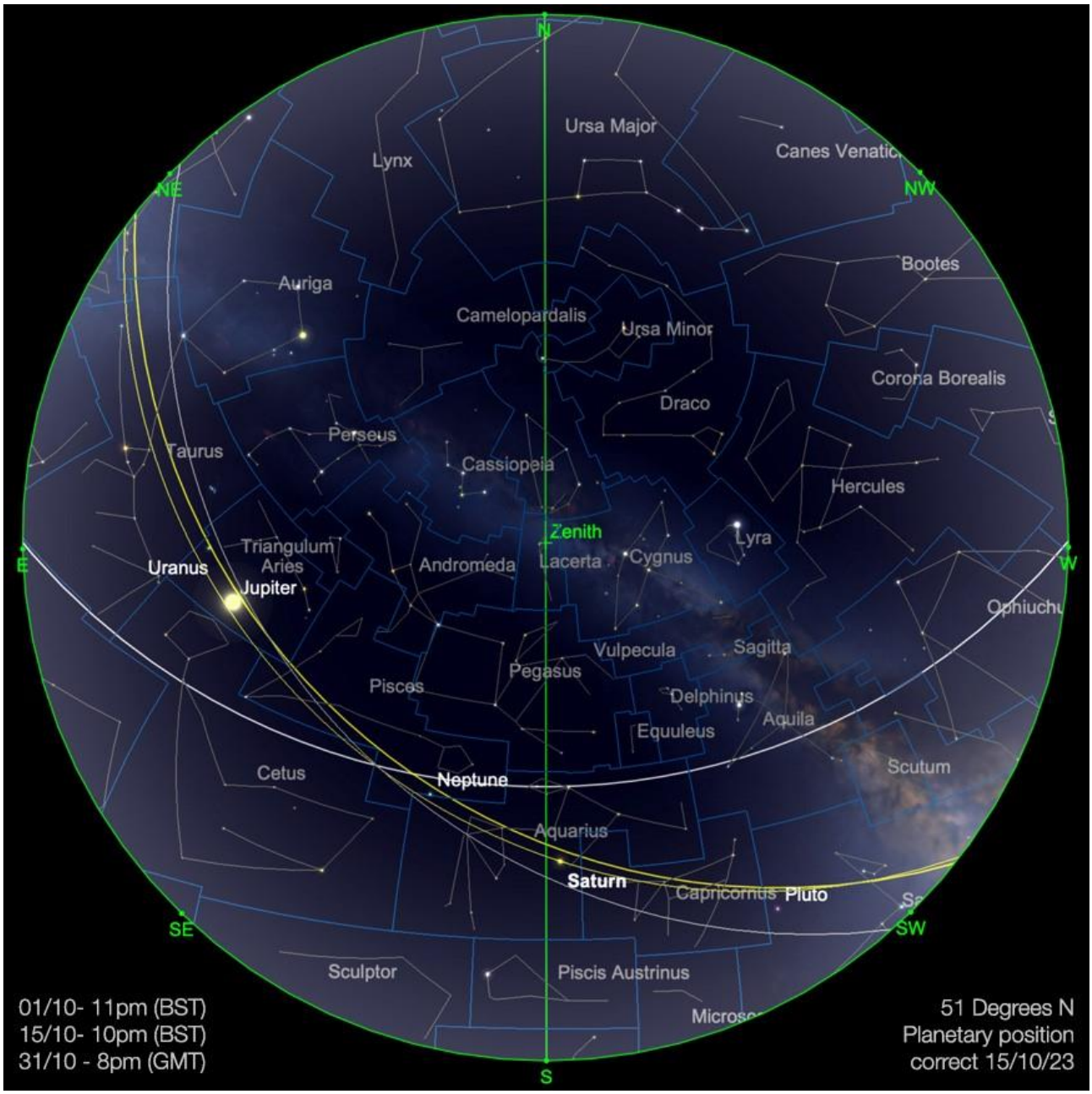
Telescope House Hosted by Bresser UK October 2023 Sky Guide



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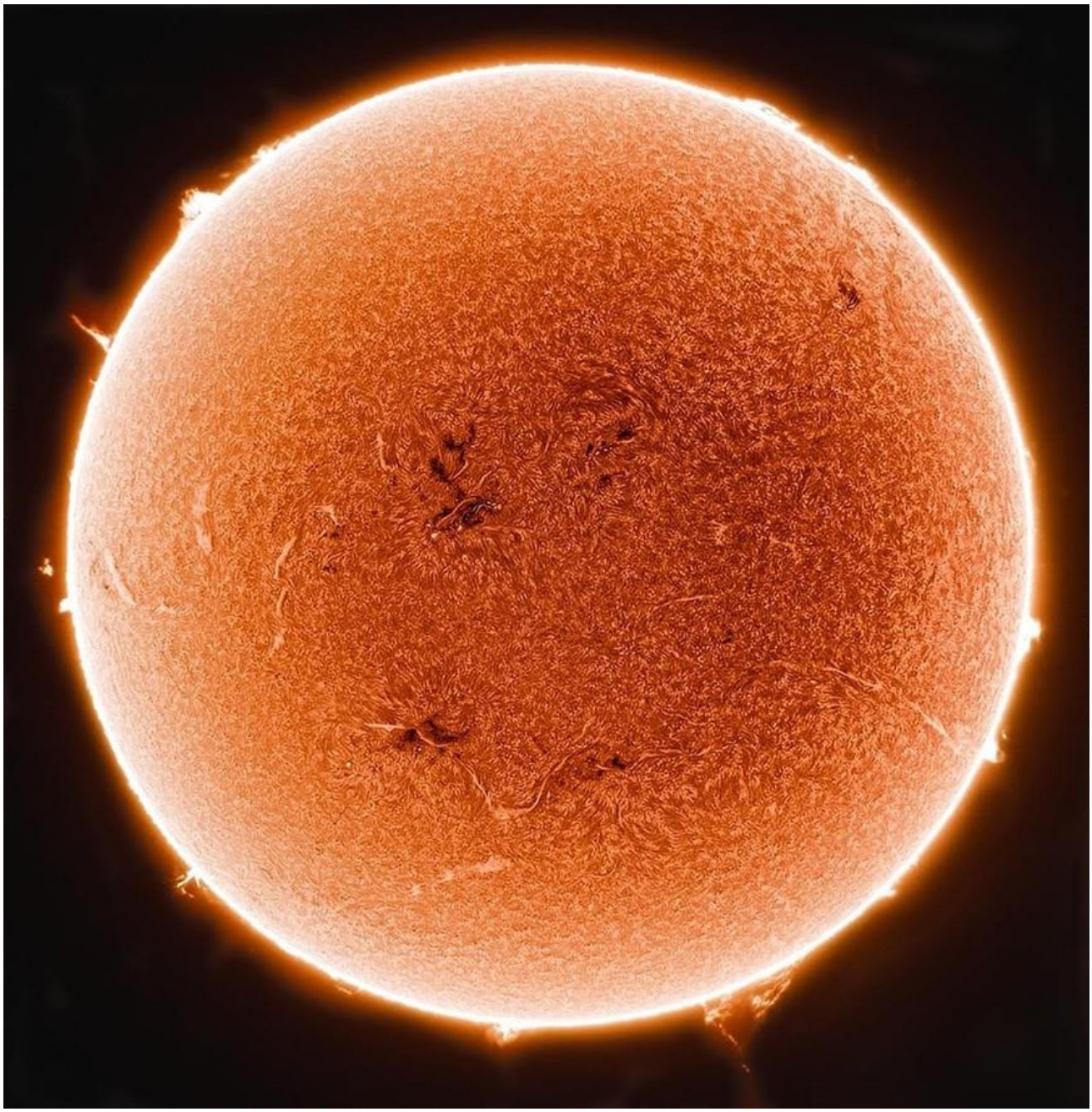
Post-autumnal equinox, skies begin to get darker a lot earlier in the evening, especially for those in higher northern latitudes. Subsequently, at this time of the year, what we would describe as “observing season” is in full swing. This is tempered slightly during late October by the reintroduction of standard time across the northern hemisphere. For most countries in Europe, the clocks go back by one hour from summer time (daylight saving time) on 29th October. From this point onwards, the skies will briefly get lighter in the evenings again, but this will be balanced out

by the further encroachment of darkness before too long. Wherever you find yourself, as ever, there is much to see in the skies above us this month. So let's find out what's in store…

The Solar System

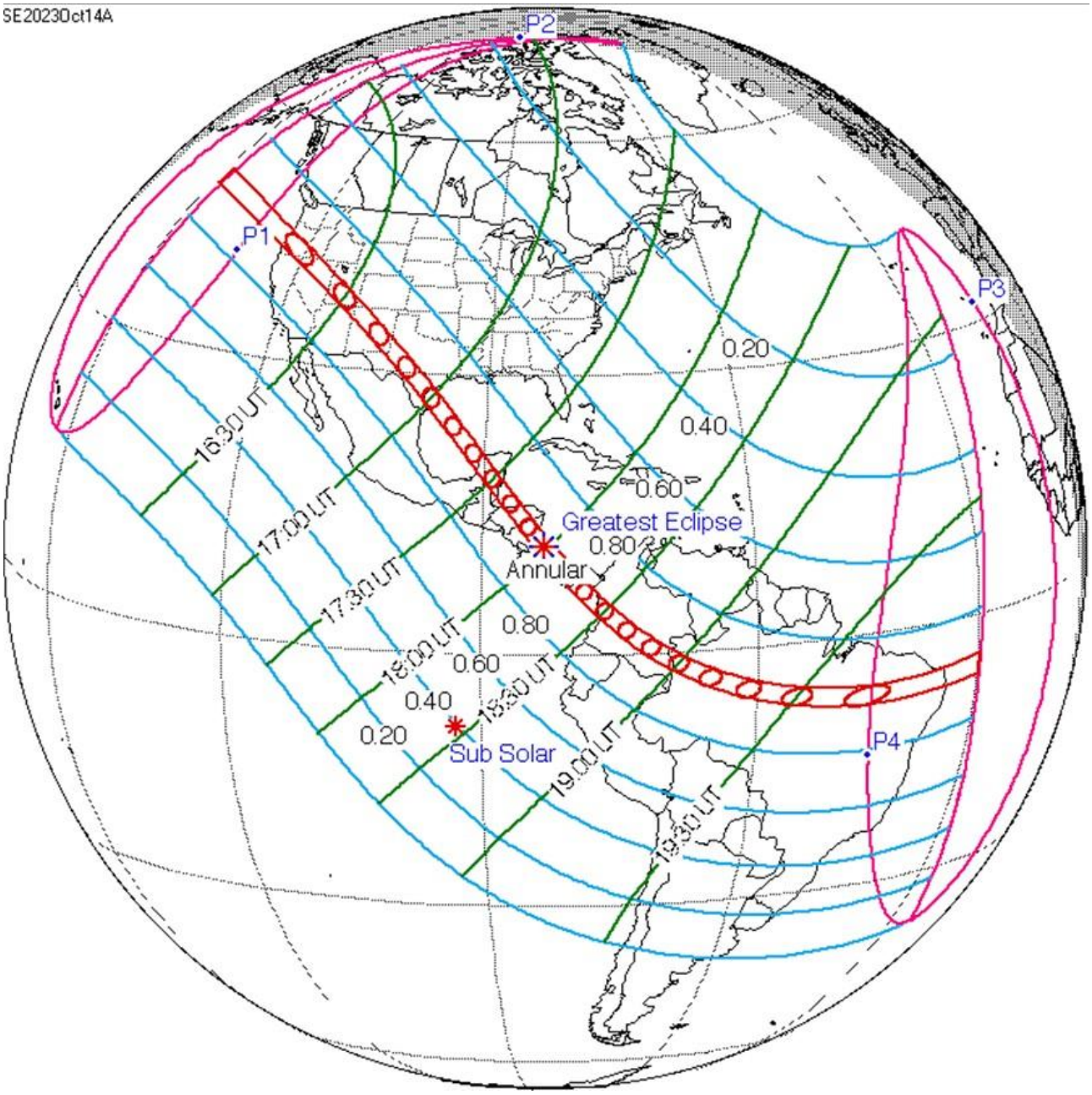
The Sun

Our parent star continues to enthral us with very active displays of both surface features and atmospherics. The current cycle of solar activity shows no sign of abating and has been responsible for a number of fairly low-level auroral displays over the past few months. We are headed up to the peak of the current cycle in 2024 to 2025, so more activity can be expected. Naturally, here is where we will always emphasise solar safety when it comes to observation of the Sun. Visual observation should never be attempted without a full aperture solar filter, Herschel wedge - or better still an H-alpha or Calcium-K line system.



The Sun in H-Alpha, taken with Lunt LS40/B500 H-alpha telescope and Bresser HD Moon & Planetary Camera (composite of 2 pane image). Image credit: Kerin Smith

This month also includes an annular solar eclipse, which takes place over the majority of North, Central and South America on the 14th October. An Annular eclipse occurs when the Moon is closer to its furthest point from Earth and therefore does not cover the entirety of the solar disc. Annular comes from the Latin “annulus”, or ring - which is very apt when this type of eclipse is observed. The track of most complete obscuration of the Sun runs in an enormous line down from the Northern Pacific into the upper north-west of the United States, through Mexico, the Western Caribbean and Central America on into Columbia and Brazil, before exiting into the South Atlantic. Even those not on the central track will stand a very good chance of witnessing the partial eclipse that surrounds this central track, as this takes in pretty much all of North America, BAR parts of Alaska and most of South America apart from the extreme south of Argentina and Chile. Sadly, the event will be completely invisible from everywhere else on Earth, but should reward many observers the length and breadth of the Americas.



Annular Eclipse track, 14th October. Image credit: NASA GSFC, Public Domain.

The Americas will be treated to another Annular eclipse in October 2024, but before this in early

April 2024, there will be a Total solar eclipse running through Mexico, Central and north-eastern United States and the eastern part of Canada. Europe will have to wait until 2026 and 2027 for two Total solar eclipse events.

The Moon

The Moon begins October in the constellation of Aries, where it will join Jupiter in close conjunction on the evenings of the 1st/2nd. The Moon at this point is at Waning gibbous phase, a little over 17 days old, rising a little after 7:30 pm (BST) on the 1st and transiting at a little before 2:30 am the following morning.

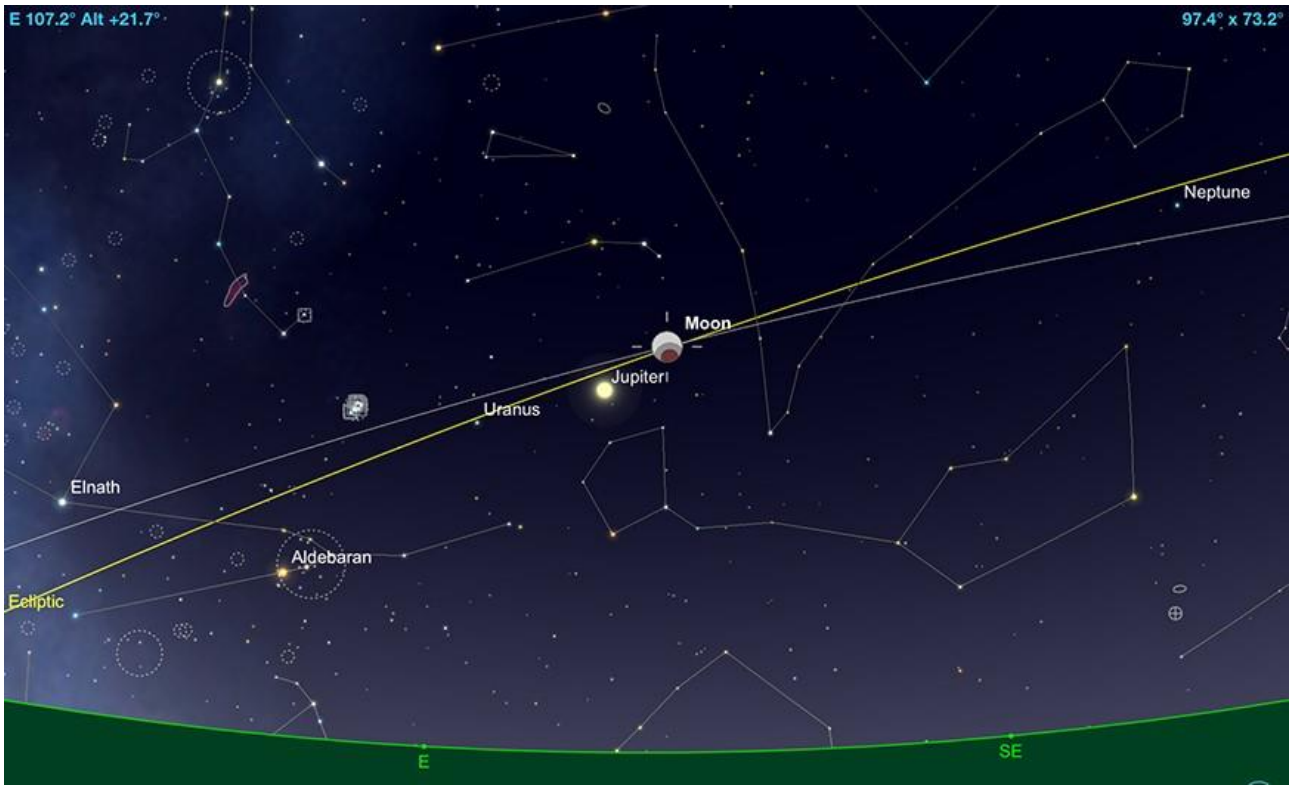
The next week sees the Moon moving through Aries, on into Taurus and (skirting the borders of Auriga) through into Gemini, where it will come to Last Quarter phase on the evening of 6th. By this point, the Moon will rise a little before 11 pm (BST), transiting at a little before 7 am the following morning.

Our natural satellite then begins the drift down from the peak northerly point of the ecliptic, through Cancer and on into Leo, where it meets the very prominent Venus on the morning of October 10th. By this point, the Moon will show a very thin 17% illuminated crescent phase, which will decrease even further over the next four days as the Moon drifts into the expansive constellation of Virgo, where it becomes New, meeting the Sun on October 14th. This is the point of the month where we would urge all of those with telescopes to get out and enjoy deep sky, observation and imaging - without the Moon's pernicious influence…

The Moon will then re-emerge from its meeting with the Sun as an evening object. The first couple of days of the evening cycle will see the Moon too close to the Sun for much in the way of observation. But by the time we get to the 16th The Moon should be separated from the Sun by a reasonable amount (34°), which will make observation that much easier. In this part of the year, the Moon in the evening sky moves through some of the most southerly parts of the ecliptic plane - and as such will not rise particularly high in the sky for those in the northern hemisphere. The next week sees the Moon move through the constellations of Libra, Scorpius, Ophiuchus and on into Sagittarius, where it will reach First Quarter phase (close to the border with Capricornus) on October 22. At this point in the month, the Moon will rise a little before 4 pm (BST) and transit just before 8 pm.

Having ploughed its way through the more southerly reaches of the ecliptic, the Moon now begins to climb in the sky, as seen from the northern hemisphere perspective. The last week of October sees the Moon climbing through Capricornus, on into Aquarius, where it will meet the planet Saturn in conjunction, on October 24th. After this, the Moon will continue its journey through southern Pisces, crossing the border with Cetus, briefly before rejoining Pisces and on into Aries, where it will become full on the evening of October 28th.

This Full Moon is significant, as it will coincide with a lunar eclipse. This eclipse will be a partial one and will begin at just before 6 pm (BST) and will reach its peak around 8.15 (BST). The Moon will have risen over Europe for the event and will be visible across very wide swathes of Africa, the Middle East, Central Asia, China and the Indian subcontinent. The eclipse will take place at Moonset for Indonesia and Western Australia and parts of the eclipse will be visible at Moonrise from the eastern seaboard of Canada, the United States and some South American and Caribbean states. As ever, a lunar eclipse represents a great opportunity for photography, so those with cameras are advised to get out and make the most of it - especially considering that this one is an early evening event. Telescopic and long telephoto images of lunar eclipses can be extremely striking. However, those with more modest focal length lenses should not be put off trying to image the event, as many wider field images are just as intriguing.

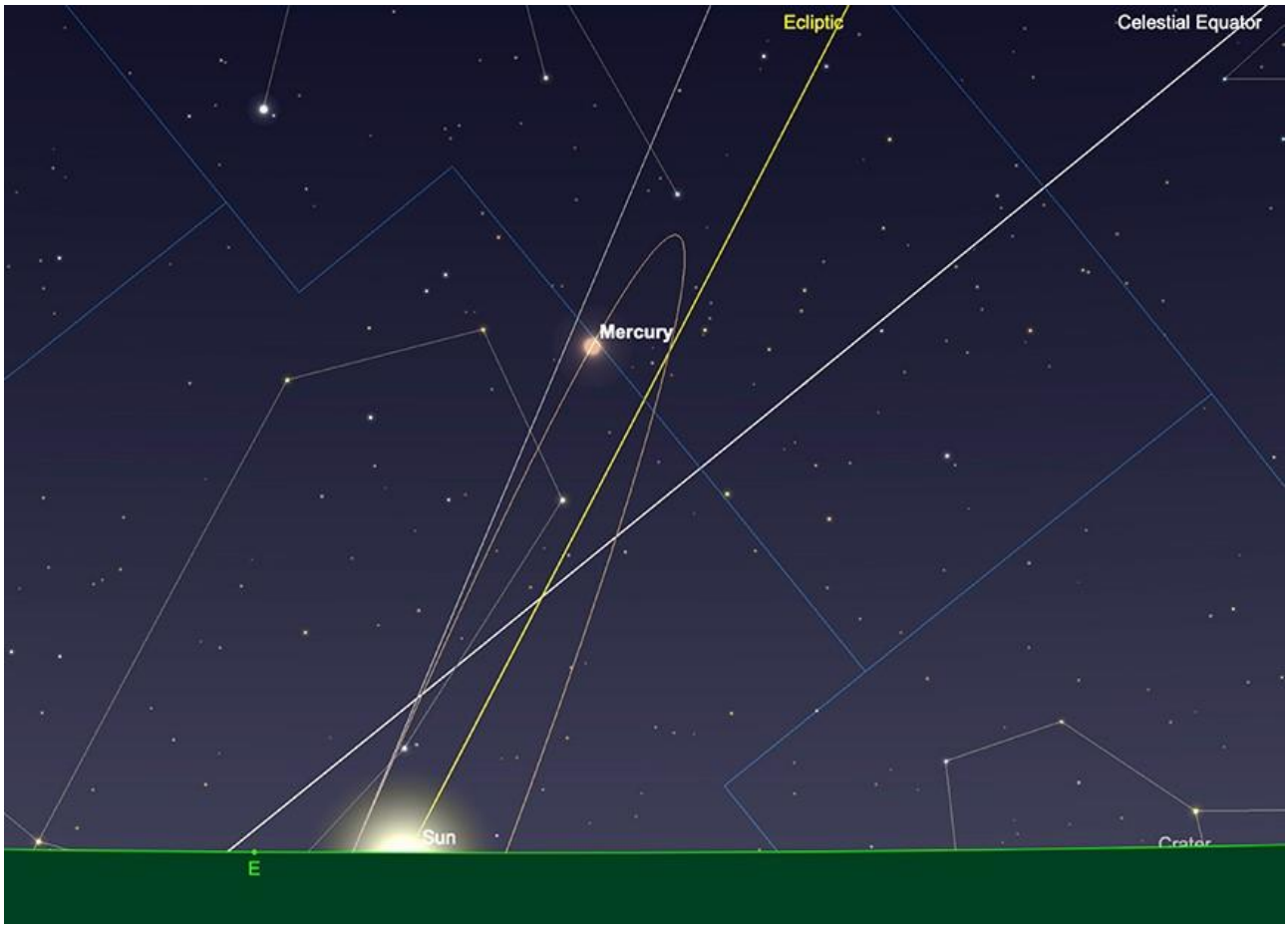


The Moon, mid-partial eclipse, 9.15pm, October 28th. Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

The Moon ends the October in Taurus. It can be found a little to the south of the Pleiades on the 30th and ends the month on the 31st at 92% illuminated Waning phase, rising a little before 6 pm (GMT) and transiting at just before 2am the following morning.

Mercury

Mercury begins October in a great position for observing in the morning. At -1.0 magnitude and displaying a 5.7 arc second, 82% illuminated disc, the solar system's smallest planet rises around an hour and a half before the Sun and stand just under 13° above the horizon as the Sun rises, on the morning of the 1st.



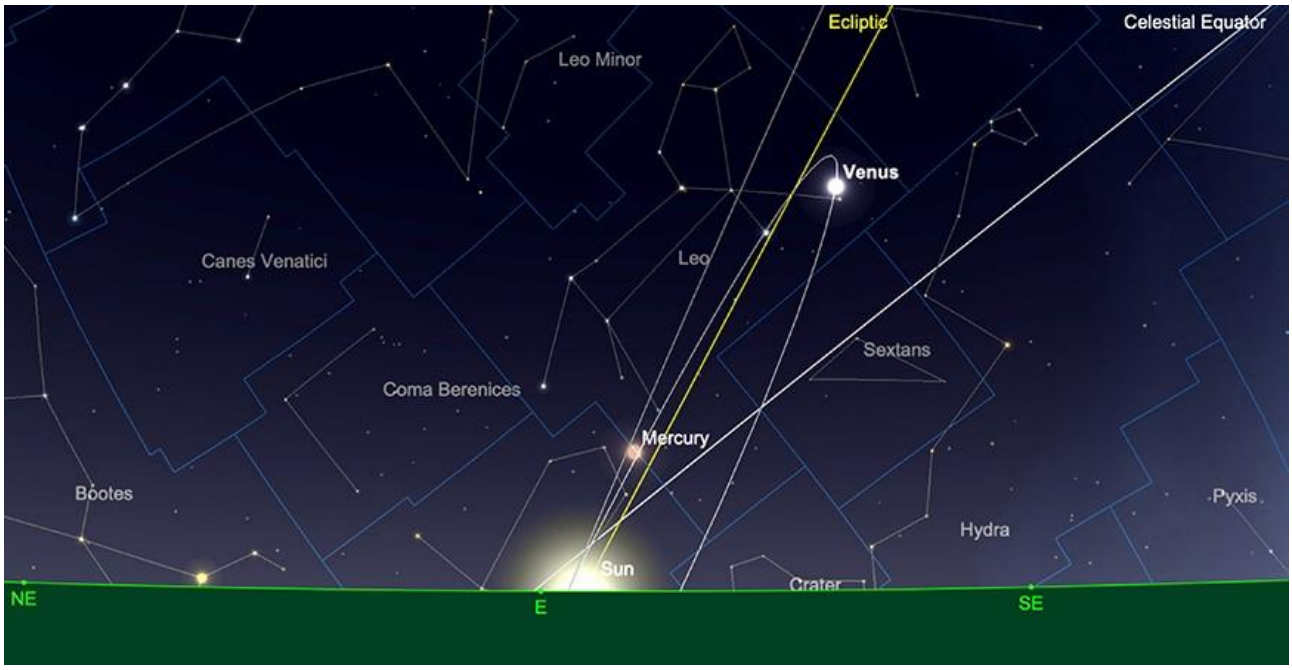
Mercury at sunrise, 1st October. Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

Mercury is headed sunward and much after the end of the first week of October - despite increasing in brightness to around -1.3 magnitude - will be very difficult to find in the glare of the morning. Around mid-month, Mercury will draw so close to the Sun that there is no chance of observations and reaches Superior Conjunction (the opposite side of the Sun as seen from Earth) on October 20th. After which, it will re-emerge as an evening target - albeit a difficult one for observers in the northern hemisphere.

As the Sun sets in a very shallowly angled part of the ecliptic at this time of the year, Mercury will inch through Libra in the latter part of October, but will not attain significant elevation above the horizon for those in temperate northern latitudes. By the time we get to October 31, Mercury will stand just under 1 1/2° above the horizon (from 51° north) Even though it is by this point separated from the Sun by around 7°. It will be much later in November until it is attained even slightly higher elevation above the horizon at sunset. Evening apparitions of Mercury at this time of the year for northern hemisphere observers are never easy ones. However, the opposite can be said for those in the mornings.

Venus

The brilliant planet Venus is exceptionally well-situated for observation in the morning sky during October. The morning of the 1st finds the planet at altitude of over 35 1/2° (as observed from 51° north), shining at a dazzling -4.5 magnitude. When observed through a telescope, Venus shows a 32 arc second diameter disc, illuminated by little over 36%. The planet is still heading away from the Sun and will reach maximum elongation from our parent star in late October, on the 24th.



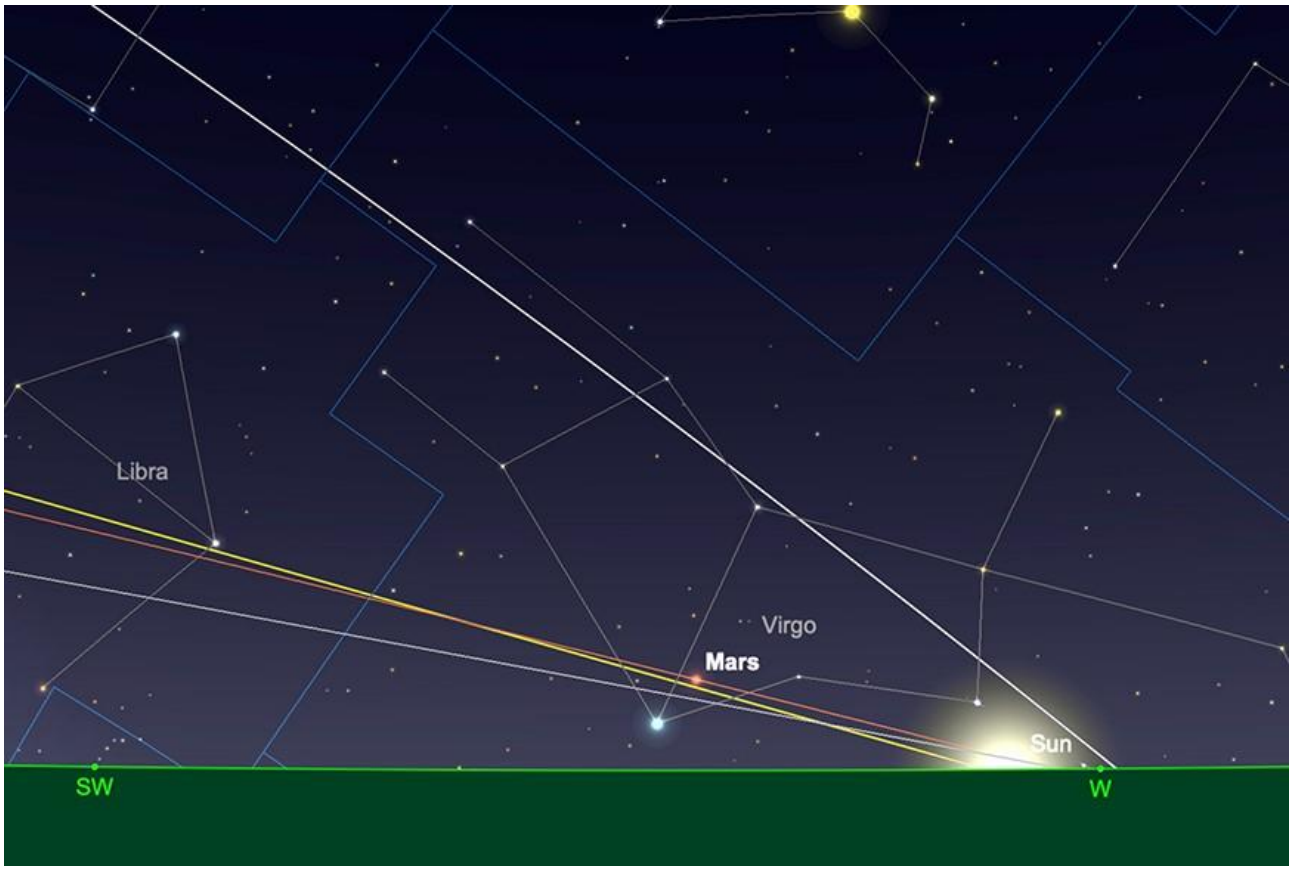
Venus, sunrise, 1st October. Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

By mid-month, the planet will have faded fractionally to -4.4 magnitude and now displays a 26 1/2 arc second diameter disc, illuminated by just under 46%. Venus will stand just over 37 1/2° above the horizon on the morning of the 15th (again, as observed for 51° north).

By the time we get to the 31st, Venus will faded a little more to -4.3 magnitude and now displays a 22 arc second diameter disc, illuminated by just over 54%. Planet will attain an altitude of just under 37° above the horizon as the Sun rises and will present as excellent a target at this part of the month as it did at October's beginning. Seeing conditions during the mornings often present themselves better than those of the evening sky, so Venus is really ideally placed for telescopic observation at the moment. Even after the Sun has risen, Venus still continues to be identifiable in the daylight sky, if you know where to look.

Mars

Mars begins October at just under 15° separation, east of the Sun. Technically, an evening target, the Red Planet will be extremely difficult to find in the evening sky for those in temperate northern hemisphere locations, as it stands around three and three-quarter degrees above the horizon (as has observed from 51° north).



Mars, sunset, 1st October. Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

Mars reaches its furthest point from Earth, around 2.5 AU (381,000,000 km) on October 18th. Most people would be forgiven for thinking that Mars' furthest point from us would coincide with superior conjunction (the planet at the opposite side of the Sun from Earth). However, due to the eccentricities of both Mars' and the Earth's orbits, the further separation of the two planets actually occurs *before* superior conjunction (which won't occur until November 18, 2023). It still seems a very long time until the next Martian opposition - which will occur in January 2025 - but we are about halfway between this and the last opposition at this point in time.

Jupiter

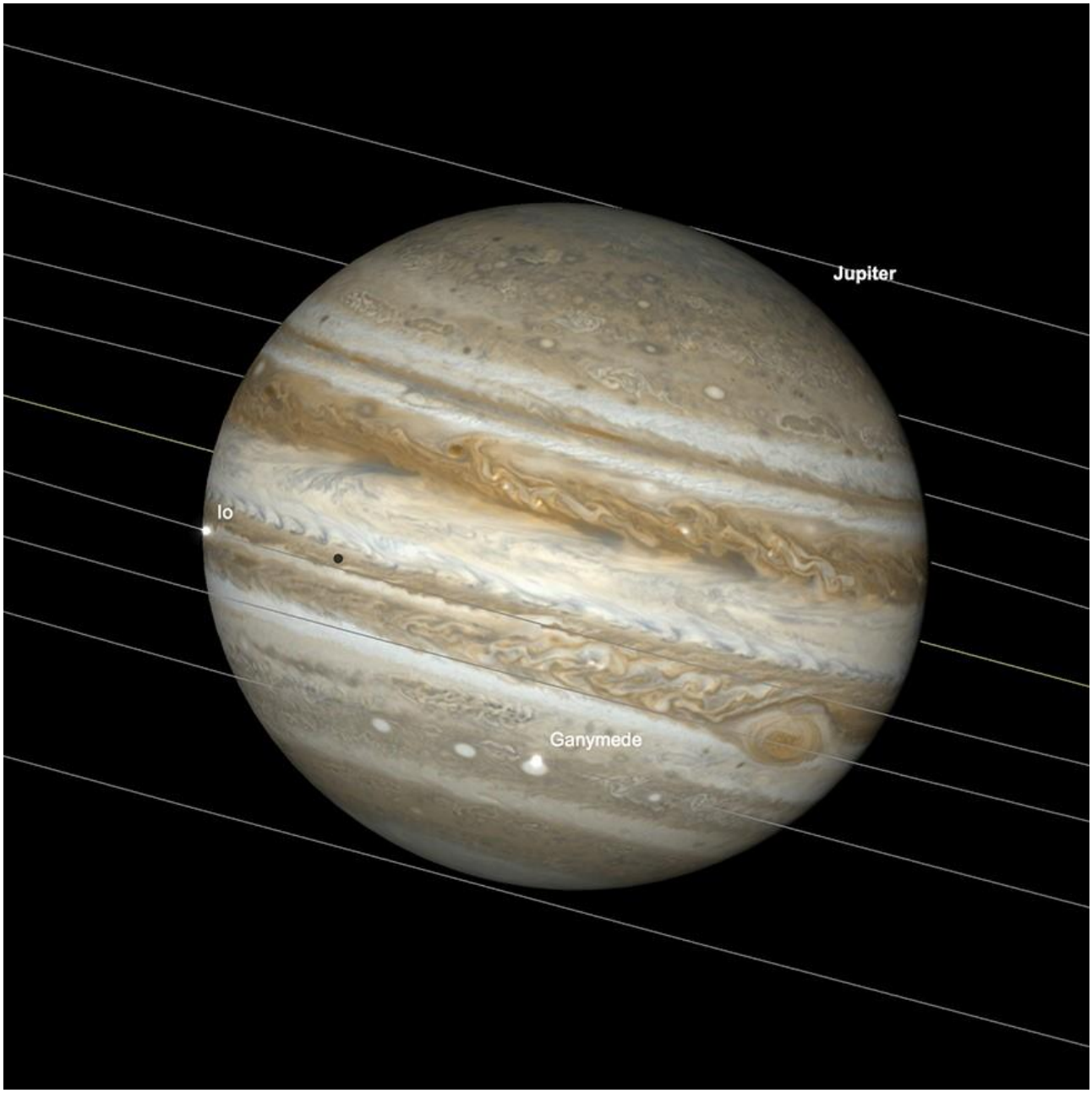
Although Venus is more brilliant, Jupiter is an absolute standout this month. The planet is found in Aries, shining at a significant -2.8 magnitude. The planet presents a disc of around 48 arc seconds diameter on the 1st and rises at around 8 pm (GMT), transiting at just before 3:30 am the following morning.

Jupiter is joined in Aries by the Moon on the 2nd, in very close conjunction, with the two bodies being separated by just over 2 1/2°. They will certainly make a striking pair when sitting high in the sky at transit point in the early hours of the morning.

By mid-month, Jupiter has brightened fractionally to a visual magnitude of -2.9 and male presents a disc of just under 49 arc seconds diameter. On the 15th Jupiter will rise at just after 7 pm (GMT) and transit at a little before 2:30 am the following morning. At transit point, the planet will sit around 53 3/4 degrees high in altitude (as observed from 51° north). The separation from the horizon is significant, as it will lead to significantly improved opportunities when it comes to seeing conditions (certainly as compared to those recent years in the northern hemisphere).

By the time we reach the end of October, Jupiter will still be at -2.9 magnitude, but now displays a 49.5 arc second diameter disc. The planet will rise around 5 pm, transiting at a little after 12 midnight, when it will attain an altitude of just over 53° (again, from 51° north). The month's end will find Jupiter just three days off opposition - subsequently, this is really the peak season for Jovian observations.

There are some good opportunities for European observers to see mutual Jovian transit events. The morning of October 3rd sees a dual Great Red Spot and Europa transit, starting at a little after 3 am (BST). There is a triple event, which occurs at just before 3 am on Friday 6th October, when Io, Ganymede and the GRS all transit mutually. There is another mutual Ganymede and GRS transit at just before 4 am on Friday 13th October, with Io joining in around an hour later. There is an attractive mutual transit of Europa and the GRS at starting at around 9 pm on Friday October 20th, with Europa hanging right over the Great Red Spot for much of the event. On 22nd October, starting at around 3 am, there is a mutual transit of Io and the GRS. Another mutual GRS and Europa transit occurs on Friday, October 27, starting at around 11 pm. A mutual GRS and Io transit takes place on October 30th, starting at just after 8 pm (GMT).



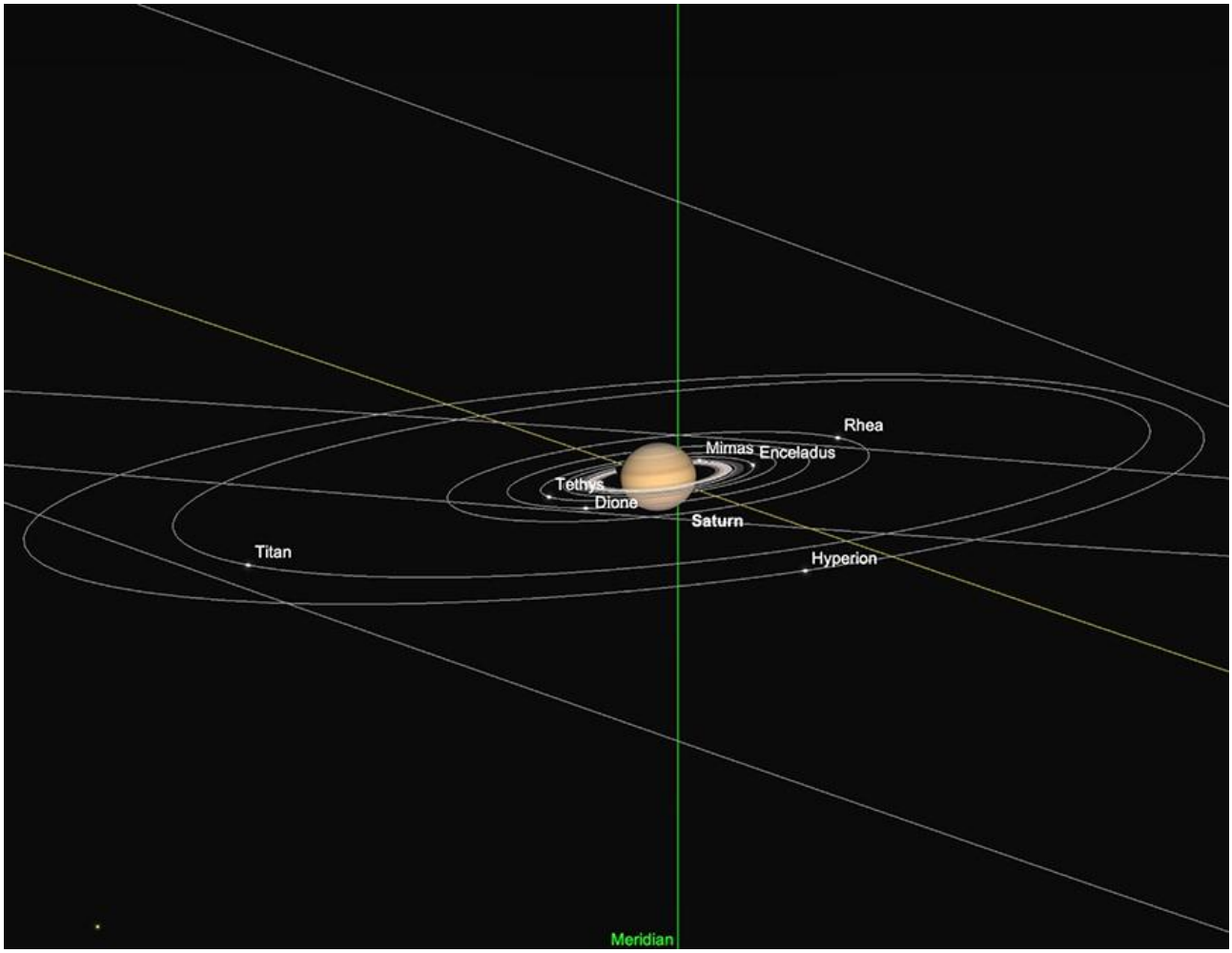
Jupiter, 3 am, Friday 6th October, with mutual transit of Io, Ganymede and the GRS. Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

Saturn

Through a little past opposition and having faded slightly in brightness to +0.6 magnitude, Saturn is exceptionally well placed for early evening observation during October. A resident of Aquarius, the Ringed Planet presents an 18.6 arc second diameter disc on the evening of the 1st, rising at just before 6 pm and transiting at a little before 11 pm. When at transit, as observed from 51° north, Saturn will reach an altitude of 26 and three-quarter degrees elevation. Although this does put it rather shy of the "magic" 30+ degrees (at which point seeing conditions often improve dramatically for higher power telescopic observations), seeing as northern hemisphere observers have had to put up with Saturn in significantly poorer parts of the sky over the past few years, this elevation is to be welcomed.

By mid-month, nothing much has changed in terms of Saturn's brightness or diameter, but the planet rises now at a little before 5 pm, transiting at just before 10 pm (both GMT).

By the time we get to October's end, Saturn has faded fractionally 2+0.7 magnitude and now displays a disc of 17.8 arc seconds diameter. By this point in the month, Saturn will rise at a little before 3 pm, transiting at around 7:45 pm (all times GMT). With Saturn so well situated for observation in the early evenings, those with telescopes really have no excuse not to get out there and enjoy the show. You are heartily encouraged to do so!

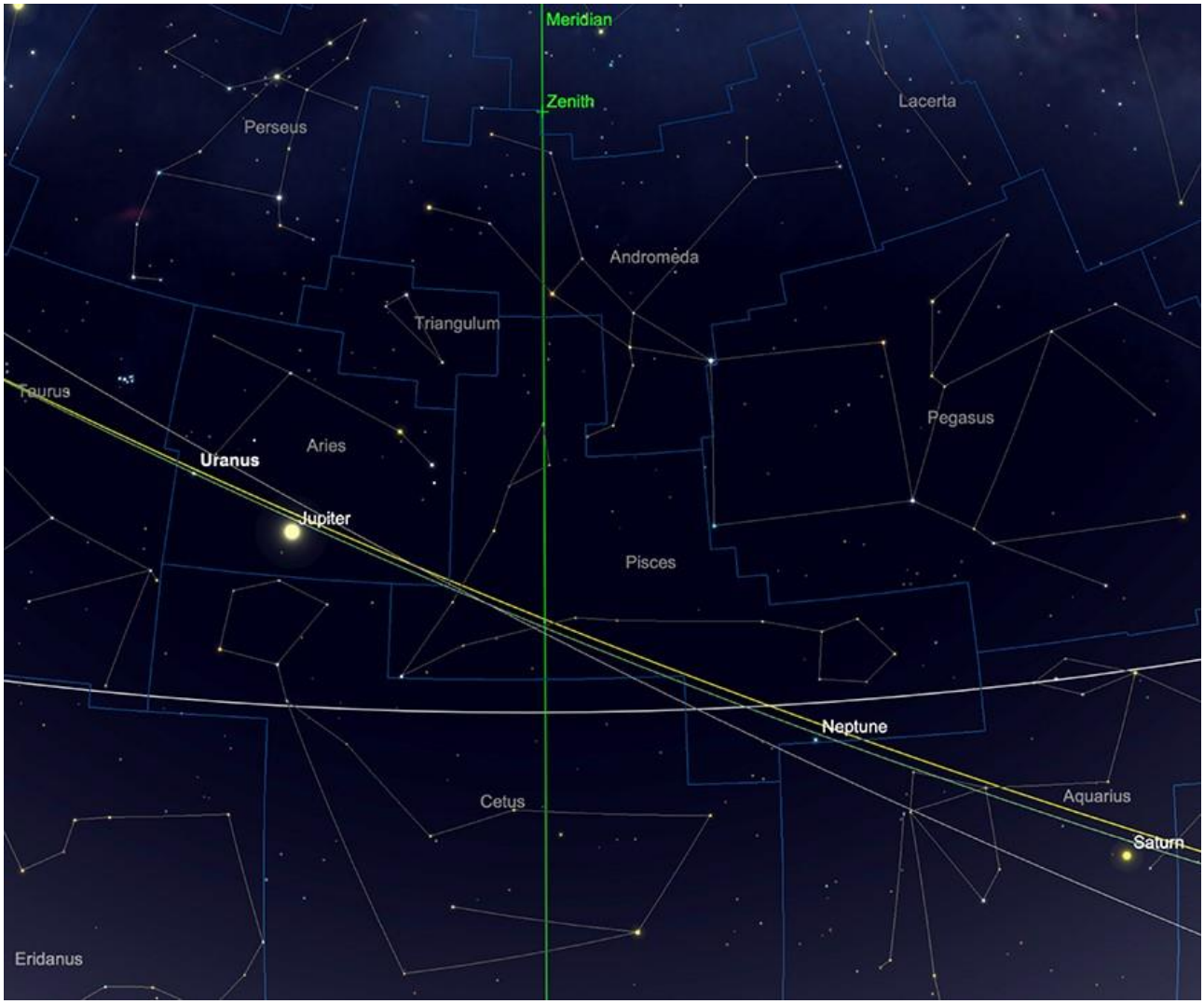


Saturn and Moons, early evening, 15th October. Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

Uranus and Neptune

Both the outer planets are well placed for observation in the later evening and early morning, during October. Uranus, which is always the brightest of the two, is currently +5.6 magnitude, displaying a 3.8 arc second diameter disc. Uranus is a resident of Aries and its position can be

easily located with reference to the much brighter planet Jupiter, which sits around 9° to west, within the same constellation. Uranus is technically a naked eye object, but is a difficult one in anything other than very favourable conditions. However, it is pretty straightforward to find with binoculars and if you take a note of your binoculars stated field of view, it should not be too difficult to wind back from Jupiter in an easterly direction until you come across the much fainter outer world.



Uranus and Neptune relative positions, mid-October. Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

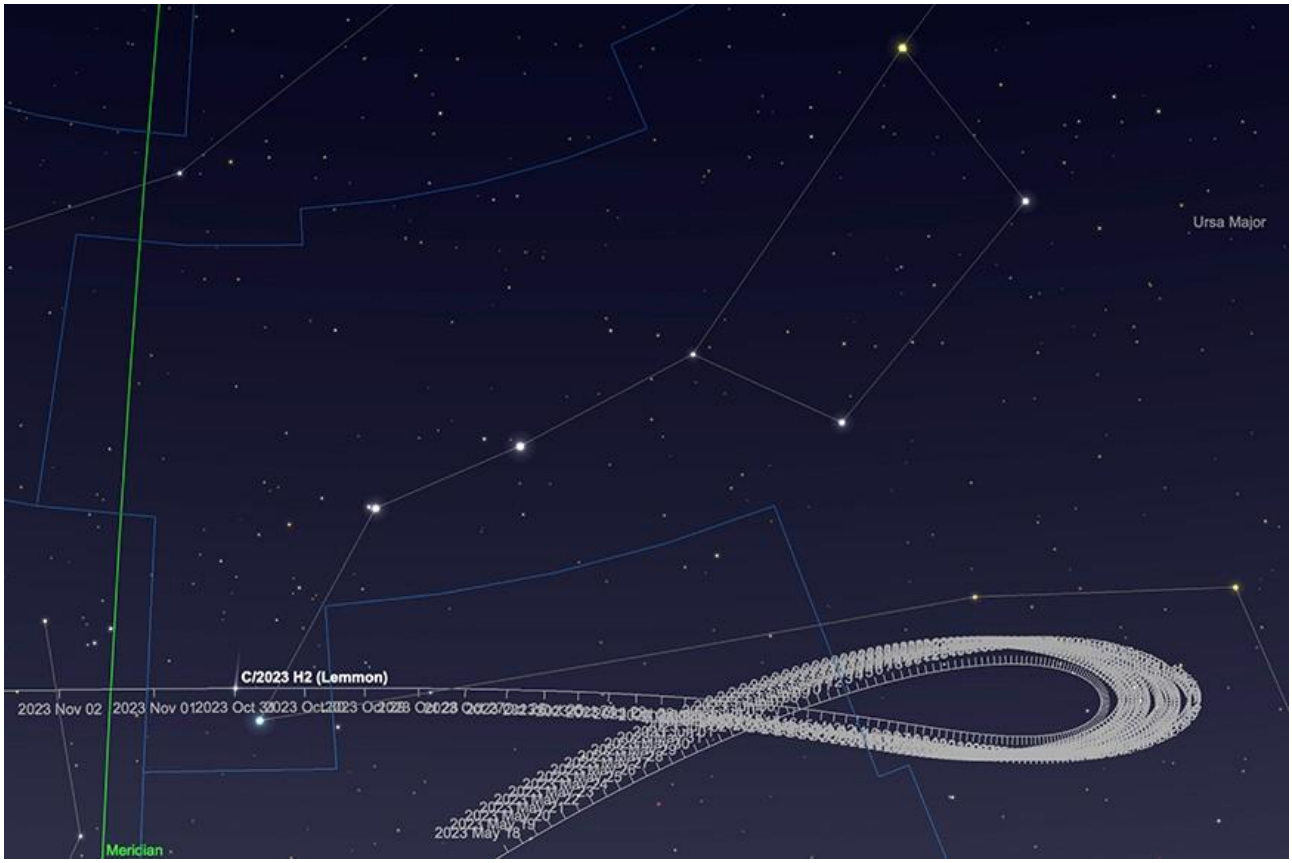
Neptune is much further to the west in the ecliptic on the Pisces/Aquarius borders. At a magnitude of +7.8 and displaying a 2.4 arc second diameter disc, the solar system's final "true" outer planet is always a trickier task to find that its neighbour. Sitting in a comparatively barren part of the sky, with no very bright stars or planets nearby, Neptune is going to be more of a challenge to find than Uranus. But those that do, will find its blue colour unmistakable in larger binoculars and telescopes.

Comets

2023 P1 (Nishimura) has now passed perihelion. The comet attracted quite a lot of attention in the media and amateurs managed to take some very lovely images of the comet before perihelion. But despite peaking at an estimated second magnitude, it was a difficult object to observe in the early morning sky visually, being relatively close to the Sun. It is now visually unobservable and is unlikely to be easily seen until it has dropped significantly in magnitude.

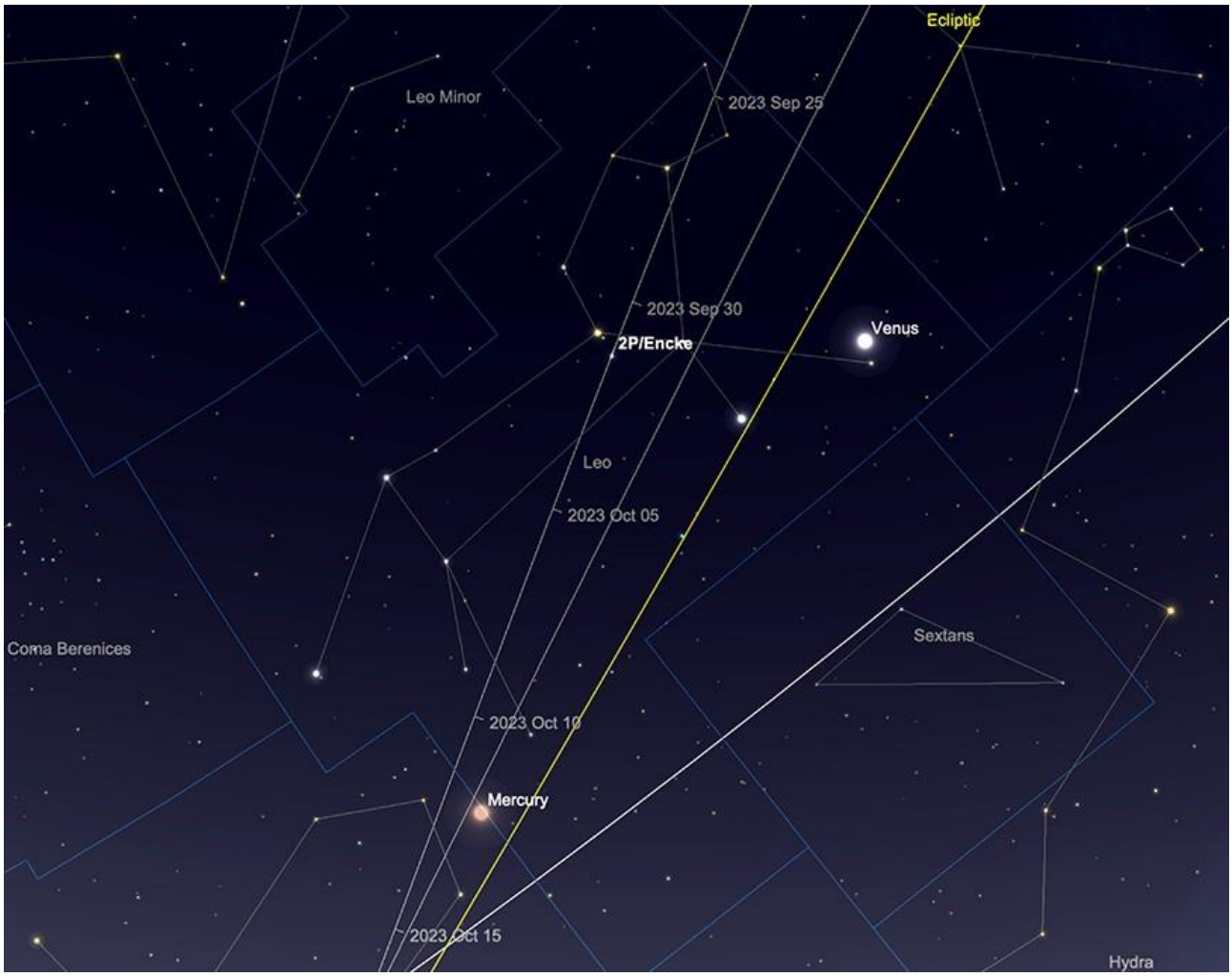
A more modest comet, the relatively newly-discovered, C/2023 H2 (Lemmon) will be coming to perihelion in late October and should be well situated for observation, being close to Alkaid, the tip

of the handle of the Big Dipper, or Plough asterism, in Ursa Major at that time. The comet is around 10th magnitude at time of writing, but could have brightened up modestly, by the time we reach late October. This comet definitely will not be anywhere near naked eye visibility and will be the preserve of telescopes and larger binoculars, but owing to the area of sky it find itself in, away from the Sun and near to an easily identifiable star, it will be an interesting object to try and observe.



C/2023 H2 (Lemmon) path through October (comet position shown 29th October). Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

The periodic comet 2P/Enke comes to perihelion in late October. The comet will be observable in the morning skies before dawn from the early part of the month. On the 1st, the comet will be rising almost in line with the much brighter Venus (just over 12 degrees to the west), in Leo and its proximity to the “sickle“ of Leo makes the area of sky it is in relatively easy to find. The comet should be around +8.3 magnitude at this point. Hardly bright, it will be the preserve of large binoculars and telescopes. This is not one of Enke‘s greatest showings, as the comet can reach 6th magnitude (so *technically* a naked eye object) at its best.



2P/Enke path, early October (comet position shown October 1st). mage created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

Meteors

There are no major showers in October - though the Southern Taurids are active in the early part of the month, peaking on the 10th. These produce no more than 5 meteors an hour, but can result in notable fireballs. The shower, along with its northern contemporaries, which peak in November, are thought to emanate from Encke's Comet, the regular short period body. If you do see a bright meteor during the month, trace the trail and if it appears to come from the Taurus areas, there's a good chance that you've witnessed a Taurid. However, it should be pointed out that you're almost as likely to see a sporadic meteor during this period, if you're in a reasonably dark location. This "shower" stretches the often disappointing term pretty thinly.

Deep Sky Delights in Perseus, Andromeda & Triangulum

Perseus, Andromeda and Triangulum. Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

We start this month in the southerly part of Perseus, where the open cluster M34 is located. M34 is an original part of Messier's List and was first identified by Giovanni Battisa Hodierna in the mid-1600s. Hordierna was born in what is now Dubrovnik in Croatia, though did most of his observing from the court of the Duke of Montechiaro in Sicily. Hodierna was a leading telescopic observer of his day and complied a pre-Messier catalogue of Deep Sky objects. M34 was part of this original list, though Messier discovered it independently in 1764. The cluster is easily spotted in smaller binoculars and occupies an area of sky roughly equivalent to the diameter of the Full Moon. At +5.19, M34 is reasonably bright and contains around 80-100 observable stars in medium-sized telescopes (the actual number stands at around 400, but many these are beyond the range of amateur instruments). Precise professional observations of M34's movement have concluded that there is a distinct possibility that M34, the neighbouring Pleiades and a number of other nearby clusters are exhibiting a common angular motion, suggesting a common origin. M34 lies 1400-1500 light years away.


M34. Image Credit: Ole Nielsen - Creative Commons.

East of M34 is a more challenging object, the Perseus A Galaxy, or NGC1275. At +11.89 mag, this is not an intrinsically bright galaxy, though it is quite a compact target and can be seen in medium to larger telescopes. This object is actually a pair of galaxies that have undergone a collision and have formed a larger galaxy strewn with laments of stars and dark material, most likely blasted outwards by the supermassive Black Hole at the heart of the system. Perseus A is a Seyfert Galaxy - strongly emitting on Radio frequencies, suggesting a large amount of star formation. NGC1275, at 235 million light years distance, is one of the most prominent members of the Perseus cluster of galaxies, which occupies this region and is amongst the largest structures in the known Universe.

5 degrees to the west of M34 lies the most famous eclipsing binary star in the sky, Algol, or Beta Persei. Algol represents the eye of the head of the Gorgon Medusa, whose gaze would turn to stone all those unfortunate enough to look at it. According to the legend, Perseus held Medusa's severed head up to the sea monster Cetus in the successful rescue of Andromeda. Cetus was turned to stone and Perseus unchained Andromeda from the rock to which she was attached. Algol's name derives from the Arabic "ra's al-ghul", translated as "head of the ghoul" - though it has been known by several equally unfortunate titles. In Hebrew, Algol was known as "Rosh ha Satan" or "Satan's Head". A 16th century text labels Algol as "Caput Larvae" or "Spectre's Head". But the prize used to go to the now sadly disproved ancient Chinese description, "Tseih She" or "Jishi", meaning "Piled Up Corpses" - though this is now thought to refer to Pi Persei instead. Regardless, Algol was part of the Ancient Chinese constellation of the Tomb or Mausoleum. No matter which culture attempts to define Algol, it always seems to have a sinister undercurrent - quite unfair really, as it is a fascinating object.

Algol's eclipsing binaries occupy a startlingly small amount of space - just 0.062 Astronomical units, or around 5.76 million miles, separates the two stars. These two stars are Beta Persei A and Beta Persei B (there is a third member of this system, Beta Persei C which plays no part in the

eclipse). Beta Persei A is the brightest of these stars and is eclipsed by the dimmer Beta Persei B every 2 days, 20 hours and 49 minutes, for around 10 hours at a time. This eclipse has the effect of dimming the +2.1 mag star to +3.4 mag for the period of the eclipse. There is also a much shallower dimming when A eclipses B, though this is very difficult to detect visually. The main eclipse can easily be detected with the naked eye and is possibly the reason that this star was held in such suspicion by ancient astronomers. Regardless, it is a very clear example of stellar orbital dynamics and Algol, suspicious or not, continues to be of interest as a result. It's always worth comparing the brightness of Algol with Almach - as they're normally roughly similar brightness. If this isn't the case, you can be sure Algol's in eclipse.

Nine and a half degrees east of Algol sits the 2.91 mag star Adid Australis, Epsilon Persei, which is a useful is a pointer to those attempting to locate NGC1499 - the California Nebula - which lies along the line between this star and the neighbouring +4.40 mag star Xi Persei, or Menkib - a prime candidate for Supernova (though lying at a distinctly safe distance of 1200 light years). The California Nebula can be found just under a degree to the North of Menkib.

The California Nebula by Mark Blundell. Image used with kind permission.

Discovered in 1884 by Barnard (he of Barnard Star's fame), the California is a confusing object Technically it is a bright +5 mag object of very large proportions - 145 x 40 arc minutes (just slightly smaller than M31, the Andromeda Galaxy), but due to its size, it has low surface brightness. The California is very easily picked up by cameras with relatively modest exposures, but to see it visually requires two things: a decent sky and a Hydrogen Beta Filter. Many observers consider aperture to be of importance when picking out low surface brightness objects from the background sky and while this is normally very sound advice, with large objects such as the California, this must be tempered by the amount of sky a telescope can adequately display at low power. It has been suggested than NGC1499 can be seen in some cases better with smaller telescopes, of shorter focal lengths at low power with a Hydrogen Beta Filter. Larger instruments will show the curtain of light of the edge of the nebula well under filtration and can pick out more detail within its inner structure, but a smaller wide field telescope can potentially take in the entire nebula in a single field of view - a potentially superior view from an aesthetic standpoint. Others have observed the nebula with the naked eye from a dark site, simply by holding an H Beta Filter up to its area of

sky. The H-Beta filter, unlike the more popular UHC and OIII options is only of great use for this nebula, and the adjacent nebulas the Horsehead in Orion and the North American in Cygnus and a few lesser objects. For those attempting to see these famous objects, it really is a must.
It is thought that the radiation from nearby Xi Persei is responsible for exciting the gas of the California and causing it to glow. The rich gas and material deposits in this area of the Milky Way have given birth to many massive stars, of which the previously mentioned Menkib and Adid Australis are probably prime examples. The California Nebula is thought to lie some 1000 light years from our position in the galaxy and is about 100 light years across at its widest point.

Moving to the opposite end of Perseus from the California Nebula, we come to the spectacular Double Cluster, or Sword Handle - NGCs 869 and 884. It is perhaps testament to the easy nature of their observation that they were never given Messier number classification. These twin clusters - and there can be little doubt about their mutual origin - are of +5.9 visual magnitude and are excellently seen through binoculars of all sizes, but really come alive in wide field telescopes. Of the two, NGC 869 is the slightly more populous being of 3700 solar masses to NGC 884's 2800 and are thought to between 3.2 and 12.8 million years old (sources, again differ on this figure) - considerably younger even than the Pleiades' 75 million years. Both clusters have in excess of 150 hot blue stars visible to amateur telescopes and are also a fabulous target for astrophotography. Both elements of the Double Cluster lie between 7500-9600 light years distance from us and are approaching us at around 39 km per second.

The Double Cluster by Mark Blundell. Image used with kind permission.

The last target we shall examine in Perseus is M76, otherwise known as the "Little Dumbell", due to its physical similarity to M27 the Dumbell Nebula in Vulpecula. Found 3 degrees North of 51 Andromedae, the other of Andromeda's feet (alongside Almach), M76 is a very compact object and one of the dimmest of the Messier list at +10.10 mag. Still, as with many planetary nebulae, it is an attractive object. Unlike the Ring Nebula, M57, M76 is presented side on, so we can clearly see the

two lobes of bass that were ejected from the central star. Were this object presented to us end on, much like the Ring Nebula, we would see the distinctive disk or ring-like pattern, rather than a sort of hourglass shape that M76 resembles. As with most planetaries, M76 responds well to OIII filters.

M76 by Mark Blundell. Image used with kind permission.

M76's distance is widely disputed; some sources give it as 1500 light years distances, others in excess of 15,000 light years away. Spectroscopy has shown it is certainly approaching the Solar System, at a rate of 19 km per second.

Moving away from M76, we cross the border into Andromeda and turn our attention to the less well-known, but prominent and easily-found galaxy in the constellation: the wonderful NGC891. 11 1/2 degrees to the SE of M76 and discovered by Sir William Herschel in 1784, NGC891 is a spiral galaxy, potentially much like our own, presented absolutely edge-on to our perspective. At +9.89 mag, it is not especially bright, but it is well-condensed. Its axis is bisected by a dark dust lane, splitting the object in two. In telescopes of moderate aperture, NGC891 appears like a shard - or rather two parallel shards of light, with a very small bulge of the galaxy's core in the centre. It is a lovely object - maybe not having the glamour of its neighbour M31 (NGC891 is 30 million light years away from us), but a very rewarding galaxy to observe or photograph.

NGC891 by Mark Blundell. Image used with kind permission.

3-degrees to the west of NGC891 can be found Gamma Andromedae, or Almach - an easy pointer to the galaxy, but an equally interesting object in its own right. Almach is one of the sky's best double stars: a pair of orange-yellow and striking greeny-blue stars of +2.17 and +4.75 mag respectively. The principle element of the system is a K3 giant star, nearing the end of its life. However, the fainter secondary green-blue star is itself a double - albeit a very difficult one. It will take telescopes in the 30-inch + class to split this second double. However, in coming years, this secondary element will become steadily easier to split with smaller instruments as the elements drift apart around their mutual gravitational centre - although it will be the mid-2020s before they are resolvable with 8-inch class telescopes.

The main elements of Gamma Andromedae are gloriously split in most small telescopes. Even for those with the smallest of telescopes should have a go at splitting this star.

Andromeda is, of course, home to the most prominent galaxy in the sky - M31 and its attendant satellite galaxies M32 and M110. As a major member of our Local Group of Galaxies, the M31 system is the largest gravitational influence on our own Milky Way and in under 4 Billion years, it is likely the two Spirals will collide and eventually form a large Spheroid elliptical Galaxy. Approaching the Milky Way at around 300km per second, M31 is already a huge angular size - the boundaries of which stretch over 6 times the width of the Full Moon in the sky. At +3.4 mag, M31 was probably one of the first Deep Sky objects - certainly the first galaxy - to be noticed by humanity. First recorded by the great Persian Astronomer Abdul al-Rahman al-Su in his 962CE text "Book of Fixed Stars", al-Rahman described M31 as the "Little Cloud" - and while his is the first record of the object, it was doubtlessly noticed sooner, being the most prominent deep sky object alongside the Pleiades and Hyades in Taurus and M42 in Orion.

Simon Marius first turned a telescope to M31 in 1612, though made no claim to its discovery - he may have been aware of it from earlier star charts - a Dutch example dating from 1500 shows the object. Throughout the 17th and 18th Centuries, the Galaxy was "re-discovered" independently by astronomers. While there was clearly communication between astronomers of the era regarding M31, many, including Edmund Halley, erroneously credited the discovery of the object to different

people. Charles Messier credited its discovery to Marius, when forming his famous Messier list in 1764. Theories abounded as to the true nature of M31: a nascent Solar System forming, a cloud of glowing gas forming stars, a dying, decomposing star. Spectroscopy hinted at the true nature of M31. William Huggins, the early adopter of telescopic spectroscopy found that unlike many other nebulae, M31 exhibits a broad, continuous spectral response, rather than the definitive lined spectra of a gaseous nebula. Something that clearly set M31 apart from the likes of M42. In 1887, the first of many, many photographs of the galaxy was taken by Isaac Roberts from Crowborough in Sussex (just a short journey from the location of Telescope House in Edenbridge). Robert's beautiful picture clearly shows dust lanes in the outer spiral arms and the satellite galaxies of M32 and M110, much as Mark Blundell's more modern portrait does below.

M31 by Mark Blundell. Image used with kind permission.

Roberts subscribed to the theory that M31 was a Solar System in the early stages of formation. However, this theory was put to bed by mounting evidence of Novae observed and photographed within the reaches of M31. Heber Curtis discovered his first Nova in M31 in 1917 and went on to find a further 11. These were observed to be a mean of 10 magnitudes fainter than those observed within our own galaxy, leading to Curtis to suspect that M31 was considerably further away than first thought. Curtis was amongst those Astronomers that put forward the theory that objects of this type were "Island Universes". This was famously debated in a meeting between Curtis and Harlow Shapely in 1920 - Curtis was for, Shapely against.

The matter was settled in 1925 by Edwin Hubble, who discovered the first Cepheid Variable in M31. Comparisons with these variables and the Cepheids in our Galaxy proved that M31 was a separate conglomeration of stars, distinct from the Milky Way. Although underestimating the distance of M31 by a factor of two, Hubble proved that the Universe was a much larger and more mysterious place.

Walter Baade, using the 200-inch Palomar Reflector discovered two separate types of Cepheids Variables in the population of M31, which had the effect of doubling Hubble's pervious distance estimate in 1943. Current distance estimates are around the 2.5 million light years mark. M31 was also discovered to be heavily blueshifted in its spectral lines, proving via the Doppler effect that

unlike the vast majority of galaxies in the sky, it is actually advancing towards us (or more accurately, both galaxies are attracting one another).

M31 can be observed with (or without) all manner of optical equipment. It is probably best seen in large Binoculars (70mm objective size +) from a reasonably dark location. Rich field, short focal ratio telescopes like Dobsonians, and shorter Refractors show it well too, but due to its large angular size, powers must be kept low to see the Andromeda Galaxy in all its glory. Both satellite galaxies, M32 and M110 are easy to spot too (M32 the easier of the two). In larger instruments, with suitable filtration, it is possible to observe nebulous regions in M31 - similar features to the Orion Nebula in the Milky Way. This is a challenge, but a rewarding one! We'll never see the true beauty of our own galaxy from the outside, so must content ourselves with the marvellous vista that M31 offers us. Some of M31's globular clusters, including the remarkably large G1 are also visible though instruments of 10-inch aperture and above.

However, it is in long duration photography that M31 really reveals its true extent and size. A 30 second unguided exposure with a wide field lens will easily show M31, though a small, high-quality refractor on an equatorial mount will be ideal in terms of framing the whole object on a standard DSLR chip. Multiple exposures, when stacked in a free program such as Deep Sky Stacker, will reveal the huge dust lanes and knotted, hydrogen rich areas of nebulosity. M31 is a prime beginner's Deep Sky photographic target, but it is such a rewarding photographic object that Astrophotographers feel compelled to return to it time and time again. That it is well-placed for those of us in the northern hemisphere during the winter months is indeed fortuitous. All though observable through much of the year, now is the time to take full advantage of this fabulous Deep Sky wonder.

To the western side of Andromeda, 2.5-degrees to the W of Iota Andromedae is the lovely NGC7662 - otherwise known as the Blue Snowball Nebula. This Planetary Nebula is a great object - albeit compact, at 0.5 minutes of arc - and is well seen in telescopes of most apertures. A 6-8inch class telescope will show it clearly as a blue-green ball of light. However in larger telescopes, the subtleties of NGC7662 really become noticeable - its internal rings and slight elongated internal lobes can be distinct. The Blue Snowball can exhibit "blinking" just like the famous Blinking Planetary and Saturn Nebula. The Blue Snowball's central white dwarf star shows distinct variability - peaking at +12 mag, but sometimes dimming down to below +16 mag. Current distance estimates put it at 5,600 light years distance from us and 0.8 light years in diameter.

The Blue Snowball Nebula. Image Credit: HST/NASA/ESA. Public Domain.

Drifting back east, beyond M31 and its companions, we come to two unusual objects. Mirach and Mirach's Ghost are formed by Beta Andromedae and a condensed elliptical galaxy, NGC404. Line of sight from our perspective on Earth place these two completely unrelated objects in a very close pairing - they are separated by just under 7 arc minutes, making this galaxy easy to locate, but not necessarily so easy to see! Mirach has a tendency to overpower its neighbour, due to their differences in brightness. In clear, calm conditions NGC404 can be spotted in large binoculars, though telescopic observation can be a little trickier. Higher magnification can help under some conditions, though aperture will help as well. Photography of NGC404 is a challenge as well, but a worthwhile one. Mirach and Mirach's Ghost are one of those interesting "Odd Couples" of the night sky, that perspective and chance throws our way. It would be a pity to let the perceived difficulty of observation stand in the way of taking a look.

Another of Andromeda's obscurer residents is the open cluster NGC752. Consisting of over 70 stars of around the 9th magnitude, NGC752's cumulative magnitude stands at +5.7. Best seen in giant binoculars, this cluster has some particularly elderly residents for a star cluster: its A2-class stars indicate an age of over a billion years. The cluster is full of star chains and occupies an area of over 75 minutes of arc in the sky. It lies over 1500 light years from Earth.

Just under 9 degrees to the SW of NGC752, just over the border in neighbouring Triangulum, forming an almost right-angled triangle in the sky with the cluster and the previously-mentioned Mirach and Mirach's Ghost is the third largest member of our local group: M33, otherwise known as the Pinwheel (a description it unhelpfully shares with M101 in Ursa Major) or simply, the Triangulum Galaxy. Whereas M31 is inclined to our perspective, M33 is presented to us in a much more "face on" aspect. It is a smaller, less massive object than its neighbour, and occupies less area in the sky - M33's major dimension is about as wide as M31's narrowest. However, at it is still a major object, though its lower surface brightness make it more difficult to spot.

M33 by Mark Blundell. Image used with kind permission.

At +5.69 mag M33 is technically visible to the naked eye, but one would have to be in a particularly dark location and very well dark-adapted in order to see it unaided. Discovered in 1654 by Giovanni Batista Hodeierna and then independently re-discovered and catalogued by Charles Messier in 1764, large binoculars will show M33 very well from a good locale and larger aperture observations can reveal some of the brighter nebulous regions. The largest and most prominent of these was first recorded by William Herschel in 1784 and now known as NGC604. As previously mentioned with M31, these two galaxies (setting aside the satellite Magellanic Clouds of our own Milky Way) are the only two external systems in which it is possible to view nebulous regions visually through a reasonably-sized telescope. H-Alpha and H-Beta Filters will help considerably with this endeavour - though inevitably, aperture and a good sky is key. Those with access to instruments in the 16-inch or above class would be able to spot some of M33's globular clusters, arranged in a halo around the galaxy, much as they are in our own Milky Way.

Current measurements put M33 at a distance of around 3 million light years away from us - 500,000 light years further from us than M31. M33 contains around 30-40 billion stars, less than our galaxy's 200-400 billion and much less than M31's trillion stars. M33 has supposedly interacted with M31 in the distant past, and as it is moving towards us and M31, will probably do so again.

Whether this results in a collision such as that predicted for the Milky Way and M31 is, as yet, unknown.

Original text: Kerin Smith