Summer 2020 Number 28

Kielder Observatory Newsletter

EDITORIAL

Last minute lockdowns permitting, we will be back open and entertaining visitors by the time you read this! We have had to reduce the numbers we allow for events, but be assured the experience will be just as good. The excitement in the skies in the last month has, of course, been Comet Neowise. After the disapointment of Comet Atlas, Neowise took everyone by surprise by reaching naked eye visibility in mid-July. Not unexpectedly, you will find quite a few images in this edition! We also have a guide to choosing your first telescope, an update from the world of space flight, and a brief glimpse a new kind of exotic object.

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

KIELDER OBSERVATORY™
Infinite Inspiration

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secretary@kielderobservatory.org
admin@kielderobservatory.org

Front and rear cover: Comet Neowise, Dan Monk.

A Word from Our CEO

We are absolutely delighted to have opened our doors again to the public - we have been closed for over four months and it's been frustrating not to share our love of stargazing with our visitors.

We have not been idle - the Observatory itself has had a facelift and spruce up and very smart it looks too. And hopefully you have all seen the various new initiatives that we have been launching under our "Kielder Observatory Constellations" banner, including an augmented reality Kielder Observatory (your very own observatory wherever you want it), a new radio telescope, and the development of a digital online learning resource.

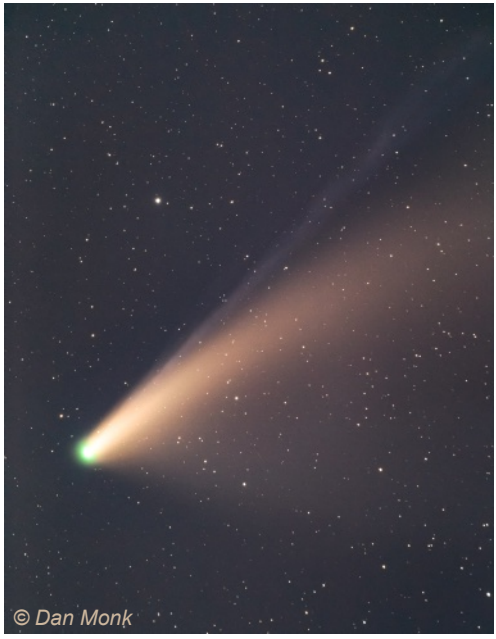
This is just the start - the point of Kielder Observatory Constellations is that we look for new and innovative ways to convey that very special "Kielder moment" of inspiration and hope to as many people as possible. You've probably heard the saying that we are all made of stardust - it is true, the iron in our blood comes from stars that collapsed billions of years ago and billions of lightyears away. We are all points of light - Kielder Observatory Constellations looks to switch those points of lights on.

If you're visiting us in the near future, you'll find our events have changed a little to accommodate social distancing - you can keep up with the latest guidance at https://kielderobservatory.org/news/latest-news/152-coronavirus-measures .

We are very grateful for all the support we have received throughout these strange times - we are certainly adapting to suit the new normal!

We are very much looking forward to seeing you soon.

Catherine Johns CEO



OBSERVATORY NEWS

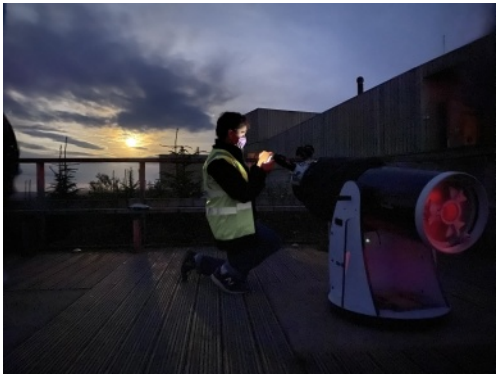
Visitors arrive for our first event after coming out of lockdown

The big news is, of course, that we successfully reopened to the public on August 1st. We have had to cut the number of visitors we can take for each event, and groups are being split between our two observatory buildings so that social distancing can be maintained. We also ask all our visitors to wear face masks. Surfaces/chair are sanitised between events and eyepieces and other equipment are santised between each use. Hand sanitiser stations are available for visitors to use.

Our reduced capacity does mean it is more important than ever to book early to avoid disappointment!

The 'new normal'?

OBSERVATORY NEWS



Back on the skies!

Apart from the reopening, our major news is that we are looking to create a radio astronomy facility and are seeking planning permission from Northumberland County Council to site a new, five-metre-diameter, Spider 500 radio telescope at the Observatory. Radio astronomy has the advantage of being weather independent and delivers important observations that have supported the Big Bang theory and discovered new objects, such as pulsars. The new facility will allow us to contribute to worldwide scientific research, attract university research into Northumberland and develop our remote outreach activities. This investment will make a dramatic difference to our astronomy offer, especially now when people are understandably reluctant to travel, as it

With a bit of photo manipulation, we can show you what our new radio telescope might look like when it is on site!

will mean people can access the observatory remotely. A school child in Sunderland or Darlington, for example, would be able to experience astronomy at the Observatory without setting foot here.

The acquisition and installation of the telescope is mostly being funded by the Tanlaw Foundation, a charity run by Lord Tanlaw which supports education.

The telescope is part of our developing strategy to connect with people in innovative ways to convey that special Kielder moment of inspiration. We have already started development on an augmented reality Kielder Observatory and we are developing an online Kielder learning resource. Some of you may have seen our recent mission patch competition which we ran for children aged 16 and under during July on https://kielder.space, where we also currently have a series of weekly challenges for schoolchildren to complete.

The new shutters in position

Installation of the new shutters

In other news, we have had shiny new shutters installed on the Sir Patrick Moore dome. So no more need for buckets on the floor when it rains!

Publicity-wise, we featured in the most recent Living North magazine with a guide to the night sky and we also had a little item in The Times newspaper. Dan Pye was interviewed about the reopening on the breakfast show on Radio Newcastle on August 1st. Also, although it seems a long time ago now, some of our images were used on the BBC's One Show at the beginning of June, as part of an item on stargazing during lockdown by Brian Cox and Dara Ò Briain.

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

Telescope selection guide

Maybe you are new to astronomy. After reading some books and visiting a public observatory (such as Kielder!) you have decided it is time to get a telescope yourself. Or perhaps you intend to get a telescope for a loved one such as your partner or child. In any of these cases, you may appreciate some guidance to ensure the telescope you decide on fulfils your expectations.

About telescopes

Telescopes were invented in the early 1600s. Since then, many variations of them have hit the scenes, either improving on size and quality, or specialising into certain aspects of observations. An astronomical telescope has various aspects that differ from telescopes intended for terrestrial observations (like spotting scopes for bird watching):

Firstly, the astronomical telescope is an open system. You can change eyepieces to adapt the magnification to your object. Small, bright objects are observed with higher magnification than faint, large

ones. Other accessories can be added quickly, for example a diagonal to access the eyepiece more easily when the telescope points upwards, or filters to get more contrast on gaseous nebulae. Even a camera can be attached to photograph through the telescope.

Secondly, while a spotting scope intended for bird watching will show the bird upright and in correct orientation, astronomical telescopes will not. In space, up or down does not matter and the additional prisms or lenses needed would just consume precious light. However, such systems can be purchased to make an astronomical telescope fit for looking at terrestrial objects as well.

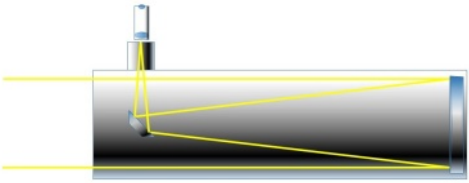
Finally, astronomical telescopes are large and powerful. They cannot be held by hand, but come on a stand. This is usually a pier or tripod with a connecting bit that allows the telescope to be pointed to an object and locked there. This connecting part is called the mount, and is a very important item. As the Earth is rotating, astronomical objects will drift out of the field of view of a fixed telescope. To compensate for this, simple alt-azimuth mounts are available which can be moved horizontally and vertically to follow the object. The more elaborate equatorial mounts are aligned to the Earth axis. This means that a single rotation with a slow-motion control or a motor will be sufficient to follow an object with ease. A stable and precise mount is as important as the telescope itself!

A complete astronomical telescope comes with a tripod, a mount and several eyepieces. In addition, there may be a smaller 'finder' mounted on the main tube to help aim at an object. This 'finder' is usually either a small telescope itself, or a sighting device such as a red dot finder. Apart from eyepieces to achieve different magnifications, some additional accessories may be included, such as filters or a Barlow lens that increases the focal length of the telescope and hence its magnification.

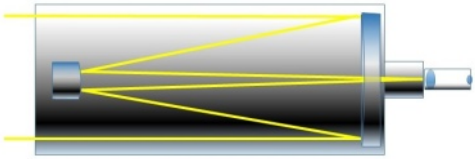
Refractors and reflectors

Telescopes come in two main “flavours”. Either they use lenses to focus an image, in which case they are called refractors. Or they use mirrors instead – reflectors. Each of the designs has certain

In a refractor, a lens system focuses the light



The Newtonian reflector uses a mirror to focus the light. A second, small mirror places the focus to the side of the top end of the tube, where the eyepiece is located.



In Cassegrain-style instruments two mirrors reflect the light to a focus located behind the primary mirror that has a central hole.

advantages. The refractor is easy to maintain as the optics do not get misaligned easily. There is no secondary mirror in the beam path that gives rise to diffraction effects in the image. However, large refractors tend to be long and cumbersome. Also they can be quite expensive. They suffer from false colour (colour fringing, or in shoptalk “chromatic aberration”, where light of different colour has a slightly different focus) although there are very expensive telescopes with specially designed lenses to suppress the colour fringing so it is not noticeable. Those telescopes are called apochromatic refractors.

The Newtonian reflector is very popular amongst amateurs. For a given budget, usually a Newtonian offers the most in terms of aperture. The larger the aperture, the more light will be collected, which makes faint objects beyond our solar system easier to see. However, observers have to get used to the eyepiece position being near the top end of the tube. Reflectors use glass mirrors with a very thin layer of aluminium evaporated onto them, and after many years this layer may have to be replaced.

The Cassegrain telescope and its varieties (like Schmidt-Cassegrain or Maksutov-Cassegrain) feature a short focal length primary mirror. The light from there is intercepted by a secondary mirror that is convex (bent outwards). This mirror relays the focus back behind the primary mirror (which is perforated so the light gets through), so looking through such a telescope is similar to looking through a refractor. The focal length of such systems is relatively high, so higher magnifications can be achieved. However,

these telescopes are very compact: 2m focal length can be hidden in a 40cm short tube!

Magnification

Here is where the trouble starts! Many cheap telescopes offer an incredible amount of magnification. For example, a 60mm refractor for less than £100 features 675x magnification! The truth is, that while this magnification can be reached, it is of no use. A rule of thumb for the maximum useful magnification is twice the diameter of a telescope in millimetres. So, the 60mm refractor can really only provide only about 120x before the image gets too blurry and dark. Sadly, 675x sells better, but the user may end up very dissappointed. With a 150mm reflector for example, the maximum magnification is still only about 300x. But even this depends on the object, as many objects look clearer with lower magnification. Usually the moon and planets are the objects where the maximum magnification can be used best. This is true only when the atmosphere collaborates. During nights when the stars twinkle, the planets may look like they are being seen from under water and less magnification shows them better.

Example: A 50mm refractor

For decades, such instruments were the default scopes for beginners. The package usually features the telescope itself, some eyepieces, a diagonal and a small finder scope. They come on alt-azimuth mounts that allow them to be moved around the sky, but to follow an object both axes have to be moved. Such an instrument will show the brightest nebulae like the Great Orion Nebula, many open star clusters like the Pleiades, a few galaxies and in our solar

system they will show the craters on the moon, the cloud stripes and moons of Jupiter and Saturn's rings. Sadly, in recent years manufacturers cut corners, and many parts of such instruments are now plastic, so the telescope is mechanically not sound any more. Usually they come with very basic Huygens-style eyepieces. On the plus side, they can be a cheap taster to check if astronomy is the right hobby or not!

Example: A 200mm Newtonian on an equatorial mount

This telescope is a 200mm Newtonian on an equatorial mount. In this version, it is already a bit big for a beginner's scope, but it shows several advantages. The mount is sturdy and driven by motors so that it follows an object automatically. This instrument can be used to take photographs of faint objects, as the tracking accuracy of the mount is good enough. Visually, such a scope shows what the small refractor does, but with much more clarity, and will also show many fainter nebulae and galaxies. Globular clusters like M13 in Hercules do not show up as a faint fuzz, as in the 50mm instrument, but can be resolved into individual stars.

Is this telescope the right choice for me/him/her?

That is another tricky question. The choice of a telescope is not straightforward, but rather a decision process like that for a musical instrument. Guitar or trumpet, a piano or rather singing classes – it all depends on various factors and interests. In the case of astronomy, there are these parameters to consider:

- Budget: astronomical telescopes can

cost £100 or £1000 pounds. Clearly, the "you get what you pay for" maxim applies here. While it is advisable not to start too cheap, it is not necessary to spend a fortune, especially if you do not know yet how strong an interest you have in astronomy.

- Particular interest: a newcomer may have been hooked by seeing Saturn through a telescope in a public observatory, and their main interest may be in planets. Or it may be in really distant objects like nebulae and galaxies. There are so many different things in the sky which a telescope can be optimised towards.
- Observing technique: is it just for looking through or will there be a desire to add a camera later to image the sky? For imaging, an equatorial mount is necessary while the visual observer can get along with an alt-azimuth mount.
- Location: is there a dark garden where a heavy telescope can be rolled out to, or is it necessary to escape a light polluted city by car? This will influence the portability you require for your telescope. While in principle a bigger telescope is better than a smaller one, a large telescope is not ideal if it does not get used because it is too cumbersome to dismantle and re-erect outside of town.
- Personal choice: is the new telescope owner a haptic person who likes to push a telescope around using star maps to find the objects? Or is the telescope rather for a "geek" who loves GPS and computer control? Can the telescope easily be physically handled by the new owner – this is especially important for children.
- Taste: even though telescopes are to be looked through rather than looked at, the question of which scope to buy may be influenced by taste as well. It is just important to remember that a stylish appearance is not particularly important when using it at night!

One word about computerised telescopes: There are now many GOTO instruments out there, where the objects are found by a computer once the telescope has been initially set up. Opinions about these telescopes differ. On the pro side, you can find objects much more easily, as you do not need a star map - you can even run them from a smartphone. However, at the low price end a significant fraction of the cost may be the computer, which may not leave much for the telescope. So you may end up with a database of thousands of objects, but the telescope unable to show any but the brightest ones. Also, finding objects yourself is fun and rewarding –

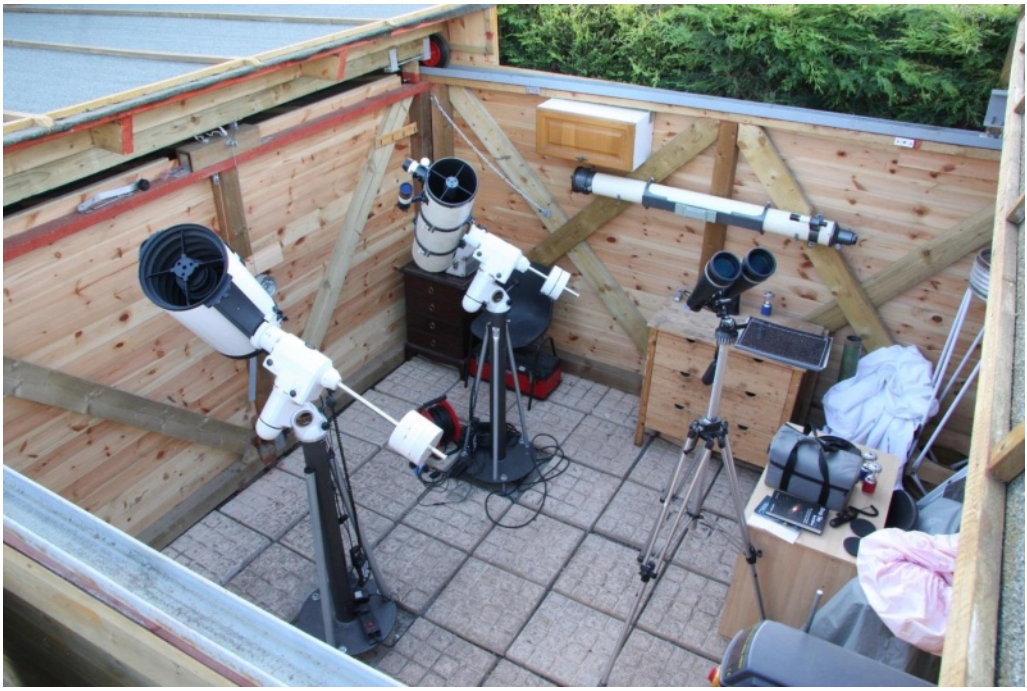
and part of a learning process. The author has two computer controlled mounts but still prefers to find objects himself. This is definitely a question of personal choice.

Where to buy a telescope?

There are many places to buy telescopes. Internet sites, department stores, or even some food discount stores have special offers – particular in the run-up to Christmas. There are also a few specialised shops around the country. However, not all suppliers have the quality needed to ensure the start into astronomy does not end up in frustration. When you have a particular instrument in mind, it is very helpful to seek advice by contacting amateur astronomers, e.g. through a planetarium or a public observatory nearby. This could also be the meeting point to look through some of their instruments to get a better idea about what to expect. It is advisable to have a look at dealers who specialise in astronomy. Popular astronomy magazines like “Astronomy Now” or “The Sky at Night” have adverts with web links. The advantage of specialist dealers is that you have a better chance to get good advice, and also a guarantee about the optical quality so you can return the instrument if it turns out to be faulty.

Got a telescope! What now ... ?

If you have access to an experienced amateur astronomer or a society, it is advisable to let somebody look through your telescope to check it out. Using star-testing, optical aberrations will show up quickly and the telescope can be adjusted if necessary. Reflectors in particular are not always in their optimum shape after unwrapping all the packaging, but a skilled amateur can put it right quickly and (more importantly) show you how to do it yourself. You will probably struggle with the first steps how to use the telescope. It is advisable to start with the lowest magnification to find an object, as the field of view is largest. Once you have aligned the finder using a distant object (a church spire for example), you can point the telescope to an object using the finder. Then you use the lowest magnification of the telescope, followed by higher ones if required. To find nebulae, galaxies and star clusters a star atlas is a very good addition to the telescope. To read the atlas without losing your dark adaptation, get a red-light torch. This torch does not have to be bright, and the red light helps to keep your night vision. To find out which constellations are visible when and where, a planisphere is another worthwhile addition. Star



atlases and planispheres are available online or in good book stores. Red-light torches can be purchased from astronomy shops, or make one yourself using a bicycle rear light or a white torch with some red material wrapped around it. It may take a full night to find your first object, but like playing a musical instrument the experience gained will help to accelerate the progress until you have learnt the new skill completely. Beware – once hooked by the astronomy bug, you may end up like the author of this article, having an observatory in the garden with various telescopes for different purposes!

Above is a picture of my observatory. The two equatorially mounted white telescopes on the left are a Cassegrain-style and a Newtonian, used mainly to photograph the heavens. Fixed at the wall there is a long refractor that is nice for moon and planets – mostly used for public observing events. The large pair of binoculars on the tripod is a nice wide field setup that also assists in locating new objects.

Jürgen Schmoll
KOAS Trustee

NIGHT SKY

AUGUST 2020 (times in BST)

Lunar phases

Full moon	03/08/2020	16:58
Last quarter	11/08/2020	17:44
New moon	19/08/2020	03:41
First quarter	25/08/2020	18:57

PLANET SUMMARY

Mercury is in conjunction with the Sun this month. Venus is a morning object visible for a few hours before dawn. Mars is an evening object visible until around 0400. Jupiter and Saturn are close in the sky and are visible between dusk [~2200] and 0100. Uranus is a morning object.

THE STARS AT 10PM

North – Lyra will be overhead with the two Bears nicely placed along with Cepheus. Auriga will be close to the horizon.
East – Andromeda and Pegasus will be nicely placed. Perseus and Cassiopeia are rising. Cygnus is high up.
South – Aquilla, Serpens Cauda and Ophiuchus are nicely placed.
West – Hercules is nicely placed with Bootes.

METEOR SHOWERS

August is well known for the Perseid Meteor Shower which is visible for most of the whole month. You should see around 50 meteors per hour. The Moon is almost new in 2020 for this shower so hopefully excellent conditions to view this prolific shower. Expect around 50 to 100 shooting stars per hour.

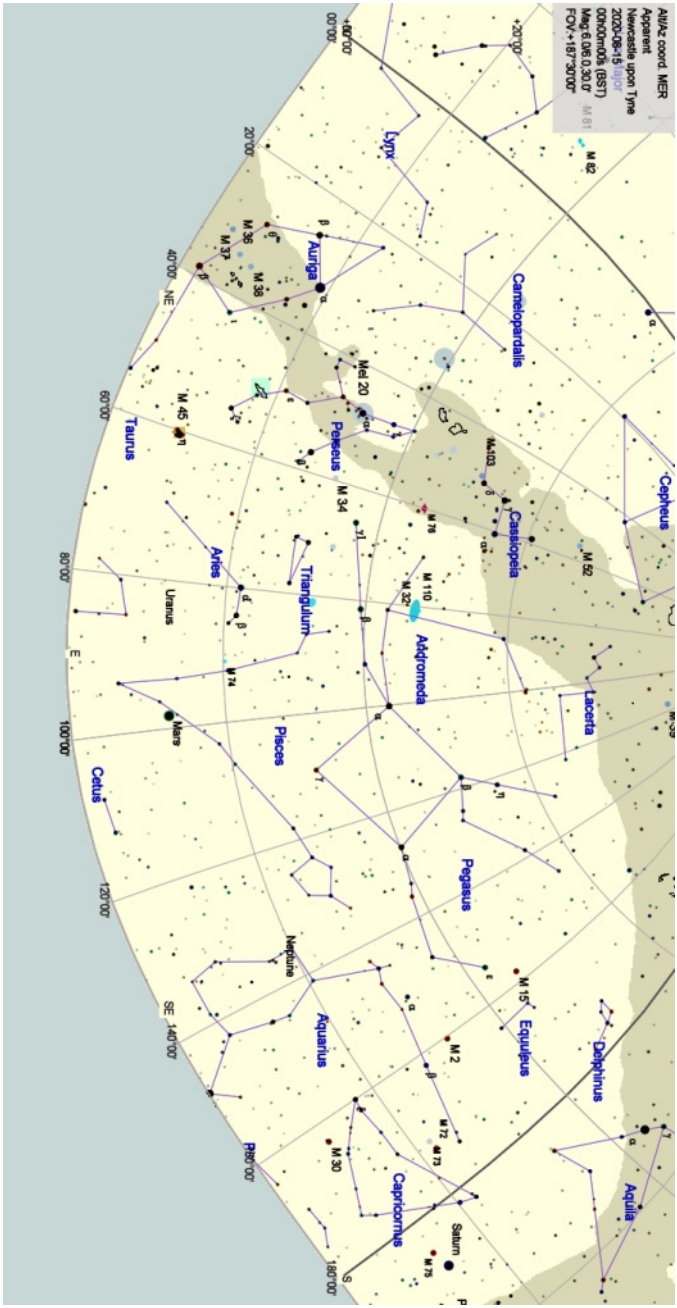
COMETS

After the wonderful apparition of Comet C/2020 F3 NEOWISE, [in Virgo during August, and fading], we take a break from bright comets for a while. Was it stunning? – very definitely yes, was it as good as Comet Hale-Bopp of 1997? - very comparable. It was a very photogenic comet with a decent ion tail and a superb dust tail. When will it be back? - sometime around the year 7785. It would seem that Comet NEOWISE may be of a similar type of Comet to Hale-Bopp [Hale-Bopp is due back in the year 4385 or thereabouts]. When will the next bright comet be? - your guess is as good as mine.

The Planets 15/08/2020

	Sun	Moon	Mercury	Venus	Mars	Jupiter	Saturn	Uranus
Rise	05:41	01:05	05:21	01:49	22:26	19:08	19:31	22:28
Set	20:40	18:36	20:47	18:11	11:38	02:32	03:18	13:34

The star map looking east from Newcastle at midnight on 15/8/2020.



NIGHT SKY

SEPTEMBER 2020 (times in BST)

Lunar phases

Full moon	02/09/2020	06:22
Last quarter	10/09/2020	10:22
New moon	17/09/2020	12:00
First quarter	25/09/2020	02:54

PLANET SUMMARY

Mercury is still in conjunction with the Sun. Venus is a morning object visible for a few hours in the dawn twilight. Mars is an evening object visible from around 2100 until dawn [~0500]. Jupiter and Saturn are still close in the sky and visible from around 2100 until 2330. Uranus is visible from around 2200 until dawn [~0500].

THE STARS AT 9PM

North – Lyra and Cygnus will be overhead with the two Bears nicely placed along with Cepheus. Auriga will be close to the horizon.

East – Andromeda and Pegasus will be nicely placed. Perseus and Cassiopeia are rising. Cygnus is high up.

South – Aquilla, Serpens Cauda and Ophiuchus are nicely placed.

West – Hercules is nicely placed with Bootes.

METEOR SHOWERS

There are no major meteor showers in September.

COMETS

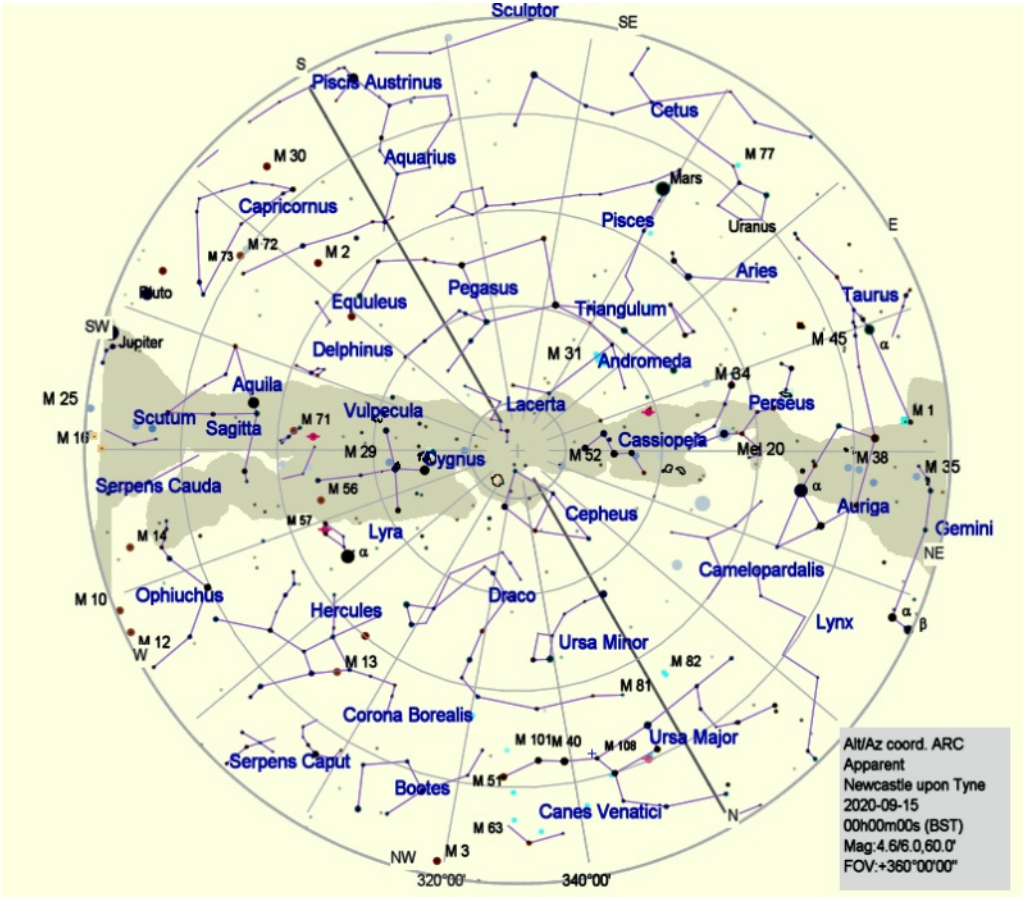
There are no bright comets expected to be visible this month. A good source of weekly data on comets is https://in-the-sky.org/data/comets.php

Night Sky credits:

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

The Planets 15/09/2020

	Sun	Moon	Mercury	Venus	Mars	Jupiter	Saturn	Uranus
Rise	06:39	03:27	08:53	02:27	20:31	17:02	17:26	20:26
Set	19:23	19:15	19:46	18:04	10:01	00:23	01:08	11:30



The all sky chart for Newcastle at midnight on 15/9/2020

NIGHT SKY

OCTOBER 2020 (times in BST)

Lunar phases

Full moon	01/10/2020	22:55
Last quarter	10/10/2020	01:39
New moon	16/10/2020	20:31
First quarter	23/10/2020	14:22

PLANET SUMMARY

Mercury is in conjunction with the Sun. Venus is a morning object visible in twilight. Mars is close to opposition and hence visible throughout the hours of darkness [~2000 until 0600]. Jupiter and Saturn are still close in the sky and are visible from dusk [~1930] until around 2100. Uranus is near opposition and like Mars is visible throughout the hours of darkness. They are fairly close in the sky so Mars acts as a signpost to locate Uranus which will appear as a magnitude 6 'green' star-like object.

THE STARS AT 10PM

North – Cepheus will be overhead with the two Bears nicely placed along with Cepheus. Auriga will be close to the horizon.

East – Andromeda and Pegasus will be nicely placed. Perseus and Cassiopeia are rising. Cygnus is high up. Capricornus will be low down.

South – Aquilla, Serpens Cauda and Ophiuchus are nicely placed.

West – Cygnus, Lyra and Hercules are nicely placed with Bootes low down.

METEOR SHOWERS

The major meteor showers of October are:

a) Around 8th October – the Draconids – a minor show but can still put on a show – visible all night in the North – the Moon is near last quarter so the sky could be reasonably dark to spot the components of this relatively minor shower

b) Around 20th October – the Orionids – a major shower of the year. In 2020 there will be a near thin crescent Moon, so once it has set [at around 8pm] then anytime after midnight – when Orion has risen above the eastern horizon - will be a good opportunity to see this prolific shower.

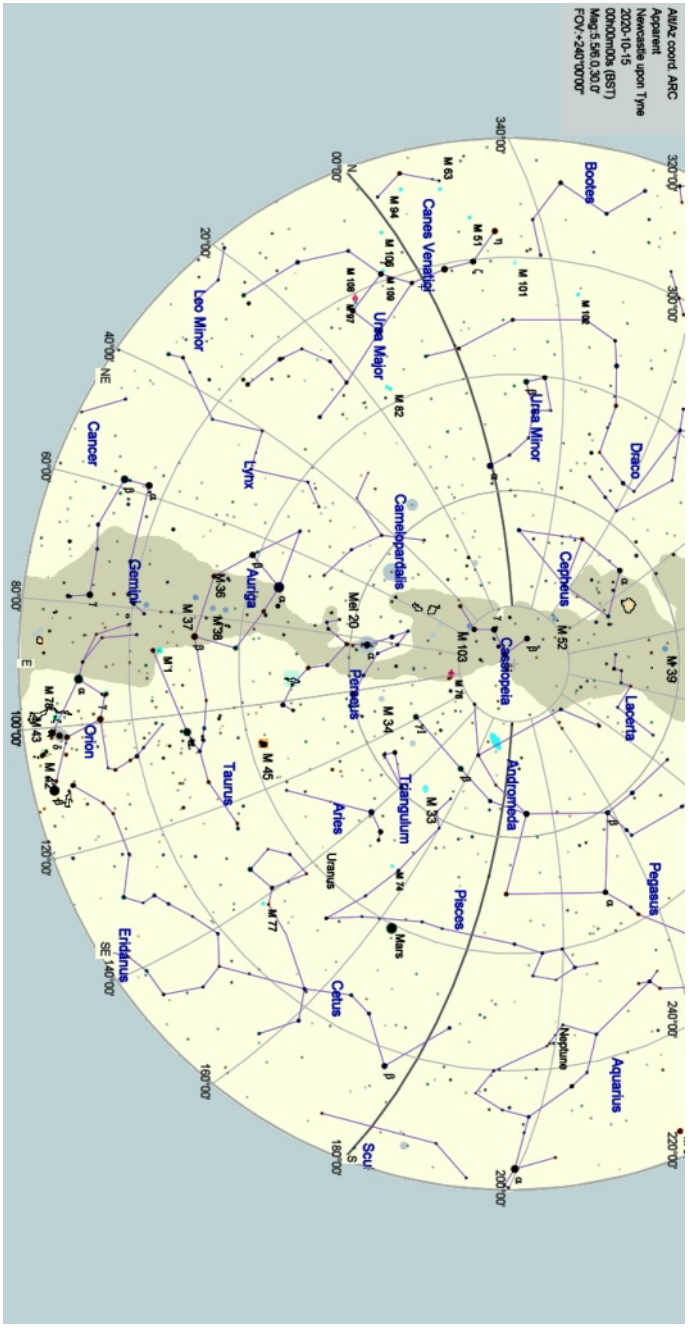
COMETS

There are no bright comets visible this month.

The Planets 15/10/2020

	Sun	Moon	Mercury	Venus	Mars	Jupiter	Saturn	Uranus
Rise	07:36	05:19	09:48	03:49	18:12	15:10	15:28	18:26
Set	18:08	18:16	18:12	17:19	07:26	22:30	23:07	09:27

The sky map looking east from Newcastle at midnight on 15/10/2020.



SPACE SLOT

The Return of US Space Launch Capability and Other Firsts

The USA space program achieved a first in May of this year; the launch of the Crew Dagon was the first crewed launch in the NASA Commercial Crew Program. This was also the first launch of astronauts from US soil since the final Space Shuttle mission, STS-135, in July 2011. The gap of almost nine years was even longer than the period between the Apollo Soyuz Test Project in 1975 and the first Space Shuttle launch in 1981.

So for almost a decade, the US had to rely on Russian Soyuz launches to get US astronauts onto the US International Space Station (ISS), which was not an ideal state of affairs for them. NASA had originally intended that, after the end of the Shuttle program, they would use the Orion Spacecraft, which was part of the Constellation Program, for a range of space missions, including ISS crew rotations. Orion should have been operational in the early 2010s, but there were significant delays and cost over-runs, which led to the cancellation of Constellation in 2010. It is still intended that Orion will be used for missions beyond low Earth orbit, including the resumption of Lunar missions by 2024 (although whether or not this actually happens is probably dependent upon the forthcoming US Presidential election).

There remained, however, the thorny issue of being reliant on Russia's Roscosmos Soyuz Program to access the ISS. The US therefore established the Commercial Crew Program in 2011, involving private sector industry to provide transport to the ISS. After a series of open competitions, in 2013 four companies were awarded contracts to develop proposals for vehicles to facilitate crewed transport to the ISS. This was followed in 2014 by the selection of Boeing and SpaceX for the main contracts to develop space vehicles for low earth orbit. The crew capsules are the Boeing Starliner and the SpaceX Crew Dragon, shown in the following photos.

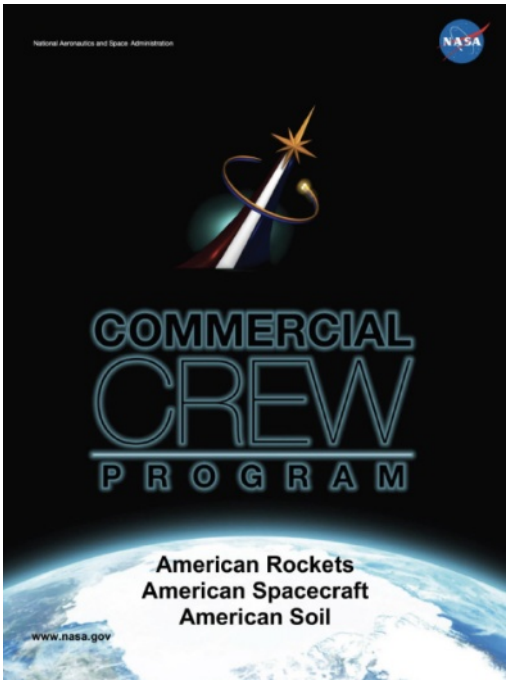
SpaceX Crew Dragon at the LC-39A Horizontal Integration Facility

Boeing Starliner Spacecraft 3 Calypso being placed atop an Atlas V launcher

Boeing had longstanding experience of the space industry; for example they had built the Saturn 1C rocket (the first stage of Saturn V which took Project Apollo to the Moon), and they also designed and built the Lunar Roving Vehicles used for the final three Moon landing missions. SpaceX (established by Elon Musk, the founder of PayPal and Tesla) was not operational until 2002, but since then they have achieved some notable firsts, such as landing their rockets back on Earth after they have finished their job.

Falcon Heavy reusable side boosters land in unison at Cape Canaveral Landing Zones 1 and 2 following a test flight on February 6, 2018 - SpaceX

SPACE SLOT



The picture above is on the front page of the NASA Commercial Crew Program press kit. Note the slogan – "American Rockets, American Spacecraft, American Soil". Launching from home territory is a big thing for the USA after having been reliant for so long on Russia to launch US astronauts into space

The Commercial Crew Program is a new way of operating for NASA. Previously, for programs stretching from Project Mercury to the ISS, the NASA operating model was to identify the need for a crew transportation system (both capsules and launch vehicles), and then its own engineers would develop the detailed plans, after which a commercial contract would be awarded to an aerospace company after a tendering process. NASA specialists would be closely involved in the manufacturing process to ensure that their specifications were followed. After the rockets or capsules were finished and delivered they became the property of NASA.
A classic example of this approach is the Saturn V rocket, which was the workhorse of the Apollo Program. The launcher was constructed by several different contractors, but was designed in detail by the Wernher Von Braun NASA engineering team at the NASA Marshall Space Flight Center in Huntsville, Alabama.

In the Commercial Crew approach, NASA identifies the need and sets out some broad requirements that will meet their crew safety and other standards. Private sector companies are then left to use their own operating and manufacturing techniques to design and deliver the end product, although there does continue to be some NASA engagement with the process. In this method, the contractors

own and operate the hardware, but the crew is still made up of NASA astronauts (and astronauts of other nationalities).

The maiden flights of the Commercial Crew Program were originally planned for 2015, but there were delays with both the Boeing Starliner and the SpaceX Crew Dragon. Eventually, the first uncrewed orbital flight of the Starliner took place in 2019. However this was a partial failure and another uncrewed test flight is scheduled for November this year; all being well, the first crewed test flight will take place in April 2021 with a crew of three, to be followed by the first operational flight later in 2021 with a crew of four. NASA has contracted Boeing for at least five more operational flights to the ISS, from 2022 to 2026.

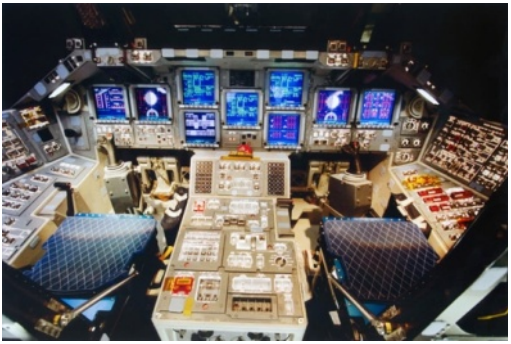
Launch of Crew Dragon Demo-2 mission on 30 May 2020

Crew Dragon astronauts Robert Behnken (left) and Douglas Hurley (right)

SpaceX have been more successful. The first uncrewed orbital flight Demo-1 launched in March 2019, and this achieved docking with the ISS. This led to the crewed Demo-2 mission this year, with experienced Shuttle astronauts Douglas Hurley and Robert Behnken. Rather fittingly, Hurley was a crew member of STS-135, the final Shuttle mission in 2011.

As planned, the Crew Dragon spacecraft undocked from ISS on 1st August, and splashed down off the coast of

Crew Dragon control panel - NASA



Space Shuttle Discovery - NASA

Florida on 2nd August for splashdown, marking the first return of a commercially built and operated American spacecraft carrying astronauts from the space station. It was the first splashdown since the Apollo Soyuz Test Project capsule in 1975, as, of course, all the Space Shuttles landed on the ground after their missions.

The first operational SpaceX mission, with four astronauts, is scheduled for launch in September, to be followed by a further operational mission in February 2021, also with four astronauts, including for the first time a Russian. SpaceX is contracted to deliver four further ISS crew rotation flights from 2022 to 2026. Taking the Boeing and SpaceX contracts together, NASA will be able to rotate the ISS crews every six months for the next six years without relying upon Roscosmos for spaceflights, which goes a long way towards the current planned ISS mission end date of 2030.

I watched the launch of the SpaceX Crew Dragon Demo-2 mission live on NASA TV, which made me think about my involvement in other space firsts over the years. I can barely remember the first Soviet Sputniks in 1958; the first space mission for which I have a clear memory is the Soviet Luna 3, which returned the first photograph of the far side of the Moon in 1959. I became very interested in space flight after that, and well remember the flight of the first man in space, Yuri Gagarin, on 12 April 1961. I found out about this when I was aged 10 on the top deck of a bus; I happened to look down as we passed a street newspaper seller, and his display stand carried, in large letters, the words “RUSSIAN MAN IN SPACE”. It was this that inspired me to keep a scrapbook of newspaper articles about spaceflight, which I kept going into the

Crew Dragon docking with the ISS

Robert Behnken seen entering the ISS after docking

early 1970s, up to volume 21 and ending with Apollo 17. I still have them all, and regular readers of this Newsletter may recall photos of my Apollo 11 volume from last summer.

Only a few weeks after Gagarin's historic flight came the first US manned space flight, in which Alan Shepard (who 10 years later managed to walk on the Moon as commander of Apollo 14) made a short 15 minute suborbital flight. I actually heard this live on the radio, which was quite exciting for a young lad.

By a strange quirk of fate, I learnt in January 1967, from another newspaper hoarding viewed from a bus, about the tragic Apollo 1 fire, in which three Apollo astronauts died. I was on the way to the cinema, and in the Pathe News section, rather poignantly, was a piece about the preparations for the launch of Apollo 1.

Two years later, on 20th July 1969, I stayed up all night for the first Moon landing of Apollo 11, with rather poor quality but nevertheless historic live TV coverage of the first moonwalks. The very next day I left for a Youth Hostelling holiday, at the end of which I returned home with a shedload of newspaper articles for my scrapbook. My holiday companions were very amused that I bought half a dozen newspapers every day.

I still clearly recall the launch of the ill-fated Apollo 13 mission, which gave the world the well know phrase "Houston, we have a problem". Just to be pedantic, the actual first message from Apollo 13 after the oxygen tank explosion was "Okay, Houston, we've had a problem here". A good one for pub quizzes. The launch date, 11th April 1970, sticks in my memory because it was also the date of my first

SPACE SLOT

marriage. I suppose you could say both missions did not end well ...

I also remember Apollo 14 quite well, as it coincided with the death of my father in February 1971, and I actually watched a live moonwalk TV broadcast on the morning of the day of his funeral. My final Apollo first was watching live on TV the launch of the Apollo 15 Lunar Module Falcon from the Moon's surface in August 1971, the first ever such live take off (although the later Apollo 17 lunar launch broadcast in 1972 was much better, as the camera on the Lunar Roving Vehicle managed to track the Lunar Module as it rose up from the lunar surface). Slightly bizarrely, I watched this in the company of about 30 junior doctors in a Common Room at a hospital where I had a summer job as a porter.

My next space first was watching the launch of the first Space Shuttle, Columbia, carried live on TV on 12th April 1981; this was 20 years to the day after Yuri Gagarin's historic first space flight. I have a slightly tenuous first in respect of the Space Shuttle Atlantis. After it returned from the final Shuttle Mission in 2011, it was parked for some months in the Vehicle Assembly Building (VAB) at the Kennedy Space Center (KSC), and it just happened that I visited KSC in the first and only year in which it was possible, for only a few months, for the public to enter the VAB as part of the KSC guided tour. Hence the photo below in which I appear in front of Atlantis. We shall draw a veil over the garishness of my T-shirt!

In conclusion, I return to Crew Dragon. Interestingly, there is a Space Adventures mission scheduled for late 2021 or early 2022, in which up to four space tourists will take a three-day flight in a Crew Dragon capsule, in an orbit higher than the Earth orbital altitude record achieved by Gemini 11 in 1966. The estimated cost per seat is $55 million, so if you are interested you'd better start saving now!

Trevor Robinson
KOAS Treasurer

When is a Neutron Star not a Neutron Star?..... when it's a Black Hole

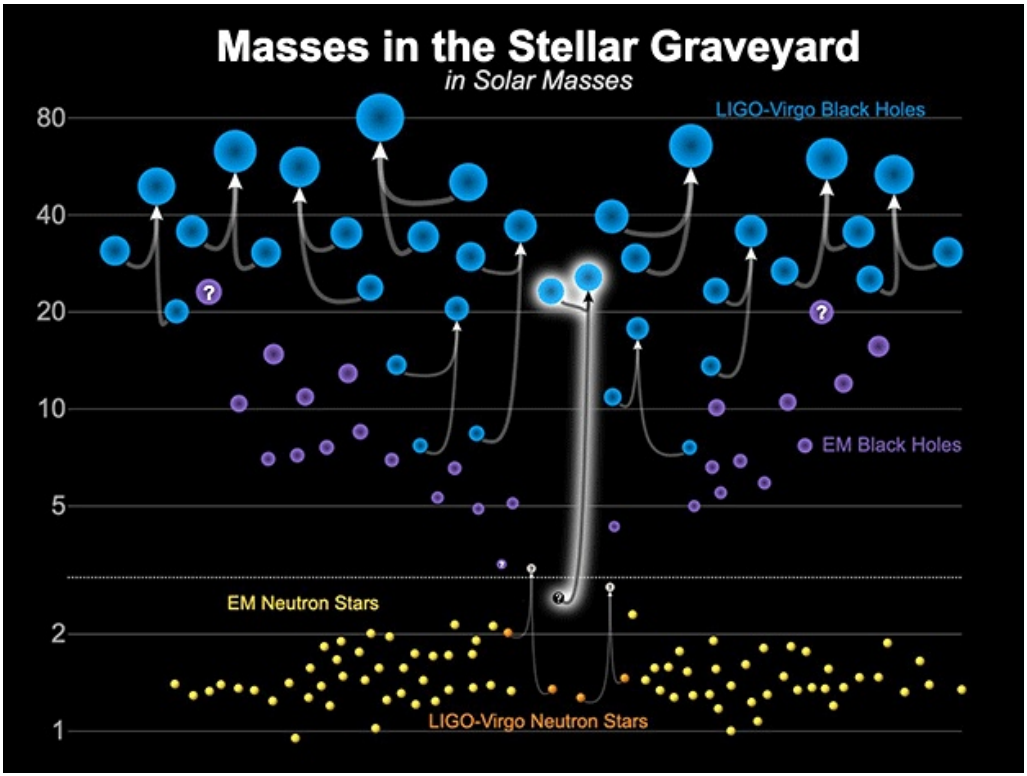
When a star significantly more massive than our Sun dies, it ends its life in a rather violent explosion, known as a supernova.
The fate of this massive star depends on a number of key factors:

1) How massive it was to start with [usually >=5 solar masses].
2) How much mass it was losing at the time of its death... some stars try to go on a crash diet to maintain stability in their final few million years or less.
3) How much of their original mass was converted to elements heavier than Helium during their lifetime.
4) Whether they exist with a companion star and what type of star (in the loosest of terms) that star was or had become – so-called Symbiotic or Black Widow Stars.

In recent years a great deal of effort has been put in to determine how Neutron Stars and Black Holes are formed. This is because, until recently, small black holes and super massive black holes could be found but so-called Intermediate Black Holes could not. Now, following some new observations (https://www.bbc.co.uk/news/science-environment-53151106), the blurred lines between Neutron Stars and Black Holes, has been observed. So-called 'Black Neutron Stars' have properties intermediate between traditional Neutron Stars and Black Holes. Using Gravitational Wave experiments in the US and Italy, one such object has been located.

The first clues were observed during a collision event between a 2.3 solar mass object and a 26 solar mass Black Hole. The lighter object was not a traditional Neutron Star, nor a Black Hole, but something new. The lighter object was swallowed by its bigger neighbour, triggering the formation of gravitational waves. Now the theories behind the formation of this new type of exotic object will have to be rewritten and (at the same time) this has implications for the theories of the formation of Neutron Stars and Black Holes. Teams are collaborating to work out how this lighter object was created. If it started off with substantial excess mass there must be a mechanism by which it was able to go on a diet. If it started off with solar-like mass there then needs to be a method by which it gained

SCIENCE SLOT



mass. Both of these are possible intuitively but the mechanisms need to be explained to satisfy a new theory.

Neutron stars are generally very 'stable' objects due to the combination of high gravity, regular-as-clockwork spin and very strong magnetic fields. Yet again, gravitational wave detectors are shining a light on new types of objects not previously observed or theorised.

Watch this space …

Robert Williams

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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.

Reader Kevan Hubbard has been out and about and sent us some shots from the local area. This shot is of our nearest star, the Sun, through the transporter bridge, at Port Clarence, Co Durham on the 24th April 2020.

GALLERY

Duncan Hale Sutton sends this shot of Comet Neowise taken from Norfolk on July 15th - it is a 10s exposure with a 45mm lens.

The Moon on 5/6/2020 rising over the Tees bay and Yorkshire Moors. Taken from Seaton Carew, Co Durham. Kevan Hubbard.

The 1/4 Moon above Seaton Carew, Co Durham on the 26th May 2020, taken with a Google Pixel 3a phone. Kevan Hubbard.

GALLERY

Another shot from Norfolk, showing noctilucent clouds overnight on June 21st/22nd. A 5s exposure at F5.3 - Duncan Hale Sutton.

Comet Neowise through a Canon 1000D with a 250mm lens: F5.6 - 4x20s exposure taken on the evening of July 18th, from Durham. Nigel Metcalfe.

A fine display of noctilucent clouds over Seaton Carew, Co. Durham, on June 26th. Kevan Hubbard.

The Moon and Venus from the remote Commondale rail station in the North Yorkshire Moors National Park. Taken with a Google Pixel 3a phone. Kevan Hubbard.

Kielder Observatory - a beacon for dark skies

https://kielderobservatory.org

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