Federation of Astronomical Societies

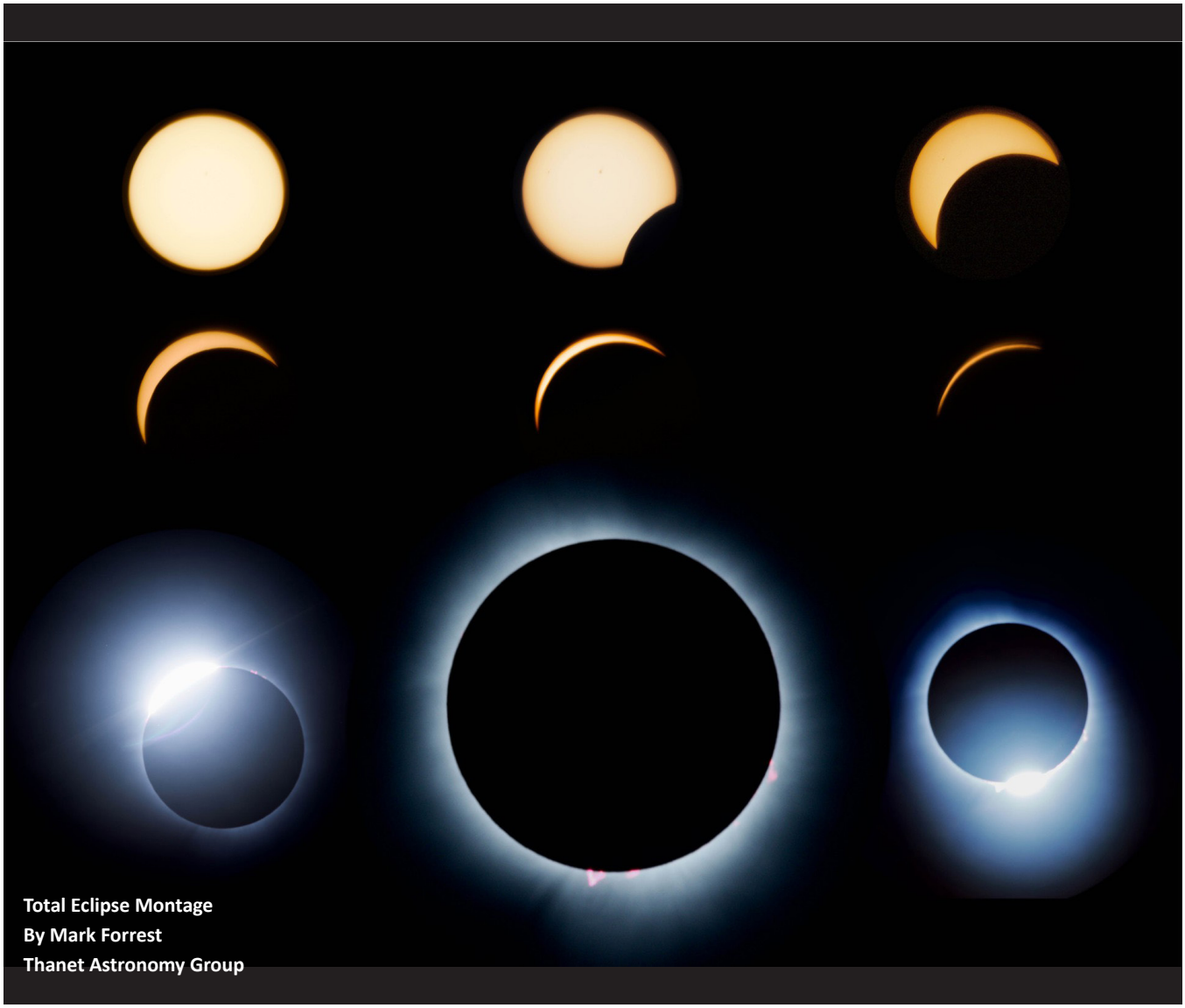
Editor: Michael Bryce

Newsletter

No 138: June 2024

fedastro.org.uk

Note: The FAS Council Reserves the Right to publish articles, events and reports submitted to the FAS Newsletter



Total Eclipse Montage
By Mark Forrest
Thanet Astronomy Group

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Interim President's Spot:

Dr Paul A Daniels

14 May 2024

A miracle has happened: I've actually managed to start writing this before the deadline for copy! I can hear bells ringing, fireworks are streaking across the sky – all that's missing are the streamers, orchestra, chorus and applause!

The President's Spot is a bit of a mixed bag this month but, before I get too far into it, we should all give a big round of applause to Clare Lauwerys, FAS Vice-president, for all her diligent work in getting the FAS PLI organised. She sent dozens of emails and made dozens of phone calls to insurance brokers to get us all a good deal and then dozens more phone calls and emails to hammer out the nitty gritty, fine detail. I gave a modicum of support but many thanks are also due to Tony Questa and some of his SAGAS colleagues for their welcome comments. Thanks again everyone!

Well, the Sun's been engagingly busy over the last few days and many of us managed to get some stunning pictures of aurorae. The Aurora Australis image in Figure 1 (right) was taken by the cousin of a friend of mine in New Zealand and many of the images I've seen of the Aurora Borealis from the UK are no less spectacular. For those that don't know it, the excellent website at https://spaceweather.com details the current space weather and shows the location of the auroral oval.

***Figure 1**: Aurora Australis in New Zealand.*
***Credit**: Nikhil Banerji, Christchurch, New Zealand*
Apple iPhone 13, 26mm, f1.6, ISO 1250, 2.0s

We're approaching (maybe already at?) the maximum of solar cycle 25 (each cycle is visually approximately 11 years long, counting from 1755). Figure 2 (below) shows measurements of sunspot numbers from the start of the cycle as well as the predicted sunspot numbers for the rest of the cycle. As you can see, the observed growth in sunspot numbers is faster than predicted and is already near the level of the predicted maximum. It suggests we're either going to see a higher maximum than expected in mid-2025 or that the cycle is a little early and we've already reached maximum. Hopefully it's the former so that we can get some more good solar and aurora images.

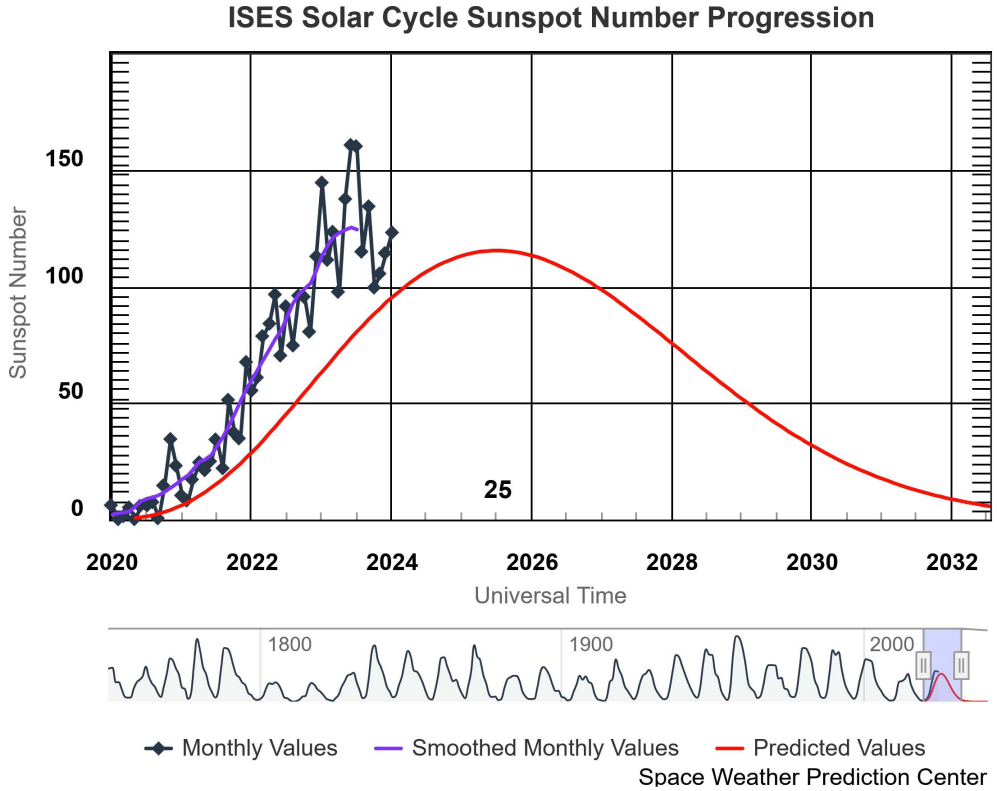


***Figure 2:** Credit NOAA - https://www.swpc.noaa.gov/products/solar-cycle-progression*

As I'm a member of the RAS Megaconstellation (Optical) Working Group I got an email a couple of weeks ago from Robert Massey, Deputy Executive Director of the Royal Astronomical Society, that was prompted by a 'heads-up' email *he'd* received from satellite guru Jonathan McDowell (Harvard U.). Jonathan had seen an article about a prototype satellite, *Gagarinets*, launched by a Russian start-up company, Avant Space LLC. The satellite was to test the feasibility of launching a proposed constellation of satellites, each equipped with bright, 150W laser diodes, moving in close formation and manoeuvred by proprietary ion thrusters so as to display company logos or QR codes in the sky. Robert was asking for comments on the likely effects of such a satellite constellation on astronomy so that the RAS Council could develop an informed position statement on the proposal. I gave the technicalities of the project some consideration and concluded that the proposal is technically flawed and non-viable and that there's likely to be a negligible threat to astronomy. See my article later in this newsletter.

You may recall from my President's Spot in FAS Newsletter #131, April 2023, that I mentioned the (potentially very bright) forthcoming comet C/2023 A3 (Tsuchinshan-ATLAS) expected to be visible to the naked eye from late-August to mid-November this year. Well, as I cautioned, the comet isn't likely to be as bright as first thought. Using the NASA/JPL Horizons System the predicted magnitudes are quite a bit fainter (see Table 1, T-mag and N-mag are the visual total and nuclear magnitudes). Brightness predictions can be wrong so you may want to keep an eye on the comet to see if it's going to surprise us! To help with that I've generated a track of the comet's predicted positions using the free charting facility of In-The-Sky.org (see Figure 3).

Before I go, remember that a lot of the earlier FAS Newsletters are downloadable from the FAS Google Drive at:

https://drive.google.com/drive/folders/1_cLTIMKwXOQOawy2Rm1OQlcZMd0_R08c

Stay safe and clear skies!

Paul

Date	T-mag	N-mag
01-Jun-2024	11.1	13.1
08-Jun-2024	11.0	13.2
15-Jun-2024	11.0	13.2
22-Jun-2024	10.8	13.1
29-Jun-2024	10.7	13.1
06-Jul-2024	10.6	13.0
13-Jul-2024	10.4	12.9
20-Jul-2024	10.2	12.7
27-Jul-2024	10.0	12.5
03-Aug-2024	9.7	12.2
10-Aug-2024	9.4	11.9
17-Aug-2024	8.9	11.5
24-Aug-2024	8.5	11.0
31-Aug-2024	7.9	10.5
07-Sep-2024	7.1	10.0
14-Sep-2024	6.2	9.6
21-Sep-2024	5.1	9.5
28-Sep-2024	4.2	9.8
05-Oct-2024	4.0	11.0
12-Oct-2024	4.0	11.0
19-Oct-2024	4.8	10.4
26-Oct-2024	6.1	10.6

***Table 1**: Predicted brightness of C/2023 A3 (Tsuchinshan-ATLAS)*

New: Download this issue to your mobile device by scanning the QR code below:

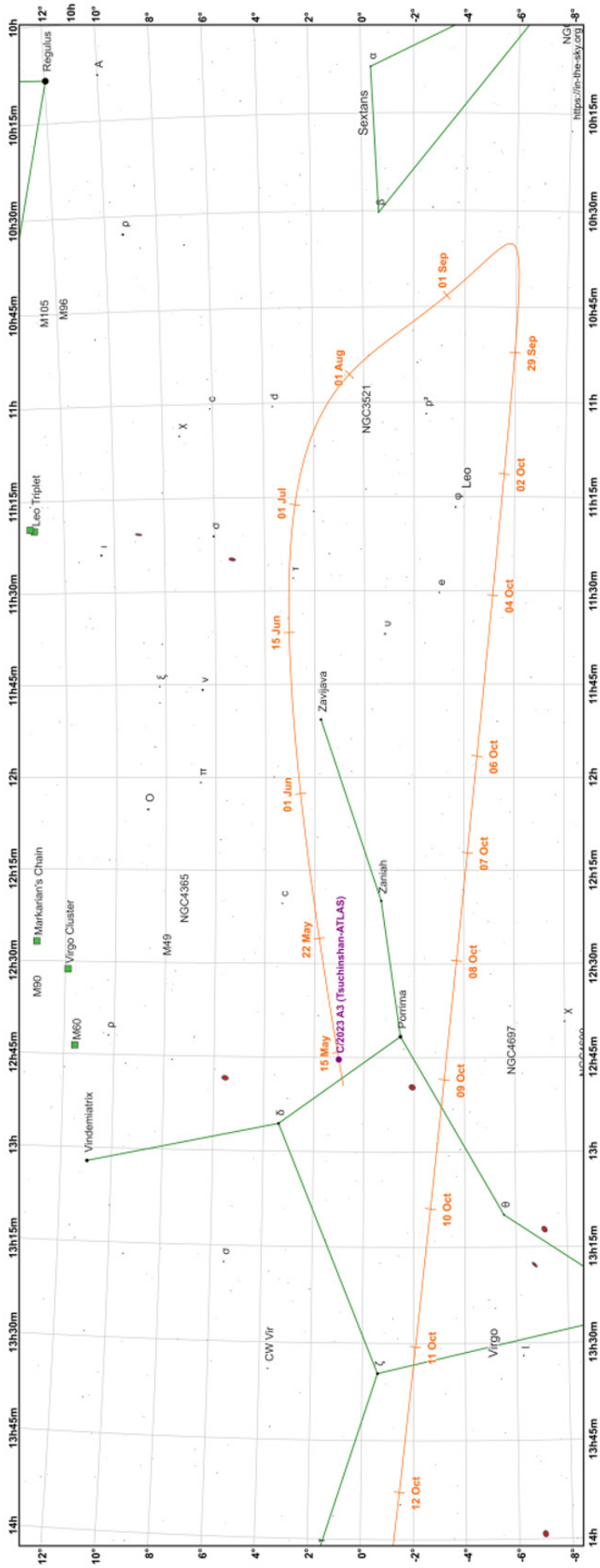


Figure 3: *The track of C/2023 A3 (Tsuchinshan-ATLAS)*

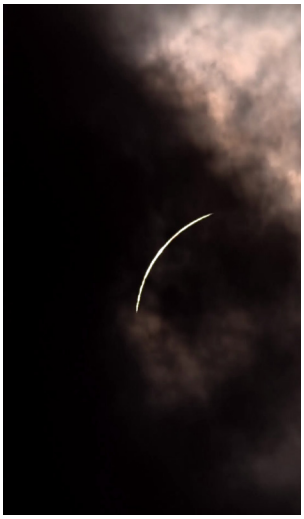
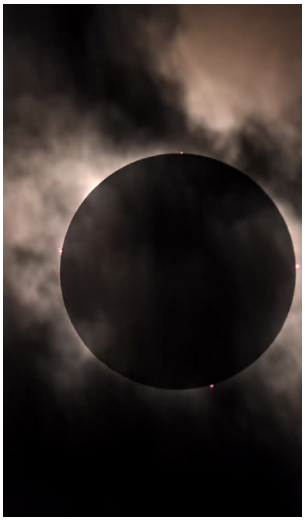
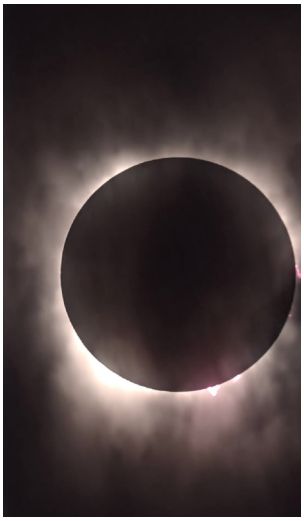
New:
Click on the sky chart image above to download a copy to your PC or tablet.

Total Solar Eclipse Special!

Many of our Readers traveled to the United States in early April 2024 to witness this Astronomical Wonder.

Mark Hardaker FRAS

Fordingbridge Astronomers

I was very privileged to be able to visit friends in the Texas and journeyed with them to Fredericksburg, Texas to watch the total eclipse of the Sun on 8 April.

The cloud forecast predicted that Texas would have the lowest cloud cover in the US but this proved not to be the case. We were able to see the initial partial phase quite well but clouds increased through to totality preventing us witnessing Baily's Beads and both diamond ring effects but we did at least have breaks in the cloud to capture these atmospheric images of clouds rolling across the eclipsed Sun. The rest of the eclipse was clouded out so we never saw the second partial phase.

In all though, this eclipse was much darker under the cloud and therefore somehow more emotional than my previous ones.

All these images were taken using a ZWO SeeStar S50, making observation of the total eclipse an absolute pleasure. Looking forward to the advancements in imaging which will make 2026 even better.

Here's to 2026.

Mark Hardaker
Fordingbridge Astronomers
fordingbridgeastro.org.uk

Calling All Astronomical Societies

Remember you can advertise your Society meetings and special events in the FAS Newsletter and on the FAS Web Site for Free. Just send full details of your meeting programme and special events to the following addresses: For inclusion in FAS Newsletter:

newsletter@fedastro.org.uk

Deadline: For any publication month the deadline is the 15th of the previous month.
I.e for the August 2024 issue the Deadline is 15 July.

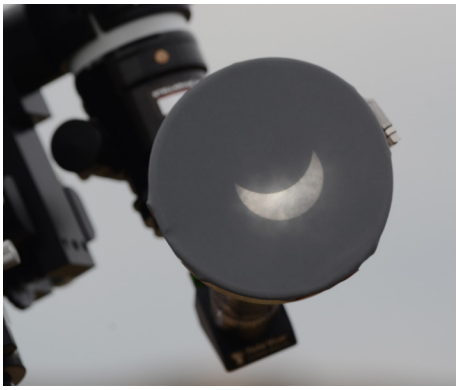
For inclusion on FAS Web Site and sent to all FAS Member Societies:

webmaster@fedastro.org.uk

Allowing at least a weeks notice

Theresa and Edward Cooper

Cardiff Astronomical Society



We joined friends and fellow stargazers from San Diego Astronomical Association at a viewing site in the town of Ingram, hill country in the southwest of Texas.

Thin high cloud to begin with which did become denser but fortunately more broken. So although we could not follow the eclipse for every second, we still were able to see most of it as demonstrated by the attached images.

The area is also renowned for its wildflowers and the eclipse timing was perfect for seeing them in all their glory! Texas stopped unnecessary mowing along roads, on grass verges etc. as long ago as 1934! The appreciation for native wildflowers was encouraged by First Lady Ladybird Johnson and there are designated wildflower trails and hikes,. And the impact is stunning.

Go for an eclipse and discover wildflowers!

Clear skies,

Theresa and Edward Cooper

Cardiff Astronomical Society and Jose Magsaysay, San Diego Astronomical Association

https://www.cardiff-astronomical-society.co.uk

https://sdaa.org

Mark Forrest

Thanet Astronomy Group

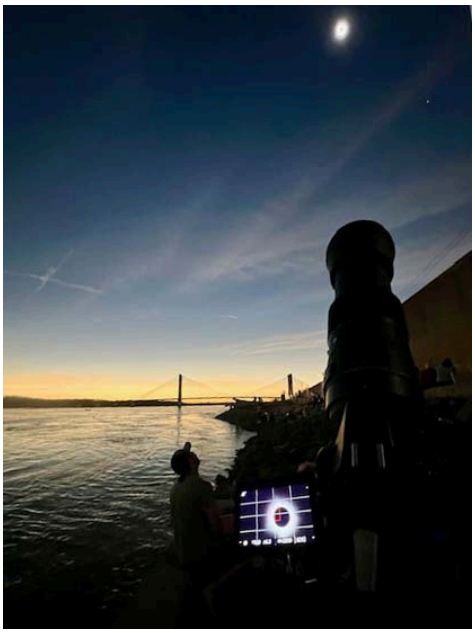
I saw totality on the banks of the Mississippi in Missouri at a place called Cape Girardou, south of St Louis and north of Memphis.

I took these with a Nikon D5300 with a 600mm lens (900mm effective) and I have to mention the tripod which was the only thing I could get into four planes in hand luggage. It was a Manfrotto 055 and I changed the head for a geared head and it worked brilliantly with that.

So no tracking and no telescope. But here's what I managed…

Mark Forrest
Thanet Astronomy Group
http://www.thanetastronomygroup.com

Please see Mark's panel of images on the front cover.



Mike Lancaster

Derby and District Astronomical Society

On Monday 8th April 2024, in the company of the UK Astro Trails tour group, I witnessed the total solar eclipse that swept across Mexico and the USA. Our observation site was the Heart of Texas Equestrian Academy near Valley Mills, Texas. It was my third total eclipse, having witnessed the 1999 eclipse from Devon and the March 2006 eclipse from near Antalya, Turkey. Devon was clouded out, but still a memorable experience, as we were plunged into the darkness of totality, made even darker by the overcast skies. Turkey remained clear and I grabbed a bunch of very pleasing photos through my ETX-90 scope, but visually missed some of the wider naked-eye experience such as first contact and the vaunted diamond ring, as I was too busy concentrating on the photography.

I was determined to have a more balanced experience this time, and I was not disappointed. Despite some nerve-wracking forecasts of cloudy skies prior to the eclipse, and much passing cloud up to the start of the eclipse at 'first contact', the clouds finally parted for the duration of the event, and we were blessed with clear skies. We were also fortunate enough to be in the company of our tour leader Mike Frost, a highly experienced and inveterate eclipse chaser. I also had the pleasure of witnessing the eclipse in the company of Henrike Lange, Associate Professor of the History of Art an Italian Studies at the University of California, Berkeley. Mike and Henrike are among the co-authors of the book Eclipse & Revelation, Henrike Lange and Tom McLeish (Eds.), Oxford University Press, 2024, a superbly researched and lavishly illustrated interdisciplinary deep-dive into the world of total eclipses, which had occupied Henrike for much of the past seven years before this eclipse.

For this event I had brought my trusty old Canon EOS-50D DSLR, with a 400 mm Tamron lens. This was mounted on a fixed tripod with no tracking. For the partial phases I used a 72 mm Seymour solar filter, and for totality - no filter was required. I also captured some wider shots using the cameras in my Google Pixel 8 Pro smart phone. I was extremely lucky that this equipment worked flawlessly, indeed exceeding my expectations, especially as I had never used it on a total eclipse before. But as I stated above, I wanted to witness the event as much with my own eyes as possible too. Having captured many photos of the partial phases, and as the seconds counted down to totality an eerie twilight began to descend, and the air became noticeably cooler. Then the Sun... winked out! The brilliant orb was replaced with the blacker than black disc of the Moon, surrounded by a pink ring of fire, and the luminous white flower petals of the solar corona. This was a... primal experience. One also felt extremely privileged to be on the receiving end of this cosmic spectacle, one which most people will never experience. Even to the naked eye an especially bright pink prominence was visible jutting out from behind the black lunar disc in the 5 o'clock position. In the darkened sky the planet Venus was also clearly visible in the 4 o'clock position to the Sun. I speedily removed the filter from my camera and reeled off a number of shots. Don't forget to bracket them now! We enjoyed around 4 minutes 20 seconds of totality, but this goes much quicker than expected. We were rapidly approaching the end of totality at 'third contact'...and wait for it...a burst of light began to appear in the 5 o'clock position to the eclipsed Sun. I hastily pressed the shutter release on my DSLR - and oh my, there it was - the diamond ring on the screen! Quickly now, I screwed back on the filter. Back to photographing partial phases - and a time to express the shared experience with my companions.

Note: An interesting wide angle shot from Mike appears image on the back page.

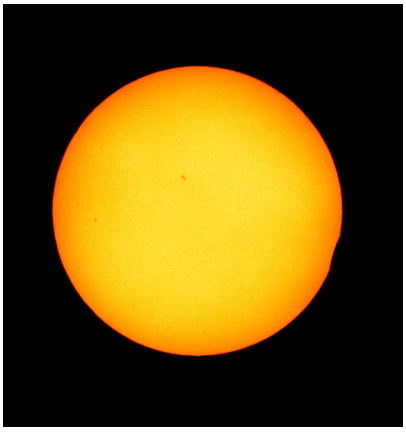
Mike Lancaster
Derby and District Astronomical Society
http://www.derbyastronomy.org

***Image above**: Partial Phase. Canon EOS 50D on a fixed tripod, 400 mm Tamron lens, Seymour solar filter.*

***Image above**: A diamond ring marks the end of totality. Taken with my Canon EOS 50D on a fixed tripod, 400 mm Tamron lens, no filter. Note the contrast between the bluish-white corona and the golden glow of sunlight returning from the photosphere. Even now though, a pink prominence is still visible in the 9 o'clock position.*

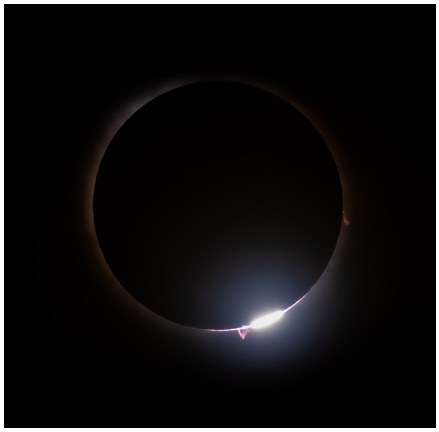
Brian Morton

Loughton Astronomical Society



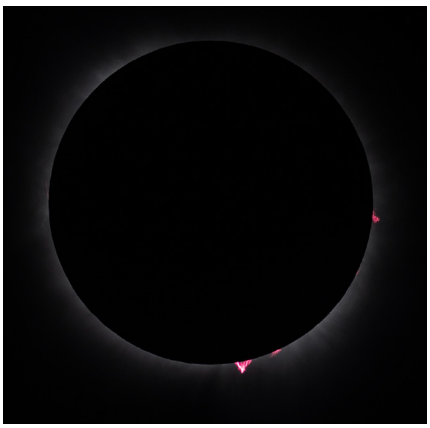
First Contact: 1/160 sec, ISO 100

Diamond Ring 1: 1/500 sec, ISO 100

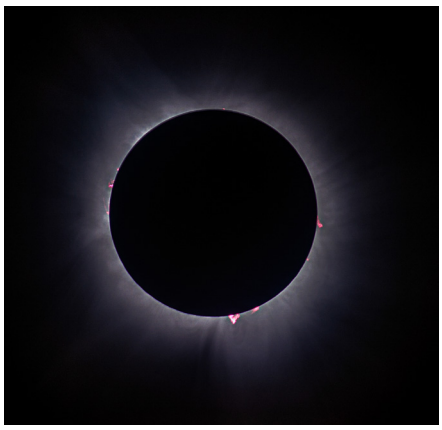


Diamond Ring 2: 1/500 sec, ISO 100

Prominence East Limb: *1/250 sec, ISO 100*



Prominence South Limb 1*: 1/250 sec, ISO 100*



Totality*: This is a composite HDR image of 3 separate frames (1/250, 1/400, & 1/15 sec, all ISO 100), blended in Photoshop, as I've tried to bring out a more natural view as we could clearly see the prominences and corona all together.*

Four Members of the LAS visited the USA and Canada for the Solar Eclipse.

Nick Williams decided Texas might give the best opportunities for seeing the eclipse. On the evening before totality, he decided to move location from San Antonio to Waco because of impending clouds. It was a wise move as he and his family had an excellent view from 1st contact through totality. "Seeing the vivid prominences, especially the massive loop on the southern edge, so clearly with the naked eye was something that will stay with me for a long time".

Taking in a visit to the General Tom Stafford Air & Space Museum made an excellent all-round trip.

Mike Zelechowski lives between Charlotte, North Carolina and North London. He planned a mainly visual experience but enjoyed the camaraderie of fellow eclipse chasers from the centreline at Spiceland, Indiana.

Steve and Gillian Ringwood took the opportunity of extending a trip to Toronto (celebrating a family centenary birthday) with a trip to Buffalo to experience the eclipse from the Canadian side of the Niagara Falls.

Fabulous atmosphere with about 8 seconds of totality between the clouds.

Brian Morton
Secretary,
Loughton Astronomical Society
https://www.las-astro.org.uk

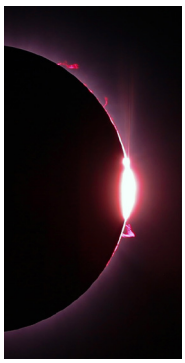
Andy McCrae

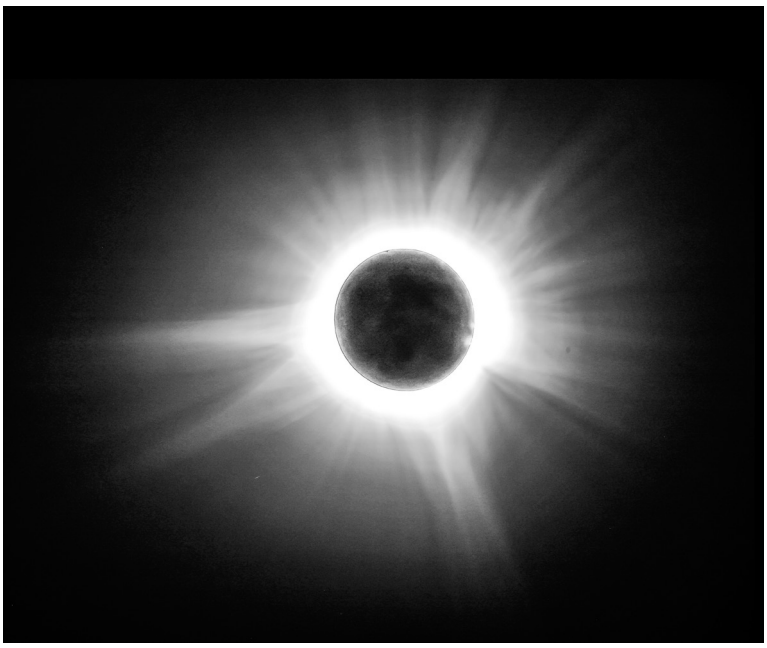
Irish Astronomical Association
Bangor, Northern Ireland

Here are some of my eclipse pictures taken on the Holland America cruise ship Zaandam on 8th April. The ship was around 40 miles from Mazatlan in Mexico.

I used Televue NP101 refractor on an AZ mount with a Canon 6D Mk II.

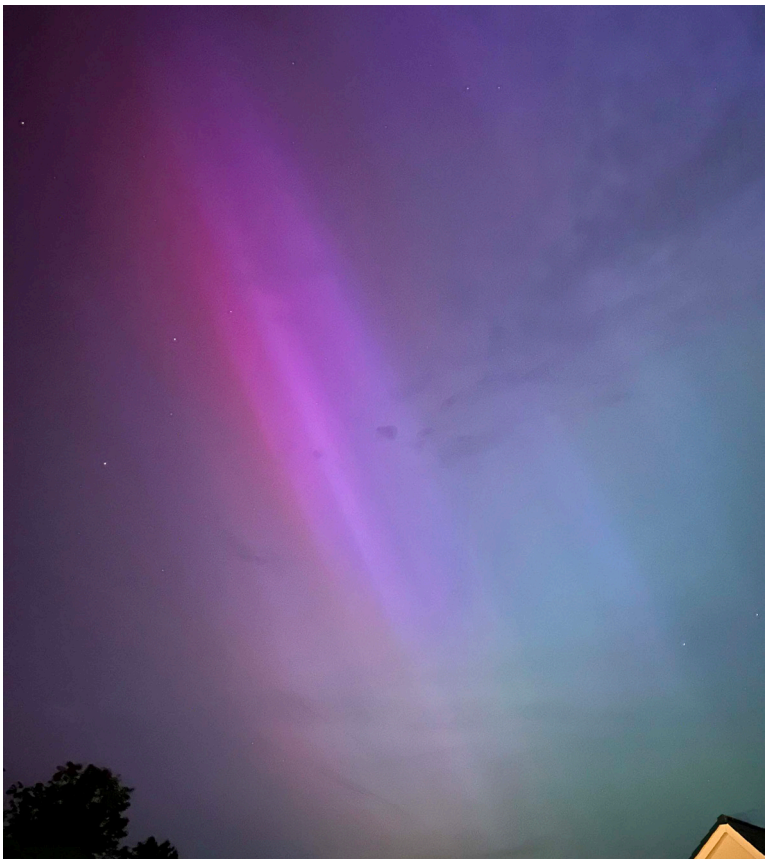
Andy McCrae
Irish Astronomical Association
https://irishastro.org





FAS Newsletter Next Issue

Send in your Aurora Images



Friday 10 May 2024 saw an amazing display of aurora all over the United Kingdom. I took this image at my home in Stourport-on-Severn, Worcestershire. Taken with an iPhone and steadied on a window ledge. Please send images to newsletter@fedastro.org.uk with full details of how the image was captured, your location and Society details. Please send images by 15 July 2024.

Michael Bryce (FAS Newsletter Editor)

National Astronomy Week 2025

National Astronomy Week is returning in 2025

It's very much at the planning stage at the moment but the steering committee (I sit on it to represent the FAS) is aware that many societies make plans a long way in advance. We wanted you to have the dates as soon as they were set to help you with your plans. The week that has been chosen is

Saturday 1 February to Sunday 9 February 2025

which we know is longer than a week but it gives everyone two weekends.

Why has this week been chosen? In early 2025 there will be a spectacular array of bright planets in the evening sky: Mars at opposition in Gemini, Jupiter a couple of months after opposition in Taurus, Venus at greatest eastern elongation and Saturn also visible in the early evening. During the 8 days, the Moon waxes from a crescent to full, moving past each of the planets as it does so.

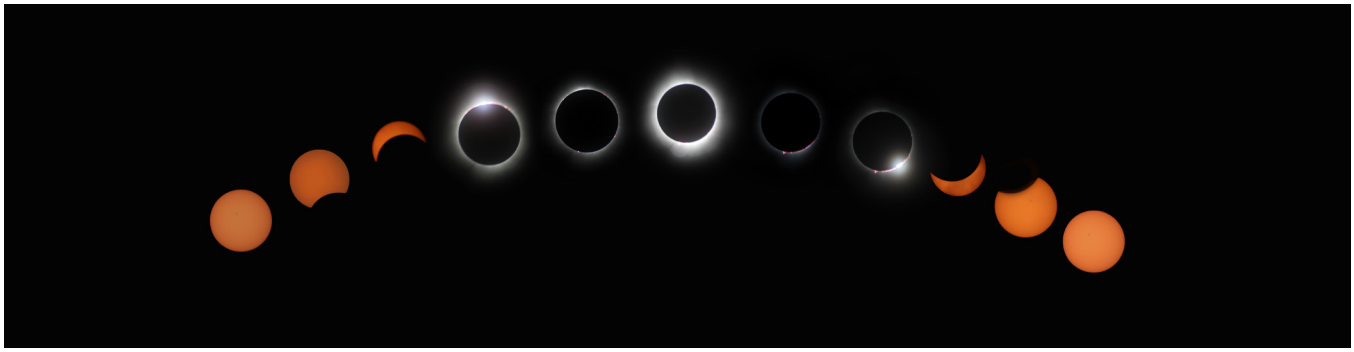
More details will follow but for the time being, please put the dates in your calendar.

Kind regards
Clare Lauwerys
FAS Vice President

Website:
astronomyweek.org.uk
X (formerly Twitter):
x.com/NatAstroWeek
Facebook:
facebook.com/astronomyweek

Neil J Short

North Essex Astronomical Society



Just another Solar Eclipse

Hi again, it's been a while. I'm once again in the good old USA and, as with my 2017 Input, I'm on a mission to see a further total solar eclipse. Again, as with the 2017 eclipse, we had the luck that the path of totality once more passed over the location of one of my wife's family, this time her cousin Eric in Tiffin Ohio. Tiffin is a small town, population around 18,000, in the Northwest of the state.

That's the good news. The not so good news was, being in Ohio, the clear sky probability in April at this location was not too good being at best around 50%.

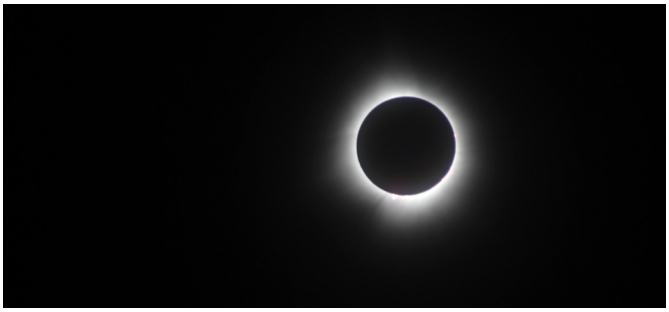
Come the day, April 8th, the early morning sky offered great promise with a largely blue, cloud free sky. Cousin Eric, our good friend Jim from "nearby" Cincinnati plus Katherine and myself settled down on Eric's driveway (not one of the great backdrops) to await the progression of the eclipse, starting around 13:00 (start of eclipse at 15:12) and finishing around 16:30. However, with a forecast for showers later in the day, cloud levels increased through the morning with matched increasing concern.

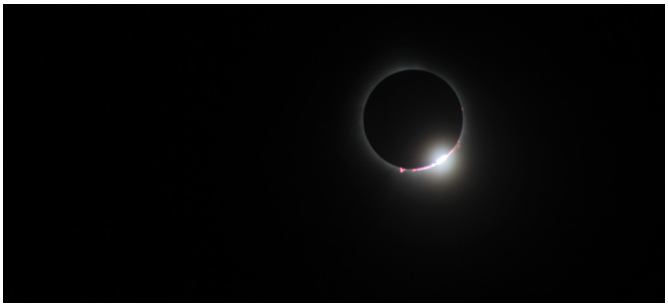
Fortunately, the clouds remained high and wispy, the light became monochrome, the birds were silent, and the odd dog barked, and, with high but thin cloud present, the moment arrived...

Few words are required to describe totality, a tremendous event and gloriously moving. We had some 3mins 52 secs of totality so, this time, I could take the odd photo but also still find the time to actually look at the eclipse.

All too soon it was over however, but fortunately the cloud and rain gods had remained silent. We could all now relax and enjoy the end of another wonderful day.

The next day we bought the required t-shirts of the event before it would be time to move on. It's Chicago next and then a flight to Hawaii with the promise of another couple of sites of astronomical interest (and the potential for a couple of further Newsletter inputs).





Above eclipse photographs taken with my trusty Canon 100D camera with Tamron f6.3 18-400mm lens fitted, set on 400mm. Camera settings for above totality photos are (all at ISO 200).

1. Diamond Ring in – 1/80sec;
2. Prominences in and out and Diamond ring out – all at 1/1000sec;
3. Corona 1/80sec.

Neil J Short
North Essex Astronomical Society
https://www.northessexastro.co.uk/

Mid-Kent Astronomical Society

14 June 2024
Ashley King - The Story of the Winchcombe Meteorite Fall

The Winchcombe meteorite is the first 'rock from another world' to be recovered in the UK for 30 years. Guided by videos from the UK's meteor and fireball camera networks, the main mass was found on a driveway in Gloucestershire only 12 hours after landing. Over 500 g of the Winchcombe meteorite are now being curated at the Natural History Museum (NHM), London, and it is both scientifically and culturally priceless; as a fresh carbonaceous chondrite fall it holds vital clues about our origins, while its rapid recovery and analysis is a shining example of international collaboration between scientists, citizen-science projects, and local communities.

28 June 2024
Sue Bowler - The Promise of Gravitational Waves

Over the past 5 years, a new type of astronomy has found a surprising number of otherwise undetected black holes and an unexpected range of masses. But why did it take 4 decades to detect gravitational waves? And what does the new detector technology offer for the future?

12 July 2024
David Bryant – Space rocks and planetary formation

David Bryant is familiar to many for making meteorites available via his website http://www.spacerocksuk.com/. At this meeting David will reveal how space rocks can reveal details about the formation of the planets, including the Earth we live on.

26 July 2024
Speaker / Summer Event – T.B.C.

For more information visit:
www.midkentastro.org.uk

2025 EU Conference on Amateur Radio Astronomy

The British Astronomical Association (BAA) Radio Astronomy Section together with RAL-Space are pleased to announce the 2025 EU Conference on Amateur Radio Astronomy. EUCARA is a biannual conference starting in 2014 and this will be the first in the UK. The Harwell campus visitor centre will be the location in September 2025 for this weekend event. The conference will include presentations from academic researchers, local amateurs, and students. We plan to have a poster session and demonstrations. If you wish to register an interest in this event, please visit the EUCARA website (www.eucara.org), where some information is already posted, and you can request to be kept updated on developments. The event organisers are Paul Hearn and Andrew Thomas.

Society for the History of Astronomy

Society 2024 Spring Conference 2024
Theme for the day – "Astronomers Royal "
Saturday 20th April

A Report by Gerard Gilligan

As the month of April approached its closure, astronomical historians from all corners of the United Kingdom assembled at the Birmingham & Midland Institute, in the centre of the City of Birmingham to celebrate the lives and work of several past Astronomers Royal. Almost sixty delegates and their guests were treated to presentations from a stellar line up of renowned speakers. The conference also saw several special guests along with family members of past Astronomers Royal in the audience

***Image above**: A Packed Dickens Room at the BMI for SHA Spring Conference.*

***Image below**: Sir Martin Rees, 15th Astronomer Royal*

However the day began with a welcome from the Society Chair Carolyn Kennett, who introduced a special recorded video question and answer session with the present and fifteenth Astronomer Royal, Sir Martin Rees, Baron Rees of Ludlow. Society Council member, John Chuter asked several questions ranging from what being the Astronomer Royal means personally, which past Astronomer Royal does Sir Martin admire the most, and how he thinks the role has changed from when it was first created in 1675, a role which will celebrate its 350th anniversary in 2025.

The first speaker for this special conference was Dr Emily Winterburn, who has been associated with the Society since it's foundation in 2002. She was the first chair, and is currently SHA Vice-President. In the past she has worked at the Royal Observatory Greenwich, completed her PhD, and has written several books on the history of Science. The subject of her presentation was AR Sir William Christie, who modernised the RGO during his term of office, and forged links with many other observatories, including the first international scientific projects, the Carte du Ciel. But Emily also focused on Christie's bold choice to employ women as "computers".

Dr Winterburn was followed by Dr Lee Macdonald, a long term member of the SHA, and the author of several astronomical history books, and has just completed a new book on the Royal Observatory, Greenwich in the 1881-1939 period. Lee's talk concerned Sir Harold Spencer Jones (1890 – 1960), who served as AR between 1933 to 1955, a time of rapid change in the science of astronomy and in the wider world. During his time in the role of AR he oversaw the move of the RGO from its London site to Herstmonceux Castle in Sussex. Sir Spencer Jones made contributions to astronomy in his measurement of the Earth-Sun distance and the discovery of the Earth's irregular rotation.

The conference lunch break followed, with delegates and their guests taking advantage of the BMI's own fine cafeteria and coffee room. The Society library located in the basement of the venue was opened especially for the meeting, and there was a sale of second hand astronomy books, with many on sale for just £1.00. Also on sale were several of the Society produced booklets on the Astronomer William Lassell, plus the recently published biography of Astronomer Royal George Biddell Airy by the SHA President Allan Chapman, who was on hand to sign his newly updated booklet, " Three North Country Astronomers"

The next presentation on the day's program was given by Emeritus researcher Dr Peredur Williams from the University of Edinburgh, Institute for Astronomy, located at the Royal Observatory Edinburgh. Peredur's subject was the third Astronomer Royal for Scotland, Ralph Copeland who studied astronomy in Germany and then joined the 2nd German North Polar expedition to Greenland to assist with a geodetic survey, during which he survived an encounter polar bears and very cold temperatures. Copland later had spells in Ireland at Lord Rosse's observatory and at the Dunsink Observatory. He also served as Director of the Dun Echt observatory, established by Lord Lindsay, at which Copland took over from David Gill.

Copeland is known for developing connections with observatories around the world and with armature astronomers in Great Britain, and his studies of novae and comets using spectroscopy. In 1889 Copland succeeded Piazzi Smyth as Astronomer Royal for Scotland, and soon was instrumental in the selection of a site for the then new site for the Royal Observatory, and the design of its buildings, together with the transfer of telescopes and other instruments.

Our fourth speaker for the day was Richard Ellis, Professor of Astrophysics from the University College London (UCL). An active observational astronomer who studies the distant Universe with a variety facilities both on Earth and in space, including the Hubble and the James Webb space telescopes. Richard's research interests include cosmology – the form and content of the Universe as a whole – and the evolution of galaxies over cosmic time. He has been influential in making many discoveries in these areas. Richard has received many awards for his contributions to international science, and for this was awarded a CBE by the late Queen Elizabeth II.

His presentation was a personally reflection on his long-time colleague and close friend at Durham University Sir Arnold Wolfendale, the 14th Astronomer Royal, and Vice-President of the SHA. Sadly Sir Arnold died away in 2020.

In an academic career that spanned over 50 years, Arnold Wolfendale was an international leader in the field of comic-ray and gamma-ray astronomy. This achievement lead to the establishment of a major group at Durham, in which Richard played a major part under the guidance of Sir Arnold. Following his appointment as Astronomer Royal in 1991 he used the role to advocate for improvements in the provision and funding for the public understanding of science. Richard paint a great legacy left by Sir Arnold in terms of the Durham contributions to UK's large ground-based telescopes, his support of modern day armature astronomy, and of the SHA as its Vice- President. During his presentation Richard tells the story of Sir Arnold seeing a recent graduate of Physics throwing a number of Physics books into a nearby river, one of which was a book written by Sir Arnold. When asked why he did not stop the person from carrying out this terrible act, Sir Arnold replied "……I was just so glad he took my book out of the library……" !

Following a break for tea, Coffee and some light refreshments, the Conference was concluded by the second Michael Hoskin Memorial Lecture. Given this year by Dr John Fisher,. John is a well-known independent scholar and one of the first graduating students from the Open University. Dr Fisher is a long time and much accomplished historian and lectures in astronomy and associated sciences. Following his doctoral studies at Imperial College London on the work of the 3rd Astronomer Royal, James Bradley, John found that there was no record of a modern biography of Bradley so decided to write one! This was indeed published at the close of 2023, and before being introduced by SHA President Dr Allan Chapman, a close friend, John was signing several copies for meeting delegates.

There was little surprise to hear Dr Fisher speak on James Bradley, a little known holder of the post of Astronomer Royal. He is

however know for the discovery of the aberration of light, and after many years of observations to the other discovery of the nutation of the Earth's axis allowing astronomers to determine the precession of the equinoxes that had remained elusive for almost 2,000 years. Bradley was involved in a major reform of the Royal Observatory and its buildings. Leading to the New Observatory through which the Prime Meridian passes today.

SHA Meetings Secretary Mike Frost brought the day to an end, following a question and answer session. This concluded what was a very enjoyable and excellent day of exceptional presentations by all the star studded speakers, and well attended by Society members and their guests. On behalf of the SHA Council, I would like to thank all our speakers for wonderful and intensively researched lectures. Sincere thanks to all BMI staff for looking after all delegates and their guests and SHA Council members for helping on the day. Especially James Dawson for opening the SHA Library, Carolyn Bedwell for looking after second hand book sales, David Sellers for taking images of the day, and Carolyn Kennett plus Mike Frost for chairing the meeting and making sure we ran to the publish timetable for the whole day.

Details of future Society events, webinars and meetings can be found on the Society for the History of Astronomy, web site at: https://societyforthehistoryofastronomy.com/ - namely the visit to the Temple Observatory in Rugby in late June, and the 2024 AGM and Autumn Conference to be held again at the Birmingham & Midland Institute on Saturday, 26th October. There will soon to be published details of a joint conference to be held in Paris , France with members of the Historical Commission for the Societe Astronomique de France (SAF), planned for March 2025.

Images Courtesy and thanks to Conference speakers, Wikimedia Commons, and Gerard Gilligan.

Gerard Gilligan
Society for the History of Astronomy
https://societyforthehistoryofastronomy.com/

Stratford-upon-Avon Astronomical Society

The Stratford upon Avon Astronomical Society meet every 1st and 3rd Tuesdays at 8pm (doors open at 7.30pm) at Alderminster Village Hall. Everyone is welcome, especially beginners and those wanting to learn more. The first Tuesday is a Club Night, in June that will be on 4th June and the speaker on the third Tuesday, which is on 18th June 2024 is due to be Adam McMaster from the Open University, with a talk entitled 'Weird Stars – a round up of some of the more unusual types of stars'. Please note that the speakers usually start quite promptly at 8pm.

Each month one of our members, Adrian Wakeham, writes an article on aspects of astronomical observation. This month it is about safe solar observing.

In previous notes, I've talked about observing our nearest star, the sun, making a point of using the correct filters, to make it safe.

There are ways of observing the sun, without expensive filters, by projecting the image on to a white back ground. One way is to mount binoculars onto a tripod, block off one eyepiece, and point them to the sun (Please NEVER be tempted to look at the sun through binoculars!) When correctly aligned an image will appear on the white background. Sun spots and filaments should be visible. (This method should also work on a full moon)

Another method is to make a pinhole camera, using a cereal packet, some white card and tin foil. The foil is kept taught with a pin hole in it, which projects the image of the sun onto the other end of the cereal packet. (For more details come to club night and I'll show you one.)

My favourite is a colander! Especially during an eclipse. Just focus the beams of light onto a background. All the circles will appear as crescents during the eclipse. Again with both the tin foil or colander methods, do not look through the holes with your eye as you can seriously damage your eyesight, but use the holes to project the image.

Club nights offer more information on what to look out for each month and if it is clear we do some observing just outside the Village Hall, so please join us. There is no charge initially to come along and find out more, but if you do want to become a member then the fee is JUST £15 A YEAR and it's free if you are in full time education. For more details go to the website

Website: http://www.astro.org.uk
Email: John Waller john.waller@astro.org.uk
Phone: 07703 192188

John Waller

Hertford Astronomy Group

Forthcoming Meetings:

Our meetings take place on the 2nd Wednesday of each month from September to June, and we also have additional events throughout the year. Doors open at 7:30 and the meetings begin at 8pm. Alternatively you can watch the event on Zoom. In either case, go to the society website to book a place.

12 June: "Looking for life on Mars and Habitability of Jupiter's moons"

by Andrew Coates, UCL / MSSL / SPA VP

Meetings held at The Lindop Building on the College Lane Campus, Hatfield, AL10 9AB

We do not meet in July or August.

For details and other information, go to:

Space Oddities Live!

Space Oddities Live! Is a weekly YouTube show featuring an International team of Astronomers who get together for a chat and discussion about the latest news in Astronomy and Space Exploration. We have Special Guests; Night Sky Notes; Viewers' Gallery; and more

We livestream every week on YouTube and Facebook. We are an international team of amateur and professional astronomers. Panel Members are from the UK, Spain, the US and Canada. We chat about anything relating to the Universe and space exploration, keeping our audience up to date with the latest news. We also present interesting presentations on a huge variety of astronomical subjects and also create our own space-related videos for all levels of astronomical knowledge.

As well as our weekly shows we also go live for important space launches or other special events. We have a lot of fun, so why not join us? For livestream details, please visit our YouTube Channel at

youtube.com/@spaceodditieslive

For inclusion in our weekly viewers' gallery, please send your images to

spaceodditieslive@gmail.com

Please include your name, location, equipment, processing details etc
One image per email please, entitling it "Gallery Entry"

Tuesdays at 8:00 pm UK (3:00 pm US Eastern Time)

Are Satellite Constellations for Space Advertising a Realistic Threat to Astronomy?

Dr Paul A Daniels, FRAS

1 Introduction

This article is derived from some comments submitted to Robert Massey at the Royal Astronomical Society who had called for comments on the potential threat to astronomy from possible satellite constellations being used for space advertising with a view to putting together an RAS position.

Robert's email had been prompted by an email he'd received from Jonathan McDowell about the launch of the prototype *Gagarinets* 3U CubeSat by sanctioned[1] Russian company Avant Space LLC[2,3] (with KosmoLab LLC) to test the feasibility of using satellite constellations to display advertising logos or QR codes in the night sky.

2 Proposed Constellation

Huawei	78
Chanel	60
Facebook	47
Renault	42
Olympic Rings	40
WWF	37
Yves Saint Laurent	36
Rolls-Royce	33
Texaco	30
Hewlett Packard	29
Apple	28
Nike	25
Audi	22

Table 1: Count of illuminated dots in commercial logos.

The Avant Space constellation[4] (Project 'Constellation') is initially proposed to be of 20×16U CubeSats in an orbit between 500-800 km altitude (though the notes at that link suggest the number could be nearer 50 satellites).

Scrutiny of the Avant Space promotional video[5] suggests various commercial logos that could be displayed and a rough count of illuminated points in those logos that I recognised is shown in Table 1 on the right.

Also, from 11 seconds into the same video, the angular width of the displayed Omega logo is about 50% greater than that of the spectator's head. The average male head is 15.2 cm wide[6] and using an estimated camera distance of 3 m to that head gives an angular width of ~3° leading to the Omega logo being about 5° or 6° of angular width. At between 500 km and 800 km altitude this would suggest the linear size of the logo at between about 38 and 60 km (but more complex logos such as the Huawei logo shown later in the video would probably be larger). There are seven illuminated points across the width of the Omega logo suggesting a spacing of ~7 km.

3 Practicality

This close spacing will require accurate tracking of the satellite positions and, possibly, inter-satellite laser ranging to determine separation distance and relative positioning to ensure that the logo, QR code or other shapes displayed are correct and also that the constellation operators are able to monitor the risk of collision and, if necessary, manoeuvre to avoid other satellites.

3.1 Constellation Configuration

The satellites need to have a consistent, planar configuration facing the ground as, with a typical separation of just ~7 km, any radial satellite displacement out of that plane of even a few dozens of metres combined with non-perpendicular viewing will not only show unavoidable distortion of the displayed image as a whole due to the off-angle viewing but also distortion of the displayed image due to the out-of-place satellite(s) and the parallax effect. In addition, any difference in altitude would cause the displaced satellite to orbit slightly faster or slower than the others and so move laterally away from its desired position. For the same reason all of the satellites will have to have very accurately controlled orbital eccentricities.

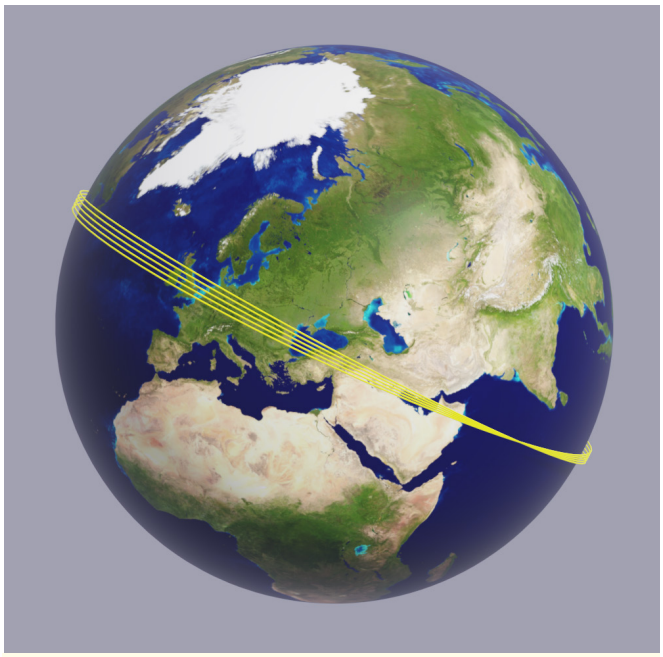


Figure 1: Bunching of satellites near the common inclination node.

Figure 1 shows a simple, exaggerated schematic of five satellites with slightly different orbital inclinations such that there are two intersection nodes with a 180° separation (one node is visible in the figure with the other behind the Earth). As the constellation approaches one of these nodes the satellites will get closer together and, if all are at a near-identical altitude (to maintain the planar configuration) there is a very high risk of collision and especially for large, complex constellations.

One solution to this may be to avoid displays where the satellites sparsely occupy a grid-like matrix of regular row/column positions as it's the columns that would shorten near the intersection nodes such that the satellites would become dangerously close. By arranging that each column of a notional grid only contained a single satellite the satellites might, with careful planning, be able to interleave near the intersection. This wouldn't, however, be generally possible with all logos or other displays and the accuracy of the satellite tracking and control may never be accurate enough.

Also, because the satellite orbits are inclined relative to each other, the vertical compression of the displayed logo means that the shape of the intended display would only be correct for a relatively small arc of its orbit.

3.2 QR Codes

Avant Space marketing have suggested that they could display QR codes. However, the foregoing argument implies that the required row/column matrix of QR code dots would have a high degree of collision risk near the intersection nodes.

Also, even a short URL (*e.g.* https://ras.ac.uk) encoded as a standard QR code will either be 21×21 dots or 29×29 dots depending on the chosen error correction level (see figures 2 and 3 that were generated using a free online web resource[7]). These QR codes have, respectively, 441 and 841 modules (barcode terminology for the black and white dots) with, again respectively, 46.8% and 45.2% black modules. Standard QR code reader software (such as found on smartphones) would require the colours to be inverted (so that the three finder pattern squares were correctly displayed against the black of the sky) which would require 206 or 380 satellites for even a short URL; significantly more than is proposed by Avant Space. In addition, the QR code standard[8] calls for no gaps between the modules[9] which would require very close formations of satellites. Safely managing this number of satellites in close formation in a planar configuration would be very difficult and especially so near the intersection nodes.

Figure 2: The URL https://ras.ac.uk as a 21×21 QR code with low error correction.

Figure 3: The URL https://ras.ac.uk as a 29×29 QR code with high error correction.

I conclude that the display of QR codes in this manner is not safely achievable and, if Avant Space were to persist in attempting this, there would be a high risk of collision.

3.3 The Display

For satellites orbiting between altitudes of 500 km to 800 km the circular orbital velocities are 7.54±0.08 kms^{-1}. An average-sized city might typically have a diameter of 60 km (*e.g.* Paris) so that the satellite constellation would pass overhead in about 8 s. This time could partly be extended by either rotating the satellites as they pass or, more easily, mounting the LED lasers on a tilt-able panel so that the downward beams could linger slightly longer over the target city but, even if this were possible, the time would still be limited to about 1520 s which, realistically, isn't long enough to generate an advertising impact. Outside that time period the displayed logo would be smaller and distorted by non-perpendicular viewing.

In an article[10] in Space.com by Brett Tingley (my highlighting):

> "The company claims that a constellation of satellites orbiting around 300 to 372 miles (500 to 600 kilometres) high will be able to project images visible even in cities with high light pollution. These artificial sky sights will be visible to millions for up to three to five minutes, according to Avant Space."

This is *significantly* longer than the 15-20 s calculated above: in four minutes the constellation would pass over 1,800 km of terrain and this is in contradiction to Avant Space's claims about protecting the night sky for astronomy by turning the display off when *not* over a city.

As well as the distortion effects due to non-perpendicular viewing outlined in section 3.1 above, the visibility of the LED laser lights has to be considered. Lasers typically have a well-collimated beam that produces a small spot-size even at large distances. If this were the case for an advertising display the beam from a single LED laser would pass over the observer on the ground in a very short time of the order of a few microseconds and an observer wouldn't see a logo but, rather, a brief flash from each satellite in turn. In order to produce a steady logo image it will be necessary to introduce some significant and evenly distributed spread to each of the beams so that the logo appears evenly bright for the 15-20 s it takes for the constellation to pass over. This will require overlapping spots from the lasers over an area comparable to the size of the target city. Spreading 150 W over 2,500-3,000 km^2 will significantly diminish the flux at ground level and make the satellite display less visible against the backdrop of a light-polluted city night sky. A possible solution to this (but not conveyed in the promotional video) might be to rapidly scan smaller, brighter, modulated beams across the target city fast enough that there's no flicker from the rasterization process.

4 Orbital Manoeuvres

The Avant Space satellites are to be powered by a proprietary ion thruster, the GT-50, of their own design. In the article on Avant

As an aside, both the promotional video[5] and the animated heading of the Avant Space website[3] show, respectively, the Omega and Chanel logos moving across the ground as a pattern of distinctly separate spots. If this were the case then an observer on the ground would only be able to see a single spot at a time rather than get an impression of a complete logo.

A 'blooper' from an over-enthusiastic marketing department perhaps?

Space[2] they claim that the GT-50 can be used on spacecraft with a mass up to 500 kg, has a specific impulse (I_{sp}) of up to 3,000 s, has an energy efficiency (η) of greater than 70% and consumes up to 150 W of power (P). From a Wikipedia article[11] on ion thrusters, the thrust force (F) in Newtons is:

$$F = \frac{2\eta P}{g I_{sp}} = \frac{2 \times 0.7 \times 150}{9.81 \times 3000} \cong 7 \text{ mN}$$

where g, the acceleration due to Earth's gravity at its surface, is 9.81 ms^{-2}.

The GT-50's thrust of approximately 7 mN is modest: for example, to accelerate a 25 kg satellite with a single GT-50 by 1 ms^{-1} would take about an hour. If the proposed advertising satellites are anywhere near the upper limit of 500 kg claimed for use of a GT-50 (only one thruster is shown in the promotional video) then a Δv of 1 ms^{-1} would take about 20 hours.

On the Avant Space website[3] they state that the logo could be changed every 98 minutes (presumably one orbit period) and that the satellites would stay in orbit for a year. For the logo to be changed that frequently (by rearranging the relative positions of the satellites) a single GT-50 with its modest thrust would struggle.

Further, with that level of thrust the satellites may also struggle to manoeuvre around other satellites in their own constellation or satellites belonging to other operators in a timely fashion. The constraints of a planar configuration make the risk of collision with their own satellites higher and the large size (38-60 km) of the constellation coupled with a less than ~7 km separation makes the constellation harder to manoeuvre away from other satellites or debris or for other satellites to avoid the Avant Space constellation.

At times of high solar activity any Avant Space satellites in an orbit near 500-600 km would likely be affected by increased atmospheric drag and the GT-50 may not be able to compensate for that. Also, any satellites that fail in higher orbits may take too long to re-enter if the ion thruster fails.

There is also the question of satellite failure and their replacement – a missing or misaligned satellite would make any intended logo look incomplete or incorrect. Unless Avant Space were to launch additional satellites as backups at the same time as the others are launched (as SpaceX do with Starlink) then they may have unhappy paying clients.

5 Summary

I think the proposed use of advertising satellites by Avant Space is unlikely to be successful:

a. There are too many technical obstacles to producing the desired display.
b. The constellation configuration likely cannot be changed with guaranteed safety or as easily as they state.
c. The ion thrusters are probably incapable of positioning the satellites as required in a timely fashion.
d. There may be regulatory problems with a constellation that needs to frequently change its orbital parameters.
e. The ion thrusters are likely unable to cope with collision avoidance.
f. There may be problems with failed satellites where the failure will be more noticeable than in the case of, for example, the Starlink constellation.
g. The company is currently sanctioned and may find it difficult to source necessary components.
h. As the company is sanctioned it has no western market; only companies in BRICS countries or Russia's CSTO commercial alliance are potential customers for the foreseeable future.
i. Most of the logos used in the promotional video and on the website are those of western companies. It's possible that for several years or more after the end of the current war in Ukraine many western companies may boycott any advertising that uses a Russian company or Avant Space may be subject to ongoing sanctions preventing western business with them.
j. The company may find problems with manufacturing manpower shortages due to the war in Ukraine.
k. The cost of operating such a constellation is likely to make the client end-cost much higher than simply employing a swarm of drones. Such drones have already demonstrated[12] the ability to display more complex graphics, in 3D, to animate them and to make dramatic use of colour – all more effectively and with significantly fewer complications than space-based advertising.
l. If the public are sufficiently persuaded that space-based advertising is crass commercial sky pollution then there may be a backlash against it that deters potential advertisers for fear of alienating otherwise potential customers.

I think, therefore, that any risk to ground-based astronomy from Avant Space's satellites is likely to be short-lived for commercial reasons. A company launching a technically different system design launched from, *e.g.* Europe or China, and without the political, economic and resource constraints that might beset Avant Space, might succeed in their venture (although some of the orbital limitations would likely still apply). It is possible, of course, that the Russian government may wish to encourage the prospect of being able to use such a constellation for other, possibly propaganda, purposes by providing funding – though there is presently strong competition with the military for such state funding.

There is likely to be little risk of light pollution from reflections off solar panels as the promotional video suggests they'll be on the zenith-pointing side of the spacecraft.

I think the risks are primarily a significantly higher collision risk than for other types of constellation which may pose a threat to orbiting observatories.

In conclusion, I don't think we need to worry about space-based advertising as it's likely to be a failed venture that won't grow to be a threat to astronomy.

Paul

References:

See overleaf.

References:

1 https://www.opensanctions.org/entities/NK-kyYxto58N3njQQtkTEkRmj

2 https://navigator-sk-ru.translate.goog/orn/1121612?_x_tr_sl=ru&_x_tr_tl=en&_x_tr_hl=en&_x_tr_pto=sc&_x_tr_hist=true#company_patents

3 https://www-avantspace-com.translate.goog/?_x_tr_sl=ru&_x_tr_tl=en&_x_tr_hl=en&_x_tr_pto=sc

4 https://www.newspace.im/constellations/avantspace

5 https://www.youtube.com/watch?v=klzjdOHJvTQ&ab_channel=OCHEVIDEO

6 https://en.wikipedia.org/wiki/Human_head

7 https://www.terryburton.co.uk/barcodewriter/generator

8 https://scanova.io/blog/qr-code-structure

9 Gaps between the modules would be confused as rows and columns of all-black or all-white modules. However, a module doesn't have to be a filled square – it can, for example, be a circular dot.

10 https://www.space.com/russia-1st-post-soviet-rocket-angara-a5-fourth-test-launch

11 https://en.wikipedia.org/wiki/Ion_thruster

12 https://www.youtube.com/watch?v=pRROyjwdNjA&ab_channel=Amazement

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Continued from page 7

Mike Lancaster

Derby and District Astronomical Society

***Image left**: During totality - taken with my Google Pixel 8 Pro phone. Venus is visible in the 4 o'clock position from the Sun. Note the eerie twilight filling the horizon.*

Mike Lancaster
Derby and District Astronomical Society
http://www.derbyastronomy.org