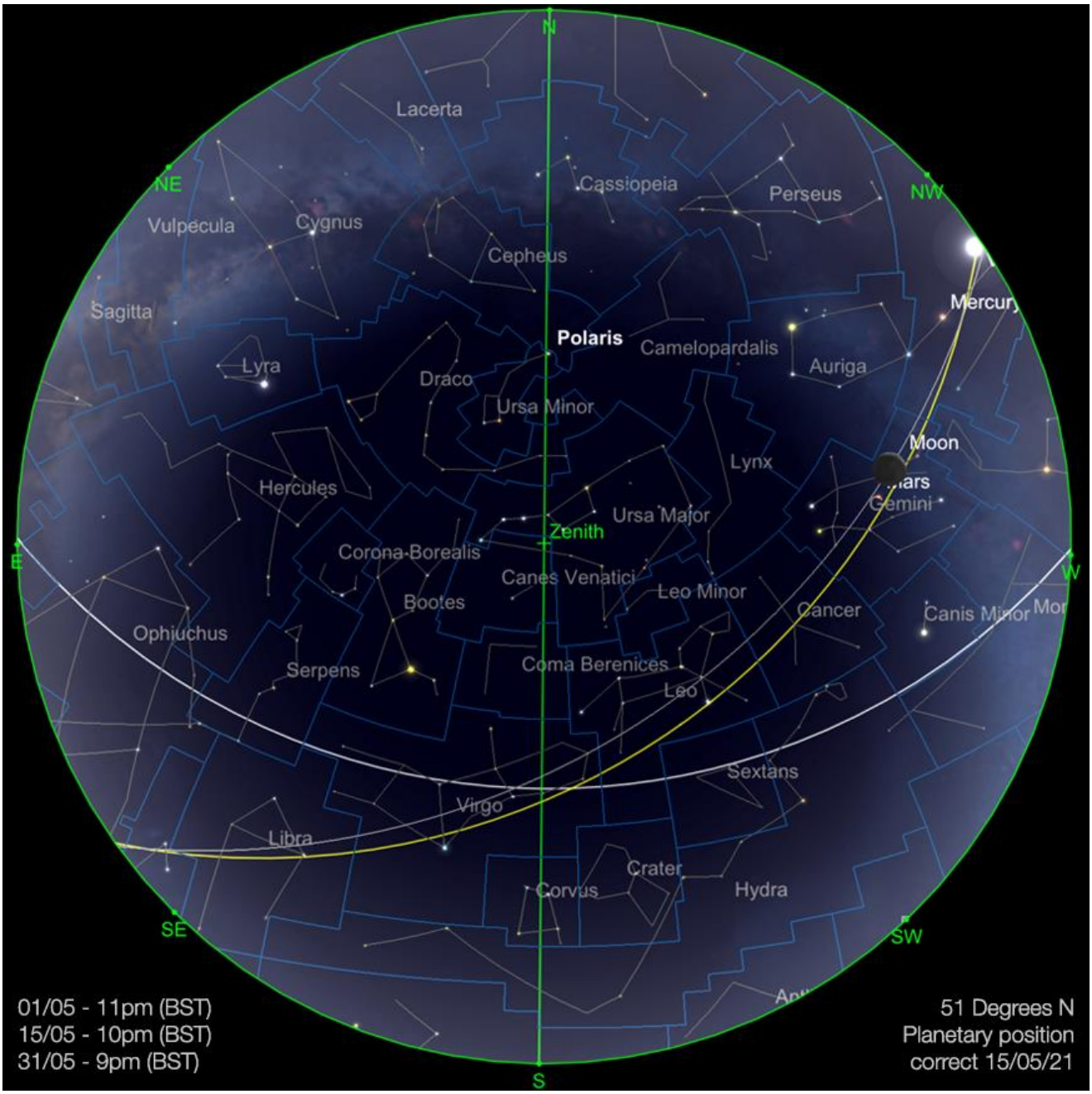


May 2021 Sky Guide. Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

Telescope House May 2021 Sky Guide

We begin May under two months from Northern Hemisphere Midsummer - and of course Midwinter for those in the Southern Hemisphere. This begins to have some knock on effects for readers at higher mid-northern latitudes, such as much of Northern Europe and North America. True darkness begins to rapidly diminish, for those at mid-to-high northern latitudes, due to the Earth's angle of rotation in relation to the plane of our solar system. For those around 50 degrees latitude N, astronomical dusk begins at just before 11pm on the 1st May and ends at just past 3 in the morning. Fast forward two weeks to the 15th and astronomical dusk begins at 11.46pm and ends at 2.11am. By the end of the month, there is no astronomical dusk and dawn for those at this latitude, as the Sun never sets more than 18 degrees below the horizon - and true astronomical darkness is never

achieved. This naturally has a knock-on effect for observation and astrophotography of fainter deep sky targets, but thankfully has no effect on brighter solar system objects.

The Solar System

The Moon

Our natural satellite begins May at a 71% illuminated Waning Gibbous phase in Sagittarius, sitting low to the horizon for those observers in the northern hemisphere. Rising at a little after 1.20am (from 51 degrees N), the beginning of the prior evening will be unencumbered by moonlight, though this will be offset somewhat by Astronomical dusk occurring at just before 11pm, giving only around 2 hours of true darkness to observe and image the deep sky in. The further south you are the earlier the astronomical twilight will end, but this is a sure sign for the of us further north that the lighter summer months are bearing down on us.

The Moon reaches Last Quarter on the 3rd May and will rise in Capricornus at just after 3am. The following morning it can be found between Jupiter and Saturn in the pre-dawn sky, though will be pretty low for observations. Beyond this point, the morning Crescent phase of the Moon kicks in as it will appear to draw closer and closer to the Sun, foreshortening its illumination as it does.

New Moon occurs on the 11th, sliding to the south of the Sun in Aries. After this occurs, the Moon becomes an evening target, high in the northern part of the Ecliptic (the plane of our solar system in the sky, as viewed from Earth). Rising in a pretty steeply setting part of the ecliptic (when observed from the higher temperate northern hemisphere), the Waxing Crescent Moon is (contrary to some received wisdom) very much observable from only a few hours “old” within the monthly lunar cycle. However, it tends not to be seen before a couple of days old, due to its proximity to the Sun and the lightness and lack of contrast of the bright evening sky. This month, the planet Venus can provide a useful guide to the location of the emerging Moon, at its earliest phase, but sky conditions and visibility will have to be kind and binoculars will be needed in order to seek it out. It may just be possible to make out the New Moon as a very faint darkening circular area of sky sitting underneath Venus on the evening of the 12th, but at under 1% illumination, don’t expect to pick up any detail and make sure the Sun has set before trying to seek it out. You can try again the evening after, when the Moon will sit higher in the sky at sunset and will be flanked by Mercury, which itself will be reasonably difficult at +0.1 magnitude. The Moon will be 3.5% illuminated by this point in time and will be about 15 degrees high in the NW at sunset. Again, binoculars will probably be essential to locate it.

A narrow 2.7 day old Crescent Moon, taken through an Explore Scientific Maksutov Newtonian Comet Hunter. Image credit: Kerin Smith

May's Moon is really the last of the "High Spring Evening Crescent" phases visible from the northern hemisphere. While next month's Crescent Moon will actually reach very reasonable height in the sky, once the Sun has crested over the top of the most northerly part of the Ecliptic, the angle at which it appears to set from the northern hemisphere gets significantly shallower and the season of lunar observation is definitely over.

The Moon reaches First Quarter phase on the evening of the 19th, while in Leo - setting at a little before a quarter to three in the morning. Continuing its slide through the southern part of the ecliptic, it will eventually come to be Full in the constellation of Scorpius on the 26th. This month Full moon will coincide with a Total Lunar Eclipse, which occurs when the Moon passes through the shadow of the Earth as cast by the Sun. Sadly for those of us in Europe and Africa, the Middle East and much of the Western part of Asia, no eclipse will be visible as it occurs when the Moon is set from these parts of our planet. However, those bordering and in the Pacific will get a grandstand view, with the Moon high in the sky from Eastern Australia and New Zealand and Micronesia, where it will probably be seen best from. Much of India, , and the rest of the Far East won't see the eclipse in full, as the Moon will be rising as it has started. Conversely, the Pacific coasts of the Americas will experience the even as the Moon is setting - though much of the beginning of the event it will still be seen by some of those on the eastern seaboard of the USA, Mexico and the Caribbean. If

you find yourself in these parts of the world, don't miss the opportunity to experience one of nature's loveliest spectacles.

This Full Moon is also a Perigee-Syzygy Moon, otherwise more popularly-known as a Supermoon, which occurs when the Moon is closest to us during the process of its slightly elliptical orbit. As stated in previous sky guides, there's no great significance to this and the synchronisation with an eclipse is mere coincidence. The Moon itself will appear slightly larger than average, especially when viewed low in the sky when atmospheric lensing also appears to expand it somewhat. The irony is - eclipse aside - Full Moon is the worst time to observe the Moon telescopically, as full illumination bleaches out many of the most interesting features to observe. Expect to see plenty of headlines about the Supermoon Eclipse closer to the May's Full Moon, but rest assured there's no greater significance to the event as a result of it being a "Supermoon".

After the excitement of the eclipse is over, the Moon will continue its path through Ophichus, Sagittarius and Capricornus, until we reach the end of May with the Moon sitting just a little to the south of Saturn in the morning sky at a 73% illuminated Waning Gibbous phase, much where we picked it up at the beginning of the month.

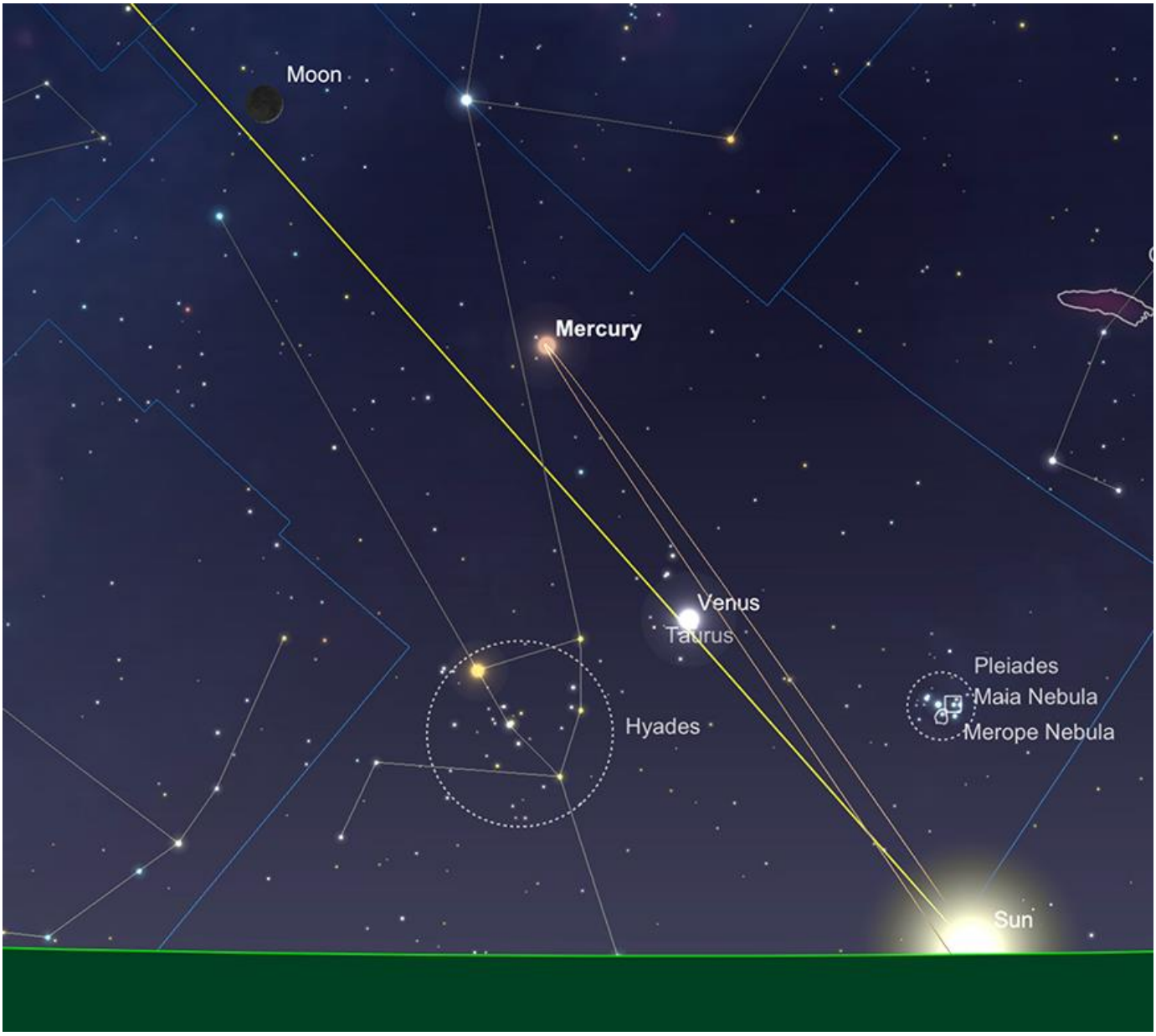
Mercury

The Solar System's innermost planet starts May very well-placed for observations from the temperate northern hemisphere. This is one of the best opportunities off the year to catch Mercury in the evening sky after the Sun goes down. On the 1st, the planet will be a bright -1.1 magnitude and sit some 11 1/2 degrees above the horizon in the west after sundown. At 5.7 arc seconds across and 81% illuminated, it will be a naked eye target, though easier in binoculars and small telescopes, which will resolve its tiny disk. Mercury is still climbing north out of the Sun's glare and as such conditions will remain kind for those trying to find this illusive world over the next couple of weeks, as it approaches maximum elongation from the Sun on the 17th May. By this point, the planet will have faded to +0.5 magnitude and show a 35% illuminated crescent phase, 8.2 arc seconds across.

Finding Mercury will be made a little more straightforward by the presence of the much brighter Venus in the same are of sky, acting as a beacon to guide observer's to its fainter neighbour. Mercury will sit higher in the sky than Venus until much later in the month, towards the end of May. Beyond the 17th, Mercury will start to fade significantly as it draws round towards us on its orbit, foreshortening illumination and dropping in brightness as it does so. By the time the two planets draw alongside each other in close conjunction at the end of May, sitting just half a degree apart on the 28th, Mercury will be a rather pitiful +2.2 magnitude and while it will have made it into double figures in terms of arc second's diameter - 10.6 - the phase of the planet will be a very low 12.6% illumination, making it impossible to see in the glare to the evening sky.

The advice as far as May's evening apparition of Mercury is to catch it early. Although common sense suggests it will be easier to find Mercury the higher it is in the sky, this separation from the Sun comes at a sacrifice of brightness. Sometimes it is easier to find a

brighter Mercury lower in the sky, than it is a fainter one, higher up. What ever method you use to try and find Mercury, as ever, we caution to make sure the Sun has set before doing so - especially when using binoculars or a telescope.



Mercury, sunset, 14th May. Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

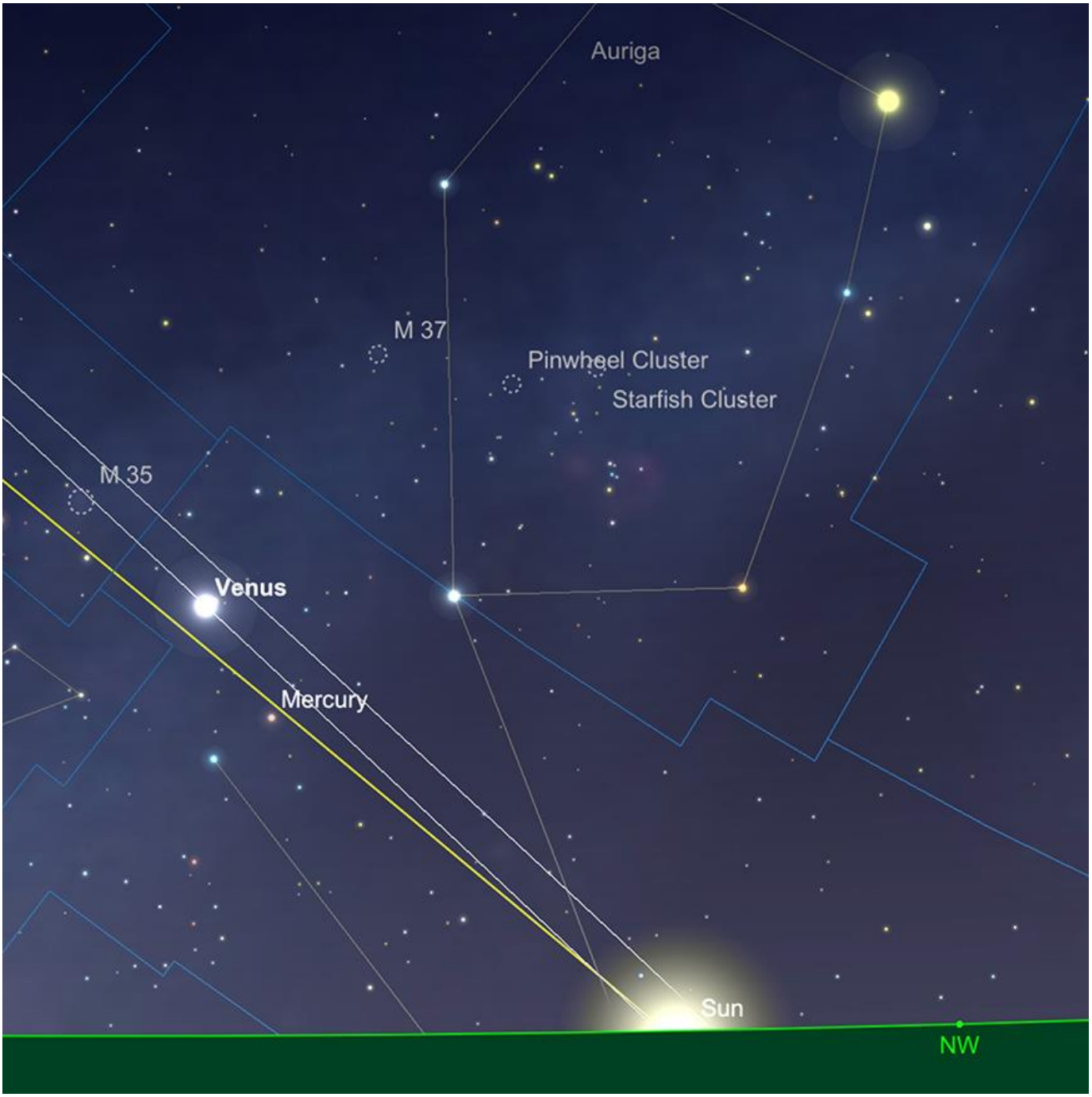
Venus

As discussed earlier in this sky guide, Venus provides a useful waypoint for both the very New Moon and Mercury this month, appearing with both in the same area of sky. As far as Venus itself is concerned, it appears to move at a much more sedate pace than its fleet-of-foot planetary neighbour and is very slowly inching its way away from the Sun. At -3.9 mag at the month's beginning, it will be seen by those with clear westerly horizons after the Sun

sets, though will not even attain a height of seven degrees (from 51 degrees N) at this point in time.

Mid-month will find Venus a tad higher in the sky at sunset - just over 9 degrees - but no brighter. The planet is still very much over on the farthest part of its orbit around the Sun, as seen from our perspective on Earth, so change is very gradual.

By May's conclusion, there's no great change in brightness or illumination of Venus. The planet sits a little over 11 degrees high in the sky and although it will prove a useful waypoint for finding other objects this month, it will need to be higher in the sky before we recommend higher power observations with telescopes.



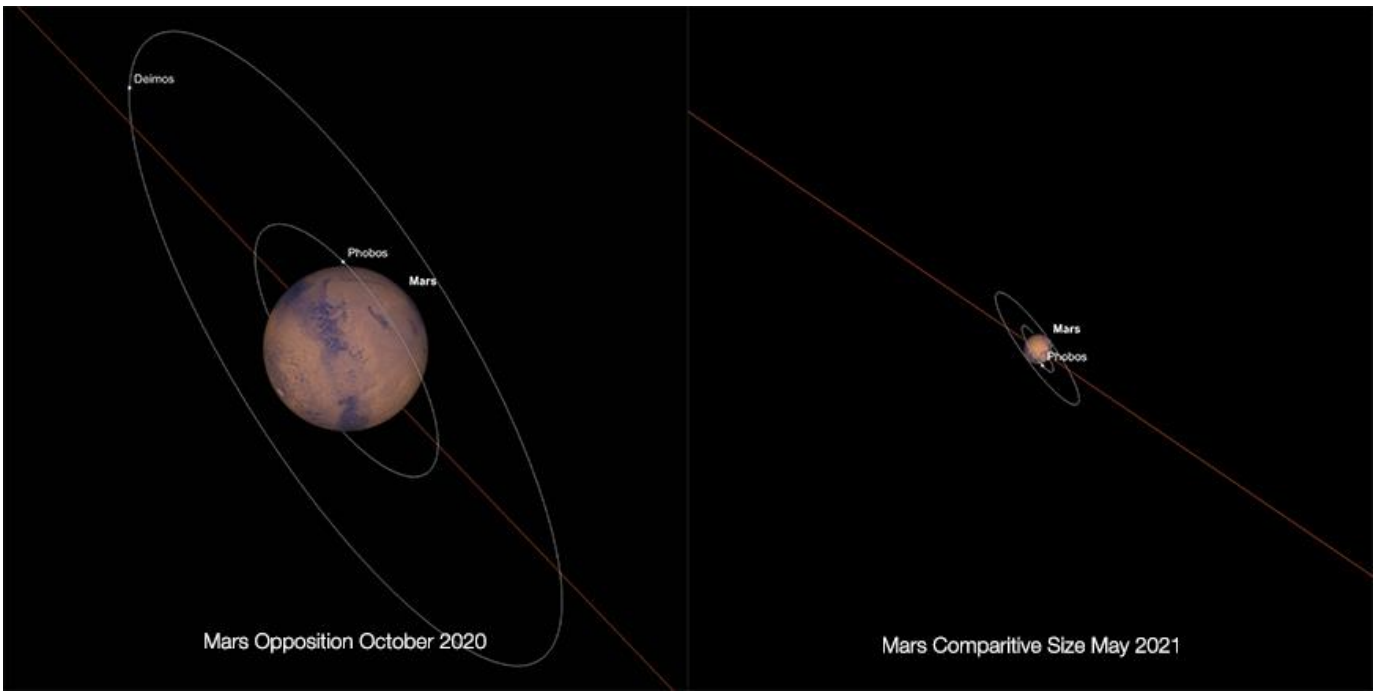
Venus at sunset, 31st May. Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

Mars

The Red Planet is a rather pitiful sight in a telescope this month. Although hanging on in there as a *potential* target for observation, the planet's disk is really tiny - just 4.6 arc seconds on the evening of the 1st and showing a brightness of +1.4 magnitude. While we would never discourage anyone from using their telescope to observe anything in the night sky, rest assured there are much better and more interesting objects to look at than Mars, at present.

As the month continues, the situation deteriorates yet further. By the 15th Mars' brightness has shrunk to +1.7 mag and disk down to 4.4 arc seconds diameter.

By the end of May, Mars is shrunk yet further to 4.2 arc seconds diameter, but is no fainter at +1.7 mag, though at this brightness it is now fainter than either Castor and Pollux, the two brightest stars in Gemini, where the planet is currently resident. Mars will not be back to close to its best until the latter part of 2022, when it returns to Opposition on December 8th.



Mars comparitive angular size October 2020 to May 2021. Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

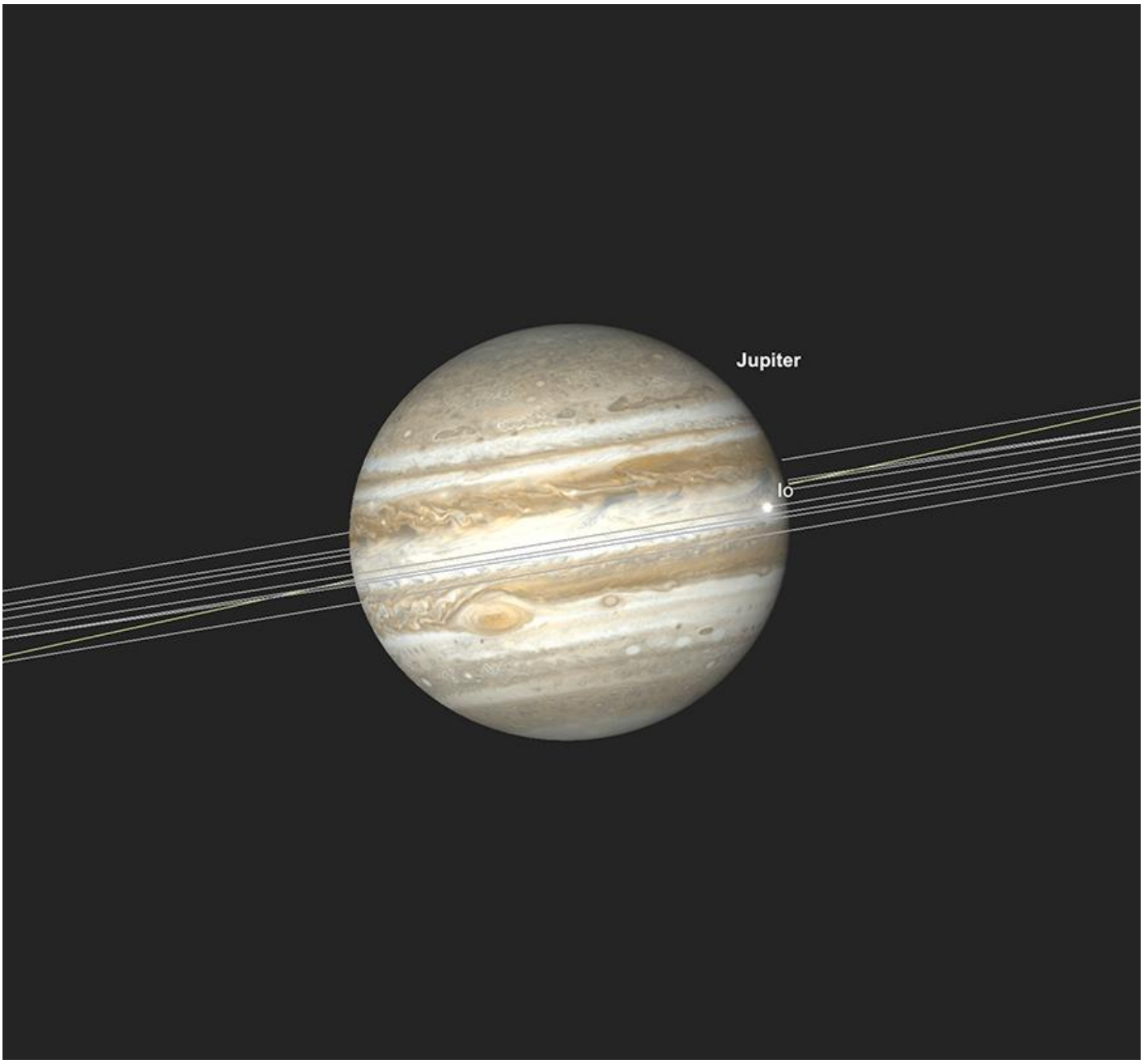
Jupiter

In stark contrast to Mars, Jupiter's situation is slowly improving. The Solar System's largest planet is so big, that even at the extremes of separation from us, it is never faint and always

presents a good-sized disk for observation. Early May finds Jupiter in Aquarius, continuing its trend as an morning target, rising a little over two hours before the Sun. At -2.2 magnitude and 37.5 arc seconds diameter, the planet will be easy to spot in the sky, as long as you have reasonable easterly horizons, though it will only attain a height of a little under 16 1/2 degrees altitude (from 51 degrees N) as the Sun rises. At the beginning of the month, Jupiter is to be found just under 72 1/2 degrees separation from the Sun.

By mid-May, Jupiter will have brightened fractionally to -2.3 mag and will now display a 39 arc second diameter disk. It will now sit over 84 degrees separation from the Sun and rises just under 2 hours 40 minutes before the Sun. It now sits just over 19 1/2 degrees high at daybreak (from 51 degrees N).

At the end of May, Jupiter will have improved yet further, displaying a -2.4 mag, 41.4 arc second disk. Rising at 1.48am (BST), the planet will attain a height of just under 23 1/2 degrees altitude as the Sun comes up. We are still some way off Jovian Opposition, which occurs on 20th August this year, by which time Jupiter will appear to be -2.9 magnitude in brightness and nearly 50 arc seconds across.



Jupiter with dual Great Red Spot and Io transit, 4.16am (BST), 13th May. Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

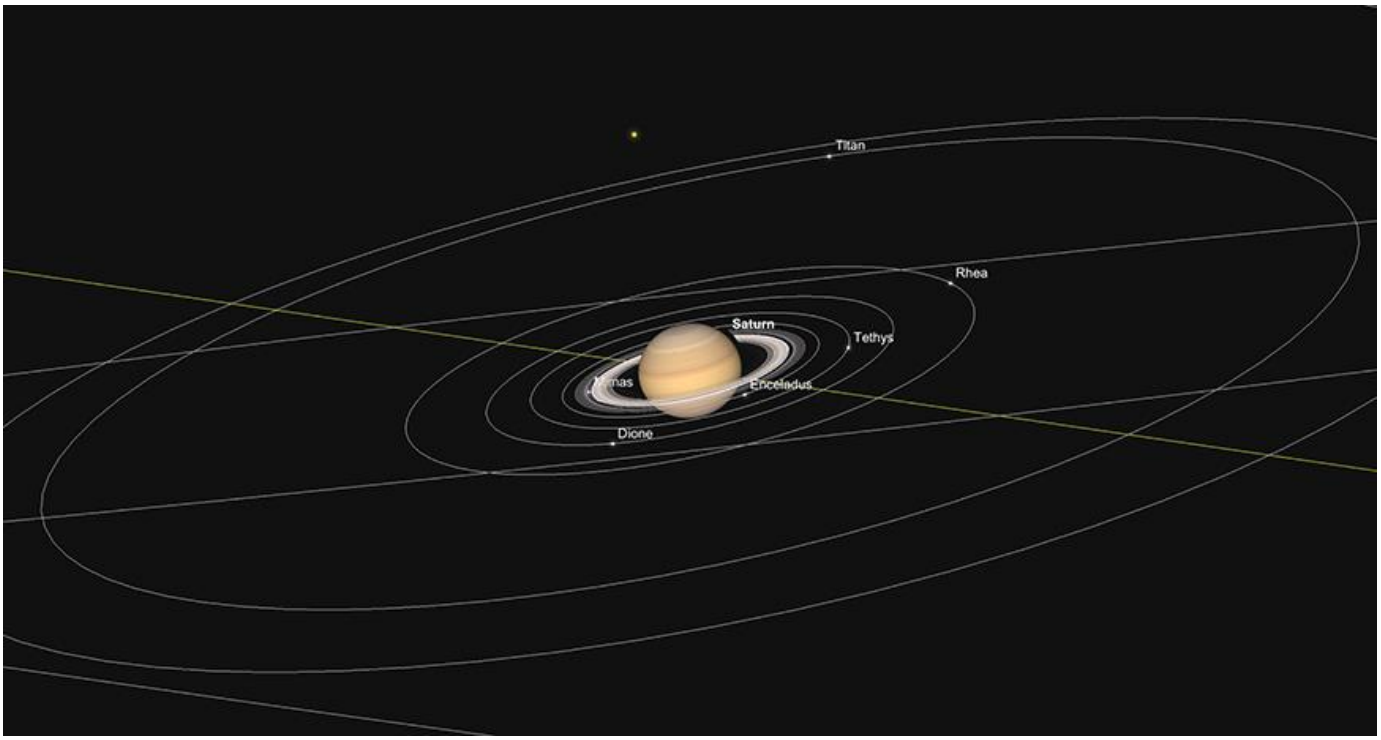
Saturn

Found in a similar area for sky, in Capricornus, but further west in the Ecliptic than its neighbour Jupiter, Saturn rises earlier and attains a somewhat greater separation from the horizon at the beginning of the day. On the 1st, the Ringed Planet is to be found at a modest +0.7 mag and displaying a 16.7 arc second disk. Rising at just past 3am on the 1st, Saturn attains a separation from the horizon of just under 17 3/4 degrees (from 51 degrees N) at sunrise.

Saturn, Jupiter and the Moon just before dawn, 5th May. Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

Saturn reaches its furthest prograde point in its path around the sky on the 23rd/24th May, after which it begins a retrograde motion - appearing to travel backwards in the Ecliptic to its "proper" apparent motion. This is a precursor to Opposition for all of the Outer Planets and it is caused by our "catching up" with the outer body on our faster interior orbit, causing the angle at which we observe the outer body in relation to the background stars to change. The analogy of catching up and undertaking a car and noting its apparent motion, relative to the car you are travelling in, is a simple version of what's happening here. Of course, the outer planet never actually changes its orbital course, but apparent retrograde motion is a clear demonstration of the visual effects of orbital dynamics at work and as such a fascinating demonstration of the way our Solar System works and our place within it. While we're still a little way off Saturnian Opposition, which occurs on the 2nd August this year, retrograde motion of any of the outer planets is always a sign that this is upcoming.

Saturn ends the month a little brighter at +0.6 mag and just slightly larger at 17.6 arc seconds diameter. It sits at an altitude of just over 21 1/2 degrees high (from 51 degrees N) in the east as the Sun comes up.



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

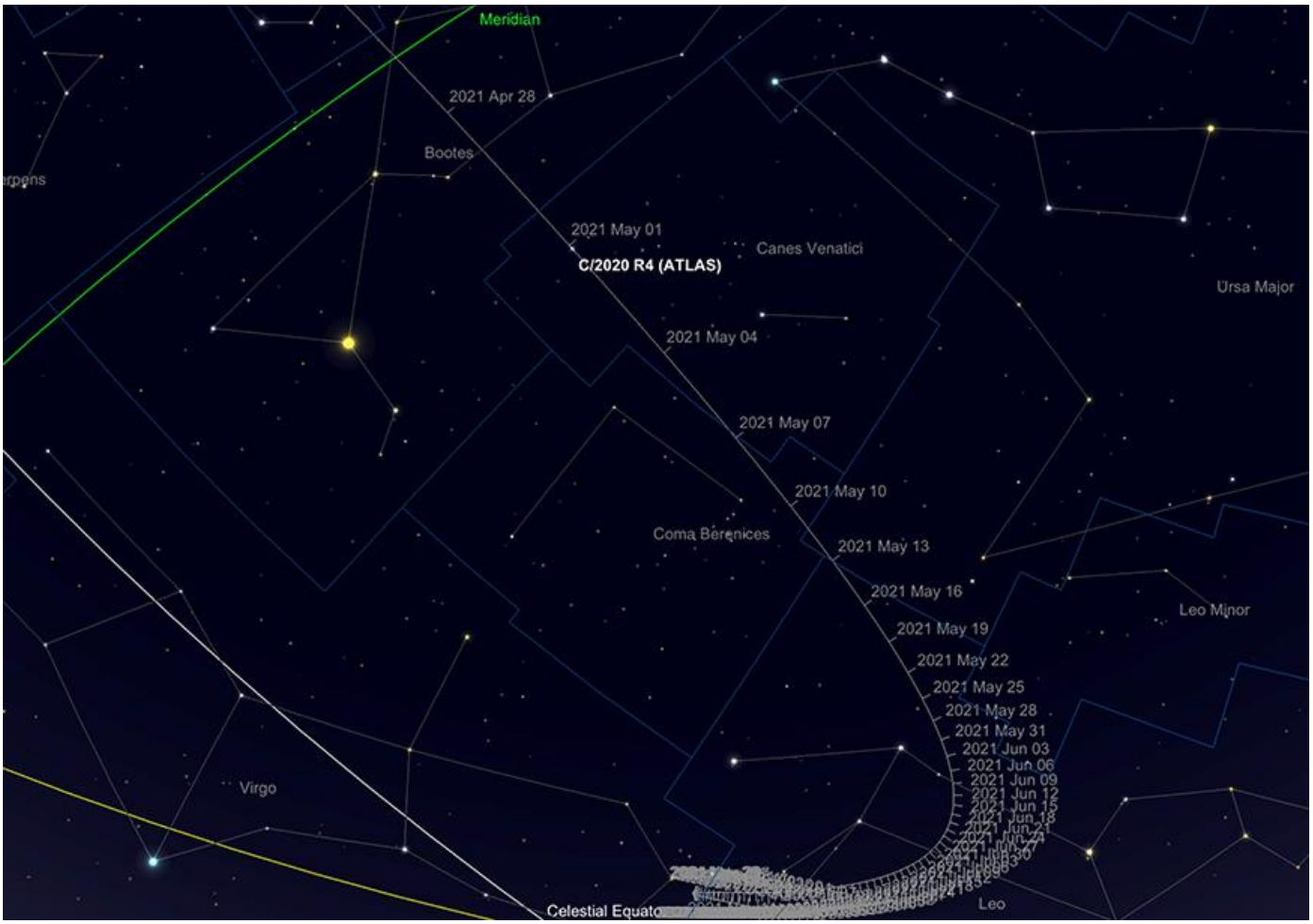
Uranus and Neptune

Uranus is just emerging from April 30th's Superior Conjunction and as such will be unobservable for some time to come as it is too close to the Sun, in Aries. Neptune, having been through Superior Conjunction in mid March, while considerably further west of Uranus, in Aquarius, is still in a very poor part of the sky to observe a planet this faint, especially as much of the temperate upper northern hemisphere will be experiencing permanent astronomical twilight from late May. It will be a little while longer before both planets are in a better position to be observed.

Uranus and Neptune, relative positions at sunrise, 15th May. Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

Comets

C/2020 R4 Atlas is visible in May, though will be faint. Those with telescopes or large binoculars may wish to hunt out comet as it is making its way through Canes Venatici, Coma Berenices, Ursa Major and Leo during the month, though it will be a difficult target.



C/2020 R4 Atlas path May 2021 (comet position shown 1st May). Image created with SkySafari 5 for Mac OS X, ©2010-2016 Simulation Curriculum Corp., skysafariastronomy.com.

As reported in previous sky guides, C/2021 A1 Leonard looks like it will be a comet to look forward to, as it passes Earth by 0.23 AU in December 2021, just prior to perihelion. It is predicted that it may reach around the 4th magnitude, so could well be an interesting binocular and telescopic sight. This is naturally still some way off and we must be cautious in regards to how this comet may develop, however potentially promising it looks at present.

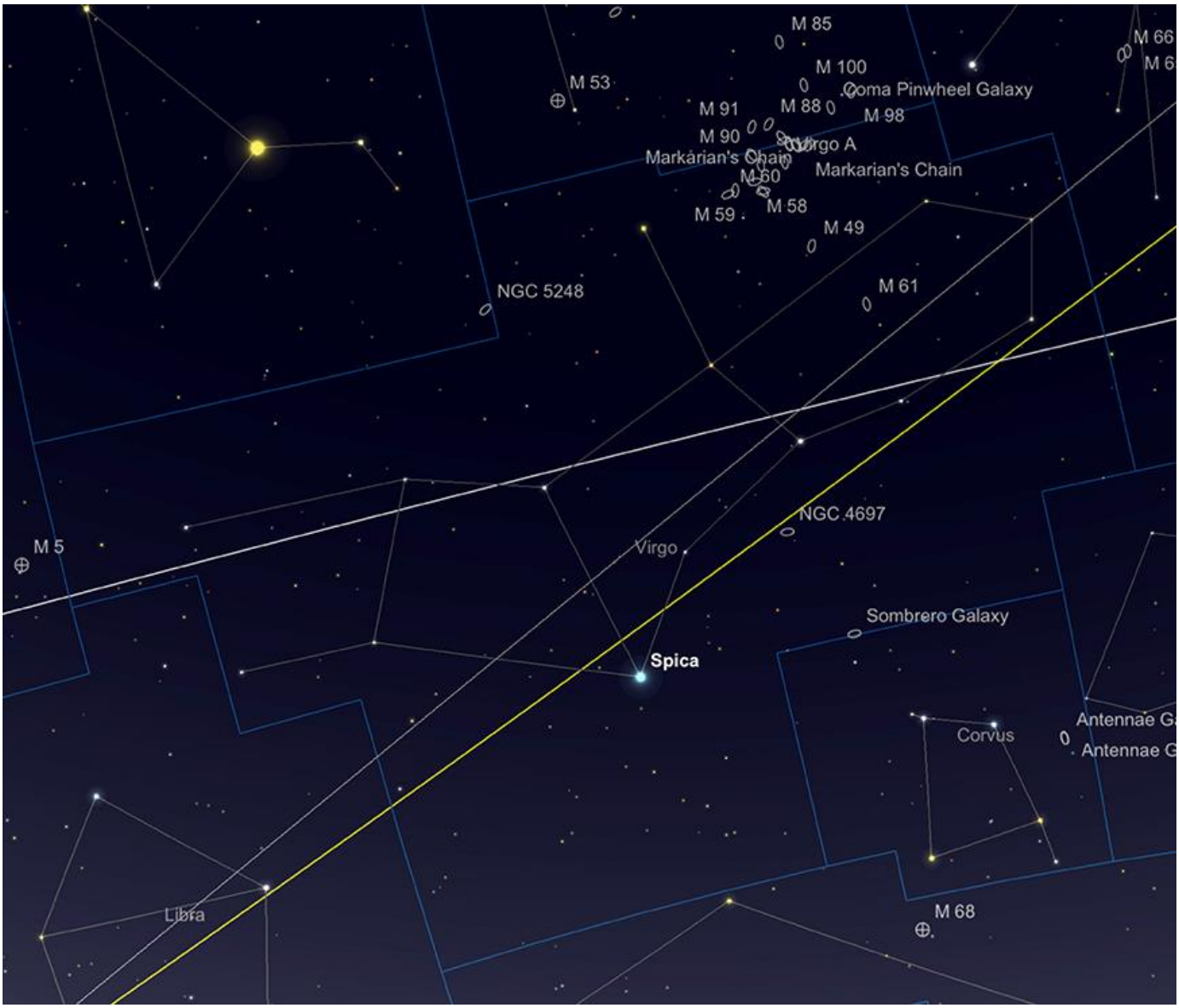
Meteors

Reaching their upper range of activity between the 4th-6th May, the Eta Aquariids meteor shower peaks on the night of May 5th this year. While the zenith hourly rate of this shower - around 30-40 at maximum, this year - is not as high as some of the major annual showers, this event would be worth staying up for (or at least attempting to record photographically), where it not for the pernicious influence of the Moon, the perennial upsetter of meteor shower observation, which will be at 36% phase and hanging around all night in Aquarius itself. As meteors from any radiant can be seen in any part of the sky, observers do not have

to solely concentrate on the part of the sky the radiant is located in to catch some decent meteor activity. As such, one could try starting off observations or photography before 4am when the Moon rises. This probably cuts the potential for observable meteors by a factor of 50% or very likely more, but this year will probably be a better strategy than waiting until later when the radiant has risen. As the radiant rises so late, it is often commented that the Eta Aquarius are better seen in the southern hemisphere, but those in the northern hemisphere should still try and catch a few meteors, if possible. This shower is seeded by the famous Halley's Comet, whose debris is quite fast-moving, resulting in bright, energetic meteors. The best of these will be visible, especially if you try to observe before the Moon rises.

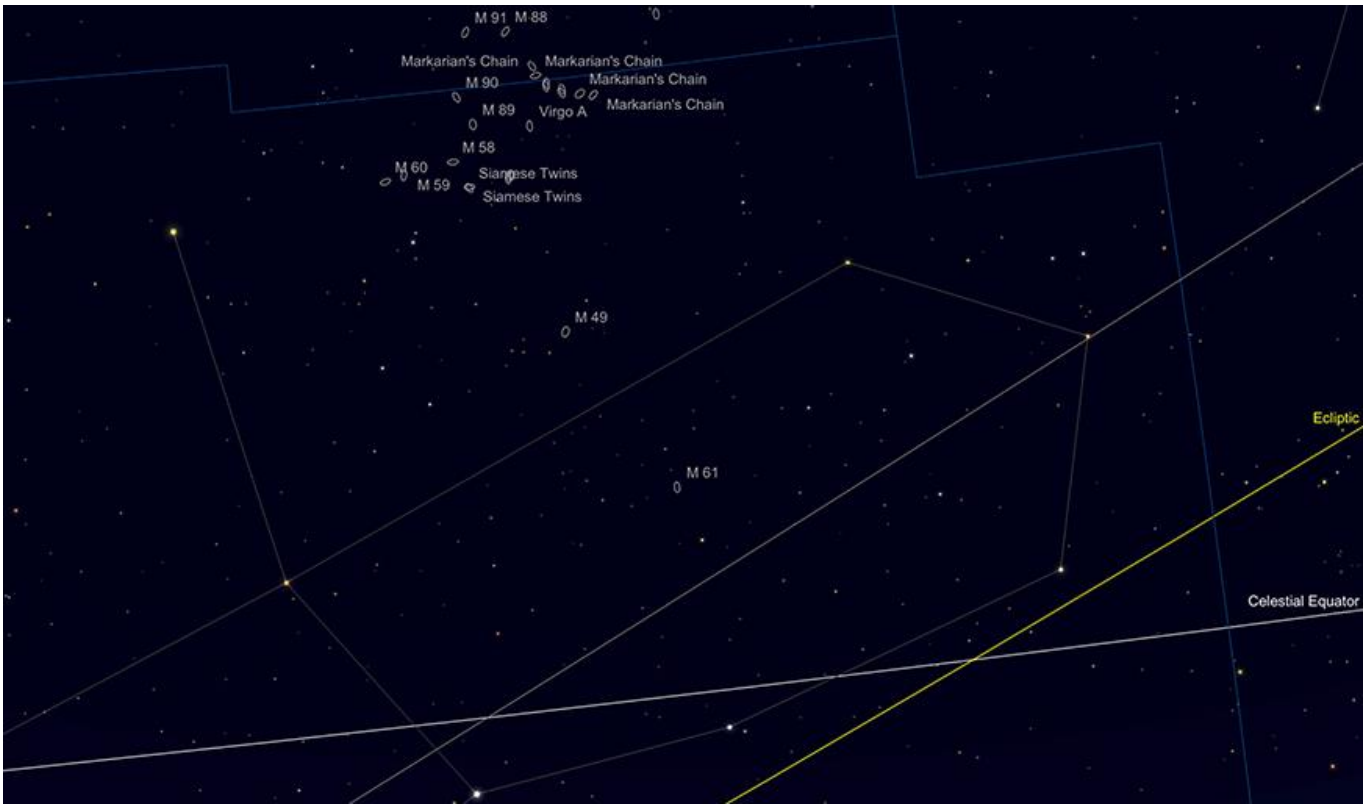
Deep Sky Delights: Galaxy Season continues in Virgo

Picking up from where we left off in Coma Berenices last month, we move south, over the border into the large and extremely galaxy-rich constellation of Virgo.



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

The so-called "Bowl of Virgo", which comprises of the most northerly section of the constellation is where the majority of the objects discussed below lie. So crammed in are these galaxies that it is difficult to see in the larger scale map above exactly where these mass of objects lie in relation to one another. The image below is a more detailed depiction of the "Bowl' area, which really gives an indication how crowded this area is.



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

The galaxies shown in the map above are just the brightest and easiest to observe in this area of sky. There are many more fainter galaxies lurking in the background, making up the Virgo cluster of galaxies. Indeed, it is thought that the interlinked Virgo Supercluster, which comprises of galaxies in neighbouring Leo, right the way through Ursa Major and our own local group of galaxies, is one of the largest structures in the known Universe.

Just under a degree SSW of M88, where we left off last month, lies the small +10.19 mag spiral galaxy of NGC 4477, which in turn marks the beginning of a glorious 1.5 degree long arc of galaxies known as Markarian's Chain. This gently curving line of galaxies is one of the finest sights in the sky and an almost peerless photographic subject from a galaxial point of view.

Markarian's Chain comprises of the aforementioned NGC 4477 at the Northerly end and the major galaxies M84 (elliptical, +9.10 mag), M86 (lentinicular, +8.89 mag), at its Southerly tip. Galaxies NGC 4473 (elliptical +10.19 mag), NGC 4461 (spiral +11.19 mag), NGC 4458 (elliptical +12.10 mag), NGC 4438 and NGC 4435 (both spiral, +10.80 mag, together known as "The Eyes"). The Chain spills over the Coma Berenices border into Virgo, where the largest part of it resides.

Markarian's Chain is named after the Armenian Astrophysicist Beniamin Markarian, who in the early 1960s first suggested a common motion for all these galaxies. Observations have proved than all the above galaxies are in fact gravitationally interacting with each other,

though there are outlying and closer objects - most noticeably the spiral NGC 4388 which may or may not to be a part of the system - which also populate the area.

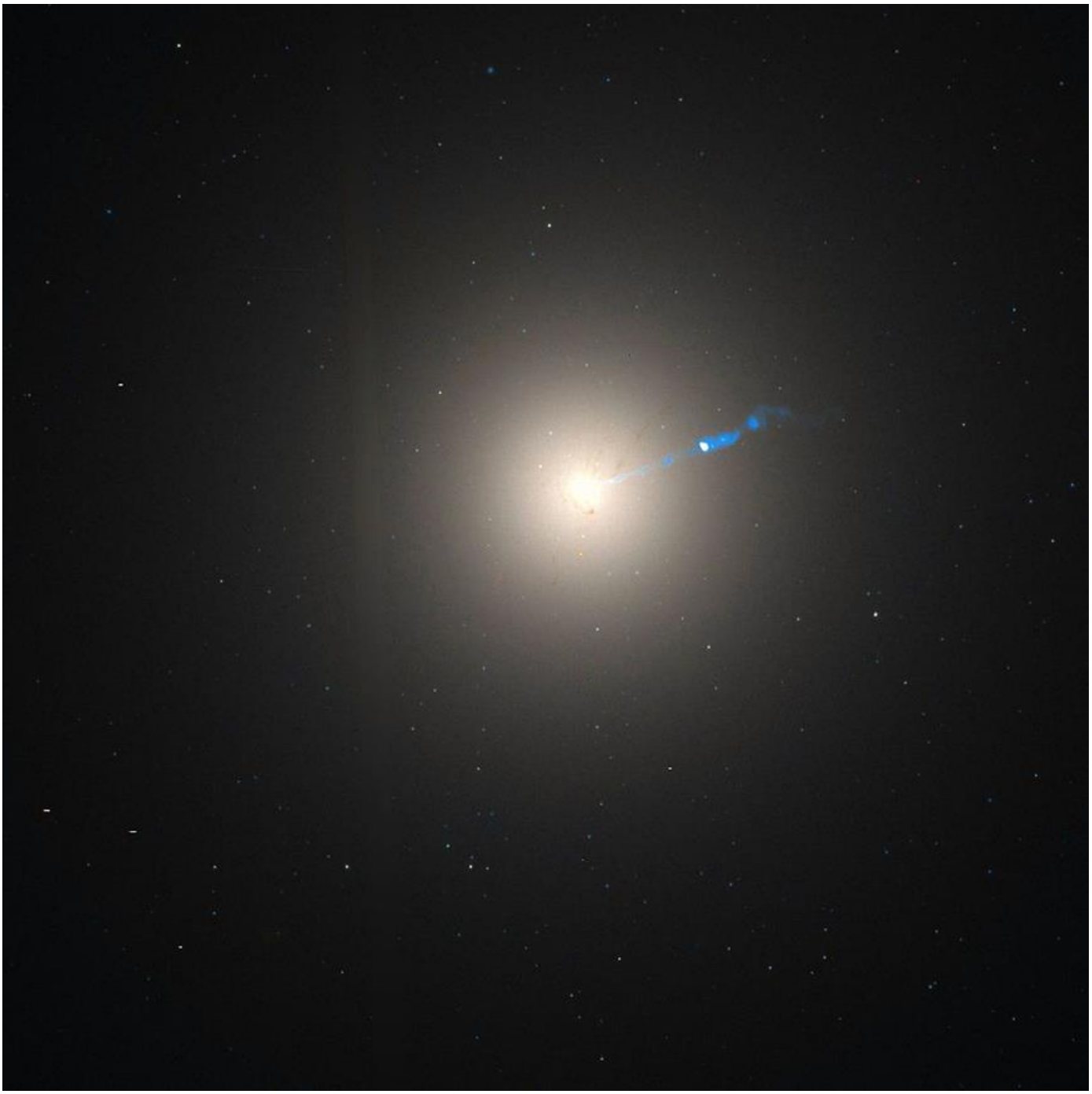
Markarian's Chain by Mark Blundell. Image used with kind permission.

Frankly, it's difficult to pick out clear highlights in Markarian's Chain, but special mention must go to the eerily-named "The Eyes" galaxy pairing of NGC 4438 and NGC 4435. This pairing do appear like a pair of eyes peering back at an observer through the gloom and were first nicknamed this by late-19th and 20th century astronomer L.S. Copeland. Looking at these two objects in even a relatively small telescope will confirm this nickname's accuracy - the similar galaxial core brightness and angular orientation of both objects help to complete the illusion. Both galaxies it is clear have gone through some sort of interaction in the recent past as astrophotography reveals a large amount of stellar and dark material spilling from NGC 4438's disk.

A degree to the SE of the eyes lies the vast elliptical galaxy M87, otherwise known simply as Virgo A. This enormous object is easily picked up in amateur instruments from even fairly light polluted environments, shining as it does at +8.60 mag. M87 was discovered and catalogued by Messier in 1781.

To call M87 vast is to somewhat understate the case: it is estimated to be anything up to 200 times the mass of our own Milky Way galaxy and has over 12,000 globular clusters in orbit around it, compared to our galaxy's rather paltry estimated 150-200. M87 also appears to

be close to the gravitational centre of the Virgo-Coma Supercluster and may be the key gravitational driver of the whole system. Astrophotography reveals a large jet emanating from M87's centre. This was first recorded by Lick Observatory Astronomer H.D. Curtis in 1918 and a corresponding much fainter opposite jet was discovered in 1966. These jets mark at their epicentre one of the most massive black holes so far postulated - a 2-3 billion solar mass object, condensed to about the volumetric size of our solar system. It is thought to be this object that makes Virgo A one of the most energetic sources of X-Rays, Radio Waves and Gamma Rays in the sky.



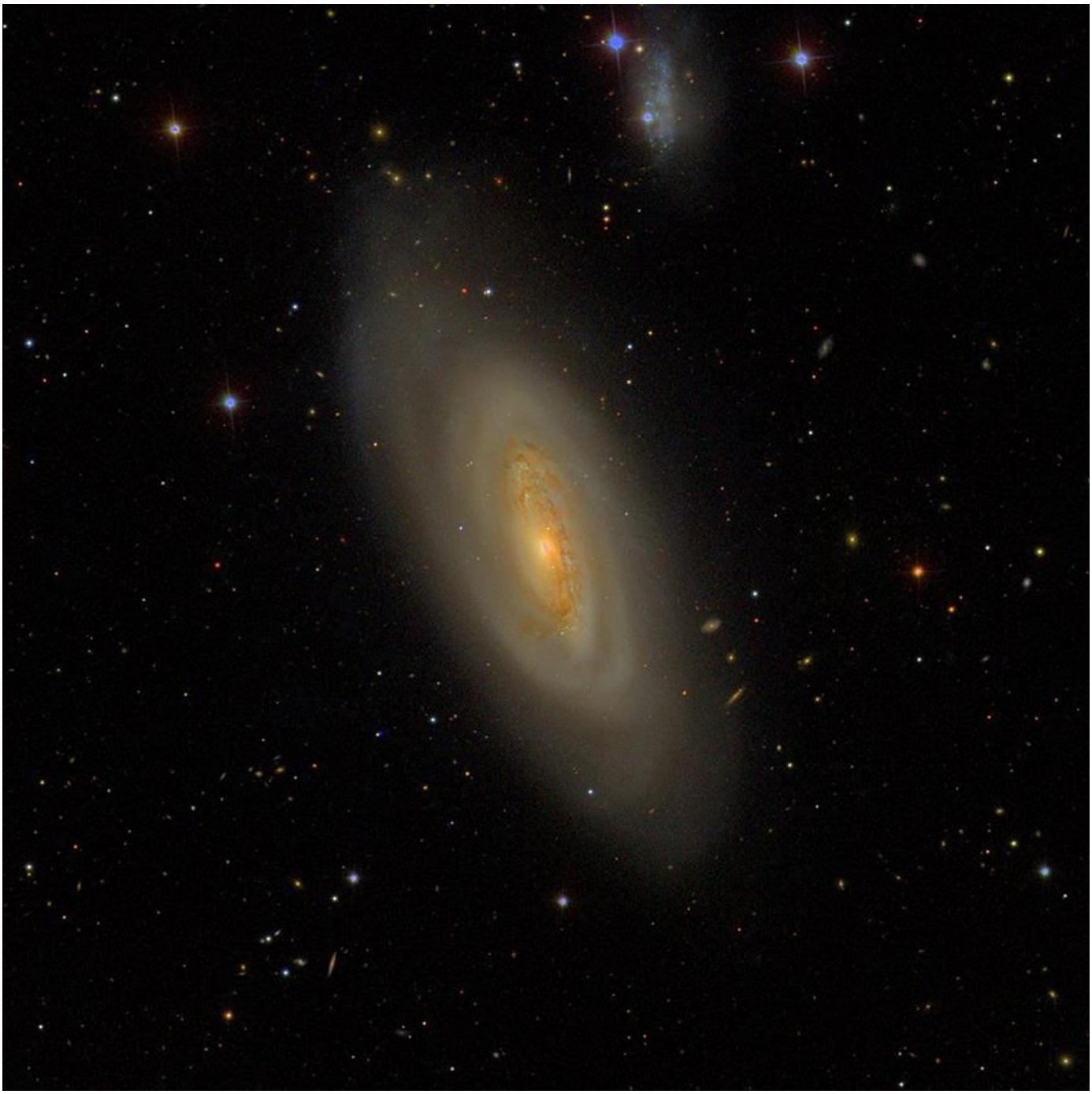
Virgo A, Hubble Space Telescope image, ESA/NASA. Public Domain.

This remarkable monster galaxy can be easily spotted in decent sized binoculars from a reasonable location and is one of the most straightforward galaxies to observe in the sky. To give a sense of scale, M87 lies 55 million light years away and its outer extents observable from here on Earth cover an area of sky larger than the full Moon. If put in place of M31, the Andromeda Spiral, in our skies, M87 would probably fit into an area the size of the Square of Pegasus - it's that big! However, even the mighty M87 pales in comparison to the galaxy IC1011 (also in Virgo) which takes the prize of the largest galaxy currently known at a staggering 6 million light years across - 60 times the size of our Milky Way's 100,000 light year span.

Just over a degree E of M87 lies another elliptical galaxy: M89. This Messier-discovered object is fairly bright and compact at +9.80 mag and 3.5 x 3.5 arc minutes in size. M89 is a remarkably spherical object, or at least appears to be from our perspective. This is unusual, as most elliptical galaxies do appear slightly elongated. M89 is rather special in terms of its conformity. This makes for an easily observed object in most telescopes, but unfortunately, a rather bland experience.

M89, Hubble Space Telescope image, Hubble/ESA. Creative Commons.

Whereas the unfortunate M89 is fairly bland, its neighbour, M90, to be found 3/4 of a degree to the N is anything but. At +9.50 mag and an angular size of 9.5 x 4.4 arc minutes, it is a touch difficult in binoculars in comparison with its two elliptical neighbour, but is well-seen as a elongated spiral in larger telescopes. M90 is fairly unique amongst Messier galaxies, as its spectral shift is very pronounced towards the blue side of the spectrum, suggesting it is rapidly approaching us in relation to the rest of the cluster. This may be due to it having broken free of the gravitational bounds of the cluster, or indeed it may be considerably closer than the 50-or-so million light years distance it is thought to lie. Another interesting feature of M90 is that star formation appears to have ceased almost entirely within the system. As such it is referred to as a "Fossil Galaxy". M90's swift flight through the interstellar medium is thought to have stripped it of much of its star forming material via the process known as "Ram Pressure Stripping". This appears to also have been compounded by several supernovae in its central arm regions, which would naturally be richer in this material. The combined stellar winds from these events have blown much of the material out of the galactic disk and out of the gravitational influence of the galaxy.



M90. Image credit: Sloan Digital Sky Survey [www.ssds.org] Creative Commons.

One and 1/3 degrees S of M90 lies another spiral galaxy, M58. Although M58 is a little fainter than M90, at +9.69 mag, it appears, due to its compact size - 6.0 x 4.8 arc minutes - a little brighter overall. M90 is a barred spiral, though due to the relative brightness of its spiral arms, the bar appears a little obscure, particularly in smaller telescopes - though these will show its disk shape well. Larger instruments will start to resolve the mottled internal structure and arms better, with the central bar becoming more obvious in instruments of the 8-10-inch class. M58, alongside M90 is a relatively poor galaxy for star formation and seems to be a victim of the dreaded Ram Pressure Stripping as well. Lying some 62-68 million light

years away (sources differ) it is suggested that at the time of its discovery by Messier in 1779, it was the furthest observed object in the Universe.

M58 taken with the 0.8m Shulman Telescope. Image credit: Adam Block/Mount Lemmon SkyCenter/University of Arizona - http://www.caelumobservatory.com/gallery/m58.shtml. Creative Commons.

Just over a degree to the E of M58 lie the first of two elliptical galaxies, M59 and M60 (a little under half a degree further E). These two galaxies were first discovered by Johann Gottfried Koehler in April 1779, Messier listing them shortly after. Both men were principally concerned with comet watching rather than any notion of "Deep Sky" objects - ironically their discoveries of these pesky objects getting in the way of "true" comets would ultimately be of much greater cosmic significance.

Of the two galaxies, M60 is dominant, being +8.8 mag to M59's +9.6 and slightly larger at 7.6 x 6.2 to M59's 5.4 x 3.7 arc minute size. Still, M59 in a large telescope is a fine object, displaying a bright outer halo, though M60 trumps it in imaging terms, which reveal a closely packed spiral companion galaxy, NGC 4647, at +11.30 mag, to its NW, overlapping the larger elliptical's outer regions. It is possible to see this attendant galaxy with large telescopes (12-inch+) from a dark site, but it will be difficult with anything smaller. It is debated whether or not NGC 4647 is truly interacting with M60, as evidence, bar the obvious visual closeness has been scant. However, latest observation by the Hubble Space Telescope suggest that interaction is possibly at the beginning stages and the two objects are not simply line of sight co-incidental.

M59 (top) and M60 (middle) by Mark Blundell. Image used with kind permission.

Both M59 and M60 are thought to contain supermassive black holes in the order of mass equal or larger than the mass of M87's - with M60's thought to be a huge 4.5 billion solar masses.

If we trace a line back West from M60, to M 59, then back to M58, we have a starting point for the identification of the next target for this month, the Siamese Twins Galaxy or Butterfly Galaxy. This is in fact two objects, NGCs 4567 and 4568, which can be found just over half a degree to the SSW of M58. These objects are +11.30 and +10.80 mag respectively and can be resolved as a V-shaped patch of light in smaller telescopes. Larger (8-10-inch class) instruments will clearly resolve the objects as a much more rounded "V" - very reminiscent of a butterfly in flight, in fact. Larger instruments under good conditions will start to resolve some variance of brightness within the disks, but it is in astrophotography that this target really begins to show its true awesome beauty. Images reveal the early onset of a collision between these two spiral galaxies, which has been confirmed by professional infrared observations.

NGC4567 and NGC4568. Image credit: Goran Nilsson & The Liverpool Telescope. Creative Commons.

Following a line from M58, through the Siamese Twins, extending SSW by just over 3 and 1/2 degrees, we come to the penultimate object for discussion this month, the bright elliptical galaxy M49. M49 was discovered by Messier on 19th February 1771 and was the first of the Virgo group to be added to his list of objects. At +8.39 mag and 10.2 x 8.3 arc minutes dimensions, this galaxy is large, but still pretty bright - certainly conspicuous enough in binoculars under average conditions. Indeed, M49 is the brightest of all the Virgo cluster, though M87 does give it a run for its money. It was thought that both objects were of

similar size and mass, but observations have now proved than M87 is by far the larger and heavier of the two galaxies. By comparison, M49 has "only" 6000+ globular clusters to M87's 12000+.

4 degrees to the SSW of M49, extending the imaginary line we stared from M58, we come to the final objects in this month's epic tour of just some of Virgo's Deep Sky delights. This object is one of the most beautiful and the most active, M61.

M61 was discovered by Barnabus Oriani on 5th May 1779 and was also noted on the same night by Messier, who classed it as a possible comet. Less than a week later, Messier had realised that M61 was a static object, so then added it to his list.

At +9.69 mag and 6.5 x 5.9 arc minutes, M61 is a fairly compact galaxy, having a bright star-like core, surrounded by evidence a its face on spiral nature, which is visible in smaller telescopes as a tenuous halo, but is resolved much more readily and successfully by the 12-inch+ class of telescope into a definitive spiral. In fact, M61 is another barred spiral, but this bar is very compact in comparison to virtually every other barred spiral galaxy previously mentioned here. Again, M61 is a worthy target for astrophotographers, who will pick up this compact spiral's structure well in long duration photographs.

M61 is unusual in being one of the most active star-forming galaxies in the Virgo cluster.Likewise it holds the joint record with M83 as being the most active Messier object for Supernovae, with six being observed in the the past century.

M61. Image credit: ESO/VLT. Creative Commons.

From M61, we can trace a curving arc to the SE in the direction of Spica, Virgo's principle star, which takes in a few of Virgo's lesser galaxies, the elliptical +9.50 NGC4636 is exactly 5.5 degrees SE of M61, followed by the +10 mag spiral NGC4753, then reaching NGC4697, which is a brighter elliptical galaxy, discovered by William Herschel in 1784. This galaxy is fairly easy in small telescopes, as is its neighbour NGC4699, an attractive but compact spiral, which lies just under 3 degrees due South.

At the bottom of this arc, 3 and 3/4 degrees to the SW of NGC4699, lies one of the jewels of the night time sky, M104, the Sombrero Galaxy. The Sombrero was discovered in 1767 by

Pierre Machain and though noted by Messier in an addendum to his original list, had to wait until Camille Flammarion rediscovered it in Messier's original notes in the early 1920s for it to be officially added as a Messier object. William Herschel made an independent discovery of it in 1784 and remarked upon the appearance of a "dark stratum" in the object. We now know this to be a prominent dust lane which rings the outer spiral structure of the Sombrero and gives it its distinctive - and apt -nickname.

The Sombrero is bright for a galaxy at + 8 mag and a decent size, (though hardly over-large) at 8.6 x 4.2 arc minutes in dimensions. It can be found in telescopes and binoculars of all sizes, though contrary to what is stated in many publications (which tend to overstate the size of telescope required), a good quality 4-inch refractor and a dark observing site and decent dark adaption will be needed to see its dust lane. Admittedly, the lane is much easier with a reflector of 8-10 inches in aperture, which will also resolve the true shape of the Sombrero better, but this should not put off observer with smaller instruments from attempting to spot it. Once found, M104 will not be forgotten in a hurry, it is a lovely object. M104 is even more spectacular when imaged, though from UK locations astrophotography of this target has to be timed carefully, as it is only at a reasonable height from the horizon for a limited period.

M104, The Sombrero Galaxy, by Gary Palmer. Image used with kind permission. https://www.astrocourses.co.uk/

M104 is thought to lie around 30 million light years away and calculations show that although it is around half the diameter (50,000 light years) of our own Milky Way Galaxy, it is considerably more luminous and has many more than our own galaxies number of attendant Globular Clusters - 1200 to 2000 compared to the Milky Way's estimated 160 - more in line with a much larger spherical galaxy like the nearby Virgo A. M104 is also thought to be home to a supermassive black hole and the first object to have its redshift measured, which proved that it was clearly not a part of the Milky Way in 1912.

There are four more objects of note in the Eastern half of Virgo. Two galaxies, the barred spiral NGC5068, a +10 mag object, 7.3 x 6.4 arc minutes in size and the slightly smaller, but similarly bright, neighbouring spiral NGC5247 are to be found to the South of Spica, by just under 7 1/2 degrees and 10 degrees respectively. Although both are reasonably faint, they are attractive in larger telescopes - NGC5247 is a broad, rather loose spiral with two large arms, presented almost face on to our perspective. NGC5068 is also face on to us and rather more chaotic in appearance, with a central bar structure and finely mottled arms. Although both objects are in quite close proximity in the sky, they are in fact unrelated. NGC5247 is part of the greater Virgo Supercluster appears problematic in terms of estimated distance, which some sources put at 60 million light years while others have it located at around half that distance! NGC5068 belongs to the Centaurus-Hydra cluster of galaxies and is 18-22 million light years away from us.

Towards the Northerly border of the Eastern half of Virgo, just above (by some 3 1/2 degrees) of Tau Virginis - thought by some to represent the knee of the Virgin - lies the very attractive "Grand Design" spiral galaxy NGC 5364. With an eye-shaped core surrounded by two massive spiral arms, NGC 5364 is not especially bright at +10.10 mag, but is reasonably compact at 4.1 x 2.6 arc seconds in size and its surface brightness is quite high. It is flanked by the almost equally bright, but somewhat bland lentinicular galaxy NGC5363 and the fainter +13 mag spirals NGCs 5356 and 5348. Instruments of reasonable aperture will be needed in order to see this grouping well, but it's a rewarding hunt. These objects are thought to lie no closer than 55 million light years from us.

We end this marathon with an object rather closer to home, with Virgo's only globular cluster, the somewhat diminutive NGC5634. This is a compact body at 1.7 arc minutes across, but rather faint as globulars go at only +9.47 mag. Again, much as with the aforementioned M53, distance really plays a part in this cluster's appearance. Larger instruments will be needed to split the core of this cluster into individual stars - unsurprising maybe as it lies around 82,000 light years away from us.

Original text: Kerin Smith