

Summer 2024 Number 44

Kielder Observatory Newsletter

KIELDER
OBSERVATORY
Infinite Inspiration



NEWS

Observatory spruce
up!

NIGHT SKY

Highlights Aug/Sept/
Oct

OBSERVING

T CrB about to go
nova?

SCIENCE

Earth-like exoplanets



EDITORIAL

Just after the last newsletter was released we were treated to one of the most spectacular auroral shows that has hit the UK in many years. I managed to miss it of course (!), but fortunately many others did not, and you can see from our cover pictures what a splendid show was seen from around the Observatory. We are now over a month after the summer solstice and the nights are finally beginning to darken - some of us will be dusting off our telescopes! There is much excitement surrounding the recurrent nova T Corona Borealis, which is predicted to brighten by 8 magnitudes or so sometime in the next year. Robert takes a closer look and shows you how to find it in the night sky. He also takes a look at the search for Earth-like exoplanets. Meanwhile, Ishbel Carlyle reports on the astronomical sites she visited on her recent trip to the US.

Nigel Metcalfe

Editors: Nigel Metcalfe & Robert Williams

Kielder Observatory Astronomical Society

Registered Charity No: 1153570.

Kielder Observatory Astronomical Society is a Charitable Incorporated Organisation.

Its aims are to

- * Promote interest in the science of astronomy to the general public
- * Facilitate education of members of the public in the science of astronomy
- * Maintain an astronomical observatory in Kielder Forest to support the above aims

<https://kielderobservatory.org>



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Front cover: The May 10th aurora from Dilston Scout Camp, credit: KOAS

Rear cover: The May 10th aurora from the Observatory, credit KOAS



A WORD FROM THE CEO



With the May Solar Storms and the summer solstice hot on the heels of the Great American Eclipse, this has been a period of incredible astronomical events that I can't help feeling are portents of change as great stuff is happening in the here and now alongside the emergence of exciting opportunities as we look to the future and begin developing our 2026-2030 strategy.

As part of our drive to improve and polish the visitor experience, we closed for a week to undertake some of the most extensive improvements the observatory has ever seen.

Across a thankfully mostly sunny and dry week, our staff were supported by trustees, volunteers, and Accenture employees to radically update our main building and the Gillian Dickinson Astroimaging Academy, alongside a whole load of external jobs and vegetation clearance. As a result, the place looks

fantastic and we've significantly enhanced the experience for our guests.

After all West End Refugee Service and school participants visited the observatory, we have been delivering the final stage of Mindsets and Missions, research projects in partnership with two academics. As this great project wraps up, delivery of STEM to Stars Phase 3 has begun in earnest with 80% of schools recruited and 12 weeks' worth of workshops planned by Ellie and Adam for our afterschool Space Club beginning in November.

The recent aurora triggered a surge of interest in stargazing, coinciding neatly with us filling our future calendar more than ever before, with over 800 events available now. The team have worked hard to build the events calendar through to August 2025 in response to huge demand and visitor feedback.

As the nights grow ever darker, we move into Autumn, a great time for stargazing. The cooler, drier air gifts us with clearer skies compared to those of the hazy, humid summer. With the autumn equinox, the Harvest Moon, several notable constellations more prominent and the Milky Way looking particularly spectacular, I'm looking forward to spending some time up on the hill with the team in our refreshed observatory.

Leigh Venus, CEO



OBSERVATORY NEWS



The assembled maintenance team ready to go!

As noted by Leigh in his CEO slot, summer has been maintenance time at the Observatory! During the week of the summer solstice, volunteers from Accenture and Avanade, together with our own volunteers, gathered with cleaning equipment, gardening tools, and paintbrushes to give the Observatory a makeover. Northumbrian Water also chipped in, delivering bulk water containers to help with the cleaning. Accenture have also committed £10,000 to support our charitable work, including subsidising school workshops (half-day workshop sessions at the Observatory for 10 North East schools), support for 35

volunteers over a three month period and money towards site improvements.



Looks like there could be quite a bit of digging to do!

One of the most impressive makeovers has been to the interior of the Gillian Dickinson Astro-imaging classroom - we hope you like it!



OBSERVATORY NEWS



The refurbished interior of the Gillian Dickinson Astro-imaging classroom.

We have welcomed James Claxton to our Science team. James began volunteering at the Observatory in January 2023, and has now been taken on in full time employment. His interests are in exoplanets and the search for life elsewhere in the Universe. Did you know that we have a very active work experience programme? Each placement is five consecutive nights at the observatory where the young person helps at our events to learn about practical astronomy, customer service and science



James Claxton has joined our Science Communication team.

communication. We have eight such placements arranged this year, between May and the end of August. Six have already happened, with two more to come in August.



Emily King, a work experience participant with us at the Observatory from 3rd-7th June.



OBSERVATORY NEWS

We have been out and about a bit during the summer months. In late May we were at the Northumberland County Show at Bywell near Stocksfield. We brought along our gravity well and telescope. And made a huge poster with the help of lots of people! We also took our planetarium to



the Bridges shopping centre in Sunderland for their space camp event. We had about



75 people enjoy planetarium shows and meteorites, and we're hoping to be back again in October. We are also planning for another event at Alnwick Gardens in October, so keep an eye open for announcements about that.

At the end of July we were in the science tent at the Deershed Festival in Topcliffe. Also in July we had a stand at the National Astronomy Meeting in Hull.



Our stand at the National Astronomy Meeting in Hull.

Back at the Observatory, our Space Kids events have been as popular as ever - and who doesn't like to fire a rocket or learn about aliens!? There are still a few places



OBSERVATORY NEWS



left over the summer, so book quickly to guarantee your place. These run from 18:00-20:00 at moment (they move back to 17:00 towards the end of September), mostly on Sunday evenings, but there are some midweek slots too.

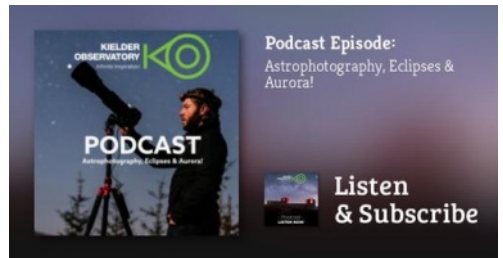


The planetarium at Benton Dene Primary in June.

Our schools programme has been in full swing over the summer term, with the inflatable planetarium proving a great hit. Our STEM to Stars project will be ramping up in the Autumn term.

We were delighted to receive a Tripadvisor Travellers' Choice Awards for 2024. This puts us in the top 10% off attractions as rated by Tripadvisor reviews!

As ever we have a new crop of podcasts for you since the last newsletter. In the latest edition Professor Danny Donoghue from Durham University tells us about the fascinating world of remote sensing. Click on the image below to find out more.



Finally, if you are interested in private events, or school bookings, take a look at our [External Events Brochure](#).

"They were fantastic. Knowledgeable and enthusiastic in a way that inspired me to get into my longtime hobby of astronomy to a deeper level. Many thanks to the team for a very enjoyable evening event."

Peter, Felixstowe



OBSERVATORY NEWS

Our Services



- Private event for your group at Kielder Observatory
- Venue hire
- Guided stargazing session at your location in the dark sky park
- Astronomer talk at your indoor venue
- Digital session
- Educational workshops or planetarium visit

All enquiries:

**Please drop us an email at
admin@kielderobservatory.org
Or call to discuss on 0191 2655510**

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T Corona Borealis

There are some quite unusual stars in our Galaxy but one strange star in particular is accessible to the amateur observer.

T Corona Borealis (T CrB) is a very odd star, even when compared to the many different types of **variable stars** that have been found in our galaxy.

T CrB is a classical Recurrent Nova. A Nova is a 'new star' - previously dim star that brightens – sometimes to naked eye visibility – and then fades and stays dim for the rest of its existence. T CrB, though, seems to undertake this rejuvenation regularly and over a fairly predictable cycle.

It was first discovered in 1866 by John Birmingham, an Irish Astronomer and polymath, who was knowledgeable about meteor showers, sunspots and the Planets. One of his writings noted that a crater on the Moon disappearing in a cloud of moon-dust [possibly a TLP].

Using a 4.5" Cooke Refractor, he made observations of the **Schjellerup** Catalogue of Red Stars, totalling 658 entries, presenting his work to the Royal Irish Academy in 1876, who awarded him the Cunningham Medal in 1884. In 1881 he made a discovery of a deeply reddened star in Cygnus

(<https://articles.adsabs.harvard.edu/pdf/1882AN....101..175B>).

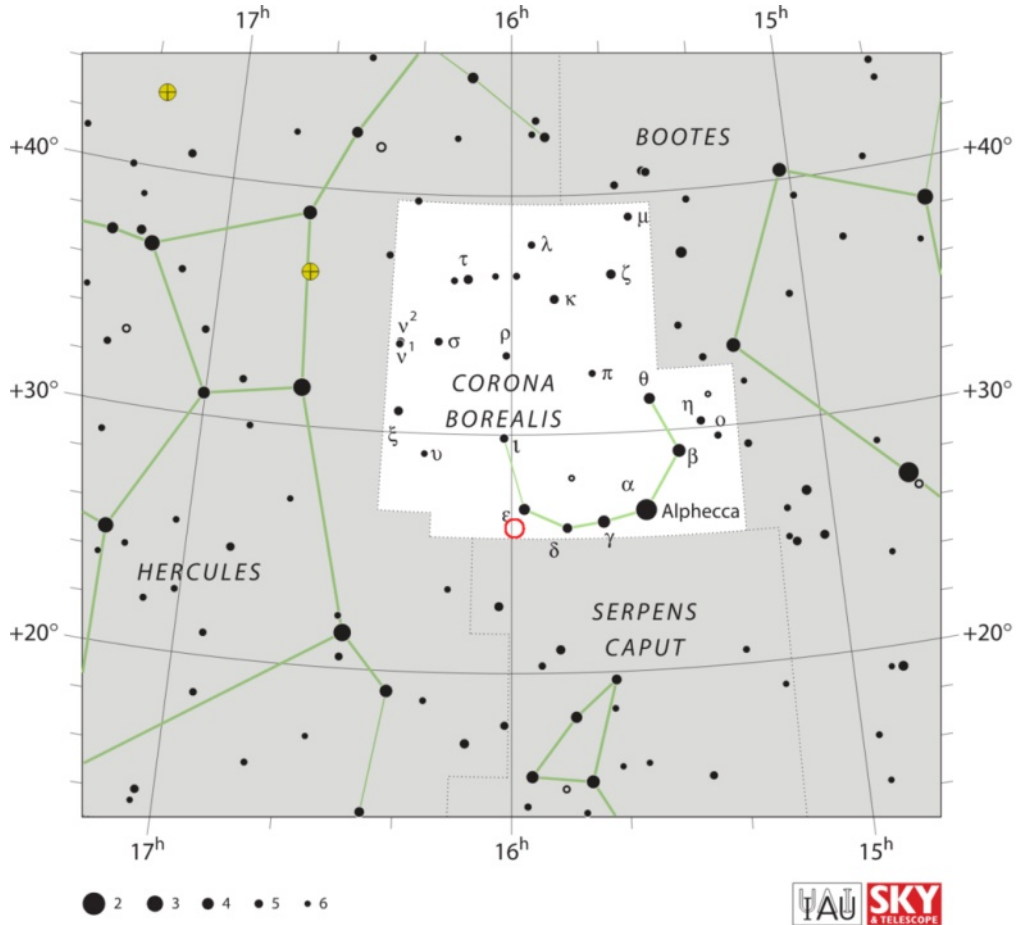
It is now catalogued as V Cygni (and is actually a carbon star, but that is another story).

Sometime between now and 2025 it is expected that T CrB will go into outburst (which has led to some quite lurid headlines in the press, and put variable star astronomers on high alert!). T CrB normally shines at 10th magnitude, it is quite stable at this brightness for many years before erupting to typically 2nd magnitude [a factor of $\sim 3,000x$]. It will then stay at 2nd magnitude for a while before fading back to 10th magnitude. Since its first outburst on May 12th 1866 and then it's next on February 9th 1946 it may suggest that its next outburst will be in the next 18 months.

The T CrB system consists of a Red Giant co-orbiting a White Dwarf star, around which an accretion disc forms. The RG star is losing material to the WD. As this process takes place the mass of the WD star -+ accretion disc creeps up to the **Chandrasekhar Limit**, the maximum mass that a WD can attain before it becomes unstable or goes supernova. The excess material in the disc then detonates with limited force allowing both stars to survive and the cycle starts again.



OBSERVERS' SLOT



In the case of T CrB the WD orbits the RG every 228 days, in a circular orbit with a diameter of 0.54AU.

Recently T CrB looks to be restarting the cycle again:

- February 2015 – brightness increased from mag. 10.5 to mag. 9.2 – very similar to that seen in 1938 and then in 1946

- June 2018 – T CrB faded slightly but plenty of activity was noted – slight but very frequent variations in brightness

- June 2023 – faded slightly by 0.35 mag – again similar to events in 1945, prior to the 1946 outburst

These all suggest that the outburst is imminent.



OBSERVERS' SLOT

How to locate T CrB – look in the bowl of the Northern Crown – see star chart on the previous page. T CrB is nicely placed in the evening, in the western sky in mid October as seen from Northumberland. It is visible rising in the east in Spring also in the early evening.

Some Supernova candidates

Just for fun, this is a list of stars thought to be likely to go supernova in the next 1 million years or so (so don't get too excited!) ...

[List of supernova candidates](#)

Some other recurrent Nova to keep watching

This is a list of Nova seen in recent times....

[CBAT List of Novae in the Milky Way.](#)

There are objects suitable for both telescopic and binocular observers.

This article

<https://apps.aavso.org/media/jaavso/2844.pdf>

contains lots of useful information about novae (be warned, some of it is quite technical, although it does contain a list of the most prolific discoverers of novae).

Robert Williams



"The team were absolutely fantastic - knowledgeable, interesting, fun, kind and ready to answer questions of all kinds. This was the highlight of our visit to the area; what a wonderful experience. Thanks so much."

Rachel, Worcester



NIGHT SKY

AUGUST 2024 (times in BST)

Lunar phases

New moon	04/08/2024 12:13
First quarter	12/08/2024 16:18
Full moon	19/08/2024 19:25
Last quarter	26/08/2024 10:25

PLANET SUMMARY

Mercury and Venus are too close to the Sun this month. Mars and Jupiter are morning objects visible from around 02:00 for a few hours before dawn twilight and quite close this month. Saturn is close to opposition and visible for the hours of darkness [approx. 23:00 to 03:00]. 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.

The Planets 15/08/2024

	Sun	Moon	Mercury	Venus	Mars	Jupiter	Saturn	Uranus
Rise	05:12	18:50	06:42	07:34	00:03	00:04	21:23	23:04
Set	21:08	00:14	20:13	21:17	17:02	16:57	08:11	15:11

METEOR SHOWERS

August is well known for the Perseid Meteor Shower which is visible for most of the whole month. Maximum of the shower in 2024 falls on FQ Moon so best seen after midnight once the Moon has set.

COMETS

Good places to check for weekly information on the visibility of comets are <http://aerith.net/comet/weekly/current.html> and <https://in-the-sky.org/data/comets.php>

NOCTILUCENT CLOUDS

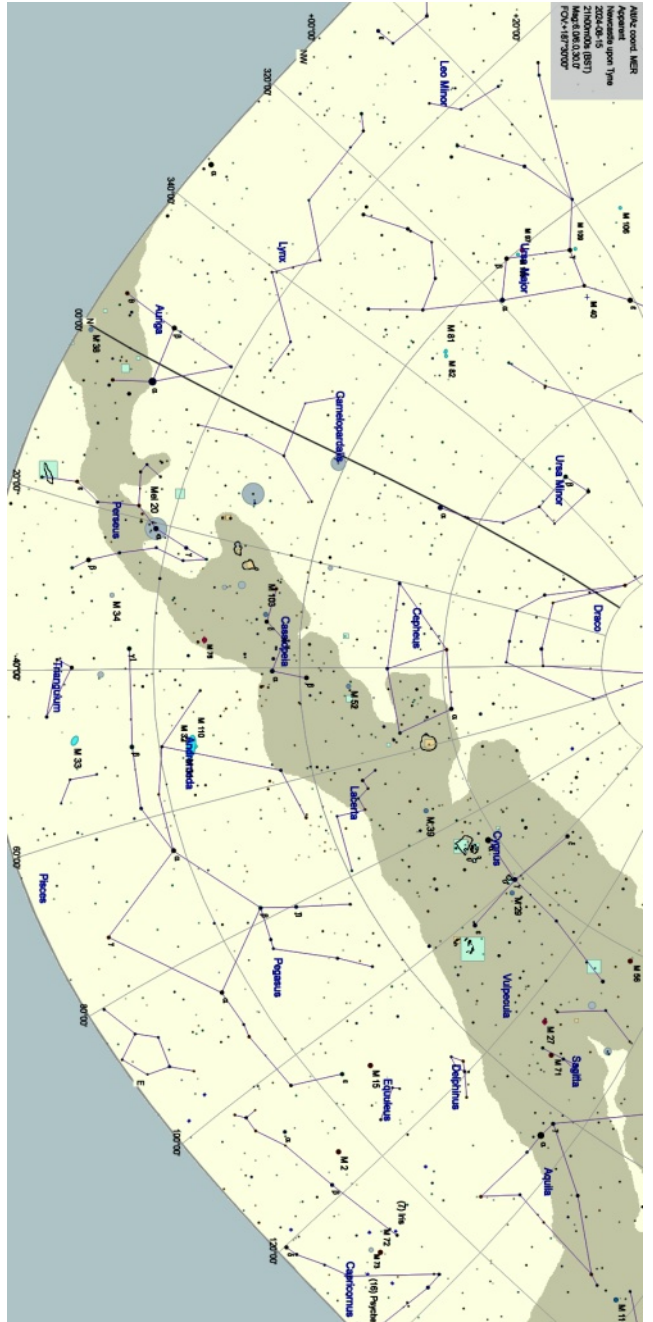
Be on the look out for these amazing cloud displays this month. They are created by a combination of extreme cold in the Earth's high atmosphere (in the Mesosphere at altitudes of about 50Km to 100Km), trapped water vapour and – it is suggested – the influence of other factors such as shooting stars and dust from – for example the Sahara Desert.



NIGHT SKY

The sky chart for Newcastle looking NE at 9pm BST on 15/8/2024.

You can find a more detailed look at the current month's night sky in our What's Up series on our [online news pages](#).





NIGHT SKY

SEPTEMBER 2024 (times in BST)

Lunar phases

New moon	03/09/2024 02:55
First quarter	11/09/2024 07:05
Full moon	18/09/2024 03:34
Last quarter	24/09/2024 19:49

PLANET SUMMARY

Mercury is a difficult morning object lost in twilight. Venus is too close to the Sun this month. Mars is a morning object visible from 01:00 to 04:00. Jupiter, Saturn, and Uranus are all morning objects, visible from around 1am [Saturn highest in the sky, then Uranus then Jupiter].

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

Comet C/2023 Tsuchinsan-ATLAS continues to get brighter – rounding perihelion on 27th September - however it is a southern hemisphere object until mid-October when it will be seen very low in the sky in the constellation of Serpens, from Newcastle.

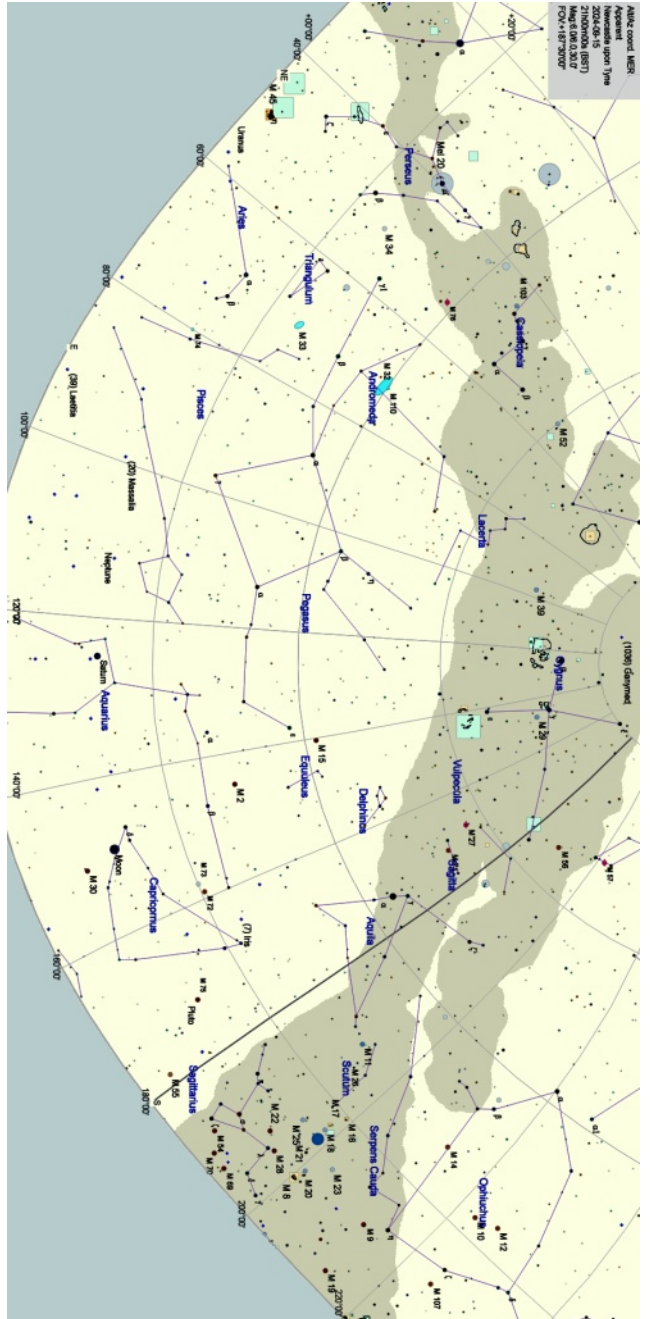
The Planets 15/09/2024

	Sun	Moon	Mercury	Venus	Mars	Jupiter	Saturn	Uranus
Rise	06:10	18:54	05:14	09:21	23:14	22:15	19:18	21:02
Set	19:58	03:39	19:13	20:02	16:32	15:13	05:55	13:10



NIGHT SKY

The sky map looking SE from Newcastle at 9pm BST on 15/08/2024.





NIGHT SKY

OCTOBER 2024 (times in BST)

Lunar phases

New moon	02/10/2024 18:48
First quarter	10/10/2024 19:55
Full moon	17/10/2024 12:26
Last quarter	24/10/2024 09:03

PLANET SUMMARY

Mercury and Venus are too close to the Sun to view easily this month. Mars is a morning object, visible after midnight. Jupiter will be visible after 10pm, low in the east. Saturn will be higher in altitude with Uranus between the two giant planets.

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. Waxing crescent Moon so best seen after moonset in the early evening.
- b) Around 20th October – the Orionids – a major shower of the year. Waning gibbous Moon so a bit of a challenge to see this shower in 2024.

COMETS

Comet C/2023 Tsuchinsan-ATLAS should continue to get brighter. By late October it will have moved in Ophiuchus. It could be spectacular if it survives its close approach to the Sun.

The Planets 15/10/2024

	Sun	Moon	Mercury	Venus	Mars	Jupiter	Saturn	Uranus
Rise	07:06	17:29	08:37	11:08	22:32	20:20	17:14	19:02
Set	18:41	05:53	18:18	19:01	15:43	13:19	03:42	11:08

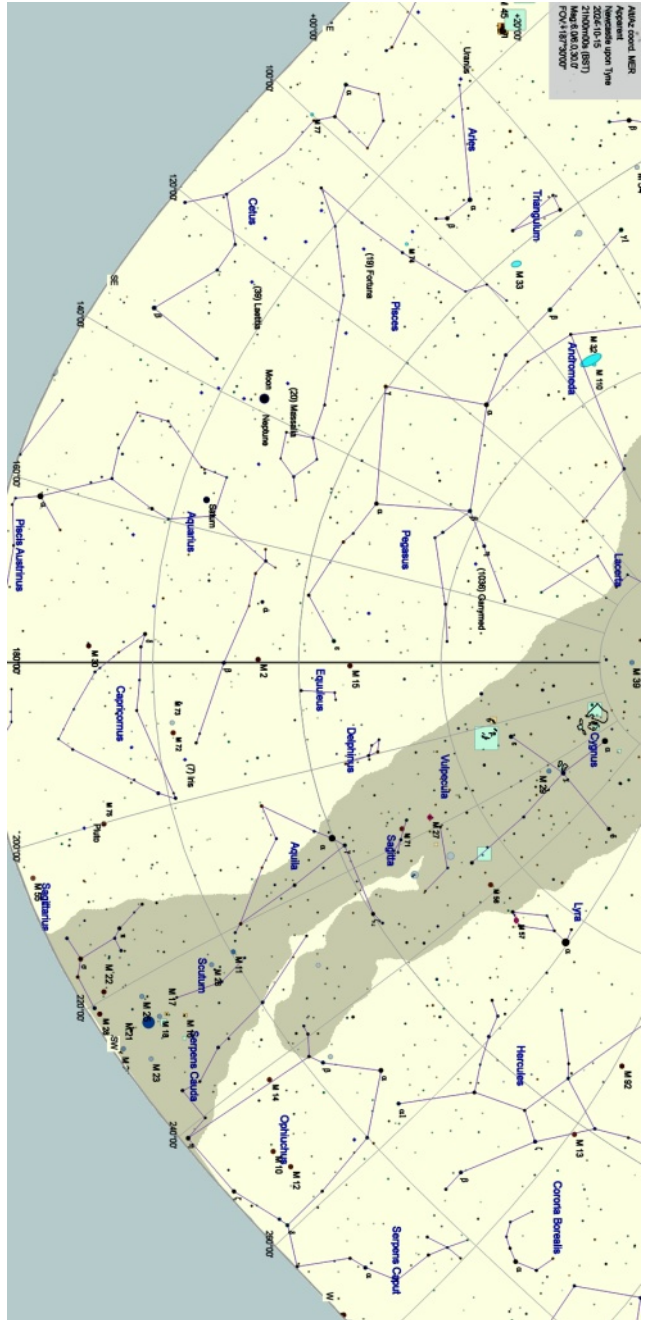


NIGHT SKY

The sky map looking S from Newcastle at 9pm on 15/10/2024.

Night Sky credits:

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





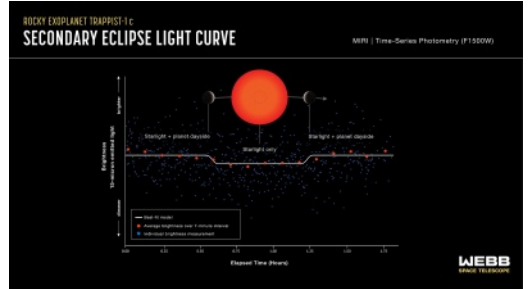
SCIENCE SLOT

Earth 2.0

Earth 2.0 is the pseudonym given to the extra stellar planet that most closely resembles the Earth – provided that it also orbits a star similar to our Sun, or at least orbits under similar conditions of temperature and radiation environments. Finding such a Planet is akin to the holy-grail of theorists and observers who are trying to decide whether – or not – Earth is unique in our Galaxy and throughout the Universe as a whole.

At the moment, and since the first extra-stellar planet – more commonly known as [exoplanets](#) - was suggested as far back as 1917, but not convincingly announced until 1992, there is, or was, a skew towards finding 'easy hits' those being massive Planets going around stars with wide orbits being easy to recognise from the data. Another candidate plucked from the data in 1988 took 15 years to confirm as a true Exoplanet. More recently many more are being discovered by specialist satellite based telescopes such as the [Kepler Space Telescope](#) and more recently the [Transiting Exoplanets Survey Satellite \(TESS\)](#).

As of 1st November 2023 there are more than 5,000 confirmed exoplanets around more than 4,000 stars. About 1,000 stars have multiple [≥ 2] confirmed exoplanets orbiting them.



The James Webb telescope light curve for Trappist 1c.

Credit: NASA, ESA, CSA, J. Olmsted (STScI), S. Zieba (MPI-A), L. Kreidberg (MPI-A)

Since the JWST started its observing activities it has already identified a new class of exoplanet, [JUMBOs](#), free-floating worlds that can't be explained. Using five principle methods of detection [Transit, Doppler, Radial Velocity, Reflection/ Emission Spectroscopy and Relativistic effects] - which all are skewed due to observational bias as mentioned above – about 85% of all Exoplanets so far discovered have the planet tidally locked to the star [similar to how the Moon is locked to the Earth] resulting in weather extremes and as a consequence significantly reducing the likelihood of that planet being able to either harbour or sustain a viable biosystem. It has been found that around 20% of all Sun-like stars [G-glass sub-dwarfs] have Earth-sized planets [in the range 0.5 E to 2.5 E] orbiting around them, in the star's



SCIENCE SLOT

Habitable Zone – in other words have conditions similar to those on Earth – potentially. If there are 200 billion stars in our Galaxy there could be upwards of 10 billion Earth-like planets in the Milky Way alone.

So far Exoplanets have been found to be a varied bunch. The least massive –

Drauger PSR B1257+12 A – orbits a Pulsar and has about twice the mass as the Moon - however because it orbits a Pulsar, it is thought to be not the most hospitable place to find life. The most massive exoplanet found to date –

HR2562 b – is around 10x the mass of Jupiter and is – practically a Brown Dwarf – a failed star. Some exoplanets orbit their parent star in hours, others take over a thousand years and are only likely to be tenuously gravitationally bound to their parent star. Others are so far separated from their nearby stars that they can be classed as **free-floating planets**.

As with everything astronomical the IAU has – and also had – a definition of exoplanet:

Old –

- a) True mass less than that to sustain thermonuclear fusion of deuterium [i.e. <13MJ]
- b) Above 13MJ the object is classed as a Brown Dwarf

c) Free-floating objects in young star clusters with masses below the limiting mass for thermonuclear fusion of deuterium are not "planets", but are "sub-brown dwarfs" (or whatever name is most appropriate).

New – as of 2018 the definitions were revised as follows –

- a) Objects with true masses below the limiting mass for thermonuclear fusion of deuterium (currently calculated to be 13 Jupiter masses for objects of solar metallicity) that orbit stars, brown dwarfs or stellar remnants and that have a mass ratio with the central object below the L4/ L5 instability ($M/M_{\text{central}} < 2/(25 + \sqrt{621})$) are "planets" (no matter how they formed) and
- b) The minimum mass/size required for an extrasolar object to be considered a planet should be the same as that used in our Solar System.

Recently – with the advent of these new and more sensitive telescopes the search has been going on to find small exoplanets. So far the Exoplanets discovered fall into a number of size classes:

- 1) Super Jupiters – often with large orbit semi-major axes distance – easiest to find because they show up more easily with the current techniques being used



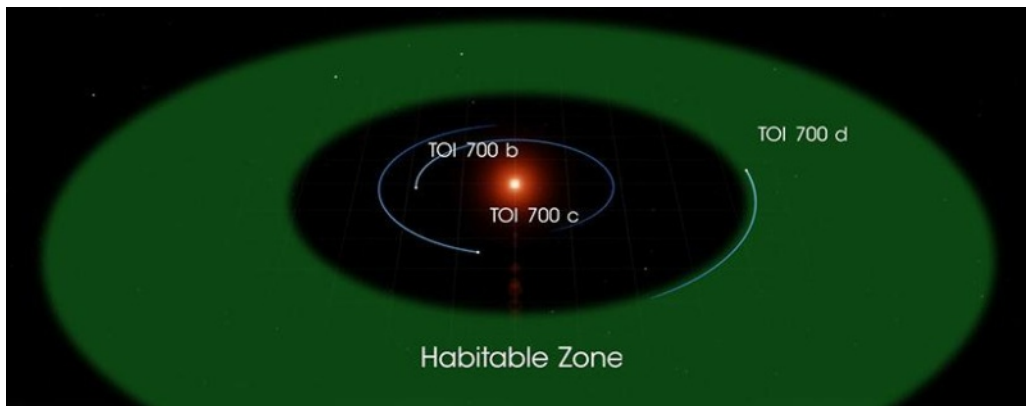
SCIENCE SLOT

2) Mini-Neptunes – it would seem that mini-Neptunes are key sizes and types of Planets to form around stars which then go on to create smaller Super-Earth sized bodies as well.

3) Super-Earths – typically 2x to 6x the mass and 1.5x to 2x the diameter of Earth. It was not until 2020 that the first Earth sized exoplanet around a Sun-like G-class stars was found. This object is known by its catalogue number [TOI 700d](#). TOI 700d is the 3rd planet in a system orbiting the Red Dwarf star TO 1700. It is located 100.4 Ly away from Earth in the constellation of Dorado – the Flying Fish in the southern hemisphere. It was discovered by TESS [The 'T' in TOI - Transiting Exoplanet Survey Satellite Object of Interest]. TOI

700 is an M-class Red Dwarf – much cooler and many times dimmer than the Sun. with about 40% of the Mass, 40% radius and 55% temperature of the Sun. It is a red Dwarf star with modest activity – some M-Dwarfs can have very eruptive solar flares – and has a slow rotation.

Because of this its magnetic field is also quite subdued – unlike other Red Dwarfs. TOI b,c,d and e are all tidally locked to the parent star – in other words they all have one hemisphere – in permanent Summer - facing towards TOI 700 and the other – in permanent Winter – facing away. As such there will be substantial trans-hemispherical winds transferring heat from one side to the other.



The habitable zone of the TOI 700 system.

Credit: NASA Goddard Space Flight Center



SCIENCE SLOT

Already a number of scientific papers have been published about this system including data from a [study by the Spitzer Space Telescope Infra Red Satellite of the d-Planet](#).

The data so far obtained suggest that planet b and d are rocky but c is Neptune-like.

TOI 700d is estimated to reside within the stars Habitable Zone. Here it will receive 35x more UV-A radiation than we receive on Earth. So high factor sunscreen would definitely be required. However this is substantially less than [$\sim 2\%$] the radiation dose on the surface of the planet around TRAPPIST-1 e. Furthermore any atmosphere on this planet is estimated to be stable for at least 1 billion years.

Unfortunately the suggested atmosphere of TOI 700d is not conducive for study

using JWST, as it does not contain any gasses that give off infra-red radiation. In November 2021, a 4th planet, TOI 700e, was suggested from the data, located closer to the star. In this position it would receive about 1/3rd of the solar radiation flux that Earth receives from the Sun. It lies on the inner edge of the Habitable Zone of TOI 700. It was confirmed a few months ago. TOI 700e has a radius just 5% smaller than Earth and a mass of 82% that of Earth. It orbits its star in just under 28 days and it is suggested that liquid water is viable on its surface – in other words its climate could be similar to that of Earth. More accurate estimates will be made once TESS does follow up observations to be published in 2024-25. Details of the TOI 700 system are shown in the table below:

Properties of the TOI 700 system.

Object	Mass (Me)	Semi-Major axis	Orbital Period	Orbital Eccentricity	Orbital Inclination	Object radius
b	1.07	0.07	9.97d	0.08	89.6	0.91
c	7.48	0.09	16.05d	0.07	88.9	2.6
d	0.82	0.13	27.8d	0.06	89.6	0.95
e	1.72	0.16	37.4d	0.04	89.8	1.07
Earth	1	1	365.25d	0.02	7.16	1



SCIENCE SLOT

All of these planets orbit perpendicular to the spin axis of TOI 700 – suggesting that these objects are in transition between pro-grade and retro-grade – or vis-versa.

TRAPPIST 1-e

This object was originally identified during the [2MASS survey](#) [by the Spitzer Space Telescope], an infra red waveband survey of the whole sky some 35 years ago or so. Trappist-1 e is estimated to be a rocky planet orbiting within the Habitable Zone of its parent star some 41 Ly away in the constellation of Aquarius. It was discovered by the transit method whereby the crossing of the Planet in front of the

star causes a very small [$<0.1\%$] dimming of the starlight during the transit. In examining this system a total of 7 planets were found orbiting Trappist-1.

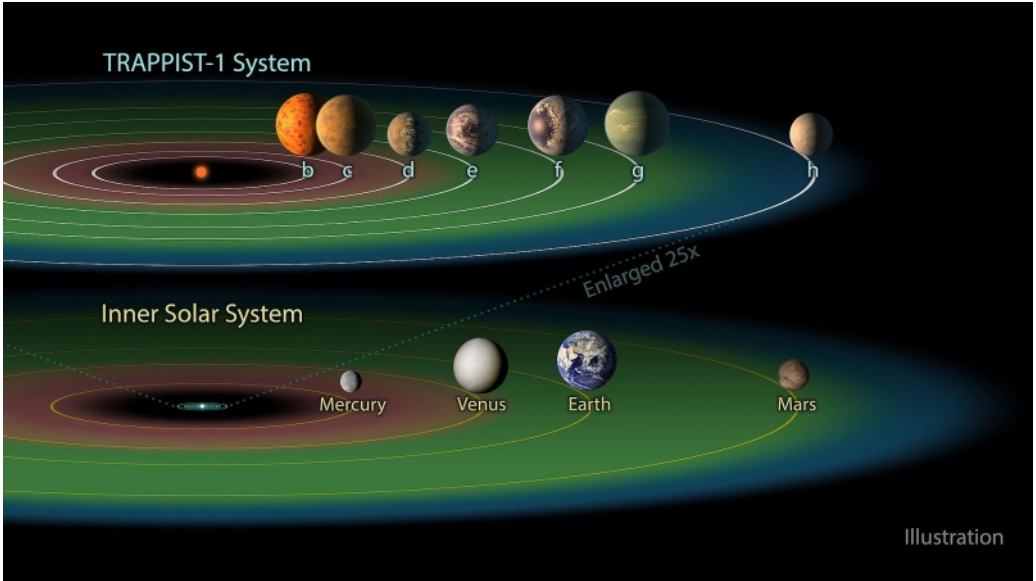
[b,c,d,e,f,g,h]. Of these [e,f,g] are orbiting within the habitable zone of the star.

Trappist 1-e has many similarities to Earth [size and mass, radius, surface gravity and radiation flux] and does not have a hydrogen based atmosphere. In 2018 further observations suggested Trappist 1-e may have a substantial ocean on its surface.

Some details of this planet are given in the table below:

Details of TRAPPIST 1-e.

Semi-major axis	0.0295 AU	
Eccentricity	0.00510 - essentially circular	
Sidereal period	6.101 days	
Inclination	89.7 deg – I.e. perpendicular to the parent star's rotation	
Argument of Periastron	108.4 deg	
Tr1-e Radius	0.92 RE	Earth=1
Mass	0.692 ME	Earth=1
Density	4,885 Kg/m ³	Earth = 5,520 Kg/m ³
Surface Gravity	8.01 m/s ²	Earth = 9.81 m/s ²
Temperature	249 K [-34oC]	Earth = 288K [+15oC]



The scale of the TRAPPIST-1 system compared with our own solar system. The so-called habitable zone is shown in green.

Credit: NASA/JPL-Caltech

It may be some time before we have the technology to visit this Planetary System and – in that time – similar or better candidates may be found closer to Earth – especially when larger Telescopes come on line which are dedicated to locating extra solar planets. But it is nice to know that Earth definitely may not be alone and

Earth 2.0 is not that far away – at least in astronomical terms.

Robert Williams



"We would like to highly compliment the Team (which we would love to be a part of!) Wonderful atmosphere, content and expertise. Above and beyond. Truly."

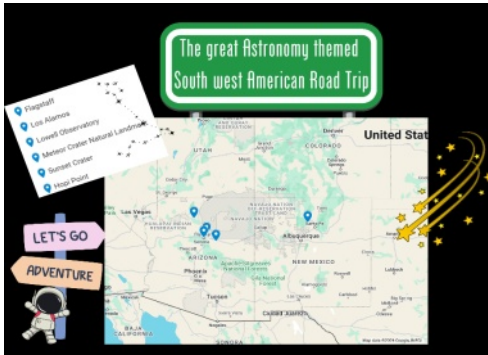
Lukasz, Galashiels



ASTRONOMERS' TALES

An Astronomer's holiday diary

In April, my Husband Billy and I made the jump across the pond to the United States of America to go visit our friend Riley. He lives in Los Alamos, New Mexico (yes, that Los Alamos if you've seen Oppenheimer) and we took the opportunity to road trip across the south west to go see the Grand Canyon. It wasn't intentional, but as it turns out the south west is an astronomer's dream, so welcome to my all American astronomy themed road trip. It was out of this world!



Los Alamos

Home of the now very famous theoretical physicist J. Robert Oppenheimer, Los Alamos is still to this day home to the National Laboratory he set up secretly in WW2. A centre for not just nuclear physics now but a broad range of sciences from biology to space weather, it was so surreal to see the impact the lab has had on the town. Approximately 13 thousand people

live in Los Alamos, and 14 thousand work in the lab. Many commute in from the closest major city of Albuquerque. It has the highest PhD per capita ratio in the world! Due to the sensitive nature of the Labs ongoing I couldn't photograph it; an armed army officer made it very clear we were allowed to drive past, but no turning left for 4 miles and certainly no photos! However the stunning surrounding landscape made up for it. Oppenheimer was right when he said that paradise would be getting to do physics in the backdrop of New Mexico.

VLA

Due to a delayed flight we postponed the



start of our road trip for a day, and what a lucky day it was because we ended up visiting our first astronomy stop – The Very Large Array (a very large array of radio telescopes) on one of their two open days a year! The scientists working there



ASTRONOMERS' TALES

put on tours, bring in food trucks, have solar telescopes, local astronomy societies and the giftshop opened up all for free to attend! We got to meet the scientists that work there and learn about the current scientific endeavours, learn about its past triumphs and get close and personal with the arrays! To say I was excited was an understatement.

The VLA is based in near Socorro, New Mexico and is part of the National Radio Astronomy Observatory. They capture radio waves coming from a huge variety of objects in space, such as stars, planets, galaxies, gas and molecular clouds and even observe the effects of black holes. This makes the VLA one of the most versatile telescopes in the world. It was also the backdrop for the 1997 film Contact, based on astronomer and science communicator Carl Sagan's science fiction novel where Alien contact is made.

Meteor crater

Anyone who has visited the observatory and heard Guy talk about our rock collection will have heard him mention one of his favourite places on Earth, the Barringer crater in Meteor Crater National Park in Arizona (yes, Meteor Crater National Park. Astronomy is notorious for its naming logic). This crater is the largest



and best preserved on Earth. We have many but quite a few are filled in by Earth and water, eroded over time or just not big to begin with. This one however was created 50 thousand years ago, when a meteor 50 m in diameter slammed straight down into the desert land of Arizona. The direct impact was equivalent to 10 megatons of TNT going off and left an almost 2000 m wide, and 1200 m deep



hole. Fragments of the meteor were named Canyon Diablo and have been found all over the site. So much so, I was



ASTRONOMERS' TALES

able to get some fragments from the gift shop and brought them back to the observatory. Don't worry there's still plenty left to go around.

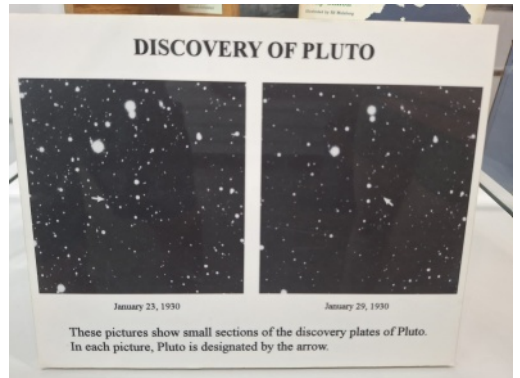
Flagstaff + Lowell observatory



I left a piece of my heart in Flagstaff. The world's first international dark sky city, awarded in 2001! Due to years of dedicated dark sky advocacy, Flagstaff is 14 times less light polluted than other American cities of equivalent size. They started their fight against light pollution in 1958 and over a half-century of policy decisions and implementations have

fostered an astronomy industry that now includes Lowell Observatory, the U.S. Naval Observatory, the Navy Prototype Optical Interferometer, the National Undergraduate Research Observatory, the U.S. Geological Survey Astrogeology Center, and the new Discovery Channel Telescope.

Visiting Lowell observatory was one of the highlights of the trip for me. The observatory is located high up on Mars hill. (Yes, everything is astronomically themed), and is a private observatory, conducting research in its own right still with its own telescopes. It boasts a wide array of current research instruments, historical telescopes and outreach telescopes including a hydrogen filter solar telescope I would quite like to get my hands on back home! It's main claim to



fame though was the discovery of Pluto in 1930. It had been mathematically hypothesised for years, but it took Clyde



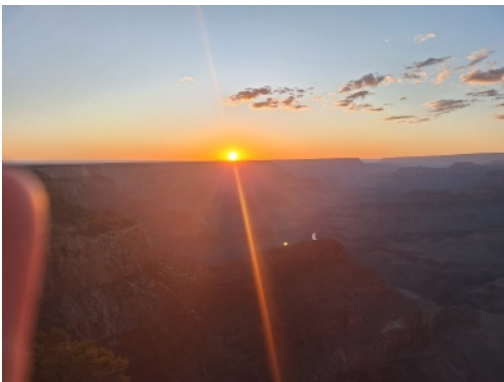
ASTRONOMERS' TALES

W.Tombaugh's dedication and strategic hunting to finally spot the little 9th planet. Fun fact: in Arizona, Pluto is the state planet and thus still officially a "planet" and not a "dwarf planet" as it was recategorized in 2006.

Stephine Lowell, Mr Lowell's wife, was an architect and her favourite planet was Saturn, so all around the site there are Saturn themed details, and of course an entire building built in the shape of Saturn too. This was the library and now the Rotunda Museum.

The visitor programme is quite similar to Kielder, with public talks, tours and stargazing. However they have a double track road, at least 10 optical telescopes at their disposal, and a whole city to staff them so they have more flexibility in their schedule than we do!

Grand Caynon by sunrise and full moon



And of course, the grandest of grand Canyons by sunset was utterly gobsmackingly amazing. The full moon rose and the caynon turned from ruby red to silvery lilac. I was almost annoyed the moon was full as it provided some natural light pollution blocking out the fainter stars. I guess I will just have to go back!



*Ishbel Carlyle
Science Communicator
(all photos by the author)*





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.



Our Director of Astrophotography, Dank Monk, was out and about for the May 10th aurora! Here are three of his amazing shots ...

Not been to Kielder Observatory yet?

Then why not book one of our events for yourself and/or your family?

Advanced booking is essential. Weekend events can fill up several weeks in advance. Please book online at <https://www.kielderobservatory.org/our-events/>.

We can also be contacted at admin@kielderobservatory.org



GALLERY





GALLERY





GALLERY



Dan Monk also journeyed down to Devon recently, and took this fantastic shot of the Milky Way core rising over the sea. That extra 5 degrees of latitude further south makes all the difference!



"Thank you so much to the team who guided us around the stars on Friday. The weather did its best to stay cloudy, but thanks to the expertise of the team we had a great night exploring space rocks, telescopes, and the universe! Right at the end of the experience we were lucky enough that the clouds cleared and Saturn was visible through the telescope! Especially thank you to Guy who took the time to ensure anyone who wanted to had a chance to see Saturn in all her glory. You're right - the hot chocolate is great!"

Rachael, York

Kielder Observatory - a beacon for dark skies

<https://kielderobservatory.org>

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