

Winter 2019/20 Number 26

Kieler Observatory Newsletter



NEWS

Art exhibition,
new events

NIGHT SKY

Highlights
Feb/Mar/Apr

SCIENCE

Gamma-ray bursts

OBSERVING

Kieler takes to the radio
waves



EDITORIAL

Once again Orion is riding high in the Winter sky, bringing with it plenty of stunning sights to be seen through our telescopes. We have news of an exciting new art exhibition to be run by the Observatory, and a description of our new venture into radio astronomy! Robert Williams tells us a little about those enigmatic objects in the sky, gamma-ray bursts, which were briefly suspected of being the signature of nuclear weapons!

Nigel Metcalfe

Editors: Nigel Metcalfe & Robert Williams

newsletter@kielderobservatory.org

Kielder Observatory Astronomical Society

Registered Charity No: 1153570.

Patron: Sir Arnold Wolfendale 14th Astronomer Royal

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

<http://www.kielderobservatory.org>

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Front cover: Milky Way over the Observatory by Natasha Lund.

Rear cover: Lyra and Cygnus over the Gillian Dickinson Academy, Nigel Metcalfe.



KOAS NEWS

The Board of Trustees approved their year-end report and accounts for the period ending 31st August 2019 when they met towards the end of January. This period had seen a number of significant changes across the organisation, including expansion of the staff team, refinement of systems and practices, introduction of a new events programme and successful piloting of our educational outreach programme. These, together with associated changes to our management structure, were all essential to position KOAS to deal with the ongoing growth in visitor numbers, planned expansion of our educational outreach activities and further development of our visitor offer at the observatory.

This was all achieved whilst hosting 34% more visitor events than the previous year, maintaining continued high levels of customer satisfaction and requiring investment of only £3,400 from our unrestricted reserves (0.5% of relevant expenditure). The fact that this was possible is testament to the hard work and continued dedication of our amazing team of staff and volunteers.

The Northumberland International Dark Sky Park celebrated its sixth anniversary

in early December. To mark this occasion, we invited various stakeholders from around the North East to a special event at the observatory. This was a great success and a most enjoyable evening, during which even the weather co-operated!

Finally, we've all been delighted with how well our educational outreach work has progressed across the North of Tyne area since it launched in October, and are excited about the team's proposals for the new season of observatory events – both of which you can read more about in this newsletter. We're also pleased to report that KOAS has now joined the Campaign for Science and Engineering and has recently been accepted into the UK Association of Science Discovery Centres.

Overall, KOAS is now well positioned to embrace the exciting future that lies ahead, as we work increasingly closely with a wide variety of partners to deliver the charitable aims outlined on page 2 above to a wider and more diverse range of beneficiaries.

Peter Standfield (Chair)



OBSERVATORY NEWS



Orion rises over Kielder Water while our Dobsonian telescopes await their first customers of the evening.

We're excited to be welcoming astrophysicist, author and broadcaster Chris Lintott to the observatory on 29th March. Professor of Astrophysics at the University of Oxford and presenter on BBC Sky at Night, Chris will be giving a talk to our guests and signing copies of his book 'The Crowd and the Cosmos'. Tickets have already sold out for this event!

Space Kids has been running successfully at Kielder Castle every Sunday and we love showing all our

visiting families the fantastic inflatable planetarium and taking them on tours of the night sky, solar system and universe! As the lighter evenings return to Kielder, Space Kids will be returning to the observatory with the popular rocket making activity. "Space Kids Rockets & More" is now listed on the calendar every Sunday 5-7pm from 5th April.

We're also excited to bring you a new family event Young Explorers. Aimed at all ages from 6 years upwards. Young Explorers is designed to build on the



OBSERVATORY NEWS

passion of your young scientists by feeding their excitement for everything space related with fun and inspirational activities while we take you on a journey of observation, navigation and creation. Young Explorers will take place every Saturday from 5 - 7pm starting on Saturday 5th April.

The Observatory was represented at the launch of the new Space Zone and Maker Space at the Centre for Life at the end of January. The team were very excited to meet Helen Sharman, the first British astronaut!



Naz and Dan P. with Helen Sharman.

Since September, our education programme has been full steam ahead! As part of our contract with the North of Tyne Combined Authority, so far, we have visited 7 out of the planned 20 for the academic year. With 4 days spent in each school, over 3600 school pupils ranging from 5 to 18 years old have experienced the inside of our inflatable planetarium



A pupil from Marden Bridge Middle School holding one of our meteorites during the 'Space Rocks' workshop.

and the range of additional workshops that we offer. Additionally, another 9 schools are already booked in for the next two terms bringing us close to reaching the target of 20 in the year. The schools visited and booked in so far all span the entirety of the combined authority – covering different areas of Newcastle, North Tyneside and Northumberland. As well as our astronomers actually going into the schools, through our partnership with the Calvert Trust in Kielder we have been able to provide access for school



OBSERVATORY NEWS

classes to visit the observatory themselves. Schools are able to take part in the Space & Adventure Residential Programme and bring whole classes to stay in the Kielder Water & Forest Park. During the daytime, they can take part in fantastic activities such as archery or axe



As part of the Space & Adventure Taster Weekend, teachers and their families were able to see the Sun and the Moon through telescopes at the observatory.

throwing, and then in the evening visit the observatory to do some proper astronomy. On 17-19th January, we took part in the Taster Weekend for this programme, organised by the Calvert Trust. There were 70 attendees, comprised mostly of teachers and their families, who spent the weekend gaining insight into how their schools could benefit.

As we move into a new decade, we will be taking the opportunity to refresh some of the events we have on offer at the Observatory. So here is a brief taster of some things to look out for in the coming months. There may be other exciting developments in the pipeline as well, so keep an eye on our website <https://kielderobservatory.org/our-events>.

The Secret Lives of Stars

Highlight: An introduction to navigation and discovery in astronomy. What are these things we call stars?

Aurora

Highlight: The Northern Lights! What are they? How do we see them?

Young Explorers

Highlight: aimed at all ages from 6 years upwards, the event is geared around a tour of the Observatory, with fun and inspirational activities along the way.

Space Kids – Rockets

Highlight: learn how to build and launch your own rockets.

Late Night Dark Skies

Highlight: a premium VIP observing event which takes place when there is no moon



OBSERVATORY NEWS

and the skies are at their darkest. Limited to 20 places.

Late Night Explorer

Highlight: a premium VIP observing event which takes place when the moon is bright. Limited to 25 places.

Myths and Legends

Highlight: stories of the stars. Learn about how the stars and constellations got their names.

Full Moon Night/Our Moon

Highlight: learn about our nearest astronomical neighbour, the Moon. How did it form and how long has it been there?

Origins of the Universe

Highlight: cosmology. How did the Universe begin? How long has it been around? When will it end?

Jewels of the Universe

Highlight: our science team take you on a tour of their favourite things to do, see, or discover.

Astrophotography

Highlight: learn how to take award-winning astrophotographs of the night sky with

your camera.

Discovering New Worlds

Highlight: Exoplanets. Learn how many worlds there are out there in the Universe. Which of them could sustain life? And how do astronomers discover these new worlds?

Our Dark Universe

Highlight: the hot topics and buzz words around Astronomy! What makes our Universe? Learn about the mysterious Dark Matter and Dark Energy, and find out the connection between Black Holes and Gravitational Waves.

Introduction to Astronomy

Highlight: early evening quick tours and an introduction to astronomy for beginners.

Our Sun/Solar Sundays

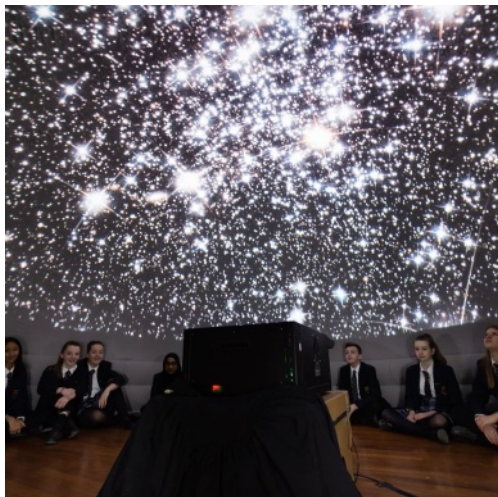
Highlight: observing the Sun. Will take place in the early evenings in Summer, when the sun has still to set.

You will also find one-off events popping up, such as Shooting Star Events, which coincide with major meteor showers, and events geared to particular planets which happen to be prominent in the night sky.



OBSERVATORY NEWS

Stargazing is the naturally the priority of all events we run at the Observatory, however due to weather conditions, that is not always possible. During events where stargazing isn't possible, or is limited, we have developed a range of activities to keep visitors inspired and entertained throughout their time with us. We aim to deliver a unique experience whatever the weather with our team of experienced and passionate astronomers.



Space Kids - Live at the Castle! On Sundays, right through to the end of March, we are running our ever popular Space Kids events at Kielder Castle, and our planetarium guarantees stars whatever the weather!

Late Night Dark Skies – December 2019

Wow stunning. We visited for a Dark Skies night 11:45 to 3am on Saturday. The forecast wasn't great but the drive to there was punctuated by owls and deer. As we arrived the clouds rolled back and we were treated to a truly "big sky". The staff were brilliantinteresting, interested and engaging at any level of interest. The laser guided constellation tour was helpful and the presentations perfectly pitched. We were the last to the car park to leave and were treated to a massive meteor right above our heads. The 3hrs passed in no time. The drive back through the forest with trees covered in a heavy frost was magical. Thank you for sharing your passion! The mechanics of the universe are both beautiful and humbling.

Andy



OBSERVATORY NEWS

Paint the Sky Exhibition at Kielder Observatory

We have an exciting opportunity for artists nationwide to exhibit their astronomically themed work in the largest public observatory in England, Kielder

Observatory. Here at Kielder Observatory we welcome tens of thousands of stargazers every year to explore the universe with our large aperture telescopes and access the wonders of the night-time sky in the largest protected area of Gold Tier dark sky in the whole of Europe. Such breath-taking views provide a liminal experience for people - and we would love to see your artistic interpretations of the impact of the universe upon you.

Any artists may apply, using any physical medium - the only criteria are that your work must be linked in a tangible way to astronomy and reflect the shared sense of wonderment our night time sky inspires. We also have limited space, so we welcome smaller submissions not exceeding a metre in height or width - although feel free to check if your work is correctly sized.

Application is completely free, and your work would be displayed in our Astro-Imaging academy which produces databases of deep sky objects and has artistic objectives with its data production. The exhibition space is our communal area for visitors, so your work will be viewed by thousands and the space encourages discussion.



Exhibit your astronomy art
at the largest public
Observatory in England

Application free
Submissions until mid February
Exhibition from Feb-Apr
Application and Queries to:

natasha@kielderobservatory.org

www.kielderobservatory.org



OBSERVATORY NEWS

The exhibition will run from mid-February for three months, however submissions are rolling so we don't have an absolute cut-off date. We would love to hear from you up to the end of February, but if you apply later, we can still consider your submission. Essentially, we just want to

show great works of art.

Artists can apply by directly emailing our Arts Programme Lead Natasha Lund at: natasha@kielderobservatory.org



© Dan Monk/KOAS

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 <http://www.kielderobservatory.org/our-events/> or call us on 0191 265 5510. We can also be contacted at admin@kielderobservatory.org



OBSERVERS' SLOT

Catching Meteors Through the Cloud

It's a situation familiar to many of us: up at the Observatory, hours have gone by without a single star being visible, the clouds are starting to condense and fall as rain. The turrets are closed and we are all huddled round the fire with our hot chocolates, wondering when we will next be able to see something, anything, in the sky.

Clouds hamper visual observing because the light our eyes are sensitive to does not travel through them very well, but some other forms of electromagnetic radiation do not have this problem. Radio waves, at the lowest energy end of the electromagnetic spectrum, travel through clouds and the regular atmosphere unimpeded and a radio receiver will therefore be able to receive signals from the sky whatever the weather.

Some famous radio observatories include the Lovell Telescope at Jodrell Bank, the Arecibo Telescope in Puerto Rico and the upcoming Square Kilometre Array (SKA). The SKA will be the largest observatory in the world, with telescopes in South Africa and Australia linked together and sensitive enough to detect an airport radar from dozens of light years away.

In late 2019, the Observatory acquired an antenna for doing radio astronomy. It is mounted on the Gillian Dickinson Astro-imaging Academy and feeds to a screen in the classroom which guests can see at all times. With this setup we can detect signals from the International Space Station and other passing satellites, but mostly it is used to detect meteors.

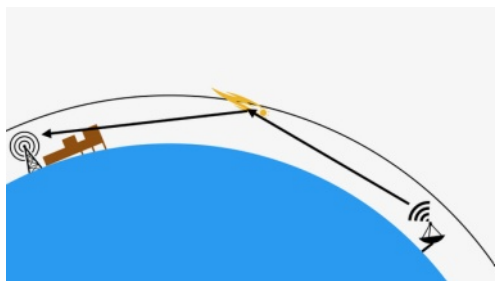
When a meteor enters the atmosphere, it is travelling more quickly than the air can 'react' and get out of the way. The air therefore gets compressed in front of the rock and heats up. When the heating is sufficient for the air to glow, we see a streak of light in the sky. These are shooting stars or meteors. Generally, the original impactor is very small, with the smallest visible shooting stars coming from debris approximately the size of a grain of uncooked rice. It is only the piece's immense speed (30,000 - 110,000 mph) that means we can see the streak from 40 miles below.

When the hot, pressurised air has disintegrated the meteor (or it has slowed down through the sound barrier and is going to land as a meteorite), there is a brief trail of ionised gas left behind. This is seen sometimes as a 'smoke trail' after large meteors.



OBSERVERS' SLOT

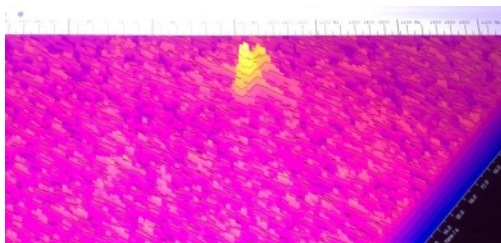
While this trail does not produce much radio emission, it reflects radio signals well and so by training our antenna on a distant radar beacon we can pick up reflections from meteors on the horizon. Our antenna is a Diamond X300N model, it looks like a vertical pole and can detect signals from any direction. The beacon we have tuned to is the Graves radar beacon, based in eastern France and used as part of the European Space Agency's satellite radar monitoring network. The station transmits a beacon signal at 143.05 MHz and by tuning the antenna to this frequency we can detect it reflected in high altitude meteor trails (see figure below). The reflected signal appears as a



The radio signal bounces off the meteor trail into the receiver at Kielder.

strong burst on our readout display and, when played through the speakers, sounds like a sci-fi laser gun ("pew pew"). To read out the data, we digitise the

incoming signal using the FunCube USB dongle and use the free software SpectrumLab to create the visualisation on screen. The system is left running 24/7 and in the coming weeks and months we will be creating a 'best of' gallery, using



A meteor trace seen on the display at the Observatory.

data saved automatically when a major meteor event occurs.

When a meteor is travelling down through the atmosphere, the air acts to brake the incoming debris and slow it down. The Doppler shift from this causes the frequency of the received radio waves to reduce and lowers the pitch we hear. Sometimes meteors skim through the atmosphere with little velocity relative to the ground and sound more like "peep" than "pew", thanks to there being very little Doppler shift.

One thing that has surprised the staff, volunteers and guests is just how much radio activity there is going on. The antenna picks up interference from our



OBSERVERS' SLOT



Waiting for a meteor in front of the screen in the Gillian Dickinson Astro-imaging Academy.

on-site Wi-Fi and walkie-talkies. If it is within range, then we can even tune the antenna to the International Space Station and potentially listen to the astronauts conversing with Mission Control. If it proves popular then there are a number of avenues open to extending our

capabilities. A larger antenna would allow us to spot smaller meteors and measure transmissions from more distant satellites, possibly even storms and lightning on Jupiter. This new equipment is opening a new window on the Universe for our guests, continuing our mission to educate and inspire as many people as possible with all the wonders of astronomy, even the ones behind the steely grey curtain in the sky.

Hayden Goodfellow



Universe Full of Stars – 12th Dec 2019

Growing up in Ireland I'd always wanted to use a giant telescope but there is nothing like Kielder in Ireland. So I flew to Edinburgh and took a car to the Observatory. It turned out to be a cloudy night, but it was still a wonderful occasion. The clouds actually created such a sublime experience and the staff were really enthusiastic. The lectures were interesting enough to make me did the cloudy night ensure even better value for money than looking through the telescopes. While there the results of the British election came through - they seemed so irrelevant compared to the Universe! It was such a great night.

Oliver – Dublin



NIGHT SKY

FEBRUARY 2020 (times in GMT)

PLANET SUMMARY

Lunar phases

First quarter	02/02/2020 01:43
Full moon	09/02/2020 07:34
Last quarter	15/02/2020 22:19
New moon	23/02/2020 03:33

Mercury is in conjunction with the Sun. Venus will be visible for about 2 hours in the western twilight after sunset. Mars is visible in the morning twilight. Jupiter and Saturn will be difficult to see in the morning twilight as they rise. Uranus is a good evening object visible from around 1830 until 2200.

THE STARS AT 9PM (GMT)

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.

The Planets 15/02/2020

	Sun	Moon	Mercury	Venus	Mars	Jupiter	Saturn	Uranus
Rise	07:30	00:38	07:44	08:34	04:51	05:58	06:28	09:15
Set	17:10	10:22	18:53	21:19	11:53	13:20	14:14	23:45

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 in February.

COMETS

Comet C/2017 T2/PanSTARRS is currently in Perseus at magnitude ~9 and visible all night. It will stay in our skies for several months.

Full Moon Party – 10th Jan 2020

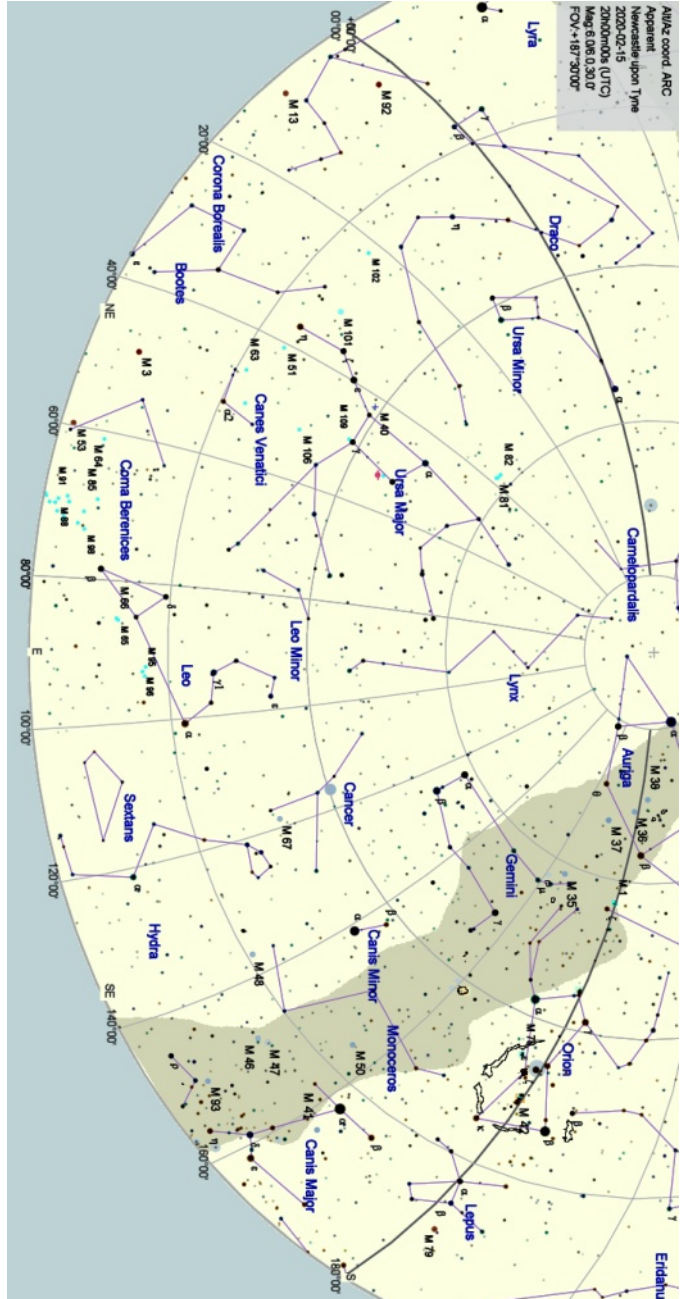
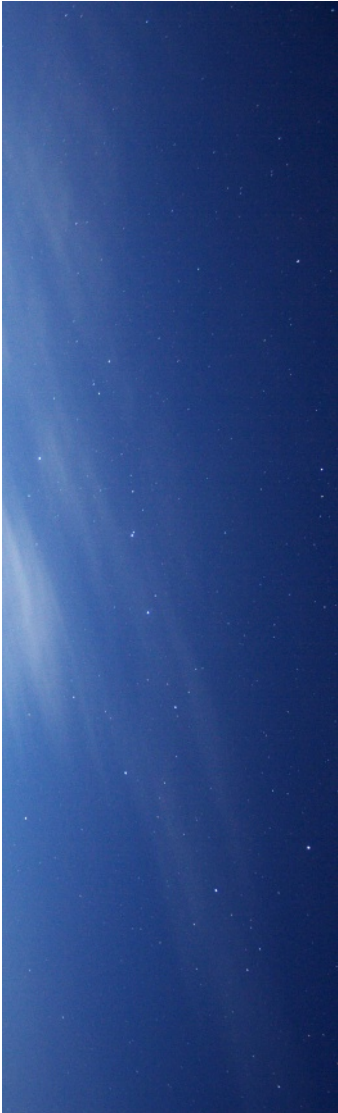
Your team are completely BRILLIANT - every single one of them was so welcoming and warm. They had so much knowledge and enthusiasm, and they were so generous with their expertise. Honestly, quite blown away by them all. Also, you DO have great hot chocolate. We will definitely be back... hopefully on a clear night!!

Abigail – Sheffield



NIGHT SKY

*The view looking east
from Newcastle at 8pm
on 15/2/2020.*





NIGHT SKY

MARCH 2020 (times in GMT)

PLANET SUMMARY

Lunar phases

First quarter	02/03/2020	19:58
Full moon	09/03/2020	17:48
Last quarter	16/03/2020	09:35
New moon	24/03/2020	09:39

Mercury is too close to the Sun to see this month. Venus is visible between the hours of 1930 until 2130 in reasonably dark skies. Mars is a morning object visible in twilight, as is Jupiter, the two being quite close together all month. Making up the trio is Saturn, so March is an excellent time to track all these down. Uranus is an evening object not far away from Venus so use that as a guide to locate the 'Green Planet', with similar rise and setting times.

THE STARS AT 10PM (GMT)

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

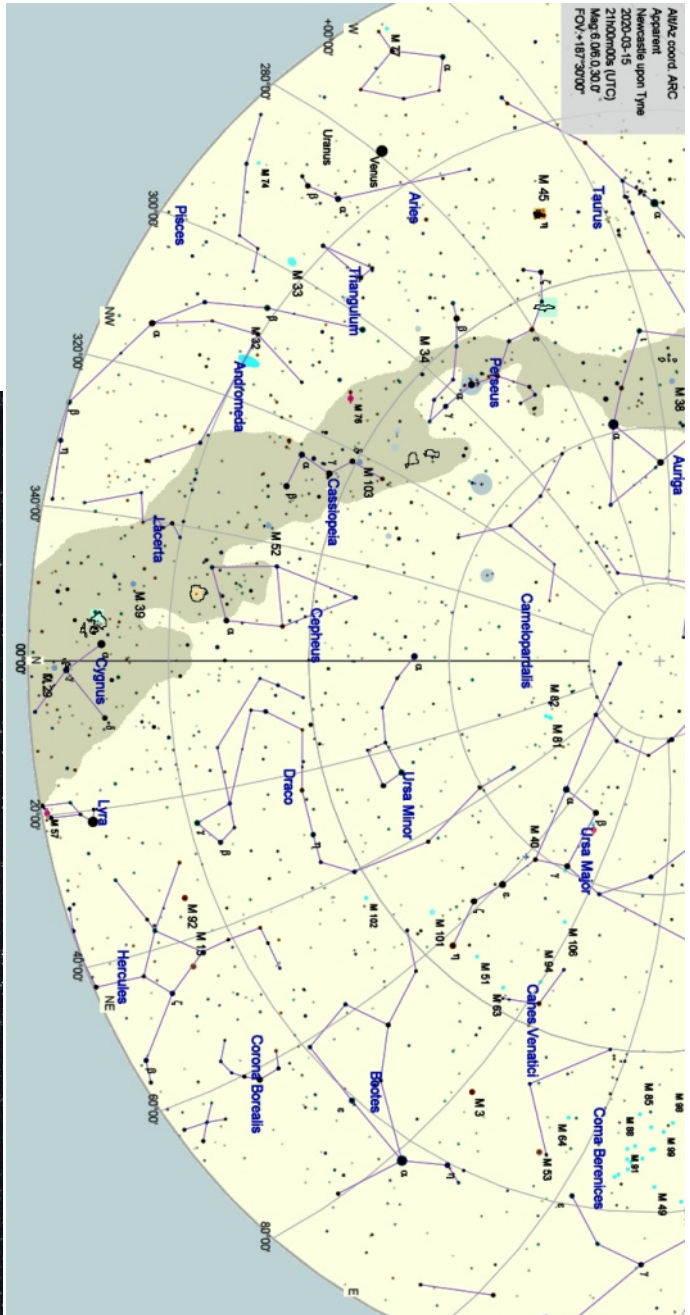
There are no major meteor showers in March.

COMETS

Comet C/2017 T2/PanSTARRS is expected to brighten slightly, and should be visible at magnitude ~9 all night. Currently traversing the edge of Cassiopeia during March.

The Planets 15/03/2020

	Sun	Moon	Mercury	Venus	Mars	Jupiter	Saturn	Uranus
Rise	06:21	00:52	05:40	07:13	00:52	04:21	04:42	07:23
Set	18:05	09:03	15:35	22:50	11:33	11:54	12:36	21:58





NIGHT SKY

APRIL 2020 (times in BST)

PLANET SUMMARY

Lunar phases

First quarter	01/04/2020	11:21
Full moon	08/04/2020	03:35
Last quarter	14/04/2020	23:56
New moon	23/04/2020	03:27
First quarter	30/04/2020	21:38

Mercury is too close to the Sun this month. Venus is an evening object visible in dark skies from around 2100 to midnight. Mars will be visible in the morning twilight just before sunrise. Jupiter and Saturn will be in close conjunction all month in the morning skies, visible from around 0430 for about 1 hour before the dawn brightens.

THE STARS AT 10PM

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. There will be a last quarter to new Moon during this period so an excellent opportunity, with a radiant point near Vega, to see this shower which can give rise to around 10 to 20 shooting stars per hours. Originating from regular Comet C/1861 G1 Thatcher, there are always the chance of seeing a few fireballs from the larger particles shed by the comet, with occasional outbursts during some years.

COMETS

Comet C/2017 T2 PANSTARRS may still be brightening - it moves into Camelopardalis at the start of April.

Night Sky credits:

Data sourced from Cybersky 5,

<https://www.timeanddate.com/moon/phases/>

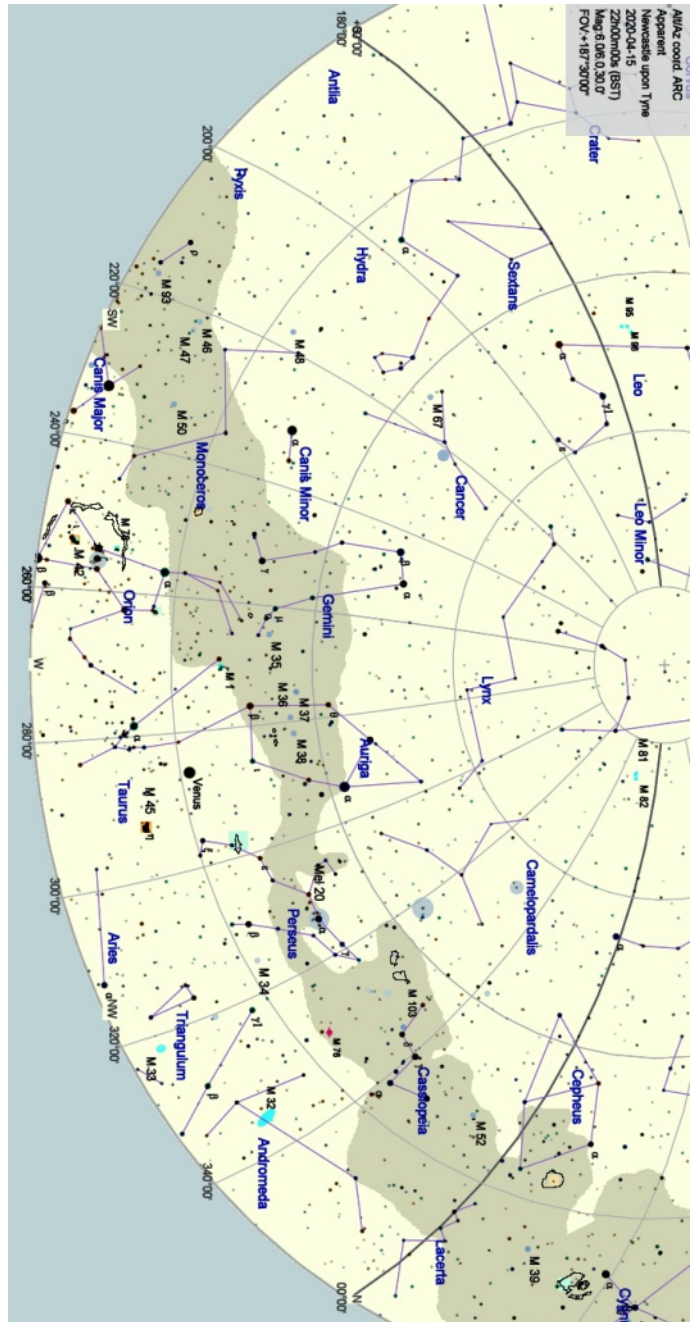
and <https://in-the-sky.org/>.

The Planets 15/04/2020

	Sun	Moon	Mercury	Venus	Mars	Jupiter	Saturn	Uranus
Rise	06:06	03:48	05:54	06:52	04:16	03:31	03:45	06:24
Set	20:03	11:00	17:55	01:06	12:32	11:13	11:45	21:06



A vertical strip of a starry night sky, showing a dense field of stars against a dark background. The stars vary in brightness and size, creating a textured appearance. The strip is wider at the top and tapers slightly towards the bottom.





SCIENCE SLOT

Gamma Ray Bursts

In Science the only thing you can say about a discovery is that it is just 'current'. Almost as soon as a discovery is made then soon-after something comes along to change the way we think about that discovery.

One of the current 'hot topics' in astrophysics is 'Gamma Ray Bursters' (GRBs). There are so many questions:

- 1) Why do they occur?
 - 2) What type of objects are involved?
 - 3) How far they are away?
 - 4) Is there an object in the 'direct line of fire' of Earth?
 - 5) When and where will be the next one?
- and many others

So this is, hopefully, a basic guide to GRBs and other similar cosmic animals. Firstly – as far as we know – all recent GRBs have been discovered in external galaxies – some many millions or billions of light years away.

Secondly – they are by far the brightest, most luminous events in the Universe today.

Thirdly – and somewhat mysteriously – the burst may be as short as a few milliseconds or as long as many minutes or even hours.

The initial burst is almost always in the gamma ray part of the spectrum with

following afterglows in other regions such as ultra-violet, visible, infra-red and radio. There are at least two ways of creating a GRB:

- 1) The explosion/implosion – by supernova – of a high mass star.
- 2) The merging of two Neutron stars, the left-overs from 1).

The story of how GRBs were first discovered is one of those by chance, but rather scary, potentially nightmare scenarios. In the early 1960s, during the 'Cold War' the Americans were concerned that the Russians could test nuclear weapons in space, circumventing the ban on testing on Earth. So the Vela group of satellites were launched. These were designed to detect the gamma ray flash from a thermonuclear explosion. Shortly after deployment the Vela system had detected many (actually 16) events and this got the US military a bit 'on edge' as there were:

- 1) No obvious corroborating data as to where the Russians could have done the test on the ground.

- 2) All the detections seemed to be located far off into space.

It wasn't until 1997 that information from red-shift data of the starlight from the afterglow events showed that the



SCIENCE SLOT

explosions were very distant. Follow-up observations by the Compton GRO and BATSE satellites showed that the GRBs were isotropically distributed across the sky - in other words they were not concentrated in any one direction or location.

In October 2018, astronomers reported that GRB 150101B, a gamma-ray burst event detected in 2015, may be directly related to the historic GW170817, a gravitational wave event detected in 2017, and associated with the merger of two neutron stars. The similarities between the two events, in terms of gamma ray, optical and x-ray emissions, as well as to the nature of the associated host galaxies, are striking, suggesting the two separate events may both be the result of the merger of neutron stars, known as a 'kilonova', which may be more common in the Universe than previously understood, according to the researchers.

In November 2019, astronomers reported a notable gamma ray burst explosion, named GRB 190114C, initially detected in January 2019, that, so far, has had the highest energy ever observed for such a cosmic event, 1 Tera electron volts (TeV) or 1 million million eV.

Currently, with the use of other satellites, such as SWIFT and BEPOSAX, it is possible to very quickly locate GRBs and watch the afterglow to see what takes place and indeed which type of object has undergone an eruption.

GRBs come in a few different flavours: Short GRBs – the event lasts typically one second or so. Of all GRBs, around 1/3rd are classified as 'short'. It was not until 2005 that the first afterglow was detected from a short GRB. They tend to occur in regions in galaxies with few or no stars. So they are neither from massive stars nor supernovae. Presently it is thought they happen during the merger of neutron stars. Because of the shortness of the pulse they seem to be very compact, perhaps less than 60,000 km across. Long GRBs – about 60% of all GRBs last over 2 or more seconds. Because they are 'long' much more has been observed about these events. It is thought that long-GRBs are associated with 'core-collapse' supernovae and occur mostly in areas of galaxies involved with rapid star formation. This is supported by extensive observations of the afterglow events. Ultra-long GRBs – these are events lasting more than around 3 hours. The current theory is that these are associated with the end of life of a Blue Hypergiant



SCIENCE SLOT

star, massive 'Black Widow' binary stars, or Magnetars – very highly magnetised neutron stars. These are, so far, rather rare because this type of star is only found once or twice per galaxy.

One feature of all GRBs is that, like neutron stars, most of the energy is released in a highly focused and directional 'beam'. This means that there is a small, but not zero, chance that a beam from a GRB could (and perhaps already has in geological time) sterilise life on Earth.

Recently, a new class of event has been observed. In March 2011, SWIFT made a detection of GRB110328A. The burst lasted 2 days and was detectable at x-ray wavelengths for many months. It took place in a small elliptical galaxy at a redshift of 0.3538. Currently it is thought that this event occurred when a massive star was ingested by a supermassive black hole.

New physics: recently it has been observed that there are also 'fast radio bursts' associated with these events and so this is a burgeoning area of astrophysical research in which Jodrell Bank and associated observatories are playing a part. The recently upgraded Gravitational Wave Observatory – LIGO – is also starting to detect signals coming

from the mergers of much smaller (sub 10-solar mass) neutron stars (e.g. event GW190425). Until only a few months ago it was thought that these types of mergers, involving no more than 10 solar masses cumulative mass, would not produce a gravitational wave, but it seems that the theorists may have got it wrong for now – until a new theory is put together to explain how Gravitational Waves can be made from such relatively little mass.

Is there a current candidate in our Galaxy? Maybe - Eta Carina is certainly on the watch list and as it's only about 8,000 ly away would be very destructive if the jet headed our way. Similarly, there is WR104, a triple star system in Sagittarius. Also about 8,000 ly away, it is likely to become a core-collapse supernova in the next 500,000 years.

For more information on what LIGO is doing, head to www.ligo.org

Robert Williams



GALLERY

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

newsletter@kielderobservatory.org

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



© Dan Monk/KOAS

This is a fish eye projection made from 36 images, showing a 360 degree view of the sky above the Observatory.



GALLERY



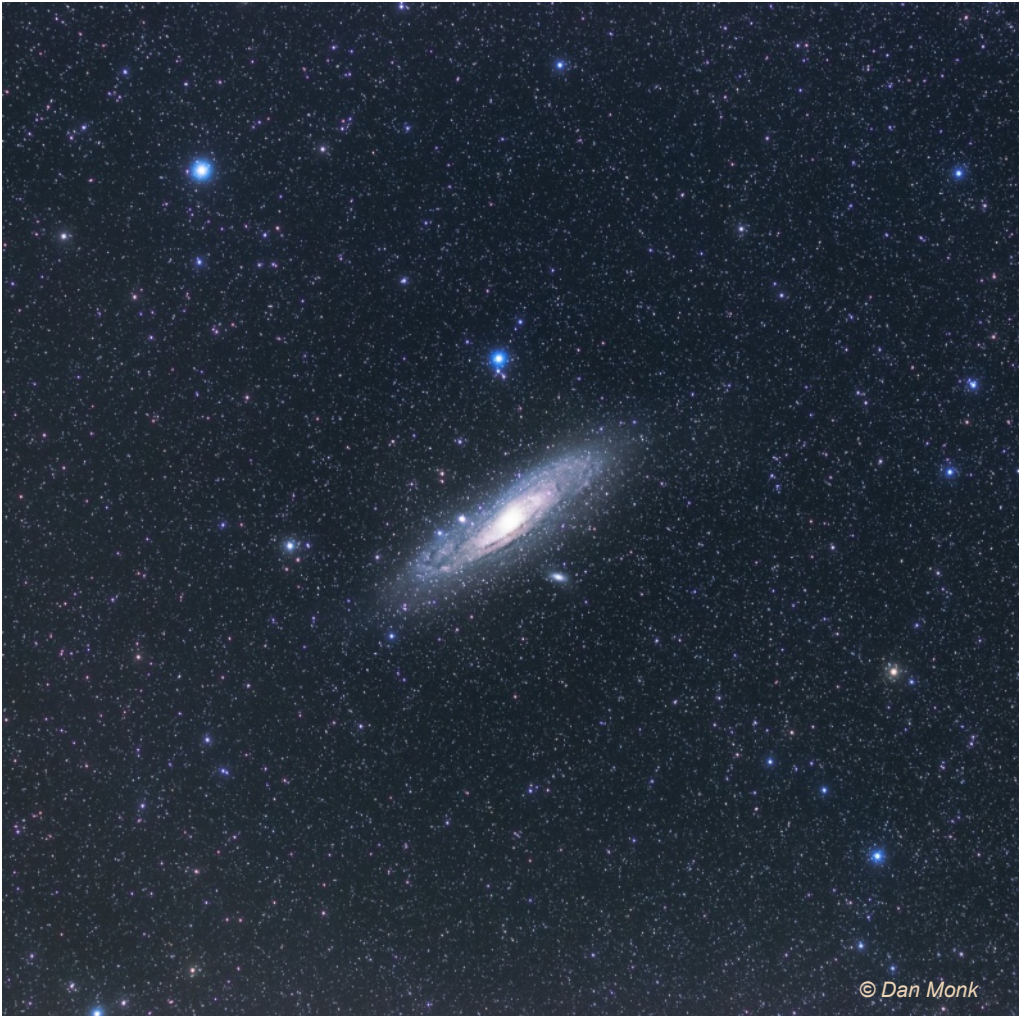
© Dan Monk

Comet C/2017 T2 (PanSTARRS) passed close to the famous Double Cluster in Perseus in late January. This shot was taken by trustee Jurgen Schmoll using a 200mm F5 Newtonian telescope and a Canon 40D DSLR. Total exposure time was 20 mins.

Moonrise over Lindisfarne Castle.



GALLERY



© Dan Monk

A wide-field view of our galactic neighbour, the Andromeda Galaxy. It is only a mere 2,500,000 light years away! This is a stack of 80 x 90 second exposures taken with 150mm lens on a star tracker. The bright blue star at the top left is μ Andromedae - it is only 130 light-years away.



GALLERY



More Comet C/2017 T2 (PanSTARRS). Taken by your editor through a 12" F4 Newtonian with a Canon 1000D DSLR on January 1st. Total exposure time was 21 mins. In that time the comet has moved relative to the stars.



The Pleiades star cluster Messier 45 (otherwise known as the Seven Sisters). The stars are visible to the naked eye, but it takes long exposure photographs to bring out the wisps of nebulosity which surround them.



GALLERY



Reader Duncan Hale-Sutton took this shot of the partial eclipse of the moon on January 10th from Norfolk. 1/250s exposure with a Nikon D90 through a Orion OMC-140 telescope.



A 1.5 hr exposure of the Orion Nebula (Messier 42) taken using the Atik 4120EX CCD through the Observatory's 5" FSQ-106EDX4 refractor in the Gillian Dickinson Astrophotography Academy.

© Natasha Lund/KOAS



"I just wanted to get in touch to say what a wonderful time I had at Kielder Observatory last night/ early hours of this morning for the Quadrantid meteor shower. I turned 30 yesterday and I chose to spend it at Kielder Observatory because I've always wanted to see the stars. Unfortunately the rain would not let up so the staff were unable to show us the night sky and use telescopes, but these things happen: you can't control the weather. But I had a spectacular time nonetheless.

I'm no expert (I can only point out the Big Dipper on a clear night) but I was in complete awe at the marvellous presentations, photographs, videos, space rocks and telescopes we were shown. The staff were so friendly and I am amazed at their knowledge. I would be quite happy to sit down and just listen to everything they have to say.

Thank you so much. I'm looking to head back to the observatory another time to hopefully catch a glimpse of the stars (so here's hoping for a clear sky!)"

Olivia – South Shields

KOAS: Your Window to the Universe

<http://www.kielderobservatory.org>

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