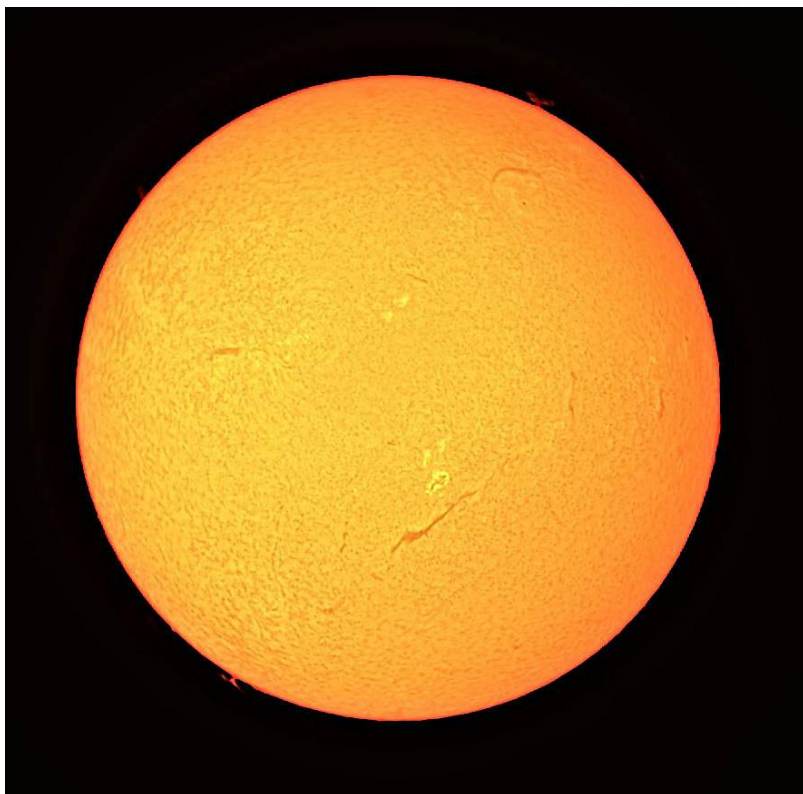


OBSERVING THE SUN



2023 04 02 Both in H-alpha light.

Mark Tweedie has been using the C&WAS club's Lunt 50mm H-alpha solar telescope to observe the Sun.

Read on page 7 how he got on.



2022 10 25 Partial Solar Eclipse.

CONTENTS

Page 2	"The Astronomer" Pub By Mike Frost
Page 3	ChatGPT By Dr.Anthony Cook
Page 4	Editors Bit By Ivor Clarke
Page 5	Pioneering Women of the BAA By Irene Rogers
Page 6	Isaac Newton's Apple Tree By Irene Rogers
Page 7	Observing the Sun By Mark Tweedie

“The Astronomer” Pub

By Mike Frost

Perhaps the highlight of the year for the British Astronomical Association is our Christmas meeting. It usually gets the highest attendance of the year as people come to London for the day; perhaps your partner is Christmas shopping whilst you are listening to the talks. This year we had Tim Parsons (a late replacement speaker) telling us about “A Massive Star Menagerie: touring through the upper reaches of the H-R Diagram” and Simon Kidd instructing us in “Asteroid Occultations. . . an observer’s view” on the best way of observing asteroid occultations. Our president David Arditti presented a number of awards, including the prestigious Goodacre Medal (jointly) to Bill Leatherbarrow and Gary Poyner. Nick James presented the Sky Notes, entertaining as ever. And that was the end of the proceedings.

Except that one of our Council members, Mary-Louise Archer, had decided it was time to hold a social event. The BAA Xmas meeting used to be paired with a Christmas dinner, which I attended on a couple of occasions; however, this fell out of favour more than a decade ago. And then of course we had the pandemic, and even meeting in person became difficult. So, with the post-pandemic opening-up, Marie-Louise decided it was time we met up again socially.

The venue was a rather ingenious choice. “The Astronomer” is a pub in Bishopsgate, not far from Liverpool Street station. Marie-Louise booked a basement suite, “The Hubble Room” and laid on nibbles and other refreshments. Entry was free for all BAA attendees, and non-council members got a token for a free drink (we felt that Council voting for free drinks for



council members didn’t look good, so we had to pay for ours).

Our function room was small, with tables to sit 40 people, and a series of booths round the outside, each named for a famous astronomer (Kepler, Ptolemy, Copernicus, Galileo and Newton, I think). There was an 1865 Wray refractor by the door, decorated with tinsel. The decorations were all astronomically themed. The roof was covered in hexagonal panels which some people claimed were inspired by the segments of the JWST, though I have my doubts.

We enjoyed a couple of hours of snacking and talking, latterly keeping an eye on the first half of the England-France World Cup quarter-final. Very enjoyable. Well, maybe not the football.

So, if you ever find yourself at Liverpool Street station with an hour before your train departs, nip round the corner to Middlesex Street and order a quick pint in an astronomically-themed pub. Just make sure your overdraft is pre-approved. Seven Pounds Fifteen for a pint! That’s London for you.

Further Information

www.theastronomerpub.co.uk is the website for the pub. There’s a gallery of photographs from inside the pub, which shows that the pub also features a selection of astronomical clocks, and an orrery. A google search reveals that there is also a pub called “The Astronomer” in Braintree, Essex, and a restaurant called “The Astronomer” at the Piece Hall, Halifax, W. Yorks. Who knew?!

Top, Astronomer Pub Sign. Left, Enjoying the social in the Hubble Room. Right, The Wray Refractor.



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ChatGPT

From the Director
Dr. Anthony Cook

Many of you may have heard some interesting claims about the use of OpenAI's ChatGPT. It is a lot more sophisticated than the Google search engine, Wikipedia, or voice devices like Alexa, in that it comes up with a well filtered short essay or paragraph, tuned to your needs. It is not quite like the fictional Artificial Intelligence of the HAL9000 computer on *2001 A Space Odyssey*, but perhaps more like Data from *Star Trek's Next Generation* in terms of its output. ChatGPT is certainly raising eyebrows in Universities in that it may make it more difficult to tell if coursework was written by students, or by Artificial Intelligence. It can even write short sections of computer programs. On the plus side though it is a good way to improve one's English, and grammar and students are finding it excellent to tune their job applications, and likewise researchers are using it to improve the style of their research applications.

In case you were wondering what use this is to the Lunar Section or amateur astronomers, I thought that I would demonstrate by asking this question: *"Please write me 600 words on geological evidence for shallow quakes on the lunar surface, in the style of TV Astronomer Patrick Moore"* :

Paragraph 1 : "Good evening, viewers. Tonight we'll be exploring the fascinating topic of shallow quakes on the lunar surface, and the geological evidence that supports their existence."

Paragraph 2 : "First, let's talk about what we mean by shallow quakes. These are seismic events that occur relatively close to the surface of a planetary body, as opposed to deeper quakes that occur within the planet's interior. On the Moon, these shallow quakes have been a subject of study for decades, ever since the Apollo missions first brought seismometers to the lunar surface."

Paragraph 3 : "One of the key pieces of evidence for shallow quakes on the Moon comes from the analysis of moonquakes recorded by the Apollo seismometers. In total, there were 28 shallow moonquakes recorded during the Apollo missions, with magnitudes ranging from 2.0 to 5.5 on the Richter scale. These quakes were all relatively shallow, with their epicenters located within a few kilometers of the lunar surface."

Paragraph 4 : "But what could be causing these shallow quakes? One possibility is that they are caused by the thermal stresses that occur as the Moon's surface goes through its day-night cycle. During the lunar day,

the surface can heat up to over 100 degrees Celsius, while during the night it can cool down to nearly -200 degrees Celsius. This rapid temperature change can cause the rocks on the surface to expand and contract, putting stress on the crust and potentially leading to shallow quakes."

Paragraph 5 : "Another possible cause of shallow quakes on the Moon is the ongoing process of lunar cooling and contraction. As the Moon cools, its interior contracts, which can cause the crust to fracture and create shallow quakes. This process is thought to be ongoing, as recent studies have suggested that the Moon is still cooling and contracting today, over four billion years after it first formed."

Paragraph 6 : "But what does the geological evidence tell us about these shallow quakes? One piece of evidence comes from the analysis of lunar rock samples brought back by the Apollo missions. These rocks show evidence of being fractured and faulted, with some rocks even showing signs of having been melted and then rapidly cooled. These types of features are consistent with the kinds of stresses that would be caused by shallow quakes on the lunar surface."

Paragraph 7 : "In addition, recent studies of the lunar surface using high-resolution images from spacecraft like the Lunar Reconnaissance Orbiter have revealed a number of intriguing features that may be related to shallow quakes. These include graben, or long, narrow depressions that form as the crust is pulled apart, and scarps, or steep slopes that form as the crust is compressed. These features are thought to be caused by the same kinds of stresses that lead to shallow quakes, and their presence suggests that such quakes may be more common on the Moon than previously thought."

Paragraph 8 : "So, in conclusion, the geological evidence supports the idea that shallow quakes are a real phenomenon on the lunar surface. While the exact cause of these quakes is still a subject of debate, they are likely related to the ongoing processes of thermal stress and lunar cooling and contraction. The study of these shallow quakes is an important part of understanding the geological history of the Moon, and may also have implications for our understanding of other planetary bodies in our solar system. Thank you for joining me tonight, and keep looking up!"

The only Patrick Moore style I can see above is perhaps in the first couple of paragraphs, and the very

last sentence of the final paragraph is more reminiscent of the catch phrase from Jack Horkheimer's (1938-2010) US series: *Star Hustler*. In terms of accuracy, paragraph 2 is right, as we did not know about shallow quakes until the Apollo missions. Paragraph 3 is spot on! Paragraph 4 highlights thermal stresses, and indeed there were very weak thermal quakes detected close to the Apollo Seismometers but these were primary due to surface rocks expanding/contracting and cracking with the huge day/night temperature swings on the Moon. However the regolith layer pretty much cancels out thermal stress below a few metres of the surface and so would probably not account for the shallow quake epicentres of a few km beneath the surface.

Paragraph 5 is correct to talk about contraction from cooling, but should clarify that cooling is over billions of years and horizontal stresses and strains that result can also vary regionally. The last sentence in this paragraph probably ought to refer to thrust faults and lobate scarps, some of which are still thought to be active. In paragraph 6, there are some Apollo returned rocks that exhibit melting and cooling, but there are many other explanations other than shallow quakes. I think that paragraph 7 is trying to talk about fresh

downhill deposits of boulders seen on the sides of graben and especially wrinkle ridges, that might indicate recent shallow quake activity? Finally paragraph 8 is a typical ChatGPT conclusion if you ask it to write an essay.

So to conclude, it has done a fair job, but has missed out a few key things that I have highlighted above – I would give it 5-6 out of 10. Beware that OpenAI warn users that occasionally ChatGPT results can be inaccurate. ChatGPT, and similar AI assistants will definitely find niche uses and improve significantly over time. Anyway you might want to give it a go, and explore, as it will give mostly accurate answers to any questions you have ever wanted to ask about the Moon. Some of the answers maybe quite thought provoking. But please remember that you will need to register first <https://chat.openai.com/chat> in order to use ChatGPT.

And finally, Congratulations to Barry Fitzgerald and Raffaello Lena for their paper on "*Lunar volcanic complex north-west of Lichtenberg*" published in the February BAA Journal.

Tony Cook.

Editors Bit

Years ago I heard a story about a Picture Editor, (this is the guy who's job it is to make magazine pages look attractive by picking the right picture to illustrate the story) asking for help and advice from a friend about a space science story he was trying to find pictures for in a magazine. It was to illustrate the story about size of the universe and how many stars there were. He had heard of the sun, moon, planets, stars and that was about his full know how on science and astronomical matters. His friend laughed at his lack of knowledge and suggested he have a look at some of the great photographs of the Andromeda galaxy, M31 as his main picture for the piece. "Great, that sounds like a good plan!".

Next time they met up some weeks later, his friend asked how the hunt for astronomical pics had gone. "Ho well, I decided not to use the photograph of the galaxy you mentioned." "Why's that?" "Well all the ones I looked at had all been taken from the same angle!"

In two to four billion years the Andromeda galaxy will start to look very different as we get closer, it will fill the sky and be moving even faster as the gravity of the Milky Way and Andromeda pull each nearer. What happens next is a guess. Will the two meet or sail past each other? At the moment it is travelling towards us at 68mps, 244,800 mph but it's still over 2 million light years away. Will alien astronomers in the far off universe get some nice images of our two galaxies looking like the Antennae galaxies, NGC 4038/9,

Caldwell 60/61 in the constellation of Corvus? They were discovered by Sir Willian Herschel in 1785. By then our star will be well on its way to becoming a red giant, so most of the solar system would be inhabitable.

From Tony Sturgess a few jokes:

A neutron walked into a bar and asked, "How much for a drink?"

The bartender replied, "For you, no charge."

F(x) walks into a bar. The barman says "Sorry, we don't cater for functions."

Q. Why are quantum physicists so poor at sex?

A. Because when they find the position, they can't find the momentum and when they have the momentum, they can't find the position.

Two atoms were walking across a road when one of them said:

"I think I lost an electron."

"Really!" the other replied. "Are you sure?"

"Yes, I'm absolutely positive."

There was an old Lady called Wright
Who could travel much faster than light
She departed one day
In a relative way
And returned on the previous night.

All from the "Times" newspaper dated 9th April 2009

Pioneering Women of the BAA

(British Astronomical Association)

By Irene Rogers.

A talk by Mike Frost, Current Director of the BAA's Historical Section, at CAWAS's meeting of 10th February 2023.

"I'm not using the microphone," Mike announced at the beginning of his talk. "I like to wave my arms about!" Thus preparing us for an entertaining, enthralling and enthusiastic presentation.

"*Pioneering Women of the BAA*" may not, at first glance, been the most enticing of titles for a mostly male audience but regular attenders know a talk by Mike would be worth turning up for, and so it was.

He outlined the differences in their attitude to women between the Royal Astronomical Society (RAS) founded in 1820, and the BAA, founded in 1890. The RAS, very much stuck in the old Victorian mindset that the roles of women were to run their households and be dutiful wives and mothers, was reluctant to have any women involved with it but by 1890, women could at least attend their meetings and have research published in their periodicals whereas the BAA had women involved from the very start.

And what women they were!

Observers and scientists; authors and adventurers: Mary Acworth Evershed, (1867 - 1949) the BAA's first Director of the Historical Section. She wrote the

"*Easy Guide to the Southern Skies*" when living in Australia and edited the BAA's "*Who's Who in the Moon*."

Lady Margaret Lindsay Huggins, (1848 – 1915), photographer and spectrographer, co-authored an *Atlas of Spectrography* with her husband William Huggins;

And the flamboyantly named Fiametta Wilson, (1864 – 1920), who ran a mandolin orchestra before becoming a prolific observer of comets and aurorae and publisher of articles and the Director of the BAA's Meteor Section along with another lady astronomer, Grace Cook.

This resume is to name but a few of the women Mike mentioned and doesn't include the intrepid balloonist, the solar eclipse follower, the electrical engineer and the world travellers.

Mike, an avid solar eclipse follower, held the attention of his audience to the last word. He finished off his talk by describing his ideal party guests' list. It, obviously, included some of the women he mentioned in his talk, plus a fellow (former rival?) solar eclipse follower, the late Sir Patrick Moore. (Mike 13, Sir Patrick 11).

If you missed this talk and see it advertised in the future, don't miss it next time.



Margaret Lindsay Huggins



Fiametta Wilson 1915

Isaac Newton's Apple Tree

By Irene Rogers

You can just imagine the young physicist Isaac Newton (1643 – 1727) sitting under the apple tree at his childhood home, contemplating the forces of the universe. Woolthorpe Manor, Lincolnshire, was Newton's birthplace and family home and he sought refuge there to work on his scientific theories after plague hit his university town of Cambridge in 1665. Legend has it that Newton formulated his theory of gravity after an apple from the tree in this garden fell on his head.

The apple tree's experiences with gravity continued in 2015 when its seeds were sent to the International Space Station. After the seeds returned to Earth, they were propagated and grown at various locations, including one at Woolthorpe, planted by astronaut Tim Peake. Six months' on, zero gravity didn't seem to have affected their growth and there is no doubt that, once ripe, the apples will fall to Earth as usual.

Newton's tree is a "Flower of Kent" – one of thousands of traditional apple varieties, many of which have fallen out of fashion. This variety has an unpleasant mealy texture and poor flavour, so the tree might have well disappeared if it weren't for its distinguished backstory.

Despite its familiarity in UK diet and culture, the domesticated apple is not a native species. Like many "modern" food plants, it originates from wild ancestors, in this case a crab apple – *Malus Sieversii* – from the mountains of Central Asia. Its long history of domestication began over 4000 years' ago and it probably spread westwards with nomadic people.

(I have lifted this article in its entirety from a National Trust magazine of 2022 that, in turn, was lifted from a new book, "50 Great Trees of the National Trust" by Simon Toomer, Curator of Living Collections, Kew Gardens. It's £10 hardback via Waterstones but I shall be buying it from my favourite, independent, bookshop.)



From Top Left clockwise, Woolthorpe Manor farmhouse, the old apple tree, C&WAS members on a visit in August 2004, bust of Newton and his instruments.

Observing the Sun

By Mark Tweedie

IMPORTANT: for the benefit of anyone unfamiliar with solar observing, what is described here is done using specialised equipment. Do not attempt this with a standard telescope, binoculars nor by directly looking at the Sun, as you will damage your eyesight and risk blindness.

Recently I had the privilege of borrowing the C&WAS club's Lunt 50mm H-alpha solar telescope. Never having observed nor photographed the Sun before, the prospect was exciting. Astronomy without the late nights, if nothing else!

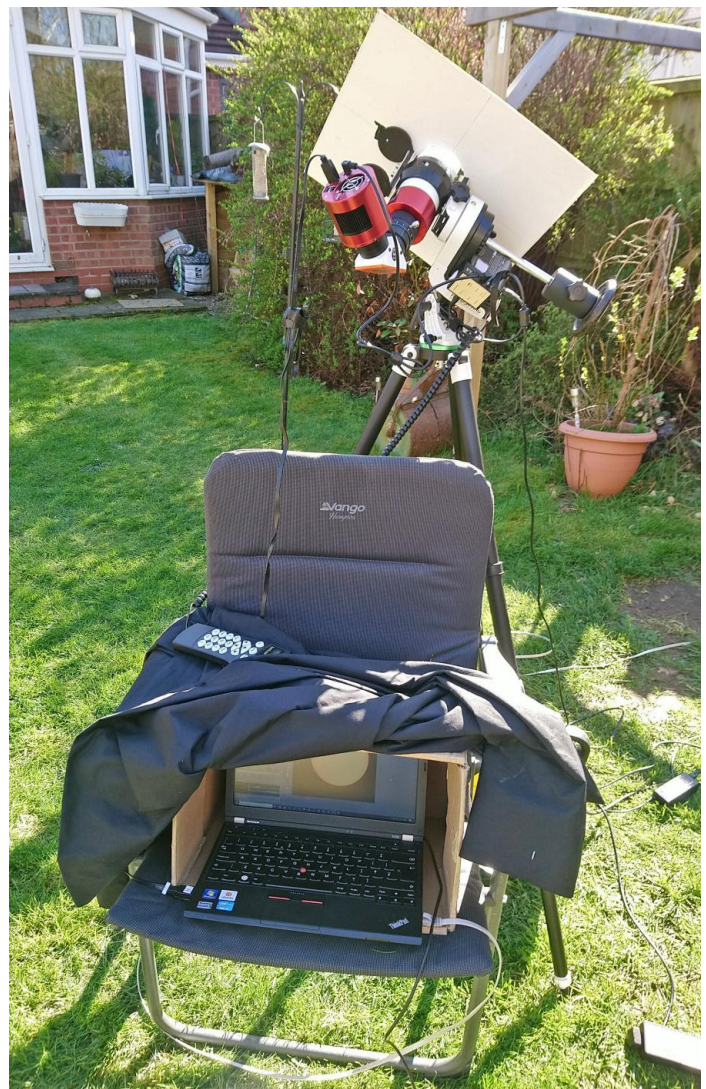
After a brief introduction from Geoffrey, I embarked on the usual long wait for clear weather before having the opportunity to try the scope out. I was particularly keen to get to grips with it as the partial solar eclipse of October 2022 was approaching and this seemed to me to be the ideal occasion to see what it was capable of.

The first thing to do before you can achieve anything at all is to point the apparatus at the Sun. This is accomplished by means of a solar finder which comprises two disks mounted in parallel with each other and aligned along the length of the telescope tube. The front disk has a hole through which the sun shines and projects an illuminated circle on the one behind. When the illuminated circle is aligned over the centre of the mark on the rear disk the tube should be pointing at the Sun. In practice, I found that the alignment of the forward hole and the rear mark was very slightly out but I soon got the hang of where it needed to land in order to have the Sun in the field of view.

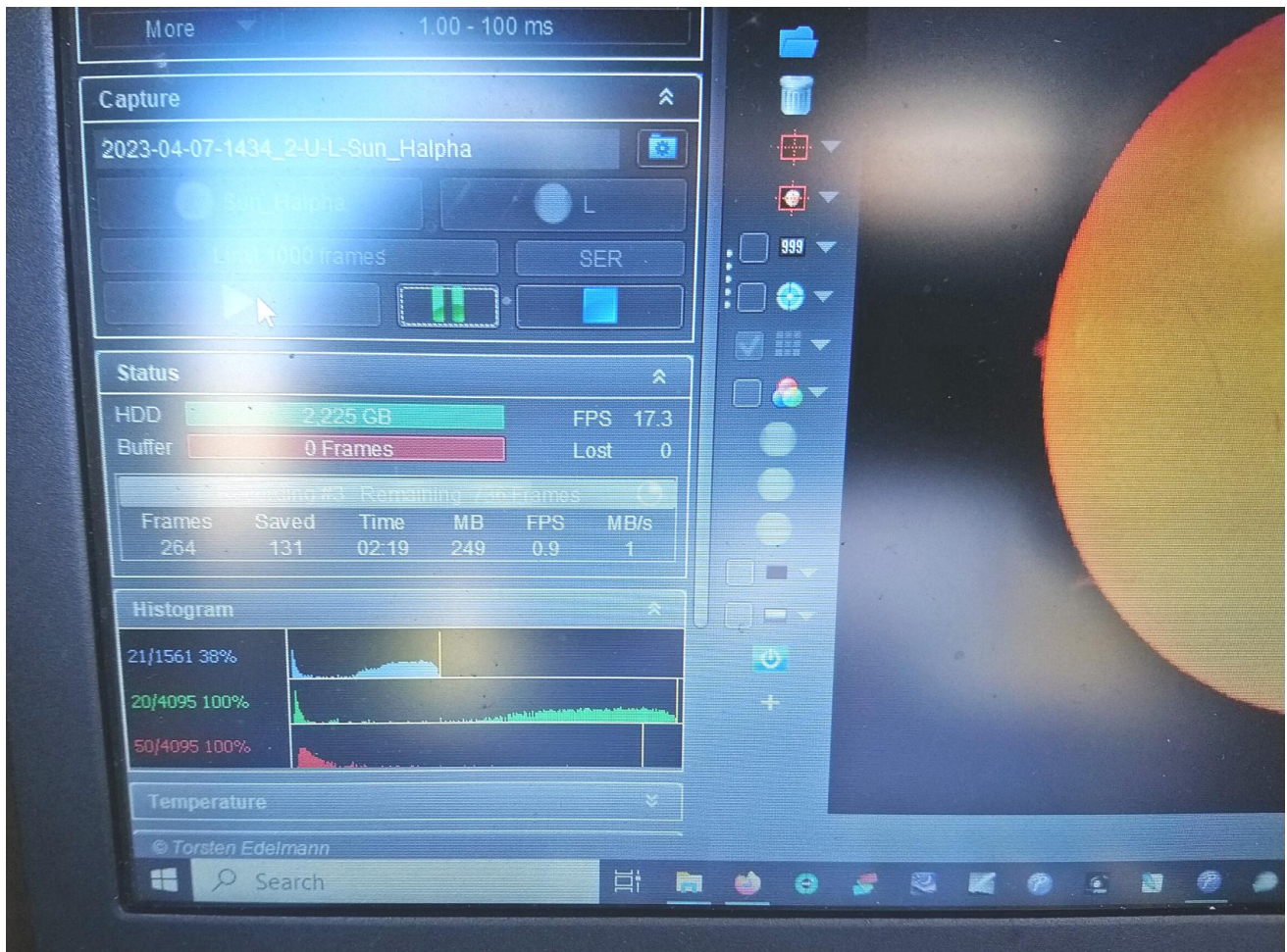
The next thing which is very different from most telescopes is the focussing. Even after some lengthy use, I still find this the most difficult aspect of using this scope. Being one of the smaller of the Lunt range there is a helical focuser rather than a Crayford or rack and pinion focuser and this makes fine focus sometimes awkward to achieve. The secret I found was to get a rough focus on the sun's limb by moving focus back and forth past the point of sharp focus and then, using extra powers of magic and concentration, getting the limb as sharp as possible. There are guidelines in the

written instructions in the box which make a good starting point.

Once this limb focus is achieved, one can then proceed to tune the pressure focus using the etalon (the big knob on the side of the scope) which brings different features of the sun's surface and chromosphere (the layer immediately around



The Lunt solar telescope ready for action with the sunshield in place and a shaded box and dark throw-over cloth for viewing the laptop in sunlight.



Being to see the screen of a laptop in strong sunlight and read all the settings needs a large blackout cloth.

the limb) into focus. The laws of physics dictate that not all of these features can be focused simultaneously and there is a rough choice to be made of viewing either the features and textures of the sun's surface or the prominences which are visible around the limb. In practice I found that getting the surface looking good to start with then allowed for some tweaking of the etalon to allow prominences to become apparent too. This is most likely a halfway house where neither looks perfect but I found it quite satisfactory. The excitement of seeing our star in action is really thrilling and the first time a prominence showed in the eyepiece was a truly jaw-dropping moment for me.

The big challenge with the solar scope over a standard telescope is that when you have poor focus you see nothing at all and only when you get somewhere very close to sharpness do you have any image to work with. Coupled with this is the unavoidable fact that you are normally squinting against the brilliance of the Sun so it

can be somewhat trying. It is most definitely worth it though! As with any telescopic observation, before starting it is worth tempering one's expectations regarding what you are likely to see. Dramatic close-ups of solar flares and surging vortices of hot plasma patterns are the realm of much larger instruments. The 350mm focal length will show you the whole of the Sun's disk with surrounded by a fairly wide margin when the 7.5mm - 22.5mm eyepiece included is used at its most zoomed in setting (47x). Here I have to sheepishly admit that I had not realised the eyepiece is a zoom eyepiece and I have only ever used it at this setting! That said, the wider setting would only be really useful in my opinion for locating the Sun initially. I have used the scope mainly for imaging so will use that as an excuse for my myopia.

Once I had more or less mastered the visual use of the Lunt, I next connected a small monochrome astronomical camera (ZWO ASI120MM-s) and a laptop to see what I could



Achieving back focus by using spacers to position the camera at the correct distance.

capture. The disappointing result was that I could see nothing at all! The problem was one that anyone who has connected a camera to a telescope will be familiar with, namely, back focus. In other words, the camera's sensor must be at exactly the correct distance to allow the light from the telescope to come to sharp focus on the sensor. With most refractors and Newtonian reflectors, the point of focus for an eyepiece and a camera will rarely be the same. I did some searching on the internet but found no specific information on the combination of camera and telescope I was using so two extremely frustrating sessions of experimentation and calculation followed while I determined the correct back focus. The ASI120MM-S requires 12.5mm of back focus but the setting up of this is complicated by the use of the integral and essential diagonal and the fact that the default eyepiece holder protrudes a long way past this point of focus. By removing eyepiece holder, buying a set of M42 spacers from Ebay and then

trying various combinations of these spacers I eventually experienced the joy of seeing a more or less sharp sun on the laptop screen.

The other technical issue for which I was unprepared was the presence of Newton's rings when imaging with this camera. Apparently, the only way to mitigate this is to use a tilt adapter which I don't possess. I attempted to remove the banding in post-processing software but this resulted in such degradation of the image that I abandoned it as a method. I did discover though that when using a larger, colour camera (ASI294MC) the rings simply disappeared. Whether this is a function of the larger sensor, the Bayer matrix of the camera or just that it is slightly less sensitive than the monochrome camera I have no idea. All I can say is that when something which previously didn't work suddenly starts work I usually give up trying to get definitive answers and just get on with enjoying the process.

I have been lucky enough to see and photograph some incredible views of the Sun in the time I have used the Lunt. The first, and possibly most breath-taking, was the partial eclipse back in October. However, the more day-to-day things have also been wonderful to observe; things such as the movements of sunspots across the Sun's face, the changing prominences around the limb, and, when photographing, the incredible textures and details of filaments and plagues which are as beautiful to watch as any art show.

Technical details and suggestions for anyone who wants to try imaging.

1. Remove the 1.25" eyepiece holder and screw in the required distance of spacers to achieve back focus.
2. Spacers required for back focus:

ASI294MC:	28mm
ASI120MM-S:	8.5mm
3. Rough polar alignment is sufficient if you cannot establish beforehand in the dark though the better the PA and star alignment, the less you will have to manual adjust the tracking.
4. I used a Sky-Watcher AZ-GTi in equatorial mode which handles the telescope with ease though even a normal photographic tripod would suffice for short exposures or when

nudge-tracking and lucky imaging.

5. A shaded box and dark throw-over cloth is handy for viewing the laptop as it will be very bright (of course!).

6. A hat is also handy to protect you from the Sun.

7. Newton's rings are virtually impossible to remove after the event. Use a tilt adapter or camera which does not display the rings.

The Lunt scope with sunshield and camera attached.

The images below were taken on 7th May this year showing sunspots. The whole Sun image is a composite of two different shots to show both the surface detail and the prominences which are difficult to observe or photograph simultaneously. Close-up of the sunspots. The panoramic image is a detail of the same image showing the best of the prominences. All taken with the club's solar scope and processed with free software (Autostakkert, Registax and GIMP) as were the others.

