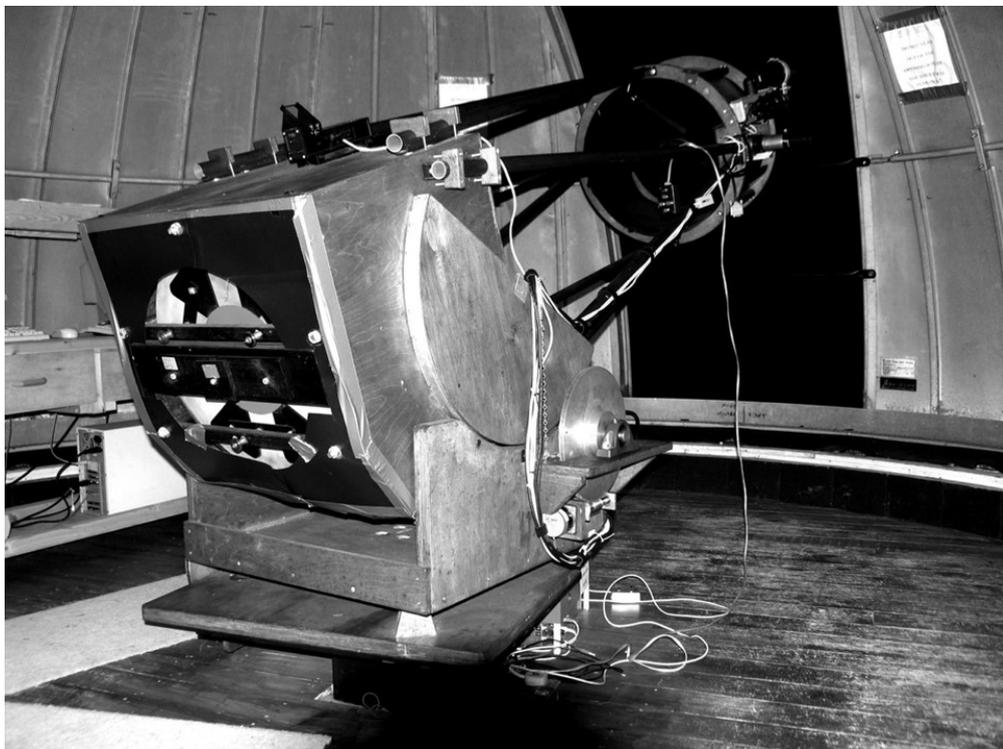


Breckland Astronomical Society

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

EXTRA ***TERRESTRIAL***

Newsletter May 2024



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 and June 2024

Hello. Thank you for your patience as we navigate a change of treasurer and committee. Of course we say a fond farewell to Andy who has served us well and made much effort to improve the society over the years.

I am heartened to see so much interest in the talks and open evenings. It has been a pleasure. Plus we still get quite some interest from people and groups wanting to visit. We hope to see John G back when he can and wish him a thorough recovery. And hope many of you can come to the summer meetings, we have some fascinating tales about Astronomy focusing on Planet Earth and hear about a star that erupts every 80 years that should "go off" this summer.

It seems as time goes on, there are fewer active astronomers around, and so is more difficult to run gatherings and events. Also we need expertise in practical engineering. I wonder if it is an economic or demographic thing or something else. It is therefore especially good to hear of those taking on new equipment with ideas, projects and citizen science. At the same time we are getting more and more donations of telescopes and equipment, of those who are too infirm or just don't use their kit anymore – this is great for clear open evenings, but we only have so much space. I have however been introduced virtually to a group of new young astronomers in Diss based at Aldburgh village hall.

We made a good adjustment to the 20 inch front ring, thanks to Peter highlighting the measurement of centrality, and Chris suggesting to stick the laser down it. In the end, the eye was better. Keith F and I got it all realigned and the primary, and there is still something to adjust, but it looks more central and is as sharp as ever, if not better. Gerry N had also noticed star tests going wrong prior to us doing this, so I hope it is satisfactory now.

I also tightened the final tensioner on the Azimuth drive. It felt quite slack and the winter cold may have caused some contraction, as the RA was wobbling in my images. It now feels significantly better and stops sooner. We must take care to re-slacken that if there is a danger of warmer weather. Keith F has offered to neaten up the rear black shield opposite the eyepiece, and put something more permanent on Mike Hutchings' 3D printed attachment tabs. The Mirror holder he made is bespoke with handy adjustments, hopefully that's all we need adjust now.

It helps to be a night owl like me.

Talks

On March 8th Dave Willis and the Wonder Dome came to the Rec Centre. The ceiling was just tall enough. We had loads of interest, while Mark ran a lovely clear observing session across the field. It was a very dark clear night, and the whole evening seemed quite a wonderful experience. Have a look at wonderdome.co.uk if you want to encounter it again – although it is mainly bookable for schools.

The projector was interesting, it looked quite a normal but very bright projector with a special curved mirror on a stand that reflected light and focused it amazingly well across the bulk of the dome. Photography inside was difficult.

Dave started with a tour of galaxies across the universe, going back in time and zooming out in scale. There were huge wide moon panoramas, and we saw inside the command module of Apollo. We heard of the Artemis 3 mission in 2026 which promises to take people back to the moon. Wow – this will be quite something. This time, rather than just ‘men’ they are aiming to include a woman and a non-white person...and a Canadian.

We got quite lost in the universe and its wonders and learned a bit of physics. Dave the Dome are an amazing asset for Children across East Anglia – lovely to see.

Infrared Galaxies

And on April 11th we had Matt Bothwell. He is a very pleasant and very capable and professional expositor of carefully crafted descriptions of the Universe on a large scale. This time we heard all about Infrared Galaxies.

It started with the origin of the awareness of Infra Red radiation to society, by William Herschel. He came to fame through merit (and probably some money) by building a street corner telescope! A passing astronomer realised he had built the best optics then known so he got a job! He had a certain obsessiveness, such that he often stood in little clothing on cold nights so his skin cooled and didn't disturb the seeing.

He was playing with an advanced version of Newton's experiment shining sunlight through a Prism, and with a genius spark of creativity wanted to measure the temperature of each colour of the spectrum. He left the thermometer off the red end of the spectrum as a control experiment, and was shocked to measure and feel a strong temperature increase. He had discovered heat radiation. A beautiful story of discovery and reason for playing around in the laboratory (don't forget chance discovery is also a great reason for amateur observing in general).

The Infra Red (IR) is much bigger than the Visible Light Spectrum, (what MB didn't say, was that measured by wavelength) it is 3000x bigger than the visible spectrum. (They are more equal in size if measured by frequency or energy, but that's another matter).

Infrared astronomy is now in its heyday, with much potential to go further, due to the James Webb Space Telescope. It was planned from the year 1996. Plans that were then called the Next Generation Space Telescope. In 2002 it was named after James Webb. In 2011 it was nearly

cancelled, or rather I should say “canceled” (US spelling). After many delays and an extensive construction and testing period it was launched Christmas Day 2021. Astronomer Jane Greaves says the JWST is the most complicated thing humans have made ever. The procedure to get it to its current position, L1 and open the telescope, had over 400 single point failures. That means each one could have resulted in the entire mission being useless.

The pictures and spectra are better than expected. The showpiece such as the Cosmic cliffs image was beautiful, set to match the tropical look of the Hubble Pallet. Also a Nebula (inset) was imaged. Of like Hubble in some images, the intensity on the pixels were converted colours for our eyes to view. So they EXACTLY the real colours. We see them of course. The useful were more like huge deep fields of gravitationally lensed galaxies. And can see deep into Nebulae, as light doesn't scatter as much, and so



amazing, images rather see like Planetary course, image into are not couldn't images

now, we Infrared our view

penetrates deeper into the dusty gas clouds, revealing new “born” stars in there. A mystery as these were always shrouded from our view and the process of star formation is obviously a crucial part of understanding how we got to be here.

The Centre of the Lagoon Nebula (M8) image is amazing considering how it compares to amateur images, the magnification is incredible. The same can be done with the Pillars of Creation (M16 – The Eagle Nebula).

The real power of JWST is how far back it can see, not just the huge collecting area on those gold hexagonal mirrors, nor the resolution (not so much better than Hubble as it is at a ‘blurrier’ wavelength), but the fact Infra Red can see more redshifted galaxies AND get their spectra for an accurate measure of their distance. A good paper is to be found by Labbé et al 2023 in Nature. Galaxies have been confirmed as visible just 600 Million years from the big bang, but nearly as big as our own Milky Way. It is difficult to find a mechanism to build such a large galaxy in such a short time after the big bang. The conditions were so different, even the cosmic microwave background wasn't microwave it was 30 Kelvin, positively warm compared to now.

To quantify things, Matt went into exquisite detail describing the parameter Astronomers use “Galaxy mass function” it count sizes and calculates the mass of the visible matter and compares all galaxies. There are lots of small galaxies then fewer large ones – the graph is curved also. There is a particular bias or systematic error that scientists can easily make when they measure the mass of these ancient galaxies.

They use the trick or fingerprint 91nm wavelength of the strongest region of Hydrogen atom light absorption. It is known as the Lyman bremsstrahlung, starting at Lyman alpha 121nm the absorption lines in the spectrum bunch up towards 91nm. This gives a break in the spectrum that

they know originally was 91nm, now it has been redshifted, so it can identify the exact redshift and using Hubble's Law, distance can be inferred.

Accidentally, some more nearby galaxies spectra can pick up on a similar looking feature, but it is actually the "Balmer series" of spectral absorptions. It is at a much higher wavelength and so further along the spectrum so the redshifts should not get muddled. Its strength is a measure of how dusty the galaxy is, or how much 'metallicity' it has accumulated. Both look rather like a 'cliff' in a spectrum graph.

So the super distant galaxy wasn't at redshift $z = 20$ it was much lower and the "Balmer cliff" was seen. They checked the image by staring at the location with a radio array of telescopes and saw it. Thus it must have been close enough to detect by radio astronomy. The real proof of a distant/ancient galaxy discovery is not seeing it in radio. It's got to be too far away to be detectable that way. Exactly what was seen for another red 'dot'!

We had great questions from the audience – it was like a science conference discussion. Such as "Is that sub mm radio interferometry?" BL: "so has it reached its limit in distance yet?" AS: "How does one go from brightness to mass and vice versa" KF: "aren't these galaxies very metal poor?" P:" "What are we looking at in IR image of the milky way?" AS: "In dusty galaxies dust forms from metals we need to explain their formation",

We were then shown a galaxy group with a Super Massive Black Hole at the centre – dominated by its light $z = 11$. There is still debate that these SMBHs can't form quick enough.

A great final question KF: "Is there a difference in galaxy structure over time?" led to an awkward answer. The nail was finally hit (is that the right metaphor?). JWST is pretty useless at this sort of thing, it turns out. It is a sniper rifle, not a shotgun. We need a large survey telescope to fix this and get enough statistics. Fortunately one is being built. Watch this space! Thanks Matt.

In May Jerry Workman is talking about the Earth – how its connected to astronomy.

And in June Mike Poxon is talking about Cataclysmic (variable) stars.

August we have Calvin Preston coming to do his Feb talk. July watch this space.

I shall endeavour to entertain stimulate and inspire with the talks. Happy stargazing.

Sky notes

4 asteroids are visible at once in the spring sky – see the Night Sky section. The slightly over hyped Comet 12P was visible but has now disappeared from Northern Hemisphere skies.

https://www.cambridge.org/turnleft/pages/the_planets/asteroids_comets_and_pluto

<https://in-the-sky.org/data/asteroids.php>

<https://www.heavens-above.com/main.aspx?lat=52.5363&lng=1.1865&loc=Unnamed&alt=0&tz=GMT>

The above link is for our location ^

Planets have left the skies for now but there is the Pluto challenge if you want to try this summer – it is low in Sagittarius and needs a very good telescope like our 20 inch. You are more than welcome to come and visit, but be prepared for a late night. It is at opposition at the very end of June.

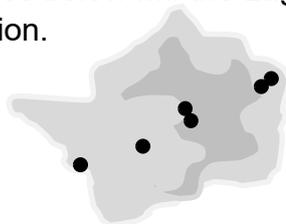
All night summer twilight will hit us from the end of May, however this doesn't preclude all deep sky observing, you can still see galaxies just very late at night.

The Moon and Twilight

May 1 – 12 Late evenings (22:30 onwards) are a good time for observing the night sky. A crescent moon appears (10%, below) on May 10



Continuous twilight starts in late May, so when the full moon rises later on, on Saturday 25th May deep sky astronomy can continue just not in ideal conditions. That night the near full moon rises at 00:16 on the 26th a few degrees below M8 the Lagoon Nebula in Sagittarius (below). It is at a particularly southerly declination.

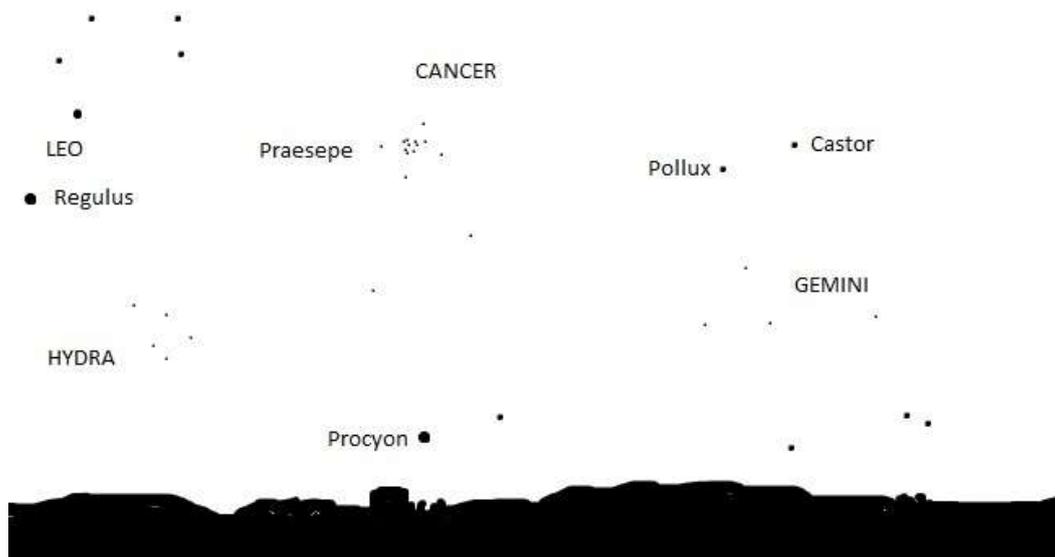


The Crescent moon appears again on June 8th, starting to interfere or compete with the twilight from June 10th, that being the last good night for galaxy observing until about June 27th when the waning gibbous moon rises near Saturn, this year in Pisces. Mars starts to make an appearance in Aries in the North East.

Deep Sky objects

Looking West, Praesepe is still high above the Western Horizon to the upper left of Castor and Pollux. This is a large open cluster of magnitude 4.4, which can be seen as a fuzzy patch in a dark sky, but is usually hidden in our light polluted skies, visible nicely in binoculars though. Especially 20 x 80 ones. Castor (the star on the right) is a fine double, which has been slowly widening its slow orbit over my lifetime. A pair 51 light years away with a distant third star seen, orbit each

other in 459 years, the third taking 14 000 years to orbit the inner two. This triple star system is actually a sextuplet, each of the three are a very close pair orbiting, with small periods, 9 days, 3 days and 19 hours respectively in order of brightness.



Another great triple star we saw with the Speers-Waler eyepiece at high magnification, on the 20 inch, was Tegmine, zeta Cancra, the star shown on the chart above just below Praesepe and the box of Cancer, aka Job's Coffin. This eyepiece allowed the 4 of us to just split the apparently brighter star into two stars of similar brightness to the other which was already a very close double, these components are only 1 arc second apart.

Another night we observed Globular clusters M3 and M53 which are beautiful showpiece objects in the spring night sky, however globular NGC 5053 was pretty much impossible due to a moon lighting the sky. This night allowed us to see the Whale and Hockey Stick galaxies in Coma Berenices, NGC 4631 and 4656, which showed a good bit of structure and size. M51 was awesome as usual. This evening a late party arrived and we were treated to a faint aurora on camera – always worth checking out via the Glendale app <https://aurora-alerts.uk> and the facebook group AUK - Aurora UK.

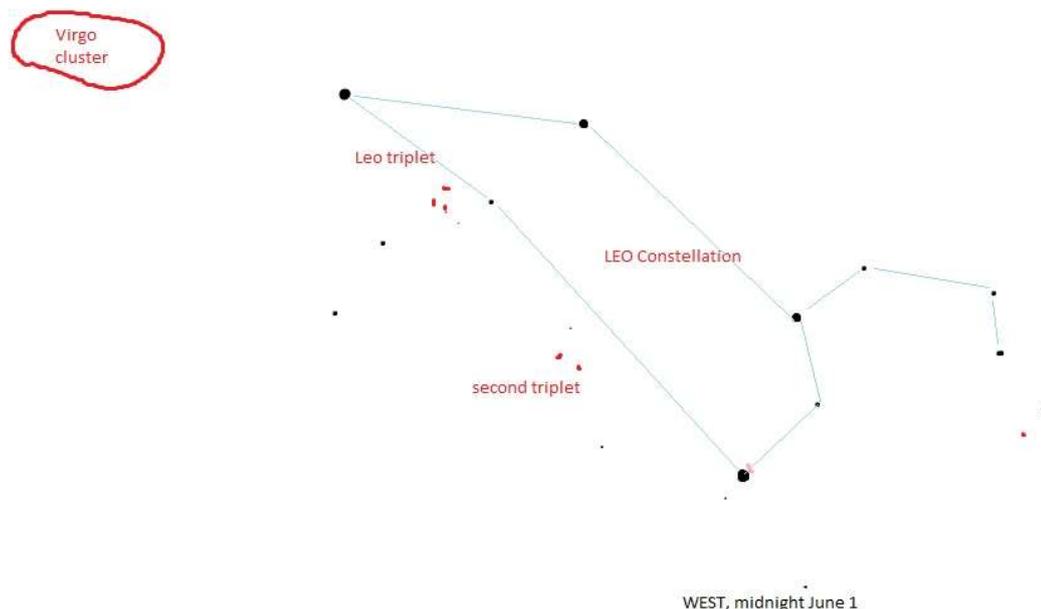
Galaxy Season

This window of time is galaxy season, you will have all the Leo galaxies, and Virgo / Coma cluster, of which about 100 are 11th magnitude or above.

The Sky At Night Magazine has a nice article on spring galaxies. Charts for them can be found using Stellarium, Sky Safari or The Sky. Leo is getting a bit lower in the West from May into June, but Virgo is still fairly prominent, however it is best viewed in May.

In Leo among the brighter galaxies to observe are the group M65, M66, NGC 3628 which is a bit more diffuse, plus the group M95, M96 and M105. I can see M65 and 66 from the city with a

gibbous moon in the sky with an 8 inch telescope. The first 'triplet' of galaxies are "on the Lion's back leg". The second 'triplet' of galaxies are harder to find, in a larger space "just below the Lion's belly". They are further apart and could be hard to hop between.



M65 and M66 are very close to each other and appear in the same field of view in most telescopes. Magnitudes are 9.3 and 8.9, they are both fairly large in extent, both about 9 arc minutes across. However M65 is 41.5 million light years away and M66 about 31, so they are only loosely gravitationally associated, considering how close they appear to each other.

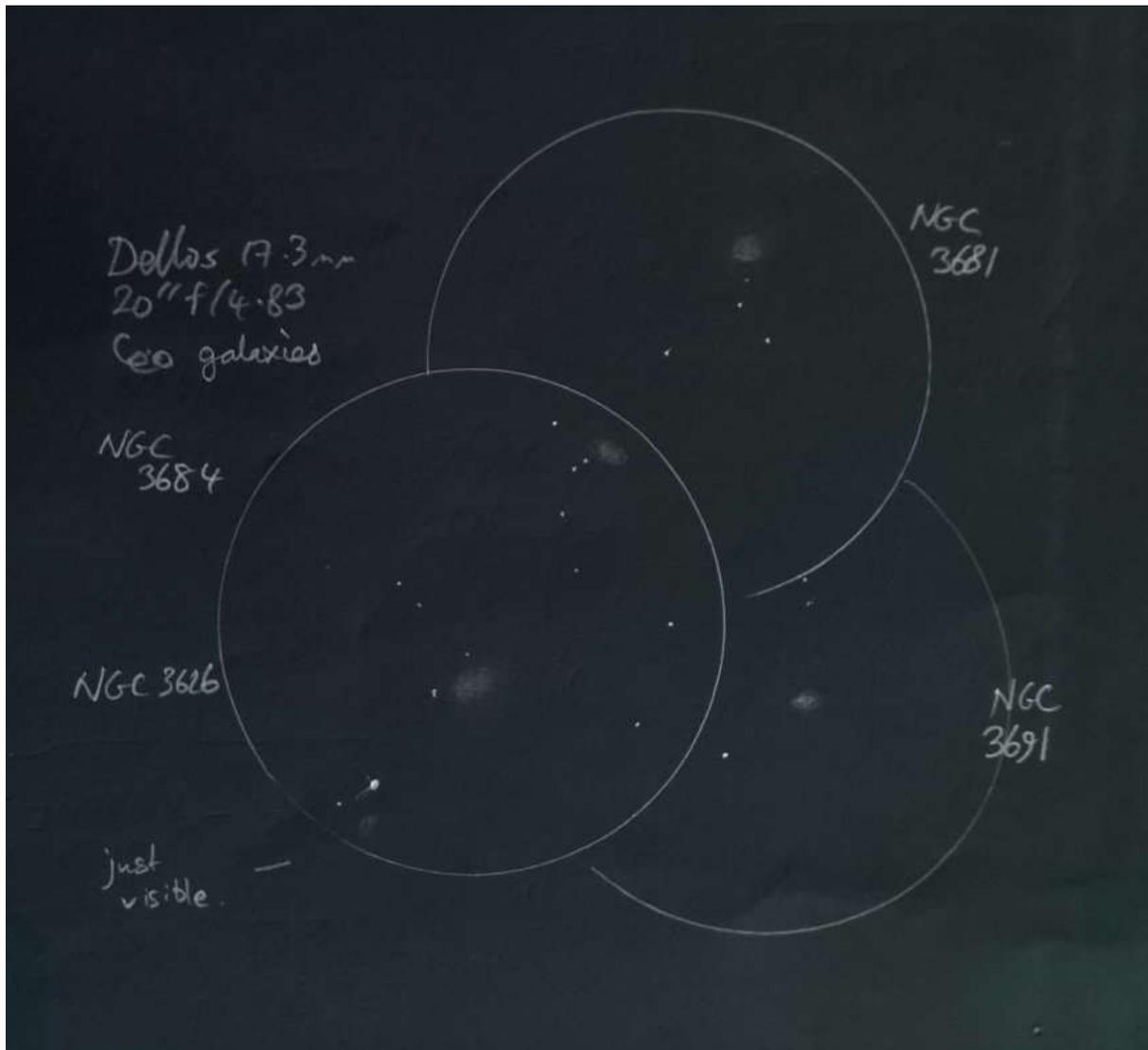
NGC 3628, which is slightly longer, larger and more diffuse and thus a little harder to see, can be found by scanning North of the former pair, it is edge on, with a dust lane that can be made out in larger telescopes, and photographs. It is a substantial sized spiral galaxy and has interacted with M66 and is 35 million light years away.

M95 is a barred spiral, 33 million light years away, magnitude 9.7, it is fairly easy to see, as it is quite compact. It is a little hard to locate however.

M96 is a spiral, a little brighter, and larger in apparent extent, magnitude 9.2, about 31 million light years away. It lies close in the sky to M95. The spiral arms are fairly poorly defined suggesting it has had significant interactions in the past.

M105 has two close companions. M105 is 37 million light years away and substantially smaller than our Milky Way. It is an elliptical galaxy and so featureless.

There is a slightly fainter third triplet I found in the twenty-inch, observing late one evening at the eyepiece. The drawing cannot capture how very faint those smudges were though, as the dynamic range of the eye has to be compressed in a drawing. This range is what heightens the experience of seeing these things. NGC 3681, 3684 and 3626 with another nearby, NGC 3691 and even a fifth small blob of light noticed.



The Virgo cluster is rather too extensive to draw here so I would refer you to other charts that can be found elsewhere. The general location is located to the left of Denebola in Leo where you may stumble across them just by panning randomly.

So before you get onto the weirder fainter galaxies, hop across to Virgo and up to Coma Berenices for some other great sights, you may pick up on the structure of some these amazing objects, containing hundreds of billions of awesomely distant stars. A really good one, although a bit tricky to find is M64 the Black Eye Galaxy high in the sky, in Coma Berenices. While you are up there, you may want to look for M3 the globular cluster, which is much more visually impressive. However, M64 has a truly colossal dust lane giving it its name, that is visible at high magnification. Another great one is NGC4565 a really long, edge on galaxy with a fine dust lane that is clear on photographs, yet too fine for the dark adapted eye to resolve easily. Also try NGC 4725, a galaxy that isn't spoken about much with no common name. Look for its outer spiral arms. Perhaps you wish to name it yourself – I think there is something to be said for naming these things.

The main part of the Virgo cluster is called Markarian's Chain, and can be stumbled upon by panning a telescope from Vindemiatrix in Virgo to Denebola in Leo. This simple technique works well from a dark site with any telescope.

South of Virgo near Corvus the Crow is M104 the Sombrero galaxy, this one has a great clean shape, and a distinct bright core. The dust lane should be fairly clear but isn't always so easy, especially as it is low down and must be seen early in the night or early in May. Higher in Virgo, in the cluster is M91, a great barred spiral, looking like a ty-fighter, and M100 cannot be missed due to its distinct bright spiral arms.

Heading to the left (east) - Edge on Spiral galaxy, NGC 5746 is another galaxy that isn't spoken of much, it is a faint "mini-sombrero" galaxy located close above and right of star 109 Virginis. If you head this way, you could hop over to the beautiful big globular cluster M5 in Serpens Caput.

The faint challenge is dwarf galaxy Leo I (one). It can be found very close (12') and due North of the star Regulus but is very diffuse. However it is almost possible to resolve its stars as it is close to us. It orbits the Milky Way at 820 000 light years away, much closer than Andromeda, but much further than the Magellanic clouds and other dwarves. It is only magnitude 11.2 and spread over a large area of 10' x 7', so the glare from Regulus will interfere.

Red Dwarf

Interesting object Wolf 359 is in Leo, south of the main constellation. It is a faint red dwarf star just 8 light years away with a high proper motion across the sky. It holds the title of the 5th nearest star to the Sun. It's only 15% the size of our sun, or a third larger than Jupiter. It has 9% the mass of the sun but has 95x the mass of Jupiter, so a fairly dense star. It is a flare star, brightening often, and by about 1 magnitude (2.5x brighter) erratically about once a month. Despite the proximity it is usually only magnitude 13.5, making it a difficult object in small telescopes. There were two suspected planets reported in 2019, but one confirmed as a false positive in 2021. Fun fact: the star was mentioned in a 1990s Blur song, 'Far out'. It is moving 4.7" south and west (towards lower right with North being up), and has just passed a faint optical double star. You may find it called CN Leonis. There is an interesting background galaxy that may show up on astrophotographs 10 arc min to the south east.

https://www.spacewalk-telescopes.de/findercharts/finderchart_star_wolf_359.pdf

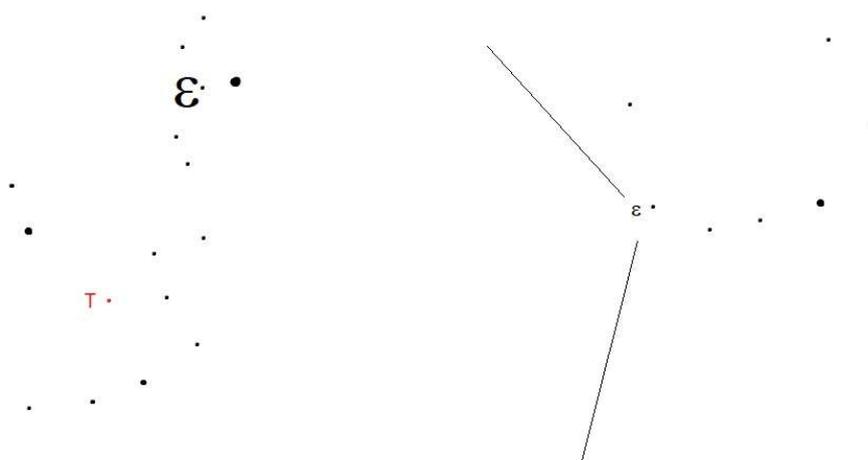
Comets

Another periodic comet, 13P/Olbers appears against the constellation Taurus moving into Auriga and slowly brightening to about 8th magnitude. This comet, which was last seen in 1956, has a period of 69 years and is named after the discoverer, natural philosopher Heinrich Olbers (1815). Olbers reasoned that if the speed of light were infinite, as was assumed at the time, that every line of sight should end on a star and thus the universe be glowing white. It clearly isn't, and this is known as Olbers' paradox. However, this is quite low in the North West so a challenging

The fifth asteroid wasn't discovered until 1830, leading to the long lasting theory that they were the remains of a planet that disintegrated, but as you all know from David Bryant and our asteroid experts their total mass is nothing like the other terrestrial planets.

Once in 80 year Cataclysmic Eruption

Star T Coronae Borealis is following the pattern of brightness just before it was seen to erupt 80 years ago. Here is a simple chart I drew which may help finding it. It is usually about magnitude 10 and can peak at magnitude 2. Well worth a cursory glance to find this constellation. Will it erupt this summer? Find out more at the June Talk.



Dan Self

JOHN'S NEWS BITS

May 2024

NASA has decided not to return the 30 geological samplers from Mars to Earth due to the high cost and length of time. The samples were collected from the Jezero crater by the perseverance rover. They will now look at new ways of bringing the back.

www.livscience.com/space/mars

The ELT (Extremely Large Telescope) is due for completion in 2028/29. Technical problems and funding issues have delayed it since the original 2022 date.

(European Southern Observatory) reckons it is about half completed.

Location of the 39.3 mirror telescope is in the Atacama Desert in Chile.

It will operate in the optical/infrared. www.elt.eso.org

NASA will now target September 2025 for launch date for the round the Moon manned mission Artemis 2 and a year later for landing the first astronauts near the lunar south pole, Artemis 3. The lunar Gateway space station remains on track for 2028. www.nasa.gov/news-release

JWST confirms that there is something wrong with our understanding of the universe. It looks like the universe is expanding at different rates depending on where we look. It is known as the Hubble tension. Observations confirm that this is not down to measurement error.

<https://webbtelescope.org/contents>

www.livscience.com/space

<https://science.nasa.gov/missions>

Boeing's Starliner spacecraft CS-100 for astronauts is ready for launch on May 6 on its mission to the ISS. It will be launched on an Atlas V rocket.

www.space.com/boeing-starliner

<https://www.spacecentre.co.uk>

The DESI (Dark Energy Spectroscopic Instrument) has been creating the largest 3D map of the universe. New preliminary findings show that the universe's accelerating rate may be slowing down based on comparisons with data from a few billion years ago. The DESI instrument is based at the Kitt Peak National Observatory in Arizona and is made up of 5,000 fibre-optical sensors.

<https://phys.org>tags>cosmology>

The controversy over the Hubble constant drags on and on. It is hoped that the JWST may solve the long-standing disagreement. Preliminary results off the JWST set the Hubble constant at 69.1 km per second per megaparsec.(one million parsecs or about 3.26 million light years). This is slightly larger than the 67 predicted using the Planck satellite. However, astrophysicists at JAMES Hopkins University calculate a much bigger value at 73 and claim it is far too early to use the JWST data and so it goes on.

<https://www.nature.com>news> <https://www.esa.int.Space>
<https://blogs.nasa.gov>2023/09/12>

After 45 years, Voyager1 is still transmitting data from the constellation Ophiuchus.. It is now 24,328,560,308 kilometres from Earth travelling at 38,000mph.. Last lot of readable data was sent on November 14, 2023.

<http://voyager.jpl.nasa.gov>mission>

John Gionis May 2024

The Astronomical Quiz

Questions:

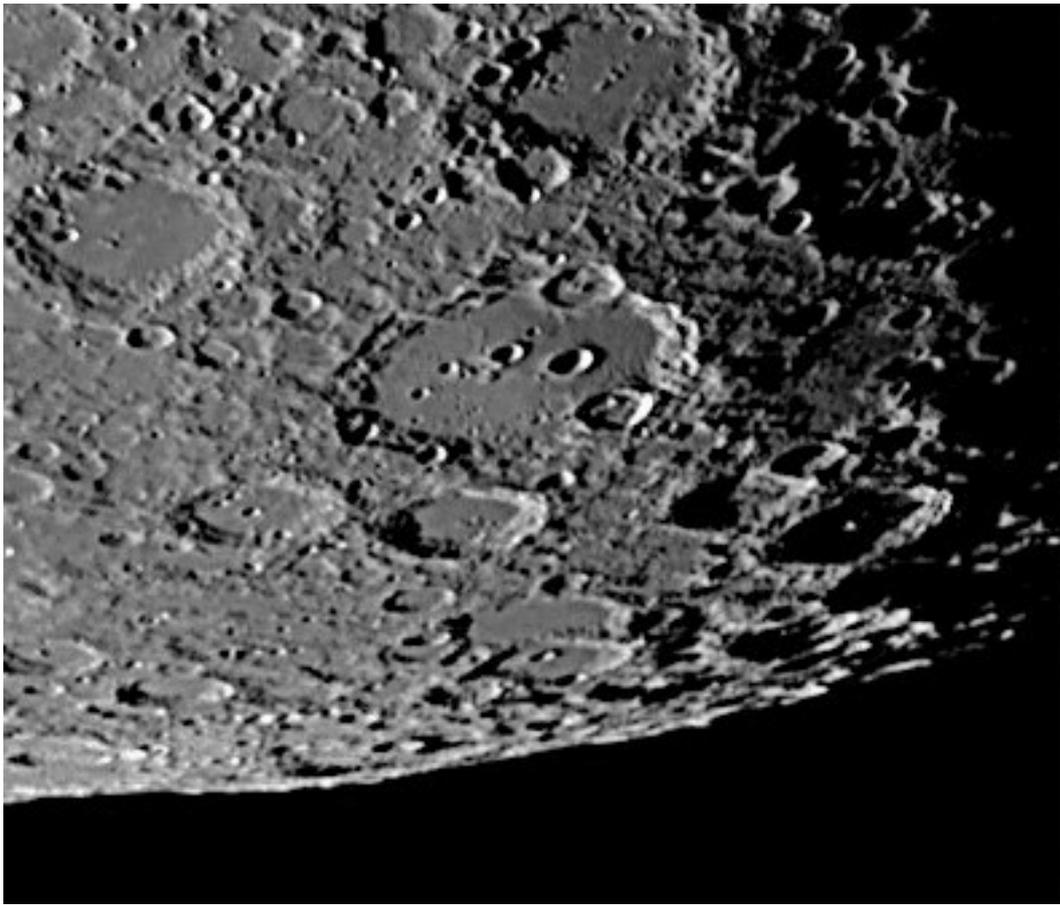
- 1 First name of the astronomer who refined the classification of stellar spectra
- 2 A 2.56 metre reflector telescope found in La Palma that is operated by Denmark, Iceland, Finland and Sweden
- 3 This probe fired a 370 kg projectile at Comet 9p/Tempel 1 in July 2005. It is also the name of a film.
- 4 The point at which a moon or large satellite would be torn apart by a planet's tidal forces. It lies 2.46 times the planet's radius from the planet's centre
- 5 This halo of comet nuclei is thought to be about 100,000 AU from the Sun
- 6 Launched from the Space Shuttle in 1989, this probe mapped Venus using radar and carried out a gravity field map of the planet. What was it called?
- 7 Another name for the "First Point of Aries" and the "First Point of Libra"
- 8 In a reflecting telescope with a secondary mirror supported by arms, this phenomenon causes stars to have spikes.
- 9 In this constellation you can find the open clusters M36, M37 and M38
- 10 This storm is roughly 20,000 km long and 14,000 km in width and has been blowing for at least 200 years
- 11 This desert is home to some of the largest telescopes on Earth
- 12 A nickname given to very large amateur telescopes
- 13 The name given to the distance of 149,597,870,700 metres
- 14 Wavelengths of electromagnetic radiation below 121 nanometres are called Extreme Ultraviolet. What abbreviation is given to this radiation?
- 15 In radio astronomy this directional antenna is used in interferometers, you may see them used for TV reception, what are they called?
- 16 What object is made up by the first letters of the answers to the preceding 15 questions?

Featured Lunar Crater No3 Clavius

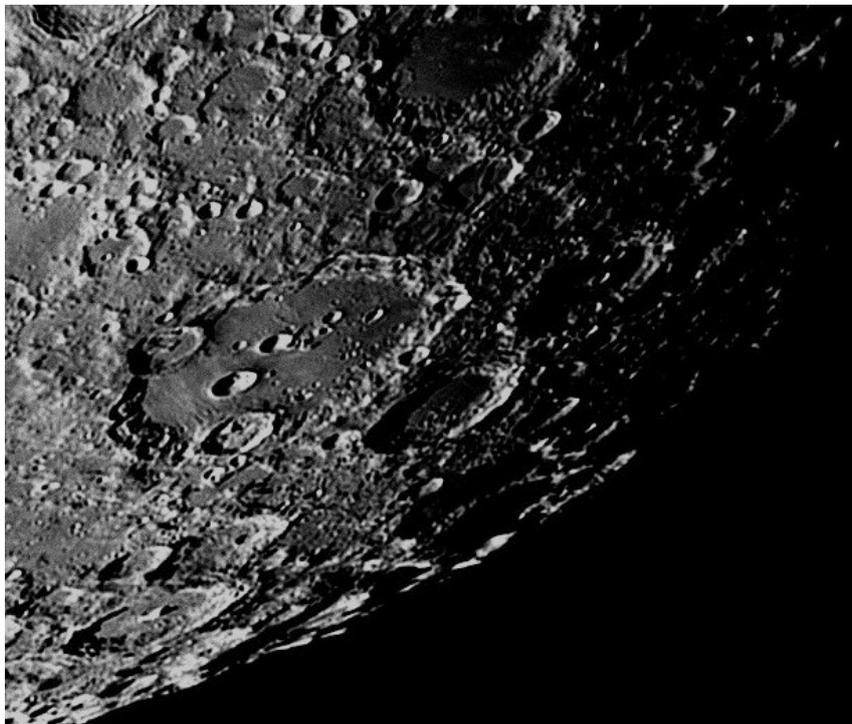


All images by the author

For our third featured crater I have chosen Clavius. This prominent Nectarian-age crater is about 231Kns in diameter and about 4900m deep, and is one of the most distinguishable nearside craters with its large oval shape and craters on its smooth high-albedo floor. Clavius is the third largest non-basin nearside crater. Half of the crater Porter rests on the northeastern floor of Clavius and the other half outside the crater. Besides Porter and Rutherford the largest crater on the floor is the cone crater Clavius D. This satellite rises steeply from Clavius's floor has sharp rim crests and mounds of slump material partly filling the bottom of the 28Km diameter crater. Streaks of bright ray materials run North to South across Clavius and the surrounding region. Ridges and crater chains tend to run Northeast to Southwest across the crater floor. To the west of the cone crater Clavius C is the central peak



complex and a clustering of craters. A low broken string of mountains appears to connect the central peak to the base of the Northern wall of the crater at the small cone crater Clavius MA. Clavius has 32 additional named craters and 1 Greek letter elevation.





The crater is named to honour the German astronomer and mathematician Christophorus Clavius (Christoph Klan) In 1564 he began teaching mathematics at the Collegio Romano and, except for two years that he was in Naples, he was on the Collage's faculty until his death in 1612. In his 1581 work 'In Sphaeram Ionnis de Saco Basco commentaries' (Commentaries on the sphere of Sacrobosco) he vehemently opposed the Copernican heliocentric system as being physically absurd and contradicting numerous passages in the scriptures. Clavius was on Pope Gregory XIII's committee to reform the calendar and he wrote books on algebra and additional commentaries on Euclid and the Greek astronomer and mathematical Theodosius of Bithynia (c150-c70 BC).

Please send any images or drawings to the newsletter newsletter@brecklandastro.org.uk

Chris Bailey

Eye-piece Candy

There are thousands of galaxies in the night sky. They are easily the most numerous of the deep sky objects. There are clusters of galaxies like Stephan's Quintet and Copeland's Septet which are nicely within reach of larger amateur instruments.

Who doesn't like little groups of galaxies where two or more could be seen in the same field of view? M81 & M82 Bode's Nebulae in Ursa Major, or M65, M66 and NGC3628 in Leo are fine examples, but surely there must be more.

So I took the Saguaro Astronomy Club Database - this Arizona club built a database of deep sky objects and made it publicly available for some years (see <https://www.saguaroastro.org/sac-downloads/>) - it comes in a variety of machine-processable formats. I ran this through a little rough and ready software of my own.

My Criteria:

- It's a galaxy
- It can be seen from my latitude
- It's bright enough to be at the limit of a 4" scope and hence probably glorious in the 20". Mag ≤ 10.5
- Two or more objects fit nicely within the field of view of my widest eyepiece. Approximately 1.2 degrees.

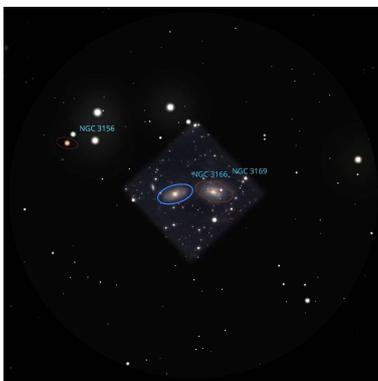
I formatted the list to be uploadable into Skysafari, my favorite bit of astronomy software. The processing resulted in a 58-object list.

A useful confirmation was the M81, M82 and M65, M66 and NGC3628 were nicely listed. So I probably got something right. Unsurprisingly, loads of the Coma-Virgo galaxies were listed like Markarian's Chain. It was all good, but the goal was to find "eye-piece candy" I hadn't considered looking for before.

I looked through the 58 object list and picked four for this article. I found surprising visual magnitude discrepancies between the various catalogues.

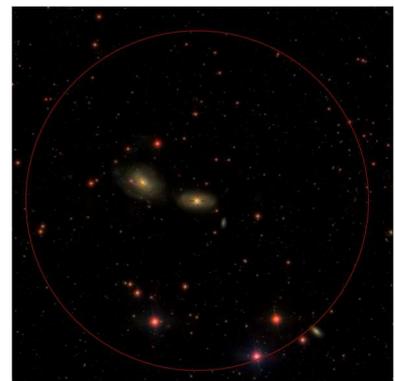
Here are those four. The left column images are from Stellarium, and are upside down and reversed. The right column is from the Sloan Digital Sky Survey, where the orientation is supposed to be natural. The fields of view are for a 24mm Panoptic eyepiece, except for the first SDSS which is for a 15mm Panoptic.

NGC 3166 and NGC 3169



Possibly the faintest pair on the list at 10.6 and 10.5 in the constellation of Sextans. Both are spirals and close to a face-on in orientation.

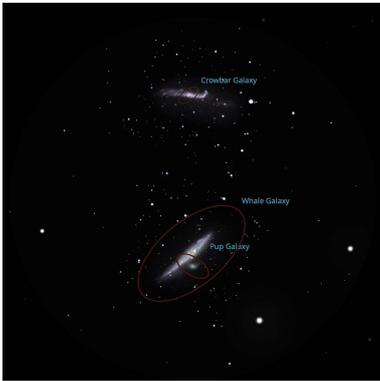
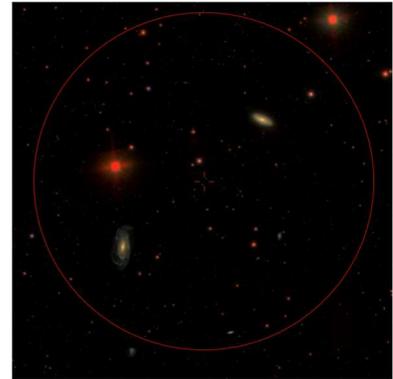
Neither sports a particularly memorable name.





NGC 5005 and NGC 5033

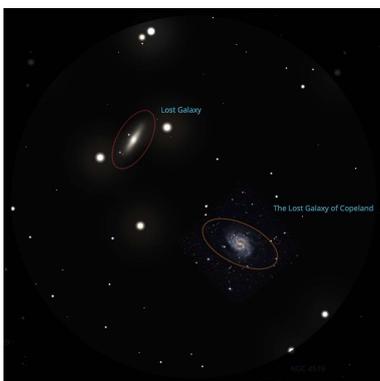
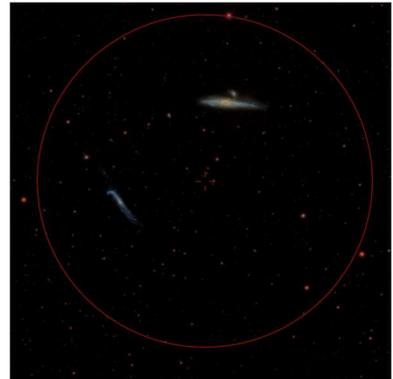
Slightly less of a strain at 9.8 and 10.1 in the constellation of Canes Venatici. The two galaxies are a physical pair and influence each other gravitationally. NGC 5033 is known as the 'Waterbug' galaxy.



NGC 4631 and NGC 4656

Another pair in Canes Venatici with magnitudes of 10.4 and 9.3 respectively.

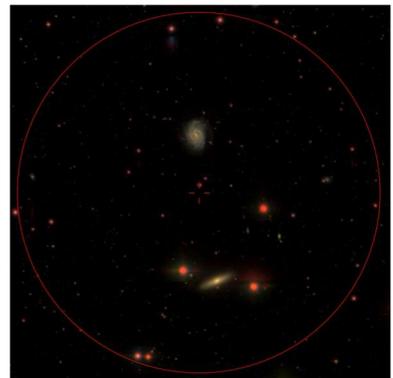
NGC 4631 ('Whale Galaxy') is an edge-on spiral, as is NGC 4656 ('Crowbar Galaxy', 'Hockey Stick', 'The Hook' or 'The Hummingbird').



NGC 4526 and NGC 4535

And my final pair is in Virgo with magnitudes of 9.6 and 9.8. NGC 4526 ('Lost Galaxy' or 'Hairy Eyebrow') is an edge-on spiral. NGC 4535 ('Lost Galaxy of Copeland') is a closer to face-on spiral.

As an astronomer, it is my duty to find a lost galaxy...



Shortly after starting on this idea and writing the article I spoke to a friend from the before time and he kindly pointed out <https://www.astroleague.org/two-in-the-view-observing-program/> followed by the comment “I think you have been out of the game too long now”. Thanks mate.

So hopefully, at some point in the future when it is somewhat less cloudy I can observe these and report back.

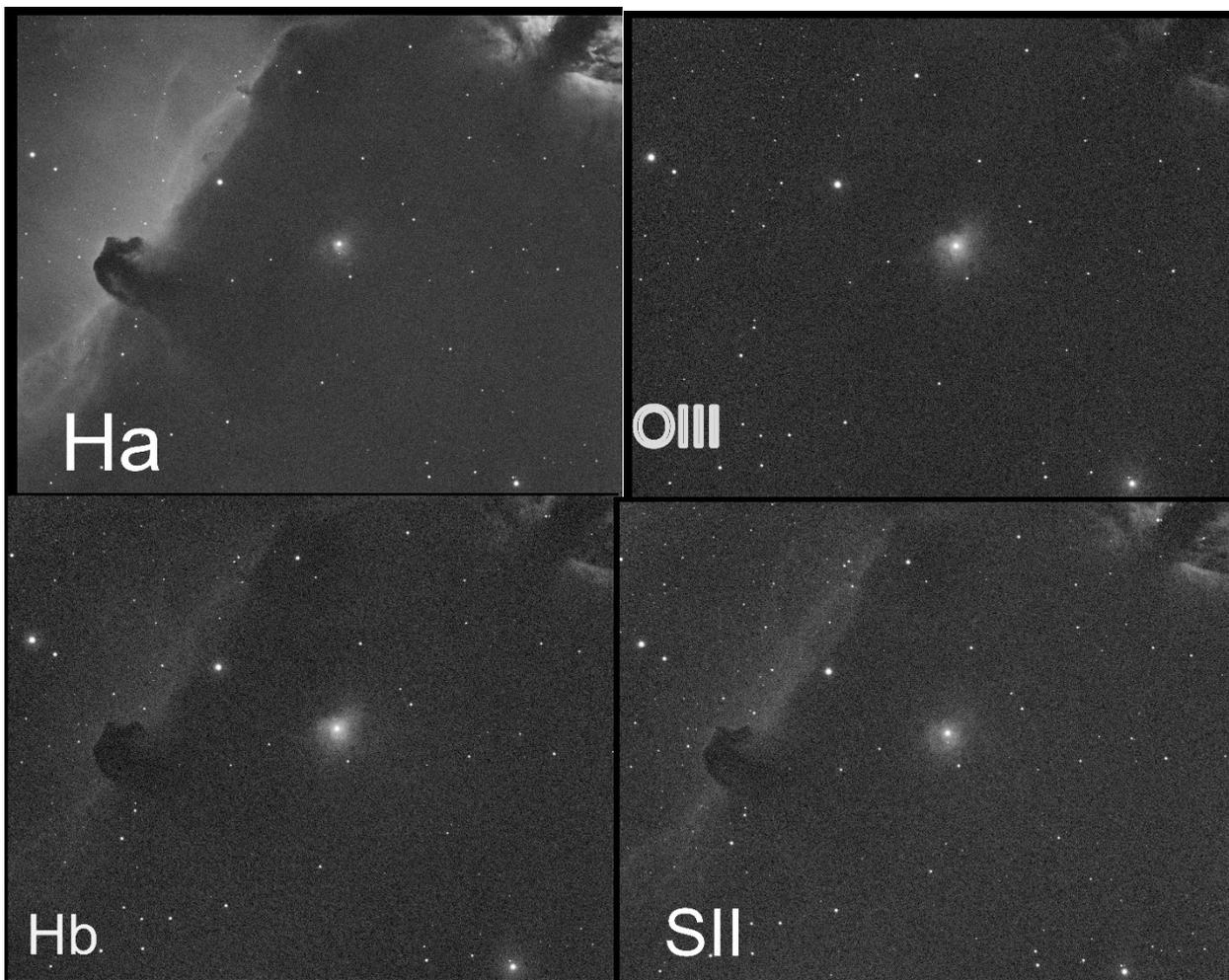
Clear Skies,
Keith Fowler

Experiments with Narrow-Band Imaging

Having borrowed several narrowband filters from the Society's collection of equipment available to members I thought I should publish some results of my experiments. The four narrowband filters used are H α H β OIII and SII. Images were also taken with an L Filter to give a broadband mono image.

The target chosen was the Horse Head nebula in Orion. This was used to give some idea of the detail obtained. Also, a small part of the Flame nebula was included and the nebula NGC2023. This gives a good idea of the different filters' capabilities. By modern standards the filters are not very narrow band being mainly 8.5nm. They are all made by Baader.

20 X 3 min images were taken with each filter and the results below are only corrected for flat and dark frames and stacked.

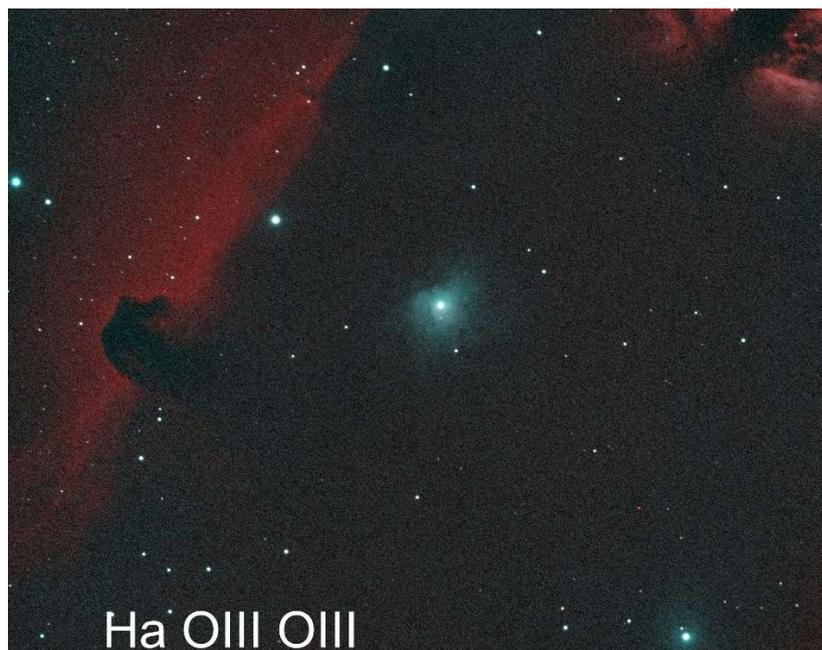


The L frame was completed in the same way.



Having obtained the corrected stacked images it was then time to stack them together to obtain a colour image. In the following experiments the channels are dedicated in the order RGB as captioned. Obviously if an L image is used this has no colour but is left as a Mono image but just added as a sperate layer. To keep comparisons between the results, little or no post stacking processing has been carried out. Obviously post stacking processing would improve any of the images but would make comparison difficult.

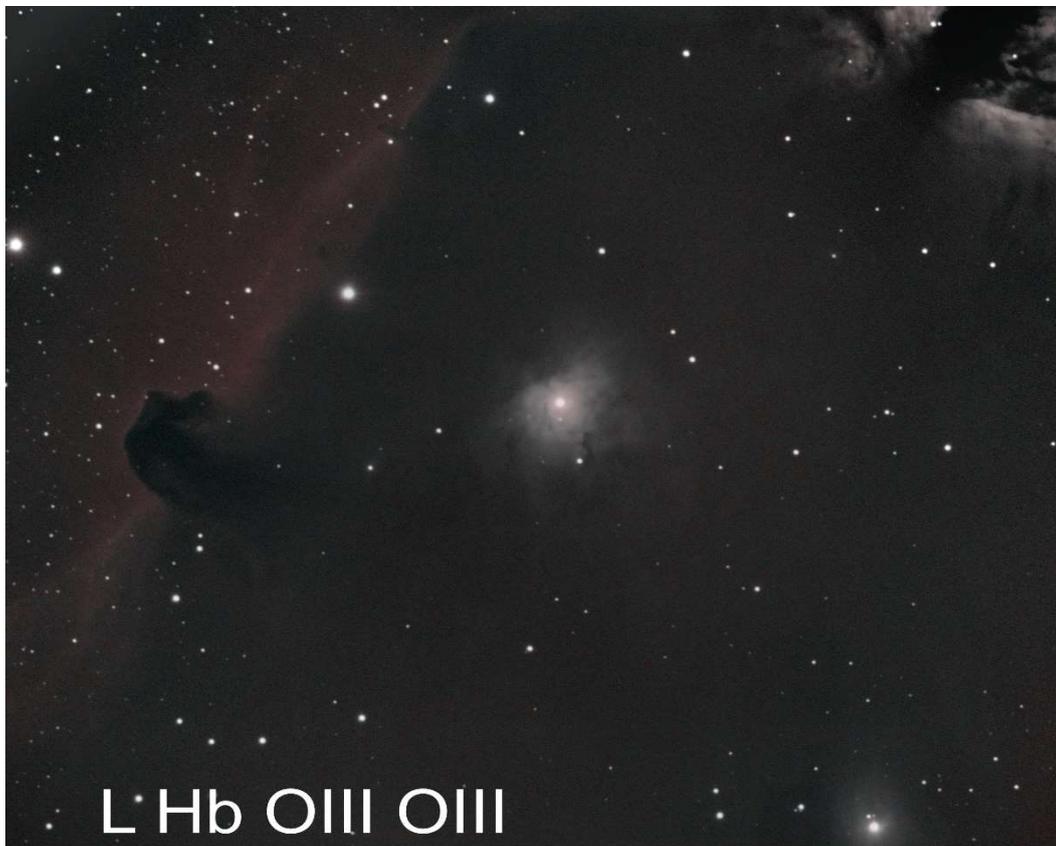
The first image is in the Ha OIII OIII palate. This is a commonly used palate for Narrowband images.



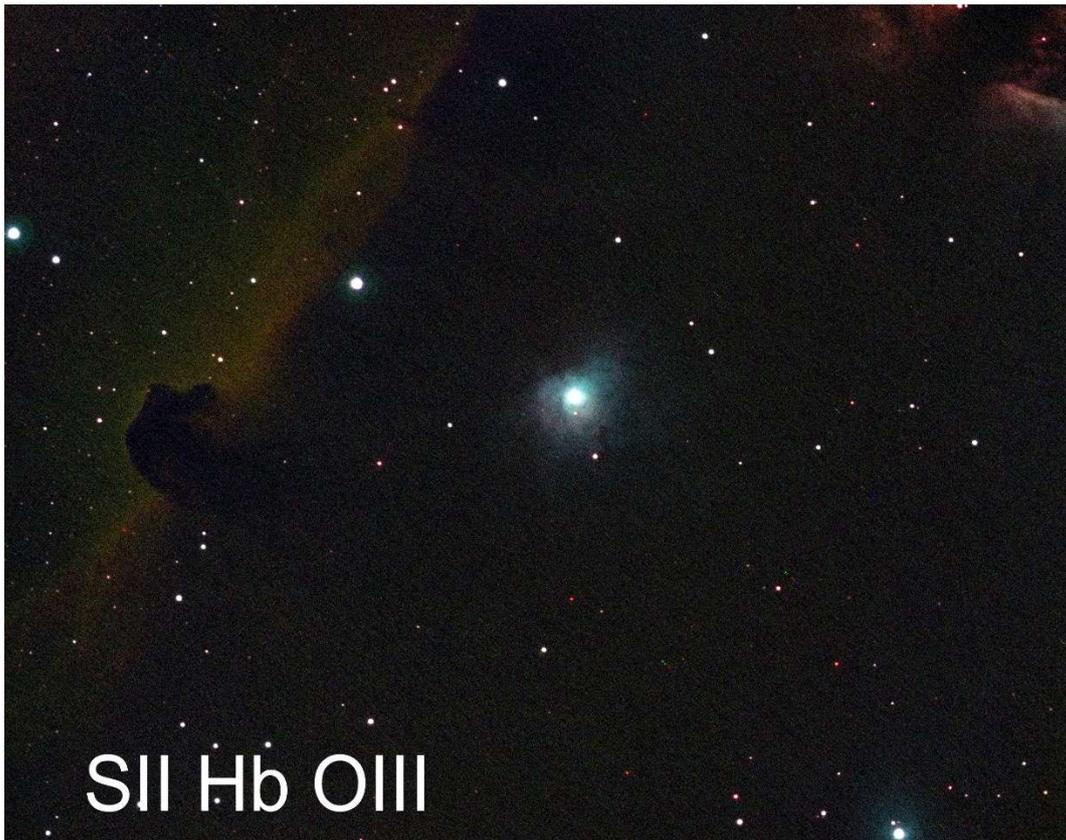
Adding the L channel lifts some of the detail.



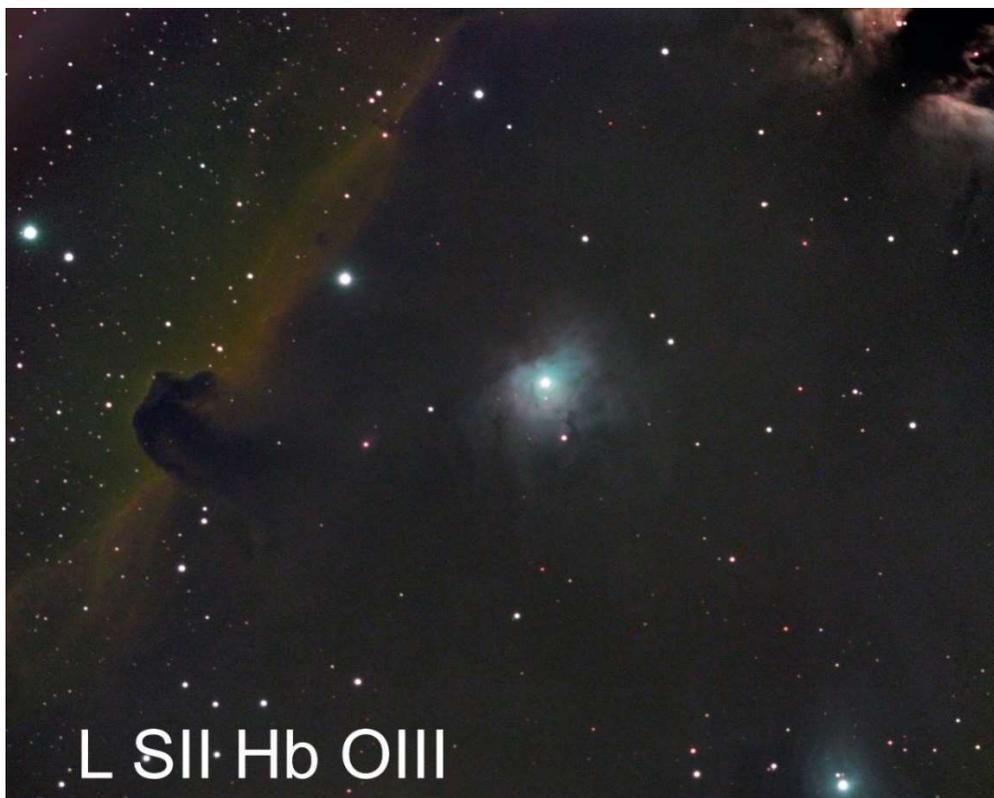
For the next experiment I have substituted Hb for Ha



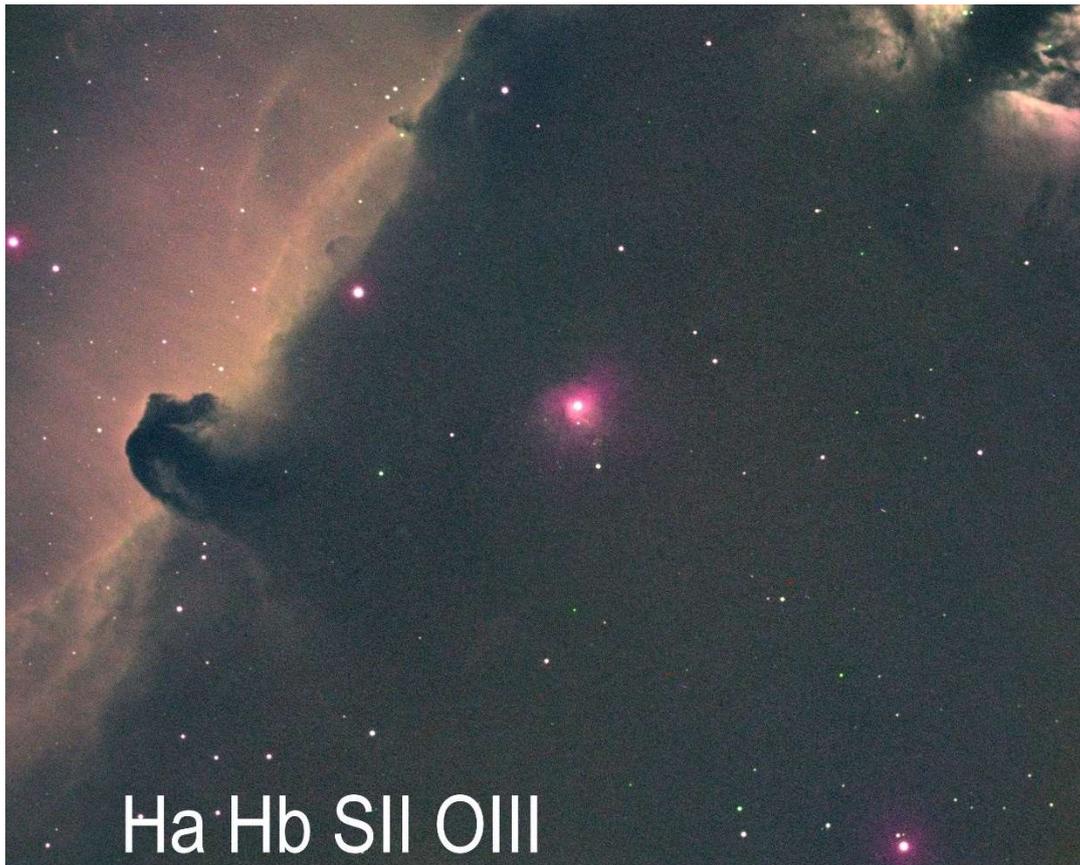
Moving on to a pallet that moves the filters nearer to their natural colours Sii Hb OIII



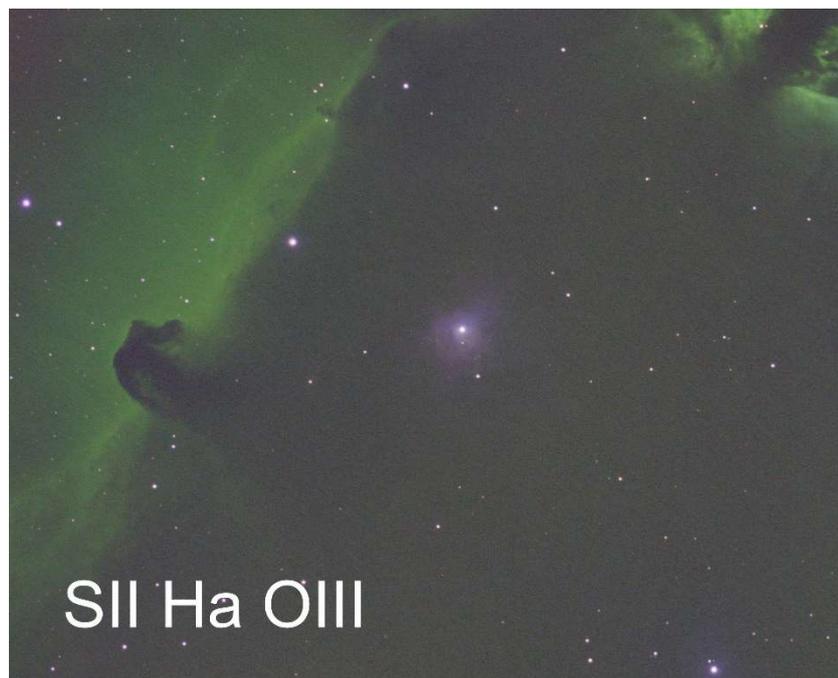
Then adding the L channel again.



Using the Ha as a L channel and then using Hb SII and OIII for the RGB channels



Next, we will try the 'Hubble palette' which is popular with imagers. This uses SII for the Red channel, Ha for the Green channel and OIII for the Blue channel.

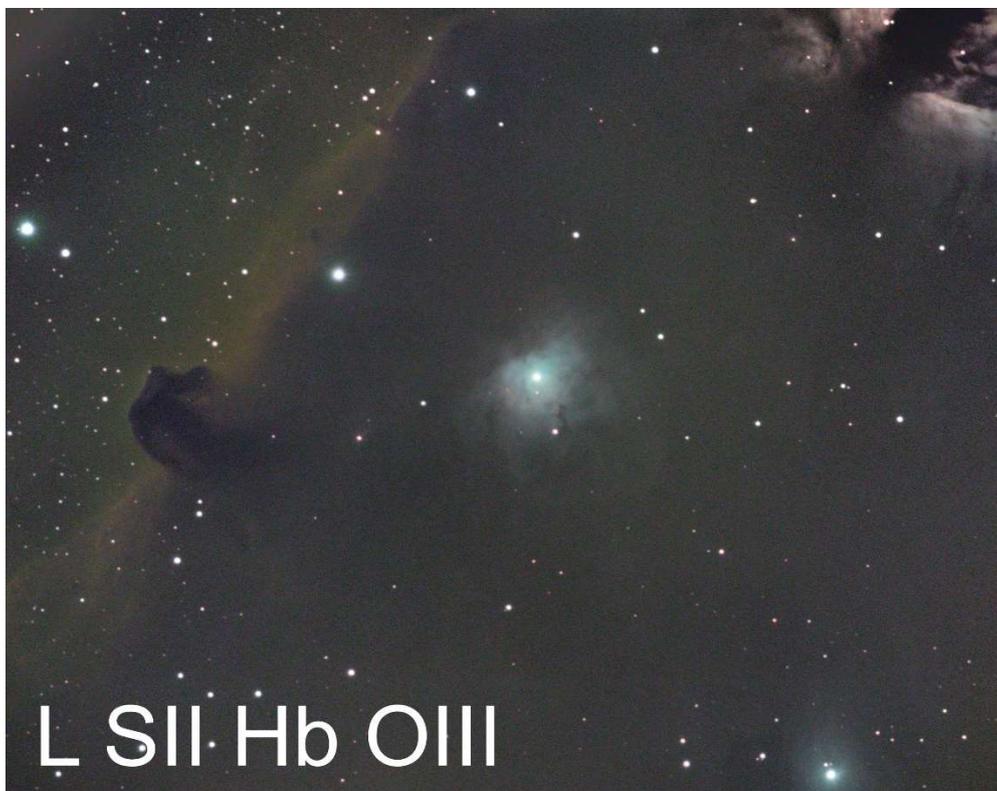


Adding a light frame

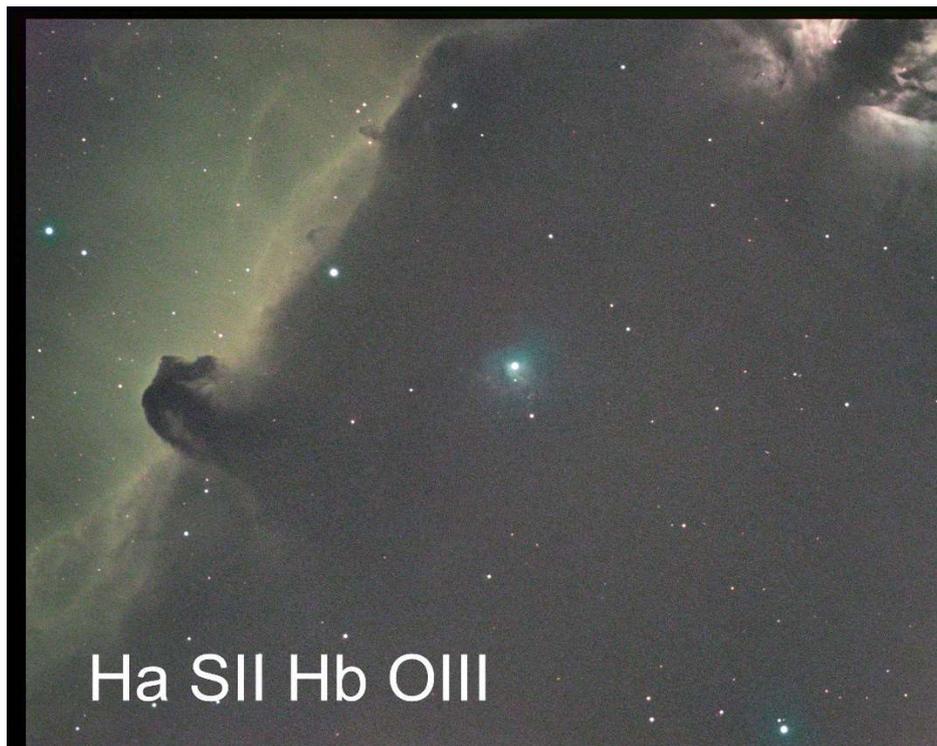


The famous purple stars have not been corrected. This is a common problem with the 'Hubble Palette'.

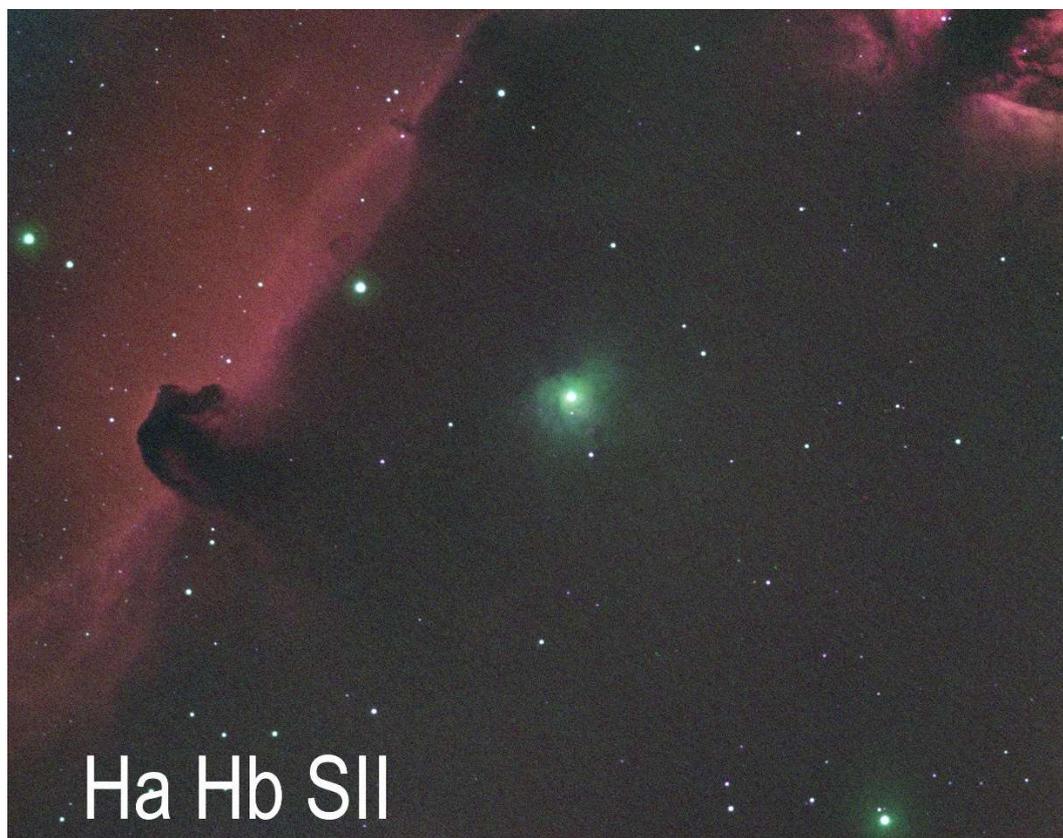
Substituting Hb for the Green channel



Using the Ha as the L Channel



Looking to try Ha as the Red channel and Hb as the Green channel and SII as the Blue channel.



Adding back the L channel



The final combination is Red channel OIII Green channel Hb and Blue channel SII



And again with the L channel



This has been an interesting experiment especially with the inclusion of the Hb filter. I am sure that if I asked for the favourite image from all those above there would be a wide range of choices. Contrary to some voices on social media there is no absolutely right way to construct an astronomical image.

As I said at the start, due to time little or no post stacking processes have been carried out, so several of the images are far from as clear as they could be. I believe any post stacking image process is individual for each filter combination and reflects my individual taste.

Chris Bailey

M-Numbers

Listen to a bunch of amateur astronomers talk and you'll hear M-this, M-that, M42, M81 and so on. We like our M numbers. We like them a lot. But what are they?

Go back in time to Paris, France in the late 1700's. Atop of the Hôtel de Cluny was a Frenchman, Charles Messier, with his telescopes, working for the French navy as an astronomer. He was there to catalogue all manner of astronomical phenomena, but his passion was for comets.

Whilst searching for comets, he would occasionally come across small fuzzy objects that were easily mistaken for comets. He used a variety of scopes, some non-achromatic, some achromatic refractors and speculum metal mirrored reflectors. His best telescopes are calculated to be equivalent to a modern 3.5". In most instances, the best way for him to tell the difference was to repeat the observation a few days later to see if the nebulosity had moved. If it moved, it was a comet, if it didn't, it was something else. I assume Parisian weather is not dissimilar to what we are used to, so this must have been very frustrating.



To avoid having to check out some of these small fuzzies repeatedly, he created a catalogue. The first catalogue item was the remnant of the 1066 supernova in Taurus, which we know as the crab nebula or M1 if you speak the dialect of the modern amateur astronomer.

Due to its nature as a catalogue of 'things which are not comets', it contained a variety of types of objects and covered areas of the sky Messier was looking for comets in. There is no particular order or object classification. In the list we find; 40 galaxies, 29 globular clusters, 28 open clusters, 4 planetary nebulae, 7 bright nebulae, 1 supernova remnant and, sadly, 1 double star. What it does have is variety and all of the objects are reasonably easy and satisfying to see in small modern amateur telescopes.

His 'Catalogue des nébuleuses et des amas d'étoiles' (Catalog of nebulae and star clusters) was published in segments, the first being M1 to M45. This list does include some objects which are easily visible to the naked eye and were included, presumably, for completeness and to bring the list to a clean number. The remainder of the catalogue was released in supplements, and finally, recent scholars have added a few that Messier's notes show he saw to bring the total to 110 objects. The later supplements, especially, had many objects credited to his contemporary Pierre Méchain.

In England, at much the same time, William and Caroline Herschel were doing a systematic survey of all the nebula with much bigger telescopes and classifying them. A very different type of undertaking, these were not objects to avoid. In 1802 Herschel visited Paris and met with Messier. In what looks like an act of respect, the Herschels didn't give their references to any of the objects in the Messier catalogue.

We still do hear of the Herschel catalogues, but they were consumed, along with William's son John's work, into the later "New General Catalogue" or NGC by J.L.E. Dreyer in the late 1800s and early 1900s.

The Messier catalogue and the NGC are the two most popular general catalogues for most amateurs today. There are specific catalogues for certain types of objects, but mostly these two cover our needs.

It's possible to do a 'Messier Marathon' in mid-March to early April and work from dusk to dawn to catch each Messier object. It's lovely to think that in doing so we are carefully looking for and at the very objects Messier had little interest in.

Clear Skies,
Keith Fowler

Gresham Lectures

Astronomy lecture series [Discovering The Universe](#).

This series tells the story of our cosmos through exploring six fundamental discoveries: that of galaxies beyond our own, via probes sent to reveal the remarkably diverse wonders of our Solar System from the fountains of Saturn's tiny moon Enceladus to Earth's hellish twin, Venus, of the sudden appearance of interstellar visitors, the strange pulses received by the first radio telescopes and the twinkling of a star that misbehaved, and the revelation of detecting the oldest light of all. Together, these discoveries take us to the forefront of modern astronomy, and to the state-of-the-art in our understanding of the cosmos.

These lectures are hybrid as you can watch online, in person or on replay at a later date. Sign up to watch through the links below.

[First light: Revealing the Early Universe](#)

Professor Chris Lintott

Wednesday 29 May 2024, 6:00 PM (UK time) or view online at:

gres.hm/first-light

Barnard's Inn Hall, 30 Holborn, London EC1N The final lecture in the series returns to the theme of how insight is derived from observations, considering the cosmic microwave background. This oldest light in the Universe, emitted just 400,000 years after the Big Bang, contains the seeds of the structures we see around us, and tells us about conditions at the Universe's beginning. It will also consider how measurements of the Universe's expansion, made using the CMB, are leading to unexpected results, creating tension in modern cosmology.

[Read more](#) about Professor Chris Lintott, who is a Professor of Astrophysics at the University of Oxford, and a Research Fellow at New College also well known as presenter of the BBC's long-running Sky at Night program, and as an accomplished lecturer.

Pro-Am Working Group

Calling all Amateur Astronomers,

As you may recall, last year, you completed a survey expressing interest in collaborating with professional astronomers from the International Astronomical Union (IAU) on various research efforts. The newly launched IAU Pro-Am Research Collaboration (PARC) initiative promotes and facilitates research initiatives between amateur and professional astronomers. We invite amateur astronomers from around the world to visit the PARC web portal, explore the “Active Projects”, and sign up to participate in those that are of interest to you.

PARC Web Portal LINK - https://www.iau.org/science/scientific_bodies/working_groups/professional-amateur/

Please note that new projects will be added as they are proposed by professional astronomers and approved, so be sure to visit the PARC web portal regularly to explore new opportunities.

In addition to these research opportunities, the first PARC workshop will take place in person in Mumbai, India, December 1-3, 2023. This is a great opportunity for amateurs to learn about new projects, tools and techniques, and to meet other amateurs and professionals interested in research collaborations. Please visit the link below for more information and to register for the meeting.

PARC Meeting LINK: <https://khagolmandal.com/ProAm2023.html>

Thank you so very much for your time and consideration, and please share this invitation with others who may be interested. We are looking forward to your participation! If you have any questions, please direct them to Tim Spuck at tspuck@ui.edu or Aniket Sule at aniket.sule@gmail.com.

Best wishes,

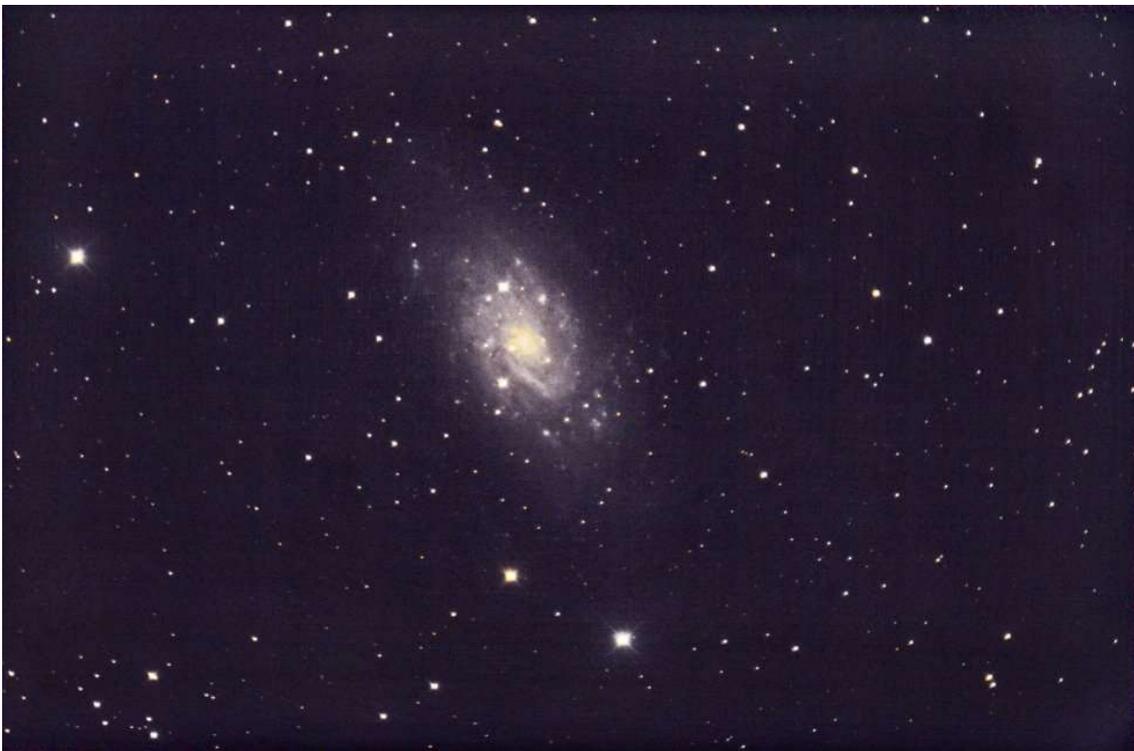
Tim Spuck, Pro-Am Working Group Co-Chair
Aniket Sule, Pro-Am Working Group Co-Chair

Members Astro-photographs.

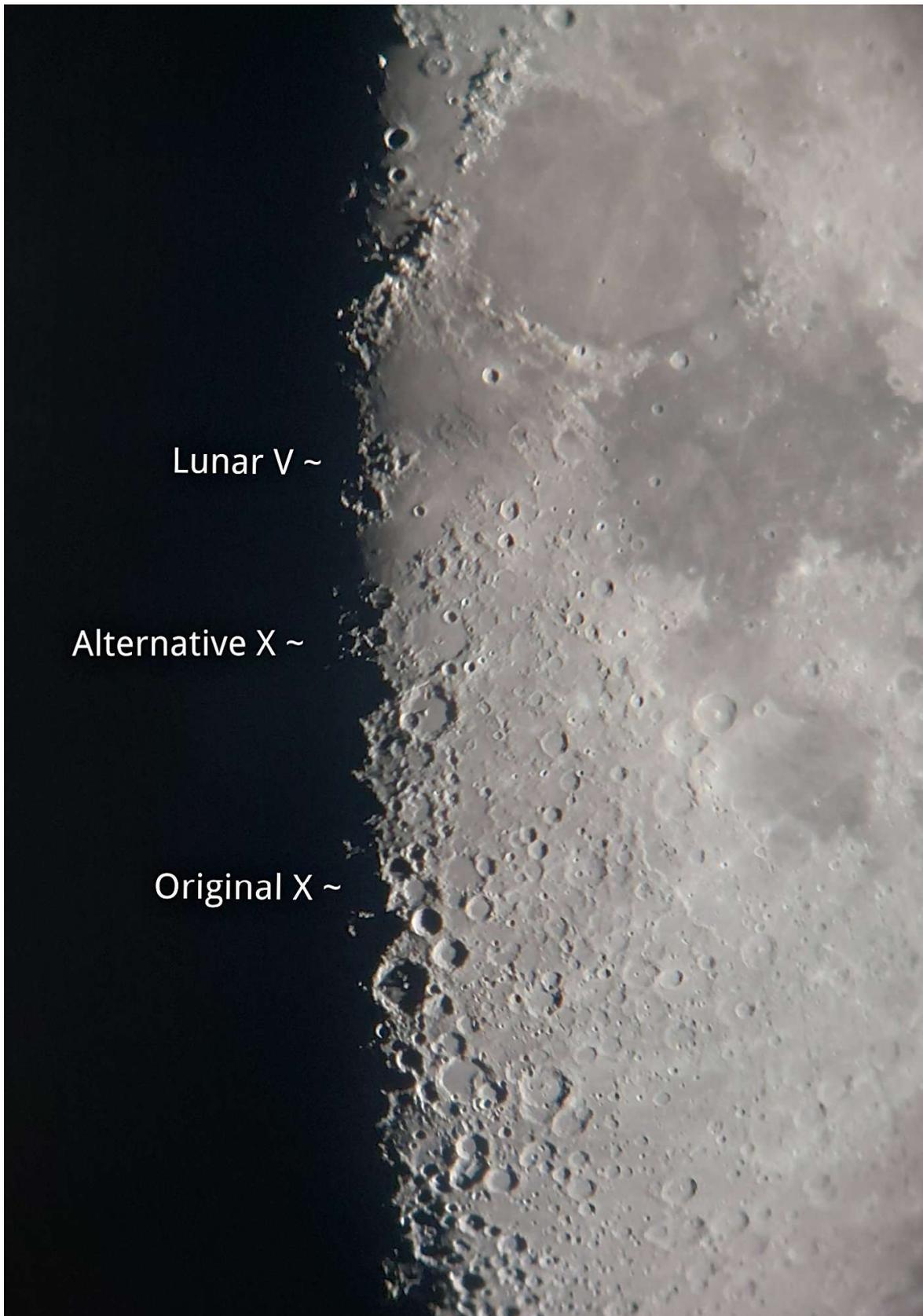
Dan Self



Aurora April 16th



NGC2403 Galaxy Camelopardalis processed in Siril.



Lunar V ~

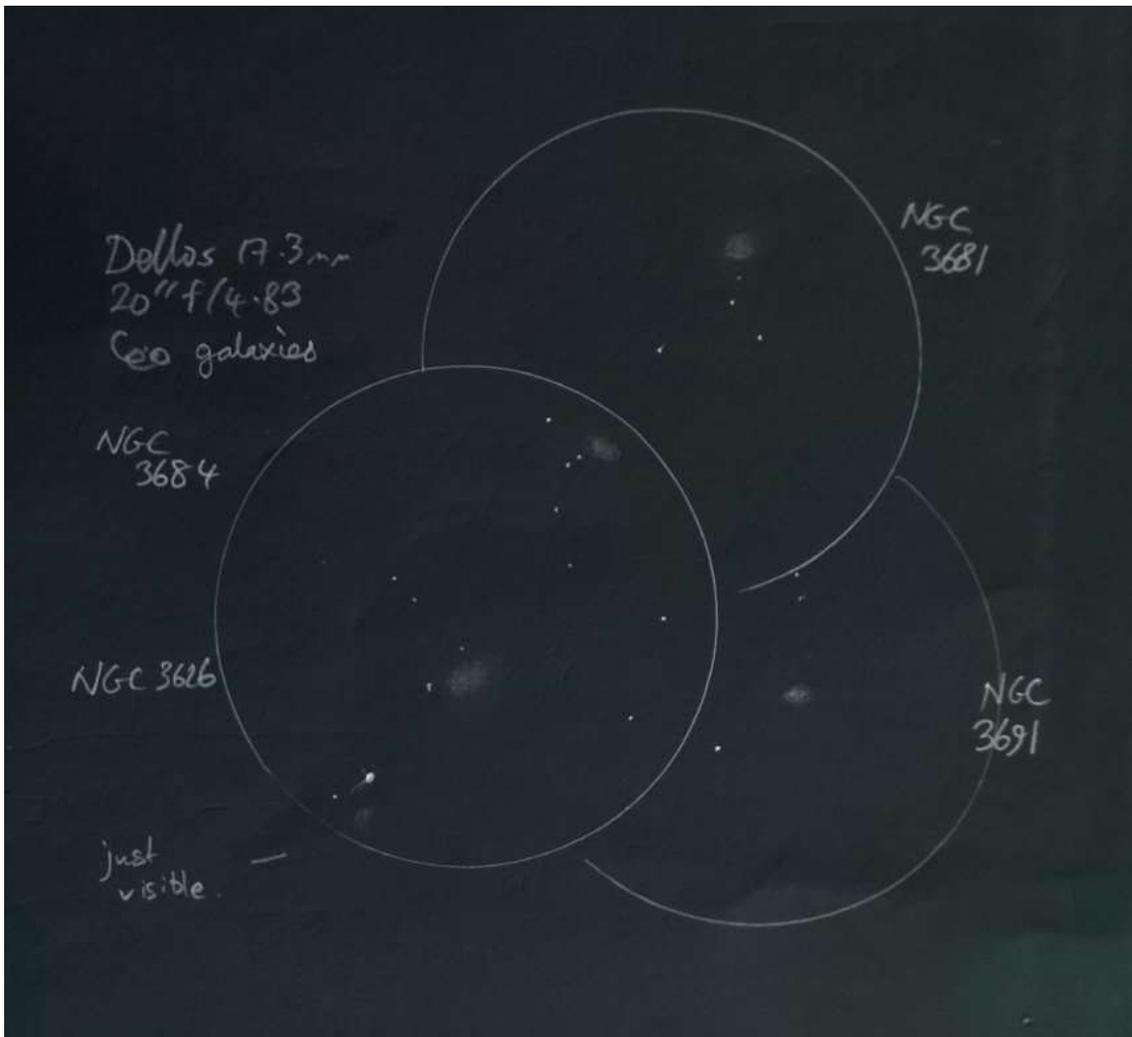
Alternative X ~

Original X ~

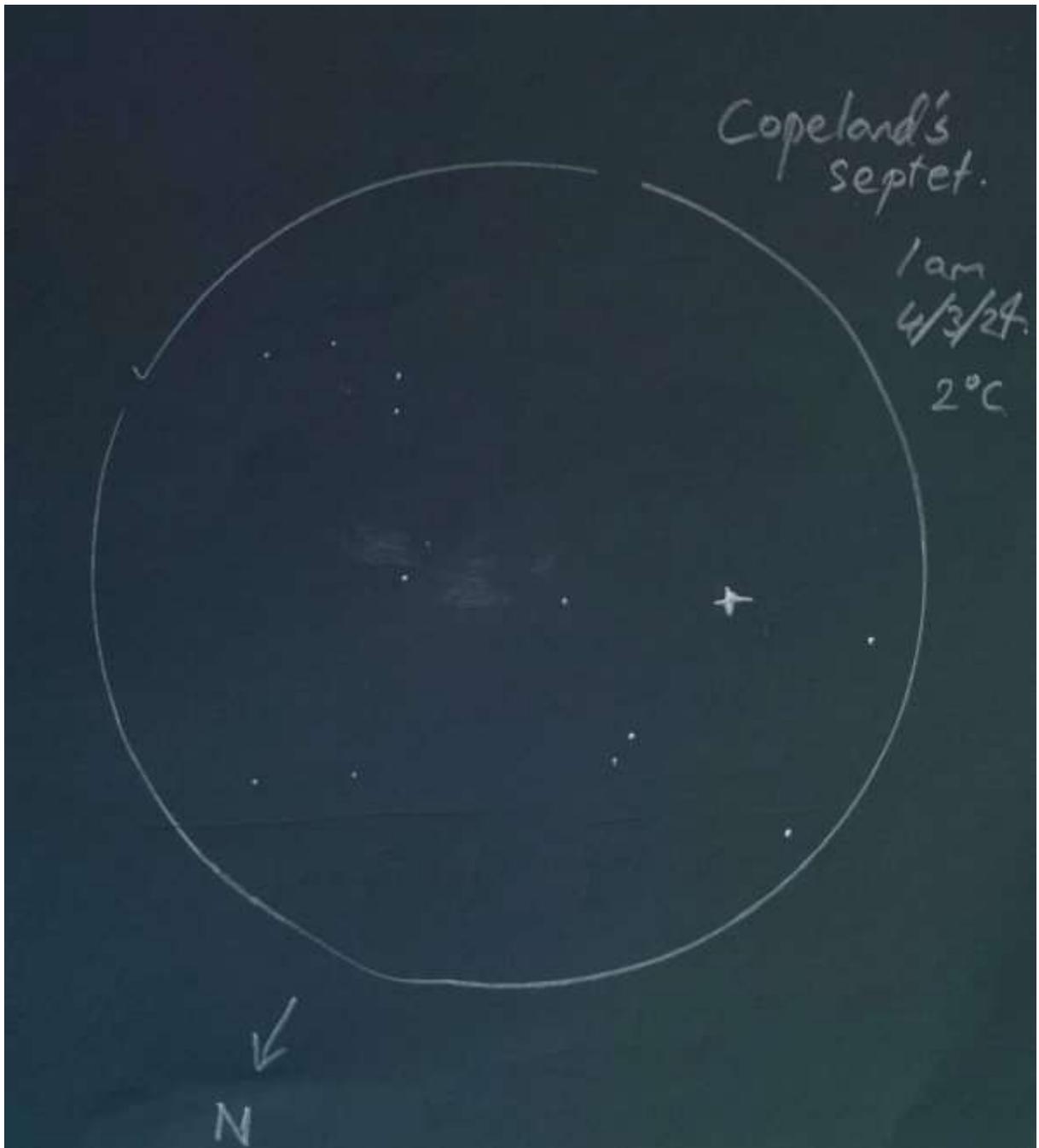
20" Observatory telescope Phoneshot



Mare Imbrium Featuring Arisitillus, Autolycus (With shadows) and Maonts Spitzbergen. 20" Observatory telescope Phoneshot.



Leo Triplet 20" sketch



Copeland's Septet Sketch 20"



Copland's Septet Leo 2 runs 20" Observatory telescope



NGC6058 Planetary nebula 20"

William Chapman (Age14)





David Bryant

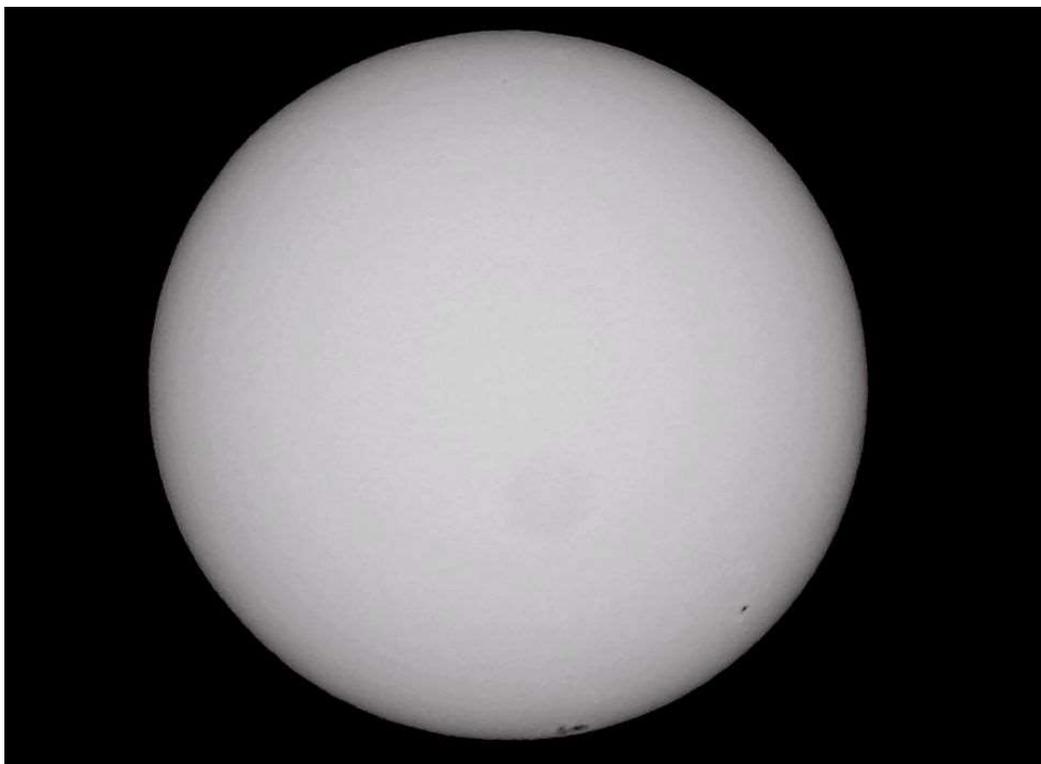


Mercury



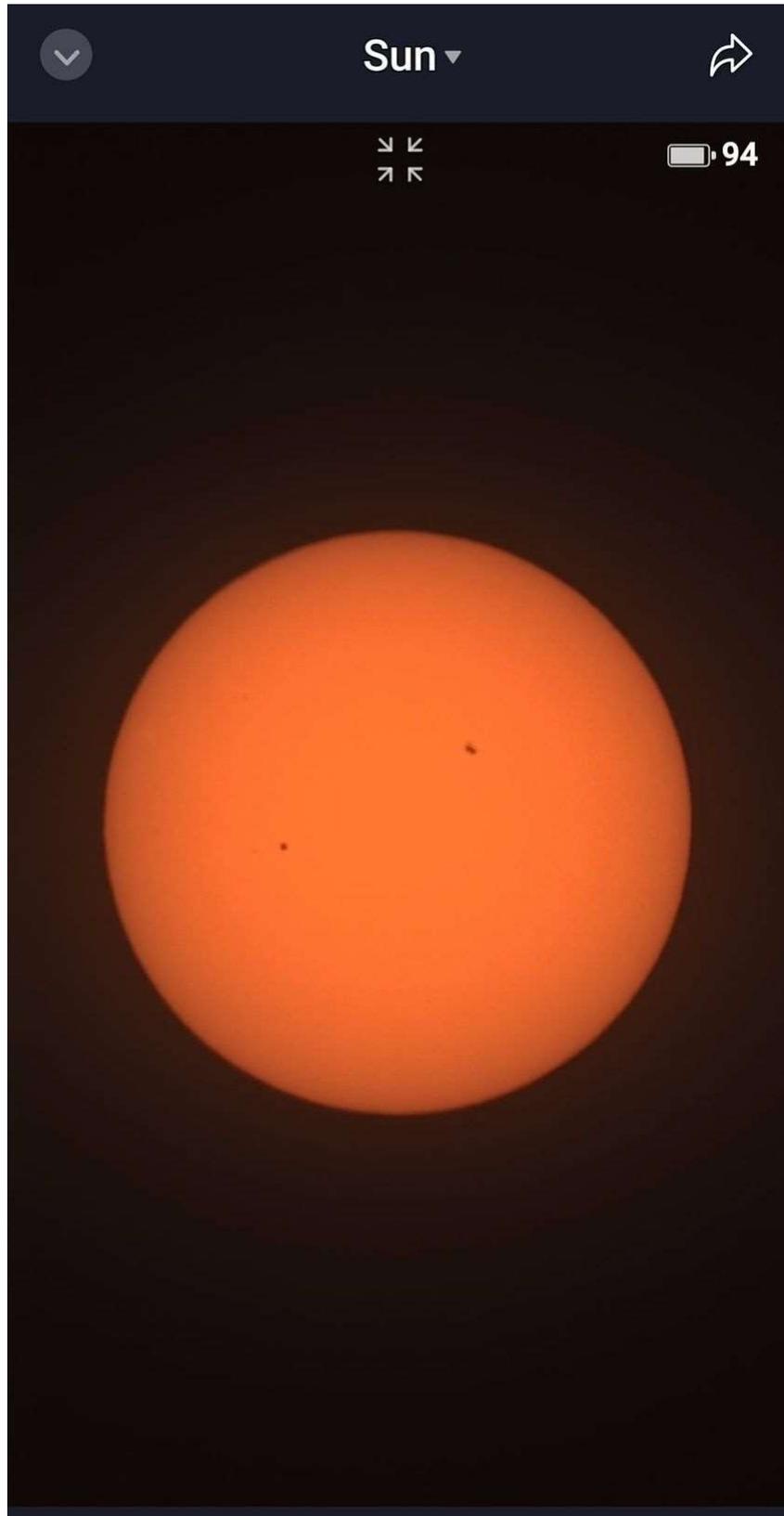


Pons Brooks Mag 5





Pat Goddard





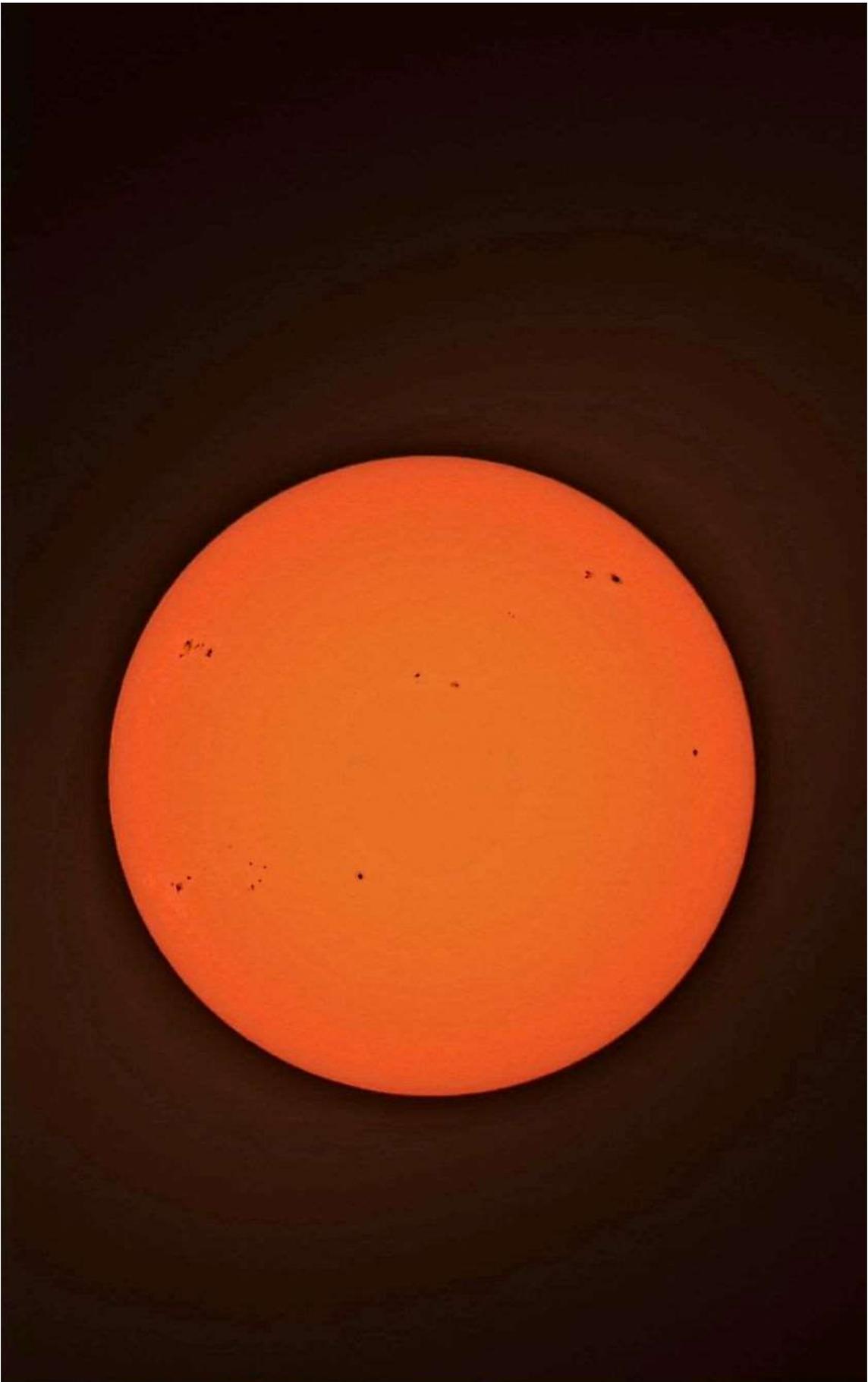
Cigar Galaxy/M 82

 Seestar

#AstroNfk 52°N,00°E/2024-04-13 21:44

M 82

10min



Seestair

Sun

#AstroNfk 52°N,00°E/2024-04-16 08:22

Keip Fowler



Roger Hyman



Neil Wilson



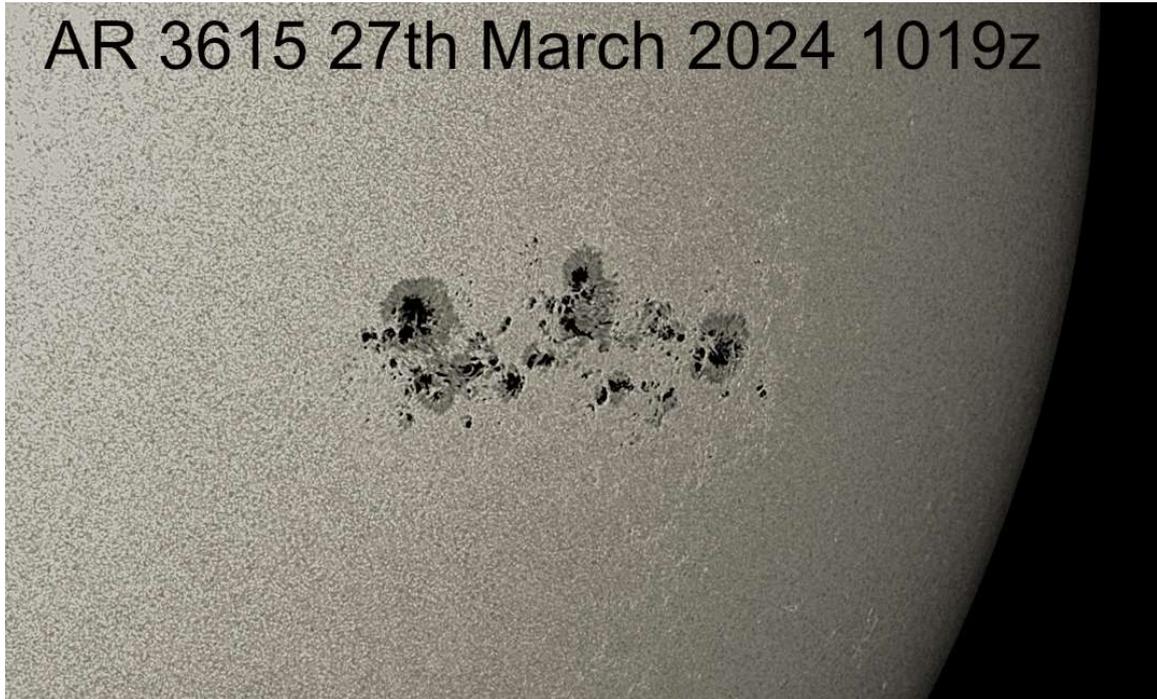
Comet P12/Pons-Brooks.

Celestron 9.25" Edge HD + 0.7x Focal reducer + Altair 26C Protec camera @ -10C

60 x 20 second light frames + calibration frames.

Stacked with Deep Sky Stacker and processed in Photoshop.

Chris Bailey



The Astronomical Quiz

Answers:

- 1 “Annie” Jump Cannon, (1863 to 1941) – she refined the classification of stars according to spectral types and produced the O B A F G K M scale.
- 2 Nordic Optical Telescope.
- 3 Deep Impact.
- 4 Roche Limit
- 5 Oort Cloud
- 6 Magellan probe
- 7 Equinox – the points at which the Sun's apparent annual path intersects the celestial equator, on the 20 March and the 22 or 23 September.
- 8 Diffraction – due to the wave nature of light, it slightly bends around an object causing diffraction rings
- 9 Auriga, the charioteer
- 10 Great Red Spot on Jupiter, first recorded by SH Schwabe in 1831. It currently rotates in about 4.5 days.
- 11 Atacama Desert in Chile.
- 12 Light Buckets – large diameter telescopes that capture as much light as possible.
- 13 Astronomical Unit (au), the mean distance from the Earth to the Sun, ratified by the International Astronomical Union in 2012.
- 14 XUV
- 15 Yagi antenna. Made of parallel rods, the one at the back is called the “reflector” and the ones in front are the “directors”
- 16 Andromeda Galaxy



BRECKLAND ASTRONOMICAL SOCIETY

Charity No.1044478

www.brecklandastro.org.uk

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

Dr Dan Self, Chairman, 56 Lindley Street, Norwich, Norfolk, NR1 2HF.

07734 364667 chairman@brecklandastro.org.uk

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,	Tolerable

	especially risky when young children running around on dark 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.

You might remember me (Mike Weatherstone) from 10 years back (I still receive your newsletter). Can't believe it's that long.

As you will see in the ad., I will separate them (but they go very well together as the binocs need a very steady, heavy duty mount like the Orion) and will reduce by 10% if a member would like one or both items. The mount will take telescopes up to 6+kg and it works very well indeed to allow people of different heights to view without having to re-find and focus the object.

Description

Celestron 25 x 100mm astronomical binoculars plus the superb Orion Monster Parallelogram mount for sale.

The binoculars are excellent for astro or terrestrial use and can show really good detail, including the rings of Saturn, moons of Jupiter, the moon etc. Current price at Rother Valley Optics £419, Wex Photo Video £389 and Amazon £339

The parallelogram is an amazing piece of kit and permits raising and lowering of the binoculars or telescope to any height up or down, while maintaining focus on the item - ideal for people of different heights (especially good to introduce children to astronomy) to observe without having to find and focus the object again. It will take binoculars or telescopes up to 15 lbs/6+kg and works very well with the Celestron 25mm x 100mm binoculars.

Parallelogram is no longer available in the UK or Europe, so a very rare opportunity to acquire this precision instrument. Current US price is \$649 (£520 approx.) See the YouTube link for set-up info.

Both items are complete, undamaged and have been very little used - maybe 20 times only since purchase August 2020.

Price for both items together £345 but will separate at £150 for binoculars and £195 for Orion Parallelogram. Collection only due to weight and size.

Can be seen at Fundenhall (between Wymondham & Long Stratton).







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 Flatteners 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

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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)

