JANUS
THE NEWSLETTER OF EWELL ASTRONOMICAL SOCIETY

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Editorial

Welcome to the July edition of Janus. This month's lecture – the last before our new season begins in September – will be given by George Seabroke from the Mullard Space Science Lab (MSSL) and will update us on the Gaia Spacecraft. Launched on19 December 2013, the spacecraft is located at the L2 Lagrange point and is creating a precise 3-D map of more than a billion astronomical objects. It is expected to cease operations next year, but perhaps George will tell us that its mission is being extended!

With the Summer solstice now behind us, nights will begin to lengthen, although they should (hopefully) remain mild, allowing more time for observations before it starts to get cold. Personally, I'm heading South into rural France next month where it should be even warmer, the nights a little longer and, more importantly, the skies will be darker. Sadly, I can't predict whether they will be clear!

The excitement of last month's Aurora is also behind us, although the Sun remains very active, and probably will be for some time. Discussion of the wider effects of the geo-magnetic storm that gave rise to the Aurora and associated phenomena is also very much alive. With this in mind, I have devoted around a third of the newsletter to a collection of pieces which I have grouped together under the heading "SOME REFLECTIONS ON THE AURORA". I hope you will find them of interest.

Finally, as noted at the start of my editorial, there will be no meeting in August. In previous years, we have held a picnic. There may or may not be one this year, so look out for any announcement. In the meantime, happy holidays!

John

The Solar System July

MERCURY: begins the month having recently passed behind the Sun at superior solar conjunction./. It will be difficult to see, reaching its highest point in the sky during daytime and being no higher than 3° above the horizon at dusk. By the end of the month, having passed greatest elongation E, it will be extremely difficult to see, reaching its highest point in the sky during daytime and being 4° below the horizon at dusk.

VENUS: recently passed behind the Sun at superior solar conjunction and begins the month not readily observable, being very close to the Sun, at a separation of only 7° from it. Visibility does not improve as the month progresses and, by the end of the month it remains difficult to see, reaching its highest point in the sky during daytime and being only 1° above the horizon at dusk.

MARS: is currently emerging from behind the Sun. It begins the month visible in the dawn sky, rising at 01:49 BST – 2 hours and 57 minutes before the Sun – and reaching an altitude of 15° above the E horizon before fading from view as dawn breaks at around 03:38. By the end of the month, it is visible in the dawn sky, rising at 00:44 (BST) and reaching an altitude of 31° above the E horizon before fading from view as dawn breaks at around 04:24.

JUPITER: begins the month having recently passed behind the Sun at solar conjunction. It is visible in the dawn sky, rising at 02:47 BST – 1 hour and 59 minutes before the Sun – and reaching an altitude of 11° above the E horizon before fading from view as dawn breaks at around 04:18. By the end of the month, emerging from behind the Sun, , it is visible in the dawn sky, rising at 01:08 BST and reaching an altitude of 32° above the E horizon before fading from view as dawn breaks at around 04:56.

SATURN: begins the month emerging from behind the Sun. Visible in the dawn sky, it will rise at 00:12 BST and reach an altitude of 26° above the SE horizon before fading from

view as dawn breaks at around 03:41. By the end of the month, it becomes accessible around 23:34, when it reaches an altitude of 11° above the SE horizon. Reaching its highest point in the sky at 03:44, 32° above the S horizon, it will be lost to dawn twilight around 04:28, 31° above the S horizon.

URANUS: recently passed behind the Sun at solar conjunction. It begins the month difficult to see, reaching its highest point in the sky during daytime and being no higher than 2° above the horizon at dawn. By the end of the month, emerging from behind the Sun, it is visible in the dawn sky, rising at 00:13 BST and reaching an altitude of 29° above the E horizon before fading from view as dawn breaks at around 03:34.

NEPTUNE: begins the month emerging from behind the Sun. It will be difficult to see, reaching its highest point in the sky during daytime and being no higher than 18° above the horizon at dawn. By the end of the month, it is visible as a morning object in the dawn sky, rising at 22:27 BST and reaching an altitude of 36° above the S horizon before fading from view as dawn breaks at around 03:34.

MOON PHASES:

Last Quarter	28 June
New Moon	5 July
First Quarter	13 July
Full Moon	21 July
Last Quarter	28 July

Notable Events:

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

July

1 Comet 13P/Olbers reaches peak brightness
Close approach of the Moon and Mars
The cluster IC 4756 is well placed

2 Neptune enters retrograde motion
Close approach of the Moon and M45

3 Conjunction of the Moon and Jupiter

5 The Earth at aphelion

6 The Moon at perihelion
1 Ceres at opposition

7 Conjunction of the Moon and Mercury

9 The Great Peacock Globular Cluster is well placed
Mercury at highest altitude in evening sky

10 Venus at perihelion

12 The Moon at apogee

14 Lunar occultation of Spica

15 Close approach of Mars and Uranus

17 Lunar occultation of Antares
Messier 55 is well placed

18 Mercury at dichotomy

20 The Moon at aphelion

22 Mercury at greatest elongation east

23 134340 Pluto at opposition

24 The Moon at perigee
Close approach of the Moon and Saturn
Lunar occultation of Saturn

25 Close approach of Moon and Neptune
Lunar occultation of Neptune

27 Mercury at aphelion

28 Piscis Austrinid meteor shower 2024

29 Close approach of the Moon and M45

30 Southern δ-Aquariid meteor shower 2024
α-Capricornid meteor shower 2024
Close approach of the Moon and Mars
Close approach of the Moon and Jupiter

31 Lunar occultation of Beta Tauri

August

5 Conjunction of the Moon and Venus

6 Conjunction of the Moon and Mercury
The Moon at perihelion
Asteroid 16 Psyche at opposition
Asteroid 7 Iris at opposition
Conjunction of Venus and Mercury

9 The Moon at apogee

10 Lunar occultation of Spica

12 Perseid meteor shower 2024

13 Messier 15 is well placed

14 Lunar occultation of Antares
Close approach of Jupiter and Mars
Messier 2 is well placed

17 κ-Cygnid meteor shower 2024

18 The Moon at aphelion

19 Mercury at inferior solar conjunction

21 Close approach of the Moon and Saturn
Lunar occultation of Saturn
The Moon at perigee
Lunar occultation of Neptune

26 Close approach of the Moon and M45

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

28 Close approach of the Moon and Mars

31 Aurigid meteor shower 2024

Collected Observations (and thoughts) – Gary Walker

SpaceX Satellite Constellation – Posted 9 June

Whilst having a night of observation, and glancing up at the sky, I just caught a pale, straight, trail of light with my naked eye. With my 11X 80 binoculars, it resolved into a beautiful long trail of satellites! There were about 8 of them in all, and they appeared blue in colour. They were all close together like a string of pearls!

I have only seen a sight like this once before. Yesterday, a SpaceX launch took place, so the satellites had obviously not yet had time to spread out.

Unfortunately, I only saw them after they had passed the zenith, so I didn't have long in which to observe them. Nowadays, there seem to be rocket launches virtually every day!

China has recently managed to land another probe on the far side of the Moon. And the Boeing Starliner rocket has
finally, successfully, been launched, too!

SpaceX rockets are recyclable, and I have watched many launches on my phone. After launching, the first stage lands back on Earth, either on a ship, or on land, itself, only about 8 minutes later!

The live feed shows two views, one from the descending first stage to its landing, and the other, of the second stage, with views of Earth, in the background.

It is particularly good, when there is a camera on the rocket taking off, as you can see the ground receding, followed by the coast of California, or wherever it is launching from!

On this night, I observed some of the Southern Deep Sky objects in Scorpio and Sagittarius, such as M4, M80, M17 and M22. M22, was easily resolved into stars with my telescope and, at a magnification of 222X, it appeared like a loose, open star cluster!

M17, the Swan Nebula, showed up well, especially with the Oxygen 111 filter, as an object with two "arms".

I also observed the planetary nebula of NGC 6781, in Aquila. This could only be seen with the use of the Oxygen 111 filter and, even with this filter, it appeared as a dim, but fairly "large" fuzzy disk.

I find that this Oxygen 111 filter is very useful for enhancing the views of nebulae, particularly planetary nebula. Without the filter, some are invisible, or nearly so, such as the ones described above, as well as M97, in Ursa Major, and NGC 2438 in Puppis.

Another Big Sunspot Group – Posted 16 June

In Mid-June, another big Sunspot Group crossed the Sun, with numerous umbrae and penumbra. This was just visible to the naked eye (with a filter of course!). In my 10 X 50 binoculars, it was easily visible, with several of the bigger spots easily seen!

Incidentally, the "Aurora" Spot group survived to make another crossing of the Sun, unfortunately, this time, without producing any Aurora!

Dr Lilian Hobbs – Posted 16 June

Having attended the monthly meeting on 14 June, I have just realised that I have got a book by Dr Lilian Hobbs, called "The ETX and LX90 - ACF Telescope Guide", which is a book on how to use all GOTO Meade ETX and LX90 - ACF telescopes! It was published back in 2008, and I bought it at the 2010 Astofest!

Moon-Spica Conjunction in Daylight – Posted 16 June

Early this evening, at about 6:40 pm, I saw the star Spica, close to the gibbous Moon, in full daylight! Both were easily seen in the same of view in my telescope at 62X and 100X. Spica was just to the SW of the Moon.

The Moon actually occultated the star, in NE Scandinavia and Western Russia. As Spica is only about 2 degrees from the Ecliptic, it means that the Moon can often occultate it. Other stars that can be occultated include Antares, Regulus and Aldebaran.

This is not the first time that I have seen stars in daylight, but it is obviously much easier

when a star is close to the Moon. Clearly, it is the brightest stars that are likely to be seen! It is really bizarre to see a star as a brilliant spark of light in a deep blue sky, but I have seen it in the past!

Spica is one of the brightest stars at magnitude 1.04, and is the brightest star in the constellation of Virgo.

By about 9.55pm, Spica was around ¾ of a degree to the West of the Moon, so the motion of the Moon was certainly very obvious over a 3-hour period!

Noctilucent Clouds starting – Posted 24 June

Early on the morning of 20 June, around 3am, I saw the first display of the Notilucent Clouds this Summer. However, they were not very bright!

Late in the evening of 23 June, around 11pm, I saw a better display of them, with some dark terrestrial clouds to the South of them. As usual, the star Capella, was in the middle of them. This star is circumpolar, so it never sets. The Noctilucent Clouds consisted of bands and streaks. Sadly, however, the less interesting earthly clouds soon appeared, and blotted out this display!

The low Moon in the Summer – Posted 24 June

I have seen that the Full Moon has been very low, in the Southern sky. This is because, at this time of the year, the Earth is tilted towards the North. It has been so low down, in fact, that it can be difficult to see well from my garden, (although I can still see and observe it). It first appears very low in the SE, and then just appears to crawl along just above the southern horizon (or rather, the horizon, above the trees and houses!).

Being low down means that the "Moon Illusion" is particularly noticeable, when a Full Moon appears larger than it really is (No, not the so-called "SuperMoon"!).

Conversely, in the Winter, the Moon can be nearly overhead in the sky!

Currently, the Moon is only reaching an altitude of about 12 degrees in the Southern sky. My horizon limit to the South is about 9 degrees – hence its proximity to the horizon.

The "Aurora" Sunspot is back! – Posted 25 June

The large Sunspot that produced the great Aurora of 10-11 May has now come back onto the Earth facing side of the Sun, for its 3rd passage across it! It is rare, for Sunspot groups to survive multiple passages around the Sun, as they generally decay!

Whether there will be a repeat performance with the Aurora, is unknown! As usual, with Astronomical events, timing is everything. The spot must produce a large flare at the right time, a Coronal Mass Ejection must reach the Earth, and not miss it, and, of course, the weather needs to cooperate, in order to see it! On 10 May, all of these things came together at the right time and in the right order!

Lack of planets in the sky – Posted 25 June

Astronomers are all too aware that Planets are currently conspicuous by their absence, and are what, astronomers term, "badly placed". They are now all in the morning sky, and very low down, just before the dawn!

Many planets come around quite quickly from solar conjunction, such as Jupiter or Saturn, but others like Mars, are particularly awkward! I have not seen Mars since 20 June last year, so it's a whole year since I last saw it! At that time, it was in the evening sky, losing its battle with the sunset glow! When this happens, it always spends months in the solar glare, and only gradually, like now, does it start inching its way out of the dawn glare, before eventually reaching a decent altitude!

Even if it is observed now, it only has a small angular size of about 4.8' degrees, which is not much bigger than Uranus! However, in these days of even amateur astronomers having advanced equipment, some images have already been taken of Mars, which show some features such as Syrtis Major, and others! Damien Peach is the outstanding planetary imager, producing fine planetary images that far exceed the Professional Astronomical photographs of the

1950's, and later. Others are now following in his footsteps!

For purely visual observation, there is little to see on its tiny disk. Events do, however, speed up over time, as the next Opposition approaches.

In all, Mars is usually visible for about one year, but the best period around Opposition only lasts a couple of months or so. Then it shrinks down in size again, for another year-long period in the doldrums!

Noctilucent Clouds again! – Posted 29 June

Late yesterday evening, I saw another display of Notilucent Clouds. Unlike the first two displays, this one was extremely bright, perhaps about the brightest that I have ever seen! It was very bright from about 10.50pm to at least 11.20pm but faded considerably by 11.40pm.

It consisted of numerous bands and streaks, with one long ribbon, or band, being much brighter than the rest of them.

They are, however, unpredictable and, on the last few clear nights, there has been no sign of them!

Incidentally, news media were saying that there was a chance of seeing the Aurora again, and had given out a red alert, but later changed it to an amber alert! I looked for this also, and tried to pick up any auroral colours with my camera, but failed to detect anything!

Although it was fairly low down in the Northern sky, this display was just high enough to see some of the clouds. There seemed to be a lot of them lower down in the North, too.

As I stated, the clouds disappeared after about 11.40pm, but I saw them again around about 2am this morning. These were lower down, so only a bit of them was visible above my Northern treeline.

Saturn virtually edge-on – Posted 30 June

I finally managed to see Saturn again, after a 5-month hiatus and, in my telescope, the rings now appeared edge-on! They showed up as two bars, or lines, of light, from either side of Saturn's disk, also extending across the disk of Saturn as a thin line, like a belt upon it!

The sight was, however, still quite beautiful, and it is also quite a rare one to see! Such edge-on events only occur every 15 years. That said, the actual edge-on event doesn't actually occur until next year!

The rings are now just under 2 degrees. Last January, which was when I last saw Saturn, the rings were significantly more open at 9.2 degrees!

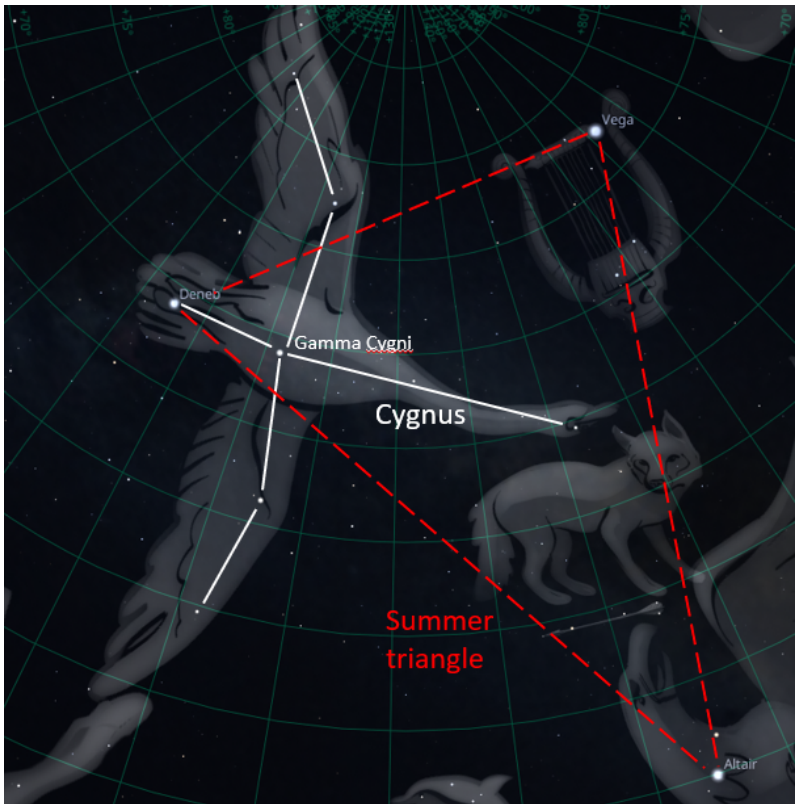
The changing tilt of the rings is only down to the changing positions of Earth and Saturn. At the true edge-on events, the rings actually disappear from view, especially in small telescopes! This is because the rings in the ring system, whilst being wide, are only a few tens of metres in thickness, so are extremely narrow!

The great Galileo first noted appendages to either side of Saturn, but his telescopes did not have a good enough resolution to work out what he was actually seeing! It took until later in the 17th century, for Christiaan Huygens, who had a much better telescope, to be able to make out their true nature!

Object of the Month – Gamma Cygni (Sadr) – Martin Howe

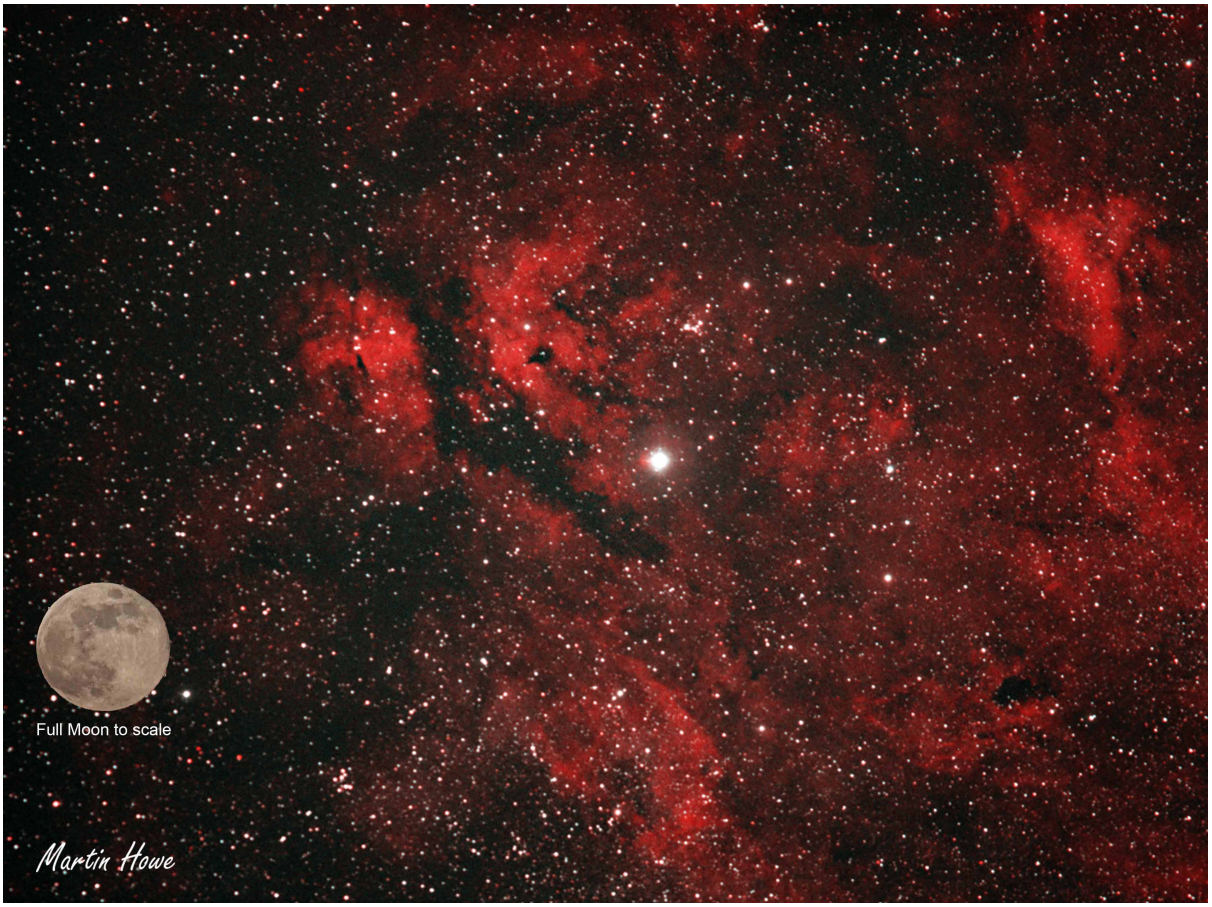
With the summer solstice having just passed the month of July is still difficult for any deep sky astrophotography. June never gets truly dark in astronomical terms, which is when the Sun sinks lower than 18^{o} below the horizon. July only fares a little better, with true astronomical darkness beginning to occur from the 21st of July. Hence deep sky imaging really only begins to be an option in late July, and even then, only for a relatively short period each evening. However, for the night owls who are prepared to stay up there are a large number of objects to see and image in the summer skies.

The constellation of Cygnus (the swan) is one of the more prominent summer constellations and contains a large number of stunning deep sky objects. By the end of astronomical twilight in late July Cygnus is already over 45^{o} high in the eastern sky. The constellation is easily located, either directly by the bright stars that make up the distinctive shape of what is also referred to informally as the Northern Cross, or, alternatively by reference to its brightest star, Deneb, which makes up one of the corners of the Summer Triangle, along with the other prominent summer stars, Altair and Vega – see the image from Stellarium below.



The object this month is the nebulosity surrounding the star gamma Cygni (Sadr), which sits at the centre of the swan. Sadr is itself a magnitude +2.2 supergiant star with a radius of 150 times that of our Sun and is 33,000 times brighter. If we placed Sadr where our Sun is the surface would be about the same position as the orbit of Venus! Sadr is surrounded by a large area of nebulosity, which, unlike many other nebulae, does not have an imaginative or evocative name, but rather just simply the “Sadr region” or “gamma Cygni nebula”. It also goes by the formal catalogue number of IC1318. This nebula is huge – stretching over an area at least 3^{o} x 2^{o}. This would make it impossible to image the entire region within the narrow field of view of a telescope and so this is where standard camera lenses come into their own for astro-imaging, either attached to a DSLR from a dark sky site, or better still, using a dedicated astro-camera with narrowband filters.

The image below was taken from my garden in London, using a 100mm f/2.8 Canon camera lens attached to an ATIK CCD camera. I used narrow band filters, taking 7 x 10-minute exposures through an Ha filter, and 4 x 10-minute exposures through an OIII filter, and combined these to create the composite image below. The image has had the full Moon superimposed onto it to give a sense of scale of the area (the Moon would not normally appear in this region of the sky!). Unfortunately, our eyes are not sensitive enough to the very faint emissions from these types of objects – if they were, this (and other large nebulae) would be a breathtaking sight to see!



SOME REFLECTIONS ON THE AURORA

Editor's Note: The following pages contain a collection of items, put together by the editor, from a variety of sources, which I hope members may find of interest. Sources are acknowledged as appropriate.

The Sun is reaching the peak of its activity – here's how that could cause more auroras and solar storms

Acknowledgement: This article was written by Ian Whittaker, Senior Lecturer in Physics, Nottingham Trent University, and was first published in THE CONVERSATION on 6th June 2024. 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/the-sun-is-reaching-the-peak-of-its-activity-heres-how-that-could-cause-more-auroras-and-solar-storms-229967*

Many more people around the world than normal were recently able to see the northern and southern lights overhead with the naked eye. This unusual event was triggered by a very strong solar storm, which affected the movement of the Earth's magnetic field.

The Sun is reaching the maximum point of activity in an 11-year cycle. This means that we can expect more explosive outpourings of particles. In the right circumstances, these are what ultimately generate the pretty auroras in the sky, as well as the geomagnetic storms that can damage infrastructure such as power grids and orbiting satellites.

So what is actually going on to cause these phenomena? The northern and southern Lights are usually confined to very high and very low latitudes. High-energy particles from the Sun flow toward the Earth, guided by the solar magnetic field. They are transferred onto the Earth's magnetic field in a process known as reconnection.

These really fast and hot particles then go sprinting down the Earth's magnetic field lines – the direction of force from a magnet – until they hit a neutral, cold atmospheric particle like oxygen, hydrogen or nitrogen. At this point, some of that energy is lost – and this heats up the local environment.

However, the atmospheric particles don't like being energetic, so they release some of this energy in the visible light range. Now, depending on which element is too hot, you will see a different set of wavelengths – and therefore colours – emitted in the visible light range of the electromagnetic spectrum. This is the source of the auroras that we can see at high latitudes and, during strong solar events, at lower latitudes too.

The blues and purples in the aurora come from nitrogen, while the greens and reds are from oxygen. This particular process happens all the time, but because the Earth's magnetic field is similar in shape to a bar magnet, the area that is energised by the incoming particles is at very high and low latitudes (Arctic circle or Antarctica in general).

So what happened to allow us to see the aurora much further south in the northern hemisphere?

You may remember at school sprinkling iron filings on a paper on top of a magnet to see how they line up with the magnetic field. You can repeat the experiment multiple times and see the same shape each time.

The Earth's magnetic field is also constant but can be compressed and released depending on how strong the Sun is. An easy way to think about this is imagining two half-inflated balloons pressed together.

If you inflate one balloon, adding more gas to it, the pressure will increase and will push the smaller balloon back. As you release that extra gas, the smaller balloon relaxes and pushes back out.

For us, the stronger this pressure is, the closer to the equator the relevant magnetic field lines are pushed, meaning auroras can be seen.

Exceptional storms

This is also where the potential problems come in: a moving magnetic field can generate a current in anything that conducts electricity.

For modern infrastructure, the biggest currents are generated in power lines, train tracks and underground pipelines. The speed of this movement is also important and is tracked by measuring how disturbed the magnetic field is from "normal". One such measure used by researchers is called the disturbed storm time index.

By this measure, the geomagnetic storms of May 10 and 11 were exceptionally strong. With such a strong storm, there is a potential danger for electrical currents to be induced. Power lines are most at risk, but have benefited from protections built into power stations. These have been in focus since the geomagnetic storm of 1989 which melted a power transformer in Quebec, Canada – causing hours of power outage.

More at risk are metallic pipelines which corrode when an electrical current is passed through them. This is not an instantaneous effect, but there is a slow build up of eroding material. This can have a very strong effect on infrastructure but is very hard to detect.

While currents on the ground are a problem, they are even more of a challenge in space. Satellites have a limited amount of grounding in them and an electrical surge can destroy instruments and communications. When a satellite does lose communications in this manner, it is referred to as a zombie satellite and is often lost completely – causing a very high loss of investment.

The changes in the Earth's magnetic field can also affect the light passing through. We can't see this change, but GPS style location system accuracy can be strongly affected, as a location reading depends on the time taken between your device and a satellite. The increase in electron density (the number of particles in the way of the signal), causes the wave to bend, meaning it takes a longer time to reach your device.

The same changes can also affect the bandwidth speed of satellite internet and the planet's radiation belts. These are a torus of highly energetic charged particles, mostly electrons, around 13,000km away from the surface. A geomagnetic storm can push these particles into the lower atmosphere. Here, the particles can interfere with high frequency (HF) radio used by aircraft and affect ozone concentrations.

Auroras aren't confined to Earth – plenty of planets have them and they can tell us a lot about the magnetic fields that exist on those celestial objects. A particular piece of apparatus used to simulate auroras is a "planeterella", first developed in the early 1900s by Norwegian scientist Kristian Birkeland.

A magnetic sphere (representing Earth) is placed in a vacuum chamber and the solar wind is simulated by firing electrons at the sphere. We have two of these instruments in the UK within universities and here at Nottingham Trent University I have recently helped a student build a budget version as a Masters project.

By altering the magnetic field strength, and the distance between objects, you can observe how auroras change. The emission is mostly purple, as you would expect in a 72% nitrogen atmosphere. A strong emission ring appears around the top, where the aurora would be seen on Earth, and this ring moves up and down in latitude depending on the magnetic field strength.

As a natural event, auroras are a marvel. But even better is that with every strong geomagnetic storm, we make improvements that help protect against the potential damage from future events.

Northern lights down south – Adrian Bourne

At over 75 you don't expect many excitements that you haven't had before, but 10 May 2024 proved to be one of the exceptions.

The northern lights have been an elusive fascination for many years. I had seen the pictures in books, and of course there have been many TV celebrity excursions to Iceland, the Arctic Circle, and Northern Scandinavia; you know the ones where there is beautiful scenery of snow and blue skies, and night-time footage searching for the Aurora day after day. It always seems to happen on the last night when they've given up hope of seeing it, but then the celebrity is immersed in wonderful blue, green and red waves of colour and flowing curtain effects. It looks magical and indeed has been magically unattainable all my life.

A few years ago, we took a Christmas cruise from Kirkenes at the northern tip of Norway down the West Coast for a week with Hurtigruten. There was no guarantee of seeing the Aurora. There was a special alert on your phone in the cabin so that you could be woken up if the northern lights were spotted. The nights were, of course, long with the sun not rising at all on the northernmost part of the voyage. But the alert didn't ring, no northern lights appeared. And we disembarked with photos in a book but no actual real-life Aurora experience. (had we done a two-week cruise we would have been a offered another week for the non-appearance but that was only if you had a north south return journey).

Back in UK, I noted there were special flights that circled northern climes, without actually landing, in which you could look out through those small aircraft windows and see the lights; they never sounded very convincing.

So it seemed the only hope would be one day to be in Scotland or Northern England on a clear night when there had been exceptional activity on the sun.

Down in Sutton near London, I regularly send my family the Internet alerts for possible Aurora sightings, especially to my daughter who lives in Suffolk, our most northerly family territory.
On 10 May in the morning, it was in fact my daughter who sent us a possible Aurora sighting for that night. Of course, it was going to be just one more in a series of no shows, wasn't it.

The forecast for the night was for clear skies. It seems to happen quite often when there is an astronomical society meeting! While we are listening to a lecture, the skies are clearing outside with reasonable observing conditions! The night of 10 May I couldn't attend the society because I was out on a football field overseeing grandson while his parents were away. At about 20:00 I

exchanged texts with our revered Janus editor (who he!) who told me that Ron advised there was "a massive CMA a couple of days ago which has led to the prospect of widespread Aurora". Expert information from the society's meeting. Standing on the touchline, I passed it on to one of the other footballers' parents who made the usual remark of incredulity "northern lights, they never come down to London, we'll never see them down here".

Back home, with a tired grandson off to sleep, I remembered the advice and went into the back garden at 22:30; it was indeed a clear night with good visibility of stars and no visibility of Moon; a warm night as opposed to those frozen winter viewing nights. By 23:00, having seen no sign of Aurora, I went back inside to go to bed. Having turned out the downstairs lights and gone upstairs I thought I'd have one last glance out of the back bedroom windows. I shall never forget the sight of that red band across the eastern sky. It was not the familiar glow of urban pollution from Croydon. There was no possibility of it being a reflection of the sunset by that time. It could only be the long-awaited Aurora.

I have rarely run down the stairs so swiftly, thinking it might be fleeting and I would miss it. But as my eyes grew accustomed in the back garden, there were shades of pink or red or purple bands across the sky. Colour streaks up above the rooftops, and I was able to get photographs using my Samsung Galaxy 10 in night mode. As they always say, cameras are far better at picking up the Aurora than the naked eye.

By this time the Ewell Astronomy WhatsApp had exploded starting from Pete S saying "everyone get outside now! Very bright aurora visible" and Sam "I've never jumped out of bed so fast in my life". I added my photos to the brilliant professional looking ones flooding in. I alerted the family hoping some of them might be awake and was delighted to see on our family WhatsApp photos of purple and yellow bands from my daughter in Suffolk.

It was an amazing experience following the colours round the sky and sharing experience by mobile phone with others. It was hard to know when to stop watching, the night was getting late, and I was pleased to see my feeling, confirmed by Pete S saying "they seem to have faded now". Caspar had gone back to make another coffee to replace his cold one! Later that night and the next morning we were able to savour the photos, amateur and professional, from all over the country and from other people who never thought they would see the northern lights this far south. The next day was Saturday, 11 May. Going out at the same time revealed no northern lights, but I was able to track 7 minutes of the ISS passing high overhead. No possibility of taking its picture as it traversed northern lights, but there was its constant speeding light…. so predictable, so precise.

What a contrast between the natural world and man-made; the natural world impossible to forecast exactly even with the experts following the activities on the sun - so amazing when actually you are lucky enough to see them. The man-made world predictable and precise - still amazing to witness even if somehow less magical.

How severe were the solar storms of 10-13 May and what was their effect? - Editor

The appearance of aurorae in geographic locations where they had seldom been seen before was a clear indication of the power of the solar storms of 10-13 May. But how powerful were they? Wikipedia suggests that the geomagnetic storm was the most powerful to affect Earth since March 1989. (See: *https://en.wikipedia.org/wiki/May_2024_solar_storms)* The G5-class storm is compared to other geo-magnetic storms by means of the disturbance storm time index (Dst index), which is a measure of the variation of the Earth's magnetic field strength used in the context of space weather. A negative Dst index means that Earth's magnetic field is weakened. This is

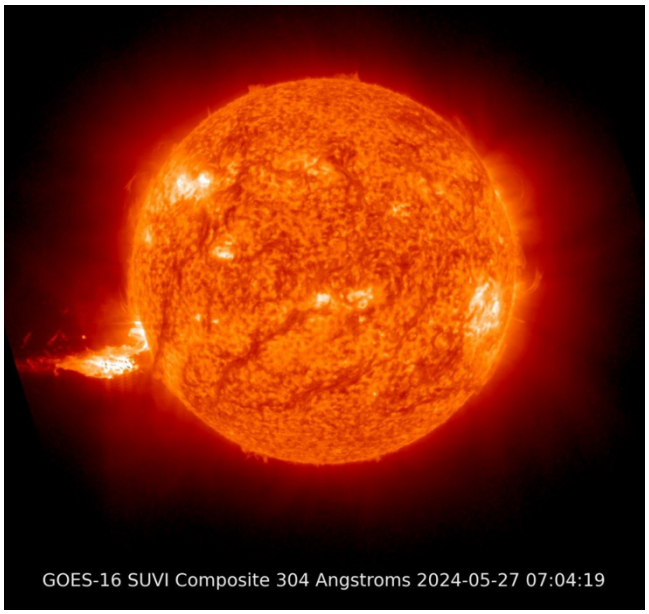
particularly the case during solar storms, with a higher negative Dst index indicating a stronger solar storm.

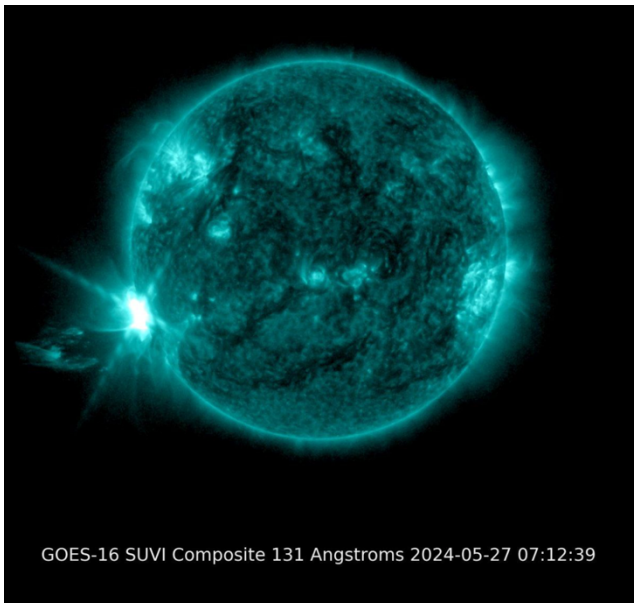
The 2003 Halloween solar storms had a peak Dst index of −383 nT (nano-tesla), although a second storm on 20 November 2003 reached −422 nT, but without reaching G5-class. The March 1989 geomagnetic storm had a peak Dst index of −589 nT, while the May 1921 geomagnetic storm has been estimated to have had a peak Dst index of −907±132 nT. Estimates for the peak Dst index of the Carrington Event superstorm of 1859 are between −800 nT and −1750 nT. The May 2024 solar storms reached a peak Dst index of −412 nT at 03:00 UTC on 11 May, putting it on a par with the 2003 Halloween storms – which did not reach G5 level – but behind the 1989 storm. For anyone interested in how many solar storms there have been over time, Wikipedia has a list (*https://en.wikipedia.org/wiki/List_of_solar_storms).*

It is worth noting that not all solar storms affect Earth. On 23 July 2012, there was an ultrafast CME. directed away from Earth with characteristics that may have made it a Carrington-class storm – a lucky escape for Earth, perhaps!

How long did activity last?

Intense solar activity continued well into May. The two images below, posted on Linkedin by Clementina Sasso, a researcher in solar physics at the INAF-Capodimonte Astronomical Observatory, Naples, were taken on 27 May by the SUVI instrument on the GOES-16 geostationary weather satellite located at 75.2 degrees W. SUVI (Solar Ultraviolet Imager) is an extreme ultraviolet (EUV) telescope which allows forecasters to monitor the sun's hot outer atmosphere (corona). Early warning from a SUVI observation of a solar eruption comes at least 15 hours before the associated CME arrives at the earth.





Impact of the storm

According to the South African National Space Agency (SANSA), a variety of impacts around the world were reported. (More detail at: *https://www.sansa.org.za/2024/05/the-mothers-day-solar-storm/)*. Examples included navigation and communication applications. SANSA confirmed High frequency radio blackouts. Elsewhere, one of the confirmed impacts of the storm was from SpaceX who announced that there was a degradation in their Starlink satellite internet service due

to the solar storms. Some while ago, Starlink reported losing several satellites when it launched its payload during a space weather event, which affected the drag on the satellites, causing them to re-enter prematurely.

SANSA also noted reports of precision agriculture being impacted during peak planting season in USA due to the impact of the storms on satellite navigation constellations.

Elsewhere, a colleague of the editor who is a vice president of a US company, Space Environment Technologies, experienced first-hand the effect of the storm on aviation.

On 10 May, he was on board a flight from San Francisco to Paris and was able to carry one of the company's radiation monitors. The flight is normally routed over Canada's Hudson Bay, across Greenland and down to Paris flying at 35,000-40,000ft while reaching latitudes >70°N. In this instance, however, the flight was diverted to lower latitudes because of poor radio communications resulting from the atmospheric disturbance caused by the storm.

A further consideration was the associated increased level of radiation to which passengers might be subjected. From the perspective of the radiation threat, the result was an exposure of 81 micro Sv, which is far less than the 200-300 micro Sv that might have been expected for the conditions during this flight if it had followed a normal higher altitude, high latitude route.

A downside of the re-routing was a predicted increase in flight time of some 1.5 hours. In the event, abnormal high-altitude winds, resulting in a significant tail wind, reduced the delay to only 30 minutes with the aircraft's speed over the ground reaching 690mph (1110 kph)!

Important Note:

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.

Up Next:

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

George Seabroke from the Mullard Space Science Lab (MSSL) will give us an update on the Gaia Spacecraft.

There will also give a presentation on the sky at night for the coming month.

NEXT USER GROUP:

Suspended until further notice.

NEXT DENBIES OBSERVING SESSION:

The next session, allowing for moon rise & set times and cloud conditions, should be sometime around the new moon which is on 5 July.

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 1-11 July.

AD HOC OBSERVING AT WARREN FARM:

These will be at short notice when the weather is favourable. Please watch our WhatsApp feed for alerts.