Winter 2023/24 Number 42

Kielder Observatory Newsletter

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Highlights Feb/Mar/Apr

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Farewell Ingenuity

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EDITORIAL

Well, no sooner had we gone to press in November than we had one of the most spectacular aurora seen in recent years in the UK on November 5th. This included an impressive, and quite rare, STEVE (Strong Thermal Emission Velocity Enhancement) display, as you can see from our front cover. It has also been a busy time in space - the latest NASA mission to the moon failed, but the Japanese landed, albeit upside down! In this edition, Robert looks at two topical stories - the discovery of a large ring of galaxies in the Universe, and the final demise of the Mars helicopter.

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

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KIELDER OBSERVATORY
Infinite Inspiration

Front cover: STEVE, November 5th 2023, credit: Dan Monk.

The new CEO of Kielder Observatory, Leigh Venus.

STOP PRESS! We're delighted to welcome Leigh Venus as our new CEO, replacing Catherine Johns, who is moving on to a new job as Executive Director of Dance City. Leigh and Catherine have been working in partnership for the last two months while Leigh gets to know the ropes. Leigh's sector leadership stretches back to 2009 when he directed operations at Newcastle's Tyneside Cinema during a period of success and redevelopment. He was also responsible for reviving and developing Jarrow Hall museum and heritage site and served as Heritage Development Manager for the Royal National Lifeboat Institution.

Until 2023, Mr Venus chaired the contemporary dance company Fertile Ground, and currently serves as a trustee of London's Vagina Museum. Leigh says "Kielder Observatory delivers a powerful social good anchored by unique visitor experiences and public outreach. I'm inheriting a wonderful team, so I'm looking forward to building on the extraordinary work accomplished so far.".

OBSERVATORY NEWS

The Team at the 2023 North East Culture Awards.

Although we didn't win, we were shortlisted in the Best Arts & Business Partnership category of the 2023 North East Culture awards, held at The Fire Station in Sunderland in mid December.

As reported in the Autumn newsletter, we have received funding through the Mindsets+Missions programme to make astrophotography more accessible to all , and as part of this our first North East Astrophotography Academy project took place on 21st November at the Lord Lawson of Beamish Academy. During this first visit, sessions inside our inflatable planetarium and lectures on astrophotography were delivered to GCSE and A-Level students. There will be many more school visits to come! You can read more about our Mindsets+Missions work in Adam Shore's article at the end of this news section.

Dan Monk presenting the first of our Mindsets + Missions astrophotography projects at Lord Lawson of Beamish Academy.

December 2023 saw the 10th anniversary of Kielder Water & Forest Park being awarded 'International Dark Sky Park (Gold Tier)' status (in case you didn't know, Kielder Observatory is part of the Northumberland International Dark Sky Steering Group). To celebrate this event a film has been produced, which can be viewed along with lots of information on stargazing in the park at https://www.northumberlandnationalpark.org.uk/dark-skies-10/

After months of working with a creative team – from sound designers and composers to poets and voice artists – we can present 'Kielder Narratives', an audio piece inspired by the communities of Kielder.

OBSERVATORY NEWS

Funded by Arts Council England, you can read more and listen to the piece at https://kielderobservatory.org/outreach/kielder-narrative

We held another of our popular Pop-up observing sessions at Exhibition Park in Newcastle on January 17th.

Observing in Exhibition Park

For those who missed it, we featured in a recent episode of Robson Green's Weekend Escapes on the BBC, where Robson talks to our Director of Astronomy, Dan Pye. You can view the episode on iplayer.

Robson Green meets Dan Pye

Gosforth Academy visited us on a Monday in January and were lucky enough to have fabulous clear skies!

"I just wanted to email to say thank you so much to the hosts for our session on Monday night. We had an absolutely fantastic time and the students haven't stopped talking about it since! The staff were so knowledgeable and really knew how to engage our students (and answer some of their left-field questions!) We're really hoping we can run a similar trip next year."

Claudia Robertson, Co-ordinator of post 16 Physics, Gosforth Academy.

OBSERVATORY NEWS

As ever we also have our regular monthly podcasts for you at https://podfollow.com/kielderobs/view

We also feature in an interesting article on stargazing in Northumberland in HighLife North magazine, 'A beginner's guide to Northumberland stargazing'.

We would have advertised our stargazing event in conjunction with The Alnwick Garden, but as you can see from the picture it is now sold out! Maybe we will do some more sometime ...

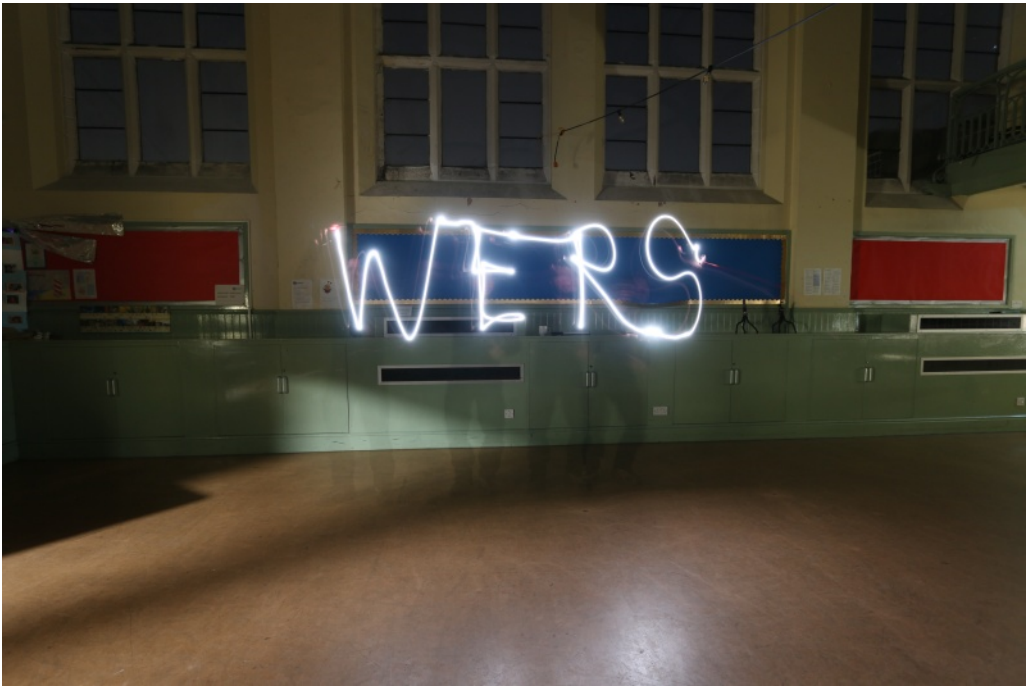
However, we still have a couple of Friday stargazing sessions at Linden Hall Hotel near Longhorsley in Northumberland in March and April. We also do occasional sessions at the Redesdale Arms near Otterburn, although the upcoming February date is sold out and the next available evening is currently in September. Nearer civilisation, we'll be delivering family workshops at Fenwick's department store in Newcastle on 22nd February (for half term).

The team gathered for their Christmas meal in mid December ...

Finally, don't forget our online gift shop – we still have a few of our beautiful 2024 calendars on sale at half price.

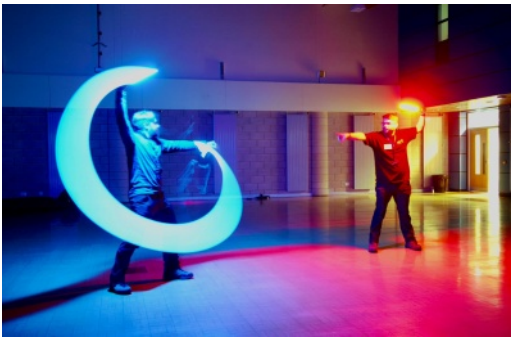
KIELDER OBSERVATORY
Infinite Inspiration

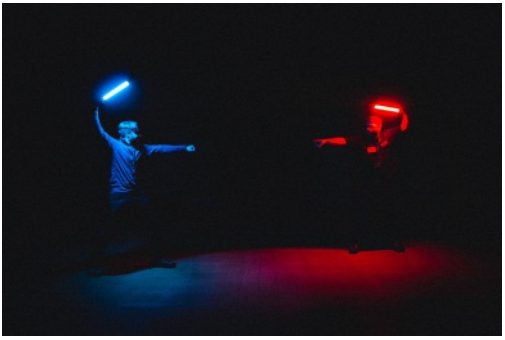
Mindsets and Missions: *The North East Astrophotography Academy*



The North East Astrophotography Academy (NEAA) project is alive with energy as seven schools from across the North East, as well as participants from the West End Refugee Service (WERS) in Newcastle upon Tyne, dive headfirst into the exciting world of astrophotography. Our mission is simple yet profound: to seamlessly blend the worlds of science, art, and community. Enthusiastic students, ranging from GCSE & A-Level Physics to Art and Photography, are already knee-deep in the captivating realms of astrophotography and image processing. With the cosmos as their canvas, they're capturing the breathtaking beauty of the night sky, infusing it with their unique touch of creativity.

Over the past few weeks, participating students, armed with DSLR and smartphone cameras, have embarked on a photographic journey, seizing the magic of clear nights to photograph the sky in all its glory. With the aid of telescopes, they've captured awe-inspiring photos of the Moon and Jupiter (along with its





The light painting looks fun!

moons!) using just their phones. When the weather turns, the light wands emerge. Light painting becomes not just an artistic endeavour but a hands-on lesson in the camera settings crucial for astrophotography – the magic of long exposures unfolds as students create incredible artworks.

The journey kicked off with WERS at a vibrant taster event on January 24th, hosted at a local church. Approximately 60 individuals, brimming with curiosity about the cosmos, joined us for an evening filled with inspiration and astronomical wonders. Following this, 16 individuals eagerly signed up to go on their own astrophotography journey over the next month.

What sets the NEAA Project apart is its unwavering focus on practical learning. Participants aren't just passive observers of the universe; they're active contributors, honing their skills and unleashing their creativity in capturing the wonders above. The ultimate goal? To empower participants to conduct their own research projects, delving into topics that ignite their passion, all centred around the fascinating theme of astrophotography.

Adam Shore
KOAS Education Lead

KOAS meets the West End Refugee Service ...

OBSERVERS' SLOT

Ishbel heads for Norway ...

Our Science Communicator Ishbel Carlyle has been hunting aurorae

Northern Lights from Skibotn in northern Norway (latitude 69 deg, inside the Arctic Circle), taken with a Samsung Galaxy A54 phone by the author.

So as part of my PhD studying the Northern lights I need to set up a few cameras to film them, so at the start of January I got on a plane and headed up to the artic circle. Specifically Skibotn observatory, about an hour from Tromso. I spent a week with some colleagues from Southampton University building the frame to hold the cameras, aligning the cameras to the stars and setting up the computers.

The days were long (if very short in light. The Sun didn't come above the horizon till the 3rd day we were there!). But I also got to see the Aurora in magnificent splendour not once but twice!

The first night they started as just a band of light moving slowing from North to South over head. A few swirls were discernible and a bit of colour stared to show. This is

known as the growth phase of the aurora. It then got cloudy. Even in Norway we get thwarted by the occasional cloud when stargazing. However on night two I got the expansion phase (the bit where it goes bang). They started off similarly to the night before and then BOOM. They got bright and fast and swirling and twirling, ripples of light going all across the sky. The colours came out too. Minty greens and pinks and purple hues. I'd describe it as a ghost. Definitely coloured and sharp shapes, but transparent still.

Cameras always pick up more signal than our eyes do so the pictures look a bit more dramatic than by eye, but I've have provided a few from different cameras so you can see it was all the same aurora, just different cameras. Next newsletter I'll talk you though them in more detail!

Ishbel Carlyle

More spectacular aurorae from Skibotn, this time taken with an Apple iPhone 14.

Credit: Nick Brindley

NIGHT SKY

FEBRUARY 2024 (times in GMT)

Lunar phases

Last quarter	02/02/2024 23:18
New moon	09/02/2024 22:59
First quarter	16/02/2024 15:00
Full moon	24/02/2024 12:30

PLANET SUMMARY

The Sun will be in conjunction with Mercury, Venus, Mars and Saturn, so these planets are not on view this month. Jupiter is an evening object visible from 7pm until 10:30pm. Uranus is an evening object close to Jupiter and will be visible until 11:30pm.

THE STARS AT 9PM

North – Cassiopeia and Cepheus are nicely placed with the two Bears. Cygnus and Hercules are low down.

East – Gemini is high up with Leo and Cancer nicely placed. Virgo is just beginning to rise.

South – Auriga is high up. Orion and Monoceros are nicely placed. Canis Major and Lepus are low down.

West – Taurus and Perseus are high up. Andromeda is nicely placed. Pisces and Pegasus are low down.

METEOR SHOWERS

There are no bright meteor showers this month.

COMETS

Comet 12P/Pons-Brookes will be a 7-8th magnitude object during February, currently in Cygnus then passing through Lacerta and into Andromeda, brightening as it does so.

Comet 144P/Kushida will be an 8th magnitude object passing through Taurus during February.

Comet 62P/Tsuchinshan is also about 8th magnitude and is currently in Virgo.

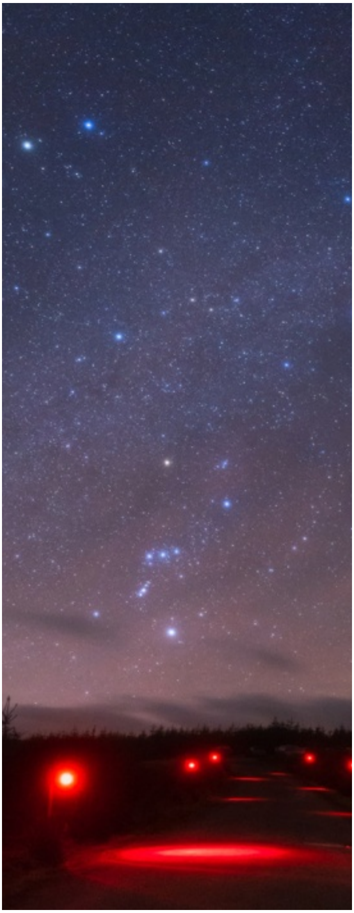
Good places to check for weekly information on the visibility of comets are http://aerith.net/comet/weekly/current.html and https://in-the-sky.org/data/comets.php

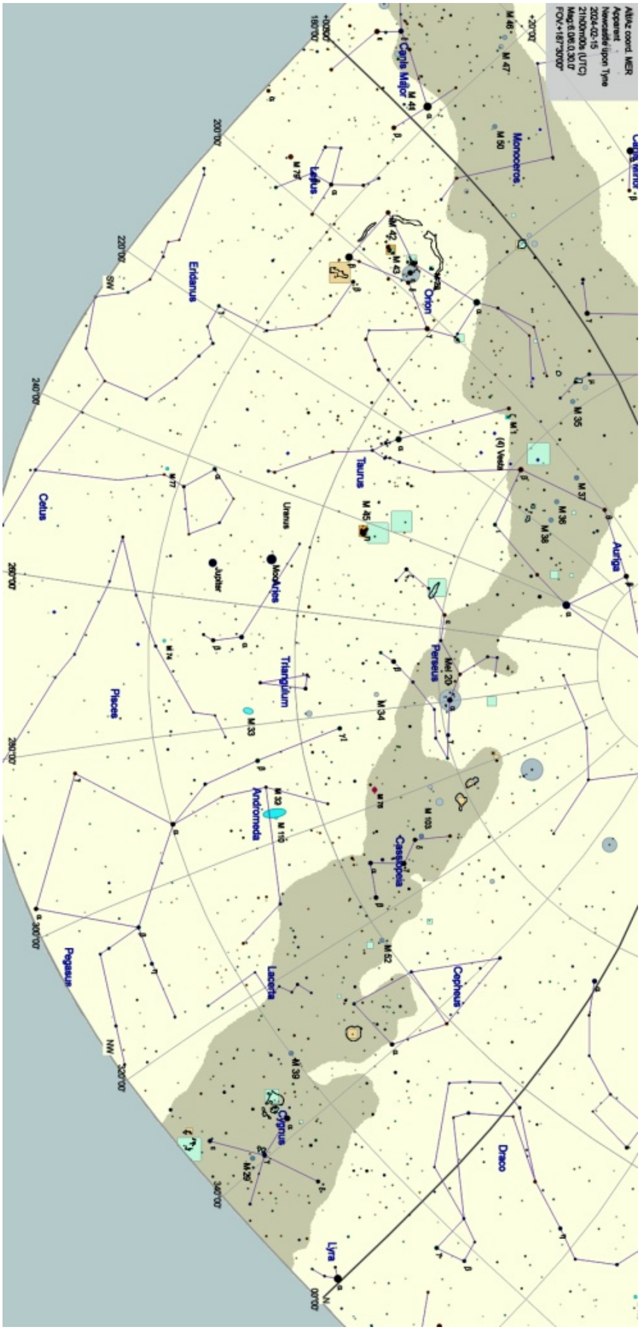
The Planets 15/02/2024

	Sun	Moon	Mercury	Venus	Mars	Jupiter	Saturn	Uranus
Rise	07:25	09:17	07:23	06:26	06:41	09:31	07:58	09:47
Set	17:13	01:30	16:02	14:29	14:41	00:12	18:13	01:15

The sky chart for Newcastle looking W at 9pm on 15/2/2024.

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

MARCH 2024 (times in GMT)

Lunar phases

Last quarter	03/03/2024 15:23
New moon	10/03/2024 09:00
First quarter	17/03/2024 04:10
Full moon	25/03/2024 07:30

PLANET SUMMARY

Mercury, Venus, Mars and Jupiter are all too close to the Sun this month to safely view in the morning sky. Jupiter will be visible from 19:30 until 21:00 low in the west in the evening sky. Uranus will be quite close to Jupiter this month.

THE STARS AT 10PM

North – The two Bears are high up. Cepheus and Draco are nicely placed. Cygnus, Lyra and Hercules are low down.
East – Leo and Coma Berenices are nicely placed. Virgo is low down. You can also find Hydra, Crater and there is Corvus near the horizon.
South – Virgo, Leo, Cancer and Gemini are nicely placed. Orion, Canis Major, Monoceros and Lepus are low down.
West – Gemini, Auriga, Perseus, Orion and Canis Major are nicely placed. Pisces is near the horizon.

METEOR SHOWERS

There are no major meteor showers in March.

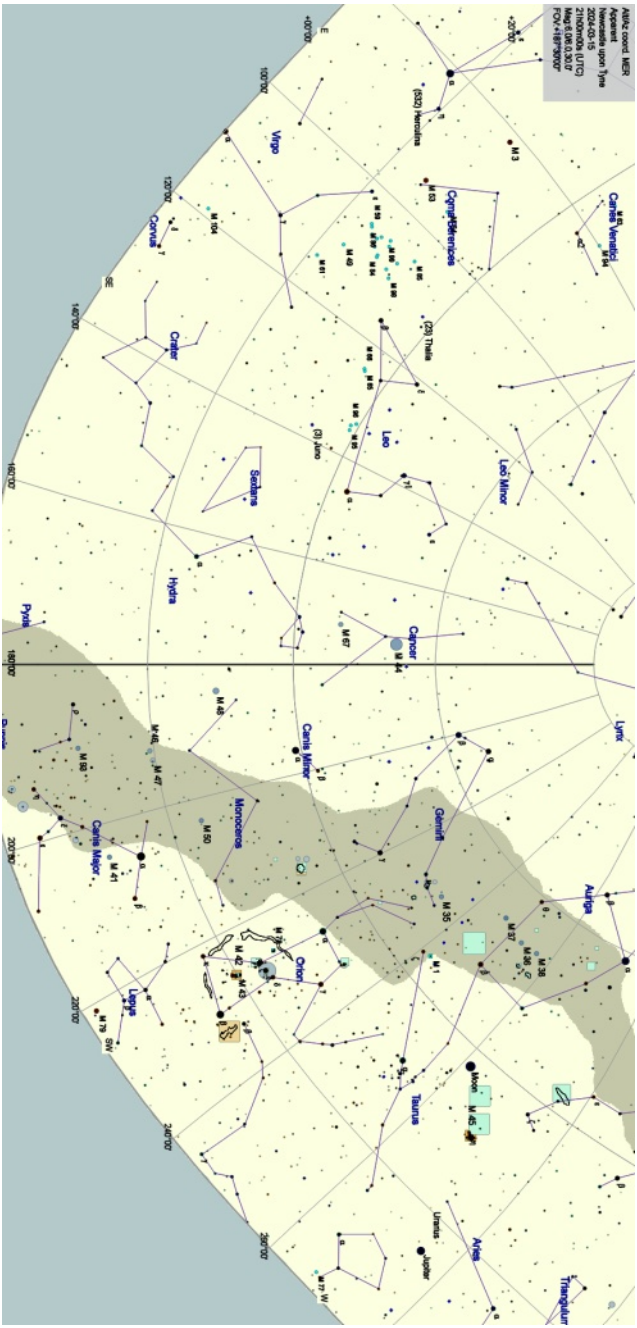
COMETS

Comet 12P/Pons-Brookes will be a 5th magnitude object during March, passing through Andromeda and Pisces.
Comet 144P/Kushida will be an 8th magnitude object passing through Orion and Gemini during March.
Comet 62P/Tsuchinshan will be a 9th magnitude object passing through Virgo this month.

The Planets 15/03/2024

	Sun	Moon	Mercury	Venus	Mars	Jupiter	Saturn	Uranus
Rise	06:18	07:56	06:36	05:55	05:37	07:46	06:10	07:54
Set	18:10	02:04	19:33	15:59	14:58	22:47	16:40	23:26

The sky map looking S from Newcastle at 9pm on 15/03/2024.



NIGHT SKY

APRIL 2024 (times in BST)

Lunar phases

Last quarter	02/04/2024 04:10
New moon	08/04/2024 19:20
First quarter	15/04/2024 20:13
Full moon	24/04/2024 00:48

PLANET SUMMARY

All the planets will be too close to the Sun to view in the morning sky this month. Jupiter will be visible low in the west after sunset. Uranus will be quite close to Jupiter at the same time.

THE STARS AT 10PM BST

North – Perseus, Cepheus and Cassiopeia are nicely placed with the two Bears high up.

East – Draco, Bootes and Virgo are nicely placed. Lyra, Hercules and Serpens Caput are near the horizon.

South – Virgo, Leo, Cancer and Gemini are all nicely placed. Corvus, Crater, Sextans and Hydra are near the horizon.

West – Monoceros, Canis Minor, Gemini, Auriga, Perseus and Cassiopeia are all nicely placed. Canis Major, Orion and Taurus are all near the horizon with Venus in Aries just setting.

METEOR SHOWERS

There is the April Lyrids – active between the 16th and 25th of April – with a waxing Moon this year it should be possible to see this shower, but the waxing Moon will gradually make it more difficult to see the later part of the shower.

COMETS

Comet 12P/Pons-Brookes may reach naked eye visibility [4th magnitude] during April, passing through Aries and Taurus. There are no other comets brighter than 10th magnitude visible this month.

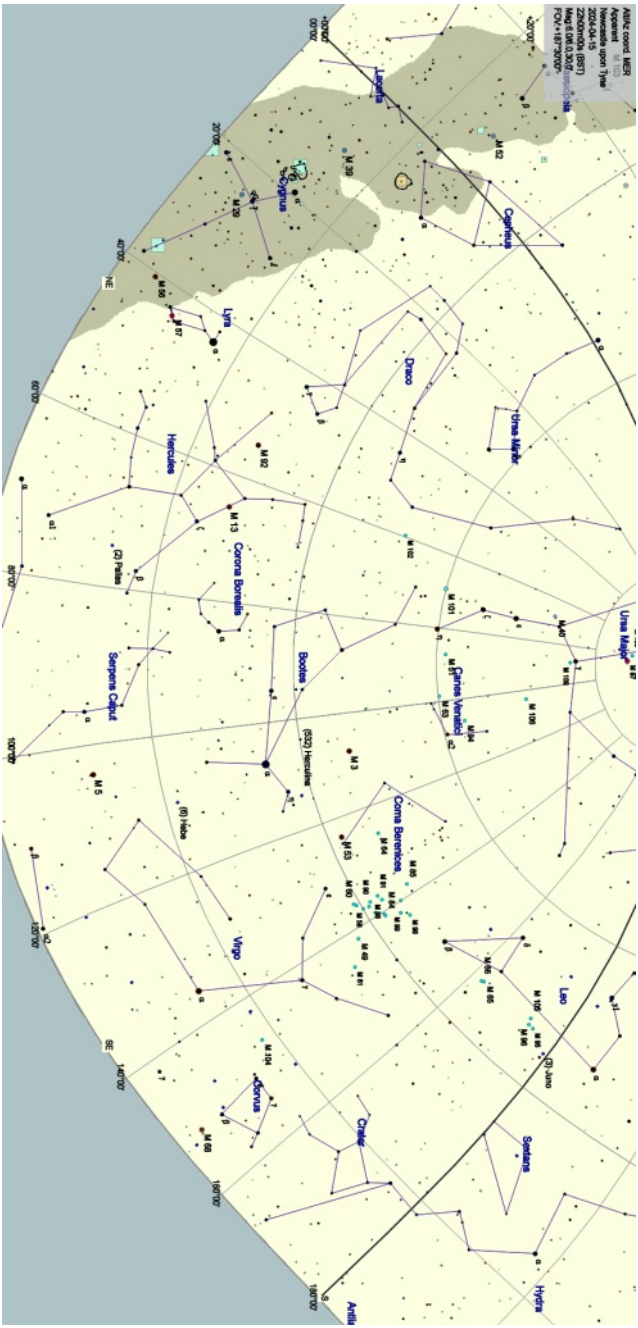
Night Sky credits:

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

The Planets 15/04/2024

	Sun	Moon	Mercury	Venus	Mars	Jupiter	Saturn	Uranus
Rise	06:03	10:05	05:46	05:54	05:16	06:57	05:14	06:56
Set	20:07	04:20	19:33	18:40	16:18	22:24	15:59	22:33

The sky map looking E from Newcastle at 9pm on 15/04/2024.



SOLAR SYSTEM SLOT

Ingenuity has had its final flight

Perseverance's view of Jezero crater on Mars. Seen to the right is the debris shield which protected Ingenuity helicopter during landing and had just been dropped a few days earlier, in preparation for releasing Ingenuity.

Credit: NASA/JPL - Caltech

In 2020 NASA sent the first – of potentially many – flying devices to Mars, to test some of the possible technology that would be further developed to be used for later missions to the Red Planet. Named Ingenuity – and nicknamed Ginny – the twin rotor device operated on Mars for about 3 years since it was first deployed on April 3rd 2021, as a hitch hiker on the Perseverance rover. Landing near Jezero Crater, one of the most fascinating features on Mars due to the combination of impact feature with geological formations normally associated with water on Earth, it took its maiden flight 16 days later.

On January 18th 2024, after a total of 72 flights [actually powered hops], one of the special rotor blades became damaged rendering the craft unable to maintain stable flight.

Originally planed – like the much earlier rovers Spirit and Opportunity – to only last 30 days on Mars, it significantly outlasted its designed mission plan. It teamed up with the Perseverance rover to scout out interesting locations for the roving laboratory to further investigate and explore. In total Ingenuity flew over Mars for just over 2 hours over a distance of about 16 kilometres.

The original design was mapped out in 2014, and following approval by NASA

Ingenuity on Mars, when in good health.

Credit: NASA/JPL - Caltech

The paths covered by Ingenuity (yellow) and Perseverance (white) by January 28th 2024.

Credit: NASA/JPL - Caltech

development of the flight hardware started in 2015. In 2017 a working full scale model of Ingenuity began simulated flight tests on Earth, mimicking the low gravity and very low ambient air pressure of the surface of Mars, including low temperature environments such as the Arctic. The project was approved for final funding in 2018. Further flight simulating testing ensued, in readiness for its launch alongside the Perseverance rover. The cost of hardware development was around $80 million and an additional $5M for operating the helicopter.

Ingenuity was the name chosen by a young schoolgirl after a public vote organised by NASA.

There was some opposition to sending a helicopter to Mars, as many scientists and engineers simply did not believe that it was possible to send a helicopter to Mars nor that it could do useful science once it got there!

Ingenuity used twin counter-rotating 6-bladed rotors to both maintain stability and afford manoeuvrability. Because of the low air pressure each rotor spun at ~2600rpm. The 'copter was managed by an advanced avionics package, utilising a cellphone-like inertial guidance and inclination chips. It was powered by 2 solar panels charging up a Lithium-Ion battery pack with a total

capacity of 2Ah.

The main computer that handled all of the control systems was powered by a mobile-phone like Qualcom Snapdragon 801 processor running Linux OS. This interfaces with the visual sensors to provide outputs to the flight control micro-controllers. Ingenuity used a commercially available off-the-shelf high resolution camera [Sony IMX214, 13MP] alongside a lower resolution Omnivision OV7251 camera [250,000 px] to receive imagery data for navigation. By making multiple hovers over any terrain, from slightly different angles, the system is able to create stereo images to provide depth-of-field context. Using special on-board software the system is able to 'map-out' a route almost live, send it back to JPL for review, and then action the flight plan without much intervention from Earth – i.e. semi-autonomously – unless a serious obstacle is spotted that needs avoiding. Following landing, the first flight of Ingenuity was ~30m [NB The Wright Brothers first flight on Earth was ~50m long]. By September 2021 a total of 12 proving flights had been successfully achieved. This was the first review point when the program was then extended indefinitely. Shortly afterwards the flight software was updated to allow the 'copter to rise to more than 17m off the ground.

By October 2021 with Mars moving behind the Sun [solar conjunction], and hence out of direct communication, the 'copter was parked, awaiting the return of direct contact again. Once this was established some time was spent warming up the batteries – essentially an MOT – prior to restarting flights.

By May 2022, NASA became aware that the batteries were not performing as well as previously [probably due to the extreme low temperatures of the Martian night], thus limiting the available flight time. One month later the navigation sensors reported failings in the inclinometer performance, further limiting the ability of the 'copter to hover in a stable condition. By January 2023, solar power output improved enough to prevent further brown-outs [temporary loss of power to the systems] and computer reboots.

An illustration of the conceptual design for the Mars Science Helicopter, Ingenuity's proposed successor.

Credit: NASA/JPL - Caltech

An artist's impression of three different models of NASA's Mars helicopters. In the upper right is Ingenuity, currently operating at Jezero Crater. Depicted in the foreground is one of two Sample Recovery Helicopters slated to fly to Mars as part of the Mars Sample Return Campaign. In the upper center of the image is the Mars Science Helicopter concept, a proposed follow-on to Ingenuity.

Credit: NASA/JPL-Caltech

By March 2023 the 'copter restarted small range flights in the Jezero delta. During the ensuing months the communication link between the 'copter and lander was frequently lost – sometimes for many days.

The end of an amazing mission happened on January 25, 2024.

What comes next?

1) Sample-Return Helicopter – a proposal is being tabled for a mission to use a helicopter on Mars to collect rock samples for eventual return to Earth.

2) Mars Science Helicopter – essentially a mini-laboratory mounted in a hexa-copter [6 rotor] framework.

3) MAGGIE – a fixed wing Mars-plane.

Robert Williams

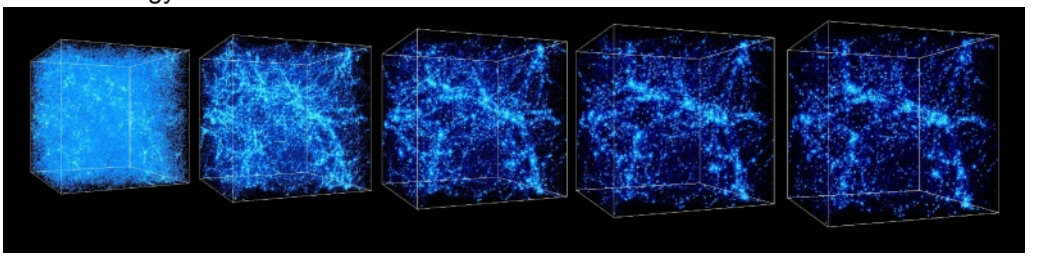
SCIENCE SLOT

Large Scale Structure of the Universe

From our vantage point on Earth we can only easily see a few 10's of thousands of light-years into the Universe with the unaided eye. However using modern telescopes we can see galaxies on a far grander vista, from our Local Group – up to distances of a few 10's of millions of Light years (Ly), to Galaxy Clusters, at distances of anything from 100's of millions to more than 10 billion Ly away. Whilst the Universe is thought to have started off as a point source, the effect of Dark Matter did – it seems – create tiny fluctuations in the density of the early Universe that have now evolved into some of the largest organised structures in our Universe today. The study of these large scale structures is providing a window how the Universe grew during its first billion years or so, and also how it might evolve billions or even trillions of years into the future, principally caused by the influence of Dark Energy.

So what has been discovered about these large scale structures and what insight might it provide about the future of our Universe.

Firstly the basics. Galaxies exist in isolation on small scales [<=1 million Ly apart], however on larger scales [10-100 million Ly] they form groups of from a few galaxies (for example our Local Group comprising the Milky Way, M31 and M33 as well as a number of smaller galaxies such as the LMC and SMC plus a multitude of dwarf galaxies [profiled in a previous Newsletter article]) to much larger graviationally bound clusters of hundreds of galaxies – for example the Virgo or Perseus clusters of galaxies – which themselves gather in even larger superclusters. From our point of view it is – relatively – easy to see these groups and how they have already interacted under gravity and likely will interact in the future.



A simulation showing the growth of structures in the universe under the influence of gravity (which includes dark matter) and dark energy.

Credit: Andrey Kravtsov, Anatoly Klypin, National Center for Supercomputer Applications.

Recent research is now challenging our existing ideas about these larger structures. In the last few weeks a huge ring of galaxies has been discovered. This structure is around 1.5 billion Ly in diameter and contains a mixture of discrete galaxies strung together – like a string of pearls - with larger galaxy clusters, comprising many 10's, 100's or 1000's of members. The appearance of this structure is apparently contrary to our existing ideas of the Cosmological Principle. This basically says that on a large enough scale, the view of the Universe is isotropic – the same laws apply to every point in the Universe - and homogeneous – the same evidence is available from any viewpoint, for all observers.

However there have always been some observations which challenge this assumption:

a) the Clowes-Campusano LQG structure which is ~550 MLy long.

b) The Sloane Great Wall – discovered during the Sloane Digital Sky Survey – which is ~1.5GLy long.

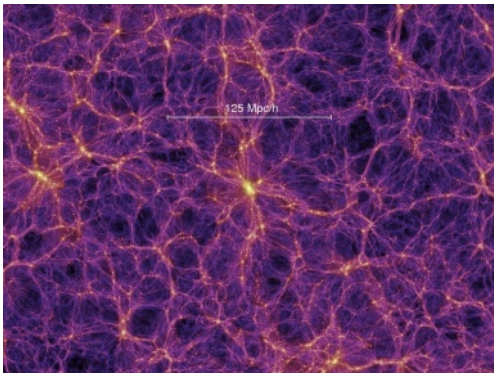
c) U1.11 – A massive cluster of Quasars which is ~2GLy in size.

d) The Huge LQG – which appears more than 2x the predicted maximum size of any galaxy cluster or string.

e) The Hercules – Corona Borealis Great Wall which is ~ 7-10GLy in size.

f) In 2020 a 4.9σ [~the chance of being incorrect is ~1 in 3.5 million] conflict was found between the kinematic explanation of the Cosmic Microwave Background (CMB) dipole and the measurement of the dipole in the angular distribution of a flux-limited, all-sky sample of 1.36 million quasars.

g) 2021 - a Galaxy structure – the Giant Arc - was located that is 3.6 GLy in size containing many galaxies, galaxy clusters, gas and dust – at a distance of ~10GLy .



The distribution of dark matter in a portion of the Millenium simulation.

Credit: the Virgo Consortium

Since the Universe came about there have been a number of epochs where different forces held court:

1) Approx <50,000 yr after the Big Bang: the Era of Radiation, where the CMB structured the Universe.

2) Approx 50,000 yr to 8 Gy: Era of

Matter, where the rate of expansion of the Universe slowed as matter was created and gravity held sway.

3) Approx 8 Gy to present day: the Era of Dark Energy, where the accelerating expansion is caused by an - as yet unidentified – source of energy, which may be vacuum energy.

Each of these have sculpted our Universe in different ways. Radiation created the scaffolding on which matter was deposited. The matter then created the vertices on which Dark Energy began to push the Universe apart.

There are some other projects currently ongoing to find out more about the way these three epochs have created the Universe we see today:

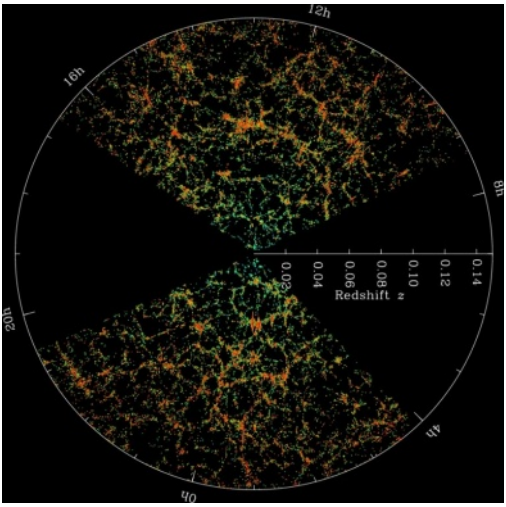
The Dark Energy Survey aims to map out how the structure of the Universe has moulded what we see. By looking back over specific timelines it is trying to understand how the large scale structure of the Universe evolved, under the influence of gravity.

Using data from the Sloan Digital Sky Survey (SDSS) and its associated spectroscopic surveys (SDSS-V) , data is being used to see if – when viewing at larger redshifts – the Universe appears differently. Moreover – if it does look different – can we work out what caused that, if it was not due to gravity alone. This will pin down more precisely the timing of any change in epoch as described above .

Fundamental to these investigations is a desire to locate when – and how – the four fundamental forces in the Universe 'budded off' from each other. We can segment the early history of the Universe in more detail than was done above:

• Planck Era: all four known forces are unified.

• GUT (Grand Unified Theory) Era: gravity "freezes out" and becomes distinct.



This figure shows the distrbution of galaxies out to about 2 billion Ly, as measured by SDSS. Note the similarity in structure to the simulations. Newer surveys will expand this distance by at least a factor six.

Credit: M. Blanton/SDSS

• Electroweak Era: the nuclear strong force "freezes out" and becomes distinct.

• Particle Era: particles begin to form.

• Era of Nucleosynthesis: nuclear fusion creates Helium, and tiny amount of heavier elements.

• Era of Nuclei: electrons are not yet bound to nuclei.

• Era of Atoms: electrons recombine with protons to form neutral atoms, and the first stars are born.

• Era of Galaxies: galaxies begin to form from gravity, leading up to the present day.

This is one of the hottest topics in Cosmology at the moment and it may be quite a while before any significant conclusions arise. Our simulations of the Universe don't exclude ultra-large structures, they only give us an indication of how rare they might be, if our current models of gravity and dark energy are right. As you might imagine, there is much debate over how rare the actual observations are – much of this comes down to the interpretation of statistics. Indeed, the existence of these giant structures is questioned by some, who argue they may be just chance alignments.

Robert Williams

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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

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.

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The penultimate week in December provided the UK with a rare display of nacreous clouds (otherwise known as Polar stratospheric clouds). This shot was taken around 2pm on December 24th 2023

Credit: Kevan Hubbard.

The effects of atmospheric refraction, when light travels through different densities and temperatures of air, distorting the rising sun. There is also a faint " sun spike" towering vertically from the Sun, caused by ice particles in the atmosphere. Taken with an Iphone in Kielder Forest on Tuesday 16th January 2024 at 08:30.

Credit: Denis Lambert

"The evening was great...lots of variety which kept the kids entertained..The st aff were so welcoming and knowledgeable... really great that despite the weather we still got to see real images through the telescope. We will definitely be back and will recommend to friends!"

Alison, Doncaster

GALLERY

Nacreous clouds taken on December 21st by our Director of Astro-Imaging Dan Monk

Kielder Mugs on tour. Well, OK, so the top one is quite close to home, but on the left we have Tromso, Norway, taken by our own Ishbel Carlyle.

Aurora and STEVE from Norfolk, 5th November 2023 at 18:54.

Credit: Duncan Hale-Sutton

GALLERY

Frosty the Snowman visited the Observatory ...

GALLERY

Sunrise over chimney pots - November 2023

Credit: Kevan Hubbard

More nacreous cloud from December 24th

Credit: Kevan Hubbard

Orion is now prominent in the evening sky. Here is everyone's favourite object, the Great Nebula, Messier 42.

Credit: Natasha Lund, KOAS

"The team and the event were absolutely fantastic. Incredibly knowledgeable and so willing to share that knowledge to ensure everyone had a great experience. Limitless patience with novices like myself and the guidance from the team meant that I came away with some great photographs from the event. I also had the opportunity to look through the telescope and frankly it blew me away as did the desire of the staff to make sure that part of the night was every bit as great as the photography an absolutely outstanding night and I am now hooked on astronomy. This was one of the best events I have attended."

Jim, Carluke

Kielder Observatory - a beacon for dark skies

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