

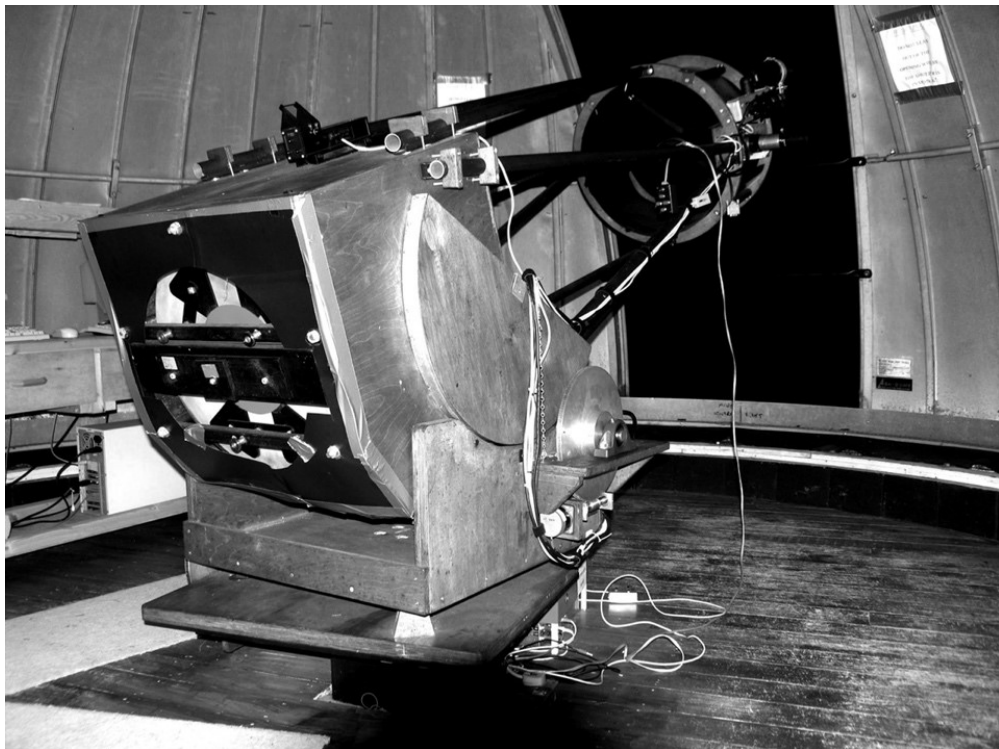


Breckland Astronomical Society

Affiliated to the British Astronomical Association and the Federation of
Astronomical Societies

EXTRA ***TERRESTRIAL***

Newsletter May 2023



Registered Charity no, 1044478

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Copy is always needed for this newsletter. Articles with an astronomical theme are welcome but anything of likely interest to the membership will be considered. Text or Word documents preferred but handwritten submissions also welcome.

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Chairman's Notes May/June 2023

Dear all,

Happy Summer Twilight Period to you all. We don't have public observing nights again until August, but do visit the observatory Tuesday, occasionally staying late if clear skies come. I've been doing a bit of observing again, producing some sketches one night seeing incredibly faint galaxies.

So what do we have in the sky? Venus is shining brightly until June when the ecliptic angle starts to get rapidly shallower to the horizon, and simultaneously Venus heads towards inferior conjunction (i.e. between us and the sun). In this period Venus becomes crescent phase reaching half on Saturday June 3rd – however 50% phase on Venus does not look 50%! This is called the Schröter effect. At this point, on this date, Venus is as far from the Sun as it is from Earth, thus making a right angle centred on the planet, and a phase of 90° (half illuminated). It is 23 arc seconds across at this point. On June 13th, it “touches” the cluster M44, Praesepe in Cancer but don't expect to see it easily, as it is near the horizon in twilight at 22:30. Perhaps it will be a good binocular view or a nice telephoto opportunity with it appearing behind a good backdrop. It will be in the WNW sky.

The ISS (International Space Station)

While Artificial, it is technically in the Solar System, the ISS does some high passes during Mid to late May, late evenings. Check it out on the Stellarium app.

An **unusual** sky pass occurs on the **12th May** where it rises in the South West in the constellation Crater, moves up and left, and disappears slowly into its own sunset as it climbs into Virgo, only reappearing as it almost reaches the E horizon near Altair. It rises 23:15, disappears 23:16 and darkly passes Porrima at 23:19:14, Rasalhague at 23:21:14, Altair at 23:23:50, reappearing fully at 23:24:37 just 3° off the horizon at a distance of 2020km for a minute or so, if you are lucky enough to see it. What a strange geometry to get your head around! It may be faintly visible throughout in binoculars as it catches dim twilight.

On the 29th May it does a final low pass along the SW horizon at 10pm, not reappearing until 26th June at 3:20am in Piscis Austrinus in twilight.

Twilight and Moon times for May/June 2023

1st May Astronomical Twilight runs from 23:00-2:47. From 17th May there is no astronomical twilight until 27th July but it is still OK for observing.

The Moon is out of the way from around 7th May with some beautiful moonless opportunities to see the Milky Way rise over the sea if you are thinking of heading over to the east coast at



night. The crescent (pic) reappears on the 23rd & 24th and brightens the sky until the 7th June. The full moon is at a very low declination now the lunar orbit has precessed to be in phase with the Earth's tilt rising only 9 degrees above the South Horizon.

The Lunar X is visible June 25th from 11am during the daytime for the next four hours.

Planets

Mars appears as a third orange star alongside Castor and Pollux during May, while Venus brightens and elongates from the sun to its lower right (see above re: June 3rd).

Mercury won't be visible through this period. Jupiter starts showing up in the morning twilight and becomes visible as a bright star in Aries from mid June, rising at 2:34am on the 15th and 1:40am on the 30th June.

Saturn rises at 4am at the start of May in Aquarius, midnight at the end of June.

Comets and asteroids

Looking on asteroidoccultation.com there is an occultation of an 11m star by asteroid 2 Pallas on May 6th 22:47:30-50 BST from the UK – it is a large asteroid casting a large shadow and should dim by just 0.12magnitudes (vis). This is a great target to record by camera in practice for exoplanet detection. It should last 17.2 seconds maximum, less for us, so a n exposure time 100ms or less would work. You would need a view of the low Western sky left and a little above Procyon – the same distance away as Gomeisa. See:

https://asteroidoccultation.com/2023_05/0506_2_80644.htm

Later that same night at 23:46:55 +/- 5s BST, another occultation occurs in the north, lower down. This time the magnitude drop is bigger 4.7 magnitude. This means the star can be visually observed to disappear behind asteroid 121 Hermione for up to 5.7 seconds. It will be low in Gemini, 10° up, a few degrees left and above Venus. The star is 9.2 magnitude, the asteroid should be 13.9mag 196 km diameter (ish); the asteroid's shape could be refined nicely by a positive report to the BAA. Sync your clock and print the time on the footage. See:

https://asteroidoccultation.com/2023_05/0506_121_80646.htm

Some faint comets are visible - see Heavens Above or a star chart app for details.

Ultra faint distant monster comet C/2023 A3 Tsuchinshan-ATLAS passes some galaxies in Virgo on June 13th, ahead of its bright pass next year.

C/2023 E1 ATLAS is another one that is faint but not so much, and it is brightening, and high in the sky passing Megrez in the Plough on May 5th and 6th

Also check out C/2022 A2 PanSTARRS, 81P/Wild 2, C/2019 L3 ATLAS, C/2019 U5 PanSTARRS and 237P/LINEAR

Going further out - Double Stars in the Spring Sky

A reminder of these lovely objects to find on even moonlit nights when you want to test your telescope out. Name, magnitudes (brightness) and separations are in this table. You will need a chart such as stellarium to find each stars location and it would help to know the Greek alphabet.

z Cancri (Tegmine)	5.6 ^m , 5.9 ^m , 6.0 ^m	6", 1" (the symbol is zeta, Greek z)
φ (phi) Cancri	6.3 ^m , 6.3 ^m	5.2" 10°E of Pollux
i Cancri	4.2 ^m , 6.6 ^m	30.5" gold and blue
a Leonis (Regulus)	1.3 ^m , 7.6 ^m	176" far apart but gravitationally connected
g Leonis (Algieba)	2.6 ^m , 3.8 ^m	4.5"
g Virginis (Porrina)	3.65 ^m , 3.56 ^m	3" widening 169 year orbit
x (xi) Ursae Majoris	4.3 ^m , 4.8 ^m	1.6" 60 year orbit
N Hydrae	5.8 ^m , 5.9 ^m	9.1" low
WNC 4 UMa / M40	9.0 ^m , 9.3 ^m	50"
a Canum Venaticorum	2.9 ^m , 5.4 ^m	19.6" white and pale yellow
z ¹ Ursae Majoris Mizar	2.4 ^m , 4.0 ^m	14.4" first double to be discovered 1650
a Geminorum (Castor)	1.9 ^m , 2.9 ^m	3.9"
k Geminorum	3.2 ^m , 8.2 ^m	6.9" orange and blue
38 Geminorum	4.8 ^m , 7.8 ^m	7.3" yellow and purple (supposedly!)
e Hydrae	3.4 ^m , 6.5 ^m	2.7" a third (too close) yellow and blue
38 Lyncis (of Lynx)	3.9 ^m , 6.1 ^m	2.6" green and pink (some say)
54 Leonis (of Leo)	4.5 ^m , 6.3 ^m	6.7" white and bluish, neat asterism
t Leonis (of Leo)	5.1 ^m , 7.5 ^m	89.7" due North-South, pale yellow and pale blue
24 Comae Berenices	5.1 ^m , 6.3 ^m	20" orange and greenish
39 Boötis	6.3 ^m , 6.7 ^m	2.7" 10°E of Plough, tiny distant spaceship
e Boötis	2.6 ^m , 4.8 ^m	2.7"
z Boötis	4.5 ^m , 4.5 ^m	0.1" now not separable until about 2030 or 2040.
g Delphinii	4.3 ^m , 5.1 ^m	8.9"

Of course Albireo and epsilon Lyrae are always worth a look too but should be easy to find.

Going further out – Deep Sky Objects

A cloudy nights forum suggested a good selection of items for a deep sky tour for May and June. They are located by Right Ascension to be visible when dark and high in the sky.

May: M3 (globular – beautiful and bright), M51 (whirlpool galaxy), M63, M64, M83 (very low galaxy in Hydra/Centaurus), M87 (galaxy with super massive black hole and jet), M104, M106, NGC 4449 and NGC 4565.

June: M5 (globular), M101 (large diffuse galaxy), M102, NGC 5566, NGC 5585, NGC 5689, NGC 5746, NGC 5813, NGC 5838, NGC 5907.

Also try out April's recommended objects still M97 and M108 in the Plough. You will need a good app or charts to find some of those.

Going further out – The Milky Way

From mid May look for the Milky Way rising in the SW, especially around 2am. Late May at 2:40am the center of the Galaxy will be beautifully visible to the South. It makes a HUGE difference if you can see this in a clear dark sky, so if you find yourself in a dark location, and dark to the south – it is stunning. Take your bins and a wide angle camera and tripod. Even an iPhone13 or equivalent can get a stunning smooth shot of it now.

Check out Steve Tonkin's Binocular Sky page for monthly charts <https://binocularsky.com/>

Events

Regarding Haw Wood Farm Star Party. Around 2019 the organisation had gone to Dave Murton of DASH but had more recently reverted back to Andrew Robertson. None of us at Breckland could make it to the spring star party and the popularity had presumably declined, so he thought he should hang up his boots and retire from organising. A shame it had to come to a close, but all good things come to an end and it is a lovely dark campsite still. I have some good memories of seeing my faintest objects from there, such as the IC designated galaxy near M13.

The Space Oddities programme is still happening Monday Nights on facebook and Youtube, well worth a watch.

Talks

Chris Lintott –

What a lovely chap, he was a pleasure to deal with and so kind to give his time, as are all our speakers. As a minor celebrity he gets asked the following things:

Do you believe in aliens?

Do you know Brian Cox?

...You must be very clever

One of the citizen science projects he was looking at was exoplanets. He likened the task to pick out a planet around star HR8799 as like looking for a glow worm by a Pink Floyd stadium light from a mile away. He told of the planet hunters online, an Aussie guy, who discovered 5 planets, this project being run by his student Nora Eisner

(<https://blog.planethunters.org/author/noraleisner/>) there is a new mission TESS going up which should further the work from Kepler.

Andy, Richard and myself went to the BAS sponsored talk at Norwich Science Festival where we heard his talk on the sounds of space with Steve Pretty the jazz trumpeter. People have been describing the music of the spheres since antiquity, such as in Stuart Clark's recent book.

Chris is a visual astronomer, and has always wanted to discover a comet, like you could in the 1990s. One evening, he said, he was looking at M42 and discovered the colour structure. He was aged 14. He then knocked the telescope and discovered the cluster next to it. He named it Lintott 1! And marked it with an X on his star atlas. Then learnt it was called NGC1981 and discovered in the 1890s, to his annoyance but it will always be Lintott 1. (Chris, I feel the same about a galaxy in Cancer/Lynx!). Amazing how we thought we had a chance, considering the skies here in the UK.

The Sloan Deep Sky Survey is based in New Mexico, where they have 320 clear nights a year. This produced loads of new data for astronomers to pore over. New faint fuzzies were seen in their thousands, and distance measurements allowed voids to be discovered. One was the Sloan Great Wall, which was unexpected – did the galaxies form differently to they had modelled? Chris used this data to plan the project of his career. With such a large amount of data at his disposal, he would test methods of classifying these galaxies to get some big statistics. He would see if his PhD student Kevin could classify a large sample of them. He needed to do a simple classification, by ways to describe the galaxy fit for a database and statistical analysis. One particular test this task was well suited to was to check a fairly rigorous paper that showed there were more anticlockwise galaxies than clockwise. This is obviously bizarre as it would show we are in a special place in the universe, and that goes against the cosmological principle.

Kevin did 50,000 (!) before beating a computer and did find more were anticlockwise. The idea that people were much better at this task was extended to the Galaxy Zoo project on the internet. The public (like SETI @ Home) got to sit and classify galaxies in their spare time, instead of playing Solitaire. It got an amazing response, they hit 70,000 an hour after 2 days running. The number of anticlockwise came out as higher with a “4.5 sigma” difference, this is almost the discovery level of particle physics. Chris decided to mirror some galaxies, and run it again. Again there was more anticlockwise. This is proof it is a human bias. A very small one, but there nonetheless. He put up the slide of a silhouette of a ballerina pirouetting which could be seen both ways. Just an illusion.

He extended his project to include new data. They wanted to look at supermassive black holes and how and why they relate to the size of their host galaxy. Our Milky Way’s SMBH is called Sagittarius A* and every year the Keck telescope on Hawai’i looks at it to see how the stars within an arc second of it have moved. And of course the Event Horizon Telescope project generated a picture of it also, showing a blurry hole in the middle of a blobby accretion disk. Becky Smethurst was appointed to this project. The SMBH is tiny in relation to its galaxy so why is there a correlation. They need to look at how they grow.

Do the SMBH’s merge along with their galaxies? The Milky Way is merging with Andromeda to form “Milkdromeda” (the alternative “Andromeda Way” sounds like a British sit com remake of Mork and Mindy (Chris is also very funny for those over 40)). He loved Sir Patrick’s description of the Milky Way as being “2 fried eggs clapped back to back”.

The “bulge” (yolk) size of the galaxy is very correlated to the size of the SMBH. So elliptical galaxies were assumed to be the product of very merged evolved galaxies, and so they should have big SMBHs but galaxy ‘Hubble’ type doesn’t relate to size of SMBH, using 1 million “Galaxy Hunters” classifications. A result albeit a negative one.

A Penguinologist approached him to add the huge camera data to his site. Count penguins! 8-18 million pics of them per yr. They wanted to see what cause the population to decrease. “What to call it”... “not Penguin Hunters”, they had to call it “Penguin Watch”. They discovered fishing was the culprit. (I think their logo should have been the Penguin and Egg galaxy). They put a Serengeti camera trap up and asked “what is the animal?” but a “zorilla” popped up. Computers and AI just can’t classify them – it is still too hard to train them.

They helped discover Hanny’s voorwerp mystery. And Tabby’s star – Tabitha Boyajian was perusing exoplanet data from Kepler and flagged a star later to be called the “wtf” star (where’s the flux?). This stars flickered downwards in a really tantalising but haphazard way. Darrell, a co-

discoverer suggested a disk but there was no infrared excess. So maybe a suite of comets, nope that didn't work. A Dyson sphere? Yeah right. If you want to look at the latest data it is called "KIC8462852" and monitored on twitter. It is faded in red light not blue, and is still a mystery. Can you guess the real reason?

There is a new scope The Vera Rubin in Chile about to come online an 8.4m survey wide field survey telescope that will produce a massive amount of data on the whole sky released every 3 days.

Many Qs were asked. I asked about transit technique of seeing planets "Surely there's such a strong bias toward close in planets. How has that not skewed conclusions?" He said, I was correct and it has skewed conclusions, we can only attempt to compensate fully for it and leave the outer planets undiscovered but still potentially there.

Chris was a pleasure to arrange this trip with, despite him not having his diary secretary Emily Carrington Freeman – she is a great artist and drew a Zoobot you can find on the website.

A last thought. Chris is humble. The idea was not his. The first citizen science document we can find was from 1715, an eclipse pamphlet was posted out to get public to time it. Edmund Halley.

Andy Jones – Volcanism in the Solar System

Andy 's talk was inspired by the BBC's Magellan programme transcript he'd written off for in the 1990s. There are 4 volcanic bodies in the Solar System: Enceladus Earth Triton Io (not Venus officially – although it is sort of obvious – this was guessed by Christa).

We started with a look at Earth the Hawai'i hot spot type of volcanism – mantle plumes, then looked at subduction type lithosphere floating on a 0.1% liquid asthenosphere. That is Earth.

We had a look at Mercury. Mercury newest part is the N pole region. It looks like and is called a volcanic plain. However there are none of any significance anyway on Mercury. They put it down to partial melting. There are ghost craters there like the moon.

Next we came to Venus the Russians sent 16 probes there, plus then we had Magellan that radar mapped it. It is mainly Silicon Aluminium and Iron very much like oceanic basalt. We had an elemental analysis and comparison. Mg Ca and Ti for the chemistry geeks, but not much potassium(K).

We were introduced to some Venusography. Mons Terras and Regios. Sapas mons 5km high shield volcano nearly as big as Olympus mons mars. There's potential volcanism there just not seen.

Then the beautiful "Pancake domes" that are about 20km and circular with upwelling magma.

A huge circular feature exists in a place called Artemis Terra – Andy says it was trying to do plate tectonics to lose heat but failed. It is not a dome or volcano as such, a large magma plume but a Corona, it is 2400 km across! It is so huge, it is thought to be a big mantle hotspot. There are loads of tiny side vents make mini domes 85000 of them in total on Venus but 85% clustered near this feature in the Shield Plains region featuring a line of 4200km length of them. This was still not enough heat loss according to calculations. This would lead to periods of catastrophic melting where the entire surface of Venus would be reshaped every few million years (how sad).

High regions from the Magellan data reflect more radar and this appears as snow but it is thought to be lead!

Another Corona, Aramaiti Corona has a gap in the side of its apparent caldera with lava flowing out the side, like Mt St Helens. This is Ahsabkab Vallis (Mayan name for morning Venus).

Then we moved on to Io (Triton and Enceladus will have to wait for Part 2 next year!) Io was Galileo Galilei's first moon discovery, the first volcano outside earth happened to be seen just as the Galileo probe arrived. Not much has changed in the 20 years between Voyager II's first look (in passing) and the Galileo probe arriving.

Io is covered in Sulphur. It is in various forms with different colours. Greenish S₁₀ molecules are visible in small regions, but mainly it is yellow or orange S₈ much as the Sulphur powder we manufacture here on Earth. The redder forms, are S₄ and S₂ darker. Silicates appear as black spots at the top of calderas and white dustings of SO₂ sulphur dioxide appear on the sides of the peaks

Galileo probe saw Pele erupting over the terminator in the sun and the volcano Loki was bright. There was an issue with a very high temperature observed 1900 Kelvin was seen despite thinking only about 380°C (650K) achievable by Jupiter's tidal heating and the predicted structure of Io.

Looking closer, a little changed. Pele changed a bit at the bottom between Voyagers 1 and Voyager 2. Loki outputs 25% of Io's thermal energy. Seen from near Earth with Hubble it was regular in its eruptions over 1.5 years like clockwork. Then it stopped. Then it went chaotic. Then stopped again.

Other features include Loki Patera - a ring lake looking directly at Io's asthenosphere. Kulan patera is the most pretty picture – go look it up. Kulan patera was the source of the high temperature anomaly but later found it could have been 1500K was thought to be 1900K hotter than earth. Very hot still! New chemistry models are needed to explain this.

Lots of questions. This talk was really well attended and the outpouring of enthusiasm was great to see. It was a rainy and cloudy night too.

Next events

Jerry Workman is talking about Apollo – apologies for the incorrect title that got out. The AGM is in May after his talk. And Dr Paul Fellows is talking about Strange Stars – stars that actually have strange quarks inside them. Amazingly weird. I'll talk about Night vision in July.

Hope to do a solar outreach day but haven't organised a venue as yet. I will see if RSPB Lakenheath want to do the same again this Father's Day. Watch this space for info. If you know of anywhere who wants an activity for summer contact me on chairman@brecklandastro.org.uk

Society notices

Note again a break from open evenings from May until July, then they resume at the end of August. They will start coinciding with larger gibbous moons so I'm not sure about keeping the times. We shall discuss.

All telescopes are functioning again at the observatory so members please come along for an observing session.

We still need help arranging speakers and with visitors at the observatory.

Dan Self

News

Sadly, one of our former speakers and campaigners against Light Pollution Bob Mizon MBE FRAS passed away recently. I feel the need to honour his name in keeping up his good work in educating people to not waste light at night. Steve Tonkin FRAS writes this words on behalf of the FAS (Federation of Astronomical Societies).

Dear Member Society,

It is with great sadness that I must report the terrible news that Bob Mizon, whom many of you will know from his outstanding efforts to protect the night from the scourge of light pollution, died suddenly at home earlier this week.

For the last few decades, Bob has co-ordinated the British Astronomical Association's Commission for Dark Skies (CfDS), which he helped to establish, but his astronomical interests ranged far wider than light pollution, as the many astronomical societies to whom he has given talks will attest. He was also passionate about education and, after a first career as a French teacher, in the late 1990s he acquired a mobile planetarium, which he named the Mizar Travelling Planetarium (Bob loved puns!), through which he took the wonders of the night sky to children and adults all over Britain. In 2010, his work was officially recognised when he was awarded an MBE "for services to astronomy and the environment".

He was one of the instigators of the All Party Parliamentary Group for Dark Skies, and was one of the people behind the establishment of the UK Dark Skies Partnership. He was instrumental in helping Cranborne Chase AONB achieve its status as an International Dark Sky Reserve.

Recently, ill health caused Bob to cease his planetarium shows, but he continued to advocate for responsible outdoor lighting and represented the CfDS at the BAA's "Winchester Weekend" only the weekend before his death.

He leaves his wife, Pam, their three children, and a granddaughter ... and the many of us who were privileged to have had our lives touched by his. The stars have lost one of their greatest friends on planet Earth.

Steve Tonkin, FAS

BAA Deep Sky Section Update for March 2023

March was not terribly good for observing for me – though I did see aurorae on two nights, one of which was a really magnificent display. And I did a little solar observing on the days when the Sun shone! Hopefully April will have some good weather, then I expect it will be too light at night for DSO's. Still hopefully there will be a some noctilucent clouds to view.

Object of Interest for March

The Cosmic Horseshoe was the March object of interest. This proved to be really hard, and many thanks to Iain Cartwright, Richard Sargent, Alan Thomas and David Strange who all had a go at it. I think in all cases the foreground galaxy was just about detected but the Einstein Ring evaded.

Object of Interest for April

For April something still a challenge I think, but should be within reach of many observers. And of course as it is Galaxies Season, I had to pick a less observed group of galaxies in Virgo, the NGC 5044 group. NGC 5044 is the brightest galaxy in the group, and is a giant elliptical. But there are a wealth of galaxies in a 30 arc-minute field around it, and a wider field displays even more. The group is a bit away from the 'main drag' of Virgo galaxies, in the south of the constellation, about six degrees south of Spica. Its low altitude will be the main problem – here in Orkney it will culminate at only about 14 degrees above the horizon.

Check out Paul Downing's recent image of Arp 244 The Antennae galaxies from Spain.

https://britastro.org/section_news_item/deep-sky-update-march-2023

Callum Potter

JOHN'S NEWS BITS

May 2023

After some delays, the SpaceX SLS Starship finally took off on April 20th. However, some time after take-off there was separation failure and it blew up...sorry...it did not blow up, according to Musk-speak it suffered an “unscheduled disassembly”. Follow-up launches are in the pipeline once the problem has been sorted out. So next time you write your car off you know what to tell the insurance company!

On the positive side, the long awaited JUICE mission to Jupiter's icy moons took off on schedule. This will have a gravity assist trajectory with an Earth-Moon flyby in August 2024, Venus in August 2025 and a second Earth flyby in September 2026 and a third Earth flyby in January 2029. The probe will take 8 years to get to its destination <https://solarsystem.nasa.gov>

The NASA OSIRIS-X mission spacecraft is on its way back to Earth with samples from asteroid BENU. The samples were taken in 2020 and the probe is due back on September 24 2023.

NASA's JWST telescope has captured an image of a Wolf-Rayet star WR 124 that is about to go supernova. This is a massive very luminous short-lived star first seen in June 2022 and is in the constellation of Sagitta some 15,000 light years away. <https://webbtelescope.org>

Reported in Livescience.com, new research suggests that there may have been a second Big Bang. Hubble images of galaxy cluster C10024+1654 along with data taken by ESA and NASA from the observatory Mid-Pyrenees in France and Caltech USA. This shadow Dark Big Bang second explosion may have given the universe its invisible dark matter. This Dark Big Bang appears to have occurred about one month after the original.

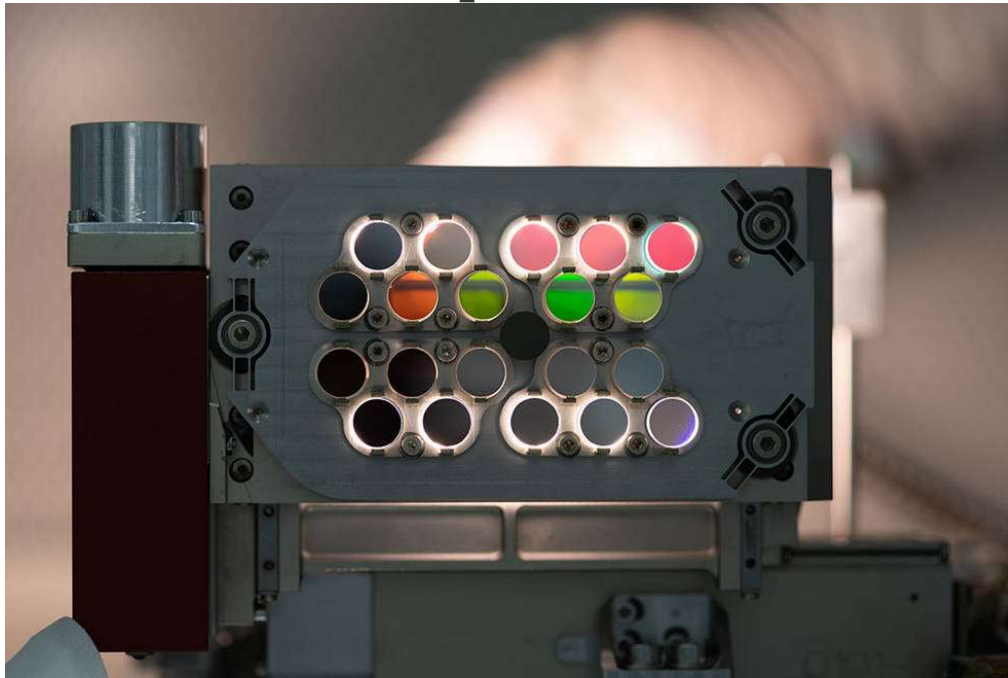
Reported on www.technology.org, research at the Atacama Cosmology Telescope collaboration has mapped the universes cosmic growth supporting Einstein's theory of general relativity. This was the most detailed map of matter distributed across a quarter of the universe. It confirms Einstein's theory about how massive structures grow and bend light. The map was made using distortions of light left over after the Big Bang.

Scientists at the NASA Goddard Space Centre are concerned at the increased risk of an asteroid hit. Asteroids and comets with diameters in excess of 1km. strike the Earth every 600,000 to 700,000 years posing a risk greater than previously thought. www.science.org

A Japanese company called iSpace launched a Moon lander Hakuto-R on a SpaceX Falcon 9 rocket on December 11,2022. It took four months to arrive on a slow journey to conserve fuel. iSpace is a private company based in Tokyo. The lander should have landed on April 25th but contact has been lost, presumed crashed on surface.. www.newsientist.com.

John Gionis

Assembly Begins on NASA's Next Tool to Study Exoplanets



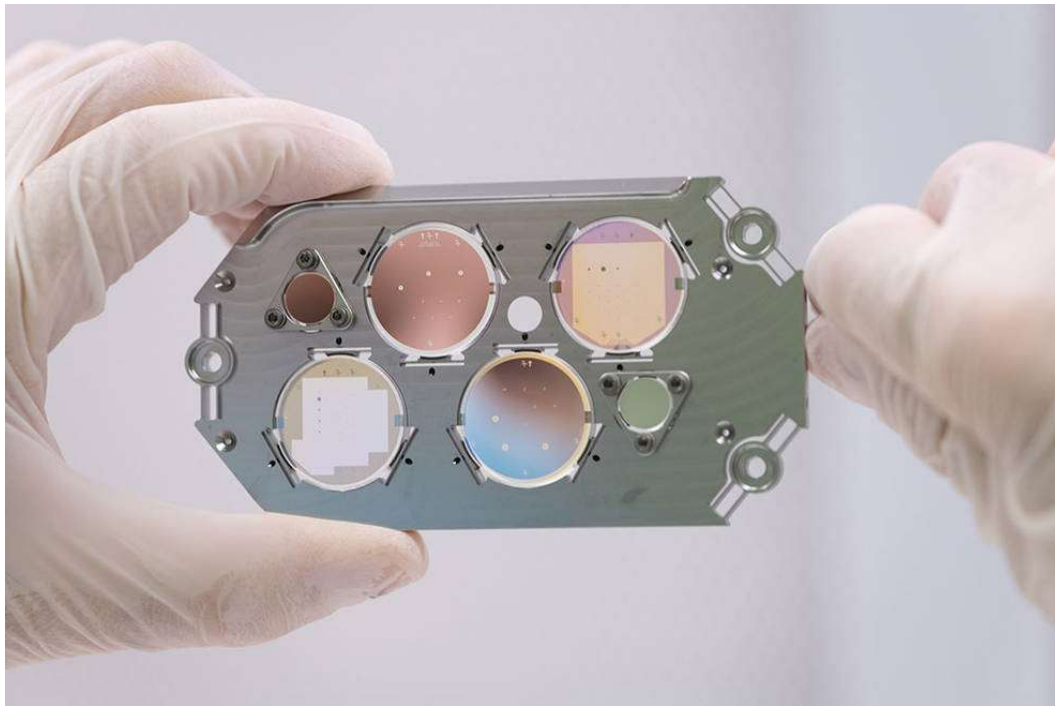
The filters on NASA's Roman Space Telescope Coronagraph Instrument's Color Filter Assembly each block all but a specific color, or wavelength, of light. Many of the filters appear dark in this photo because they are transparent only to infrared light, which is invisible to the human eye.

Credits: NASA/JPL-Caltech

The Coronagraph Instrument on NASA's Nancy Grace Roman Space Telescope will study planets around other stars. Putting it together will require a highly choreographed dance.

Scientists have discovered more than 5,000 exoplanets, or planets outside our solar system. As technologies for studying these worlds continue to advance, researchers may someday be able to search for signs of life on exoplanets that are similar in size, composition, and temperature to Earth. But to do that they'll need new tools, like those being tested on the [Coronagraph Instrument](#) on NASA's [Nancy Grace Roman Space Telescope](#). The instrument will block the light from each distant star it observes so that scientists can better see the planets around the star, and it will demonstrate technologies needed to eventually study potentially habitable planets with future missions.

The Coronagraph Instrument team has already designed the cutting-edge instrument and built the components. Now they have to put the pieces together and run tests to make sure they operate as intended. "It's like all the separate tributaries are finally coming together to form the river," said Jeff Oseas, product delivery manager for the Coronagraph Instrument's optical subsystem at NASA's Jet Propulsion Laboratory in Southern California.



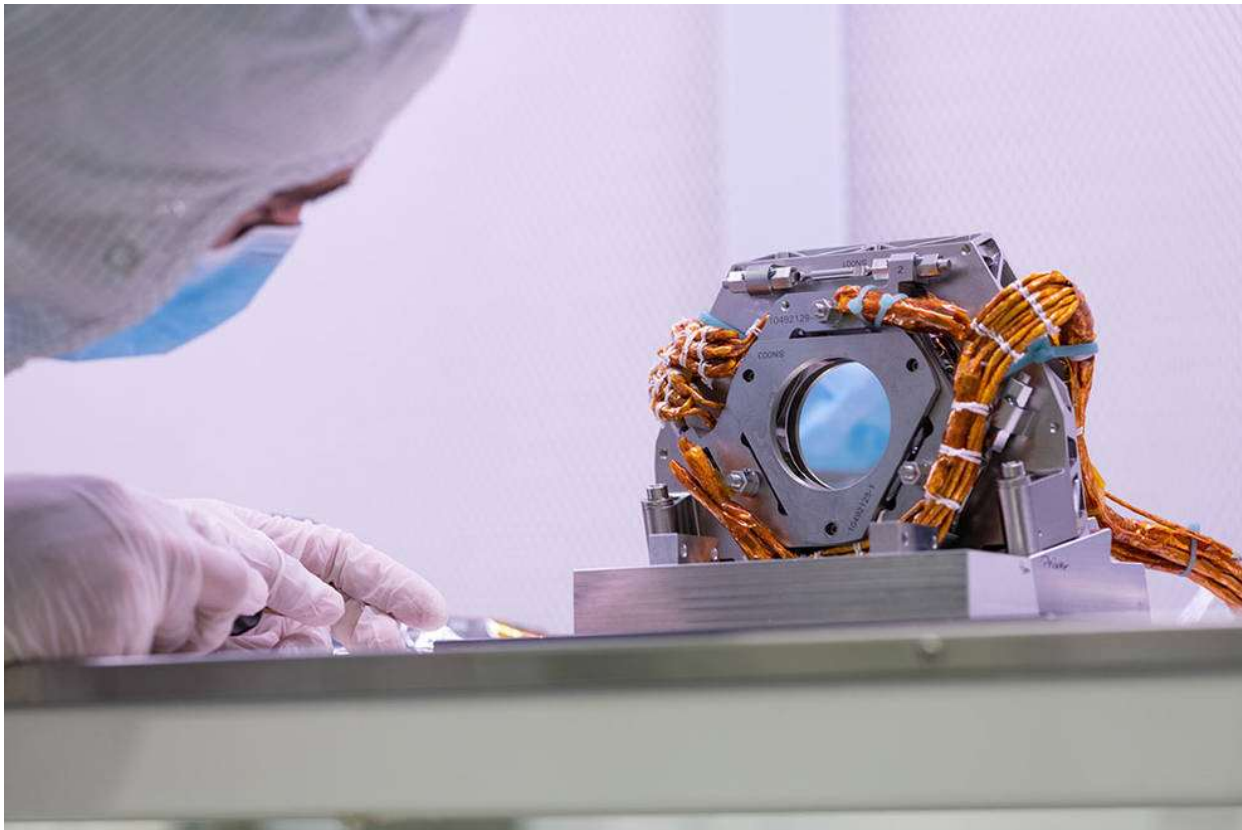
The focal plane mask for the Roman Coronagraph Instrument, shown here, helps block starlight and reveal hidden planets. Each circular section contains multiple “masks” –carefully engineered, opaque obstructions designed to block starlight. Some masks are about the width of a human hair.

Credits: NASA/JPL-Caltech

The process kicked off recently at JPL and will take more than a year. Once complete, the Coronagraph Instrument will be shipped to the agency’s Goddard Space Flight Center in Greenbelt, Maryland, and incorporated into the Roman observatory.

JPL engineer Gasia Bedrosian leads the assembly and testing process as the instrument’s integration and test product delivery manager. She likes to say that while integration and testing are technically the last steps in building an instrument, they’re actually part of the process from the beginning.

In 2018, Bedrosian started working on a set of assembly plans for something that’s never been built before. She and her team then spent another two years collaborating with various subject matter experts and project members to review and adjust the plan, ensuring all the pieces would come together on time and in the right order. The process will resemble a well-choreographed ballet that involves heavy duty cranes, lasers, and vacuum chambers the size of buses.



An engineer examines the fast steering mirror, part of the Coronagraph Instrument's optical bench. The mirror makes small movements that correct for slight wobbling of the Roman spacecraft. The instrument must be perfectly still in order to detect light from planets orbiting distant stars.

Credits: NASA/JPL-Caltech

Roughly the size and shape of a baby grand piano, the Coronagraph Instrument is composed of two main sections that will stack on top of each another: the optical bench and the instrument electronics pallet.

The more delicate of the two is the optical bench, which contains 64 elements, such as mirrors and filters, designed to remove as much starlight as possible without suppressing the light from planets. This approach to finding and studying [exoplanets](#) is called direct imaging, and it is expected to be the best way to study the atmospheres and surface features of rocky worlds similar to Earth. Some of the optical components on the Coronagraph Instrument are so small they're barely visible to the naked eye.

The Coronagraph Instrument on NASA's Roman Space Telescope is designed to block the light from a star and capture the much fainter light from orbiting planets. This video explains how the complex instrument works.

Credits: NASA's Goddard Space Flight Center

[Download high-resolution video and images from NASA's Scientific Visualization Studio](#)

The pallet, or bottom layer, houses the electronics that receive instructions from the Roman spacecraft and return the Coronagraph Instrument's scientific data. The electronics also control the mechanical components on the optical bench as well as the instrument heaters. The optical bench will be stacked by crane atop the electronics pallet. Because the two layers have to be aligned with each other to within a fraction of a millimeter, the team will use lasers to get them positioned just right over the course of four days.

Eye for Detail

Integration and testing teams will often use digital 3D models of the instrument to help make their plans, but nothing can compare to seeing the object in a real space. That's why the coronagraph team made use of an augmented reality headset that lets users see a virtual projection of a 3D object and the world around them. The headset is also [used by the Mars Curiosity rover team](#) to see in 3D the Martian terrain that the rover drives over.



The Roman Coronagraph Instrument consists of two key sections, including the optical bench, shown here. Light from the telescope is directed through series of lenses, filters, and other components that ultimately suppress light from a star while allowing the light from orbiting planets to pass through.

Credits: NASA/JPL-Caltech

“We learned a lot from that exercise,” said Bedrosian. “We could get a sense of how tight the access would be at certain points of integration by literally laying on the floor and getting visuals of under the instrument. It showed us when it would be beneficial to lift the entire instrument with a crane, or if we were going to need a specialized tool to do our work at that angle. It helped make a lot of our plans safer and simpler.”

Once assembled, the Coronagraph Instrument will undergo a series of tests, including almost a month of dynamical testing to simulate the rocket ride into space. It will then be put in a vacuum chamber that replicates the space environment to check that the hardware remains aligned and operating correctly.

“It’s exciting to finally start putting all the pieces together,” said Bedrosian. “It’s definitely a delayed gratification, because we’ve spent so long preparing. But now that we’re here and my team members are talking about the hardware arriving, I can hear the excitement in their voices.”



Engineers at NASA's Jet Propulsion Laboratory are shown assembling the electrical palette for the Coronagraph Instrument, which houses the electronics that receive instructions from the Roman spacecraft and send back the Coronagraph Instrument's scientific data.

Credits: NASA/JPL-Caltech

More About the Mission

The Nancy Grace Roman Space Telescope is managed at NASA's Goddard Space Flight Center in Greenbelt, Maryland, with participation by JPL and Caltech/IPAC in Southern California, the Space Telescope Science Institute in Baltimore, and a science team comprising scientists from various research institutions. The primary industrial partners are Ball Aerospace & Technologies Corp. in Boulder, Colorado; L3Harris Technologies in Melbourne, Florida; and Teledyne Scientific & Imaging in Thousand Oaks, California.

The Roman Coronagraph Instrument was designed and is being built at JPL, which manages the instrument for NASA. Contributions were made by ESA (the European Space Agency), the Japanese Aerospace Exploration Agency (JAXA), the French space agency Centre National d'Études Spatiales (CNES), and the Max Planck Institute for Astronomy (MPIA) in Germany. Caltech, in Pasadena, California, manages JPL for NASA.

For more information about the Roman telescope, visit:

<https://roman.gsfc.nasa.gov/>

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2022-205

Last Updated: Feb 1, 2023

Editor: Tony Greicius

Adjusting the Optics of a Newtonian Telescope

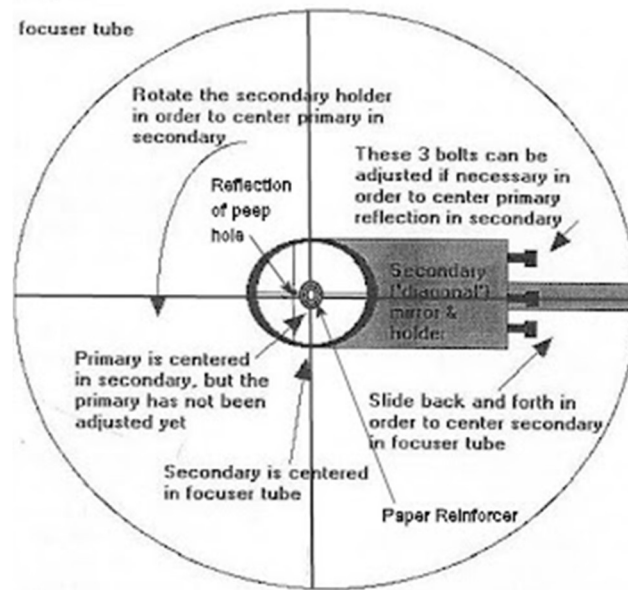
The heart and soul of a Newtonian telescope are the three basic optical elements: mirror, diagonal and eyepiece. All three must be optically perfect, but unless they are lined up properly or collimated with respect to each other, the telescope will not produce a sharp image no matter how carefully focussing is done.

Much has been written about aligning a Newtonian telescope and the subject is often treated as though it is extremely complex. As a matter of fact, it is a fairly simple process and there is no need for cross hairs, pinholes, diaphragms screens, or any other paraphernalia which is often claimed to be necessary. There is no real need for a laser collimator as the method given will get you to the same position and the final check should always be on a star as that is the object you will use the telescope for. I will run through a check using a laser collimator at the end and explain the limitations. All we need is the eyepiece holder from a reasonably high-powered eyepiece so that we can be sure the eye is centred on the draw tube of the eyepiece holder. If this is not available it is possible to improvise with something over the eyepiece holder with a small hole in the centre, but it is important that it is in the centre.

In good, even daylight turn the focuser out as far as possible and check that the eyepiece holder is perpendicular to the tube. A good set square or engineers square will do for this but you may also require a ruler to use as a parallel to raise the square above the base of the eyepiece mount. Most commercial Newtonian telescopes do not have any adjustment on the eyepiece mount so it may not be possible to correct in all cases.

Look through the hole in the direction of the diagonal mirror. If this is in the correct position it will appear centred on image. To get it into perfect alignment there are usually three push screw and one pull centre bolt visible on the front of the diagonal holder. It is good practice to have the tube level whilst adjusting the secondary as if a tool is dropped with the tube pointing up damage may easily occur to the main mirror due to the falling tool. Depending on how much you need to move the secondary up or down the tube you will need to slack off the three screws and carefully tighten the centre bolt (or visa versa to move down the tube.) At the same time the diagonal can be rotated on the centre bolt to ensure that you can see the main mirror (not the side of the tube) the image of the secondary should be round and central as you look at it. When this is the case the three screws can be nipped up being careful not to overtighten.



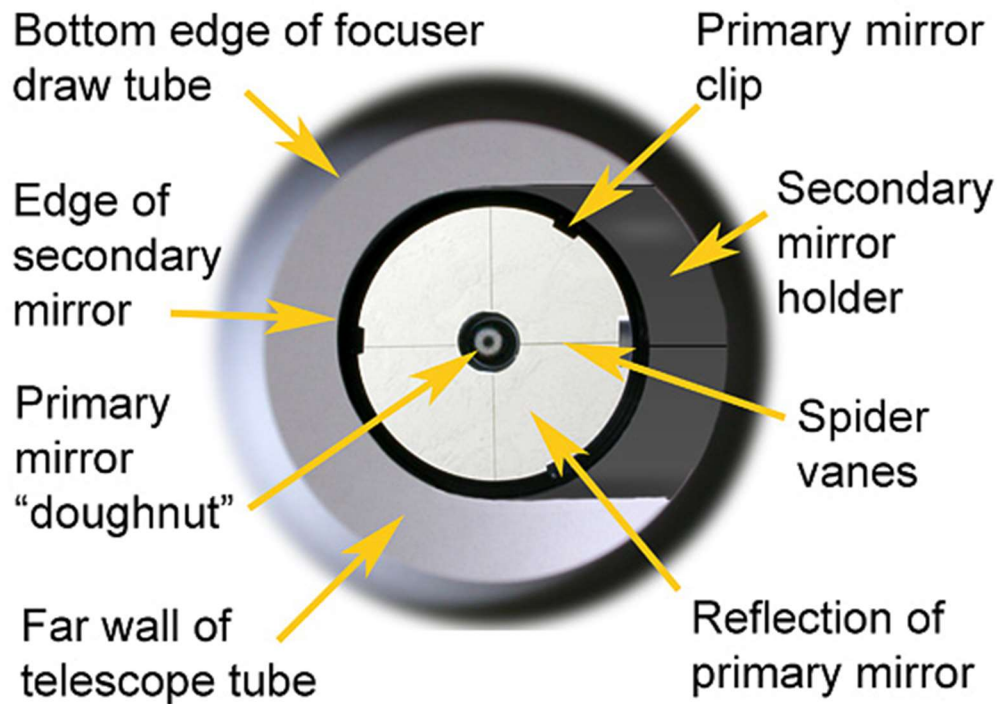


Carefully adjust the three screws on the diagonal until the main mirror appears equally just inside the image on the diagonal. Do this slowly and make sure you do not overtighten any of the screws. The reason that the image should be just inside is so that the diagonal can take all the light from the main mirror but not be too large and cause an obstruction bigger than is required. Some commercial telescopes have small diagonals and do not use the whole of the surface of the main mirror. Sometimes this was also used where due to poor figuring of the main mirror it had a turned down edge. If either of these are the case the best guess that the mirror is centred will have to suffice.

Next, we are looking at the reflected image of the diagonal in the main mirror (still though the eyepiece holder). It should also appear in the centre; if it does not you can adjust the position using the three adjusting screws on the back of the main mirror. These are usually spring loaded so can be adjusted individually. If the reflection of the diagonal is displaced to one side, advancing the screw on that side will bring it back towards the centre. You may want to check the centring of the diagonal by stretching two threads across the face and bringing the image to the intersection. (Some mirrors have the centre point marked already and it is no problem as it is in the shadow of the diagonal when observing stars, so has no effect on the image when the telescope is in use). Actually the eye can detect very small deviations from the centre without the centre being marked.

When all the optical elements are lined up you will see the following as you look through the hole in the eyepiece holder.

- 1/ The diagonal mirror centred in your field of view
- 2/ The image of the main mirror nearly filling the surface of the diagonal mirror.
- 3/ A reflected image of the diagonal centred in the main mirror.
- 4/ Your own eye seen by double reflection centred in the diagonal mirror



Laser Collimation

Laser collimators use a small laser beam to mark the centre line of the optical train. They are fitted in the eyepiece holder and have a target which shows the return beam. The main mirror must have the centre marked in some way. First the diagonal is adjusted so that the beam is seen on the centre mark of the main mirror, then the main mirror is adjusted to bring the return beam to the centre of the screen of the collimator. It is a good idea to rotate the laser in the eyepiece holder to ensure that the collimator is exactly parallel to the drawtube. The laser should now be set such that it can be seen from the bottom of the tube. The three screws on the main mirror can now be adjusted. (If locking screws are fitted these should be first slackened) The adjustments are continued until the laser beam is centrally located on the target. And then the locking screws (if fitted) nipped up to ensure no further movement. A final check should be made after the locking screws are tightened to ensure it is still in collimation.

The advantage of laser collimators is that it is a quick check (although not much quicker than putting the eyepiece holder in and having a look). Also the laser can be used at night if there is any doubt about collimation. I have doubts about its ability to detect out of position diagonal mirrors as it only uses a small part of the mirror.

Star testing

For most purposes this preliminary lining up of the optical train will be entirely satisfactory. A slight displacement of the elements is not usually apparent at low powers when the eyepiece is focussed, but at higher powers slight defects in placement will cause coma (the flaring of a star image to one side, or even double images. So, you proceed to more exact collimation using a third magnitude star as a measuring device

Use a low powered eyepiece, choose a star somewhere overhead to be sure that the main mirror will remain seated on its supports (will come back to this later). Move the eyepiece out slightly. Coma diffraction effects and any astigmatism present will make their

appearance at this point by a flaring of the image and partially broken diffraction rings on the side of the image on which the flaring occurs.

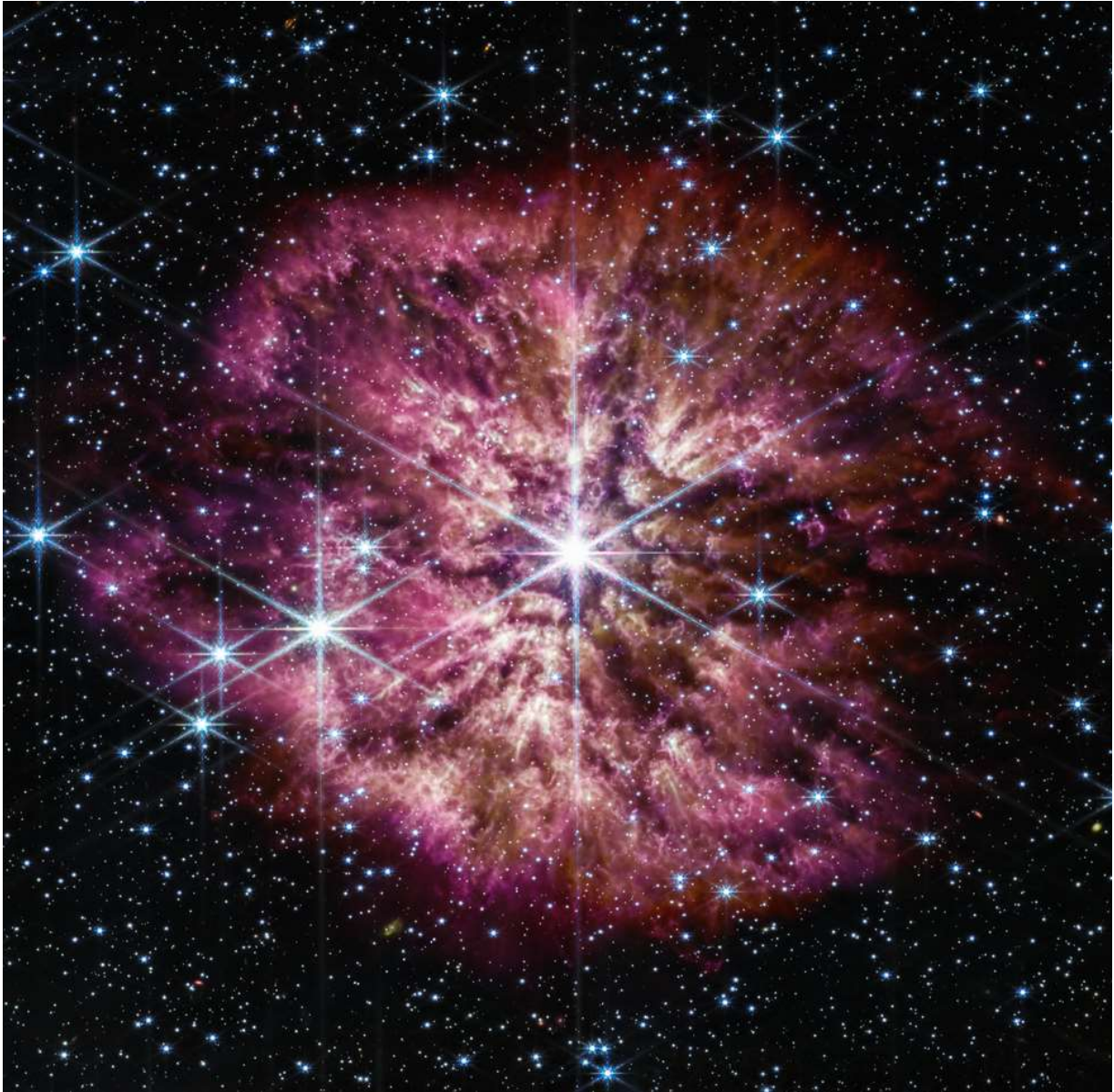
Making adjustments with the telescope pointed overhead is a very difficult operation for one person since you need to be in two places at once - looking through the eyepiece and making the adjustments on the main mirror. So it is best if possible to have an assistant to adjust the screws while giving directions from the eyepiece. Most of the adjustment must be on a trial-and-error basis and is done by turning the spring-loaded screws on the mirror cell. In general, the image must be displaced towards the flare of the star. When you have succeeded in producing the roundest image possible, change the eyepiece for one of a higher power. The diffraction rings that surround the star image are more evident under higher powers, inside and outside of focus. The eyepiece should be moved in and out of focus and final adjustments (these will be small ones) are made until you have succeeded in centring the star in its diffraction rings.

Testing the optical system for collimation by using a star should preferably be done on a night when there is very little turbulence in the atmosphere. Such a night is hard to find and some of the defects seen may be due to atmospheric turbulence. Also ensure the optics and tube are cooled down properly before attempting adjustments. A good rule is that any defect you see that appears to shift position is probably due to causes outside the optical system, but if the defect does not move or disappears and returns in the same position it is caused by either irregularities in the mirror surface or in the way the optical system is lined up.

If having completed the star collimation and used the scope on low objects a check shows that the collimation is out it is a good idea to check the main mirror cell for loose parts as it is possible that the mirror is moving in the cell. If the diffraction rings show three squeezed-in areas equally spaced around the circle, it is possible that the mirror is being pinched in its cell and deformed. Both these are normally correctable and will benefit the operation of the telescope.

Chris Bailey

NASA's Webb Telescope Captures Rarely Seen Prelude to Supernova



The luminous, hot star Wolf-Rayet 124 (WR 124) is prominent at the center of the James Webb Space Telescope's composite image combining near-infrared and mid-infrared wavelengths of light from Webb's Near-Infrared Camera and Mid-Infrared Instrument.

Credits: NASA, ESA, CSA, STScI, Webb ERO Production Team

The rare sight of a Wolf-Rayet star – among the most luminous, most massive, and most briefly detectable stars known – was one of the first observations made by NASA's James Webb Space Telescope in June 2022. Webb shows the star, WR 124, in unprecedented detail with its powerful infrared instruments. The star is 15,000 light-years away in the constellation Sagitta.

Massive stars race through their lifecycles, and only some of them go through a brief Wolf-Rayet phase before going supernova, making Webb's detailed observations of this rare phase valuable to astronomers. Wolf-Rayet

stars are in the process of casting off their outer layers, resulting in their characteristic halos of gas and dust. The star WR 124 is 30 times the mass of the Sun and has shed 10 Suns' worth of material – so far. As the ejected gas moves away from the star and cools, cosmic dust forms and glows in the infrared light detectable by Webb.

The origin of cosmic dust that can survive a supernova blast and contribute to the universe's overall "dust budget" is of great interest to astronomers for multiple reasons. Dust is integral to the workings of the universe: It shelters forming stars, gathers together to help form planets, and serves as a platform for molecules to form and clump together – including the building blocks of life on Earth. Despite the many essential roles that dust plays, there is still more dust in the universe than astronomers' current dust-formation theories can explain. The universe is operating with a dust budget surplus.



Wolf-Rayet stars are known to be efficient dust producers, and the Mid-Infrared Instrument on NASA's James Webb Space Telescope shows this to great effect. Cooler cosmic dust glows at the longer mid-infrared wavelengths, displaying the structure of WR 124's nebula.

Credits: NASA, ESA, CSA, STScI, Webb ERO Production Team.

Webb opens up new possibilities for studying details in cosmic dust, which is best observed in infrared wavelengths of light. Webb's Near-Infrared Camera (NIRCam) balances the brightness of WR 124's stellar core and the knotty details in the fainter surrounding gas. The telescope's Mid-Infrared Instrument (MIRI) reveals the clumpy structure of the gas and dust nebula of the ejected material now surrounding the star. Before Webb, dust-loving astronomers simply did not have enough detailed information to explore questions of dust production

in environments like WR 124, and whether the dust grains were large and bountiful enough to survive the supernova and become a significant contribution to the overall dust budget. Now those questions can be investigated with real data.

Stars like WR 124 also serve as an analog to help astronomers understand a crucial period in the early history of the universe. Similar dying stars first seeded the young universe with heavy elements forged in their cores – elements that are now common in the current era, including on Earth.

Webb's detailed image of WR 124 preserves forever a brief, turbulent time of transformation, and promises future discoveries that will reveal the long-shrouded mysteries of cosmic dust.

The James Webb Space Telescope is the world's premier space science observatory. Webb will solve mysteries in our solar system, look beyond to distant worlds around other stars, and probe the mysterious structures and origins of our universe and our place in it. Webb is an international program led by NASA with its partners, ESA (European Space Agency), and CSA (Canadian Space Agency).

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Last Updated: Mar 15, 2023

Editor: Jamie Adkins

Noctilucent Clouds

Night-shining

Noctilucent clouds are rare collections of ice crystals and form above a height of 200,000 feet. They occasionally appear after sunset in late clear summer evenings. They become visible about the same time as the brightest stars and often stay visible after dark because they are still reflecting sunlight due to their great height. They are higher up than any other clouds, occupying the layer of atmosphere known as the Mesosphere, and are only seen at latitudes between 45°N and 80°N in the Northern Hemisphere, and equivalent latitudes in the Southern Hemisphere. They are seen less often in the Southern Hemisphere as there is very little land and very few people there. Only the southern tip of Argentina and Chile, and the Antarctic are at the correct latitude.

Noctilucent clouds need water vapour, dust, and very low temperatures to form. Low temperatures are easily attainable in the Mesosphere, but water vapour and dust are in short supply. The dust may well come from tiny meteors from space, although dust from volcanoes or man-made pollutants may add to these. Scientists believe that the moisture comes through gaps in the Tropopause, or perhaps forms from the chemical reaction of methane and other chemicals.

They often closely resemble thin streaky cirrus, though other shapes are often seen. They are usually blue or silver in colour, but sometimes orange or red.

They may also be visible during August on a suitable clear night so please send any images obtained

Dan Self





Chris Bailey





David Bryant.



Mick Ladner



Eddie Mallet





Andrew Luck

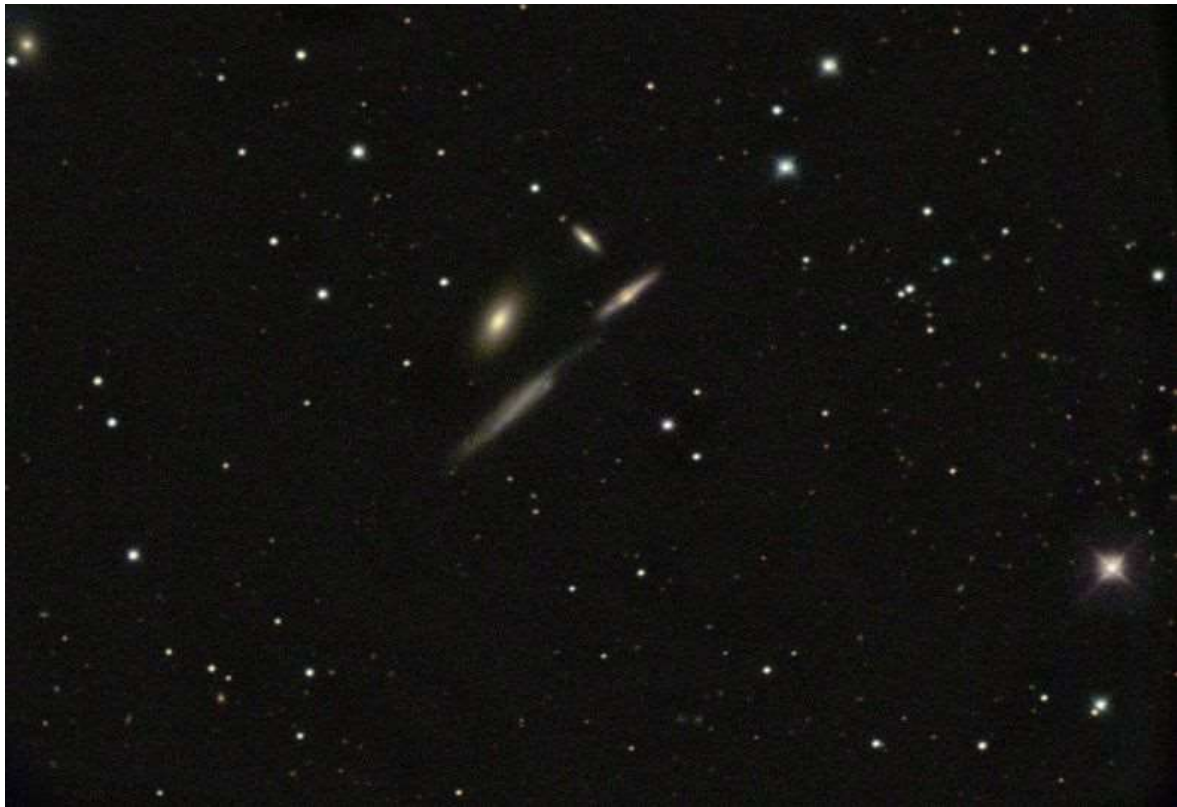


Members Astro-photographs.

Dan Self



Lunar 'V' and 'X'



The brightest is NGC 4169, on the left here, at magnitude 13.2, an S0 galaxy.

The bluish, more irregular galaxy NGC 4173 at the bottom is nearby, and consequently a bit smaller in actual size, more diffuse to see visually, and magnitude 13.4. It is (as is the whole structure) about 5 arc minutes ($1/12^\circ$) long.

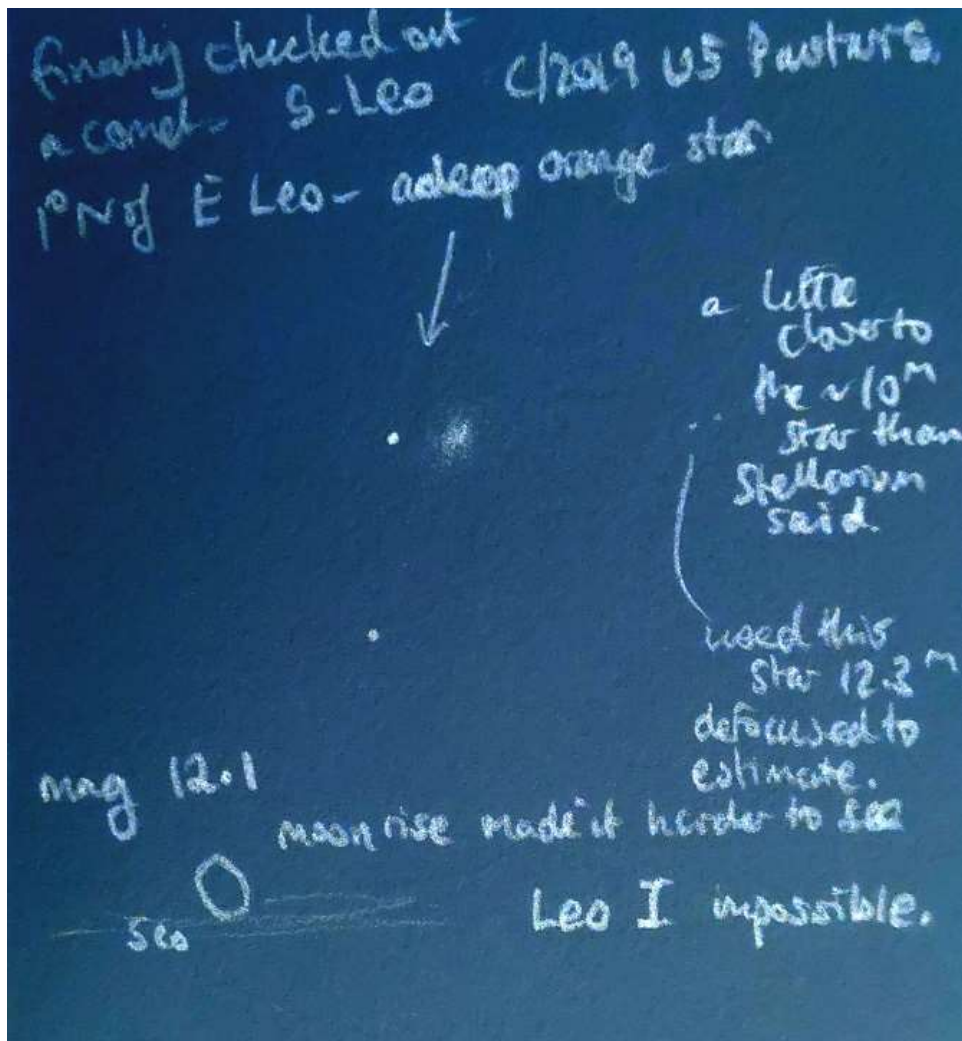
NGC 4175 on the right is 14.2 magnitude and $1.8' \times 0.4'$ in size, it is 86° inclined to our line of sight.

The smallest, at the top, NGC 4174 is 14.4 magnitude.

There are two background galaxies next to the latter two I'd estimate at about magnitude 16 and 18, and loads of streams of very redshifted galaxies floating around the background of the image.



Twin Quasar



C2019U5 Leo

M13 wow!

put the fantastic globular out the edge of the field of view

17 Delos

tried with
Baader-zoom
more eye
dark
adaptation
all lights out.
+2 min.

faint
parallelogram
asterism.

NGC 6207

something here
and here

tried for
IC 4617

too
faint to
be sure

NGC 5466
Globular
in
Bootes

fascinating
view!

v in SB
dispersed. Large
easy to resolve.
textured bright small spots.

Hercules Bootes

After cloud quickly cleared 0052- was in Cr-B

NGC 6001 ^{13.6^m} tough to see in glare of star -
had to turn out red lights + wait 2 min.
small.



— had to get this star out of view.

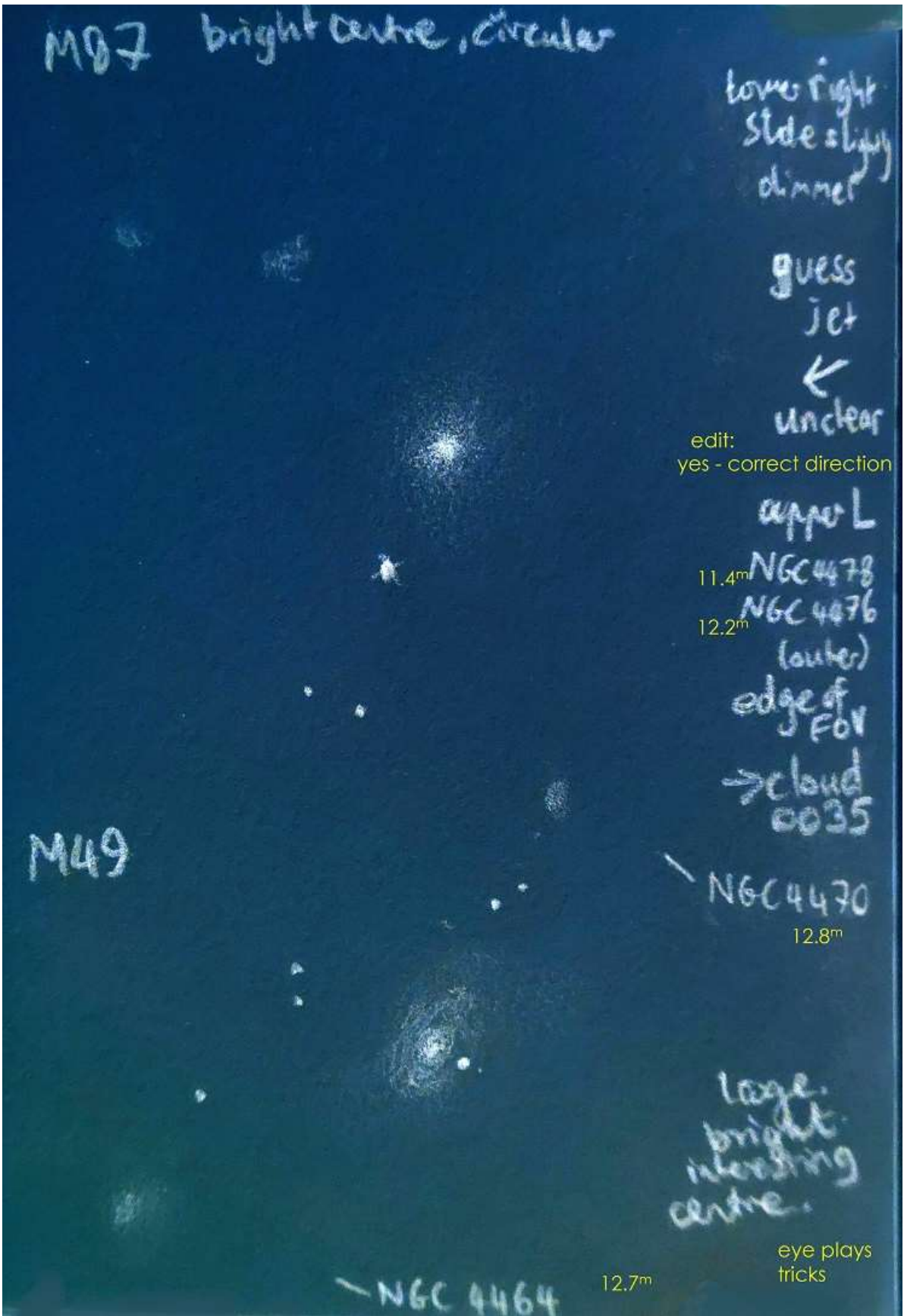
NGC 5958

ACROSS
DOWN
CrB

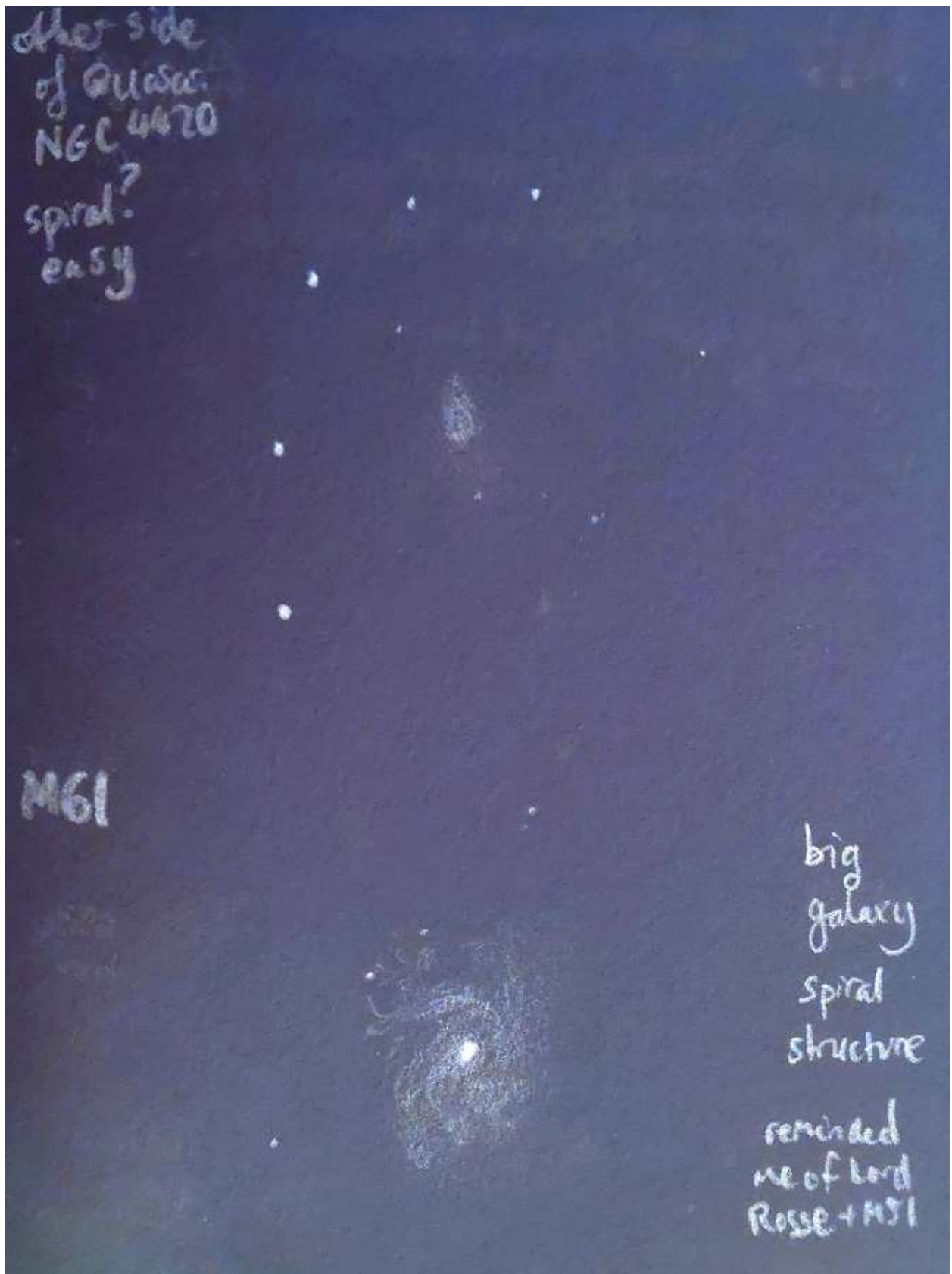
easy

12.9^m
1x1'

After Cloud Corona Borealis



Virgo



Virgo (2)

Porrina beautiful double



top(s) maybe 0.45^m brighter?
o/w both look white + same

3C 273

(quasar)

April

0000-0200

7°C after rain

17.3 Dello's

20" obs

most N



Go to
excellent

just about DV
direct vision

found
NGC 4536



near
quasar

then
4536
hint of
4533



big. long Gx
poss dust lane
bright linear
centre DV

Virgo (3)



NGC5374 9X30Sec



Lost Galaxy NGC4526 Virgo Single 30sec shot.

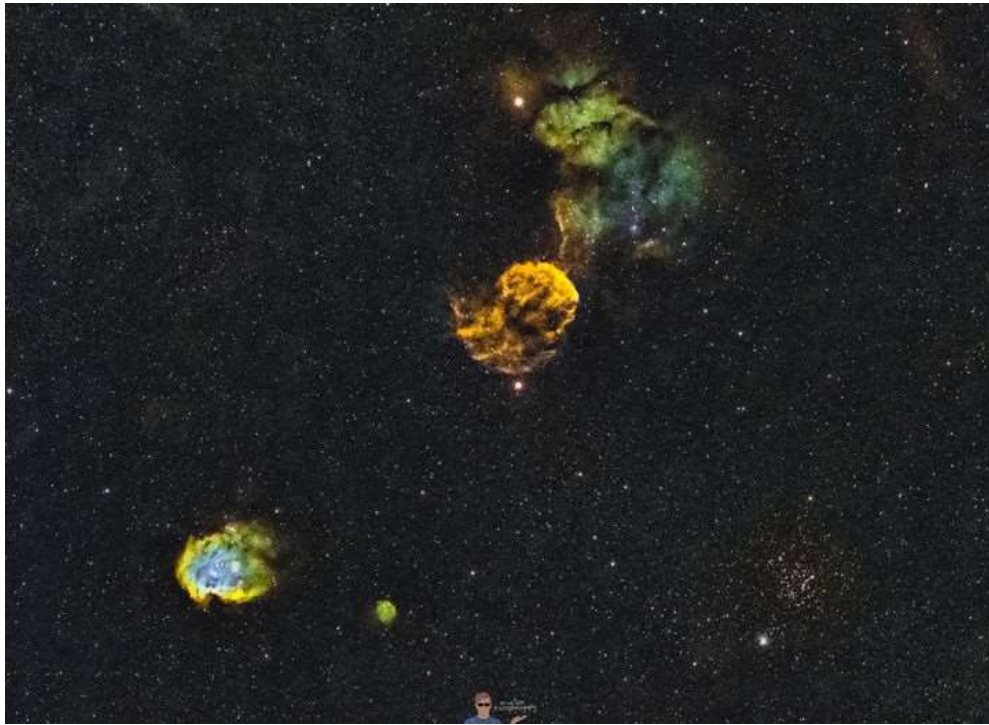


Abell 36 20X30sec Virgo with L Enhance filter



Copelands lost galaxy 20" Virgo

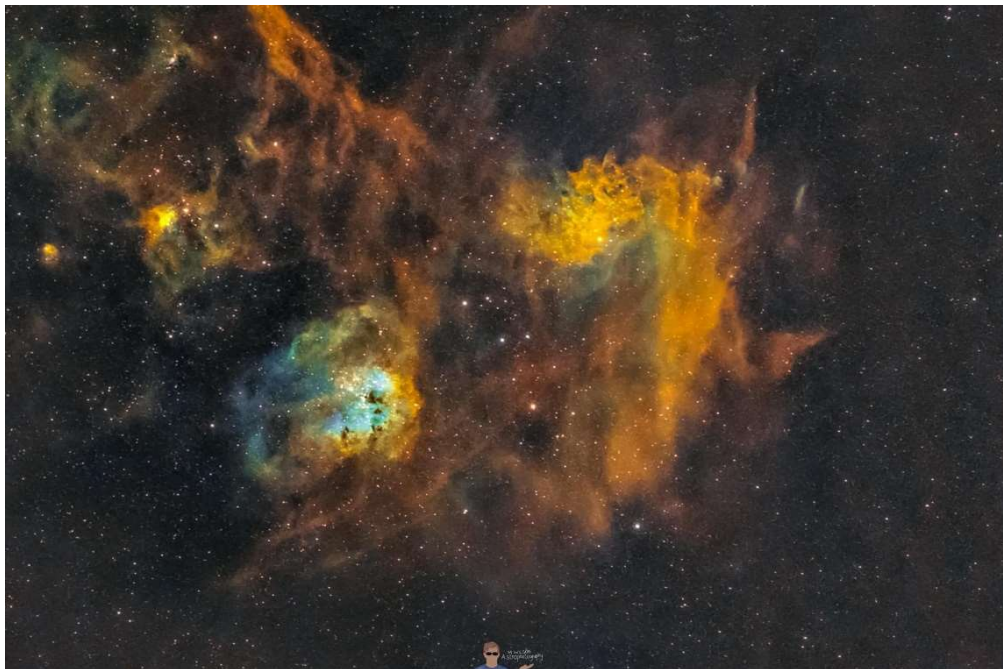
Michael James Wilson



Canon 6D astro mod, Astronomik 12nm Ha, OIII and SII clip filters

Samyang 135mm, Star Adventurer star tracker

RGB: 128x90 sec, SII: 178x90 sec, Ha: 85x120 sec, OIII: 78x120 sec



Canon 6D astro mod, Astronomik 12nm Ha, OIII and SII clip filters

Samyang 135mm, Star Adventurer star tracker

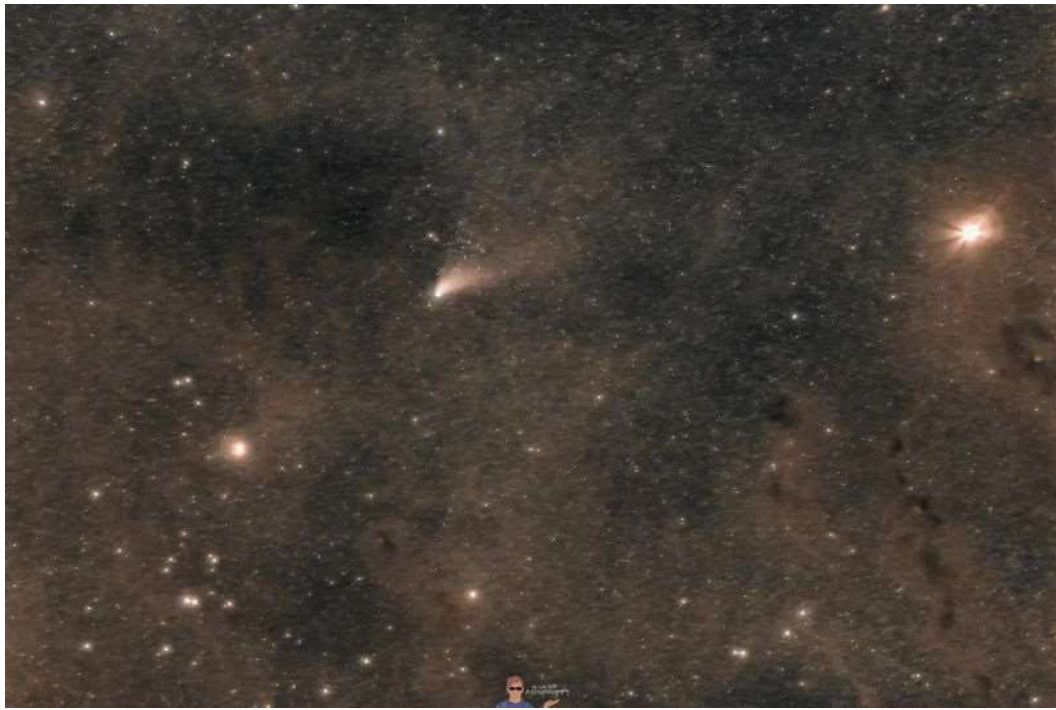
RGB: 84x90 sec, SII: 135x90 sec, Ha: 49x180 sec, OIII: 68x120 sec



Canon 6D astro mod, Astronomik 12nm Ha, OIII and SII clip filters

Samyang 135mm, Star Adventurer star tracker

RGB: 35x90 sec, SII: 147x90 sec, Ha: 58x120 sec, OIII: 78x90 sec



Canon 6D astro mod, Samyang 135mm, Star Adventurer star tracker

RGB: 65x60 seconds

iPhone 13 Pro, 1x10 second exposure



Edited in Photoshop Express and Apple iPhone image editor apps

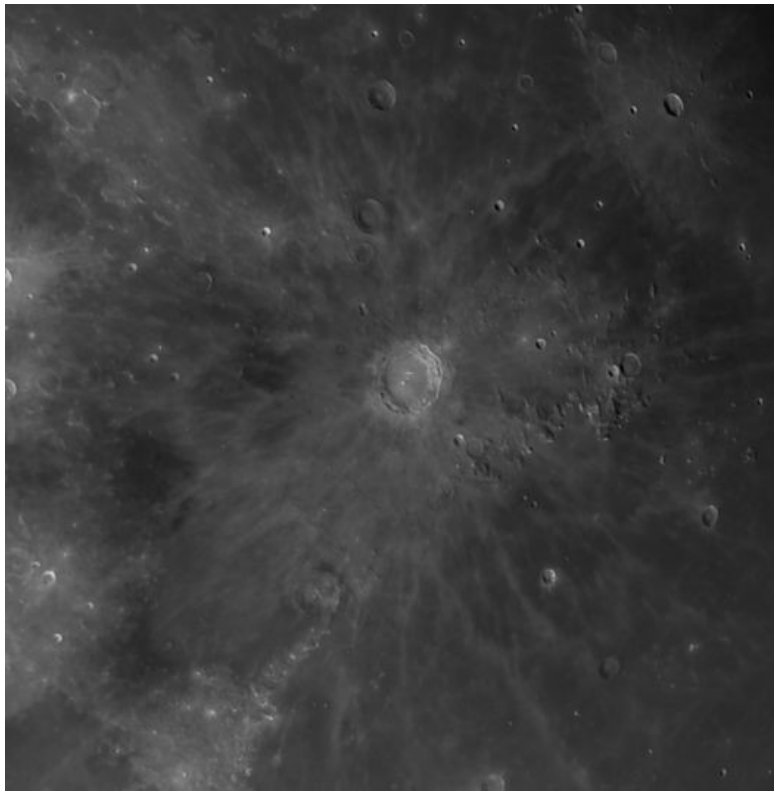
Malcolm James Dent



M100



NGC 7331 and Stephan's quintet



Copernicus, about 90km in size and about a million years old. Terraced walls rise several km from the floor, It has several central peaks that are illuminated nicely. Ejecta and rays from debris extend over 800km.



M5. 30 mins of each RGB filters.

Roger Hyman.



William Optics Z126 with Saturn-C camera on AZ-EQ6 Pro mount. Captured with SharpCap Pro and processed in Autostakkert, Registax and Photoshop.



M106, 2.5 hours integration time William Optics Z126, Saturn-C camera on AZ-EQ6 Pro mount. 150 x 60 seconds Captured in SharpCap Pro 4 and processed in APP 2.0 (Beta 15) and Photoshop.



Mare Humorum and Mare Nubium with some of the larger craters still showing some detail. Z126 with x2.5 Powermate and Saturn-C camera

William Hoolahan



Keith Morris





BRECKLAND ASTRONOMICAL SOCIETY

Charity No.1044478

www.brecklandastro.org.uk

Affiliated to the British Astronomical Association and the Federation of Astronomical Societies

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OBSERVATORY RISK ASSESSMENT 2022

This policy document applies to the aforementioned charity and covers all instances of normal use of the observatory building and equipment within it. All other statements of intent are laid out in the society's constitution.

The purpose of the society (Breckland Astronomical Society) is to promote and to advance public education in the Science of Astronomy and all branches of scientific research and in so doing the following policy statements are necessary.

Persons visiting are members and public of all ages by pre-arrangement, or on public open nights.

Section 2 - Risk Assessment

Hazards (<i>visit leaders must identify any additional hazards where applicable</i>)	Risk Control Measures	Outcome risk rating
For external parties: Safety whilst travelling to observatory.	Responsibility is with individual regarding transport.	Low
Lost people	A nominal roll should be available for parties with minors. Stay in groups and count in and out, especially risky when young children running around on dark	Tolerable

	field. Responsibility with teachers/akelas.	
Pre-existing medical conditions	Visitors have been asked to bring with them anything they need with regard to medicine/ first aid training. DS is first aid trained as part of job.	Tolerable
In the Observatory: Moving the telescope dome - Mechanical hazard from cogs and metal clips on dome motors and sliding parts. Falling from dome.	Supervision is necessary to prevent visitors' fingers being caught in dangerous places before moving. Train supervisors. Gears are located in inaccessible places. Signs to keep head out of opening while moving it. Failure of clips holding very difficult due to strong fastening.	Tolerable Tolerable
Electrical hazards	All electrical circuits are protected by RCD trip switches, which have been checked. Equipment should only be used by trained demonstrators as PAT testing is not viable.	Tolerable
Light intensity from laser pointer, bright LEDs	A low power class 2 laser can be used to collimate scope, this should not be used during visits. An upper end- class 2 green laser is sometimes used for pointing out stars outside. This should NOT be pointed near people, or planes, only switched on briefly and used by supervisors/demonstrators only. Laser is currently broken.	Low
Skin contact with dangerous chemicals	Fly spray, propanol, and cleaning fluid kept in cupboard in small quantities. Keep cupboards shut when visitors are present and supervise.	Tolerable
Standing in dome - Falling (height is 7 feet)	Shutter opening is guarded by 2 bars at child / adult heights. Limit numbers in dome 7 + supervisors can easily fit.	Tolerable
Standing in dark places - Stumbling in low light	Use dim red lights on floor to preserve night vision. Dim lights gradually.	Low
Climbing ladder in dark - Falling while viewing through telescope.	Ladder must be shown to people first, but enough light is available. Check for mobility difficulties.	Tolerable
Ascending stairs - Falling or being hit with trap door	Be sure demonstrator to go up first and lock door open. A knocking procedure is known if the door is shut.	Tolerable
Fire risk	Large items are not flammable. Mainly metal fixtures and fittings. Sources of ignition (sparks) are contained in electrical equipment. Flammable gases are not kept in building. Radio linked smoke alarms installed. Fire extinguishers available and annually checked. Call 999 in emergency. Can exit via dome opening in emergency	Tolerable

Standing in dark cold field - frostbite	Weather could be freezing in most months. Warm clothes to be advised to visitors. Heaters indoors if cold and keep a blanket at the observatory.	Tolerable
Trips and slips	Trip hazard in dark. Torch guidance will be provided but is limited because of dark sky observing. Advised to dip and dim lights.	Tolerable
Child protection risks (under 18s)	Two adults should be available at all times. DBS checks should be in place for group supervisors. The organisation that runs the observatory, Breckland Astronomical Society, operates a child protection policy. The committee are vigilant with regard to risks.	Low
Airborne viral transmission indoors	The place is fairly well ventilated with vents in toilet and loose fitting door and dome and dome floor hatch. Open internal doors Physically Distance 1m+ between groups Limit numbers to what any national guidelines state at the time. Space is quite limited. Provide outdoor activities, e.g. electronically assisted astronomy. Telescopes outdoors.	Tolerable – as we have very good ventilation.
Outdoor transmission	Risk is found to be low outdoors. Follow national guidelines. Be mindful of face to face breath transmission.	Tolerable
Surface transmission	Sanitisers are available. Wipe surfaces. Limit one to use of kitchen/bathroom area. Offer people option of using own mugs and washing up. Clean toilet regularly.	Low
Reporting	Not needed, ask permission, but a record of visitors names is good to keep a for any future possible information purposes. It will be destroyed before 5yrs (GDPR).	N/A

Trustees as of 17/04/2022 are: Dr Dan Self ⁺(Chairman), Andy Jones⁺ (Treasurer), Richard Harmon. Committee members (acting trustees): Rebecca Greef^{*}, John Copsey. Trusted supervising members: Mick Ladner, John Gionis, Peter Farmer, Andrew Luck, Chris Bailey.

^{*}DBS checked for day job. ⁺Frist Aid trained for day job

Signed.....
Chairman, Breckland Astronomical Society, UKCC 1044478.

For Sale or Wanted

This section is for the sale of Astronomical items and any wants from members. Details of items for sale (With photographs where applicable) should be forwarded to the newsletter editor at newsletter@brecklandastro.org.uk

It is suggested that a donation of 5% of the final sale price be given to the Society to assist with funds. If sellers do not wish to make their contact details public then please make this known to me and I will field any enquiries on a box number system. Please send any sales details to me before the 26th of the month for inclusion in the next issue.

Please ensure that if any item is sold by another means prior to publication that I am advised so it can be removed to avoid confusion.

Free to a good home

(Or perhaps a donation to the society)



Contact Dan via chairman@brecklandastro.org.uk for further details

Equipment available for loan to Members

As well as our fantastic library members of the society can borrow our equipment. Here is an equipment list that can be used or borrowed by members, subject to personal responsibility for replacement value. Discuss your plans with one of the regulars first, as it is not easy for beginners to use some of this kit. We are here to help show you how to use it, when the weather holds up, then you will need to sign it out and get approval by a member of the committee. We can discuss a reasonable term.

Refractors:

William Optics Megrez 102 S.V. F7 D102mm f/7 and reducer to f/5.6 – this may be unavailable soon.
William Optics GT-102 2019 D102mm F703mm f/6.9
Vixen 4" Refractor f/9

SCT/Maks:

Celestron C925 Starbright F10 SCT FL D234.95mm F2350mm f/10 Refractor – preferably this should not be taken off the premises.

Celestron C8 SCT D203.2mm F2000mm f/10 Refractor (orange tube)

Meade LX200R SCT D203.2mm F2000mm f/10

Konus Motormax-90 Maksutov-Cassegrain 90mm F1200mm f/13 #1795

Meade ETX125 D127mm F1900mm f/15 Maksutov-Cassegrain Reflector

Mak-Newt:

Skywatcher 190MN DS Pro Maksutov-Newtonian Optical Tube Assembly D190mm F1000mm

Dobsonians:

Skywatcher Skyliner 200mm F1200mm Dobsonian Reflector

Helios D200mm F1000mm Dobsonian Reflector

8-inch Dobsonian (turquoise tube, hand-made)

Solarscope:

Coronado Solarmax 40

Meade 8x50mm Guide Scope

Binoculars:

Vanguard KR-7500 7X50mm Field 7 degrees Binoculars – a little out

Konus #2253 7x50 Field 6.8° Binoculars

Chinon RB Optics 8-20 x 50 HB Zoom Binoculars

Prinzlux 10x50 Binoculars – needs optically cleaning

Mounts:

Berlebach Planet Tripod with Double Clamps

Orange EQ4 telescope mount

Skywatcher SynScan EQ5 Equatorial Mount & Tripod

SynScan mount controller

Meade LXD German Equatorial Mount & Autostar Controller

SynScan mount controller

iOptron IEQ45 Mount and Pier

iOptron Go2Nova mount controller

Eyepieces:

Tele Vue Delos 17.1mm 2"
Antares Speers-Waler 4.9mm SWA Series 2 2"
Antares Speers-Waler 9.4mm SWA Series 3 2"
Meade Ultra Wide Angle 14mm 1.25/2"
Antares W70 Series 8.6mm
Meade Super Wide Angle 18mm 1.25"
Celestron 32mm Plossl 1.25"
Celestron 26mm Plossl 1.25"
Antares 17mm Plossl FMC 1.25"
Intes-Micro Q74 WA 21mm 1.25"
Orion (Or) Circle-T 9mm 1.25"
Vixen K 18mm 1.25"
Fullerscope K 25mm 1.25"
66 Ultrawide 20mm Long Eye Relief 1.25"
Or 6mm 1.25"
Plossl 40mm Multi-coated
Plossl 17mm Multi-coated
14mm (7mm 21mm) 1.25"
Super 20mm 1.25"
Soligor PE-6mm 1.25"
Super Plossl 32mm 1.25"
Lanthanum LV 2.5mm 45 degree 20mm 1.25"
Televue 2x Barlow 1.25"
Televue 2.5x Barlow Powermate 1.25"
2x Barlow Lens
Meade Teleneegative 2x Barlow 1.25"

Telescope accessories:

William Optics AFR-IV Adjustable Flattener Reducer
Meade Zero Image-Shift Microfocuser
Meade 4000 Series f6.3 Focal Reducer
Meade 4000 series f3.3 CCD Focal Reducer with T-Adapter
Celestron Reducer/Corrector f6.3 (Model: 94175)
Tamron Adaptall-2 Custom Mount

Eyepiece accessories and filters:

Meade Electronic Eyepiece
Meade Illuminated Reticle MA12mm
Celestron Radial Guider (#94176)
Light Pollution Filter 1.25"
Meade #908 O-III Nebular Filter
Variable Polarizing Filter #3
Baader Planetarium Contrast-Booster Filter (#2458360) 1.25"
Celestron Colored Eyepiece Filters (#25 Red, #38A Blue, #47 Violet, #53 L Green)
Baader G-CCD Filter 1.25" (Cat: 2458470G)
Baader R-CCD Filter 1.25" (Cat: 2458470R)
Baader B-CCD Filter 1.25" (Cat: 2458470B)
Baader UV/IR Cut/L-Filter 1.25" (Cat: 2459207A)
Baader H-alpha 7nm CCD Narrowband-Filter 1.25" (Cat: 2458382)
Baader O-III 8.5nm CCD Narrowband-Filter 1.25" (Cat: 2458435)
Baader S-II 8nm CCD Narrowband-Filter 1.25" (Cat: 2458430)
Baader H-beta 8.5nm CCD Narrowband-Filter 1.25" (Cat: 2458425)
Astronomik L-RGB Type 2c Filterset 1.25" (4 filters, Cat: 10220125)
Astronomik CLS-Filter 2" (Cat: 10213200)
Astronomik CLS-Filter 1.25" (Cat: 10213125)

Astronomik CLS CCD-Filter 1.25" (Cat: 10208125)
Star Analyser 100 (Model: PHEL-SA100) – produces spectra

Cameras:

Atik Focal Reducer 58mm
Atik 383L + FW 1 1/4"+Filters
Atik Infinity Camera
Atik 314L+ CCD Camera (SNI1003041)
Atik One 6.0 Monochrome CCD Camera (SN: 1191452-0093)
Atik 460EX Color (SN21223-26)
ZWO ASI290MM Mini USB 2.0 Monochrome Small Format CMOS Camera
Imaging Source DBK21AU618.AS 640x480 USB2 planetary camera
STV ('vintage video CCD AV camera) and Filter Wheel
Astrovid 2000 ('vintage' CCD camera)
Nikon D100 DSLR
Sigma EX DG Macro 105mm 1:2.8 DLSR Lens
Geoptik CCD Adapter x Canon (Model: 30A189)

CONTACTS

Chair Dan Self
Contact chairman@brecklandastro.org.uk

Observatory/Visits Mick Ladner
Contact visitors@brecklandastro.org.uk

Webmaster Andrew Luck (temporary)
Contact webmaster@brecklandastro.org.uk

Newsletter Chris Bailey
Contact newsletter@brecklandastro.org.uk

Membership/Treasurer Andy Jones
Contact treasurer@brecklandastro.org.uk

Secretary Rebecca Greef
Contact secretary@brecklandastro.org.uk

Please check with any of the contacts in bold before visiting the observatory. Please ensure you are wearing appropriate footwear and clothing and bring a torch (preferably one showing a RED light)

