Autumn 2024 Number 45

Kielder Observatory Newsletter

NEWS
Matt Baker visits!

NIGHT SKY
Highlights Nov/Dec/ Jan

OBSERVING
Remote observing.

SCIENCE
The end of WISE/ Globular clusters

EDITORIAL

Well those auroral shows just keep coming, and the October 10th display was probably even better than the one in May. This time even I managed to see it (at last!) - although in the excitement I managed to fail to get any of my photographs in focus. Not only have we had the aurora but also Comet C/2023 A3 (Tsuchinshan-ATLAS). I was up at the Observatory on October 14th and managed (just) to see it with the naked eye before it set, but mostly it has been a binocular object - and a good photographic target. In this edition, our science communicator Rosie Braunholtz describes her experiences of beginning deep-sky astrophotography, whilst Robert laments the demise of the WISE satellite mission. He also takes a look at strange things which lurk inside globular clusters!

Nigel Metcalfe

Editors: Nigel Metcalfe & Robert Williams

Kielder Observatory Astronomical Society

Registered Charity No: 1153570.

Kielder Observatory Astronomical Society is a Charitable Incorporated Organisation. Its aims are to

* Promote interest in the science of astronomy to the general public
* Facilitate education of members of the public in the science of astronomy
* Maintain an astronomical observatory in Kielder Forest to support the above aims

https://kielderobservatory.org

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Front cover: Comet Tsuchinshan-ATLAS sets behind the radio telescope, credit: KOAS
Rear cover: The October 10th aurora from the Observatory, credit KOAS

A WORD FROM THE CEO

As the longer nights continue to draw in, the North East has been treated to spectacular auroral displays, with people running out of their homes in droves to see the stunning Northern Lights lighting up our skies. As social media blew up and the streets, parks and beaches filled with people dropping everything to look up together, it was invigorating to see the public so captivated, reminding us how astronomy can ignite a shared sense of wonder and excitement.

I recently attended the launch of World Space Week at the Life Science Centre, which focused on the incredible growth of the space industry in our region. The opportunities this presents—especially for young people passionate about space science—are remarkable. With Kielder Observatory's ongoing commitment to outreach and education, we're thrilled to be part of this evolving landscape, helping to foster a new generation of space enthusiasts.

Closer to home, we've welcomed a bunch of new volunteers who have begun their inductions. Volunteers are essential to our work, and we're incredibly grateful for their time, energy, and fresh perspectives as they help us inspire visitors with the wonders of the universe.

Dan, Adam, Ellie, and Rosie have been delivering workshops in schools across the region for Phase 3 of our From STEM to Stars project. Funded by the Reece Foundation, this most expansive phase yet aims to reach 50 schools and inspire 10,000 students, leaving behind a legacy of space clubs and telescopes for the children to continue exploring astronomy after our visits.

Additionally, we've concluded the Mindsets and Missions project with the West End Refugee Service and other schools in the North East, introducing participants to astrophotography and new perspectives. It has been a deeply rewarding experience, and we're committed to expanding our reach to underserved audiences.

Finally, our staff and trustees have begun conversations about our 2026-2030 strategy, laying the foundations for the next exciting chapter in Kielder Observatory's journey. Together, we'll take the observatory into the next decade and beyond, keeping our mission to inspire wonder and curiosity at the heart of everything we do.

Leigh Venus, CEO

OBSERVATORY NEWS

We were delighted to welcome Matt Baker with his parents (and the dog Archie!) filming the Channel 4 programme "Travels with Mum & Dad". They were shown round the Observatory by our Science Communicator Rosie Braunholtz and also touched some fragments from the Moon and had the opportunity to stand on Mars! This was broadcast on More 4 on Monday October 7th, but you can catch up on the C4 player - it is series 3 episode 6.

Elsewhere in the media, we provide a piece for The Scotsman newspaper on

the Perseid meteor shower, plus an interview with Anna Foster of BBC Radio Newcastle. We also produced a lunar eclipse feature for ITV Local news in September.

Our "From STEM to Stars" project delivery is in full swing with Adam and the team in schools across the North East almost every day of the week between now and Christmas, with observatory visits for the schools being planned for the first term of 2025.

Adam, Ellie and Maggie the Puppy demonstrate the planetarium at Prudhoe West Academy.

Between November and December, up to 20 after-school stargazing events will be held for students and their families and participating schools.

Dan and Adam took the planetarium to the James Calvert Spence College in October.

Hopefully, by mid-November work will be completed on repairing the Observatory stanchion which has caused the closure of the Sir Patrick Moore turret for the last year. So by the next newsletter we should have some good news!

Meanwhile, we are developing a plan to revamp our power supply on site, with a new wind turbine, solar panels and inverter. Hopefully this will reduce our reliance on the diesel generator. The Observatory is, as you might expect, "off grid", and installing mains power up to the top of the hill would be prohibitively expensive.

OBSERVATORY NEWS

At the end of August we were at the Bellingham Show, with a few exciting bits and pieces to keep the show-goers occupied. Made a change from the sheep!

In our online gift shop we have a new pin badge featuring the aurora to celebrate recent activity, and some new Christmas card designs.

Also with Christmas in mind, don't forget that we sell gift vouchers, and some spectacular large prints of the night sky taken by our astronomers, not mention a jigsaw of the moon and a snow dome!

We have a new regular event scheduled, Astrology to Cosmology! Our astronomers are often mistaken for astrologers and it's a fair mistake to make (discuss - ed.!). The two were one and the same for a long time, but our new event will see how different beliefs and influences from technology saw the two go different ways. At the moment this runs on selected Tuesday evenings.

We have a special event coming up on 6th December in partnership with whisky distillery and museum Ad Gefrin - called "Starcraft - Astronomy in Anglo-Saxon England". In this event we will be exploring how and why observers such as Bede took such a keen interest in the night sky,

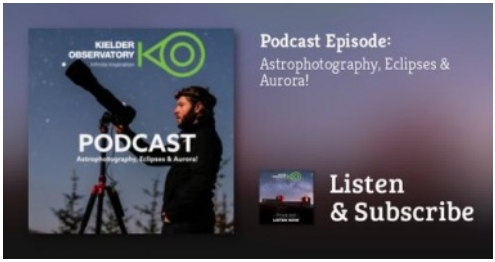
and an expert guide from Ad Gefrin will be with us to provide a guided tasting of their

signature spirits and liqueur; Tácnbora, Thirlings, and Flÿte. Weather permitting, the Observatory's telescopes will be in action to show you the wonders of the night sky.
As always, events in November and December are selling fast, so grab your tickets while you can!

We're super excited to be working with our friend at The Aurora Zone in taking our Kielder expertise to international lands! We'll be travelling to Finland in 2025 to be the designated Astronomer on an incredible 5 day Dark Skies experience. These trips are really like no other- your chance to experience the Northern Lights in full force, accompanied by one of our team to talk you through exactly what you're seeing. Trips take place from January 17th 2025 and March 14th 2025.

We are now taking bookings for in-school planetarium delivery through British Science Week 7th-16th March 2025, if any school would like more information, they can get in touch at admin@kielderobservatory.org.

As ever, we have our latest series of podcasts for you to listen to, the most recent being "The Search for Life" by long-standing friend of the Observatory and evolutionary astrobiologist Professor Wallace Arthur.



"Interesting talks, great staff would definitely come again. Got us totally interested in the night skies."

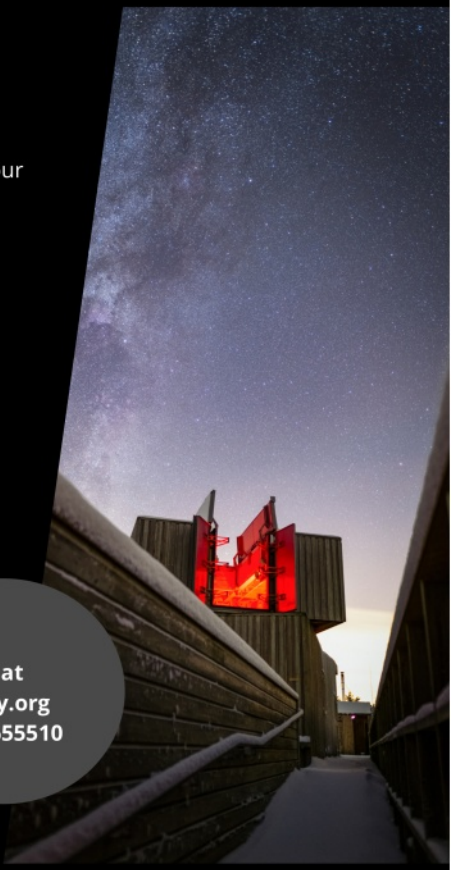
Bev, Warrington

OBSERVATORY NEWS

Our Services

KIELDER OBSERVATORY
Infinite Inspiration

- Private event for your group at Kielder Observatory
- Venue hire
- Guided stargazing session at your location in the dark sky park
- Astronomer talk at your indoor venue
- Digital session
- Educational workshops or planetarium visit



All enquiries:

Please drop us an email at admin@kielderobservatory.org Or call to discuss on 0191 2655510

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Something weird found in Globular Clusters

Globular clusters are collections of stars numbering in the many thousands up to a million or so members. Because of this they can be many times larger than open clusters, with much more closely packed stars.

In open clusters, stars may be around 1 Ly or more apart, but in globular clusters the spacing may be a few light-weeks [approx 200 billion km] at most. In comparison, the Sun's nearest neighbour, Proxima Centauri, is 4.3 Ly [or approximately 26 Trillion km] away.

Until recently it was thought that globular clusters contain mostly old red stars, since – in theory – these stars should have all been born at the same time and by the same processes. They are found in the halo or bulge of most galaxies.

Since the launch of the Hubble Space Telescope (HST), one of the principle long duration studies by it has been to examine as many globular clusters as possible and make comparisons about their constituents – the types and age of stars, their spacing/packing/distribution within the cluster – and to identify if there is something that might be different within them, that is at odds with the other stars. Then, in 2021, the HST came across something very unusual – some / many globular clusters contained evidence of evolved high mass stars in the form of pulsars and black holes. In particular in NGC6397 – one of the brightest globular clusters found in the far southern constellation of Ara, the Altar – was found to contain a sizeable black hole [an intermediate-mass black hole].

The globular cluster NGC6397 (also known as Caldwell 86) in Ara, "The Altar".

Globular clusters come in different types, depending upon how their stars are clustered. Some have tightly distributed stars, others have stars arranged in 'lanes', in some respects like the shape of a spiders web. Yet others have a highly concentrated core of stars with more loosely attached outer layers of stars – essentially an intermediate shape between the previous two. Some others seem to have rather randomly distributed stars. These differences are likely to be as a result of the mechanism by which they

were formed, and whether another object was the trigger for their formation.

Now, though, the HST has identified a number of black holes lurking in the central core of NGC6397, and - the thinking goes – these may be a previously unidentified source of gravitational waves.

Another recent study of Terzan 5, located in Sagittarius, has now identified that within its 2-million M_{sun} of stars, its very dense core has a star density of approximately 300,000 M_{sun} per 30-cubic light years. It has also found that these stars have a a high metallicity. In 2009, Terzan 5 was found to contain two completely different age-populations of stars, some were 12 Gy old and the other group was 4.5 Gy old. Each age group had different metallicities indicating different populations, in other words the two groups of stars were formed at very different eras or by different mechanisms. The thinking is that NGC6397 did not start off as a globular cluster but rather as a dwarf galaxy, which interacted with another group of stars.

In our Galaxy there are only three other globular clusters that have a similar pattern of star ages, namely Omega Centauri, Messier 54 – also in Sagittarius, and Liller 1 – in Scorpio – which is located very close to the Milky Way galaxy centre.

The globular cluster Omega Centauri (NGC5139). It is the largest known globular cluster in the Milky Way.

Liller-1 is a strong source of gamma rays, an indication that there are regular star collisions and/or a number of pulsars present. Liller-1 also has two sets of star populations. It also contains a number of helium burning horizontal branch stars and at least one RR-Lyrae type variable star.

In Terzan 5, 49 millisecond pulsars have been found, the highest concentration of this type of object in any Milky Way cluster found to date. Of them, the first - PSR B1744-24A – discovered in 1980, rotates at around 90x per second. Also there is PSR J1748-2446ad, which rotates 716 times per second, one of the fastest millisecond Pulsars so far discovered.

This cluster also contains an X-ray burster, XB1745-25m, and at least 50 low mass X-ray binaries [Either "vampire stars" or cataclysmic variables]. Using X-ray Telescopes, Terzan 5 is known to have a thermal X-ray glow and some sources of GeV [10^9 eV] and TeV [10^{12} eV] gamma ray emissions, from the effects of the millisecond pulsars.

Now, using follow up surveys – in the radio wavelengths – from information provided by the Greenbank Radio Telescope in America [a survey done in the 1980s] and MEERKAT in southern Africa [a survey done in the 2020s], some even more extra ordinary objects have been found - binary pulsars – about 20 in total out of the 3,600 pulsars so far located in our galaxy.

Further analysis has shown that these "vampire binaries" come in two favours

1) Redbacks
2) Black Widows

based on their behaviour:

Redbacks – leech on stars up to approximately 0.5 M_{sun}.

Black Widows suck the life from much smaller stars of about 0.05 M_{sun}.

The researchers are eager for data so if you fancy a project join the Einstein@Home Citizen Science, which has already found 90 new neutron stars in its data-set.

Robert Williams

(Photos taken in Namibia by the author)

KIELDER OBSERVATORY
Infinite Inspiration

"As I said last night that's the best night I've had in ages that didn't include beer. Please don't change anything as I will be astounded if you get anything other than very positive reviews. Keep up the good work."

Keith, Doncaster

NIGHT SKY

NOVEMBER 2024 (times in GMT)

Lunar phases

New moon	01/11/2024 12:47
First quarter	09/11/2024 05:55
Full moon	15/11/2024 21:28
Last quarter	23/11/2024 01:27

PLANET SUMMARY

Mercury is too close to the Sun this month. Venus will be visible low in the west after sunset. Mars will be visible from 22:00 until 06:00. Jupiter is quite close to opposition and will be visible form 18:30 until 06:00. Saturn will be visible from 18:00 until 23:00. Uranus is close to opposition and will be visible from 18:00 until 06:00.

THE STARS AT 8PM

North – Cepheus is high overhead, with Draco and the two Bears nicely placed.
East – Cassiopeia and Andromeda are high up with Perseus nicely placed. Taurus is near the horizon and to its top RHS is Aries.
South – Pegasus is nicely placed with Pisces. Aquarius is low down and you can find Formalhaut in Pisces Austrinus – a bright star that is the most southerly placed bright star we can see from the UK.
West – Cygnus dominates this view along with Sagitta, Vulpecula and Lyra. Low down you can find Hercules.

METEOR SHOWERS

November hosts two meteor showers:

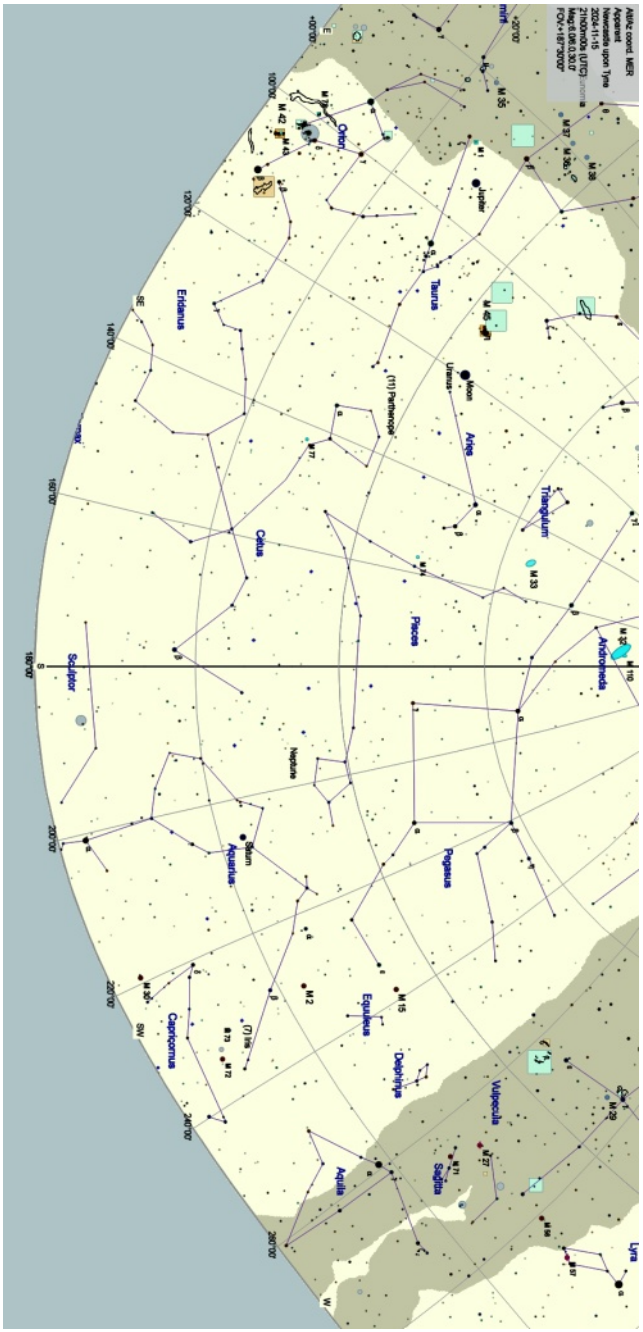
1) Taurids – around the 1st to 6th of November – this is a short shower but the particles are quite 'large'. The Taurids tend to be few in number but they make up for this by being bright slow moving and often quite colourful, with occasional fireballs. Best seen after midnight in 2024, once the Moon has set.

2) Leonids – on the 16th, 17th and 18th November – another annual shower that usually puts on a good show of 50 to 100 meteors every hour. These particles are fast moving and 'small' and so the meteors are quite faint. With a near full Moon in 2024, it will make viewing these shooting stars a challenge.

The Planets 15/11/2024

	Sun	Moon	Mercury	Venus	Mars	Jupiter	Saturn	Uranus
Rise	07:36	15:16	10:06	11:30	20:29	17:11	14:10	15:54
Set	16:02	08:54	16:38	17:57	13:11	10:07	00:35	07:55

The sky chart for Newcastle looking S at 9pm GMT on 15/11/2024.



COMETS

Comet C/2023 A3 (Tsuchinsan-ATLAS) will be in the constellation of Serpens Cauda on the 15th November. It is fading from 6th magnitude during November, so is only visible in binoculars or a small telescope.

For further news on upcoming bright comets please check https://in-the-sky.org/data/comets.php or http://www.aerith.net/comet/weekly/current.html

You can find a more detailed look at the current month's night sky in our What's Up series on our online news pages.

NIGHT SKY

DECEMBER 2024 (times in GMT)

Lunar phases

New moon	01/12/2024 06:21
First quarter	08/12/2024 15:26
Full moon	15/12/2024 09:01
Last quarter	22/12/2024 22:18
New moon	30/12/2024 22:26

PLANET SUMMARY

Mercury will be a challenging object in the morning twilight. Venus will be noticeable in the evening twilight, once the Sun has set. Mars is near opposition and will be visible from 20:00 until 06:30. Jupiter will be visible from 17:30 until 06:00. Saturn will be an evening object visible from dusk [~5pm] until 21:00. Uranus will be visible from 17:00 until 04:20.

THE STARS AT 8PM

North – Cepheus is overhead, with the two Bears nicely placed. Hercules is low in the NW and Cancer low in the NE.

East – Perseus is overhead, with Auriga nicely placed. Taurus, Gemini and Orion are well placed for observation.

South – Triangulum and Aries are overhead. Pisces and Cetus are nicely placed. Aquarius is low down in the SW.

West – Lacerta is overhead with Cygnus nicely placed for viewing. Pegasus is nicely placed in the SW. Hercules and Lyra are low in the SE.

METEOR SHOWERS

The main meteor shower of December is the Geminids which are visible on the night of the 13th/14th December with some activity a few days either side. This shower is unusual in that it originates from an Asteroid – Phaethon. It will be visible best seen after midnight following moonset.

Later in the month – on Christmas Day the Ursids are active. Expect up to 5 per hours form this weak shower. It will be visible all night but best seen before midnight, until moonrise .

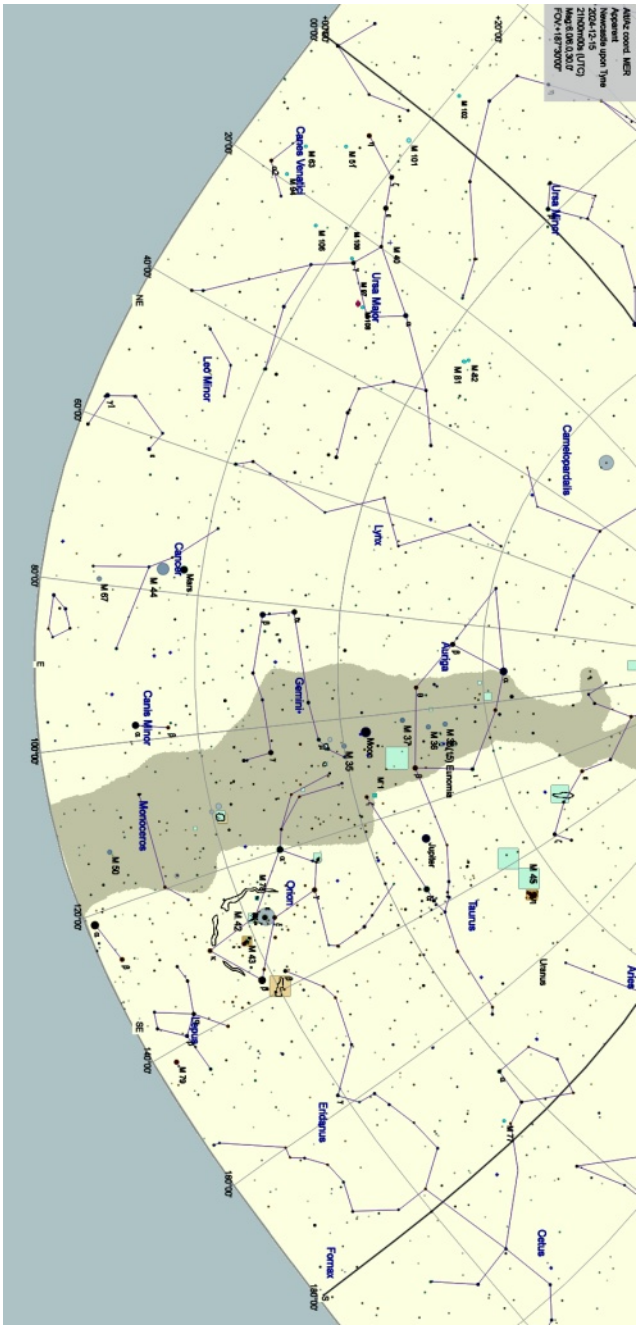
COMETS

There are no bright comets expected in the sky this month.

The Planets 15/12/2024

	Sun	Moon	Mercury	Venus	Mars	Jupiter	Saturn	Uranus
Rise	08:23	14:51	06:36	11:17	18:36	14:55	12:13	13:53
Set	15:37	10:21	14:57	19:14	11:30	07:46	22:42	05:50

The sky map looking E from Newcastle at 9pm GMT on 15/12/2024.



NIGHT SKY

JANUARY 2025 (times in GMT)

Lunar phases

First quarter	06/01/2025 23:56
Full moon	13/01/2025 22:26
Third quarter	21/01/2025 20:30
New moon	29/01/2025 12:35

PLANET SUMMARY

Mercury is too close to the Sun to view this month. Venus will be nicely placed for viewing in the western sky after sunset. Mars is an evening object visible for most of the hours of darkness [17:40 to 06:30. Jupiter will be visible from dusk [~17:40] until 04:00. Saturn is an evening object visible from dusk until 19:20. Uranus will be visible from dusk until 02:00.

THE STARS AT 8PM

North – Draco is prominent splitting up the two Bears. Hercules is low in the NNE. Cepheus is nicely placed in the NW with Cygnus just below it.

East – Auriga is overhead with Gemini nicely placed. Orion is prominent in the NE with Lepus – the Hare, Monoceros the Unicorn and Canis Major – and Minor - beginning to show themselves again.

South – Taurus and Orion are well placed for observing. Eridanus and Cetus are low down. Aries and Pisces are high up in the SW.

West – Andromeda is overhead with Lacerta just below it. Pisces, Pegasus and Cygnus are well placed as is Pisces – with Mars.

METEOR SHOWERS

The major meteor shower of this month are the Quadrantids on the 4th January. Muralis Quadrans was a constellation introduced in the early 17th century, but as the use of the quadrant circle diminished it was absorbed back into Bootes. The Quadrantids meteors shower is a very short – sharp – peak of very bright and often colourful shooting stars. The shower may only last a few hours around midnight on the 3rd or 4th January, but if you catch a fireball then it will be worth the wait. A first quarter Moon will have set when this shower it most active [early morning], so conditions are favourable.

COMETS

There are no bright Comets in the sky this month.

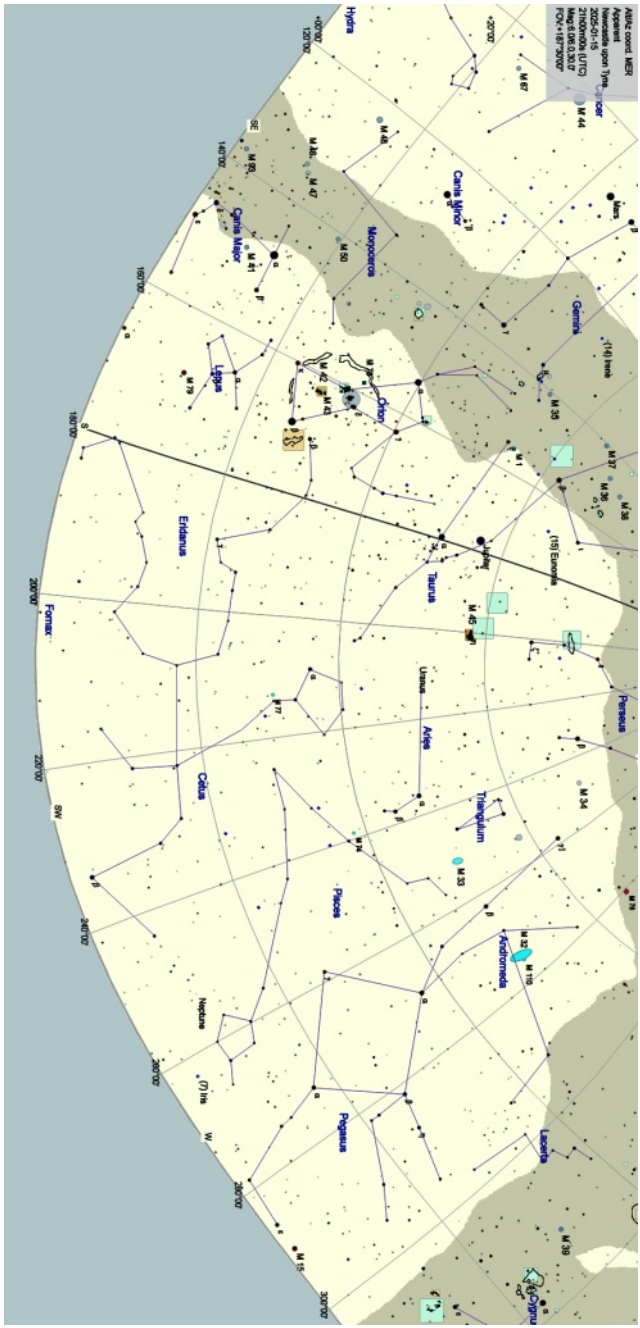
The Planets 15/1/2025

	Sun	Moon	Mercury	Venus	Mars	Jupiter	Saturn	Uranus
Rise	08:20	16:23	07:39	09:56	15:29	12:41	10:13	11:49
Set	16:09	09:40	14:38	20:43	09:17	05:27	20:54	03:44

The sky map looking E from Newcastle at 9pm on 15/1/2025.

Night Sky credits:

Data sourced from Cartes du Ciel, https://www.timeanddate.com/moon/phases/ and https://in-the-sky.org/



SPACE SLOT

The end of NASA Mission WISE

This enormous section of the Milky Way is a mosaic of images from NASA's WISE, and encompasses the constellations of Cassiopeia and Cepheus.

Credit: NASA/JPL-Caltech/UCLA

One of NASA's most important space telescope missions, WISE, has come to an end.

WISE – an acronym for the Wide-field Infrared Survey Explorer – was launched in 2009 and its original mission was to image large fields of cool objects in the Universe – essentially those that did not give off much/any visible light. As part of its mission it was designed to search for asteroids and comets in our solar system as well as galaxies and very distant objects in the far universe.

It operated in the 3-micron to 22-micron wavebands [visible light is ~0.4 to 0.7-micron wavelength], using frozen hydrogen [melting point ~10 K] to keep its systems and detectors as close to the temperature of space as possible, in order to minimise thermal noise in its cameras.

By September 2010 the coolant was depleted but NASA decided to continue its mission as NEOWISE – to hunt for other objects that did not need the detectors to operate at their full sensitivity. This extended the main mission by 4 months.

During the 14 months of the main mission [NEO]WISE imaged the following objects:

1) 158,000 minor planets in our solar system, of which almost 35,000 were new discoveries, resulting in a big enough sample size to make god estimations of the properties of the entire compliment of such objects roaming around our Sun.

2) Earth's first Trojan object.

In February 2011 the spacecraft was placed into hibernation pending a decision on its future. Almost 2 years later – in

December 2013 – the spacecraft was restarted and began a new survey to:

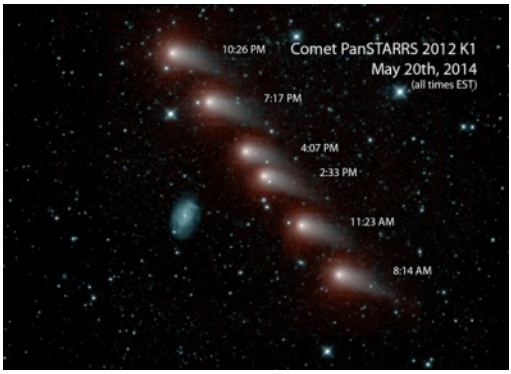
1) Identify and map Near Earth Asteroids – specifically those whose orbits cross that of Earth and would be classified as Potentially Hazardous Asteroids. Those observations to include their size and albedo [how reflective they are]

2) To catalogue these objects for follow up with ground based observations

The final observation was completed in late July 2024 and the spacecraft was finally shutdown about one month later. As its orbit decays it will enter the Earth's atmosphere and burn up in the next few months.

The WISE spacecraft being prepared at the Space Dynamics Laboratory in Logan, Utah.

Credit: SDL



NEOWISE images of comet C/2012/K1 Pan-STARRS.

Credit: NASA/JPL-Caltech

Some other numbers to consider:

* NEOWISE surveyed the entire sky more than 21 times during its mission.

* More than 1.6 million measurements were taken of the more than 44,000 objects it was pointed at.

* It discovered 1598 new asteroids and 291 new comets

* It investigated the limits of size and temperature of brown dwarf objects.

If you want to delve into its object database it can be found here ... NEOWISE Diameters and Albedos.

If you want to investigate some of the papers written resulting from its observations please take a look here ... NEOWISE 2015 Data Release.

The JWST is just one of the follow up missions from WISE.

Robert Williams

OBSERVERS' SLOT

Imaging the Bubble Nebula

Beginning last year and ending this year the observatory has been running a project called Mindsets and Missions . This was a project led by our education lead Adam Shore, and designed to connect and engage socio-economically deprived communities in the North East of England through astrophotography.

As part of the program participants were able to use a remote observatory in Grenada by First Light Optics. They were provided with images of 29 deep sky objects which they were encouraged to use creatively and further develop their astrophotography skills. Of course, this meant that observatory staff were also able to take pictures (and still are) while we have a subscription to the First Light Optics remote observatory! I have always wanted to try deep space astrophotography. I have only dabbled in landscape astrophotography with my £100 second hand DSLR. So I thought while we have this subscription, this would be a fantastic opportunity to try my first deep sky imaging.

When deciding what to capture with the

The Bubble Nebula within Cassiopeia, taken with the Hubble Space Telescope.

Credit: NASA's Goddard Space Flight Center.

remote observatory telescope, I thought a nebula would make the perfect subject—mysterious, colorful, and far more striking through a camera than the naked eye. During some research of nebulas within the constellation Cassiopeia, I stumbled across the Bubble Nebula, which appeared as if it was about to pop! In that moment, I knew I had found my target.

The Bubble Nebula (NGC 7635) is located around 7,100 light-years away. The reason for its distinctive bubbliness is due to an extremely hot, humongous star inside of it blowing out gas and dust at speeds of four million miles per hour! Notice in the picture above taken by the Hubble Space telescope, on one side the expanding shell slams into a dense region of cold gas, making the bubble grow asymmetrically from its star. Unfortunately, like all bubbles, it's fate will end the same way. In about 10-20 million years the star will explode in a supernova, "popping" the bubble.

As an emission nebula, the sphere glows due to ionized gas from radiation. The Bubble Nebula is primarily glowing due to ionized hydrogen, and emitting mostly H-alpha light, which is a reddish hue. The reason Hubble's Bubble glows blue instead of red is because it uses a false colour palette called the "Hubble Palette", and shades specific emission lines a different colour.

For this object:

Element	Emission line	Colour
Hydrogen	Hα	Green
Oxygen	O-III	Blue
Nitrogen	N-II	Red

As you can see the Hubble Palette colours H-alpha green. Giving a more teal looking bubble.

Capturing

Now that I had decided on my target, it was time to actually take a photo of it! The remote observatory we have is a 90mm refractor already with preinstalled software which allows us full control of the equipment remotely. The software luckily

First Light Optics Remote Observatory.

was simple enough to use that even a beginner like me could figure it out, with some help from Adam. Essentially all I needed to do was wait for a clear night and point and shoot at my chosen target. There was just the decision of deciding how long my exposures should be, and what filters I should use. I did a mixture of 10 and 20 minute exposure times, and I tried two filters : L-Pro and L-Ultimate. The L-Pro filter is best for general astrophotography where you want to maintain natural colour, especially for galaxies and other broadband targets, it also reduces light pollution by blocking out specific wavelength that correspond to artificial light and sky glow (sodium, mercury vapour etc). L-Ultimate is a narrowband filter designed for emission nebulae, it isolates two key emission lines: H-alpha (656.3 nm) and OIII (500.7 nm). The telescope was set up in the evening and continued throughout the night. It depended on cloud cover and weather conditions if it could take all the pictures I wanted. In the end I captured a total exposure time of 13 hours using the L-Ultimate filter, and 6.4 hours using the L-Pro.

Stacking

After capturing all the images, they need to be stacked together to accumulate all the data. This was done with deep sky stacking software imaginatively named DeepSkyStacker. DeepSkyStacker is completely free and stacks deep sky pictures but can't stack planetary objects or do any post-processing of the image. Again, this software was mostly idiot-proof, you simply put in all your pictures and sometime later your stacked image shoots out. As well as the images of the Bubble Nebula (known as "lights"), I also needed to add dark frames, offset/ bias frames and flat frames. These help improve the image quality by reducing noise and correcting errors in the sensor.

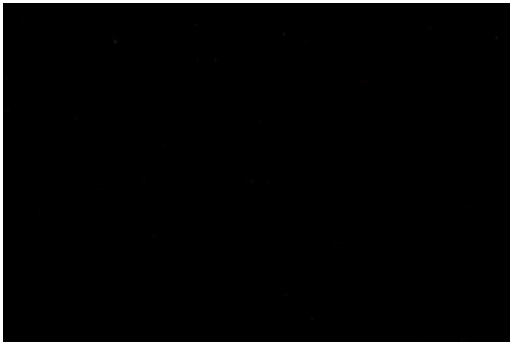
- Light frames: The actual images of the astronomical target.
- Dark frames: Taken with the same settings as light frames but with the lens cap on, used to remove thermal noise.
- Bias frames: Captured with the shortest exposure possible, with the lens cap on, to account for sensor readout noise.
- Flat frames: Images of an evenly lit surface to correct for dust, vignetting, and uneven illumination.

Luckily for me Adam had already taken dark frames and flat frames, and we

decided not to bother with bias this time.

So, DeepSkyStacker swallowed up all these frames and shot out two images, one for the L-Pro filter, and one for the L-Ultimate. As you can see from the pictures above there's not too much there. With the L-Pro filter you can see a few more stars, but no Bubble was appearing. However, this was all about to change because now it was time for processing!

L-Pro filter stacked. Total exposure time 6.4 hours.



L-Ultimate filter stacked. Total exposure time 13 hours.

Processing

This is the most exciting part because it's where you see your image actually come together. Post-processing is for enhancing your images by adjusting the colour, reducing noise, adjusting saturation, contrast and luminance of the image (and many more things). It's used to bring out the most detail possible in your deep sky object. There are many processing softwares available, but I decided to use PixInsight as it was the one recommended to me by Adam. As a complete novice I won't lie and say I understood all the processing steps, but I followed an online guide which showed me what to do. And et voilà!

After processing the images you really see the difference in the two filters. Even with a shorter exposure time, the L-Pro shows many more stars due to the broadband wavelengths it allows through. But clearly the L-ultimate is the best filter for emission nebula. Since it isolates just H-alpha and OIII, the result is high contrast and immense detail in the nebulae as it's emitting primarily in these wavelengths. I've not used any false colour so my image shines primarily with a reddish hue due to a lot of H-alpha emission.

OBSERVERS' SLOT

L-Pro filter after processing, 6.4 hours.

If we zoom in, we can even see the Bubble!

Although I admit it is not quite as good as Hubble's, I'm proud of my first deep sky object!

Rosie Braunholtz
KOAS Science Communicator

KIELDER OBSERVATORY
Infinite Inspiration

L-Ultimate filter after processing, 13 hours.

References :

Bubble Nebula: https://hubblesite.org/contents/media/images/2016/13/3725-Image.html

Remote Observatory: https://www.remoteobservatory.com/about-us

PixInsight Guide: https://astroexploring.com/blog/easiest-pixinsight-workflow-for-beginners/

DeepSkyStacker: http://deepskystacker.free.fr/english/index.html

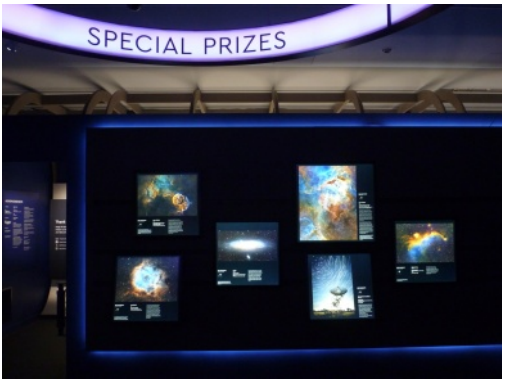
PixInsight: https://pixinsight.com/

ASTRONOMERS' TALES

The Astronomy Photographer of the Year Exhibition

This summer I found myself in London for a couple of days, so I decided to wander along to the National Maritime Museum in Greenwich, which was hosting the Astronomy Photographer of the Year 2023 exhibition. I have not been before (though I have a collection of most of the books!), so I wasn't quite sure what to expect. Tickets for the museum were free (supposedly due to the extensive works being carried out in the museum) which included the exhibition.

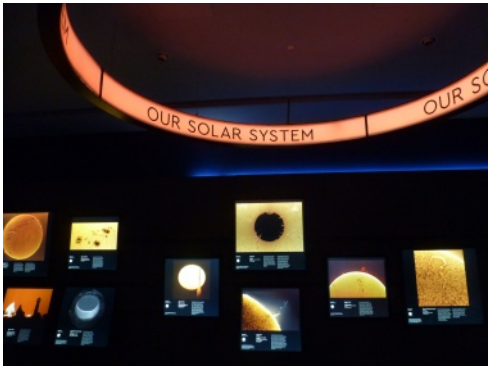
It is slightly curious that the exhibition resides in the National Maritime Museum, as there is little else there relating to astronomy, and the Greenwich Observatory is just up the hill! Nevertheless, I was extremely impressed by what I found. The photographs were beautifully displayed on light boxes attached the walls, and divided into the various categories run by the competition. Apart from the light boxes the rooms were kept pretty dark, and all the images were mounted on black backgrounds, ensuring maximum contrast. There was some



central seating so you could sit and admire!

All in all I would definitely recommend a visit to the exhibition if you are in London. This year's appears to be free as well, and runs until July 2025.

Nigel Metcalfe
(all photos by the author)



"What a great night. Your team were informative, friendly and enthusiastic. The event was well organised and we had a fantastic time. Thank you."
Marianne, Manchester

GALLERY

We would love to display your images here, whether they are taken up at Kielder or not. Please send them to

admin@kielderobservatory.org

along with a brief description of how and when they were taken.

Comet C/2023 A3 (Tsuchinshan-ATLAS). From Durham City, a 410s exposure at F5.0, 96mm FL, Canon 1000D.

Credit: N. Metcalfe

Not been to Kielder Observatory yet?
Then why not book one of our events for yourself and/or your family?
Advanced booking is essential. Weekend events can fill up several weeks in advance. Please book online at https://www.kielderobservatory.org/our-events/.
We can also be contacted at admin@kielderobservatory.org

GALLERY

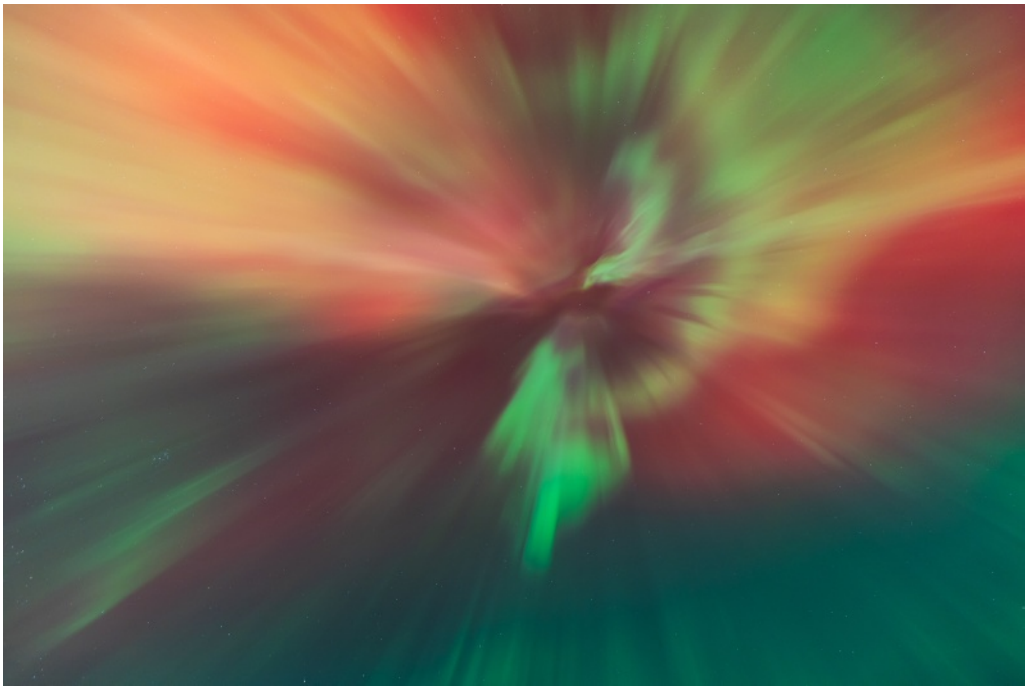
Above: the partial lunar eclipse on September 18th.

Credit: Dan Monk

Left: Comet C/2023 A3 ((Tsuchinshan-ATLAS) sets behind the radio telescope at the Observatory on October 14th.

Credit: Dave Morland

GALLERY



This page and previous - assorted shots of the spectacular October 10th aurora taken around the Observatory.

"The staff, and volunteers, were all very knowledgeable on astronomy and space. My girlfriend and I are both very fascinated by space and this experience really captured our interests. There was not a dull moment and I was left amazed. I would strongly recommend this to anyone, be they interested in space or not, as it was truly fantastic. I will definitely be coming back again in the near future as this was a phenomenal experience."

Abbie, Stockton

Kielder Observatory - a beacon for dark skies

https://kielderobservatory.org

KIELDER OBSERVATORY

Infinite Inspiration