jan	15	07:52	08:33	16:38	17:18	09:27	17:58	-0.9	5.65	0.839	07:37	15:07	-3.9	10.39	0.959	11:28	02:13	0.1	9.11	0.886	09:07	17:31	-1.9	32.57	08:59	17:15	0.6	15.17
Jan	31	07:33	08:11	17:07	17:45	08:30	18:37	0.7	8.59	0.229	07:45	15:46	-3.9	10.12	0.975	10:40	02:00	0.4	7.92	0.886	08:13	16:50	-2.0	32.48	08:01	16:23	0.6	15.16
Feb	01	07:32	08:10	17:09	17:47	08:24	18:32	1.1	8.85	0.185	07:45	15:49	-3.9	10.10	0.976	10:37	01:59	0.4	7.86	0.886	08:10	16:48	-2.0	32.48	07:58	16:20	0.6	15.16
Feb	14	07:09	07:45	17:34	18:11	06:59	16:34	2.6	10.20	0.084	07:35	16:30	-3.9	9.93	0.986	10:00	01:50	0.7	7.10	0.889	07:26	16:14	-2.0	32.63	07:10	15:38	0.7	15.23
Feb	28	06:40	07:15	18:02	18:37	06:23	15:28	0.2	7.98	0.448	07:15	17:17	-3.9	9.80	0.994	09:23	01:43	0.9	6.43	0.895	06:38	15:38	-2.0	33.01	06:19	14:51	0.7	15.37
Mar	01	06:38	07:13	18:04	18:39	06:22	15:27	0.2	7.83	0.469	07:13	17:21	-3.9	9.79	0.994	09:20	01:42	0.9	6.39	0.896	06:34	15:36	-2.0	33.05	06:16	14:48	0.7	15.39
Mar	15	06:05	06:40	18:30	19:05	06:11	15:52	0.0	6.32	0.682	06:47	18:08	-3.9	9.71	0.999	08:47	01:34	1.1	5.85	0.903	05:46	14:58	-2.0	33.67	05:24	14:01	0.7	15.59
Mar	31	05:26	06:01	18:59	19:35	05:51	17:09	-0.4	5.38	0.849	06:13	19:01	-4.0	9.68	1.000	08:14	01:23	1.3	5.35	0.913	04:50	14:15	-2.1	34.66	04:24	13:06	0.7	15.91
Apr	01	05:23	05:59	19:01	19:37	05:50	17:15	-0.5	5.34	0.859	06:11	19:04	-4.0	9.68	0.999	08:13	01:22	1.3	5.32	0.914	04:46	14:12	-2.1	34.73	04:21	13:03	0.7	15.93
Apr	15	04:48	05:26	19:26	20:04	05:28	18:59	-1.7	5.03	0.986	05:42	19:52	-3.9	9.72	0.996	07:49	01:08	1.4	4.97	0.923	03:56	13:32	-2.1	35.86	03:28	12:13	0.7	16.26
Apr	30	04:12	04:53	19:53	20:34	05:11	21:17	-1.2	5.57	0.860	05:16	20:43	-3.9	9.82	0.988	07:30	00:50	1.5	4.65	0.934	03:02	12:47	-2.2	37.32	02:31	11:18	0.7	16.67
May	01	04:10	04:51	19:55	20:36	05:10	21:25	-1.1	5.66	0.833	05:15	20:47	-3.9	9.83	0.987	07:29	00:48	1.6	4.63	0.934	02:58	12:43	-2.2	37.42	02:27	11:14	0.7	16.69
May	15	03:41	04:25	20:19	21:04	05:10	22:36	0.1	7.64	0.425	05:00	21:33	-3.9	10.00	0.975	07:17	00:25	1.6	4.40	0.944	02:07	11:58	-2.3	39.02	01:33	10:21	0.6	17.09
May	31	03:15	04:05	20:42	21:32	05:01	21:48	2.8	11.04	0.091	05:02	22:13	-3.8	10.28	0.955	07:07	23:51	1.7	4.17	0.954	01:07	11:03	-2.4	41.06	00:30	09:18	0.6	17.55
Jun	01	03:14	04:04	20:44	21:33	04:58	21:41	3.0	11.23	0.077	05:03	22:15	-3.8	10.31	0.953	07:07	23:49	1.7	4.16	0.955	01:03	11:00	-2.4	41.19	00:26	09:14	0.6	17.58
Jun	15	03:04	03:57	20:56	21:48	04:06	19:51	4.9	11.97	0.019	05:27	22:30	-3.8	10.66	0.930	07:01	23:17	1.8	4.00	0.963	00:09	10:08	-2.5	43.10	23:27	08:17	0.5	17.94
Jun	30	03:09	04:01	20:57	21:49	03:06	18:57	1.0	9.02	0.252	06:09	22:25	-3.8	11.14	0.901	06:57	22:39	1.8	3.86	0.972	23:07	09:08	-2.6	45.12	22:27	07:14	0.4	18.27
Jul	01	03:10	04:02	20:56	21:48	03:04	18:57	0.8	8.80	0.274	06:12	22:24	-3.8	11.18	0.899	06:57	22:36	1.8	3.86	0.972	23:03	09:04	-2.6	45.26	22:23	07:09	0.4	18.29
Jul	15	03:28	04:16	20:46	21:34	02:54	19:37	-0.7	6.27	0.660	06:58	22:04	-3.9	11.77	0.866	06:54	21:58	1.8	3.76	0.979	22:07	08:04	-2.7	46.95	21:26	06:09	0.3	18.50
Jul	31	03:56	04:40	20:22	21:06	04:24	20:31	-2.1	5.05	0.996	07:50	21:31	-3.9	12.62	0.825	06:51	21:12	1.8	3.67	0.986	21:01	06:52	-2.8	48.40	20:20	04:59	0.2	18.60
Aug	01	03:58	04:42	20:21	21:04	04:32	20:32	-2.1	5.02	0.998	07:53	21:29	-3.9	12.68	0.822	06:50	21:09	1.8	3.66	0.986	20:57	06:47	-2.8	48.47	20:16	04:55	0.2	18.60
Aug	15	04:26	05:05	19:53	20:32	06:22	20:24	-0.7	5.12	0.908	08:37	20:55	-4.0	13.62	0.782	06:48	20:28	1.8	3.61	0.991	19:59	05:42	-2.9	49.07	19:19	03:54	0.2	18.55
Aug	31	04:56	05:33	19:17	19:53	07:54	19:47	-0.1	5.81	0.751	09:27	20:16	-4.0	14.96	0.732	06:45	19:40	1.8	3.57	0.996	18:53	04:26	-2.9	48.91	18:14	02:45	0.3	18.35
Sep	01	04:58	05:35	19:14	19:51	07:59	19:44	-0.1	5.87	0.740	09:30	20:13	-4.0	15.06	0.729	06:44	19:37	1.8	3.57	0.996	18:49	04:22	-2.9	48.87	18:10	02:40	0.3	18.34
Sep	15	05:24	05:59	18:41	19:16	08:46	19:01	0.1	7.08	0.557	10:14	19:40	-4.1	16.57	0.682	06:42	18:55	1.7	3.55	0.998	17:51	03:17	-2.8	47.97	17:13	01:41	0.4	18.06
Sep	30	05:51	06:25	18:04	18:39	08:24	18:04	1.3	9.38	0.202	11:00	19:08	-4.2	18.64	0.626	06:40	18:11	1.7	3.55	1.000	16:50	02:11	-2.7	46.42	16:13	00:40	0.5	17.68
Oct	01	05:52	06:27	18:02	18:36	08:17	18:00	1.5	9.55	0.173	11:03	19:07	-4.3	18.80	0.622	06:40	18:08	1.7	3.55	1.000	16:45	02:07	-2.7	46.30	16:09	00:36	0.5	17.65
Oct	15	06:17	06:52	17:29	18:04	05:51	17:09	2.3	9.30	0.092	11:43	18:46	-4.4	21.36	0.564	06:38	17:27	1.6	3.58	1.000	15:49	01:09	-2.6	44.50	15:14	23:36	0.5	17.26
Oct	31	06:46	07:22	16:55	17:31	05:39	16:37	-0.8	5.96	0.763	12:12	18:36	-4.6	25.33	0.488	06:38	16:41	1.7	3.62	0.998	14:47	00:08	-2.5	42.31	14:12	22:35	0.6	16.80
Nov	01	06:48	07:24	16:53	17:30	05:43	16:35	-0.8	5.84	0.790	12:13	18:36	-4.6	25.63	0.483	06:38	16:39	1.7	3.62	0.998	14:43	00:04	-2.5	42.17	14:08	22:32	0.6	16.77
Nov	15	07:12	07:51	16:28	17:07	07:02	16:14	-1.0	4.89	0.971	12:13	18:41	-4.7	30.60	0.402	06:39	16:01	1.6	3.68	0.996	13:49	23:12	-2.4	40.31	13:15	21:41	0.7	16.39
Nov	30	07:35	08:16	16:11	16:53	08:28	16:05	----	4.64	1.000	11:46	18:47	-4.9	38.17	0.295	06:40	15:23	1.6	3.76	0.991	12:53	22:23	-2.3	38.48	12:18	20:47	0.7	16.03
Dec	01	07:37	08:18	16:11	16:52	08:33	16:05	-1.3	4.64	0.999	11:43	18:47	-4.9	38.78	0.287	06:40	15:21	1.6	3.77	0.991	12:50	22:20	-2.3	38.36	12:14	20:44	0.7	16.01
Dec	15	07:52	08:35	16:06	16:49	09:34	16:27	-0.8	4.83	0.970	10:48	18:35	-4.8	48.74	0.164	06:41	14:50	1.6	3.86	0.986	11:58	21:37	-2.2	36.89	11:22	19:56	0.7	15.72
Dec	31	07:58	08:41	16:16	16:59	09:55	17:35	-0.7	5.79	0.804	09:09	17:40	-4.3	60.46	0.030	06:40	14:20	1.5	3.99	0.978	11:00	20:51	-2.1	35.49	10:23	19:03	0.7	15.48

Times are in UT - add 1 hour when Summer Time is in effect. B/CT and E/CT are beginning + end of Civil Twilight. Mag = planet's magnitude, D" is diameter in arc-seconds, and Ph is the illuminated phase