
Journal

of the

Nottingham Astronomical Society

December 2023



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Thursday, December 7th

**Nottingham Emmanuel School
Gresham Park Road,
West Bridgford,
Nottingham, NG2 7YF**

7:45pm (doors open at 7:15pm)

This evening we welcome

Peter Jenkins

who will be speaking on

**Astrophotography
Past and Present**

Chairman's Message, December 2023

Dear Members,

Almost the end of the year. Where does the time go! The last couple of events we have are a talk on astrophotography with I'm sure some absolutely stunning images from Peter Jenkins at the last Emmanuel meeting on Thursday December 7th. Then at the Plumtree meeting we have the AGM. You should already have the AGM pack, and there isn't very much changed. We decided to make the joint membership a family membership, which includes all people in a family home. So not really much change. The rest of the committee are standing again. After the AGM, which we hope will be relatively quick, we will have some mulled wine, mince pies and maybe other festivities to get us in the Christmas spirit. So hope you can come along, as we need a certain number of members to pass the AGM resolutions. Other than that not too much has changed. You may have seen in the AGM pack a few changes at the observatory, but the weather has yet again made the track unusable. We are still hoping that there will be some work on the access way, but we continue to watch this space. So best wishes to all, and if I don't see you before, a happy Christmas and New Year.

Julian

NAS Chair

Sky Notes

December 2023

Compiled by Roy Gretton



All times given below are in Universal Time

The Winter Solstice occurs in the early morning of December 22nd. The centre of the Sun will then be 23.436 degrees south of the celestial equator.

PHASES OF THE MOON

Phase	Date
Last Quarter	December 5 th
New Moon	December 12 th
First Quarter	December 19 th
Full Moon	December 27 th

This month the Moon is closest to Earth on the 16th, and furthest on the 4th.

THE PLANETS

Mercury puts in an appearance in the evening sky in the first half of December, although it will always be setting before 5 pm. Greatest eastern elongation (21.3 degrees) occurs on the 4th. It will return to inferior conjunction on the 22nd, thereafter becoming a morning object rising over an hour before the Sun on New Year's Eve.

The brilliant morning apparition of **Venus** continues, with the planet remaining brighter than magnitude -4 for the rest of the year. At the end of December it will still be rising three hours before the Sun.

Mars remains unobservable this month, having passed through conjunction as recently as November 18th.

Jupiter continues to adorn the evening sky, being due south at 9:30 pm as December begins, and at 7:30 pm at the end of the month. Its brightness will be fading slightly from magnitude -2.8 to -2.6.

Phenomena of Jupiter's satellites

The **reappearance of Jovian satellites from eclipse** is the easiest type of phenomenon to observe with a small telescope (say, 50mm aperture). As we are now viewing Jupiter after opposition, satellites will reappear from eclipse on the east side of the planet (viewed from Earth). Next in ease of observation (with instruments of 100mm aperture and above) are **shadow transits**. In this case, look for a dark spot crossing Jupiter's disk. Lists of eclipse reappearances and shadow transits visible in the evenings this month are given below. *In the case of reappearances, start looking **several minutes ahead** of the stated time, because this refers to the moment when Jupiter's shadow bisects the satellite.*

December	Reappearance from eclipse of
5 th	Ganymede 21:40
7 th	Europa 21:44
9 th	Io 18:32
16 th	Io 20:27
23 rd	Io 22:22
25 th	Europa 16:51

December	Shadow transit of
1 st	Io 17:09 to 19:20
8 th	Io 19:05 to 21:15
15 th	Io 21:01 to 23:11
16 th	Europa 16:49 to 19:08
17 th	Io ends 17:39
22 nd	Io begins 22:57
23 rd	Ganymede 18:14 to 19:53
23 rd	Europa 19:25 to 21:43
24 th	Io 17:26 to 19:35
30 th	Ganymede 22:17 to 23:55
30 th	Europa begins 22:00
31 st	Io 19:22 to 21:31

Saturn will be setting at 10pm at the start of December, and before 9pm by the end of the year, so the current apparition will soon be drawing to a close, although it won't completely disappear before the end of January. By next summer it will be only 6 degrees south of the celestial equator and therefore higher in our sky than it has been in any year since 2011.

Uranus, a few degrees northeast of Jupiter in the constellation of Aries, is visible all night, having passed through opposition on November 13th.

Neptune, magnitude 7.8, now just over 3 degrees south of the celestial equator in the constellation of Pisces, will be setting at midnight in mid-December.

METEORS

This year we have a highly-favourable return of the **Geminids**, our richest annual meteor shower. Peak activity is expected in the early evening of December 14th, with a 2-day-old Moon (near perfect). Best views are expected near to midnight on that date, giving us a great opportunity to view these meteors, or to attempt to image them, weather permitting.



The Geminid radiant

DIARY DATES 2023-2024

Monthly Meetings of the Nottingham Astronomical Society

1. Meetings at
Nottingham Emmanuel School
Gresham Park Road,
West Bridgford,
Nottingham, NG2 7YF

Held on the **FIRST Thursday** of each month **(unless otherwise stated)**
except **August**

Doors open at 7:15pm for 7:45pm start.

*These events are normally centred around a talk by a visiting speaker,
except Quiz Nights, etc, when NAS members provide the activities.
Normally we have a **Helpdesk** open at each meeting.*

Date	Topic	Speaker
December 7 th	Astrophotography Past and Present	Peter Jenkins
January 4 th	Interstellar Interlopers	Phil Sutton University of Lincoln
February 1 st	(TBA)	(TBA)
March 7 th	Exploring the distant universe with cosmic explosions: what reionized the universe?	Nial Tanvir University of Leicester

2. Social and Practical Astronomy Meetings at the Burnside Memorial Hall, Plumtree

Church Hill, Plumtree, Nottingham, NG12 5ND
Held on the **THIRD Thursday** of each month from **7:30pm**

These meetings are of a more informal nature, providing opportunity for members and guests to share their hobby over a cup of tea or coffee, as well as listening to a short talk or discussion

The next meeting will be on **December 21st** and will be our **Annual General Meeting**, followed by festive food and drink

Social and Practical Astronomy, Plumtree, November 2023

The **November** Plumtree talk was delivered by NAS member David Dunford, who gave a fascinating talk on his journey exploring what solar telescope he should purchase. I hope David is going to submit a summary of his talk to the Journal along with some of the many web links to internet sites he mentioned. David can be seen here cutting the cake Chris kindly made, and decorated with the name David and a depiction of the Sun.



After David's talk, there were many questions and a good discussion. A number of members had also brought along their own solar scopes to show others. Sam Boote talked about his Coronado [PST](#). Graham Winstanley showed his [Daystar](#) Solar Scope. James showed the Daystar [Quark](#) and his 50mm Double Stacked [Lunt](#) Solar Scope. Baz Chacksfield brought along his [Solarscope](#) which is also double stacked. Baz is pictured below (right) with Julian.



The **December** Plumtree will be the **AGM**, accompanied by festive snacks and drinks, and something educational, yet to be decided.

Thank you to all who have helped out at Plumtree over the last year. The Plumtree meetings remain a highlight in the calendar for many of us and if anyone has an idea for a Plumtree meeting or wants to contribute to one we would welcome that.

James Dawson

Observatory Director

observatory@nottinghamastro.org.uk

Etalons: what are they and what do they do?

At the November Plumtree meeting there was a lot of mention of the etalon filter in solar telescopes, and I've found an excellent explanation of how they work and why some require an external power supply etc. I have copied this word for word from an online forum and given a link to this forum topic. This was written in 2014.

Everything you always wanted to know about Fabry Perot etalons but were afraid to ask

A FP etalon is a type of “interference” filter which uses two highly polished, exceedingly flat, and precisely spaced partially reflective mirrors facing each other to achieve an ultra-narrow bandpass of usually less than ~ 0.1 nm (1 Ångstrom). The gap between the mirrors can be either solid or open (air-spaced). Light entering the etalon is reflected in the gap and resonates back and forth, and depending on the wavelengths being in or out of phase, can either be reinforced or destroyed – e.g. constructive or destructive interference.

Several interacting factors can affect how such an etalon filter performs:

Peak Transmission – Depending on the spacing of the etalon plates (gap thickness), various wavelengths can be selected, with their associated harmonics falling on either side of the desired wavelength of light. This spacing of solar filter etalon plates generally needs to be changed in order to “tune” the etalon, which shifts the etalon peak to account for environmental conditions, or allows better viewing of off-band phenomena. Solid etalons usually do this by changing the etalon temperature, and thermal expansion and contraction changes the spacing of the mirrors; or tilting the etalon, which results in a greater path-distance for light to travel between the etalon plates. Air-spaced etalons can change the spacing by several methods: tilting as just described; pressure tuning, which changes the air density – and hence gap refractive index -- and slows down the light making it “feel” as if it is going a longer distance resulting from increased air pressure/density; or mechanical pressure on the etalon spacers which changes the etalon plate separation.

Bandpass -- technically referred to as the FWHM - full-width half-maximum - is the width of the transmission profile at one-half of the filters maximum transmission at the design frequency/wavelength, usually denoted in Ångstrom units for solar filters. For solar applications, narrower is generally considered to be better. Bandpass is a function of the size of the gap between the reflective surfaces, and the reflectivity of the mirror coatings: The larger the gap, or the higher the reflectivity, the narrower the bandpass.

However, as one might infer, the higher the reflectivity, the less the transmission: at 100% reflectivity no light would pass through, and at zero reflectivity there would be 100% transmission, but no interference, and hence no narrow-band filtering. The reflectivity at the desired wavelength is therefore chosen somewhere in between, and usually results in a peak transmission of around 60% for a single etalon.

Etalons can generally be made down to a FWHM of 0.03 nm (0.3 Ångstrom) but will be rather dim in overall view when this "narrow." Narrower bandpasses can also be achieved by “stacking” multiple etalons, but the overall transmission will also be lowered. For example: the practice of double stacking two etalons with 60% transmission will have a combined transmission of 36% ($0.6 \times 0.6 = 0.36$).

Free Spectral Range -- the distance between the harmonic resonant peaks passed by the etalon. The smaller the etalon gap, the wider the FSR becomes. If the resonant peaks are too close together, they become harder to block using standard dielectric interference filters, and therefore the blocking filters become more expensive to make. Therefore the FSR is usually chosen to be around 1.0 nm (10 Ångstroms), and this value aids in keeping the out-of-band continuum light from getting through via the blocking filter.

Finesse -- defined as the ratio between the the FSR and bandpass, and the higher the better. An etalon with a finesse of 2 has a very broad and flat transmission curve, with a lot of out-of-band leakage and poor performance. An etalon with a finesse of 30 will have a very tall and narrow transmission curve with very good performance and virtually no out of band leakage. The typical solar etalon with a bandpass of 0.7 Ångstrom and FSR of 10 Ångstroms would therefore have a theoretical finesse of ~ 14 if perfectly made. This is where the optical flatness and parallelism of the etalon plates is of critical importance in the filter performance. When these are less than ideal, the noise floor of the etalon transmission curve rises significantly above zero, and background glow begins to be visible and interferes with faint prominences and low contrast disk detail.

So once we have established the basics of reflectivity and gap spacing, we can determine the filters bandpass. But this is a theoretical value only. Several issues can render the bandpass specification almost meaningless, such as the previously discussed etalon flatness, parallelism, and resulting finesse.

Another major factor to consider is the nature of how light passes through the etalon. An etalon only performs ideally with perfectly parallel light passing through it normal - or perpendicular - to the etalon plates.

Most etalons have another specification known as the “acceptance angle.” The acceptance angle is the angle away from normal (perpendicular) to the etalon that a ray of light can deviate and still be within the specified bandpass. As described above for tuning, as a light ray begins to deviate away from normal through the etalon, the path length through the gap increases, and the transmission peak is shifted toward the blue end of the spectrum, and the bandpass begins to widen as well. If the ray exceeds the acceptance angle, the filter falls “off band.” This has very important consequences for etalon design and placement.

If the sun were a point source of light, all would be easy. Unfortunately, the sun is a rather large object subtending a half a degree. When placed on the optical axis of a telescope, light from the sun’s disk center will be exactly normal to the etalon, but light rays from the sun’s limb will subtend about 1/4 a degree before it even enters the telescope. With a front mounted etalon, this usually is no problem, as the acceptance angle for a 0.7 Å filter is usually about half a degree, and the entire disk remains on band. A front mounted etalon using tilt tuning therefore has about another 1/4 of degree or so of tilt available for tuning before the filter will begin to shift off-band, and therefore contrast uniformity is minimally affected.

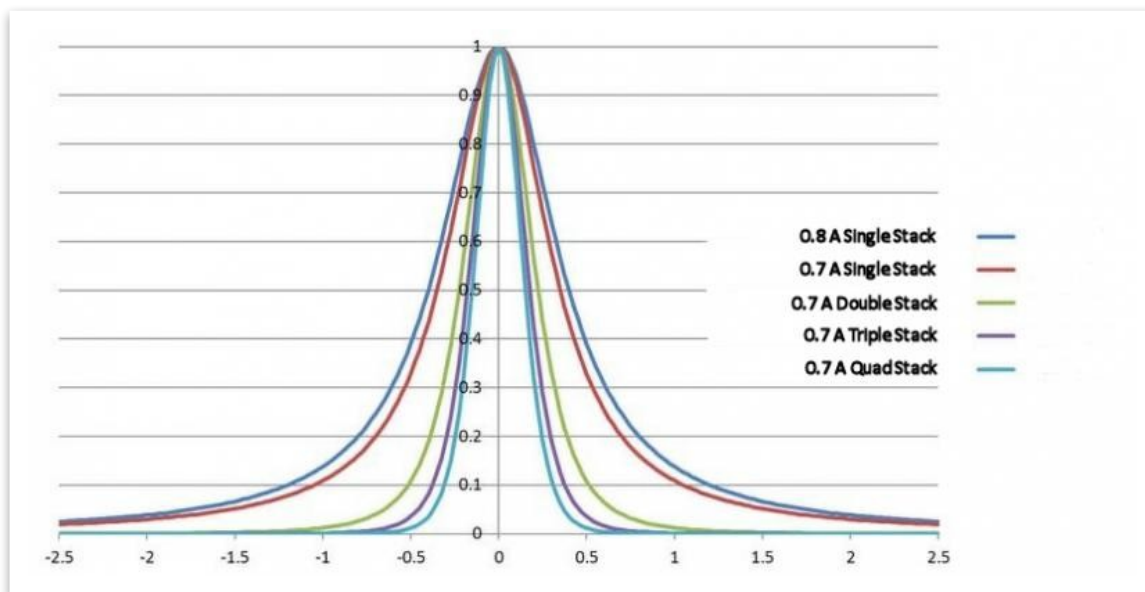
And we can now see why an etalon placed on the front of an objective has the best possible performance – there are no instrument angles to contend with, and the etalon deals only the field angle of the sun’s limb - which is low as can be obtained. However, as filter size increases, it becomes increasingly difficult to make with good flatness and parallelism, and

the practical limit is based on funds available to achieve an acceptable finesse. For this reason, etalons are rarely made larger than about 15 cm (six inches) in diameter.

As smaller etalons are more easily (economically) made to an appropriate finesse, an alternative placement is within the optical system behind the objective. This is usually done in one of two ways: via a collimator lens system or a telecentric lens system. However, one or both of these systems can introduce additional ray angles to contend with in the form of instrument angles and magnified field angles, which can degrade etalon performance, especially when these angles exceed the etalon acceptance angle. Using tilting for tuning the etalon only exacerbates the situation, and that is why pressure tuning or mechanical pressure tuning are much preferred. These issues can result in poor contrast uniformity, “sweet posts,” and “banding.” Properly configuring and optimizing the placement of an internal or rear mounted etalon is therefore supremely important if one is to realize the maximum filter performance possible.

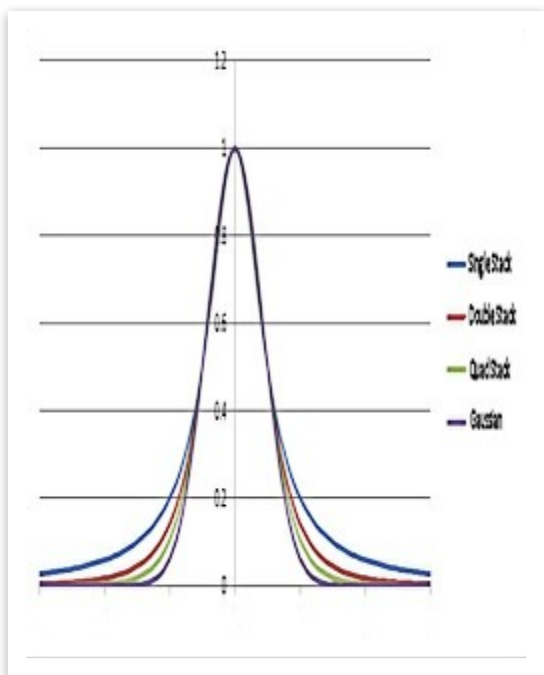
Lastly, another word about double stacking: As previously described, double stacking is used to decrease filter system bandpass, and this also results in a reduction in overall transmission. However, the filter becomes a “double cavity” filter verses a single “cavity,” and the transmission curve will be narrower and have greatly suppressed "tails" compared to an equivalent single filter with the same bandpass specification and finesse. A double stacked pair of 0.7\AA filters will have a bandpass of $\sim 0.5\text{\AA}$, but a transmission profile of a much narrower (higher finesse) filter. This keeps out-of-band energy from degrading contrast, and therefore the transmission profile of a solar H alpha filter system seems equally if not more significant than a bandpass specification alone.

A comparison from George 9 of transmission curves, showing the improvement stacking of multiple filters provides. The transmission peaks have been normalized to better the comparison. While bandpass is reduced significantly, note the vast reduction in the filter "tails" from single to double stacking 0.7\AA filters. While triple or quad stacking offers a marginal improvement in both bandpass and tail suppression, in reality they would also have drastically reduced peak transmissions.



This representation, also from George 9, shows the difference between filters with an identical FWHM bandpass, but using a different number of "cavities." The blue curve is a

single stacked filter, the red curve is a double stacked filter, the green curve is a quad stack filter, and the purple curve is an ideal Gaussian curve. Again the transmission peak is normalized.



From: <https://www.cloudynights.com/topic/480925-etalon-basics/>

James Dawson

The Arecibo Radio Telescope Crash

Following Emma Chapman's recent talk which mentioned Arecibo, there is a video of the radio telescope collapsing, with the second half being the most dramatic. Follow the link:

https://www.google.co.uk/search?q=arecibo+puerto+rico+telescope+collapse&sca_esv=579769985&sxsrf=AM9HkKkUGgBwd21YV60q-aJnsNdCGovB0w%3A1699273769737&ei=KdxIZffPLLWYhbIP3aeWiAo&oq=arecibo%2C+puerto+rico+collapse&gs_lp=Egxnd3Mtd2l6LXNlcjAiHWFyZWNPYm8sIHB1ZXJ0byByaWNvIGNvbGxhcHNiKgIATIFEAAyGAQyBhAAGBYHjIGEAAyFhgeMgYQABgWGB4yCBAAGIoFGIYDMggQABiKBRiGAzIEAAyigUYhgMyCBAAGIoFGIYDSJlhUNUaWMk2cAF4AZABAJgBVqABkgWqAQE5uAEBYAEA-AEBwgIKEAAyRxjWBBiwA8ICBBajGCfCagcQABiKBRhDwgIIEAAyigUYkQLCagYQLhgWGB7CaggQABgWGB4YD-IDBBgAIEGIBgQBBgg&sclient=gws-wiz-serp#fpstate=ive&vld=cid:94f87f17,vid:joLYVix5DLU,st:0

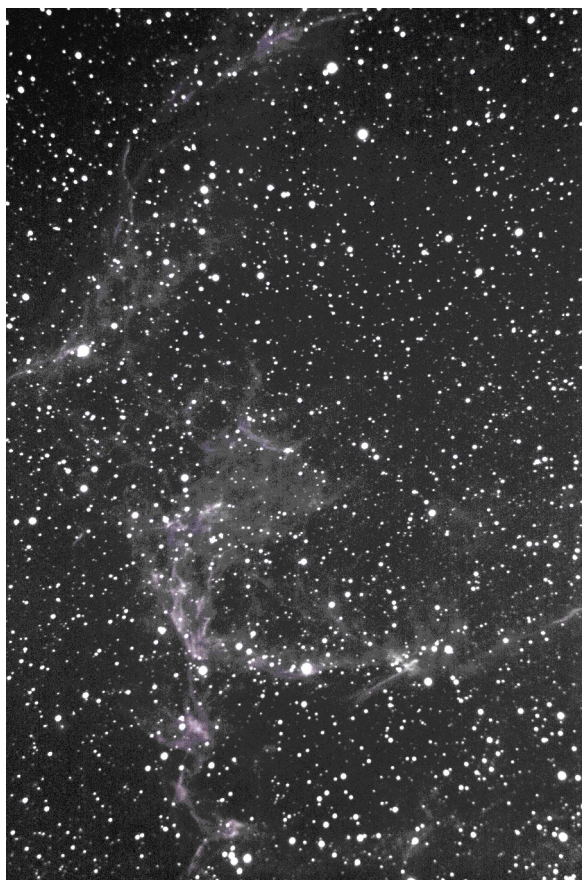
Neil Mudford

Two Views of NGC6995 through the same telescope

Both images of **NGC6995** (part of the **Veil Nebula** in Cygnus) were taken at ISO1600 with a Canon 450D at the focus of my C11 SCT, but using different focal ratios.



At f/6.3, using a focal reducer
108 x 30 sec exposures, stacked



At f/10, without the focal reducer
344 x 30 sec exposures, stacked

Roy Gretton

The Nottingham Astronomical Society: E - SERVICES

Whether or not you are a NAS member, you can keep up to date with details of the Society's meetings and other events by visiting the NAS website: www.nottinghamastro.org.uk

NAS on Facebook

You are welcome to connect with other members and friends of the NAS on Facebook by going to: <http://www.facebook.com/nas.org.uk>

NAS on Twitter

The Society has a Twitter account at <https://twitter.com/NottinghamAstro>

NAS Journal e-mailing list

To register for your monthly e-mailed link to the NAS Journal, and a copy of our SkyNotes, just e-mail secretary@nottinghamastro.org.uk

You don't have to be a Society member to take advantage of this service.

If you happen to change your email address, please remember to inform the Society by emailing us at treasurer@nottinghamastro.org.uk

Herbel Pabla reports on the Seestar S50

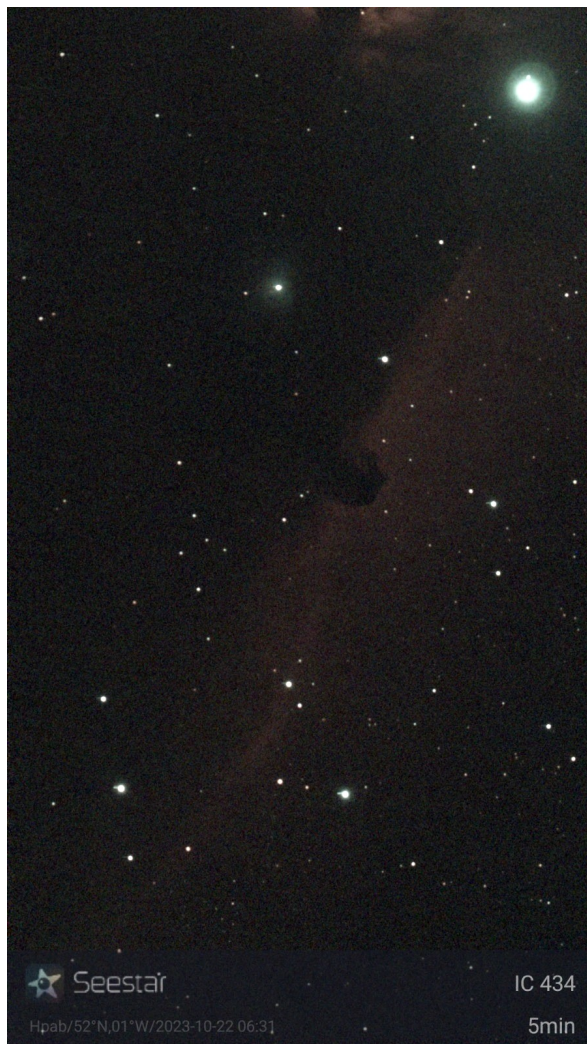
The **Seestar S50** is a 50mm triplet refractor with ASI462 sensor, and weighs 3kg including the tripod. I ordered this telescope in July this year at the promotional price of £459.

It arrived nicely packaged in a small lightweight bag. Initially opening it and trying to sync caused a little frustration but eventually I got it going indoors. The next day was sunny so I thought I would take it for a test drive. There were a lot of clouds that day and I couldn't get the telescope to fix on the sun. Finally on the following day there was a clear sky and the telescope easily captured the sun and stayed tracking it across the sky. I waited for a clear night sky and was able to easily locate and photograph some deep sky objects. The images I have taken on several different days.

The telescope is so easy to use. If you are not level, it will not fix on targets but also lets you know. Sometimes it wouldn't locate the target because of cloud cover, or that it needed calibration which involves rotating the whole scope 360 degrees.

The Seestar S50 is a well made and pleasant piece of gear to use and has saved me a lot of time in setting up each for each observing session.

Here is a selection of images that I have taken:





M45



M67



M33



Jupiter



M27



M31



M57



The Pleiades



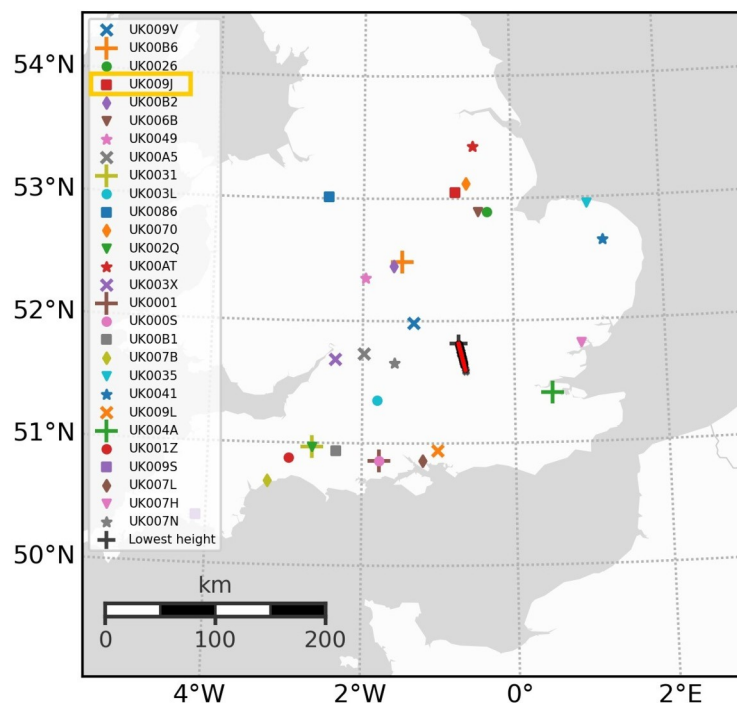
North American Nebula

Leonid Meteor

by Mark Fairfax
(Credit: UK Meteor Analysis)

The Leonid meteor shower - a medium shower with peak around 17th November and expected ZHR of 15.

Despite the long run of poor observing weather I managed to capture a bright, fast-moving Leonid meteor on my UK Meteor Data camera set-up on 15th Nov at 06:05 UTC.
(Visual magnitude -3.0; Vg 71.15 km/s; mass 0.14g)



My UK Meteor station ID is UK009J and the bold red line on the UK map is the passage of the meteor.

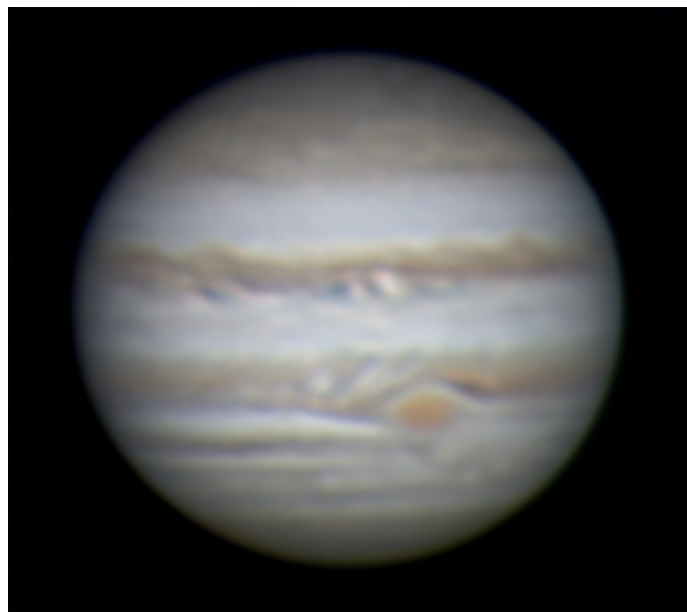
Lunar Occultation of Venus

Image taken by **Richard Severn** through a Skywatcher ED80 Refractor with a Canon EOS 6D on Thursday 9th November. The image was taken approximately 1 minute after Venus had reappeared from behind the moon. ISO400, exposure 1/4000s.

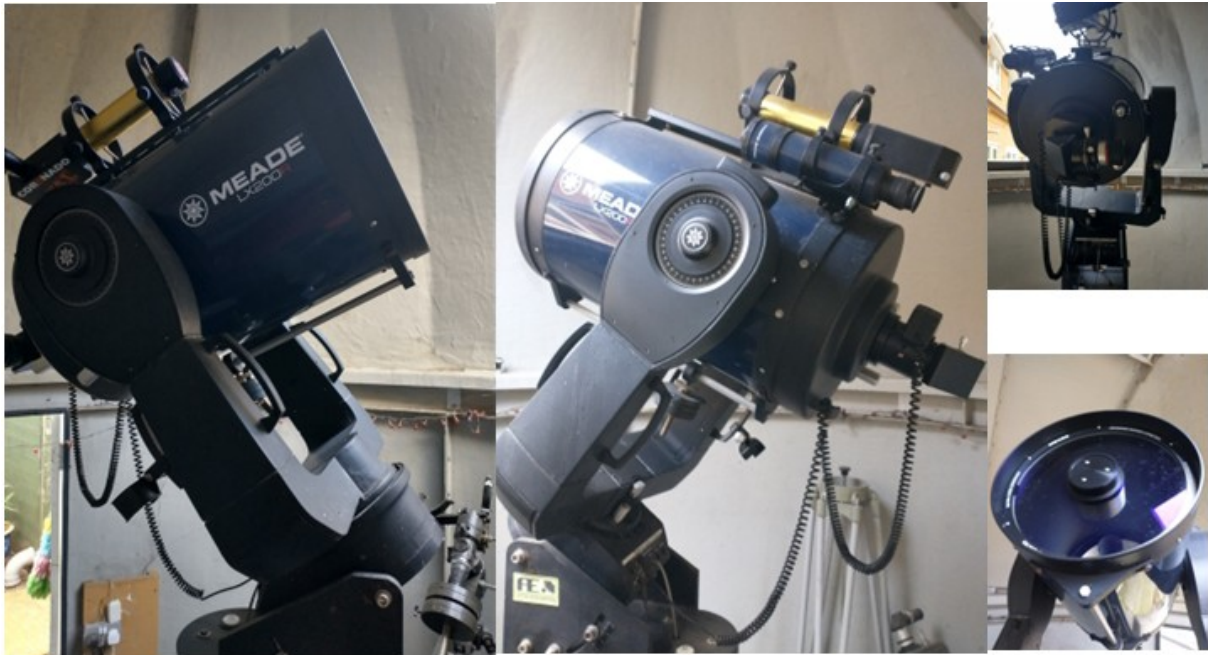


Jupiter

Imaged by **Richard Severn** on 2023 November 11 at 21:14 UT
Equipment Celestron C14, ZWO ASI224MC camera, TeleVue PowerMate x2, ZWO ADC
Exposure:
Shutter=2.336ms, Gain=375 (62%)



Advertisements



For sale in Loughborough:-

The vendor is "death cleaning" and wanting to sell his under-used astronomical equipment to others who would value it.

Meade LX200R 300mm SCT, purchased new in 2006. It is mounted on a Meade fork mount, with an AE Equatorial Wedge and on an AE Pier. It is GPS enabled and has level north and goto facilities but sadly I never mastered these. Sidereal drive rate is excellent.

A 300mm white light solar filter stopped down to 100mm, a Bahtinov mask and Telrad finderscope are available, along with a selection of eyepieces and a Barlow, at additional cost.

The Pulsar Observatory is 12 feet in diameter, purchased at the same time in 2006, as it was always intended to be user and visitor friendly.

The buyer MUST arrange to dismantle and carry the items away after purchase at their own expense. The Observatory and telescope were delivered and installed by a team of three people (without any cranes or lifting equipment!).

The vendor has a hearing loss so initial contact by text or email is preferred.

Email:- north_star_observatory@hotmail.co.uk

Text:- 0791 442 7387

Visits by potential buyers can be made by mutual arrangement.

Realistic offers for the items are invited. Good luck!



FOR SALE

Meade ETX90 Maksutov-Cassegrain telescope

with

Deluxe field tripod

Carrying case

4 Super Plossl eyepieces (all 1.25-inch)

Erect image roof prism

2x apochromatic Barlow lens (1.25-inch)



£600 or near offer

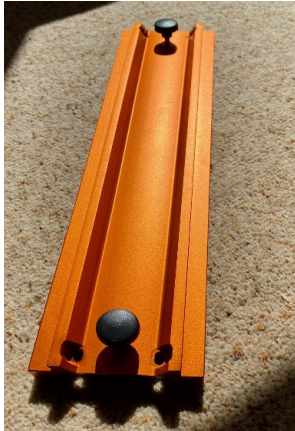
Contact Mrs Clayton

01949 860022



FOR SALE

Celestron dovetail bar to fit C11 telescope.
New, unused **£15**



Celestron 9 x 50mm finderscope and
mounting bracket. New, unused **£45**



Achromatic object glass
50mm diameter
focal length approx 40 cm

£5



British army brass telescope by Broadhurst Clarkson
42mm aperture, with leather sling

£10



Contact Roy Gretton, 07483868162
journal@nottinghamastro.org.uk

Telescope looking for a good home

We've been contacted by someone who lives near Langar who no longer wants this telescope. It is a 114mm reflector with GOTO mount. It needs a new battery pack, but these can be made or sourced quite easily. It comes with two eye pieces. The gentleman is happy to exchange the telescope for a couple bottles of wine or some such exchange. He just wants it to go to a good home and get used.



If you are interested in this, please contact Alan Dodson

alandodson2@gmail.com

Nottingham Astronomical Society

Affiliated to the **British Astronomical Association**
Member of the **Federation of Astronomical Societies**
Supporters of the **Commission for Dark Skies**

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Holly Gonzalez McNiven

Mark Fairfax

Meetings

Our formal meetings, often with an illustrated talk by a guest speaker, **normally** are held on the first Thursday of each month (except in August) at:

Nottingham Emmanuel School
Gresham Park Road,
West Bridgford,
Nottingham, NG2 7YF

Doors open 7:15pm
Meetings start 7:45pm
Meetings end 9:15 pm

These meetings are open to the public, and visitors are welcome to attend, subject to a charge of £3 per meeting for adults.

Annual subscriptions 2023

Full	£30
Joint rate for partners	
living at the same address	£45
Under-18s and full-time students	£5

Subscriptions become due on 1st January. Half-price subscription is charged if joining after 30th June (minimum subscription £5).

Please make cheques payable to:
Nottingham Astronomical Society.

If you would like more information about the **Nottingham Astronomical Society**, or would like to become a member, please contact the Secretary secretary@nottinghamastro.org.uk or speak to any NAS committee member at one of the regular monthly meetings.

The Nottingham Astronomical Society

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