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Stars Over Surrey Episode August 2024

Notes & Pictures

Perseids & Aurora

August is a month awash with meteor showers, we have the Perseids lasting pretty much all month, the Cygnids, the Aquariids as well as sporadic meteors. On the 12th August we had the peak of the annual Perseid meteor shower. For anyone not in the know, this is the debris field that the earth passes through, left behind by comet Swift Tuttle, a comet 26 km across or 16 miles, which for reference is thought to be twice the size of the impactor that caused the demise of the dinosaurs.

Always a stunning site in clear skies, this year's display was more spectacular than usual because we had aurora as well, which is rare this far South in the Northern Hemisphere. Now some of us were treated to the unforgettable display back in May, and whilst the Northern UK has had some great aurora since, this is the next big occasion this far south. This display was weaker with a more gentle diffuse glow, but still beautiful. Some of my friends captured meteors with aurora which are stunning pictures. I was down in Cornwall and we had some spectacular meteors and fireballs visible to us as we watched and whilst I couldn't see the aurora with the naked eye, my sister in law who has blue eyes, which are better adapted for the dark could see something and our phone cameras picked up a diffuse aurora which we couldn't see on our screens until we were in light again.

Aurora in Cornwall UK, August 2024 Credit: Rachel Dutton FRAS

This goes to show that even if you can't see the aurora on our phone screen at the time, don't delete your pictures until you have time to review them in daylight! Also, all images mentioned in this show, if you go to the listen again page with previous episodes, there will be the picture file uploaded there so you can take a peak at all the images we discussed today.

Aurora & Perseid Images from

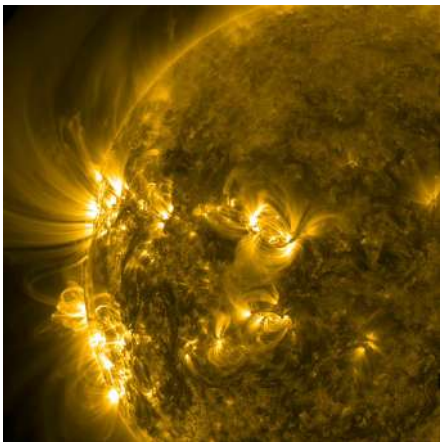
August 2024

Meteor during aurora. Surrey, UK August 2024 Credit: Morning Star Images

Meteor during aurora. Oxfordshire, UK Credit: Mary McIntyre FRAS

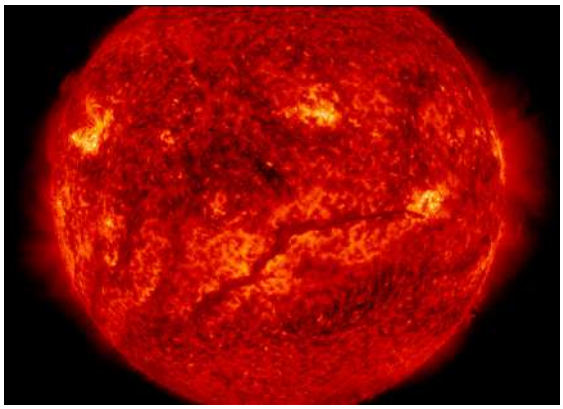
Has the Sun Started a New Solar Cycle Already?

Speaking of aurora, we know that they happen at solar maximum. A quick 101, the sun has magnetic field lines like the earth, coming out the North and South magnetic poles, but because it does not rotate as a solid object, the equator rotates faster than the poles, and as a result these field lines get twisted and resemble a ball of wool that got attacked by a cat with loops all over the place. Where these loops interact with different layers of the sun, we see sunspots, and there is always a North and South Sunspot.



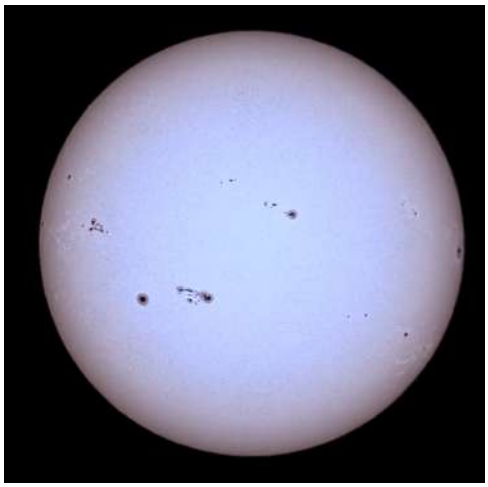
Loops on the Sun. Credit: Solar Dynamics Observatory/NASA

I have provided some pictures of different layers of the sun to look at. These are all the sun at different wavelengths. You can see the loop lines in some of these images and you can see sun spots on some of these images. If you look at some of these, you can see there is a granulation pattern on the surface and that is essentially the sun boiling, as it's a big ball of boiling plasma.



Chromosphere Credit: Solar Dynamics Observatory/NASA.

In some of the more Van Gogh style images, these are of the chromosphere, also known as the colour sphere, where you can see that boiling as a van Gogh looking surface. If you look around the edge of the disc, which we call the limb, you can see little spikes which we call spicules, and prominences which come in many shapes and sizes. You'll also see some dark wiggles on the surface, those are prominences that are facing us. And you will also notice some sunspots.

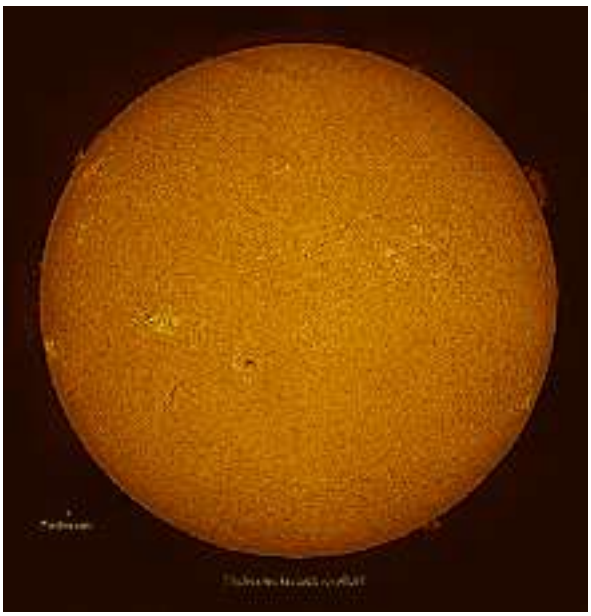


Photosphere in White Light Credit: Rachel Dutton FRAS

Let's move on to a picture I took of the photosphere. This is the layer of the sun we "see" when we look at the sky, and please do not look directly at the sun or point a camera or optics at the sun, as you can get permanent damage.

If you look carefully and zoom in a bit, you can see the granulation on the middle part of the picture, which shows the sun boiling, and if you look towards the limb or edge again, you will see that it gets darker. This is the space showing through from behind, because the sun isn't solid, so there is more material in the centre and less as you move away from the centre.

Now let's take a look at the sunspots, I have a zoomed in picture too. The darkest area of each sun spot is called the umbra and the outer area, the penumbra. The loops of material linking each north and south pair, when they explode, in something called a coronal mass ejection or CME, which is what causes aurora. When the sun is at the start of a new cycle, there are fewer sunspots, and they are further away from the equator, when we are at solar maximum, you see many more sunspots and near the sun's equator. When the magnetic fields flip, we get a new solar cycle and there is one every 11 years approximately.

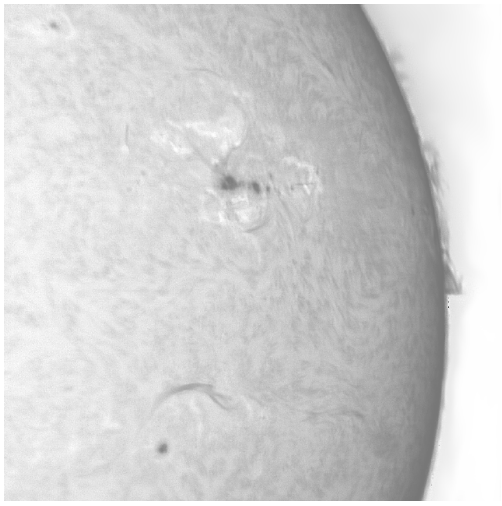


Sun in Hydrogen Alpha Credit: Martin Baker

OK, so we are currently at solar maximum of solar cycle 25, which is due to last until mid 2025. It's solar cycle 25 as the first one was when we started measuring them, not when they began. We are not expecting the next cycle to begin for approximately another 6 years as cycles last for 11 years.

We know that with imaging observations, sunspots appearing closer to the poles with reversed polarity are a sign of a new solar cycle and they can migrate downwards as the cycle progresses, and you can even get a mix of sunspots from different cycles.

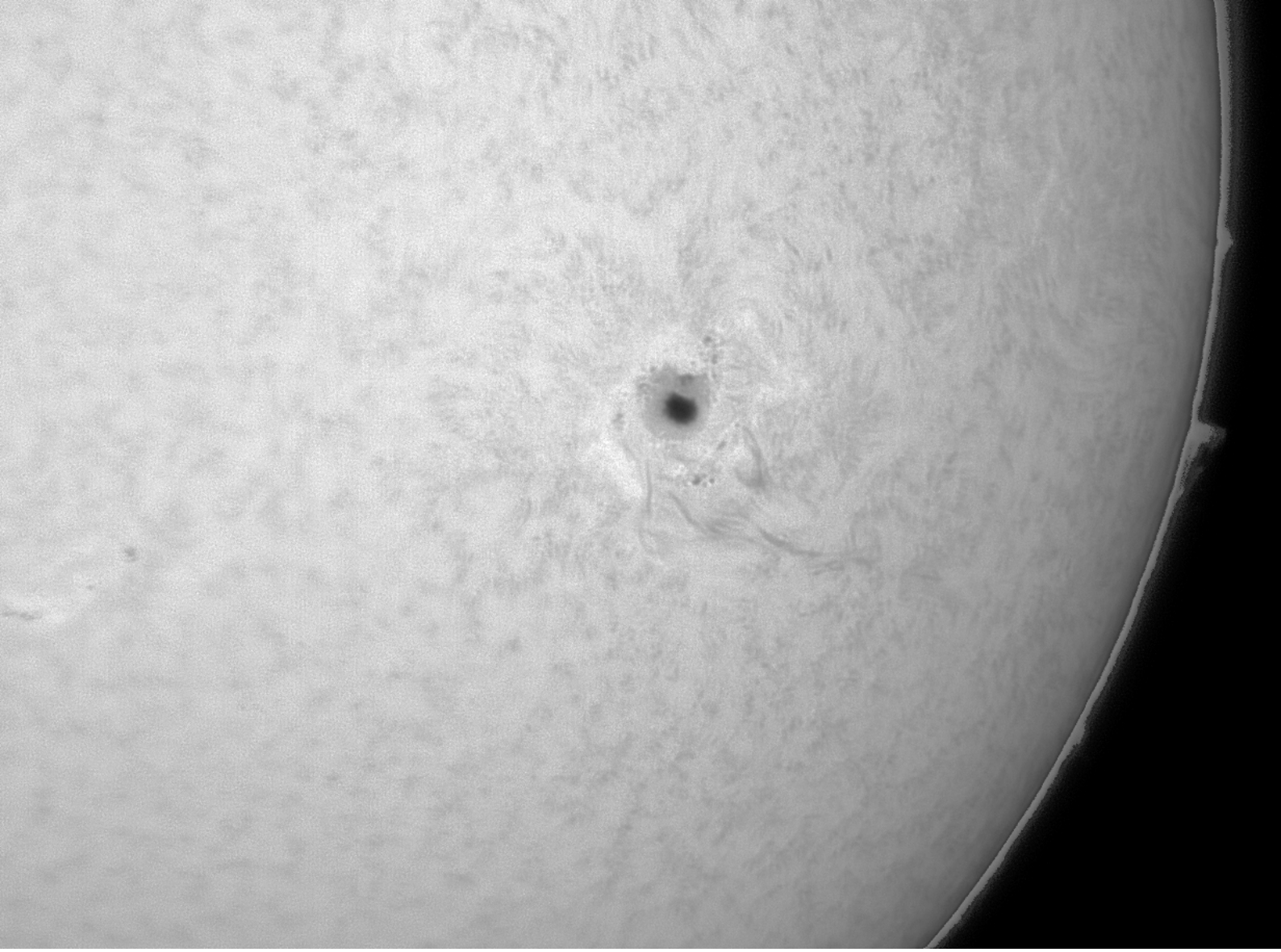
However, solar physicists use the Sun's internal sound waves to measure how it rotates, making visible a pattern of bands (known as solar torsional oscillation known as helioseismology) that rotate slightly faster or slower. These move towards the Sun's equator and its poles during the activity cycle. The faster-rotation belts tend to show up before the next solar cycle officially begins.



Sun in Hydrogen Alpha13th August using C11 and Altair GPCam2 130M. Stacks of 3000 6ms exposures. Credit: Philip Beastall

Dr Rachel Howe from the University of Birmingham and her international collaborators have discovered a faint indication that the next solar cycle is starting to show up in the data they have been analysing from the rotation bands. She says "The indication of Cycle 26 that we see is that the solar rotation has been speeding up at around 50 degrees latitude and now appears to be levelling off.

“This forms part of a pattern called the torsional oscillation, where bands of slightly faster and slower rotation emerge at mid-latitudes before the cycle officially starts and move down to lower latitudes, alongside the sunspot activity, as the cycle develops. In earlier cycles we have seen that the faster-rotating band associated with the cycle can be traced back to around the maximum of the previous cycle, and we think we’re seeing the beginning of the pattern again.”



Sun in Hydrogen Alpha17th August using C11 and Altair GPCam2 130M. Stacks of 3000 6ms exposures. Credit: Philip Beastall

A few other things to note, we do see sunspots and flares on other stars, but if you are wondering why we care about sunspots and the sun, aside from the standard astronomy research and studying, space weather, the arrival of solar particles that cause aurora can cause significant events such as the Carrington event in 1859 which saw telegraph operators receiving shocks and still able to use their machines without mains electricity. Imagine if such events were to happen today, grids could be wiped out, your computer or phone could run off the electricity in the air and set itself alight, satellites, essential for communications, weather forecasting and effective GPS, which all of us use in someway could be knocked out of commission.

All electronic systems and records could be lost, so there would be supply chain issues. Fires but no way to call the fire brigade, then no electricity. Even now, with the stunning auroras, we have to watch out that they don't impact satellites that are essential for communications and the Hubble space telescopes useful life is being shortened as it is being moved about in its orbit due to the added friction. It also impacts astronauts and whilst a lot of space weather and activity from our sun can cause damage to their cells if they are not appropriately shielded, the Sun's magnetic field protects us from the galactic cosmic rays from other stars in the Milky Way which impact us more at solar minimum when the sun's magnetic field is weaker and not protecting us as much. We need to

understand the sun and it's activities more as we use more satellites in our daily lives and for future space exploration.

Milkdromeda May Not Happen After All

If you follow popular science, attend astronomy or physics talks or lectures, or even just documentaries, you may have heard the often touted "fact" that the Milky Way and Andromeda are on a collision course and due to collide in about 4.5 billion years time, and there is even some evidence that we have started exchanging stars which marks the start of this process, with the new galaxy dubbed Milkdromeda. Yes, astronomers need to get better at naming things. And any astronomers who have been to the Southern Hemisphere may have seen two dwarf galaxies that are orbiting and currently merging with the Milky Way called the Large and Small Magellanic Clouds.

Whenever I look at artist impressions of these, they are tiny little things going around the massive Milky Way, but looks can be deceiving. The gravity that something exerts depends on their mass, how much matter something has, the more mass the more gravity, and the LMC alone is estimated to have perhaps up to 20% the mass of the Milky Way, which is a lot for such a small galaxy and as such, it does have a role in the gravitational interplay of these galaxies merging. There are thought to be around anywhere between 50 and 100 dwarf galaxies in our local group of galaxies and we also have the Triangulum galaxy as well, a stunning spiral galaxy 2.73 million light years away.

To understand the impact of this we need to look at the three body problem, made popular recently by a Netflix adaption of a book of the same name, it is a known problem in physics. I won't be giving any spoilers so you can continue to listen, spoiler free, if you haven't watched it yet but intend to. Let's start with the two body problem.

When we look at a simple two body system like the Earth and the Moon, it's easy to imagine the moon orbiting the Earth and most people, if they start thinking about the gravity of the Earth, being greatest in the centre, I do come across some people assuming that the Moon is orbiting the centre of mass of the Earth, which is a good start, but it's not quite correct. The Moon also has mass, and it's a fairly substantial moon compared to the mass of the Earth too, so it tugs on the Earth a little bit, and we get tides. The Earth and the Moon are orbiting a common centre of Mass which is slightly out from the centre of the Earth. We can describe this very easily with the known laws of physics, and Isaac Newton even applied this to the Earth orbiting the Sun and in that case we can ignore the moon as it's mass is so small in comparison to the Earth Sun system.

However, we have another thing to consider here. We have Jupiter, which is the most massive planet in the solar system, that both grabs, passing asteroids saving earth, where it can divert their orbits, or even capture them as moons or trojan asteroids, but also flings them about, potentially endangering the earth and Jupiter is so massive, that the centre of mass of the solar system, is not the centre of the Sun, it is just outside the Sun thanks to Jupiter's influence.

This means that Earth, when it's orbit places it between the Sun and Jupiter is going to be affected a little bit by Jupiter, a third body in the system. This worried Newton as he had concerns about the stability of the solar system. One of this concerns was Jupiter, tugging on Earth's orbit could cause us to be pulled away from the Sun. Now later on, La Plasse worked out that the solar system was stable by creating a new branch of calculus called

perturbation theory that said that small regular tugs on the orbit basically cancel out and the solar system is stable, so you can all breathe a sigh of relief.

However, it does help us realise that adding a third body, is problematic. When you add in a third body, you are adding chaos into the system and that is where things get tricky and we can't predict things as accurately. We can calculate things incrementally as they are happening, but it is very tricky to do any long term modelling accurately.

Now when we look at our local group of galaxies, we have all these tugs going on all over the place. Researchers at the University of Helsinki have been trying to work out what is happening and there is a 50% chance of a straight forward merger of Andromeda and the Milky Way. But there is a 50% chance that it could not happen or, happen with both galaxies taking long and circuitous routes to merge. So Milkdromeda may be cancelled after all. Either way, we will not be around long enough to know.

Gaia Finds Asteroid Moons

Gaia is one of my favourite missions as it's data is essential for so much research, and I feel that she is often overlooked for the more exciting JWST images. Gaia is the OG Lagrange point 2 observatory, and has been there since 2013. Gaia is creating an extraordinarily precise three-dimensional map of more than a thousand million stars throughout our Milky Way galaxy and beyond, mapping their motions, luminosity, temperature and composition.

This is stellar census will provide the data needed to tackle an enormous range of important questions related to the origin, structure and evolutionary history of our galaxy. And it's mapping is so precise and accurate, it can not only detect but also place asteroids which are tiny rocks in the outer belt beyond the orbit of Neptune. And even better it can see if those asteroids have moved. Some of these asteroids are in binary systems with some of those asteroids being referred to as a moon as it is smaller and has less impact on the binary system than the main asteroid.

Back in 2022, the DART mission, testing to see if we could deflect an asteroid went to the Didymos system and impacted with the asteroid moon of the binary Dimorphus to see if it could change it's orbital trajectory, with great success, so some of you may have heard of binary asteroids and asteroid moons before, or thinking this does sound familiar. Now the data hasn't been confirmed yet, but when it is, there will be approximately 350 new binary asteroids to add to the count.

Does Mercury Have A Secret Diamond Stash?

Mercury is a one of the planets we know the least about as it's incredibly hard to reach thanks to it's proximity to the Sun. One interesting thing about Mercury is that it has a bigger core as a percentage of it's mass compared to the other rocky planets, and a persistent magnetic field. We know Venus' magnetic field slowed down and Mars' field is very weak, which has had an impact on their atmospheres, so Mercury is certainly intriguing. NASA's Mercury Surface, Space Environment, Geochemistry and Ranging or MESSENGER mission explored Mercury and scientists are now going through the data to explore Mercury further.

There is a lot of graphite on the the surface of Mercury, which leads us to suppose that it has a lot of carbon. Originally, it was thought that it wasn't diamond as diamond is formed

under immense pressures, which were not available in Mercury's core. Rocky planets like the Earth have three layers, core, mantel and crust. Researchers theorised that a layer formed when the planet's liquid core crystallised, enriching the remain melt with carbon and when the when the liquid reached it's solubility threshold, and as such could no longer dissolve more carbon, diamonds begin to form.

Diamonds being less dense than metal would have floated to the top of the core mantel barrier forming a layer getting thicker. The researchers believe this layer could be 11 miles thick. Now aside from Mercury being very difficult to send a space craft to, it wouldn't be an appropriate mining mission to get these diamonds, even if their existence was confirmed as they would be too deep into the planet. I do however, enjoy that the planet named after the God who was mischievous and known as the God of Thieves, may have it's own vault of jewels below the surface.

Mars Jupiter Conjunction

On the night of 14th-15th August we had a conjunction of Mars and Jupiter in the early hours in the early hours of the morning. A conjunction is the term we use to describe when two planets or other celestial body such as the Moon appear very close together in the sky. A true conjunction requires the discs to "touch" from our perspective as we see the 3D sky where objects can be millions of miles apart but appear next to each other or touching from our perspective as we see the stars, planets and other celestial bodies on a 2D surface. Where I was, the clouds were too bad to see it, but you can see pictures taken on the internet.

Mars' Hidden Water

Off to Mars next, and the continuous hunt for where Mars' water went. It is largely assumed to have disappeared along with the atmosphere as Mars' magnetic field weakened. Researchers at UC San Diego’s Scripps Institution of Oceanography have been investigating the water cycle on Mars and have used data from Mars' InSight Lander which stopped working in 2022.

One of the instruments measured Mars' seismic data so it could measure things like Marsquakes and meteor impacts which gives us data on the core, mantle and crust. Some of the orbiters we have show us that the upper crust, from the surface to a depth of 8km, which appears to upper crust is like a cryosphere that contains abundant frozen water and images appear to show us ice in areas where meteor impacts have exposed more of the surface.

However, the seismic data appears to contradict that. Analysing the flow of seismic waves, one possibility is a mid-crust composed of igneous rock with thin fractures filled with liquid water. InSight's data was taken from its location of Elysium Planitia, but if that data could be extrapolated across the planet, there could be a layer of water 1 to 2 km deep at a depth of 11km. Unfortunately, for future inhabitants of Mars, this would not be easy to access at that depth, unless significant infrastructure is developed.

Super Full Moon is Red but it's not a Lunar Eclipse

On the evening of the 18th August, we had a number of images and reports cropping up about the moon being red or orange, which usually only happens during a lunar eclipse. When we have a "blood moon" or lunar eclipse, the full moon takes on a red colour as it

passes into the Earth's shadow as the Earth's atmosphere splits the sun's light into a rainbow and the moon sometimes passes into the area of orange/red giving it that exquisitely haunting view.

Full Moon in August. Surrey, UK. Credit: Julia Gaudelli

This full moon is a super moon, which means it is slightly closer to the Earth in it's elliptical orbit making it look a little bit bigger, but it isn't a lunar eclipse, so why is everyone posting this beautiful reddish hued moon? Unfortunately, the answer lies in major forest fires in the US and the particles are being blows over the Atlantic creating a colour filter in the sky which is making the moon appear red or orange in colour. I have shared some pictures on my instagram and the file will be in show notes when the replay is available on the Stars Over Surrey Listen Again page.

Moon Occulting Saturn

In the early hours of 21st of August, we had Saturn appear to go behind the moon from our perspective, with the word occult meaning hidden and in this case the moon was occulting Saturn. Observers were able to see Saturn disappear behind the moon and reappear on the other side.

Moon Occulting Saturn. Oxfordshire, UK Credit: Mary McIntyre FRAS

Astronomy Tip of the Month

Phone Astrophotography

I get many people asking how to do the best night sky images with their phones. The two biggest issues are exposures that are too short, so you can't see much on your image and stars being oval or line shaped. There are four things you need to overcome these issues. One is work out how nightmode works on your phone, some like my iphone, it's automatic at night, but you will have to look up your make and model and even what operating system update you have.

The next thing you want to consider is a tripod to avoid any kind of shaking from holding the phone up. These are relatively cheap, I got one for £15 off amazon. Whilst you are there, it is also worth getting a remote shutter release, again you can get one for less than £10 on amazon and that stops any shake from pressing on your phone.

Finally, is exposure time, you want to ideally get around 8 seconds, longer than that, your stars will start "trailing" as the Earth moves in relation to the sky. But this will get you the most clarity, especially on the Milky Way. Now if you want to capture the moon as somethig other than a blob, on your phone, that is going to be more tricky.

I find going to video mode, then changing the brightness until you can see the difference between light and dark areas which will be very subtle, then taking a screenshot is your best bet. For anything better than that you will need a DSLR and a longer kit lens or a telescope. I have a smart scope that is very affordable and you can see the amazing resolution of the moon pictures on my instagram.

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Space News

Starliner

Sunny Williams and Butch Wilmore were on board the Boeing Starliner test flight launched on 5th June. Sunny and Butch are not only experienced astronauts, but also helicopter test pilots and they were aware they were signing up for a test flight with all the risks involved. Originally slated to be a mission anywhere in duration from 8 - 45 days, with that upper limit being based on battery life.

There were issues with helium leaks and thruster problems, and whilst they think they have gotten to the bottom of the issue, after doing simulations of the separation and de-orbit burn, NASA decided that whilst they could calculate the risk profile, but not the certainty of that risk to an acceptable level, and so they are going to send Starliner back uncrewed, and the Dragon 9 crew, will have 2 of the 4 due to fly astronauts fly up with ballast representing Sunny and Butch and Sunny and Butch will be part of that crew 9 mission staying on board for another 6 months, returning in the crew 9 dragon in February.

NASA were praising Boeings co-operation and provision of data and testing and very positive about the collaboration and the work done, however, they said when it came to a poll on what to do, whilst Boeing teams were disappointed, they were willing to go either way, with what NASA believed to be best.

They also said in context of safety, NASA changed it's policies after previous incidents, the Challenger and Columbia disasters, they have a very open culture and pay attention to all safety concerns and if anyone is unsure, they will always err on the side of safety. As such all of the NASA team voted for the crew to return on the dragon. This is reassuring as it shows that NASA have really encouraged people to come forwards with concerns and listen to them. Sunny and Butch were briefed, have been providing data and asking questions, bearing in mind that they were aware this was a test flight and could be there up to a year and were supportive of this decision.

Whilst they did sign up to this, I'm sure it was challenging not knowing what the decision would be, and it is going to be tough for them to know that they will not be with their families over the holiday season in the US from Thanksgiving through to new year. NASA were clear that the family support from their families is always keen and thanked them for supporting their astronaut family members in their missions. However, astronauts are usually keen for extra time on board, so I am sure there is a lot of mixed feelings there, excitement at a full mission potentially with space walks towards the end, some

disappointment in missing their families, and dealing with uncertainty, but astronauts are a rare breed of extremely resilient individuals who are very tough mentally. Some of you may remember that a number of astronauts were interviewed for tips during lockdowns as they are used to being locked into a vehicle for months at a time.

Now we have covered the human element, the part of Starliner they were concerned about was the separation sequence to get Starliner away from the ISS and the de-orbit burn. They are going to re-configure that to get some more test data as they will lose the stage once it lands in the ocean and also as the flight is now unmanned. There were questions on whether this will go through certain risk event reporting and whether NASA will certify Starliner after this mission but NASA were keen to say they will only look at those after Starliner has returned to Earth.

Polaris Dawn

As we recorded this a little in advance, there is a Polaris Dawn launch due on 26th August, which will take private non professional astronauts further than any humans since the Apollo era. At the time of recording, the rocket has been rolled onto the launch pad, but I will cover this in our next show.

Juice Flyby

JUICE the Jupiter Icy Moons Mission which is an ESA mission to the Jupiter mission to explore 3 of the 4 icy moons of Jupiter, Ganymede, Callisto, and Europa, was launched from the European Spaceport in French Guiana on the 14th April 2023 and is due to arrive in 2031. Like many missions, if we were to put fuel on board to rely on fuel propulsion to get it there, it would be too heavy and expensive to be feasible, so instead it is using gravity assists or flybys to get there.

What may seem counterintuitive is that it is flying by Venus and the Earth to use gravitational assists to get to Jupiter, it is the most efficient way to do this and on the night of the 20th August, it went by the moon and was imaged by amateur astrophotographers and on the night of the 21st it flew by the Earth. I have seen some images of it flying by the moon leaving a dark line against the moon on the same night that the moon occulted Saturn. One of the instruments on board was provided by a local space science laboratory, so it is a mission I am tracking with excitement.

Terraforming Mars

So one dream of some people in the space flight industry is to inhabit and eventually terraform Mars. Mars has a number of issues making it unsuitable for human life in it's current form. A very thin atmosphere which is not breathable, and doesn't shield well from

the Sun, a radioactive surface, temperatures too cold for human habitation and lack of water being just a few of the issues that humans would run into.

One way to solve this would be to terraform Mars, as in heat it up, give it an atmosphere and a way to create water, and then introducing flora and fauna to create ecosystems that would support human habitation is still in the realms of science fiction. Even if we could just add an atmosphere to Mars, the lack of magnetic field means it would be lost within 100,000 years as solar wind blasts the planet over time, so it would need to be self replenishing.

And heating it up would be tricky, because you could do so by creating a greenhouse effect with the atmosphere, but what if it goes wrong, you get a runaway greenhouse effect and end up with another Venusian world with an atmosphere so dense and acidic, it would crush anything within an hour. And moreover, getting the geo-engineering infrastructure needed there, as well as the feedstock materials will be extremely challenging and potentially not financially viable. That is unless we use materials available on Mars.

A group of researchers at Northwestern University, the University of Chicago and the University of Central Florida have proposed a new method of terraforming Mars using nano particles, made from materials and resources available to us on Mars. So how do they intend to do this?

They propose a method of warming up Mars. The Perseverence and Curiosity Rovers have analysed many rock samples and we know that there is an abundance of aluminium and iron. You could make nanoparticles from these and configure them in different ways that would absorb and scatter light from the sun in different ways, including to warm up the planet.

When the planet warms, the ice caps would warm up releasing water, dry ice and other gasses into the atmosphere and increase the atmospheric pressure to around 30% of that on earth. At this pressure, humans wouldn't need a pressure suit but they'd still need either bottled oxygen or some kind of mixture of gasses that will mix at that pressure and temperature, and they'd still be cold. This warming would also make the planet more friendly to microbial life, maybe even cyanobacteria.

Now cyanobacteria or blue/green bacteria on earth were able to photosynthesize and later became integrated into plants. Obviously more research and simulations would be needed in order to try and work out what the resulting processes could look like but it's an interesting start and far more economic that previous solutions. On that note, whist we are talking about terraforming Mars, we are unterraforming Earth at the moment, and surely any way of restoring Earth is going to be cheaper than trying to terraform a whole new planet, or even, just working towards reducing climate change and it's impacts.

Rocket Explosion on Launch Pad in Shetland

A rocket test at Saxavord Spaceport on 20th August went dramatically up in flames after a test caused an engine explosion. For those who are unaware of Saxavord Spaceport, it is based in the Shetland Islands on the Isle of Unst on the Lamba Ness peninsula. Formerly known as Shetland Space Centre, the site is near the RAF Saxa Vord radar station and the Saxa Vord distillery.

The £43m Spaceport is designed to allow for the launch of small satellites into either polar or Sun-synchronous low-Earth orbits, with the building of the three launchpads starting in 2022 and in December, they received the UK's first licence to do rocket launches this year from the Civil Aviation Authority. Rocket Factory Augsburg AG (RFA) is a German NewSpace start-up founded in 2018 with a mission to build spacecraft like we build cars. In January 2023, they signed a multi year deal with the spaceport with exclusive access to the northernmost launch pad of the spaceport, Launch Pad Fredo.

They were testing the RFA One which is a three-stage launch vehicle designed to launch small satellites and payloads of up to 1,300 kg into polar orbits. The vehicle is 30m long with a diameter of 2m and has two configurations to allow for single payloads or a rideshare model with multiple payloads.

The test this month was not a launch, but a full testing of all 9 engines of its first stage which resulted in large plumes of smoke and flames as the stage turned into a fireball. It was one of several tests due to happen before the whole thing can launch. RFA said that the explosion happened as a result of an anomaly which resulted in a hot fire on the launchpad. The firm said that no one was injured in the incident and that the launch pad itself had not taken any significant damage.

RFA have said that any immediate danger has been mitigated and that they are now working closely with SaxaVord Spaceport and the authorities to gather data and info to eventually resolve what happened. They have said that they will take time to analyse the data, but they are using the same iterative model that we have seen with SpaceX, and with that comes the higher risk of things going wrong until they get them right. They hope to resume to normal operations as soon as possible.

Frank Strang the CEO of Saxaford Spaceport has posted a message on the news section of their website re-iterating that this is part of the risk and reward of the space industry, that RFA are doing the investigations expected and praising the Saxavord staff for their handling of the situation for following all protocols which resulted in no injuries. The good news is that the launchpad isn't damaged, there is no damage or injuries to the surrounding areas, and whilst it's disappointing after a successful test 3 months ago, it is part of the nature of iterative design. Let's hope they come up with the answers soon.

Blue Origin New Glen Rocket Explosion & Implosion

Blue Origin's New Glen rocket has seen two upper stages fail in the New Glen rocket, due to launch the NASA Escapade mission in the next couple of months. There was one upper stage that exploded thought to be caused by handling errors and another imploding due to temperature and pressure changes whilst moving the parts around. Whilst rockets are supposed to be robust, they are essentially giant bombs that have to launch into the atmosphere, they are very sensitive to being handled. When you think of things such as warnings not to touch car light bulbs when changing them out as the new bulb could explode due to the finger print left behind changing the glass' reactivity to the radiation coming off the bulb, rocket parts are not dissimilar as they are being handled and moved around and in this case they were subject to temperature and pressure changes throughout the process.

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Target Of The Month

Saturn

Saturn is at opposition, this means that it is on the far side of the sun, which means that the sun is lighting up the full disc facing us, a bit like a full moon is the whole face lit up, and as Saturn is a large planet, we can see it with the naked eye throughout September. If you are looking at Saturn through optics, like a decent scope, you may just about make out it's rings, but there were reports on its rings disappearing because it appears to be changing tilt relative to earth so the rings are edge on.

Astrocast	
3rd	New Moon
5th	Mercury at elongation
8th	Saturn in Opposition
11th	First quarter moon
17th	Moon near Saturn
18th	Full moon, Supermoon and partial lunar eclipse
20th	Neptune opposition
22nd	Autumn Equinox
23rd	Moon near Jupiter
24th	Last quarter moon
26th	Moon between Castor and Pollux

- For telescope users, 13th-14th Ganymede shadow transit of Jupiter, 20th Neptune at opposition and 28th Comet Tsuchinshan-ATLAS at perihelion
- Mercury, Mars, will be morning planets

- Venus will be an evening planet.
- Saturn and Neptune are well placed for the whole month and Jupiter and Uranus will be improving in the second half of the month.

Events	
5th September - Guildford AS	We have a PhD candidate from the University of Surrey giving a talk.
7th September - Ewell AS	Annual picnic
10th September - Farnborough	Dr Or Graur, (Institute of Cosmology & Gravitation, University of Portsmouth) via Zoom Dr Graur talks us through the science of galaxies as discussed in his latest book.
13th September - Ewell AS	Martin Lumm MBE – The Star of Bethlehem
14th September - Guildford AS	International Observe the Moon Night - details TBC

About

Rachel Dutton FRAS is an astronomer and cellist and she looks after outreach at the Guildford Astronomical Society. She presents Stars Over Surrey bringing a monthly review of space news, astronomical matters including a review of the past month's discoveries, events and space missions, Astrocast what to look for in the night sky over the coming month, forthcoming talks and events.

If you want a reminder of when the show is on, and links to the images discussed, you can sign up here for notifications from Rachel.

https://mailchi.mp/f7101b2028fc/spaceastronomy-media-updates

Stars Over Surrey Previous Episodes