Spring 2022 Number 35

Kielder Observatory Newsletter

EDITORIAL

We are now well into 'galaxy season' with the Virgo supercluster with all its Messier objects high in the south. But the nights are getting lighter and soon so-called 'astronomical darkness' will vanish from Kielder until August. But don't worry - the centre of our galaxy rises in the south in summer, bringing with it some of the finest nebulae in the sky. In this edition, Robert Williams takes an in-depth look at the astronomical uses of the electromagnetic spectrum, while Durham University student Jodie Kelly tells us about her third year project designing material to inform the public about the new radio telescope.

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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KIELDER OBSERVATORY
Infinite Inspiration

Front cover: No explanation needed!
Rear cover: The Milky Way rising - Dan Monk.

We have welcomed yet another new trustee into our fold! Charlotte Emmett joined us in March.

Charlotte is an Associate Professor of Law at Northumbria University Law School where she researches mental health and mental capacity law. She has worked at Northumbria for over 20 years and during this time has sat on the School's Senior Leadership Team, was Director of Education and a member of the Faculty of Business and Law Ethics Committee. In a former life she was a solicitor in private practice specialising in personal injury and civil dispute resolution.

Charlotte lives under the dark skies of Northumberland National Park, close to the village of Greenhaugh, Tarset. She loves the surrounding countryside and wildlife and is a keen gardener and beekeeper. She is married with two grown-up sons.

The trustees have already met twice this year, for a standard Board meeting in February (on Zoom) and then for a longer strategy session in March, which was mostly in person (at long last). One thing which the pandemic has done is made it much easier for trustees who cannot be

present in person, due to e.g. work committments, to join remotely. Previously they would probably have just sent their apologies.

The next job will be to submit our Annual Report and Accounts to the Charity Commission, which the trustees are obliged to do each year at around this time. These are then made available for the public to read.

Small Visitor Attraction of the Year

North East England Tourism Awards 2022

Gold Award Winner

OBSERVATORY NEWS

Don't they scrub up well! The team celebrating having won the Small Visitor Attraction of the Year Gold Award at the North East Tourism Awards ceremony.

The big news is that we have won the North East Tourism Small Visitor Attraction of the year Gold Award for 2022. The awards were announced at a ceremony at Newcastle Civic Centre on Thursday March 24th, to coincide with English Tourism Week. BBC Radio Presenter Alfie Joey presented the awards and winners on the night. Many of the team turned out in their finery to receive the award. It is not the first time the Observatory has won this award. We took gold in 2015, having won the silver award in 2014.

There are now more tickets available for events at the Observatory. We've reviewed our COVID procedures and visitor feedback and feel confident that we can increase numbers to 36 for our main events. We appreciate everyone's patience - demand for tickets has been extraordinarily high but we felt we had to

take things slowly and increase numbers gradually. As ever, book early to avoid disappointment, or keep an eye on our Facebook page for last minute cancellations.

As we mentioned in the last edition, NORSS have been installing some of their tracking cameras at the Observatory. Here is their shed!

In other news, we have been awarded money from The Reece Foundation who are helping support our STEM to Stars programme, working with children to encourage them to investigate careers in STEM
https://kielderobservatory.org/news/latest-news/230-hundreds-of-youngsters-to-benefit-from-stem-to-stars-project
This will enable us to send our teams out into 45 more schools across the North East.

We have also launched Frank's Fellowship - a bursary for young artists aged 14-18 in Northumberland who can apply for £250 to help them develop their practice. This was set up thanks to Frank Fortescue who left a gift to the Observatory after his passing. He loved the dark skies and art, so his family wanted to use the money to help others use the observatory as a spark of inspiration. Applications have just closed for first round, and successful applicants will be contacted shortly.
https://kielderobservatory.org/news/latest-news/229-frank-s-fellowship

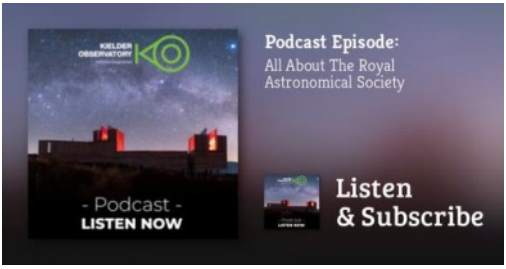
We are planning a beacon viewing event at the Observatory on 2nd June for the Queen's Jubilee. Further details will be given nearer the time.

For International Dark Sky Week at the end of April, we ran a little campaign to #shareyoursky and encouraging the public to take their own astro-images and share them with us via social media or email. We wanted to see what other people see when they look up from wherever they are in the world, whether in the middle of a city centre or out in the sticks somewhere on a clear night. We will share them and use them to show the different things people see when they look up at night.

OBSERVATORY NEWS

As a thank you to those who support the lottery (and hence good causes like ourselves!), we gave out free star charts to visitors who came with a lottery ticket during National Lottery Week at the end of March.

As ever, we have some new podcasts out for you. A couple of months ago we held a live "Ask An Astronomer Special" with our own Directory of Astronomy Dan Pye, then last month we interviewed Dr Robert Massey about the Royal Astronomical Society. Just as went to press, our latest live podcast was broadcast to coincide



with International Dark Sky Week, with a link to the Royal Observatory Greenwich, and guests from New Zealand celebrating dark skies. Find all our podcasts at https://podfollow/kielderobs/view.

In the media, Land Rover magazine named us as one of the UK's best stargazing spots.

One of our volunteers, Ant, featured on BBC Radio 4's "The Listening Project" in April, talking about dark skies, whilst Science Communicator Finn Burridge gave his "Top tips for beginner astronomers" for Dennis Maps as part of their "Five incredible spots to stargaze" (which of course included Kielder).

We have been neglecting our duties slightly, as we have failed to introduce our new Operations and Marketing Director, Hannah Matterson. Hannah has worked in a variety of roles over the last ten years, including as CEO of music talent development agency generator,

Hannah Matterson

Innovation Partnerships Developer with Manchester Metropolitan University and as a fundraiser and development manager for a number of cultural organisations across the North East. Hannah joined us

at the end of last year and says "I'm thrilled to have joined the team at Kielder Observatory. Astronomy is such a fascinating subject, one which I'm learning more about each day, and I can't wait to put my knowledge and experience to good use to help the observatory further develop its offer to those across the North East and beyond."

KIELDER OBSERVATORY
Infinite Inspiration

" Fantastic time, staff were very knowledgable and friendly- very passionate which made it an amazing evening and great experience. Fab place."

Megan, Newcastle

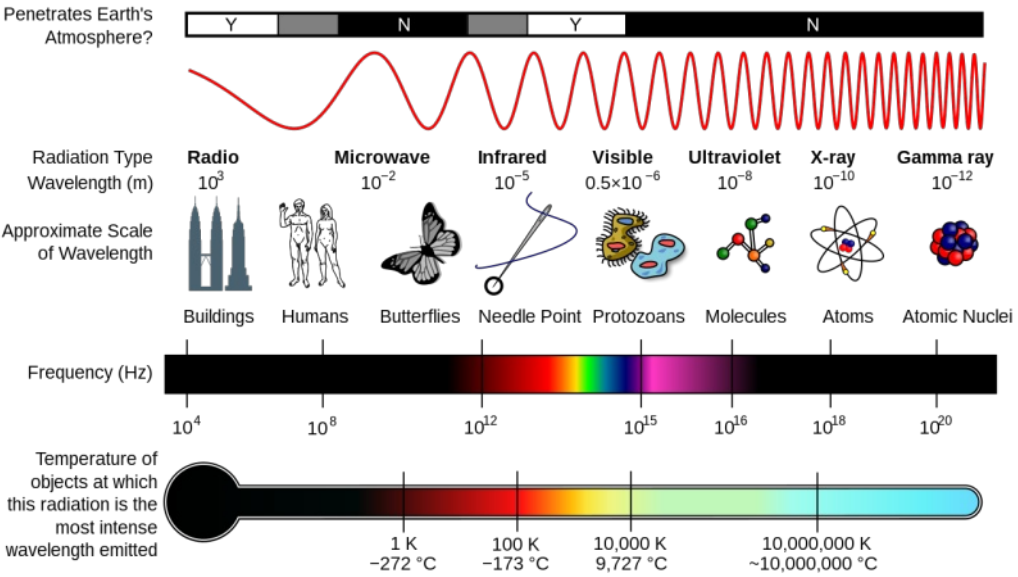
SCIENCE SLOT

What is Light?

At first glance the answer to this question seems simple enough – light is given off or reflected by the things we can see. However, light is a bit more complicated than that.

Most people will experience light in a number of forms without realising that they are 'light'. In this context 'light' should really be termed electromagnetic (EM) radiation, which gives a strong hint about how it is formed – from a combination of electrical and magnetic forces. But not everything in the Universe radiates every form of EM radiation. The EM spectrum covers a wide range of 'light' from the very short wave gamma and X-ray radiation at one end to ultra long radio waves at the other end of the spectrum. In fact, if you compare the two, the range covers more than 20 orders of magnitude [i.e. 1 followed by 20 zeros].

Light has been known about since ancient Greek times. They understood that it travels in straight lines and can be reflected and refracted. During the Renaissance [16th/17th c.] light was shown to have both wave-like and particle-like properties. However, major advances in our understanding came in the 19th century. In the year 1800, William Herschel discovered infra-red radiation, He did this by splitting up light using a prism and then, by passing a thermometer across the spectrum, found 'invisible' light beyond the red that caused the thermometer to change temperature. He called them Calorific Rays. A year later Johann Ritter discovered 'chemical rays' beyond the blue end of the visible spectrum, which became know as ultra-violet light. In 1845 Michael Faraday made the link between 'light' and magnetism, when he noticed that polarised light responded to the presence of a magnetic field. In the 1860s James Clerk Maxwell developed the four key equations to describe the interplay between electricity and magnetism, and concluded that light must travel at a fast but finite speed. In 1886, based on Maxwell's predictions, Heinrich Hertz constructed the first device to produce radio waves. In a follow-up experiment he identified microwave radiation. In 1895 William Rőntgen discovered X-rays whilst experimenting with a vacuum discharge tube connected to high voltages. Finally, in 1900, Paul Villard discovered gamma rays whilst exploring the radioactivity of the element radium. Ten years later WH Bragg showed that these were indeed EM rays and not high energy particles.



The energy of a EM wave is related to its wavelength by the formula $E=hc/\lambda$, where h= Planck's constant [6.63×10^{-34} m^2kg/s], c= speed of light in a vacuum [3×10^8 m/s – approximately!] and λ is wavelength - measured in meters. So, for example a single photon of green light with a wavelength of 500nm [5000Å] will have an energy of 0.00000000000000003978 Joules – i.e. not much! However if you have a lot of them it can add up. The Sun releases 3.8×10^{26} photons every second and if you multiply these two numbers together you get 153 MJ of green light energy every second.

Each type of 'light' has distinct effects in the medium through which it travels. Taking each type in turn:

1) Radio waves – because of the work of Marconi we are very familiar with radio waves. I am sure that some of you will remember the radio station at 247m medium wave, so many years/decades ago (Radio 1, for our younger readers)! Radio waves are – because of their long wavelength - very low energy, which for us is a good thing! They can also travel very long distances without being attenuated. This is why radio astronomers – for example at Jodrell Bank Radio Telescope in Cheshire – can view objects at great distances. These include radio galaxies,

the Sun, the Moon, other planets, comets, asteroids and more. In recent times the airwaves have been filled with music and voice carried on higher frequencies – in the region of 100MHz. These have a wavelength of ~3m, and are able to carry more information, but cannot propagate over such large distances.

2) Microwaves. So, hands up who doesn't have a microwave in their house? Probably not many. These form the band ranging from about 1m to 1mm wavelength, corresponding to frequencies between 300 MHz and 300 GHz. Here we find the region where 3G, 4G and 5G [λ ~10cm to 1 cm] lurk. This is one of the reasons why some people think that mobile phones are microwaving our brains – but rest in the knowledge that the power of mobile phone signals is too low to cause any harm. The heating effect of microwaves relies on the water molecule. H_20, to give it its chemical name. The bonds that hold the hydrogen atom to the oxygen atom can do two useful things: they can bend and they can stretch – and it is these properties that respond to microwaves when you stick your TV dinner in the oven. As the bonds bend/stretch they absorb energy then relax and re-emit that energy in the form of heat – warming up your food. The more water-like bonds in your food the more rapidly it will heat up and the hotter it will get.

In space there is lots of water and also lots of microwave energy in the form of masers. A maser is to microwaves what a laser is to visible light. When atoms move back-and-forth in synchronisation within a medium that can absorb energy of a particular wavelength, the 'light' is amplified. Around hot stars (especially in clusters) dust and gas can get stirred up in such a way as it all flows in the same direction absorbing and then re-emitting microwave energy, creating a maser . This then beams powerful microwaves across vast distances in space. Masers were first identified in space (by chance) in 1965, from an emission line seen at 18cm (1665MHz) – which corresponds to the OH radical [essentially a form of ionised water]. Since then other molecular masers have been discovered in vast, rotating and collapsing gas clouds containing methanol [CH_3OH] and carbon monoxide [CO]. CO is one of the most common molecules in space after H_2. It is often found near highly evolved red giant ['Carbon'] stars where the carbon soot has combined with oxygen from a deeper layer of the star and then been ejected into a cloud around the dying star. Many masers are found in external galaxies – such as quasars – but more modest masers are also found in the tails of comets. Currently 13 molecules

have been identified forming astrophysical masers. These include quite a few of the 'building blocks of life'. The most powerful masers so far identified are located around quasars and active galactic nuclei. Some of these are billions of lightyears away. One, TXS2226-184, which was discovered using the Very Long Baseline Array, is a Seyfert Galaxy which has a so called Gigamaser, about 100Ly in diameter, and is close to Markarian 273 in Ursa Major, which also sports a Megamaser. These clouds contain millions/billions of solar masses of water and other molecules and being in a region of galaxy mergers there's lots of energy pumping the masers into action.

3) Infra-red (IR). With a bit more energy, we are more familiar with the heat given off by warm bodies. Every object at a temperature of >0K [-273.15^{o}C – Absolute Zero] gives off IR energy in the form of black-body radiation. The Sun generates vast quantities of IR radiation. This has a wavelength of typically 700nm to 1mm [frequency of 430THz to 300GHz]. The JWST has a detector designed to pick up IR signatures from any 'warm body'. Similarly to microwaves, IR radiation causes molecules to rotate and molecular bonds vibrate. In space, IR astronomy is very useful in probing a wide range of astrophysical objects. It can be used to 'see' every object in the solar system. Some planets, such as Venus, [Earth], Jupiter and Neptune are active emitters of IR radiation. All other objects are passive emitters – i.e. they reflect solar radiation. This can still be used very successfully to probe these 'dark' objects. As early as 1856 IR radiation from the Moon was being recorded, by Charles Piazzi Smythe, the then Astronomer Royal of Scotland. With the advent of better detectors, the field of IR astronomy mushroomed in the 20th century and IRAS – the first IR Space Observatory – was launched in 1983. This was most recently followed by the Spitzer Space Telescope – named after Lyman Spitzer - launched in 2003 and still going, though its main mission ended in 2009 when it ran out of coolant for its detectors [they have to be kept colder than space itself for them to work!]. Sometimes, IR astronomy in deep space works better than visible light. This is because IR, being longer in wavelength, can pass through dusty clouds, whereas visible light [and shorter wavelengths] cannot. This is why views of dusty nebulae – such as the Eagle Nebula [M16] can look dramatically different when comparing the view in visible light with that taken in IR light. Visible shows the stars, IR shows the dusty clouds about to become stars.

SCIENCE SLOT

The Trapezium cluster in the Orion Nebula. On the left is the view of glowing gas and dust in visible light, on the right that in the infrared, which penetrates the dust and reveals the underlying stars. ***Credit: NASA***

The JWST is certain to make new and exciting discoveries about the dusty Universe. If it has the same impact as the Hubble Space Telescope has had for visible astronomy we are in for many years of astonishing discoveries. Since the JWST uses passive cooling – as compared to IRAS or SST, it should hopefully maintain its instruments cold enough for many decades of work.

4) Visible light. What we can see of the Universe depends on two key factors:

1) Objects that give off light by the astrophysical processes taking place within them

2) Objects that absorb other radiation of shorter wavelength from their surroundings and re-emit light in the visible waveband – e.g. the Moon!.

A leaf is not green because it emits green light – though some plants [and animals] do fluoresce - but because the pigments [Chlorophyll] in green leaves absorb all of the other colours of the spectrum. The visible part of the spectrum occurs at a wavelength of 400 to 700nm. This is about 1/2000th of a mm. Stars emit a considerable amount of their 'light' in this waveband. The peak wavelength of their emission is determined by the surface temperature of the star. Wien's Law states that: $\lambda_{peak}=b/T$, where b is a constant and T

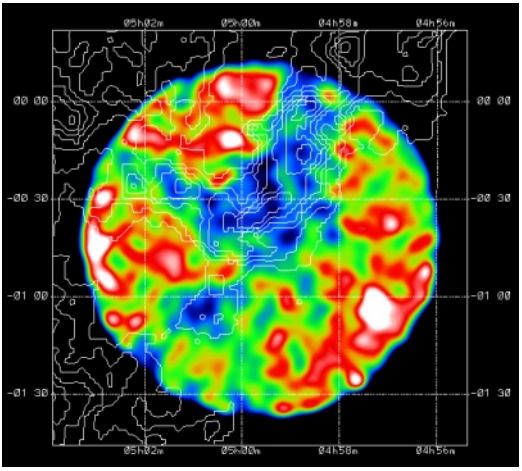
the temperature of the star. For the Sun its peak occurs in the green part of the spectrum at ~500nm. It just so happens that our eyes are most sensitive to this part of the spectrum. For hotter stars [e.g. Deneb, Rigel] this peak is pushed towards the blue/ultraviolet and for cooler stars [e.g. Betelgeuse, Omicron Ceti] it is pushed towards the red/IR part of the spectrum. As a comparison the human body radiates of most of its energy at ~9.5μm wavelength. So for a little exercise let's look at the Cosmic Microwave Background radiation at a temperature of ~2.7K. Plugging this number in gives us λ_{peak}= ~1.1mm. Visible light causes or is caused by electronic transitions in the outermost electrons of the atoms of an object. The nature of what those atoms are or how they are connected to other atoms determines which wavelengths of light are absorbed or emitted. The best method to understand this is fireworks! Every element in the periodic table – when burnt - generates light of a particular colour. For example all of the noble gases [Hydrogen, helium, neon, argon, krypton, xenon and probably oganesson] all glow red when excited in an electric arc discharge tube. Sodium always glows yellow. Potassium always glows with a lilac colour. So, as well as the background black-body radiation, if we see an emission or absorption line in the spectrum of an astrophysical body we instantly know what that object is composed of from the colour. There is a slight complication that the expansion of the Universe causes the light from distant galaxies to be shifted to the red, BUT the relative positions of the lines do not change. A fact exploited by Edwin Hubble to actually discover the expansion of the Universe!

5) Ultra-violet. UV light is given off by objects at least as hot as the corona of our sun. Using Wien's law again, UV light with a wavelength of 100nm requires a black body with a temperature of ~2.77×10^6 K. The Earth's atmosphere absorbs quite a bit of the ultraviolet light (fortunately, as it is harmful to humans) so most telescopes observing in the UV either have to be at the top of a high mountain above ~90% of the Earth's atmosphere, or in space. Astronomy in the UV waveband mainly looks at the violent processes happening in young stars, supernovae, galaxies and collisions and extreme objects such as neutron stars and black holes. To date there have been ~20 UV telescope missions launched into space and about 10 spacecraft based systems.

The processes by which UV light is

emitted are similar to that for visible light but involve heavier atoms or bigger molecules. Astrophysical objects with temperatures in the range ~3 million to ~120 million Kelvin give off most of their light in the UV.

6) X-ray Astronomy. The heaviest of stars, neutron stars, black holes emit most of their light in the X-ray. Our Sun also emits X-rays, but not much compared to UV and visible light. X-rays occur in the wavelength range 10^{-11}m to 10^{-8}m. At this wavelength they are often referred to by the energy of the photon. This equates to 124eV to 124 KeV, where 1eV~1.6x10^{-19}J. X-ray - Wikipedia. Early X-ray satellites were only able to locate the position X-rays came from to within a wide arc [~10º] of the sky. However, as technology improved both the positional location and energy of the X-ray source could be more accurately determined. The very first X-ray astronomy was done in 1927 by the US Naval Research Observatory. As early as the 1930's it was recognised that the solar corona gave off X-rays and in 1948 the very first payload was launched [Project Hermes]. Today scientists are learning more about the true morphology of astrophysical x-ray sources. In doing so a new type of object has been detected. Stretching between the constellations of Orion and nearby Eridanus is a soft X-ray



This is a ROSAT false-color X-ray brightness image of the Eridanus Bubble. X-rays are emitted by hot gas (~2-3 million °C) in the interior of the bubble. Imprinted on the image is a "shadow" of a filament of gas and dust, shown by the contours, which represent 100μm emission from dust at a temperature of about 30°K (30° C above absolute zero) as measured by the IRAS satellite. This filament absorbs the X-rays, indicating the hot gas is located behind the filament. ***Credit: NASA***

'hot spot' known as the Eridanus Soft X-ray Enhancement, or simply the Eridanus Bubble, a 25° area of interlocking arcs of Hα emitting filaments – including Barnard's Loop.

In the future, further exploration of the X-ray universe is planned to investigate objects as diverse as the corona around nearby stars [e.g, α Centauri], Brown

Dwarfs, stellar winds around A-class stars, cool M-class stars, strong X-ray emission from Herbig Ae/Be stars, K-class Giant stars and Eta Carina in the southern sky. At the moment amateur X-ray astronomy is very new - but it is a growing area of exploration, using 'self built' equipment. These are currently packages constructed by universities and launched into space by NASA.

7) Gamma Ray astronomy. The most energetic form of 'light', with photons of energy >=100KeV. The current record holder for a gamma ray (GR) observation is an energy of 1.4PeV [1.4×10^{15}] detected on 18th May 2021 in China. This equates to an object with a temperature of ~2 million million K, some 200,000x hotter than the core of the Sun! Only available since the 1960s, the technology for observing GRs from outer space has improved dramatically in recent years, not least with the launch of the Chandra satellite in 1999. Ground based observatories are also are able to detect GR photons above 30GeV in energy [much of the GR spectrum is absorbed by the Earth's atmosphere – thankfully!]. TeV GRs were detected from M1 [the Crab Nebula] in the 1980s. Many missions observing the Sun from space have GR detectors. GRs were detected from SN1987A in the LMC, using simple scintillation detectors based on sodium iodide crystals. This is because lighter elements than iron are unable to deflect GR photons. Usually heavy metal [e.g. tungsten] mirrors are used to reflect the photons at very narrow [$<1^{o}$] angles into the detector using a 'Lobster's Eye' arrangement of nested spherical mirrors, similar in shape to the petals of a peony flower. The SWIFT Satellite launched in 2004 has been ground breaking in being able to detect and locate GR astrophysical sources for further study by other satellites and observatories. The future is undoubtedly in being able to observe objects at many/all wavelengths of the spectrum.

So, when you go out on a clear night to observe any object of the night sky be aware that if your eyes were sensitive to other parts of the EM spectrum your view of the night sky would be very different. Cases in point..... please ensure you have a LARGE TV to view these links:

The Eagle Nebula – Herschel Space Observatory
Hyperwall: Milky Way Center in Multiple Wavelengths
Crab Nebula in Multiple Wavelengths

Robert Williams

NIGHT SKY

MAY 2022 (times in BST)

Lunar phases

First quarter	09/05/2022	01:28
Full moon	16/05/2022	05:14
Last quarter	22/05/2022	19:43
New moon	30/05/2022	12:30

PLANET SUMMARY

Mercury will be a challenging object visible low in the west after sunset. Venus will not be visible this month. Mars will be visible low in the east at dawn. It will be close to Jupiter which will be considerably brighter and can be used as a signpost for Mars. Saturn will be visible in the east in the morning twilight. Uranus will not be visible this month.

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.

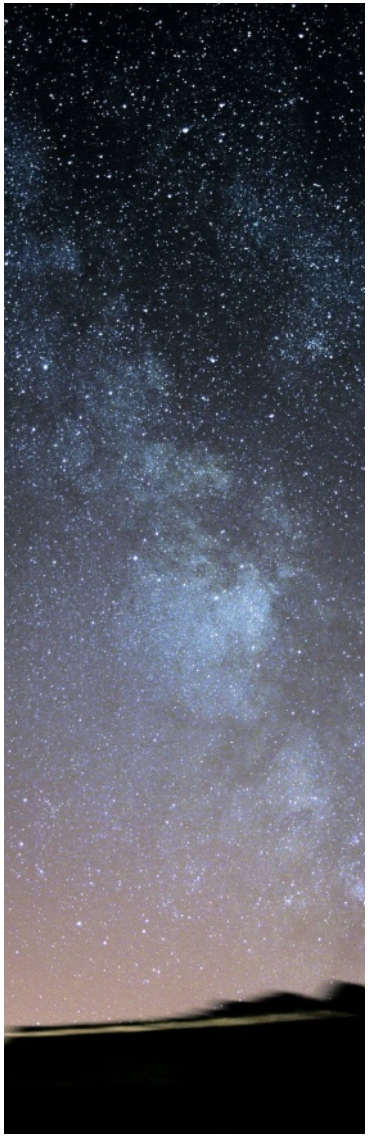
COMETS

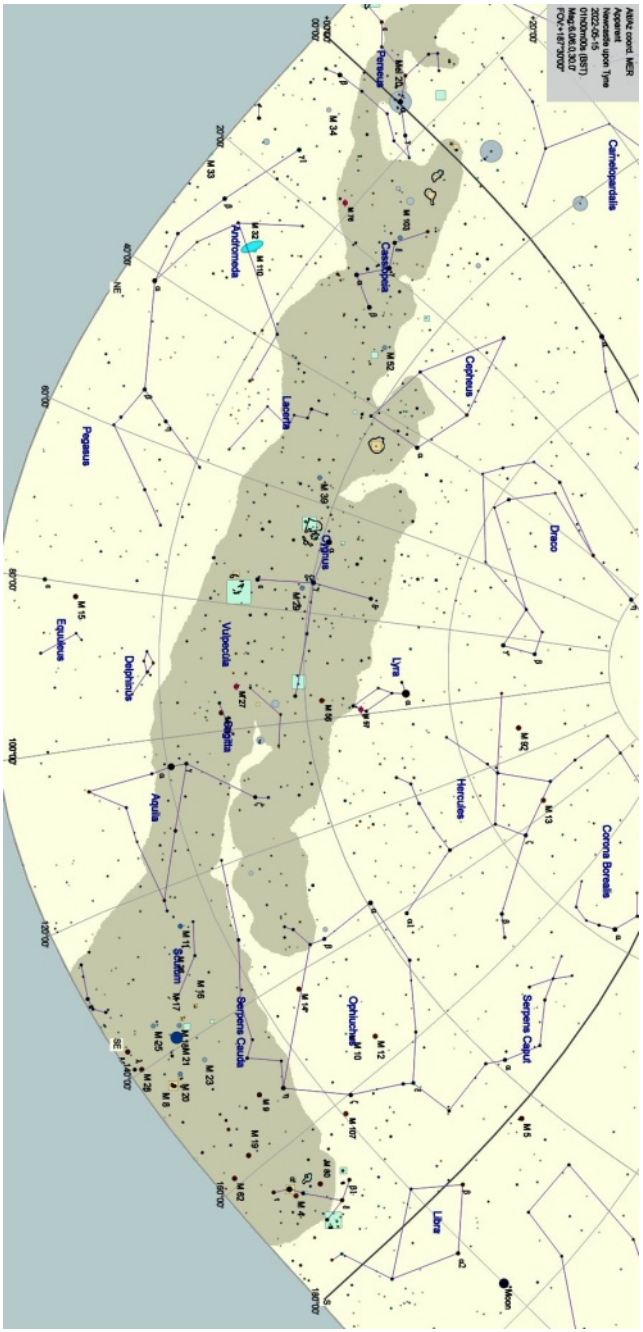
There are no bright comets visible in May, although it may be worth keeping an eye on comet C/2017 K2 Pan-STARRS, currently at 10th magnitude but expected to brighten as it approaches the Sun later in the year.

The Planets 15/05/2022

	Sun	Moon	Mercury	Venus	Mars	Jupiter	Saturn	Uranus
Rise	04:57	20:27	05:17	04:03	03:31	03:38	02:44	04:43
Set	21:07	05:00	22:00	16:56	14:48	15:37	12:02	20:05

The sky chart for Newcastle looking E at 1am on 15/05/2022.





NIGHT SKY

JUNE 2022 (times in BST)

Lunar phases

First quarter	07/06/2022	15:48
Full moon	14/06/2022	12:51
Last quarter	21/06/2022	04:10
New moon	29/06/2022	03:52

PLANET SUMMARY

All of the Planets this month are morning objects. Jupiter and Saturn will rise 3 to 4 hours before the Sun so may be seen in moderately dark skies. Mars, Uranus, Venus and Mercury will all line up in the eastern sky before dawn. Venus and Mars can be used as a signpost for Uranus, with Mercury rising just before the Sun.

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.

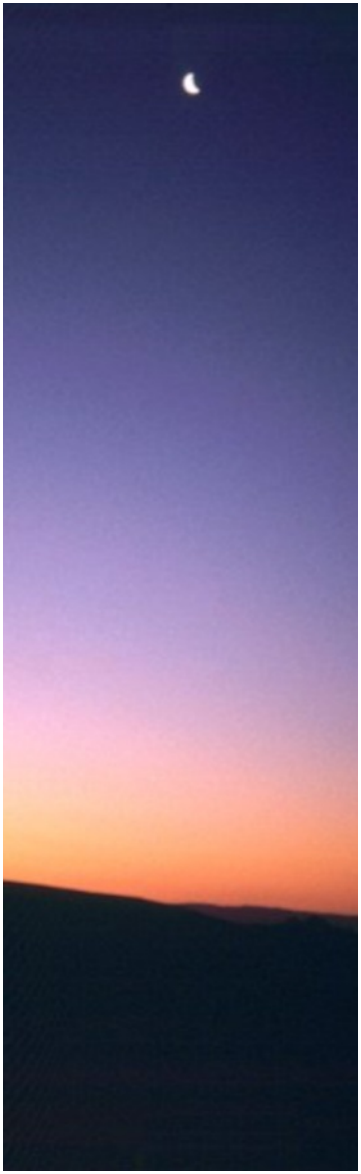
COMETS

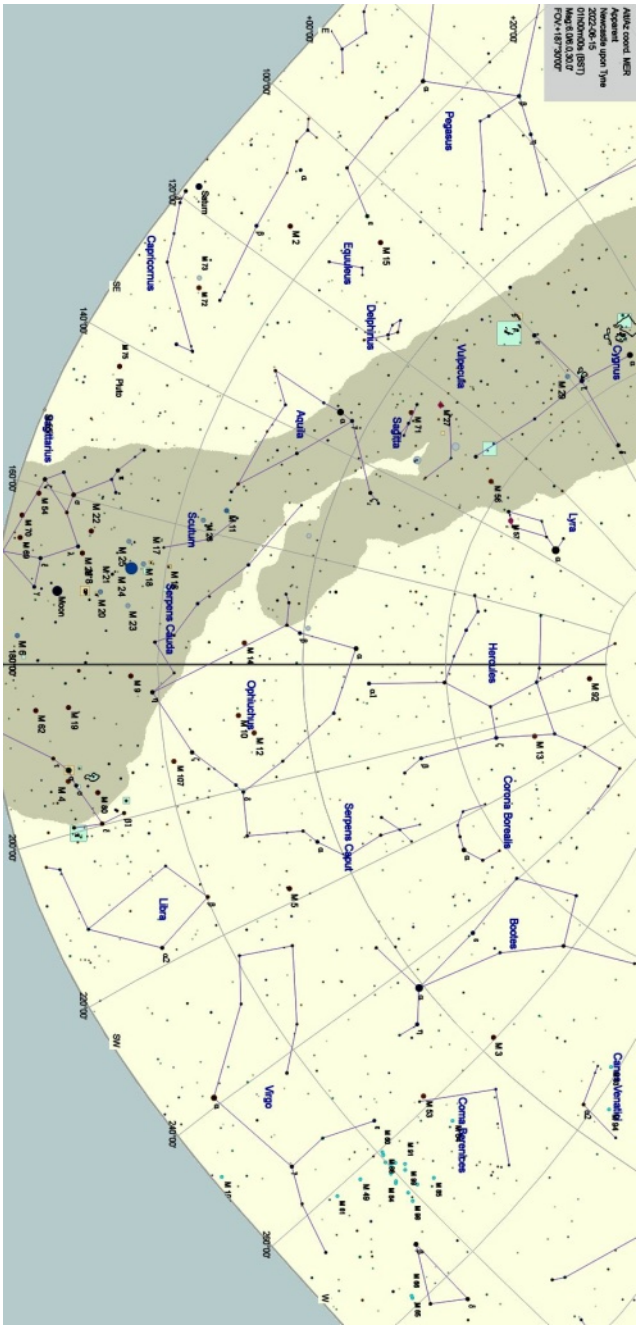
Check on the behaviour of C/2017 K2 Pan-STARRS. There are no other comets brighter than magnitude 10 expected in the sky this month. Weekly comet updates can be found at http://aerith.net/comet/weekly/current.html or https://in-the-sky.org/data/comets.php

The Planets 15/06/2022

	Sun	Moon	Mercury	Venus	Mars	Jupiter	Saturn	Uranus
Rise	04:24	22:33	03:44	03:04	02:02	01:44	00:43	02:44
Set	21:46	04:40	19:17	18:29	15:01	14:04	10:01	18:13

The sky map looking S from Newcastle at 1am on 15/06/2022.





NIGHT SKY

JULY 2022 (times in BST)

Lunar phases

First quarter	07/07/2022	03:14
Full moon	13/07/2022	19:37
Last quarter	20/07/2022	15:18
New moon	28/07/2022	18:54

PLANET SUMMARY

Mercury is in conjunction with the Sun. Venus is visible in the morning twilight. Mars, Jupiter and Uranus are all quite close in the sky. Saturn is visible throughout the hours of darkness [approx. 2300 to 0300].

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 C/2017 K2 Pan-STARRS is still getting closer to the Sun and may be visible in binoculars.

NOCTILUCENT CLOUDS

Be on the look out for these amazing cloud displays.

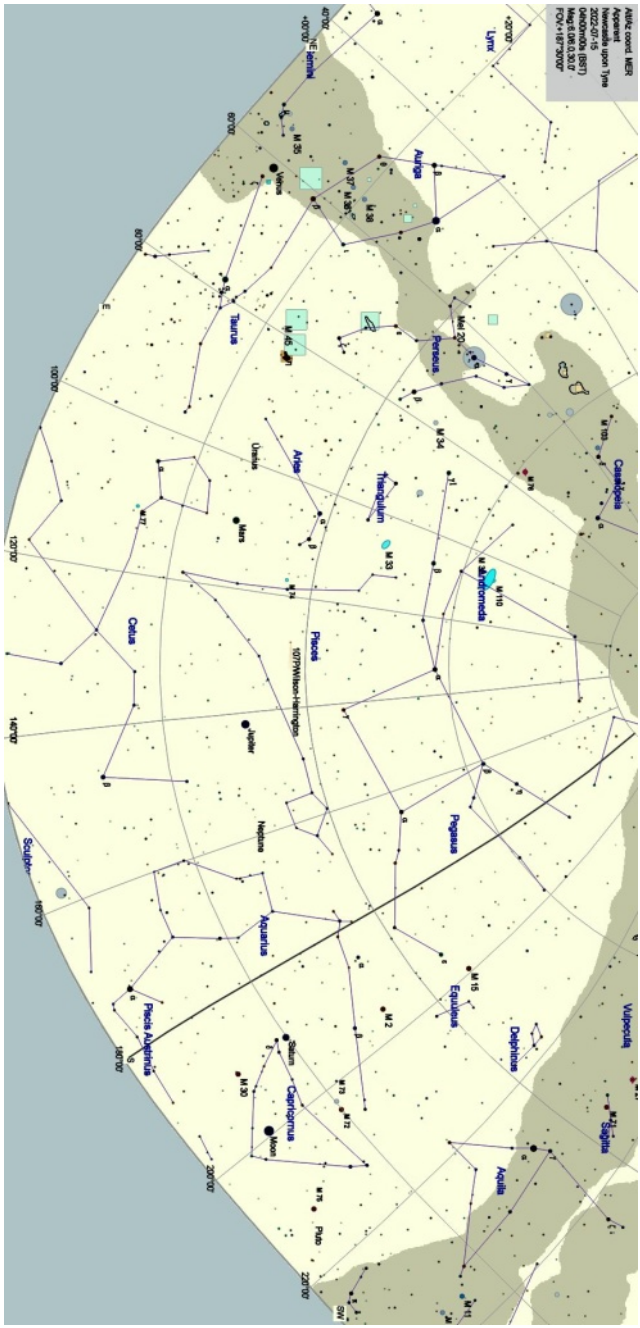
The Planets 15/07/2022

	Sun	Moon	Mercury	Venus	Mars	Jupiter	Saturn	Uranus
Rise	04:44	22:53	04:28	02:47	00:38	23:51	22:44	00:49
Set	21:36	06:22	21:41	19:49	15:09	12:21	07:58	16:23

The sky map looking SE from Newcastle at 4am on 15/7/2022.

Night Sky credits:

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



ASTRONOMERS' TALES

Public Outreach at Kielder Observatory

I was fortunate enough to be given the opportunity to work with Kielder Observatory on my Level 3 Public Engagement project. I had already planned to do a project surrounding space and telescopes so being provided this opportunity was more than I could have asked for and has easily convinced me to consider a job in the science outreach sector after university. The project was to teach public attendees and volunteers at the observatory about Kielder's new radio telescope, which you may have read a bit about in the Summer 2020 newsletter, and the importance of radio astronomy through the use of booklets and a short talk.

The new Spider five metre radio telescope was a fantastic piece of equipment to be able to work with for my project and I look forward to attending future events at Kielder where said telescope is used. In order to properly explain the usage and importance of the radio telescope, I gave a brief presentation on the subject at the observatory, highlighting the key differences between a radio telescope and an ordinary, optical telescope. These are, summarised, that radio telescopes, operating with radio waves as opposed to visible light, can be used during the day, and can even be used on cloudy days. They can also be used to see astronomical objects through obstructions such as galactic dust. This means that while optical telescopes are useful only at night and with clear skies, radio telescopes eliminate these obstacles and allow Kielder's astronomers and volunteers to hold events regardless of the time of day or weather. The booklet, which was handed to guests to peruse during the talk, pertained to information regarding

the operation and usage of the radio telescope, as well as using photography to illustrate the key differences between a radio telescope and an optical telescope.

In order to gauge the personal responses of the attendees of my talk, I prepared a simple questionnaire for the audience to voluntarily fill out at its conclusion. It used questions ranging from 'would you recommend this talk to a friend' to 'Is there anything you would improve about this talk and/or booklet?'. I found the feedback to be incredibly useful in understanding how my talk was received in the most simple and concise format possible.

There were a multitude of issues that I was both worried about and excited for when I first started putting together the booklets to present at Kielder. This was the first official public outreach project that I had ever undertaken, and I was extremely nervous about such a personal and potentially disastrous undertaking. However, my fears were immediately quelled by the kind and light-hearted nature of the Kielder team who, while still running a tight and efficient ship, made me feel right at home almost immediately on arrival. Honesty seems to be the key word at Kielder, when I made no sense, the team let me know, and they also knew exactly when to tell me that work had to be redone and to keep to their higher standards in a kind and polite way. They conversely also let me know what they loved about my work with the observatory and showed great enthusiasm to the booklet, whilst still letting me know what I needed to improve upon. I can truthfully say that there is not much more I can ask for in a professional, working environment.

The attendees themselves, members of the public who booked Kielder for reasons ranging from simple stargazing to learning more about the science behind the cosmos, I found to be deeply engaged throughout my talk, taking on my information, and providing highly useful feedback. Before I arrived at Kielder, I was worried that my talk on the radio telescopes would be considered far too advanced and filled with scientific jargon for the public to receive, but by sitting in on a talk given at the observatory earlier that year, given by Ellie MacDonald, I learned the exact kind of language and information that could be used in these types of public outreach.

I personally do not feel at ease giving public speeches in any situation and was

ASTRONOMERS' TALES

wary that my nerves would lead to utter embarrassment and failure. However, while I may have stumbled somewhat during my talk, I managed to give what was received as a 'very interesting' and 'well presented and informative' speech. This I attribute not only to my own personal work on improving my public speaking skills, but also from the advice of the Kielder staff and team who let me know how they themselves had gone through the very same thing and that everyone must start somewhere. With this advice in mind, I went on to give a well-received and informative talk.

It found it highly rewarding to finally achieve my goal of working in an observatory and I was lucky enough to get to work in Kielder Observatory. I found not only the facility itself interesting and exciting, but also the staff who made me feel like one of the team from the very get go. Special thanks goes to Prof. Alastair Edge who connected me with Kielder Observatory, supervised my work and served as a constant source of reassurance. From my time here, I have truly come to see myself in a career in astronomy in the future and can only hope that one day I come to work at an institution as professional and personal as Kielder Observatory.

Jodie Kelly

Jodie is a third year student at Durham University studying for an MPhys degree in Physics & Astronomy. This work was done as part of her Public Engagement in Physics module, which will count towards her final degree.

Not been to Kielder Observatory yet?
Then why not book one of our events for you 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

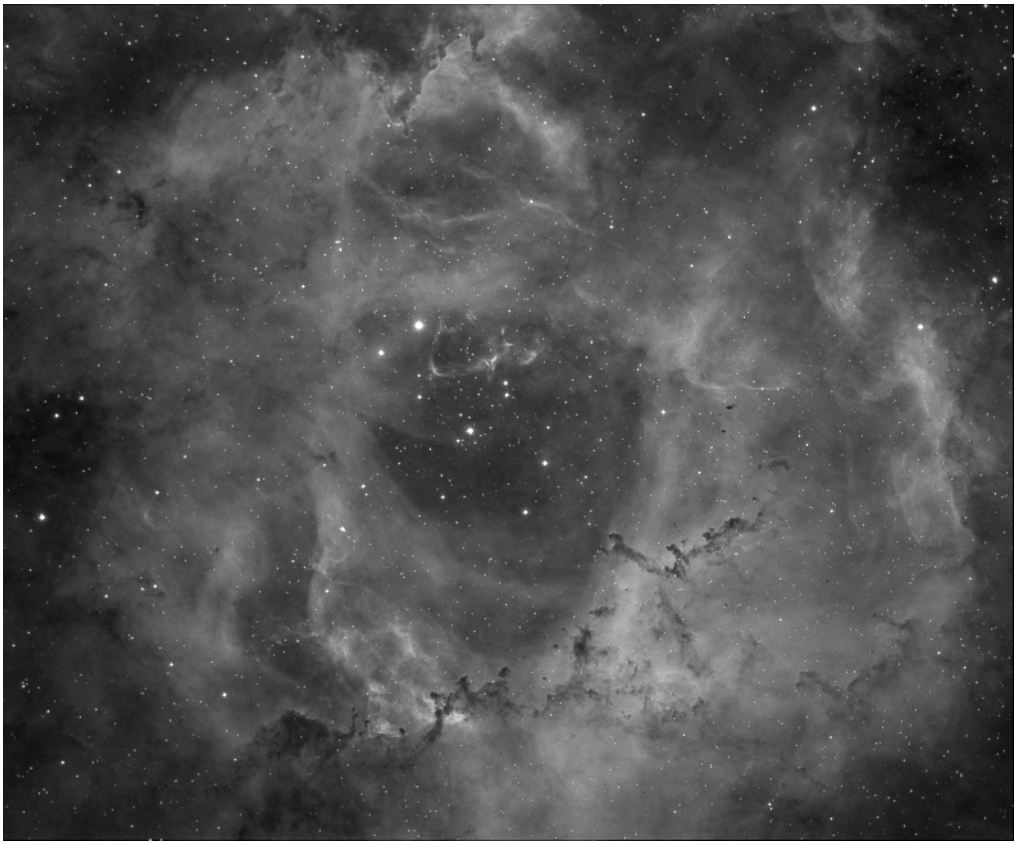
GALLERY

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

admin@kielderobservatory.org

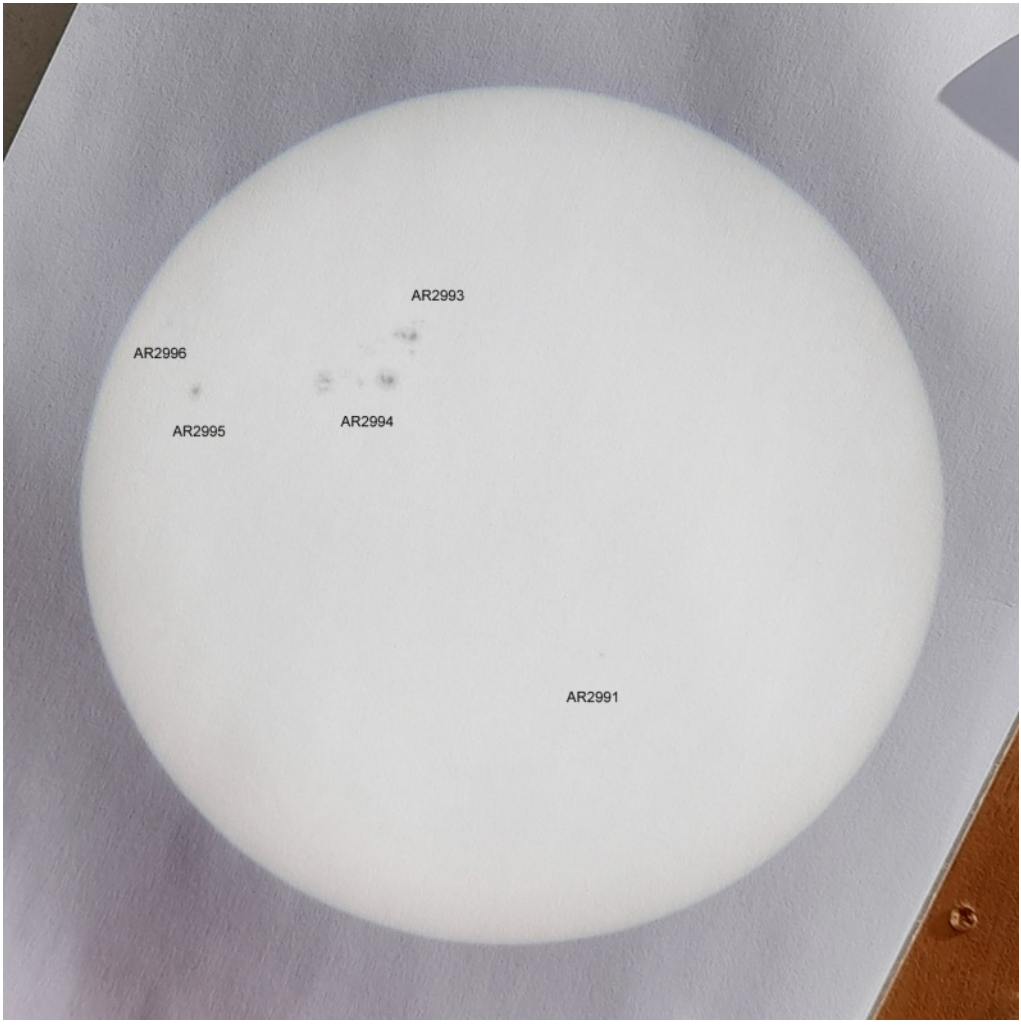
along with a brief description of how and when they were taken.

KIELDER OBSERVATORY
Infinite Inspiration



Four hours worth of imaging of the Rosette Nebula (Caldwell 49), taken through one of our telescopes in the GDAIA using a Hydrogen-alpha filter. In the centre is the open cluster NGC2244, who stars provide the radiation to heat the gas.

Credit: Dan Monk



An image of the sun taken on April 21st at 11:07UT. The promiment sunspots are labelled with their 'Active Region Number', as assigned by the Space Weather Prediction Center. The picture was produced with a NexStar 102SLT using a 25mm eyepiece and a star diagonal.

Credit: Duncan Hale-Sutton

GALLERY

Previous page: A photograph showing Mercury and the Pleiades together, taken on 25th April 2022 at 20:29UT. This is a single 2.5s shot at ISO1600 (f/5.6), with the focal length of the lens at 105mm. The original image has been binned x2 and corrected for barrel/pincushion distortion and vignetting. Taken with a Nikon D90 with a Nikkor VR 18-105 f/3.5-5.6 ED lens.

Credit: Duncan Hale-Sutton

The galactic centre rising behind the Observatory. A reminder that summer is on the way.

Credit: Dan Monk

GALLERY

Not all things Kielder are in the night sky! Here is a most unusual cloud formation over the Observatory.

Credit: Dan Pye

"Really great event. Thank you. It was the highlight of our holiday. Kids loved the bottle rockets."

Kate, West Midlands

The new moon (through cloud!) only 2.4% illuminated.

Credit: Dan Monk

"We had a fabulous visit thank you so much. It was so informative, hands on and friendly. We will definately come back. Thank you."

Laura, Stannington

"We both enjoyed the event. The staff were passionate, knowledge and very approachable and the talk given by Finn was fantastic. Looking through the telescope was amazing, the cloudy skies did not detract from the experience at all. We got to see a double star and a galaxy, very exciting! It was a life long ambition to go to an observatory and you did not disappoint."

Dean,
Peterborough

Kielder Observatory - a beacon for dark skies

https://kielderobservatory.org

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