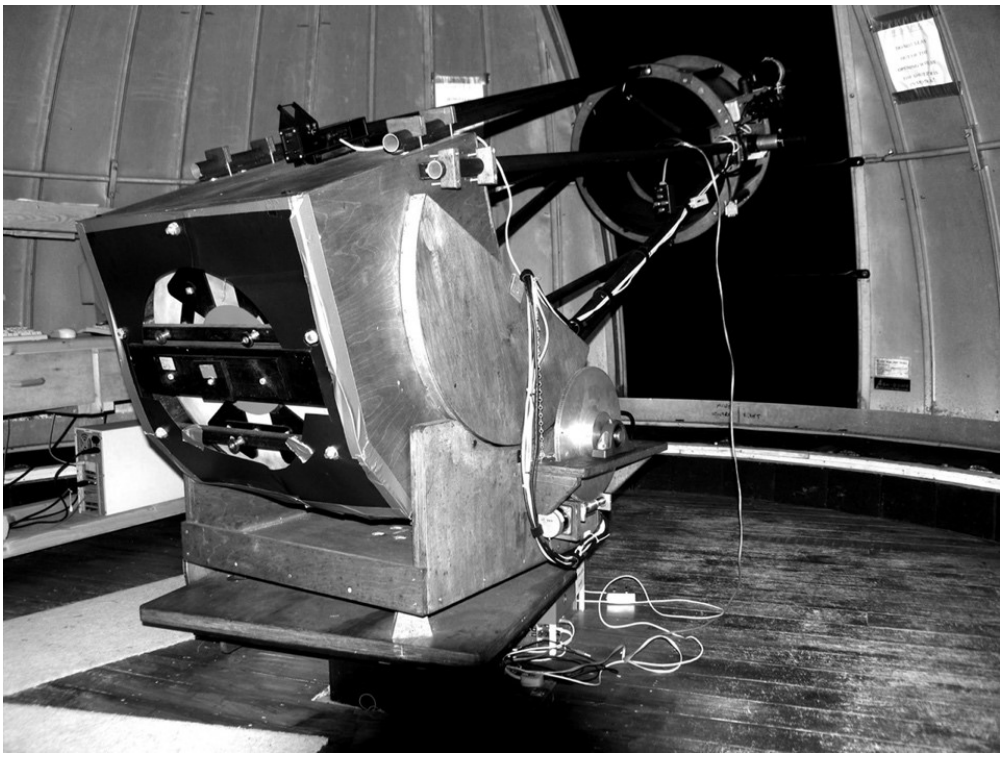
Breckland Astronomical Society

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

EXTRA TERRESTRIAL

Newsletter January 2021



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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 January 2021

Welcome to 2021! Let's hope we can safely resume enjoyment of the skies together soon. We had an interesting 2020, didn't we? I thought we had some exceptional speakers over the year, even if only via Zoom. Sincere thanks for your donations, we are an educational charity so we will purchase a few things to enhance especially youngsters' experiences at the observatory. We also have speaker costs, observatory fixed costs, and costs keeping equipment up to date and fixed. We are raring to get back to outreach if we can possibly find time, and (post covid) help will be greatly received. It is lovely to help put people in touch with the Heavens and learn about all the technology used to do so. We did manage one forest school visit pre lockdown and a virtual class via Zoom.

Elon Musk got busy in 2020 despite covid. We may have lost the visual trails of the StarLink satellites, but business has just taken to Global skies. President of the FAS Paul Daniels, a local resident, has made a public campaign about how low earth orbit is dangerously unregulated. Think what you like. Many Rocket launches (Dragon and crew Dragon) were made and that landing of the stage on a barge is an awesome sight.

£1000 Tesco funding has been given to the society. Sincere thanks go to Andy for applying for this scheme which turned out differently than expected due to the token scheme no longer being allowed. We will be spending all of this on things of educational value that enhance the society's activities for children

The society now has some astronomy equipment kit that could be loaned out to members is a benefit of joining. Note: there will be a few conditions, as we have no insurance. This provides practical help starting enjoying this hobby and comes with our advice and expertise.

The Sky in Summary – more detail in separate article

Right at the end of the year the cloud and rain was pretty dreadful. As such, the Geminid meteors were so-so. I drove out to my dark local spot and it clouded over, but I saw two before it did so. I also caught a decent Geminid a few days after. In January we have the Quadrantids, that are Moonlit. The radiant is low in the NW and sinks then rises in the early morning. 6-7 am may be a good time on the 3rd and 4th of January.

Jupiter and Saturn are rapidly getting lost in the twilight now, so goodbye, and we will see Jupiter much higher next summer, not so for Saturn.

Observatory rules January 2021 (as of December 27):

- Tier 4 government rules apply
- The observatory is therefore closed, except for maintenance and security purposes.
- One household is allowed in per day in accordance with the above.

Talks

14 of us joined Kate Dougan for some really uplifting information about what we can do to combat light pollution. Kate's main aim is to preserve the rural character of the AONB Norfolk Coast, but this extends to our area due to the way we need to work together. A really lively

discussion came about afterwards, about policies, and various night sky protection measures. We couldn't record the talk unfortunately. She was thoroughly interesting and inspiring. We even spent an hour chatting at the rehearsal. It was uplifting to hear how many ideas Kate had. A document has been written up which has been approved to be heard by parliament, namely the APPG on light pollution rules which contains 10 main recommendations that should be brought into law. Let's encourage our MPs to help this along. In 2018 France brought about some strong and clear light pollution laws. Under current British law you have a 'right' to get lighting corrected if it is a 'statutory nuisance'. The 2005 Clean Neighbourhoods and Environment Act + UK Planning Policy Framework have light pollution conditions in place. Norfolk County Council have an ELZ (Environment Lighting Zone). A Sky Quality survey follow up could be done to see the change in light pollution in North Norfolk over the last 10 years. Approved by Design is an architectural standard which upholds light pollution rules.

The role for us to play in all this is showing people (maybe a neighbour or friend with an external light) the night sky. Kate points out that this is the only form of pollution where the onus is on the sufferer rather than the source to do anything about it so we need to be proactive on this one. Kate is very positive and encouraging about this.

Kate will be doing a September/October Dark Skies Festival, for which we should get our thinking caps on. I find it difficult to help at that time of year, but hopefully I can find some time and some other members can join in the astro-festivities perhaps by participating in KLADAS (King's Lynn) activities. This year it is around the Kelling Heath autumn star party. Dark Sky Discovery Site statuses have been created at Titchwell and a nearby Heath and Wiveton Down. We appeared as a green blob on the bottom of the light pollution map, showing some around Great Ellingham, separate from Attleborough.

The google meet link to this month's talk will go out by email and be up on the facebook group near the time. Paul Money is coming (virtually) with "The Vikings at Barsoom" Mars tales on January 8th. Hope to see lots of "faces" there ☺

Paul Fellows of Cambridge Astronomical Society is following up his popular Stephen Hawking talk on Friday Feb 12 with the talk "Cosmic Dawn and Destiny". It has gone down well. This date is also a palindromic one 12022021, so don't forget it!

The Star Party is planned for March at Haw Wood Farm (now looked after by DASH), on the weekend of our March talk on the Friday night. They are booking places now but you can usually book fairly late on. Check out hawwoodfarm.co.uk for details. Please call the lovely Dan or Georgina to book and say you are with Breckland AS. Pitches are usually about 10m apart from experience and the horizon is great except for the occasional hedge or sapling. Consider checking out this wonderful dark site before any Sizewell C development starts. Proviso: please only if it has become safe to do so!

Looking forward to seeing some new faces and those interested friends of friends on the next online talks and hopefully we'll be back by the time Jerry Workman is due in May.

Dan Self

Astro Dairy

January 2021

1st -12th January	**Quadrantid meteor Shower**
1st January Cluster.	**Moon Lies 2.3Degrees Northwest of Beehive**
2nd January	**Earth at Perihelion (0.983257AU=147,093,163Km**
	Regulus 4.7 degrees south of Moon
3rd-4th January	**Peak of Quadrantids meteor shower.**
6th January	**Last Quarter Moon**
	Straight Wall Rupes Recta visible on Moon. With the curved Stag mountains this makes the effect known as the Cutlass
9th January	**Moon at Perigee (367,387Km)**
	Mercury 1.7 Degrees South of Saturn (very low in SW at Sunset)
10th January	**Antares 6 Degrees south of the Moon.**
11th January	**Venus 1.5 Degrees N of Moon**
13th January	**New Moon**
14th January that one)	**Pluto conjunction with the Sun (Good luck with**
15th January	**Mars will show the large 'V' Syrtis Major on the central meridian about 1800z**
16th January	**Favourable Libration of the moons NE limb will show Humboldtianum.**

17th January	**Neptune 4.5 degrees from Moon**
20th January	**1st Quarter Moon**
	Lunar 'X' and 'V' will be visible around 1800 - 2000
21st January	**Uranus 3.3 Degrees North of Moon**
	Moon at Apogee (404,360Km)
	Minor planet (15) Eunomia at opposition (Mag 8.5)
22nd January	**Uranus 1.7 Degrees south of Mars**
24th January	**Mercury at greatest elongation (18.6 Degrees East Mag 8.5)**
	Moon passes close to Hyades
25th January	**Moon Occults part of M35 starting around 2300**
28th January	**Full Moon.**

JOHN'S NEWS BITS

January 2021

Astronomers have revealed the most detailed map ever of two billion stars in the Milky Way. The map was taken with the ESA GAIA telescope floating 2 million miles from Earth at the Lagrange 2 point. This was announced by Dr Floor van Leewen, the UK team at Cambridge is headed by Professor Gilmore who opened our observatory in 2000.

As reported in New Scientist by Stuart Clark, Edvard Mortsell at the University of Stockholm in Sweden has produced data from observations that show the Universe is expanding too fast and could rewrite our theories on cosmology. Different measurements of the Hubble constant refuse to agree leading as to whether we need to revise our understanding of gravity.

The famous Arecibo telescope, made even more famous by the bond film GoldenEye, has collapsed on December 1st with a mighty bang as the second supporting cable broke causing the 900 ton receiver platform to fall 400 feet onto the 305 metre diameter dish. Luckily no-one was hurt. This telescope has been making observations for the last 57 years.

As reported in nature.com, the detection of neutrinos produced by the Sun's solar-fusion cycle paves the way for a more detailed understanding of the structure of the Sun and of the formation of massive stars from the carbon-nitrogen-oxygen (CNO) cycle. Data was obtained from the Borexino Collaboration scintillator neutron detector.

Japanese space experts have put the Earth some 2.000 light years closer to the black hole at the centre of the Milky Way from 27,700 light years to 25,800 light years.

no need to panic yet!

Also the solar system is orbiting the Milky way a bit faster at 227km/sec as opposed to the official value of 220km/sec.

From a media report in the Asia Times and published in the magazines Science and Nature, China claims to have got a breakthrough in the quantum computer race.

They carried out a quantum computation in 200 seconds that would have taken over 2 billion years with to-day's supercomputers. The work was done at the University of Science and Technology in Heifei.

And some latest news, Jet black chunks of rock and soil from asteroid Ryugu have been returned to Earth from the Japanese Hayabusa-2 spacecraft.

The capsule landed on December 14 parachuting down near Woomera in Australia.

Analysis of the material will provide valuable information as to the formation of the Solar System.

China's Moon mission, Chang'e-5, which took off on the 24th Nov. returned 4.4lbs of lunar rock and gravel successfully to Earth. The capsule landed in Inner Mongolia on Dec. 16th at 17.59GMT. The material came from a volcanic plain known as Mons Rumker, a raised area north of Oceanus Procellarum.

Elon Musk's bullet shaped Starship, (30mx9m) a prototype Mars rocket, took off successfully on its test flight, got up to 8 miles and then attempted a soft landing return. Unfortunately It crash landed and ended up as a fireball. The problem was due to the fuel system causing a hard landing. At least it was unmanned.

John Gionis

The Night Sky in January and 2021 in a little more detail

Our society is affiliated to the BAA (British Astronomical Association). They provide a VERY detailed annual handbook every year. I have taken notes from this and Steve Tonkin's Binocular Sky Newsletter for December and used Stellarium to compile a little guide to what's up in the sky January 2021.

In 2021 generally, the BAA compiled some useful data:

The NEW MOONS (dark skies) are on Jan 13, Feb 11, Mar 13, Apr 12, May 11, June 10, July 10, August 8, September 7, October 6, November 4, December 4.

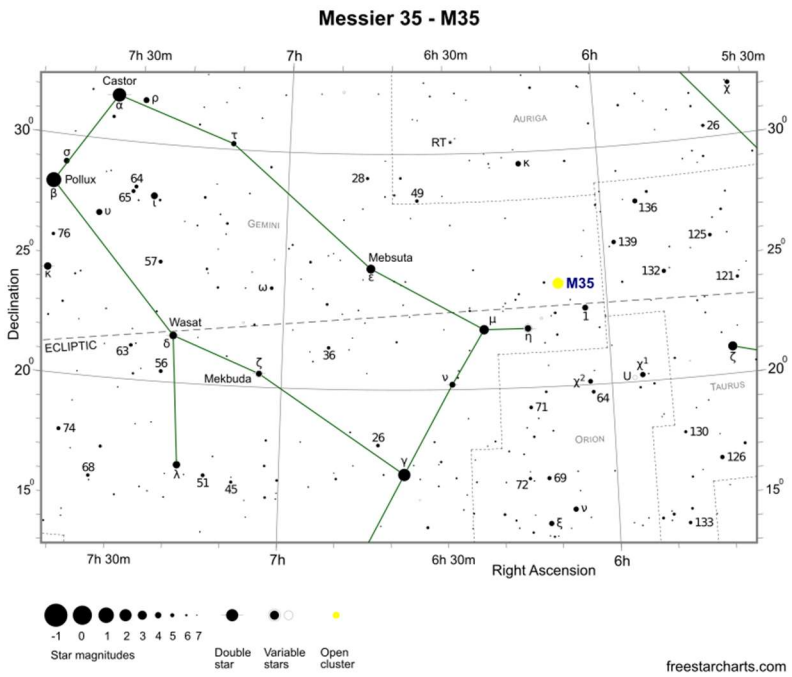
HIGHLIGHTS are:
- A partial solar eclipse June 10 9:09 - 10:14(22% obsc) - 11:23am.
- Perseids are under dark skies August 12 night.
- Comet 67P Churyumov-Gerasimenko containing a dumped Philae and Rosetta sails by in October in Taurus, and November moves into Gemini then Cancer.
- Comet 17P Holmes is in the skies in February and may have an outburst like in 2007, it had a smaller one in 2015.
- Vesta peaks at mag 5.9 on March 5 in Leo, near star Chertan. This is the only asteroid I think that could be seen with the naked eye.
- Grazing Lunar Occultation of SAO190087 mag 7.4 on Oct 14 21:49 UT.
- Venus is at Eastern Elongation (evening) on October 29
- Mercury is at Eastern Elongation (evening) on January 23 and May 17.
- Mars hangs around in the evening all spring.

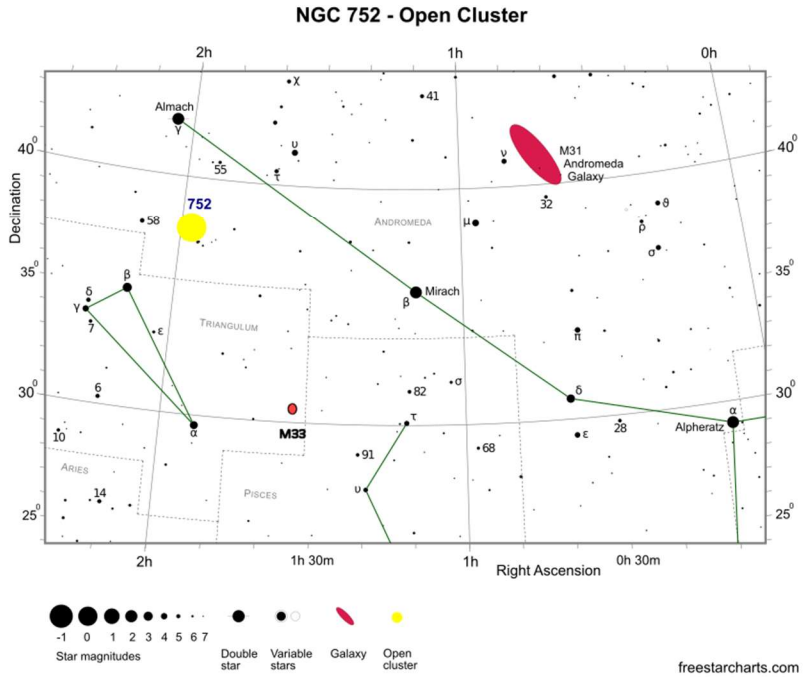
Steve Tonkin's Binocular Sky Newsletter is free at binocularsky.com

He lists some lovely objects to find in the night sky for all to attempt. I found and added one or two of my own.

M35 in Gemini. It is a lovely open cluster. High in the sky in the mid to late evening. There is a harder cluster, NGC 2158 almost embedded in it from our perspective, which is ½ a degree to the SE. An even harder cluster IC 2157 lies 1 degree ESE of the main cluster. Stars can look beautiful in these concentrations in even small telescopes and even binoculars, use the chart to locate M35.

Moving from overhead to the West early evening is the great Andromeda galaxy, M31 and there are two other objects to try to find in this area. M33 is the more difficult, diffuse Triangulum galaxy, another local group member and NGC 752 a star cluster. I remember one fairly dark and transparent night at the observatory, just standing outside without binoculars, trying to see M33 with my naked eye (I didn't on this occasion but did another time). I was looking overhead almost and was convinced I could see a fuzzy patch of light between Triangulum and Andromeda, not where M33 was. I got up a star chart and realised it was star cluster NGC 752. It didn't look that

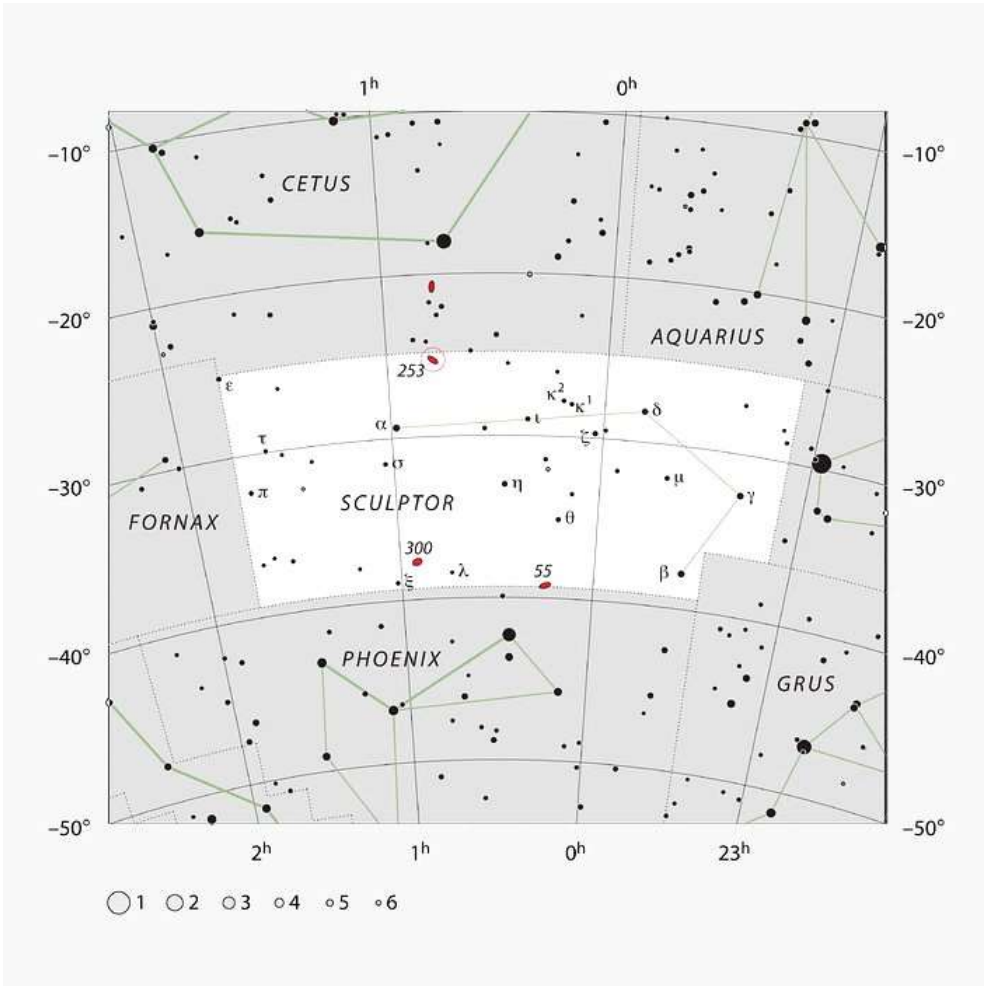




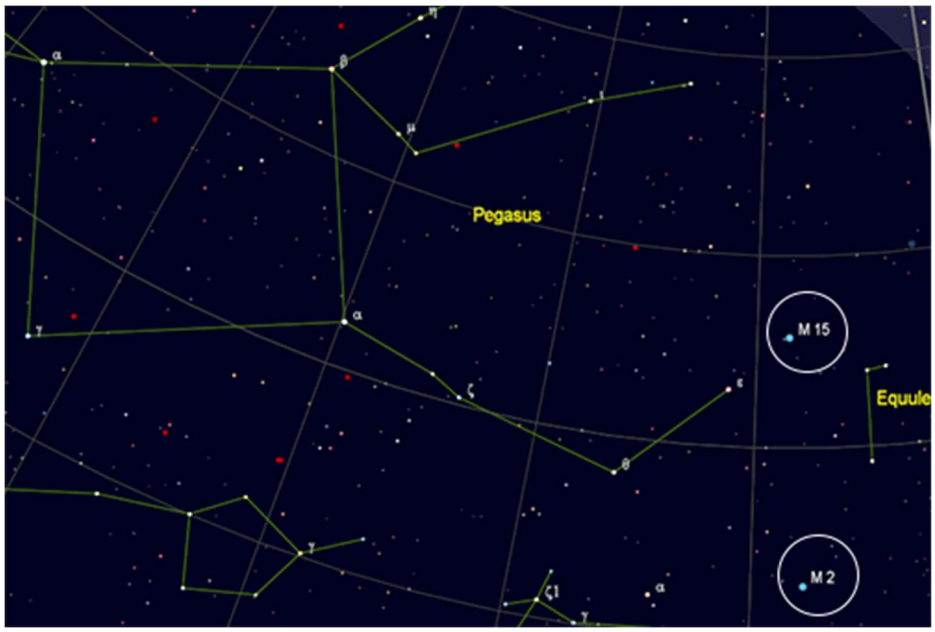
bright in binoculars, so I was surprised my eyes could pick it up. It is listed as being magnitude 5.7 and so is M33. However I would put M33 as fainter than NGC 752 but it may just depend on the sky properties.

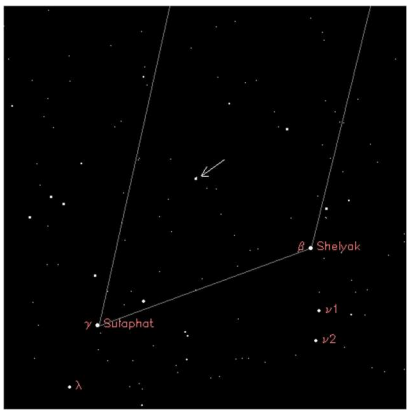
M34 is a nice large cluster in Perseus that is best placed a bit later on in the night. A Planisphere has this on it. I spotted this first with binoculars from central Norwich when younger. I was surprised what I could see while streetlights were glaring at me.

Now maybe for a challenge for telescopes or good binoculars. How good is your South horizon? Can you take the scope to a field nearby? The Sculptor Galaxy NGC 257 (the reverse of the numbers above) is a nice galaxy for Southern Hemisphere observers, but how well can it be seen all the way up here? It is higher in Declination than the bright star Fomalhaut, and about on a par with the Helix Nebula in Aquarius. It is above the faint stars of Sculptor which lie beneath a triangular asterism in Cetus, so has to be caught earlier in the month around 17:30 before it starts dipping too low.



There are some globular clusters still in the sky after dark, especially M15 and M2. M15 has a nice star hop route from Enif in Pegasus. But M2 is across a long way from alpha Aquarii and above beta Aquarii. M2 has a tighter, brighter core, which really responded to the Atik camera on the 20 inch telescope. It gave a beautiful picture in just 2 seconds of exposure.

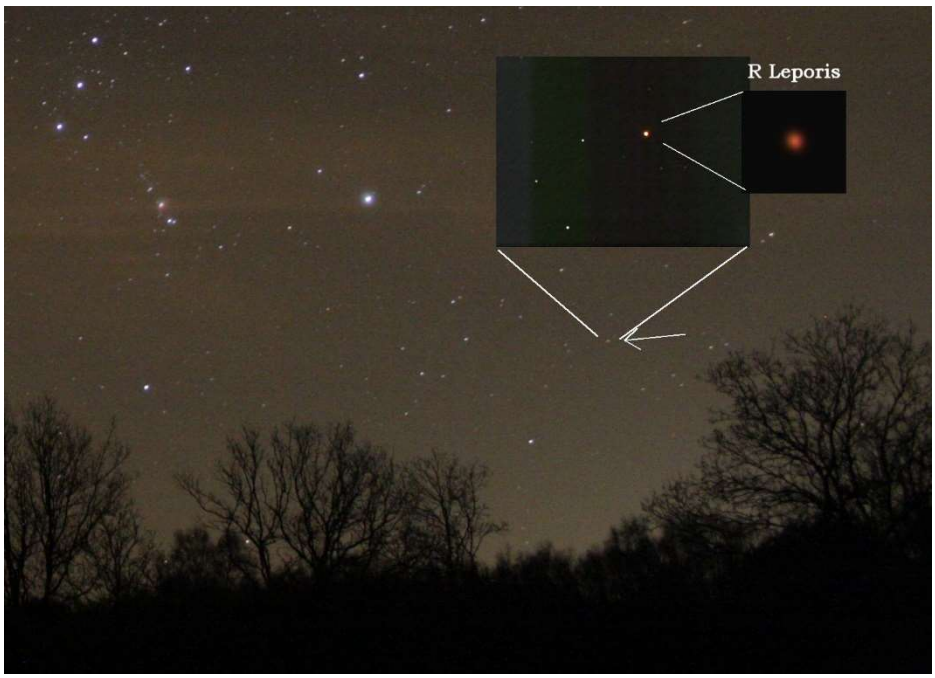


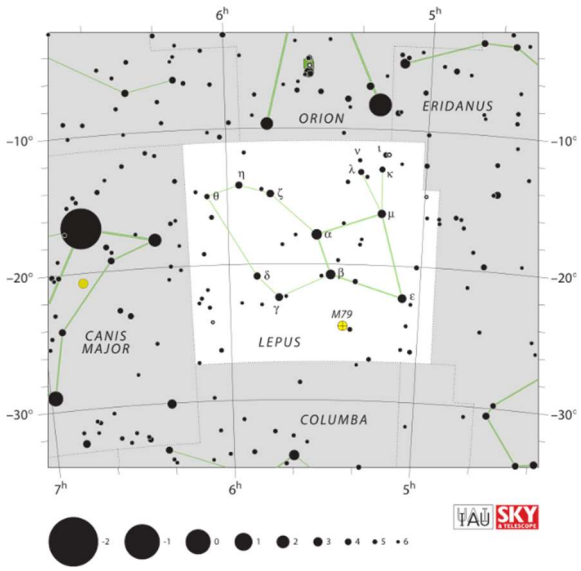


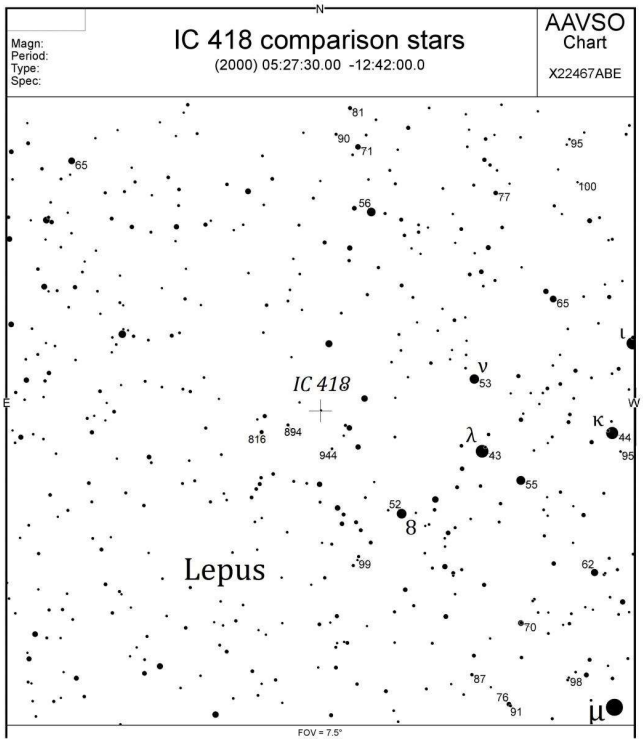
An interesting double with a G0 and A0 star of 6 and 7.6 magnitude 45 arc seconds apart is OΣ525 (Otto Struve 525) in Lyra, which is near the Ring Nebula. Lyra is still up after dark, so check it out, along with the double-double epsilon Lyrae in the triangle at the top of Lyra. You should notice some colour contrast. Of course Albireo (beta Cygni) is the favourite wide double.

If you are into coloured stars, my favourite red star, R Leporis, a carbon star that burns very cool, and is covered in soot, is in a great position for those with a reasonable Southern View. Lepus (of which the genitive form is Leporis) is the constellation below Orion when it rises high. It contains this star and another very small gem of an object, IC 418, called the Spirograph nebula, after Hubble took a close up of it and revealed its fine detail. It looks like a pink or even red circle

around a star on the 20 inch, with the right eyepiece, which is strange as you normally can't see H alpha emission, but it is especially concentrated in this nebula. The central star of IC 418 is fairly bright in comparison to its nebula, so averted vision may help if you have a smaller scope. See Picture for R Leporis and Chart for IC 418 below. See if you can match up the stars.







After all that difficult stuff, how about a lovely cluster to end the night. M41 in Canis Major is a wide pretty thing lying just below Sirius. It gets higher later in the night. See the photograph below that I got the other day with a 100mm f/2 lens South of Norwich. It is a great binocular object, just a bit low from the UK.

To round off this short guide, I'll mention that in January 2021, as Jupiter is sinking into the sunset horizon, Saturn will disappear first, but on January 12, Jupiter will have the company of Mercury 2 degrees to its left. All 3 planets will technically be in a binocular field of view. I think this would probably be too low to see. The planets may be found during the day only if you are EXTREMELY cautious and EXPERIENCED about how to handle the DANGER of the SUN. Mercury fades over the next few days but separates from the Sun, making it easier to find. So don't forget to check out Mercury if you can around January 23.

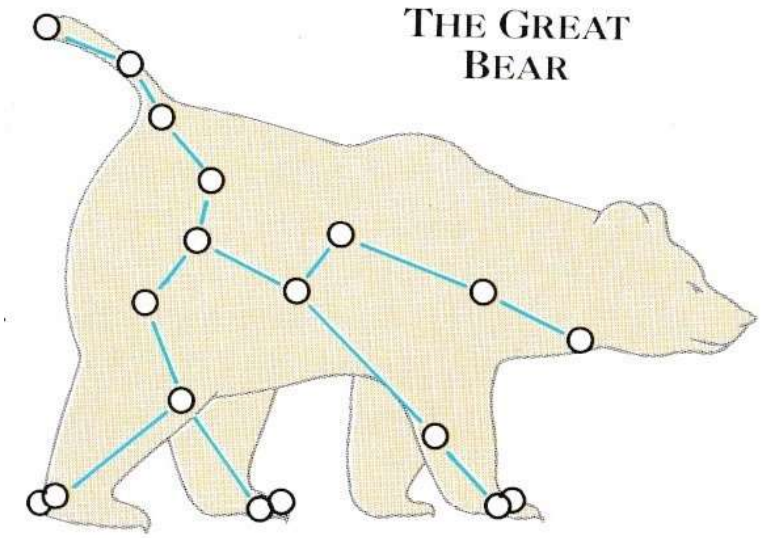
Mars and Uranus move 1.5 degrees apart (appulse) on January 19th. Mars looks tiny now and will only be 8.7" compared to Uranus's 3.6". This is the night the Moon returns to the skies.

Dan Self

Myths and legends of the cosmos,

Ursa Major and Cassiopeia

Alison Chapman



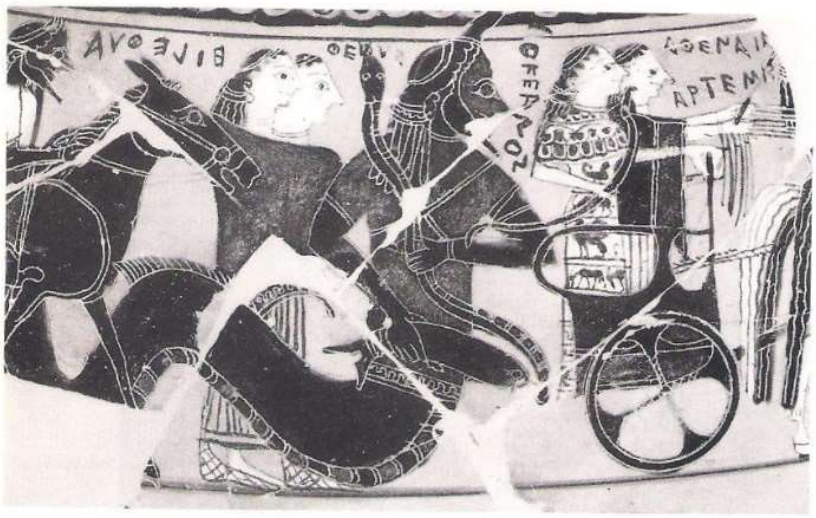
Two constellations that are easy to spot and always visible from the northern hemisphere are Ursa Major and Cassiopeia. They both rotate around Polaris, the north (or Pole) star.

Ursa Major (the Great Bear) represents Callisto, the daughter of Lycaon, king of Arcadia. She spent her time hunting in the mountains of Arcadia and often accompanied Artemis, the goddess of hunting. The name Callisto in Greek means ‘most beautiful’ and soon she caught the eye of that serial philanderer, the god Zeus. He seduced the girl and she became pregnant with a son, Arcas. Consequently, Artemis rejected her as a hunting companion. Zeus’s wife, Hera, ever suspicious, found out that Callisto was the latest object of his affections and punished her cruelly by turning her into a bear.

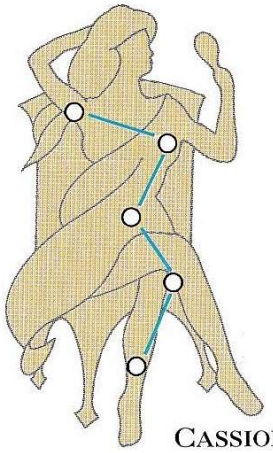
For fifteen years Callisto wandered about in the forests, afraid of both humans and wild animals, and forever mourning the loss of her human form. One day she came face to face with her own son Arcas when he was out hunting. He had no knowledge of the

The mountains of Arcadia

fate of his mother and, when the bear, with its eyes fixed on him, stood motionless instead of fleeing, he prepared to throw his spear. At that moment Zeus at last took pity on the mother and son and stopped Arcas's spear. He then immortalised Callisto in the stars as the constellation Ursa Major. Arcas became the brilliant star, Arcturus, in the nearby constellation of Boötes. Arcturus in Greek means 'bear guard' and perhaps Arcas keeps guard over his mother, ensuring the hunter Orion never comes too close.



Tethys and her husband in a wedding procession



Another feature of the constellation is also explained in myth. Hera, still hating Callisto and resenting the fact she had been so honoured, went to Tethys and asked as a favour that Callisto should never be able to cool herself in the ocean. This is why the Great Bear never sets, but revolves eternally around the Pole Star, high in the sky.

On the other side of the celestial pole is the constellation Cassiopeia. Its W-shape makes it as easy to recognise as the distinctive ‘Plough’ asterism of Ursa Major. In the story of Perseus Cassiopeia was the mother of Andromeda and the one responsible for causing the sea-monster Cetus to ravage the land. She had boasted that she was more beautiful than the Nereids, nymphs of the sea. They had complained to Poseidon and he had responded by sending a flood and the sea-monster to the land ruled by Cassiopeia and her husband Cepheus. A prophecy stated that only the sacrifice of Andromeda would deliver the country from this menace. When Perseus arrived and declared his intention to rescue Andromeda,

if he could marry her, Cassiopeia and her husband gladly agreed. However, at the wedding festivities, another of Andromeda's suitors, Agenor, probably summoned by her parents, arrived with an armed guard and demanded Andromeda for himself. In the ensuing battle, when he was greatly outnumbered, Perseus made effective use of Medea's head and turned everyone to stone. It was Poseidon who put the images of Cassiopeia and Cepheus among the stars. For much of the time Cassiopeia is upside-down in the sky, looking ridiculous, in order to teach her some humility. (It is sometimes said that she is tied in a wicker basket and whirled around in the sky.)

Perseus holding the head of the Gorgon Medusa

VNS Equatorial Platform Part 2

The first article was very last minute and together with newsletter re-editing it went to print with a couple of typo errors, sorry about that. I'm a hacksaw and hammer guy not a keyboard and mouse man which probably leaves the editor with a head ache.

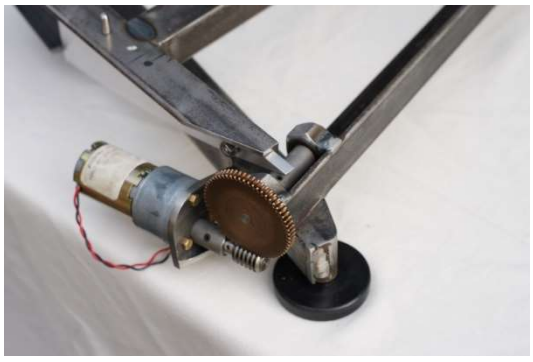
I have added some adjustable feet, the motor drive and some additional iron mongery to the frames. I spent some time with the positioning of the telescope and found it to be better balanced on the platform with the ground board on top of the upper tilting frame. I did consider removing the ground board and installing three bearing pads on the upper tilting frame, enabling the telescope rocker box to mount directly on the assemble. The foot pads have thread studs allowing some level adjustment and can be removed and replaced with spikes if required, they screw into some threaded sockets welded to the base frame.

A picture of the telescope (windy day) on the platform during the early stages of construction.

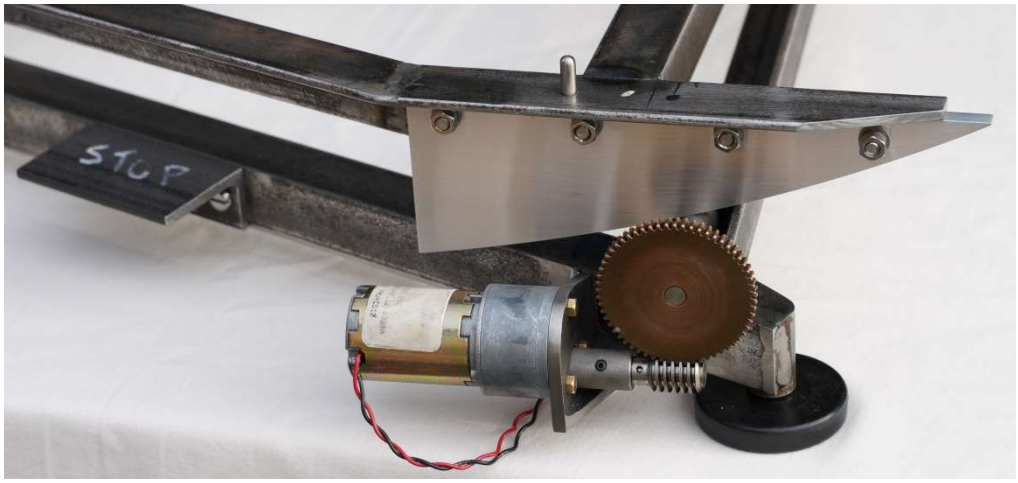
View of the north side with ground board

Two views demonstrating the angular movement for approximately 60 minutes, shown with telescope ground board and rocker box on top.

The platform is aligned north south, the point of the triangular frame faces south and the pivot point called the south bearing.



Different views of the construction and rollers.



Just above the right north segment is a short pin (removable) that engages with the ground board RH foot to stop the board from slipping off (there's another pin for the LH side) The bracket to left of picture is what it says a "stop" I intend to fit a micro cut out switch underneath so that will stop the motor when the segment get to the end of travel.

Just need to paint it, add an on/off switch and battery box, the motor will run on just a few volts via an adjustable voltage regulator.

The whole package is 4" high and will fit in a 24" square box, cost nowt apart from the paint, everything else from left overs.

Notable COMETS of 2021

C/2019 N1 (ATLAS)

C/2019 N1 (ATLAS) already reached perihelion on December 1st of 2020. However, being located at the opposite side of the sun its elongation (apparent sun-comet distance) has been very poor. As the comet is moving south on its highly inclined orbit, it will become better observable from the Southern hemisphere. Up until August of 2020, its increase in brightness has been some somewhat less than average, so I would expect the brightness of this comet to end up somewhere between magnitude 12.0 and 12.5 around closest approach on February 8 of 2021.

141P/Machholz

Periodic comet 141P/Machholz, discovered in 1994, has an orbital period of 5.3 years. From the year of its discovery the comet is already known to be accompanied by several smaller fragments from a pre-discovery break-up. For the 2021 apparition, the main component was recovered by PANSTARRS in August and then not seen for a while. It was observed again on December 4th by Alan Hale. On December 5, two smaller fragments were found by Michael Jäger, which have been tentatively identified as the fragments -b and -d as observed in 1994. The main component reached perihelion on December 16, 2020 and its brightness at the beginning of 2021 will be somewhere between magnitude 13.5 and 14. The comet will be closest to earth (0.53 AU) on January 19, 2021.

398P/Boattini

Following its recovery in August of 2021, periodic comet P/2009 Q4 (Boattini) has been redesignated as numbered comet 398P/Boattini. The comet has performed better than expected in the last months of 2020 and begins the year 2021 as bright as magnitude 12.2, conveniently located in the winter constellation of Orion. Perihelion occurred on December 26, 2020 so the comet is expected to begin fading ever more rapidly over the course of January and February of 2021.

246P/NEAT

Jupiter-family comet 246P/NEAT was discovered in 2004 and has an orbital period of 8.05 years. After a close approach to Jupiter in 2001, the comet's perihelion distance has decreased to 2.86 AU, resulting in increased activity. The comet was already extensively observed in the first half of 2020 with a reported brightness of magnitude 14 during the early summer, which is much brighter than the parameters published by the MPC would suggest. Images taken by Michael Jäger showed a very long (~2 degree) tail. It hasn't been observed after the summer due to low elongation, but it should be observable again in the morning sky by the time it reaches perihelion on February 22, 2021. Closest approach to earth will be on July 1st, at which time the comet will be located in the constellation of Sagittarius, favouring mid-latitude observers. Given the brightness estimates from 2020, it may reach magnitude 12.5 at closest approach.

C/2020 R4 (ATLAS)

Discovered last September, C/2020 R4 (ATLAS) is one to keep an eye on. Recent observations suggest that it has brightened rapidly between November and December. Although this could be an indication of fragmentation, it could also mean that the comet may become visually

observable in medium sized instruments from the Northern hemisphere around closest approach (0.46 AU) to earth on April 23, when the comet is also expected to be at its brightest. Perihelion will occur on March 1 already, but the comet will be distant (1.7AU from earth) and at poor elongation at that time.

28P/Neujmin

Periodic comet 28P/Neujmin has an orbital period of 18.44 years and will reach perihelion on March 11, 2021. Unfortunately, this apparition is not a good one. Elongation will be poor at least until July, at which time the comet's brightness is expected to have already dropped to magnitude 14.5 or fainter. Closest approach to earth will occur on November 6, 2021.

C/2020 N1 (PANSTARRS)

Comet C/2020 N1 (PANSTARRS) was discovered in July 2020 and is expected to reach magnitude 14.5 around perihelion on March 12, at 1.29 AU from the sun. Closest approach to earth will occur on February 3rd, 2021. A single visual observation from December 19 that puts the comet over a magnitude brighter than the overall trend, has yet to be confirmed.

C/2020 F5 (MASTER)

C/2020 F5 (MASTER) is a distant comet that will reach perihelion at 4.33 AU from the sun on March 24, but it will be at its brightest at closest approach (3.57 AU from earth) on August 21. It is not expected to get brighter than magnitude 14.3 or so. 10P/Tempel Also reaching perihelion on March 24, 2021 is 10P/Tempel. Unfortunately, the 2021 apparition of this Jupiterfamily comet is an unfavourable one with the comet at poor elongation until the summer, when it has already faded significantly.

C/2020 J1 (SONEAR)

Comet C/2020 J1 (SONEAR), discovered in May of 2020, will reach perihelion on 18 April 2021 at a large distance of 3.36 AU from the sun, just outside the main asteroid belt. Based on a relatively small number of observations, it can be expected reach magnitude ~13.5 around closest approach (2.37 AU) on May 16.

7P/Pons-Winnecke

As it does every 6.3 years, periodic comet 7P/Pons-Winnecke will reach perihelion on May 27, 2021. This apparition is quite favourable, as the comet will approach earth to 0.44 AU on June 12, just over two weeks after perihelion. The comet was recovered in January of 2020 when it was still as faint as magnitude 21. Parameters currently published by the MPC suggest that the comet would almost reach magnitude 8, but these values seem to be tied to estimates obtained when the comet was in outburst back in 2008. Looking at average data from 2002, 2008, 2015 a peak brightness of around magnitude 11.3 seems far more likely, unless of course a new outburst occurs.

C/2020 K5 (PANSTARRS)

Discovered last May and observed until late summer, C/2020 K5 (PANSTARRS) is currently not observable but may, based on default parameters, reach magnitude 14 or so around closest approach on May 19 and perihelion on June 5, 2021. Its highly inclined orbit favours the southern hemisphere.

F1 (ATLAS-Africano C/2019)

This distant comet has already been around for a while and will reach closest approach and perihelion on June 21 and 22 of 2021, respectively. It probably won't get brighter than magnitude 14, as observed from the southern hemisphere.

C/2020 T2 (Palomar)

Also reaching perihelion in the summer of 2021, but favouring the northern hemisphere for a change, is C/2020 T1 (Palomar). The comet has an orbital period of 5718 years. Unfortunately, approaching earth to 1.4 AU on May 12 and the sun to 2.1 AU on July 11 of 2021, the comet is not expected to get much brighter than magnitude 14.5.

15P/Finlay

Jupiter-family comet 15P/Finlay has an orbital period of 6.6 years and will reach closest approach on June 17, and perihelion on July 13 of 2021. This apparition is marginally better than that of 2014 and the comet may therefore be expected to reach magnitude 10 or so. During the 2014 apparition however, two outbursts occurred at which the comet brightened to around magnitude 8.5 and 7 respectively. Although outbursts are entirely unpredictable by nature, one can always hope for such events to be repeated.

8P/Tuttle

8P/Tuttle is remarkable in the sense that it has a very high inclination of almost 55 degrees, which is uncommon for short-period comets. Its orbital period is 13.6 years, and it will reach perihelion on August 27, 2021. Unfortunately, the 2021 apparition is as about as unfavourable as it gets, with the comet at poor elongation throughout the year.

4P/Faye

Discovered by Hervé Faye in 1843, 4P/Faye is yet another short-period Jupiter-family comet reaching perihelion in the year 2021. It has an orbital period of about 7.5 years, and in 2018 the comet approached Jupiter to 0.63 AU, which slightly reduced its perihelion distance from 1.66 to 1.62 AU. It will reach perihelion on September 9, and closest approach to earth on December 5, 2021. Between those dates, it is expected to brighten to magnitude 11 or so.

6P/d'Arrest

Jupiter-family comet 6P/d'Arrest has an orbital period of 6.5 years and will reach closest approach to earth (0.75 AU) on August 2, and perihelion on September 17, 2021. The apparition is quite good, and the comet is expected to be slightly brighter than magnitude 10 for about two months in August and September.

110P/Hartley

Although 110P/Hartley will be observable when it reaches perihelion on October 18, this apparition is far from ideal with the comet located at distance of 2.3 AU from earth at the time. The comet is not expected to be at its brightest (barely reaching magnitude 14) until closest approach in January of 2022.

67P/Churyumov-Gerasimenko

Were it not for its recently acquired celebrity status, 67P/Churyumov-Gerasimenko would have been little more than the next one in our list of Jupiter-family comets reaching perihelion in 2021. But now that the comet has enjoyed the companionship of the Rosetta spacecraft and Philae lander during its 2015 apparition, 'rubber ducky' has become the most extensively studied comet in human history. On November 12, 2014 the Philae lander performed the first successful landing on a comet and on September 30 of 2016 - at the end of its mission - the Rosetta spacecraft also ended up on the surface of 67P in a controlled crash. The apparition of 2021 marks the first return of 67P/Churyumov-Gerasimenko since those memorable events, making observations of this comet in 2021 not just interesting, but also scientifically relevant. If any noteworthy changes occur, attempts will certainly be made to correlate them to the scientific data that was obtained during the space mission. Around the end of 2018, 'Chury' came relatively close to Jupiter, slightly reducing its perihelion distance from 1.24 to 1.21 AU. Seen from earth, the 2021 apparition will be far more favourable than that of 2015. Perihelion will occur on November 1st , 2021 - only 10 days before closest approach at 0.42 AU from earth. It is expected to brighten to magnitude 9 or so at sublime elongation.

132P/Helin-Roman-Alu

The 2021 apparition of Jupiter-family comet 132P/Helin-Roman-Alu is the most favourable in many years, in part due to a close encounter with Jupiter in 2016 that has significantly altered the comet's orbit. The orbital period has been reduced from 8.23 to 7.66 years, and the perihelion distance from 1.91 to 1.69 AU! The comet will be at its closest to earth (0.74 AU) on October 9, and perihelion will follow just over a month later, on November 13, 2021. Based on previous activity, the comet is expected to become slightly brighter than magnitude 14, but the decreased perihelion distance may induce an increase in activity. This certainly is a comet that should be monitored closely during its 2021 apparition.

C/2019 L3 (ATLAS)

C/2019 L3 (ATLAS) will reach perihelion on January 9 of 2022, only three days after its closest approach to earth. Despite its large perihelion distance of 3.55 AU, it is performing well and has already been extensively observed in 2020. It probably is a large and active object and based on observations so far it is expected to brighten from magnitude 14 to magnitude 11 or better over the course of 2021.

22P/Kopff

Periodic comet 22P/Kopff won't reach perihelion until March 18, 2020. But by the end of 2021 it may already be observable, probably at a magnitude of somewhere between 12 and 13.

C/2017 K2 (Panstarrs)

This extraordinary object was discovered while already active at a mindboggling distance of 16 AU from the sun. It will not reach perihelion until December 19, 2022 at 1.8 AU from the sun, but this remarkable comet has been gradually brightening since its discovery in 2017 and is already as bright as magnitude 15 at the end of 2020. It is expected to have reached magnitude 11.5 by the end of 2021.

Comets are active objects that can behave unpredictably. Therefore predictions about their future performance are constantly evolving based on newly acquired data. For up-to-date information on current bright comets, see: astro.vanbuitenen.nl/comets

Gideon van Buitenen, 30 Dec 2020

Constructing an Observatory Part 2

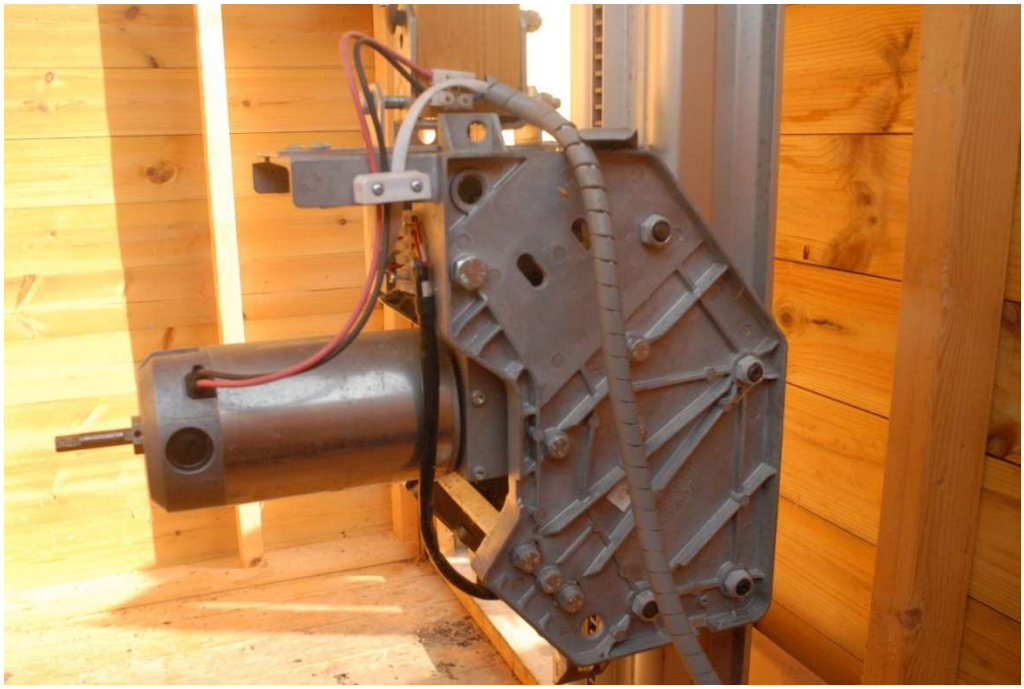
Back in July I produced an article on the construction of an observatory building that I originally built some 5 years ago and has stood the test of time. At the end of the article, I promised to write a second part to show the fitting out and use of the observatory. Apologies for the delay, but I will now attempt to put the experiences into words. The site of the observatory was one of the determining factors in the design with the room being in two parts with the top section lifting to almost vertical (hinged at its top edge) and the lower section sliding down to be clear of any line of sight. The reason for the top section moving in the way that it does is that there is a road behind; although about 15-20 feet below the level of the observatory the concern was lights reflected off the hedgerow trees and bushes.

The upper section has proven to be highly effective with there being no visible difference in the light pollution of images taken whilst cars or lorries are passing behind the observatory. The lack of a Northern horizon is a bit of a disadvantage, but the advantages are far outweighed. A roll-off roof design would not have given the protection from the road and would have taken up almost twice the ground area.

Powering the roof.

With both sections moving in such a way it was considered that power operation would be an advantage. I had at the time the opportunity to acquire two short stairlift mechanisms that had been removed from a house before it was sold due to the passing of its previous residents. Apparently, there is no re-sale value in these normally as the manufactures will not refit stairlifts that have been used before.

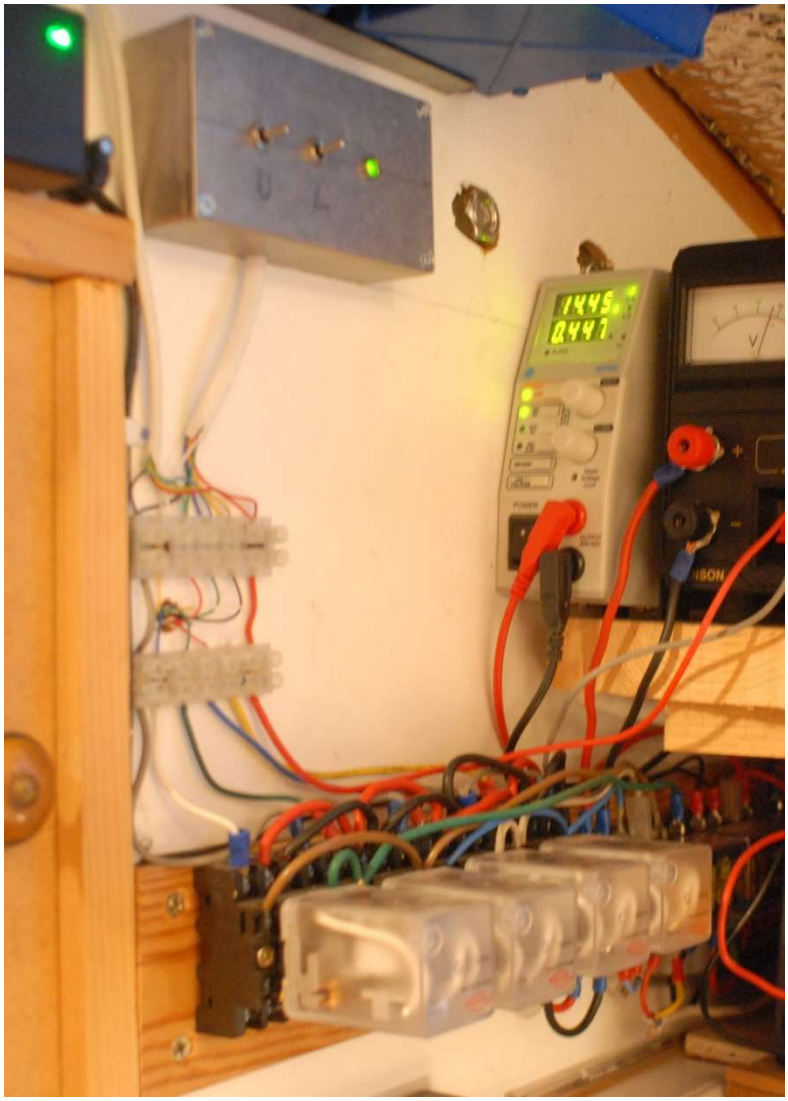
Both units were stripped down and the unnecessary parts removed and disposed of (seat etc). The motor/gearbox and limit switches were retained. For the upper section, the motor works in the normal manner and runs vertically along its track. For the lower section, the motor is fixed to the structure and the rail moves in and out. The advantage of this is that the rail also structurally strengthens the roof section when it is cantilevered out in the open position. Because the mechanisms cannot be in the centreline of their roof sections, additional assistance is required to stop them racking out of true. For the top section this is in the form of a gas strut and on the lower section there is a counterweight which runs on a cable that passes above the door.



Motor for top section (the hex rod allows for manual operation in an emergency, either by hand or battery drill)

The other advantage to these motor/Gearboxes is that they drive through a worm drive, so with the motor stopped there is no chance of movement. Also, when closed the roof cannot be moved from outside and is therefore self-locking.

With the motors fitted and working, attention turned to the control circuitry. This needed to be robust and reliable so high-quality plug-in power relays were used to control the main power to the motors. These are housed in the Warm Room with the control wiring.



The relays are in the lower part of the picture. There are four- two for each section (Up and Down) This arrangement allows the limit switches in the actuators to be used. The silver box at the top is one of the control boxes (the other being in the telescope section but is identical). The green light shows control power is available. The use of relays means that the current flowing in the control circuits is low and the only high-power circuits are the ones from the relay contacts to the motors. The motors can take up to 24 volts but normally run at 12 volts with no problem, taking about 5 amps to lift the top section of the roof. All circuits are fully fused which can be glimpsed to the right of the relays. The roof

has so far operated for five years with only one problem when a limit switch wire came loose but was easy to find and fix.

Pier and Mount

The Pier is an Altair Sky Shed 8. This is set on 4 X 1 metre pieces of stainless steel stud bar that are set in concrete as described in Part 1. It has mounted on top a Skywatcher EQ8 with optical encoders on both axis. The choice of mount was primarily to have a high carrying capacity and accurate tracking capability. Another advantage of this mount is its ability to have PEC (Periodic Error Correction). This is then saved within the software for use regardless of the mount being turned off. This has improved the tracking capability considerably. The mount was drift aligned as I have no view of the pole from this site. This was done carefully over a period when the mount was first set up and has been checked several times since; it has not as yet required adjustment. It has proven to be a good setup and allows the telescopes and mount to be stored at a custom parked position without loosing orientation. There is not enough clearance under the roof to park the mount in a normal 'Home' position.

There have been several telescopes used on the mount. The current setup has two telescopes permanently mounted.

1/ 9 ¼ inch Celestron SCT. (This is the older version when they were still manufactured in the USA)

2/ 110mm F7 William Optics Refractor

These telescopes were both bought second-hand at different times although they were originally from the same observatory.

This combination has so far proven to be very good, covering most of what I feel I want to do. They are both excellent examples of their types.

On top of the William Optics is fitted an auxiliary Vixan style dovetail. This is used for a variety of auxiliary equipment including an 80mm guide

scope, an ETX125 used for sun and moon, and also the WO Star 71. It can also be used for a ball head for camera/lens mounting. To handle the balance simply, each piece of equipment has a stop on the dovetail and the inner counterweight is moved against a spacing bar for each setting. This allows different setups to be completed quickly and simply.

Both main telescopes are mounted on Losmondy style dovetails and the dual mounting bar is mounted on the mount with the same style of dovetail. This gives a very rigid arrangement.

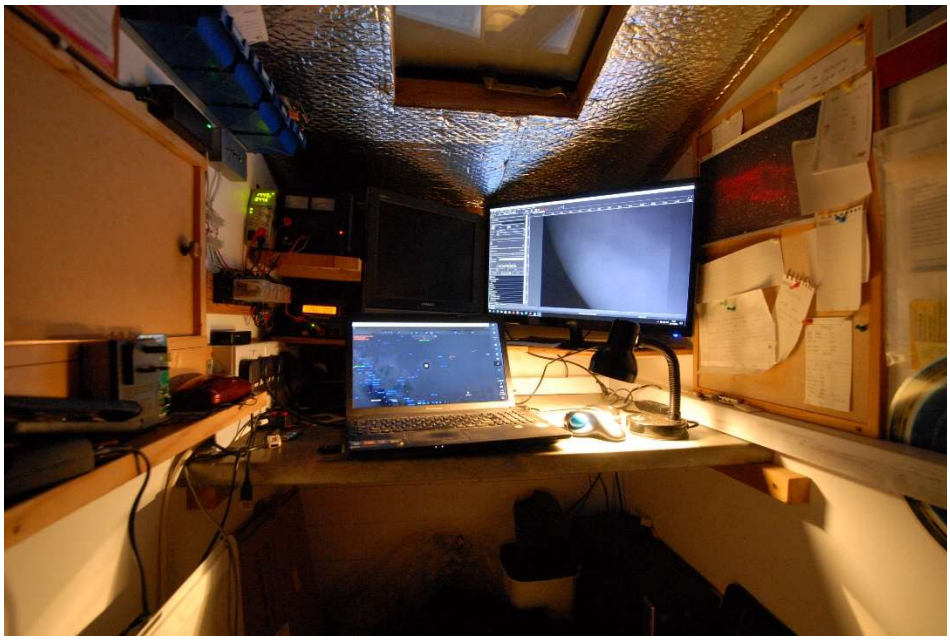
The image shows the general arrangement (set up for white light solar imaging.) The ETX125 with solar filter is on the auxiliary mount. Above the William Optics is a homemade solar finder with a 50mm William Optics finder behind. On the wall by the door (below the red and white lights) is the second control panel for the roof.

Warm Room

The warm room is separated and heated using an oil filled radiator. This keeps the area warm and dry. The heater is thermostatically controlled

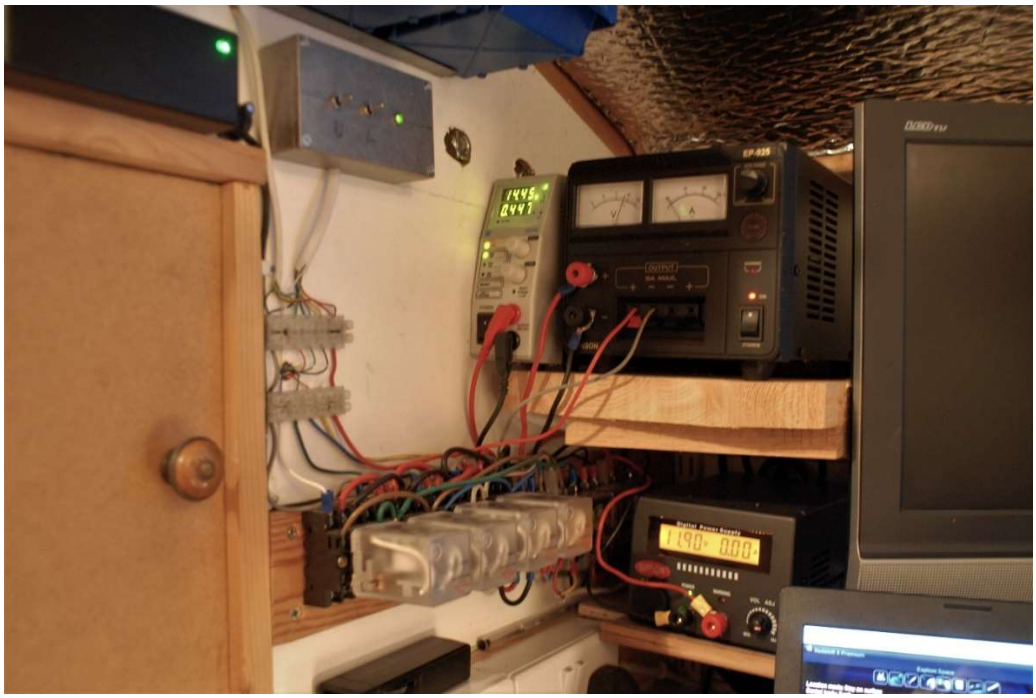
and keeps the room at about 14° C. The Warm Room is quite small but adequate for single person use.

The Warm room houses a desk for computers and all the power supplies. There is also secure storage in a steel cabinet secured to the base, together with bookshelves and storage for frequently used items.



In the above image the upper screen runs all the imaging and guidance. The lower screen (laptop) runs the planetarium software and mount control. I use Redshift 8 software mainly because I started with Redshift 2 and have stayed with it. I have used Stellerium but always seem to return to Redshift. There is a third screen just to the left of the upper screen. This is used for low level IR cameras which are used to monitor the movement of the mount and also finder work. The image was taken when imaging the sun so the third screen is not required. Also visible in this shot is the skylight which is double glazed and gives a view of the sky at night to monitor for clouds. It is covered with an external blind in this daytime image.

On the left can be seen a small window to the telescope area, which had its cover on when the image was taken. In the previous picture it is visible below the solar finder.

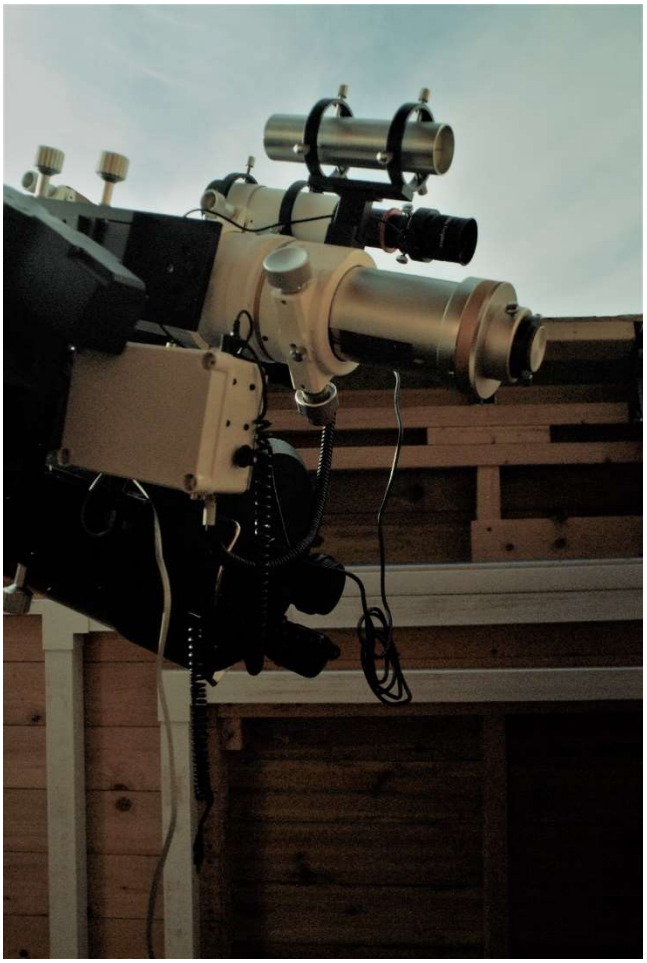


The image above shows the power supplies. The small white one on the top shelf is for the mount and runs at 14.5 volts as recommended by the manufacturers. At this voltage, the currant draw is less than half an amp. Next to it is the power unit for the roof and roof control system, and below is the 12-volt stabilised supply that is used on the telescope for cameras, heaters etc. The black box above the window frame next to the roof control is a dedicated power supply for the USB hub mounted between the telescopes. The blank screen to the right is the one mentioned previously for the low light IR cameras.

All cables to or from the mount/telescopes are carried in two cable trunk-ways with removable covers. There is a lift-up section in the floor to allow access to the cables. Two trunk-ways are used to keep power cables away from signal cables. This arrangement makes it easy to add, remove or replace cables as circumstances require.

The two cableways are on the left, the upper one carries power circuits and the lower one carries signal cables. (There is a spare piece of trunking lying on the upper trunk way.)

Between the telescopes there is a 10-way powered USB2 hub, This replaced a USB3 hub which was found to be unreliable over the distance required. On the opposite side of the same plate is a grey/white box that contains the Arduino. This runs through a motorshield up to four dew heaters taking its input from a sensor for temperature and humidity and calculating the dewpoint. This box also controls two focus controllers (on ETX125 and 9 ¼ inch), intervalometer signals, and power for Telrad finder and illuminated reticule in the WO finder eyepiece. These supplies were added to avoid my forgetting to turn the finder off and meeting flat batteries the next time I tried to use them.



That is the story to date. There are several ongoing projects which I will present at some time in the future.

If any other observatory owner would like to share their experiences, then an article would be appreciated. Please send to newsletter@brecklandastro.org.uk

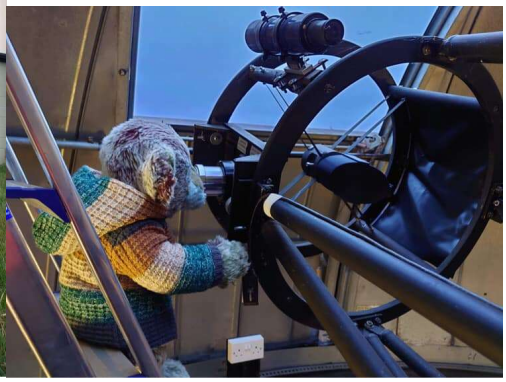
Chris Bailey

Observatory Visits 2020

As most of you probably know I took over as the Observatory Visitor Coordinator from John Gionis back in March 2020, and then what happened "Covid" which pretty much put a stop to most visits during the year and obviously is still the case now.

However, we have managed a few visits with Covid restrictions in place.
If my memory serves me right, we have been able to accommodate 6 visits during the season, mostly for people celebrating a birthday be it from a 13-year-old to a 40-year-old.

One in particular deserves a mention though, where the visitor brought his teddy along to do some observing.



I think these images are great.

But the most challenging but rewarding was a request from a schoolteacher from Scole CEVC Primary who asked if we could do a "Virtual Visit" as her class was learning astronomy during the school term.
Dan and I tested the possibility of using Zoom and it seemed to work okay with just a short time delay.
The date was arranged, and the teacher sent us a list of question the children had written in advance.
The "Virtual Visit" went really well, and I asked the teacher for some feedback as this was new ground for us, and something we may be able to do in the future.
Well, the feedback we got was not what we expected, as she got all the children to write thankyou letters themselves.
The letters will be on display at the observatory, when we can open again, for you all to see.
But here is a selection of some of their comments.

"Thank you for showing us around your incredible Observatory"

"My favourite part was when the Dome moved"

"You answered our questions really well and you were kind to us"

"The pictures are very cool. They made me think how big the universe is and how small we are"

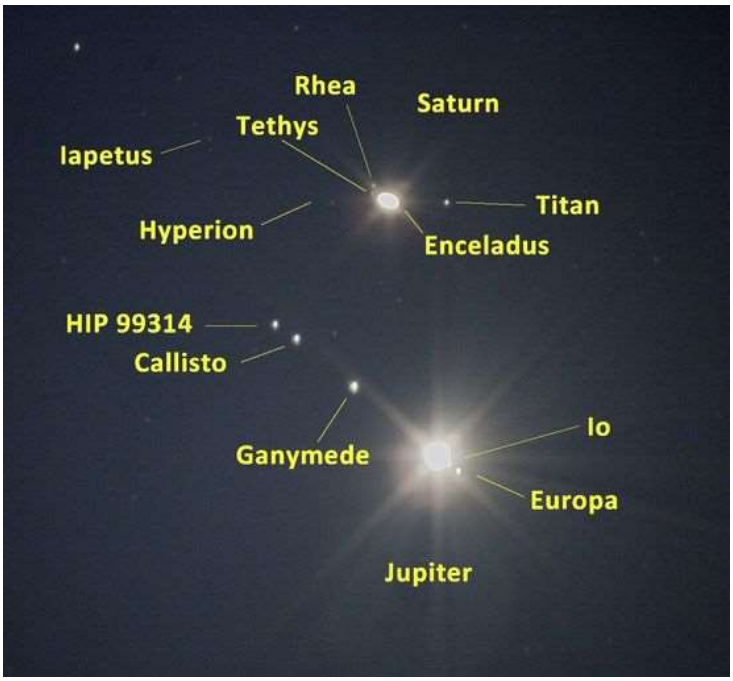
In fact, most of them said one of their favourite parts was seeing the photos on the wall.

Let's all hope that 2021 sees an end to the pandemic and all the restriction and we can get back to opening the Observatory to the general public again.

Mick Ladner

Members Astro-photographs

Dan Self



Saturn and Jupiter on the 20 inch 20th December. Hyperion is a bit iffy but there is a smudge there if I squint. So many moons in one image!

20th Dec Jupiter and Saturn Last 6 Contrast enhanced

Jupiter & Saturn 20inch telescope Short exposure

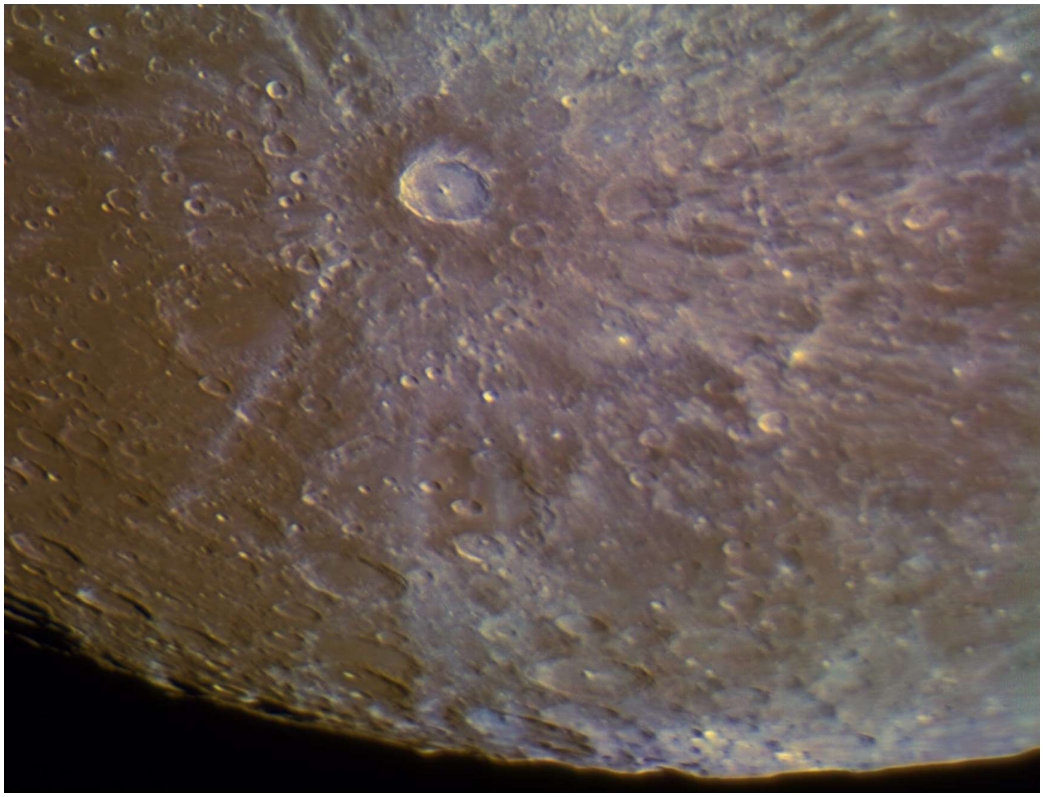
Jupiter Saturn View from Observatory.

M31 10 X 1 South of Norwich 100mm F2

NGC 246, the Skull Nebula in Cetus. This is a planetary nebula of around 8th magnitude in total, however it's usually hard to see visually due to its large size and low surface brightness.

Taken on the 20 inch with the modified Canon 1000D and L-Enhance filter and focal reducer at f/3 after viewing the conjunction. The filter has revealed a much sharper, smoother nebula than I've managed to achieve before, and revealed the reddish centre.

I used the STV and 200/50mm binocular lens as an auto guider. The guide star was a little way off, so had to limit exposures to 30 seconds - and I got 33. Plenty of darks were taken, but flats weren't used (to avoid noise). The image is a slight crop and rotation and has had some processing.



Moon pic from 27th December Ramped up the saturation to overdrive (after a colour balance calibrate and colour smoothing). So these are natural colours, just exaggerated a lot (7x). The bluer areas are Titanium rich, I believe.

The area is Tycho crater and Clavius below it on the South of the Moon. Stacked 223 x 1/200" in AutoStakkert, 8"@ f/10.

Jay Hensley

Mick Ladner

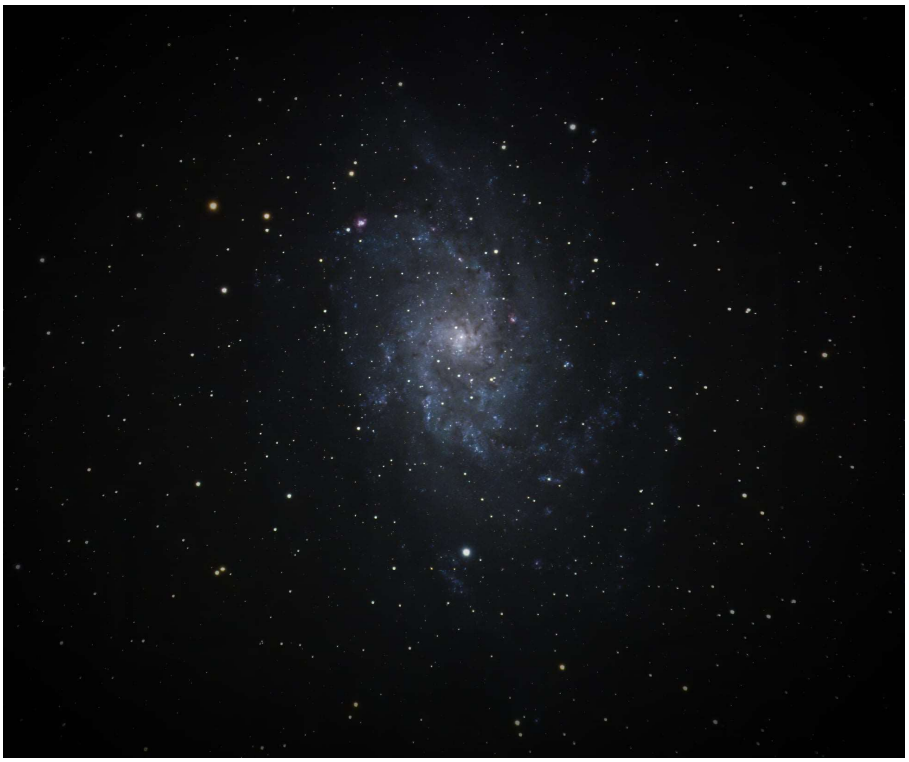
First light from The Orchard Sky Shed, an old favourite of mine an image of M45 The Pleiades in the constellation of Taurus 444.2 LY away, also known as The Seven Sisters.

Spent a while last night/this morning getting the new mount all set up, hadn't been able to do anything since getting it about 3 weeks back now due to the bad weather. ended up with just 10 60 sec subs of the Orion Nebula,

Sat 19th at 16:24.

16 x 120 sec subs on the Flame and Horsehead last night before the clouds put a stop to it. Ended up only 12 were usable, so this is only 24 mins worth of data.

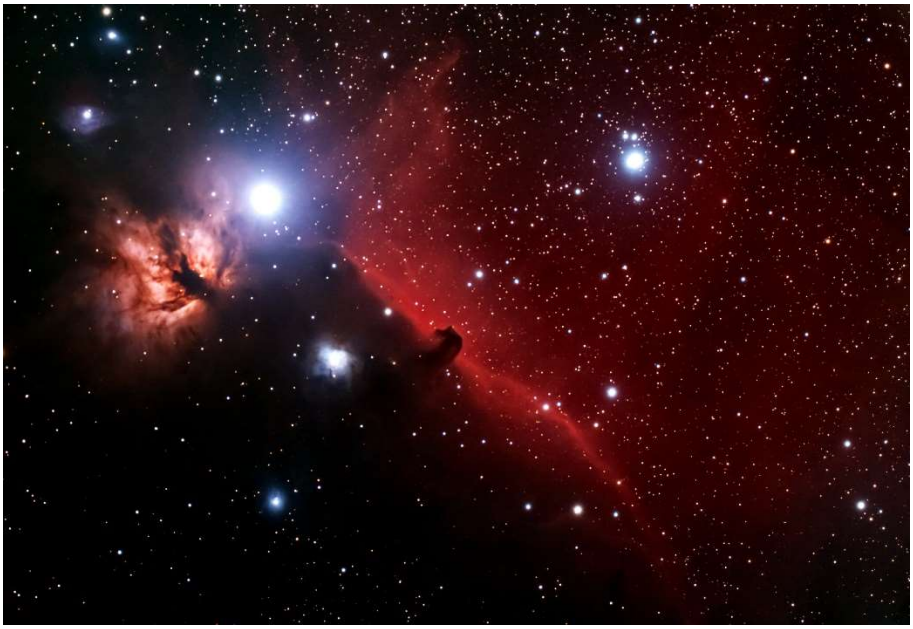
Darrell Brown



15mins of data from the Altair 26c

My first image out of the Altair 26c 45 mins no calibration frames

About an hour on m45, not really edited it just pushed levels up, another great pic from the 26c from altair



An hour using Altair 26c.

Malcolm James Dent

Best 3000 from 5000 frames. f5.

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.

Full Astrophotography Setup £4600 (May split if required.)

For examples of the capabilities of this setup see images By Darrell Brown in the Members Astrophotography Section.

Full astrophotography setup, some of the best equipment money can buy currently, the new very sort after altair astro 26c is currently one of the best osc camera's on the market if not the best in its price bracket, the altair astro 102edt triplet produces amazingly good colours in stars and nebula, fitted with a 60mm altair guide scope and one of altairs better mono guide/planetary cams the 290m, the power comes from the advanced pegasus powerbox that also controls the dew bands and can control focus motors, the new v3 0.8 reducer and a filter holder with a quad band filter which produces stunning images.

All sitting on one of the most sort after mounts the ioptron cem60 astrophotography mount with 2 altair losmandy plates making it very sturdy setup. This kit is only a few months old and is in perfect condition apart from a few marks on the mount but nothing major, the mount is a few years old, it also includes an extra weight and flight boxes for both scope and mount head and all wires to control it.

Its also fitted with the ioptron ipolar built-in to the mount, I am waiting for an adapter for this but should be here soon but can be sent on, but it still works fine as is.

Your welcome to view it but I wont except paypal, only bank transfers or cash on collection, I will also post for a fee and it will have to be insured at your cost, or for petrol money if not too far I will deliver.

Along side this is a Intel nuc to enable remote control of this amazing kit, 120gb of space 8gb of ram enough to run all programs needed for Astrophotography.

This whole kit would cost somewhere in the region of £7000 new but I'm asking £5000.

If your wanting a setup or wanting to upgrade your kit you won't be disappointed with this setup it amazes me what this setup can capture.

I'm reluctantly selling this kit due to a family emergency where I need to fund something more important, don't hesitate to message me with any further questions you might have, again most of this kit has only been used a handful of times at most, it's practically brand new.

I've now reduced the price of the complete setup but that will be the final price, if you are interested in any of the items separately then message .

Macmandarrell1@gmail.com

07711109154


ALTAIR

CONTACTS

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Newsletter Chris Bailey
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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)

Breckland Astronomical Society Events – 2021 7:30pm Great Ellingham Recreation Centre, Watton Road, Great Ellingham, Attleborough, Norfolk **Google Meet – details to follow - £free** **We may return someday! Hall entry £2.50 £1 U18s**		
Friday, January 8th	**The Vikings at Barsoom part 1 – orbital operations**	Paul Money (the one and only)
Friday, January 29th	**Public open night (subject to public mobility)**	Observatory
Friday, February 12th (palindrome date!)	**Cosmic Dawn and Destiny (follow up to Hawking/Edge of Physics)**	Paul Fellows, Cambridge AS
Friday, February 26th	**Public open night (subject to public mobility)**	Observatory
Friday, March 12th	**Building an Observatory + The Crisis in Cosmology**	Malcolm Dent and Dan Self (BAS)
Week March 10 – 17th Main: Sat, March 13th	**Spring Star Party 2021* (*star walk/talk Sat eve*)**	Haw Wood Farm (see below)
Friday, March 26th	**Public open night (subject to public mobility)**	Observatory
Friday, April 9th	**The Vikings at Barsoom part 2 – the search for life**	Paul Money
Friday, April 30th	**Public open night (subject to public mobility)**	Observatory
Friday, May 14th	**Our Moon – a closer look + AGM**	Jerry Workman (in person)
Friday, June 11th	**Comets past and future**	Nick James, BAA
* Haw Wood Farm Caravan Park, Hinton, Saxmundham, IP17 3QT. www.hawwoodfarm.co.uk to book: info@hawwoodfarm.co.uk 01502 359550. £12 per pitch per night subject to updates		

DASH has kindly invited us to the following great talks in early 2021 To ask to join please email **Jim** in advance on dashastro.info@gmail.com		
Sunday, January 24th	**Quasars and Their Influence on Galaxy Evolution.**	Amy Rankine, IoA Cambridge
Thursday, January 28th	**Surveying the Sky for Radio Galaxies**	Prof Martin Hardcastle Uni of Herts.
Sunday, March 28th	**The Čerenkov Telescope Array**	Prof Michael Burton, Director Armagh Obs
Friday 23rd April	**Effects of Impacts on Planet Atmospheres**	Catriona Sinclair.