

Autumn 2020 Number 29

Kieler Observatory Newsletter



NEWS

Podcast lauched

NIGHT SKY

Highlights
Nov/Dec/Jan

SCIENCE

OSIRIS-REx,
e-ROSITA

OBSERVING

Andromeda



EDITORIAL

The strange world of lockdown continues, and as I write this we have been forced to close again for the whole of November. At least the skies have not disappointed with the planet Mars reaching its closest approach to Earth and dominating the eastern skies in the early evenings. And the clocks have changed, so dark nights are back! We also have a spectacular conjunction of Jupiter and Saturn to look forward to in December, when hopefully we will be back open. In this edition we take a look at the constellation of Andromeda, which is high in the sky at the moment, and contemplate the X-ray universe.

Nigel Metcalfe

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admin@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



<https://kielderobservatory.org>

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Front cover: Mars. Taken at Elf Kirk View Point beside Kielder reservoir, using a Sony A7III and Zeiss 18mm lens with a fog filter. A single 20-second exposure, f2.8, ISO 6400. Dan Monk.

Rear cover: M31 taken using the 10" F/8 RC in the GDAIA Observatory with the Canon 5D Mk3. The image is a stack of 22 x 140 second guided exposures, with darks. ISO 5000. KOAS/Dan Monk.



A Word from the Trustees

With a second national lockdown starting as we finalise this newsletter, we must - regrettably - close the observatory once again. Hopefully, this will only be for a few weeks, but we can't yet predict when we'll next be able to welcome visitors back on site to experience those much-loved moments of Kielder inspiration.

Thankfully, we can approach this second lockdown with even greater confidence than the first. We've been hugely encouraged by the resilience and optimism of all our staff team throughout this difficult year, and by the enthusiasm and support shown by our visitors, partners and supporters. Our accounts for the financial year to 31st August are now being finalised and show a much healthier financial position than we could possibly have predicted in March. We're preparing to install our new radio telescope and - as you'll see from the pages below - we've also made significant progress towards digital delivery of our charitable objects. This all reflects great credit on our dedicated team of staff and volunteers.

As this second lockdown is starting in [Trustees' Week 2020](#), it seems appropriate to mention that this team also includes our Board of Trustees, whose innumerable hours of often-unseen voluntary commitment have helped to enable these many achievements. If you're not familiar with the role and responsibilities of a charity trustee, you might like to know that these are clearly explained in [various helpful documents](#) on the [Charity Commission website](#). Our trustees exercise these duties and

responsibilities with appropriate care and diligence, and were pleased to have this confirmed by the Charity Commission earlier this year after a review undertaken in accordance with their [regulatory and risk framework](#).

As a board, we were very sorry to bid farewell recently to Anna Charlton, whose input to the development of KOAS dates back over many years and who has served as a trustee since 2017. We know we can count on Anna's continuing support over the years to come, but we will certainly miss her wise counsel in our board discussions. We thank you Anna for all you've done for KOAS and wish you every success in your other endeavours.

Our seven remaining trustees combine a broad range of expertise and depth of experience in relevant fields - including leadership, governance, education, astronomy, finance and law - with a passion for delivering the charitable objects summarised on page 2. Over the next few months we'll be looking to extend the skillsets and diversity of our board in a way that will best position us to guide and support Catherine, our CEO, and her team in securing a sustainable future for KOAS in the challenging post-Covid world that lies ahead. If you feel you have the experience, time and energy to help us on this journey, whether as a trustee or in any other voluntary capacity, we'd be delighted to hear from you.

Meanwhile, we wish you all a safe and secure end to a most challenging 2020 and look forward to more settled times ahead next year.



OBSERVATORY NEWS



The track up to the new radio telescope is in place.

It's been a very busy few months at Kielder! Firstly, we'd like to thank all our visitors for being so patient with us as we adapt to the changing levels of lockdown restrictions. We have been running a full timetable of events but with reduced numbers (so book ahead!)

<https://kielderobservatory.org/our-events> - although at the time of writing we, along with the rest of country, have entered a second lockdown, so we will be closed during November. However, be assured that we will re-open as soon as government regulations allow!

We have also updated our terms and conditions, reducing the notice period required to change dates - you can see the guidance in full here <https://kielderobservatory.org/news/latest-news/152-coronavirus-measures>

The Spider 500 radio telescope, kindly donated to us by the Tanlaw Foundation, is in the North East and awaits the arrival of engineers from Italy to install it. Recent visitors to the Observatory will have noticed the new track leading to the concrete pad



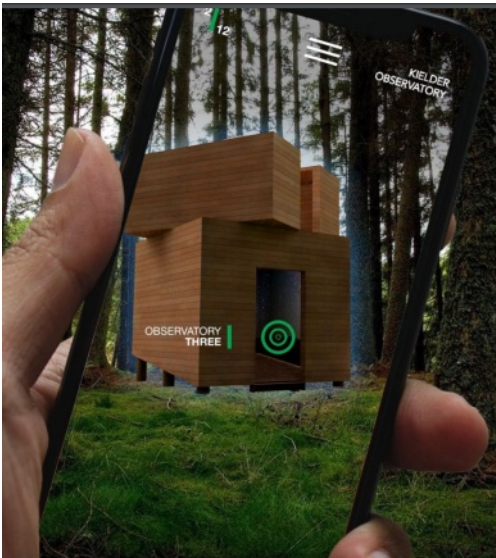
OBSERVATORY NEWS



The foundations for the radio telescope are in place.

where it will be installed. We can't wait to get it commissioned and observing the skies.

Have you seen our new podcast series? There's sections on what's happening at the obsy, what's up in the sky, hints and



tips, and interviews. The first one features Prof Wallace Arthur, Kielder visiting scientist, on the occasion of his new book, *The Biological Universe* (and, coincidentally, phosphine on Venus). Check it out [here](https://www.podfollow.com/kielderobs/)

<https://www.podfollow.com/kielderobs/>
We will be adding content monthly, with November's edition due to be on Cosmology. Our Augmented Reality app, Kielder Constellations, is now at a prototype stage and we are looking for volunteers to take 5 to 10 minutes to test it. We'll be sending out a dedicated email about this soon.

One of the unintended consequences of the pandemic has been an increasing interest in dark skies and astronomy. We have featured in several publications, including *The Times* (<https://www.thetimes.co.uk/article/watch-this-space-a-midnight-stargazing-class-in-northumberland-8l6xln6ws>) and *The Mirror* (<https://www.mirror.co.uk/travel/uk-ireland/best-stargazing-spots-uk-including-22762021>).

We also featured on the ITV local news - you can watch it at <https://www.youtube.com/watch?v=p0IXwfSvWg0>



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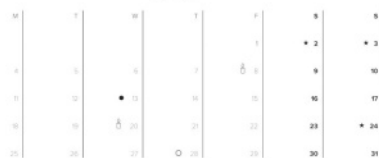
At the time of writing, we still have places for 'Discovering New Worlds' on 3rd December, 8pm-11pm, with special guest speaker Professor Wallace Arthur. Bookings can be made at

Unfortunately, places for the Geminids meteor shower on the 13th and 14th December are sold out, but there is availability for the 'Great Conjunction' from 4pm-7pm on 21st December:

https://kielderobservatory.org/index.php?option=com_virtuemart&view=productdetails&virtuemart_category_id=6&layout=event&virtuemart_product_id=6721.

JANUARY

Our home galaxy arching nicely over the observatory. Spring is a great time to image a Milky Way panorama from the UK.
- Dan Monk



* Collected Exports

2nd & 3rd: Quadrantids Meteor Shower
24th: Mercury at Greatest Eastern Elongation

Birthdays
 14th January 1942 - Stephen Hawking
 20th January 1930 - Buzz Aldrin

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OBSERVATORY NEWS



Aurora season is back! Shot from the Observatory on September 25th.

such a close approach on the sky of Jupiter and Saturn has not happened since 1623 (!), and will not happen again until 2080.

In late September the aurora made an appearance in the skies around the Observatory! Senior Astronomer, Dan Monk, captured a lovely image of it which

takes pride of place on our social media pages. Aurorae are dependent of the state of the 11 year sunspot cycle, and we have just passed solar minimum and moved into the next solar cycle (officially number 25!). So expect auroral activity to increase from now until the next maximum in 2025.

"We felt safe and happy with the COVID precautions that have been put in place, we felt we were lucky to be part of only 16 participants for the event. Such a beautiful location despite the midges! We are already planning when we can come back again, big thank you to Hayden, George, Adam and Natasha for sharing your knowledge with such enthusiasm ."



OBSERVATORY NEWS

On the staffing front, our long term resident, Hayden Goodfellow, has left the Observatory to train as a teacher. Thankfully, he will be coming back as a part-time astronomer when his schedule allows. Jesse Beaman has also left his full-time post - again we hope to see him coming back as and when his time permits.

And last, but not least, that much-desired and much-travelled item, the Kielder Observatory Mug, is to undergo a revamp! The new travel-style mugs should be available to buy at the observatory, or from our online shop, in the next few weeks. Meanwhile, here is a sneak preview of what they are going to look like.

Lots of news to come in the next month or so. Keep your eyes peeled for a new Kielder Observatory Mission Patch, the winner of the Ann Cleeves competition, and some new arts projects.



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



OBSERVERS' SLOT

The Constellation of Andromeda

High in the sky at this time of year is the constellation of Andromeda, in Greek myth the daughter of Cassiopeia, who is chained to a rock waiting to be eaten by a sea monster! Needless to say, the actual pattern of stars in the sky bears no resemblance to any of this.

Its three most prominent stars, Mirach, Almach and Alpheratz (actually the top left star in the Square of Pegasus!) only shine around magnitude 2. Almach (Gamma Andromedae) is, however, a splendid binary star for those with telescopes. The two stars are yellow and blue and separated by only 10 arcseconds. The yellow star is the brighter. It turns out that the blue star is itself a double, but a large telescope and good conditions are needed to split this visually.

The main object of interest in Andromeda is, of course, the Andromeda Nebula - Messier 31 - which is the nearest large galaxy to our own Milky Way, and can be seen with the naked eye from a dark sky. If you manage to see it, from Kielder or elsewhere, you might like to contemplate that the light reaching your eye set out on its journey about 2.5 million years ago.



Messier 31, with its two satellites, M32 (top) and M110 (bottom).

M31 has two smaller companion galaxies which orbit around it, M32 and M110. Both are described as dwarf elliptical galaxies, so you might expect them to be featureless balls of light in a telescope. However, M110 is unusual in that it shows a dark dust patch near its centre, easily photographed with an amateur telescope.



M110 is unusual in looking like an elliptical galaxy but having some dust lanes near its centre.



OBSERVERS' SLOT

Although they attract by far the most attention, M31 and its companions are not the only interesting objects in the constellation.

Next to the bright star Mirach lies 'Mirach's Ghost', otherwise known as the galaxy NGC404. A chance alignment in the sky, the glare of the star makes this quite tricky to spot visually with a telescope. Otherwise it might have made it into the Messier catalogue. The galaxy



Galaxy NGC404 lies in the glare of the bright star Mirach (β Andromedae).

lies about 5 times further away than M31. Another galaxy which might have made it into Messier's catalogue but didn't is NGC891, the 'Silver Sliver' galaxy. This fine, edge-on spiral has a prominent dust lane and is an excellent photographic target for amateur equipment. This lies



The edge-on spiral galaxy NGC891.

even further away than NGC404, at a distance of about 27 million light years. Andromeda is also home to some nice groups of galaxies and several Abell galaxy clusters, named after professional astronomer George Abell. He created the catalogue in the late 1950's by visually inspecting photographic plates of the northern sky taken with the Palomar Observatory Schmidt telescope and counting galaxies. Your editor can vouch for the fact that this is not an easy task, having spent his younger days inspecting galaxies on just one such plate!

The most prominent is probably Abell 262. This cluster lies a staggering 200 million light years away, but its central galaxy, NGC708, is about magnitude 13 and can easily be photographed from a back garden!



OBSERVERS' SLOT



The distant galaxy cluster Abell 262.

Not all of Andromeda's treasures are outside our galaxy though. NGC752 (also known as Caldwell 28) is an open star cluster a mere 1300 light years away. It is probably best seen in binoculars or a small telescope, as it spans over a degree on the sky. Its brighter stars are about 9th magnitude.

Finally we have the Blue Snowball Nebula, NGC7662 (aka Caldwell 22). This is a so-called planetary nebula. They have nothing to do with planets except that they tend to look small and round on the sky! They are actually glowing gas ejected from stars nearing the end of their life. The Sun may well end up in this state one day. NGC7662 is quite bright, at around 8th magnitude, but, as with many planetary nebula, it is quite small in appearance, covering only about 30



The open cluster NGC752.

Credit: PS1 consortium.

arcseconds on the sky. For this reason, high magnification and good sky conditions are needed to see it as much more than a rather fuzzy blue star.



The planetary nebula NGC7662.

Credit: PS1 consortium.

Nigel Metcalfe

All photos by the author, with a 12" Newtonian telescope and Canon 1000D camera, except where stated.



NIGHT SKY

NOVEMBER 2020 (times in GMT)

Lunar phases

Third quarter	08/11/2020	13:46
New moon	15/11/2020	15:07
First quarter	22/11/2020	04:45
Full moon	30/11/2020	09:29

PLANET SUMMARY

Mercury is a morning object visible in twilight. Venus rises about 1 hour before Mercury and may be visible in a fairly dark sky. Mars is an evening object visible from around 1730 until 0230. Jupiter and Saturn are evening objects visible low in the west after sunset. They will be quite close together in the sky and will make a striking pair [Jupiter magnitude ~ -3 , Saturn $\sim +1.5$, similar to Regulus in Leo]. Uranus will be visible for most of the hours of darkness [1700 until 0500].

THE STARS AT 8PM

North - Cepheus is high overhead, with Draco and the two Bears nicely placed. East – Cassiopeia and Andromeda are high up with Perseus nicely placed. Taurus is near the horizon and to its top RHS is Aries.

The Planets 15/11/2020

	Sun	Moon	Mercury	Venus	Mars	Jupiter	Saturn	Uranus
Rise	07:38	07:50	05:43	04:28	14:48	12:21	12:31	15:22
Set	16:03	16:28	15:40	15:16	03:59	19:51	20:13	06:17

South – Pegasus is nicely placed with Pisces. Aquarius is low down and you can find Formalhaut in Pisces Austrinus - a bright star that is the most southerly placed bright star visible from the UK. West - Cygnus dominates this view along with Sagitta, Vulpecula and Lyra. Low down you can find Hercules.

METEOR SHOWERS

November hosts two meteor showers:

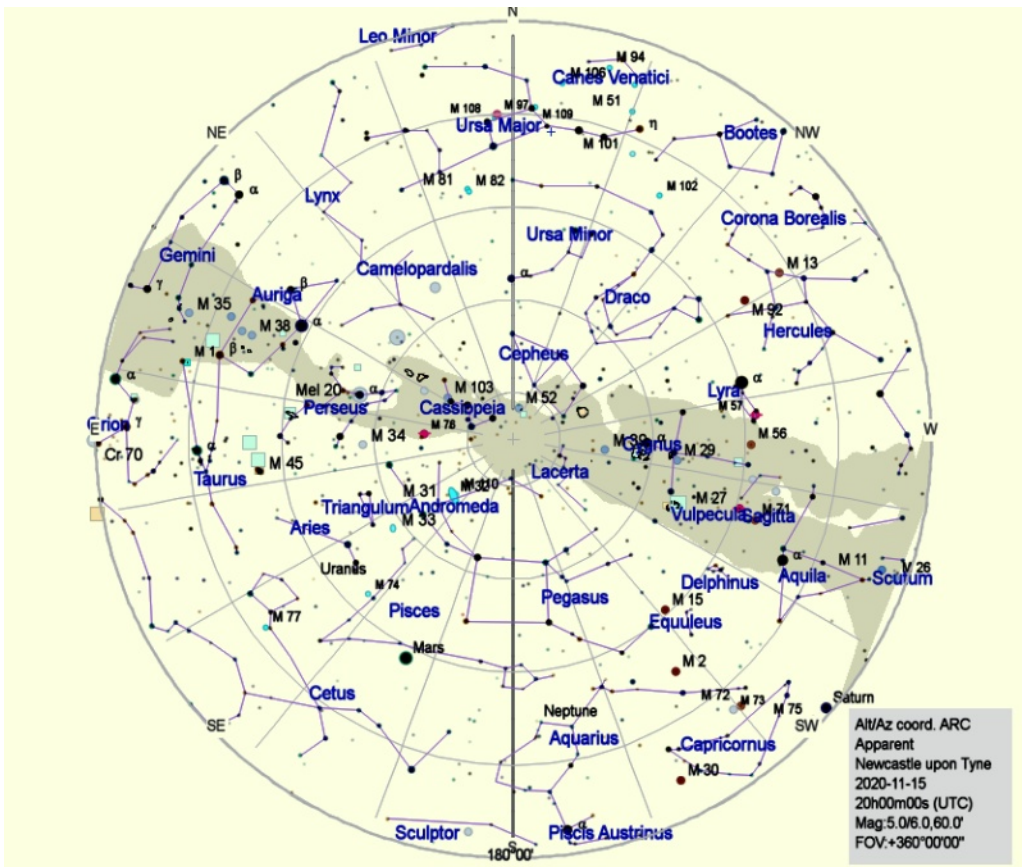
- 1) Taurids – around the 1st to 6th of November – this is a short shower but the particles are quite 'large'. The Taurids tend to be few in number but they make up for this by being bright slow moving and often quite colourful, with occasional fireballs. In 2020 there will be a last quarter Moon which will interfere somewhat.
- 2) Leonids – on the 16th, 17th and 18th November – another annual shower that usually puts on a good show of 50 to 100 meteors every hour. These particles are fast moving and 'small' and so the meteors are quite faint. In 2020 there will be a thin crescent moon setting at around 1845 on the 17th so this will be a good opportunity to view this shower.



NIGHT SKY

COMETS

There are no bright comets in the sky this month, although Comet C/2020 M3 (ATLAS) has brightened to around magnitude 8, and should be visible through a telescope in Orion after midnight.



The night sky above Newcastle at 8pm on 15/11/2020.



NIGHT SKY

DECEMBER 2020 (times in GMT)

Lunar phases

Third quarter	08/12/2020	00:36
New moon	14/12/2020	16:16
First quarter	21/12/2020	23:41
Full moon	30/12/2020	03:36

PLANET SUMMARY

Mercury is in solar conjunction and not visible. Venus will be just visible in the morning twilight before sunrise. Mars will be a good opportunity in the evening skies and will be observable from around 1700 until 0100. Jupiter and Saturn - now extremely close - will be visible low in the west after sunset. Uranus will be visible from around 1700 until 0300.

THE STARS AT 8PM

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

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

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

The Planets 15/12/2020

	Sun	Moon	Mercury	Venus	Mars	Jupiter	Saturn	Uranus
Rise	08:25	09:28	08:23	06:10	12:50	10:39	10:40	13:22
Set	15:28	16:16	15:16	14:28	02:39	18:26	18:31	04:13

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

METEOR SHOWERS

The main meteor shower of December is the Geminids which are visible on the night of the 13th /14th December with some activity a few days either side. This shower is unusual in that it originates from an Asteroid – Phaethon. In 2020 there will be a New Moon – on the 14th – so an excellent opportunity to view this shower

Night Sky credits:

Data sourced from Cybersky 5,

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

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

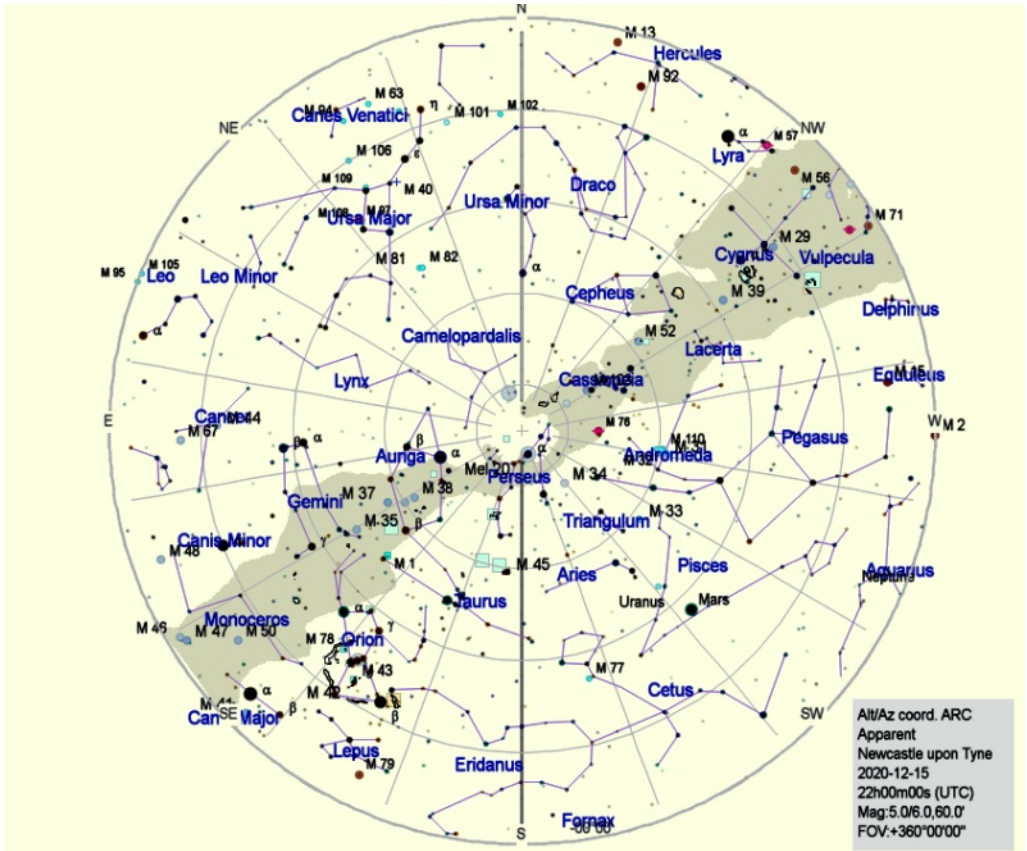
under dark skies. Later in the month, on Christmas Day in fact, the Ursids are active. Expect up to 5 per hour from this weak shower. It will be visible all night but best seen after midnight once the Moon has set.

COMETS

There are no bright comets expected to be visible this month.



NIGHT SKY



The all sky chart for Newcastle at 10pm on 15/12/2020

The Great Conjunction

On the evening of December 21st 2020, the two giant planets of the solar system, Jupiter and Saturn, will appear to lie only 1/10 of a degree apart on the sky. That is 1/5 of the apparent diameter of the full moon. This will be the closest approach of the two planets since the year 1623, and it will be 2080 before they approach this

closely again. Jupiter shines at mag -2 and Saturn at mag 0.5.

The pair will be visible about 10 degrees above the SW horizon as the Sun sets, but be quick - they will set themselves shortly after 6pm.



NIGHT SKY

JANUARY 2021 (times in GMT)

Lunar phases

Third quarter	06/1/2021	09:37
New moon	13/1/2021	05:00
First quarter	21/1/2021	21:01
Full moon	28/1/2021	19:16

PLANET SUMMARY

Mercury will be a challenging object visible after sunset low in the west. Venus will be all but lost in the morning twilight. Mars will be visible from around 1730 until just after midnight. Jupiter and Saturn are now in conjunction with the Sun and not visible this month. Uranus will be visible (close to Mars) between 1730 and midnight. Mars can be used as a marker to locate Uranus which will be seen as a ~6th magnitude green star-like object. The two will make a good colour contrast.

THE STARS AT 8PM

North - Draco is prominent splitting up the two Bears. Hercules is low in the NNE. Cepheus is nicely placed in the NW with Cygnus just below it. East - Auriga is overhead with Gemini nicely placed. Orion is prominent in the

NE with Lepus the Hare, Monoceros the Unicorn and Canis Major (and Minor) beginning to show themselves again. South - Taurus and Orion are well placed for observing. Eridanus and Cetus are low down. Aries and Pisces are high up in the SW.

West - Andromeda is overhead with Lacerta just below it. Pegasus and Cygnus are well placed as is Pisces (with Mars).

METEOR SHOWERS

The major meteor shower of this month is the Quadrantids on the 4th January. Muralis Quadrans was a constellation introduced in the early 17th century, but as the use of the quadrant circle diminished it was absorbed back into Bootes. The Quadrantids meteor shower is a very short, sharp peak of very bright and often colourful shooting stars. It may only last for a few hours but if you catch a Quadrantid fireball then it will be worth the wait. These particles can be both bright and colourful but the shower may only last a few hours around midnight on the 3rd or

The Planets 15/1/2021

	Sun	Moon	Mercury	Venus	Mars	Jupiter	Saturn	Uranus
Rise	08:22	10:06	09:15	07:27	11:04	08:55	08:47	11:20
Set	16:09	18:40	17:29	14:28	01:58	17:05	16:09	02:09

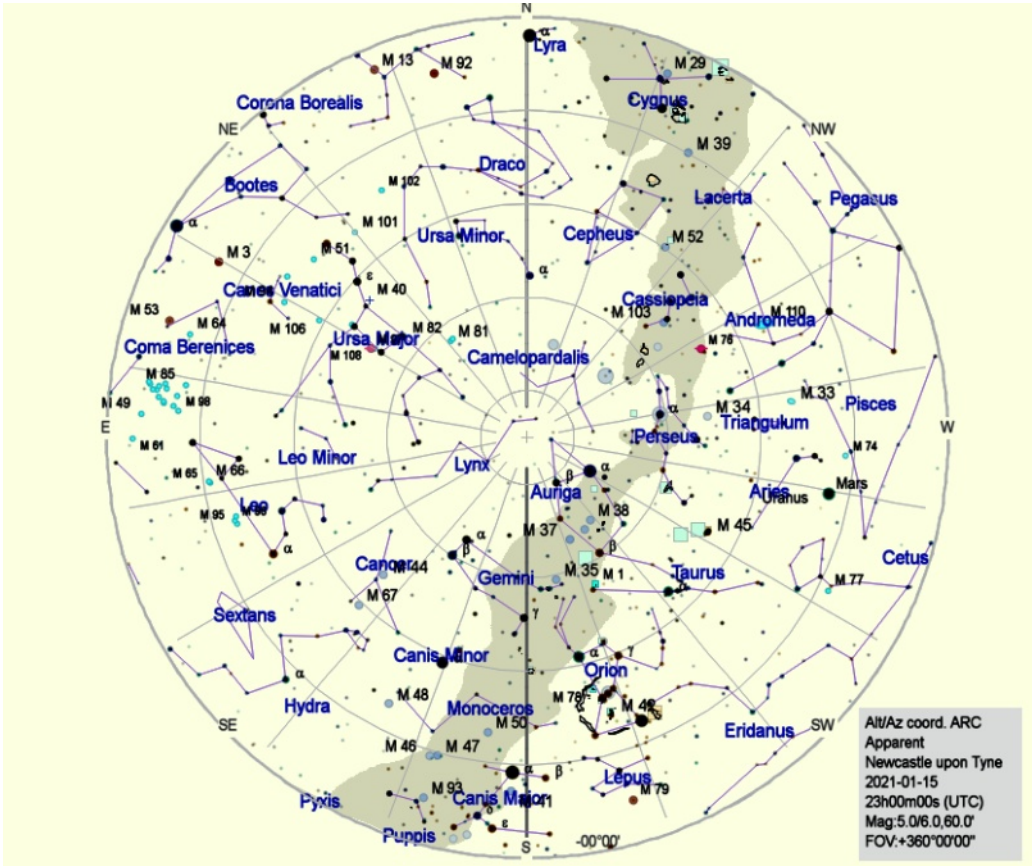


NIGHT SKY

4th January. This year a last quarter Moon may interfere with all but the brighter particles.

COMETS

There are no bright comets visible this month.



The sky map looking east from Newcastle at 11pm on 15/1/2021.

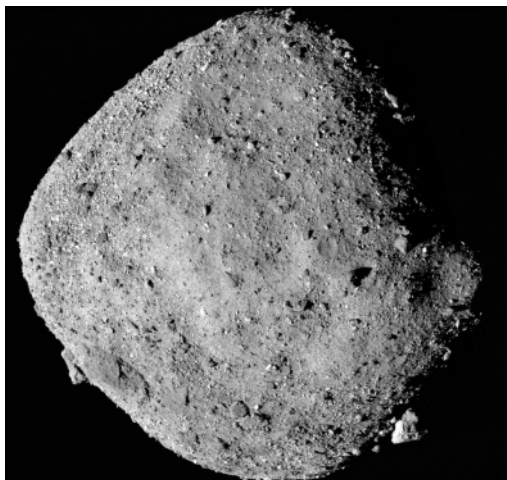


SPACE SLOT

Mining an asteroid - OSIRIS-Rex on Bennu

On October 20th, the NASA spacecraft OSIRIS-Rex touched down on the surface of the asteroid 101955 Bennu and collected some 400g of material. Despite some initial panic when a flap which was supposed to keep the material enclosed jammed open, it seem that most of the cargo has now been safely stored in the spacecraft for its long return to Earth.

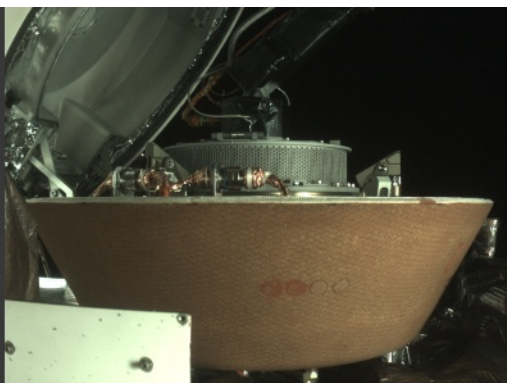
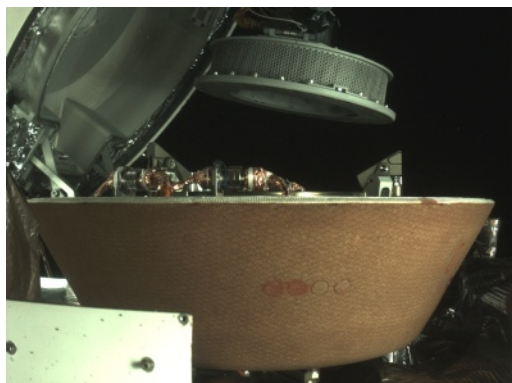
OSIRIS-Rex was launched in September 2016 and took over two years to reach Bennu, arriving in December 2018. After that it, orbited the asteroid at a height of about 1.75km, mapping the surface looking for a suitable site to collect the sample from.



A view of Bennu from 24km away, taken by OSIRIS-Rex in 2018.

Credit: NASA/Goddard/University of Arizona

Analysing the composition of asteroids can tell us much about the formation and early history of the solar system, as they are mostly believed to be remnants left over from the formation some 4.6 billion years ago. There are over 1 million



OSIRIS-Rex successfully stores the sample collector head ready for its return journey to Earth.

Credit: NASA/Goddard/University of Arizona/Lockheed Martin



SPACE SLOT

asteroids known, although, if you added them all together, their combined mass is less than that of the Moon.

Bennu, discovered in 1999, is not very large, being only about 500m across. It is what is known as a near-Earth asteroid, which means it does have the potential to collide with the Earth at some stage in the future. Indeed there is a roughly 1-in-3000 chance it will hit in the latter quarter of the 22nd century.

Unfortunately Bennu is very faint, well below 22nd magnitude at the moment, so it is not really within the reach of amateur telescopes.

OSIRIS-REx is not the first spacecraft to return asteroid samples to Earth, although it is the first such NASA mission. That accolade went to the Japanese probe Hayabusa, which returned samples from

25143 Itokawa in 2010. That mission was not without its problems though, and only a small number of grains were returned. A second Japanese craft, Hayabusa2, should return samples from 162173 Ryugu in December this year, long before OSIRIS-REx returns to Earth in 2023.

The first spacecraft to fly-by an asteroid was Galileo in 1991. It was actually a mission to study Jupiter and its moons, but it flew within 1600km of asteroid 951 Gaspra. The record for the first landing goes to NEAR Shoemaker, which landed on 433 Eros in 2001. It also became the first spacecraft to orbit an asteroid.

Nigel Metcalfe

Space Kids at the Observatory

"Very kind, patient and knowledgeable team who were able to interact and tailor sessions to children of all ages. Well done on creating a Covid secure venue - one of the best social distancing arrangements I've seen. It can't have been easy and it was appreciated and reassuring to know that a lot of hard work has gone into preparations for a safe reopening."

Dan, Leeds - October 2020



SCIENCE SLOT

The Extreme Universe

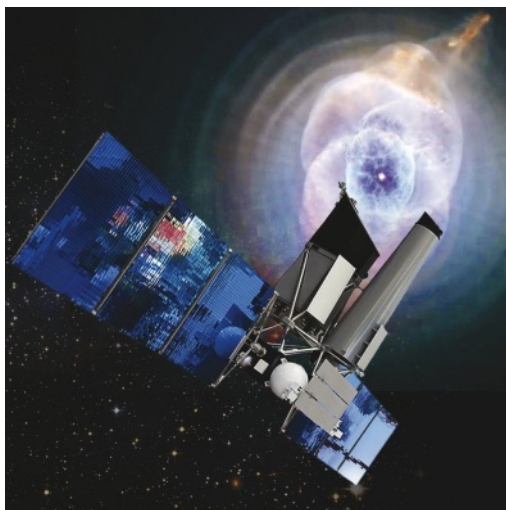
We are all very familiar with seeing the Night Sky through pictures as they might appear to our own eyes, but when we switch to a different waveband some new vistas can be glimpsed. To do this we must use special instrumentation and - because of the attenuation of Earth's atmosphere - we must place those cameras in Earth orbit.

The X-ray Universe is the realm of high energy occurrences in Stars (such as Supernovae), Nebula (such as collapsing gas clouds), exotic objects such as Black Holes and - at the highest energies - Neutron Star collisions and Gamma Ray Bursters (GRBs), which also pour out copious quantities of so-called 'hard' X-rays.

The very first satellites launched to examine the X-ray Universe were Ariel 5 and 6, launched in 1974 and 1979. These were UK/USA collaborations and designed to do simple science to detect what sources were out there and where they were located. Since then, some very successful missions have taken place. ASCA, for example, which was launched by Japan in 1993, was designed to locate sources and also to take images and spectra. Its primary mission was to

investigate Quasars – galaxies with active black holes at high red shift. HETE-2, an American/Japanese/European mission to investigate gamma ray bursters, was launched in 2000. It was capable of locating GRB sources to a precision of 10 arc-seconds on the sky.

Following on from these were a number of significant Observatory grade satellites, such as Einstein [1978-82], ROSAT [1990-99], SWIFT [2004-present], FERMI [2008-18], NUSTAR [2012-present], CHANDRA [1999-2018] and numerous other smaller missions that have

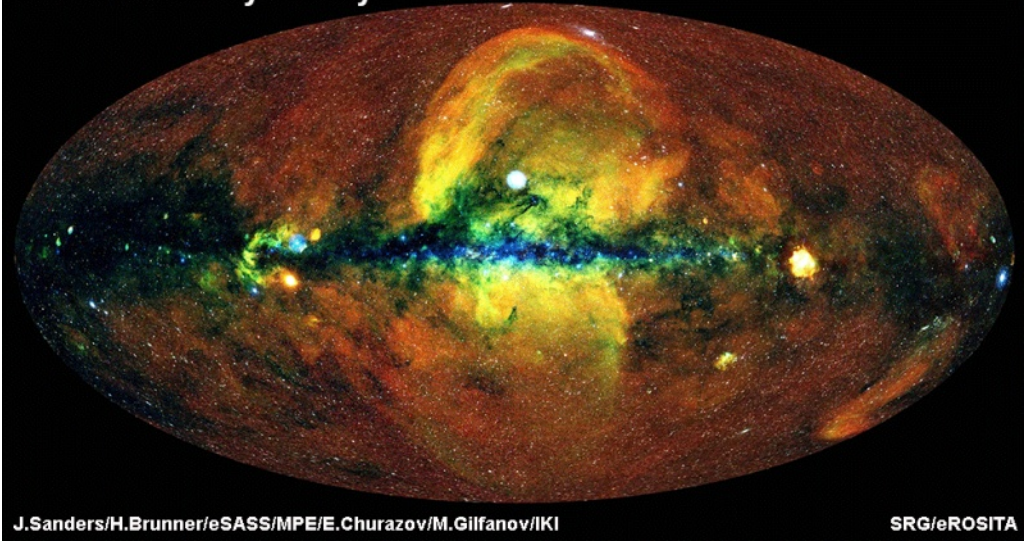


An artist's impression of the Russian-German space probe Spektrum-Roentgen-Gamma (SRG) - e-Rosita - in space.

Credit: Roscosmos/DLR/SRG/Lavochkin



eROSITA All-Sky Survey



The energetic universe as seen with the eROSITA X-ray telescope.

Credit: MPE

expanded our knowledge of the high energy Universe.

The processes these observatories are detecting take place deep within the atoms of 'heavy' elements. The first twenty elements of the Periodic table [Hydrogen to Calcium] do not have enough energetic electrons to create X-rays. This is because all radiation with wavelengths shorter than red visible light, is created by the transition of electrons from one shell to another. The more nuclear mass and the greater the change in shell of the atom's electrons, the higher the energy of the X-ray.

Just as with visible light you can fingerprint the element responsible by measuring the energy of the X-ray. With visible light it is easy to split up the light spectrum using a prism or grating, but with X-rays that is not possible because the prism would absorb the radiation. Instead it is necessary to 'glance' the X-ray off a plate of Tungsten or some other high-Z atom at a very shallow angle [less than 1-degree], which makes focusing X-rays a big challenge. This was first done in December 2012 with a balloon launched X-ray camera.

The latest incarnation is Spektr-RG [also



SCIENCE SLOT



The Vela supernova remnant is one of the most prominent objects in the X-ray sky. The bright blue point source in the middle of the image is the Vela pulsar.

Credit: Peter Predehl, Werner Becker (MPE), Davide Mella.

energies in the range 1Ke to 10Kev. To put this in perspective visible light is only $\sim 5\text{eV}$. The science mission has just started and the early results are just in (see the included images).

There are follow up missions planned with XPOSAT (an Indian mission due for launch in 2021) to examine the polarisation of X-ray light waves in space and to study high energy high magnetic field environments, and XRISM, due for launch in 2022. This is a JAXA mission to provide breakthroughs in the study of structure formation of the universe, outflows from galaxy nuclei, and dark matter.

Robert Williams

known as e-ROSITA], a Germany/Russia collaboration, which is a 7-year mission to image the whole of the sky in X-rays with

Discovering New Worlds

"Visited on the 17th and were blessed with clear skies and no moon - was absolutely fantastic! Got to see Jupiter, Mars and it's ice cap, Saturn and even Neptune not to mention the band of the milky way. The staff were brilliant so knowledgeable and helpful. Highly recommend."

Rob, Stafford – September 2020

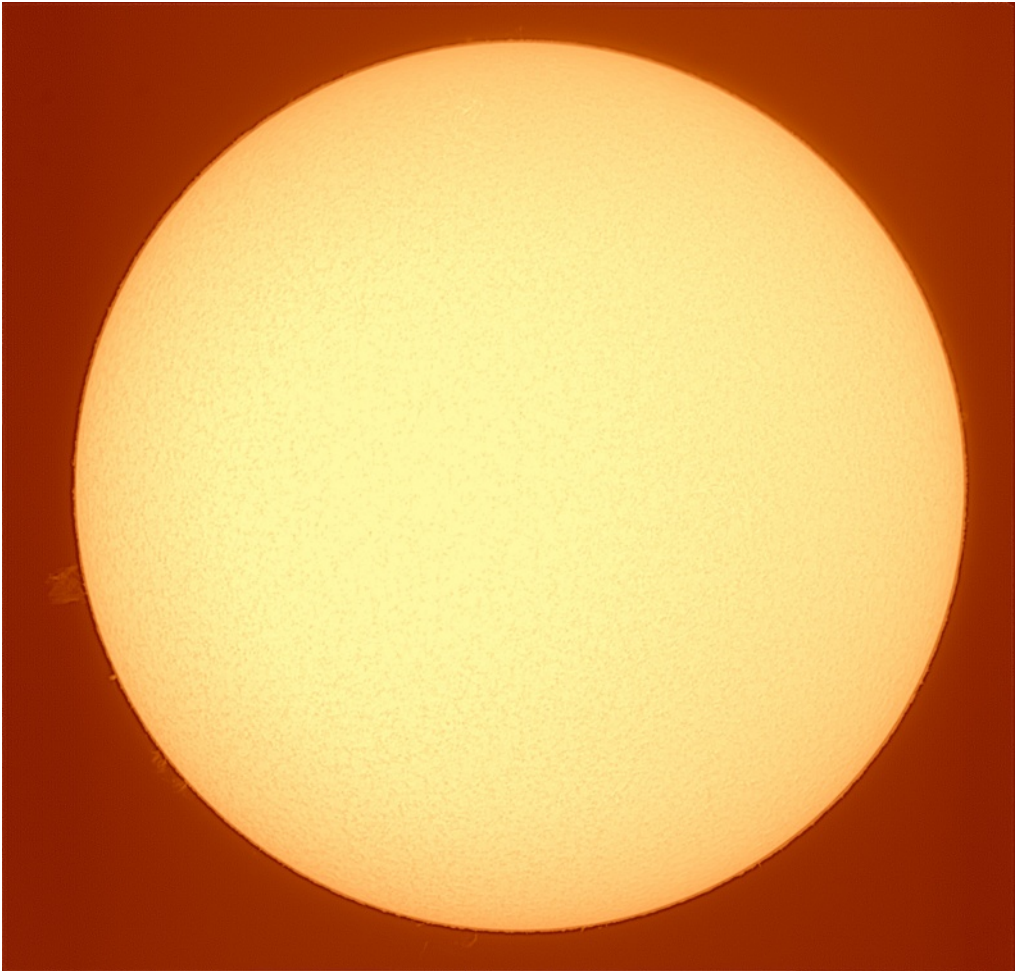


GALLERY

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.



The sun with prominences on the 1st of June 2020: Lunt 50 telescope with a Celestron Skyris 445M camera. Jurgen Schmoll.



GALLERY



Mars on Oct 27th 2020. Taken using a 14" SCT at 3.5m focal length, with a ZWO ASI120MC camera. Jurgen Schmoll.



The lunar Apennine Mountains taken through a 14" Meade SCT with a Skyris 445M camera. Jurgen Schmoll.



GALLERY



The North America Nebula and the Pelican Nebula (in Cygnus), as imaged on October 22nd 2020. Taken through a 200mm f/5 Canon lens with a Canon EOS 40D camera. 35x3min exposure time. Jurgen Schmoll.



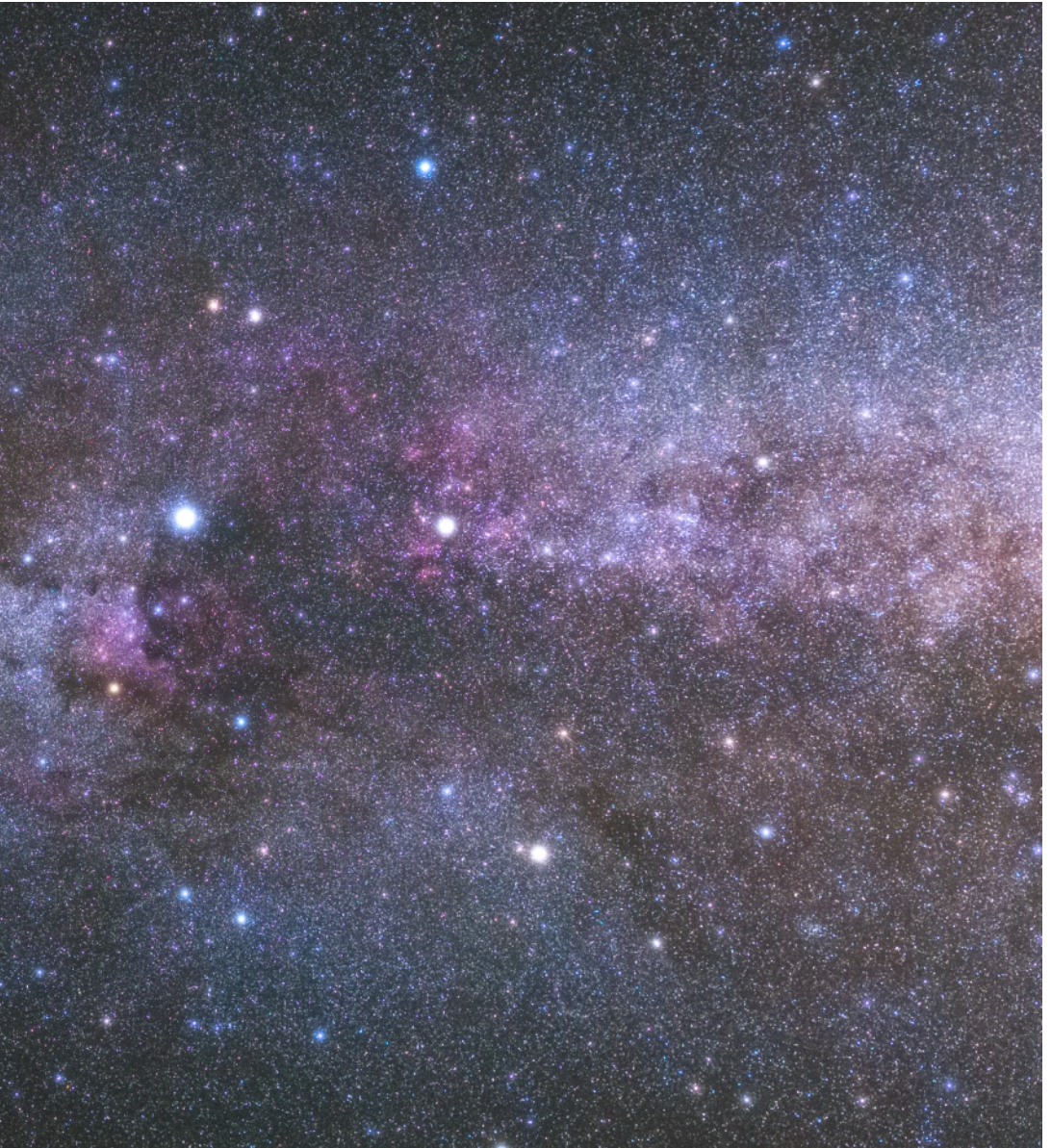
GALLERY



Page 26/27: The stars of the Milky Way. The constellation of Cepheus is to the top left. Taken with a Canon 6D and Sigma 35mm Art lens and a fog filter to enhance the stars. A single panorama split over the two pages.



GALLERY



Page 26/27: The stars of the Milky Way. The bright star left centre on this page is Deneb in the constellation of Cygnus. Composed of 46 x 30 second exposures stacked, f3.2, ISO 5000, using a star tracker. Dan Monk.



Fantastic event Rocket Making

"I'm so glad I hadn't read any reviews on here before I booked this event as I don't think they give the place credit. The kids loved the event and yes you volunteers are extremely intelligent and lost me in the detail never mind the kids (which is why I didn't give full marks as it was PowerPoint driven, which I understand), but the kids loved it they stood on Mars they touched meteorites, they made Princess rockets out of plastic bottles and paper with lots of Sellotape (Blue Peter skills needed) and watched them fly. It was too cloudy to see anything with the telescope which was a shame but they didn't seem to notice and the evening of blowing plastic bottles up and taking them home was great fun for us all. What's left of the rockets have pride of place in the girls bedrooms. Well worth a visit. Definitely visit again with their upgrade designs for rockets."

Vikki, Lancaster –
August 2020

Kielder Observatory - a beacon for dark skies

<https://kielderobservatory.org>

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