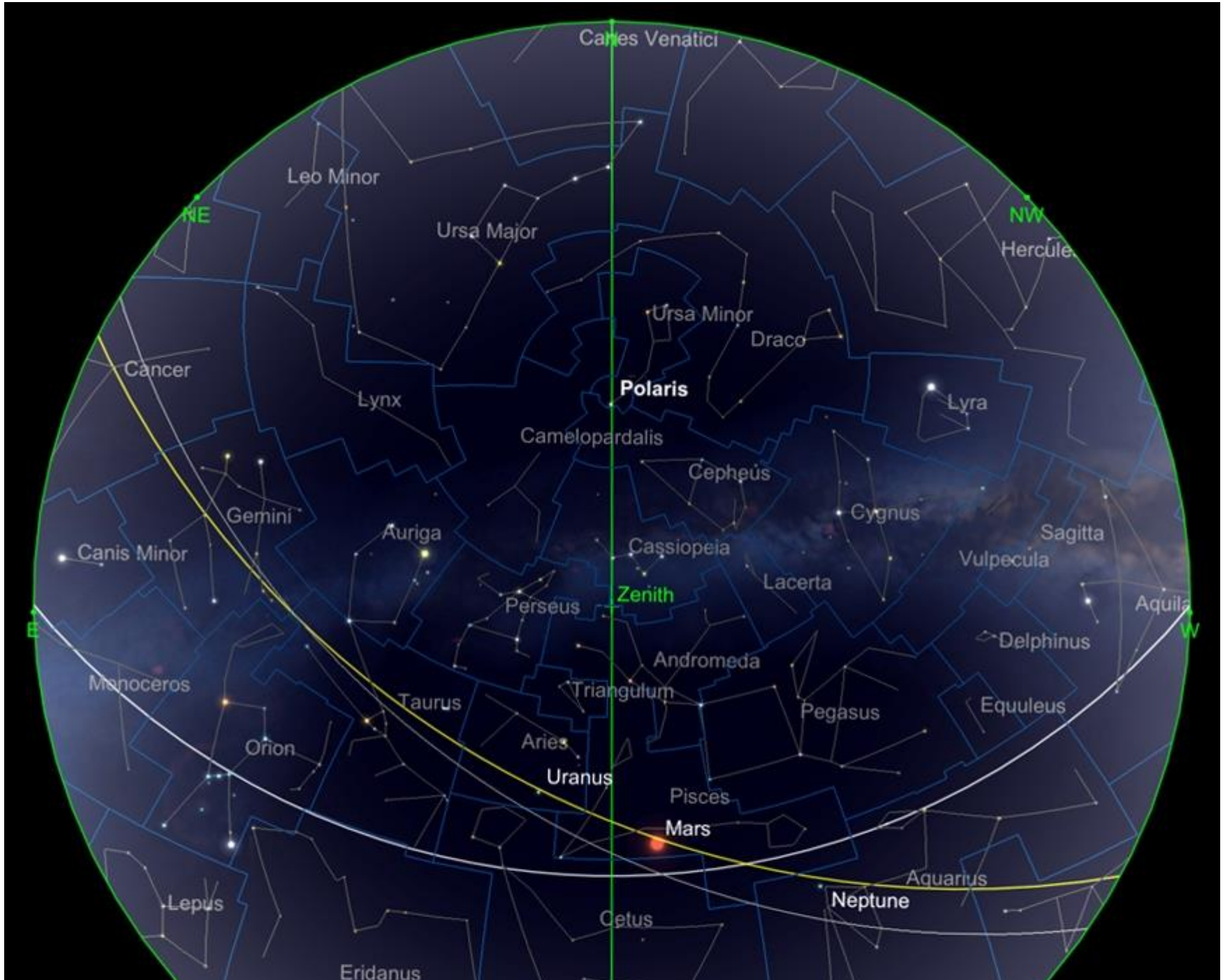

Canes Venatici
Leo Minor
NE
Ursa Major
NW
Hercule
Ursa Minor
Draco
Cancer
Polaris
Lynx
Lyra
Camelopardalis
Cepheus
Gemini
Cygnus
Auriga
Sagitta
Canis Minor
Cassiopeia
Vulpecula
Lacerta
Zenith
Perseus
Aquila
E
W
Delphinus
Andromeda
Monoceros
Triangulum
Taurus
Pegasus
Equuleus
Orion
Aries
Uranus
Pisces
Mars
Aquarius
Neptune
Lepus
Cetus
Eridanus

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

The Monthly Sky Guide November 2020

November finds nights continuing to lenghten and offers up increasing hours of darkness to make observations and image in. We are gradually losing Jupiter and Saturn amongst the stars of the northern hemisphere's summer in the evening time, but Mars is holding steady in Pisces and will still be well-seen for a while to come. Uranus and Neptune, either side of the Red Planet in the ecliptic are also observable in the evenings, while Mercury and Venus will also be well-placed for early risers in the morning sky during November. We have the delights of the Leonid Meteors to look forward to mid-month, which will be happily unaffected by the Moon this year. Plus there's our regular guide to deep sky observing in the neighbouring constellations of Taurus and Auriga. While the weather at this time of year for temperate northern hemisphere observers is often variable at best, we entreat you to get out and make the most of the gaps in the clouds - as ever, there's plenty to see...

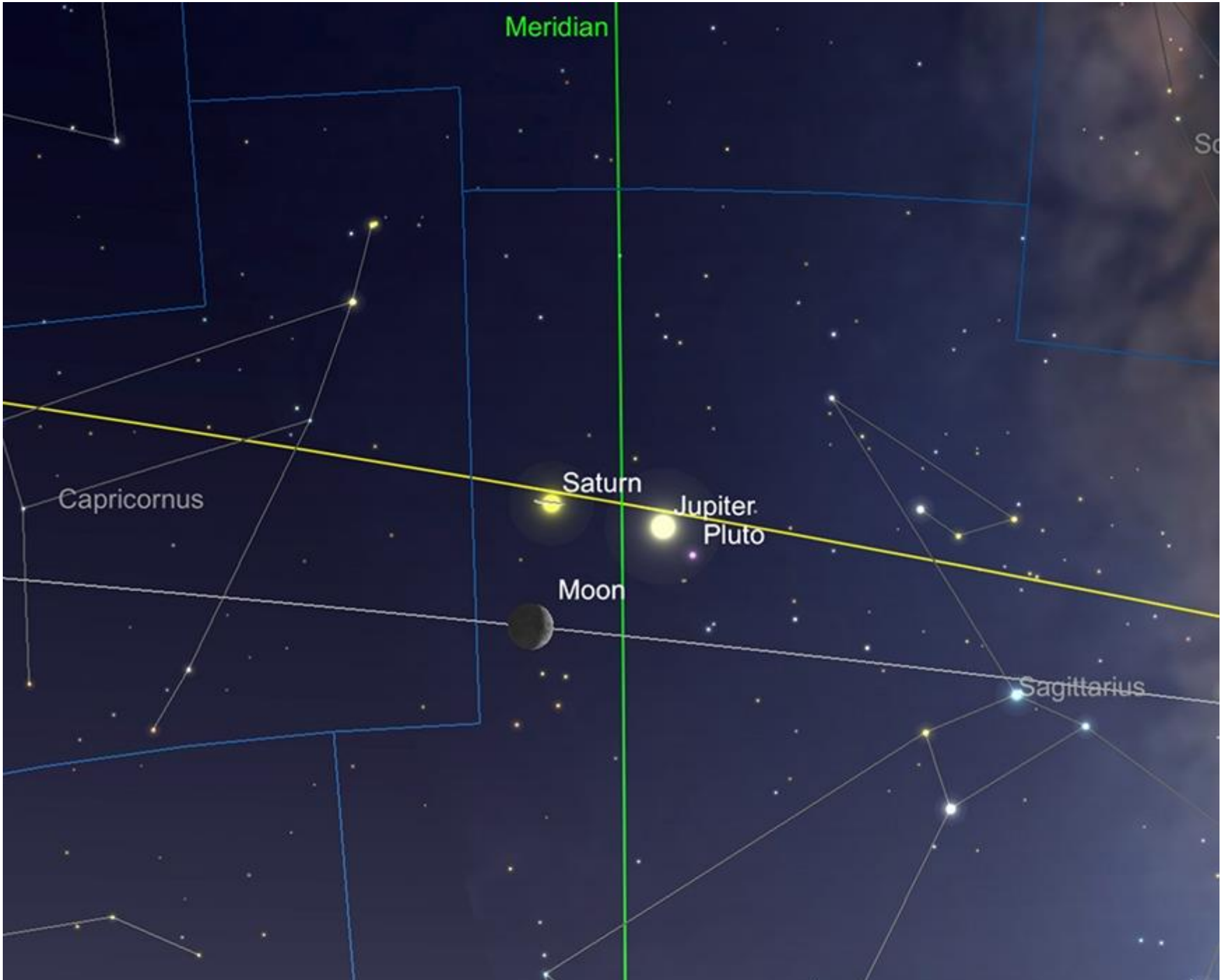
The Solar System

The Moon

The Moon starts November in Taurus at Waning gibbous phase, just a day past Full. The Moon will rise at around 5.30pm and be transiting in the south a little after midnight during the early part of the month. Naturally, around the the beginning of the month isn't the greatest part of the month for visual deep sky observations, or imaging without narrowband filtration. The Moon will continue its gentle path over the northerly "top" of the Ecliptic the descending southern section of the Ecliptic. The Moon will reach Last Quarter on the 8th, when it will be found in the constellation of Cancer.

The Moon will reach New on 15th, gliding to the north of the Sun in Libra. As the Moon is at New at this part of the month, this is going to be the most useful period for deep sky observations.

From this point, the Moon becomes an evening object and may just be found a few days later, on the 19th, as a very thin crescent in Sagittarius, forming a distinct triangle in this part of the sky with Jupiter and Saturn. As the Sun is now in the most southerly part of the Ecliptic, Crescent Phase will be very low in the sky from a northern hemisphere perspective.


Meridian
Capricornus
Saturn
Jupiter
Pluto
Moon
Sagittarius

The Moon, Jupiter and Saturn, early evening, 19th November. Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

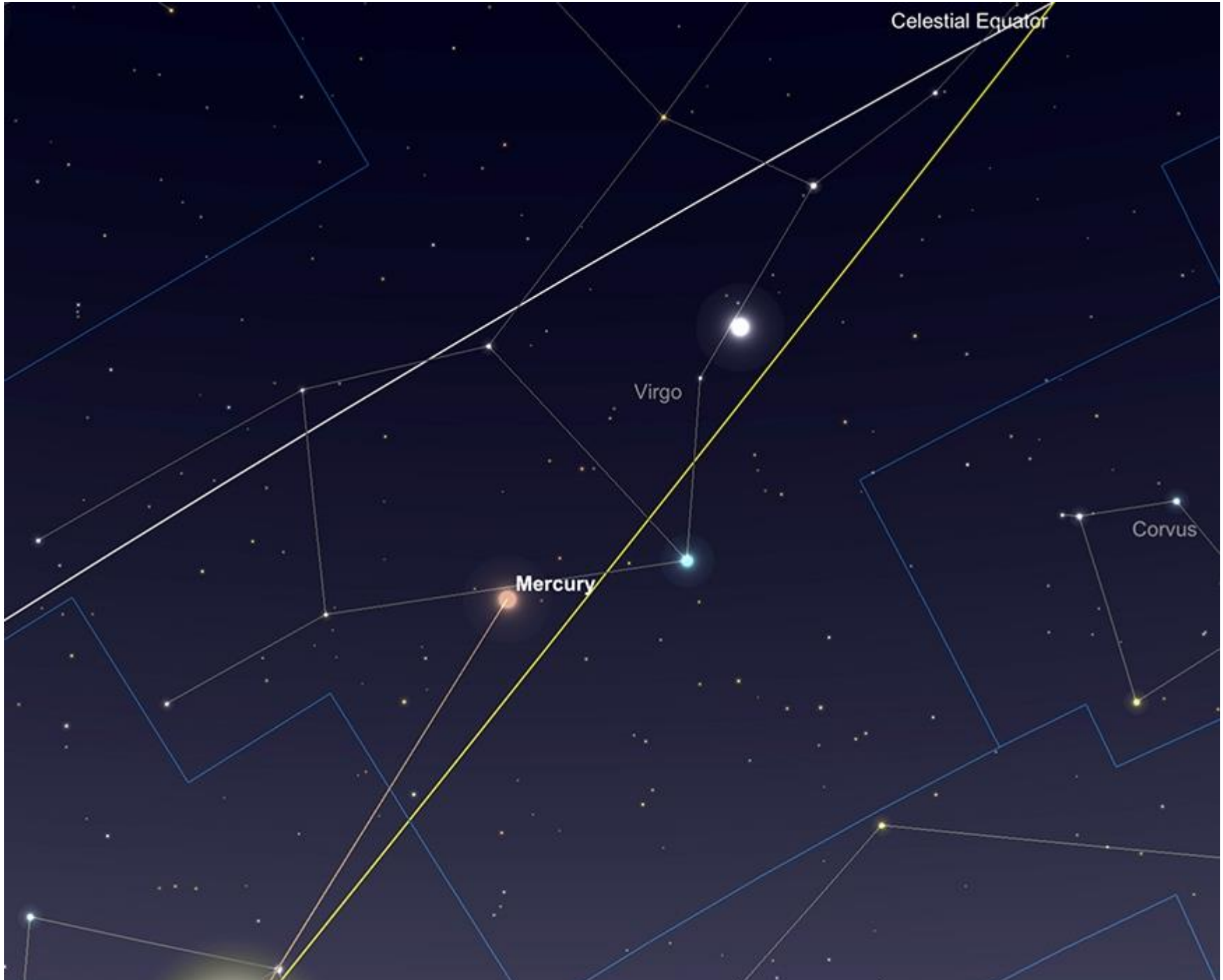
First Quarter phase occurs on the 22nd November, when the Moon can be found in Aquarius. Three days later, the Moon will pass to the south of Mars in Pisces, separated from the planet by around 5 3/4 degrees.

The Moon ends the month on the 30th, at Full Phase, having returned to Taurus, where it was found at November's beginning. Again, this part of the month won't be the greatest for deep sky observing and imaging, without serious filtration.

Mercury

The early part of the month is a reasonably challenging time to catch the illusive innermost planet in the morning. The 1st finds Mercury in Virgo, shining at +1.5 magnitude, at 8.9 arc seconds diameter, showing a slim 15% crescent phase. The planet will be practically invisible to the naked eye, even under ideal conditions, due to the glare of the dawn, but will possibly be found in binoculars and telescopes at the beginning of the month, sitting around 10 1/2 degrees high at sunrise (from 51 degrees N). However, with Mercury, nothing stays the same for long and it only takes a few days for the situation to improve and present one of the best observing opportunities of the year.

Mercury reaches maximum western elongation from the Sun on the 10th November, when it will have brightened considerably to -0.6 mag and is now showing a 57% phase. At this point it will reach an elevation of 15 1/2 degrees high at sunrise (from 51 degrees N). Beyond this point it will begin to head down towards the Sun rapidly, loosing altitude as it does but brightening a little as it does. Mercury is moving away from us round the Sun and increasing its phase from our perspective here on Earth.


Celestial Equator
Virgo
Corvus
Mercury

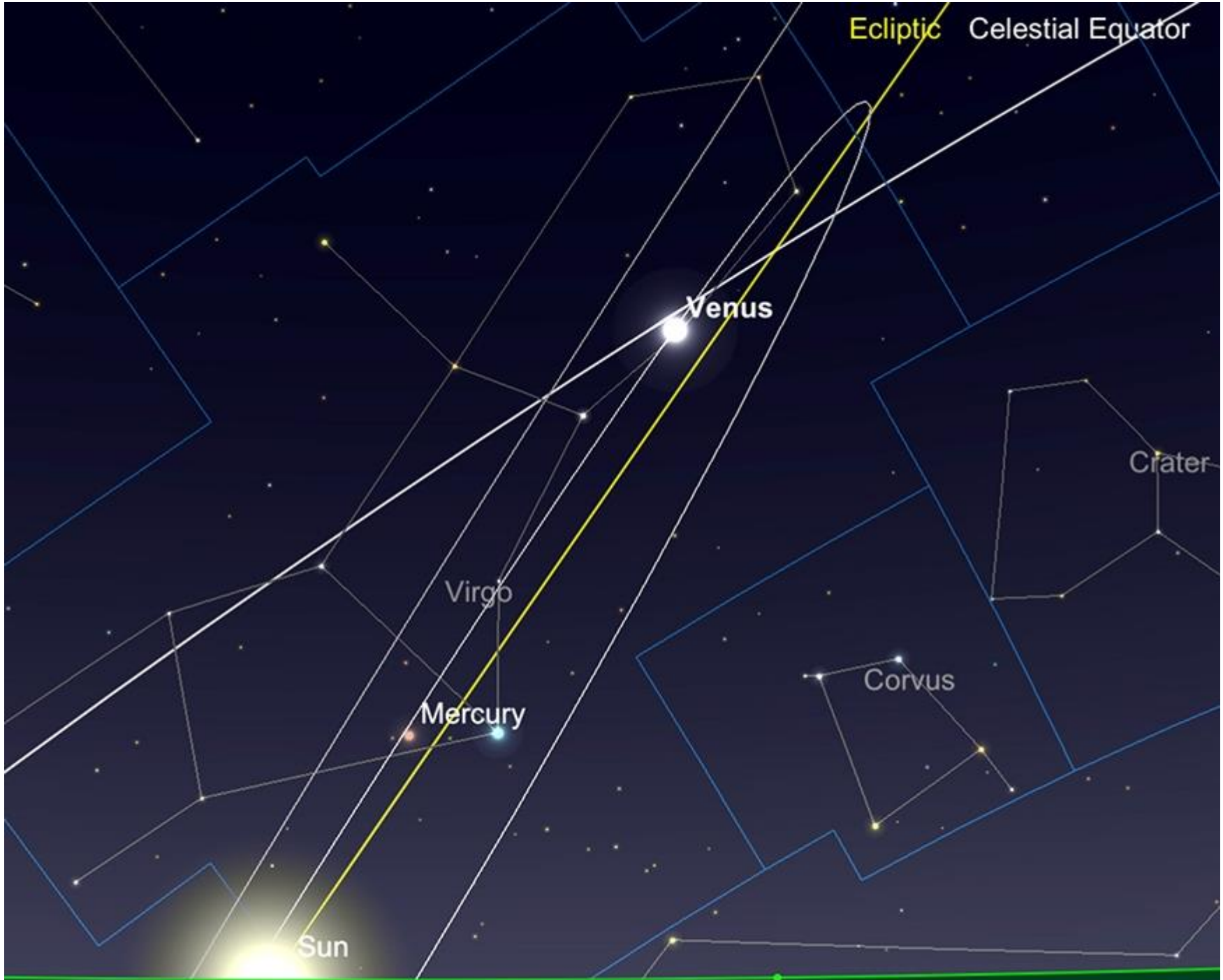
Mercury at Greatest Western Elongation, November 15th. Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

By the 15th November, Mercury is 74% illuminated and has increased brightness to -0.7 magnitude, though has shrunk to 6.1 arc seconds diameter. The elevation from the horizon at sunrise will now be 14 1/2 degrees (from 51 degrees N).

By the 30th November, Mercury has dipped further towards the Sun and is just over 7 degrees elevation above the horizon at sunrise from 51 degrees N). It is now 5 arc seconds in diameter and 95% illuminated, but remains at -0.7 magnitude.

Venus

Venus is still well-placed for morning observation, though is dipping slowly towards the Sun. At the beginning of the month it will sit 27 degrees high at sunrise (from 51 degrees N), shining at -4.0 mag. The planet is 13 arc seconds diameter and showing an 81% phase.


Ecliptic
Celestial Equator
Venus
Crater
Virgo
Corvus
Mercury
Sun

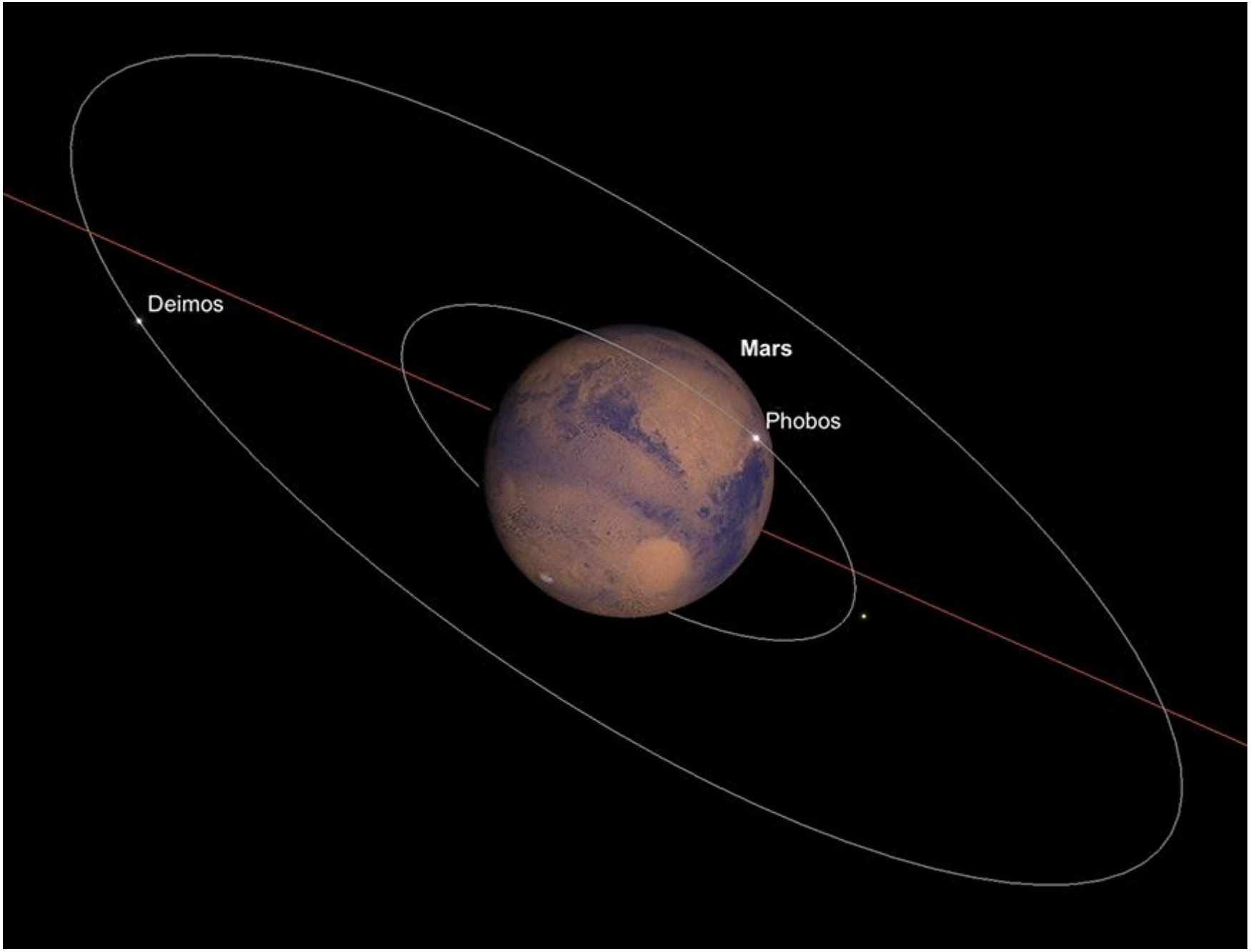
Venus, sunrise 1st November. Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

By the end of the month, Venus will have sunk further towards the Sun in the morning sky. The planet can be found at 19 degrees altitude (from 51 degrees N) at sunrise on the 30th, still shining away at a brilliant -4.0 magnitude in Libra.

It's still some time before Venus reaches Superior Conjunction in March, so there's still some time left during this apparition to observe and image the planet.

Mars

Mars, while a little way past Opposition, which it reached in early October, is still very bright and well-placed for evening observation at the beginning of the month. On the 1st, it is found in Pisces, shining at a steady -2.1 magnitude. It is 19.9 arc seconds across and will stand just over 44 degrees high in the sky in the SE as it transits (at a little before 10.30pm). As Mars is a small world, the drop-off in brightness and diameter is pretty dramatic, so observer's are encouraged to catch it as early as possible.


Deimos
Mars
Phobos

Mars, Phobos and Deimos, transit point (from Western Europe), 1st November. Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

By the 15th, Mars has dimmed considerably to -1.6 magnitude and will now be 17.3 arc seconds diameter. It will now transit at around 9.30pm.

By the end of the month, Mars will have dimmed further to -1.1 mag and will now display a 14.6 arc second diameter disk. The planet is still found in Pisces, but will transit now at just past 8.30pm. While there's still a while to catch the planet before it really dims down, it's worth taking a look at in a telescope as early in the month as possible.

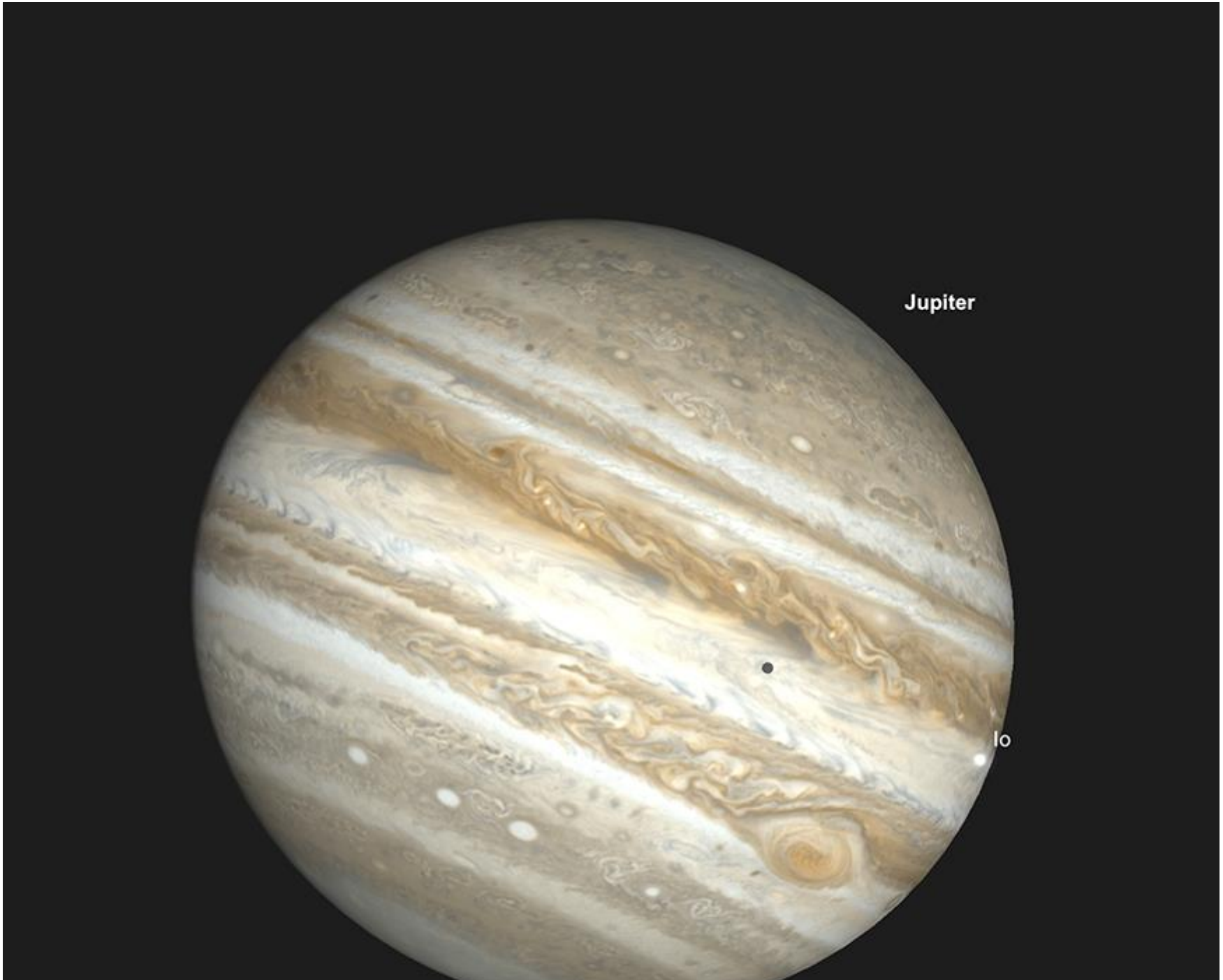
Jupiter

Jupiter is also evening object during November. At the start of the month Jupiter will be found a little over 71 degrees from the Sun on the eastern side — standing at an altitude of just over 17 degrees at sunset on the 1st (from 51 degrees N). At -2.2 magnitude and just under 37 arc seconds across, it will be a easy find in the evening sky in the south, but it will be at lower than optimal elevation, so will be require some reasonable sky conditions to be observed at decent powers in a telescope.

By mid-month, the situation has changed a little: Jupiter's dimmed fractionally to -2.1 mag and is now 35.6 arc seconds angular diameter. It approaches transit point 4.13pm GMT (from 51 degrees N) , just a little before sunset, so there's still a very reasonable window for observation in the early evening, before the planet sets at 8.20 GMT.

By the 30th Jupiter is found at magnitude to -2.0 and will sit at 18 degrees elevation in the south, as it transits at around 3.26pm GMT.

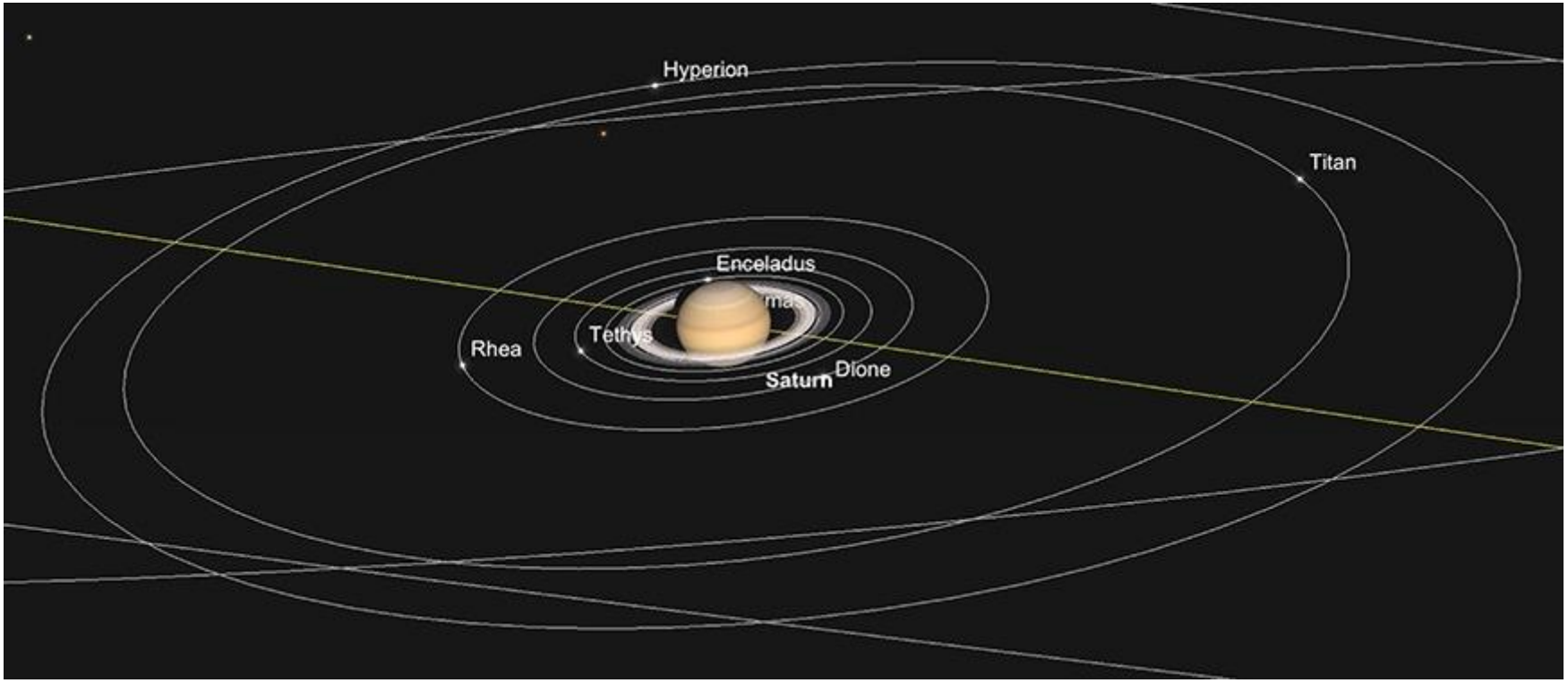
There’s a few good mutual transit events visible from Europe: on the 1st there’s a mutual Great Red Spot and Ganymede transit in the early evening and a GRS/Io/Io Shadow Transit on the 11th and also on the 18th. There’s a brief GRS and Io/Io Shadow Transit on the early evening on the 25th and a GRS/Ganymede Shadow Transit on the evening of the 30th.


Jupiter
Io

Jupiter, GRS, Io and Io Shadow Transit, 11th November. Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

Saturn

Saturn is found a little to the east of Jupiter in Sagittarius, rising at a little after 1pm (BST, from 51 degrees N) and stands just over 18 degrees high as it transits, which occurs at 5.20pm. At +0.6 mag, and 16.3 seconds of arc diameter, Saturn isn't especially prominent, but still brighter than any star in its resident constellation (though somewhat overshadowed by the much brighter Jupiter, just under 5 degrees to the west, also in Sagittarius). It is separated from the Sun by just under 76 degrees on the 1st.



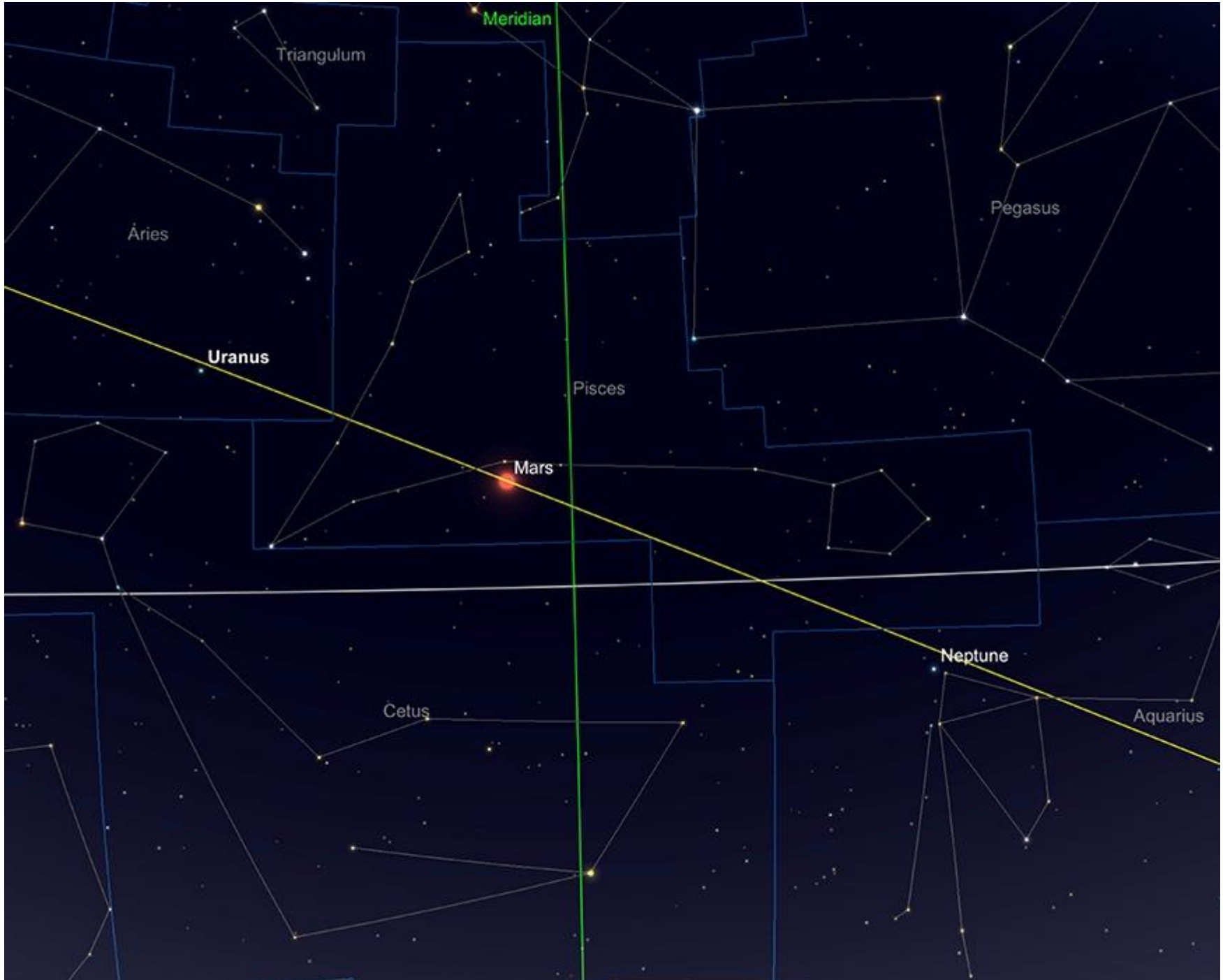
Saturn and major moons, 1st November. Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

By mid-month, Saturn remains at +0.6 magnitude and a little smaller in angular size at 16 degrees of arc. The Ringed Planet will rise at 12.17 pm and will reach transit point - the highest point in the sky - at a little before 4.30pm GMT (from 51 degrees N).

By the end of the month, the Ringed Planet remains at +0.6 mag and is now 15.7 arc seconds across. The planet now rises at just before 11.30am (GMT), transiting at just after 3.30am.

Uranus and Neptune

Both the outer gas giants are evening objects. Neptune is the further east of the two in Aquarius, at +7.9 magnitude, Neptune is always a tricky target, needing powerful binoculars (at the very least) to make a positive identification, but its's well placed for observation in the early evening, now nights are drawing in, in the northern hemisphere.


Meridian
Triangulum
Pegasus
Aries
Uranus
Pisces
Mars
Neptune
Cetus
Aquarius

Uranus and Neptune, relative positions, November 2020. Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

Further East in the Ecliptic than Neptune, Uranus is brighter at +5.7 magnitude, but rises a little later in Aries. At just past Opposition in late October, it's still at peak brightness in early November, so this really is the best time of year to get out there and track down this far-flung world. While technically a naked eye object, again, binoculars will be needed to make a positive identification of the Uranian disk. Those with larger telescopes and cameras can attempt to record Uranus' collection of major moons. These are very faint targets, but worth seeking out for the challenge. When using a camera, you will need to overexpose Uranus' disk in order to image the moons Oberon, Titania, Miranda, Umbriel and Ariel.

Comets

We speculated last month that another Neowise comet had the potential to put on another impressive show. 2020 P1 (NEOWISE) has now emerged from Perihelion, but sadly not unscathed. There was the possibility that it would survive its encounter with the Sun, but now sitting at 12th magnitude, this clearly did not occur. While its namesake, the previously spectacular 2020 F3, is currently sitting at 13th magnitude , the party is definitely over for these two comets.

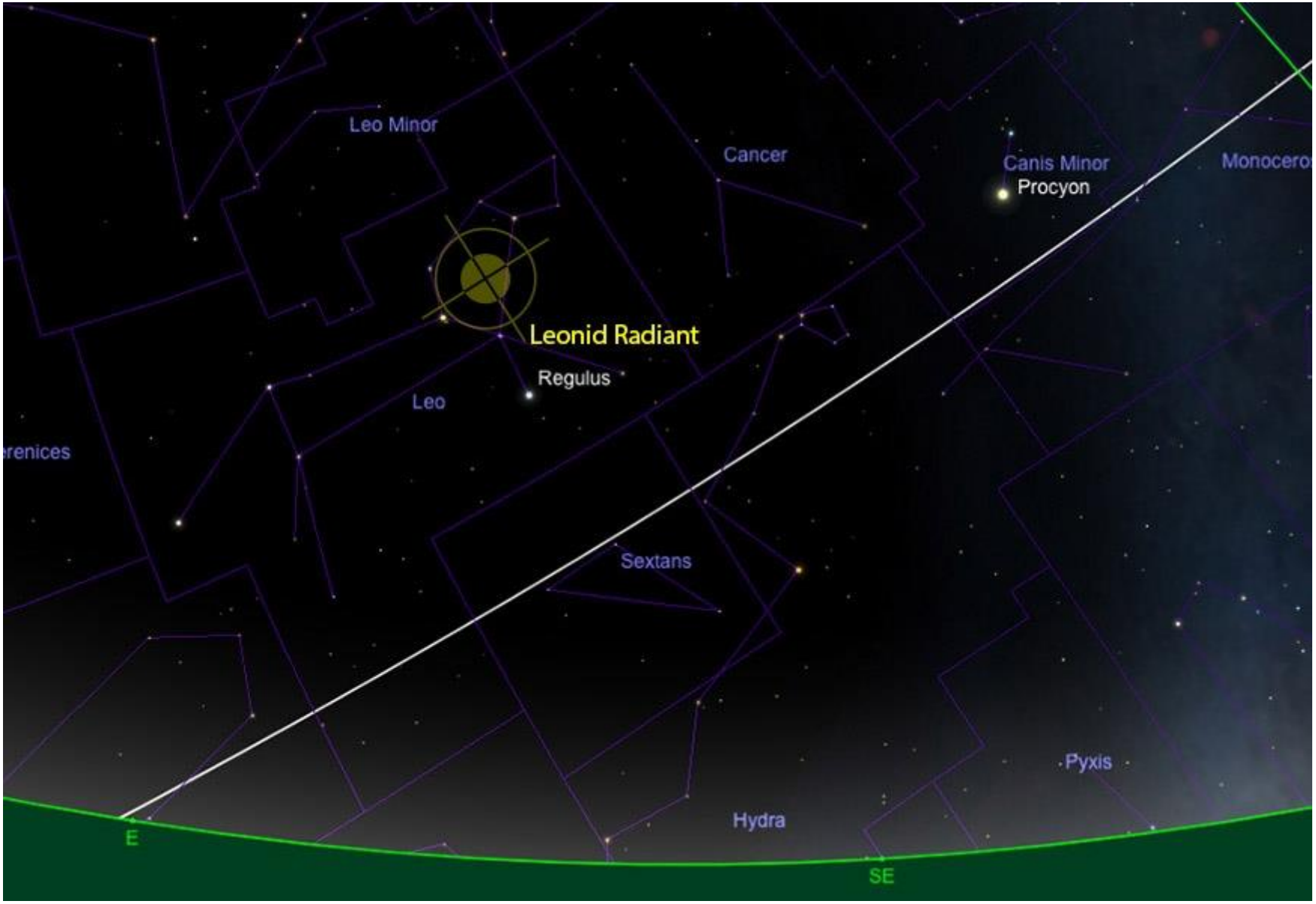
At present, comet 2020 M3 ATLAS is our best hope for observations during November. Having reached perihelion on 25th October, the comet starts the month in Lepus and tracks north through Orion into Taurus at the month's end. Passing through some of the most readily identifiable constellations in the sky should (in theory) make this comet relatively easy to find. However it is relatively faint, being only +8.5 mag at time of writing. This means this comet is the preserve of those with telescopes and larger binoculars.


Gemini
2020 Dec 01
Taurus
2020 Nov 19
Orion
Monoceros
2020 Nov 07
C/2020 M3 (ATLAS)

C/2020 M3 ATLAS path through November. Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

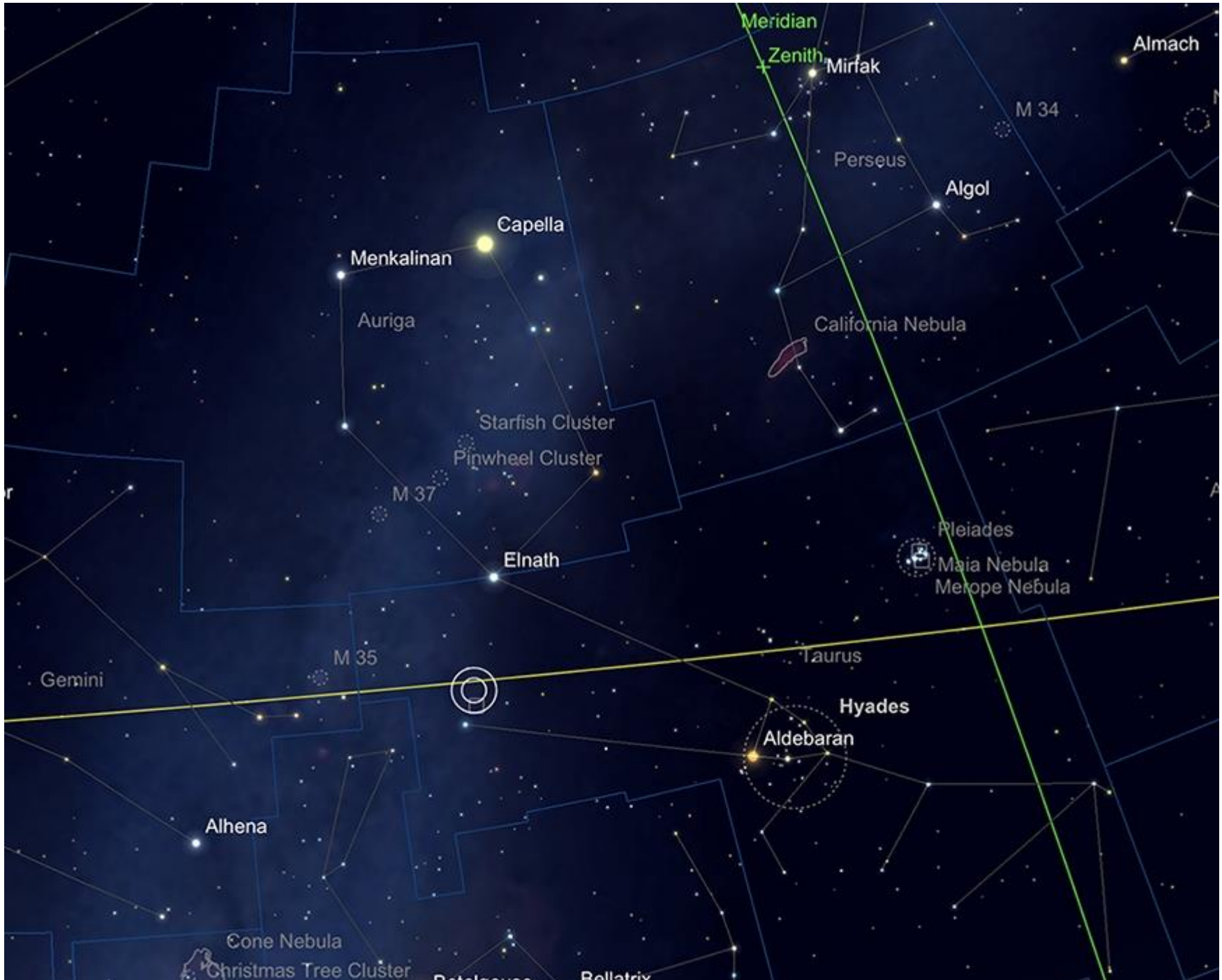
Meteors

November brings us one of the most mercurial of meteor showers: the Leonids. This shower is ordinarily quite low in number - peaking at around 10-15 meteors an hour maximum from any given location. However, once its parent comet, 55P/Tempel-Tuttle returns to the inner solar system (which it does every 33 years), the chances of a really active shower becomes much more likely. We now know a little more about modelling the positioning and density of debris left over from Tempel-Tuttle, so can predict a little more accurately. Suffice to say, this year's Leonids won't be anything near storm levels, but with the Moon being a very New Crescent for the peak evening - that of the 17th November - and out of the way in the early evening, there will at least be pretty ideal conditions for catching a few meteors. The next real peak of the Leonids won't occur until around 2033, though it is suggested that the Earth may encounter debris laid down by Tempel-Tuttle by its passage through the inner solar system in 1733, again in 2022, causing a peak of hundreds of meteors an hour again, as occurred in 1999 and the early years of the 21st century.


Leo Minor
Cancer
Canis Minor
Procyon
Monocero
Leonid Radiant
Regulus
Leo
renices
Sextans
Pyxis
Hydra
E
SE

Leonids radiant point, 17th November. Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

Deep Sky Delights in Auriga and Taurus


Meridian
Zenith
Mirfak
Almach
M 34
Perseus
Algol
Capella
Menkalinan
Auriga
California Nebula
Starfish Cluster
Pinwheel Cluster
M 37
Pleiades
Maia Nebula
Merope Nebula
Elnath
M 35
Gemini
Taurus
Hyades
Aldebaran
Alhena
Cone Nebula
Christmas Tree Cluster
Bellatrix

Auriga and Taurus. Image created with SkySafari 5 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.


M45 Pléiades Cluster
©2000 Mark L Blundell

M45 by Mark Blundell. Image used with kind permission.

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

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 both 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's 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. Though it can be very effectively recorded with single shot colour cameras. Mark Blundel's bi-colour picture below, was taken with a ZWO ASI1600 Pro, an H-Alpha and OIII filter, via a Meade 6000 Series Triplet Refractor on a Skywatcher HEQ5 Pro mount, guided via the Orion Magnificent Mini Autoguider package.


M1 Crab Nebula
© 2018 Mark L. Blundell

M1 by Mark Blundell. Image used with kind permission.

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.

Moving northwards into Auriga, the Charioteer, following straight line from Zeta Tauri, the more southerly tip of the Bull's two horns, through Elnath, one of the few stars in the sky that is shared between two constellations, giving it the classification of both Beta Tauri and Gamma Aurigae, we come to the Flaming Star Nebula, IC405. Found 6 degrees north of Elnaith, 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.


IC 405 Flaming Star Nebula
Const: Auriga
7th/15th January 2016
By Mark 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.


M38 & NGC 2907 Open Clusters
© 2019 Mark L'Blundell

M38 by Mark Blundell. Image used with kind permission.

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.

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, 2Mass image - a joint project between University of Massachusetts and University of California, funded by NASA/Nation Science Foundation. Public Domain.

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. Image credit: Ole Neilsen, 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.

Sitting astride (from a northern hemispherical perspective) this rich are of sky is Auriga's principle star, Capella. At +0.08 mag, Capella is the sixth brightest star in the night sky, being a shade fainter than Vega. It is comprised of two large G-type stars - roughly the same temperature as our Sun - but these are much larger in mass and diameter and have already begun to exhaust their nuclear fuel. Despite being a little over 42 light years away, this system is not split-able (as yet) with even the largest of Earth-bound telescopes, as the two main component stars orbit a common centre of gravity which keeps them around 60 million miles apart, roughly 2/3rds of the distance between the Earth and Sun. There is a much fainter outlying star system which is gravitationally bound to the main Capella pairing, though this comprises itself of two faint M-class dwarf stars, making the whole system technically a Quadruple star.

Text: Kerin Smith