



Stars Over Surrey September 2024

Stars Over Surrey, a monthly guide to astronomy and developments in space with Graham Laycock and Rachel Dutton of Guildford Astronomical Society.

And welcome along to Stars Over Surrey with Graham Laycock and Rachel Dutton from the Guildford Astronomical Society and a fellow of the Royal Astronomical Society. Hello, Rachel. Hi, Graham. How are you today? Very well, thank you. And you? I am fantastic. Good, you've had some good stargazing I hope this month.

Partial Lunar Eclipse



Lunar Eclipse 18th September 2024
from Guildford Credit: Rachel Dutton
FRAS

I have and I've had some decent eclipse gazing as well. Right, well tell us about that. Okay, so on the early hours of the 18th of September, I was one of the people who, it may be said they're a bit crazy enough to go outside and start imaging, even on a work day. So, it was a partial eclipse, which means the way that the sun, the earth and the moon line up, the moon is passing into part of the earth's shadow.

And you just get this kind of cookie bite picture of the moon in the sky. So if you take a look, there is an image and this will be on the show notes for people to look at. So this is one of the images I took at the maximum point of the eclipse. And you can see that kind of cookie bite at the top right.

Yes, indeed. I love the aeroplane you've got going across the moon. Yes, so that was my surprise picture as well. So, I was using a smart telescope. Right. And you control that with like your phone or your iPad. And I was looking at it and then suddenly I saw this plane go across the screen, which made me jump and I quickly hit the shutter release.

It sounds, it looks an amazing picture, and it almost seems as if there's a shadow of the airplane on the moon, but, uh. Yeah, that was just the, , trail from the plane, so, I've got a few candidate planes from, , varlous people who have suggested times of flights that were going in that directlon at a similar time, so I've emailed a load of airlines.

Funnily enough, they don't. The bots that they have for customer service don't have any kind of pre programmed response to, "Hi, I'm an astronomer. I've got a picture of your plane, I think". Oh boy, a bit of an unusual request you're making. Yeah. So, it'll be nice to see if I can find out who was flying that because from a few pilot friends, they quite like it when you get images of their planes from under the moon or the sun.



Lunar Eclipse with Plane: 18th September 2024 from Guildford Credit: Rachel Dutton FRAS

But they were flying, so hopefully we can match that up. But yes, otherwise it was a small eclipse, but we don't get many of them. So, I do try and make an effort if it's a clear sky to get up. I mean, how often do these occur then? Is there any regularity to it? Yeah, sort of. The next one is, I think, maybe March 2025.

I'll make a note to my diary then, okay. Yeah, I'll mention it in advance when we get there, but the next one is in 2025. So, they're not rare, rare, but they're, they're different enough to make it worth going out and having a look. Now, here's a question for you.

Would there be habitable worlds around bigger stars?

That's a really interesting question, Graham, and I'm going to give you a bit of stargazing 101. Okay, because we're entering the beginning of the sort of astronomy season, as I like to call it in the UK, now we're getting dark nights. So one of the things we tell people in outreach is to take a look at whether stars are more blue or red.

And this is a bit of a misnomer because we're talking about the electromagnetic spectrum and blue is hotter stars and red are cooler stars. It's. back to front what you look at when you're looking at your bathroom taps, but, to the naked eye, blue stars

tend to look slightly more whitish in colour and red stars look slightly yellower in colour when you really don't take time to focus and let your eyes adapt to the dark.

If you've got binoculars, you'll see these differences. Some like our favourite Betelgeuse that looks quite orangish in the sky. Mars, which is not a star, obviously looks a bit orange too. So you can. If you take your time to let your eyes adapt to the dark and you're in a relatively light pollution free area, so in a green space and sorry, away from the towns, you can just about make out the sort of warmer tones and the cooler tones of stars.

Now, the reason for this is because blue stars, are more massive, so they have more matter, more mass, and The more mass you have, the more fuel you have to burn. So they actually get hotter and they burn through that matter much faster. And as a result, they move through their life cycle a lot quicker.

So we call blue stars, young stars, because they formed. far more recently than red stars which will happily go on burning for long periods of time. And we have this tool in astronomy called the Hertzsprung Russell diagram or the HR diagram and you can plot on that stars On the main sequence, main sequence means they're turning hydrogen into helium and they are classed on what we call this main sequence based in order of colour, which we use as a substitute for temperature.

Now, if you want to chat up line for an astronomer, there is a spectral class across the bottom and the mnemonic for the colours is Depending on your preference, Oh Be A Fine Guy, Kiss Me, or Oh Be A Fine Girl, Kiss Me. If you want a chat up line for an astronomer, ask them to help you with your spectral class mnemonic.

I should remember that. Yes. All right. So anyway, we've got those different kinds of stars. The O Class stars are on the left and are these more massive blue stars and redder, lower mass stars are on the right. For reference, the Sun is kind of in the middle as well. G class star. So we've got all these different kind of classes of stars, and when we're looking at life and habitable worlds, we at the moment know of one solar system and one star with intelligent life.

Depending on whether you want to define us as intelligent, going around in that our own sun. So the first thing that astronomers were looking for is, can we find another solar system with a sun like ours? And they've started then looking into cooler stars like red dwarfs. But the question is, what about bigger stars?

Because the larger stars, you've got higher temperatures, you've got more ionizing radiation, and that's not great for life because it strips atmospheres, it can sterilize planets, so it's not really sounding like it's the sort of thing that you would want. Obviously you get, , more x rays and things as well.

So looking into this, you think that doesn't sound great. But then on the offsets, when we're thinking about habitable worlds, we're thinking about liquid water. So I'm often talking to you about whether we can find water on the moon or on other moons of

Jupiter and Saturn. So we have The Goldilocks zone is where you can have liquid water and, , we have that point where water becomes ice or snow and it's not really likely that life like us would survive that.

Obviously life could take many different forms. So if we look at the Goldilocks zone around these bigger stars, they are much further out, but they're actually bigger too. So scientists were going through, , thinking about different stars, and we are a G class star on that spectral class diagram, and they were looking at the next size up, so, , F type stars, and they found, going through the database of about 80 F type stars, 18 systems have exoplanets that spend at least part of their orbit in the habitable zone of the star.

And in one case, there's an exoplanet with one of these wonderful names, 38 Virginis B, that is always in the habitable zone. Now, this planet is a gas giant. It's about four times more massive than Jupiter, so it's probably habitable for life. But, like Jupiter, it could have Earth sized moons, similar to the Galilean moons of Jupiter, and one place that we're looking for potential water and life are three of those moons, hence the JUICE mission to go to the Jupiter icy moons to look at Europa, Ganymede, et cetera, to take a look at whether there is water there.

So, in theory, moons of other gas giants could also be habitable worlds for life. So, These F type stars, they make up about 3 percent of the main sequence stars in the Milky Way. It is possible that their excess UV light could rule out habitable worlds, but it's thought that around 5 to 20 percent of F type stars could have potential for life.

That is interesting. I'd never thought about moons having life as opposed to, uh, planets. Graham, have you not watched Star Wars? I should have realised, shouldn't I? Yes, the forest moon of Endor with Ewoks. I'm going to move on to Betelgeuse, I think, now. This is one of my favourite names, at least.

Anyway, does Betelgeuse, have a friend?

Yeah, apparently. Well, maybe. Okay, so Betelgeuse. Again, let's do some Astronomy 101 for people that may not know, because it's Orion season again, and it's my favourite constellation. It's a great one for beginners, and it's now rising in the early hours of the morning. So I've got a picture here. It's not backlit, it's come off my phone, but you can kind of see, , there's a really bright, what looks like a that's Jupiter.

And then can you see the splotch, sort of. It's in the upper right corner, not in the far corner, it's sort of towards the centre. If you come in a bit. And then at the bottom, , poking out of the tree line to the left, you can see the three stars of Orion's belt. And then the four corner stars and Betelgeuse is that top left one.

Ah, right. So that was a very quick wide field that I took on my phone of Orion. So that's one of my favourite constellations. There's so much going on there and it's really easy to find. So Betelgeuse is the right arm pit of Orion. But it's on the top left



Orion, Taurus, Pleiades and Jupiter over Guildford.
September 2024. Credit: Rachel Dutton FRAS

and it's quite famous because it may go supernova.

We had that big dimming event in 2019 where people were saying is that aliens building structures around it that are blocking the light and absorbing light, kind of like massive solar panels going around it so they can harvest energy. Again, with Star Wars things like Starkiller Base, extracting energy from the sun.

So it wasn't that, was it about to go supernova? But actually it turns out that it probably erupted a load of dust which cooled down, and the dust was between us and Betelgeuse. And as a result, we sort of had less light coming from it, so it appeared to dim. However, Betelgeuse is a variable star. So variable stars are ones that have finished their main sequence of life.

They expand out into giants and their outer layers are really far away from the inside. So if you were to pick up Betelgeuse and replace the sun with Betelgeuse in our solar system, the outer layers of Betelgeuse would be as far as the orbit of Jupiter. Really? Yeah. So. Wow. Quite a large radius. I try not to say massive because massive obviously relates to mass, but size wise, very large.

And as they burn through the next layer of element that they're fusing, , when they stop fusing, fusing has outward pressure. So they collapse inwards a bit and they dim. And then as all that matter sort of gets closer together, it reignites fusion, it expands, and it gets brighter again. And these stars are called variable stars.

And Betelgeuse has a long secondary period of 2, 100 days, but this seems to be a secondary pulsation to a shorter period of variability. So, having a think about it, one possible explanation is a secondary companion star that is affecting the dust around the system, and when it's in transit, , it's affecting the dust and sort of moving it around, which could lead to this reduction in brightness.

So if that's the case, this would have to be 1.17 solar masses. So that's 1.17 times the mass of our sun. And it would have to be at an orbit of 2.43 times the radius of Betelgeuse. And we already know that the radius of Betelgeuse is roughly the size of

the orbit of Jupiter. My goodness. Now. 2.43 times further out from that.

Goodness me. Betelgeuse may have a friend. Indeed.

Now, Earth. Can I have a new moon?

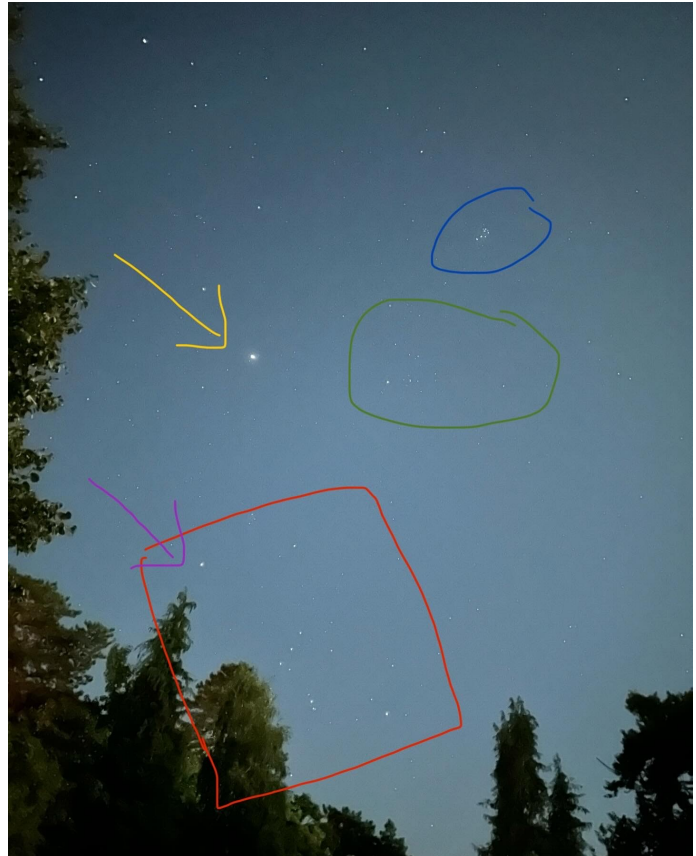
Sort of. Sort of. I get puzzled by this. Yes. So, there are three ways to make a moon. One, you can co accrete. So, when you have a new solar system forming, you can have a planet forming and another sort of planetesimal forming, and actually that ends up being a moon of the bigger planet.

That's one way. Another way is similar to how we think the Earth got its moon. Insane. Collision, load of material escapes and sort of coalesces into, , the moon and ends up orbiting the Earth. That's what we think happened here. Or, , if you can't make your own, you can order one in, so you get an asteroid coming in from the outer solar system, or even comets as well, , but more likely to be asteroids.

They can come in and they get gravitationally bound to a big object, Jupiter collects them, , And you end up with this sort of potato like rock orbiting the planet and it's a captured moon. And that's what we've got with Mars. We've got two of these rocky space potato moons that Mars has. So Earth kind of had a, what people called like a false moon or a demi moon, , a while ago.

And that's 3753 Creithne, which is an asteroid in orbit around the Sun with a one to one orbital resonance of the Earth. So it's not actually technically going around the Earth, but this one to one orbital resonance means that in the time that Earth makes one orbit and arrives in the same place, Creithne also does that.

one orbit as well. So it's a co orbital object, but it's not going in a nice circular orbit. It's going in this weird, almost horseshoe like orbit, crossing over the orbits of like Mercury, Venus, Mars, and Earth. So over 770 years, it completes one of these horseshoe or jellybean shaped movements around the Earth.



Orion, Taurus, Pleiades and Jupiter over Guildford. September 2024. Credit: Rachel Dutton FRAS

So some people call it this quasi moon. And Cruithne, is an Irish name, from a picked king, I think, but anyway, we've got that going on, and we've got lots of strange things that go on in the solar system, like Things that are part comet, part asteroid that we call centaurs, like the mythical creatures in Greek mythology that are half man, half horse.

And we've got all these Trojan comets that sort of, sort of orbit planets, but they're not moons. They sort of orbit at the same distance as the planet, but they're not orbiting the planet itself. So it gets really complicated. However In this case, we have a near Earth asteroid that was detected on the 7th of August by ATLAS, the Asteroid Terrestrial Impact Last Alert System, and we have now called that Asteroid 2024 PT5.

So, this alert system is looking for these rocky bodies because they are dark, so they're not reflecting light. And they're really strange shapes that we don't see them until they're quite close. And this one is about 11 meters across and it can approach within 1 million kilometres of earth and anything that gets within 1.3 astronomical units, one astronomical unit being distance from the earth to the sun, it's called a near earth object. And it'll probably do this similar sort of horseshoe shaping, similar to our friend Cruithne, but it's likely that it'll be caught in the Earth's gravitational well and do one sort of full orbit before it continues on.

And it may even come back and do another orbit in a number of years time. So how long is it going to last for? So we think it will probably be around for about 56 days, from the 29th of September to the 25th of November 2024. , But then we probably won't see it again until around 2055. Right. And will we be able to see it then?

Maybe with really good telescopes. It's unlikely that people who are general telescope users will see it. Maybe some of the really more advanced, telescope users within astronomical societies might be able to. So it'll be an interesting challenge for them. Indeed, indeed.

So, did Mars have three moons?

That's another interesting one. So to explore this question a bit more, I've mentioned Mars had two moons, both of these rocky space potatoes, as I call them. So Mars ordered in its moons. However, someone was looking at the shape of Mars and realised that there is something funky going on there. So when we look at the shapes of most planets, you may have heard the Earth's prolate spheroid.

Which means it's a sphere, but it's slightly chubbier around the equator. Okay, the moon is a tri axial ellipsoid. So to imagine this, right. So thinking about, you've got the earth and its axes going from north to south, right, right. You've got the moon. If you imagine head to toe, that being your north to south axes, and now hold your arm out to the side.

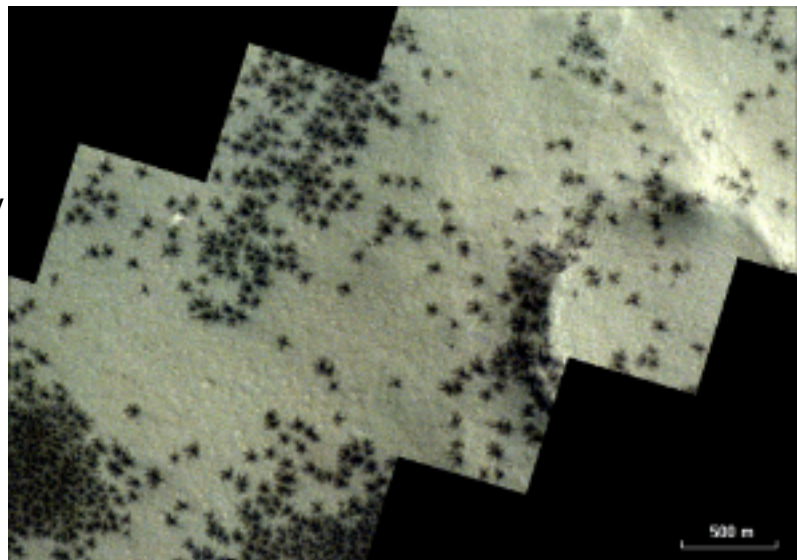
And you've got a second axis. Now hold another arm out in front of you. So you've got this 90 degree gap. That's your third axis. And if they're all of different lengths, then you have a tri-axial ellipsoid, which is kind of round like a sphere, but not quite. And our moon is a tri-axial ellipsoid. And the reason for that is because, not, only did it have the sort of gravitation of its own mass causing it to sort of become a bit roundish, but you have the sun tugging on it, you have the earth tugging on it, and the moon is a triaxial ellipsoid.

But it turns out that Mars is also a triaxial ellipsoid, and it has two bulges. In the areas called the Tharsis Rise and the Sirtis Major Planis Reglons. So, one clever person was having a think about it. And they decided that this could be explained by a moon, about the third mass of our moon at most, going into synchronous orbit, so again being a captured asteroid around Mars, which would be enough when Mars had more liquid magma, sort of create that deformation in the shape, and especially the sort of tidal interactions, like the moon pulls the tides of the liquid water on Earth, it does have a small effect on the solid matter of Earth as well.

But, if you've got more magma, then you're going to see more of those tides within magma. So. It's possible that we had the synchronous moon around Mars whilst it had magma oceans creating a third directional pull of gravity resulting in two bulges.

Right, okay, what about Martian spider updates?

Do you remember back in May? We were talking about Martian spiders. We were indeed. Right, so it looked like there were images of spiders on Mars, except they would be massive. And what it turned out to be was carbon dioxide forming over the poles during the Martian winter, then when the sun shines on it during the spring, this causes it to turn into gas, which bursts through the surface like geysers.



[ExoMars TGO view of ice spiders on Mars](#) Credit: ESA

And then as it settles, it sort of forms into these spider like deposits anywhere between 45 meters and a kilometre across, but to aerial photographs, it kind of looks like spiders on the surface. So, scientists at NASA JPL decided to have a go at recreating them in the lab, as you do. , so, they were thinking about it, they needed lower air pressure, and you need temperature to be around about minus 185 degrees centigrade, to mimic, , the atmospheric conditions, on the surface.

Mars. So they use the liquid nitrogen cooled test chamber at JPL called the Dirty Underwater Vacuum Simulation Test Bed for Icy Environments. or Dusty for short.

Physicists are not great at naming things. So they chilled this Martian soil stimulant in a container, dipped in a nitrogen bath, and they put the whole thing into Dusty and replaced the earth pressure with Mars air pressure. And, , they got carbon dioxide gas to flow in and condense into ice. And with this simulation, they managed to get plumes of carbon dioxide gas escaping from the soil simulants, which is similar to what's happening on Mars.

It's not quite the same because that's caused by the sun. And they still haven't answered any of the big questions, like why does this only happen on the Southern Hemisphere and only in certain regions? But it is giving us some more clues as to the processes that are going on on Mars.

Now what can Jupiter's moon Io tell us about life on other planets?

We've mentioned the effects of tidal pools of other bodies affecting Mars, but the latest research on data from the Juno mission about Jupiter's volcanic moon Io has come back with some interesting findings too. Astrobiologists looking for signs of life are particularly intrigued by the potential subsurface oceans believed to exist on the three other Galilean moons of Jupiter.

Which if they do hold some kind of life, will also be due to some kind of tidal heating from Jupiter. But Io could be the place to look at for the sub, for the surface effects of Jupiter's tidal forces on the planet, similar to how our moon affects the tides of water on Earth. Whilst Io is Rocky Planet.

The huge effect of Jupiter's mass on it causes the rock to form tides, heating it up into magma, which erupts as volcanoes, which creates these red, orange, brown and yellows that we see on the surface. Its volcanoes are not evenly distributed on the planet, though. They are mostly found around the equator, but it's the ones on the poles that are the most interesting for scientists, as they may be helping to regulate Io's temperature.

Researchers were studying heat flux maps of Io and comparing them to the three models we have to understand Io's tidal heating and its effects on Io's volcanism, but they found that the data matched none of these models as the volcanic activity is far greater than it should be at those distances from the equator.

So, Whilst we don't have enough data yet, the analytical techniques being developed here can help us work with other data from potential other habitable worlds by exploring tidal heating.

Right, okay. Let's move on now to the target of the month.

Target of the Month

Okay, so the target of the month is Jupiter. Some people won't like me for this because you do have to get up early in the morning or be up after midnight.

But Jupiter is sort of back in an easy to see position. At the moment I mentioned it was in front of Orion in the early hours of the morning so it's nice to find it's easy to see in the sky it's bright so I recommend taking a look at Jupiter and if you've got a camera or a phone you might be able to play around with the exposure and get a bright dot which is Jupiter with smaller bright dots around it being the four Galilean moons.

Right and the chip of the month. So the tip of the month this month is there is an interesting challenge online called 100 hours under the night sky and it's running from the 2nd to the 5th of October and it's a really nice outreach program based in the UK to try and log between lots of observers 100 hours under the night sky between those dates and they've put together materials that show, , I think it's like four constellations and a planet, how to find them.

So you have a little activity to try and do, as well as sort of hints and tips on how to do that. So I am recommending people sign up to do that. You'll get the worksheets after you've signed up close to the time, and have a go at logging that time under the night sky. That sounds like a good idea, doesn't it?

It does. Right, we'll take a break now, and when we're back, we're going to be going into space.

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Stars Over Surrey. Your monthly guide to astronomy and developments in space on Brookland's Radio.

Starliner

And welcome back to Stars Over Surrey with Graham Laycock and Rachel Dutton from the Guildford Astronomical Society. Well, we're going off into space now and that Starliner returning to Earth. As a former railwayman, I'd call it an ECS movement. What does ECS mean? Empty coaching stock move. Oh, I guess it is.

Yeah, it is. Yeah. Okay. So I think everyone knows about Starliner, especially if you listen to this show. You can listen to previous episodes for the saga. So on the 3rd of September there were reports of strange noises emanating from Starliner and lots of

people were saying oh no it's haunted now online and there were lots of jokes about Starliner now having more issues and being haunted.

So NASA have, this on YouTube. You can listen to it. We're going to take a listen to it now. And Graham, I'd love to hear what you think.

Audio:

It's not too, I got a question bud with you, but strange noise coming through and I didn't know if you could catch Starliner me, uh, making it, but uh, between here and there happened, but anyway, can you do that?

Repeated pinging noise

Can figure that Butch, figure it out. Recording. We'll pass it on to the team. You don't notice anything else.

Well, that does sound really ghost like, doesn't it?

I was thinking it sounded like, one of those submarine horror films. Oh, yes. Yep. Absolutely. So where do they think this is coming from then? So after researching it and investigating a bit more, it turns out it was a microphone that was left on inside and the interference between all that radio and audio equipment.

This is probably more up your street growing than mine. Yes, we've had something mics left on, yes. And you can get feedback on all sorts of things. Yes. Yeah. So essentially it was that, right. That's all it was then with everything else going on, everyone was saying, "Oh no, great. Now it's haunted. Abandoned the astronauts and the ghosts have taken over."

Yeah, it must have been worrying though, because you've got this, this thing attached to your station and obviously keeping people alive and pressurised is really important. And now it started making strange noises, of course, you're going to investigate it, but I can imagine it, it must have been disconcerting to think, Oh no, I wonder what that is now.

Yeah, I mean, is it air escaping or whatever? Yeah. Yeah, so. Obviously, it turned out to just be left on microphone and actually there was a guy on Reddit that recreated that noise before the NASA engineers figured it out. So, very, very clever people. And then eventually, Starliner was returned to us, on the 6th of September, the flight back lasted six hours.

And it landed back in White Sands Harbour in New Mexico, where Boeing have their testing facility. Unfortunately, the bit that was faulty is jettisoned off, which is why they were trying to get all that data before sending it back. But the part that has come back, they're obviously really going to be investigating.

And I think you saw the press conference with Butch and Sonny as well, didn't you? I did. Yes, they didn't look too stranded. They looked quite happy to be up there for a few more months and, uh, obviously doing lots of, uh, experiments, et cetera. Yes. I, As I've said before, most astronauts do enjoy being given extended missions because they all want to get as much time in space as possible.

Obviously, it wasn't in their initial plans, but hopefully you saw on that press conference that they were aware that it was a possibility. They knew they were signing up for it. They emphasised it was a test flight. They expected things to happen. Yeah, and stuff like that and they send up about four months worth of food ISS So it's not like they're suddenly going to run out of food Yes, any pressure suits to return in the dragon.

There's one there. There's another one being flown up and I noticed that Butch said he thinks if they had more time available, they could fix the problems and go back. Hmm. Interesting, wasn't it? Yes. NASA was having none of that then. It wasn't that. It was that that port was closed off, so it was interfering with the operations of the space station.

And also not having the right astronauts there at the right times, et cetera. Right. So they are now part of the dragon nine crew, two had to stay behind. So they are taking on other people's responsibility. So I feel gutted for the two astronauts that didn't get to fly. Also they would have done about two years of trainings on their specific mission tasks.

Yes. Yes. So they're the real losers, aren't they? Yeah. So Butch and Sonny have to learn how to do those, but both of them are experienced astronauts. So, you know, there is some prior knowledge there. It's not like that. I was fascinated by Sonny's hair as well. She's got amazing hair. Yeah, floating around there.

At one point about half a dozen or about four or five went by them, didn't they, to try and get into another part of the space station. Oh, yes. The press conference. Although that was quite good work has to carry on. Yes. And actually, I don't know if you noticed this, but when they're talking, a lot of them either cross their arms or put their arms in their pockets.

And we're going to come on to this with Polaris Dawn. But the reason why is because when you relax in space, your arms float up in front of you. That's just the natural thing that your arms do. And your legs do something similar. They sort of float up in front of you, but remain bent. So rather than look a bit weird, they, put their arms in their pockets or cross them when they're not using them when they're doing press conferences so that it doesn't look weird.

Look like they're all doing some kind of strange and they were saying which was saying about, you know, you don't feel your aches and pains because of the weightlessness, but you've got to obviously maintain your bone mass and, uh, and your muscles by getting on the treadmill every morning. Yes. But the thing is when

they return to earth, it can be quite painful when everything sort of settles back down again.

Oh, right. Yes. Yes. So I've seen at the European astronauts and various sort of prototype suits. They're trying to try and stop people expanding too much. So the pain's not too bad. So if anyone has been pregnant and you imagine like mass, the baby pushing down being quite. But yeah, because you do get a bit taller, don't you?

Well, yeah, yeah, yeah. They experienced that, but with more of the body, but that's probably the closest thing that any non astronaut would ever have to experiencing that.

And now we're on to Polaris Dawn.

Did you watch this one, Graham? I saw, I've seen excerpts from it, uh, not the, not the whole thing, but, uh, I saw the crucial bit when the, the hatch opened and, uh, the first guy went out and then the next one, it was amazing, wasn't it?

And the fact there's no, there's no airlock. Yeah, so there's so much going on with this story. So the launch was delayed a few times. Some people were confused because they said we're delaying the launch due to weather and they were like the weather's fine, but actually it was the landing weather of the projected landing date that was problematic, so they have to make sure when you're coming down on a dragon, they're either going to land in the Atlantic or the Gulf of Mexico and the waves have to be, you know, within certain conditions, so it got delayed a few times and they want to do extra spacewalk training.

So, I don't know if you heard lots of people sort of comparing it to Ocean Gate and things like that. Oh, right. No, I didn't hear that. Okay, so I can kind of see where people were worried to a degree because with professional astronauts that have gone through programs, , such as like the ESA program or the NASA program.

They do their initial astronaut training. They're qualified astronauts. Then when they're given a mission, they do several years of training for all those tasks within their mission. They test every single bit of that. They're taken through it to make sure that they've really got it to the nth degree.

And then on top of all that, the people that are selected from those programs, most of them have flight experience. And come from like a STEM or an engineering background where they are constantly problem solving throughout their daily lives. And like Butch and Sunny, Sunny was a test helicopter pilot.

And I don't know if you know what test pilots do. Well, test aircraft. Yeah. What they do is, what they do is they look at the margins of safety and they work out how far they can push it. So if it says. do not do this manoeuvre above this speed, they will say, okay, let's do it at five knots faster, 10 knots faster, 15 knots faster, and see what happens.

And they are used to pushing craft their limits. And if it goes wrong, they've got the experience, the creative thought, and the, , the sort of instinct you get, like when you've been driving for a long time to be able to recover from that. And that's something that comes with lots of experience that can't really be taught.

So for that reason, when I heard it was going to be a dragon capsule, there's no safe haven, there's no airlock, I can kind of see why people would be worried about that, because There's no, no safe place to retreat if the depressurisation goes wrong, and if you shock depressurise, well, if you, you shock a suit, a pressure suit that could depressurise as well and cause problems.

So everything has to be gently, gently, slowly, slowly. So watching it was really, really painful and I didn't share the feed with anyone until I saw that it was successful. I saw the hatch was very, very slowly. Opened, wasn't it? And it's almost shut again, wasn't it? You know, it was just tiny movements. Yes.

And it has to be done that way because you can't shock a pressure suit. If you want to keep the astronauts alive. So the ocean gate similarities are not fair in my opinion, because those suits were really well tested. Unlike ocean gate, which obviously nothing was tested. We know the dragon capsule works.

Yes. They're not professional astronauts, but actually two of them, one was a space flight director for Space X. One of them was an engineer for space X, and the third one that wasn't Jared Isaacman, was, He was a U. S. Air Force pilot. So these are people who have that kind of similar background.

They just haven't done that really extensive training, but they did delay the launch because they did say they needed more training in that. ,And you also had some experts saying it was violating the anti space treaty because they weren't , looking after the safety of the astronauts by not having that safe haven, the depressurisation, so it, it was pretty nail biting in terms of concern for these very brave individuals that were going, I think it was three times.

The distance from the Earth that the ISS is, but it's certainly a lot further than, anyone's been since the Apollo missions. So anyway, that's out of the way. They blasted off on the 10th of September at 1023 British Standard Times. It was a five day mission, and it's the first of three missions. Jared Isaacman, Scott Petit, who's a retired air force pilot, , engineer called Sarah Gruce and Anna Menon, who's the SpaceX mission director.

So they were performing the first ever, commercial space walk, which I think you said you saw. Yep. Absolutely. It's amazing as they left the capsule, you know, for, for those, uh, short moments. Yeah. Excellent. So the earth in the background, you could see they went from day side to night side. So then it went dark in the background.

A lot of people thought he was doing the Macarena.

So the first test he was doing, as I said, slowly, slowly, gently, gently with the suits, the regular spacewalk suits they have for the ISS, you'll notice a really bulky with the, articulation around the arms, because when you're moving, manoeuvring around the ISS to handle things, you're pulling yourself along by your arms.

Very gentle. So you're not walking walking with your legs, you're kind of walking with your arms. And these are like a next generation spacesuit. They're looking at future Artemis. like missions, but with SpaceX instead. So going to the Moon, going to Mars, you want something you can walk in. And it's a very revolutionary design of suit and it was really thoroughly tested a few months ago.

But going into the vacuum of space, he's like wanting to be super, super gentle. So first was getting out of the capsule and just getting the upper body out. Like I mentioned with the arms, did you notice his arm went into that sort of position floating up in front of him? So he wasn't doing like t rex hand puppets or anything like that.

That was the natural position the arm goes into and then the sort of gentle hand movements he was literally just trying things like flexing and extending his fingers, gently moving and rotating the arms to check that the suit could withstand that pressure differential. So that's what he was doing. It looks very, very strange, but it was essential for the suit test.

And it had already gone through many of the tests and then they were testing the umbilical connection and things like that. So that's what was going on in the spacewalk. And I mentioned Sarah Gruijs his engineering background when they were resealing the hat. She actually noticed there was a problem with the seal and they reoriented it or something.

So, she did have that right background and mindset to know she clearly been trained. You know, to look at everything. Yes. So I think that criticism, uh, was not entirely justified either, so she did a great job. And my favourite bit, did you see her playing the violin in space? Indeed. Incredible. Yeah. So to prepare for that, they had to put the violin in a vacuum chamber to check it wasn't going to off gas.

Oh. I guess it's a wood everywhere. Yeah. Yeah. Yeah. And she played a raised theme from Star Wars, but they got, loads of amateur and professional orchestras to do the backing track for that. So it was like this big, moment, which I was quite jealous of, if I'm honest. , if anyone wants to put a cellist on a space flight, let me know.

You'll be there. I'll be there. I'm up for it. So. Do you think having a separate pressurised chamber is going to be the future then? Personally, I hope not. No, it seems a bit extreme to me. No, but in terms of having the ability to do that and having more flexibility in terms of what you could launch to places, I suppose it's quite useful.

So it's good that we've got the technology there. I personally, my risk tolerance wouldn't allow for that. I wouldn't be happy about launching people without that. But, you know what, if there was any real problem securing the hatch again, what would you do? That is something that was, uh, muted, but, yeah.

That didn't happen. They successfully landed. They've all gone to, Houston to NASA to do their, , post flights checks. So they undergo very serious medicals. One to check that they're okay. Two to check they haven't got any space viruses. , but three also that's where Like all the astronaut space medicine specialists are that can check that they haven't had any serious adverse effects, et cetera, and they know what they're doing when they're checking, you know, people's vital signs, et cetera, after they've been in space.

Right. Now we've got the Bepi Colombo flyby.

Yep. So it's Bepi-Colombo, after the scientist, , this is a mission going to Mercury, and Mercury is a planet that we don't know much about. If you want to know a bit more about this mission, go to May's episode. There's a few things I've referenced from May, actually, in this one.

So it's getting there through a system of flyby manoeuvres, and then these flybys is testing its instruments and its cameras. And again, if you look at these images, and again, they will be on the replay page links, and sent out to people on the mailing list in advance. You can see these incredible images of Mercury, kind of look a bit like the Moon.

Indeed he is, he's got a lot of pop marks, isn't there? A lot of craters and marvellous detail. Yeah, it's probably the best detail I think I've seen of Mercury. , but they are stunning. So it's really exciting, we know that the cameras on it work. So that's another big tick on that mission. Good, they're doing well then.

And uh, Juice Flyby confirms that there's life on Earth. Yes. Do we need to know that? So again, this is the testing and calibrating of instruments. So I mentioned Juice is going out to the Galilean moons to look to see whether it's got, , the ingredients such as water and various elements like carbon and hydrogen and nitrogen and oxygen that are needed for life like us.

So, , As it was doing its flyby, because it's also using these gravitational shifts around the solar system, last month it passed by Earth, and , to test and calibrate its science instruments, it did those same tests, and it did confirm that there is life on Earth. That is reassuring, but it's reassuring that it's working.

Technically conditions were right for life on Earth. Indeed. But, yeah, it's an important phase, but it's always nice to know.

Astrocast

All right. Well, let's move on now and go to Astrocast and see what we can look out for in the night sky over the coming months. Okay, so on the second we have the new moon with an annular solar eclipse.

So, , that is where you have a ring around the moon. Thanks for tuning in. , when it's between the moon and the sun, . You then have, on the 5th, the moon near Venus, on the 10th, the first quarter moon, which is the waxing half moon. On the 13th, comet Tsushinshan Atlas is nearest to Earth. On the 14th, moon is near Saturn.

On the 17th, we've got the supermoon, full moon. On the 19th, we've got the moon occulting the southern part of the Pleiades, which is the splodge constellation in the picture I mentioned earlier. On the 20th, we have the moon near Jupiter. On the 21st, we have the peak of the Orionid's meteor shower. On the 27th, the Moon is near Castor and Pollux.

And on the 24th, we have the last quarter moon. And just to note, on the 27th, we switch back to Greenwich Mean Time. , Telescope users, you can look at the shadow transits of Ganymede on the 26th. Mars is a morning planet in the constellation of Gemini. , Venus, Saturn and Neptune will be evening planets and Jupiter and Uranus will be well placed.

Events

And finally, we'll look at what events are coming up in October you might be interested in. Right, so on the 2nd to the 5th of October is the 100 Hours Under the Sky. So if you go to 100hours.online or just Google it, you can take part there. Guildford Astronomical Society have a talk from Professor Ian Corbett taking us from the Anglo Australian Telescope to the European Extremely Large Telescope and how UK astronomy grew and prospered.

On the 5th of October, we have Space Week in Guildford Town Centre. We'll be there with telescopes. On the 8th of October, we have Farnham Astronomical Society having a talk from Zach Thomas. of Surrey Satellites talking about Earth sensing satellites. And on the 11th October, Yule Astronomical Society have Michael Foulkes, the director of the BAA Saturn, Uranus and Neptune division, talking about Herschel's planet.

Just a spoiler alert, that's Uranus because Herschel discovered Uranus and wanted to name it George after the king. Right. Well, plenty going on there, Rachel, and a fascinating edition, and may you be the first cellist in space. Yes. Here's hoping. Indeed. Right, well, that's Rachel Dutton there from the Royal Astronomical Society, and we look forward to talking to you again next month.

Our next edition is on Tuesday the 29th of October at 8pm on Brookland's Radio. Bye for now, Rachel. Bye, everybody.

Stars Over Surrey on Brooklyn's Radlo. Join us on the last Tuesday of the month at 8pm for the Monthly Guide to Astronomy and Developments in Space.

2nd-5th October	100 hours under the sky 100hours.online
3rd October GAS	Prof Ian Corbett taking us from the Anglo Australian Telescope to the European Extremely Large Telescope, how UK astronomy grew and
5th October	Space Week Guildford Town Centre
8th October	Farnham Earth-Sensing Satellites, Zac Thomas, Surrey Satellites (FAS)
11th October	Ewell Astrosoc - Michael Foulks Director of the BAA Saturn, Uranus, and Neptune,
	Herschel's planet

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.

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