Autumn 2019 Number 25

Kielder Observatory Newsletter

EDITORIAL

Welcome to our new CEO! Catherine Johns took up the position in September. In the skies, November hosts a rare transit of Mercury across the face of the Sun on the 11th (you will have to wait until 2032 for the next one), so we all have our fingers and toes crossed for good weather! Robert Williams has written a little article on the subject. Somewhat longer is the story of how three of our Science team spent a 'busman's holiday' in Tenerife photographing the stars, and, as promised in the last edition, Hayden Goodfellow gives his full account of the National Astronomy Meeting.

Nigel Metcalfe

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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

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KIELDER OBSERVATORY™
Infinite Inspiration

New CEO appointed

We are pleased to announce that Catherine Johns joined us at the start of September as our new CEO.

Catherine comes to Kielder Observatory on the back of an illustrious career that has included developing the North East Technology Park into a world-class science park, and leading the development of the UK's fastest growing space cluster. Speaking about her appointment, Catherine said: "I am absolutely delighted to be joining Kielder as its new Chief Executive. I've been involved in the space industry for a number of years now and I'm very much looking forward to working with a team that has such a passion for the way astronomy can connect with people and their place in the universe. That moment of connection and inspiration is critical to me – wherever I've worked, it comes back to how what we do can unlock inspiration and transformation. Kielder Observatory provokes that reaction. Whether people have visited or not, their eyes light up when you mention you work there and the reaction is always the same; they love it there or have always wanted to go. That's why I took the job."

And this is something which seems very much underway with the Observatory having secured the contract with the North of Tyne Combined Authority STEM and Digital Skills Programme to deliver mobile planetarium and teaching events in Northumberland, Newcastle and North Tyneside schools, which, over a three year period, will visit every secondary and middle school in the Combined Authority area. This programme follows on from our very successful Transforming Tees Project, which delivered educational outreach work in schools in the Tees Valley area.

And with most Observatory events selling

out quickly, Catherine has a very clear roadmap planned for her first months in post.

"My priority is to look at how we extend the reach and impact of the Observatory," continued Catherine. "How do we work together – the trustees, the team and the partners – to tell the astronomy story to more people, creating that moment of inspiration. And very importantly, how do we develop the exceptional talent of the team we have, giving them everything they need to develop and communicate their passion for astronomy to make a real impact on people's lives."

A sentiment echoed by the Chair of the Trustees Peter Standfield, who, commenting on Catherine's appointment, said: "Catherine has the business acumen we need to further develop and deliver the ambitious vision we are creating. She has a phenomenal track record of not only attracting and leveraging funding but has a very obvious passion for increasing the reach, impact and revenue of Kielder Observatory. We're delighted to have her on board."

Ready for action at Marden Bridge Middle School

KIELDER OBSERVATORY™
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Late Night Explorer - September 19

This is my 3rd visit to the observatory and it's always such a good night. Although this time I visited on Friday 13th and the weather was bad we still managed to see some stars and the moon for a short while. On past occasions we saw planets as the sky was so clear. It never puts me off coming to the event. The staff are so lovely and friendly and their presentations are so informative. I can't wait to go back already!

Tyler - Newcastle upon Tyne

North of Tyne Mayor Jamie Driscoll visiting our planetarium session with Adam Shore and Dan Monk at Marden Bridge Middle School in Whitley Bay

As you can imagine, with the new CEO in place the staff at the Observatory have been pretty busy over the last couple of months. In particular, we have just started our educational contract with the North of Tyne Combined Authority, and we were delighted that North of Tyne Mayor Jamie Driscoll came to see the team in action at Marden Bridge Middle School in Whitley Bay during our four day science week there early in November. Students were given a tour of the night sky in our planetarium, followed by a hands-on meteorite workshop. You can read and see all about the visit at https://www.northoftyne-ca.gov.uk/news/kielder. Eight local schools have already signed up to the scheme.

With the financial year for 2018/19 now completed, we can report an increase of 22% in the number of events we held and a 13% increase in visitor numbers during the year, with a total of around 19000 people visiting the Observatory.

OBSERVATORY NEWS

Having introduced the CEO to you, we thought now would be a good time to introduce the rest of the team. So here they all are! Doing sterling work In the office we have

Alison, Patti & Heather

whilst wowing you with the science are

from left to right: Ellie, Jesse, Naz, Hayden, George, Dan M., Adam, Natasha & Dan P.

In other news, you might be interested in an article by the Forestry Commission's writer in residence, Tiffany Francis. She has written an inspiring piece about a visit to the observatory. Here is just a small extract: "Having shared a lifetime with the internet, I'm sad to say there are now few things that genuinely blow my mind. The cocktail of current affairs, disaster and devastation, clickbait articles and cat videos we are exposed to have made many of us immune to the wonders of the universe, and most of the world's most beautiful and awe-inspiring offerings are now cast aside with the flick of a scrolling finger. So when I experience something that literally makes my jaw drop, or sends my brain into amazement overload, I relish it. This is what happened during my visit to Kielder observatory – before it grew dark, before the hot chocolate was poured – before we had even opened the telescope hatch.". You can find the rest of Tiffany's story at https://unbound.com/boundless/2019/09/09/tiffany-francis/

As you may remember from previous newsletters, we have been helping Beacon Films with their full-dome film "The Cosmic Unknown". This has its premiere at Great North Museum on Thursday 14th November (free but booking essential): https://www.beaconfilms.org.uk/premiere Beacon Films is a charity offering opportunities for filmmakers with learning disabilities, autism and additional needs

to make and showcase great productions and develop valuable creative skills.

Christmas is coming, and by popular demand the KOAS calendar is back for 2020! It will be available during November from our on-line gift shop (https://kielderobservatory.org/shop). If you take in an Event before Christmas you will also find we now have Kielder Christmas cards for sale. These exclusive items will only be available to visitors to the Observatory.

By the way, events in the week after Christmas are selling fast so book quickly if you want a place (note that we are closed 24/25/26/27 December and New Year's Eve and New Year's Day, but open all other days in December and January).

Helen McGhie, our photography PhD student, would like to draw your attention to the following series of events at which she is exhibiting images from her project 'Anatomy of a Northern Astronomer', which has been inspired by conversations she has had with staff and volunteers at the Observatory.

'Observe, Experiment, Archive'
Photography exhibition at Sunderland Museum and Winter Gardens,
15 November 2019 - 5 January 2020
Private View: Thursday 14 November 2019, 5.30-7.30pm
Free Admission:

NEPN (North East Photography Network) presents a new exhibition exploring the relationship between photography and science. Observe, Experiment, Archive brings together for the first time, the work of eight contemporary photographic artists and reflects on how their art has been informed by historical collections, scientific innovations and our rapidly changing world - bringing into focus the ways in which the universe is mediated and transformed by light and lens.

OBSERVATORY NEWS

Exhibiting artists include Helen herself, Liza Dracup, Tessa Bunney, Maria McKinney, Robert Zhao Renhui, Mandy Barker, Penelope Umbrico and Sophie Ingleby.

There will be a series of free public talks and events to complement the exhibition at Sunderland Museum and Winter Gardens including Observing the Changing Natural World with Robert Zhao Renhui and Maria McKinney (15 November); Joseph Swan: A New Vision with Liza Dracup and photographic historian Carol McKay (22 November) – also part of the national Being Human Festival; The Polluted Seas and the Transformative Power of Photography with Mandy Barker and Matt Barnes from the Marine Conservation Society (27 November).

From 'Anatomy of a Northern Astronomer' by Helen McGhie

In particular, there will be a "Space Rocks! Art and Astronomy Family Day" with Kielder Observatory, Helen and potter David Partington on Saturday 23rd November. A couple of our Science team will be on hand and there will be several free activities for children, but booking is essential - see https://sunderlandculture.org.uk/events/space-rocks-art-and-astronomy-family-day/

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

KOAS at the National Astronomy Meeting

The National Astronomy Meeting (NAM) is the annual conference of the Royal Astronomical Society (RAS). A few hundred astronomers (almost exclusively researchers) descend on a different UK university for a week each Summer to share results, socialise and form potential future collaborations. NAM dates back to 1948 and the 2019 conference was hosted by Lancaster University on 30th June to 4th July.

The organisers kindly agreed to waive the registration fee for one person from Kielder to represent the Observatory at the conference, due to its charitable status. I would be exhibiting a large roll-up banner promoting our new education programme in the Tees Valley and North of Tyne, as well as our activities with the Gillian Dickinson Astrophotography Academy (GDAA).

I set up our stand in the exhibition hall with the poster and also a digital screen which would show recent news and images from the Observatory, as well as more detail about our activities. The roughly fifteen minute looping presentation showed off the Observatory's pristine location in Kielder Forest, the incredible views our guests can get on clear nights, the astronomy team who deliver events every night, the new telescopes and research possibilities of the GDAA, Helen McGhie's photography PhD research looking at the experience of the stargazer and our special events for the 50th anniversary of Apollo 11. There were also Kielder fridge magnets for interested people to take away.

Hayden represents KOAS at the National Astronomy Meeting

SCIENCE SLOT

The conference was started with a welcome from the local organising committee, as well as the Vice Chancellor of Lancaster University and the President of the RAS. Over the following days, I attended sessions to hear talks about education, outreach and diversity in astronomy, as well as hear the latest research into gravitational waves (just in time for our new "Physics in the Forest" sessions starting in the Autumn) and results from the Gaia satellite. There were also five Plenary talks, where researchers would deliver particularly noteworthy talks about exciting areas of their work. One particular highlight was hearing Dr Nicky Fox, NASA's director of Heliophysics, talk about the design and mission of the newly launched Parker Solar Probe. Some of the insights she shared have already been incorporated into our presentations at the Observatory. I also hope that we will be able to work with Gaia researchers to bring real European Space Agency research into workshops for our schools programme.

A social highlight of the conference was the RAS Awards dinner, which I believe it is now an unwritten rule of the RAS for Jon Culshaw to compere. The impressionist, keen astronomer and friend of Kielder Observatory was on top form as usual. A standing ovation was in order for Professor Margaret Kivelson, who received the Society's Gold medal for Geophysics thanks to her career working on planetary magnetospheres and developing instrumentation to fly out and measure them. She is still active in research at the age of 90 and warmed the audience with a speech about her inspirations and motivations.

The conference was a great success and the Local Organising Committee should be applauded for their efforts, as well as the catering staff and student "NAMbassadors". Conferences like this where people can meet and exchange ideas are invaluable for forging working relationships and I am positive that Kielder will play a more active role in contributing to research with our telescopes, and bringing some of that research into schools with new workshops across the North East.

NAM heads to Bath, home of William Herschel, in Summer 2020.

Hayden Goodfellow

The Transit of Mercury

Like its bigger sibling – Venus, the innermost Planet Mercury, can on occasion cross in front of the Sun in an event commonly known as a transit. Whilst the Transit of Venus has got far more publicity in recent years – there being two ToV's since the new millennium – in 2004 [seen widely across Europe and North Africa] and 2012 [seen principally in the Pacific Islands and Hawaii] - transits of Mercury are interesting because of at least two facts:

a) Unlike Venus, which has a thick atmosphere, Mercury – like the Moon – has but a very tenuous - and for all practical purposes non-existent – atmosphere,

b) Mercury's orbit – compared to all other planets - is not just governed by Newtonian gravity, but has noticeable perturbations due to Einstein's theory of relativity.

Like the Transit of Venus, the Transit of Mercury takes place on a regular cycle; in fact each subsequent event happens more regularly than the ToV. Transits of Mercury always occur in May or November. The last four transits occurred on November 15, 1999; May 7, 2003; November 8, 2006; and May 9, 2016. The next will occur on November 11, 2019, and then on November 13, 2032. A typical transit lasts several hours, so the two events share many similarities.

As a general rule, 1st and 4th contacts cannot be accurately detected, while 2nd and 3rd contacts are readily visible within the constraints of the Black Drop effect, irradiation, atmospheric conditions, and the quality of the optics being used. They have been observed scientifically since 1677 to 1881 – and a theory was developed from those results by S. Newcombe.

The scientific value of a ToM includes:

- Investigations of the variability of the Earth's rotation and of the tidal acceleration of the Moon.
- Measuring the mass of Venus from secular variations in Mercury's orbit.
- Looking for long term variations in the solar radius.
- Investigating the black drop effect, including calling into question the purported discovery of the atmosphere of Venus during the 1761 transit.
- Assessing the likely drop in light level in an exoplanet transit.

OBSERVERS' SLOT

More recently [1999 onwards] observations of ToM's from spacecraft have added to the book of knowledge of this event.

ToM's only occur when the Earth is aligned with a node of Mercury's orbit. Presently that date is 8th May -/- 3 days [Descending node] and 11th November +/- 3 days [Ascending node]. Because of the unusual nature of Mercury's orbit [precession of the nodes at 1.1 degree per century] the date of transit is gradually getting later in the years. Transits of Mercury occur on a regular basis. As explained in 1882 by Newcomb, the interval between passages of Mercury through the ascending node of its orbit is 87.969 days, and the interval between the Earth's passage through that same longitude is 365.254 days. From the ratio of these values, it can be easily shown that Mercury will make an almost integral number of revolutions about the Sun over intervals of 4, 6, 7, 13, 33, 46, 171 and 217 years. By a similar reasoning each successive ToM alternates between Northern and Southern hemispheres on Earth. However, because of the limit on the diameter of the Sun, not all of these

After 6 years	65' 37" S	31' 35" N
After 7 years	48' 21" N	23' 16" S
Hence after 13 years (6+7)	17' 16" S	8' 19" N
... 20 years (1x6 + 2x7)	31' 05" N	14' 57" S
... 33 years (2x6 + 3x7)	13' 49" N	6' 38" S
... 46 years (3x13 + 7)	3' 27" S	1' 41" N
... 217 years (14x13 + 5x7)	0' 17" N	0' 14" N

Saturn Night – October 19

The team were amazing, so friendly and accommodating, incredibly knowledgeable and all of them had fab sense of humours. Couldn't fault a single member of staff or their performance or knowledge. Their enthusiasm really rubbed off!

Emma - Harrogate

transits will be visible from Earth. Like the Saros Cycle of Solar Eclipses, there is a similar repeated cycle of ToM's. The most recent ToM, on 9th May 2016, was visible along a track from Northwest Africa, across the central Atlantic Ocean to Central America.

The next ToM on 11th November 2019, will start across the centre of the South Atlantic, cross Brazil, and end off the western coast of Chile. The track is quite wide so the event will be visible – though not completely – from the UK. If you miss this one, the next ToM will be on 13th November 2032. For more details of the 2019 event please check here.....

https://www.timeanddate.com/eclipse/transit/2019-november-11

From Newcastle the event timings [all times are in GMT] are as follows:

Partial Mercury transit visible:

Duration: 3 hours, 32 minutes, 9 seconds
Duration of full transit: 3 hours, 30 minutes, 28 seconds
Partial begins:11 Nov, 12:35:36
Full begins:11 Nov, 12:37:17
Maximum:11 Nov, 15:19:46
Full ends:11 Nov, (16:07:45)*
Partial ends:11 Nov, (16:07:45)*
Sunset:11 Nov, 16:09:50

* These times are actually when Mercury sets (followed closely by the sun). The transit continues for another 2 hours after sunset but obviously will not be visible from the UK.

Robert Williams

The last transit of Mercury visible from the UK was on May 9th 2016. The North East was blessed with good weather for once, and we were able to follow the transit in almost unbroken sunshine. This photo shows Mercury as the dot just below and to the right of the centre of the sun. Above and to the left is a group of sunspots.

Credit:Nigel Metcalfe

NIGHT SKY

NOVEMBER 2019 (times in GMT)

PLANET SUMMARY

Lunar phases

First quarter	04/11/2019
Full moon	12/11/2019
Last quarter	19/11/2019
New moon	26/11/2019

Mercury will be a very challenging object as it will be lost in the morning twilight. Venus will be equally challenging in the evening twilight. Mars will be seen low in the east before sunrise, but then lost in twilight. Jupiter will be visible low in the west after sunset. Saturn will be also visible in the west after sunset but it will set some 3.5 hours after the Sun so can be seen in moderately dark skies. Uranus is close to opposition and will be visible throughout the hours of darkness. [approx. 1815 to 0400].

THE STARS AT 8PM (GMT)

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.

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 we can see 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. With a near first quarter moon setting before midnight – with Taurus rising at the same time, 2019 could be good year to view this shower.

2) Leonids – on the 16th, 17th and 18th November – another annual shower that usually puts on a good show of 50 to 100

The Planets 15/11/2019

	Sun	Moon	Mercury	Venus	Mars	Jupiter	Saturn	Uranus
Rise	07:36	18:14	06:42	10:00	05:04	10:37	11:58	15:17
Set	20:40	10:20	15:52	17:01	15:18	17:46	19:21	05:54

meteors every hour. These particles are fast moving and 'small' and so the meteors are quite faint. With a last quarter moon rising close to Leo, the Leonid shower will be somewhat muted in 2019 not least because we are only 2-3 years after minimum activity [33 year cycle – next 'peak' in 2032?]

COMETS

Comet C/2017 T2/PanSTARRS is brightening, currently in Auriga at magnitude ~9 and visible all night.

OTHER SKY HAPPENINGS

A transit of Mercury takes place on November 11th (see article on pages 11-13). The Sun continues to surprise observers with brief eruptions so keep a look out for aurora.

Now is a good time to look for Uranus. The planet was in opposition at the end of October, so at its most favourable for viewing. At magnitude 5.7, only those with exceptionally dark skies and eagle eyesight will be able to spot it with the naked eye, but binoculars will show it easily. If you want to see any of its moons you will need a large telescope though, or resort to photography (as seen here), as the brightest moons only hover around magnitude 14.

Credit: Nigel Metcalfe

NIGHT SKY

DECEMBER 2019 (times in GMT)

PLANET SUMMARY

Lunar phases

First quarter	04/12/2019
Full moon	12/12/2019
Last quarter	19/12/2019
New moon	26/12/2019

Mercury is not visible this month. Venus will be seen low in the west after sunset. Mars will be visible low in the east before sunrise. Jupiter is not visible this month. Saturn will be visible low in the west after sunset. Uranus will eb visible from about 1730 until 0130.

THE STARS AT 8PM (GMT)

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

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 2019 there will be a full moon washing out all but the brightest of the meteors

Later in the month – on Christmas Day the Ursids are active. Expect up to 5 per hours form this weak shower. It will be visible all night . With a new moon 2019 will be a good opportunity to see this shower.

COMETS

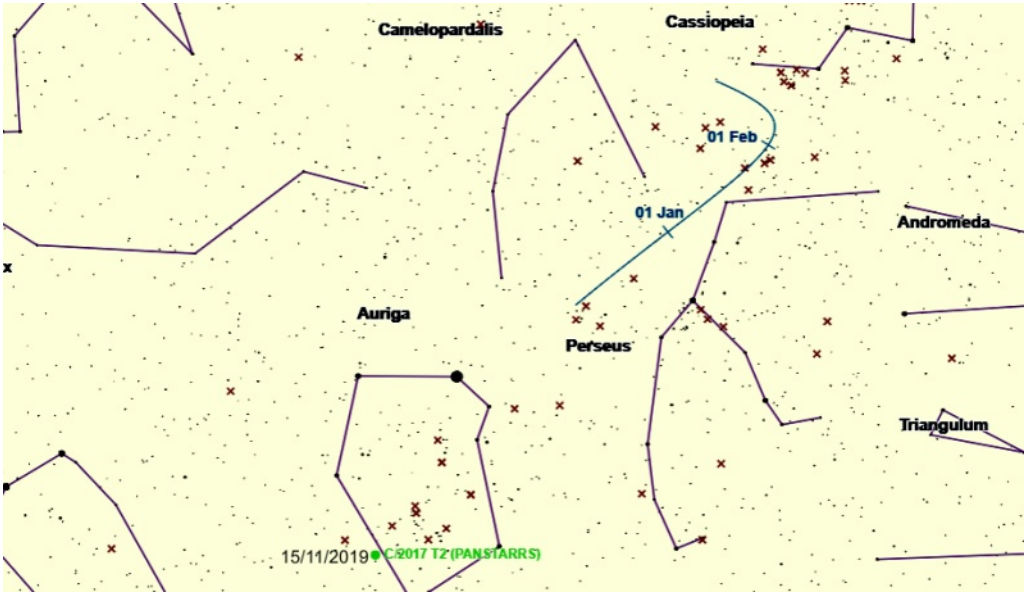
Comet C/2017 T2/PanSTARRS is still brightening, currently in Perseus near the border with Camelopardalis.

Comet 289P/Blanpain is in Aquarius. It is too faint for observation at the moment but in the past has been prone to

The Planets 15/12/2019

	Sun	Moon	Mercury	Venus	Mars	Jupiter	Saturn	Uranus
Rise	08:23	19:24	07:08	10:39	05:05	09:09	10:09	13:17
Set	15:26	10:10	14:50	17:50	13:55	16:16	17:38	03:50

outbursts. If it does brighten significantly it should be visible low in the south in the early evening, and is moving rapidly north throughout December towards the Square of Pegasus, brightening as it does so.



The position of Comet C/2017 T2/PanSTARRS on November 15th, plus its track in Dec/Jan/Feb. It was discovered in October 2017 by the PanSTARRS 1.8m telescope, hence the name. The 'C' refers to the fact that is it a non-periodic comet (i.e. on an orbit which won't see it return for at least 200 years). The 'T' simply indicates the half-month of the year it was discovered in and the '2' means it was the second comet discovered in that half-month.

July 19

What a fabulous night last night, let down only by the cloud cover that decided to descend as the night went on. Incredible setting, beautiful location, amazing staff, very knowledgeable and enthusiastic about all things astronomical. This was a present for our ten year old boy who loves to stargaze and it was amazing the time the staff took to chat to him about everything and anything to do with the night sky. We will be back!

Scott - Glasgow

NIGHT SKY

JANUARY 2020 (times in GMT)

PLANET SUMMARY

Lunar phases

First quarter	03/01/2020
Full moon	10/01/2020
Last quarter	17/01/2020
New moon	24/01/2020

Mercury will be a difficult object low in the west after sunset. Venus will be the Evening Star this month setting some 3.5 hour after the Sun. Mars is a morning object visible low in the east before sunrise. Jupiter and Saturn are not visible this month. Uranus is an evening object visible form about 1800 until midnight.

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. Pisces, Pegasus and Cygnus are well placed as is Pisces – with Mars.

METEOR SHOWERS

The major meteor shower of this month are 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 meteors 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 4th January.

The Planets 15/01/2020

	Sun	Moon	Mercury	Venus	Mars	Jupiter	Saturn	Uranus
Rise	08:21	22:43	08:50	09:54	05:04	07:35	08:18	11:15
Set	16:07	11:20	17:08	19:38	12:42	14:47	15:55	01:47

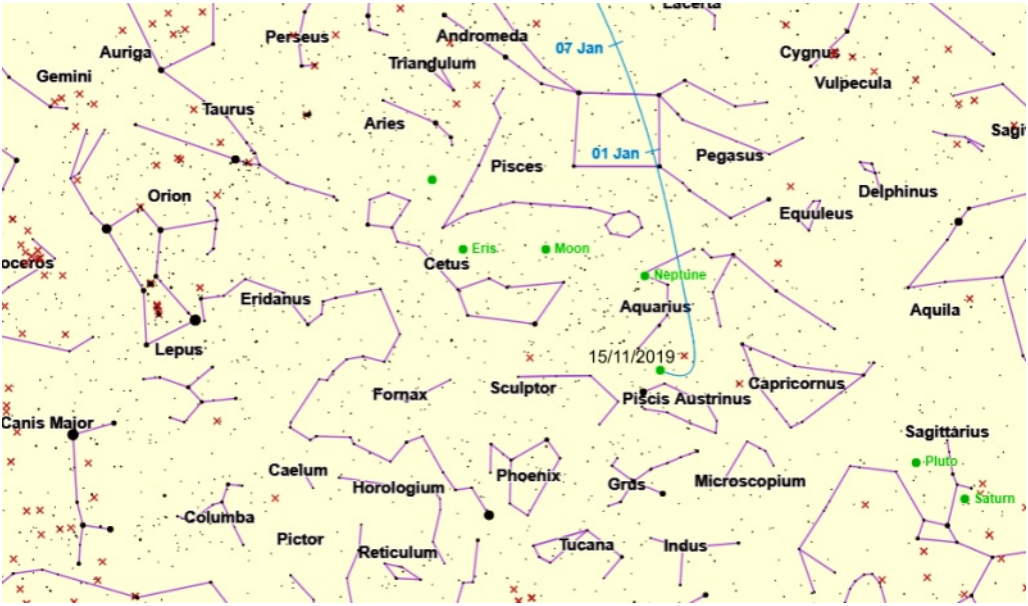
COMETS

Comet C/2017 T2/PanSTARRS should still be brightening - it is anticipated to be around magnitude 7, and is still in Perseus. At the end of the month it passes through the Double Cluster in Perseus so should make a fine sight photographically.

Should it undergo an outburst, comet 289P/Blanpain is circumpolar throughout January. In the middle of the month it is in Cassiopeia.

Night Sky credits:

Data sourced from Cybersky 5, https://www.timeanddate.com/moon/phases/ and https://in-the-sky.org/ .



Comet289P/Blanpain starts November in Aquarius, moving in to Pegasus by January. It is very faint at the moment and only really suitable for photography, but it does have a history of undergoing outbursts which make it much brighter.

ASTRONOMERS' TALES

3 Astronomers, a Volcano and the Milky Way

Early in September, three KOAS science presenters, Adam Shore, Dan Monk and myself, set off on our wildest mission yet, on a journey to the Island of Tenerife, our purpose, not that of a regular "lads holiday" but to drive up Spain's highest peak, Mt. Teide. Home to a collection of research telescopes, Mt Teide's summit sits at 3,718m, while the observatories sit at a slightly more oxygen comfortable 2,450m above sea level. Technically still active, this volcano's last major eruption was in 1909, so with the excitement of imminent eruption, dizzying altitudes, and the lust of imaging the Galactic Core in mind, off we went.

We set off from Edinburgh airport on the morning of August 30th. 5 hours later we touched down in Tenerife South, bleary eyed from an early start for the usual night owls that we are. We hired a car, and set off to explore the nearest beach while we waited for check in. We then dropped off our bags at the hotel, following a quick stop at the local Lidl

on the way, and set out immediately for the mountain. The climb in our hire car was that of an adventure. With winding roads following paths like cables left unattended in a drawer for 10 minutes, and sudden drops into a bed of cacti, we pushed on. It was my first major observation that the locals have little awareness of the imminent doom of plunging hundreds of feet into prickly fauna as they rally around the blind corners and narrow streets. It still astounds me that, at the heights we were reaching, there were farmers making sustainable plots of vegetation in amongst spectacular rocky terrain, hanging on the edge of a mountain, overlooking the rest of the Island. Around every bend was another little settlement of classic white buildings, and a bustling micro population.

After 20 nail-biting minutes, we reached a road which opened up into something more comfortable to drive on, a wonderful wide, tarmac highway, with safety barriers either side. Every now and again we caught glimpse of a little sign with a camera on it; we worked out that this meant, "you wanna see this and take a picture", and on most occasions, the sign was right. The views as we continually climbed were breath-taking, almost as much as the air was becoming as oxygen began to become a little sparser. Suddenly, there it was, the looming summit of Mt. Teide, the reddened flow lines stretching down its side, and the rising pillars of volcanic vents. We were in the middle of a field of pumice, surrounded by boulder remnants of falling magma bombs. My jaw dragging along the floor, we scurried out of the comfort of the air-conditioned car to take it in. We climbed higher and found "the spot" to set up for the night, surrounded by a stunning horizon of cragged peaks in an almost Martian looking terrain. On a personal note, I spent a great deal of time trying to adjust to the altitude, something which I hadn't expected would become such an issue. Dazed and a little confused, likely as a result of the flight and lack of sleep, admittedly, I struggled to adjust, so stayed close to the car. At this point I haven't mentioned, the weather… in classic Kielder fashion it was cloudy, but did that dissuade us? Absolutely not! If there is anything we have learned at Kielder, it's that weather changes rapidly, and a healthy level of optimism is required at all times. After a couple of hours, it was a wash out, so we headed back down a slightly less treacherous route this time,

and certainly the route we would be taking the next couple of nights.

The next day, worried and on tenterhooks, we waited by the pool catching some sun, before heading up the mountain again. Still cloudy, our optimism was fading, however Dan Monk's skin wasn't, it was gradually changing shade, becoming a slightly less peachy, more crimson colour. Dan learned a very important lesson this day, despite the cloud, still wear sun lotion… that evening after a shower he was beginning to resemble a male, slightly chubby Britney Spears impersonator in her shiny red skin-tight jump suit from the music video "oops I did it again", which is something Dan won't be saying in future after this lesson.

Finding a spot in a field of boulders near the base of the cone of the great volcanic peak, we set up with a mountain of hope. At a slightly lower altitude of 2200m, I was feeling much more comfortable and confident and adjusting well, so I ventured ever further from the car this time, and set up in the middle of the desert of dust. The cloud was breaking,

and our excitement was building.

We snapped away at a slither of a waxing moon as it set below the mountainous horizon, taking advantage of the breaks in the cloud, the sky's colour slowly evolving into a deep purple, waiting in hope of clear skies. An hour passed beyond the darkness setting in, and we were about to give up hope, and then, in true Kielder fashion, away went the clouds and out it came - the stretching band of light of the billions of stars in our interstellar neighbourhood, and the unmistakable tail of the constellation of Scorpius. Gazing around we started spotting constellations we don't see in the UK, Grus, Telescopium, the whole of Sagittarius, Microscopium, all while the Galactic Core drifts by the southern part of the sky. Our cameras were snapping frantically - amongst our kit was; a range of Sony mirrorless cameras, Samyang, Sigma and Zeiss lenses, a range of Canon DSLR, and a Nikon with a range of lenses, all mounted on Skywatcher Star Adventurers. 3 hours later, we were spent. Star trails, tracked Milky Way, foregrounds galore, we skipped back to the hotel with treats in tow!

The following day was filled with frantic pre-processing of initial shots, whilst of course sitting in the sun by the pool, which was frequently distracted by water activities, until that evening, up we went again. Dan Monk packed like a mule with his army of cameras, tripods and other kit, rubbing against his freshly sun burnt shoulders. This time on the way, we opted to visit the local McDonalds, a recommendation we can all make (they do bacon and cheese fries… unreal)!

It was the final night, and clear skies were definitely upon us, so we headed up the east side of the mountain, up what I can only describe as one of the most magnificent roads I have ever experienced. We went through forests, just like that of Kielder, towering pines pitched on the edge of drops into nothing but cloud tops. As we were climbing, we stopped to take in the view. Someone with nerves of steel was paragliding down the side of the mountain, into the tops of nothing but a sea of white, fluffy cloud.

We stood by the side of the road, suddenly realising there was no barrier, just a very uncomfortable tumble down 2000m. Climbing higher, the roads were like nothing I've experienced before. To the left, rock faces of layered colours, to the right, a most definite plunge into the

The Milky Way from Tenerife, with well-known objects highlighted.

abyss, but views which are unrivalled by anything I've seen before. Turning a bend, we saw the glistening white domes of the observatories, and, to my relief, only 1 mile of terrifying road before we were back to mild comfort.

We arrived at the base of the road where the Observatories sat, the same view we have become accustomed to on one side, the tops of clouds, and the other rising above us, the turrets of tech. Gazing up at them from this angle, you can almost imagine them stretching into the heavens, and plucking out their findings, a marvel of modern day research into the great unknown. After some time basking in their glory 'blue hour' was approaching, and we needed our foregrounds for the evening's shots, so we drove onward. After a few miles, passing through terrain formed by lava flow, carved holes with roads laid precisely between, we arrived at our destination, Tabonal Negro, at 2362m. Tonight altitude worries were gone, I was acclimatised and feeling great. The peak shadowed over us from behind, and to the front, a red desert ridged by a surround of cragged peaks. We began selecting our

spots, close to the ridge of the desert. If we lost our footing, or walked too far, we would have most certainly woken up sore the next day.

As the sun set, 'blue hour' was upon us - this is the perfect time to take advantage of to capture our foregrounds. Frantically snapping as much as we could in the 18 minutes we had, time was finally up. The waxing Moon was setting behind the peak, and already a band of light was becoming visible. It was incredible to see how quickly and early we could see the Milky Way from here. Dan Monk had set up 3 cameras in various different places, Adam was set up not far from myself, and I was rushing around to get the all sky camera operational, while tracking the Milky Way. This was the night, we spent hours, and hours, and hours in the plummeting temperatures, snapping away. Although the cold was setting in, the dew was non-existent, which made imaging incredibly pleasant. The atmosphere was stable, the stars barely twinkling, it was a night I think we will always remember for the rest of our lives. Satisfied and on a high, we danced our way back to the hotel, for our final rest before the trip back.

We learned a lot from our trip. There's things we would do more of, there's things

we would maybe do less of, but there is one thing for sure, we're going back, and with the 10.4m Gran Telescopio Canarias on La Palma only 250 miles away by plane from Tenerife North, it's firmly in our sights for 2020.

Dan Pye
Science Presenter

All shots except the opening scene @ Dan Pye. The MIlky Way was 33 mins (of 90 sec exposures) taken with a Sony A7 II and Samyang 35mm f1.4 AF at ISO3200, F2.8, tracked on a SkyWatcher Star Adventurer, stacked using Starry Sky Stacker and edited and annotated in Light Room. The foreground volcanic landscapes were 60 seconds, ISO 200, f2.8.

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.

The crescent moon setting over the forest in early October.

Credit: Dan Pye

The Orion nebula, Messier 42, taken from Norfolk using a Borg 76 telescope and Canon 60Da camera. 15x1 min exposure.

Credit: Robert Williams

A fisheye view of the Miky Way taken from Norfolk using a Canon 60Da camera and Samyang 8mm lens.

Credit: Robert Williams

Star trails seen through the roof of the Gillian Dickinson building, with our 14" telescope in the foreground.

Credit: Dan Pye

"The evening we attended was not particularly kind in terms of weather as the forecast of clear skies was not borne out by reality. However, we did get to look through some telescopes at stars in gaps in the overcast and it was stunning to observe them. On reflection, we might have geared our whole trip to Northumberland so we were not at Kielder when the moon was both pretty full and blazing away during the period of time we were at the observatory. The dark skies over Kielder are a real pleasure to see and one wishes that more of rural Britain was the same. The absolutely stunning part of the whole evening was the two talks we received from one of the astronomers where I learned (or more accurately - re-learned) what makes the whole cosmos tick. It is delivered in a balanced way which would appeal to both scientists and non-scientists. The whole experience is really rather uplifting. I will be going back again when I can because I think you would learn something new every time. You just take pot luck with the British weather."

Sybil - Buckingham