

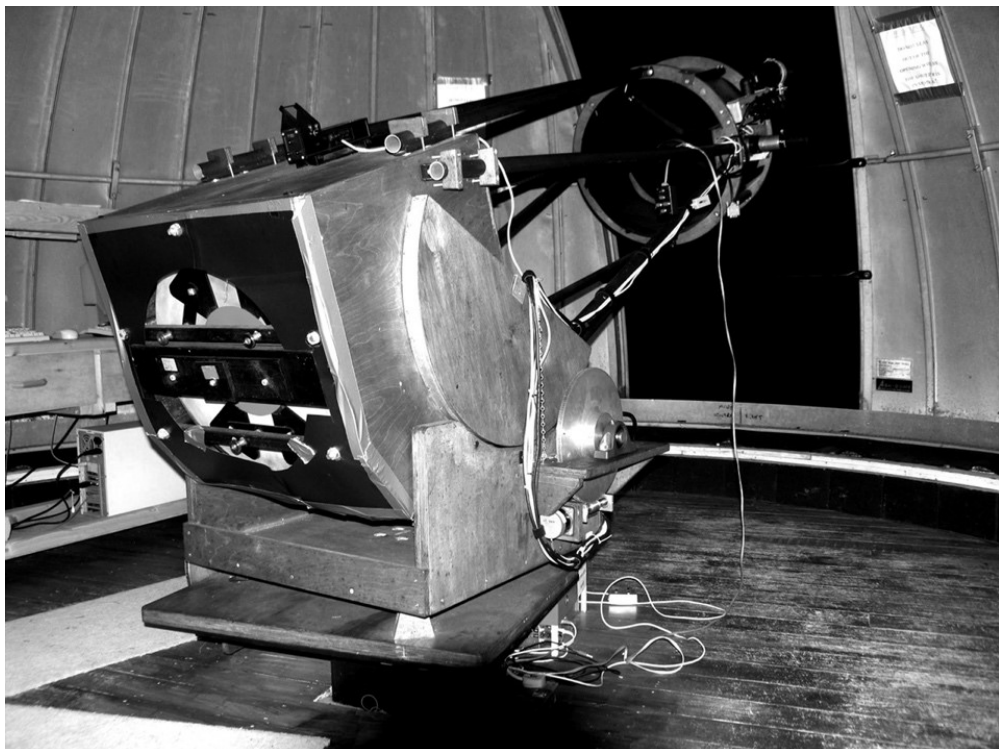


Breckland Astronomical Society

Affiliated to the British Astronomical Association and the Federation of
Astronomical Societies

EXTRA ***TERRESTRIAL***

Newsletter September 2022



Registered Charity no, 1044478

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Copy is always needed for this newsletter. Articles with an astronomical theme are welcome but anything of likely interest to the membership will be considered. Text or Word documents preferred but handwritten submissions also welcome.

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Chairman's Notes

September and October 2022

Dear all,

Hello again. I'm excited about the new season and getting back to seeing some young visitors. Saturn and Jupiter are back in the sky, along with the Milky Way, and gone is the twilight of summer and all the satellites it now brings. Mars is appearing later on in the night now and will be high and reasonably sized, becoming glorious towards Christmas time, rivalling nearby Aldebaran in Taurus by a large factor.

Here are some interesting moon alignments of Saturn and Jupiter

These can be viewed using Stellarium the free app for 'desktop' computers.

- Sep 3 23:26 Enceladus, Tethys and Dione then Rhea in a small line to the West of Saturn.
- Sep 9 21:00 Dione and Tethys very close (2") all evening
- Sep 13 23:00 Titan, Dione, Enceladus, Tethys and Rhea all close to the planet. Hyperion passes N.
- Sep 22 22:30 Mimas, Enceladus W and E elongation, all 4 other main moons close to the planet.
- Oct 2 late Iapetus appears inbetween Rhea and Dione
- Oct 8 21:30 Dione and Rhea close S of W ring; Tethys and Enceladus close E of rings.
- Oct 15 21:30 Hyperion 20" S of Titan, S of planet; Rhea and Dione 10" apart NE of planet.
- Oct 17 21:30 Titan, a 13th magnitude star, and Hyperion all in a close line.
- Oct 22 20:30 Tethys, Dione and Rhea all close.
- Oct 23 20:30 Tethys and Enceladus at Eastern elongation close to each other.
- Oct 26 20:30 Mimas at E elongation, Enceladus close to S, and Dione close to the N.
- Oct 28 19:00 Enceladus, Rhea, Tethys and Dione all clustered to W of the planet's rings

- Sep 2 23:59 Io leaves transit
- Sep 6 21:59 Ganymede leaves transit
- Sep 9 23:07 Io shadow transit starts, followed by Io at 23:30
- Sep 10 23:00 Io reappears from behind Jupiter
- Sep 13 21:09 Ganymede shadow transit starts, followed by Ganymede at 22:33
- Sep 15 23:42 Europa goes into shadow
- Sep 17 01:01 (am) Io shadow transit starts, followed by Io at 01:15
- Sep 17 21:11 Europa shadow transit ends, followed by Europa leaves 21:38
- Sep 17 22:17 Io goes into shadow
- Sep 18 21:51 Io leaves transit after shadow leaves 21:40
- Sep 21 01:08 Ganymede shadow transit stars, followed by Ganymede at 01:49
- Sep 21 20:45 Callisto passes S of planet, casting no shadow this year.
- Sep 24 21:15 Europa shadow transit starts, followed by Europa at 21:22 (close)

Sep 24 23:44 Europa shadow transit ends, followed by Europa at 23:51
 Sep 25 00:11 Io goes into shadow (very close to Jupiter)
 Sep 25 21:22 Io shadow transit starts, followed by Io at 21:25 (overlapping)
 Sep 25 23:36 Io shadow and Io transit ends, almost on top of each other. OPPOSITION
 Sep 26 20:53 Io reappears from behind Jupiter; 0.5" shadow between planet and moon.
 Oct 1 21:58 Ganymede reappears from behind Jupiter
 Oct 1 22:35 Europa transit starts, followed by shadow transit 22:52
 Oct 2 23:09 Io 21:18 Io shadow transit starts
 Oct 3 20:53 Europa reappears from shadow 22:47 Io reappears from shadow
 Oct 4 19:47 Io 20:00 Io shadow transit ends
 Oct 8 21:50 Ganymede disappears behind Jupiter
 Oct 10 22:06 Io disappears behind Jupiter
 Oct 11 21:31 Io 21:54 Io shadow transit ends
 Oct 16 01:07 Ganymede disappears behind Jupiter
 Oct 16 dusk fades with Callisto N of Jupiter
 Oct 17 23:50 Io disappears behind Jupiter
 Oct 18 21:04 Io 21:37 Io shadow transit starts, 23:16 Io 23:50 Io shadow transit ends
 Oct 19 dusk fades with double shadow and Europa transit underway.
 Oct 19 21:06 Io reappears from shadow
 Oct 25 00:46 Europa disappears behind Jupiter, as Callisto passes S of Jupiter
 Oct 26 22:49 Io 23:33 Io shadow transit starts, 01:02 Io 01:43 Io shadow transit ends
 Oct 26 18:19 Ganymede starts transit, 19:25 Europa starts transit (A GOOD NIGHT)
 Oct 26 20:02 Io disappears behind Jupiter as Europa and Ganymede transit
 Oct 26 20:55 Europa shadow (elongated) transit starts as 20:57 Ganymede transit ends
 Oct 26 21:18 Ganymede shadow (elongated) transit starts (moon shadows reverse order)
 Oct 26 21:55 Europa transit ends, 23:22 Europa shadow transit ends, 00:01 Ga sh tr ends
 Oct 27 19:29 Io 20:12 Io shadow transit ends

Telescopes

We have kindly been given a 12 inch Meade Schmidt Cassegrain, by a local astronomer whom I know. What a wonderful piece of optical equipment to train on the planets. The three metre focal length compact design scope will be quite powerful on open evenings last Fridays of the month, and especially to observe these Jupiter moon phenomena.

We removed the Dobsonian telescope built by John Spelling, as the mirror had tarnished and other parts were irreparable and it wasn't being used. But we sold Bob Greef's Dobsonian telescope to a good home, someone who knows the sky. I managed to 3Dprint some knobs for it. We still are very equipment heavy, so if any members would like to visit on a Tuesday, please come and see what we have. You can try it out for a period as part of your membership.

You may be able to read a little about me and the observatory in an Archant Norfolk magazine. Malcolm and I had a great night viewing at the observatory with the journalist. The summer months are always too light and so we stayed until midnight to get the most of the sky.

I really want to help anyone who wants to use a telescope and finds they are not getting the most out of it, but as a lot of things, it is a question of time. Time the owner has to use it and time our volunteers have got to show folk equipment. Thank you John G for demonstrating setting up a Celestron 9 inch, and we need to assist more folk like this. Once you can start to use your instrument, you can go off and discover stuff for yourself. It's a matter of time. As I said to the

journalist, you can calculate there is about 1% of the time when you can actually do proper astronomy. 50% is daytime. 10% more is twilight. 30% the remaining is clear enough. At least half that free time you're otherwise committed to events in your life. Then the majority of the night you will probably need to spend sleeping! The moon is up 50% of the time, washing out the sky. Often, after all that, astronomical objects of interests are too faint, too low, lost in light pollution, or behind a bush or wall. Hence 1%. As Roy Castle said Dedication is what you need. If you dedicate a little time to practice, research, arrange to meet one of us first, you can get going. This could be testing out the scope by bringing it to an open evening or contacting us for a visit. The field, Great Ellingham Recreation Centre, is a dark sky discovery site and ideal for bringing a scope and testing it yourself.

Events

I went back to Lakenheath Fen on the 20th, a beautiful clear evening, to show some young folk and parents some sights through my 8 inch telescope. They ran an event The Wild Sleepout for all ages of children to camp at a reserve and have a nature day and night. So it was ideal to add astronomy to the mix.

The RSPB staff stayed until astronomical twilight had ended and were fantastic, providing help moving, teas and managing for the first time to turn off the visitor centre outdoor lights and car park lights. The southern sky was clear but quite light polluted, with some awful bright lights around there, but we were well hidden from them by the poplar trees. We were also entertained by some sort of party music wafting across from the Norfolk side of the river. The stargazing session followed a bat walk and my first sighting of hummingbird hawk moths near the visitor centre. The children, younger than in previous years, has a great time but many were too tired to stay up until it got properly dark. I had some really enthusiastic questions, a little gentle queue pushing, and uncontrollable excitement – it was a lovely thing to do.

We have some scouts arranging visits during autumn. Helpers are really welcome.

Talks – Eclipses and Astrophotography

Last month we had a talk about eclipses by the very keen Sheridan Williams. He wrote a book on all eclipses from 1 – 3000 AD. He demonstrated that he was a very encouraging and professional speaker. There was some magical feeling about eclipses that he got across, especially in the video clips. While we know computers and experts in their use such as Sheridan can calculate eclipses now, it is very impressive when you hear how Edmond Halley predicted and then calculated the UK eclipse in 1715. It covered most of the country, and his edge bounds were only slightly out. An amazing calculation, as it was a fairly low Sun, which gives you bigger uncertainty on landfall positions.

When Sheridan was 19 years old he was a programmer for rocketry and after a career in computing he became a volunteer at Bletchley Park. He also is a longstanding member of the BAA and helped electronically archive many of their observations and physical recordings. He was so happy and keen to visit it was a pleasure to have him. He has been featured as a UK eclipse expert on many TV programmes, and travelled to many eclipses, including one where Kate Humble got a bit choked up with emotion. There was a magical feeling Sheridan got across to us via the videos. Big awe.

Historically there was even a record of an eclipse in 1230 where labourers left work as it was a totality after a sunrise on 14th May. This was seen across the UK.

In terms of calculations, he found out that the biggest eclipse density is in a tiny triangle in Egypt, where 5 occur in the space of 31 years. The next good one for the UK is in 2151. He kept referring to this as if it were next year. A good website to look at is that of Xavier Jubier, and now TimeandDate.com are a great resource.

He also explained the SAROS cycles. There are three 'months' a Draconic Month of 27.2 days, a Synodic Month (new moon to new moon) 29.53 days, and an Anomalistic Month of 27.55 days. If you 'multiply these up' (not just a straightforward multiplication, but a calculation when next all three come in sync) you get 6574 days, or 18 ½ years, so the eclipse repeats for somewhere else in the world. The 2026 eclipse in Spain follows a long eclipse SAROS that remains repeating from years 1501 to 2763, 71 identical eclipse arcs across the Earth, just the Earth is in a different rotational position each time. The whole centuries long cycle starts with partials, then goes total, then partial again toward the end.

Tunç Tezel is a Turkish photographer who has produced fantastic works, getting famous for his beautiful Analemma (sun throughout a year) including the eclipse in 2006, taken from a hotel. This is the eclipse I attended, and it was a stunning experience.

The 2017 eclipse in USA had the americans speechless!

A nice eclipse passes overhead in Luxor, Egypt on August 2nd 2027

And the 2026 eclipse crosses the North Atlantic from Iceland to the North coast of Spain, and when low at the end of the day touches the Balearic Islands.

On 22 July 2028, one crosses Australia, specifically Sydney, and reaches Dunedin in New Zealand, where it is more likely to be cloudy.

It was nice seeing you all there! We had a nice little observing session afterwards, getting the big binoculars out.

Dave Eagle – Astrophotography using Affinity Pro

Affinity Pro software is a great alternative to PixInsight, at £48 full price, often discounted, compared to £230 or so. Better value than Adobe who charge subscriptions thus costing a huge amount long term, or Maxim who want £600 up front.

Dave is one of the keenest educators in astronomy and is totally dedicated to the subject. He was really happy to come out to us, but it was his last long distance talk. He is a STEM ambassador and runs an inflatable planetarium. The night's talk was more technical, but had some impressive results displayed at the end.

Affinity Pro works on PC or Mac, it does most stuff but has a few slight quirks. It will now stack your photos and allow a massive range of processes that Photoshop can do. It doesn't do comet stacking like Deep Sky Stacker, and like DSS won't pick up really fat stars. You may need to download tools such as 'Gradient XTerminator' which do add a bit of cost. These are the same Plug Ins as photoshop and will just work perfectly in AP.

There are oddities to the menu such as a layer of 'Personas' you have to work in – just use the 'Photo' one. You will need to customise your layout and you can do this really nicely – i.e. drag out things like adjustments, layers and histogram to where you want them. Other oddities are that it compresses tifs by default, and you need to export your final image, not save it, as it will only save in Affinity Photo's own format. RGB channels are also a bit slow and fiddly to merge.

We then got a really clear explanation of the photons as raindrops analogy building up an image on the chip. These are read off using a conveyor belt system that collects and counts the values in each bucket. This count led to a nice explanation of the histograms, and we were also told about how colour is applied with the Bayer Matrix that sits on top of a black and white camera sensor. Image stretch processing was demonstrated, showing that you can only brighten an image as far as the noise will allow. This is analgous to an elastic band being pulled, i.e. don't break it. If you have more exposure, you have a stronger and longer elastic band and can stretch the thing incredibly far, revealing amazing faint details.

The September talk is on the 9th and by Dan and James Rowley Hill, a local aurora photographer, who will be talking about how to see the aurora from Norfolk and what they are caused by.

The October talk on the 12th is by Prof Chris Lintott about the Zooniverse project he runs. A fantastic speaker I think you'll agree.

Society notices

Many thanks go to Richard Harmon who helped the society with many issues and engineering, technical and software expertise as well as bringing a healthy dose of jovial character. He has recently moved abroad and so will not be able to participate easily in running the society, and as such we have a great need for someone or two people join the committee, or to come along Tuesdays. It really isn't a great commitment, but if you are local, and can spare some time and know us a bit already, it is a wonderful way to serve your community.

Just as a reminder, Breckland Astronomical Society are a charity that provides an educational service and inspirational experience the community can access for the price of a short road journey. We are always looking for helpers at open nights and events also, so if you can help at one or more of these please contact chairman@brecklandastro.org.uk

Please note Andy's address has changed, we will send that information to members securely.

Dan Self.

JOHN'S NEWS BITS

September 2022

JWST's latest deep sky image shows x10 more galaxies in the early universe than previously thought, with some of the earliest that existed some 600 million years after the big bang. Two had redshifts of 11 and 13 or just 400 and 300 million years since the big bang.

Reported in New Scientist, the world's most sensitive dark matter detector in South Dakota LUX-ZEPLIN, has been tested for the first time

Reported in Science Daily, scientists at the university of Geneva have detected that neutrinos from deep outer space come from blazars, galactic nuclei fed by super massive black holes. Blazars are quasars that point their jets at the Earth.

The work was done using the Ice Cube neutrino observatory in Antarctica.

SCI news reported that the heaviest neutron star ever recorded some 3,200 to 5,700 light years away has shredded and consumed its stellar companion. The work was done with the 10 metre Keck 1 telescope in Manna kea Hawaii.

One cubic inch of these monsters weights 10 billion tons!!!

The Artemis 1 Moon mission still on track for August 29 launch. This will be the first integrated test of NASA's Space Launch System (SLS) rocket, Orion spacecraft and ground control systems at the Kennedy Space Centre.

This will be followed by Artemis 2 in 2024 which will take the astronauts on a round trip of the Moon and Artemis 3 which will actually land them in 2025.

LiveScience report, lunar scientists have located 200 Goldilocks zones on the Moon where the temperature is a liveable 17 deg.C. These are in shaded lunar pits that are perfect for human shelter from solar winds, cosmic rays and micrometeorites. Also there are lava tubes and caves for offering more protection from the Moon's extreme temperatures of -173deg.C at night to + 127deg.C during day time.

(currently I am trying to locate a Goldilocks zone in my back garden!)

The Large Hadron Collider has observed three never seen before exotic particles. One a pentaquark and a pair of tetraquarks. Now a proton is made up of three quarks (two up and one down) and a neutron three quarks (two down and one up). These new exotic particles were predicted some 60 yrs. ago but only just seen by the LHC scientists. <https://home.cern>

The Psyche spacecraft to metal-rich asteroid of the same name should have taken off in October 11 for arrival in 2026. However, NASA has now announced a delay due to software problems with a possible 2023 launch or even a cancellation.

The mission is now being re-evaluated by an independent review board.

John Gionis

A little piece about our dark rural skies

I want to write a brief article highlighting what seems like a minor issue and a bit of general public information for rural areas. I will also try to avoid politics with regard to housing in the county and country. I'll start with a couple of definitions. Light Pollution is the light that is thrown away (far into the sky on most occasions). Useful lighting is the light that is required that reaches the area that needs to be lit (at the correct brightness). It sounds simple, but, like climate change, it is increasing.

Lighting is often installed without required thought despite best intentions. It really isn't simple. As with most things, there is more to it when you start looking. For instance, if you want to light an area next to a barn so you can move stuff in and out on winter nights, you go look for a light, find one that is LED and cheap to run and install it on the roof or a pole and tilt it at an angle that points to the area you want to light. Job done. This light is now visible for several miles away and contributes to light pollution for the same sort of radius. The appropriate light for the environment is hard to source (I have tried) and needs more research than most people have time for. It doesn't need to be as bright and it doesn't need to be daylight (electric) blue. Maybe it is tilted so it shines some of its light outwards and upwards, maybe it is installed too high, maybe it won't allow you to tip it fully downward because of the bad designs commonly sold in B&Q, etc. Most light manufacturers only care about making a profit.

Often outdoor lighting gives a feeling of security which is totally understandable. Being in a dark house and being able to see anything around it genuinely feels safer, but those lights also can be a beacon in a dim area. "Is there something worth protecting here?" After a few studies on the link between lighting and crime, there has not been a link ever shown. In fact after folk were worried about street light switch offs, data showed that by a non-significant effect those darker streets were

safer. It suggests any benefits of permanent lighting are outweighed. In an unlit area a ne'er-do-gooder would have to get a torch out to see what they were doing, making them obvious. And conversely, poorly installed lights create glare that can hide someone creeping beneath it. Besides, is there always someone watching? In case of industry yes, surveillance cameras are there (these can be infrared to be more effective), but is there someone watching all night from inside a house with outdoor lights on all night?

Yes, it harms a few astronomers, but they are in an incredible minority and there are more important things to worry about. However this line of thought neglects many things. Astronomers may be few and far between but most people, especially children are charmed and even inspired by the view of the Milky Way in a dark sky. It is something that takes you off this planet. This leads to an interest in science and more technical achievements in their education, a great thing for the country's future. Those views of the sky are limited in Norfolk now with sky glow being visible everywhere. It is also unnecessary and can make savings to switch unneeded lights off or get dimmer bulbs. Why do we now need to light everything so brightly and wastefully?

A down tilt or timer could really save the sky

A big issue we should all be concerned about is how stray light affects ecology. A recent study was done on new 'daylight' blue LED streetlights and showed less than half the number of caterpillars than before the lights were installed. This leads to a breakdown, i.e. less birds, mammals, even pollinators which are essential for our crops which may have long term consequences. Some councils are aware of this colour difference but many developers use standard blue-white lights. We ask all lights are 'warm white' (3000K) because the bluer ones have a wide scattering ability and are closing up many areas of darkness, despite them being more directional and dimmer. They also have an effect on our sleep. Any hint of blue light at night, signals 'morning!' to a receptor in your eye that governs your waking time caused by a disturbance of your melatonin levels.

There is also the point about general irritation by light. Imagine you could always see a relaxing view of stars out of your bedroom window until someone decides they need a security light on all night. They may think that it's inconsequential, or is helping keep the area safe (good intentions), but since when is it acceptable without asking? Even sensor lights that go on and off, can be triggered by cats, leaves, dust, anyone walking past who really doesn't need that thing to shine at them. The sensor is clearly too sensitive or has not been installed properly, as well as the light. We need to look out for each other and putting up lights incorrectly isn't always considerate.

The onus shouldn't be on the astronomers or neighbours to call out every light or planned light, this is an impossible task, a problem with the planning process perhaps. France has a light pollution law, but has much bigger dark spaces and lower population density than here. I could argue that we need more awareness rather than necessarily forcing a nanny state approach (sorry, politics). In the local area, Snetterton has increased in brightness, big firms lighting the outside of the huge buildings. A mass production chicken farm want to move and build North of Snetterton, their existing site is covered with lights shining out brightly in all directions. Slowly, expansion in the ever popular Norfolk has the potential to ruin the sky with lighting.

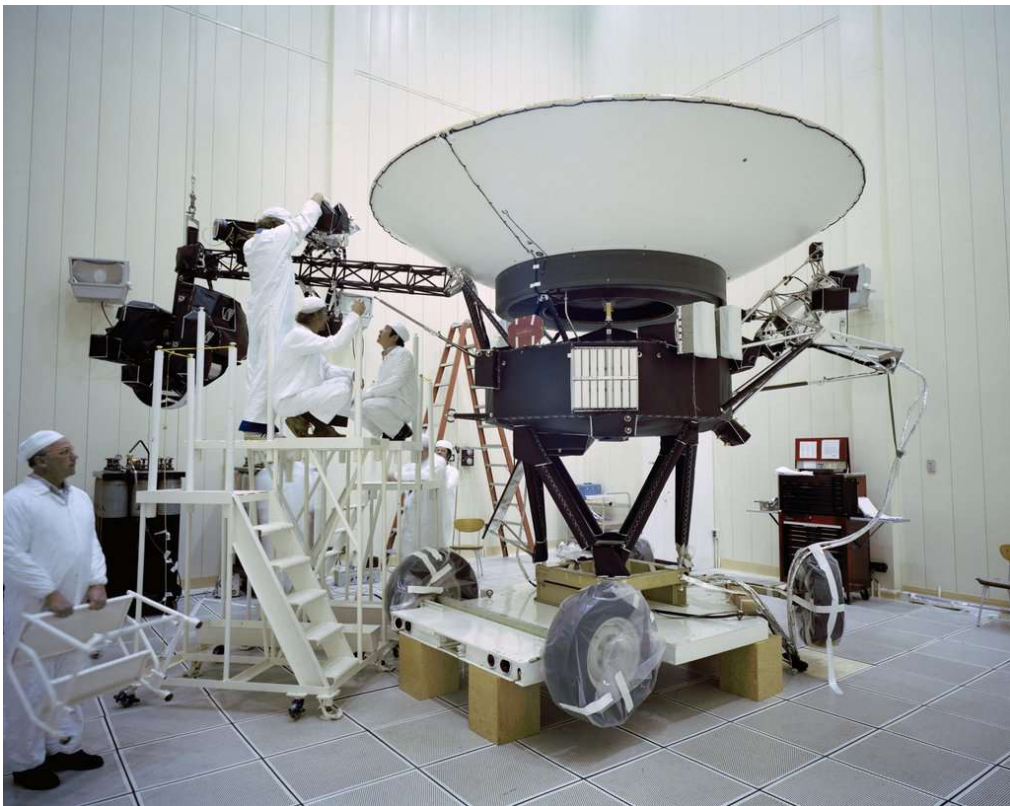
Big money is behind the lack of care for the environment but we can all do something about it. It needs spreading awareness, looking out for things in the sky like the northern lights that were visible the other day. Look for the Milky Way, the huge galaxy in which our tiny solar system exists, it is always there, especially in late summer and autumn. Is it behind light pollution for you? Comets like NEOWISE in 2020 become totally unimpressive or invisible with just a bit of light pollution. It has a massive impact on dark areas. So for now, be vigilant and watch and comment on planning proposals to counteract the spread of light. Go chat to your neighbours and in time, politely mention the lights. We are all people just trying to do the best thing.

Good old Sir Patrick Moore used to say (I paraphrase), it is not that we ask anyone to turn the lights out, just light the right thing, at the right brightness, at the right time. I would add to this to shield the light from

going above the horizontal so no glare can escape the property (i.e. no one can see the bulb itself from outside the grounds of the property). This can be achieved by tilting the fixture fully downwards, achieving a much less harsh, glare-free look. Dim downlights lighting the floor can help people see paths really nicely, these can be solar powered but are often not glare-free and are daylight blue. A petrol station that applied this rule to its forecourt lights managed to get a big increase in custom. The final reminder is to make sure it is a warm white colour temperature of 3000K or less. With those few rules applied, everyone and nature can co-exist happily for many decades.

Dan Self

Voyager NASA's Longest-Lived Mission, Logs 45 Years in Space



This archival image taken at NASA's Jet Propulsion Laboratory on March 23, 1977, shows engineers preparing the Voyager 2 spacecraft ahead of its launch later that year. Credit: NASA/JPL-Caltech

NASA's twin Voyager probes have become, in some ways, time capsules of their era: They each carry an eight-track tape player for recording data, they have about 3 million times less memory than modern cellphones, and they transmit data about 38,000 times slower than a 5G internet connection.

Yet the Voyagers remain on the cutting edge of space exploration. Managed and operated by NASA's Jet Propulsion Laboratory in Southern California, they are the only probes to ever explore interstellar space – the galactic ocean that our Sun and its planets travel through.

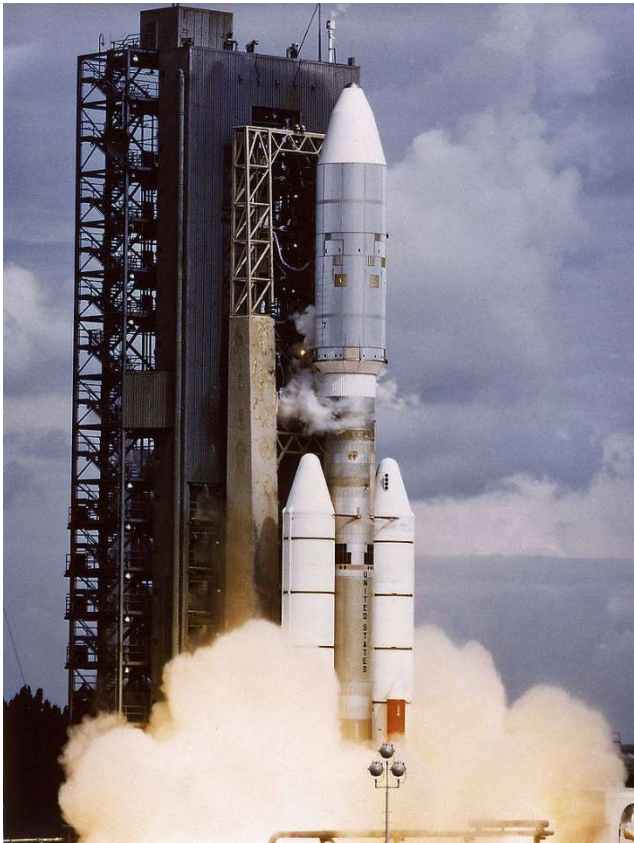
The Sun and the planets reside in the heliosphere, a protective bubble created by the Sun's magnetic field and the outward flow of solar wind (charged particles from the Sun). Researchers – some of them younger than the two distant spacecraft – are combining Voyager's observations with data from newer missions to get a more complete picture of our Sun and how the heliosphere interacts with interstellar space.

The heliophysics mission fleet provides invaluable insights into our Sun, from understanding the corona or the outermost part of the Sun's atmosphere, to examining the Sun's impacts throughout the solar system, including here on Earth, in our atmosphere, and on into interstellar space," said Nicola Fox, director of the Heliophysics Division at NASA Headquarters in Washington. "Over the last 45 years, the Voyager missions have been integral in providing this knowledge and have helped change our understanding of the Sun and its influence in ways no other spacecraft can."

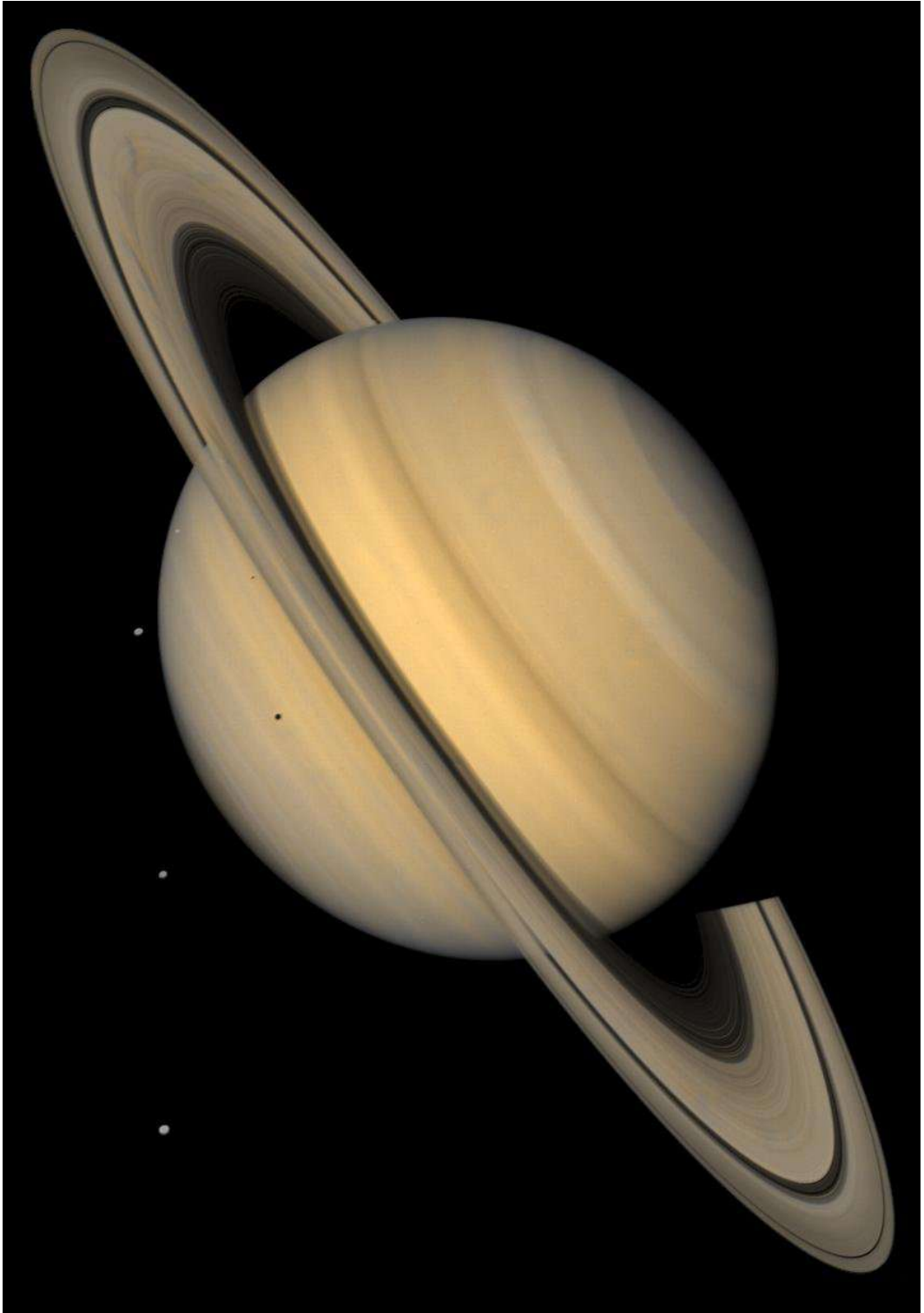
The Voyagers are also ambassadors, each carrying a golden record containing images of life on Earth, diagrams of basic scientific principles, and audio that includes sounds from nature, greetings in multiple languages, and music. The gold-coated records serve as a cosmic "message in a bottle" for anyone who might encounter the space probes. At the rate gold decays in space and is eroded by cosmic radiation, the records will last more than a billion years.



45 Years of Voyager I and II



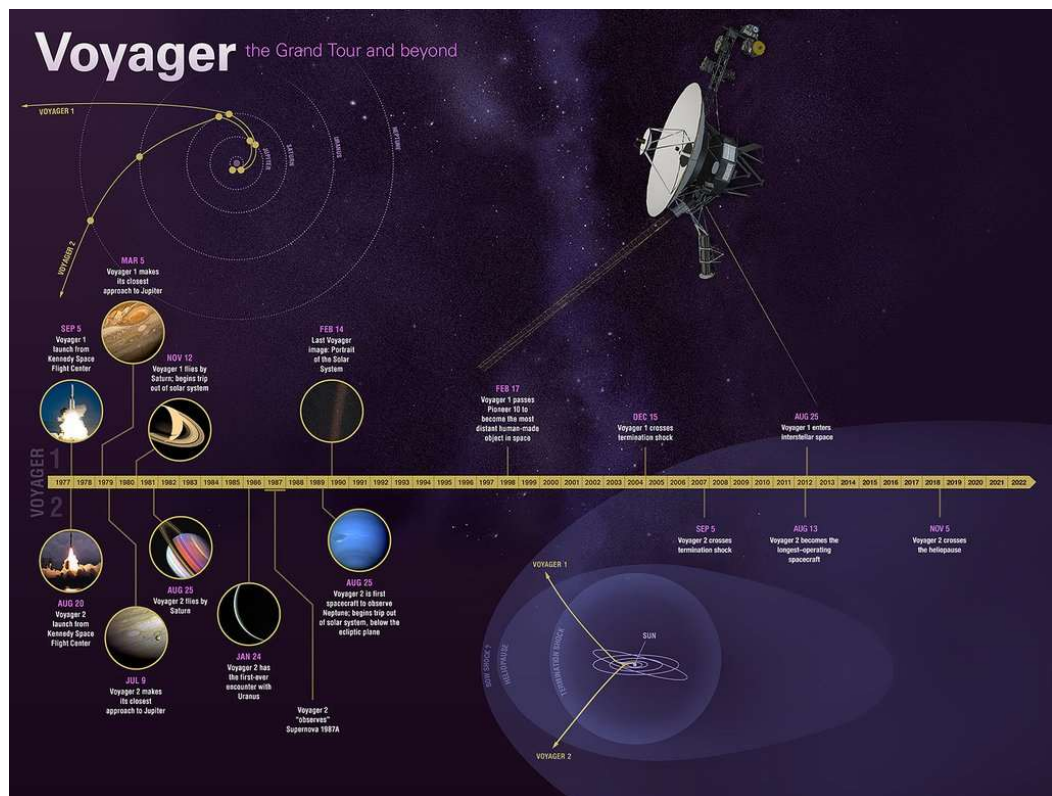
Launched in 1977, NASA's twin Voyager spacecraft inspired the world with pioneering visits to Jupiter, Saturn, Uranus, and Neptune. Their journey continues 45 years later as both probes explore interstellar space, the region outside the protective heliosphere created by our Sun. Researchers – some younger than the spacecraft – are now using Voyager data to solve mysteries of our solar system and beyond.



Beyond Expectations

Voyager 2 launched on Aug. 20, 1977, quickly followed by Voyager 1 on Sept. 5. Both probes travelled to Jupiter and Saturn, with Voyager 1 moving faster and reaching them first. Together, the probes unveiled much about the solar system's two largest planets and their moons. Voyager 2 also became the first and only spacecraft to fly close to Uranus (in 1986) and Neptune (in 1989), offering humanity remarkable views of – and insights into – these distant worlds.

While Voyager 2 was conducting these flybys, Voyager 1 headed toward the boundary of the heliosphere. Upon exiting it in 2012, Voyager 1 discovered that the heliosphere blocks 70% of cosmic rays, or energetic particles created by exploding stars. Voyager 2, after completing its planetary explorations, continued to the heliosphere boundary, exiting in 2018. The twin spacecraft's combined data from this region has challenged previous theories about the exact shape of the heliosphere.



Voyager 1 and 2 have accomplished a lot since they launched in 1977. This infographic highlights the mission's major milestones, including visiting the four outer planets and exiting the heliosphere, or the protective bubble of magnetic fields and particles created by the Sun.

“Today, as both Voyagers explore interstellar space, they are providing humanity with observations of uncharted territory,” said Linda Spilker, Voyager’s deputy project scientist at JPL. “This is the first time we’ve been able to directly study how a star, our Sun, interacts with the particles and magnetic fields outside our heliosphere, helping scientists understand the local neighborhood between the stars, upending some of the theories about this region, and providing key information for future missions.”

The Long Journey

Over the years, the Voyager team has grown accustomed to surmounting challenges that come with operating such mature spacecraft, sometimes calling upon retired colleagues for their expertise or digging through documents written decades ago. Each Voyager is powered by a radioisotope thermoelectric generator containing plutonium, which gives off heat that is converted to electricity. As the plutonium decays, the heat output decreases and the Voyagers lose electricity. To compensate, the team turned off all nonessential systems and some once considered essential, including heaters that protect the still-operating instruments from the frigid temperatures of space. All five of the instruments that have had their heaters turned off since 2019 are still working, despite being well below the lowest temperatures they were ever tested at.

Recently, Voyager 1 began experiencing an issue that caused status information about one of its onboard systems to become garbled. Despite this, the system and spacecraft otherwise continue to operate normally, suggesting the problem is with the production of the status data, not the system itself. The probe is still sending back science observations while the engineering team tries to fix the problem or find a way to work around it.



“The Voyagers have continued to make amazing discoveries, inspiring a new generation of scientists and engineers,” said Suzanne Dodd, project manager for Voyager at JPL. “We don’t know how long the mission will continue, but we can be sure that the spacecraft will provide even more scientific surprises as they travel farther away from the Earth.”

A division of Caltech in Pasadena, JPL built and operates the Voyager spacecraft. The Voyager missions are a part of the NASA Heliophysics System Observatory, sponsored by the Heliophysics Division of the Science Mission Directorate in Washington.

For more information about the Voyager spacecraft, visit:

<https://www.nasa.gov/voyage>

Book Review

The end of Astronauts – why robots are the future of exploration

Donald Goldsmith and Martin Rees (Astronomer Royal)

This book's central theme is that the danger and cost of manned spaceflight cannot be justified into the future. Support systems for humans comes at a cost ten times that of robotic exploration, and the effects of long-term radiation on the body are not yet fully understood. By not sending humans on exploration flights, the need for food/water/oxygen, shelter and shielding, fuel for the return flight, and consideration for hibernation on long flights, all go away.

Artificial Intelligence and robotics are already much used today (viz rovers on Mars) and further developments are happening apace. Apart from the points above, robots can greatly reduce the timescale to launch future missions.

However the authors acknowledge the limits of robotic exploration and the loss of expertise and improvisation that humans can bring (repairing Hubble for instance). Human space exploration fuels public imagination and inspires the next generation.

The book is fairly up-to-date. It includes discussion of Elon Musk's Mars ambitions, Jeff Bezos lunar colonies, satellite swarms, and the use of Ingenuity, the helicopter on Mars.

Other chapters debate space colonisation, off earth settlements that would outlive our human presence on earth, governance and space law, and the issues of space pollution/debris. A further disadvantage of human exploration that is overcome by the robotic kind is the need for quarantine – either us infecting another planet or bringing something undesirable back.

One niggle – all the units are Imperial/US rather than metric; the book is clearly aimed at the American market.

Throughout the book the story of our space exploration to date and our plans for the future are presented. And there is a handy appendix contains a timeline of key events in space exploration.

Martin Kaye

Perseid Meteor Shower 2022



Picture by Roger Hyman

They're called the Perseids because the meteors seem to come from the constellation of Perseus. However, they're actually caused by the Earth crashing into debris left behind by the Comet Swift-Tuttle.

The Perseids had been observed for thousands of years but it was Giovanni Schiaparelli who in 1862 realised the connection between comets and meteor showers.

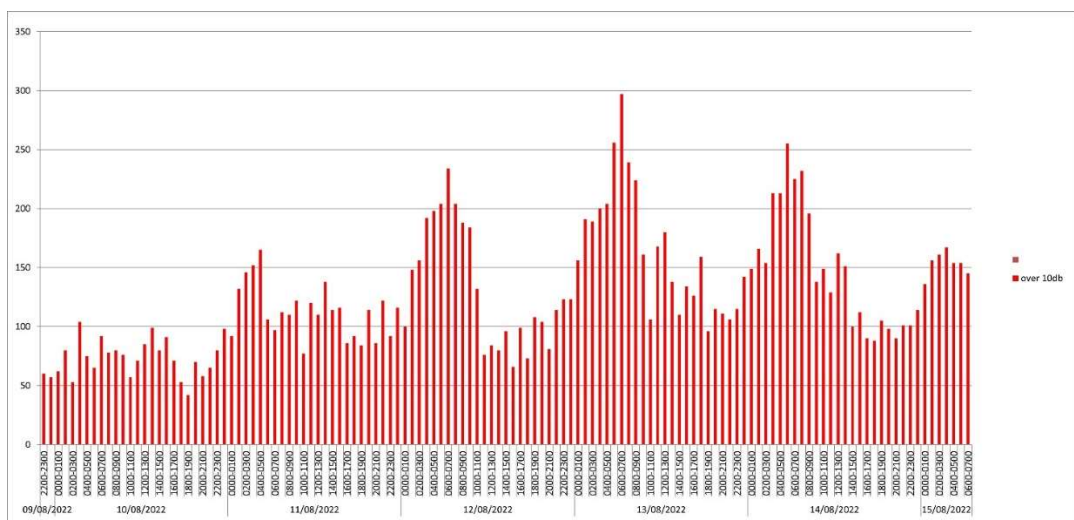
The average speed for a Perseid meteor is 36 miles per second (that's 129,600 miles per hour!). The air in front of the meteor is squashed and heated to thousands of degrees Celsius. The smaller meteors vaporise and leave behind a bright trail but larger meteors can explode as **fireballs**.

Perseus was the Greek hero who beheaded Gorgon Medusa and later married Andromeda. They had nine children together and the word 'Perseids' is derived from the Greek word 'Perseides', which refers to their descendants.

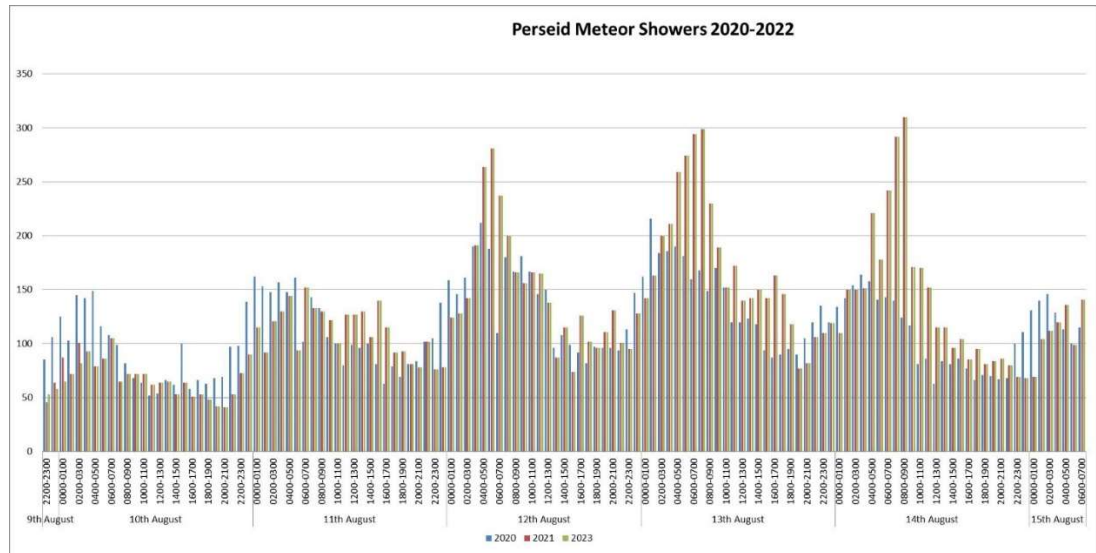


This year the skies were generally clear but an almost full Moon made observations difficult. The above is cropped from an all sky camera sequence.

Graves Radio Observations



The system had been running previous to this period but was limited to allow comparison with the previous years.

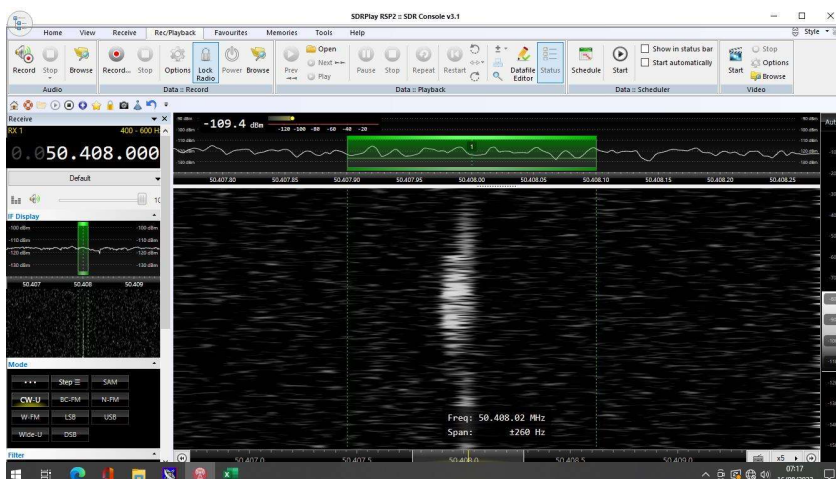
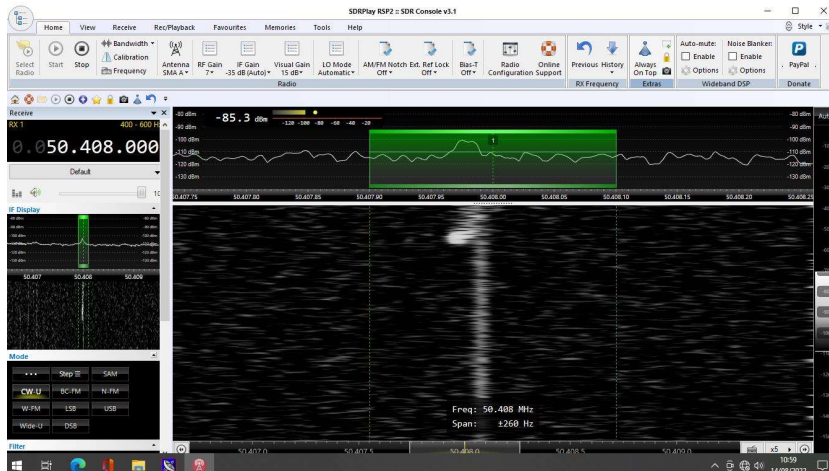


There are some interesting comparisons between the 3 years shown both in the timing of the daily peak and the overall peak. There was some concern about the removal of the Starlink satellite echoes but as the oner average count for the period has been fairly consistent although the number of Satellites has increased drastically. This still requires manual identification and counting. Several automatic systems have been trialled, but they all struggle and overcount. It appears to be the short low power Sat echoes that become a problem,

Trial of UK Meteor Radio Beacon

The UK Meteor Beacon is a transmitter to located at the Sherwood Observatory of the Mansfield and Sutton Astronomical Society (MSAS). The Radio Astronomy Group (RAG), which is part of the British Astronomical Association (BAA) and supported by the Radio Society of Great Britain (RSGB) and The Mansfield and Sutton Astronomical Society, are running a project. This will facilitate the study of meteors over the UK. In addition to enabling existing amateur radio astronomers to participate in this interesting citizen science, schools and colleges will have access to the beacon either directly or via web-based receivers in support of STEM education.

I decided to try reception during the Persied Meteor shower. First attempts were with an end fed wire antenna and proved that the carrier could be received in my location. Further experiments were carried out with a 5 element home built YAGI type antenna directed in a WNW direction and elevated about 45 degrees. This antenna was originally built for the Belgium BRAMS system. This detected several meteor echoes including the two below.

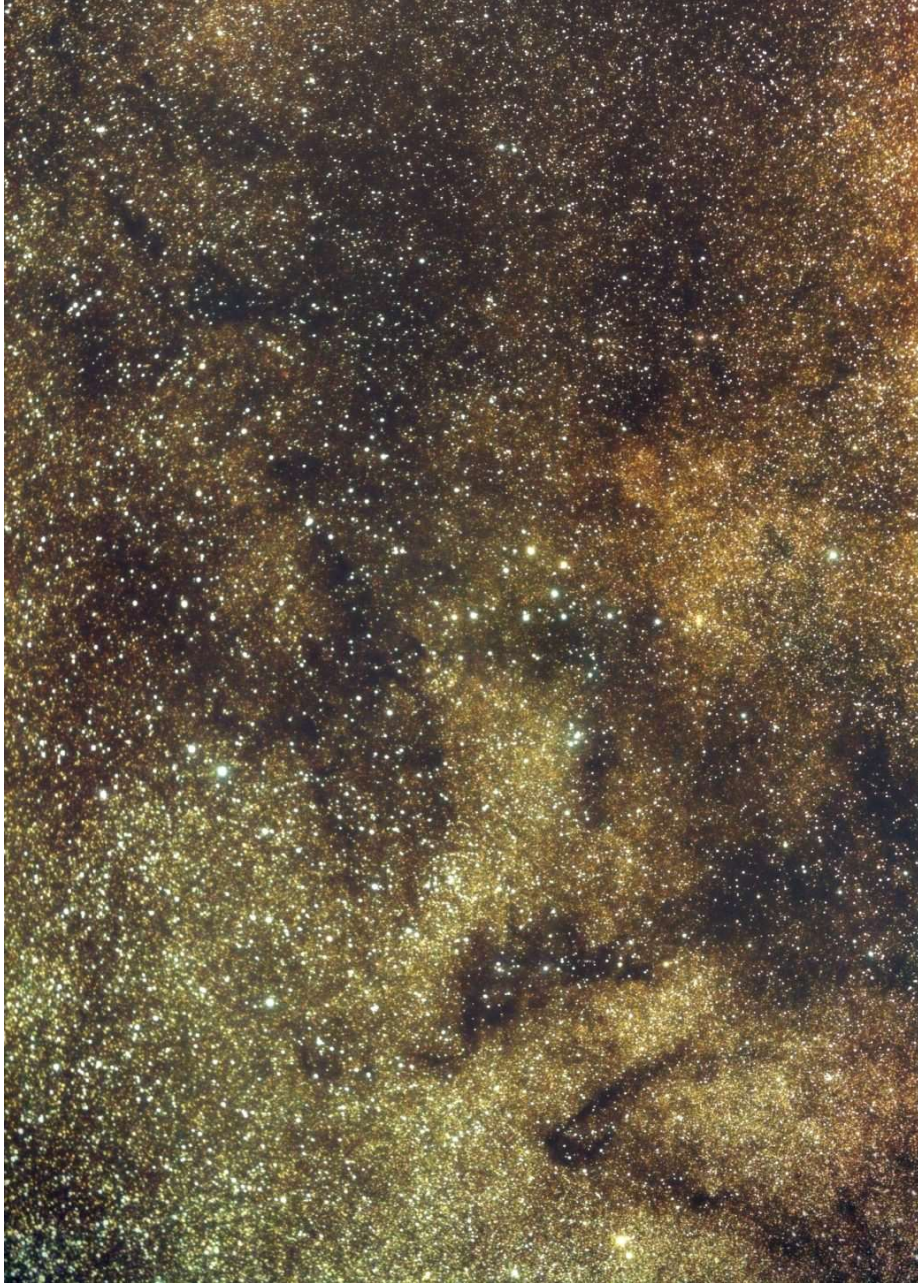


There is further work to do over the next few months including a better antenna and also more practice at interpreting the display.

Chris Bailey

Members Astro-photographs.

Dan Self



Coathanger cluster in Vulpecula Canon 100Da 135mm F2 lens 10mins



Cocoon Nebula Canon 100Da 135mm F2 lens 5mins



Ghost Nebula AtikCamera 20" Breckland Observatory Total 2 hours.



NCL July 5th.



Saturn 4X800 Opposition showing Seelinger effect.

Andy Weller



The Pacman Nebula (NGC 281) is a large Hydrogen Alpha (HII) emission nebula appearing in the constellation Cassiopeia. The nebula lies around 9,200 light years away from Earth HQ. The Nebula stretches approx. 48 light years across and is a star-forming region



The Iris Nebula

Scope - Celestron C11 XLT reduced to F6.3

Camera - ZWO ASI294MC Pro

Filter - Optolong L-Enhance

48No. 6 Minute exposures @ 180 Gain & -15C

30 Darks

50 Flats

50 FlatDarks

Stacked & Processed in Pixinsight

George Newell



1st attempt at Jupiter and moons
iPhone, HEQ5 Pro and C8 XLT.

Roger Hyman



C/2017 K2 (PanSTARRS) 100 x 30 exp William Optics Z126 Altair 183C Pro



14% Moon William Optics ZS126,

Altair 183C Pro camera with Astronomik 742 ProPlanet filter.

Captured with SharpCap Pro 4 and stacked in AS!

Adjusted in Photoshop 2022, Topaz DeNoise and Sharpen AI.



M31 - The Andromeda Galaxy.

William Optics GT71 with 68III flattener/reducer

Altair Hypercam 183C camera iOptron SkyGuider Pro Tracker

180 x 60 seconds at 800 gain - no guiding.30 x darks, flat and dark flat

Captured with SharpCap Pro 4 and processed in APP, Photoshop 2022 and Topaz



Jupiter and Europa

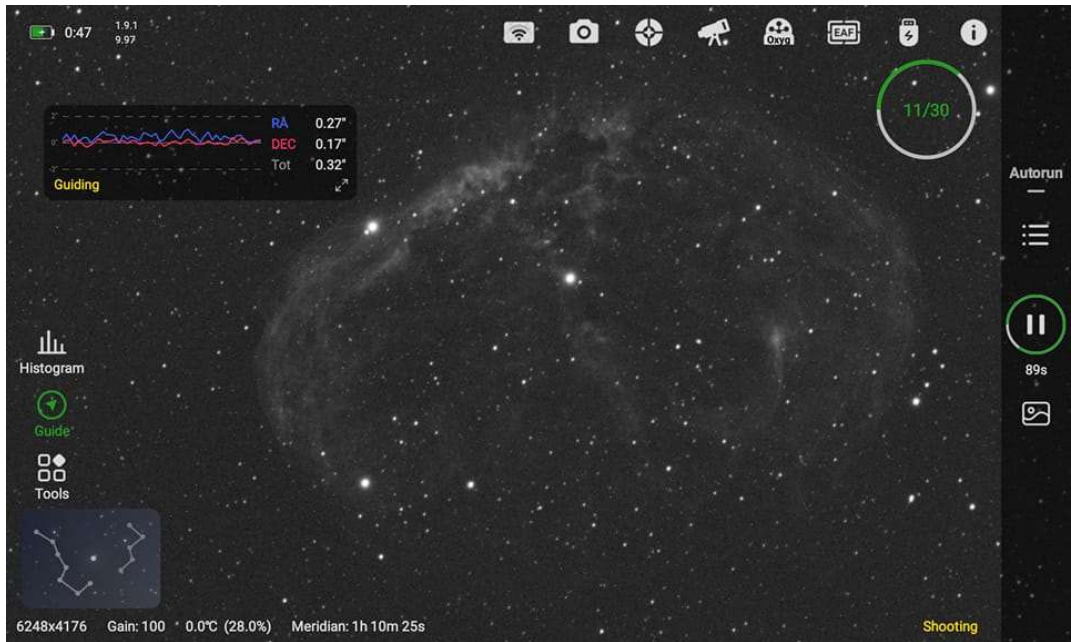
WO Z126 refractor with ES x3 Barlow attached to ADC and ZWO ASI 462 camera. 5,000 frame video processed in ASI3, Registax and Photoshop.



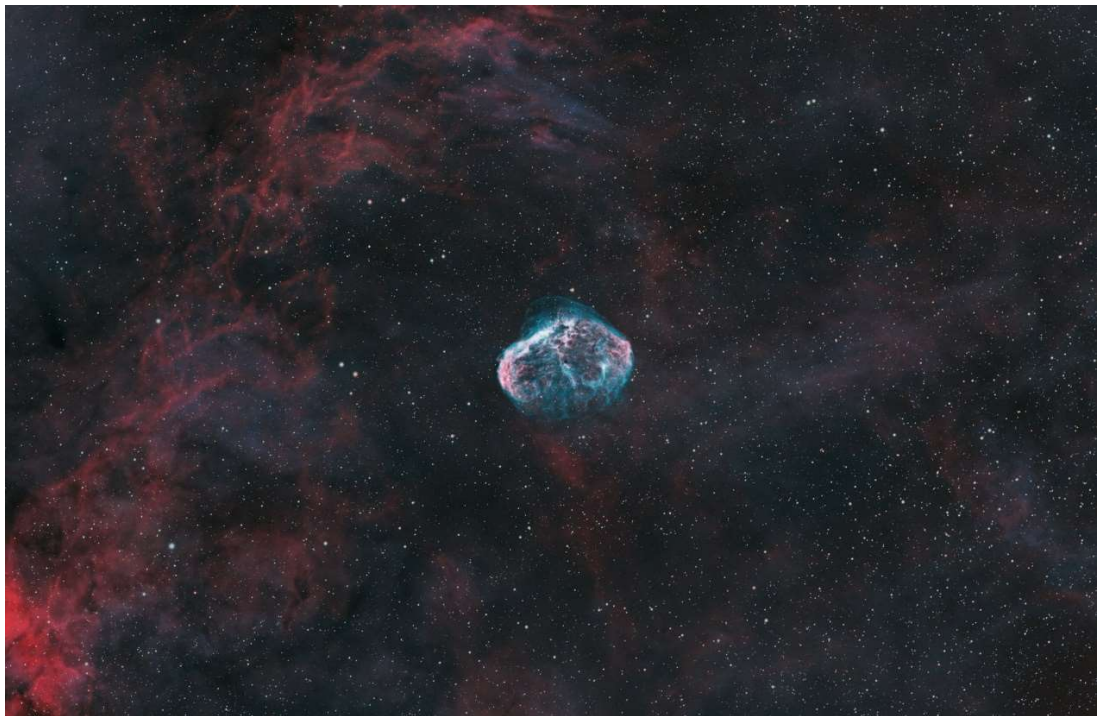
A 'Sturgeon' full Moon



Malcolm James Dent



10 minute Oiii subframes with great guiding on Ngc6888



3 hours of HA data and 3 hours of Oiii. Combined in my first Plxinsight HOO image. Ngc6888



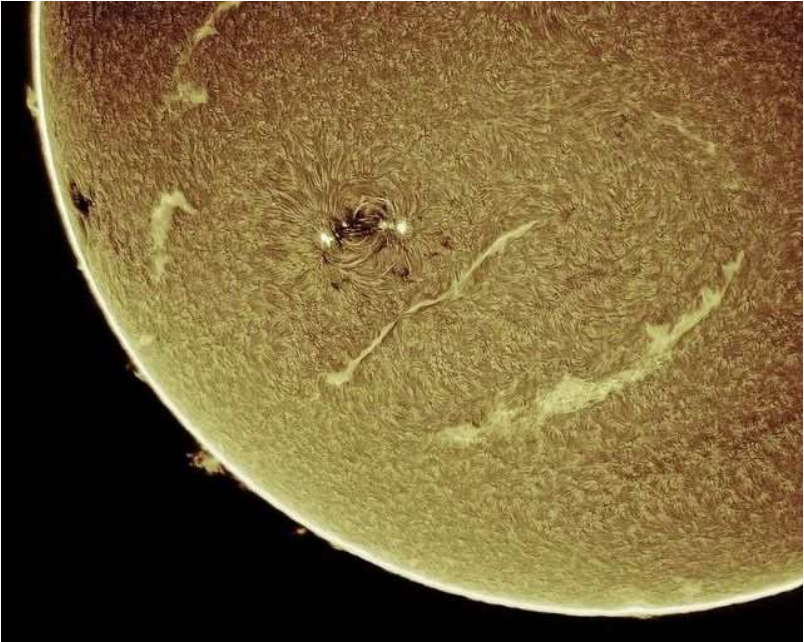
Heart Nebula. 3-hour integration of Ha data

David Bryant



Moon: Pentax K3, 300mm prime, cropped with Paintshop Pro

Neil Wilson



Chris Bailey



Deslandres





The Aircraft are getting bigger!



Comet C/2017 K2 near globular cluster M10



BRECKLAND ASTRONOMICAL SOCIETY

Charity No.1044478

www.brecklandastro.org.uk

Affiliated to the British Astronomical Association and the Federation of Astronomical Societies

Dr Dan Self, Chairman, 56 Lindley Street, Norwich, Norfolk, NR1 2HF.
07734 364667 chairman@brecklandastro.org.uk

OBSERVATORY RISK ASSESSMENT 2022

This policy document applies to the aforementioned charity and covers all instances of normal use of the observatory building and equipment within it. All other statements of intent are laid out in the society's constitution.

The purpose of the society (Breckland Astronomical Society) is to promote and to advance public education in the Science of Astronomy and all branches of scientific research and in so doing the following policy statements are necessary.

Persons visiting are members and public of all ages by pre-arrangement, or on public open nights.

Section 2 - Risk Assessment


| Hazards (<i>visit leaders must identify any additional hazards where applicable</i>) | Risk Control Measures | Outcome risk rating |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| For external parties: Safety whilst travelling to observatory. | Responsibility is with individual regarding transport. | Low |
| Lost people | A nominal roll should be available for parties with minors. Stay in groups and count in and out, especially risky when young children running around on dark field. Responsibility with teachers/akelas. | Tolerable |
| Pre-existing medical conditions | Visitors have been asked to bring with them anything they need with regard to medicine/ first aid training. DS is first aid trained as part of job. | Tolerable |
| In the Observatory: Moving the telescope dome - Mechanical hazard from cogs and metal clips on dome motors and sliding parts. Falling from dome. | Supervision is necessary to prevent visitors' fingers being caught in dangerous places before moving. Train supervisors. Gears are located in inaccessible places. Signs to keep head out of opening while moving it. Failure of clips holding very difficult due to strong fastening. | Tolerable Tolerable |
| Electrical hazards | All electrical circuits are protected by RCD trip switches, which have been checked. Equipment should only be used by trained demonstrators as PAT testing is not viable. | Tolerable |
| Light intensity from laser pointer, bright LEDs | A low power class 2 laser can be used to collimate scope, this should not be used during visits. An upper end- class 2 green laser is sometimes used for pointing out stars outside. This should NOT be pointed | Low |

| | | |
|--------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| | near people, or planes, only switched on briefly and used by supervisors/demonstrators only. Laser is currently broken. | |
| Skin contact with dangerous chemicals | Fly spray, propanol, and cleaning fluid kept in cupboard in small quantities. Keep cupboards shut when visitors are present and supervise. | Tolerable |
| Standing in dome - Falling (height is 7 feet) | Shutter opening is guarded by 2 bars at child / adult heights. Limit numbers in dome 7 + supervisors can easily fit. | Tolerable |
| Standing in dark places - Stumbling in low light | Use dim red lights on floor to preserve night vision. Dim lights gradually. | Low |
| Climbing ladder in dark - Falling while viewing through telescope. | Ladder must be shown to people first, but enough light is available. Check for mobility difficulties. | Tolerable |
| Ascending stairs - Falling or being hit with trap door | Be sure demonstrator to go up first and lock door open. A knocking procedure is known if the door is shut. | Tolerable |
| Fire risk | Large items are not flammable. Mainly metal fixtures and fittings. Sources of ignition (sparks) are contained in electrical equipment. Flammable gases are not kept in building. Radio linked smoke alarms installed. Fire extinguishers available and annually checked. Call 999 in emergency. Can exit via dome opening in emergency | Tolerable |
| Standing in dark cold field - frostbite | Weather could be freezing in most months. Warm clothes to be advised to visitors. Heaters indoors if cold and keep a blanket at the observatory. | Tolerable |
| Trips and slips | Trip hazard in dark. Torch guidance will be provided but is limited because | Tolerable |

| | | |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|
| | of dark sky observing. Advised to dip and dim lights. | |
| Child protection risks (under 18s) | Two adults should be available at all times. DBS checks should be in place for group supervisors. The organisation that runs the observatory, Breckland Astronomical Society, operates a child protection policy. The committee are vigilant with regard to risks. | Low |
| Airborne viral transmission indoors | The place is fairly well ventilated with vents in toilet and loose fitting door and dome and dome floor hatch. Open internal doors Physically Distance 1m+ between groups Limit numbers to what any national guidelines state at the time. Space is quite limited. Provide outdoor activities, e.g. electronically assisted astronomy. Telescopes outdoors. | Tolerable – as we have very good ventilation. |
| Outdoor transmission | Risk is found to be low outdoors. Follow national guidelines. Be mindful of face to face breath transmission. | Tolerable |
| Surface transmission | Sanitisers are available. Wipe surfaces. Limit one to use of kitchen/bathroom area. Offer people option of using own mugs and washing up. Clean toilet regularly. | Low |
| Reporting | Not needed, ask permission, but a record of visitors names is good to keep a for any future possible information purposes. It will be destroyed before 5yrs (GDPR). | N/A |

Trustees as of 17/04/2022 are: Dr Dan Self *⁺(Chairman), Andy Jones*⁺ (Treasurer), Richard Harmon. Committee members (acting trustees): Rebecca Greef*, John Copey. Trusted supervising members: Mick Ladner, John Gionis, Peter Farmer, Andrew Luck, Chris Bailey.

*DBS checked for day job. †Frist Aid trained for day job

Signed..........
.....

Chairman, Breckland Astronomical Society, UKCC 1044478.

For Sale or Wanted

This section is for the sale of Astronomical items and any wants from members. Details of items for sale (With photographs where applicable) should be forwarded to the newsletter editor at newsletter@brecklandastro.org.uk

It is suggested that a donation of 5% of the final sale price be given to the Society to assist with funds. If sellers do not wish to make their contact details public then please make this known to me and I will field any enquiries on a box number system. Please send any sales details to me before the 26th of the month for inclusion in the next issue.

Please ensure that if any item is sold by another means prior to publication that I am advised so it can be removed to avoid confusion.

6" ETX LS Telescope and Accessories

With Autostar 3 Hand controller

Located Ipswich area

£500

Contact through newsletter@brecklandastro.org.uk









Skywatcher Starquest 130P

with super 10 and 25, 2 x Barlow and a Plossl 20mm eyepieces



£190 o.n.o.

Attleborough area Contact
rans4547@gmail.com

12" Skywatcher, Flex Tube, Go To, Dobsonian

Only used a few times over the last two years....
Too heavy (getting too old) so there is a wheeled base.

£1000 ono



Contact Jim Slight (j.slight@btopenworld.com)

Equipment available for loan to Members

As well as our fantastic library members of the society can borrow our equipment. Here is an equipment list that can be used or borrowed by members, subject to personal responsibility for replacement value. Discuss your plans with one of the regulars first, as it is not easy for beginners to use some of this kit. We are here to help show you how to use it, when the weather holds up, then you will need to sign it out and get approval by a member of the committee. We can discuss a reasonable term.

Refractors:

William Optics Megrez 102 S.V. F7 D102mm f/7 and reducer to f/5.6 – this may be unavailable soon.

William Optics GT-102 2019 D102mm F703mm f/6.9

Vixen 4" Refractor f/9

SCT/Maks:

Celestron C925 Starbright F10 SCT FL D234.95mm F2350mm f/10 Refractor – preferably this should not be taken off the premises.

Celestron C8 SCT D203.2mm F2000mm f/10 Refractor (orange tube)

Meade LX200R SCT D203.2mm F2000mm f/10

Konus Motormax-90 Maksutov-Cassegrain 90mm F1200mm f/13 #1795

Meade ETX125 D127mm F1900mm f/15 Maksutov-Cassegrain Reflector

Mak-Newt:

Skywatcher 190MN DS Pro Maksutov-Newtonian Optical Tube Assembly D190mm F1000mm

Dobsonians:

Skywatcher Skyliner 200mm F1200mm Dobsonian Reflector

Helios D200mm F1000mm Dobsonian Reflector

8-inch Dobsonian (turquoise tube, hand-made)

Solarscope:

Coronado Solarmax 40

Meade 8x50mm Guide Scope

Binoculars:

Vanguard KR-7500 7X50mm Field 7 degrees Binoculars – a little out

Konus #2253 7x50 Field 6.8° Binoculars

Chinon RB Optics 8-20 x 50 HB Zoom Binoculars

Prinzlux 10x50 Binoculars – needs optically cleaning

Mounts:

Berlebach Planet Tripod with Double Clamps
Orange EQ4 telescope mount
Skywatcher SynScan EQ5 Equatorial Mount & Tripod
SynScan mount controller
Meade LXD German Equatorial Mount & Autostar Controller
SynScan mount controller
iOptron IEQ45 Mount and Pier
iOptron Go2Nova mount controller

Eyepieces:

Tele Vue Delos 17.1mm 2"
Antares Speers-Waler 4.9mm SWA Series 2 2"
Antares Speers-Waler 9.4mm SWA Series 3 2"
Meade Ultra Wide Angle 14mm 1.25/2"
Antares W70 Series 8.6mm
Meade Super Wide Angle 18mm 1.25"
Celestron 32mm Plossl 1.25"
Celestron 26mm Plossl 1.25"
Antares 17mm Plossl FMC 1.25"
Intes-Micro Q74 WA 21mm 1.25"
Orion (Or) Circle-T 9mm 1.25"
Vixen K 18mm 1.25"
Fullerscope K 25mm 1.25"
66 Ultrawide 20mm Long Eye Relief 1.25"
Or 6mm 1.25"
Plossl 40mm Multi-coated
Plossl 17mm Multi-coated
14mm (7mm 21mm) 1.25"
Super 20mm 1.25"
Soligor PE-6mm 1.25"
Super Plossl 32mm 1.25"
Lanthanum LV 2.5mm 45 degree 20mm 1.25"
Televue 2x Barlow 1.25"
Televue 2.5x Barlow Powermate 1.25"
2x Barlow Lens
Meade Telenegative 2x Barlow 1.25"

Telescope accessories:

William Optics AFR-IV Adjustable Flattener Reducer
Meade Zero Image-Shift Microfocuser
Meade 4000 Series f6.3 Focal Reducer
Meade 4000 series f3.3 CCD Focal Reducer with T-Adapter
Celestron Reducer/Corrector f6.3 (Model: 94175)
Tamron Adaptall-2 Custom Mount

Eyepiece accessories and filters:

Meade Electronic Eyepiece
Meade Illuminated Reticle MA12mm
Celestron Radial Guider (#94176)
Light Pollution Filter 1.25"
Meade #908 O-III Nebular Filter
Variable Polarizing Filter #3
Baader Planetarium Contrast-Booster Filter (#2458360) 1.25"
Celestron Colored Eyepiece Filters (#25 Red, #38A Blue, #47 Violet, #53 L Green)
Baader G-CCD Filter 1.25" (Cat: 2458470G)
Baader R-CCD Filter 1.25" (Cat: 2458470R)
Baader B-CCD Filter 1.25" (Cat: 2458470B)
Baader UV/IR Cut/L-Filter 1.25" (Cat: 2459207A)
Baader H-alpha 7nm CCD Narrowband-Filter 1.25" (Cat: 2458382)
Baader O-III 8.5nm CCD Narrowband-Filter 1.25" (Cat: 2458435)
Baader S-II 8nm CCD Narrowband-Filter 1.25" (Cat: 2458430)
Baader H-beta 8.5nm CCD Narrowband-Filter 1.25" (Cat: 2458425)
Astronomik L-RGB Type 2c Filterset 1.25" (4 filters, Cat: 10220125)
Astronomik CLS-Filter 2" (Cat: 10213200)
Astronomik CLS-Filter 1.25" (Cat: 10213125)
Astronomik CLS CCD-Filter 1.25" (Cat: 10208125)
Star Analyser 100 (Model: PHEL-SA100) – produces spectra

Cameras:

Atik Focal Reducer 58mm
Atik 383L + FW 11/4"+Filters
Atik Infinity Camera
Atik 314L+ CCD Camera (SN11003041)
Atik One 6.0 Monochrome CCD Camera (SN: 1191452-0093)
Atik 460EX Color (SN21223-26)
ZWO ASI290MM Mini USB 2.0 Monochrome Small Format CMOS Camera
Imaging Source DBK21AU618.AS 640x480 USB2 planetary camera
STV ('vintage video CCD AV camera) and Filter Wheel
Astrovid 2000 ('vintage' CCD camera)
Nikon D100 DSLR
Sigma EX DG Macro 105mm 1:2.8 DLSR Lens
Geoptik CCD Adapter x Canon (Model: 30A189)

CONTACTS

Chair Dan Self
Contact chairman@brecklandastro.org.uk

Observatory/Visits Mick Ladner
Contact visitors@brecklandastro.org.uk

Webmaster Andrew Luck (temporary)
Contact webmaster@brecklandastro.org.uk

Newsletter Chris Bailey
Contact newsletter@brecklandastro.org.uk

Membership/Treasurer Andy Jones
Contact treasurer@brecklandastro.org.uk

Secretary Rebecca Greef
Contact secretary@brecklandastro.org.uk

Please check with any of the contacts in bold before visiting the observatory. Please ensure you are wearing appropriate footwear and clothing and bring a torch (preferably one showing a RED light)

Breckland Astronomical Society Events – 2022

7:30pm Great Ellingham Recreation Centre, Watton Road, Great Ellingham,
Attleborough, Norfolk

Hall entry £2.50 £1 U18s

| | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|-----------------------------------|
| Friday, September 9 th | The Aurora Borealis: Theory and Recent Observations | Dan Self and James Rowley-Hill |
| Friday, September 30 th | Public open night | Observatory |
| Friday, October 14 th | Citizen Science | Prof Chris Lintott |
| Friday, October 28 th | Public open night | Observatory |
| Saturday, October 29 th – Wednesday, November 2 nd | External Event: Star Party* | Haw Wood Farm* |
| Friday, November 11th | Quiz Night | Dan Self |
| Friday, November 25th | Public open night | Observatory |
| Friday, December 9 th | TBA | - |
| Friday, December 30th | Public open night | Observatory |
| * Haw Wood Farm Caravan Park, Hinton, Saxmundham, IP17 3QT. www.hawwoodfarm.co.uk to book: info@hawwoodfarm.co.uk 01502 359550 Dan & Georgina. £16 per pitch per night. | | |
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