Spring 2024 Number 43

Kielder Observatory Newsletter

NEWS
Live US eclipse broadcast

NIGHT SKY
Highlights May/Jun/ July

OBSERVING
Solar eclipse

SCIENCE
Gamma ray burst
3D galaxy map

EDITORIAL

The weather has not been great for the last couple of months but there have been a couple of good auroral displays. And of course the USA has been treated to a spectacular solar eclipse. Our own Ellie Macdonald was there, reporting for KOAS, and gives us a brief overview of her experience. Meanwhile Robert takes look a at the brightest ever gamma ray burst, and the latest from the Dark Energy Spectroscopic Instrument survey, which has just produced the largest ever 3D map of the Universe. Sadly, in the last month or so we have lost the man who predicted the Higgs boson, Peter Higgs, and astrophysicist Ian Morison, who was very much involved in the amateur astronomy world, and a past president of the Society for Popular Astronomy. Also, landscape astrophotographer Alyn Wallace, who had a popular Youtube channel, passed away after a short illness - he was only 34.

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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Infinite Inspiration

Front cover: Aurora at the Observatory, credit: KOAS
Rear cover: Observatory welcome board, credit: KOAS

A WORD FROM THE CEO

It's been a whirlwind over the past few months coming into the organisation, getting to know our staff, volunteers, trustees, and the huge swathe of friends and partners across the region and beyond who support what we do.

With 2024 well underway, and 2025 approaching swiftly on the horizon, my eyes are set on 2030 and where we want to take Kielder Observatory as we sail past our twentieth anniversary in 2028 and into the undiscovered country beyond.

The world around us is experiencing significant socio-economic, cultural, environmental, and technological change, of which the effects are difficult to predict. The only certainty is change itself, which is happening at an accelerating rate.

To thrive, Kielder Observatory must be sure of its reason for existing, confident in its vision, and, critically, adaptable, and able to ride the waves of transformation breaking on our shores. As we build our strategy to 2020, this adaptability will sit at its heart.

Thankfully, in looking ahead to where we take things next, in the here and now I've inherited a brilliant team to begin building our future with, a team I've been regularly wowed by since I landed in this role.

In the last few months alone, we've delivered our first livestream of solar eclipse (our first livestream from another country too) to much media fanfare, worked with refugees to turn them into astrophotographers, continued delivering essential astronomy sessions in schools across the region, came second place in the North East tourism awards Small Visitor Attraction of the Year category, made the final three in the North East Prison Group Awards for our work with prisoners at HMP Northumberland, and delivered events with a range of external partners, including an immediately sold-out show with The Alnwick Garden.

All that stuff is just a sample of what we've been up to, and, as ever, our core offer up on that hill at the observatory remains the beating heart of everything we do, with our team inspiring wonder, revelation and joy in the people who join us night after night.

Leigh Venus, CEO

OBSERVATORY NEWS

The Team at the North East Tourism Awards ceremony.

The Observatory was delighted to take silver in the Small Visitor Attraction of the Year category at the North East Tourism Awards, held at the end of February. We were pipped to the gold by the Spanish Gallery in Bishop Auckland!

The big event in the last few months was the US solar eclipse. Our astronomer Ellie MacDonald jetted over to Texas and broadcast the eclipse live for the Observatory. You can still watch the video on Facebook. Ellie also made it onto BBC Breakfast news, Channel 5 News and Sky News. Unfortunately the next total eclipse in the UK won't be until 2090, and the next one visible from the North East of England will be 2135!

The last one in our region was in 1927, when totality swept over Wensleydale, then Richmond, Darlington and Hartlepool, reaching as far north as Durham and Sunderland. Had the Observatory existed then, we would have

seen a 99% partial eclipse (or possibly not, as it was mostly cloudy!!).

The final phase of our Mindsets + Missions programme is about to get underway, which will be a research-focussed project around astrophotography, working with Helen McGhie from Manchester Metropolitan University.

Also about the start is phase 3 of our STEM to Stars project. This will involve us engaging with 50,000 school pupils up to Key Stage 3 in the next 12 months, through astronomy workshops, star groups and teacher CPD sessions.

We have a couple of special events on the horizon: on May 15th we will be presenting "Discovering New Worlds: An evening with Kielder Observatory" at the Common Room of the Great North in Westgate Road, Newcastle. At the end of July we will be in the (taking over the!?) science tent at the Deer Shed Festival in Baldersby Park, Topcliffe.

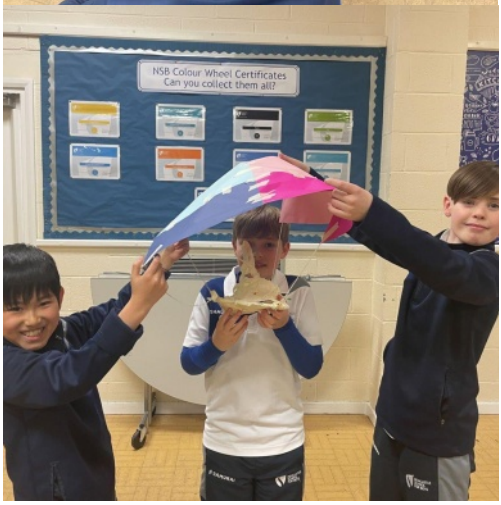
As reported in the last edition we held an event at Alnwick Garden in February. This was a great success - here are a couple of images of the evening taken by professional photographer Jane Coltman ...

"The whole team were really friendly, enthusiastic and knowledgeable and that made such a difference. The person who led the outside star gazing in particular had an incredible knowledge of the stars and constellations. We also really appreciated towards the end of the night one of the people using the big telescopes let us request a couple of specific stars to look at."

Harriet, Cumbria

OBSERVATORY NEWS

For British Science Week in March we visited several schools across the North East, delivering some hands-on, interactive workshops for young scientists.



For British Science Week, we delivered a variety of workshops for the boys in Years 1 to 6 at Newcastle School for Boys.

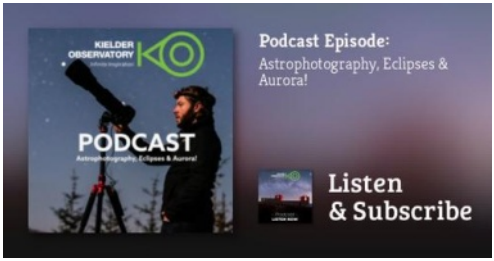
At the end of February we ran some meteorite and aurora workshops at Fenwick in Newcastle. Some impressive aurora art was made!

Fun at Fenwicks!

Dan Monk, our Director of the Gillian-Dickinson Astro-Imaging Academy, celebrated 10 years at the Observatory in February, complete with cake and candles.

We were also at the "Great North Nights: Out of this World" event at the Hancock museum in Newcastle at the end of April.

Our latest selection of podcasts is available to listen to. We have "Aurora Hunting Inside The Arctic Circle!", where Ishbel Wright describes her visit north of the arctic circle (see her article in our last edition), "The Black Hole from the dawn of time & meet our new CEO!", where you can meet our incoming and outgoing CEOs, and our most recent podcast, "Astrophotography, Eclipses & Aurora!".



Our summer programme is selling well and as we approach May half term and the summer holididays. Some events in the coming weeks have already sold out, so if you're planning a trip to Northumberland, get your booking in soon to avoid disappointment!
At the moment we are taking bookings up until the end of August, but we will have a full 12 month programme of events available to book from June.

Finally, if you are interested in private events, or school bookings, take a look at our External Events Brochure.

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Our Services

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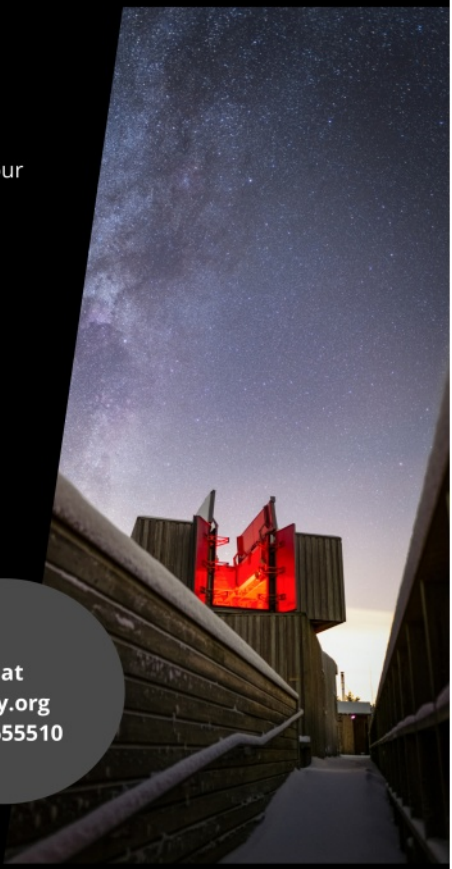
- Private event for your group at Kielder Observatory
- Venue hire
- Guided stargazing session at your location in the dark sky park
- Astronomer talk at your indoor venue
- Digital session
- Educational workshops or planetarium visit



All enquiries:

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

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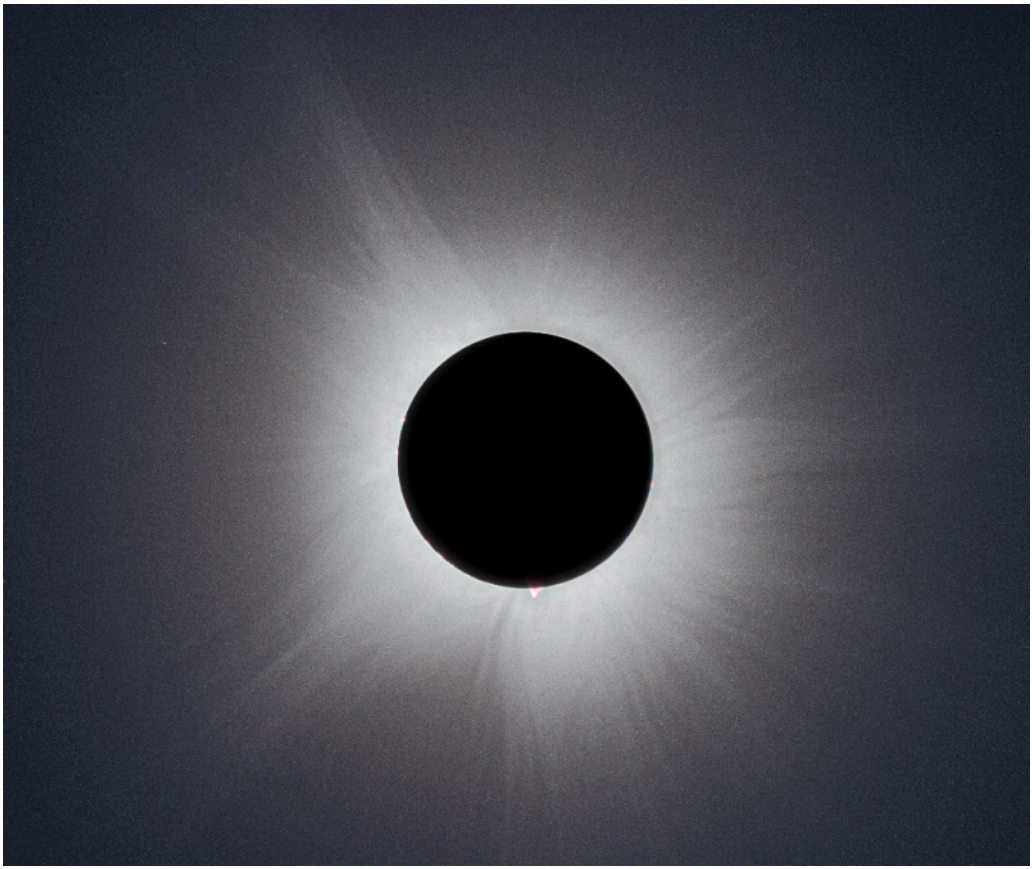
The Great American Eclipse



This April I had the opportunity to finally cross something new off my astronomical bucket list – a total solar eclipse! To see it, I merely had to travel around 4,500 miles (Proclaimers eat your hearts out).

It was, admittedly, a fairly last-minute decision to go. I had been planning to visit family in North Carolina and in December I off-handedly remarked on the eclipse, complaining about how far the path of totality was from Raleigh. I mentioned that if I could get to Texas that I would love to be able to see it, and to my surprise my father offered to drive!

So why Texas? Looking at a map of the US and the path of totality you'll see that we could have gone somewhere closer to Raleigh, but stargazers know that when

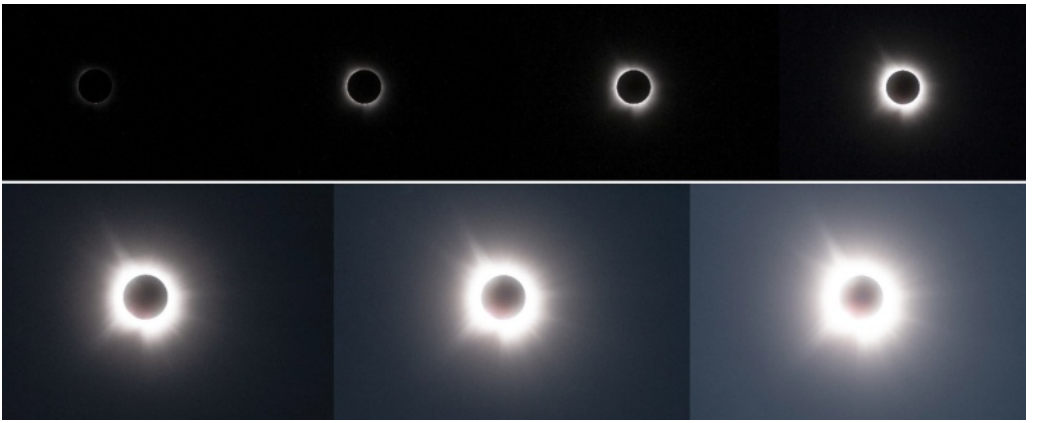
you are planning things months out that you must work with statistics. It just so happens that of all the places along the path of totality, Texas was statistically most likely to be clear. That's never a guarantee of course, but we work with what we have.

Once everything was booked in, I approached the Obsy team and offered a bit of my time to livestream the event back to the UK, in return I wanted to take a camera to capture my own image. My plan was to re-create the Eddington experiment, first performed 105 years ago providing the first observational evidence for Einstein's theory of general relativity. To do this I would need a picture of the Sun at totality with stars in the background and as you can see, I got that!

I'm not sure quite what I was expecting of the eclipse itself. I think I half expected to be disappointed by it, I had seen partial eclipses and I figured it would be like that but darker. I am happy to be wrong in this instance. I now firmly believe everyone should try to see totality at least once in their lives, because that's the only way to really understand what it is like.

The day of the eclipse, the 8th April, we made the decision to stay at our cabin and avoid the crowds. We were staying on the shore of Lake O' The Pines, a reservoir surrounded by forest, so it felt like I had never left Kielder. The weather was shaping up to be very Kielder-like too- cloud, rain, sun, and storms all at once. All week people had been doomsaying about the weather forecast in Texas, but you should never trust a forecast!

The hours leading up to the eclipse we



had thick cloud which only started to thin out as the Moon made first contact with the Sun. As it progressed the skies remained almost entirely clear over the Sun, and I started to relax. There was a tense moment near totality where a stray cloud rolled over the Sun, but that too cleared away just in time. As I said, I wasn't sure what to expect of totality. I didn't expect to be dumbstruck. There was a moment where all I could do was look; I didn't have a thought in my head. I forgot about my cameras and all my plans for getting my pictures. I didn't have long though, so I did have to snap to quickly and get on. Dan Monk had sent me away with very clear instructions to take 7 exposures that he could put together.

Ellie Macdonald
KOAS Science Communicator/ Science lead

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"We attended your Origins of the Universe event on the 25th of April and just wanted to write to say a huge thank you to your team for a truly magical experience. It couldn't have been better organised. The passion and enthusiasm of the staff and volunteers was so inspiring, and the clear skies made it the perfect evening. It was the first visit to the observatory for one of us, and the third visit for the other (albeit the first time to have been blessed with such clear weather!). We'll certainly be back and wouldn't hesitate to recommend Kielder Observatory as a brilliant place to visit."

Angela & Simon, Morpeth

NIGHT SKY

MAY 2024 (times in BST)

Lunar phases

Last quarter	01/05/2024 12:27
New moon	08/05/2024 04:21
First quarter	15/05/2024 12:48
Full moon	23/05/2024 14:53
Last quarter	30/05/2024 18:12

PLANET SUMMARY

All of the planets are too close to the Sun this month to be easily spotted. Saturn may be glimpsed before sunrise in the early dawn sky.

THE STARS AT 10PM

North – Perseus, Cassiopeia and Cepheus are nicely placed. Andromeda, Cygnus and Lacerta are near the horizon.

East – Bootes, Hercules and Lyra are nicely placed, with Ophiuchus and Serpens near the horizon along with Libra.

South – Coma Berenices, Leo and Cancer are high up, Virgo is nicely placed. The southerly constellations of Crater – the Cup, Corvus the Crow, Sextans and Hydra the Water Snake hug the horizon.

West – Cancer, Gemini and Auriga are nicely placed, along with Perseus. Orion skirts the horizon.

METEOR SHOWERS

There are no bright meteor showers this month.

COMETS

Comet 12P/Pons-Brooks will be a 5th magnitude object travelling though Aries, Taurus and Eridanus, fading to 6th magnitude by the end of the month.

Comet 13P/Olbers is brightening throughout May as it moves through Taurus and into Auriga.

Comet C/2023 A3 [Tsiuchinsan-ATLAS) will be a 9th magnitude object as it passes through Virgo. It will brighten significantly up until October when it may be as bright as Sirius.

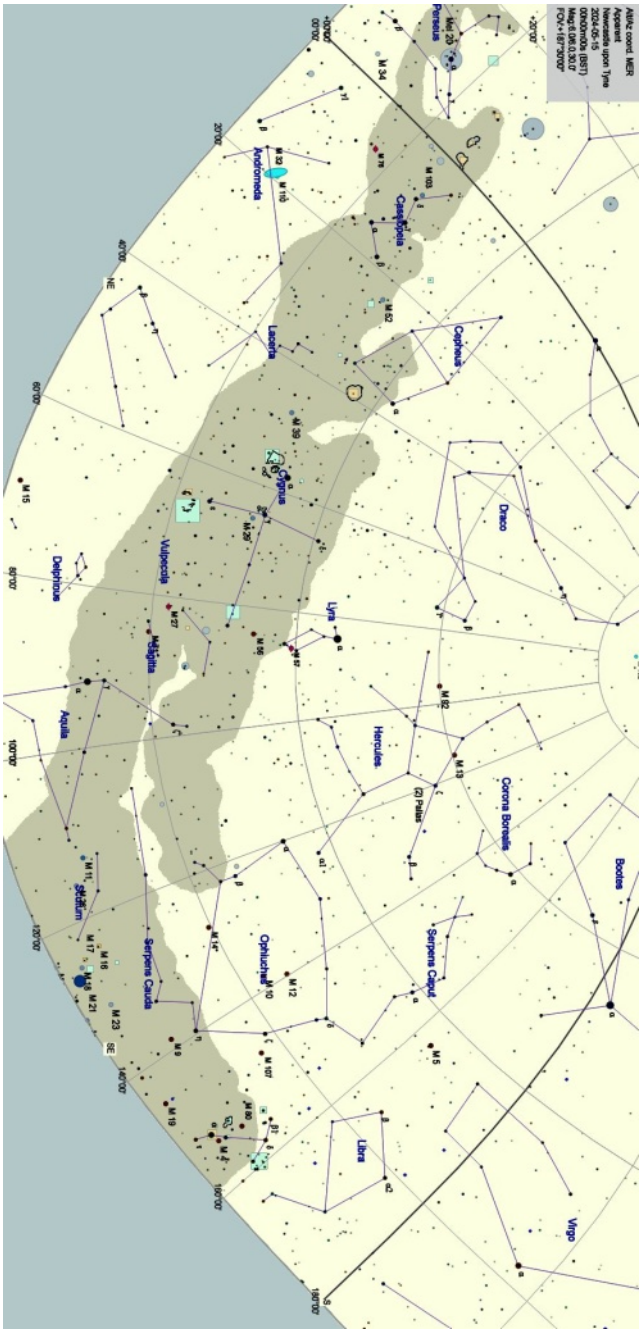
Good places to check for weekly information on the visibility of comets are http://aerith.net/comet/weekly/current.html and https://in-the-sky.org/data/comets.php

The Planets 15/05/2024

	Sun	Moon	Mercury	Venus	Mars	Jupiter	Saturn	Uranus
Rise	04:56	11:41	04:33	04:53	03:52	05:10	03:22	04:56
Set	21:07	03:04	18:17	20:26	16:36	21:13	14:14	20:50

The sky chart for Newcastle looking E at midnight on 15/5/2024.

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

JUNE 2024 (times in BST)

Lunar phases

New moon	06/06/2024 13:37
First quarter	14/06/2024 06:18
Full moon	22/06/2024 02:07
Last quarter	28/06/2024 22:53

PLANET SUMMARY

Mars, Jupiter, Saturn and Uranus will all be visible before dawn, though only in twilight.

THE STARS AT 11PM

North – Cepheus is nicely placed with the two Bears high up. Near Cepheus are the not-well known constellations of Lynx and Camelopardalis. Auriga, Perseus and Andromeda skirt the horizon.

East – Hercules, Lyra and Cygnus are nicely placed. Ophiuchus along with both parts of the Serpent are nicely placed in the south-eastern sky.

South – Hercules, Bootes and Coma Berenices are nicely placed along with Ophiuchus, Libra and Virgo. To the lower LHS of Libra can be found the claws of the Scorpion.

West – Virgo, Leo , Cancer and Gemini cut a swathe across this view. Auriga is low in the NW.

METEOR SHOWERS

There are no major meteor showers in June.

COMETS

Comet 12P/Pons-Brookes will be a 5th magnitude object in Canis Major - it will be a difficult object to view from the UK and will be much better seen from at least 20 degrees further South.

Comet 13P/Olbers will be a 3rd magnitude object in Auriga – it will be a morning object - visible in twilight.

Comet C/2023 A3 [Tsiuchinsan-ATLAS) will be a 10th magnitude object as it passes through Leo. It will brighten significantly up until October when it may be as bright as Sirius.

NOCTILUCENT CLOUDS

Be on the look out for these amazing cloud displays over the next couple of months. They are created by a combination of extreme cold in the Earth's high

The Planets 15/06/2024

	Sun	Moon	Mercury	Venus	Mars	Jupiter	Saturn	Uranus
Rise	04:24	14:24	04:22	04:36	02:25	03:27	01:24	02:58
Set	21:47	01:40	21:56	21:59	16:54	19:52	12:21	18:59

The sky map looking E from Newcastle at midnight on 15/06/2024.

atmosphere – in the Mesosphere at altitudes of about 50Km to 100Km, trapped water vapour and – it is suggested – the influence of other factors such as shooting stars and dust from – for example the Sahara Desert. They appear as bright blue streaks, nets and flows and look nothing like any other type of cloud. They tend to appear just after sunset and before sunrise though can also be seen late at night too.

NIGHT SKY

JULY 2024 (times in BST)

Lunar phases

New moon	05/07/2024 23:57
First quarter	13/07/2024 23:48
Full moon	21/07/2024 11:17
Last quarter	28/07/2024 03:51

PLANET SUMMARY

Mars, Jupiter, Saturn and Uranus are all morning objects. Mercury and Venus will be challenging to see in the evening twilight. are near the horizon.

THE STARS AT 10PM

North – Corona Borealis and Bootes are high up, with Coma Berenices and Canes Venatici nicely placed. Virgo and Leo are close to the horizon.

East – The Milky Way cuts a swathe across the sky at this time. From Perseus in the east, through Cassiopeia, Cepheus, Cygnus – in the south - into Sagitta and Vulpecula, towards Aquila, Scutum and Sagittarius in the west. Low down are Andromeda and Pegasus.

South – Cygnus, Lyra, Hercules and Bootes are nicely placed with Aquila, Ophiuchus and Virgo still worth a look. You may see the body of Sagittarius and the head of the Scorpion near the horizon.

West – The two Bears, Corona Borealis and Hercules are well placed. Libra, Virgo and Leo are still visible with Cancer setting.

METEOR SHOWERS

There are no major meteor showers in July.

COMETS

Comet 12P/Pons-Brookes will not be visible this month as it is in the far south of the sky

Comet 13P/Olbers will be a 3rd magnitude object in Leo Minor – it will be visible in the early morning during July.

Comet C/2023 A3 [Tsiuchinsan-ATLAS) will be a 8th magnitude object as it passes through Leo and is visible in the morning sky. It will brighten significantly up until October when it may be as bright as Sirius.

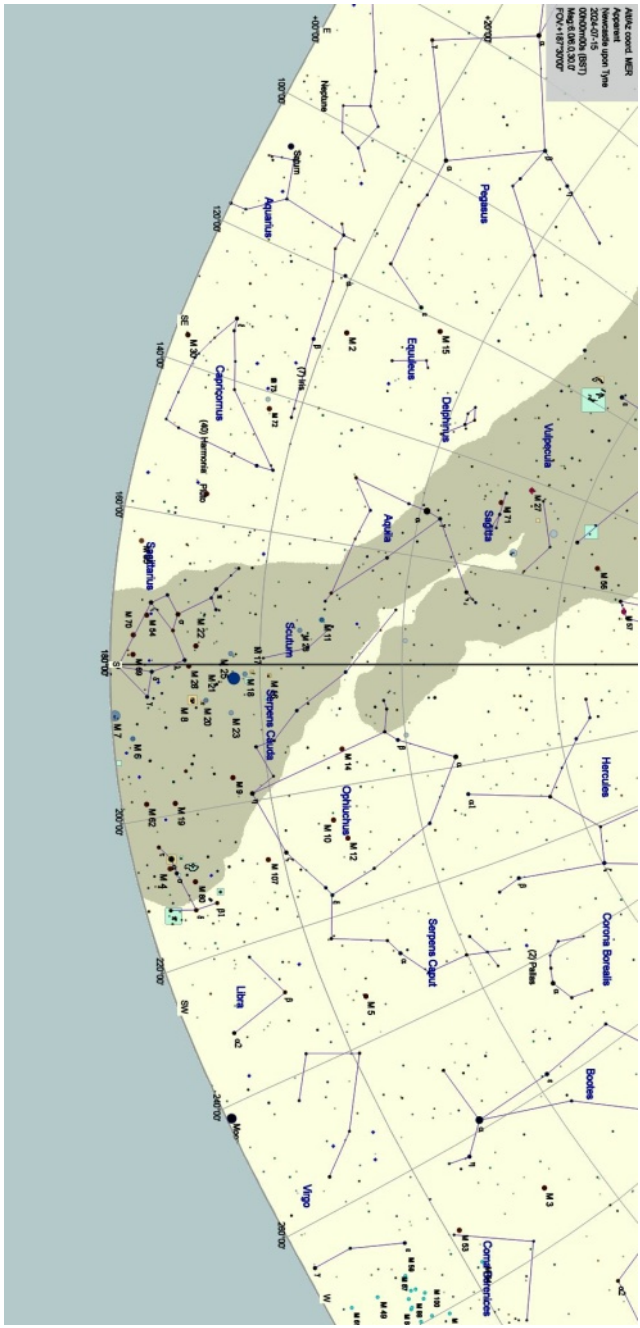
The Planets 15/07/2024

	Sun	Moon	Mercury	Venus	Mars	Jupiter	Saturn	Uranus
Rise	04:45	15:57	07:19	05:45	01:08	01:48	23:26	01:04
Set	21:35	00:08	22:34	22:12	17:05	18:30	10:22	17:09

The sky map looking S from Newcastle at midnight on 15/07/2024.

Night Sky credits:

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



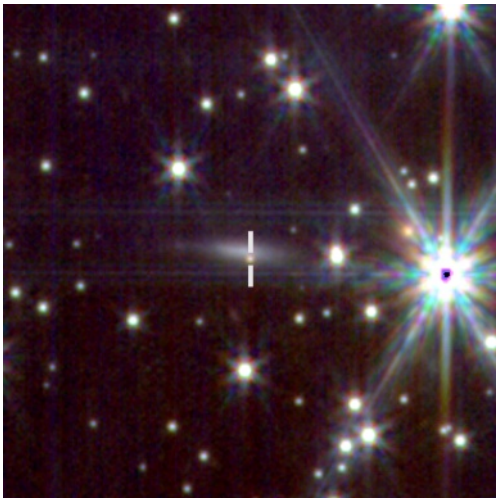
SCIENCE SLOT

GRB221009A – a new idea

Near-simultaneous observations were made of GRB221009A from the Gemini South telescope in Chile. The image is a combination of 4 exposures in I, J, H, K with two instruments taken in the morning of Friday, October 14, 2022.

On October 9th 2022, the SWIFT Satellite detected what turned out to be the brightest Gamma Ray flash ever recorded from a transient object.

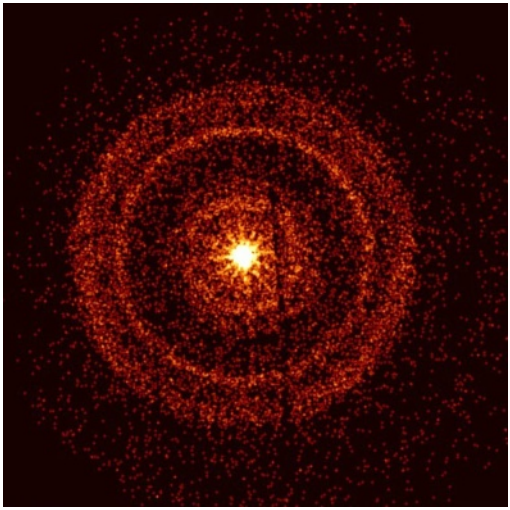
Not only was it the brightest event of its type ever recorded it was also one of the longest – lasting many hours before fading. Known as GRB 221009A, it came from an object in a galaxy around 2 billion Ly away. Since then the scientists have been trying to decipher the nature of the event that created this flash. It was bright enough to cause some ionisation of Earth's upper atmosphere. It was recorded at a peak brightness of 2×10^{47} Joules/second for a period of 1.042 seconds. GRB221009A was located in the constellation of Sagitta, the Arrow. It was located 1.9 Billion Ly away but in the intervening time the Universe has expanded so the left over is now 2.5 GLy away.



Near-infrared afterglow and host galaxy imaged by the James Webb NIRCam camera.

The radiation from this event spanned 15 orders of magnitude in the electro-magnetic spectrum, from gamma to radio. In doing so the pulse overwhelmed the FERMI Gamma Ray Telescope's detectors, and an Earth based detector saw 5000 of the strongest GRB photons [Cherenkov radiation] ever recorded at ground level. The most powerful of these was estimated at 18TeV [comparable to the power of the Large Hadron Collider]. Another detector may have picked up a single 251TeV photon. These photons are an order of magnitude [at least] above the previous GRB record holder. This event also resulted in a number of afterglow X-ray showers.

So what caused this event?

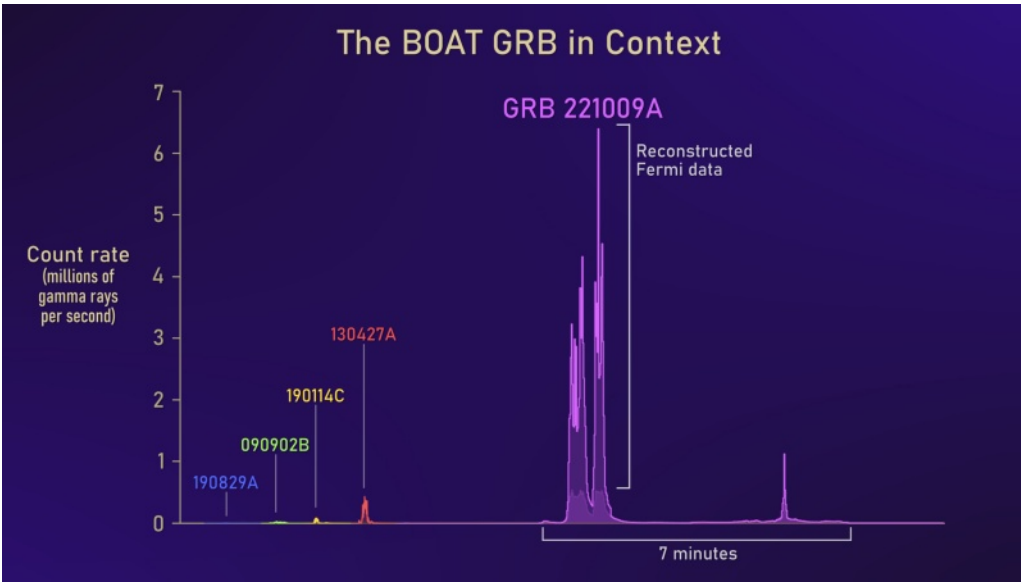


Swift's X-ray image of GRB 221009A shows circular rings around the gamma-ray burst. Dust in the Milky Way scattered the x-ray emission of the gamma-ray burst, creating the rings.

Credit: NASA/Swift

These types of events are – or rather were – thought to be created in the crucibles of very large stars which undergo a core-collapse supernova … or....
a kilo-nova event whereby two Neutron stars merge.
However a recent analysis has added some new thinking about how the

SCIENCE SLOT



A comparison of the number of gamma rays emitted by GRB221009A compared with the four previous record-holding gamma ray bursts.

Credit: NASA

heaviest elements of the periodic table are created. The platinum group of elements were thought to be created in kilo-nova/ core-collapse events. However when the researches checked the afterglow of GRB221009A, none of these elements were found. Some of the newest data came from an observation by the JWST – once the initial flash had dimmed sufficiently to prevent saturating its very sensitive detectors!

Further observations are planned to follow the continuing light curve as the object dims further. So, the origins of our most precious metals still remains somewhat mysterious – awaiting a new theory – to explain their beginnings.

Robert Williams

You can read more about gamma ray bursts in our Winter 2019 Newsletter.

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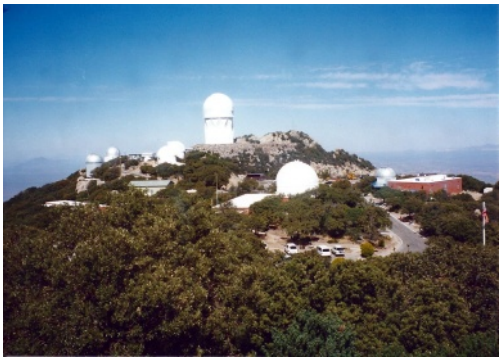
Plotting the Universe in 3D

One of the key questions that both theoreticians and observers of the structure of the Universe have had over the past many decades is 'what shape is the Universe'. Knowing the shape of our Universe will confirm certain details of both the theories we have of the origin of the Universe and its evolution since the Big Bang. It will also confirm our more complete understanding of how the Universe behaves on the medium scale – i.e. in the realms of superclusters of galaxies which are a fundamental driver in the expansion of the Universe, which at the moment seems to be accelerating towards the so-called Big Rip/Heat Death of the Universe many years into the future.

Recently a new study has shed some more information on this quest. For more details see this BBC article to get you started:

Scientists make largest 3D map of the universe to date.

Using the Dark Energy Spectroscopic Instrument (DESI) this survey is attempting to map out the influence Dark Energy – the driver for the expansion of the Universe – has had, is currently having and will have on the shape of the Universe. It is attached to the Nicholas U. Mayall 4-metre telescope at Kitt Peak National Observatory, near Tucson, Arizona.



Credit: the author

The science:

We know that 95% of all of the mass of the Universe is 'invisible' – cannot be directly seen by any form of instrument that can record electromagnetic radiation. Of this 95% Dark Matter accounts for 27% and Dark Energy the remaining 68% . The aim of DESI is to provide a timeline – over the past 11 billion years – of how each of these effects have shaped our Universe, and whether in some era[s] one played the greater role than at at other times.

The task:

To measure the position of and the apparent motion of 40 million galaxies and quasars, based on a survey of suitable candidate objects acquired

SCIENCE SLOT 2

before the start of the DESI survey from images taken by the Dark Energy Camera Legacy Survey (DECaLS).

DESI at prime focus of the Mayall 4-metre telescope.

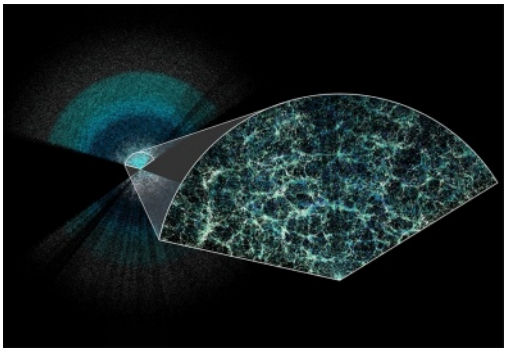
The measurement:

To record the Baryon Acoustic Oscillation of these candidate objects. This is a 'sound wave' that expanded through the contents of the – much smaller – early Universe causing ripples in the density of early matter – during the era before baryonic matter [where protons, neutrons and electrons bind together to form atoms] were formed. However, once the Universe had cooled sufficiently for atoms to form, these ripples were unable to expand any further and were 'frozen' into place with a particular size. This was also the moment in the Universe just before and gravity – one of the 5 fundamental forces went onto shape the large scale structure of our Universe. As a result there was a tendancy for galaxies to be be formed along these ripples where the density of matter was highest.

Although the evolution of the Universe has long since washed out the exact shapes of these circular ripples, their presence can still be detected statistically, showing up as a preferred separation between galaxies. In today's Universe, if our theories are correct, this is expected to show up as a connection between a pair of galaxies spaced approximately 500 MLy apart. So by measuring the position and distances (using redshift and Hubble's law) of lots of galaxies, DESI can combine all the data together and measure the actual size of these Baryon Acoustic Oscillations.

DESI is not the first survey to detect this effect. In 2005 the Sloan Digital Sky Survey [SDSS] and its Baryonic Oscillation Sky Survey [BOSS] follow-up, and well as the 2dF Galaxy Redshift Survey both reported a detection of Baryon Acoustic Oscillations. Several other surveys have confirmed this since. However DESI is the largest survey by far, and when complete will have enough data to determine how the scale of the ripples changed as the Universe expanded, thus telling us about the behaviour and relative importance of

Dark Energy and Dark Matter, and to check whether – or not – these ripples are consistent with Einstein's General Theory of Relativity. This is very important as it may shed light on whether gravity has always worked the same way throughout the history of the Universe or – possibly – it was somehow different in the early Universe.



The DESI 3D map of our Universe. Earth is at the center of this thin slice of the full map. The magnified section shows the underlying structure of matter in our Universe.

Credit: Claire Lamman/DESI

DESI will be a massive project and its data could or will be mixed with information from other surveys – in the microwave, Infra red, visible and X-ray wavebands and to confirm if similar details are present now or were present in the past.

What else?

It is expected that the data recorded may have other applications too, all of which will be ground breaking:

1) Finally pinning down the mass of the neutrino.

2) Whether – or not – the fluctuations in the early Universe follow a simple model.

3) Whether – or not – large scale structures in the early Universe [T_U~1 second] behaved in a somewhat unexpected manner – compared to our current understanding.

4) Whether – or not – the Standard Cosmological Model - needs some 'tweaks'.

Data Collection:

DESI has several specific classes of objects it is observing:

a) Bright galaxies – out to a redshift of 0.4 – observing as faint as 20th magnitude. These can be imaged at any moon phase – including full.

b) Observe LRGs [Luminous Red Galaxies] – essentially very massive elliptical galaxies – up to a redshift of 1.0, and 2-3 magnitudes fainter than the bright galaxies.

c) Observe ELGs [Emission Line Galaxies] – Starburst galaxies, Seyfert Galaxies - up to a red shift of 1.6.

d) Observe Quasars to >= redshift 3.5 – this will include measurements of the presence of any substantial inter-galactic hydrogen gas clouds [the Lyman Alpha

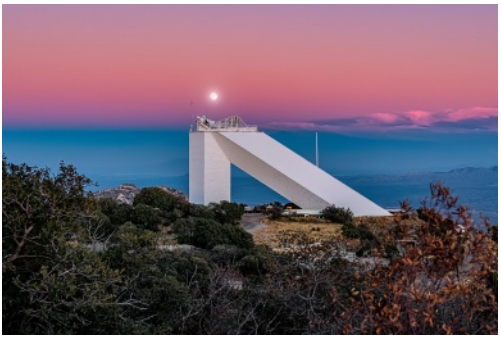
SCIENCE SLOT 2

Forest, which becomes red-shifted to longer wavelengths].
e) Observing stars in the Milky Way to more accurately determine their chemical fingerprint and the gravitational dynamics between them.

DESI is, initially, a 5 year mission and the data currently released used only the first year of data (observing officially started in May 2021). So there is much more to come! There is also a connection to the North East, as Durham University is a member of the consortium running DESI.

Old telescope – new tricks:
As already noted, DESI is attached to the 4m Mayall Telescope at Kitt Peak National Observatory. This has been operating as a general purpose telescope for the astronomical community since 1973, but in 2018 DESI essentially took over the telescope, which underwent extensive rebuilding for the sole use of DESI. This includes 5000 optical fibres robotically positioned at the telescope's prime focus to direct light from individual objects to the spectrographs. There is also a large optical corrector which provides a field of view about 3 degrees across in which the fibres can be placed.

KPNO is located just outside Tucson, Arizona, and has been at the forefront of American and International Astronomical research for many decades. Construction started in 1958 on what is – or rather was – Native Indian Land. At the time the Native tribe of that area were very suspicious of the motives of the astronomers to build an Observatory on what they saw as sacred land. However, an enterprising astronomer took a sizeable telescope [for amateur astronomers] and showed the locals what could be seen of our galaxy and beyond, and the Tribal elders soon decided to agree to the founding of KPNO.
There are more than 20 astronomical observatories on the site including the McMath-Pierce Solar Telescope – one of the first significant Solar Telescopes ever constructed.



The Belt of of Venus over the McMath-Pierce Solar Telescope at KPNO.

Credit: KPNO/NOIRLab/NSF/AURA/P. Horálek

The full list of the other Instruments at KPNO is as follows:

a) Mayall Telescope - 4m Richey-Cretien.

b) WIYN 3.5m Telescope.

c) KPNO 2.1m.

d) NEID Solar Telescope.

e) A triple Coronado Array – for public solar observing and outreach.

f) RCT Consortium Robotic Telescope.

g) WIYN 0.9m Telescope – Galaxy Surveys.

h) SOLARIO Remote Telescope – Astrophotography.

i) CWRU Burrell Schmidt – Galaxy Surveys.

j) SARA Observatory 0.9m – Variable Stars and Undergraduate training.

k) Visitor Centre has a number of 16" SCT for public outreach.

l) Spacewatch 1.8m – originally on a Telescope from Mount Hopkins Observatory.

m) Spacewatch 0.9m.

n) Super LOTIS – optical components of GRBs.

o) 2 x 0.9m auxiliary telescopes associated with the MMST.

p) BoK Telescope – versatile instrument.

q) MDM Observatory – moved from An Arbour Observatory.

r) 2.4m Hiltner Telescope.

s) 2 x 12m ARO Radio Dish Telescopes.

t) VLBA – 10x radio dish antennas in an array.

In the past few years there has been a cloud hanging over this site because of a number of tensions, both financially and domestically. Since it was constructed in the 1960s, it has been a mainstay of observations undertaken by professional astronomers. Like many Observatories in the USA, it has facilities for visitors, though they are not able to look through any of the larger instruments. In recent years activity at KPNO was wound down due to budget cuts, but a concerted effort by both professional astronomers and the general pubic has seen an upswing in activity in the past few years.

The site contains a range of telescopes, run by multi-national groups researching in a number of key subjects such as the search for Near Earth Objects, Kuiper Belt Objects. Solar Physics, Nebulae, Galaxies and much more …

Daytime tours include a telescope tour of one of the site historic instruments : 1) McMath-Pierce Solar Telescope, 2) 2.1m Instrument or 3) the Nicholas. U. Mayall 4m instrument, but only when any one is stood down for maintenance.

Robert Williams

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.

KIELDER OBSERVATORY
Infinite Inspiration

A faint aurora taken in March by one of our volunteers, Jodie, who fortunately happened to be on duty that night.

Our own Dan Monk has been aurora spotting in Iceland. Looks like he had a good time!

GALLERY

It's Kielder Mug time!

Director of Astronomy Dan Pye sends the above from Japan. Right: volunteer Briggy Kiddle's mug is at Lake Malawi, in Malawi.

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

Two more mugs from our wandering Science Presenters:
Above: Ishbel Carlyle from the Canyon Diablo meteorite crater in Arizona.
Right: Ellie Macdonald took a rest from eclipse hunting to show hers in Durham, North Carolina.

GALLERY

The US eclipse taken by our volunteers Jo and Helen, and processed by Dan Monk.

GALLERY

Our guests survey the colourful auroral display at the end of April.

"Everyone was extremely helpful, friendly and knowledgeable. The whole thing was run really well and very organised. We learned some things we didn't know as well as our daughter and even though she's only 7 it was pitched well for her to be able to follow and understand. We really enjoyed our visit thank you."

Marie, Cramlington

"Big thank you for bringing out the light show (I get to see the sparkles in the night sky). Very well organised and highly educational event. Staff explain how the event was run and give each guest the opportunity to ask questions and viewing the telescope to look at the stars. Bonus marks by providing hot drinks and take away goodies (travel mug & date poster of Kielder observatory. I would book again in the winter times hopefully to see more of the milky way skies."

Mary, Bolton

Kielder Observatory - a beacon for dark skies

https://kielderobservatory.org

KIELDER OBSERVATORY
Infinite Inspiration