

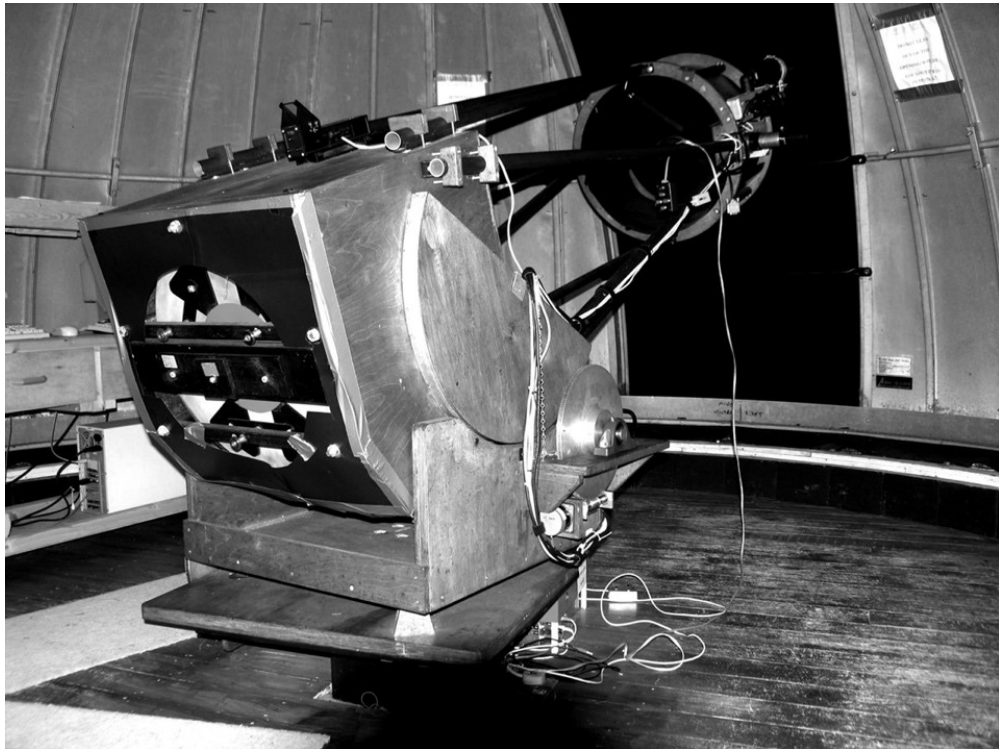


# Breckland Astronomical Society

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

## ***EXTRA*** ***TERRESTRIAL***

**Newsletter January 2024**



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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# Jan 2024

## Chairman's Notes

Welcome to 2024. I would like this to be a year of giving time to inspire others about the wonders of science. Thanks everyone for making 2023 a success, whether by attending a talk, or appreciating a nice view through a telescope or doing some admin for us. I appreciate all the help even if I do not name you personally. Special thanks go to Mark who is our new representative on the Rec Centre committee, Andy for doing the bulk of the administration, Mick for helping arrange visitors, John G for those frequent but essential little jobs, Chris for imparting his wisdom to our visiting groups, driving a long way and... Compiling 6 annual 64 page (epic) BAS small magazines – these are available on the facebook group in files contain some really useful stuff and are worth referring to or browsing for a bit of education.

Some of us found it a difficult year in some way or other, but here we want to focus on the heavens and the enjoyment the night sky can bring to us. I would be personally thrilled if I heard of more of you that were able to become more inspired by the night sky and dedicate a bit of time to it; it is an initial effort to drag yourself out into the cold when tired.

I reiterate that point as I was sad to hear about one such inspired chap, Jim Slight of our fantastic neighbour society DASH passed away recently. He was an avid stargazer and extremely altruistic chap, giving much of his time to help run the society. My condolences go out to those who knew him. The world is at a loss.

### **A Quick Sky Diary**

Some events courtesy of the BAA Handbook 2024 (to whom we subscribe).

Jan 4 is the Peak of the Quadrantid Meteor Shower – it is a northerly shower emanating from a now defunct constellation between the Plough, Hercules, Boötes and Draco. which is low in the North. This year the meteors occur during a low last quarter moon. Either look early in the evening from 6pm or between 10pm and 1:30am from a DARK place, not necessarily with a great horizon. Expect a meteor every few minutes, as not all will see them but the wider the view the better, so best to recline in a thick coat and socks with a flask of coffee. Cameras struggle to pick them up but are getting better these days.

Jan 15 6-9pm Neptune can be located directly above the crescent moon, approaching a pass 0.9 degrees North as it reaches the horizon.

Jan 20 9:41 + or – a minute or so, the Moon occults star 36 Tau. The star disappears so suddenly it is unexpected.

Feb 14 22:00 or so, Crescent Moon occults star HD12479/HIP 9533. Nicer to view against the Earth shine dark side.

Feb 16 20:58 or so, Half Moon occults a star just beneath the Pleiades.

No easy Lunar X viewing times occur in January or February 2024.

### What's easy to look at in January and February

I have used *Stellarium* and *Paint Shop Pro* to generate some sky charts at about 8pm on January 31<sup>st</sup>, this can be taken as the same sky as 10pm on January 2<sup>nd</sup>, 9pm on the 16<sup>th</sup> or 7pm on February 14<sup>th</sup>.



### Nebulae in the South

Starting in the South, we have Orion, with good large binoculars you can see the nebula M42 clearly in the sword below his belt. M43 needs more power. If you want to test out using a telescope you can try finding M78 above the belt – it has been described as 'headlights in the fog'. You will notice alignment and positioning are crucial if you have just started out with star-hopping. It is a rare skill, but somewhat pleasant still being lost among the stars. That is, if you don't mind the cold.

Due to the nature of the display settings, Stellarium likes to include large photographic nebulae, these are generally not visible by eye. I would stick to the Messier objects as a beginner, so M1 the Crab Nebula, would be a suitable target, near zeta Tauri above Orion, it needs quite a reasonable telescope or dark sky as it is fairly faint and I can only ever see a cotton wool like fuzz shape to it but it is amazing you can see light from a supernova that went off 1000 years ago (from our perspective).

### Clusters in the South

M35 is a bright, large cluster in Gemini with a smaller companion, and M46 and M47 in Puppis can be found using Sirius and Murzrim as a ruler and extrapolating to the left almost 3 of those

distances. The fuzzy patch should be faintly visible in the finder scope, and when found look hard and long because you may see the faint planetary nebula NGC2438 in M46. I can't stress that enough, look for longer: try averting your vision from the object, try breathing, try covering any light from above, try another eyepiece, try moving the telescope. Sometimes things pop out. If new to this, you may notice the really deep levels of night vision we have and appreciate the need for less lighting.

M44 in Cancer is beautiful but large for a telescope, M67 is much nicer in a telescope.

For a more advanced amateur level observing object, look up NGC 2261 – Hubble's Variable Nebula, a small comet shape reflection nebula, near the Christmas Tree cluster in Monoceros. It is a bit trickier to find, but there is an obvious and easy star hopping route.



## Galaxies in the West

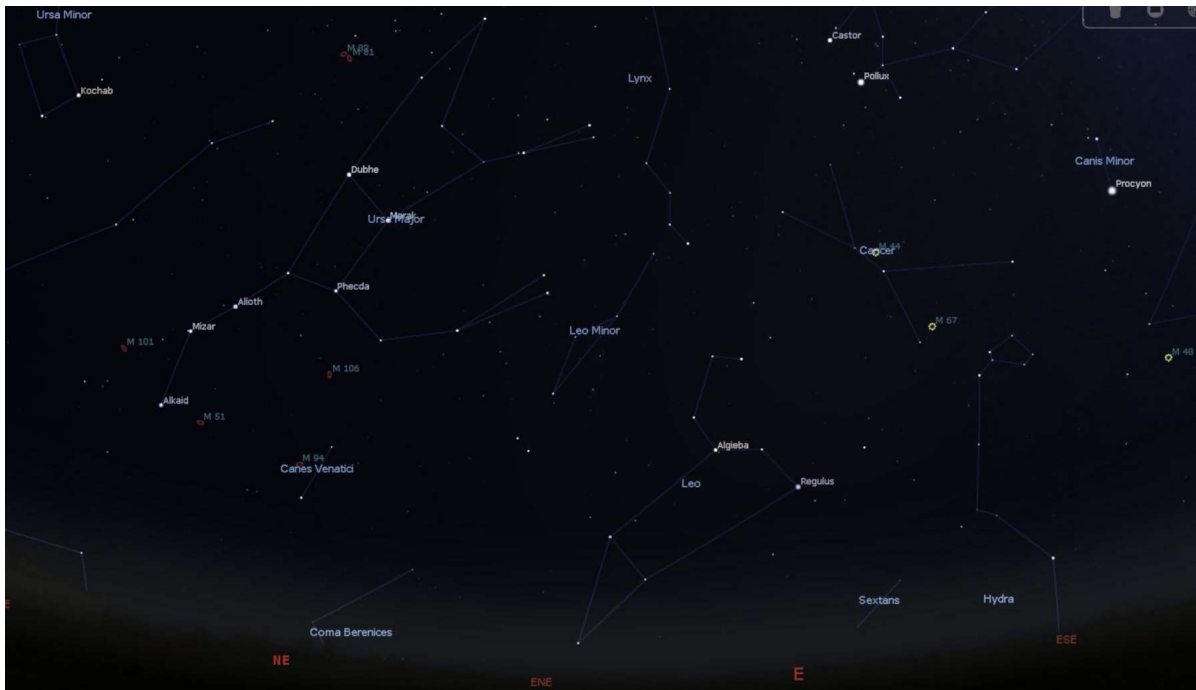
Looking West, you can still see the Andromeda Galaxy and Triangulum galaxies, M31 and M33 above Jupiter. M31 may still be visible without any binoculars if high enough. The star Mirach which is between the two has a faint galaxy behind it, NGC 404, called Mirach's ghost. It is worth a look if you have a reasonable telescope, it is just 7 arc minutes away and the glare from the star is distracting to the eye. The galaxy itself is a dwarf spheroidal galaxy, 10.3 million light years away.

The star Almach above Mirach, is a fine double also worth checking out in a telescope. Not marked but visible to the left at the top of Perseus in the milky way is the double cluster h&x Persei, there are many clusters visible in Cassiopeia also. Don't forget Comet Pons Brooks is in this area if you have a telescope, a chart from heavens-above.com and patience.

## An Easy Variable Star

You may be able to catch Algol at one of its minima. Algol is the “Eye of Medusa” looking at you, and on occasions it winks. This myth is fitting for that ominous or spooky feeling you get when you truly feel or appreciate the heavens. So the star (or stars) is an eclipsing binary, where a fainter larger star passes in front of the hotter brighter companion, causing a dip in brightness with a slow decline and rise in the few hours before and after.

These dips occur on January 7<sup>th</sup> midnight (Jan 6 evening), Jan 9<sup>th</sup> 9pm, Jan 27 early am, Jan 29 11pm, Feb 19<sup>th</sup> (eve of the 18<sup>th</sup>) midnight. The orbital period is 2.867 days, and it goes from bright magnitude 2.1 to 3.4 and is visible easily by eye.



## Galaxies also in the North East

In the North East, the Plough rises high, with all the wonderful galaxies behind it. These are telescope showpieces, especially M81 and M82 in the same field of view. If you extrapolate a line diagonally across the bowl of the “saucepan” upwards you pretty much arrive in the right area. I find it tricky to find them usually though. M101 is much fainter than expected usually due to its diffuse large nature and how it hides with the slightest bit of light pollution. M51 is bright enough to get through a bit of light pollution however. In this area gamma Leonis is the star Algieba, worth looking at. There is also a bright galaxy not marked NGC 2903 just below and to the right of the top star of the Sickle Asterism.

Don't forget to check out those double stars if the moon is up – see previous two years spring editions for details. Zeta Cancri, alpha Geminorum and gamma Leonis are good for starters.

## **Object of the Year – NGC 2024.**

It is the Flame Nebula, positioned near the Celestial Equator for the whole world to see this year. If you can get the bright glare of Alnitak, the left star of Orion's belt, out of the field in an eyepiece, you may notice a large, half-degree-sized patch of nebulosity. The Flame Nebula looks like a burning bush or classic campfire in photographs. It can be seen by eye unlike the Horsehead or IC 434, which is very difficult, as it has some non H-alpha wavelengths among its emission spectrum, to which the eye is more sensitive. Hence it appears more yellow-red than IC 434.

Please post up your photographs, observing notes or sketches to the facebook group or email them to me or show them to us at the observatory. Or come along to the observatory and have a look yourself, it is visible in the 20 inch.

## **Inspiration from staring at a Starry Night**

A beautiful human aspect of stargazing when staring at the sky in awe like Brian Cox in a remote desert, or whatever dark place we have found, is that all of us humans can share an inner sense of something there. Whether feelings of vastness, wonder, peace, awe, fear, it is a deep, indescribable stimulation as if connecting with nature. It's rather like a mild form of tripping without drugs. As Stuart Clark writes in "Beneath the Night" we are seeing exactly what our ancestors saw as if 'in' history, I paraphrase of course.

It was then that my mind began wandering on to those star pictures we saw in Impressionist paintings. I stumbled upon Van Gogh's 'Café Terrace at Night in Arles', which contained some stars some researcher had vaguely identified and dated the scene. Vincent was apparently fascinated with the stars, and back then you could see 5<sup>th</sup> magnitude stars clearly from the centre of towns, it seems. I decided to trace the sky to a moonless September evening in 1888 using Stellarium and tried to recognise the pattern.

To no avail. I went down a rabbit hole. I looked on Google Earth for that very café, which has now been restored and preserved to look the same. Those French squares look the same anyway, which is a part of the country's charm. Thus the Street View is pretty much just as in the painting, trees a little taller, that's all. And I identified the view as South. I eventually came across research findings saying that the stars had an accurate correspondence to 'Verseau' i.e. Aquarius. Yes, Aquarius is in the South at that time, but I still couldn't match up the stars. I then found a diagram, which again didn't look conclusive. The impressionist style had either distorted the pattern so much or he ran home and painted them from memory (more likely). Take a look at this blog on the topic:

<https://blogs.futura-sciences.com/e-luminet/2019/09/23/the-starry-nights-of-vincent-van-gogh-1-cafe-terrace-at-night-in-arles/>

I am in total agreement with Luminet, however, about how he describes the light pollution.

An earlier, much more realistic painting also called *Starry Night*, by Jean-François Millet struck me as capturing that moment of making it out to that dark field I was describing above. I will refrain from analysing it. Just take a look here, good work Wikipedia! Perhaps a donation to them is in order. Can you recognise the star constellations?

[https://en.m.wikipedia.org/wiki/Starry\\_Night\\_\(Millet\)](https://en.m.wikipedia.org/wiki/Starry_Night_(Millet))



## **A timeline of Twilight and Moon times for the two-month period Jan-Feb 2024**

Jan 1 Twilight end (astro) 18:05, Moonrise 21:54  
Jan 2 Twilight end (astro) 18:06, Moonrise 23:03  
Jan 3 Twilight end (astro) 18:07, Moonrise 00:13  
Jan 5 (am) Waning Crescent Moonrise next to Spica 01:26  
Jan 15 Waxing Crescent Moonset 21:48  
Jan 16 Waxing Crescent Moonset 23:13  
Jan 18 Conjunction with Jupiter  
Jan 26 Full Moon (Snow Moon)  
Jan 30 Twilight end (astro) 18:41, Moonrise 22:01  
Jan 31 Moonrise 23:11  
Feb 2 (am) Moonrise 00:22  
Feb 12 Waxing Crescent Moonset 20:51  
Feb 13 Waxing Crescent Moonset 22:19  
Feb 16 Moon passes Pleiades very close  
Feb 24 Full Moon  
Feb 27 Twilight end (astro) 19:27, Moonrise 20:59  
Feb 28 Twilight end (astro) 19:29, Moonrise 22:09  
Feb 29 Twilight end (astro) 19:31, Moonrise 23:24 Leap Day!

### **Dawn viewing of Mercury (7:00am)**

Jan 1 altitude  $3^\circ +0.46$  mag  
Jan 5 alt  $4\frac{1}{2}^\circ +0.04$  mag  
Jan 8 alt  $4\frac{1}{2}^\circ -0.09$  mag Venus and Moon nearby  
Jan 12 alt  $4^\circ -0.18$  mag  
Jan 16 alt  $3^\circ -0.22$  mag  
Note from March 13 Mercury makes a much better appearance in the evening sky.

### **Jupiter Moon and red spot phenomena**

Jan 1 Io emerges from shadow 18:48, Europa emerges 19:04 (asteroid 21 Lutetia passes  $\frac{1}{2}$  degree S)  
Jan 3 GRS 19:50  
Jan 6 Ganymede crosses planet followed by Europa  
Jan 8 As GRS crosses Europa appears from behind limb 19:10 then disappears into shadow 19:20 then Io emerges from shadow 20:48, then Europa 21:47  
Jan 10 GRS cross  
Jan 11 Callisto passes N pole  
Jan 15 Io then Europa disappear behind disk 19:07 and 19:13 with GRS visible, high altitude. Europa reemerges 21:41 goes into shadow 21:56  
Jan 17 Ganymede emerges from shadow 21:57 while GRS crosses disk

Jan 22 GRS crosses, then Europa disappears behind disk 21:49  
Jan 23 Io starts to cross disk 18:19 followed by shadow 19:40 elongated at first.  
Jan 24 Europa leaves disk 18:48, Io appears from shadow 19:01, Europa shadow crosses disk 19:10  
Jan 31 GRS, Europa shadow, Ganymede going behind disk, Io close at 22:38 – interesting but low 20°

Feb 1 GRS crosses 19:15  
Feb 3 GRS crosses 20:57  
Feb 4 Ganymede shadow starts to cross disk, distorted, near S Pole 18:21-20:01  
Feb 5 GRS crosses 22:31  
Feb 6 GRS crosses 18:25, Io starts to cross disk 22:13  
Feb 7 19:22 Io disappears behind disk and Europa begins to transit 21:45  
Feb 8 18:35 onward Io transit, Io's shadow and GRS becomes visible.  
Feb 9 21:35 Europa appears from eclipse.  
Feb 10 GRS crosses 21:36  
Feb 11 17:35 GRS crosses with Ganymede in transit. Ganymede shadow starts to cross disk, distorted, near S Pole 22:32 (low altitude)  
Feb 13 GRS crosses 19:09  
Feb 14 21:17 Io hides behind disk  
Feb 15 18:41 nice transit of Io then GRS, then shadow that moves to cover GRS 20:55.  
Feb 16 21:37 Europa emerges from behind disk, then goes straight into eclipse 21:49  
Feb 17 GRS crosses disk 22:24  
Feb 18 Europa shadow and GRS transit in progress as sun sets 17:48. Ganymede crosses 21:09  
Feb 20 GRS crosses disk 19:54  
Feb 22 Io transit across GRS from 20:41, shadow 21:51. Callisto passes S of disk during this.  
Feb 23 Io reappearance from eclipse 21:11 Europa disappearance behind disk 21:56  
Feb 24 Io and shadow transit from sunset  
Feb 25 Europa transit (sunset), then GRS then shadow 18:47 enters disk.  
Feb 29 Ganymede emerges near sunset and enters eclipse 20:14, emerges 22:00 (low).

### **Other Solar System**

Vesta is passing through Orion and Taurus. Don't miss the close pass to Zeta Tauri on Jan 8<sup>th</sup> and even closer pass to 114 Tauri on Jan 22<sup>nd</sup>. It is under a degree from the Crab Nebula for a few days during mid-January.

Uranus is somewhat close to Jupiter in Aries. It passes N of the planet on April 20<sup>th</sup> (low).

Saturn and Neptune are getting lost in the sunset throughout the period but still visible.

Morning: Ceres is there but isn't favourable although Venus is a much brighter morning object. Mars won't be around until June or July.

## Comets

Comet 12P/Pons-Brooks, discovered in 1812, is brightening via an outburst or two as it heads towards the sun, destined to become brightest in April, when twilight makes it more difficult to spot. It hangs over the W-NW horizon after sunset, racing through the constellations as Earth's orbital motion makes them slide by. It passes through Cygnus, Lacerta, Andromeda, Pisces and Aries. Catch it now, it has a 71 year orbit!

On January 12<sup>th</sup> it passes less than  $\frac{1}{2}$  a degree from the Crescent Nebula in Cygnus, NGC 6888. This should be a great shot if you can make it Friday evening during our talk night on Comets and Extinctions. We may be able to spot them afterwards using electronic assisted astronomy. It passes a few degrees below M33 in March.

Comet 62P/Tsuchinshan, another periodic comet discovered in 1965 in China. It reached perihelion on Christmas 2023 but is ideally placed for viewing until May, slowly fading. It moves in front of the Virgo cluster of galaxies, encountering a pair NGC 4608 and NGC 4596 as it reaches a stationary point in the sky where its position loops backwards from February 7<sup>th</sup> until the 27<sup>th</sup>. It should be around 9-10<sup>th</sup> magnitude, so a bit brighter than the galaxies.

Comet 144P/Kushida was discovered in 1994. It is beneath the Pleiades – which may be fairly bright and reasonably placed. Look for it in mid January to catch it at its best. You never know what it will do.

Here is a link to an amazing blog detailing comets of yesteryear - well worth a read.

<https://georgebishopjr.com/tag/comet/>

## Talks

The Quiz was a close race between 4 teams and one straggling. It was certainly fun but not the bustling atmosphere of the past. Kathryn won the telescope - we hope you get to test it out soon! I may have a rethink of the quiz this year it needs a revamp.

Dr Thomas North – Exoplanets talk was very well attended 40+ people filled the hall. Tom is a kind chap who went to Birmingham Uni 8 yrs doing a PhD using Kepler data. He is now an outstanding school teacher, and is moving to teach in Mallorca.

First of all Dr North looks at the variations of light from stars in the Kepler fields of view. He talks about a special group of giant stars called LLSRG stars, and realises Kepler is a fantastic mission to monitor oscillations of stars and discovers some astro seismology can be done!

We often are looking right across the Milky Way galaxy for these stars too. It is Galactic archaeology, i.e. history of the entire Galaxy using the subtle clues remaining.

But on to Exoplanets. He Defined 'exoplanet' - Pluto would be too small, sorry!

He told us of the Kepler transit method history how the planets pass in front of the star and cause

a dip in the light. The HiRES facility on the Keck space telescope can monitor one star only! So clearly a need for monitoring more was there. Prior to Kepler, an amateur team demonstrated the proof of concept, and recorded a planet transit from behind a car park over a night. It was clear and data got noisy due to cloud.

Only downside of the transit method is you need really well lined up planets.

Dr North shows us a hugely detailed solar spectrum with busy lines pic and explains nicely about the Doppler shift caused by the wobble. This is another method that can back up transits but is biased to faster and bigger planets - closer less time periods. i.e. Hot Jupiters.

So Kepler was launched, and stared at Cygnus for a while. It monitored 150 000 stars. As of now it has discovered >2000 planets or >4000 including all awaiting follow up. It takes a look for 30 minutes then has a 30 min pause, then 30 min again later.

It had an accident somehow in the depths of space and lost a bit of control pointing, therefore it was turned into K2 – a new mission. K2 used a solar sail effect to drift due to a loss of the gyro. To keep an 80 day constant yaw. This was a very clever useful solution. They scanned across the ecliptic, in about 18 places.

He showed us a live graph of planets' period vs mass. Containing very short periods down to under a day. Of course this graph was biased to hot Jupiters. Some of these have puffed up atmospheres and are called Chthonian. We can't explain how the super fast ones got there.

An example was HD209458b - it had a 2000degree atmosphere.

Corot-7b has no atmosphere like a bare core of Jupiter

He showed us "Doomed planets".

WASP-12b being eaten by its host star

KOI-6194.01 has a 42-day orbit so may survive the plunge - this was his planet. His planet could be dead in 140Myr, swallowed by the star.

Also we have "pulsar planets". This is very unusual if you think about it, they have survived a supernova, which generally would send anything flying.

This was the first planet to be discovered around pulsar PSR B1257+12 in Jan 1992

May have formed from the SN debris or captured. But we may never know, for now they are good guesses.

K2 has discovered

K2-18b A "Hycean" atmosphere "super earth" or "mini neptune" it is not habitable! It has water and thick H<sub>2</sub> at the high pressure supercritical boundary, so not even a distinct surface.

JWST has looked at this one and got a MIRi spectrum showing this fascinating new detail.

Amazing but the simulated atmospheric spectrum is quite an extrapolation from the accuracy of the data. So the paper has not a very significant claim.

Check out Tabby's star! There are many interesting and outrageous theories out there to explain its strange deep irregular dips in light. Go look them up.

Kepler 56b is pulling a tide on the stars outer atmosphere.

Going back to seismology he shows a complicated graph of star temperature, with different types of internal oscillations on the plot. Boiling water like rolling convection cells on stars surfaces, mean they effectively make sound and can be measured by doppler shifts. Therefore one can infer what is inside of stars. We got to listen to the stars at this point!

M4 globular cluster had some interesting examples from the K2 campaign 2

One can work out a star radius from its wobble radius. It is in the region of micro-Hertz or a period of hundreds of thousands of seconds. Lots of good star info was available here.

So he found a planet with 3 weeks to go in his PhD. You have to put in a model to clean up the data. This was the one mentioned above – the red giant star, which is eventually probably gonna eat it.

The next transit mission is ready, called TESS. The EU launched it when Kepler died. TESS scans 24 degree wide strip and swirls across the sky. It is looking for habitable zone stars. Plus astro seismology also as a bonus.

Next in this area is a space telescope called PLATO to be launched in 2026 with longer pointings and covering an even larger area.

Future talks coming up we have David Bryant talking on Comets and Extinctions (Jan) and Calvin Preston a galaxy PhD researcher from Cambridge who is working with Prof Alex Amon's group who have now moved to New York (talking in Feb) – I look forward to meeting many of you again at those on the second Fridays of the months.

*Dan Self*

# JOHN'S NEWS BITS

January 2024

NASA has announced that it will send two scientific spacecraft to Mars aboard the Bezos Blue Origin New Glenn rocket in August 2024. This beats Elon Musk's Space X Falcon heavy rocket that hoped to get this contract. It will measure plasma and magnetic fields around the red planet.

[www.ssl.berkeley.edu>nasa...](http://www.ssl.berkeley.edu>nasa...)

Columbia University chemists have discovered a ballistic flow in quantum material which will overcome shortcomings in semiconductors. Acoustic exciton-polarons move twice as fast as electrons in silicon so speeding up performance.

<https://quantum.columbia.edu>

Japan's experimental nuclear fusion reactor the JT-60SA has been inaugurated, it is the world's biggest. It will investigate the feasibility of fusion as a safe large-scale source of carbon-free energy. This is a joint EU-Japan project.

The doughnut shaped tokamak vessel will heat plasma to 200 million deg.c.

[www.japanesetimes.co.jp/news/nuclear-fusion-reactor-inaaugur](http://www.japanesetimes.co.jp/news/nuclear-fusion-reactor-inaaugur)

The Euclid telescope was launched on the 1<sup>st</sup> of July is a SpaceX Falcon rocket's and now parked at Lagrange 2 point, 1,5 million km from Earth. It will survey 1/3 of the sky in the next 6 months. It will throw more light on both Dark Matter and Dark Energy. Meantime it has released some amazing first images.

[www.esa-int>euclid](http://www.esa-int>euclid)

China has unveiled a Mars foldable quadcopter design helicopter as part of the mission to return samples to Earth. the quadcopter will carry a load of up to 100gms to take to its mission lander.

[www.space.com>china-mars](http://www.space.com>china-mars)

BOAT, the 'Brightest Of All Time' ultra-high energy cosmic ray burst with the power of one quintillion eV (that's a million x 18 zeroes) slammed into Earth and no-one can find what it came from as it seemed to come from a place in the universe where nothing is known to exist. It may have come from a massive star going supernova and ending up with a black hole.

It has been designated GRB 221009A.

It was picked up by the Telescope Array Project.

[www.livescience.com](http://www.livescience.com)

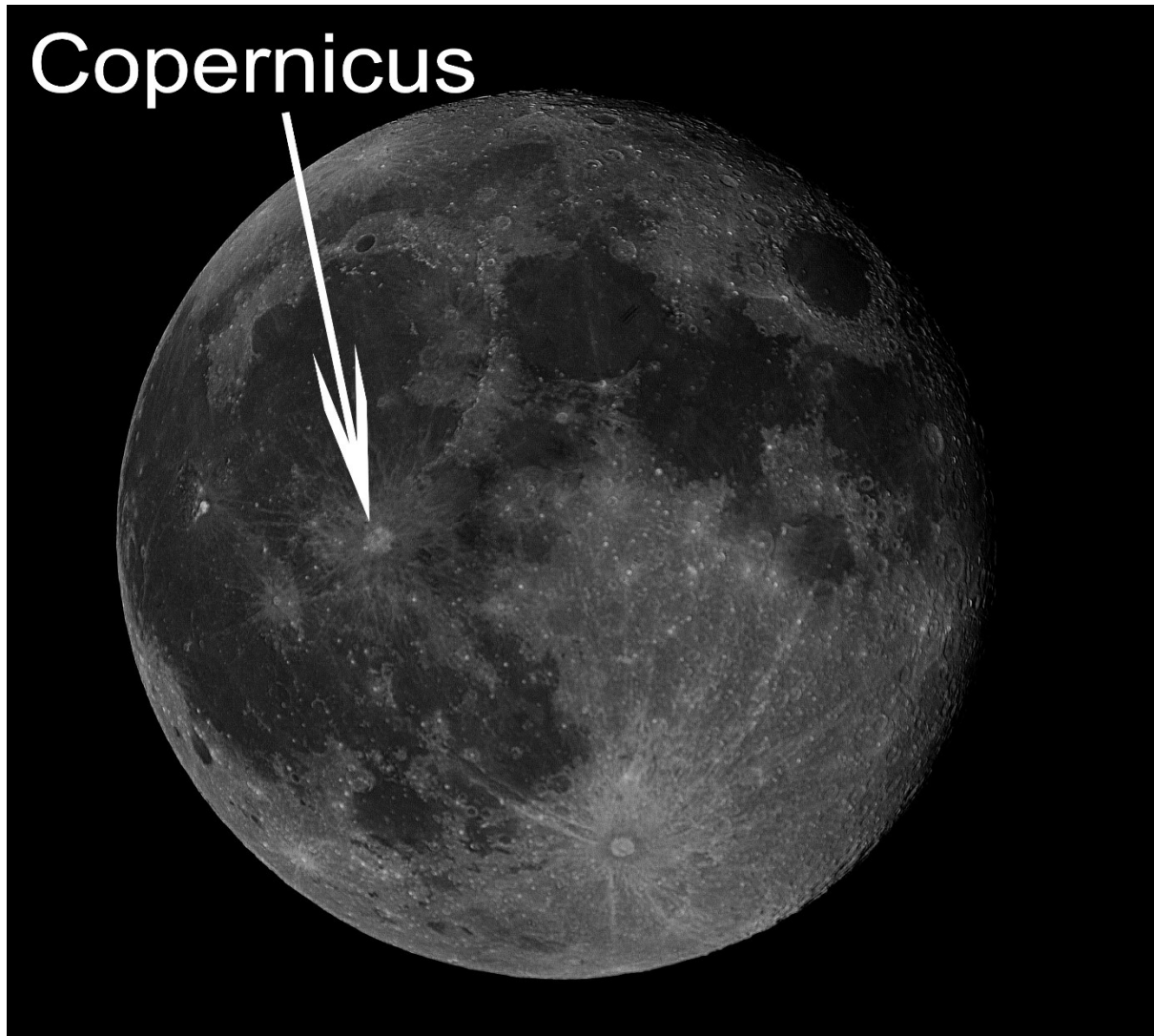
The Telescope Array Project is located in Utah and is a collaboration between universities in the USA, Japan, Korea, Russia and Belgium.

The ground-based arrays cover an area of over 300 sq. Miles and is designed to pick up cosmic rays of extreme energy. It combines both a ground array to detect the cosmic rays getting to Earth's surface and air fluorescence scintillation to pick up the radiation hitting the Earth's atmosphere.

[www.telescopearray.org](http://www.telescopearray.org)

John Gionis

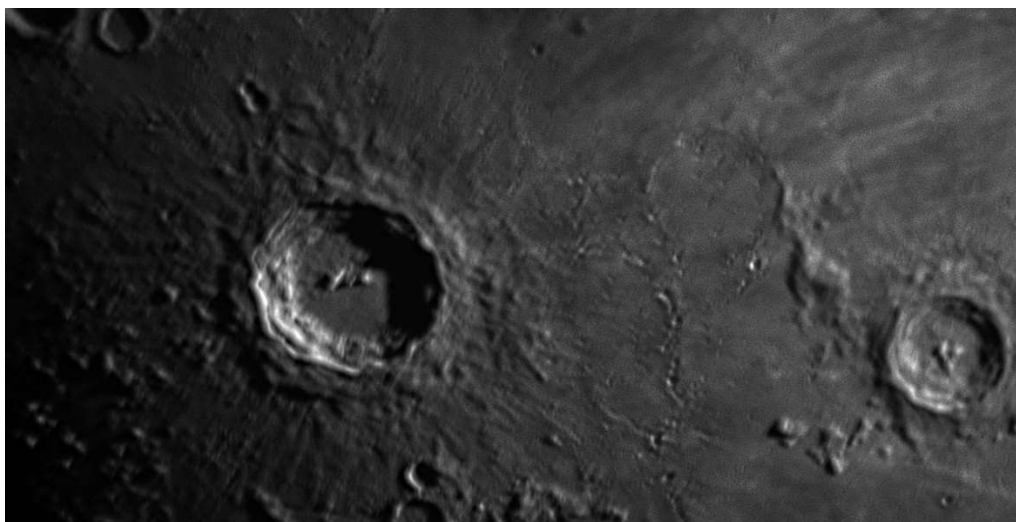
## Featured Lunar Crater No1 Copernicus



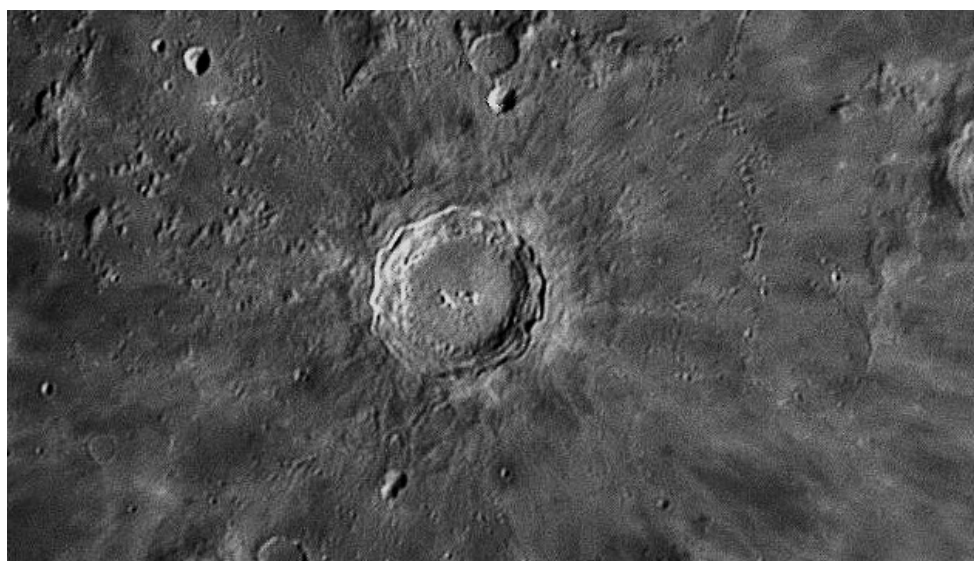
All Photographs by Author

Lat 09.62N 20.08W. The Copernicus-aged, rayed crater is about 96Km in diameter and 3800 mtrs deep. The crater can be seen from earth without the use of optical aids and forms the bright greyish eye in the "Lunar Rabbit". On day 9 of the lunar cycle this crater emerges out of the darkness of lunar night but the interior of the crater is still in darkness Over the next couple of days, the thin sharp, scalloped rim crests become brighter until they form a very bright ring at full moon. The interior walls are terraced with a wider band of terracing along the western walls when compared to the eastern ones. The southern walls are pushed out forming a large notch in the otherwise almost perfect circle rim. The interior walls are steeper than the exterior being about 35

degrees compared to the exterior slopes of about 6 to 7 degrees. The highest summit of the multi peaked central complex is about 1060 mtrs above the crater floor. The central peak complex consists of three separate mountain ridges. The peak in the middle appears to have lost its southwestern sidewall. This peak appears similar to the terrestrial volcano Mt St Helens after its eruption in May 1980 in which the entire side of the mountain was blown away. Perhaps the same happened to the peak in Copernicus. The crater floor is hummocky south and north-east of the central peaks and generally smooth to the northwest of them.



The dark halo crater Copernicus A sits about halfway down the eastern interior wall directly below the highest peak on the craters rim.



On the northern wall directly above the mounds of material on the main crater floor is a small cone crater. When the rising sun is about 10 degrees above the lunar horizon the interplay of physical features on the terrace rim and the cone crater rim combine to form a spiral shadow and a fleeting very dark spot above the crater. It has been suggested that this is a cave on the wall of Copernicus. The believers of life on the moon have used this cave entrance as some form of evidence as the entrance to the abode of the Selenites

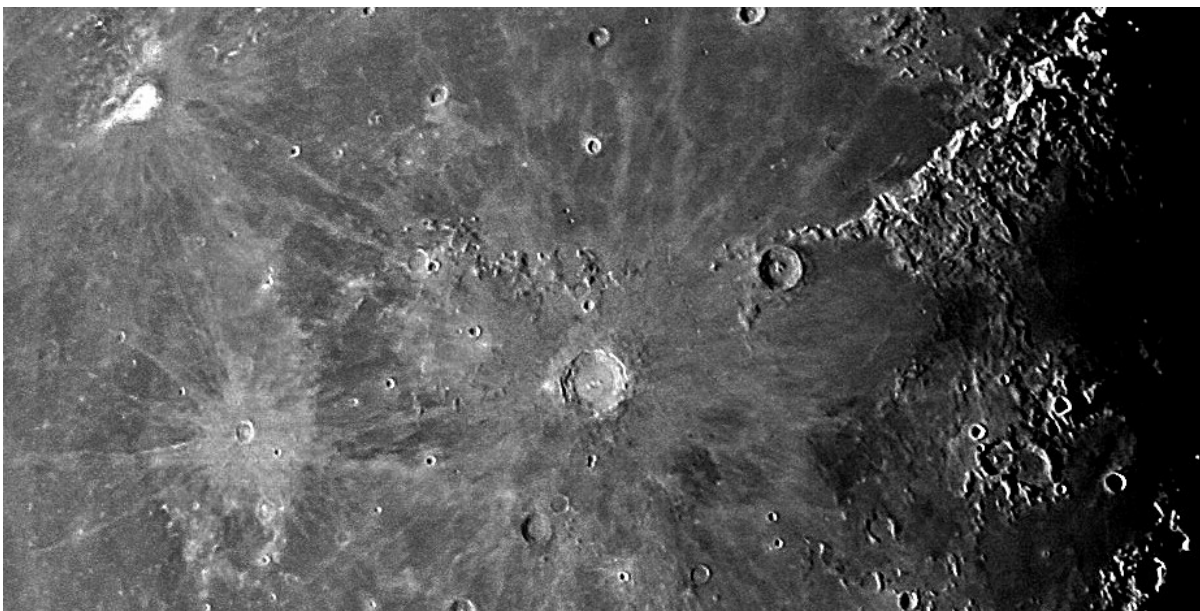
The crater is surrounded by the most beautiful, rayed ejecta blanket on the Moon. It looks like a giant can of spray paint has been splashed on the Moon with streaks of this material extending for hundreds of kilometres in all directions over mountains craters and across the surrounding area.



You can study this area many times and see something new every time. Close to the crater the ejecta blanket is piled up against the crater's exterior wall and is pockmarked with tiny crater pits.

Further out from the crater the ejecta blanket has an extensive field of small secondary craters and numerous crater chains that appear to be radial to the main crater.

The crater is named to honour the polish astronomer and church administrator Nikolaj Copernik ( Nicolaus Copernicus). After the death of his father when Nicolaus was about 10 years old, his uncle Lucas Watzelrode, later the Bishop of Ermland, ensured that the boy would have a wide ranging education as preparation for joining the priesthood. Copernicus attended universities in Krakow, Bologna, Padua and Ferrara. While a student of cannon law at the University of Bologna on March 9<sup>th</sup> 1497 Copernicus observed the lunar occultation of Aldebaran by the Moon. This is his earliest recorded celestial observation. He also around this time attended lectures on Astronomy given by Dominicus Maria Novara. He resided in Novara's house. In 1503 after receiving his doctorate in law from the University of Ferrara Copernicus returned to Poland to become a physician and lawyer working in the church administration in Frombork. For almost 30 years he worked on his project to bring order to the mathematical chaos needed to create the solar system table and explain the motions of the Sun, Moon and the then known five planets. On his deathbed he received a copy of his De Revolutionibus Orbium Coelestium (On the Revolutions of the Heavenly Spheres) in which he demonstrated that the Sun was at the centre of the solar system and not the Earth



I know that you will want to return again and again to carefully observe Copernicus and its environs in differing illumination conditions.

Please send any images or drawings to the newsletter [newsletter@brecklandastro.org.uk](mailto:newsletter@brecklandastro.org.uk)

# NASA's Juno to Get Close Look at Jupiter's Volcanic Moon Io

Jet Propulsion Laboratory



This image revealing the north polar region of the Jovian moon Io was taken on October 15 by NASA's Juno. Three of the mountain peaks visible in the upper part of image, near the day-night dividing line, were observed here for the first time by the spacecraft's JunoCam.

Image data: NASA/JPL-Caltech/SwRI/MSSS, Image processing by Ted Stryk

*The orbiter has performed 56 flybys of Jupiter and documented close encounters with three of the gas giant's four largest moons.*

NASA's Juno spacecraft will on Saturday, Dec. 30, make the closest flyby of Jupiter's moon Io that any spacecraft has made in over 20 years. Coming within roughly 930 miles (1,500 kilometers) from the surface of the most volcanic world in our solar system, the pass is expected to allow Juno instruments to generate a firehose of data.

“By combining data from this flyby with our previous observations, the Juno science team is studying how Io's volcanoes vary,” said Juno's principal investigator, Scott Bolton of the Southwest Research Institute in San Antonio, Texas. “We are looking for how often they erupt, how bright and hot they are, how the shape of the lava flow changes, and how Io's activity is connected to the flow of charged particles in Jupiter's magnetosphere.”

A second ultra-close flyby of Io is scheduled for Feb. 3, 2024, in which Juno will again come within about 930 miles (1,500 kilometers) of the surface.

The spacecraft has been monitoring Io's volcanic activity from distances ranging from about 6,830 miles (11,000 kilometers) to over 62,100 miles (100,000 kilometers), and has provided the first views of the moon's north and south poles. The spacecraft has also performed close flybys of Jupiter's icy moons Ganymede and Europa.



This JunoCam image of Jupiter's moon Io captures a plume of material ejected from the (unseen) volcano Prometheus. Indicated by the red arrow, the plume is just visible in the darkness below the terminator (the line dividing day and night). The image was taken by NASA's Juno spacecraft on October 15.  
NASA/JPL-Caltech/SwRI/MSSS

“With our pair of close flybys in December and February, Juno will investigate the source of Io's massive volcanic activity, whether a magma ocean exists underneath its crust, and the importance of tidal forces from Jupiter, which are relentlessly squeezing this tortured moon,” said Bolton.

Now in the third year of its extended mission to investigate the origin of Jupiter, the solar-powered spacecraft will also explore the ring system where some of the gas giant's inner moons reside.

### **Picture This**

All three cameras aboard Juno will be active during the Io flyby. The Jovian Infrared Auroral Mapper (*JIRAM*), which takes images in infrared, will be collecting the heat signatures emitted by volcanoes and calderas covering the moon's surface. The mission's Stellar Reference Unit (a navigational star camera that has also provided valuable science) will obtain the highest-resolution image of the surface to date. And the JunoCam imager will take visible-light colour images.

JunoCam was included on the spacecraft for the public's engagement and was designed to operate for up to eight flybys of Jupiter. The upcoming flyby of Io will be Juno's 57th orbit around Jupiter, where the spacecraft and cameras have endured one of the solar system's most punishing radiation environments.

"The cumulative effects of all that radiation has begun to show on JunoCam over the last few orbits," said Ed Hirst, project manager of Juno at NASA's Jet Propulsion Laboratory in Southern California. "Pictures from the last flyby show a reduction in the imager's dynamic range and the appearance of 'striping' noise. Our engineering team has been working on solutions to alleviate the radiation damage and to keep the imager going."

### **More Io, Please**

After several months of study and assessment, the Juno team adjusted the spacecraft's planned future trajectory to add seven new distant Io flybys (for a total of 18) to the extended mission plan. After the close Io pass on Feb. 3, the spacecraft will fly by Io every other orbit, with each orbit growing progressively more distant: The first will be at an altitude of about 10,250 miles (16,500 kilometers) above Io, and the last will be at about 71,450 miles (115,000 kilometers).

The gravitational pull of Io on Juno during the Dec. 30 flyby will reduce the spacecraft's orbit around Jupiter from 38 days to 35 days. Juno's orbit will drop to 33 days after the Feb. 3 flyby.

After that, Juno's new trajectory will result in Jupiter blocking the Sun from the spacecraft for about five minutes at the time when the orbiter is at its closest to the planet, a period called perijove. Although this will be the first time the solar-powered spacecraft has encountered darkness since its flyby of Earth in October 2013, the duration will be too short to affect its overall operation. With the exception of the Feb. 3 perijove, the spacecraft will encounter solar eclipses like this during

every close flyby of Jupiter from now on through the remainder of its extended mission, which ends in late 2025.

Starting in April 2024, the spacecraft will carry out a series of occultation experiments that use Juno's Gravity Science experiment to probe Jupiter's upper atmospheric makeup, which provides key information on the planet's shape and interior structure.

### **More About the Mission**

JPL, a division of Caltech in Pasadena, California, manages the Juno mission for the principal investigator, Scott J. Bolton, of the Southwest Research Institute in San Antonio. Juno is part of NASA's New Frontiers Program, which is managed at NASA's Marshall Space Flight Center in Huntsville, Alabama, for the agency's Science Mission Directorate in Washington. Lockheed Martin Space in Denver built and operates the spacecraft.

More information about Juno is available at:

**<https://www.nasa.gov/juno>**

# December Meteor Showers

## Andromedid Meteor Shower

The shower in question, the Andromedids, is caused by dust and rocks left behind by the comet 3D/Biela entering Earth's atmosphere and burning up. In most years the Andromedids barely produce more meteors than you might expect on an average evening

Records show that the Andromedids in 1872 and 1885 were particularly spectacular, with more than 1000 meteors in an hour. The last time the shower was active was in 2011, producing about 50 meteors per hour.

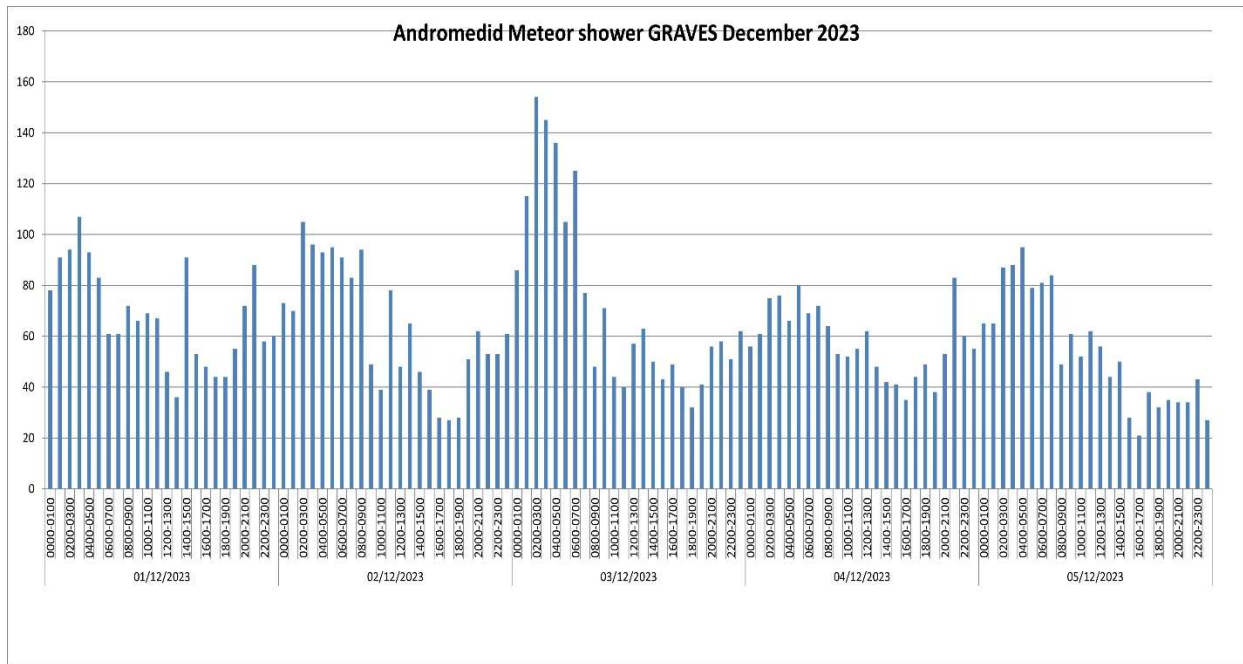


The reason for this inconsistency is the death of comet 3D/Biela. It was first spotted in 1772, and then again in the mid-1800s, when it had split into two pieces, but it has never been seen again. It seems to have disintegrated, which caused the particularly bright showers in the late 1800s. But there is still a trail of debris and dust left behind by the comet's original path, which Earth, on occasion, finds itself flying through. This happens rarely because the remaining material moves along orbits similar to the comet's path. "It takes the meteoroids 6.7 years to orbit the sun," says Robert Weryk at the University of Hawai'i at Mānoa. "Earth is rarely in the same place at the same

time.” But this year could be one of those times. In a paper in 2012, astronomers from the University of Western Ontario in Canada, including Weryk, simulated the movement of the dust trail. The model predicted we could be in for as many as 200 meteor per hour, peaking on 2 December. 2023

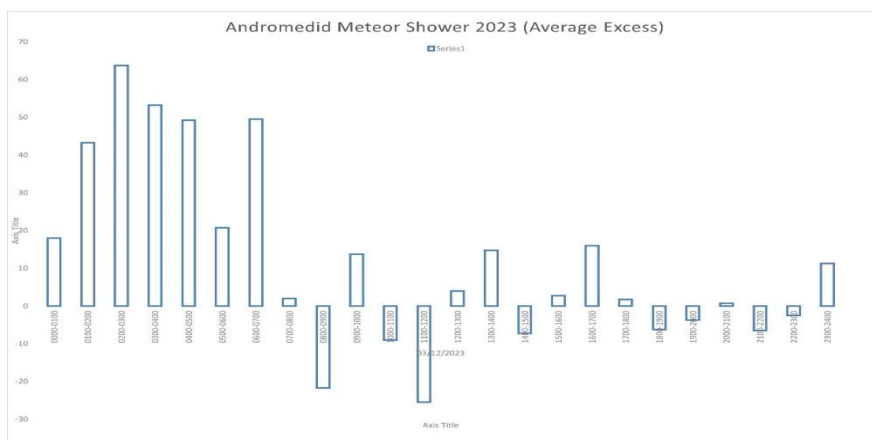
## Observations

Using the GRAVES transmitter, the following record was obtained. The count was completed manually to attempt to remove Starlink and other man made returns.



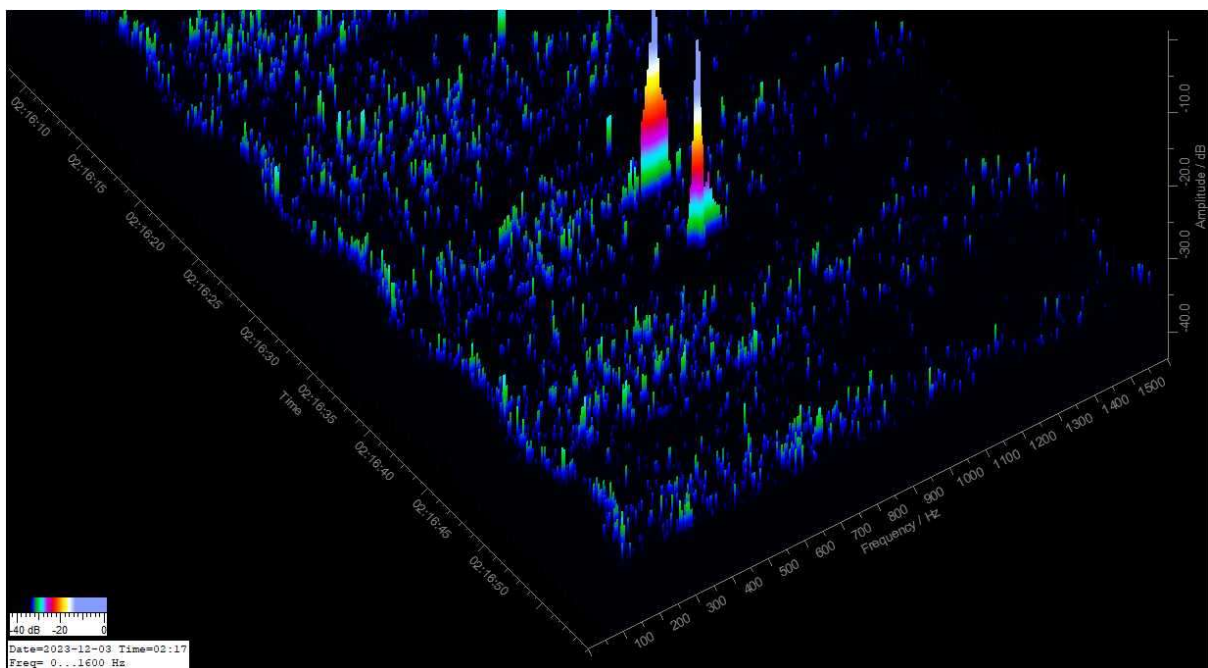
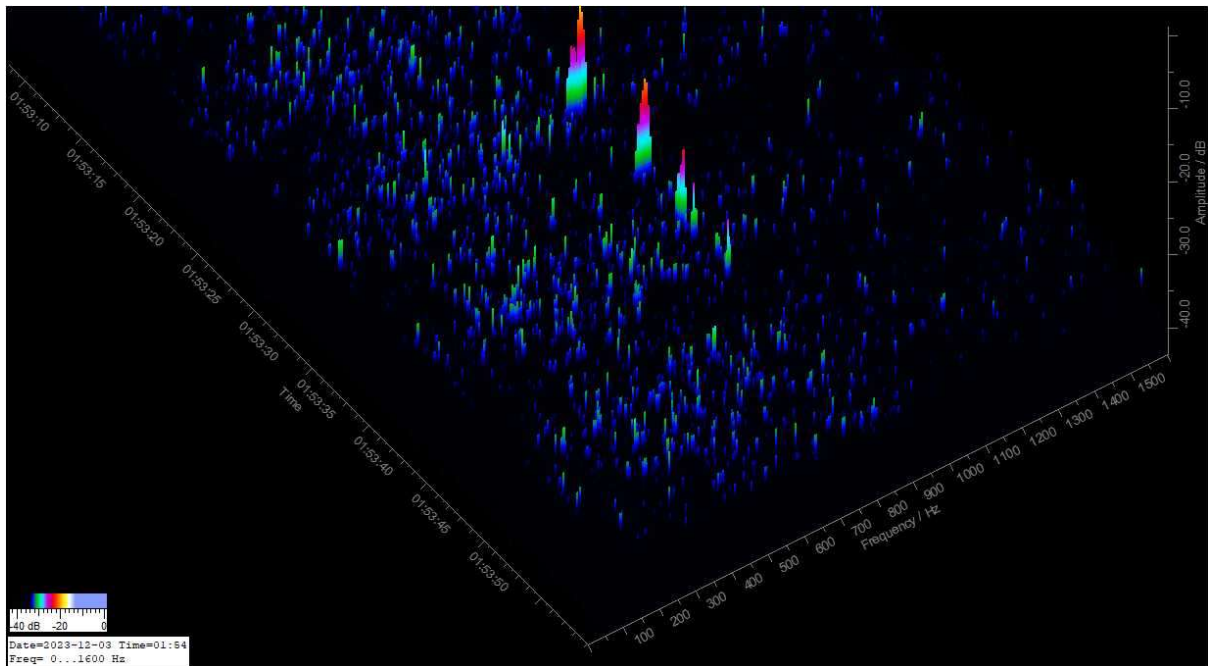
It would appear that the peak was in the early hours of the 3<sup>rd</sup> December.

To try to remove the sporadic echoes and the those from other showers the two days before and the two days after were averaged and subtracted from the echoes on the 3<sup>rd</sup>.



This shows a definite trend on the morning of 3rd above the average to be expected. This has worked before and so far it is difficult to have a common factor for sporadics so it appears to be the best method.

Typical echoes during this period show short doppler trails which would imply debris moving at a slower relative speed.



# Geminid Meteor Shower

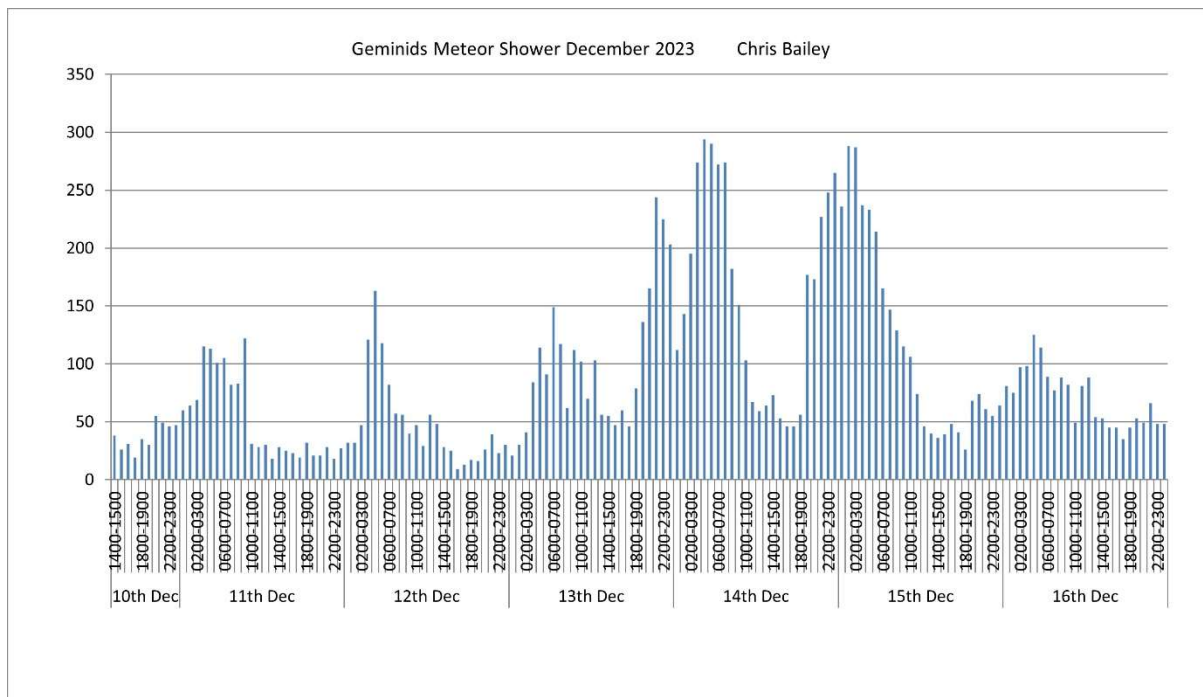
The Geminid meteor shower is one of the last of the year's major showers and can generally be relied on to put on a good display. In 2023, the Geminid meteor shower was active between 4<sup>th</sup> and 20<sup>th</sup> December and peaked on 14<sup>th</sup> -15<sup>th</sup> December.

The meteors of the Geminid meteor shower are very bright, moderately fast, and are unusual in being multi-coloured – mainly white, some yellow and a few green, red and blue. These colours are partly caused by the presence of traces of metals like sodium and calcium. The shower has been known to produce over 150 visual meteors per hour at its peak, although light pollution and other factors mean that in reality the actual number visible is far less. Geminid meteors appear to radiate from near the bright star Castor in the constellation of Gemini.

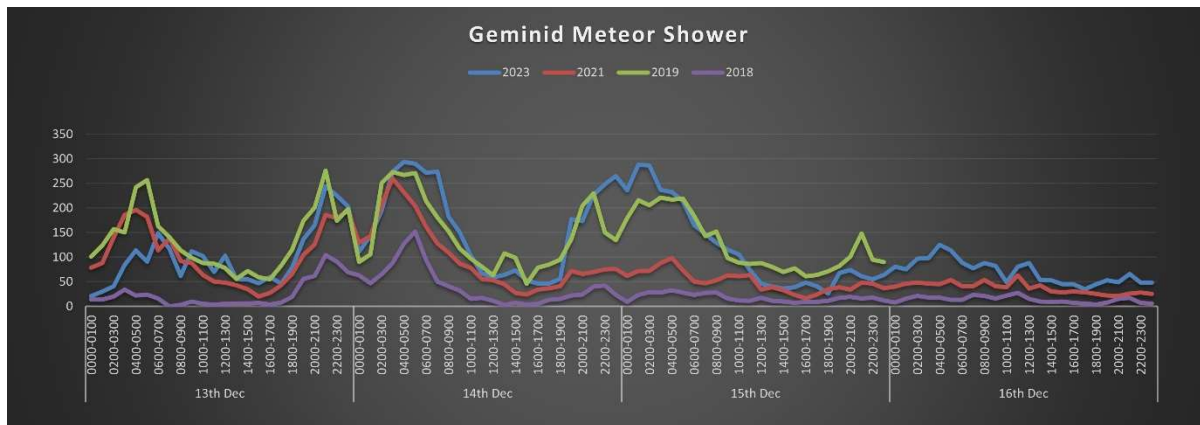
What sets the Geminids apart from other meteor showers is their origin; while most meteor showers originate from comets, Geminids are leftover bits and pieces of the asteroid known as 3200 Phaethon. Unlike comets, asteroids don't develop tails when approaching the Sun, and their composition is different. However, scientists are still debating if Phaethon is even an asteroid - although it is built like one, it doesn't move like one. Its orbit is highly elliptical, like a comet, which is why some scientists debate if Phaethon could be a completely new class of celestial objects - a rock comet.

The Geminids were first observed in 1862, much more recently than other showers such as the Perseids and Leonids.

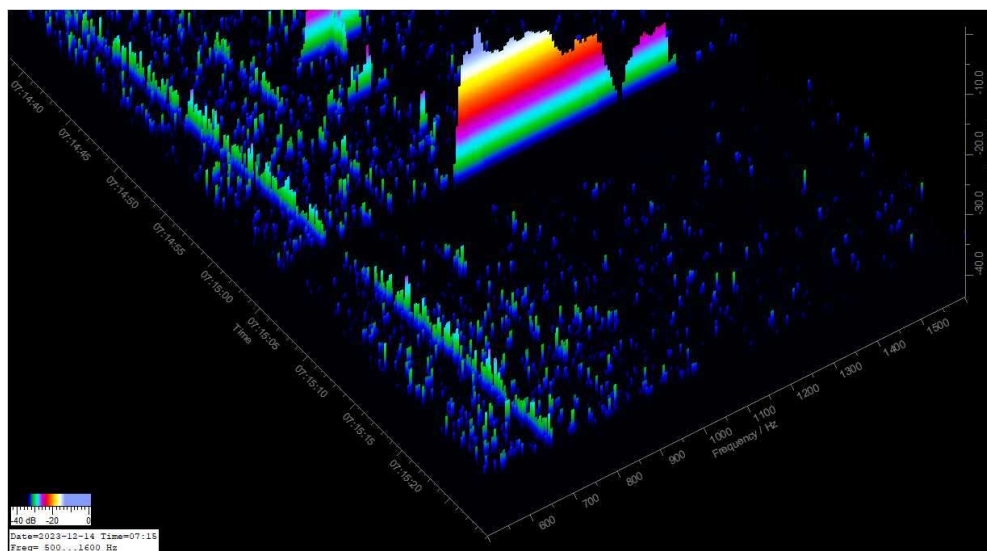
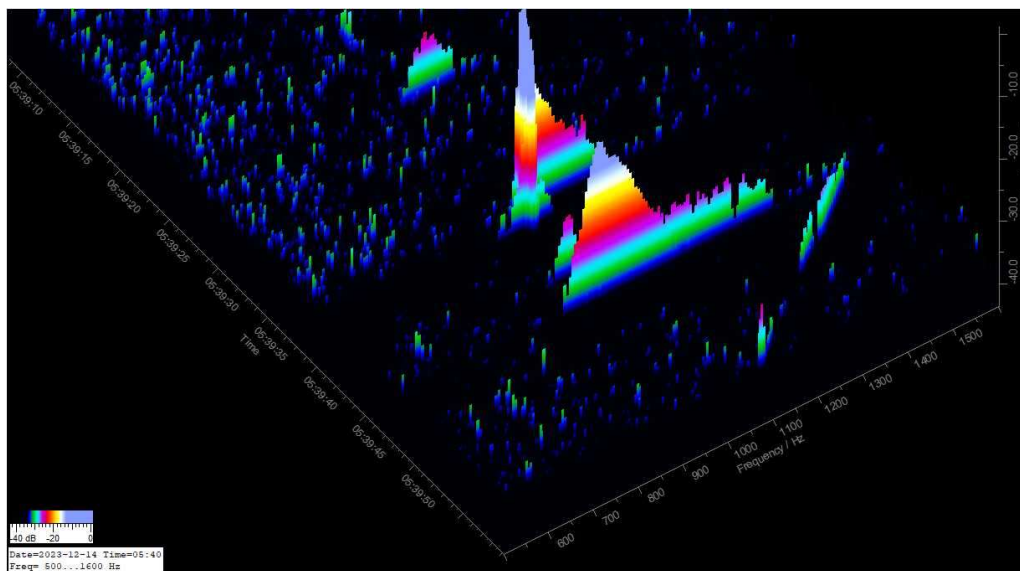
The Geminids are thought to be intensifying every year.

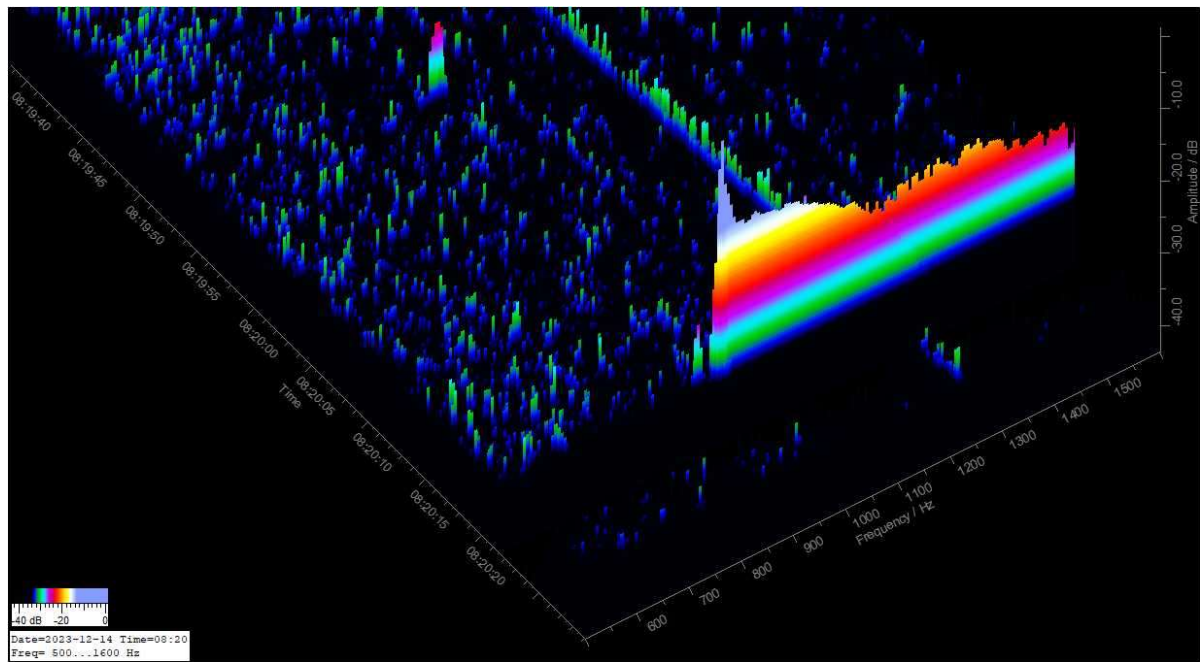
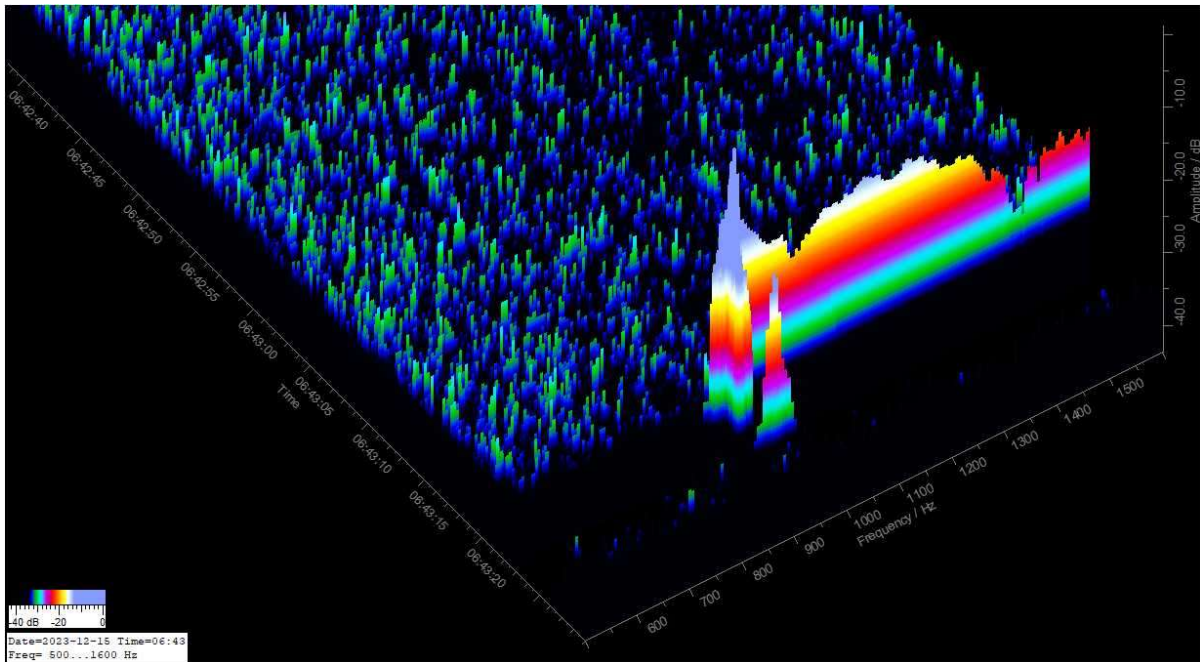


## Radio observations using GRAVES transmitter



The above shows the recordings obtained in the 4 years shown. The missing years are due to either equipment failure giving an incomplete data set or being unavailable.





Examples of Geminids Echoes showing much greater doppler shift.

The first example also shows a Starlink Satellite crossing.

All echoes for both showers are manually counted to remove as far as possible all unwanted echoes from Starlink, Moon bounce etc

Chris Bailey

# Gresham Lectures

## Astronomy lecture series [Discovering The Universe](#).

This series tells the story of our cosmos through exploring six fundamental discoveries: that of galaxies beyond our own, via probes sent to reveal the remarkably diverse wonders of our Solar System from the fountains of Saturn's tiny moon Enceladus to Earth's hellish twin, Venus, of the sudden appearance of interstellar visitors, the strange pulses received by the first radio telescopes and the twinkling of a star that misbehaved, and the revelation of detecting the oldest light of all. Together, these discoveries take us to the forefront of modern astronomy, and to the state-of-the-art in our understanding of the cosmos.

These lectures are hybrid as you can watch online, in person or on replay at a later date. Sign up to watch through the links below.

### [Oumuamua: Our first interstellar visitor](#)

Professor Chris Lintott

Wednesday 24 January 2024, 6:00 PM (UK time) or view online at:

[gres.hm/oumuamua](https://gres.hm/oumuamua)

Barnard's Inn Hall, 30 Holborn, London EC1N 2HH

In 2017, the Solar System was visited by an object named 'Oumuamua', which came from another star. The unusual properties of this first interstellar visitor led some to suggest it may be an alien spacecraft - but the truth is that its oddness is already teaching us lessons about how solar systems form. This lecture also considers the prospects of discovering more unusual objects in the Solar System, and what we might do about asteroids that threaten the Earth.

## [Pulsars, Microwave Ovens and the Radio Sky](#)

Professor Chris Lintott

Wednesday 21 February 2024, 6:00 PM (UK time) or view online at:

[gres.hm/radio-sky](https://gres.hm/radio-sky)

Barnard's Inn Hall, 30 Holborn, London EC1N 2HH

There have been two major revolutions in how we look at the sky - the shift beyond the optical to other wavelengths, particularly the radio, and the increasing attention paid to how objects change over time. We start with the discovery of pulsars by Jocelyn Bell Burnell, explore how a microwave oven bamboozled astronomers, and discuss the latest research on Fast Radio Bursts, mysterious events detected in galaxies billions of light-years away.

## [Is it Aliens?: The Most Unusual Star In The Galaxy](#)

Professor Chris Lintott

Wednesday 10 April 2024, 6:00 PM (UK time) or view online at:

[gres.hm/alien-star](https://gres.hm/alien-star)

Barnard's Inn Hall, 30 Holborn, London EC1N 2HH

Boyajian's star, a faint and unprepossessing presence in the constellation of Cygnus, attracted astronomers' attention when it began to flicker alarmingly. We will discuss explanations for its behaviour, from disintegrating comets to alien megastructures, and consider how modern astronomy hunts for the truly unusual objects in the Universe. For this task, the involvement of large numbers of volunteers - citizen scientists - is essential, for example via the Zooniverse platform, which invites you to participate in classifying galaxies and discovering planets.

## [First light: Revealing the Early Universe](#)

Professor Chris Lintott

Wednesday 29 May 2024, 6:00 PM (UK time) or view online at:

[gres.hm/first-light](https://gres.hm/first-light)

Barnard's Inn Hall, 30 Holborn, London EC1N The final lecture in the series returns to the theme of how insight is derived from observations, considering the cosmic microwave background. This oldest light in the Universe, emitted just 400,000 years after the Big Bang, contains the seeds of the structures we see around us, and tells us about conditions at the Universe's beginning. It will also consider how measurements of the Universe's expansion, made using the CMB, are leading to unexpected results, creating tension in modern cosmology.

[Read more](#) about Professor Chris Lintott, who is a Professor of Astrophysics at the University of Oxford, and a Research Fellow at New College also well known as presenter of the BBC's long-running Sky at Night program, and as an accomplished lecturer.

# Pro-Am Working Group

## Calling all Amateur Astronomers,

As you may recall, last year, you completed a survey expressing interest in collaborating with professional astronomers from the International Astronomical Union (IAU) on various research efforts. The newly launched IAU Pro-Am Research Collaboration (PARC) initiative promotes and facilitates research initiatives between amateur and professional astronomers. We invite amateur astronomers from around the world to visit the PARC web portal, explore the “Active Projects”, and sign up to participate in those that are of interest to you.

PARC Web Portal LINK - [https://www.iau.org/science/scientific\\_bodies/working\\_groups/professional-amateur/](https://www.iau.org/science/scientific_bodies/working_groups/professional-amateur/)

Please note that new projects will be added as they are proposed by professional astronomers and approved, so be sure to visit the PARC web portal regularly to explore new opportunities.

In addition to these research opportunities, the first PARC workshop will take place in person in Mumbai, India, December 1-3, 2023. This is a great opportunity for amateurs to learn about new projects, tools and techniques, and to meet other amateurs and professionals interested in research collaborations. Please visit the link below for more information and to register for the meeting.

PARC Meeting LINK: <https://khagolmandal.com/ProAm2023.html>

Thank you so very much for your time and consideration, and please share this invitation with others who may be interested. We are looking forward to your participation! If you have any questions, please direct them to Tim Spuck at [tspuck@ui.edu](mailto:tspuck@ui.edu) or Aniket Sule at [aniket.sule@gmail.com](mailto:aniket.sule@gmail.com).

Best wishes,

Tim Spuck, Pro-Am Working Group Co-Chair  
Aniket Sule, Pro-Am Working Group Co-Chair

# Members Astro-photographs.

Dan Self



NGC1333 in Perseus 20" Observatory Telescope



Close-up of Moon.



Merope on 20" Observatory Telescope



Faint Auroral arc 5X30sec Tripod. Upton Fen



Witch Head (Rigel out of shot) 135mm Lens. Canon Camera. Star tracker mount

Mick Ladner



Moon and Venus

Malcolm James Dent



Katheryn Jasmine Towell



Perry Warburton



David Bryant



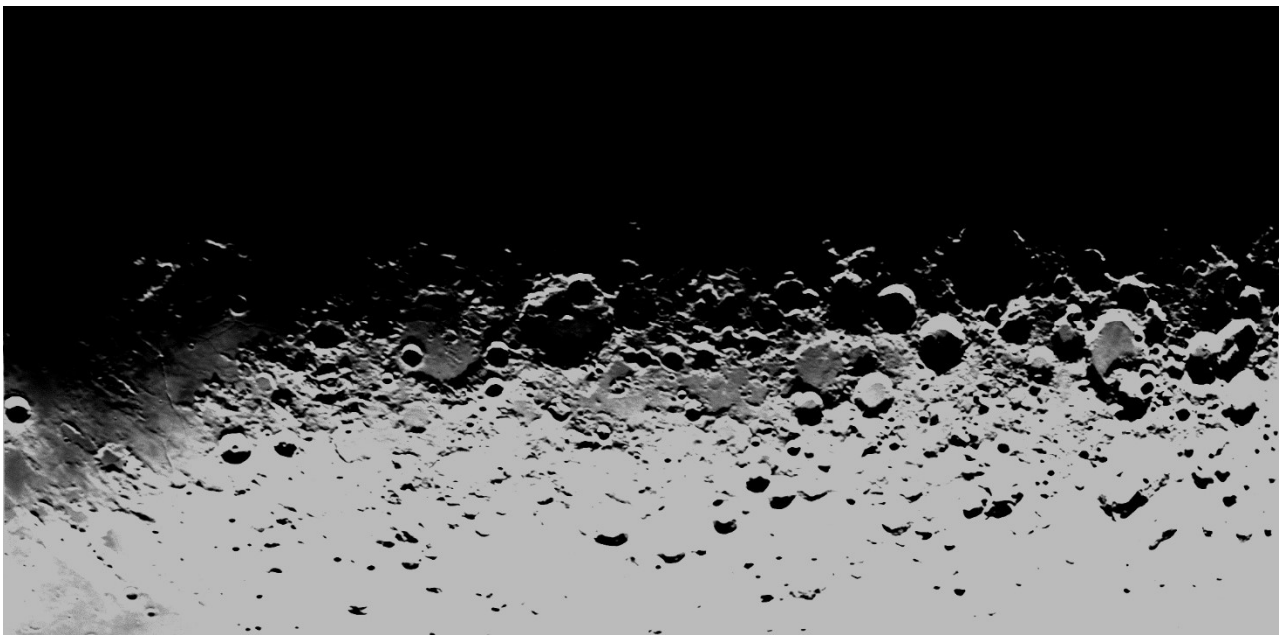
Moon and Venus

Mark Humphries



8" Celestron

Chris Bailey



Lunar 'V' and 'X'



# BRECKLAND ASTRONOMICAL SOCIETY

Charity No.1044478

[www.brecklandastro.org.uk](http://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](mailto: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
<b>For external parties:</b> 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
<b>In the Observatory:</b> 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 near people, or planes, only switched on briefly and used by supervisors/demonstrators only. Laser is currently broken.	Low
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	Tolerable

	checked. Call 999 in emergency. Can exit via dome opening in emergency	
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 of dark sky observing. Advised to dip and dim lights.	Tolerable
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 <sup>+</sup>(Chairman), Andy Jones<sup>+</sup> (Treasurer), Richard Harmon. Committee members (acting trustees): Rebecca Greef\*, John Copsey. Trusted supervising members: Mick Ladner, John Gionis, Peter Farmer, Andrew Luck, Chris Bailey.

\*DBS checked for day job. <sup>+</sup>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](mailto: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 26<sup>th</sup> 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.

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## **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 Teleneegative 2x Barlow 1.25"

## **Telescope accessories:**

William Optics AFR-IV Adjustable Flatteners 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 1 1/4"+Filters  
Atik Infinity Camera  
Atik 314L+ CCD Camera (SNI1003041)  
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](mailto:chairman@brecklandastro.org.uk)

**Observatory/Visits** Mick Ladner  
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**Webmaster** Andrew Luck (temporary)  
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**Membership/Treasurer** Andy Jones  
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**Secretary** Rebecca Greef  
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**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 – 2023 winter

7:30pm Great Ellingham Recreation Centre, Watton Road, Great Ellingham, Attleborough, Norfolk  
between NR17 1HZ and 1HX    **£2.50 adults £1 children**    *what3words: octopus.vibrates.hubcaps*

Friday, January 12 <sup>th</sup>	<b>Comets and Extinctions</b>	David Bryant
Friday, January 26 <sup>th</sup>	<b>Public Open Evening</b>	Observatory
Friday, February 9 <sup>th</sup>	<b>The Structure of the Universe</b>	Calvin Preston, PhD University of Cambridge
Friday, February 23 <sup>rd</sup>	<b>Public Open Evening</b>	Observatory
Friday, March 8 <sup>th</sup>	<b>TBC</b>	-
Friday, March 29 <sup>th</sup>	<b>Public Open Evening</b>	Observatory
Friday, April 12 <sup>th</sup>	<b>Infrared Galaxies</b>	Dr Matt Bothwell, University of Cambridge
Friday, April 26 <sup>th</sup>	<b>Public Open Evening</b>	Observatory
Friday, May 12 <sup>th</sup>	<b>The Outer Solar System</b>	Jerry Workman