



June 2026

Editor: ewellaastro.editor@gmail.com

Email: ewellaastro@gmail.com

Website: <https://www.ewellastronomy.org>

Important Reminder:

To allow sufficient time to compile Janus and place it on the EAS Website by the 1st of the month any submissions for publication are required at least 3 days before the end of the month. Any items received after this date will be held over until the following month.

Editorial

Welcome to the June edition of Janus. This month's meeting on Friday 12 June features a talk by Dr. George Seabrooke from the Mullard Space Science Laboratory (MSSL) about the continuing discoveries from ESA's billion-star surveyor, Gaia.

I wonder how many (if any) readers spotted the error in Martin Howe's piece last month – I didn't! M81 & M82 are not about 12 light years away from us – they're a million times further away than that; one missing word makes a lot of difference!

NASA's jubilation at the success of the Artemis II mission must have been tempered by the 29 May explosion on the launch pad of Jeff Bezos' Blue Origin's New Glenn rocket which was due to launch a Lunar lander for NASA later this year. The explosion damaged the only launch pad built to launch this rocket, calling into question the company's ability to deliver on a string of commitments to NASA in its efforts to send astronauts to the lunar surface and build a moonbase. It will also adversely affect Bezos' plans for Amazon's LEO communications project, formerly known as Kuiper.

Meanwhile, Bezos' rival in the LEO communications satellite world, Elon Musk, continues to launch his Starlink satellites.

Gary Walker reports (probably) observing some of the recently launched Starlink satellites, and there have been examples on the EAS WhatsApp group of images showing Starlink satellite trails. This has prompted me to include in this issue a piece by myself with some facts about Starlink focussed on those launched in May.

June, of course, brings the summer equinox, after which the days will begin to shorten and, more importantly, the nights will lengthen. Whilst having no desire to wish the summer and the current warm nights away, longer nights mean more time for observing and/or an earlier start!

Finally, an update on progress on the Society's observatory. Electrical work is now complete, and the telescope has been installed into the observatory. Power has been put through it, and it responded moving East, West, South and North. It still needs to be aligned, and the HDMI cable and monitor to allow images to be viewed in the shed procured. So, at last, after a long and at times frustrating wait, we're nearly there! Huge vote of thanks to all who have helped bring the project to fruition, most especially Ron Johnson.

In this edition:

2. Sky Update – The Solar System in June
3. Notable Events for June and July
4. Collected Observations and thoughts - Gary Walker
6. Object of the Month: The M106 neighbourhood – Martin Howe
8. Dragons, Hares, and Dark Skies – John Pillar
12. World's biggest astronomy camera seeks to answer pressing questions about the universe. From **THE CONVERSATION**
14. Recent Starlink launches – John Davey
16. Up Next

John



The Solar System - June

Only Venus is an easy target throughout this month. Jupiter begins the month as an easy target but becomes more challenging as the month progresses. Saturn, on the other hand, is challenging early on, but becomes easier as the month progresses. The remaining planets are either intermittently visible, or not visible at all

MERCURY: begins the month difficult to see, rising about 40 minutes after the Sun and reaching its highest point in the sky during daytime. It goes on to be no higher than 7° above the horizon at dusk. By the end of the month, now rising 2 hours after the Sun, and approaching inferior solar conjunction, it is not observable – it will reach its highest point in the sky during daytime and is 7° below the horizon at dusk.

VENUS: begins the month visible from around 21:34, 17° above the W horizon, as dusk fades to darkness. It will then sink towards the horizon, setting 2 hours and 43 minutes after the Sun at 23:50. By the end of the month, now emerging into the evening sky as it approaches greatest elongation east, it will become visible at around 21:48, 13° above the W horizon, as dusk fades to darkness. It will then sink towards the horizon, setting 2 hours and 6 minutes after the Sun at 23:26.

MARS: begins the month rising only an hour before the Sun. It is therefore not observable, reaching its highest point in the sky during daytime and setting well before the Sun. By the end of the month, despite rising well before the sun, it remains very difficult to see being no higher than 7° above the horizon at dawn and setting in the early evening, well before the Sun.

JUPITER: begins the month becoming visible at around 21:34, 21° above the W horizon, as dusk fades to darkness. It will then sink towards the horizon, setting 3 hours after the Sun at 00:07. By the end of the month, it will be difficult to see. It will reach its highest point in the sky during daytime, set only an hour after the Sun at 22:30, and be no higher than 4° above the horizon at dusk.

SATURN: begins the month difficult to observe. Although rising 1 hour and 40 minutes before the Sun, it will be no higher than 8° above the horizon at dawn, before going on to reach its highest point in the sky and set during daytime. By the end of the month, now rising at 01:01– 3 hours and 43 minutes before the Sun - it is visible in the dawn sky and will reach an altitude of 24° above the SE horizon before fading from view as dawn breaks at around 03:46.

URANUS: passed behind the Sun at solar conjunction on 22 May. It begins the month not readily observable since it is very close to the Sun, at a separation of only 8° from it. By the end of the month, it is not observable as it will reach its highest point in the sky during daytime and, despite rising 2 hours before the Sun, be close to the horizon at dawn.

NEPTUNE: begins the month not observable as it will reach its highest point in the sky during daytime and be no higher than 0° above the horizon at dawn. By the end of the month, it remains difficult to observe, reaching its highest point in the sky during daytime and being no higher than 16° above the horizon at dawn.

Notable Events:

Some observations will require a telescope, whilst others will be visible with the naked eye.
More information at: <https://in-the-sky.org>

June

1	The Moon at apogee The Moon at aphelion
2	The Great Globular Cluster in Hercules is well placed
3	Lunar occultation of Sigma Sagittarii Messier 12 is well placed
6	Messier 10 is well placed
7	Messier 62 is well placed
8	Moon at Last Quarter Mercury at highest altitude in evening sky
9	Conjunction of Venus and Jupiter Close approach of Venus and Jupiter Mercury at dichotomy
10	Close approach of Moon and Saturn Conjunction of the Moon and Saturn Daytime Arietid meteor shower 2026
11	Messier 92 is well placed
12	Conjunction of the Moon and Mars
13	Close approach of the Moon and M45
14	The Moon at perihelion
15	The Moon at perigee New Moon Asteroid 14 Irene at opposition Mercury at greatest elongation east
16	Conjunction of the Moon and Mercury NGC 6388 is well placed
17	Conjunction of the Moon and Jupiter Close approach of Moon and Jupiter Conjunction of the Moon and Venus Close approach of Moon and Venus Lunar occultation of Venus The Butterfly cluster is well placed NGC 6397 is well placed
18	Close approach of the Moon and M44 The cluster IC 4665 is well placed
19	Lunar occultation of Regulus
20	Close approach of Venus and M44 The Ptolemy cluster is well placed
21	June solstice Moon at First Quarter
23	The Lagoon Nebula is well placed
24	NGC 6541 is well placed
27	Lunar occultation of Antares June Bootid meteor shower 2026
28	The Moon at apogee

29	The cluster NGC 6633 is well placed
30	Full Moon The Moon at aphelion Lunar occultation of Sigma Sagittarii

July

1	Mercury at aphelion Messier 22 is well placed The cluster IC 4756 is well placed
4	Conjunction of Mars and Uranus Close approach of Mars and Uranus
6	The Earth at aphelion
7	Neptune enters retrograde motion Close approach of Moon and Saturn Moon at Last Quarter Conjunction of the Moon and Saturn
9	Asteroid 18 Melpomene at opposition Asteroid 8 Flora at opposition
10	The Great Peacock Globular Cluster is well placed
11	Close approach of the Moon and M45 Close approach of the Moon and Mars Conjunction of the Moon and Mars
12	Lunar occultation of Beta Tauri
13	Mercury at inferior solar conjunction The Moon at perigee
14	New Moon The Moon at perihelion
17	Lunar occultation of Regulus Close approach of Moon and Venus Conjunction of the Moon and Venus Messier 55 is well placed
21	Moon at First Quarter
24	Lunar occultation of Antares
25	The Moon at apogee
26	Saturn enters retrograde motion
27	Asteroid 3 Juno at opposition 134340 Pluto at opposition Lunar occultation of Sigma Sagittarii
28	The Moon at aphelion
29	Asteroid 324 Bamberga at opposition Piscis Austrinid meteor shower 2026 Jupiter at solar conjunction Full Moon
30	Southern δ -Aquariid meteor shower 2026 α -Capricornid meteor shower 2026 Jupiter at apogee

Collected Observations (and thoughts) – Gary Walker

The Sun – Posted 6 May

During late April and early May, the Sun has been very "busy" with numerous spot groups - often as many as 4-5 separate groups on the Sun! They frequently formed "chains" of spots going right across the Sun, and some spots become very large!

Meteor Shower in Coronation Street – Posted 11 May

In what I see as another example of ignorance, tonight's episode of Coronation Street showed Sam taking his TELESCOPE out to the "Red Rec" to watch a meteor shower. The producers apparently know nothing about Astronomy (or, perhaps, are just seeking to add some erroneous interest to the programme) as a telescope would be absolutely useless for observing a meteor shower. Sam, himself, would have known that but, nonetheless, for whatever reason, they still insult his intelligence, by making him take his telescope along, to observe the meteor shower. In reality, of course, the naked eye, is the only way of observing them!

The Body Count just keeps on rising – Posted 18 May

The International Astronomical Union Minor Planet Centre has announced that ELEVEN more moons have been discovered around Saturn, and FOUR more moons orbiting Jupiter!

This means that Saturn now has a (KNOWN) total of 285 moons, whilst Jupiter now has 101 moons in all. This is really astounding!

I can remember, back in the 1970's, Jupiter only had 12 moons, which was the largest amount for any planet, whilst Saturn had 9 moons. Watch this Space for more undiscovered moons!

Owen Brazell – Posted 19 May

I noticed that Owen Brazell's articles are still appearing in the Astronomy Now magazine, i.e. in the (latest) June issue. His "Deep Sky Challenge" for June, is the planetary nebula of IC 4634.

It is a bit eerie that he is still appearing in the magazine from beyond the grave... but also reassuring!

Venus – Posted 20 May

Today, I observed Venus through my telescope, and I could see that it was now clearly gibbous in phase. Also, as expected, it was a little larger in size than last month.

Venus and Jupiter are slowly closing up prior to a Conjunction on 9 June, when they will only be 1.6 degrees apart. At present, however, they are still quite a way apart.

The Lunar X and the Lunar V – Posted 24 May

Every month, the Moon displays various "Clair Obscur" effects due to varying illumination by the Sun of various features on the Moon's surface.

Yesterday evening, I observed the Lunar X and the Lunar V on the terminator. The Lunar X appears to me as more like a turboprop aircraft, or a cross, whilst the Lunar V appears as a V letter, with a fainter and larger V to the South of it, formed by the outline of a crater.

One has to be ready for them, as the correct conditions for the light and shadow effects may only last for a few hours. They are best seen when on the terminator, as the interplay of light and shadow is always at its greatest then, bringing features into sharp relief. Once away from the terminator, the shadows disappear, leaving many formally prominent craters and other features virtually invisible! This is why observing

the Moon at Full Moon is the worst time to do so!

Space X Satellites – Posted 25-28 May

On the evening of 24 May, I was sitting out in my garden, enjoying the night sky and the beautifully warm weather in this heatwave, when I noticed a number of satellites passing overhead, mostly through the same area, which I assume must be a Space X launch! They passed through the constellation of Lyra.

Most came singly, but I twice saw pairs of satellites going over in parallel. One pair were easily visible to the naked eye, and were about, 5 degrees apart, orientated North-South, whilst the other pair were fainter, about 2 degrees apart, but also oriented North-South.

Most of the satellites were yellow in colour, and very few were blue in colour. That is a bit naughty, as the blue ones are supposed to be dimmer than the ordinary yellow ones, to save interfering with Astronomical observations!

Again, around 1am on 26 May, there were satellites continuously passing over my garden every minute, or so. They were over the same region of the constellation of Lyra as the previous evening. They were there for a third time on the night of 27-28 May, still appearing every minute or so!

They don't affect my observations, but astronomical imagers will be cursing them, with their images being crossed by lines of light, similar to scratches on Vinyl Records.

Editor's Comment: The latest Starlink satellites are 3rd generation. Whilst larger than the previous generations, they are, essentially, identical. Their "colour" is most likely a function of the amount of glint from them due to reflected sunlight. The amount of glint is affected by both their orientation relative to the sun and, to a lesser extent, their altitude (they may become dimmer, and are more dispersed as their altitude increases). Glint from both the body and the solar panels will be greater than that from the body alone. Illumination of the entire length of the body will result in more glint than from illumination of the body end-on. Orbital inclination may also affect the Sun-satellite geometry. The fact that they appear at roughly the same time and in the same place over several days is likely due to their gradual transition from their initial orbital insertion point to their eventual operational orbit – either that, or they were from different launches (there were launches of Starlink Satellites on 25 May and 26 May – from Cape Canaveral and Vandenberg respectively). The transition to operational orbit is made slowly so as to conserve precious propellant – rapid transition requires more propellant, the rate of use of which ultimately determines operational life.

Jupiter and Venus – Posted 27 May

Jupiter and Venus are now obviously closing in for their Conjunction on 9 June. This evening, they were approximately 10 degrees apart.

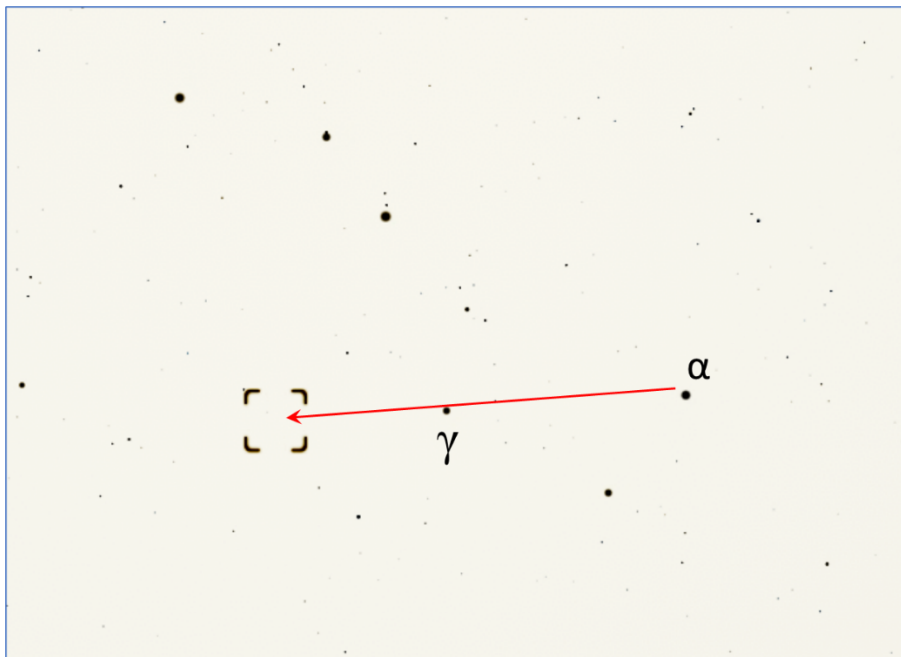
They were making a fine sight in the evening sky, with Venus obviously being somewhat brighter than Jupiter.

Object of the Month: The M106 neighbourhood – Martin Howe

June brings with it the summer solstice, where the sun never drops lower than 18° below the horizon – the boundary between astronomical twilight and truly dark skies. Hence, we will not experience truly astronomically dark skies again until late July.

Early summer in particular is known for galaxy hunting season, as our view of the night sky is pointing away from the centre of our galaxy which would otherwise inhibit our view to the universe beyond. However as many of these galaxies are very faint, then it makes June a difficult month to track these down. That said, some of the brighter galaxies should still be visible, especially if you can get away from the worst effects of light pollution.

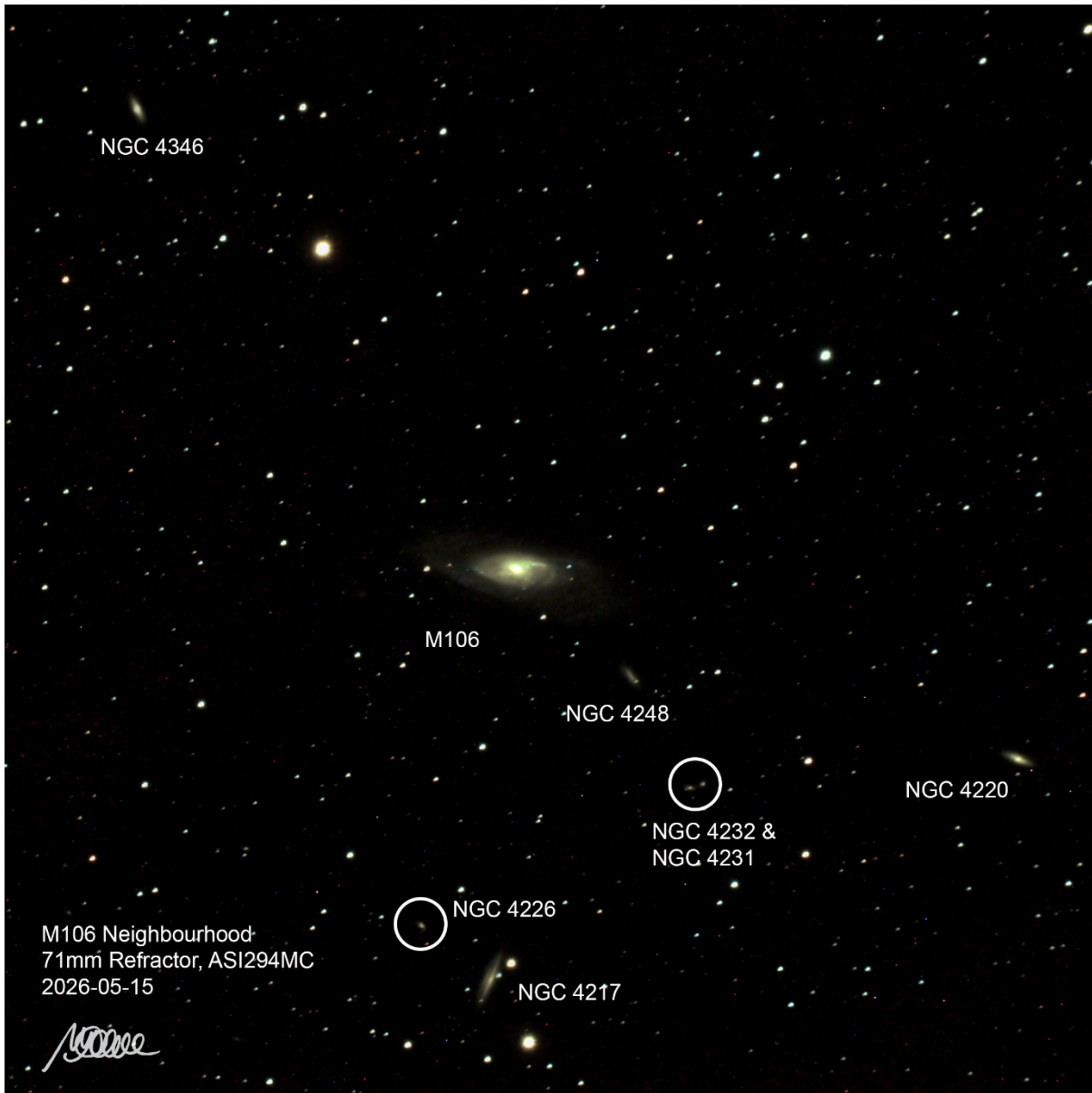
This month's object is the galaxy catalogued as M106, discovered by Charles Messier's observing assistant, Pierre Méchain in 1781. M106 is riding very high in the sky at this time of year, in the constellation of Canes Venatici, the hunting dogs, and very close to the border with Ursa Major. At magnitude 8.4 it should just be visible with a pair of binoculars as a faint fuzzy patch of light, about 19×7 arcminutes in apparent size. For reference, the full Moon is about 30 arcminutes (half of one degree) in diameter.



You may recall last month we looked at the galaxy pairing of M81 and M82 in Ursa Major, and how they were relatively easy to locate by drawing a line from γ Ursae Majoris (Phecda) and extending it through α Ursae Majoris (Dubhe) by a similar length. M106 is similarly easy to locate, albeit in the opposite direction! Draw a line this time starting at Dubhe, and extend it through Phecda by a little under the same distance.

M106 is about 24 million light years away from us (twice the distance of M81 / M82), but is about 50% larger in diameter than M81, and is thought to contain about 400 billion stars – perhaps four times as many as in our own Milky Way galaxy. M106 is actually about the same size as our nearest large galaxy, M31 in Andromeda, but is ten times further away.

The image of M106 below is a wide-field view taken with a 71mm refractor and an ASI294MC colour camera (cropped). It shows a number of galaxies in the same line of sight as M106, and NGC4248 just below M106, is thought to be a dwarf satellite galaxy of M106. Of the others, NGC 4346 is about 50 million light years away, as is NGC 4220. NGC 4217 is closer to 60 million light years away, whilst the much smaller looking NGC 4226, NGC 4231 and NGC 4232 are farther away, at around 340 to 350 million light years.



Dragons, Hares, and Dark Skies – John Pillar

Clear nights, dark skies and low light pollution – when the stars align, life is good.

Over coffee, one rainy winter morning, an ex-colleague astrophotographer friend told me he'd found a perfect place for dark skies.... an Airbnb shepherd's hut near the village of Slindon, not far from Arundel, south of Bignor Hill in the South Downs. Checking the light pollution map showed the location should be about a Bortle 2 to 3... sounded too good to be true - I put it on my astro-bucket list, waiting for the chance.

Mid-March - two clear nights showed in the forecast, and there was no moon ... quick... check the Hut availability... yes – it's available, 2-nights? ... yes... book it... yes... DONE.... And the next day, loading the car... 'scope (Askar SQA85), mount (AM5N), camera (ASI 2600MC), tripod (ZWO TC40), computer, back-up computer, cables, power extension cable, 12V adapters, battery power-pack just in case, more cables, two box-meal dinners, snacks, wine (essential astro equipment), warm clothes, hat, gloves, the works.

It was about an hour's drive. The shepherd's hut was idyllic, in a perfect location down a bumpy track. There are two

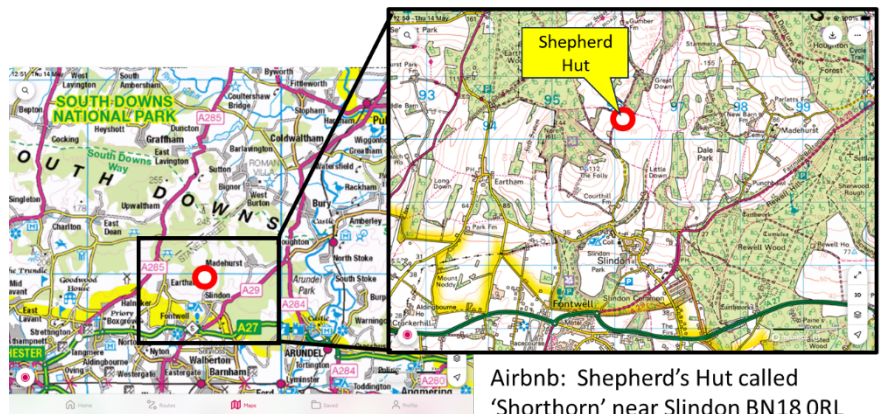


Figure 1: Location of the shepherd's hut in the South Downs



Figure 2: Panoramic view of the site (top left), ready to go (lower left) and after a hard night's imaging covered in dew (right)

huts on site, but the other wasn't occupied, so no risk of lights or BBQ smoke causing any problems. With not a cloud in a blue sky I set the kit to acclimatise, figured out how to connect my RaspberryPi computer to the hut's Wi-Fi (!! Stressful – the Rpi sits on the mount outside, and I connect to it using VNC software from my iPad. Getting the iPad and Rpi to talk via the hut's WiFi could have been tricky, but it worked OK), ran an extension cable out

of the hut's window as far as I could go, made dinner and, as darkness fell, the first stars appeared. I fired up Kstars on the Rpi, made sure everything was connected, and set about focusing and polar-alignment. Kstars assists polar alignment by taking 3 images across the sky and using spherical geometry to inform the directions the mount needs to be nudged to polar-align – this adjustment process took a few minutes, but it all worked out.

I decided on my targets – start off with time on the gaseous emission nebula of **IC410** in Auriga, follow-up with M66 and the **Leo Triplet**, and then use the whole second night on a challenging dark sky object, the **Fighting Dragons** or LBN552, a dusty dark nebula in Cepheus. I would use Siril (running on the same Rpi5) to stack and process the images, and use Gimp to fine-tune filtering and stretching.

I set up the targets and schedule in Kstars and set the system running. The night went well, though I found that with the dew heater working hard to keep the lenses clear my single 10A, 12V, power supply wasn't really enough for the mount plus heater etc (next time I'll take a second power supply). Guiding was OK but not the best – the lightweight TC40 tripod is great for taking into a field but isn't as sturdy as a standard tripod or pier at home.

I collected 3 hours of dual-narrowband image of the **IC410 area** (Optolong L-Enhance filter), plus 3 hours of Oiii narrowband, which supplemented 4 hours I'd already captured at home. Then slewed to M66, the Leo Triplet, and collected 69 images of 2 minutes (Optolong LPro filter) before the dawn light brightened the sky. It was a glorious morning – blue sky, bright sun, and breakfast entertainment was provided by hares running around the field (they are sooo rapid!).

Figure 3 shows the IC410 area result – in a pseudo-Hubble palette... Ha emission regions are in the orangey colour and bright areas of illuminated dust and Oiii emission show as blue.



Figure 3: Nebulae in the constellation Auriga. Flaming Star nebula IC405 (top left), Tadpole nebula, IC410 (bottom), and the Spider Nebula IC417 (small emission nebula on the right).

The Tadpole nebula, IC410, is a 100-light-year wide emission nebula and star forming region. It gets its name from the linear dust clouds that some think look like tadpoles (Figure 4) – these are streams of dust blown away from the central, star cluster region (NGC1893) of hot, massive O and B-type stars. These are similar to the ‘Pillars of Creation’ made so famous by the Hubble image of M16, the Eagle Nebula.



Figure 4: Zoom-in of the tadpoles. Dust clouds streaming away from proto-stars at the tips.

IC405, the Flaming Star nebula is combination reflection nebula (the central blue area ... star-light reflected by dust) and an emission nebula illuminated by the bright central star, AE Aurigae and sculpted into a rippling, flame-like, structure that gives the nebula its name. The star AE Aurigae is a fast-moving star that originated in the area of Orion’s Belt.

IC 417, the small bright emission area on the right of Figure 3 is about 10 million years old (a bit older than the other nebulae in the region) and is an area of intense star formation – it’s estimated that there may be 100’s of thousands of new stars within the nebula.

Next on the schedule was the **Leo-triplet**, shown in Figure 5. The three galaxies of the triplet are engaged in a gravitational tango - for millions of years they have interacted and tugged on each other, warping and distorting their spiral arms, triggering intense periods of star formation and ripping a 300,000 light-year stream of stars and gas from NGC3628,



Figure 5: Galaxies of the Leo-triplet. M66 (top), M65 (left) and NGC3628 (bottom). The dark skies revealed the faint stream of stars extending toward 2 o'clock from the Hamburger Galaxy (NGC 3628, the lower of the 3).

faintly imaged on Figure 5 (I hope it shows on the web-site... so exciting to image this – many published images of the triplet don’t reveal this faint object). NGC3628, also known as the Hamburger Galaxy because of its shape and central dust lanes, is viewed edge-on and is believed be a warped, spiral, barred galaxy. M66 is one of the brightest galaxies in the

sky and can be observed using binoculars – it is an asymmetric barred spiral galaxy, warped by interaction with other members of the group.

In addition to the galactic triplet the area hosts an amazing number of additional galaxies – several are apparent on the left, and about 60 more are identified in astrometry.net. Some believe that the Leo Triplet is associated with a larger M96 galaxy group, which may itself be part of the Virgo supercluster.

After a day walking the roman Stane Street and lunch in the village (Slindon), the target for the second night was **LBN552**, a dark, dimly illuminated molecular cloud 600 light-years away in the constellation Cepheus, quite close to Polaris. Dark skies are needed to image this object, and also, to ensure the night's imaging went easily, I quickly built an approximate 'horizon model' for Kstars so that the app knew where the treeline was and would avoid imaging when the target was behind the *one* tree. I captured nearly 8 hours of image, 228 frames of 2 minutes with an Optolong LPro filter.

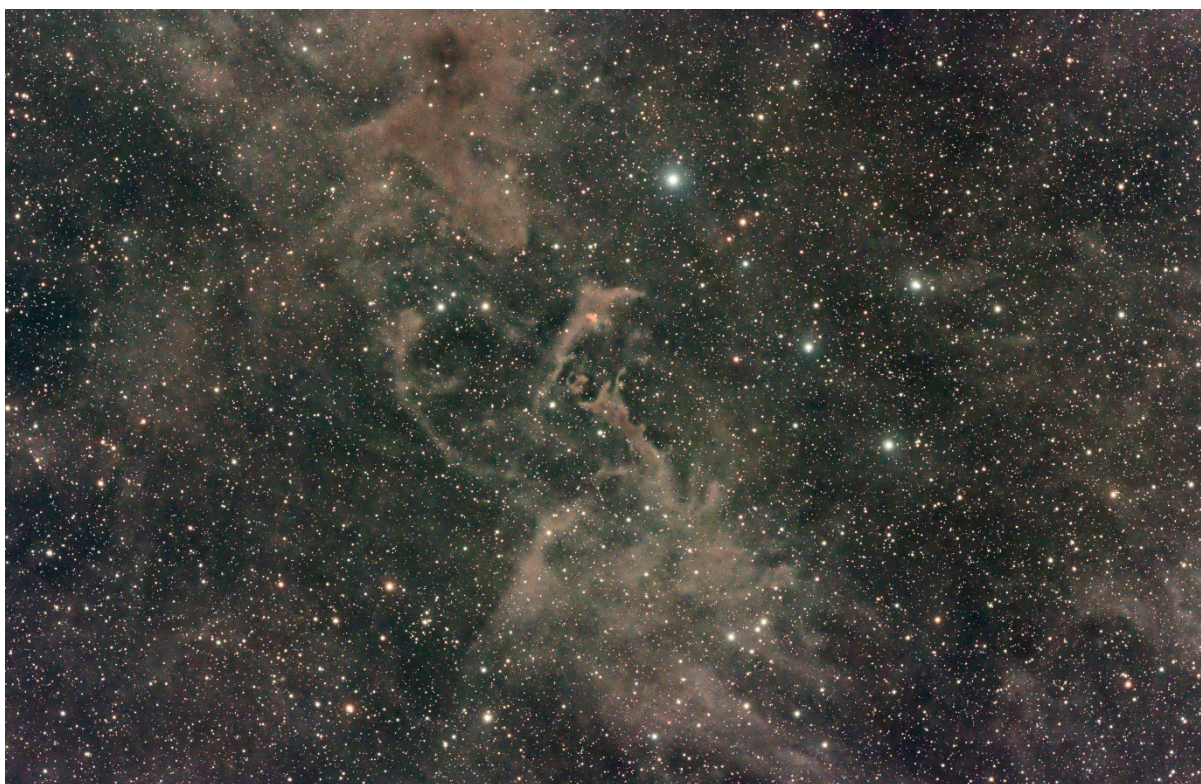


Figure 6: LBN552, the Fighting Dragons, in Cepheus

LBN552 was listed by Beverly T. Lynds in 1965. Lynds was an astronomer working at the University of Arizona, and is known for two catalogues, Lynds Bright Nebulae (LBN) and Lynds Dark Nebulae (LDN). Lynd's nebulae are categorised according to their brightness, and LBN552 is rated a 5, on a scale of 1 to 6 (dimmiest).... If this is in the 'bright' list then the 'dark' list must be absolutely black 😊.

LBN552 and similar cold dark nebulae of (10-30° Kelvin, near absolute zero) are composed mainly of molecular hydrogen gas H₂, helium, and trace amounts of carbon monoxide (CO) and cosmic dust. The dust is very diffuse, and composed of carbon, oxygen, nitrogen and neon bound in silicates and carbonaceous molecules. The tiny (smoke sized) grains of carbon-rich dust reflect starlight from nearby stars – they scatter shorter, blue, wavelengths

more effectively than red, which results in the dusts clouds showing a faint diffuse brown to blue hue.

Tiny pockets of bright reflection are also present in the widespread dust cloud – in Figure 6 one such feature is visible in the centre, showing in an orange/red colour (Figure 7). This is Cohen 129, a star-forming reflection nebula intensively illuminated by a local starlight.

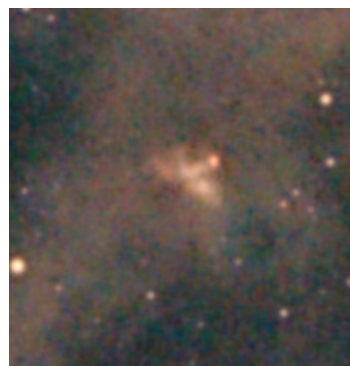


Figure 7: Cohen 129, a small dusty reflection nebula glowing by the light of a nearby star, in Ibn552.

World's biggest astronomy camera seeks to answer pressing questions about the universe

Acknowledgement: This article was written by Joshua Weston, PhD Candidate, School of Mathematics and Physics, Queen's University Belfast. First published in **THE CONVERSATION** on 3 March 2026, it is republished in full under a Creative Commons Licence. The original article, with additional links and images can be found here: <https://theconversation.com/worlds-biggest-astronomy-camera-seeks-to-answer-pressing-questions-about-the-universe-277017>

The Vera C. Rubin Observatory has started releasing its first discoveries: including supernovae, variable stars and asteroids, which will from now on be discovered at an astonishing rate as it begins its Legacy Survey of Space and Time, a ten-year survey probing the deepest reaches of the universe.

During the course of this survey, astronomers around the globe will seek to answer some of the most pressing questions about the nature of our world.

To the naked eye, the night sky seems like a static and unchanging firmament, with the occasional planet or comet or shooting star visible.

But with a larger, more sophisticated telescope or camera we are able to discover hundreds of new phenomena every night, from dying stars to near-Earth asteroids.

The camera that allows this exploration – attached to a telescope over eight metres wide atop Cerro Pachón in Chile – is the largest in the world, weighing almost three tonnes and built over ten years.

The Rubin Observatory's giant camera can probe the faintest reaches of our existence, capturing light emitted as much as 12 billion years ago. But the Rubin camera will capture new events much closer to our Solar System.

By taking multiple photographs of the sky every night – and tracking any differences between them, scientists will be able to capture objects moving through space such as the tens of millions of asteroids and comets hurtling through the Solar System.

Outer reaches

Increasing the number of known asteroids in the belt between Mars and Jupiter can help us to understand the formation history of the Solar System.

Beyond Neptune in the faint and distant Kuiper Belt – a population of icy objects in the outer reaches of the Solar System – astronomers will be able to study an environment similar to our Solar System in its infancy, to better understand how we came to be.

It has been theorised before that disturbances to the orbits of Kuiper Belt objects indicates the existence of a hypothesised “planet nine” – Rubin may even be able to build more evidence for this as-yet undiscovered world.

Beyond the solar system, astronomers seek to identify stellar streams of stars leftover from smaller galaxies merging with our own, which help us understand the history of the Milky Way.

What Rubin will capture more than any previous telescope are optical transients – stars brightening and dimming, and those that eventually explode as a supernova.

These explosions produce elements essential to life, from oxygen to iron, and scatter across the universe the materials required for forming stars and planets.

Capturing more of these supernovae and understanding how they happen is vital for understanding the evolution of the universe. While these are some of the more common “flashes” Rubin will find in its game of spot-the-difference, other rarer objects such as black holes will also be detected and studied to improve our understanding of cosmology.

Some supernovae can be used to determine how far away the galaxy they inhabit is, letting us discover new environments from the earliest years of the universe. Why is it important to capture data about these ancient galaxies?

Scientists believe that the universe after the Big Bang was uniform in all directions. How then did galaxies form? Astronomers believe the answer lies in small clumps of dark matter, which gas and dust gravitated around until galaxies could be born.

The issue with dark matter is that we cannot observe it directly, though it makes up 80% of matter in the universe. The dark matter is responsible for galaxies – and everything within them – developing, but it also forms even larger-scale filaments of galaxies.

How these structures form is dependent on what dark matter is – which requires us to know how it influenced the formation of galaxies big and small, old and young.

Understanding existence

The Legacy Survey of Space and Time seeks to answer one question – what is the universe? It also prompts another – why does it matter? By understanding where our existence comes from, we can predict the nature and eventual evolution of the universe: a complete picture of cosmic evolution from start to finish.

Humanity has turned to a number of answers for its own existence over the course of its existence, with Rubin another step in the direction of finally getting the full picture.

Understanding the fundamental forces at work in our universe is a path to answering many of the spiritual questions of society (what are we here for?) but also the practical ones (what steps do we take now?).

The Legacy Survey of Space and Time has inspired collaboration from scientists across the world based in countries such as Chile, the US, France, Germany, Australia, Japan, Brazil and the UK.

Techniques in machine learning and AI to analyse the huge amounts of data generated by Rubin will have uses in industries such as finance, medicine and engineering.

Regardless of how Rubin furthers our understanding of the universe, it will still enable technological innovations and international collaboration

More information about The Vera C Rubin Observatory can be found here:
<https://rubinobservatory.org/>

Recent Starlink launches – John Davey

It's fair to say that, since its inception, Starlink has come in for its share of criticism – some of it (perhaps) justified. The astronomy community has been particularly vociferous, but others – notably those concerned about the proliferation of space debris - have also had their say.

Gary Walker reported seeing several probable Starlink satellites on successive nights towards the end of May, and some of the EAS “imaging community” have had their images affected by them - so I thought I'd look into what SpaceX had been up to recently. The following table summarises the eight launches that took place in May.

Launch Date	Mission Designator	No of Sats	Orbital Inclination	Launch Site
May 01	Starlink-384 (10-38)	29	53.2°	Cape Canaveral
May 06	Starlink-385 (17-29)	24	97.3°	Vandenberg
May 20	Starlink-386 (17-42)	24	97.3°	Vandenberg
May 21	Starlink-387 (10-31)	29	53.2°	Cape Canaveral
May 25	Starlink-388 (10-47)	29	53.2°	Cape Canaveral
May 26	Starlink-389 (17-37)	24	97.3°	Vandenberg
May 29	Starlink (10-53)	29	53.2°	Cape Canaveral
May 30	Starlink (17-41)	24	97.3°	Vandenberg

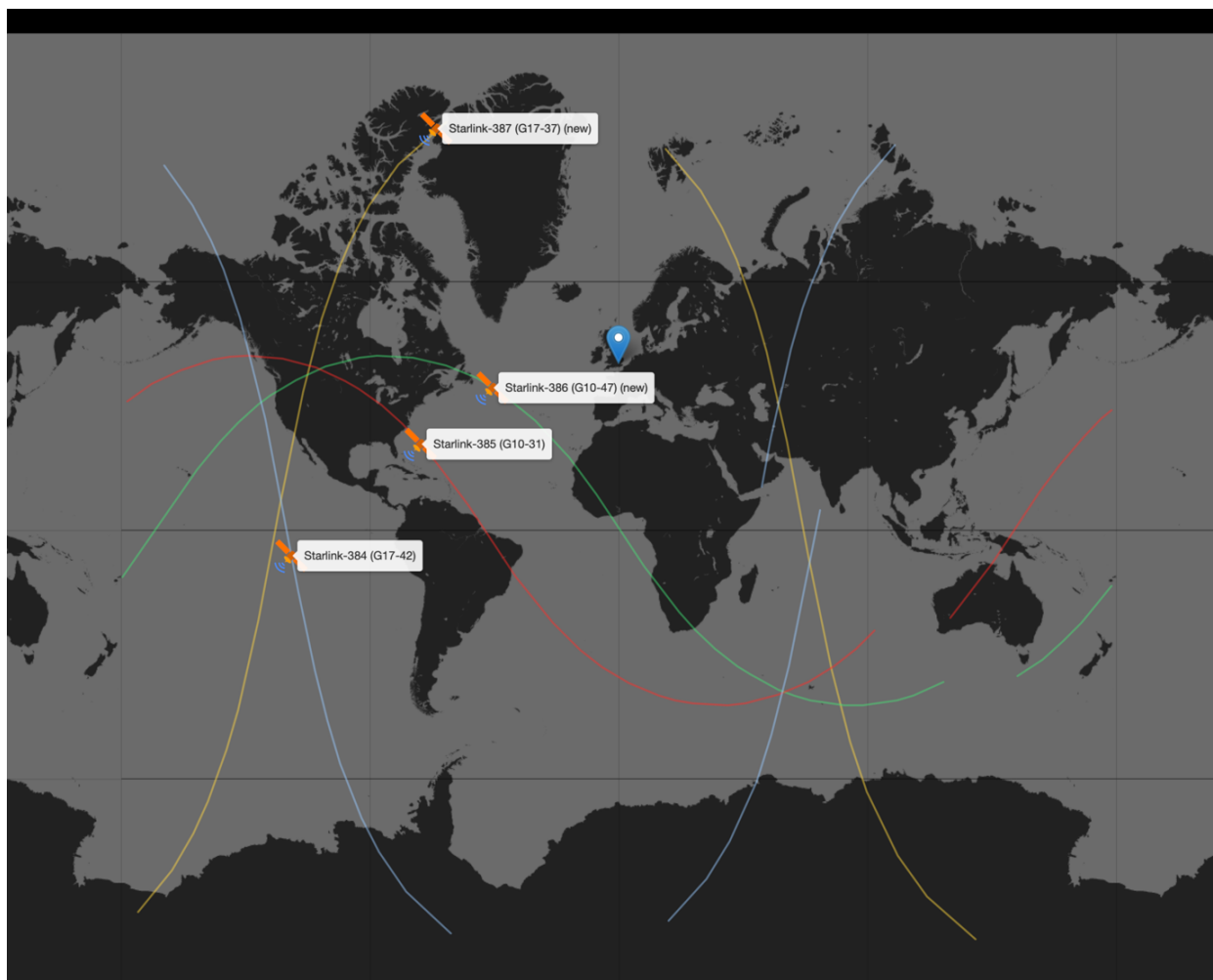
As the table shows, a total of 212 Starlink satellites were launched into one of two orbits at inclinations to the equator of 53.2° or 97.3° – respectively known as prograde (inclination of between 0° and 90°) or retrograde (inclination between 90° and 180°) orbits.

Orbits inclined around 90° are a sub-set of retrograde orbits called Polar orbits as they pass over the poles. The orbit used by Starlink is a specific case of a Polar orbit known as “Sun-synchronous” because satellites in such an orbit over-fly a given location on the earth’s surface at the same sun-time each day. This is particularly beneficial for earth observation satellites (doesn’t include Starlink), but any satellite in such an orbit will benefit from the fact that its solar arrays are continuously illuminated by the Sun.

In general, launching into a prograde orbit requires less propellant than a retrograde orbit as there is an added component to the launcher’s force resulting from the earth’s rotation.

The reason for the use of the two different orbits by Starlink is that the higher inclination retrograde orbit greatly enhances satellite visibility for customers at higher latitudes. A satellite at an altitude of 460km (typical for Starlink) is not visible beyond latitudes of around 74°N or 74°S. Customers outside these latitudes rely on the Starlink satellites in Polar orbit for their communications.

Some of you might be interested to find out about the potential visibility of individual Starlink satellites once they have been deployed . The image below is from a website <https://findstarlink.com/> taken at 15:32 BST on 30 May. It shows the ground tracks for 4 Starlink satellites – two in Polar orbit and two in the more conventional 53.2° orbit – with a marker for the location of Sutton. An indication of the likely magnitude of each satellite is also given on the site, together with viewing times.



Up Next:

NEXT MEETING: 8pm Friday 12 June – Nonsuch High School

Dr. George Seabrooke, an astronomer and Principal Research Fellow at the Mullard Space Science Laboratory (MSSL) at University College London, will talk about the continuing discoveries from ESA's billion star surveyor, Gaia.

As usual, there will also be a presentation on the sky at night for the coming month.

NEXT USER GROUP:

Suspended until further notice.

NEXT OBSERVING SESSIONS

The next sessions, allowing for moon rise & set times and cloud conditions, should be sometime around the new moon which is on 15 June.

The precise date and timings of any session will be advised by email and WhatsApp a few days in advance but should be within the period 12 – 17 June.

AD HOC OBSERVING AT WARREN FARM:

These will be at short notice when the weather is favourable, and may replace, or be additional to, sessions at Denbies. Please watch our WhatsApp feed for Alerts.