JANUS
THE NEWSLETTER OF EWELL ASTRONOMICAL SOCIETY

APRIL 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 April edition of Janus. This month's talk, entitled "Formation of Planetary Systems" will be given by Society member Martin Howe, who will also present the "Sky at Night" for the forthcoming month.

In addition to the usual contributions from Gary Walker and Martin Howe, I'm delighted to include a second contribution from John Pillar which I hope readers will find interesting – be warned, it contains some maths which you may not be familiar with!

March was the month in which there was an eagerly anticipated Partial Solar Eclipse. Occurring as it did in the latter half of the morning of Saturday 29th, there was every prospect of it being visible to most people, with the obvious proviso that the weather needed to "play ball"! In the event (for myself at least) the sky was clear, and the eclipse was visible for a total of around 2 hours – an hour either side of 11:03 when the maximum coverage of around 35%-40% occurred. Judging by the posts on WhatsApp, many members successfully imaged the event and, doubtless, even more viewed it in some way.

19 March marked the return to earth from the ISS of the two stranded US astronauts, Butch Wilmore and Suni Williams. Sent to the Space Station, on an 8-day mission aboard a Boeing Starliner which developed problems and was deemed too unsafe to return them to Earth, they had to wait 9 months before finally getting home aboard a SpaceX rocket! The date of 19 March is significant for the fact that, almost exactly 60 years earlier, on 18 March 1965, the Soviet spacecraft Voskhod-2, with a 2-man crew consisting of Pavel Belyaev and Alexei Leonov, launched from the Soviet base in Baikonur (modern-day Kazakhstan). An hour and thirty-five minutes after launch, Alexei Leonov left the airlock of the ship and became the first man to perform a spacewalk. He spent 12 minutes and 9 seconds in outer space. This spacewalk marked the beginning of the history of extravehicular activity (EVA), which is now an important part of the work of astronauts. Full details of the EVA – and a number of associated life-threatening issues - can be found here: *https://starwalk.space/en/news/first-spacewalk*. This month's piece from "The Conversation" highlights that, even now, there are still some life-threatening issues for humans in space.

John

skyUpdate
What's up this month?

The Solar System April

MERCURY: recently passed in front of the Sun at inferior solar conjunction and begins the month not observable. It will reach its highest point in the sky during daytime and be 7° below the horizon at dawn. By the end of the month, having recently passed greatest elongation W, it remains not observable, reaching its highest point in the sky during daytime, and being 2° below the horizon at dawn.

VENUS: recently passed in front of the Sun at inferior solar conjunction. It begins the month not observable as it will reach its highest point in the sky during daytime and be no higher than 6° above the horizon at dawn. Visibility improves as the month progresses until, by the end of the month, emerging into the morning sky as it approaches greatest elongation W, it is visible in the dawn sky, rising at 04:13 UT – 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 05:09.

MARS: is currently an early evening object. It begins the month visible from around 20:13, 62° above the S horizon, as dusk fades to darkness. It will then sink towards the horizon, setting at 04:22. By the end of the month it will become visible from around 21:14, 49° above the SW horizon, before sinking towards the horizon and setting at 02:54.

JUPITER: begins the month as an early evening object, receding into evening twilight. It will become visible at around 19:53, 48° above the SW horizon, as dusk fades to darkness. It will then sink towards the horizon, setting at 01:25. By the end of the month, it will soon pass behind the Sun at solar conjunction, but will become visible at around 20:44, 26° above the W horizon. It will then sink towards the horizon, setting 3 hours and 36 minutes after the Sun at 23:57.

SATURN: recently passed behind the Sun at solar conjunction. It begins the month not observable, reaching its highest point in the sky during daytime and being 5° below the horizon at dawn. By the end of the month, it is only just observable, still reaching its highest point in the sky during daytime and being only just above the horizon at dawn.

URANUS: will soon pass behind the Sun at solar conjunction. At the beginning of the month, it will become visible around 20:55, 22° above the W horizon, as dusk fades to darkness. It will then sink towards the horizon, setting 3 hours and 59 minutes after the Sun at 23:32. By the end of the month, it is not observable, reaching its highest point in the sky during daytime and being 2° below the horizon at dusk.

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 11° below the horizon at dawn. Remaining unobservable throughout the month, it ends the month still reaching its highest point in the sky during daytime and is 6° below 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*

April

1	Close approach of the Moon and M45
2	The Sombrero Galaxy is well placed
3	Close approach of the Moon and Jupiter Lunar occultation of Beta Tauri
5	Messier 94 is well placed Moon at First Quarter Close approach of the Moon and Mars
6	The Jewel Box cluster is well placed
11	Mercury at highest altitude in morning sky

13 Full Moon
Lunar occultation of Spica
The Moon at apogee

14 Centaurus A is well placed
Omega Centauri is well placed
136199 Eris at solar conjunction

15 The Whirlpool Galaxy is well placed

16 The Moon at aphelion
Conjunction of Mercury and Neptune
Mars at aphelion
Lunar occultation of Antares

17 Messier 83 is well placed
Mercury at aphelion

18 Messier 3 is well placed

21 Moon at Last Quarter
Mercury at greatest elongation west

22 136108 Haumea at opposition
Lyrid meteor shower 2025

23 Messier 101 is well placed
π-Puppid meteor shower 2025

24 Venus at greatest brightness
Mercury at dichotomy

25 Close approach of the Moon and Saturn
Close approach of the Moon and Venus
The Moon at perihelion

26 Conjunction of the Moon and Mercury

27 The Moon at perigee
New Moon

28 Close approach of Venus, Saturn and Neptune

29 Conjunction of Venus and Saturn
Close approach of the Moon and M45

30 Close approach of the Moon and Jupiter
Lunar occultation of Beta Tauri

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

12 Messier 5 is well placed
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

29 Messier 4 is well placed

30 Mercury at superior solar conjunction

31 Mercury at perihelion
Venus at greatest elongation west

Collected Observations (and thoughts) – Gary Walker

Mercury – Posted 3 March

I managed to find Mercury through my telescope early yesterday evening. Of course, it appeared very small, even at 222X, but I could see that it appeared as a half phase!

Mercury always has a small angular size, from about 6' arcseconds and, even at maximum, at Solar transits, it never gets above 10-12' arcseconds. This is one of the many difficulties in observing it.

As it is always low in the sky, atmospheric turbulence can degrade the viewing of it. This, and its tiny angular size, makes trying to see surface features extremely difficult. This is a shame as, apart from Mars, it is the only planet that has surface features that CAN be observed at all - all

the other planets are either gas giants, or in the case of Venus, permanently covered by cloud!

It is only rarely well seen, as it is usually too close to the Sun and, hence, always low down in the early evening sky. Also, due to its rapid orbit, unlike the other planets, it never stays in one place for very long! In February and early March, we get the best opportunity to see Mercury in the evening sky.

Mercury and Venus – Posted 8 March

I observed Mercury today, and I could just see it as a crescent 🌙 phase. However, again, even at 222X and 300X, it still appeared very tiny. This is because its angular size never gets very big and, even at absolute maximum, it is only 10'-12' arcseconds in size! Today, it was probably only about 7' arcseconds in size!

Tonight, Mercury reached its greatest Eastern Elongation, at 18 degrees from the Sun.

Venus was now, noticeably drawing in towards the Sun, as it approaches Inferior Conjunction on 23 March. Thus, it, too, was fairly low in the sky, and not too far "above" Mercury.

Venus is now in its best viewing period with a beautiful, large, and thin, crescent 🌙. However, unlike Mercury, it was far larger in size, at over 50' arcseconds, and a phase of less than 10%!

In fact, Venus has the largest angular size of all the planets, even surpassing Jupiter on these occasions! However, the problem is that even if Venus had no cloud cover, it would still mean that the closer and larger Venus is, the less we would see of its surface - a classic "Catch 22" situation.

Latest Moon Landings, and other Space Missions! – Posted 8 March

As predicted in the most recent edition of Janus, so far this month, there have been two more Moon Landings by probes! One was successful, with the Blue Ghost lander touching down in Mare Crisium. This marks the first successful Moon landing by a private firm (Firefly Aerospace), although it will also carry out experiments for NASA.

Sadly, the other landing, by the probe "Athena", which touched down in a crater near the South Pole, was unsuccessful. The private company of Texas Intuitive Machines managed to, just like it did with its first probe, Odysseus, last year, tip the probe onto its side!

In addition, a SpaceX rocket blew up, raining debris over the sea. This was the largest rocket ever launched. An earlier rocket also exploded, raining debris over the Caribbean, and causing property damage in the Turks and Caicos Islands! On both occasions, aircraft flights were briefly cancelled.

Conspiracy Theorists – Posted 8 March

Everyone is probably familiar with the conspiracy theories, that the Moon Landings were faked. However, on viewing many of the great Space sites on Facebook, it is depressing to see people still saying that they were fake. Indeed, there are so many of these posts infesting most Space sites, that it actually spoils the enjoyment of going on them!

There are even Flat Earthers, and Bible Bashers, too, all over these sites. Sadly, it is difficult to tell how many of these people are simply ignorant of basic Science and Photography, or else, are just trolls!

There are conspiracy theorists for everything, nowadays, including the Trade Towers 9/11 and the Covid Pandemic!

The prevalence of these conspiracy theorists is no doubt mainly down to the general public, many of whom are uniformed about Astronomy and Science in general. There is often a distrust of science, and how scientists actually

operate, so there are a lot of "keyboard warriors", coming up with their own theories and outlooks!

The Pandemic may have made it worse, as many regard even that as a great hoax and a plot by governments!

5 years since the start of the Covid Pandemic! – Posted 11 march

It is now about 5 years since the start of the Covid 19 Pandemic in 2020.

For the Society, as well as the wider world, this must have been the most dramatic event in its history. It was something that none of us had any previous experience of. Especially, as it suddenly came, without warning. Early on, briefly, Covid was just in the background but, after mid-March, things worsened dramatically.

By the week of 16-20 March, things were becoming more uncertain. We managed to have our lecture on 13 March although, even before that, I was worried that would be called off. Then, only 5 days later, on 18 March, Anita sent an email saying that all sessions were cancelled until further notice and, on 19 March, on the Society website, all events were cancelled for late March and April, but events from May, onwards, were still listed. This, of course, proved to be way too optimistic, but at this time, nothing was certain, and nobody knew how long it would be before things returned to normal!

Schools and Libraries closed on 20 March and, the following week, on the evening of 23 March, 5 days after Anita's email, Boris Johnson addressed the Nation, telling us to stay at home, and only go out for an hour, or so, for exercise. All non-essential shops and businesses had to close down immediately! This was the start of the first Lockdown, which was the worst one, and particularly shocking and dystopian! It felt like we were all starring in a Science Fiction film.

People in public and other areas were required to keep 2 metres away from each other - the "Social Distancing" rule. This, more than any other rule, effectively stymied any meetings including, of course, our Society!

As if to compensate for all this disruption, we were blessed with a freakishly long clear period of days and nights! Also, in July, we had the first bright comet for a long time, Comet C/2020F3 NEOWISE, which produced a beautiful tail in binoculars, and was also visible to the naked eye.

There was also "The Great Conjunction" of Jupiter and Saturn in late December 2020, when both planets were so close to each other, that they were easily visible in the same field of view of telescopes, even at high powers.

In fact, the enforced isolation led to an increase in people taking an interest in star gazing, and Astronomical retailers began running out of stock!

However, in October 2020, it was possible to do online "meetings" on "Zoom", and lectures started again, each month, on Zoom, from then until July 2021.

These Zoom meetings showed "attendees" in separate boxes, which reminded me of either "Celebrity Squares", or indeed, even more humorously, "The Muppet Show"!

The first lockdown ended on 15 June 2020, but there were two more shorter lockdowns in late 2020, and extending up to 29 March 2021, and the dreaded "Social Distancing" was still in force until 19 July!

All the main restrictions ended on 19 July 2021, but it was too late for any meetings that "season". When meetings finally resumed in September 2021 they were "hybrid" meetings, meaning people could either physically attend, or "attend" on Zoom! In fact, 3 ½ years later, these hybrid meetings are still carrying on,

perhaps the most obvious hangover of the Pandemic in our Society!

At the earlier physical meetings in September 2021, Gel sanitisers were placed for people to use when they entered the library. One's temperature was also taken at the entrance, and face masks could be worn, unless exempt from doing so!

As a result of being unable to have physical meetings, the Committee decided to suspend Membership fees for a year! However, the Pandemic had caused a lack of financial resources in the Society, so when reintroduced, the Membership fees were increased (to £40, for adults). On 27 January 2022, the first group observing session since the onset of the Pandemic was able to take place at Ranmore.

Since the Pandemic, we have been unable to have our tea breaks in the School Staff Room, so we now have to bring our own drinks, e.g. in flasks, to drink during meetings and at the tea breaks.

Things have now been back to normal for over 2 years in the Society and, apart from the changed tea breaks, the only other surviving "legacy" of the Pandemic, is the continuing use of Zoom in our meetings.

As we now know, the Pandemic restrictions lasted for sixteen months, and it was eighteen months before physical meetings could resume!

Mercury and Venus – Posted 11 March

I saw both Venus and Mercury through my telescope today. They seemed now to be only about 5 degrees from each other. Mercury was to the South of Venus, virtually horizontally.

Venus was an even more beautiful, larger, and thinner crescent 🌙, and was large enough to be visible as a tiny crescent 🌙 with my 11 X 80 binoculars.

Mercury, of course, was much smaller, although still just visible as a crescent!

Partial Lunar Eclipse – Posted 13/14 March

No doubt, everyone in the Society, like me, was up bright and early, observing this eclipse!

As it was a low altitude event, I went over into the fields at the back of my house, as I would never have seen it from my garden.

There were some areas of patchy stratocumulus in the sky but, luckily, the Moon was below the cloud deck, being as it was very low down in the West.

The air was clear in the fields, but there was fog in Chipstead Valley.

There was a heavy white frost, and the Eastern sky was soon brightening.

There were a few early dog walkers about - presumably, they too saw the eclipse and, certainly, one woman did.

Eclipse times were as follows :

Start of Penumbral eclipse at 3.57am.
Start of Umbral phase at 5.09am.
Total Eclipse at 6.26am.

I first saw the start of the Umbral phase just after 5.09am. The shadow slowly increased from the left-hand limb of the Moon. By about 5.38am, it was at least a third of the way across the Moon. I could see the left-hand limb of the Moon, dimly visible within the Umbral Shadow.

Even at the start of the eclipse, the Moon was only just over 10 degrees above the horizon. At 5.45am, the Moon was down to just under 5 degrees above the horizon!

By about 5.45am, the Moon was appearing as a crescent 🌙. The shadow still appeared black but might have had a tinge of reddish colour to it. However, I estimated that the shadow was, at most, only just over halfway across the Moon!

I finally lost the Moon at about 6am, when it sunk into a bank of low cloud near the horizon. By now, it was less than 3 degrees above the horizon!

There was absolutely no chance of seeing even the start of Totality, because it started at 6.26m, only a minute before the Moon actually set at 6.27am, at my location!

Thus, I saw the eclipse for about 50 minutes in all but lost it about half an hour before the start of Totality! Nevertheless, I was glad to be able to see it, anyway.

This was the 31st Lunar Eclipse that I have seen. In contrast, in the same period of time, I have only managed to see 13 Solar Eclipses!

I called this a "Partial Lunar Eclipse" but, of course, it was really a Total Eclipse. However, in the UK, it was essentially a partial one, as the Moon set before Totality!

I just used my 11 X 80 binoculars and my naked eye to observe this eclipse. In any case, one's naked eyes, or binoculars, give the best views of these eclipses, so a telescope is not essential.

The BBC News reported this eclipse on the 6pm News, (13 March), having Doctor Robert Massey from the Royal Astronomical Society speaking about it. Also speaking about it was the Astronomer Royal of Scotland, Professor Catherine Heyman. Both of them were last shown on the "Planetary Parade" item, in late February!

The eclipse was again on the 1pm and 6pm News later the next day (14 March) – as usual, as the final item on the main News!

Not that many of the Society saw this eclipse, mainly due to its unsociable timing. At least one reported a fair amount of cloud at Worcester Park, whilst Ron Johnson observed the eclipse, and showed images of it in his Sky at Night presentation, at this evening's meeting. He said that conditions were hazy, so that his images were not sharp.

Ron also rightly pointed out that the media kept on saying that the eclipse was starting about 4am, but that was only the penumbral phase. The real Umbral phase started over an hour later! This is yet another example of the media getting the wrong end of the stick, as usual.

The lunar eclipse was shown in most of the national newspapers, on 15 March. I was surprised, as only part of it could be seen from the UK, and it occurred early (or late!) in the night.

The Media have taken to calling Total Lunar Eclipses, "Blood Moons"!

The Blue Ghost lunar lander that touched down on the Moon, on 2 March imaged the 14 March eclipse from the Moon. Obviously, from there, it was seen as a Total Solar Eclipse!

Apollo-12 also photographed an eclipse from Space.

Venus – Posted 18 March

I saw Venus this afternoon, only 5 days before Inferior Conjunction on the 23rd. Through my telescope, the sky appeared white, rather than blue, because it was now only a few degrees from the Sun!

It was now a "wire-thin" crescent 🌙, scarcely wider at the centre of the crescent 🌙, than at its "horns "!

The return of the stranded astronauts – Posted 19 March

Today, the two stranded US astronauts, Butch Wilmore and Suni Williams, finally managed to return to Earth. They were

sent to the Space Station, on an 8-day mission aboard the Boeing Starliner, but it developed problems and was deemed too unsafe for them to return to Earth in! So, the Boeing Starliner returned to Earth on its own and, ironically, landed safely!

The two astronauts were thus stranded on the Space Station, waiting for 9 months before they could finally get a SpaceX rocket to take them home!

It's probably fair to say that they got value for their money!

Two Dolphins were seen swimming around the splash down site, probably thinking "Goodbye, and Thanks for all the Fish"!

10 years since the last Big Partial Solar Eclipse – Posted 20 March

Today marked the tenth anniversary of the last Big Partial Solar Eclipse of 20 March 2015!
On that occasion, the eclipse reached 85% at maximum eclipse from here, and 97% from the Isle of Lewis. It was totally eclipsed over the Faroe Islands and the Norwegian Islands of Svalbard and Spitsbergen. This was the biggest solar eclipse visible from the UK since the Total Eclipse on 11 August 1999.

Sickeningly enough, it was completely overcast from here, due to a huge cloud bank over Eastern England which, due to stagnant air, just hovered over us. Even worse, the clouds all cleared away before 1pm, well after the eclipse was over!

It was particularly frustrating when I couldn't see anything of the eclipse, when you consider that solar eclipses are one of the very few astronomical phenomena that can still be seen in fairly poor conditions, when you wouldn't bother to try to observe other astronomical events!
Even more frustrating, like today, 10 years later, the sky was virtually cloudless on this day!

However, the weather was very hit and miss even over the rest of the UK, with good visibility over Plymouth, Penzance, Avebury, and parts of the Midlands, such as Leicester and Jodrell Bank! It was also visible to the North of London, in Oxfordshire, and in Northern England.
It was also visible from the Isle of Lewis, where it was 97% eclipsed. A reporter there said that they had experienced "4 seasons in one morning" (which could actually be an advantage as, with the weather was varying, the Sun was visible some of the time!

The only interesting thing that saw was a notable dimming and a gloomy light over the landscape at maximum eclipse, around 9.30am - for a little while at least.

The trouble is that you need the RIGHT WEATHER at the RIGHT TIME but, sadly, we always seem to get the WRONG WEATHER!

The next Big Partial Solar Eclipse on 12 August 2026 will be over 90% at maximum eclipse!

Venus at only 3 days before Inferior Conjunction – Posted 20 March

As it was a very sunny day today, I had another look at Venus, in the afternoon sky.

It was now just over 8 degrees from the Sun, so I took the safety precautions of putting Mylor Filters over BOTH the objective lens, AND the Finderscope!

Being daytime, I could not use accurate GOTO, so I looked up the precise positions and coordinates of the Sun and Venus on the Night Sky website. I then entered these coordinates into the "User Objects" in my GOTO Menu and centred the Sun in the field of view. Next, I "synched" on it, to preserve this position, and then got the telescope to go to Venus. This is not an entirely accurate procedure, but I usually seem to find Venus, and it's certainly more accurate than using the normal planets in the "Solar System" part, on the menu!

Today, as on 18 March, I could see the thin, large, very delicate crescent 🌙 of Venus! However, it was harder to see well, as the sky that it was in was white, rather than blue, being as it was, close to the glare of the Sun!

That is why I put filters on the telescope, (obviously only on the objective, when centring the Sun), but I kept the filter on the Finderscope all the time, as it was so close to the Sun!

A Stange Spiral Object seen in the night sky! – Posted 25 March

Last night, many people across the UK and Europe saw a strange spiral object moving across the night sky. The sky was clear across a large area, and the event was reported on the BBC News.

It appeared as a bright spiral shaped object, that resembled a photo of a spiral galaxy! Was it a UFO? No! It proved to be a fuel dump from a SpaceX Falcon rocket that had been launched only a few hours earlier.

Unfortunately, I didn't see the event. Just like Fireballs, it was, of course, not predictable. So, unless you happened to be outside at the critical time, you wouldn't have seen it. I have often seen images of these objects taken, but previously, always in America, I have never previously heard of one being visible from the UK!

This reminds me of a sighting that I made of a strange comet like tail, moving along below the ISS back in August 2001. This "tail" was only visible in binoculars and was about 4-5 degrees in length! It proved to be a water ballast dump from the Space Shuttle which was docked with the ISS at the time!

Spectacular Prominence – Posted 28 March

Today from about, 3.30pm I saw a spectacular Prominence on the top limb of the Sun. It consisted of numerous branches, rods and other fragments extending a long way above the limb. There were 3 "rows" of Prominence fragments extending up from the Sun, immediately upwards from the limb. This was surely the largest and most spectacular Prominence that I have ever seen!

There was a flare on the limb, immediately below it. The Prominence was clearly an "active" Prominence, as it was changed, and then decaying within only a few minutes. By about 3.50pm, it had virtually disappeared, apart from a few small Prominences! The general appearance was of 3 long "rays" of Prominence fragments, splaying out from the limb in 3 parallel lines!

As Professor Sarah Matthews noted during her talk, the Sun has been less active for sunspots lately, and I have only seen a few scattered small to medium sized spots over the past few weeks. Surprisingly enough, Aurora have been sighted again in Southern England in the past few days!

Partial Solar Eclipse – Posted 29 March

Throughout the week leading up to the eclipse, the weather symbol for today showed cloud, and showers. However, by about Thursday, it was showing cloud, with partial sun and, on Friday, the forecast was stated to be good for this area, and the 6pm BBC News had an article on it, filmed at Hampstead Observatory. Then, amazingly enough, the day of the eclipse was perfectly sunny although, admittedly, there were some extensive cirrus patches, but they did little to interfere with the eclipse!

The timings of the eclipse were as follows:

- First Contact at 10.07am
- Maximum eclipse at 11.03am
- Last Contact at 12am.

I first saw the slightest hint of a shallow indentation of the top limb at about 10.10am. It's amazing how the "bite" into the Sun rapidly grows within only a few minutes! The eclipse came from the

right-hand side of the Sun, (the Western side) and, as time passed, it moved onto the top limb.

At maximum eclipse, around 11am, the bite into the Sun was quite sizable, but most of the Sun was uneclipsed, as it only reached about 30% at maximum, here. Further North and West, it was just over 50%, but nowhere in the world was it total, as it was one of those eclipses where the total shadow misses the Earth!

Unfortunately, there were very few sunspots on the Sun, although one new, fairly large, spot was not far from the eclipsed part. As usual, near the end of the eclipse, around 11:46 am, the cut out of the Sun was still fairly large, but it was shrinking fairly rapidly during the last few minutes. I could see this in real time, in the last few minutes of it, seeing the eclipse shrinking and flattening out against the limb!

By an amazing coincidence, there was a partial Solar Eclipse exactly 19 years ago, on 29 March 2006! I often find that other previous eclipses are either on the same date, or else, very close to it! A similar situation occurs with Lunar eclipses, which are often on, or around, 16 September; this year, the second lunar Eclipse is on 8 September!

The current period of time is a prolific period for solar eclipses, what with this one, and next year on 12 August, when there is a really big 92% eclipse visible (the largest seen in the UK since 1999). Finally, to top that off, there is yet another eclipse in August 2027!

Solar and Lunar Eclipses compared – Posted 31 March

Solar eclipses always occur at a New Moon whereas Lunar eclipses always occurs at a Full Moon.

Solar eclipses are caused by the Moon casting its shadow on the earth whereas Lunar eclipses are caused by the earth casting its shadow on the Moon.

Totality at a solar eclipse is always brief, lasting anything from a few seconds to an absolute maximum of 7 ½ minutes whereas Totality at a lunar Eclipse often lasts well over one hour.

Lunar eclipses are rarer than solar eclipses but, as the Earth's shadow is much larger, it means that they last far longer, and can be seen from a much larger area of the earth, than a solar eclipse. If a lunar eclipse is occurring, you can see it from your location, provided the Moon is up, and the sky is clear.

Depending on one's location, one can see a lunar eclipse from beginning to end, or else only see part of it. In the case of this year's two visible lunar eclipses, there are differences. For the one on 14 March, only the start of it could be seen, before Moonset. In the case of the 7 September one, the Moon rises during the eclipse.

Solar eclipses are seen less frequently at any given location, because the Moon's shadow is much smaller than that of the earth. Thus, the Sun can be visible from your location, but you can easily find yourself outside the path of the Moon's shadow, in which case you won't see the eclipse.

It can be seen that solar and Lunar eclipses usually come in pairs, about two weeks apart, as was the case, this month. This is because eclipses can only occur when the Earth's orbit reaches a "Node". As the Moon takes two weeks to grow from New Moon to Full Moon, it is often still near a node, when the second eclipse occurs.

Partial Solar eclipses are far more commonly seen from a given location than a total solar eclipse.

Partial Lunar eclipses are rarer than total lunar eclipses!

In all, I have now seen 31 lunar eclipses, but only 14 solar eclipses, over the same period of time, from about 1971, to the present day!

Object of the month - Aurora- Martin Howe

Last month we had Sarah Matthews from MSSL/UCL join us for our March monthly meeting and give us a talk about our Sun. This talk included aspects of solar activity such as sunspots, the heating of the corona, solar flares and coronal mass ejections (CMEs). These latter two types of activity can have far reaching effects on us here on Earth, some 150 million kilometres away. These events can release highly energetic streams of particles from the Sun that, if directed towards us, can enter our atmosphere, and are channelled down the Earth's magnetic field lines towards the magnetic poles. These energetic particles excite atoms in the atmosphere, shifting electrons to higher energy levels. When these elections then drop back to lower energy levels, they release that extra energy as light, giving us the characteristic glow of the aurora. Different atoms will release different wavelengths of light resulting in very specific colours. Our atmosphere is comprised mostly of oxygen and nitrogen, but the colour will also depend upon the atmospheric height at which these atoms were energised. Red and green colours will come from excited oxygen atoms at higher and lower atmospheric altitudes respectively. Pink, blue and purple colours will come from excited nitrogen atoms at higher and lower atmospheric altitudes respectively

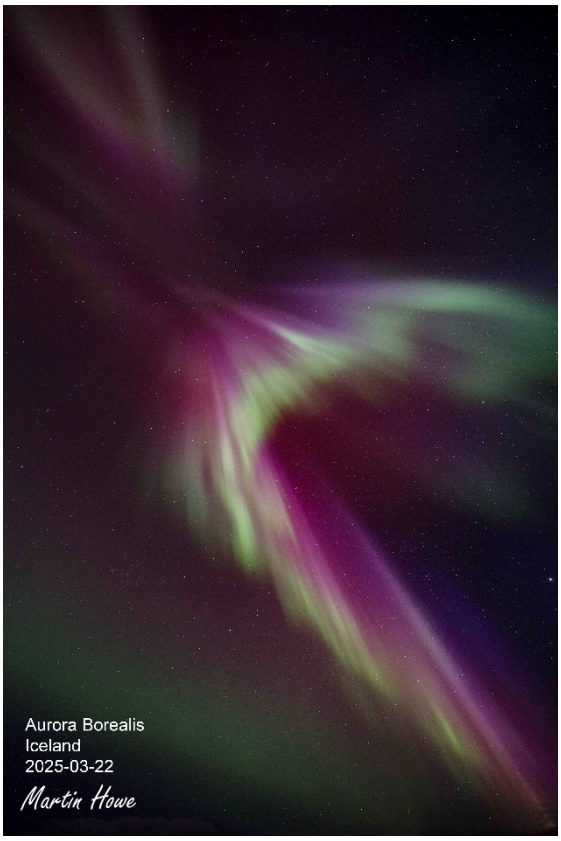
Unfortunately, the human eye is not very sensitive to colours at low light levels, and so a weak aurora will often appear a dull grey colour, but potentially with a hint of the typical colours noted above. During the auroral storm of May 2024 I did see quite a distinct, if not pale, red-pink shade to the naked eye as seen from London.

However, camera sensors are much better at detecting the colours of the aurora than humans, and even a mobile phone camera can easily detect these. If you suspect you might be seeing an aurora, simply point your phone camera to the area and if it is glowing with colour then it is most likely an aurora. However, to get the best results, get away from any direct source of artificial light, and use a tripod (or steady yourself against a ledge or wall) and take photos with varying exposure times – even an exposure of a few seconds should reveal amazing results. Similarly, if you have access to a DSLR with a wide-angle lens, put the DSLR into manual mode. Initially select some settings like ISO 800, and an exposure of 5 seconds, with the aperture open as far as the lens allows. I suggest you also set the focus to manual and try to focus initially on a very bright star, using the magnified "live view" screen if the camera has this feature. Then experiment with the exposure settings to get the best result.

We also heard from Sarah that the Sun is now at its peak of the 11-year solar activity cycle, which means the aurorae are more active than otherwise. Also due to the geometry of the Earth in its orbit, aurorae are more frequent around the equinoxes. Hence April 2025 may be the last real good month for aurorae in this cycle (although predicting the exact peak of the solar cycle is not an exact science, and so the September equinox may also prove to be fruitful for aurora hunters). Of course, aurorae can be seen at any time of the year, and the two big auroral storms that were visible from London last year were in May and October. Although, as we know, visible aurora as far south as the latitudes of London are very rare, and so to boost your chances, then a trip to more northern latitudes would improve your chances.

Although predicting exactly when an aurora will occur is also not an exact science, a bit like the terrestrial weather, reasonable forecasts (but with no guarantees!) are possible up to a

few days ahead, based upon the fact that this is the typical time it would take for a solar flare or CME to reach Earth (if it was in fact directed towards us). There are a number of apps that can provide useful predictions, but also real time alerts if an aurora is currently active. Some of the more popular ones include Space Weather, Aurora Watch UK and the Glendale App.



The photograph above left was taken during the auroral storm of 10 May 2024 from my back garden in Southfields, London. It was taken with a Canon 5D mk III DSLR with a 14mm lens, using an exposure time of 6 seconds, aperture of f/2.8, and ISO 400. It clearly shows the different colours of nitrogen and oxygen, from reds to pinks to purples to greens.

The photograph on the right was taken on a recent trip to Iceland – same camera and lens but exposure 10 seconds at ISO 800 (this event was recorded as a KP6 so was not as strong as the London event, which was KP9. The KP Index is a measure often used to signify the intensity of the auroral activity, on a scale of 0 (weak) to 9 (extreme)).

Happy hunting!

NGC1501: A beautiful planetary nebula – John Pillar

NGC1501, or Oyster Nebula, is a beautiful planetary nebula in Camelopardalis – the Giraffe constellation. Located 4200 light years from us, it was discovered by William Herschel in 1787. The expanding body of hydrogen, nitrogen and other gases is illuminated by a hot stellar wind from a central star – a celestial pearl in a blue-green shell, and has been modelled as an irregular lobate ellipsoid filled with bumpy, bubbly internal structures. I chanced upon NGC1501 on a recent clear evening – it was nicely located in the sky, above the roof tops and trees, so I setup and captured 31 images, each 5 minutes long. After processing the images, here's the result (Figure 1).

Figure 1 NGC1501, Camel's Eye or Oyster nebula. A planetary nebula in Camelopardalis

You may be able to make out the irregular internal structure, and see the central star, which has a visual magnitude of around 14.

Reading about NGC1501, I found that there's more to this nebula than first realised. The central NGC 1501 star exhibits a spectrum characterised by very hot temperatures and an atmosphere rich in ionised nitrogen and oxygen and carbon rich dust. It has a spectral type similar to a Wolf-Rayet star … a relatively rare type of star – rare because they live fast and die young, maybe only a few hundred thousand years – a blink of an eye in the cosmic timescale. They are generally massive stars that have used up their main supply of hydrogen, gone through a super-giant stage and subsequently collapsed, continuing to fuse He and heavier elements in their core. They shed vast quantities of material by a strong stellar wind. Ultimately the star will explode as a spectacular supernova. Wolf Rayet stars are important contributors of heavy elements to interstellar space.

Unusually for a planetary nebula, the central star exhibits rapid changes in brightness, varying dramatically and irregularly over a period of a few minutes. GAIA data suggest the central star is possibly part of a binary system with another Wolf Rayet star, a neutron star or

a black hole. In a seemingly stable and unchanging night sky it always amazes me to find objects that vary on the scale of a human time-scale, even over a period of minutes – so I decided to try to detect changes in the brightness of the central star.

During the first night of imaging I had taken 31 images, 5 minutes apart, but to detect any periodicity I decided that it might be better to have more images of the central star, so a second night of imaging resulted in 110 images of 2 minutes. Each frame was star-aligned using Siril, and using some Python code, the brightness of the central star, 3 nearby stars and an area of background sky were extracted to use for calibration – basically to try to remove any systematic variation in brightness caused by my neighbour's security lights, high altitude clouds etc.

Figure 2 shows the calibrated brightness of the central star on a time scale of minutes – you can see how it shows variations in brightness, displaying 4 or 5 peaks and troughs over a period of about 4 hours.

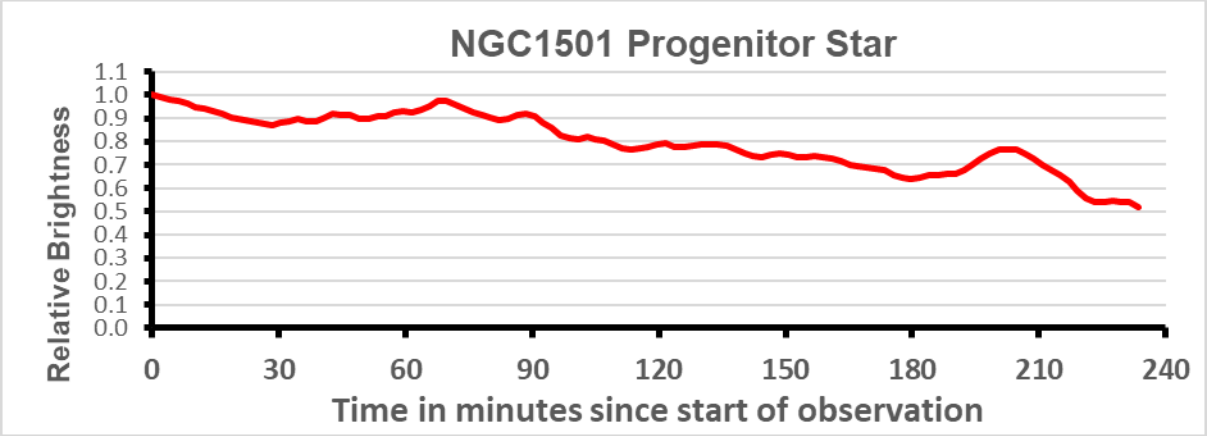


Figure 2 Brightness variation of the NGC1501 central star. Relative to the first image

Fourier analysis is a fab way to get at hidden cyclicity in data – FFT as it is often known, breaks a varying signal like the brightness of the star into its constituent waveforms to reveal any dominant frequencies.

The data-analysis tool in Excel provides a neat way to perform FFT analysis on data – here's the result (Figure 3 below).

The input data is very noisy, and the analysis would benefit from many more samples taken over a longer time period than 4 hours, but the analysis shows a peak frequency with a period of about 21 minutes. This is the strongest frequency component "hidden" in the brightness variations shown in Figure 2.

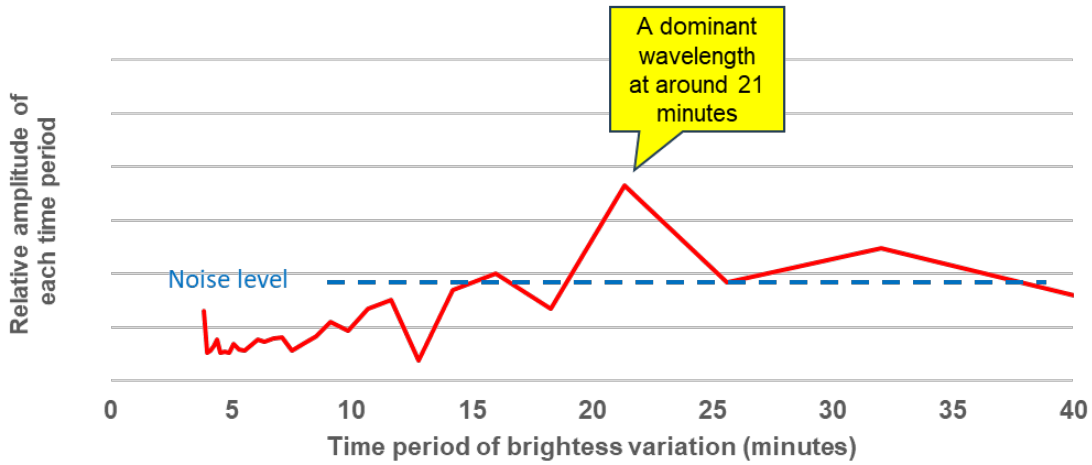


Figure 3 Dominant frequency analysis of the brightness variation with time of the central star. There appears to be a dominant period of about 21 minutes

Despite a very short imaging session, and very noisy data, this result is in line with published research on the NGC1501 star. Researchers have published several papers on NGC1501…. Bond etal 1996, imaged the central star for a two-week period, and concluded that the star's brightness varies in a very complex cycle, but that there is a dominant spacing of 22.3 minutes – consistent with this observation.

Modern spacesuits have a compatibility problem. Astronauts' lives depend on fixing it

Acknowledgement: This article was written by Berna Akcali Gur, Lecturer in Outer Space Law, Queen Mary University of London, and was first published in THE CONVERSATION on 25 March 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/modern-spacesuits-have-a-compatibility-problem-astronauts-lives-depend-on-fixing-it-252935*

Suni Williams and Butch Wilmore, the NASA astronauts who were stuck on the International Space Station (ISS) for nine months, have finally returned to Earth.

Spacesuits were an important consideration that NASA had to factor into its plans to bring the astronauts back home. Wilmore and Williams had travelled to the ISS in Boeing's experimental Starliner spacecraft, so they arrived wearing Boeing "Blue" spacesuits.

Following helium leaks and thruster (engine) issues with Starliner, Nasa decided it was safer not to send them back to Earth on that vehicle. The astronauts had to wait to return on one of the other spacecraft that ferry crew members to the ISS, the SpaceX Crew Dragon.

This meant they needed a different type of spacesuit, made by SpaceX for use in its vehicle only. Boeing's suits cannot be used in Crew Dragon in part because the umbilicals (the flexible "pipes" that supply air and cooling to the suit) have connections and standards that don't work with the ports inside a Crew Dragon.

This highlights a general problem for the growing number of space agencies and companies sending people into orbit, and for planned missions to the Moon and beyond. Ensuring that different spacesuits are compatible, or “interoperable”, with spacecraft they weren’t designed to be used in is vital if we are to protect astronauts’ lives during an emergency in space, especially in joint missions.

The spacesuits worn during a return from space are called “launch, entry and abort” (LEA) suits. These are airtight and provide life support to the astronauts in case there is a decompression, when air is lost from the cabin.

Unfortunately, a decompression has already caused loss of life in space. During the Soyuz 11 mission in 1971, three Soviet cosmonauts visited the world’s first space station, Salyut 1. But during preparations for re-entry, the crew cabin lost its air, killing cosmonauts Georgy Dobrovolsky, Vladislav Volkov and Viktor Patsayev, who were not wearing LEA suits. All cosmonauts wore them after this incident.

As well as the connections for life support, the Boeing and SpaceX suits also have restraints and connections for communications that are specific to each vehicle. For their return home from the ISS in a SpaceX capsule, Williams was able into use a spare SpaceX suit that was already aboard the space station and the company sent up an additional suit on a cargo delivery for Wilmore to wear.

Two spacecraft are usually docked at the ISS as “lifeboats” to evacuate the astronauts in the event of an emergency. These are generally a SpaceX Crew Dragon and a Russian Soyuz capsule.

If an emergency evacuation were to occur and there weren’t enough of the right spacesuits available – for either the Crew Dragon or Soyuz – it could endanger astronauts during the fiery re-entry through Earth’s atmosphere. Interoperability between spacesuits has therefore become a matter of survival.

The Outer Space Treaty, which provides the basic framework for international space law, recognises astronauts as “envoys of humankind” and grants them specific legal protections. These were expanded on in subsequent UN treaties – notably the Rescue Agreement, which imposes a range of duties on states to render assistance to each other’s astronauts in cases of emergency, accident or distress.

For the ISS, a collaborative space programme with international flight crews, protocols include terms that set forth how this obligation is to be met. However, these protocols do not contain terms relating to spacesuit interoperability.

Risks to astronauts in space

A major potential cause of an emergency evacuation is space debris. The ISS has regularly had to manoeuvre to avoid collisions with debris – including entire defunct satellites.

In his memoir, Endurance, Nasa astronaut Scott Kelly describes being commanded to enter the Soyuz vehicle with two other crew members and prepare to detach from the ISS

because of a close approach by a large defunct satellite. Luckily, the spacecraft passed by harmlessly.

As orbits become increasingly congested, with an exponential increase in the number of space objects being launched, the risk of collisions will also increase.

Ever more companies and governments are entering the human spaceflight arena. The Tiangong space station, China's orbiting laboratory, has been fully operational since 2022, and there are plans to open it to space tourism, just like the ISS.

India is planning to join the community of nations with the capability to launch humans into space, under a programme called Gaganyaan. And while most space travellers remain government-funded astronauts, the number of private space-farers is increasing.

Billionaire Jared Isaacman (who is President Trump's nominee to run Nasa) has commanded two private missions into orbit using Crew Dragon. On the second of these, he participated in the first spacewalk by privately funded astronauts. The ISS is set to be retired in 2030 – but one company, Houston-based Axiom Space, is already building a private space station.

Against this complex and part-unregulated backdrop, ensuring the interoperability of different spacecraft systems, including spacesuits, will increase levels of safety in this inherently risky activity.

While the safety and practicality of spacesuits has always been the top priority, compatibility between different suits and vehicles should also be high on the list. This requires space agencies and private spaceflight companies to engage with each other in a process to agree on standard interfaces and connections for life support and communications, across all their suits and space vehicles.

Amid this period of increased commercialisation and competition between the organisations and companies involved in orbital spaceflight, a move toward greater collaboration can only be a good thing.

Up Next:

NEXT MEETING: 8pm Friday 11 April – Nonsuch High School

Martin Howe will talk about the Formation of planetary systems.
There will also be a presentation from Martin 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 29 April.

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 27 April to 3 Mayl

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