JANUS
THE NEWSLETTER OF EWELL ASTRONOMICAL SOCIETY

MAY 2025

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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 May edition of Janus which has a lengthy, hopefully interesting, editorial written as an alternative to an article by the editor.

This month's talk, entitled "If Venus had a moon", will be given by Greg Smye-Rumsby from the Royal Observatory and Astronomy Now magazine. There will also be the usual presentation on the "Sky at Night" for the forthcoming month.

Perhaps the most headline grabbing news item in April, at least for astronomers, was the announcement of strong hints of life being discovered elsewhere in the Universe. A team led by Dr Nikku Madhusudhan, professor of astrophysics and exoplanetary science at Cambridge University, believe they have established the strongest evidence, yet, that life exists on another planet. They claim that a watery exo-planet called K2-18b - roughly 124 light years from Earth - may be "teeming" with algae-like organisms. Their findings are based on the presence on the planet of compounds made up of carbon, hydrogen and sulphur. On Earth, these compounds - dimethyl sulphide (DMS) and dimethyl disulphide (DMDS) – are produced only by living organisms, most often the tiny plant-like phytoplankton that thrive in the ocean. When bacteria consume phytoplankton, DMS is produced as a by-product. It is, apparently, these molecules that give the sea its distinctive smell.

The team made their discovery using data gathered by the James Webb telescope which, for eight hours last year, they fixed on K2-18, a red dwarf star in the constellation of Leo. When the K2-18b planet passed in front of the star, its light dimmed tellingly. Since different molecules in the planet's atmosphere absorb differently at different wavelengths, it's possible to work out how much absorption is happening at different wavelengths and, hence, estimate what molecules in the planet's atmosphere are causing that absorption. The resulting calculation showed a 99.7% chance that the molecules were present in very high concentrations, and the team is now seeking more time with the telescope to achieve the gold standard of 99.99994% certainty.

We are, of course, a long way from proving that the presence of these molecules is related to life, and scepticism abounds. Lisa Kaltenegger, director of the Carl Sagan Institute at Cornell University and author of Alien Earths, said: "Planets like K2-18b are completely different from Earth and we are a long way from understanding them, let alone identifying anything that could be a sign of life". K2-18b is unlike any planet in our solar system: it is a "hycean" planet, believed to be

entirely covered in water and with a hydrogen-rich atmosphere. It is 2.6 times bigger than Earth and has 8.6 times the mass.

Although Dr Madhusudhan and his team insist they welcome such scepticism, they remain excited and think, based on current understanding, that life is the only explanation. Time will tell if this is true and, if it is, what form such "life" takes.

This month's item taken from "The Conversation" seeks to explain further what the new research means when looked at through the eyes of another astrophysicist.

A second newsworthy item – less well publicised, but no less notable - was the fact that, on 24 April, the Hubble space telescope celebrated a significant anniversary: **35 years in space!** Since its launch, Hubble has been giving us jaw-dropping views of the Universe and answering some of the biggest questions about space. Whether it's capturing the stunning beauty of faraway galaxies or showing us black holes in action, Hubble never fails to amaze.

During its 35 years of operation, Hubble has made more than 1.6 million observations, which contributed to over 21,000 peer-reviewed scientific papers. If you were to stack them all on top of each other, they would reach about 53 metres (175 feet). Listing every discovery facilitated by Hubble would require considerably more time and space than is available to me in this edition of Janus, so I'll restrict myself to just a handful of the key discoveries:

- Shedding some light on dark matter and dark energy: Hubble helped scientists discover that the Universe is not just expanding but doing so at an accelerating rate. By looking at distant supernovae, Hubble showed that galaxies are moving away from each other faster than expected. This led to the discovery of dark energy - an "anti-gravity" force that pushes things apart instead of pulling them together. Dark energy is believed to make up about 68% of the Universe and is responsible for the accelerating expansion of the cosmos. Hubble has also played a key role in helping scientists study dark matter, a mysterious substance that makes up a significant part of the Universe's mass (up to 27%). It doesn't emit light, so we can't see it directly, but Hubble's observations have helped show that dark matter affects the way galaxies are held together and move through space.

- Confirming that supermassive black holes exist: Hubble is great at revealing the invisible, including black holes. Their gravity is so strong that not even light can escape them, but before Hubble, astronomers could only hypothesize their existence. Hubble provided solid proof by capturing the most detailed and clear images of gas and stars surrounding black holes, as well as measuring their speeds. Thanks to Hubble, we now know that supermassive black holes are likely at the centres of most, if not all, large galaxies. This discovery has given us valuable insights into how galaxies form and evolve.

- Imaging astronomical objects colliding: In 1994, Hubble witnessed the Shoemaker-Levy 9 comet crashing into Jupiter. The comet had broken into pieces, and when it hit the planet, it created huge explosions that left some "scars" on Jupiter's surface. This gave scientists a chance to study Jupiter's atmosphere and learn more about how planets handle big impacts from space objects.

  Hubble has also captured a number of galaxy collisions. These images reveal what happens to stars, gas, and dust when galaxies interact. By the way, did you know that our home galaxy, the Milky Way, is set to collide with the Andromeda Galaxy? Hubble was the first to provide evidence of this future cosmic event.

Since its launch, Hubble has continuously expanded our understanding of the Universe, and it's still going strong today. Each year, Hubble receives about 1,000 proposals for observations and data usage from scientists around the world.

Thanks to its ability to be serviced and upgraded in space, Hubble is more scientifically productive today than ever before. It has undergone five servicing missions carried out by NASA astronauts aboard the Space Shuttle, each one boosting its capabilities and extending its lifespan. These missions included installing new instruments, repairing and upgrading existing equipment, and replacing aging components. Even though the last servicing mission took place in 2009, Hubble is expected to remain operational until the mid-2030s.

Astronomers frequently track and image the ISS, but many people are unaware that, under the right conditions, Hubble can be seen from Earth with the naked eye! If it passes closely enough overhead on a clear, dark night, Hubble will appear as a fast-moving dot of light across the sky. It can reach a magnitude of 0.5, which is almost as bright as Betelgeuse from Orion, Achernar from Eridanus, or the planet Saturn.

So, what will happen to Hubble after its mission comes to an end? Initially, the plan was to safely deorbit Hubble at the end of its operational life, preserving it as a museum exhibit. However, since the demise of the Space Shuttle program, this plan is no longer feasible. Hubble has no engines, so its orbit is gradually decaying due to atmospheric drag. It is expected that Hubble will eventually re-enter Earth's atmosphere and disintegrate.

As Hubble nears the end of its service, several advanced telescopes are poised to continue and enhance its legacy:

- James Webb Space Telescope (JWST): Launched in December 2021, JWST observes the Universe in the infrared spectrum, allowing it to peer deeper into space and time. It complements Hubble's capabilities by focusing on different wavelengths.

- Euclid Space Telescope: Launched in July 2023, Euclid aims to map the large-scale structure of the Universe to better understand dark energy and dark matter. It observes the Universe in visible and near-infrared wavelengths.

- Nancy Grace Roman Space Telescope (RST): Scheduled for launch in May 2027, this telescope will conduct expansive surveys of the Universe in visible and near-infrared wavelengths, focusing on dark energy, dark matter, and exoplanet research.

- Large Ultraviolet Optical Infrared Surveyor (LUVOIR): Proposed for 2039, LUVOIR is designed to observe the Universe across ultraviolet to near-infrared wavelengths with high resolution. It aims to study Earth-like exoplanets, galaxy formation, and more.

- Habitable Worlds Observatory (HWO): Proposed for the first half of 2040s, HWO is envisioned as a flagship mission to search for signs of life on Earth-like exoplanets.

The other item of note of course is the enormous contrast between the weather over the last month or so, when compared with that in the early months of the year. Long may the current spell of clear nights continue!

Finally, I have assembled a collection of images of the March partial solar eclipse which have been provided by EAS members.

John

skyUpdate
What's up this month?

The Solar System May

MERCURY: recently passed greatest elongation W and begins the month not observable reaching its highest point in the sky during daytime and being 2° below the horizon at dawn. By the end of the month, having recently passed behind the Sun at superior solar conjunction, it remains not observable – in addition to reaching its highest point in the sky during daytime and being 3° below the horizon at dusk, it will be very close to the Sun.

VENUS: begins the month emerging into the morning sky as it approaches greatest elongation W. It is visible in the dawn sky, rising at 04:11 BST– 1 hour and 19 minutes before the Sun – and reaching an altitude of 8° above the E horizon before fading from view as dawn breaks at around 05:07. Visibility remains good throughout the month and, at the end of the month, having now passed greatest elongation W, it is visible in the dawn sky, rising at 03:14 BST – 1 hour and 34 minutes before the Sun – and reaching an altitude of 9° above the E horizon before fading from view as dawn breaks at around 04:21.

MARS: is currently an early evening object. It begins the month visible from around 21:16 BST, 48° above the SW horizon, as dusk fades to darkness. It will then sink towards the horizon, setting at 02:52. By the end of the month, now receding into evening twilight, it becomes visible at around 22:17 BST, 27° above the W horizon, as dusk fades to darkness. It will then sink towards the horizon, setting at 01:24.

JUPITER: will soon pass behind the Sun at solar conjunction. It begins the month visible from around 20:46 BST, 26° above the W horizon, as dusk fades to darkness. It will then sink towards the horizon, setting 3 hours and 31 minutes after the Sun at 23:54. By the end of the month, it is more difficult to observe, reaching its highest point in the sky during daytime and being only 6° above the horizon at dusk.

SATURN: begins the month not observable. Having recently passed behind the Sun at solar conjunction, it will reach its highest point in the sky during daytime and be on the horizon at dawn. By the end of the month, now emerging from behind the Sun, it might just be observable, although it will reach its highest point in the sky during daytime and be only 10° above the horizon at dawn.

URANUS: will soon pass behind the Sun at solar conjunction and begins the month as an extremely difficult target. Reaching its highest point in the sky during daytime and it will be 2° below the horizon at dusk. By the end of the month, having recently passed behind the Sun at solar conjunction, it is not observable as it will reach its highest point in the sky during daytime and be 11° below the horizon at dawn.

NEPTUNE: recently passed behind the Sun at solar conjunction. It begins the month not observable, as it will reach its highest point in the sky during daytime and be 5° below the horizon at dawn. Remaining almost unobservable throughout the month, it ends the month still reaching its highest point in the sky during daytime and is only 1° above the horizon at dawn.

Notable Events:

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

May

1 Conjunction of Saturn and Ceres
2 Asteroid 4 Vesta at opposition
4 Close approach of the Moon and Mars
Conjunction of Venus and Neptune
Moon at First Quarter
5 Close approach of Mars and M44
6 η-Aquariid meteor shower 2025
Equinox on Saturn
8 η-Lyrid meteor shower 2025
9 Asteroid 9 Metis at opposition
Conjunction of Mercury and Eris
10 Lunar occultation of Spica
Conjunction of Neptune and Ceres
11 Moon at apogee
Messier 5 is well placed
12 Full Moon
14 Lunar occultation of Antares
The Moon at aphelion
18 Uranus at solar conjunction
20 Moon at Last Quarter
22 Close approach of the Moon and Saturn
23 Close approach of the Moon and Venus
25 The Moon at perihelion
26 The Moon at perigee
27 New Moon
28 Conjunction of the Moon and Jupiter
Messier 4 is well placed
30 Mercury at superior solar conjunction
31 Mercury at perihelion
Venus at greatest elongation west

June

1 Close approach of the Moon and Mars
Venus at dichotomy
2 The Great Globular Cluster in Hercules is well placed
3 Moon at First Quarter
Messier 12 is well placed
4 Conjunction of Venus and Eris
5 Messier 10 is well placed
6 Lunar occultation of Spica
Messier 62 is well placed
7 The Moon at apogee
10 Lunar occultation of Antares
Daytime Arietid meteor shower 2025
11 Full Moon
Messier 92 is well placed
12 The Moon at aphelion
Venus at aphelion
15 NGC 6388 is well placed
16 The Butterfly cluster is well placed
NGC 6397 is well placed
18 Moon at Last Quarter
The cluster IC 4665 is well placed
19 Close approach of the Moon, Saturn and Neptune
Conjunction of the Moon and Saturn
20 The Ptolemy cluster is well placed
21 June solstice
22 Conjunction of the Moon and Venus
The Lagoon Nebula is well placed
23 Close approach of the Moon and M45
The Moon at perigee
NGC 6541 is well placed
24 Jupiter at solar conjunction
Mercury at highest altitude in evening sky
25 The Moon at perihelion
New Moon
26 Jupiter at apogee
27 Conjunction of the Moon and Mercury
June Bootid meteor shower 2025
28 Mercury at dichotomy
The cluster NGC 6633 is well placed
29 Conjunction of Saturn and Neptune
30 Close approach of the Moon and Mars
Lunar occultation of Mars

Collected Observations (and thoughts) – Gary Walker

Moon occulting the Pleiades – Posted 2 April

Occasionally, in its travels, the Moon will pass in front of stars and, even more rarely, planets! Early yesterday evening, I saw the crescent Moon occult three of the Pleiades cluster - Celaeno, at 10.04pm, then Merope at 10.25pm and, finally, Alcoyne at 10.47pm.

They were best seen through my telescope, especially as they could be seen approaching the dark limb of the Moon, visible as the "Earthshine". However, in my binoculars, I could see a star about to be occulated, seemingly touching the Moon's limb, which was a beautiful sight. It's, of course, always easier to see the stars, approaching the dark limb, rather than the bright limb!

As the Moon has no atmosphere, and stars have essentially no angular size, it means that the stars, just blink out instantaneously - just like switching off a light! Only once, years ago, did I see a star fade slowly, and this was because it was a close double. Inexpensive, some close double stars have actually been found by this method!

Planets, of course, DO have an appreciable angular size, so they can take many seconds to disappear from view.

Venus Again – Posted 2 April

Early this afternoon, I saw Venus again, for the first time since Inferior Conjunction. The crescent is now reversed to the other way around, but it was still a large, wire-thin crescent, and still close to the Sun!

The freakishly long clear spell of very sunny days, and clear nights, has continued throughout this first week of April. It reminds me of a similar long clear spell, just after the first Covid Lockdown started, 5 years ago!

The Weather – Posted 6 April

The reason for the continuing excellent weather is down to an "Omega Blocking Pattern ", or "Omega Block", where the normal weather pattern is blocked. The Jetstream has been pushed up far to the North of the UK which is currently in the area in between. As a result, a high-pressure zone is currently stuck over the UK (not that any of us will be complaining!), which is excellent news for us astronomers.

Conversely, however, the same type of blocking pattern in the Winter can lead to an "Anticyclonic Gloom ", resulting in endless overcast days and nights, as we had earlier this year!

A similar weather blocking was also responsible for the Great Drought of 1976, where a high-pressure zone was stuck over the UK for about 3 months.

The end of the Mars Season – Posted 7 April

I was looking at Mars yesterday and today and, although Syrtis Major was centred on the planet, I could only see vague hints of dark features on it, even at 300X.

Mars is now only 7.8' arcseconds in size, so it is now, effectively, the end of this Mars "season", (at least, for me). Mars is, and has been, very close to Castor and Pollux, in Gemini, making a "3-star system"!

Mars on Conjunction with Pollux and Castor – Posted 12 April

Recently, there has been an almost straight line of 3 "stars" in the evening Western sky. These are, from the left, Mars, about 5 degrees from Pollux, with Castor, another 5 degrees from Pollux. They make quite a striking sight, like another version of the Orion Belt, (which,

incidentally, is also visible, setting now in the early evening sky).

The media are continuing with their naming of every Full Moon, with today's being called the "Pink Moon", because of its association with pink flowers. All Full Moons are named after what the Native Americans called them, so it is rather irritating to see on social media that so many people have got excited about this so-called "Pink Moon" to the point that many of them actually expected the Moon to BE pink in colour! The only time that the Moon MIGHT be pink, or pinkish in colour, is when it is low down near the horizon, or during a lunar eclipse, or else, if forest fire smoke is blowing over your area!

At this month's lecture, Martin Howe mentioned the media obsession about T Corona Borealis "going off". I had seen a similar BBC report at the end of last year about it "going off" and wrote about in the January edition of Janus.

This month's Astronomy Now also had a piece on it by Tracie Heywood, stressing that the media are getting it entirely wrong (as per usual!) She also commented that the media are always claiming that a certain astronomical event will "light up the skies", whereas in most cases it would be seen as a damp squib by non-astronomers. As for T Corona Borealis, as it will only rise to about magnitude 2, it means that the general public would not even notice it!

Solar Observations – Posted 16 April

It is quite informative to look at how many times over the last 6 months I have observed the Sun. This reflects both the weather conditions and the seasons!

A summary of my monthly solar total observations is as follows:

- October 2024 - 20 days
- November 2024 - 13 days
- December 2024 - 14 days
- January 2025 - 17 days
- February 2025 - 16 days
- March 2025 - 30 days

The weather was, of course, notoriously grim from late October, into November, and through to February this year. However, in March, we had an unprecedented clear period, as a result of the "Omega Block", with a high-pressure zone stuck over the UK.

In March, I counted a total of 17 very sunny days, and even the rest had some sun. So, it was a rare month which, luckily, included the day of the solar eclipse!

Obviously, during the winter months, the weather is worse, and even when high pressure IS over the UK, it usually fills in with clouds, resulting in extensive, extremely frustrating long, periods of cloudy weather. Also, the Sun is only up in the sky for shorter periods, anyway. Conversely, during the summer months, the reverse happens with much better weather, and the Sun being visible for far longer. November and December onwards are, usually, notoriously cloudy for long periods.

Space News – Posted 17 April

On the BBC News today, there was an item about life being discovered on an exoplanet, namely, K2-18b. Molecules of Dimethyl Sulphide and Dimethyl Disulphide have been discovered in its atmosphere which, if correct, can only be produced by marine organisms. Evidence to support the discovery was provided by the James Webb Space Telescope.

This exoplanet is thought to be a Hycean world, with a liquid ocean, and an atmosphere rich in Hydrogen, as well as Methane and Carbon Dioxide. It orbits in the "goldilocks zone" of its Red Dwarf star and is 124 light years from Earth.

Professor Nikku Madhusudhan of the University of Cambridge Institute of Astronomy, who led the study said that more data was required to be absolutely sure but, at present, he was 99.7% sure that there is life there.

If this turns out to be correct, then it will be a major turning point, showing that life exists elsewhere in the universe, and that we are not alone! The existence of Life that is nothing to do with our Earth would be really mind blowing. It's important to remember, however, that we have had controversial results before, such as in the case of Phosphine being detected in the clouds of Venus.

Finding ANY sort of extraterrestrial life, even if it is only microorganisms, never mind actual space civilisations, would be about the greatest game changer ever, but would raise many scientific and philosophical questions. Scientists have been searching for life on other planets for well over a century, since HG Wells and Percival Lowell thought that Mars had a civilisation, complete with extensive canals across Mars.

The existence of exoplanets had been theorised long before any were ever discovered, as it would be logical that our Sun couldn't be the only star with planets. As of today (17 April 2025), at least, 5,876 exoplanets are confirmed to exist, along with thousands more awaiting confirmation.

Telescopes are now sophisticated enough to know the size of planets, and can see what atmospheres they have, as well as their temperatures. Indeed, some planets have actually been imaged by these telescopes.

In other news, the first all-female crew was launched to the edge of Space in an 11-minute-long flight, followed by a landing back on Earth. Katy Perry, the pop singer was one of them, and the trip was funded by the Amazon billionaire, Jeff Bezos, on his Blue Origin reusable New Shepherd rocket. There has been much criticism of this flight in the media, being as it is again rich people doing space tourism and gimmicks.

Advert showing incorrect representation of telescopes – Posted 24 April

Tonight, I saw an insurance advert depicting men looking through two refractor telescopes. The view through the telescope showed several meteors exploding!

I'm not sure what the message was supposed to be, but this is another typical example of the media and advertisers not understanding Astronomy. Of course, looking through a telescope to see meteors would be useless, as the field of view is far too narrow. The best way to see meteor showers is by using your naked eyes, as you can see most of the sky.

Yet more Saturn moons – Posted 24 April

It has recently been announced that a further 128 moons have been discovered orbiting Saturn. The Grand Total (so far!) is now 274.

I am old enough to remember when Saturn had 9, possibly 10, moons. Only Jupiter was ahead of it at the time, with 12; now Saturn is far ahead of even Jupiter in terms of its moon count as Jupiter has, as of today, "only" 95 confirmed moons!

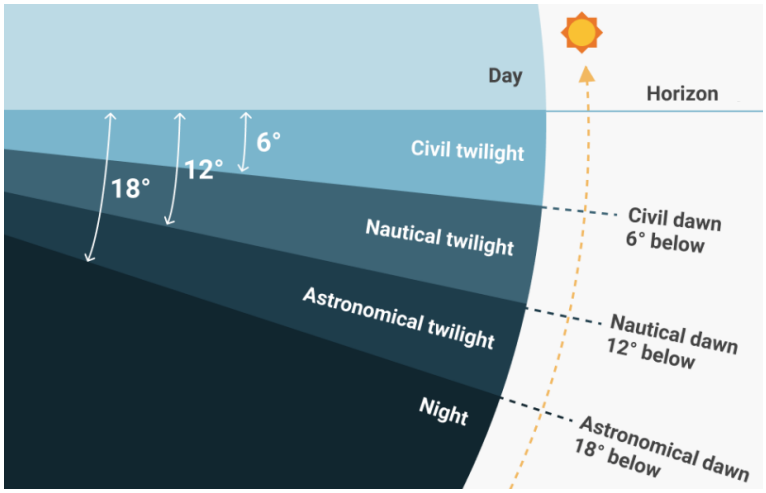
This just illustrates how the Solar System is a lot more complicated and interesting than it appeared to be in the 1960's - 1980's!

It wasn't very long ago, that a lecturer to our Society was saying that Saturn now had 146 moons. The ever-increasing number of "new" moons is a result of more sophisticated astronomical telescopes and space probes!

Object of the month – The Lunar Apennines- Martin Howe

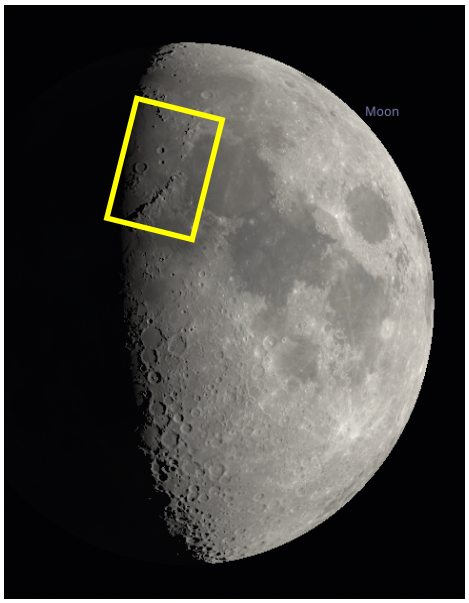
The month of May sees the end of truly dark skies, making the fainter deep sky objects difficult to see or image. On the 1st of May the Sun is setting at 20:24 BST, and skies become astronomically dark about 10pm BST. Astronomical darkness is when the Sun dips below 18° below the horizon - see the accompanying diagram from *timeanddate.com*.

However, by the 23rd of May the Sun never dips below 18° below the horizon, and so as we approach the summer solstice in June, our skies never get truly dark – and the lighter skies become more noticeable the further north you go. Thurso, for example, at the northern tip of Scotland, lost its astronomically dark skies by the 26th of April – nearly a full month before here in London.



Despite the lighter evenings, the Moon is always a good target – readily observable, even if the skies are not truly (astronomically) dark.

The accompanying image of the Moon is taken from *Stellarium*, as at 5 April 2025, with the highlighted area covering the region between Mare Imbrium and Mare Serenitatis. Being close to the terminator on this date makes it a great time to observe this very interesting area.

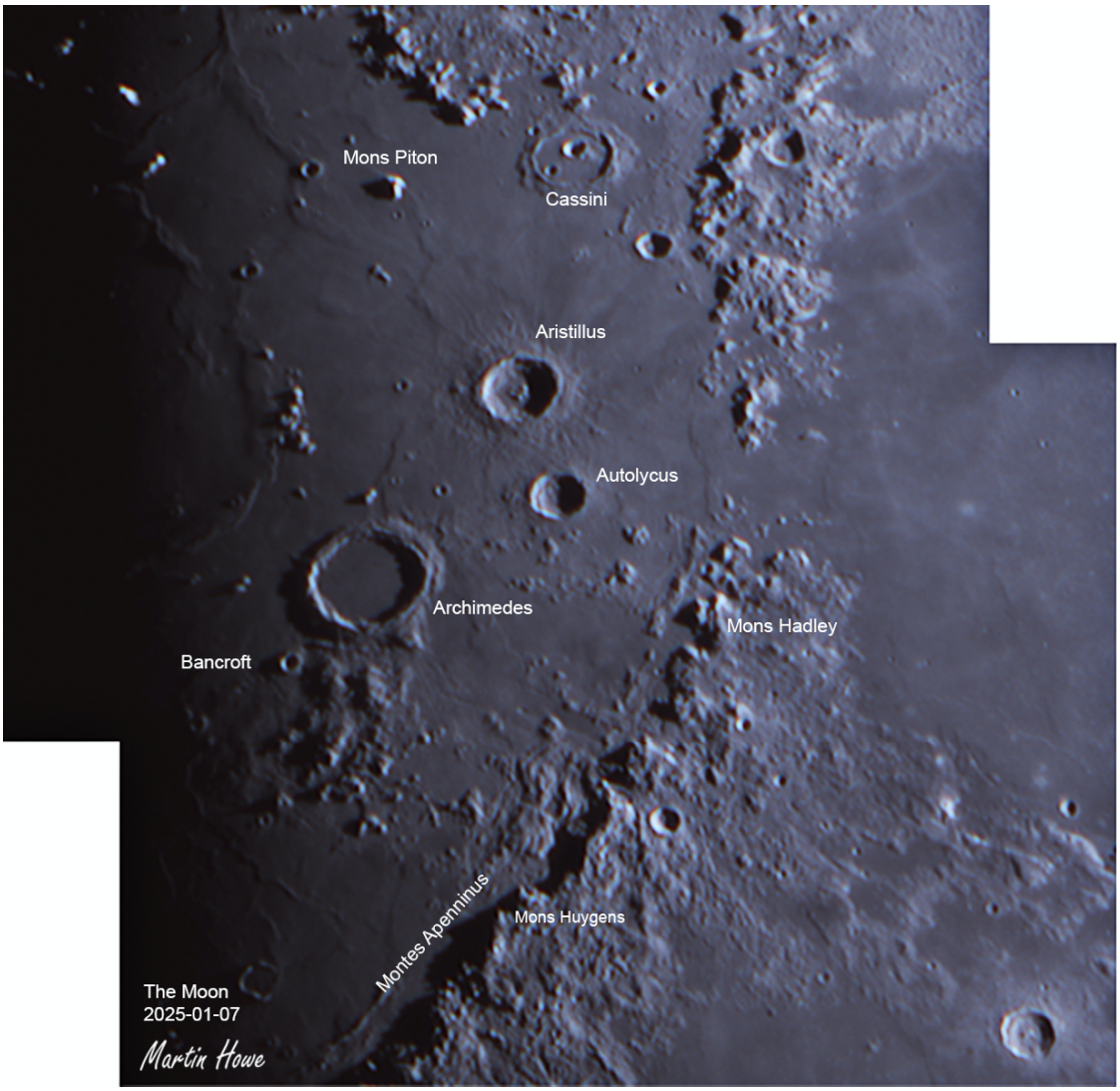


The image below is a two-pane mosaic of the area, with a number of features annotated. The largest crater on show is Archimedes, at about 81 km in diameter, located at the eastern side of Mare Imbrium. This crater has a featureless crater floor, as it has been flooded with lava at some point after its formation by a giant impact over 3 billion years ago.

Directly north of Archimedes is an isolated peak standing out in the early lunar sunrise, Mons Piton (2,300m above the mare floor). The two small craters just below Mons Piton are 5km and 6km in diameter - about the smallest features readily visible in this image (subject to how well this image has been reproduced).

To the right of Mons Piton is the crater Cassini. Cassini is about 58 km in diameter – for context this is pretty close to the diameter of London as defined by the M25 orbital motorway. This is another crater with a fairly featureless floor except for two rather

prominent impact craters contained fully within its rim. These craters are called, somewhat unimaginatively, Cassini A (17 km) and Cassini B (9 km).



Heading south now from Cassini, passing the large craters Aristillus (55 km) and Autolycus (39 km), we reach Mons Hadley, marking the start of the chain of mountains known as the Montes Apenninus, which stretch for about 600 km – about the same distance in a straight line from Brighton to Edinburgh. Apollo 15 touched down just southwest of Mons Hadley

The final stop on this brief tour is Mons Huygens, the highest peak in the Montes Apenninius at about 5,500 m – considerably taller than the highest peak in western Europe – Mont Blanc (4,800 m). It is also often referred to as the highest mountain on the Moon, but this can be debated semantically. Officially the highest point on the lunar surface is the northern rim of the South Pole-Aitken basin, on the far side of the Moon, at over 10,000 m above the mean lunar radius, but one could also argue that this is not a “mountain”, just a crater rim with a slope of barely 3º. I’ll let you decide.

Each of these two panes was captured with a ZWO ASI664MC camera attached to a 127mm refractor, and then stitched together in Photoshop.

Cosmic early morning light – John Pillar

The constellation Leo is one of the most prominent constellations in our sky and is easily seen at this time of year soon after sunset – a good way to find it is to start with the bright blue-white star Regulus at the bottom of Leo's head, and follow up a backwards question-mark to Algieba (Figure 1). Then look to Denebola, one of a triangle of stars tracing the lion's haunches and tail. Leo is rich in deep sky objects, perhaps the best known is the Leo Triplet, comprising 3 spiral galaxies Messier (M) 66, M65 and NGC 3628, visible on a good night through binoculars. Also, you may seek out Messier objects, 105, 95 and 96, located midway below the 'body' of the lion.

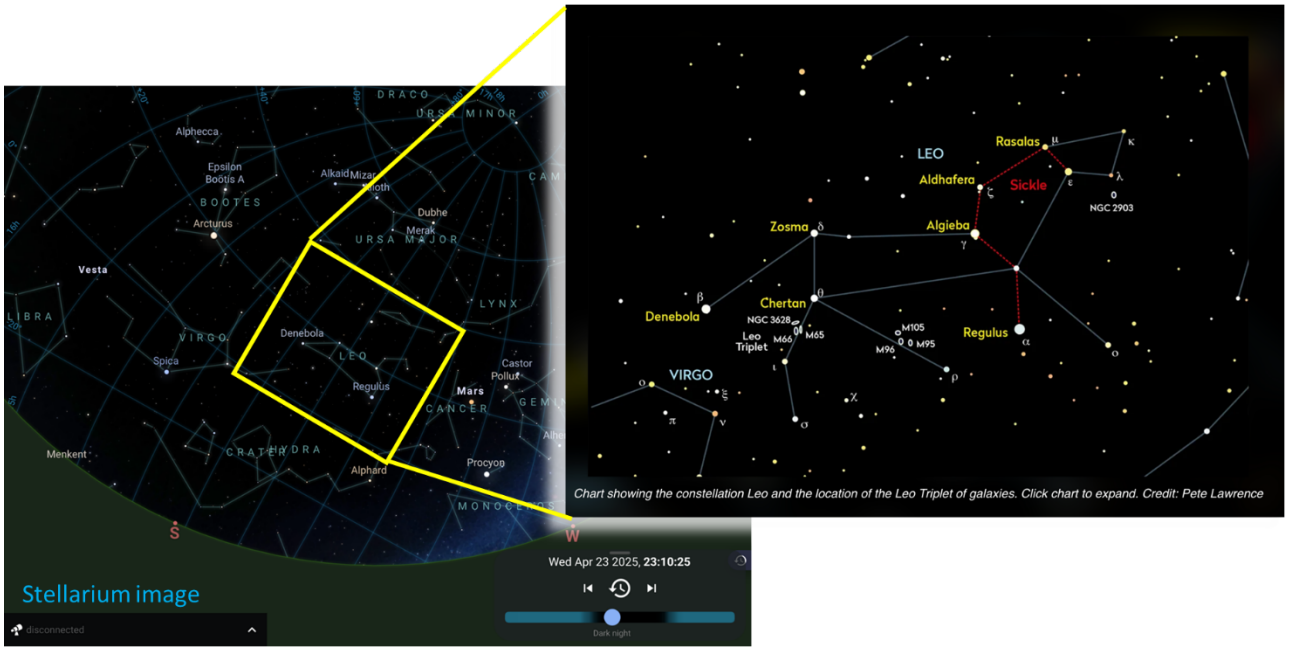


Figure 1: Constellation Leo, showing the key stars and popular deep-sky objects. Images from Stelllarium and BBC Sky at Night website

Perhaps less well known in the constellation Leo is an object known as the Cosmic Horseshoe, shown in Figure 2. This is an Einstein Ring located in eastern Leo above and between the tail end stars Denebola and Zouma - it was discovered in 2007 by a team using the Sloan Digital Sky survey and has been extensively studied since. It is described as a 'challenging target' (BAS Deep Sky Update, Feb 2023) at magnitude 20.3 – but hey, up for a challenge, I thought I'd give it a go from my back-yard in Dorking with a 9 ¼" SCT.

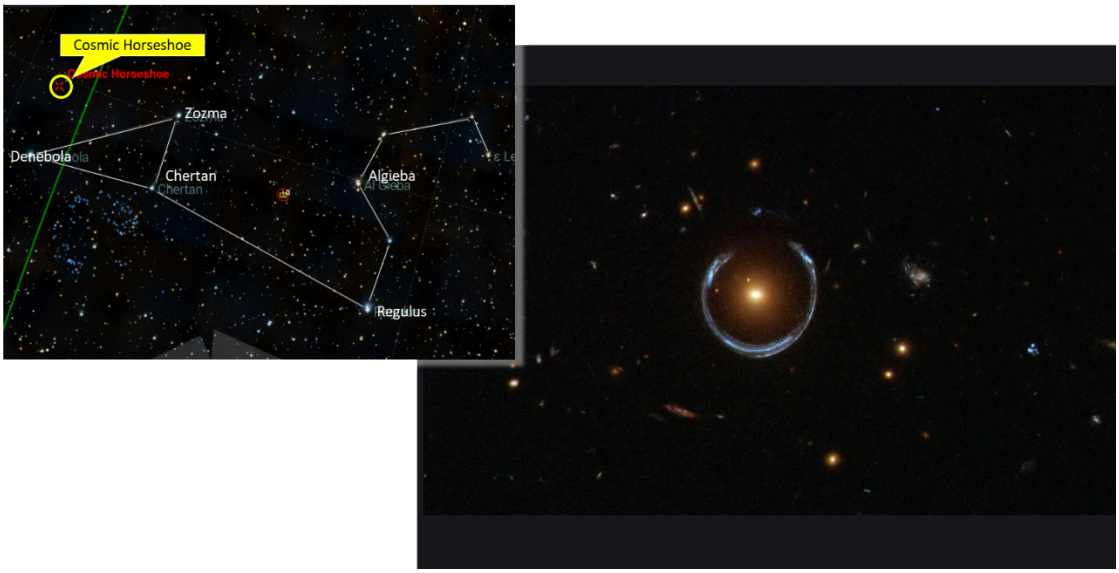


Figure 2: Hubble Telescope image of the Cosmic Horseshoe. Image from HST/ESA+NASA

An Einstein Ring is a phenomenon caused by the distortion of space-time by the gravitational effect of very large and dense objects. Light rays travel in a straight line through space-time, but when space-time is warped the light rays follow an apparent curved path. If, as Figure 3 illustrates, the dense 'deformer' falls in direct line of sight with a far

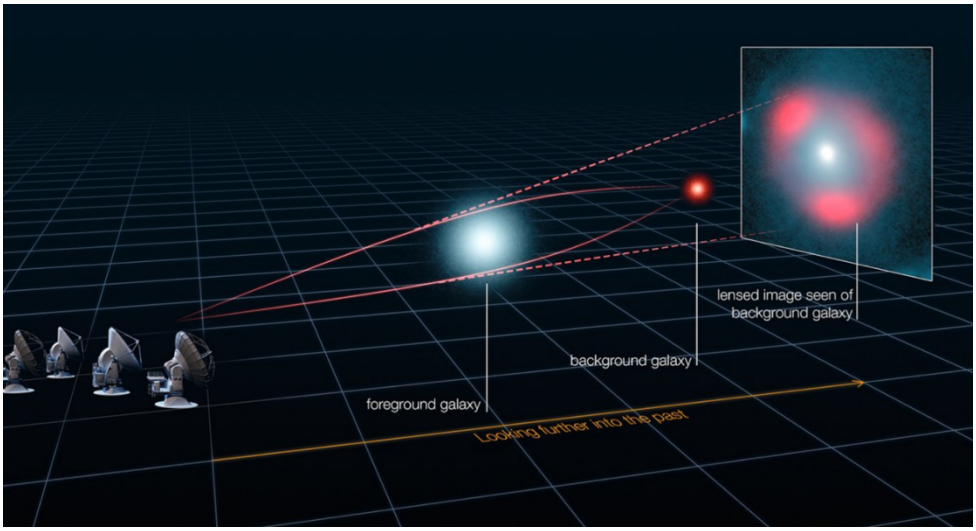


Figure 3: Schematic showing how light from a distant object is distorted by a nearer foreground galaxy which acts like a lens. Credit: ALMA (ESO/NRAO/NAOJ)

distant object a lens setup can occur, and the far object may be stretched and magnified and appear as curved streaks, or multiple points, of light (actually – all mass deforms space-time according to Einstein's theory of General Relativity, but the effect is almost imperceptible unless the mass is very large.. at star or black hole level). Interestingly, the light rays on one side of the lensing mass may travel a longer path than rays on the other, and examples are known where the light is delayed by several months depending on its travel path.

Figure 2 shows an image from Hubble of the Cosmic Horseshoe. The central object is the foreground galaxy LRG 3-757, and the background far distant galaxy is distorted into the blue/white ring around it. The circular gravitational arc is incomplete, hence the name. The foreground galaxy LRG 3-757 is at a redshift of z=0.44, and the blue tangential arc is a star forming galaxy at z=2.381, equivalent to an age of around 10.7 billion years, 3 billion years after the Big Bang.

I knew that the Cosmic Horseshoe would need a super long exposure time, but in the end, maybe I used up too many of the rare clear nights in 2024… ultimately I had some 370 images of 180 seconds, plus about 50 images of 600 seconds taken using a narrow-band filter (these weren't particularly useful – the ancient photons were just too scarce 😊) . Registering and stacking only the best 170 frames in Siril, taking only frames with the 'roundest' stars, lowest background noise and maximum number of detected stars, yielded the image in Figure 4. Admitedly, it doesn't look like much, but with a bit of imagination you may be able to see the red coloured foreground galaxy in the centre, and then 3, maybe 4 brighter areas surrounding, which I believe may be the brighter portions of the blue Hubble 'horseshoe' image in Figure 2. Interestingly, the Cosmic Horseshoe is the subject of a preprint by Melo-Carneiro et al 2025, available to read in arxiv.org (astro-ph.GA 26 Feb 2025) who calculate that LRG 3-757 has a central ultra-massive black hole that is one of the most massive ever observed, at 10.56 billion solar masses.

It is amazing to think that the photons captured in this image have been travelling the universe for 10 billion years, leaving their host galaxy when the universe was just getting going, 6 Byr before our sun and solar system even began to form.

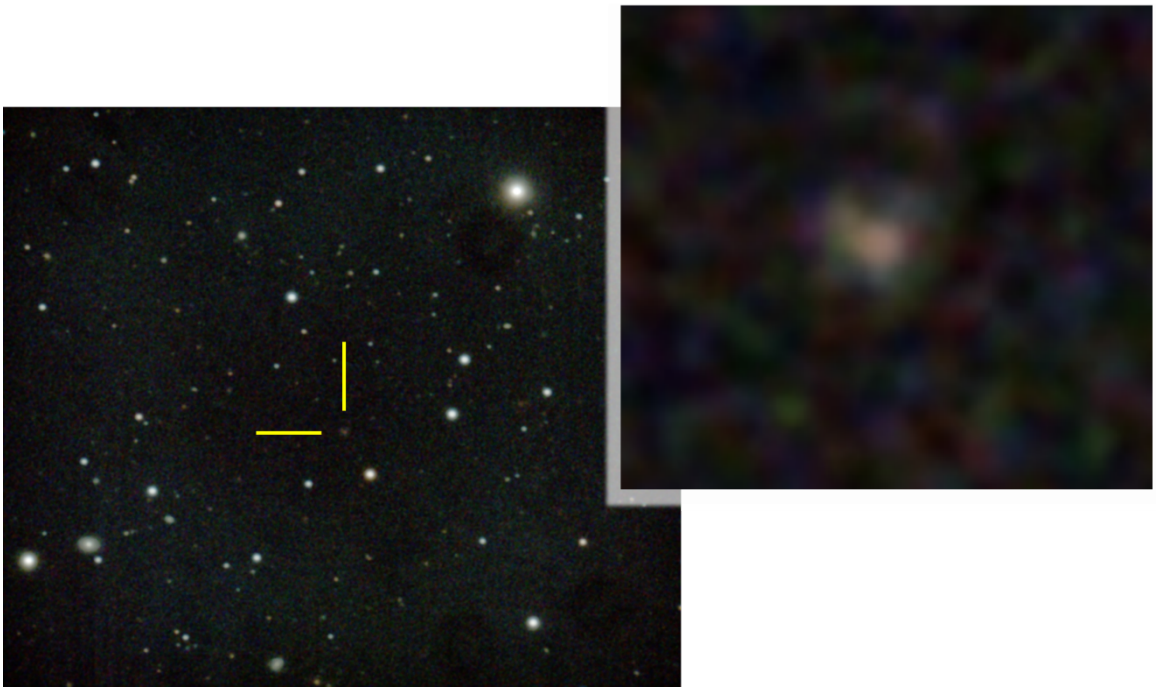


Figure 4: The Cosmic Horseshoe, imaged with Celestron 9.25" EdgeHD, total imaging time ~8 hours. In the inset you may be able to discern the central Massive Red foreground galaxy, and 3 or 4 bright areas that correspond to the brightest portions of the tangential arc in the Hubble image.

Indicators of alien life may have been found - astrophysicist explains what the new research means

Acknowledgement: This article was written by Ian Whittaker, Senior Lecturer in Physics, Nottingham Trent University and was first published in THE CONVERSATION on 17 April 2025. 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/indicators-of-alien-life-may-have-been-found-astrophysicist-explains-what-the-new-research-means-254843*

What do you think of when it comes to extra-terrestrial life? Most popular sci-fi books and TV shows suggest humanoid beings could live on other planets. But when astronomers are searching for extra-terrestrial life, it is usually in the form of emissions from bacteria or other tiny organisms.

A new research paper in the Astrophysical Journal suggests that Cambridge scientists have managed to find this type of emission with a certainty of 99.7% from a planet called K2-18b, 124 light years away. They used NASA's James Webb Space Telescope to analyse the chemical composition of the planet's atmosphere and say they found promising evidence K2-18b could host life.

It's an exciting breakthrough but it doesn't confirm alien life.

Let's look at why scientists largely do not accept the paper as proof of alien life.

Why it's so hard to detect to alien life

Exoplanet hunting fell out of public interest quickly due to the staggering number of planets scientists are discovering. The first convincing exoplanet around a sun-like star was discovered in 1995 via radial velocity, where you don't look at the planet but instead observe its effect on its nearest star. As the star wobbles back and forth it causes a tiny shift in the wavelength of the light it emits, which we can measure. We already know of roughly 7,500 planets.

Only 43 (to date) have been observed directly (about 0.5% of them). Most are discovered through indirect means, such as radial velocity or the transit method. The transit method is where you look at how the brightness of the star decreases as the planet passes in front of it. It will block a tiny amount of the light.

An exoplanet atmosphere

Looking at the atmosphere of an exoplanet is even more difficult. Scientists use spectroscopy to do this. The light coming out of the star can be observed directly and a small amount of it will also pass through the atmosphere of the planet. Researchers can estimate what an exoplanet's atmosphere is made of by studying which light from the star is emitted or absorbed in the atmosphere.

Let's try an analogy. You have a desk lamp at one end of a long table and you are standing at the other end, looking at the lamp. There is a glass of liquid in between you and the lamp. In very simple terms, the glass of liquid acting as the exoplanet and atmosphere, looks slightly blue, which allows you to identify it as water. In reality for scientists though, it's more like the glass of water is a tiny glass bead which is rolling around while someone is messing around with a dimmer switch on the lamp. Then, freak weather results in a gentle mist forming on the table. The liquid is 99% pure water and 1% mineral water and the scientist is trying to see what minerals are in the water.

You can see that the expertise required to be perform this work is incredible. They observed molecules with a 99.7% confidence rate, which is a remarkable achievement.

The data from JWST and K2-18b

The key data in this study is in a graph fitting light absorption rates to which kind of molecules could be there and working out how abundant they are. It features in this short film about the discovery. (*https://youtu.be/yGWDeP4rZzc*)

The graph produced by the study's authors shows evidence for dimethyl sulphide and dimethyl disulphide (DMS).

Some scientists think of DMS as a biomarker - a molecular indicator of life on Earth. However, DMS is not only produced by bacteria, but has also been found on comet 67P and in the gas and dust of the interstellar medium, the space between stars. It can even be generated by shining UV light onto a simulated atmosphere. The authors acknowledge this and claim the amount they determined was present cannot be produced by any of these conditions.

Similar to other claims of life?

Multiple studies have shown indicators for DMS and life in general on K2-18b and there are many other claims for other exoplanets.

The most recent is the idea that phosphine (another biomarker) was discovered in the Venusian atmosphere, so there must be bacteria in the clouds. This claim was quickly refuted by other researchers. Scientists pointed that a tiny error in the matching of data created results that showed a larger abundance of phosphine than was accurate. The Cambridge study is more rigorous and has more certainty in the result. But it is still not strong enough to convince the academic community, which needs 99.999% certainty.

The study authors suggest their findings indicate liquid oceans and a hydrogen atmosphere, but others have countered it could be a gas giant, or a volcanic planet full of magma.

The Cambridge study is not proof of life, but it is an important step forward to characterising what other planets might be like and determining if we are alone or not. The study presented the best result yet and should inspire other scientists to take up the challenge.

Partial Eclipse of the Sun – 29 March 2025

The six images below record the total passage of the eclipse. They were taken by Ron Johnson using a 102mm f9.8 OG with full aperture solar filter and Canon 400D DSLR camera. Exposures were 1/2000s at ISO 1600.

10:06 UT

10:14 UT

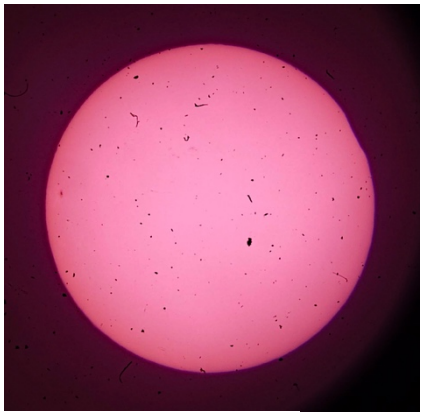
10:23 UT

10:45 UT

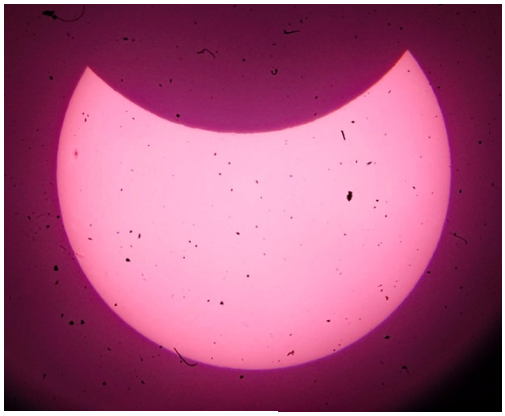
11:18 UT

11:59 UT

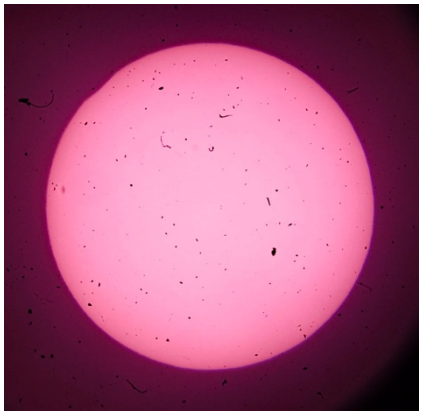
The three-image sequence below also shows the passage of the eclipse and was taken by Sagar Shringarpure. Note also the sunspots.



First contact at 10:07

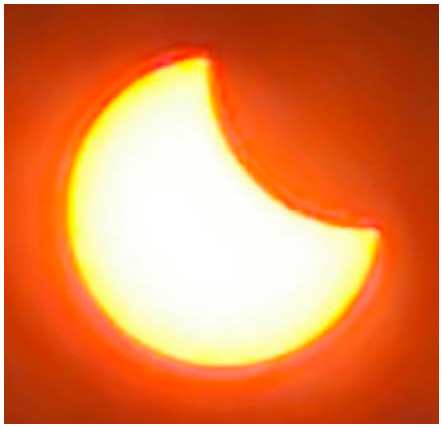


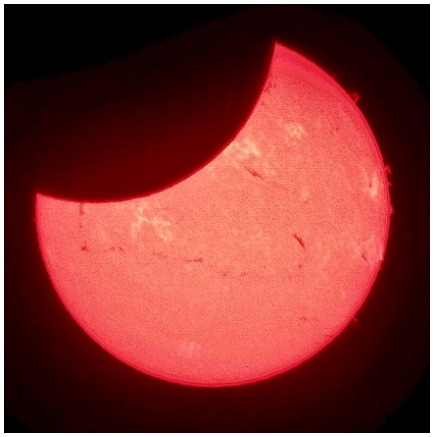
Max cover at 11:03



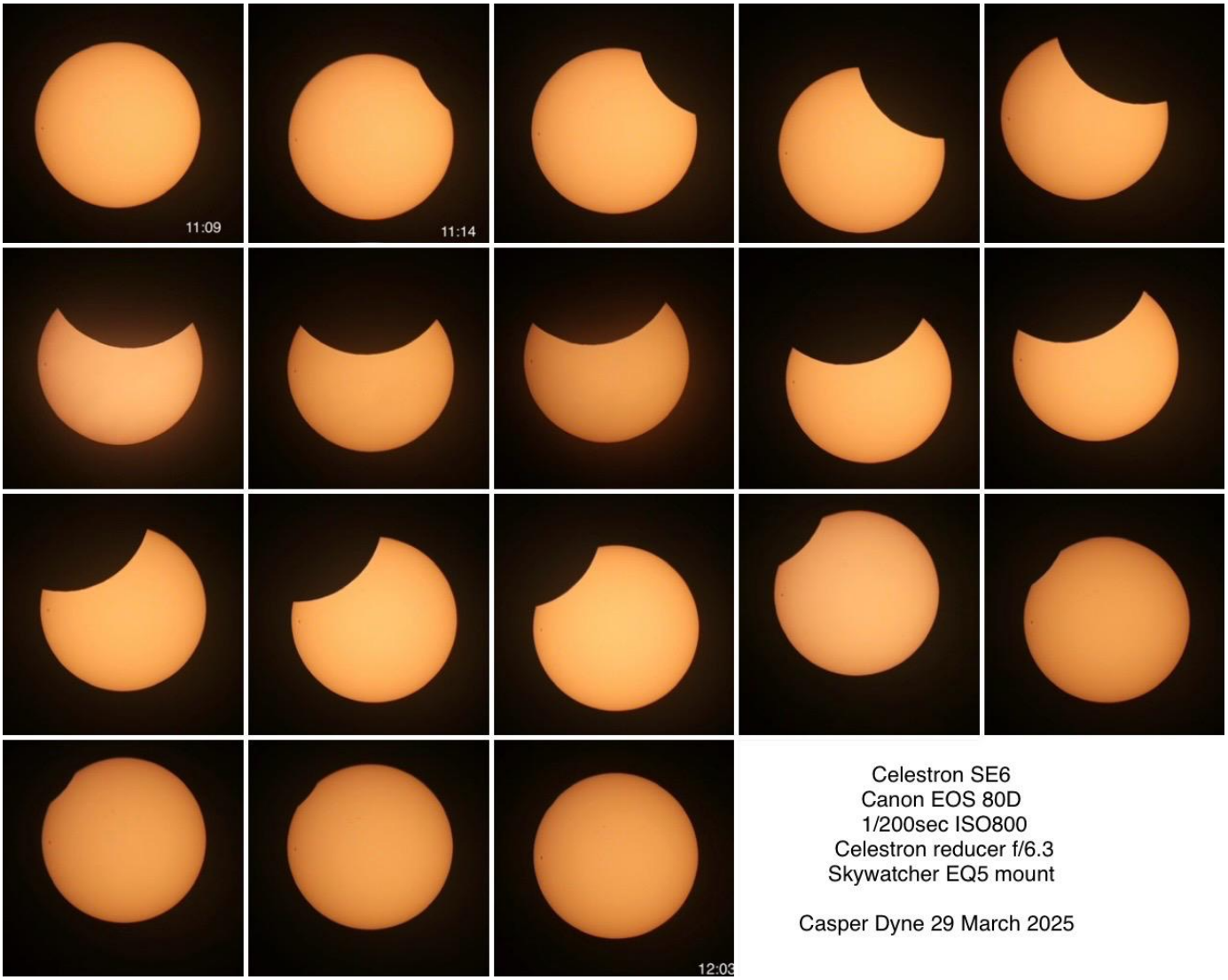
Last contact at 12:00

The three images below (from left to right) were taken by Marco Gulino, Anita King and Matt Graydon. Matt's shows significant detail of the surface of the sun.





Finally, another sequence of images showing the passage of the eclipse. This one was taken by Casper Dyne.



Up Next:

NEXT MEETING: 8pm Friday 9 May – Nonsuch High School

Greg Smye-Rumsby from the Royal Observatory and Astronomy Now magazine will give a talk entitled "If Venus had a moon". There will also be a presentation on the sky at night for the coming month.

NEXT USER GROUP:
Suspended until further notice.

NEXT DENBIES OBSERVING SESSION:

The next sessions, allowing for moon rise & set times and cloud conditions, should be sometime around the new moon which is on 27 May.

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 24 – 30 May.

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