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 June's Stars over Surrey. I'm Graham Laycock, and with me is Rachel Dutton, a fellow of the Royal Astronomical Society, and a member of the Guildford Astronomical Society. Hello, Rachel. Hi Graham, how are you? Alright. A bit hot and bothered, but otherwise okay. And you Same. Absolutely.

There we go, anyway, we're here again to have a look at all things astronomical and also developments in space as well. And as usual, we start with astronomy and we start today with

K2-18B Alien bio signature update.

So a couple of months ago, you may remember that there was this another big alien story.

We were looking at the world K2-18B, an exoplanet 124 light years away, that orbits at star every 33 days, and it sits within the habitable zone, but it's orbiting a red dwarf star, which is a lot cooler and dimmer than our Sun. And they are known for throwing out a lot of radiation. And on top of that, they thought, well, certain, scientists published a paper thinking that they had found signatures of dimethyl sulphide and dimethyl disulphide to DMS and DMDS, in the spectra. Which is normally made by plankton on Earth. So that could have been a potential bio signature. And as we reported at the time, there was only a three Sigma strength in the detection.

You need five sigma for it to be certain that his dimethyl sulphide or dimethyl disulphide. So we were joking that we may have found radioactive face plankton, but even if they had definitely found DMS or DMDS, then it could be some kind of chemistry that we are not familiar with on Earth that is not created by any kind of life.

So two more papers have come out looking into this claim. One group took the raw data from JWST and re-analysed it using their maths and code, and they said that using that data, the signal for DMS is the same as that signal for methane and that you would need at least another 25 observations least to distinguish between the two.

Ideally far more. I doubt they'd get that much time on JWST. Another group also delved into how to recognise different molecules within data and have come up with different suggestions and what evidence you would need to make a claim of successful. Detection because astrobiology is still a relatively new field.

We're still trying to figure things out, and they came out with some more ideas and sort of better governance for declaring. You think you may have found something? Well, we are going to be widening the search for aliens now. Yes. So this is kind of expanding on a similar theme to that last one. So Graham, what are your favourite aliens from different films?

Ooh, I think Or TV series. Oh, tv. Well, I suppose Dr. Who is the one, isn't it? You know, the cyber men I thought were pretty good. And I, I really do love the, the darleks, the dear things. But going way back, the Hitchhikers Guide to the Galaxy, I remember, I can't remember the name of them now, there's a big green blob that is, Vogans.

Vogons. That's right. Yes. They had to create this super highway Yes. And knock Earth out the way. And why hadn't we read the planning notice on a particular star? A few million light years

away. Yes. Right. So, exactly. So within that, you've already named one thing that kind of looks like an octopus.

One thing that's an exoskeleton with a brain inside it and the big blobby vogons with their infamous poetry and lovable things, paperwork related. So that's great. And then if you think of other things you've got like Alien versus Predator. Thinkable, the Star Trek and Star Wars aliens. You've even got the Blob, which is literally just this blob.

Yeah. Right. And this is the problem with. Astrobiology as a field, because everyone these days I think is fairly intelligent to intuit that looking for aliens. We could, in theory, be looking for anything. And our view of what life is is fairly biased based on what it could look like. And even on Earth, it's still pretty diverse.

If you think that, you know, a tree is life and amoeba is life, and octopus is life, we are life. But we are all very different things. And even then, we are still heavily biased towards looking for things. A world that has a liquid solvent like water on it. So we're looking within the habitable zone. We are looking at things that are carbon based that have chirality.

So there's so many things that we are looking for, and you can't apply for funding and say, we want to look for aliens. And then they all say, okay, where are you going to look? We don't know. Okay, well, how would you know that you found them? We don't know. How would you recognise that you found them? You don't know.

Can you guarantee you'd find or exclude anything? We don't know. So you have to start looking with the bias that you've got on Earth. So you have to start looking at, we need a solvent. Water is pretty good, so we need that habitable zone of liquid water. We need that carbon based chemistry. We think at the moment.

So you have to sort of narrow it down to have some idea what you're looking for. because unless you see something really obvious like city lights from a planet that clearly has cities lit up at light, you are not going to spot these things easily. And you are looking at more at molecules like biosignatures in the atmosphere with the technology that we have at the moment.

So. At the moment, we are quite limited in what we are looking for. Our original constraints started off looking at wells of liquid water, as I said. So we're looking at that temperature range. We're looking at that thick atmosphere so that there is some kind of way of having, aerobic respiration and maybe we can see signs of, life such as, cow burps and farts, which creates lots of methane that goes into the atmosphere.

We know that we found that potential phosphene detection in Venus and that was something that excited people because on Earth that is something that is excreted by penguins. So we're talking about Venusian space Penguins. There are so many things that could be a biosignatures or could be some kind of exotic chemistry, but at the moment our search is quite narrow because it kind of has to be in order to get any kind of funding.

Researchers were also looking at how adaptable life on Earth really is. So bacteria like extremophile that can survive and thrive in atmospheres, rich in gases like hydrogen, helium, carbon dioxide, and carbon monoxide. Those were conditions we once thought were hostile to life, but we know these tiny, tiny.

Life forms can adapt to those and they can adapt to really icy conditions. They can adapt to space. They've had them on the outside of the Space Station. They can adapt to volcanoes and hydrothermal vents in the ocean. So. These are pretty hardy examples of life. So the team brainstormed different scenarios where life might exist without solid ground underneath it, and started looking at cloud biospheres as they called it, where life could potentially float in atmospheres of planets where rocky surface are too hot to support traditional life forms.

Or aerial ecosystems that might exist in thick atmospheres of super Earths or maybe even cloud layers of gas giants. So aside from the mass difference of like super Earths to Earth, this kind of

takes us back to where could life as we know it exists. And rather than just assuming that they could live on an Earth-like world, what are the worlds could life as we know it exist in so.

This is going to widen up the potential search, and hopefully it means that we could have more things to look for before we sort of exclude them. Fascinating stuff. Yes. It really, really makes you think, doesn't it? It does indeed.

Now, could the 2024 YR four cause a spectacular meteor shower, right?

So, do you remember it's not falling down to Earth or something, is it? Hmm. Bit of a complex answer to that one. So do you remember back in the end of 2024. We had the news that there was this asteroid YR four that may or may not hit the Earth it was going to be pass us around New Year, disappear for four years return.

We'd get more data, then disappear off, return again in 2032 and potentially collide with the Earth and at one point the likelihood went up to potentially 4% and then it sort of dropped back off as we got more and more observations could calculate its trajectory a lot more accurately. And then we went back to very unlikely to hit again.

Right, I remember that. Great. So we're found sounding familiar. So now there is a tiny chance. Around 4% that it could impact the Moon in 2032. Oh boy. So we're 4% again. Yes. So let's refresh our memories on the stats of this one. So it's 53 to 67 m across and it's thought collision with the Moon would have an impact equivalent to 6.5 million tons of TNT leaving a one km size crater.

And that will cause a load of rock from the Moon to be ejected, which could rain down on the Earth igniting as it does so. And as it goes through the atmosphere, creating a load of fireballs and an extremely spectacular meteor shower that may cause some small level damage on the Earth. nothing too spectacular.

But you know, things like when people get meteorites landing in their garden type, spectacular. Right. Okay. No problem with sort of communications and other things. They may collide with satellites, but it would be like individual satellites or ones in a particular area. But again, statistically the chances of that happening are still pretty low.

Good. So again, keep a check on this. I'm sure they will, and they will again, keep predicting trajectories. I think we've got to wait for the next pass now. So in four years time we'll get more data. Yeah. So I may have top datas in four years. Indeed.

Now we're onto the Martian atmosphere, which is, is sputtering.

That's right. Really. Yes. It sounds like an unusual term, doesn't it? It does sputtering. So I've spoken many times about space weather or solar wind that causes auroras and it's stripped with the Venusian atmosphere of the lighter molecules such as hydrogen causing thicken. And then we had the runway Greenhouse Greenhouse effect.

But let's recap. So one of the biggest mysteries of Mars that we are trying to understand is how Mars went from a planet with water on the surface to a dry, barren, radioactive wasteland. And using nine years of data from NASA's Mars Atmospheric and Volatile Evolution or Maven mission, scientists have come up with something.

Called atmospherics sputtering that could have caused the atmospheric loss. So this mission entered into orbit around Mars back in 2014, and the goal was to explore the planet's upper atmosphere, the ionosphere, and interactions with the Sun and the solar wind. And scientists use Maven data to explore the loss of volatile compounds such as carbon dioxide, nitrogen, under water, from the Martian atmosphere to space.

And we can get space weather causing weathering of the atmosphere. So instead of the standard, it just strips the lighter molecules from the atmosphere, charged particles crash into

Mars's atmosphere, causing other particles to be ejected into space. Similar with, you know, that, ejector from a potential asteroid hitting the Moon.

Right? Imagine something similar, not identical, but just in terms of, an analogy that people can understand. Imagine that sort of happening with the atmosphere. So. Earth has this too, but our magnetic field helps to keep the atmosphere intact, but Mars doesn't have that magnetic field, so it doesn't have anything to keep it intact.

So the solar wind interacts directly with planet's, upper atmosphere, ionising particles that can be accelerated to point, or they can escape into space, and then they can also be accelerated towards the planet. Precipitate back into the atmosphere, colliding with other particles, transferring enough energy into those particles, then to exceed their escape velocity, which is a process known as sputtering.

So whilst the atmospheric loss is dominated by photochemical and thermal escape today, so basically radiation from the Sun heats things up or creates various different reactions, and then the extra speed that you get with heat, because temperature is essentially measuring the speed of atoms. That can cause them to escape the atmosphere.

It's proposed that sputtering was the primary escape process billions of years ago when the solar activity was much higher than it is today. So I've covered, we think some of Mars's atmosphere could be contained in the rock. Some of it could have been bombarded away by solar wind, and now it looks like atmospheric sputtering has had a significant effect too.

And now the punch mission sees a solar eruption.

Yep. So the Polarimeter to Unify the Corona and Heliosphere mission, or so known as Punch is a two spacecraft mission operating together, but they're apart. So they kind of have this 3D effect like you get with your eyes, or when you film something in 3D, you have two cameras, you have a left and a right.

So you get that stereoscopic vision and this is doing something similar. And they used an occult disc, which blocks out most of the light from the Sun so that you don't damage the sensors. And they're in the commissioning phase right now, so they're still testing it. They're working out how to sort of align things, how to calibrate things, how to get it all to work together as a system before the science mission starts.

And during this phase, they observed this giant coronal mass ejection, and you can see the video of it online. It's quite spectacular. This mission will help us to understand and hopefully predict these coronal, mass ejections far better so that we don't have these catastrophic events like a modern day Carrington event that could knock out all our electrical items, the grid, and electrify the air.

Yes, we don't want that happening.

Now mystery object. Unlikely to be aliens.

Yes. You're disappointing me all the time. I know this was another one that everyone, was reporting that we'd got more radio waves from some kind of unknown civilisation in space. So. Astronomers detected an object that was making a radio pulse every 44 minutes.

Now we have pulsars that do that, but a long period pulsar is usually around two to three minutes, and a pulsar is a spinning neutron star, and if it's axis is tilted the right way to one of our detectors because they've got this really strong magnetic field, it hits a detector. We get a pulse and we can tone the pulse to know how fast it spins.

And the first one was detected by Dame Professor Jocelyn Bel Burnell, an incredible woman whose achievement was credited to her professors who won the Nobel Prize for her discovery, which we've mentioned before. Indeed, and she's an incredible scientist. She's still based in the UK at Oxford, but moving on pulsars are very accurate and repetitive.

They make great lighthouses to mark your way around the sky if you were to go traveling around in a spaceship. So. They do eventually slow down their spin over very, very, very long periods of time. So the longer the period, the older, the pulsar being you, shorter the period, the younger, the Pulsar. And we've played, pulsar noises before so you could hear different spins.

So some of them were so slow, you just got to click every few seconds. And some were so fast. You got what sounded like a musical note. I don't know if you recall that, Graham, when we did our pulse, our listening. I do remember that. Absolutely right. So the weird thing about this is one, it's 44 minutes, but there's also a 44 minute x-ray pulse that was found in the Chandra X-ray observatory data.

So we have no idea what this is and it's likely to be classed. As an object that we've never seen before. So the press for having a field day with this saying it's an alien civilisation communicating with us. But there are a couple of potentially likely scenarios. So maybe it's two objects such as a white dwarf and a neutron star, or a white dwarf and a black hole, or other combinations of star pairs that are interacting with each other in some way.

And we've not observed them before now, and this could be a new thing. It could be a magnetar, which does emit both radio and x-rays, but not together on a regular basis. But the favoured front runner is a pair of stars, including a white dwarf and another star. But this would only be possible if the white dwarf has the most strong magnetic field that we've ever encountered so far, and way stronger than we've ever imagined of the white dwarfs.

So the exciting thing is we've probably discovered an entirely new class of objects. Wow. But we don't know yet what it is. More investigation, obviously. Yes. Right.

Well, let's move on now to the **target of the month.**

Yes. So the target of the month is the Milky Way. Now you can see this in Surrey. If you know where to look, you need to find dark places.

So I've seen it before around the back of Denbies and at Ranmore. try and find the least light polluted place with a good Southern horizon. What you want to do is look up, find the Summer Triangle. That's Target one to look for. So you've got Deneb, which is part of Cygnus. Then Vega, which is a super bright star, and it'll be one of the next pole stars in the sky.

And then you've got Capella, which is part of Aquila. So you have this triangle in the sky. You can use an app to help you get there. Then if you look down the middle of Cygnus, the Milky Way is in that area. So see if you can find Cygnus and then continue that line either way, but ideally towards the southern horizon.

Just keep an eye on that part of the sky. And after 20 minutes, you may start to see a whitish smudge in the sky, and you might need to use averted vision. So this means instead of looking directly at that area, just look about 30 degrees away so you can see it out the corner of your eye. And usually it's a lot easier to find that way when you're in Surrey.

So that's always a good fun one. You do need about 15 to 20 minutes, and then our astronomy tip of the month is a bit more of an **astrophotography tip of the month** on how to image the Milky Way. So there are lots of free online courses and blog articles telling you how to do this. You want a long exposure, but usually anything longer than eight seconds will cause trailing of stars.

So depending on what camera or phone you're using, you want to get the longest exposure you can, but you want it to be super steady as well, so you don't get any squiggly stars. So if you're using a mobile phone, use a tripod and then put it on the longest setting you can. It's usually sort of eight to 10 seconds, then have a go.

You obviously need to be able to find sickness to be able to do this so that you can aim for the Milky Way. If you have a DSLR, you can do eight second exposures. again, you'll need to go on a

manual mode. You'll need to play around with your ISO usually around 6400 or the next one up, or the next one down.

Depending on your camera, you will, you should know your camera and the manual settings sort of well enough. If not, look for any kind of. Blog posts, there's free YouTube videos telling you how to do it. Again, you will need to use an iPod, not an iPod, a tripod. and you can also use techniques where you take a picture of the foreground and then you take multiple pictures of the background and stack them together, and then you sort of Photoshop to put the foreground with the background together, which some people say is.

Sort of cheating, but it's, it's not really, you are, you're still getting all the data there. you're just kind of making it into one coherent image. So that is our astro astro photography tip of the month, when I can say it. Thank you, Rachel. Well, well, we'll be back shortly with the Space News for this month after this short break, stars over Surrey on Brooklands Radio.

Join us on the last Tuesday, the month at 8:00 PM for the monthly guide to astronomy and developments in space.

Stars over Surrey. Your monthly Guide to Astronomy and developments in space on Brooklyn's radio.

And welcome back to Stars Over Surrey with me, Graham Laycock, and Rachel Dutton, fellow of the Royal Astronomical Society. And now Rachel, we're onto this month's space news and starting with **the catastrophic loss of Starship 36**.

Yes. So last month we covered Starship Flight nine, which did have some successes, but the door failed to open and then they lost control of the ship and it crashed, landed back to Earth.

So the investigation of that has not been completed, but they had started building the next Starship for Flight 10, although they would still have to wait for the investigation to be over to get the launch license for Flight 10. This was being tested ready for launch at the Massey facility facility, which is near star base in Texas.

It's literally like a couple of miles down the road from the star base launch site. So whilst a hot fire test was being conducted, an ignition was seen originating from the nose cone before the whole camera screen went white and the whole area was in shrouded in a mushroom cloud. It was quite spectacular.

It was. Did you see the imagery? I did, yes. I thought, oh no. Yeah, so very luckily, the whole process of what they were doing was fully automated, so there was no one around. There was no injuries, although residents up to 30 miles away, felt the explosion really. It was quite, was it on the Richter scaler? I don't know.

But I can imagine. Do you remember the Buncefield explosion? Yes, I do. About 20 years ago. Yes. Instead. Yeah. Yes. I have family around that area and some of them had things like windows blown and yes, roofs on garages moved. So I should imagine it was probably something akin to that, if anyone around experienced that.

The damage was confined to the test site. The cloud may have distributed tiny particles of material from the rocket, so residents around the area who were downwind would definitely need to take care not to breathe in dust, which could damage their lungs, but there wasn't anything sort of toxic that would've hung around.

So overall, not the worst in the world for an explosion. You know, no injuries, no damage to anything other than the local site. So at the time of the explosion, the ship was being loaded with liquid, methane and oxygen, which is super cold and volatile propellants. And this was supposed to be the final test before flight 10.

But, not only will this be delayed until all investigations are completed, that whole test area that they are. Pop fire tests the rockets, and before they even moved them to star base and launched

them, that whole area has been destroyed. So it'll all need rebuilding. So we're probably looking at Autumn at the earliest.

So Musk initially, is it Xed or Tweeted? the initial evidence points to a nitrogen COPV, which is composite pressure vessel in the payload bay failed below its proof pressure, which is. If this is true, is the first time it's happened with this iteration of Starship. This is sort of the second block of Starship, the second iteration of Starship version two.

The official statement from SpaceX a day later said, after completing a single engine static fire earlier this week, the vehicle was in the process of loading cryogenic propellant for a six engine static fire when a sudden energetic event resulted in the complete loss of Starship and damage to the end.

Immediate area surrounding the stand. The explosion ignited several fires at the test site, which remains clear of personnel and will be assessed once it has been determined to be safe to approach individuals should not attempt to approach the area whilst, saving operations continue. So some people have said this could be a blessing in disguise.

A Starship Block two has had issues with the last few flights. This delay for Flight 10 might mean that, SpaceXs fail fast, learn fast. A lot of people think maybe it's swung too far. In the other direction of it, it's just sort of dangerous, not enough checks in place and it's just wasting money and resources on starships that are likely to fail.

Maybe this will force them to slow down a bit and do a bit more testing to figure out what is going wrong. So some people have said maybe it's a sort of blessing in disguise because it takes that pressure off from, all the sort of press and the fan boys sort of pushing them to go through the next situation and the next situation.

They might sort of have a little bit of breathing space now because they've got no test site to test it before it launches. Yeah. in order to try and get something a bit more nailed down in terms of what's going on. Yeah. It went through my mind whether they haven't got the balance right in terms of testing.

Yeah. And **now interesting one armbands for astronauts legs.**

So there'll be Yes. Be leg bands. You think so? But let's have a talk about space travel and being an astronaut. So, there's a lot of talk about making travel to Mars with the current US administration. And there are still many issues with long duration space travel that we have yet to work out, such as radiation exposure and protection, loss of bone mass, loss of muscle mass from the lack of gravity, and other issues with fluid distribution, with lack of gravity, and even how drugs and medicine react with the body in both.

Within the space environment. So I think there was some EpiPens sent up to the ISS. They weren't used. They were brought back and they looked at the EpiPens and they turned into a toxic substance. Oh dear. And also because the blood no longer has sedimentation due to gravity, the way medications react with blood.

It's different in space as well. So there's a whole load of research that still needs to be done on this, and we still need to really understand this a lot more, but one of the big things that most people are aware of is mitigation of bone loss and muscle loss. So you see astronauts on the ISS doing their two hours of exercise every single day to try and reduce the amount of loss, but they still have that loss.

And in all those big films like Interstellar, you see them doing their exercise as they're traveling. So. The other thing that you see a lot is. Even our missions in the ISS in microgravity, which last six months to a year, when astronauts return to Earth, they struggle with adapting to gravity for a few days and we see them being stretched off so they don't injure themselves after the landing back on Earth because they sort of fall over.

Things like lifting up your arms is really hard because you've got to get used to gravity again. Even lifting up a glass of water will be very strange and a bit of a challenge at first. So I'm sure you've, seen this Graham, because you've seen a few landings now, haven't you? Absolutely. Yes. And how they come outta the capsules, the last one, you know, and they're, as you say, really carried out almost, and then put on a stretcher straight away till they can get their sea legs back.

Yes, exactly. So you want them to be safe and not injure themselves. Mm-hmm. So as you can imagine, if you were to travel. For a few years and end up on Mars. Mm. And there's no rescue team there to stretch you off. No, that's a good point. Yes. And you're going to have even more muscle and bone loss at this point.

Mm. So they're looking at different solutions and as well as extended exercise routines and exoskeletons. So where you see people who have been paralysed and lost the ability to walk, they are put in sort of exoskeletons and they can walk in those. those are going to be really heavy and not easy to take to another planet because we want as little mass as possible.

But one very new and very novel solution inspired by swimmers. Armbands has been proposed. So bones are moved by the muscles when the muscle fibres sort of contract and relax again. So they sort. Stretch out and go back to the original shape and all the muscles working in concert cause this sort of MO movement of our skeleton.

So research has built a robotic leg and then put together. These sort of airbag muscles made out of things similar to armbands and then coordinated them to move very precisely together and change the air around inside these to simulate and. Stimulate pressure against the muscles to get them to move in a similar way, but with the help of these little, little air bubbles pushing against the muscles to get them there as well.

And then the airbags can also replicate a bit of that movement themselves to sort of give a little bit of. Boost to the legs. So clever. Clever. Yes. Try to be on a robotic leg. Yeah. So could they, you know, while they're sleeping, even have these on that would do the work for them overnight. That's a great idea, Graham.

Yeah. You should let them know. Yeah. There's so many different potentials. So, yes. It could mean that they could do that kind of passive exercise. It could mean that instead of being on the other side and being a lot weaker, that they've. Got these extra sort of boosts helping them when they land. So there's a lot of exciting potentials with that one thing.

And I see that NASA has got cut proposals.

Yes. Pressure on the budget from the, from the White House, I guess. Yeah. So this hasn't passed through Congress yet, and I'm going to tell you how you can help wherever you are in the world. There was the skinny budget and now there's the more in depth budget, which shows a 46% reduction in the budget to NASA and a number of missions that are already on their way to destinations or are in place, Earth and solar science.

There are so many different things that are going to have cuts and the potential could be catastrophic. And I'm not exaggerating, unfortunately. So, Graham, I provided a diagram. People can find this on the Yes. Internet. Yes. I see that there's a lot of, a lot of crossings out. So that's a list of all the active missions at the moment in various places around the Earth, the Moon, and going to different places in the solar system.

And there is 147 projects there. 41 of them are crossed out. Goodness me. So each loss is going to be the loss of thousands of jobs, and that means that we spent billions on a mission that is doing something and it has data, and we'll come back to how important astronomy data is in general and technology.

So these are already taking place then? Yeah. So many of them are, are already out there. Some of them are due to launch and everything is in place to launch. So, It will be like waste of billions and losses of jobs at honestly a catastrophic scale. So we've got a 51.6% reduction in Earth

science, a 31.6% reduction in planetary science, a 65.8% reduction in astrophysics, a 25.8% reduction to funding to the International Space Station.

So I'm just going to go through and talk about some of the impacts of these. So. One of the big ones that a lot of people don't realise is that NASA does a lot with climate science on Earth and meteorology science as well. So there are cuts to climate science. I think most people understand that climate change is real, whether you want to argue it's human based or not, it's real.

It's happening. and we need to understand it more to understand these extreme weather events that cuts to NOAA and the meteorology services have also. Have already, resulted in weatherman in Florida, literally presenting on TV saying, I want to give you a more accurate forecast. I can't, I can't tell you if there are hurricanes coming at the moment or how bad they are because that's just been cut.

So there are people in Hurricane Ali who may not get enough warning that a hurricane is coming or the strength of the hurricane or the path projected, which is obviously really serious because. So many people in Florida and in other areas, they have various different protocols, whether they can evacuate or not.

They know how to make the area safe. So like putting things like the garden furniture into their swimming pool so it doesn't go around and kill someone or chop off someone's arm if it goes flying. It's really serious stuff. Being able to accurately predict it so people can either flee the area or make it safe is really, really important.

We've also got the impact of solar storms on Earth. I mentioned a bit earlier in our astronomy section, we love that they can cause Aurora, but we know they cause satellites to the orbit by adding friction to the atmosphere. And there was a round table simulation, I think just last year of the disaster response that showed we are woefully unprepared for a major geomagnetic storm.

So the Carrington event that I mentioned a bit earlier back in 1859 was not even the most severe storms that could be on Earth as a result of space weather, but even then, people saw auroras of mid-latitudes telegraph lines were experiencing strong induced currents causing sparks and shocks to operators, even fires in some offices.

And the telegraphs worked without any electricity supply. Just the electricity in the air caused them star working. Can you imagine if you've turned off your computer and it just turns on by itself? Or even worse, just sets itself on fire. Yeah. Or any battery around you just sets itself on fire. with.

Warnings of two days of severe storms from the Sun, which is roughly what we get. So when I'm looking for my Aurora, I get roughly two days notice that there could be something after we see something leaving the Sun surface. In today's electricity based society, we might be able to warn people how to make their electrics less vulnerable.

So turning everything off, maybe putting them in places to confine fire, better, preparing fire brigades that would be overwhelmed and give. Countries around the world chances to disconnect the electricity grids, which would be damaged. And with all this in place, we might at best suffer a few months of disruption to the supply chains.

Agriculture would also be severely disrupted, so crops may be affected for years causing food shortages. We would essentially be living. In a severe depression where you don't have the internet, you don't have anything electronic. So things like, inventory services or even a lot of farming now is based on machinery that has, it all automated where it decides when to order things, when to fertilize things, everything neatly calculated, not sort of the farmer having to work it out for themselves, going to buy things in shops.

Those tools won't work. You won't have access to a lot of things. Many people will be left unhoused. There may not be enough food for people, and that's our best case scenario. But without the warning and information to disconnect our grids, we could be looking at post-apocalyptic societies that take decades to recover and rebuild our grids on whoever survives.

So that is one which is quite scary. But we've got missions such as New Horizons, Osiris, apex, and Juno. So New Horizons got us that beautiful image of Pluto with the heart on it. Osiris Apex is the next stage from Osiris Rex, which did the return from the asteroid Bennu. And then it's flown back out again.

And Juno, which is in the Jupiter system and still sending us images back, they are still in space. And yes, they have finished their primary missions, but they are still out there flying past major objects. And one way to prevent spending big money on big missions and big launches like JWST, I think most people know is about 30 billion US dollars.

Rather than spending the money on a brand new mission, a lot of these missions, whilst they're out there, we still take data back from them by extending the life. So that means we are, still paying for more people on the ground using the ground tracking stations and the radar stations that collect data from these missions and store it.

And then you have scientists that are specialists in that particular area that sort of get that data in ways that other scientists can use it. So there is a lot of that that happens on, that's going to be cut. Hubble gets 9% budget cut. I can kind of understand that. I love Hubble, but it is towards the end of its life.

JWST at 25% budget cut. which covers again the operational staff on the ground. Because apparently they need to make things more efficient, which would probably mean people working longer hours. Nancy Grace Roman Telescope survives, but with a 62% budget cut before it even gets its first light.

Physics of the cosmos 99% cut. So the Fermi gamma ray telescope gone Chandra X-ray telescope, which has helped calibrate thermography for breast cancer screening. So it, this is mind blowing to me that we use X-ray data from a space telescope to make breast cancer screening more effective and safe of people. the US contributions to European based projects like LISA, the space gravitational wave interferometer that would detect.

Gravitational ways from emerging black holes and neutron stars. That will go, their portion of funding towards the Euclid Space telescope being cut, which might restrict scientists from the US being allowed to access data earlier before it's published to the general public. So they won't have any sort of head start if there's anything they wanted to look for.

The Habitable World's Observatory will. 81% cut, but survive. That's looking for direct images of exoplanets, of planets that are like Earth. The Keck Observatory in Hawaii, which is super famous, it's a cornerstone of US astronomy. It was the telescope that proved there is a super massive black hole at the centre of our galaxy.

Hundred percent cut the Rosalyn Franklin mission, the Mars Rover due to go to Mars in 2029, manufactured by Airbus in the uk and I've gone to the Mars yard and played with mockups of this. And it's designed to scan for DNA on Mars that'll be canceled, along with a number of other missions. So again, billions of dollars wasted, massive job losses.

There are two missions that were scheduled to go to Venus, the Da Vinci mission and the Veritas mission, they've been canceled. So when I mentioned earlier before about potential phosphene detections and these were going to give us a bit more data for us to work out. Is it phosphene, is it something else?

If it is phosphene, could it be life or could it be new exotic chemistry or gone? People who are looking to graduate and finish their PhDs, if it's funded, some of them have lost their funding already. Anyone who is postdoctoral or fellowship level. So between your PhD and in the UK being a professor or being tenured in the US, that sort of chunk from your twenties through to your thirties, roughly maybe to your mid forties part of the career of the field of astrophysics and planetary science, et cetera, the funding for those is already going as, budget cuts are being anticipated and people are losing their jobs positions there. despite the cuts to the ISS, which is a floating laboratory, and yes, it is leaking and slowly breaking down, it is essential for us to

understand the safe of space travel, such as the Artemis and Luna Gateway programs, which are also being cut after Artemis three.

So the ISS is having funding cuts Artemis after Artemis three have funding cut. Luna Gateway. Several gateway modules have already been constructed, that's going out the window Mars sample return mission is also being canceled. With an interesting twist. So instead of looking at getting humans to the Moon, which is an important step in understanding how to get humans safely to Mars, they're looking at getting humans to Mars within the same timeframe that they were looking at getting.

Sample returns using, you know, automated things like robots and probes and things like that, which is going to cause a whole load of other challenges without the data from the ISS or the Moon missions, et cetera. And then we've got the spinoff technology. Graham, I don't know what you know about NASA spinoffs.

No, I don't. Okay. So one quote I love is that we sent people to the Moon with the Apollo missions with technology more primitive than something that most people have in their pocket. And most people think their mobile phone. We're not even talking about mobile phones. We're talking about car keys. Oh. So this is how much technology has changed thanks to the space industry.

So your phone, your computer being made of smaller components, memory, storage, the internet, those are all space and astronomy, spinoffs I mentioned, the Chandra X-Ray observatory and the calibration of that data being used for all sorts of things from medical purposes to security scanning. There are thousands of spinoffs that we as a society take for granted that we use every day thanks to the space industry.

And on top of that, you've got the NASA Search and Rescue Program, which saved 50,000 lives so far since, its inception back in 1982. Again, NASA technology. The cuts are also happening to the National Science Foundation to many museums across the the board, so things like NASA outreach is completely gone.

I've used their materials a lot for things like the international observed the Moon night, and they provide such great materials and everyone around the world has an event. We have one in Guilford and we log it there and we can see how many different places sort of. We're observing the Moon at the same time or within the same 24 hour period all gone.

And outreach is really, really important to help not just get kids excited in STEM careers, but adults who are voting on important things like have you got a. Politician that understand science and how important it is to your everyday life that you are, you are making informed decisions about who you're voting for and you understand the impact of the policies that they are saying.

I will say there are some positive points within this. So planetary defence is getting a increase in its budget and that monitors potential Earth collisions with asteroids and comets. Potentially it might fund, missions to go and deflect the asteroids. There's a mission called Dragonfly that will be going to tighten the large Moon of Saturn that you can see through most everyday telescopes.

Now, Titan's, really fascinating. It has its own precipitation cycle, but with methane instead of water. So. Dragonfly will see if it is a habitable world, and that's getting a funding increase. So if you want to know what you can do to help, there was a petition that the Planetary Society had that anyone in the world could sign.

I think that's now closed, but do go and check out their website. I've signed it. There's also a list of things that they've put together, materials such as scripts so that people in the US can send their elective representatives. So if you're in the US, you know anyone in the US who wants to try and help, not get this budget put through, there are resources on the Planetary Society website.

So, I don't know, Graham, if I've given you an argument as to why space science is really important to everyone, but I hope I've given a flavour. Oh indeed, absolutely. Just seems so mad to, with all this learning, you know, to suddenly stop many projects. You just lose the momentum

and even you can try and pick it up five years later, 10 years later, you know, you've got a learning curve again, picking it up.

It just seems you have, and people are calling it an extinction level event for Yes, yes. Space science in the us Yeah. Must be the world. It just anti-science basically.

Right. Let's move on maybe to something a bit more cheery now. **Honda Rocket successful launch.**

Yes, so this one was exciting, some good space news at long last. So Honda, the well-known manufacturer, of, cars and motorbikes and other similar things. On the 17th of June, Honda launched a rocket for 56 settings and it. Ascended and descended successfully had a soft landing on its legs in a perfect vertical takeoff. At Honda's facility in Tiki Hokkaido, which is often referred to as Japan's space town.

The experimental reusable rocket measures approximately 20.7ft in length, which is 6.3m, and 33.5 inches or 85cm in diameter. It has a dry weight of 1,984 pounds or 900 kg, and a wet weight of 2,893 pounds or 1,312 kg. The rocket developed by Honda R and D reached an altitude of 271 m or 890 ft and touch down just 37cm or 14.6 inches from its target according to the company statement, which is pretty accurate.

So to give you an idea of what it looked like, if you haven't seen the video, if you saw the earlier versions of SpaceX rockets that had legs that they landed on, it looks quite similar to that.

Oh, right. So, yeah, so that just gives you like a visual idea of what you're looking at. And although the Honda Rocket Research is still in the fundamental research phase, no decisions have been made regarding the commercialisation of these rocket technologies as of yet. But Honda is continuing to make, progress.

They haven't given an end, but they are saying they're looking at making a suborbital launch by 2029. Good. Well, that completes our space news.

Astrocast

2nd	1st quarter moon
3rd	spica near the Moon
4th	Mercury at greatest Eastern elongation
5th	Moon at apogee
7th	Anatres near Moon
10th	Full Moon
13th	Venus near Aldebaran
14th	Mercury at aphelion
16th	Saturn near Moon
18th	Last quarter moon
20th	Pleiades near Moon
	Moon at perigee
23rd	Jupiter near Moon
24th	New Moon
26th	Regulus near thte Moon

28th	Mars near the Moon
30th	a-Capricornid Meteor Shower Maximum
	South delta Aquariid Meteor Shower maximum
31st	Spical near moon

Events

3rd	Guildford Astronomical Society	AGM
8th	Farnham Astronomical Society	Joe Williams (University of Exeter)
11th	Ewell Astronomical Society	Prof. Adam Amara – UCL Dark Energy Surveys

We look forward to a brighter show next month. Yes. So wishing your clear skies and happy star gazing everyone. Thank you, Rachel. That's Rachel Dutton, a fellow of the Royal Astronomical Society, and a member of the Guilford Astronomical Society. And the next edition of Stars Over Surrey will be on Tuesday, the 29th of July at 8:00 PM.

Until then, good star gazing.

Stars over Surrey on Brooklyn's radio. Join us on the last Tuesday, the month at 8:00 PM for the monthly guide to astronomy and developments in space.

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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Stars Over Surrey Previous Episodes