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SKY GUIDE

Astronomical guide for December 2024

The most up-to-date guide to planetary and lunar activity, comet news and space wonders.

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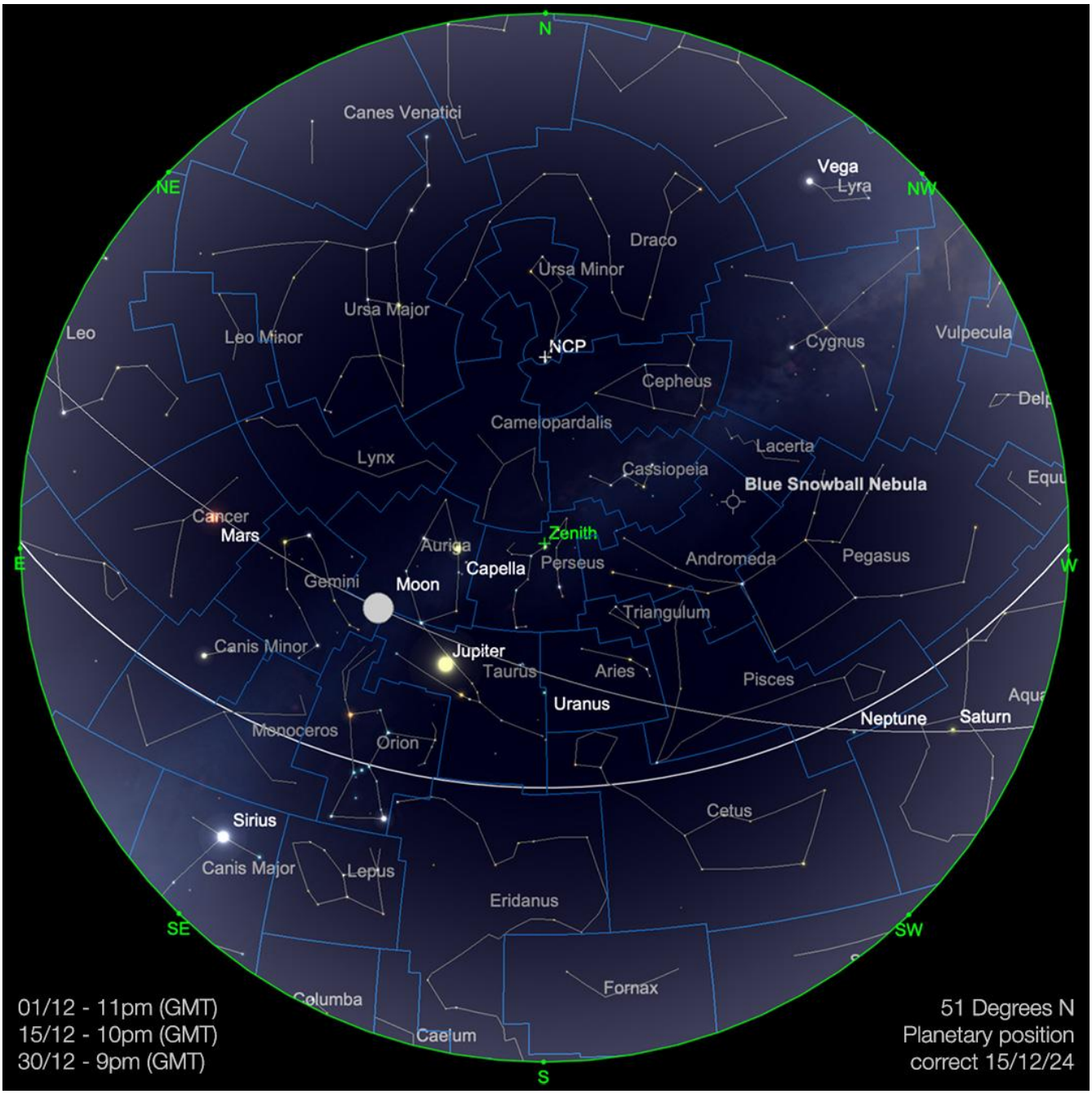
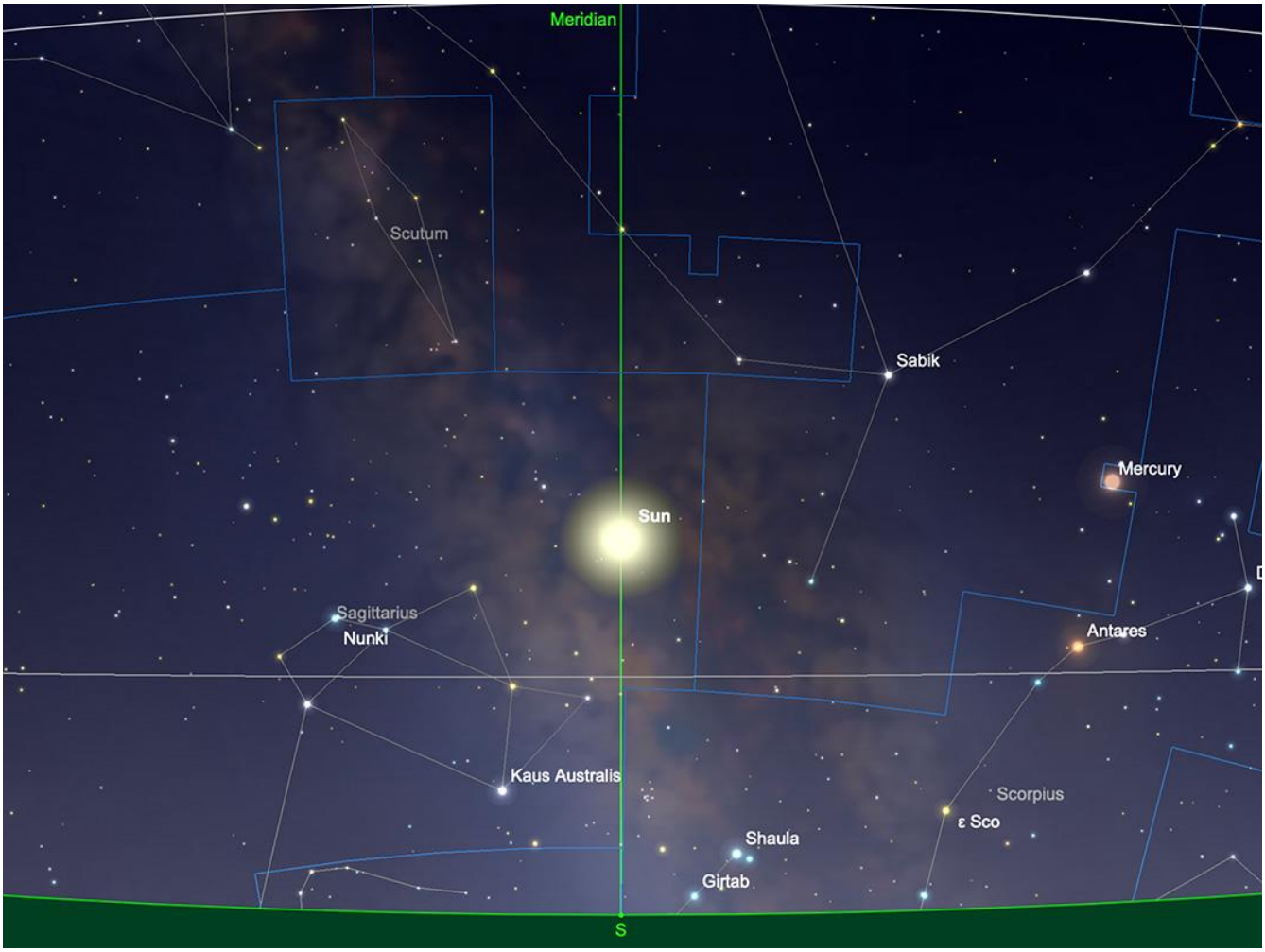
Expand your horizon



Telescope House hosted by Bresser UK December 2024 Sky Guide

As is now traditional, at this point in December's sky guide we pause to reflect on exactly where the year went? When you're dealing with the onward march of our planet around our solar system, it seems to go especially quickly. For inhabitants of both the northern and southern hemispheres, December always marks the two opposing solstices: Winter for the north; Summer for the south. This December, the Northern Hemisphere will experience the Winter Solstice on December 21st, marking the shortest day and longest night of the year. At this point, the Sun reaches its southernmost position in the sky along the ecliptic, at present located in the constellation Sagittarius, near the border with Ophiuchus. For those in northern latitudes—such as around 51°—the daylight hours are significantly reduced, with roughly twice as many hours of darkness as sunlight. Above the Arctic Circle, the Sun doesn't rise at all, resulting in continuous darkness. Conversely, in the Southern Hemisphere, December 21st marks the Summer Solstice, bringing the longest day of the year and the height of summer.

No matter where you are, we wish you a peaceful end to 2024 and clear skies, as there's plenty to see above us this coming month…



The Sun at transit point, on the day of the Winter Solstice. Image created with SkySafari 6 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

The Solar System

The Sun

Solar cycle 25 shows no sign of abating in activity. It is thought that the current cycle will peak during the first half of next year and possibly start to tail off at the beginning of 2026. However, current activity is help performing predicted values, and it will be interesting to see whether this trend continues. Yet again, in the past month, the Sun has produced some significant CME activity, resulting in further spectacular lower level auroral displays - most recently over the night of 10th/11th November. Given the current state of sunspot activity, it is not unreasonable to think that we may have further lower latitude aurora waiting round the corner for us. However, such activity is difficult to forecast over longer periods and we may only get a few hours warning of its potential.

As we've suggested in previous sky guides, signing up to the AuroraWatch app, produced by Lancaster University in the UK, is recommended for those looking for warnings of impending auroral events. Popular solar websites such as www.spaceweather.com and Michel Deconinck's monthly newsletter: https://astro.aquarellia.com/doc/Aquarellia-Observatory-forecasts.pdf cover many aspects of

solar observations and are also sources of a great deal of useful information on the current state of play with our parent star.

Mercury

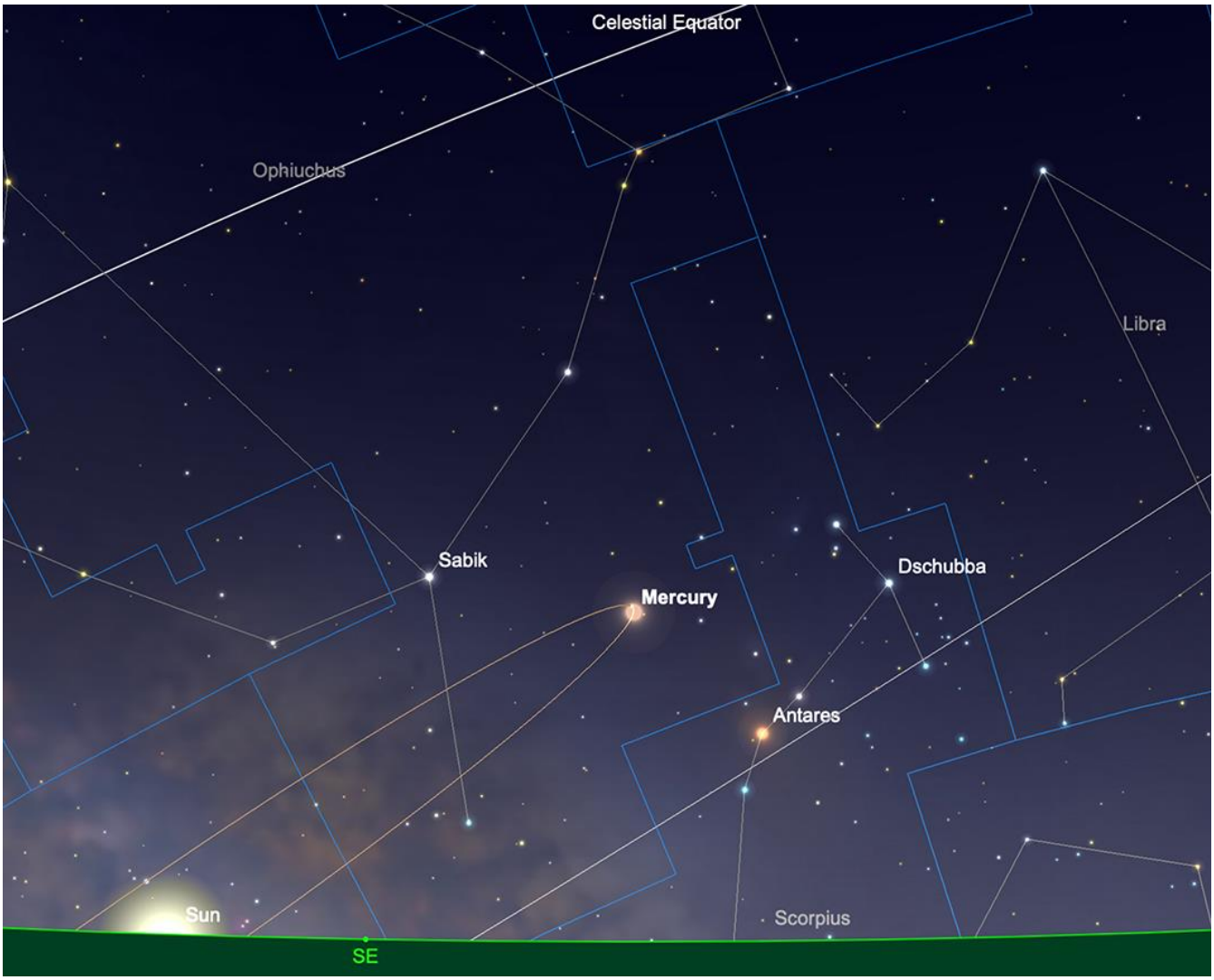
We start with the solar system's innermost planet in a very poor position for observation. Mercury - theoretically at least - can be found around 10° to the east of the Sun in the evening sky on the 1st. However, it will be illuminated by only 8% and subsequently very dim at +2.4 magnitude. Mercury will be lost in the glare of sunset as a result.

Mercury reaches inferior conjunction (in between the Earth and the Sun, from our perspective), on December 6th. After this point it will re-emerge as a morning target and due to the orientation of the eclectic plane from higher northern hemisphere latitude will be in a considerably better position for observation.

By the time we get to mid-December, Mercury can be found standing a little under 12° high in the south east as the Sun rises (as observed from 51° north). By this point the planet will display an 8.4 arc second diameter disc, illuminated by just under 29% and showing a brightness of +0.5 magnitude.

Mercury continues its separation from the Sun towards the month's end and comes to maximum western elongation on Christmas Day. At dawn on the 25th, Mercury will be found at an altitude of just over 12°, shining at a visual magnitude of -0.3 and displaying 64% illuminated, 6.6 arc second diameter disc. The planet should be visible in binoculars and small telescopes by this point, as long as your eastern horizon and sky conditions are clear enough.

By the time we get to the end of the year, Mercury will have brightened fractionally to -0.4 magnitude and although it will have shrunk a little to 5.9 arc seconds diameter, will have increased its phase to over 76% illumination. Rising a couple of hours before the Sun, Mercury will be found at an altitude of just over 10° (again, as observed from 51° north), as the Sun rises.



Mercury at Greatest Western Elongation, Dec 25th 2024. Image created with SkySafari 6 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

Venus

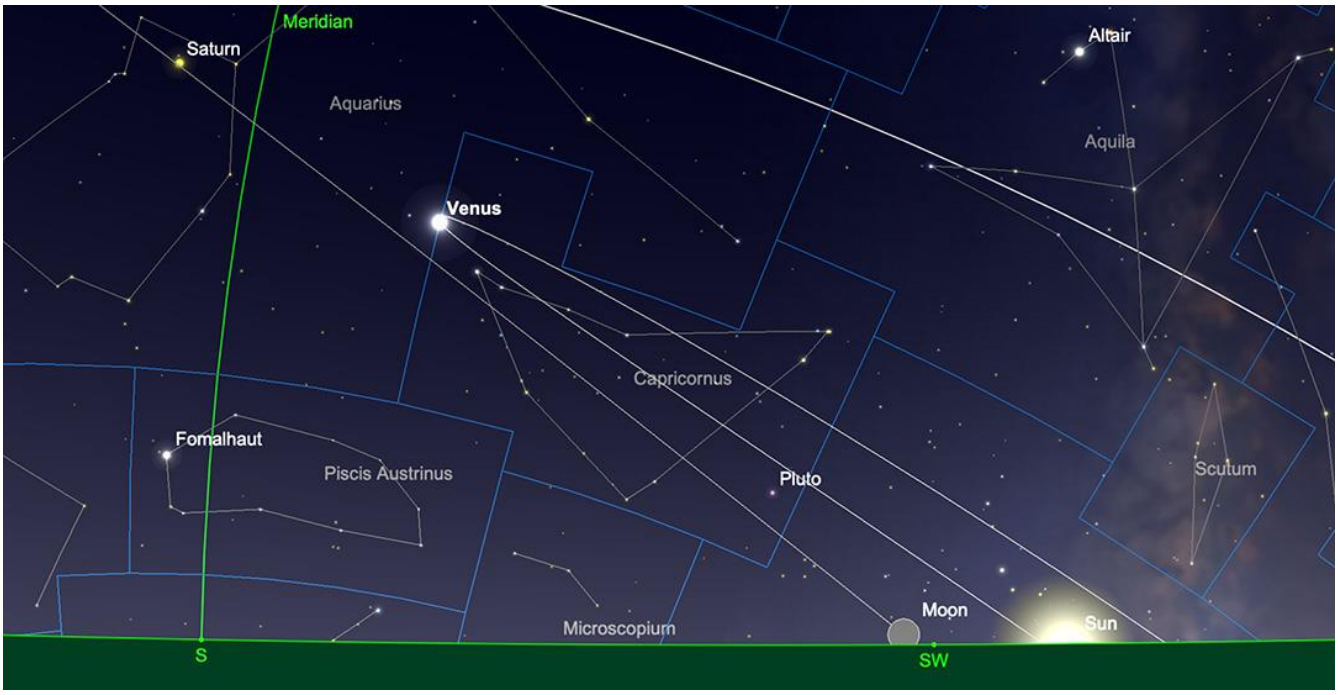
In previous months, Venus has hugged the horizon for those observers in mid-northern latitudes. Although bright, its elevation has been very poor and subsequently will only have been noticed by those with exceptionally clear Westerly Horizons. However, Venus is now climbing out of the most southerly parts of the ecliptic and well a resident of Sagittarius at the month beginning will soon begin to rise in altitude for northern hemisphere observers and become much more apparent in the evening skies.

We start December with Venus displaying a brilliant -4.2 magnitude, 17 arc second diameter disc. The planet will sit around 14 1/2° above the horizon (as observed from 51° north) as the Sun sets on the evening of the 1st.

By the middle of December, Venus will have crossed over the borders into neighbouring Capricornus and although will not have gained anything in terms of brightness, staying static at -4.2 magnitude, will now display a disk of just over 19 arc seconds diameter. The planet will stand just under 19° high in the south as the Sun sets and by this time will become much more prominent for casual observers.

By the time we reach the end of the year, Venus will have crossed over the borders from Capricornus, into Aquarius. By this point it will be much more prominent, displaying a visual magnitude of -4.4 and the apparent size of 22 arc seconds. The planet will stand just under 25° high in the SSW at sunset (again, as observed from 51° north). Although this altitude is below the “magic” 30° plus, which is generally

considered to be the point where atmospheric conditions dramatically improve for higher power telescopic observation, if skies are clear and the atmosphere steady it will be well worth taking a look at Venus. By this point, the planet will be barely 10 days off greatest eastern elongation and well separated from the Sun as a result. The criteria for northern hemisphere telescopic observation of Venus improves yet further towards the end of January 2025, when Venus crosses over the celestial equator in Pisces and will be drawing closer to the Earth. Naturally, will cover this in greater detail in future sky guides.



Venus, sunset, 31st December. Image created with SkySafari 6 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

Mars

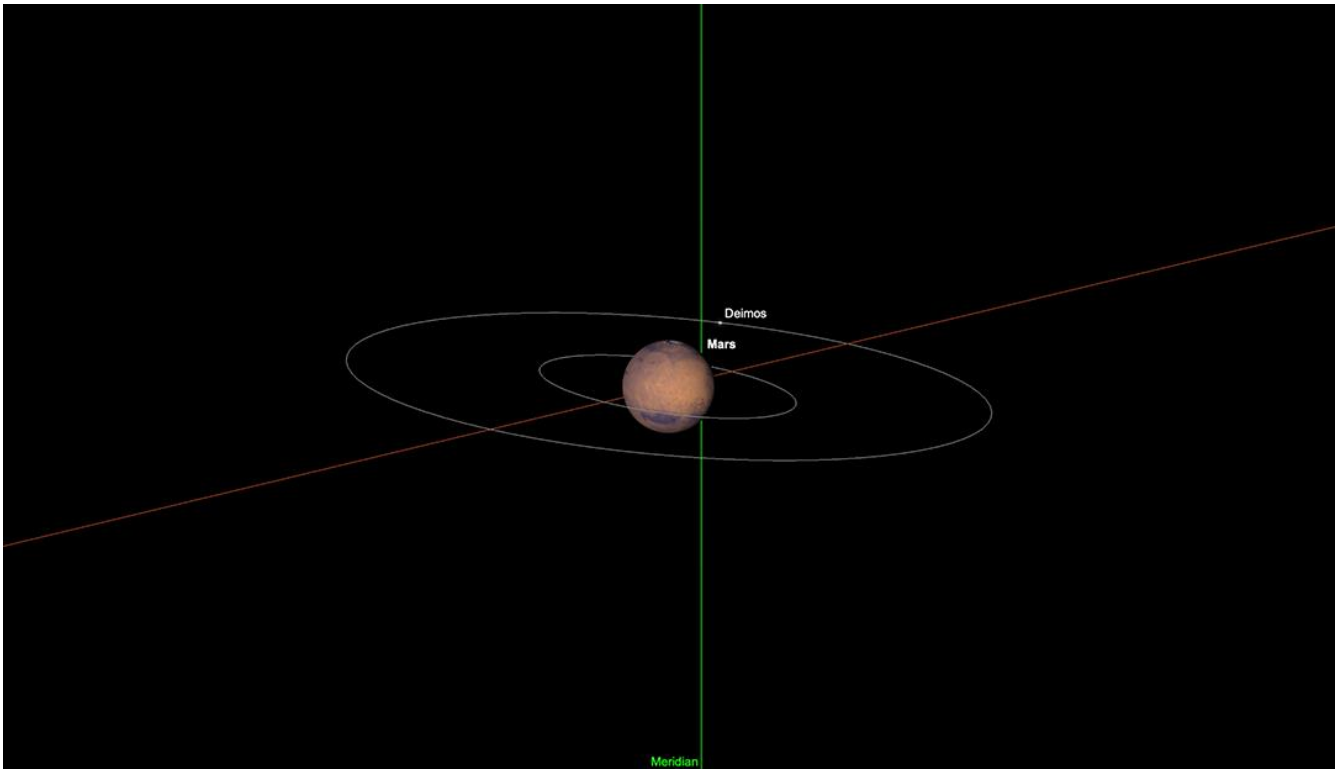
It is generally recognised that the six weeks either side of a Martian opposition represents the most significant change in brightness and prominence of Mars. Compared to the gas giant outer worlds of our solar system, Mars is absolutely tiny in size, so needs reasonable proximity to Earth for a significant change in brightness to occur. Mars comes to opposition in mid-January, so the 1st of December represents the beginning of this six week cycle. The evening of December 1st sees Mars a resident of Cancer, shining at a visual magnitude of -0.5 and displaying an apparent size of 11.6 arc seconds. Mars is just over 120,000,000 km away from Earth at the beginning of December. The planet will rise at a little after 8 pm on the evening of the first and transit at just past 4 am the following morning (all times GMT).

Mars begins to go retrograde, always the sign of an approaching opposition, at the end of the first week of December. The planet appears to track “backwards” against its proper motion through the sky, as it approaches opposition and the closest point to Earth. Mars is (of course) not moving backwards in the solar system. Retrograde motion is merely a line of sight effect caused by the Earth catching up and “overtaking” an outer planet on its faster interior orbit.

By the time we get to mid-December, Mars has brightened to -0.8 magnitude and now shows the apparent diameter of 13 arc seconds. The Earth is rapidly closing in on Mars and is now some 108,000,000 km away from the Red Planet.

By the time we get to the end of 2024, Mars has brightened again and is now -1.2 magnitude and displays a 14 arc second diameter disc. By this point in time, we are around 98,000,000 km from Mars. The red planet will rise at a little after 5:30 pm and will transit it just before 2 am the following morning. Although it will mean staying up late (or getting up very early), it’s always worth doing so to observe Mars at transit, during this cycle towards opposition.

The planet will be just under 63° elevation at the end of the year, when it reaches transit point (as observed from 51° north) and as such, in an ideal position for higher power telescopic observation and imaging from the northern hemisphere.



Mars at transit point, 31st December. Image created with SkySafari 6 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

Jupiter

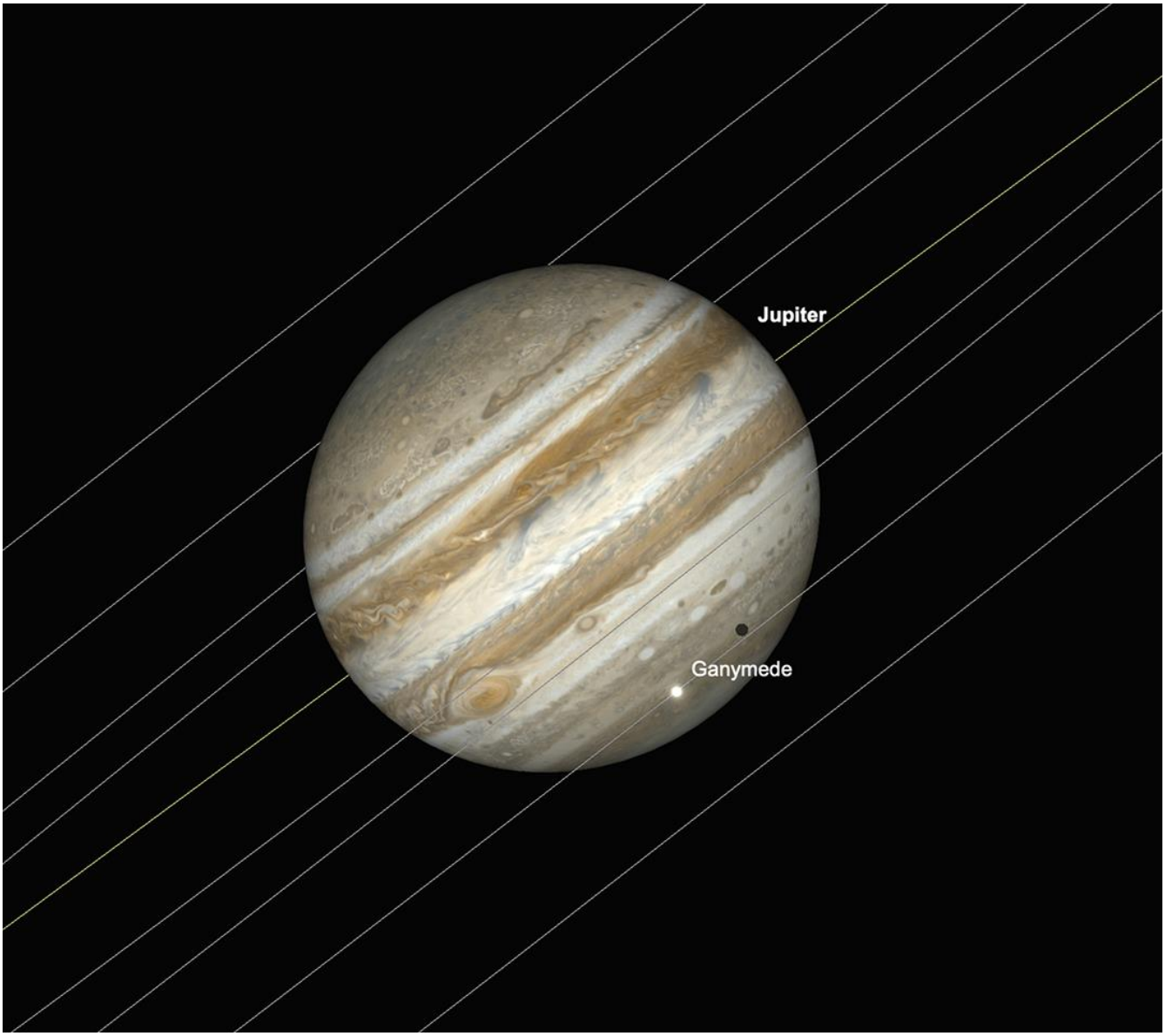
Jupiter reaches opposition in early December and is subsequently at its best. The 1st of December finds Jupiter a resident of Taurus, shining at a very impressive -2.8 magnitude and displaying a generous 48.2 arc second diameter disc. While Jupiter comes to opposition on the 7th of December, these figures won't change significantly for the month. As we previously mentioned in regards to Mars, Jupiter and the outer gas giants do not appear to vary as significantly in diameter and apparent brightness as Mars does.

Jupiter will rise at just after 4 pm (GMT) on the night of opposition, transiting at a little after midnight. Like its neighbour Mars, Jupiter is extremely well placed for northern hemisphere observation and attains an altitude of just under 61 1/2° above the horizon, as it transits on opposition night (as observed for 51° north).

By the middle of December, the planet is still at a visual magnitude of -2.8 and has shrunk by a minuscule .1 of an arc second from the month's beginning. Jupiter will rise at a little before 3:30 pm on the 15th, transiting at just before 11:30 pm.

Moving on to the end of 2024 and Jupiter will have dimmed almost unperceivably to -2.7 magnitude and still displays a healthy 47 arc second diameter disc. By this point in time it will rise at a little after 2:15 pm and transit at a little after 10:15 pm. This makes Jupiter an absolutely ideal target for those in the northern hemisphere with any type of Telescope. Time spent at the eyepiece observing Jupiter is almost never wasted, no matter what the observing conditions are. But for those of us in the northern hemisphere, who have been in a less than ideal observational position, as far as the outer planets are concerned over the past few years, it is time to reap the benefits. Make the most of Jupiter at its best this month.

As usual, around opposition, we like to list some Jovian transit events that may be of interest (all times GMT). The evening of first of December sees a mutual Great Red Spot, Ganymede and Ganymede shadow transit starting at around 7:30 pm. The evening of the 3rd of December sees a GRS, Io and Io shadow transit starting at around 9:30 pm. The evening of the 8th of December sees another GRS, Ganymede and Ganymede shadow transit, beginning at around 10:30 pm. The evening of December 10th sees another GRS, Io and Io shadow transit, starting at just before 10:30 pm. December 16th sees a GRS, Europa and Europa shadow transit starting at just after 6:30 pm. December 23rd sees a brief GRS, Europa and Europa shadow transit event, beginning at a little before 9 pm.



Jupiter, Great Red Spot and Ganymede/Ganymede shadow transit, 8pm, 1st December 2024. Image created with SkySafari 6 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

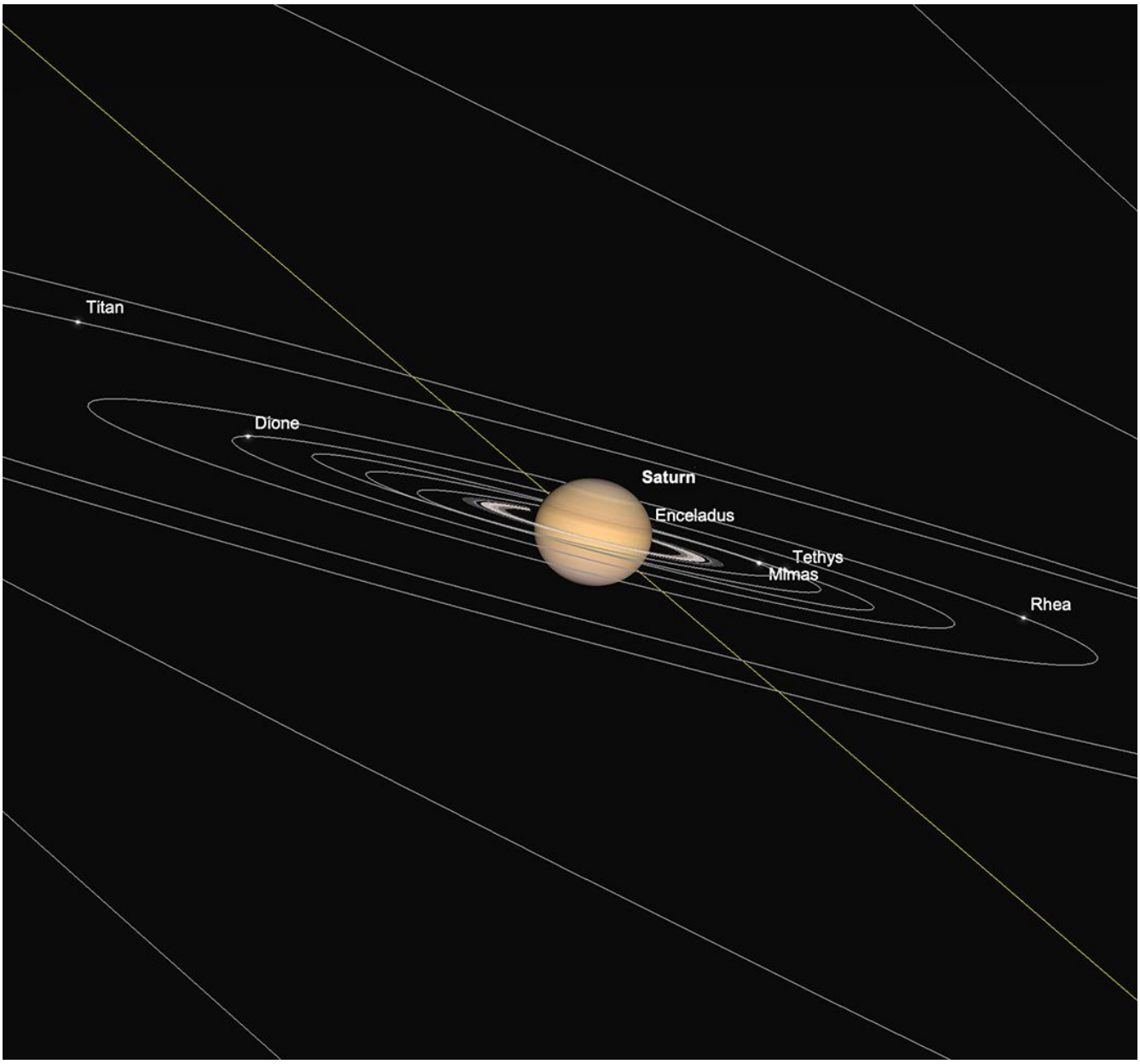
Saturn

The jewel of the solar system, Saturn, is an ideal target for observation in the early evening. The planet can be found in Aquarius during early December, at a magnitude of +1.0 and displaying an apparent size of just over 17 arc seconds diameter. The planet will transit at around 6:30 pm, when it will attain an altitude above the horizon of just over 30° (as observed from 51° north). As remarked upon previously, this puts Saturn just into an area of sky where it is less likely to be negatively affected by atmospherics. But having only just attained this elevation at its highest position in the sky, the window of observation at this point, is

brief. However, it's worth pointing out that Saturn, being intrinsically dimmer, is often remarked to appear to be less negatively affected by less than ideal atmospheric conditions, than its much brighter neighbour Jupiter. This is a bit of an illusion though: Saturn's lower contrast cloud patterns, coupled with the dominance of its ring system, tend to make observers less sensitive to atmospheric distortion than Jupiter, whose intricate cloud features require steadier conditions to be resolved clearly through a telescope.

Come mid-month, nothing has changed dramatically as far as Saturn is concerned. It is still sitting at a steady +1.0 magnitude and displays a 17 arc second diameter disc. The planet will rise at a little after midday and transit at just after 5:30 pm.

When we reach the end of 2024, Saturn will still be found in Aquarius, having dimmed fractionally to +1.1 magnitude and now displays a 16.6 arc second diameter disc. The planet will transit at a little past 4:30 pm and set at around 10pm. As we've remarked in previous years sky guides, we tend to lose Saturn in the early evening fairly quickly, so make the most of its early evening apparition during December.



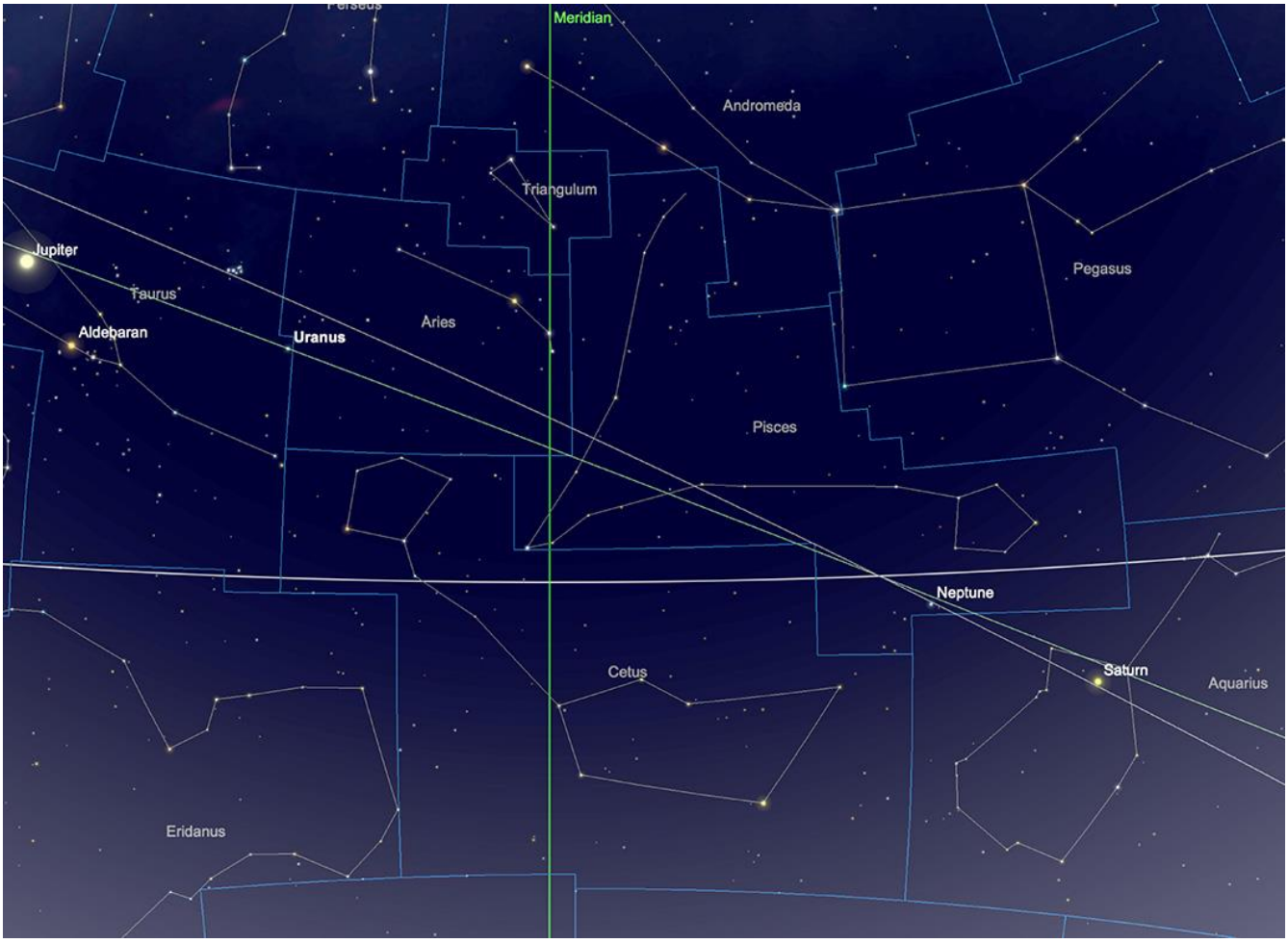
Saturn and Inner Moons, 6pm, 31st December. Image created with SkySafari 6 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

Uranus and Neptune

Of the two outer gas giants, Uranus is the best situated during December.

At just past opposition, which it reached in November 2024, the planet is a resident of Taurus and at close to maximum visual brightness at +5.6 magnitude during the middle of December. While technically it is possible to see Uranus with the naked eye, you will need very good eyesight and excellent sky conditions to be able to do so. The proximity of Uranus a little to the south-west of the Pleiades in Taurus gives a reasonable waypoint for finding it. Uranus transits at 10 pm on the evening of the 15th.

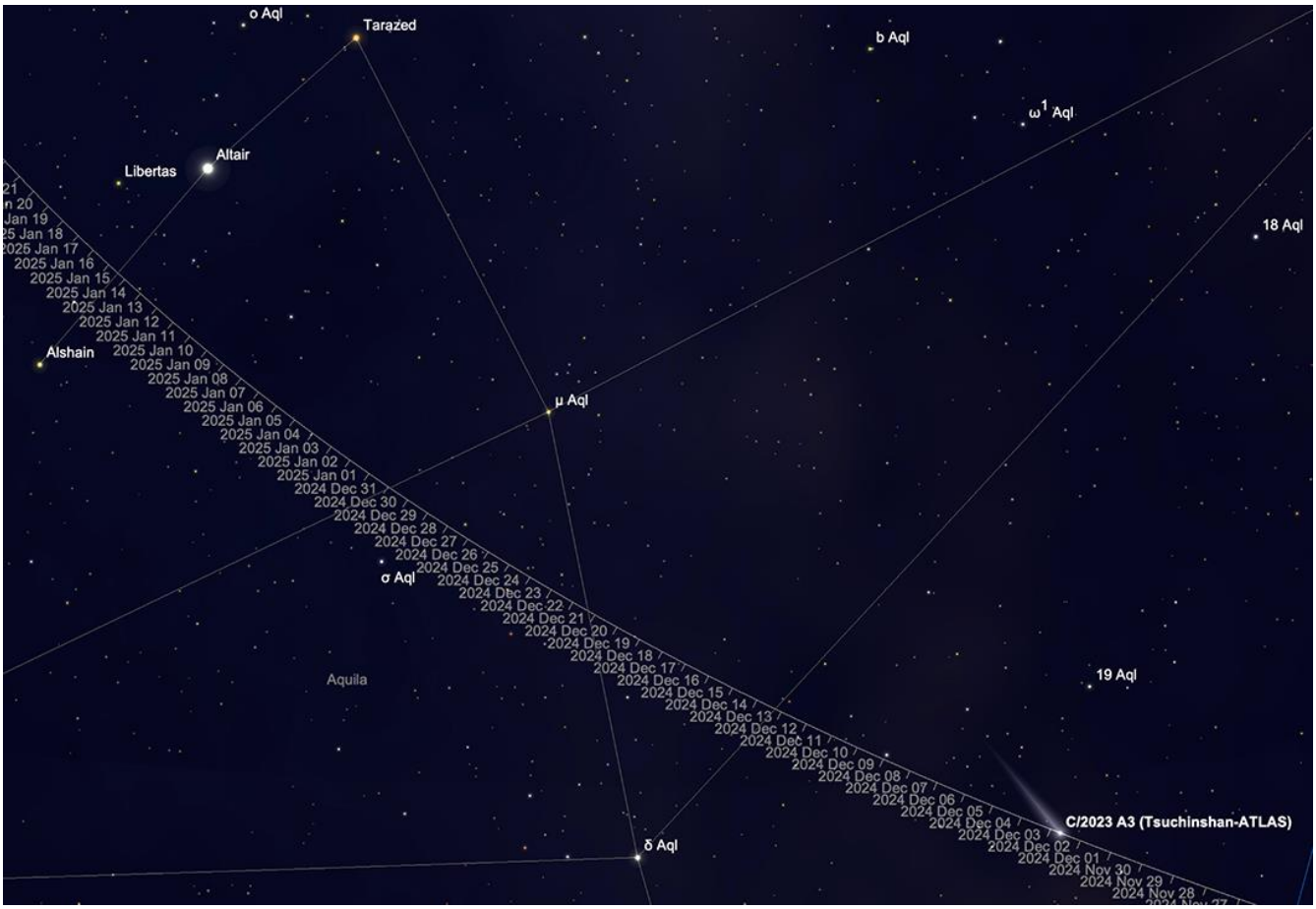
Neptune can be found in the southern part of Pisces during mid-December, not too far from the planet Saturn in neighbouring Aquarius. Unlike Uranus, Neptune can never be seen with the naked eye and is a current visual magnitude of +7.9, displaying a 2.3 arc second diameter disc in mid-December. The planet will reach transit point at a little before 6:30 pm during the middle part of the month and as such will be relatively easy to find it its best at a clement hour of the evening.



Uranus and Neptune relative sky positions, mid-December. Image created with SkySafari 6 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

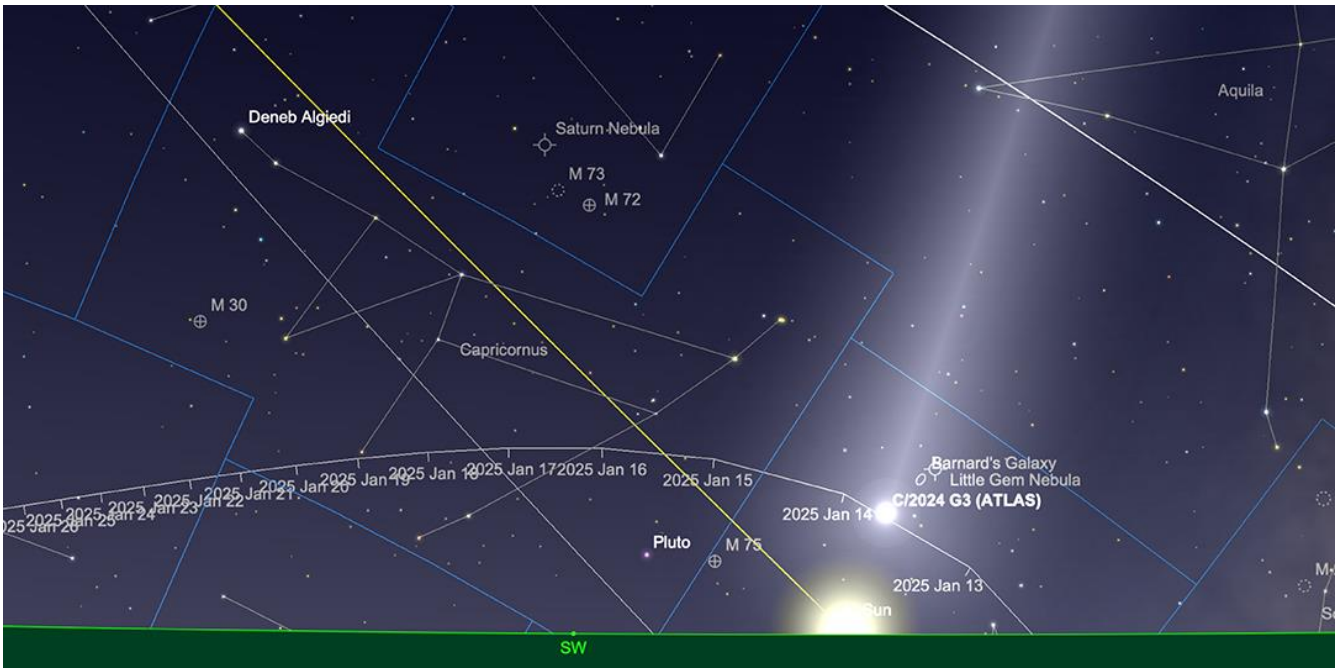
Comets

C/2023 A3 (Tsuchinshan-Atlas) is now heading out of the inner solar system and fading rapidly and will be an evening resident of Aquila during the entirety of December. Estimated to be around 9th magnitude at the beginning of the month (fading to 11th by the month's end), the comet will creep through Aquila and will be found to the south of Altair by the end of December. While not in the league of a truly "great" comet, it was an interesting object to observe at its best.



C/2023 A3 (Tsuchinshan-Atlas) path through Aquila, December 2024. Image created with SkySafari 6 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

While we may be disappointed to lose C/2024 A3, there's a new kid on the block, comet-wise: C/2024 G3 (Atlas). This looks as if it could be briefly spectacular in mid-January. Some of the higher brightness estimates of this object put its peak magnitude higher than -20 magnitude. Even median brightness predictions make it to -12 mag. The comet is going to reach perihelion very close to the Sun, so there is a reasonable chance it will not survive its encounter with the fierce environment of the very inner part of the solar system. However, if it does survive closest approach, it could be a really prominent object for a short window. As with anything cometary, we must be cautious. At time of writing, the comet is the preserve of southern hemisphere observers and just 14th magnitude and by the beginning of December, it should be around 11th magnitude. Over December it is predicted to brighten by around 6-7 magnitudes and this rate will increase even further when we start the New Year. It could be that C/2024 G3 (Atlas) will disappear in rather less than a puff of smoke, come early January. However, if this comet survives perihelion on January 13th, it could be something very special. We will have more news for you in January's sky guide.



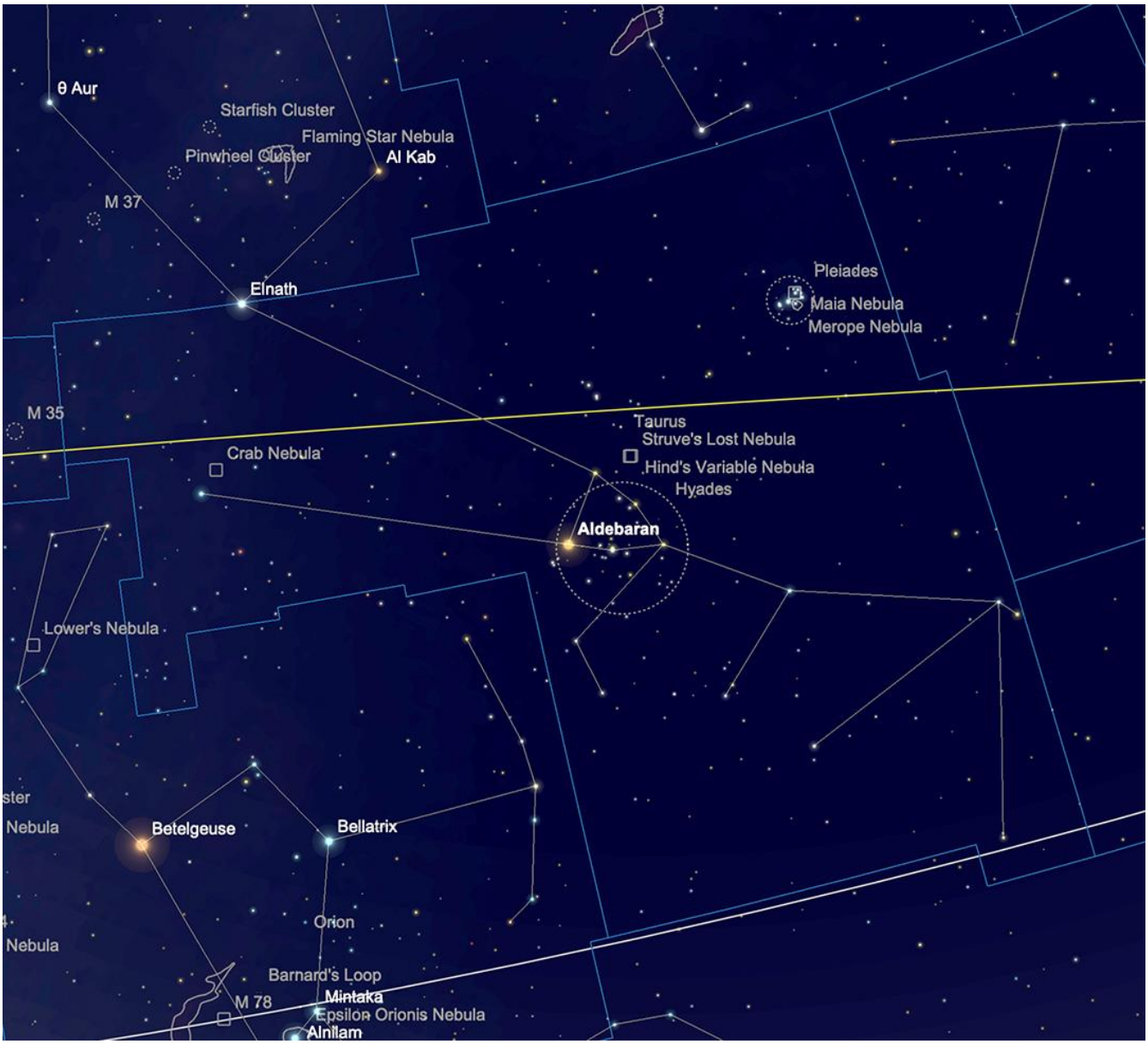
C/2024 G3 (Atlas) during mid-January 2025. Image created with SkySafari 6 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

Meteors

The annual Geminid meteor shower, peaking on the night of December 13–14th, 2024, remains a celestial highlight of the year. Offering up to 100 meteors per hour under ideal conditions (though fewer may be visible, depending on your location), the Geminids are one of the most dependable meteor showers, originating from the enigmatic "rock comet" asteroid 3200 Phaethon. This year, the shower will be active from December 4–5 through to December 17th.

The meteors appear to radiate from the constellation Gemini, making the northern hemisphere an excellent vantage point for viewing. Unfortunately, 2024's conditions are highly unfavourable, with the Moon at just past Full in neighbouring Taurus, maximising its interference, as it is above the horizon for the majority of the night. This creates less than ideal opportunities for observing and for astrophotography of the shower. However, the most luminous Geminids can pierce through Moonlight and significant light pollution, and can offer a spectacular show for both seasoned stargazers and casual observers alike.

Deep Sky Delights in Taurus



The constellation of Taurus. Image created with SkySafari 6 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

The zodiacal constellation of Taurus, The Bull, is home to some of the most outstanding deep sky objects in the sky, the most notable of these is perhaps M45, the Pleiades, or the Seven Sisters. At collective magnitude of +1.5, M45 is easily seen with the naked eye and has been recorded by numerous cultures throughout the world. The ancients knew the Pleiades by different names: Subaru in Japanese, Krittika in Hindi, Soraya in Persian, amongst many others. The Pleiades are mentioned in Homer's Odyssey and Iliad, the Bible and the Quran. It is known that cultures as far apart as the Maori and Aborigines and the Native Plains Tribes of North America had knowledge of this star cluster - which makes it pretty well-known worldwide!

M45 presents its nine major members, (named after siblings from classical Greek mythology), the "sister" stars of Merope, Sterope, Electra, Maia, Tygeta, Celaeno and Alcyone - along with the "parent" stars Altas and Pleione - to the naked eye from a very dark location, but most people with reasonable eyesight can split six under average skies. Telescopes and binoculars reveal many more of the 1000-or so members of the cluster and larger instruments and photography can pick up blue-hued reflection nebulosity surrounding the cluster - particularly around Maia and Merope. This nebulosity is caused by illumination of left-over material from the cluster's formation. The view of M45 with a widefield, low power eyepiece is one of the

most glorious sights in any telescope, though at 2 degrees in diameter, one has to be careful about eyepiece choice in order to get the outlying members in a useable field of view.

The Pleiades are thought to be around 100 million years old and lie between 430 and 440 light years away.

The Pleiades by Mark Blundell. Image used with kind permission.

Two interesting objects - or rather one, these days - lie to the north of the Pleiades: NGC 1554 - Struve's Lost Nebula and NGC 1555 - Hind's Variable Nebula.

NGC 1555, or Hind's Variable Nebula, is a reflection nebula near T Tauri (mag 9–13) in Taurus, discovered in 1852. Hind's Nebula, once easier to observe, now appears as a faint haze west of T Tauri, near a 14th-magnitude star, forming an arc in photos. T Tauri, central to NGC 1555, is a prototype for young stars, with its surrounding reflection nebulae illuminated by shifting dust clouds that cast dynamic shadows on interstellar gas.

T Tauri, at the heart of NGC 1555, is amongst the first type of young stars, emerging from the dusty outer shells of the nebula that formed them, to be definitively recognised as such. The surrounding complex features reflection nebulae, illuminated as shifting dust clouds alternately block or reveal light from the star, casting dynamic shadows across the interstellar gas.

NGC 1554, or Struve's Lost Nebula, was discovered in 1868 by Otto Wilhelm Struve and confirmed by Heinrich d'Arrest. Listed in J.L.E. Dreyer's New General Catalogue, it disappeared within a decade. NGC 1554 was definitely verified by d'Arrest, and catalogued as nebulosity nearby a 13th-magnitude star, but hasn’t been seen since, earning the name "Struve's Lost Nebula."

Dreyer described it as "variable, small, round, with a nucleus north of a 13th-magnitude star." Modern sources often group NGC 1554 with NGC 1555, though it's absent from modern sky surveys. At its reported position, 4 arc minutes west-southwest of T Tauri, a 14th-magnitude star is visible. The Lost Nebula may have been a fleeting part of the local reflection nebula complex.

NGC 1555, Hind's Variable Nebula. Adam Block/Mount Lemmon SkyCenter/University of Arizona, Creative Commons.

Next door - though not cosmically speaking - to the Pleiades is the older and more spread-out Hyades cluster. Its major naked eye members are arranged in a V-shape, which marks the head of Taurus. Again, similarly to M45, the Hyades have been known since antiquity and were traditionally seen by the Ancient Greeks as being the sisters of the Pleiades - via their shared father Atlas.

The Hyades lie 152 light years away, and as such are nearest star cluster to us on Earth (though arguably the stars in the Plough or Big Dipper in Ursa Major can actually be thought of as a cluster and are closer). The Hyades consist of over 300 individual stars and modern estimates put its age at around the 600+ million year mark - making it markedly older than the Pleiades. The Hyades share a galactic trajectory with M44, the Beehive in nearby Cancer, again suggesting a common origin point in space. However, the Beehive appears to be slightly older at 600-730 million years.

Line of sight puts Taurus' principle Alpha star Aldebaran - the eye of the Bull - within the boundaries of the Hyades, though this Red Giant is unrelated and distinctly closer to us at 65 light years.

Reaching East down the Southerly "horn" of the Bull, we come to the +3 mag star Zeta Tauri. This star is a convenient location point for another jewel of the night sky - the Crab Nebula, M1 on Messier's List.

The Crab Nebula is the remnant of a star which went Supernova in the year 1054 (to us here on Earth). This event was recorded throughout the world, from New Mexico to China. It would have been a dazzling sight, peaking at -6 mag, brighter than the planet Venus and visible in daylight. After it faded, the event receded from popular consciousness and it was nearly 700 years later, in 1731, that the object than

would become known as the Crab was discovered by Astronomer John Bevis. Messier rediscovered it when searching for the return of Halley's Comet 27 years later in 1758. First thinking the object was a comet, it was the Crab that prompted Messier to compile his list, so other comet-hunters would not be confused by these static, cloud-like objects when searching the heavens.

Lord Rosse, observing the Crab with what was then the largest telescope in the world at his Birr Castle Observatory in Ireland, in 1844, made a sketch that showed claw-like protrusions - presumably the filament structure of the outer lying regions. The object was nicknamed the Crab - and the moniker stuck.

Early 20th Century photographic observations of M1 showed that the object was expanding rapidly. This expansion was extrapolated backwards and it was noted that the object should have started its expansion around 900 years previously. A little bit of astronomical detective work ensued and the events of 1054 and the Crab were tied together.

Although a hardly dazzling +8.39 mag, the Crab is quite well condensed and as such, its surface brightness is fairly high. It can be found as a misty patch with ordinary binoculars, though larger binoculars reveal it as a definite elongated, round-edged feature. Telescopically, the texture of the Crab becomes evident in refractors of 4-inches aperture or reflectors of the 6-8-inch class. Reflectors of 16+ inches in aperture and dark skies are needed to glimpse the filament structures of M1's outlying regions and real striation in its core. Filtration will help with this object, especially in small instruments where it can sometimes be difficult to isolate the nebulosity of the object from the rich background of the Milky Way.

Photographically, the Crab Nebula is a rewarding target, with the "Hubble Palette" of H-Alpha, OIII and SII being particularly useful in bringing out the tangled, chaotic structure of the object's core, as displayed by Mark Blundell's picture below.

No-one with any form of optical equipment should ignore the Crab Nebula. While not as spectacular is the neighbouring Orion Nebula, it is the only easily-observed remnant of a Supernova that humans have actually observed in relatively recent history. Given the dearth of Supernovae in our galaxy in recent times, the Crab remains a special object to us.