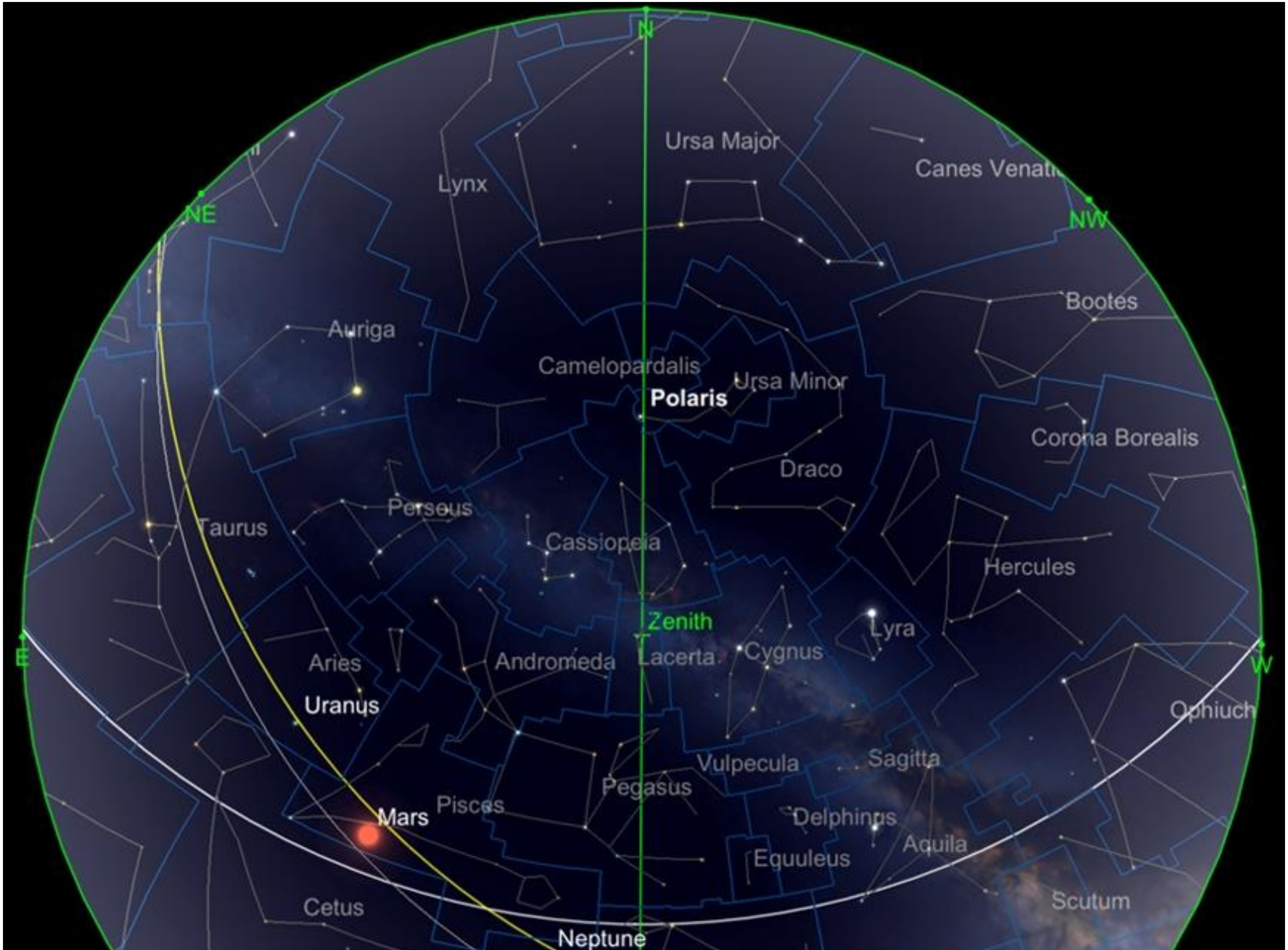

N
NE
NW
E
W
Ursa Major
Canes Venati
Lynx
Auriga
Bootes
Camelopardalis
Ursa Minor
Polaris
Corona Borealis
Draco
Perseus
Taurus
Cassiopeia
Hercules
Zenith
Lyra
Aries
Andromeda
Lacerta
Cygnus
Uranus
Ophiuch
Vulpecula
Sagitta
Pegasus
Mars
Pisces
Delphinus
Aquila
Equuleus
Cetus
Scutum
Neptune

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The Monthly Sky Guide October 2020

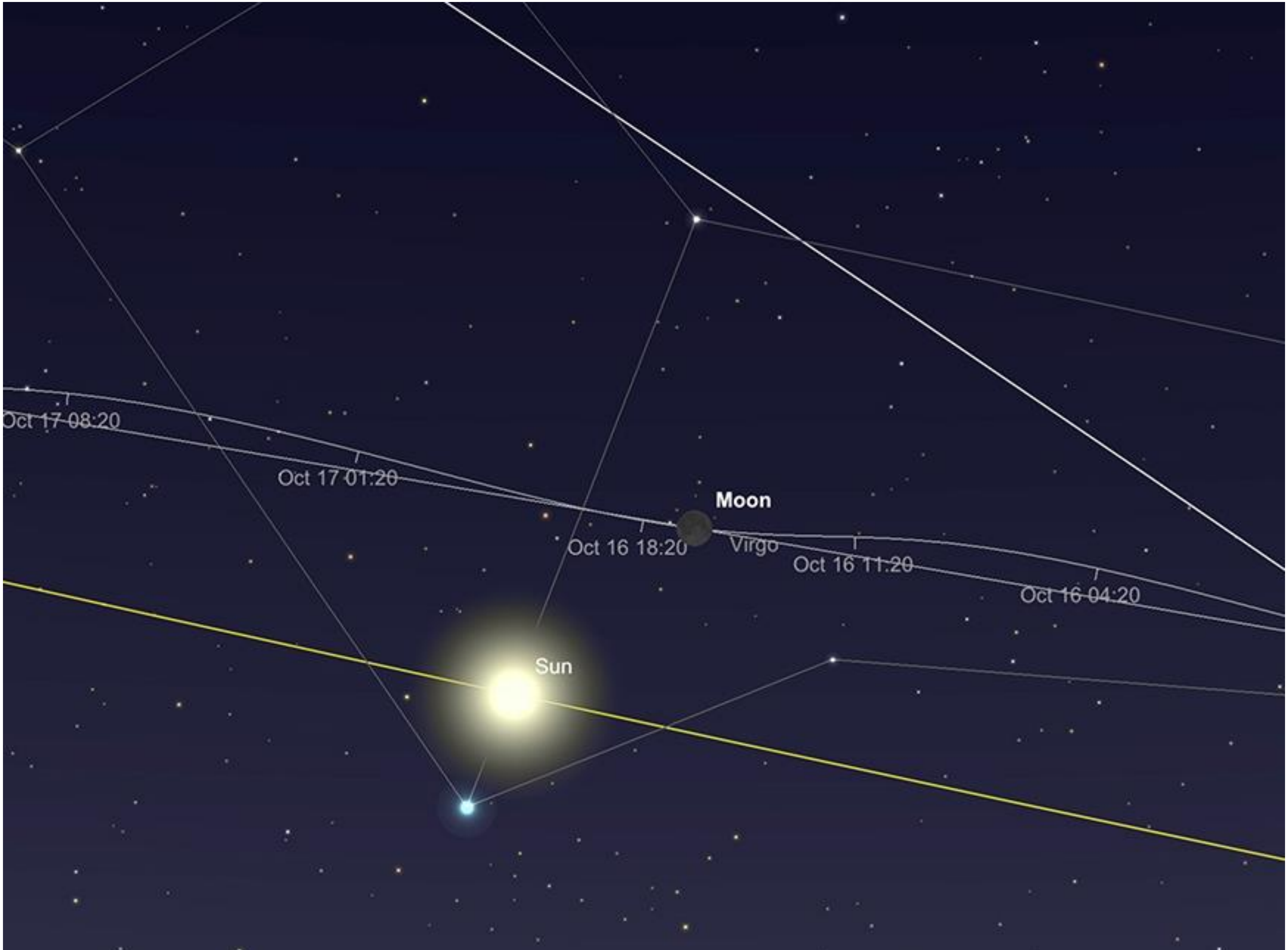
Late October is normally the part of the year that finds those of us in the UK and Europe reverting to standard time (CET/GMT). This is normally greeted with groans by those outside the astronomical community, as it leads to it getting darker earlier - those of us of a more astronomcial inclination will feel somewhat different, as it increases the opportunity for observations at a reasonable hour of the evening. In the UK, the clocks go back on Sunday 25th October this year. Those in North America will have to wait until the early part of November for this changeover to take place. Naturally, what happens in the Northern Hemisphere has the opposite effect in the Southern. Those in many territories in Australia and Brazil will begin their Daylight Saving Time (Summer Time) in October (New Zealand and Chile having started their DSTs somewhat earlier).
Wherever you find yourself in the world, there's plenty going on in the skies above us this month...

The Solar System

The Moon

The Moon starts October in Cetus, at Full phase. The Moon will rise at a little after 7pm (BST) and be transiting in the south a little after midnight, the following morning. Naturally, around 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 reach Last Quarter on the 10th, when it will be found in the constellation of Gemini. This is followed by one of the Moon's high morning crescent phases, the Autumnal equivalent of the high evening Spring crescents. If you're up early enough this is one of the best times of year to observe the "morning" hemisphere is the Moon from the temperate Northern hemisphere. The Moon will then slink down from the highest part of the ecliptic (from a Northern Hemisphere perspective) until it reaches New on the 16th, gliding to the north of the Sun in Virgo. Now the Sun has passed through the Autumnal Equinox, and is in the Southern celestial hemisphere, the moon will appear to pass to the north of the Sun at New Phase. Once we're back past the Vernal Equinox in March 2021, the Moon will start to appear to pass to the south of the Sun when New.


Moon
Sun
Virgo
Oct 17 08:20
Oct 17 01:20
Oct 16 18:20
Oct 16 11:20
Oct 16 04:20

New Moon, October 16th. Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

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. With the steady encroachment of earlier true astronomical darkness for those of us in the temperate northern hemisphere and above, the window for deep sky observation and imaging in the evenings is growing larger.

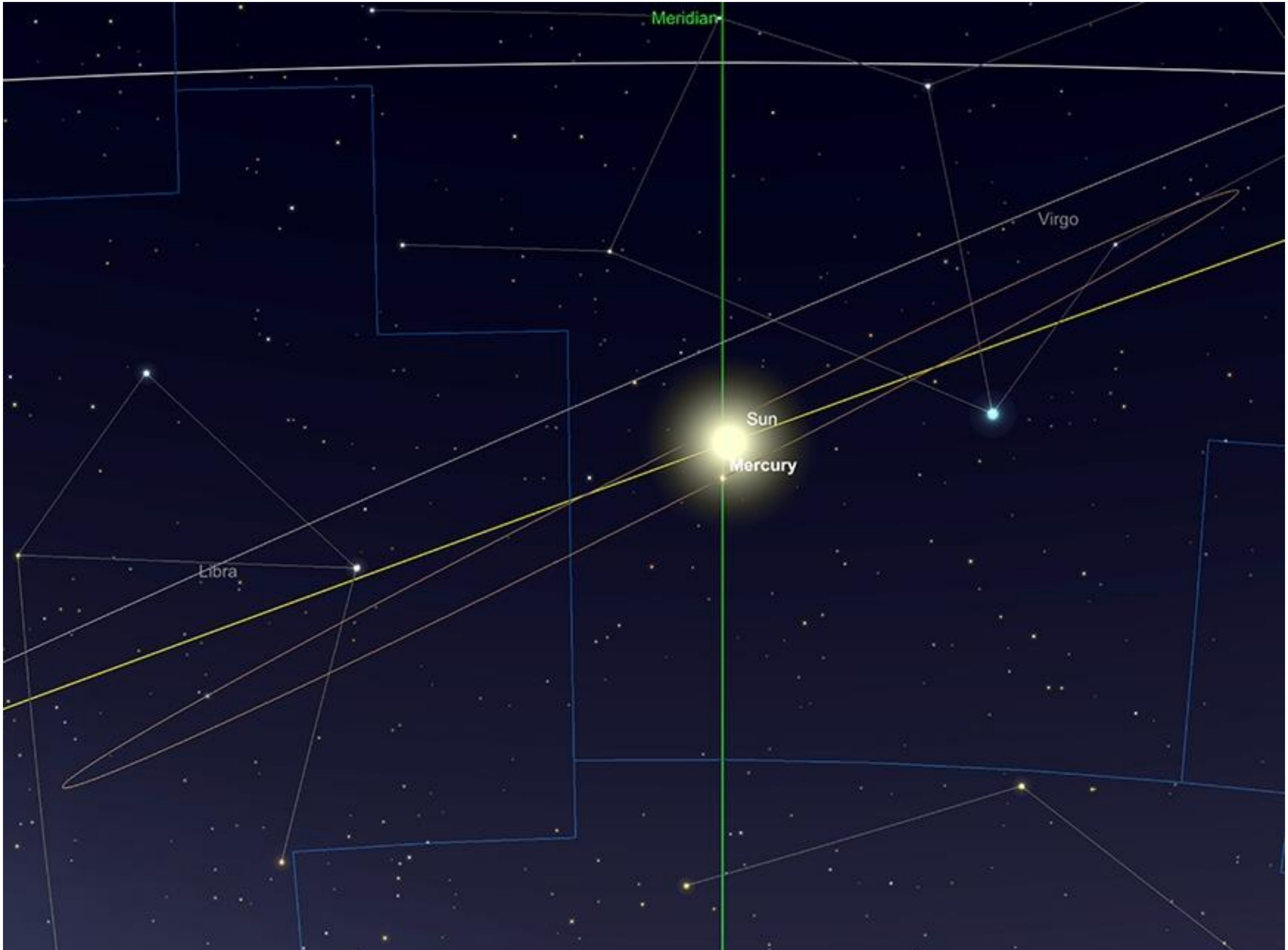
From this point, the Moon becomes an evening object and may just be found a few days later as a very thin crescent in Libra, Scorpius Ophiuchus and Sagittarius. This is a low part of the sky as viewed from the northern hemisphere, so the Moon's evening crescent phase isn't especially well-placed for observation from northern climes. The Moon reaches First Quarter, in Capricornus, on the 23rd, transiting at around 7.30 pm (BST).   The Moon ends the month on the 31st, back at Full Phase, sitting on the Aries/Cetus borders - a real Hallowe'en treat! This is the second Full Moon of the month, as so-called "Blue Moon". The term Blue Moon has nothing to do with the Moon's colour. It is thought to be a corruption of the archaic English word "belewe" which means to betray. The reasoning behind this is that two Full Moons in one calendar month "betrays" the regular monthly lunar cycle - hence the term "Belewe Moon".

Mercury

The Solar System's smallest true planet is to be found in Virgo at the beginning of October, at maximum eastern elongation from the Sun. At +0.1 magnitude and 6.8 arc seconds across, the planet is 60% illuminated. Sitting in Virgo, Mercury is setting almost in line with the Sun in the temperate parts of the Earth - though at just shy of 25 degrees froth Sun will be much better seen from equatorial regions at this time. From 51 degrees N, mercury will sit just above 3 1/2 degrees high from the horizon at sunset, making it very difficult to spot, even under absolutely ideal conditions.

By mid-month, Mercury will have drifted back sunward and is now around 19 degrees from the Sun. At +1.0 mag and displaying a 24% phase, it will sit just a little below 2 degrees high, making it nigh on impossible to observe.

Mercury reaches inferior conjunction - in-between Earth and Sun on the 25th October. By the end of the month, the innermost planet has re-emerged on the morning side of the Sun and will sit at 7 1/2 degrees high at sunrise (from 51 degrees N). At just +2.4 magnitude, and 7.6% illuminated, it won't be readily observable, but is in a much better position for observation for temperate Northern Hemisphere observers moving into November.

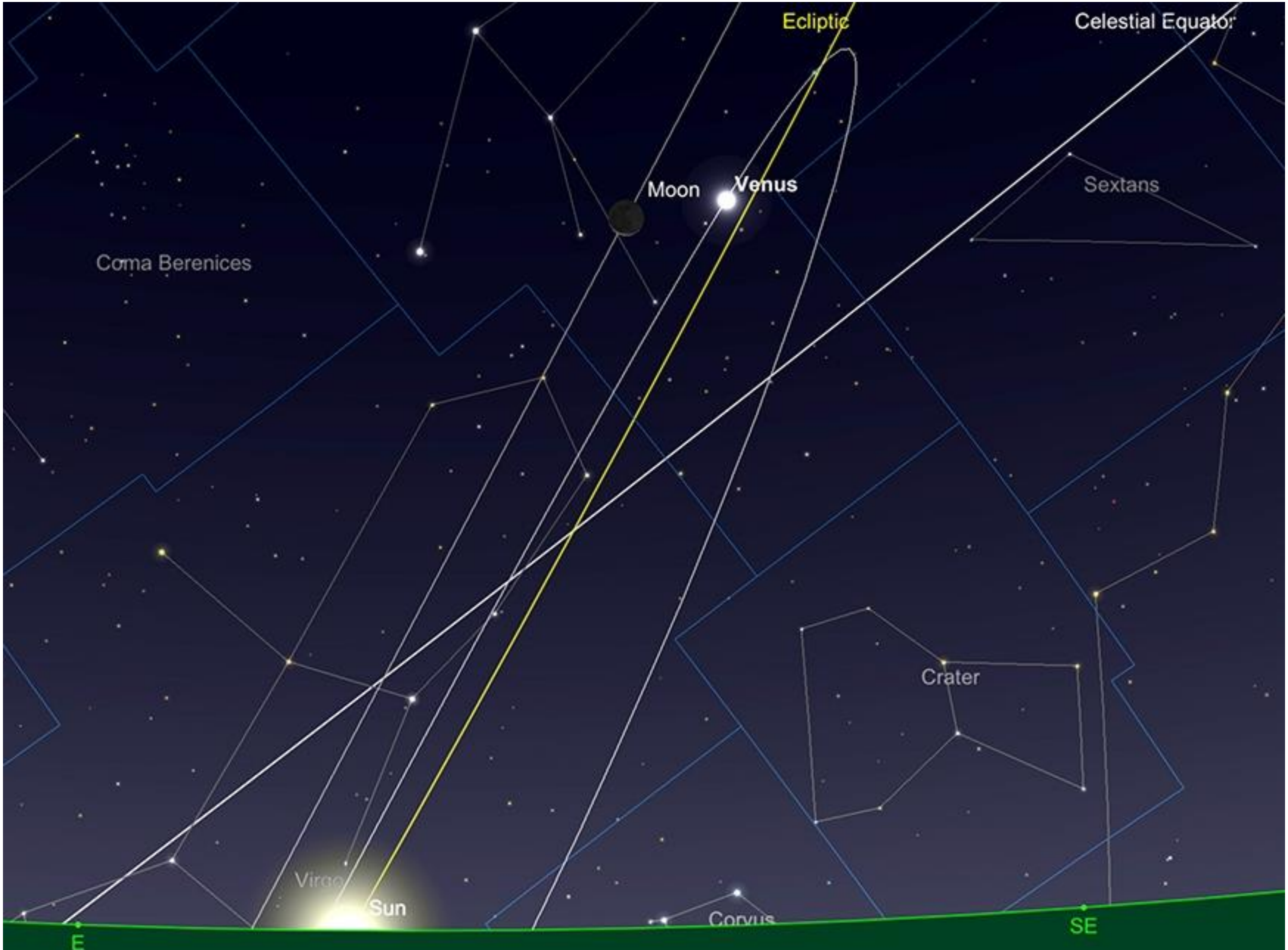

Meridian
Virgo
Sun
Mercury
Libra

Mercury at Inferior Conjunction, 25th October. Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

Venus

Venus is still well-placed for observation in the morning sky. Although the planet is now slowly headed back towards the Sun, it is separated from pour parent star by just over 40 degrees and still sitting at 34 1/2 degrees high at sunrise (from 51 degrees N) on the 1st, so is in a good position, above the worst part of atmospheric seeing at the beginning of the day. At -4.1 magnitude and 71.7% illumination, the 15.5 arc second diameter planet should reward both visual observers and imagers alike.

The morning of the 14th finds Venus joined in Leo by a very narrow Crescent Moon, the two forming a striking pair in the dawn sky. Mid-month finds Venus separated from the Sun by 37 3/4 degrees, sitting at -4.0 magnitude, 76% illuminated.



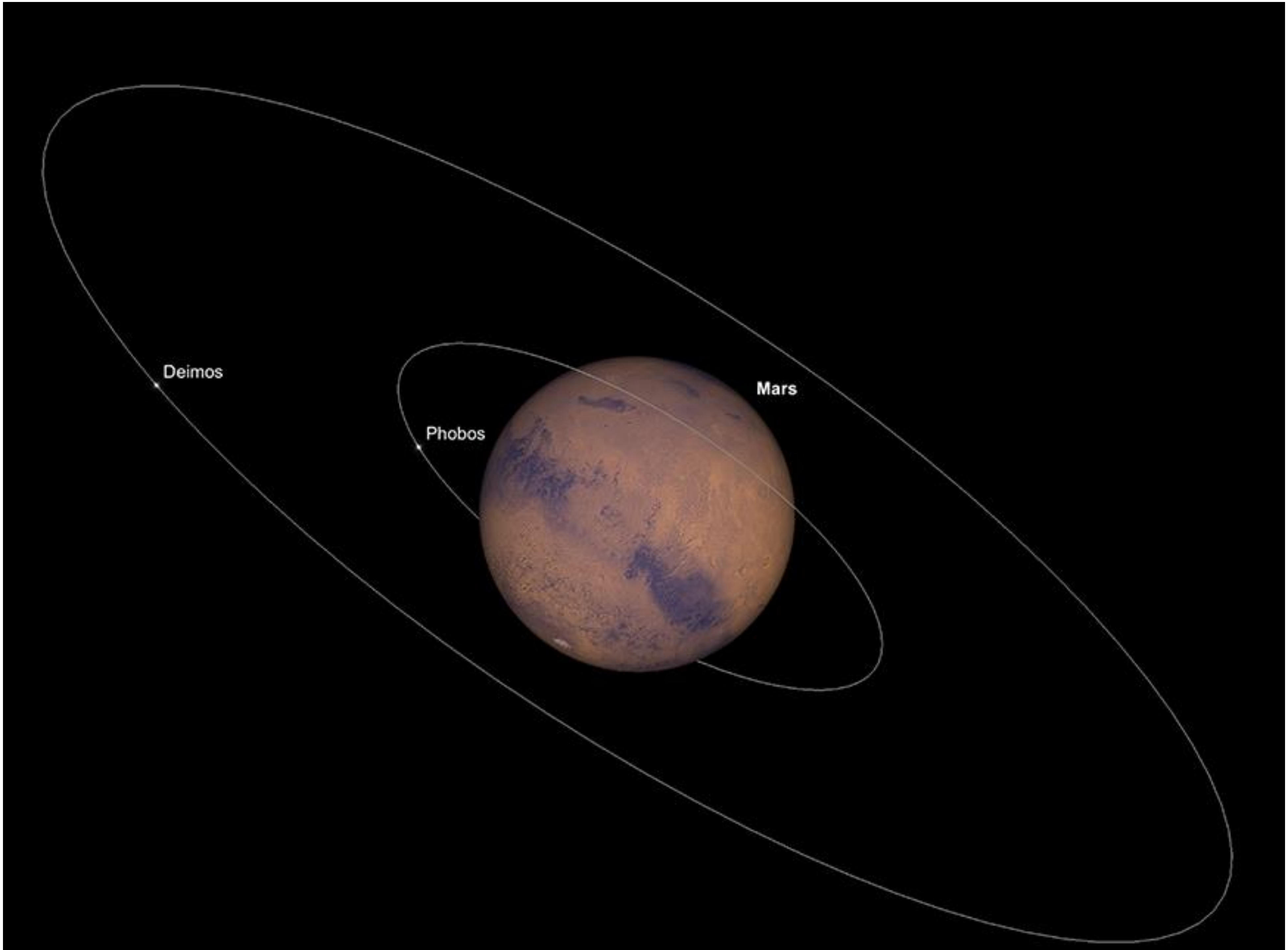
Ecliptic
Celestial Equator
Moon
Venus
Sextans
Coma Berenices
Crater
Virgo
Sun
Corvus
E
SE

Venus and the Crescent Moon, sunrise, 14th October. Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

By the end of October, Venus has decreased its separation from the Sun a little, to just under 34 1/2 degrees. It will stand a little under 28 1/4 degrees high (from 51 degrees N) on the morning of the 31st and now displays a 81.2% illuminated phase.

Mars

The main planetary event of October is the long-awaited Opposition of Mars. Martian Oppositions occur just over every two years (actually, once every 26 months to be strictly accurate). Mars is to be found in Pisces on Opposition night, 13th/14th October. It will be an impressive -2.6 magnitude and display a disk of 22.3 seconds of arc across. By comparison, Jupiter will be -2.3 magnitude, at the same point in the month, although a little be distinctly larger at just under 39 arc seconds diameter. This Opposition is a reasonably favourable one for Northern Hemisphere observations - and not before time, as we'll explain below.


Deimos
Phobos
Mars

Mars, Opposition night 2020. Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

Mars is often described as the most Earth-like of all the planets. While there are very distinct differences between the two worlds there are some similarities - it shares a similar orbital inclination, which result in seasons and a day that is just a little longer that ours. As Mars has a rotational period of 24 hours 39 minutes, this means that it takes a while for the surface to rotate in relation to us on Earth. Come back at the same time the night after an observing session and you will notice the face Mars presents is much the same. Only after a few days of observation at the same time every night will an observer end up seeing more of the surface.

As Mars is a small world (since Pluto's planetary demotion it is now the second smallest in the solar system after Mercury) it rarely challenges the other brighter planets for sheer angular size. It is only once or twice in a 14-15 year cycle of oppositions that Mars gets close to Jupiter in apparent maximum brightness. This is due to the eccentricity of Mars' orbit. Whereas Earth's orbit has a pretty stable eccentricity of 0.0167, Mars has an orbital eccentricity of 0.09 - this may not seem a huge difference, but it makes Mars' apparent angular size during opposition fluctuate from a minimum of around 13.8 seconds of arc to a much more impressive 25+ seconds of arc. Although the maximum angular size of Mars' disk during the 2014 Martian opposition was a modest 15.1 seconds of arc, it was reasonably well placed for observation by those of us in the Northern Hemisphere at a declination of -5 degrees. The previous two, 2016 and 2018 were better in terms of brightness and angular size, but these were very poorly placed from a Northern Hemispherical point of view at -21 degrees and -25 degrees South respectively. 2020’s Opposition finds Mars is much better placed and while not quite as bright as the 2018’s, will be a good deal better for Northern Hemispherical Astronomers. See the table below for comparisons:

Opposition Date.	Declination (+N/-S)	Angular Size.	Max Mag.
08/4/2014	-5.1	15".1	-1.5
22/5/2016	-21.6	18".4	-2.0
27/7/2018	-25.4	24".2	-2.8
14/10/2020	+5.5	22".4	-2.6

2016’s Opposition, delivered a large, bright disk, but was washed out by planet-wide dust storms just prior to Opposition and mired by poor seeing for those of us in the Northern Hemisphere. The last majorly bright Martian opposition in 2003 was also pretty far south in the ecliptic and again was comparatively poor from the Northern Hemisphere. Though this is by no means uncommon: looking back over the cycle of Martian oppositions stretching back to 1901, all the really impressive ones have all taken place in the Southern part of the ecliptic during the late Spring or early Summer months. Only a few of these have been slightly later in the year and thus higher in the Northern sky

- most notably and recently the memorable 23".8 opposition of 28th September 1988. Why is this the case? Put simply, Mars and Earth are in a very slowly changing resonant orbital cycle with one another, which currently favours really close orbital approaches in the Northern Hemisphere Spring and Summer, when Mars is in the Southern part of the Ecliptic. As Mars' year is not quite two Earth years, this cycle will take a long time to work through, with gravitational interaction with other planets also playing a part too. We are fortunate that this one occurs later in the year when the planet is also in the northern celestial hemisphere - as such, this one should be much better for those in the northern parts of the Earth. The next Martian Opposition after the current one takes place in December 2022, when mars will only reach -1.9 magnitude. This will occur with Mars in Taurus, so very high in the sky for those of us observing in the Northern Hemisphere. Opposition night 2022 also has the added bonus of a rare Lunar Occultation of Mars, which should be something to note in the diaries! The following three Oppositions to the current one, those of 2022, 2025 and 2027, are better placed in terms of position in the northern celestial hemisphere, but also substantially less brilliant and by no means as large in terms of angular diameter - none of them making it over 17 seconds of arc. Indeed, it’ll be the mid-to-late 2030s before we’ll get this close to Mars again, which makes this Opposition one to enjoy while we can.

From a practical point of view Mars can be well-observed at Opposition with any telescope. Naturally, the bigger, to a certain extent, the better - certainly as far as high speed imaging goes. As Mars will still appear smaller than Jupiter and Venus regularly do, the temptation is to increase magnification. This will only work as long as atmospherics play ball - which is sadly more often not the case. The one thing we encourage observers to do is wait for the planet to be as high in the sky as you can - this will give you the best chance of observing through the least amount of atmosphere possible, which will substantially increase your chances of better viewing. Smaller instruments will only take so much power before image brightness is lost and larger instruments will more readily reveal atmospheric seeing defects, so the old adage "less is more" will come into play. Learn to look at an image critically. If high power isn't revealing any more detail than a slightly more modest eyepiece and is loosing image brightness and quality, take the step down and stick with it. Valuable observing time can be lost chopping and changing between eyepieces when you should just be enjoying the view. Happily, from a visual point of view, Mars also responds well to colour filtration - the Wratten 23A Red filters (for major surface features) and 80A for some transient surface and atmospheric detail and a Light Green or Yellow (56 or 15A) for polar cap observation. Indeed, it has often been suggested that a Yellow filter may assist a smaller (sub-6-inch reflector/sub-3-inch refractor class) instrument with less light grasp than a 23A will do, as a Yellow filter will let in slightly more easily visible light. Certainly those more serious planetary observers will have a whole range of filters in their arsenal, and will spend a good deal of time getting used to the views through one, before moving on to another, noting the subtle differences as they progress. Those with larger instruments can also use neutral density filters to stop down glare. This can often help a great deal too. Actually sketching what you see through a telescope is a great idea - even for those not normally imbued with natural artistic talent. A quick sketch of the planet forces the observer to look a little harder and concentrate on the detail visible. Although your drawing might not be as detailed as an photograph, the meditative quality of sketching can really help bring on your observational skills, especially if you’re just starting out.

However, it is the realm of USB imagers which will bring out the most detail for amateur astronomers this Martian opposition. It is only by filming Mars at high speed, grading and stacking the best frames from these films via programs like Registax and AutoStakkert that we can hope to artificially freeze the atmosphere we all look through and render the best observational results. This of course, is not as instantly gratifying as visual observation: imaging takes time, dedication and perseverance to get the best results, but it is always amazing to find how much a relatively modest telescope and imager will reveal using these methods. If you've got a telescope already, why not give it a go?

Wherever you find yourself in the world, Mars will be visible this Opposition. If you find yourself up late, sometimes in less than clement conditions, you can be assured that many thousands of people worldwide are looking at the Red Planet too, under similar circumstances. If you have any observations or images of Mars you'd like to share, please send them in to us and we'll publish them so others can enjoy your efforts as well.

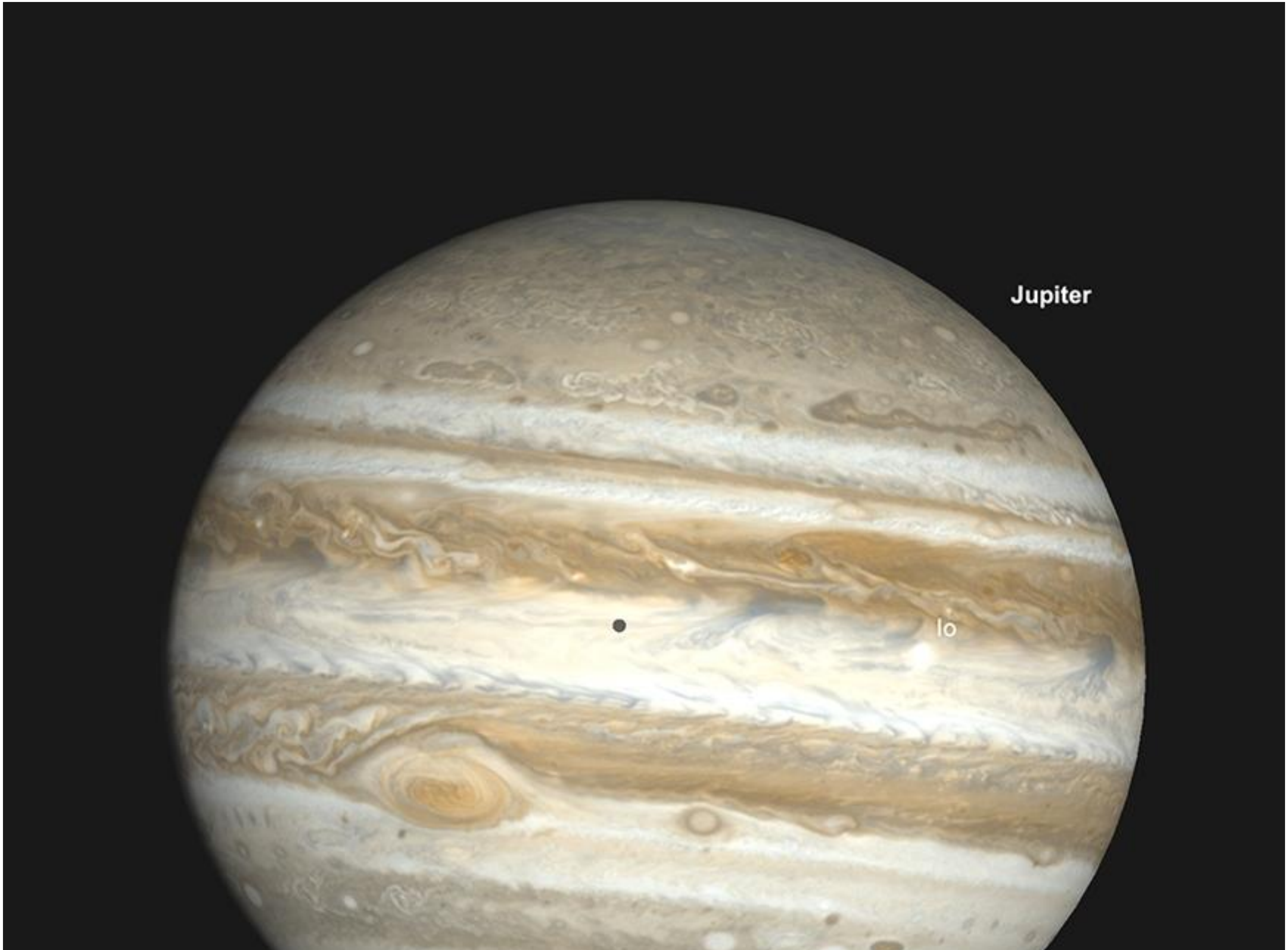
Jupiter

The Kings the Planets is somewhat eclipsed in brightness by Mars at present, but is still striking in Sagittarius, at -2.4 mag brightness and just over 40 arc seconds across. Rising at a little before 4pm (BST) on the 1st, it will transit in the south at a little after quarter to eight in the evening, setting at just before midnight. We are now at that period of Jupiter’s cycle where the observing window is shortening towards the end of the evening, but also extending at the beginning of the evening too, as darkness encroaches more quickly at the Sun sets earlier. Suffice to say it’s enjoyable to observe in the earlier evenings and we should take advantage of this window as far as Jupiter and Saturn are concerned.

Mid-month finds Jupiter much unchanged: it has reduced fractionally in brightness to -2.3 mag and is now 38.7 arc seconds diameter. The planet rises at a little before 3pm and transits at around 7pm, setting four hours later.

At the end of October, Jupiter is again fractionally fainter at -2.2 mag and now 37 arc seconds across. We have the difference in shift from Daylight saving to standard time to take into account here, to the planet now rises at a little before 1pm, transiting at just after 5pm (GMT) and setting at just after 9pm.

There's some great transit events to observe from Europe during the month; a Great Red Spot and Io and Io shadow transit on the early evening of the 3rd; a GRS and Europa dual transit on the early evening of the 6th; a GRS and Ganymede shadow transit early evening of the 18th; a GRS and Ganymede transit on the early evening of the 23rd.


Jupiter
Io

Jupiter with GRS and Io/Shadow Transit, early evening, 3rd October. Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

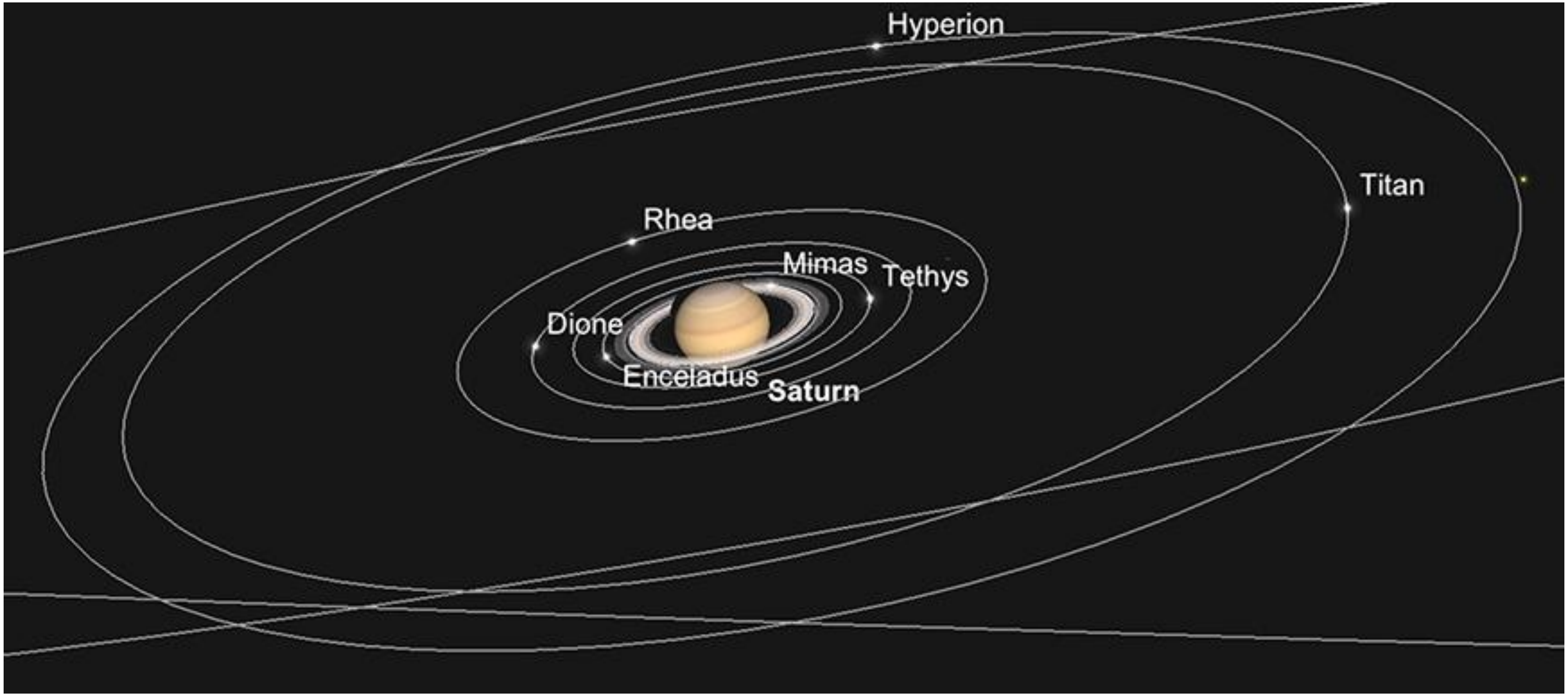
Saturn

Saturn is to be found a little of 7 degrees to the east of Jupiter in the same constellation of Sagittarius. Having just come to the end of its retrograde phase, which began in May, Saturn is on its way east within the Ecliptic, now following its regular “proper” motion. At +0.5 magnitude, the planet is by no means as obvious as Jupiter, but the pale yellow “star” a little to the left of it (as seen from the northern hemisphere) is easily enough found. Binoculars will show it as a tiny oval, but magnifications of at least 40x will be needed to show it as a tiny ringed disk.

Saturn rises at just past 4pm (BST) on the 1st, transiting at just past 8.15pm and setting at just past 12.30 the following morning (from 51 degrees N).

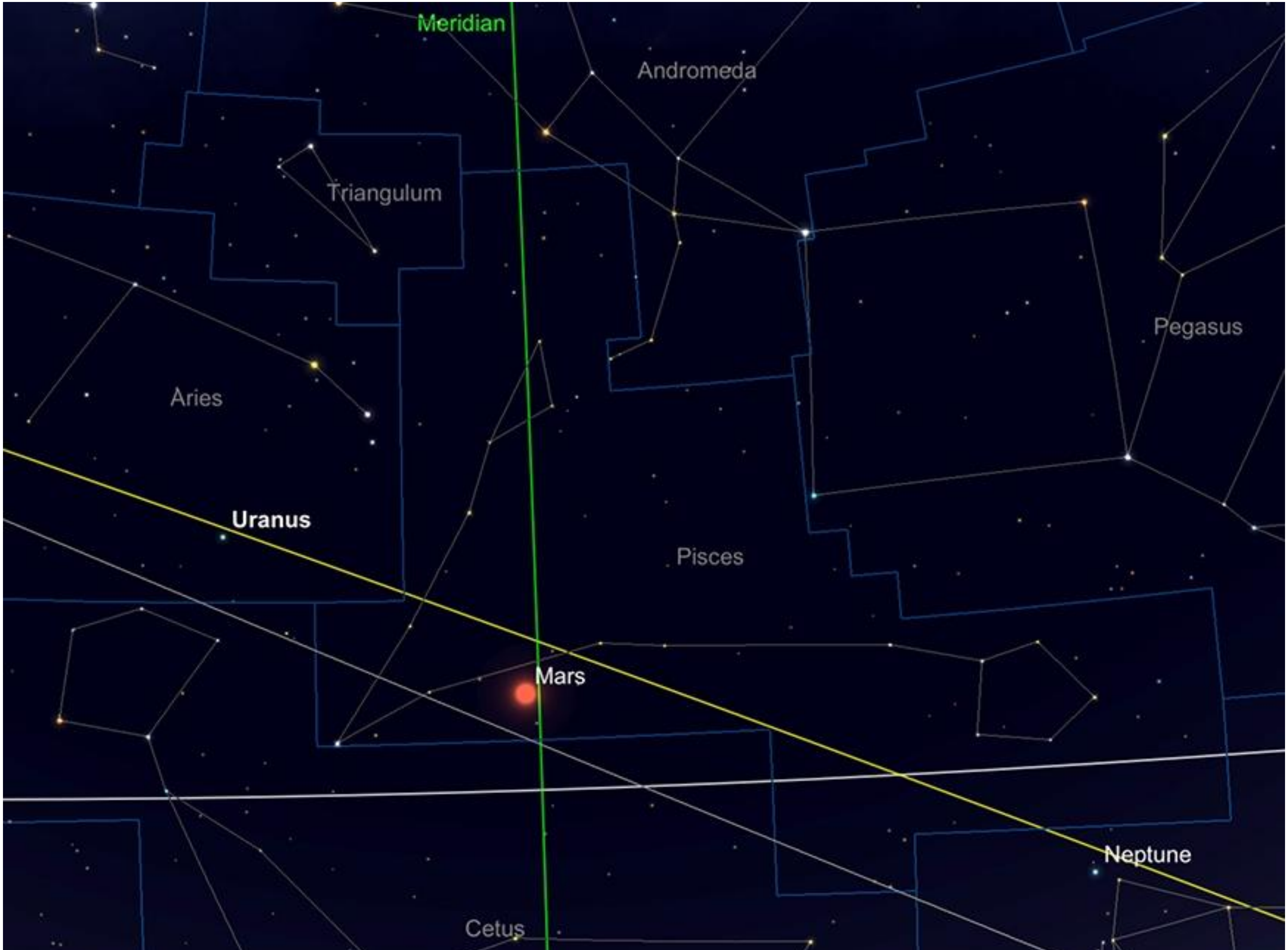
At mid-month, Saturn is no fainter, and now rises at just before 3.15pm (BST), transiting at just before 7.30 and setting at little after 11.30pm.

By the month’s end, the Ringed Planet rises at a little before 1.15pm (GMT) and transits at a little before 5.30pm. Saturn sets at a little after 9.30pm on the 31st, having faded fractionally to +0.6 magnitude.



Saturn and Inner Moons, 31st October. Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

Uranus and Neptune


Meridian
Andromeda
Triangulum
Pegasus
Aries
Uranus
Pisces
Mars
Neptune
Cetus

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

The Outer Planets, Uranus and Neptune, are flanking Mars in Aries and Aquarius respectively - the brighter planet providing a rough signpost to the are of sky they occupy. Neptune is just past Opposition and transits a little before 11pm, mid-month. At +7.8 magnitude, it will need powerful binoculars or better still a telescope to make positive identification as a distinct tiny blue disk. Uranus, while technically a naked eye object at +5.7 magnitude, will probably require similar equipment in finding and identifying, as its neighbour does. Rising later than Neptune, Uranus will transit in the south at around 2am, mid-month and is distinctly higher up in the sky. Uranus will reach opposition on the 31st October, its 3.8 arc second disk will be found around 5 1/2 degrees NW of of the Full Moon (also occupying Aries).

Discovered by Sir William Herschel, in 1781, Uranus' grey-green globe is usually pretty featureless, though on rare occasions, cloud belts have been noted in larger telescopes. Much more challenging will be attempting to observe Uranus' system of moons. The largest and most prominent of these are Titania and Oberon, discovered again by Herschel in 1787. Titania is large at 1580 km across, Oberon is a slightly smaller 1520 km - both hover at around the +13.8 to 14th mag level of brightness from here on Earth so are tricky to observe, but can be seen in larger telescopes. Two further satellites, Umbriel and Ariel are a little fainter normally, but are in reach of larger amateur instruments, though the fifth Uranian Moon, Miranda skirts above the 16th magnitude, so is much more of a challenge. In addition to these 5 primary satellites, Uranus has another 22 further Moons, all below 150km in diameter. Many of these were discovered during the NASA space probe Voyager 2's journey through the Uranian system in 1986, though further Earth-base observations were needed to con rm these discoveries and led to further Moons being found.

Uranus famously has a ring system, orbiting the planet's equator, which is highly inclined to the plane of our solar system - indicating a violent encounter in Uranus' past. These rings, unlike those of Saturn, are completely invisible to all but professional instruments and are never seen visually - or are they? Intriguing observations by Sir William Herschel hint at his suspicion of a ring around the planet. On February 22nd, 1789, he wrote in his observations of Uranus: "A ring system was suspected", also noting they were "a little inclined to the red [in colour]". His sketch of the ring location and orientation tallies with fact - as does the colour of the brightest Epsilon ring, which has been confirmed by modern spectroscopic observations. However, Herschel never saw the ring again, and abandoned the idea after later observations failed to confirm it. Herschel's power of observational skill should not be underestimated, but could conditions conspired to give him a brief view of the ring, albeit faint and fleeting? Uranus was in Cancer in 1789, high in the northern part of the Ecliptic and thus in a great position for observation from England. It would be 1977 before the ring of Uranus was definitely discovered - by the instrument aboard the Gerard P. Kuiper Airbourne Observatory, operated by NASA. Infrared images of a star occultation by the Uranian system captured by the KAO's Cassegrain telescope appeared to dip in brightness prior to the star's occultation of the planet - this could only have been caused by Moons, or a series of rings. The chance alignments of unseen Moons for this event was extremely unlikely, especially as the dips occurred in the star’s light post- occultation too, so a ring system was correctly suspected. This was confirmed by Voyager 2’s pictures and later Hubble Space Telescope and ground-based observations.

Uranus is never a visually rewarding object in the same was as the brighter planets, but now is the best time to see it - as we’ve said before, the reward incomes in the finding and identifying of this mysterious world - so have a go and seek it out. Those with more sophisticated equipment can attempt to image this far off member of our solar system, as demonstrated below, by Marco Hodde's picture of Uranus and its four major moons.


Umbriel
Ariel
Titania
Oberon

Uranus and four Moons by Marco Hodde, taken with ZWO ASI224MC and Vixen VMC260L Cassegrain Telescope. Image used with kind permission. https://marcosastroseite.jimdofree.com

Comets

After a bumper few months for cometary observations, the situation is calming down somewhat. Comet Neowise, which out on such a good show earlier in the Summer is now magnitude +9.5 and beyond the reach of all without telescopes. Periodic Comet 88/P Howell is of a similar brightness to Neowise and is found in Sagittarius, but again be a rather difficult find.

One interesting comet that may produce some results is C/2020 P1 (NEOWISE) - another of the NEOWISE survey discoveries. This is a small comet which will come to perihelion on October 20th. It is difficult to tell if this comet will survive its close approach to the Sun (many of this size and perihelion distance don’t). However, if it does, this small comet might become quite bright after it re-emerges from its close approach to the Sun. Predictions put it potentially as high - brightness-wise, as the previous Neowise. As ever, we urge caution here, but it’ll be interesting to see how this develops - spectacular survival, or fantastic failure?

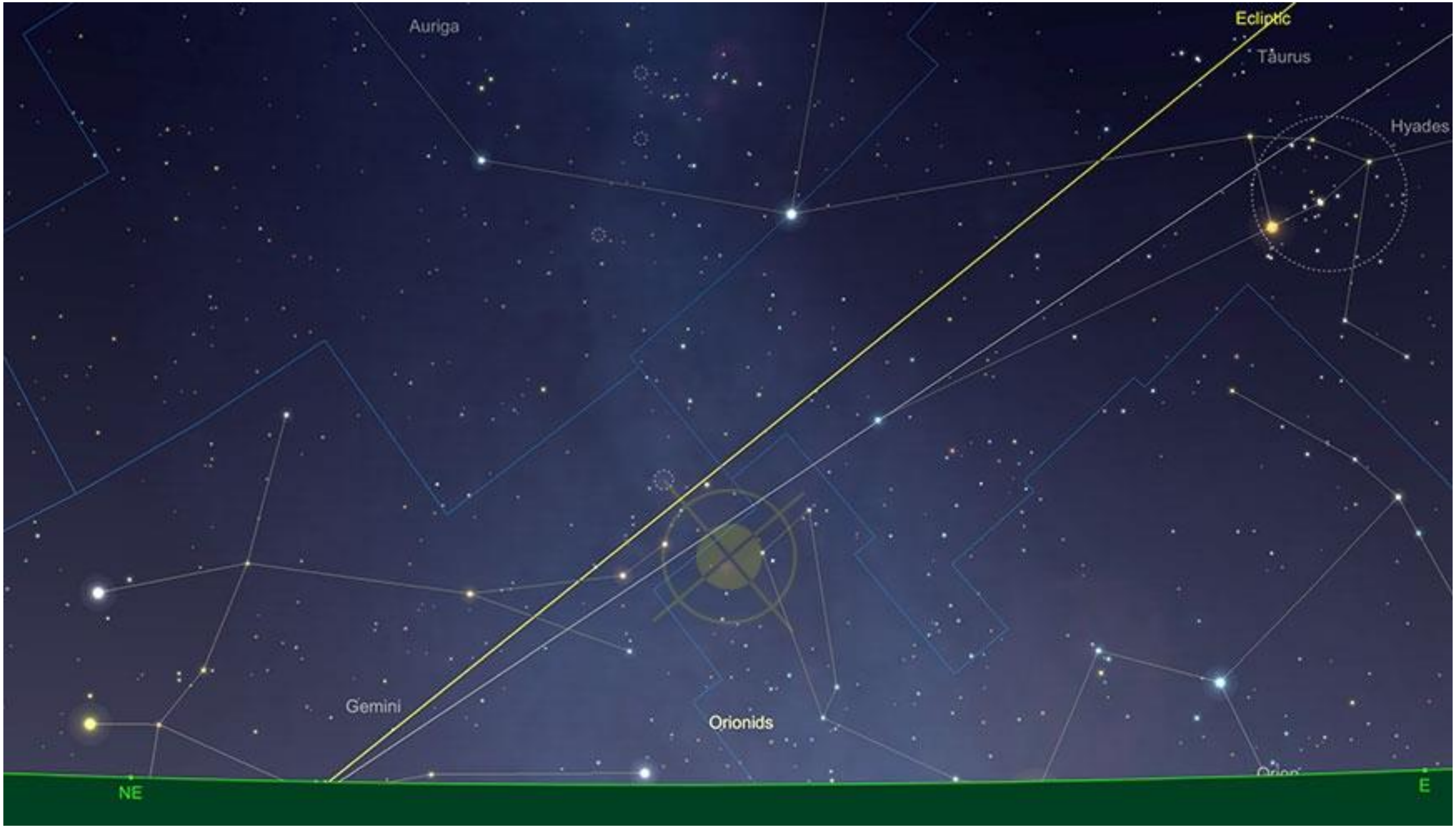

Ecliptic
Venus
2020 Oct 28
2020 Oct 25
_31
2020 Oct 23
C/2020 P1 (NEOWISE)
2020 Oct 20

Potential path of C/2020 P1 (NEOWISE), dawn, October 20th onwards. Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

Meteors

The Orionid Meteor shower will peak on the 21st/22nd October this year. This shower peaks at around 10-20 meteors per hour visible under ideal conditions, with the radiant well above the horizon.

On the night of peak activity this year, the Moon will be in Sagittarius and won't spoil the party, being a very narrow old crescent. By the early morning the radiant will be approaching transit in the south, so will offer the best chance to catch the fiery death of some of the debris left over by the most famous comet of all, P1/Halley (a trait the Orionids share with the Eta Aquariid shower of May). When you see an Orionid, you're witnessing the demise of a tiny piece of the most famous of short period comets, meeting its end in the Earth's atmosphere.



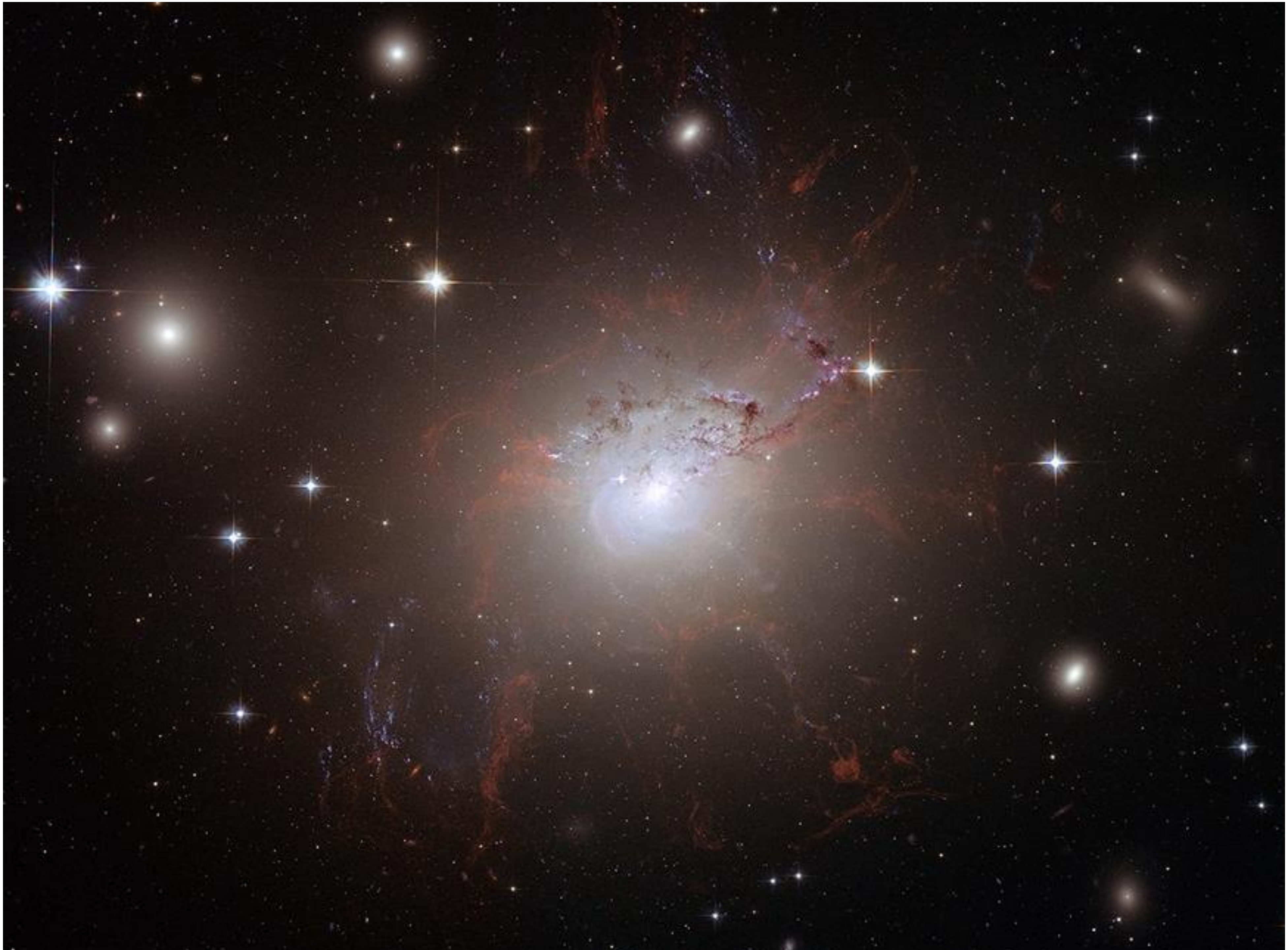
The Orion Radiant rising, 21st October. Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

Deep Sky Delights in Andromeda, Perseus and Triangulum

Perseus, Andromeda & Triangulum

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.

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.



Perseus A, Hubble Space Telescope Image. Public Domain.

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 tho 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 wasattached. Algol's name derives from the Arabic "ra's al-ghul", translated as "head of the ghoul" - though it has been know 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 diffcult 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 the 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.

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Image Credit: Ole Nielsen, creative commons.

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 lament detail within its inner structure, but a smaller wide eld telescope can potentially t the entire nebula into a single eld 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 eld 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.


NGC 869/884 Double Cluster - Perseus
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The Double Cluster, 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 Little Dumbbell
By Mark Blundell
19th Augest 2014

M76 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.


NGC 891 Galaxy
Const: Andromeda
By Mark Blundell
2nd October 2016

NGC891, 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.


M31 Andromeda Galaxy
By Mark Blundell
19th December 2014 (PM)

M31 by Mark Blundell. Image used with kind permission.
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 locations of Telescope House offices in Edenbridge). Robert’s beautiful picture below 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 above.

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 eld, 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 o ers 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 eld 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 6-8-inch class telescope will show it clearly as a blue-green ball of light. However in larger telescopes, the subtleties of NGC7662 really become noticeable - it's 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.

NGC7662. Image Credit: HST/Mark Landherr, 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 the 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 Triangulum Galaxy
Const: Triangulum
By Mark Blundell
23rd September 2015

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.

Text: Kerin Smith