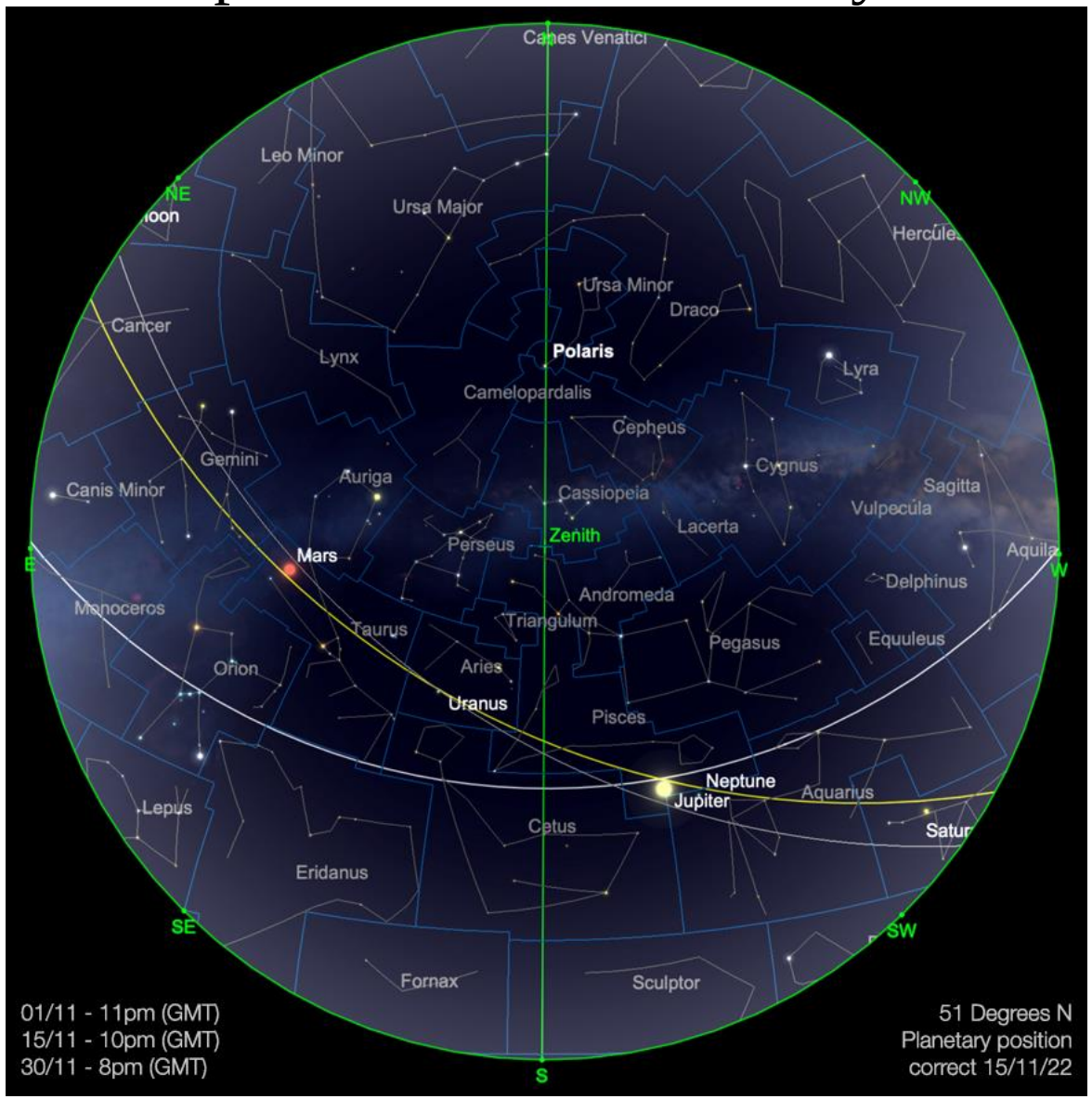
Telescope House November Sky Guide



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November is upon us and readers of this sky guide in upper northern latitudes will have inevitably noticed the encroaching darkness in the evenings. All of Europe has now reverted to Standard Time, principally in order to preserve daylight in the mornings, in counties at higher latitudes.

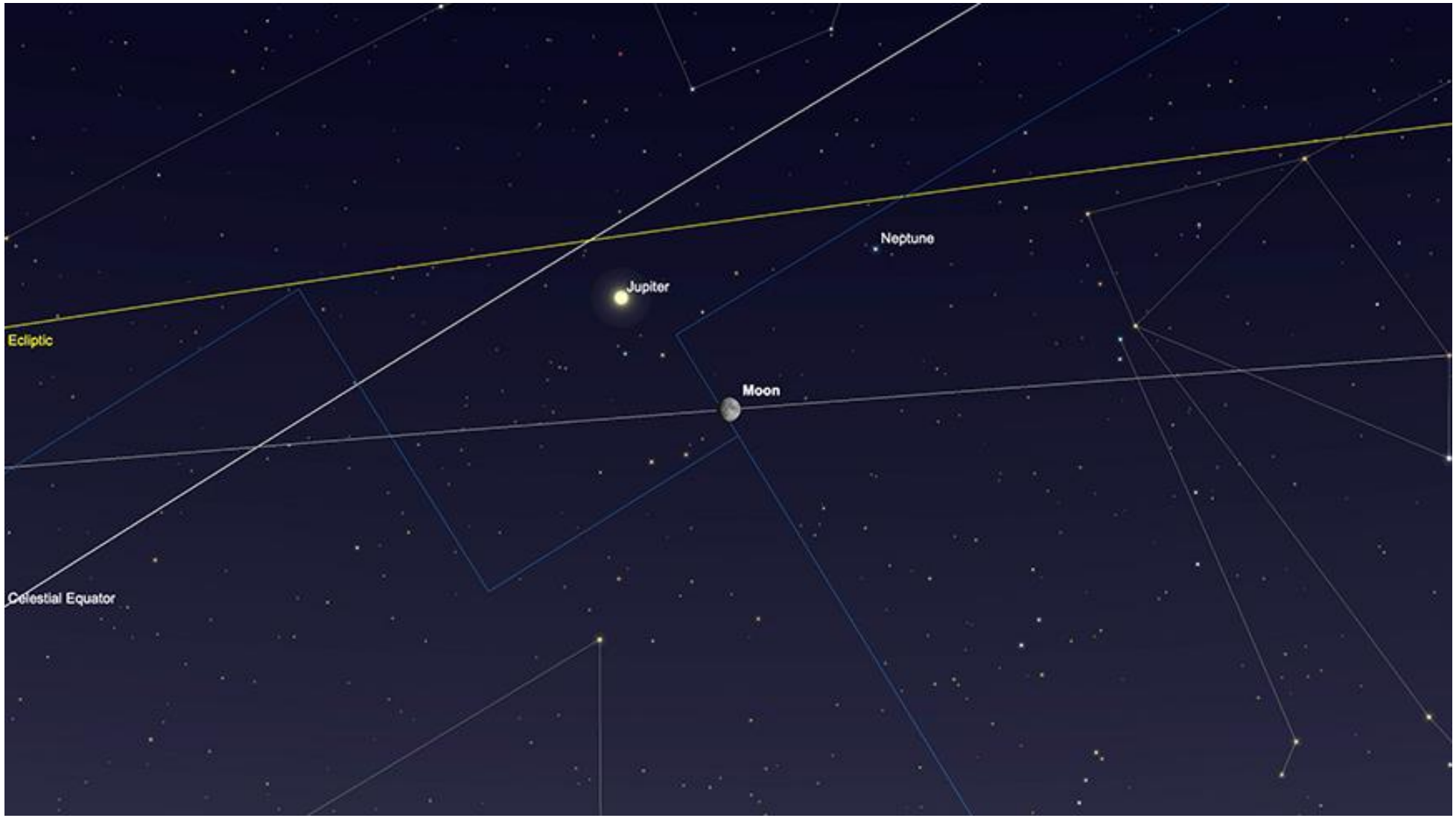
November, while not being quite as cloudy on average than December and January, is still a pretty challenging time for astronomy in Europe. On average, across the continent, October has twice as many clear skies as November and September two and a half times more clear skies. Picking our way through the clouds, as ever, there's plenty to see in the skies above us this month...

The Solar System

The Moon

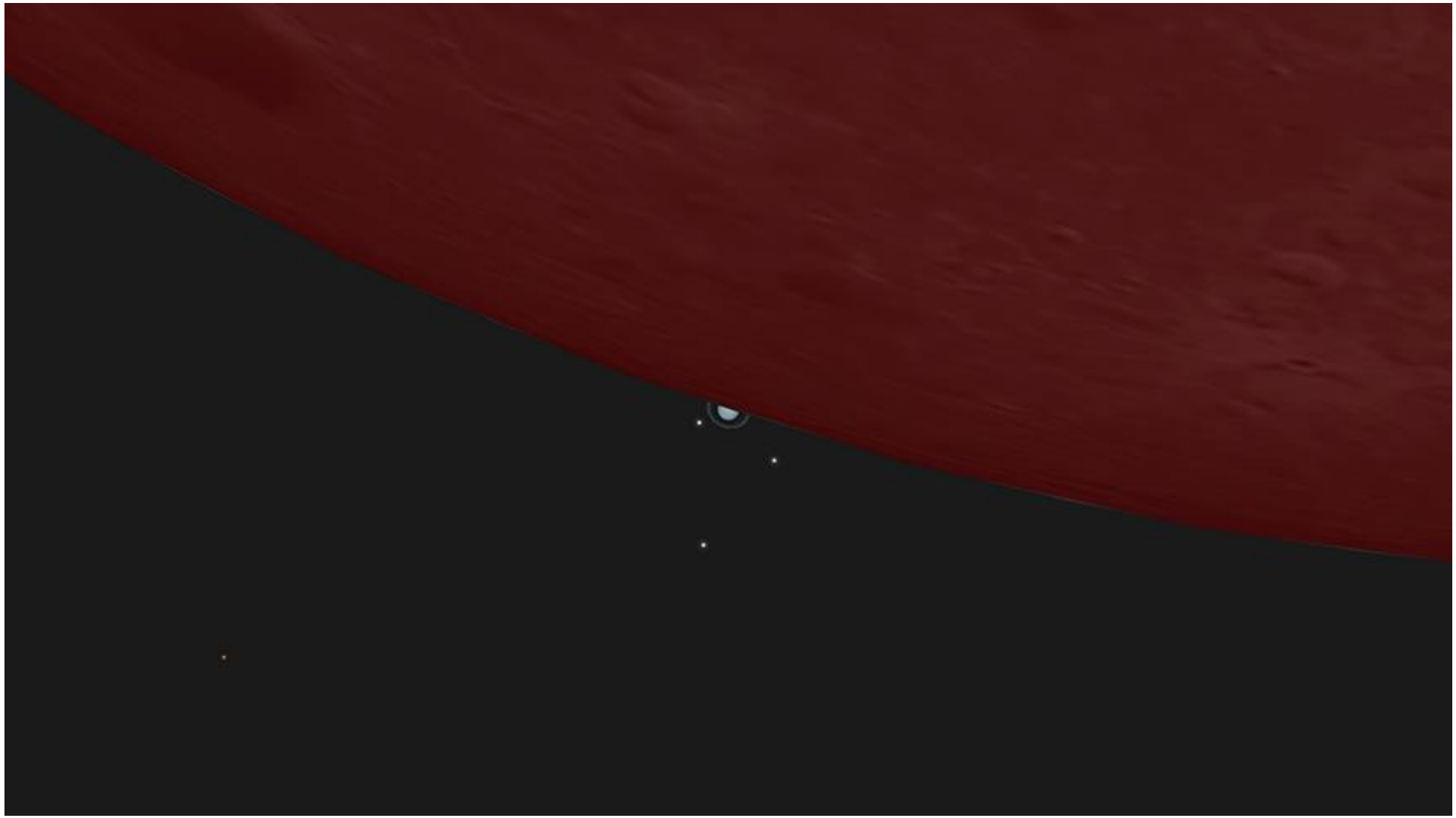
Our natural satellite starts November in the constellation of Capricornus, at First Quarter phase. Sharing the constellation with nearby Saturn, which can be found just over 6 degrees to the north of the Moon on the evening of the 1st. This part of the year sees the Moon rising through the more southerly parts of the Ecliptic plane, during its waxing phase, so the height of the evening Moon, from mid-Northern latitudes during the early part of the month won’t be especially high.

The first week of November see the Moon pass through Capricornus, Aquarius and on into Pisces. The evening of the 4th sees the Moon sitting on the Pisces/Aquarius borders, forming a loose triangle with the brilliant Jupiter and the distinctly un-brilliant Neptune, which lies 5.5-6.5° to the west of its naked-eye neighbours. At this point of the month the Moon is at 85% illuminated Gibbous phase, so atmospheric conditions will have to be kind to prevent scatter drowning out the very faint Neptune.



The Moon, Jupiter and Neptune Aquarius /Pisces borders, 4th November. Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

The Moon then continues on its track through Pisces, into the non-Zodiacal constellation of Cetus and then back into Pisces in the lead-up to Full Moon, which occurs on 8th November, with the Moon in Aries. Full Moon coincides this month with a Full Lunar Eclipse, the very beginning Pre-Umbral phase will be visible from parts of Western Europe, just before the Moon sets, just before 7am (GMT). Sadly, the full eclipse will be invisible from Europe, but those in Australasia and the Far East will have a good view of the entire event, as will some observers on the West Cost of the Americas. The rest of the Americas will see at least some of the Umbral part of the event, before the Moon sets. However, the real bonus - a serendipitous co-incidental Occultation of Uranus, during the eclipse - will be visible from Japan, China and through a fairly wide area of Northern Asia. Naturally, Uranus, being somewhat further away from Earth and its shadow than the Moon, will be unaffected by the Eclipse itself and will technically visible to the naked eye, being +5.6 mag, during this period. This should be a fascinating and very rare event to witness. Apart from the mid-Eclipse, we (as usual) at the point remind readers that this part of the month will not be the greatest from a deep sky observing or imaging point of view.



Uranus Occultation, mid-Lunar Eclipse as seen from Guangzhou, China, 8th November. Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

Beyond the Eclipse, the Moon spends the early part of its Waning phases climbing through the easterly part of Aries into Taurus, where it comes into close proximity with the prominent Mars on the evenings of the 11th and 12th. The next few days finds the Moon drifting onwards through the most northerly part of the Ecliptic plane, cresting through Gemini and down into Cancer and on into Leo, where it will come to Last Quarter phase no the 16th. The following week finds the Moon at one of its "high autumnal morning crescent phases", which rewards the early riser with some of the best opportunities to observer the Moon's western limb, during the year. The steeply rising ecliptic plane (as seen from mid-to-higher northern latitudes) affords observers from these locations some of the greatest separations of the Moon from the horizon, during its latter crescent phase, leading to better seeing conditions and thus resolution through a telescope.

The next few days the Moon spends in the vast expanse of Virgo, shrinking in phase and brightness, until meeting the Sun, to become New in Scorpius on the 23rd.

After this point, the Moon becomes an evening object, albeit a very low one for those in higher northern latitudes, rising up through the extreme south of the Ecliptic in Sagittarius, on the 26th and 27th and on into Capricornus on the 28th and 29th, again, passing Saturn as it did at the month's beginning. The Moon ends November in Aquarius on the 30th.

Mercury

We begin the month at an awkward time for observing the Solar System's innermost planet. While Mercury is at a brightness of -1.2, it is separated from he Sun by just over 4 3/4° and will be very difficult, if not impossible to find in the dawn sky. As the early part of November continues, Mercury sinks lower and lower towards the Sun, until it reaches Superior Conjunction (the opposite side of the Sun from our perspective on Earth) on the 8th.

Re-emerging as an evening object, Mercury is in a pretty disappointing positioning the Ecliptic for those observers in mid-to-higher northern latitudes. As we've covered with the Moon, the Ecliptic plane of our Solar System rises in a very shallow fashion from the northern hemisphere at this time of year (exactly the opposite is the case for the southern hemisphere), this keeps the interior planets and the Moon, when closer to the Sun, locked into a very low part of the sky in the evenings. The lower the target - the more difficult is is to observe and the worse the atmospheric distortion caused when observing through a telescope. Such is the case for Mercury during the rest of November. Although it increases its angular distance from the Sun, Mercury hugs the horizon at sunset, making it almost impossible to observe, unless you have a <u>very</u> clear horizon and extremely clement atmospheric conditions.

By the end of the month, Mercury will be sitting at a rather pitiful 2 3/4° elevation at Sunset (from 51° north) and while at a reasonable brightness of -0.6 mag, will be a difficult object to see in many locations. Those further south will fare better.

Mercury and Venus, sunset, 30th November. Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

Venus

Venus is also emerging from late-October's Superior Conjunction, so is to be found in the same are of the evening sky as Mercury throughout most of the month. While Mercury whizzes round the Sun once every 88 days, Venus 'year is 225 days long, so it moves at a considerably more sedate pace than its neighbour. At -3.9 magnitude throughout the entire month, Venus is normally always bright enough to see during practically all conditions (even observable in broad daylight at times). However, the planet's elevation from mid-northern latitudes is not that much better than Mercury's - making it tricky to find in built up areas. At the end of November, Venus can be found just under 10 degrees east of the Sun at sunset, at an elevation of around 3° above the horizon (from 51° north). It should be easy enough to find, but atmospheric conditions will make it a poor target for telescopic observation in the limited window before it sets. Those of us in higher northern latitudes will have to be content to wait until the late-winter and spring of 2023, when Venus will be in a much better position to observe.

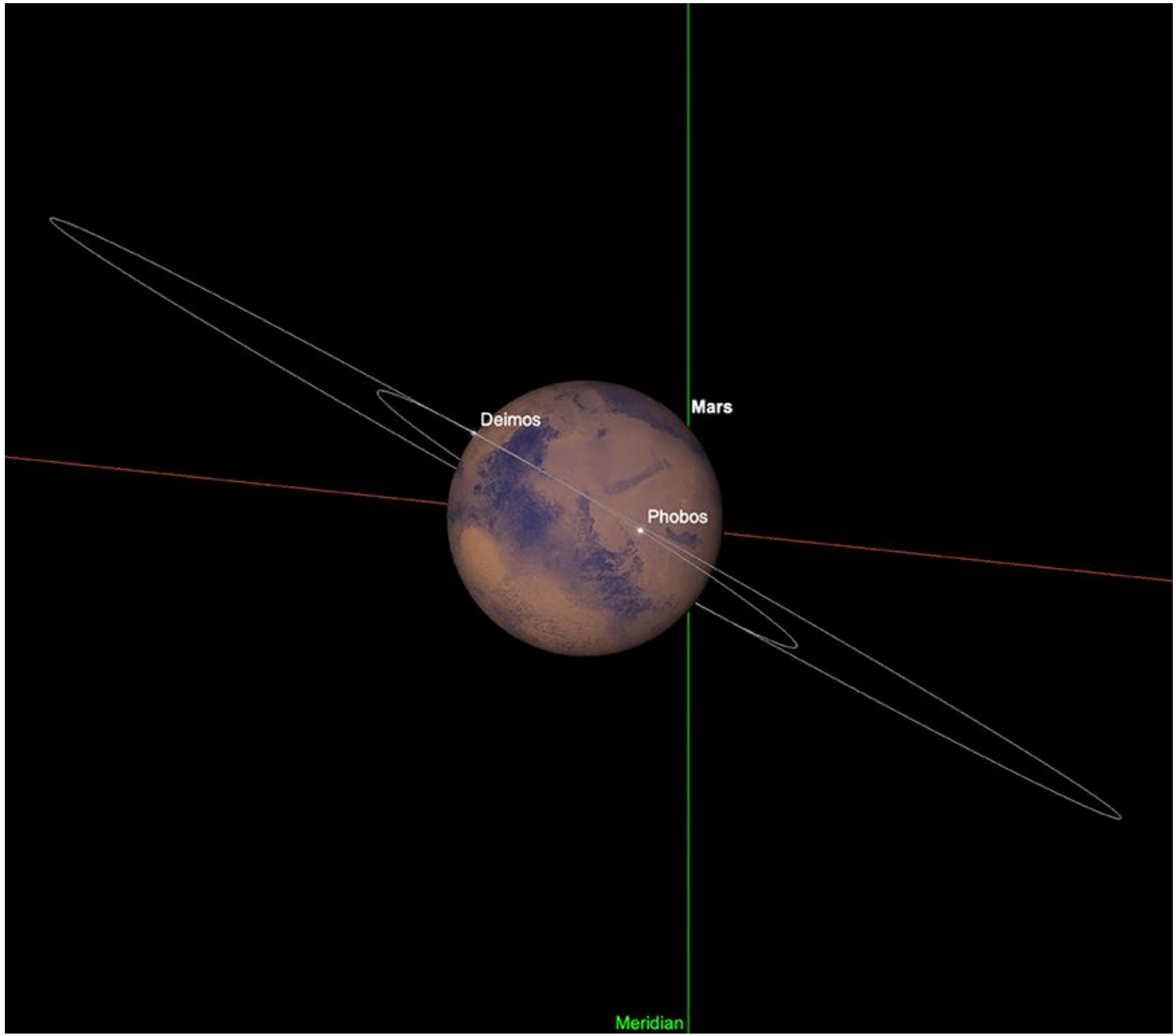
Mars

Mars is rapidly accelerating towards Opposition in late 2022. Those readers who have been out recently in the late evenings will not have failed to note the presence of the rising Mars, firmly ensconced in Taurus. The 1st finds Mars at -1.2 magnitude and 15.1 arc seconds diameter. Observers have to wait until the small hours (just past 3am GMT) for Mars to transit in the early part of the month.

By mid-November, Mars will have increased brightness to -1.5 mag and will now be displaying a 16.5 arc second diameter. It remains fairly static in the sky in-between the "horns" of Taurus - Elnath, Beta Taurii, to the north and Zeta Taurii to the south. It will now transit at just past 2am (GMT).

By the end of the month, Mars has increased magnitude significantly to -1.8 and is now displaying a 17.2 arc second diameter angular size - larger than Saturn. It will transit at just before 1am (again GMT) and will be a significant 64° elevation (from 51° north), when it does so. At this sort of elevation, telescope owners can afford to ramp up magnification (sky conditions being clement). It should be quite a view, as Mars will be just over a week from Opposition on the evening of the 30th. While it brightens yet further and grows slightly larger in size

during the first week of December, heading up to Opposition on the 8th, November - particularly the latter half - should afford us with plenty of opportunities for observing the Red Planet at close to its best this year. We would (as usual) recommend waiting for the planet to have risen a significant amount above the horizon before attempting higher power telescopic observations. Coloured filters - notably the Wratten numbers 23a Orange, 80a Blue and 56 Green will help isolate certain features of Mars ’surface and atmosphere.


Mars
Deimos
Phobos
Meridian

Mars at transit point, November 30th. Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

Jupiter

The King of the Planets continues to dominate the evening skies. It is unmissable in Pisces, shining at a brilliant -2.8 mag on the 1st. Transiting at just after 9.30pm (GMT), Jupiter displays a 47.5 arc second diameter disc in telescopes, making it ideally-placed for early-to-mid evening observing.

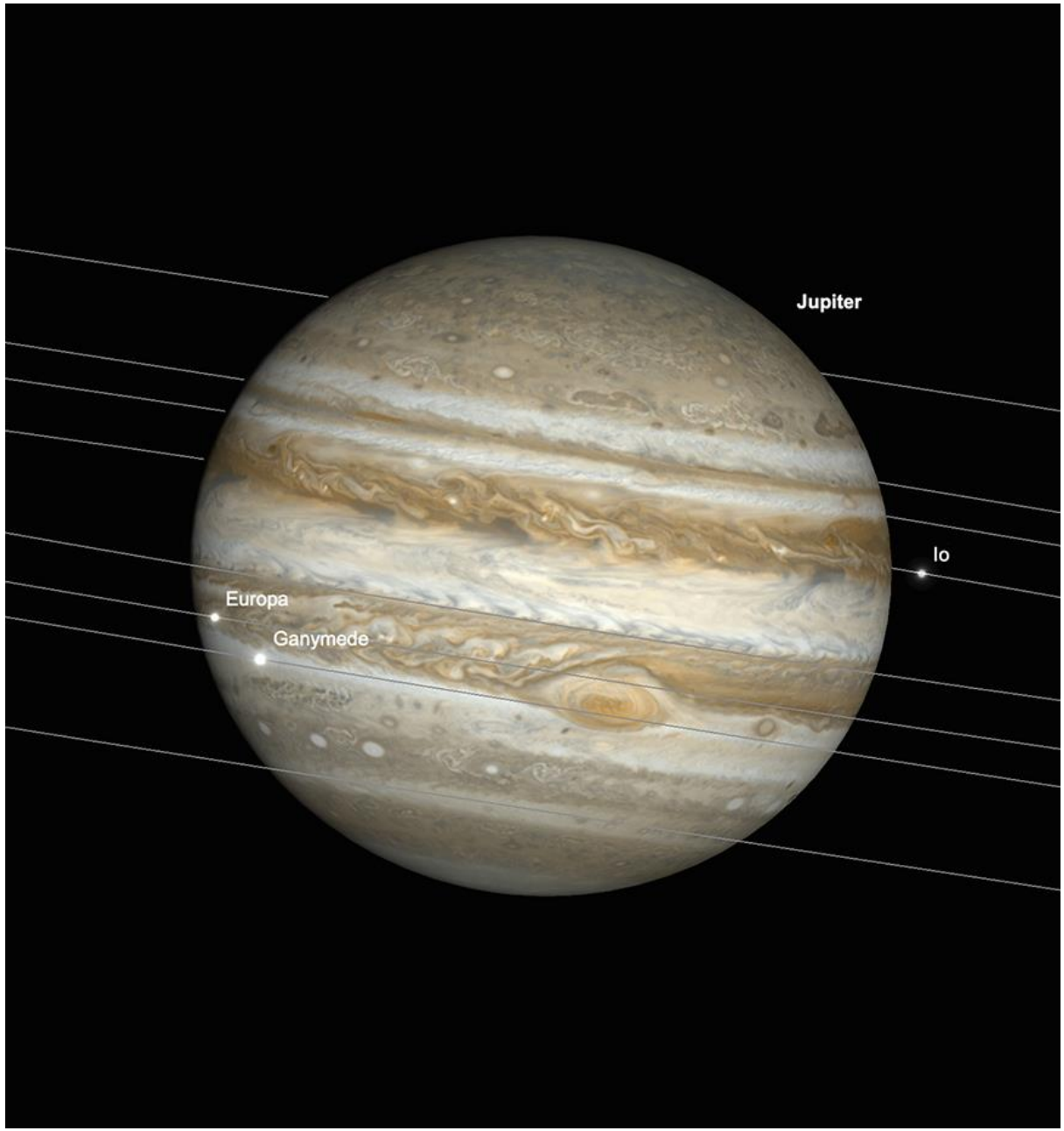
By mid-month Jupiter will have faded fractionally to -2.7 mag and now displays a 45.7 arc second diameter disc. It transits at just after 8.30pm on the 15th.

Jupiter begins its regular Prograde direction in the sky on the 24th/25th November, a sign that the Opposition cycle for this year is firmly a thing of the past. It will continue in a Prograde direction in the Ecliptic until early September 2023, in preparation for the next Jovian Opposition in early November 2023.

At the end of November, not much has really changed. Jupiter is not -2.6 mag and displays a 43.6 arc second diameter disc, transiting at just after 7.30pm (GMT).

As usual, with such an energetic world (Jupiter's day lasting just over 10 hours), possessing such easily observable major Moons (Ganymede, Callisto, Europa and Io), there are plenty of mutual transit events to observe from various parts of the world. Some of those visible from Europe include the following:

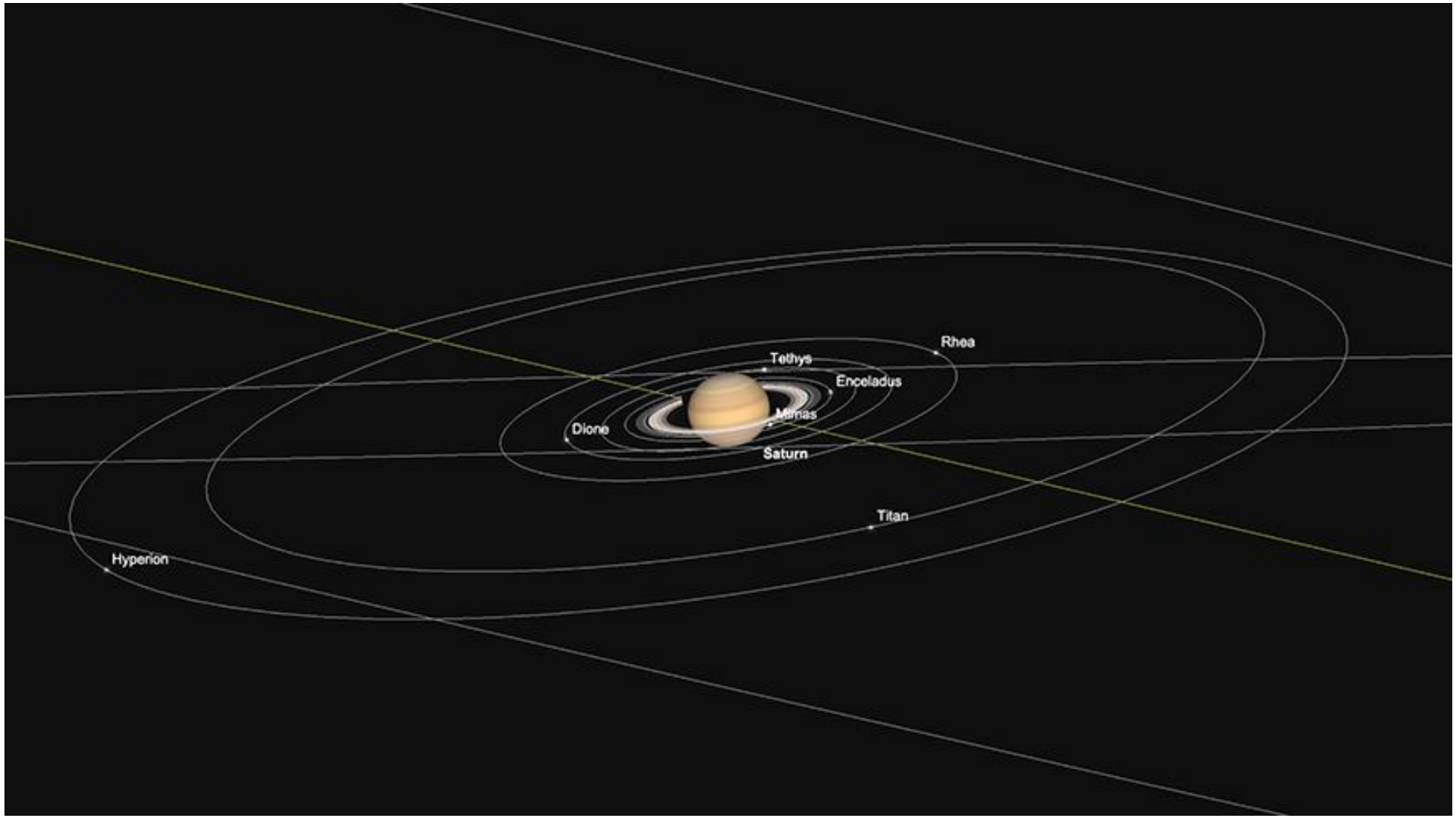
Mutual Great Red Spot (GRS) and Io Transit, starting around 11pm (GMT), 1st November.
GRS, Europa and Ganymede Transit, starts just before 8pm (GMT) 2nd November.
Europa and Ganymede Transit, starts just after 11pm (GMT) 9th November.
Mutual GRS and Callisto Transit, observable from Sunset, 10th November.
Mutual GRS and Io Transit, observable from Sunset, 12th November.
Mutual GRS and Io Transit, observable from Sunset, 19th November.
Mutual GRS and Io Transit, starts just before 5.30pm, 26th November.
Mutual GRS and Europa Transit, observable from Sunset, 27th November.


Jupiter
Io
Europa
Ganymede

Jupiter, Europa, Ganymede and GRS mutual transit, 8pm, November 2nd. Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

Saturn

Saturn is well-placed for observation in the early evenings, transiting at just before 7pm on the 1st. At +0.7 mag and 17.2 arc seconds diameter at the beginning of November, it is a rewarding target for telescopic observation and shouldn't be hard to find, as it's the brightest "star" in the south at sunset. While not as brilliant as Jupiter, it should be easy enough to locate. Saturn is much further south in the Ecliptic than Jupiter and moves at a much more sedate pace around the sky. It will reach an altitude of just under 23 degree high at transit point (from 51° north) - not above the "magic" 30° elevation, where seeing conditions improve significantly, but high enough to press magnification somewhat, if sky conditions allow. Naturally, the higher north you find yourself, the lower Saturn's maximum elevation will be.



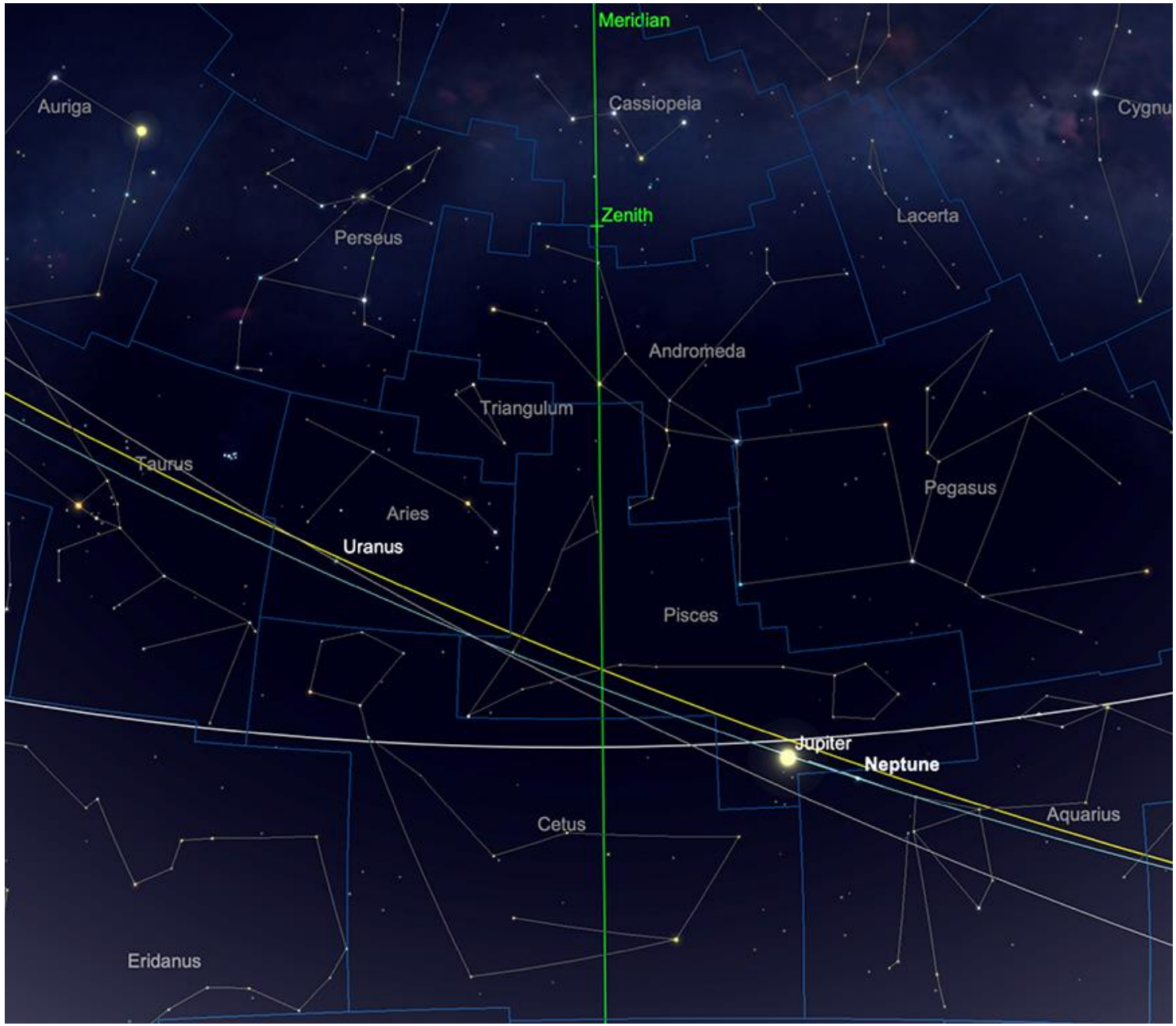
Saturn and Inner Moons, early evening, 1st November. Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

By mid-month, Saturn will still be the same brightness, but will have shrunk fractionally to 16.8 arc seconds.

By the end of November, the Ringed Planet will be +0.8 mag and 16.4 arc seconds across. It will transit at a little past 5pm (GMT).

Uranus and Neptune

The Outer Planets are well-positioned for observation during November. We've already discussed the highlight of Uranus 'Occultation by the eclipsed Moon on the 8th, but the next day, the planet comes to Opposition. At +5.7 mag and displaying a 3.7 arc second disc, Uranus is never prominent, like the classical "major" planets, but it can be glimpsed with he naked eye and now is the best opportunity to attempt this. You will need good eyesight (or decent spectacles), a dark observation sight, well away from artificial lighting and decent atmospheric conditions to do so. The Moon being out of the way will also help significantly, as the scatter of light caused by the Moon when close to Full, will significantly downgrade the ability to make out fainter stars. It is possible to observe Uranus through powerful binoculars and telescopes when the Moon is around though and it's this path that many observers in light polluted environments will have to take anyway. Even in urban areas, Uranus is visible with optical assistance - just as long as you know where it is. Currently a resident of Aries, it has no really bright stars nearby to act as waypoints. Uranus at transit point can be found 22 degrees to the west of Aldebaran, Alpha Taurii, at around the same angular height, throughout the month.


Meridian
Auriga
Cassiopeia
Cygnu
Zenith
Lacerta
Perseus
Andromeda
Triangulum
Taurus
Pegasus
Aries
Uranus
Pisces
Jupiter
Neptune
Aquarius
Cetus
Eridanus

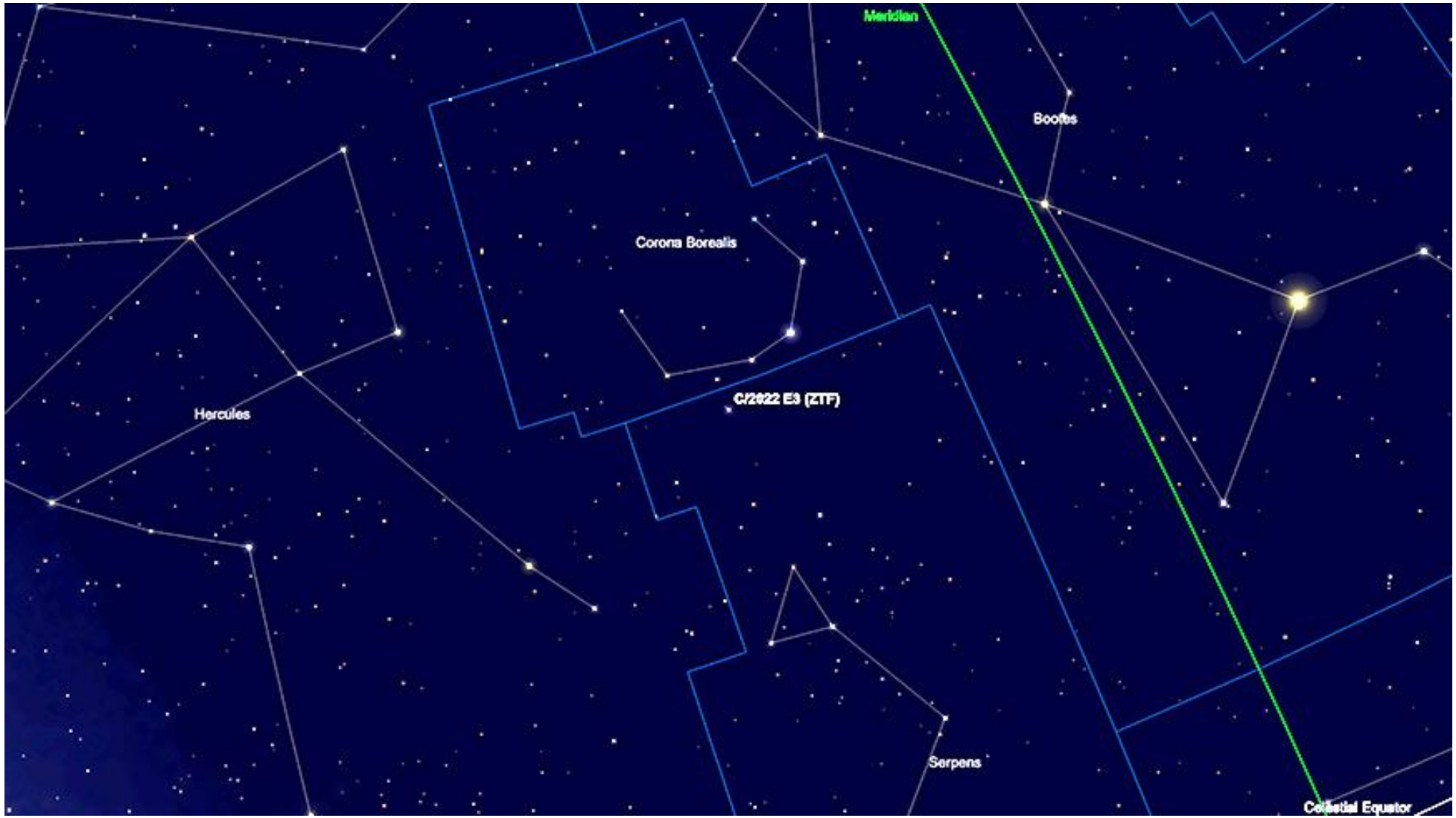
Uranus and Neptune relative positions, November 2022. Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

As previously-mentioned, Jupiter's presence in the same area of sky as Neptune acts as a handy pointer to its location. At +7.8 mag and just 2.3 arc seconds across, you will definitely need larger binoculars, or a telescope to pick it out. But tracking just over 6 1/2° to the west of Jupiter on the evening of the 1st, will put Neptune in your field of view. Neptune's prominent blue colour is often remarked upon, so despite its relative dimness, its colour can often be used to make a positive ID.

Comets

Comet C/2017 K2 (PanSTARRS) has reached peak brightness, but below the horizon for observers in the temperate northern hemisphere. Those situated further south will enjoy a good view of the comet at its brightest, though it will remain invisible those of us further north.

There is potential excitement in the guise of C/2022 E3 (ZTF) to look forward to, though this will not reach its peak until late January/early February next year. At present it is lurking in the northern part of Serpens, just underneath the border with Corona Borealis. It'll remain fairly static in this part of the sky for the whole of November, tracking very slowly south for the first half of the month, before looping back northwards for the second half.



C/2022 E3 (ZTF) location, 1st November 2022. Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

All other observable comets remain above the 10th or 11th magnitude at present and as such, present a much more difficult observing challenge.

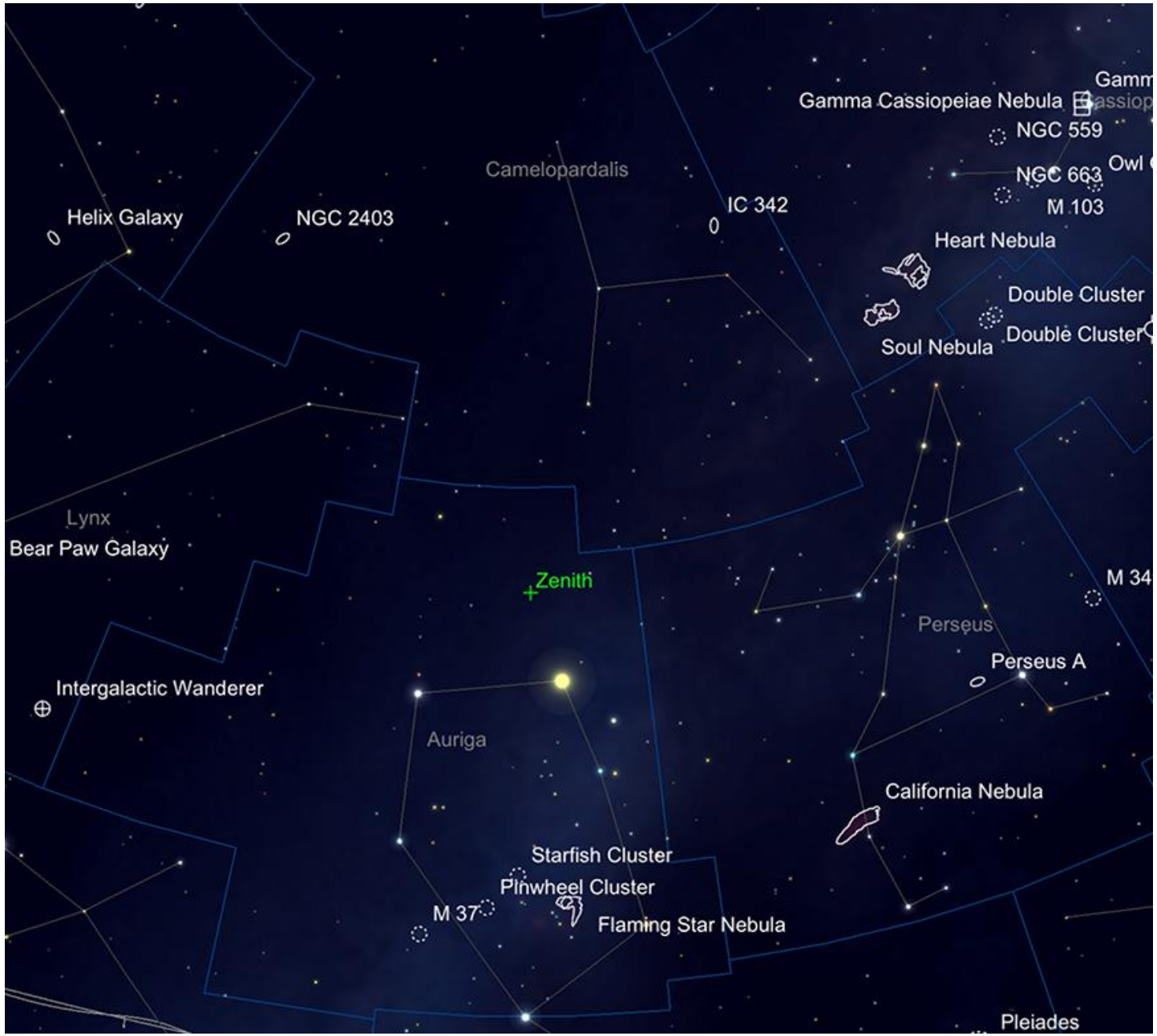
Meteors

One of the most famous meteor showers, the Leonids, peak on the 17th/18th of November. This shower is fed by the periodic comet 55P Temple-Tuttle, which returns to the inner solar system once every 33 years, potentially triggering a large outburst in the shower after reseeding its orbit with debris. The next return will not be until 2033, which means the shower at present is fairly inactive in comparison to its lofty, but very brief, peaks.

The ultimate disrupter of meteor showers, our own Moon, will be around to spoil the Leonids shower this particular year. While only at Half phase, the Moon is up for most of the night, during the peak of the shower - right in the middle of Leo itself. This truncates the opportunities for observing the Leonids this year somewhat - although it is noted that meteors can appear at any point in the sky, not just around their radiant point in the sky. We would never discourage anyone from attempting to observe any meteor showers, there are better opportunities in the future, than the Leonids present this year.

Deep Sky Delights in Camelopardalis and Auriga

Last month's Deep Sky section was a trek around the multiple delights of Perseus, Andromeda and Triangulum. This month we will examine the nearby constellations of Camelopardalis and Auriga.


Gamma Cassiopeiae Nebula
NGC 559
NGC 663
M 103
Camelopardalis
IC 342
Helix Galaxy
NGC 2403
Heart Nebula
Double Cluster
Double Cluster
Soul Nebula
Lynx
Bear Paw Galaxy
Zenith
M 34
Perseus
Perseus A
Intergalactic Wanderer
Auriga
California Nebula
Starfish Cluster
Pinwheel Cluster
M 37
Flaming Star Nebula
Pleiades

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

Starting at the top - or very close to the North Pole (with suitable apologies readers in the Southern Hemisphere) - we begin with the rather uninspiring constellation of Camelopardalis. Camelopardalis represents a Giraffe in the sky, its name being a rather literal amalgamation of "Leopard" and "Camel". While those who have seen a Giraffe up close will marvel at the scale and majesty of this peaceful, unassuming animal, the same cannot be said for its representation in the sky. When the principle star of a constellation - in this case Beta Camelopardalis - is only +4 mag in brightness. As a constellation, Camelopardalis is a relatively new one, being added to the sky in 1612 by Dutch Astronomer Petrus Plancius and not being one of Ptolemy's original 88.

Maybe it is because of Camelopardalis' relative obscurity and lack of bright stars that two very worthy objects for observation were overlooked by Messier and his correspondents during the compilation of his original list. The first of these is the wonderful galaxy NGC2403, which Herschel first catalogued in in 1788 - surprising maybe as this target can easily be seen in large binoculars from a decent site. Spiral in structure, NGC2403 is not presented fully face on, but at an attractive angle that benefits both surface brightness and a clear view of its architecture. 23.4 x 11.8 arc minutes in angular size - roughly the same size as M81 - and 8.5 mag in brightness, NGC2403 can be seen clearly in small telescopes, while larger instruments will show a suggestion of spiral structure and knots of nebulous material in its arms. In this way, NGC2403 is akin to a mini-M33, the Triangulum Galaxy - and is a treat for both visual observers and Deep Sky Astrophotographers too. NGC2403 is part of the M81 group of galaxies in neighbouring Ursa Major and lies around 10 million light years from us.


NGC2403 Galaxy in Camelopardalis
By Mark Blundell
19th December 2014 (PM)

NGC2403 by Mark Blundell. Image used with kind permission.

Just under 23 degrees to the west of NGC2403 lies the second of Camelopardalis' Deep Sky treasures, the wonderful face-on spiral galaxy IC342. This object is a true victim of celestial geography, as it lies close to the plane of our Milky Way galaxy and is obscured - as are many other objects in Camelopardalis - by interstellar dust surrounding our galaxy's main spiral arms. Estimates are varied, but this dust is generally though to have decreased the brightness of IC342 by 2.5 magnitudes. At +8.39 mag, it is of reasonable brightness, but would be a dramatically easier object were it not for us seeing it through the veil of our own galaxy. At 21.4 x 20.9 arc minutes in diameter, it is one of the larger observable galaxies in the heavens and a fantastic subject for imagers. Visually, IC342 is not in the same league as neighbouring NGC2403, as it is of low surface brightness. Observers with reasonable sized telescopes will see the glowing core of this target but little else. Much larger instruments are needed - and dark skies - to see much else of IC342's extensive spiral structure. However, long duration photography is on and to give us a real idea of quite how beautiful this object - said by many to be an analogue of our own Milky Way's make-up - truly is. Lying just 7 million light years hence, IC342 is not a true part of our local group, but is certainly close enough to have had some gravitational interaction with our own group of galaxies.

IC342 imaged by Sean Curry. Creative Commons

Sliding down the rather dim forelegs of the Giraffe, from IC342, we come to into neighbouring Auriga, the Charioteer, and its principle star, Capella, or Alpha Aurigae. This is the sixth brightest star in the sky at +0.08 magnitude and the brightest, most northerly star in the sky. Capella is actually a binary star and once of the first to be found by spectroscopic observation, where it was found to have two spectra, overlaid on top of each other, which appeared to doppler shift in relation to each other - hence it became known as a spectroscopic binary. The two stars in the system are orbiting each other by 0.75 AU - three quarters of the distance of the Earth to the Sun. As they are so close, even lying at a comparatively close 42 light years, they cannot be split, even with the largest telescopes on Earth. The system also comprises of two additional red dwarf stars lying much further out. The two main components are similar spectral class to our Sun (G class), but much bigger and classed as giants. They are thought to be much further along their lifespan than the Sun is and have run out of hydrogen as nuclear fuel and are now “burning” helium and in the case of one, carbon. Neither are thought to have enough mass to go supernova at the end of their lives and are likely to end up as planetary nebulae.

Moving to the southern part of the constellation, we find to the Flaming Star Nebula, IC405. Found just under 12 degrees almost due south of the Capella, this object is a partial emission, partial reflection nebula, meaning that one part of its structure glows under excitement from radiation, whereas the other part merely reflects light from the stars imbedded in the object. Measuring around 30 x 19 arc minutes, IC405 is centred around the star AE Aurigae, a star which was ejected from the nearby Orion Nebula under 3 million years ago. At +10 mag, it is not an intrinsically bright object, but condensed enough to be seen in small telescopes from a decent location. It is unsure if any of the material that makes up the Flaming Star Nebula was once a part of the Orion Molecular Cloud - it is more likely that it is material that the star is merely passing through. As previously mentioned, this is an area rife with gas and other star forming material. IC405 lies some 1500 light years from Earth.


IC405 Flaming Star Nebula
© 2019 Mark L Blundell

The Flaming Star Nebula by Mark Blundell. Image used with kind permission.

Just under 3 degrees to the NE of the Flaming Star lies the first of Auriga's three great open star clusters, the lovely M38, otherwise known as the Starfish Cluster. It's difficult to see exactly what resemblance this +6.4 mag, 20 arc minute diameter collection of stars has to the titular marine invertebrate, but it is certainly a pretty sight in any sort of optical instrument. M38 was first recorded by the preeminent Sicilian astronomer Giavanni Batista Hordierna in 1654 and re-squired much later by French observer Le Gentil in 1749. Le Gentil's observations alerted Charles Messier to M36's location and it was included in his original list in 1764.

At over a third of a degree angular diameter, M38 is ripe for observation in most telescopes and binoculars. Observers will note long chains of stars, many of which are blue, but there are also some lovely contrasting yellow and gold-coloured members. In total, M38 has around 100 stars as members and lies around 4200 light years from us. It is thought to be around 200-225 million years old.


M38 & NGC 2107 Open Clusters
© 2019 Mark L'Blundell

M38 and the smaller NGC1907) by Mark Blundell. Image used with kind permission.

2 and 1/3 degrees to the SE of M38 we come to the second of Auriga's great clusters, M36. This cluster is a good deal more compact than its neighbour at 10 arc minutes diameter and slightly brighter as a resultant +6 mag. Through a telescope, this collection of hot white stars can appear quite brilliant in comparison to M38 - indeed, it is said that if M36 were placed in the position of the Pleiades, it would outshine them by a factor of three. M36 was again discovered by Hordierna, in 1654, rediscovered by Le Gentil and added to the Messier list in 1764.

M36. By Ole Neilsen. Creative Commons

This cluster is a good deal younger than its neighbour and contains many young hot blue main sequence stars, of spectral type B2 and B3. There are no older population stars to speak of in M36, so it is thought to be just 25 million years old. Lying at around 4300 light years hence, M36 is one of the many objects that share the moniker "The Pinwheel" - though apart from a circular collection of stars to the NE side of the cluster, it is difficult to see why it has picked up such a name - especially in the light of the other "Pinwheels" in the sky. Perhaps we should come up with a new more original nickname for this great cluster - it deserves better.

The last of Auriga's fine open clusters is its best - the spectacular M37. There are many great clusters in this area of sky: the much nearer Hyades, Pleiades, Beehive, the nearby M35 in Gemini and the Double Cluster in Perseus - but M37 is one the most beautiful of these and is a lovely sight is any telescope or binoculars. At a quarter of a degree in diameter, M37 is about the same angular size as the Full Moon in the sky. It is also the brightest of Auriga's "Trio" at +5.59 mag and the oldest at an estimated 300 million years of age. Like its neighbours, M37 contains many hot blue stars, but also significantly many more mature yellow , orange and red giant stars. This more evolved stellar population makes for some fine viewing for we astronomers here on Earth as the blues of the newer, hotter population contrast superbly with the warmer tones of the older stars.

M37 by Jim Mazur. Creative Commons.

M37 was again discovered by Hodierna, though almost inexplicably was missed by Le Gentil - Messier himself found it again at catalogued it in 1764. M37's total stellar population is thought to number in the 500+ levels, of which maybe 150-or-so are observable in amateur telescopes. It is the furthest lying of Auriga's clusters at 4500 light years distance and the largest at 25 light years across.