



OASI News

The newsletter of the Orwell Astronomical Society



Image of the ISS from night-sky camera, 14 May 2019

A stack of three consecutive frames, spanning the period 01:07:23 – 01:13:26 (6 mins)

Photo by Alan Smith

Trustees:

Mr Roy Adams

Mr Neil Morley

Mr David Payne

Honorary President:

Dr Allan Chapman D.Phil MA FRAS

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Society Notices

Society Contact details

Observatory (meeting nights only)

07960 083714

Email queries: info@oasi.org.uk

Facebook: <https://www.facebook.com/groups/445056098989371/>

Twitter: @OASlpswich

The OASI Facebook pages are proving very popular. Several non-members are active contributors.

Other contact details will be issued to members on a separate printed list.

Please send material for the OASI web site and newsletter e.g. observations, notices of events, general interest articles, to news@oasi.org.uk

Access into the School Grounds and Observatory Tower

Please use the third gate into the school grounds by the gym.

Areas out of Bounds

Access to the Observatory is **only via the black door** at the foot of the Observatory tower, which leads to the staircase and thence to the spiral staircase up to the Observatory. If the black door is locked, please phone the observatory mobile, **07960 083714** during meeting hours.

Please do NOT explore other routes. When in doubt, ask or call the Observatory mobile.

Remember this is a school and straying into the main part of the school where the pupils reside would cause the society big problems and could see us losing the use of the observatory. Any member found to be anywhere other than the approved access route or the observatory area will face serious sanctions up to and including expulsion from OASI.

Please note that access time for all observatory member nights is after 20:15

Articles for OASI News

News, pictures and articles for this newsletter are always welcome. Please send them to

news@oasi.org.uk

The CLOSING date is the 15th day of the month

Please submit your articles in any of the following formats:–

Text: txt, rtf, rtf, doc, docx, odt, Pages, pdf

Spreadsheets: xls, xlsx, OpenOffice/LibreOffice, Numbers

Images: tiff, png, jpg

Please send tables as separate files in one of the above formats.

If you don't feel up to writing a major article, perhaps you might write a short note for OASI News along the lines of *"This month I have mostly been observing/constructing/mending/reading/etc."*?

[Newsletter archive www.oasi.org.uk/NL/NL_form.shtml](http://www.oasi.org.uk/NL/NL_form.shtml)

Authors, please note that your articles will now be publicly available worldwide!

Reproducing articles from OASI News

If you plan to reproduce an article exactly as per OASI News then please contact the [Editor](#) – otherwise, as a matter of courtesy, please seek permission from and credit the original source/author. You may not reproduce articles for profit or other commercial purpose.

Committee 2019

Chairman	Andy Gibbs	Set overall agenda for OASI, Chair committee meetings, Press and publicity, Visits by outside groups, Observatory tours, Public appreciation of astronomy, Outreach activities.
Secretary	Roy Gooding	Outreach meetings (jointly with Chairman), observatory decoration.
Treasurer	Paul Whiting FRAS	Finance, Supervision of applications for grants.
Committee	James Appleton	Committee meeting minutes, Web site
	Martin Cook	Membership, Tomline refractor maintenance & user testing
	Peter Richards	Lecture meetings, Email distribution lists
	Martin Richmond-Hardy	Newsletter, OASI @ Newbourne
	John Wainwright	Equipment curator
	Mike Whybray	Astronomy Workshops, Child protection officer, Orwell Park School Astronomy Club.
	Matt Leeks	Safety & security
	Andy Wilshire	Librarian

Signing in and out

Please ensure you sign in and out when visiting the Observatory and/or Newbourne.
This is for fire safety precautions and also provides an historic record.

Next Committee Meeting

Friday 21 June 2019, 8pm at Horley Spiritualist Church, 345 London Rd, Ipswich IP2 0BG
Please note the change of venue.

OASI and BAA Events

For the latest event details, please see www.oasi.org.uk/Events/Events.php

There's a Google Calendar on the OASI web site with the latest dates (and corrections!). If you want to easily add OASI Events to your own computer/phone/tablet calendar application click this button on the website Events page or use this address to access this calendar from other calendar applications.



<https://calendar.google.com/calendar/ical/1jhs9db71ncki4sojo7092vfvc%40group.calendar.google.com/public/basic.ics>

For other astronomy news and astro pictures try our

Twitter feed <https://twitter.com/OASlpswich>

Facebook page <https://www.facebook.com/pages/Orwell-Astronomical/158256464287623>

Subscribe to the OASI Yahoo group by emailing oasi-subscribe@yahoogroups.com

Key:

OASI public events

BAA events

Other events

Date, Time & Location	Contact	Event
Weekly, every Wednesday, 20:15–22:00 Orwell Park Observatory	Martin Cook, Roy Gooding	General observation (weather permitting) using a variety of telescopes. Entry via the third gate left. NOT the main gate
Sat 8 June 10:00 West Berkshire Mencap Centre, Enborne Gate, Newbury, RG14 6AT	https://www.britastro.org/historical2019	<i>BAA Historical Section meeting</i>
Sat 8 June 12:00 Kirton Recreation Ground, Back Rd, Kirton	Martin Richmond-Hardy newbourne@oasi.org.uk	OASI at Kirton Fete. Public event.
Sun 9 June 09:00 Kirton Recreation Ground, Back Rd, Kirton	Paul Whiting, FRAS treasurer@oasi.org.uk	OASI at East Suffolk Wireless Revival. Public event.
Monday 10 June from 19:00 Newbourne Village Hall	Martin Richmond-Hardy newbourne@oasi.org.uk	OASI @ Newbourne.

Date, Time & Location	Contact	Event
Sat 22 June 10:00–18:00 RAL, Didcot OX11 0QX	https://www.britastro.org/RAL2019	<i>BAA Summer meeting</i>
Monday 24 June from 19:00 Newbourne Village Hall	Martin Richmond-Hardy newbourne@oasi.org.uk	OASI @ Newbourne. 19:30 Sky notes Bookswap
29 June Newbourne Village Hall	Pete Richards lectures@oasi.org.uk	OASI Summer BBQ. Members and their guests.
Monday 8 July from 19:00 Newbourne Village Hall	Martin Richmond-Hardy newbourne@oasi.org.uk	OASI @ Newbourne.
Sat 13 July	Pete Richards lectures@oasi.org.uk	OASI at Nacton Fete
Monday 22 July from 19:00 Newbourne Village Hall	Martin Richmond-Hardy newbourne@oasi.org.uk	OASI @ Newbourne. 19:30 Sky notes 19:45 Workshop/Talk: Martin RH “Siding Spring & Parkes observatories” Bookswap
Tues-Wed 30– 31 July	www.cimuseums.org.uk	Planetarium at Christchurch Park (see page 4). OASI in attendance with solar scopes and children's activities.
Monday 12 Aug from 19:00 Newbourne Village Hall	Martin Richmond-Hardy newbourne@oasi.org.uk	OASI @ Newbourne.
Sat 24 Aug 10:00–17:00 9 Margaret St, Birmingham, B3 3BS	https:// www.britastro.org/ spectro2019	BAA Spectroscopy Software Training Workshop
Monday 26 Aug		NEAS visit to Newbourne and picnic. From 7pm OASI @ Newbourne
Fri 6 Sept		<i>BAA Autumn Weekend meeting</i>

Date, Time & Location	Contact	Event
Monday 9 Sept from 19:00 Newbourne Village Hall	Martin Richmond-Hardy newbourne@oasi.org.uk	OASI @ Newbourne.
Fri 20 Sept 20:00 St Augustine's Church Hall	Peter Richards lectures@oasi.org.uk	Lecture. "Monsters in the Dark: Searching for the Most Massive Galaxies in the Universe." Dr Matthew Bothwell. University of Cambridge.
Monday 23 Sept from 19:00 Newbourne Village Hall	Martin Richmond-Hardy newbourne@oasi.org.uk	OASI @ Newbourne. 19:30 Sky notes Bookswap
28-29th Sept	http://las-skycamp.org	<i>Kelling Heath Autumn Star Party</i>
Sat 5 Oct		<i>BAA Back to Basics workshop</i>
Sat 12 October		<i>BAA Observers' Workshop</i>
Monday 14 Oct from 19:00 Newbourne Village Hall	Martin Richmond-Hardy newbourne@oasi.org.uk	OASI @ Newbourne.
Fri 18 Oct 20:00	Peter Richards lectures@oasi.org.uk	Lecture. "Pulsars and our understanding of the cosmos" Dr Robert Ferdman. University of East Anglia.
Sun 27 Oct	Paul Whiting, FRAS treasurer@oasi.org.uk	Bawdsey Astronomy Day
Monday 28 Oct from 19:00 Newbourne Village Hall	Martin Richmond-Hardy newbourne@oasi.org.uk	OASI @ Newbourne. 19:30 Sky notes 19:45 Workshop: 'Observing Transits of Mercury' Bookswap
28 Oct–4 Nov		<i>Haw Wood Autumn Star Party</i>
Wed 30 Oct		<i>BAA AGM</i>
Mon 11 Nov		Transit of Mercury
Monday 11 Nov from 19:00 Newbourne Village Hall	Martin Richmond-Hardy newbourne@oasi.org.uk	OASI @ Newbourne.

Date, Time & Location	Contact	Event
Fri/Sat 15/16 Nov. Stoneleigh Park, Coventry CV8 2LH	https:// www.ukastroshow.com	<i>International Astronomy Show</i>
Fri 15 Nov 20:00 St Augustine's Church Hill	Peter Richards lectures@oasi.org.uk	Lecture. "Neighbours - An Introduction to the Local Group". Dr Nick Hewitt. British Astronomical Association.
Sun 17 Nov, 05:30 TBC	James Appleton info@oasi.org.uk	Field trip to observe graze of ZC1128. More info.
Monday 25 Nov from 19:00 Newbourne Village Hall	Martin Richmond-Hardy newbourne@oasi.org.uk	OASI @ Newbourne. 19:30 Sky notes Bookswap
Monday 9 Dec from 19:00 Newbourne VH	Martin Richmond-Hardy newbourne@oasi.org.uk	OASI @ Newbourne.
Fri 20 Dec 2019, 04:30	James Appleton info@oasi.org.uk	Field trip to observe graze of ZC1840. More info.
Monday 23 Dec from 19:00 Newbourne VH	Martin Richmond-Hardy newbourne@oasi.org.uk	OASI @ Newbourne. 19:30 Sky notes Bookswap

Planetarium Event at Ipswich Museum

Those of you with children/grandchildren, etcetera, may be interested in an event at Ipswich Museum during the Summer Holidays.

On **Tuesday 30th of July** and **Wednesday 31st of July** there will be an inflatable planetarium at Ipswich Museum. Sessions, which are suitable for age 4+, are £3.50 and have to be booked online in advance. The event is part of a Summer of Science at the Ipswich museums (Ipswich Museum – on High Street, Christchurch Mansion and Ipswich Art Gallery) during the Summer school holidays. More information can be obtained online at <http://www.cimuseums.org.uk> or by calling 01473 433100 (phone number is the Ipswich Regent theatre through which tickets can be bought). Now bookable on this site:

<https://apps.ipswich.gov.uk/en-GB/shows/planetarium-%20discover%20the%20solar%20system/events>

As part of the Ipswich Summer Science, we will be attending this event

Weather permitting, we will be providing Solar observing. In the event of cloudy weather, we have offered to do other activities, i.e. colouring-in, making craters. These would be aimed at children aged four and upwards.

We need around four helpers for both days, so if you can help on one or both days, please let me know.

Thank you

Andy Gibbs

OASI @ Newbourne

Martin Richmond-Hardy newbourne@oasi.org.uk

We normally meet at Newbourne Village Hall, Mill Lane, IP12 4NP on the 2nd and 4th Mondays (with a few exceptions).

OASI @ Newbourne is a good place to start for beginners. If you are thinking of buying a scope or binoculars, come and try before you buy and talk to owners about the strengths and weaknesses of particular models. If you've already splashed the cash, bring your new scope along to use or for advice on setting-up and adjustment. All welcome, with or without telescopes. We would like visitors to join OASI to enjoy the full benefits of membership.

There are also **Stargazers' Guide (Sky Notes)**, **Astronomy Workshops** and the **Book Swap**.

OASI@Newbourne Meetings

10 June	24 June (S+B)	
8 July	22 July (S+B+W)	
12 Aug	26 Aug (B/H)	NEAS visit & picnic.
9 Sept	23 Sept (S+B)	
14 Oct	28 Oct (S+B)	
11 Nov	25 Nov (S+B)	
9 Dec	23 Dec (S+B)	

We open up for all meetings at 7pm. Star Guide (S) at 7:30pm and Workshops (W) at 7:45pm. B = Book Swap night (see below).

Stargazer's Guide

On the last meeting each month Bill Barton FRAS will give a short presentation of what can be viewed in the following 4 weeks.

Astronomy Workshops/Informal talks

Contact Mike Whybray

Location: Newbourne Village Hall IP12 4NP

Doors open at 7:00pm.

Workshops start at 7:45pm

If you are a new OASI member, or haven't been to one of these informal workshops before, they are a mixture of events of different characters including beginners talks, interactive workshops, films, etc., suitable for all. They are also a chance to chat with other members over a cup of tea and a biscuit, in a venue rather warmer than the observatory dome on a winter's night!

Given a clear night, we can make use of the field for a workshop or continue afterwards with some observing.

Do you have a subject you could workshop? You could do a short one, or share the effort with a partner. Drop Mike Whybray a line! workshops@oasi.org.uk

22 July **Martin Richmond-Hardy, "Siding Spring and Parkes observatories".**

28 October **Bill Barton FRAS, "Observing Transits of Mercury"**



**Alan Smith demonstrating his all-sky camera enclosure with automatic rain cover
at the talk given by himself and James Appleton on Monday 6 May at Newbourne
*Fireballs and how to catch them***

Astronomy Book Swap

Pete Richards

If you are anything like me you'll have a bookcase or two full of astronomy books and no room for any more but you know the next time you are at an astronomy event you'll be tempted again. OASI will be hosting an astronomy book swap event at Newbourne on a Monday evening to help you clear some space – or maybe you can provide a home for someone else's unwanted books?

If you bring any books and they are not taken you will need to take them home again as OASI has no spare storage space for books.

You can take away any books you are interested in but if you have not provided any books yourself you might like to make a small cash donation to OASI.

Any cash donations will help towards running OASI @ Newbourne.

The books can be on any area of astronomy, or space exploration, or related subjects. They can be factual or works of fiction including space related science fiction. As well as books you could bring DVDs on similar subjects, or maybe you have an astronomical jigsaw puzzle you'd like to give away or exchange.

The book swap will be held at Newbourne Village Hall on Monday Star Guide/Workshop nights.

Lecture Meetings

Contact: Peter Richards lectures@oasi.org.uk

We have an exciting and interesting set of lectures by guest speakers for the Autumn.

There is a new venue for lectures this year which is:

St Augustine's Church Hall
Bucklesham Road
Ipswich IP3 8TH.

The start time for all talks will be 8pm and, as usual, the talks will be held on Friday evenings.



OASI Guest Speaker Lectures

- | | |
|----------------|--|
| 20th September | "Monsters in the Dark: Searching for the Most Massive Galaxies in the Universe." Dr Matthew Bothwell. University of Cambridge. |
| 18th October | "Pulsars and our understanding of the cosmos" Dr Robert Ferdman. University of East Anglia. |
| 15th November | "Neighbours - An Introduction to the Local Group". Dr Nick Hewitt. British Astronomical Association. |

Other local astronomy society meetings

Athaneum Astro Society

www.3a.org.uk/index.htm

We meet fortnightly on Thursdays, from 7.30pm, at our dark-sky site in the [Walled Garden](#) at Nowton Park, just outside Bury St Edmunds. If you're planning on joining us for the first time, please [contact us](#) in advance, just to make sure the meeting is going ahead. We recommend that you wear warm clothing (even summer nights can be chilly, especially when the skies are clear!) and bring a flask, or insulated mug, for a warm drink. We have tea and coffee-making facilities on-site. Events are listed here <http://www.3a.org.uk/events.htm>

LYRA Lowestoft & Yarmouth Regional Astronomers

www.lyra-astro.co.uk

LYRA Programme and Local Events 2019 – All talks (unless other wise stated) will commence at 7.30pm in the Coach House Room at Parkhill Hotel, just outside Oulton Village on the B1375 (Oulton Broad to Gt. Yarmouth Road) NR32 5DQ

All Talks £2.50 For Non Members

- | | |
|---------|--|
| June 11 | A talk "The Silver-On-Glass Revolution" by Bob Marriot |
| June 25 | LYRA Observing/Practical night at Barn Car Park, Parkhill Hotel from 7.30pm |
| July 9 | A talk "Midsummer madness? – Astronomy versus Pseudoscience, Flying Saucers & Conspiracy Theories" by Mark Shepherd. |
| July 23 | LYRA Observing/Practical night at Barn Car Park, Parkhill Hotel from 7.30pm |
| Aug 13 | Summer Social Evening at Parkhill Hotel |
| Sept 10 | TBA |
| Sept 24 | LYRA Observing/Practical night at Barn Car Park, Parkhill Hotel from 7:30pm |
| Oct 8 | A Talk "Variable Stars – being a Professional-Amateur" by Michael Poxon |
| Oct 22 | LYRA Observing/Practical night at Barn Car Park, Parkhill Hotel from 7:30pm |
| Nov 12 | TBA |
| Nov 26 | LYRA Observing/Practical night at Barn Car Park, Parkhill Hotel from 7:30pm |

DASH Astro

Darsham And Surrounding Hamlets

<http://dash-astro.co.uk>

All DASH Astro observing sessions will take place at WESTLETON COMMON. ASOG observing sessions and locations may be arranged at the time of observation.

Unless stated all group meetings will take place from 7:30 pm.

May 19th will be the last of this season's meetings at Westleton village Hall. Due to building work to Westleton Village Hall, we will be moving to the New Darsham Village Hall, from September 8th until further notice.

Note these meetings are now on Sundays.

- June 16 Solar Observing Outreach - Location Sutton Hoo National Trust
- June 23 International SUNday - Location Dunwich Heath
- August 10 (Saturday) DASH Summer Social - confirmed. (Members and Guests only)
- Sep 08 Meeting – Dr. Sonali Shukla, Lecturer in Astronomy, Cambridge Univ.
- Sep 21&22 Henham Steam Rally. Solar Observing and Displays
- Sept 29 Dash Observing Session (Sunset 18:35 Moonset 19:24 1.1% Moon)
- Oct 13 Meeting – Dr. Manda Banerji, Inst. of Astronomy, Cambridge Univ.
- Oct 23&24 Family Stargazing Evening at Sutton Hoo N.T. Site 6-9pm
- Oct 27 Dash Observing Session (Sunset 16:33 Moonset 16.46 0.9% Moon)
- Nov 10 Meeting – Steve Hubbard, Ian Lomas & David Gwynn, plus “Q & A Panel” Title TBC
- Nov 11 DASH Observing. “Transit of Mercury” start 12:35 ends 16:06 (sunset)
- Nov 24 Dash Observing Session (Sunset 15:49 Moonset 15.10 6.7% Moon)
- Dec 07(Saturday) DASH Christmas Social – confirmed. (Members and Guests only)

The Night Sky in June

Martin RH

All event times (**BST** unless otherwise stated) are for the location of Orwell Park Observatory 52.0096°N, 1.2305°E



Moon

Source: <http://heavens-above.com/moon.aspx>

New Moon	1st Quarter	Full Moon	Last Quarter
03 June 11:02	10 June 06:59	17 June 09:31	25 June 10:46

Sun, Moon and planets

Source: <http://heavens-above.com/PlanetSummary.aspx>

Object	Date	Rise	Set	Mag.	Notes
Sun	1 June	04:41	21:05		Summer solstice Jun 21, 16:54
	30 June	04:39	21:19		
Moon	1 June	04:05	18:41		
	30 June	02:58	18:47		
Mercury	1 June	05:18	22:17	-1.1	Max. eastern elongation Jun-24
	30 June	06:54	22:21	1.1	
Venus	1 June	04:00	19:01	-3.8	
	30 June	03:51	20:18	-3.8	
Mars	1 June	06:41	23:21	1.8	
	30 June	06:25	22:27	1.8	
Jupiter	1 June	21:41	05:28	-2.4	Opposition Jun-10
	30 June	19:30	03:20	-2.4	
Saturn	1 June	23:41	07:39	0.3	
	30 June	21:41	05:35	0.1	
Uranus	1 June	03:21	17:31	5.9	
	30 June	01:29	15:44	5.8	
Neptune	1 June	02:05	13:07	7.9	
	30 June	00:12	11:13	7.9	

Paul's Astronomy Podcast for June

Paul Whiting FRAS Podcast, June 2019 www.oasi.org.uk/2019_06_pod.mp3

Occultations during June 2019

James Appleton

The table lists occultations during the month under favourable circumstances. The data relates to Orwell Park Observatory, but will be similar at nearby locations.

The events should be readily visible in small telescopes or binoculars. The first two columns list the date and time (UT) of the occultation. Column three gives the phenomenon: 'D' denotes a disappearance and 'R' a reappearance. The table lists circumstances of disappearances and reappearances as dictated by the visibility of each phenomenon (determined by altitude, lunar phase, etc). Column four details the lunar phase ('+' for waxing and '-' for waning). Columns five and six give the altitude of the Sun and the star, both in degrees. (A negative solar altitude means that the Sun is below the horizon.) Columns seven and eight provide the star's magnitude and catalogue number.

The data relates to Orwell Park Observatory, but will be similar at nearby locations.

Please note that **times are shown in UTC**.

Date	Time (UT)	D/ R	Lunar Phase	Sun Alt(°)	Star Alt(°)	Mag	Star
12 Jun	22:09:49	D	0.79+	-11	27	7.2	H67083
12 Jun	23:46:16	D	0.79+	-15	17	7.0	ZC1976
13 Jun	00:20:03	D	0.79+	-15	12	6.6	88 Vir
26 Jun	01:44:49	D	0.43-	-11	10	4.8	20 Cet
	02:32:12	R		-7	17		

Meteor showers

Source: BAA Handbook 2019 p100-101

Shower	Maximum	Normal limits	ZHR at Max	Notes
Daytime Arietids	June 8	May 22 – July 2	30?	Most active of the daytime showers. Good for radio observers [1]. ZHR and radiant location uncertain.
June Bootids	June 28	June 22 – July 2	?	Unexpected outburst with ZHR~100 m/h in 1998 June 27 after a quiescent period of several decades. Very favourable.

1. For radio observation, use reflections from Graves radar on 143.050MHz or the Brams transmitter in Belgium on 49.97MHz,

Visible ISS passes $\geq 15^\circ$ max altitude

Martin RH

Source: <http://heavens-above.com/PassSummary.aspx?satid=25544>

Times are UTC. Predictions are approximate (23 Jan) due to craft adjustments. Check the day before.

A quiet month.

Date	Mag	Start			Highest point			End		
		Time	Alt.	Az.	Time	Alt.	Az.	Time	Alt.	Az.
02 Jun	-1.5	22:16:15	10°	WSW	22:18:14	15°	SW	22:20:13	10°	S

Astronomy on the radio

Bill Barton's Radio Broadcast

ICRFM (Ipswich Community Radio) 105.7 MHz at about 08:25 in the morning of the first Wednesday of each month. I aim to cover what there is to see in the sky and then a little bit on something topical. ICRFM is also available to listen to over the Internet and there is a listen again option on their website. <http://www.icrfm.com>

David Murton's Radio Broadcast

On 1st Tuesday of the month, 1.40pm on the Lesley Dolphin show on BBC Radio Suffolk – now digital (channel 10c) and FM 103.9 (Ipswich), 104.6 (west Suffolk), 95.5 (Lowestoft), 95.9 (Aldeburgh) and the internet. <https://www.bbc.co.uk/radiosuffolk>

BAA news

BAA meetings in June

Historical Section Annual Meeting Saturday, 2019, June 8 - 10:00, Newbury

Webb Deep-Sky Society Annual Meeting, Cambridge Saturday, 2019, June 15 (All day)

A short AGM followed by a day of talks from amateurs and professionals

BAA Summer Meeting "Astronomy and Space today" Saturday, 2019, June 22 - 10:00, Rutherford Appleton Laboratory

BAA meetings in August

[Spectroscopy Software Training Workshop](#)

Saturday, 2019, August 24 - 10:00 at 9 Margaret St, Birmingham, B3 3BS

An introduction to using BASS and ISIS software

BASS Project Downloads - https://uk.groups.yahoo.com/neo/groups/astrobodger/links/all/BASS_Project_downloads_001356094893

ISIS – A free Windows application dedicated to processing of astronomical spectral data.

Download - <http://www.astrosurf.com/buil/isis-software.html>

BAA Notes: Noctilucent Cloud and What to Look For

By Sandra Brantingham

**Article dated Saturday, 2019, May 11 - 20:20
Reproduced by permission.**

In 1884 a gentleman called Thomas Backhouse was looking at cloud formations. It had been a good year for this, as the effects of the Krakatoa eruption were still showing in sunsets all over the world. He noticed a new type of cloud which was only visible after sunset. He kept observing these clouds even after the dust of Krakatoa had faded. These clouds became known as polar mesospheric clouds or Noctilucent clouds (popularly referred to by the abbreviation "NLC") and are high atmosphere clouds which occur over summertime at mid latitude locations. They form at very high altitudes – around 82 km above sea level – and are, thus, a quite separate phenomena from normal weather or tropospheric cloud.

NLCs can be seen in the northern hemisphere from around late May to early August during the darkest part of a summer's night when the Sun is between 6 – 16 degrees below the horizon. Typically, they will occupy the northern horizon, along the twilight arch, extending to an altitude of 10 – 15 degrees. Over the NLC "season" the bright star Capella dominates this part of the sky and serves as a good marker for the NLC observer. They used to be associated with northern UK but were seen as far south as southern France in 2018, and they seem to be spreading further south with each season.

So, what do you look for and when? You need to start looking from about 11pm BST and

keep going till 3am BST. You need a clear northern horizon and clear skies for the best chance of viewing them. All low clouds will appear dark, and you should also be able to see stars, particularly Capella. The colour of the clouds will vary from white to an almost electric blue and will stand out quite markedly. There are several types, but the most common and easiest to recognise is the "herring bone" or rippling sand type pattern which looks like lots of curved lines drawn in parallel. At the start of the season you may get days with out NLC but as it builds you may see several displays on consecutive nights.

Photographing them is easy but you will need a tripod to ensure a stable platform. Modern digital cameras will capture NLC with an exposure of anything from 0.5 to 6 seconds but it is best to vary shutter speed and take as many as possible as display intensity will vary.

Observations of NLC remain of great value to professional scientists studying upper-atmosphere phenomena. Useful observations are very easy to make and require no special equipment.

So in finishing, I wish you clear skies and pleasant nights observing NLC and it's normally a lot warmer than observing aurora in winter.

Please do send me your results and also post them to your [BAA Members Page](#).

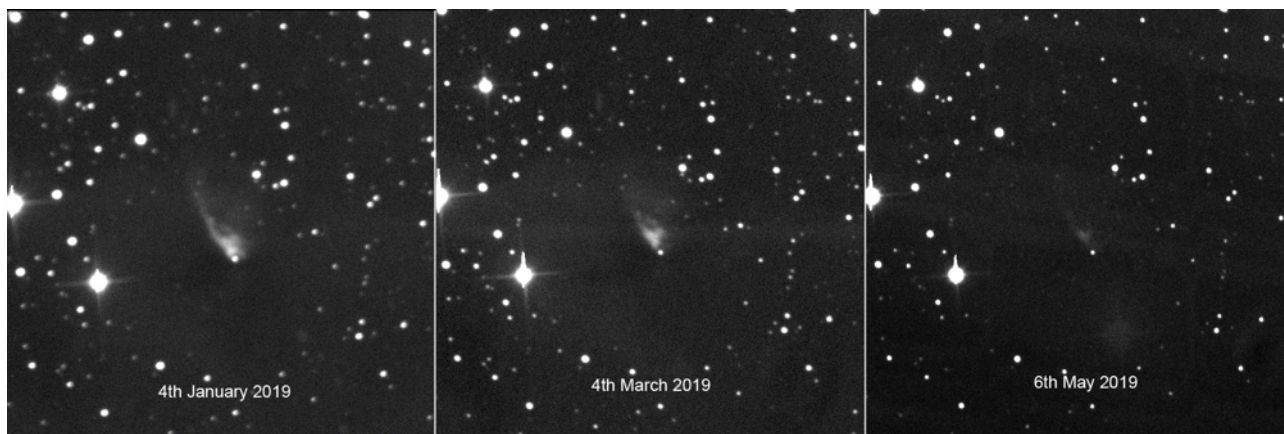
Sandra Brantingham Aurora & Noctilucent Cloud Section Director

Editor's note: There are some excellent photographs of NLCs in the source article.

Variable Nebulae

Mike Harlow

Latest results on the ongoing variable nebula project attached. Three images from 2019 showing a slow fade of Gyulbudaghian's variable nebula. All images taken with the University of Iowa 0.51M telescope in Arizona. Single 3 minute exposures that I take just to monitor activity. A bit noisy with some artifacts but enough to see what is going on.



The overall fading trend is real although the last image was taken in poorer conditions than the first two so may exaggerate the effect. Only time will tell if it fades out completely, as it did in August 2009, or brightens again.

A Grazing Lunar Occultation of ZC2401

James Appleton

In 2019, the grazing lunar occultation season began early! The first graze of the year was at 05:34¹ on 01 January. Alan Smith, OASI Graze Observation Location-Finding Supremo, undertook several reconnoitres and identified that the most practical viewing locations were in the vicinity of Southwold lifeboat station. Fortunately, persistent cloud cover meant that would-be OASI observers attempted no observation, so were spared the problem of avoiding the attentions of New Year revellers intent on drowning each other in Southwold harbour!

The second graze of 2019 was forecast to occur during the lunar eclipse on 21 January. The star was faint at magnitude 9.7 and even during eclipse conditions threatened to be difficult to observe. In consequence, no observing trip was organised.

The third graze was different! As usual, Alan and James used the freeware software

package Occult2 (version 4.5.6.1) to calculate nominal circumstances. The time, 03:29, was unsociable but other parameters were generally favourable. The star, ZC2401, was relatively bright at magnitude 5.6 (Hipparcos, visual). The graze occurred on the southern limb, so offered the prospect of multiple disappearances/reappearances. Although the approach was on the bright limb, the actual disappearances and reappearances were predicted for the dark limb.

Alan used Google Earth to identify potential observing locations, all in relatively isolated locations. After a field reconnaissance and discussion on a Wednesday evening at Orwell Park Observatory, there was a consensus to observe from the beginning of a footpath along the west side of Tunstall Forest, off a minor road, approx. 0.5km NE of the five-way crossroads of the B1084 / Snape Road / Hospital Road / Sudbourne Road / minor road.

¹ All times in this report are expressed as UT (GMT).

² *Occult* is developed by the amateur astronomer David Herald. It may be downloaded from his website: <http://www.lunar-occultations.com/iota/occult4.htm>

The WGS84 coordinates of the site are 1.532450° E, 52.112839° N, 10m above MSL.

Following the usual arrangements, Alan contacted previous graze observers plus anyone who had responded to the publicity for the event in the OASI Newsletter. Four observers mustered for the customary go/no-go audio-conference at 22:00 on the evening of the graze, Andy Gibbs and Joe Startin joining Alan and James. The preceding days' forecasts of cloud cover were very changeable, but the short-range forecast for the morning of 26 March was for certain clear skies, so the decision to proceed with observations was easily made. Alan informed Suffolk Constabulary by email of the group's intentions.

Traffic congestion in East Anglia in the early hours of a Tuesday morning is not generally a problem and so it proved on this occasion. In fact, wildlife proved more numerous than vehicles. James left home at 01:30 and saw more deer (three) than other cars (two) en route to site. Andy also encountered deer en route (a herd near Butley) and had to slow down for a badger crossing the road.

Arriving first on site at 02:20, James admired the view while waiting for the others to arrive. The night sky was glorious, with only a very slight haze, the Moon in southern Ophiuchus appearing above Antares and above and to the west of Jupiter. The site itself was excellent, hard underfoot, completely obscured from the road by mounds of Earth, perfectly aligned for observations of the

graze, and with space for several vehicles and observers.

In the still of the night, sounds were audible at a great distance. And so it was that, circa 02:30, James became aware of a car approaching. Alan, he thought. Moving out of the shelter of the mounds of earth for a better view, he then witnessed a car pull up to the nearby crossroads and proceed down Hospital Road, away from the graze site. Plonker!, he thought. Five minutes later, he watched as the car retraced its path along Hospital Road towards the crossroads, then took the correct turning for the graze site (definitely Alan!) arriving at 02:40. Some five minutes later, Andy arrived. Alas, Joe was a no show for the event; it transpired later that he suffered an alarm malfunction and awoke at 02:35, too late to head for site.

The three observers were all set up by 03:00 and had easily acquired the star. Alan and Andy observed visually, but James decided to take a video. This was something of a gamble because, although the star was easily visible in the eyepiece, in the viewfinder of the camera it was initially invisible against glare from the bright lunar limb. James therefore set the camera based on experience at previous grazes and hoped for the best. Unfortunately, an overly hasty setup and careless execution of the telescope alignment procedure resulted in inaccurate automatic tracking and the need for frequent manual adjustments to keep the star and Moon in frame.

Table 1 summarises the equipment in use and approaches to timing the event.

Observer	Equipment	Timing
James	Meade LX200 SCT, 254 mm, F10 on Meade alt-az driven mount with x2 Barlow and Canon EOS 6D MkII camera. Recorded video at 50 fps, 1/50s exposure, ISO 10,000).	Commentary and time pips from Alan's "Clock Sync" app recorded on the video for off-line determination of event times.
Andy	Orion XX12i push-to Dobsonian, 305 mm with 14 mm Meade Series 5000 eyepiece (107x magnification).	"Audio Memos" app on iPhone used to record commentary and timings from Rugby radio watch and Alan's "Clock Sync" app.
Alan	250 mm Newtonian on home-made Dobsonian mount, with electric drives on alt and az. 10 mm Plossl eyepiece giving about 150x magnification.	Time pips from Android app "Clock Sync" broadcast at one-minute intervals. Commentary and pips recorded with MP3 audio recorder.

Table 1. Observers, equipment and approaches to timing the event.

As time progressed, a slight haze developed, reducing contrast, but not so much as to cause problems, and the star remained easily visible in the eyepiece throughout the graze. Once the star had crossed the terminator and appeared against the dark limb, shortly before the first disappearance event, it became visible too in the camera viewfinder. The star was at relatively low altitude, only 17° , so the image was quite unsteady but, again, this did not cause any serious difficulties. Alan noted that the image quality improved steadily as his telescope equalised to the ambient temperature, approx. 1°C .

The lunar limb profile (see figure 1) offered the prospect of observing almost half a minute of repeated short flashes of the star against the limb, followed by a complete disappearance lasting almost one and a half minutes. However, the observers each recorded two disappearances, with sharp transitions. No flashes were observed, neither visually nor in a later frame-by-frame analysis of the video. Table 2 and figure 2 compare predicted and empirical event times.

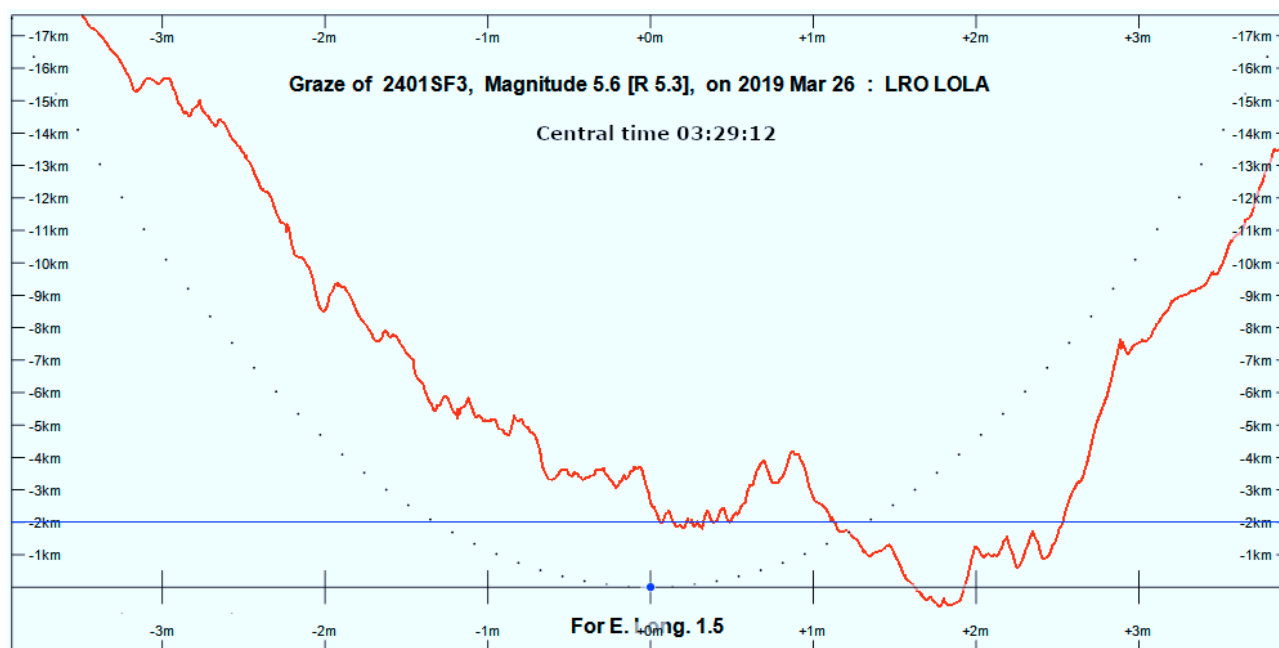


Figure 1. Limb profile (from Occult).

Observer	D1	R1	D2	R2
James	03:29:14	03:29:48	03:30:14	03:31:48
Andy	03:29:14	03:29:50	03:30:15	03:31:49
Alan	03:29:14	03:29:49	03:30:14.5	03:31:48
Theory	03:29:15 – 03:29:41 Multiple short-duration D/R events		03:30:20	03:31:44

Table 2. Theoretical and empirical event times (UT).

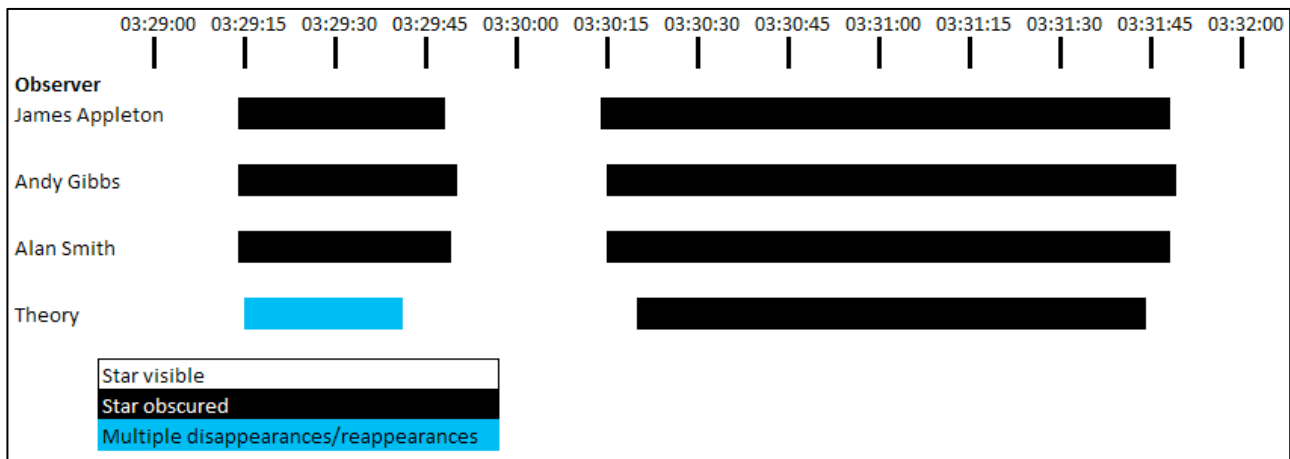


Figure 2. Theoretical and empirical event times (UT).

Figure 3, extracted from the video for time 03:29:52, shows the scene between first reappearance and second disappearance. Brightness has been artificially increased in the region immediately surrounding the star. The lunar features responsible for occulting the star appear to have been in the region behind crater Demonax (in shadow on the limb in the figure); nearby, illuminated craters are as marked.

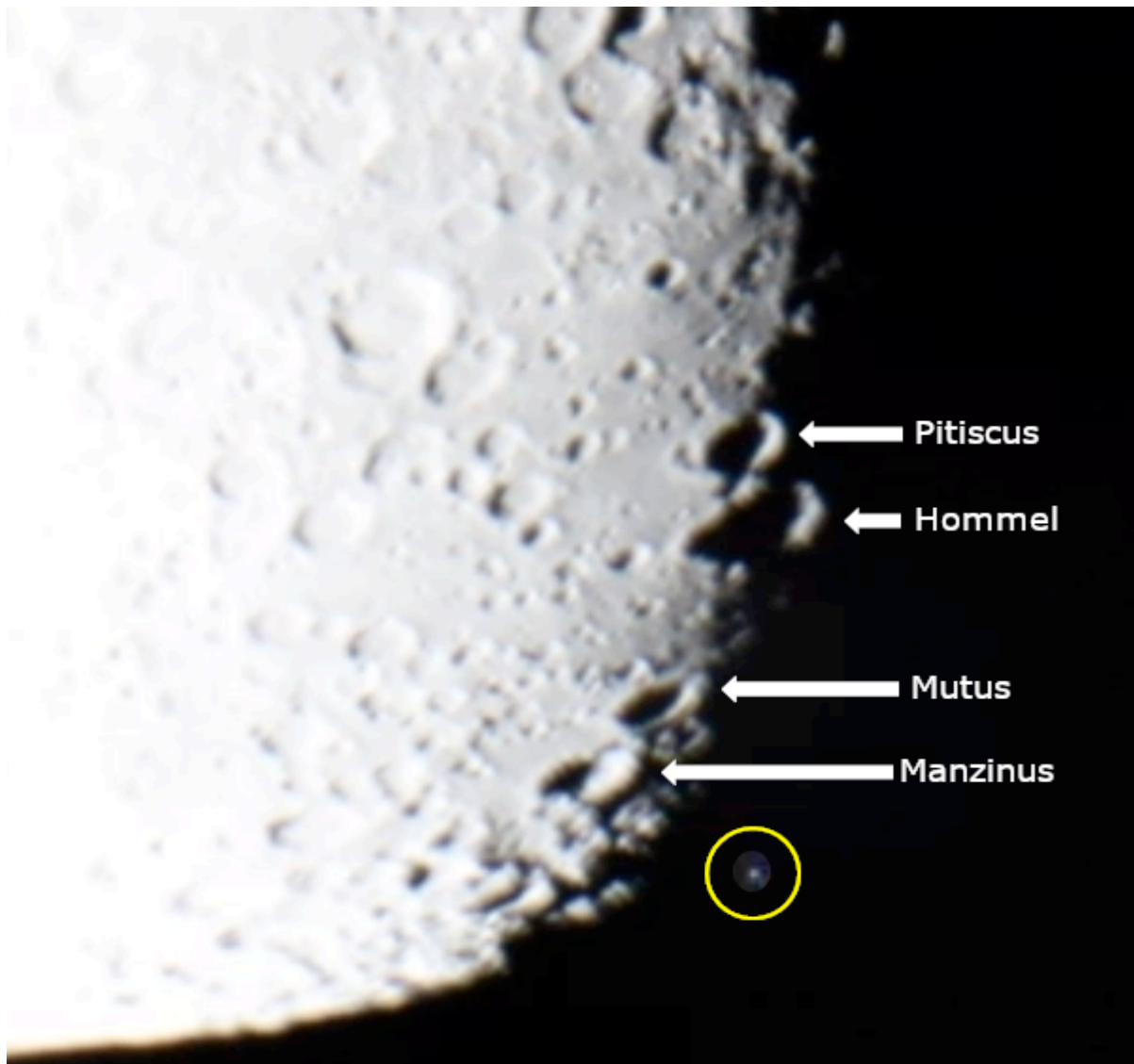


Figure 3. ZC2401 between first reappearance and second disappearance.

Following the obligatory team photo (figure 4), the observers packed up and returned home.



Figure 4. The observers.

Table 2 summarises astronomical information about the event.

Star	ZC2401, H81754
Magnitude	5.6
Constellation	Ophiuchus
Lunar phase	70% waning
Lunar elongation	113°
Lunar libration	$\lambda = +7.39^\circ$, $\beta = -3.54^\circ$
Approach	Bright limb
Limb	South
Predicted central time	03:29:12 UT
Altitude of Sun	-22°
Altitude of star	17°
Azimuth of star	167°
Observing location (WGS84)	1.532450°E, 52.112839°N, 10 m elevation

Table 2. Astronomical information for the event.

Tomline Refractor Training (at the Observatory)

Martin Cook

If you would like training to become an approved user of the Tomline refractor, please contact Martin Cook.



Society Excursion 2019

It has been many years since an OASI excursion has been organised. At present this is just a feasibility study. In previous years we have gone to Herstmonceux, RGO Greenwich, The National Space Centre Leicester, Newton's House, Mullard Radio Observatory Cambridge, Bletchley Park. Attendance will be open to any one and not just members. I am tentatively thinking about organising this for a Saturday in October, but only if I get sufficient response.

We can either hire a coach privately or join an existing excursion. Galloway coaches do a excursion to RGO Greenwich. The price includes a guided tour and a meal, but there are only a few a year. For this one we may have to book for next year now.

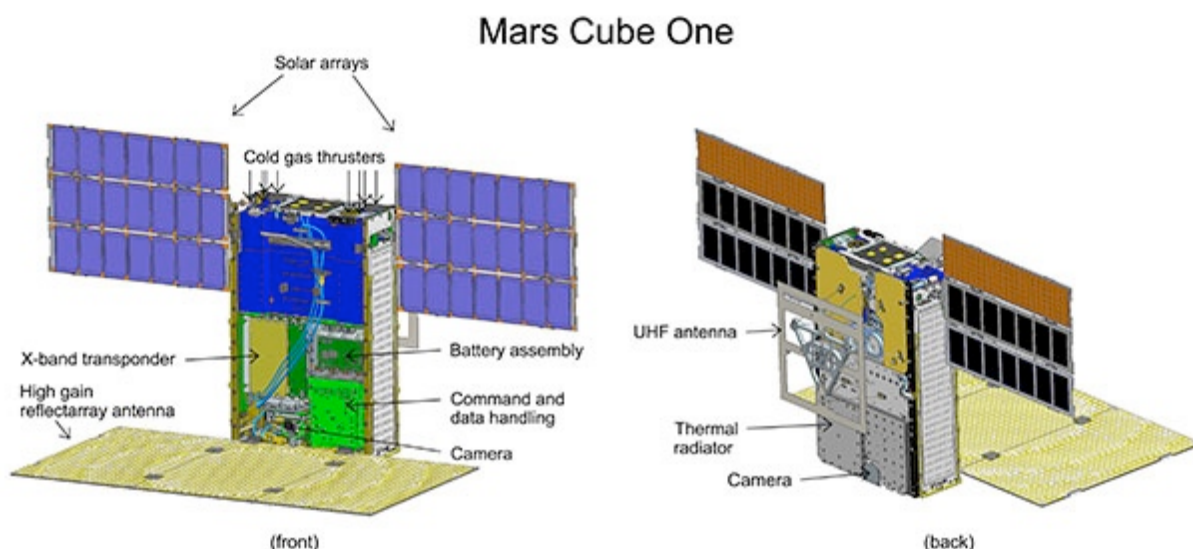
If you are interested, please contact me, Roy Gooding at secretary@oasi.org.uk

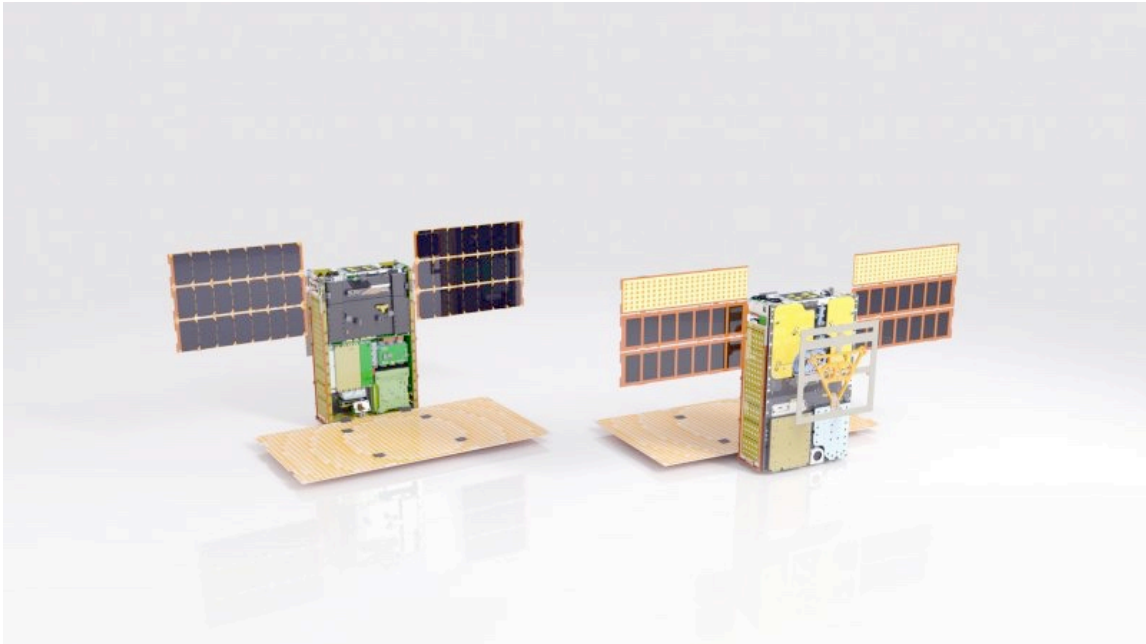
WALL-E and EVE fly to MARS

From the library

Andy Willshire

On 5th May 2018 at 4.05 a.m. PT (7.05a.m. ET) Wall-e and Eve were launched as part of the InSight experiment. InSight stands for "Interior Exploration using Seismic Investigations, Geodesy and Heat Transport" and is a Mars lander, designed to study with great detail the crust, mantle and core of Mars. The research will hopefully investigate and provide explanations about how the rocky planet of Mars was formed, as well as its structural function. InSight's mission is essentially to evaluate formation, evolution and tectonic activity. Mars was selected because it is a goldilocks planet, not too big and not too small and will therefore retain its past history to allow information about its formation to be acquired. Mars also has long deep canyons and volcanoes useful for analysis. A seismometer is also on the lander to analyse waves meandering through the structures of the planet. On board there is also a heat flow probe and a movement identification module which will detect how Mars moves in its rotation. After landing, InSight's robotic arm will position the instruments onto the designated position on Mars' surface. The lander was launched from Complex 3 attached to an Atlas V-401 rocket. The Atlas V is one of the largest rockets accessible for interplanetary journeys. The number 401 indicates firstly the nose cone which is 4 meters in diameter, the zero indicates the solid rocket boosters supplementary to the main booster and the 1 indicates the one upper stage which has one engine. The weight is about 730,000 pounds (330,000 kg). With InSight and the Atlas V-401 were two mini CubeSats called Mars Cube One (MarCo). This was the first interplanetary mission to utilise this type of very small craft, approximately about the size of a briefcase,(individual cube size of 4 inches *4 inches *4.5 inches with larger satellites being multiples of these), and were nicknamed Wall-E (MarCO-A) and Eve (MarCO-B) who were characters in a Pixar film, and flew alongside InSight. They have a limited mass of approximately 1.33 Kg and use easily available components for their electronic constituents. Up to January 2019, more than 1000 CubeSats had been launched, with a small failure rate of only 8%.





Picture shows one of the MarCo space-craft. Image credit: NASA/JPL-Caltech.

These CubeSats are the first to be propelled towards their interplanetary assignment, by eight cold gas thrusters (propellant R236 FA gas, found in most fire extinguishers) which control trajectory and a reaction control system for altitude. Five small corrections were made on this trip by the propulsion unit. The goal was to provide a new insight into how data is obtained and used during the landing phase. This hypothesis proved successful, providing data about the landing in the time signals take to travel from Mars to Earth, i.e. in just 8 minutes. Normally NASA's Mars orbiters are used, but these have to be in the correct position, which makes their availability transient and can make data transfer difficult.

The mission for these mini satellites was to see if it was possible to communicate from and to deep space in real time, and test navigation techniques. InSight landed on Mars on the 26th November 2018. Both WALL-E and Eve delivered all that was asked of them, with the Chief engineer suggesting that these tiny CubeSats would be a useful adjunct to further missions. Although neither of the two carried much in the way of scientific instruments this time, it was obvious that their prospective ability to convey all types of small scientific apparatus into deep space will open the gates to new types of exploration.

They did however both have an Ultra-high frequency antenna which was used to transmit data from InSight through the UHF band at 8 kbit/s to the CubeSats which was then sent instantaneously at an X band (micro-wave radio region) frequency at 8kbit/s to Earth. A high gain reflect array antenna is used on both to relay information. WALL-E was last heard on 29th December 2018 and EVE on 4th January 2019. They will start to head towards the inner solar system during this summer of 2019, where NASA will see if they can be contacted, but they think not.

So, WALL-E and EVE, looking into each others antenna, will drift hand in hand into space having performed far better than was expected.

NASA's JPL laboratory have stated that MarCo has laid the groundwork for future mini spacecraft with most of the features being accommodated in new space projects.

References:

1. <https://www.jpl.nasa.gov/cubesat/missions/marco.php>
2. https://en.wikipedia.org/wiki/Mars_Cube_One
3. <https://nasasearch.nasa.gov/search?query=marco+A&affiliate=nasa&utf8=%E2%9C%93>

Sun images in H α

John Hughes

This was a day of firsts today (12 May). First time in 2019 imaging the Sun and first time imaging with my new William Optics Z103.

Attached is an image of AR2741, one of two spots on the Sun today. You can see the two umbra regions and the penumbra surrounding the spot. There is also a small plage to the bottom left of the spot.

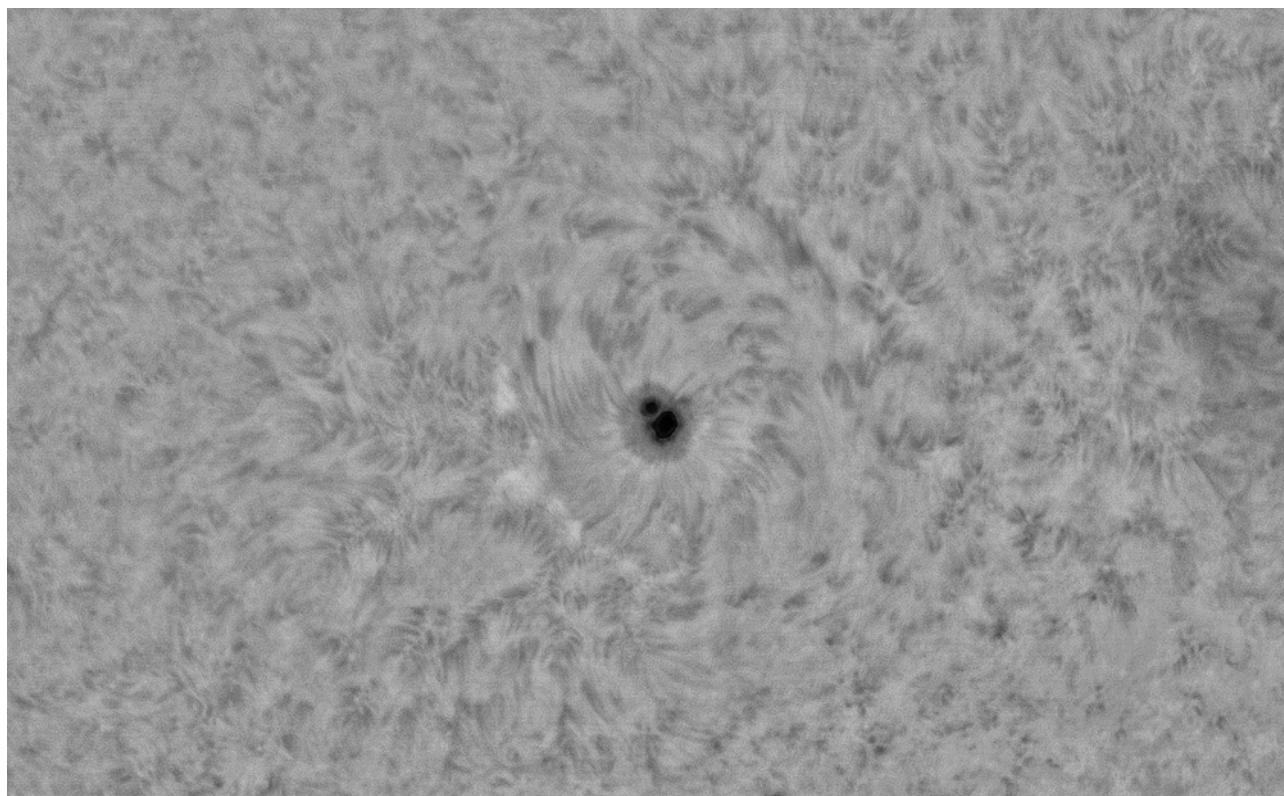


Image produced from 1,000 frames then the best 60% stacked in Autostakkert2. Levels and curves adjustments and contrast and sharpening was completed in Photoshop then the image was resized.

Equipment used;

WO Z103 WO 1.25" diagonal Quark Chromosphere
ZWO ASI174MM Celestron AVX mount.

Second session this year with the old Sun.

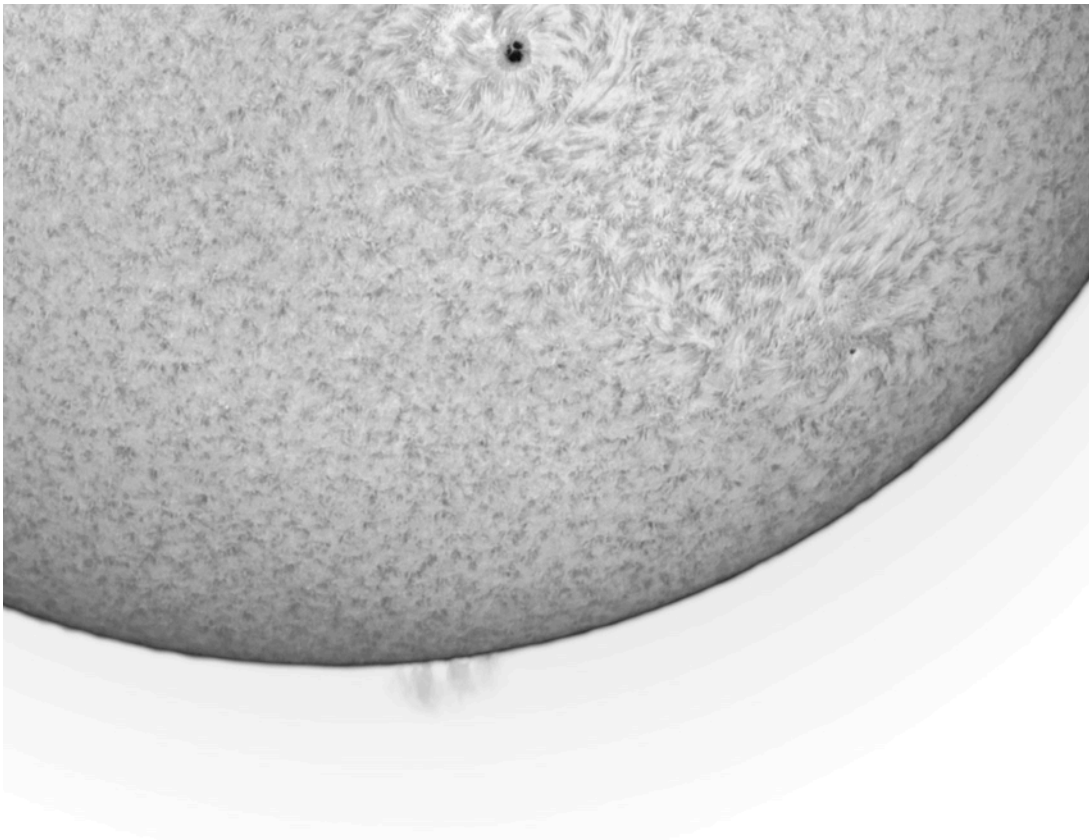
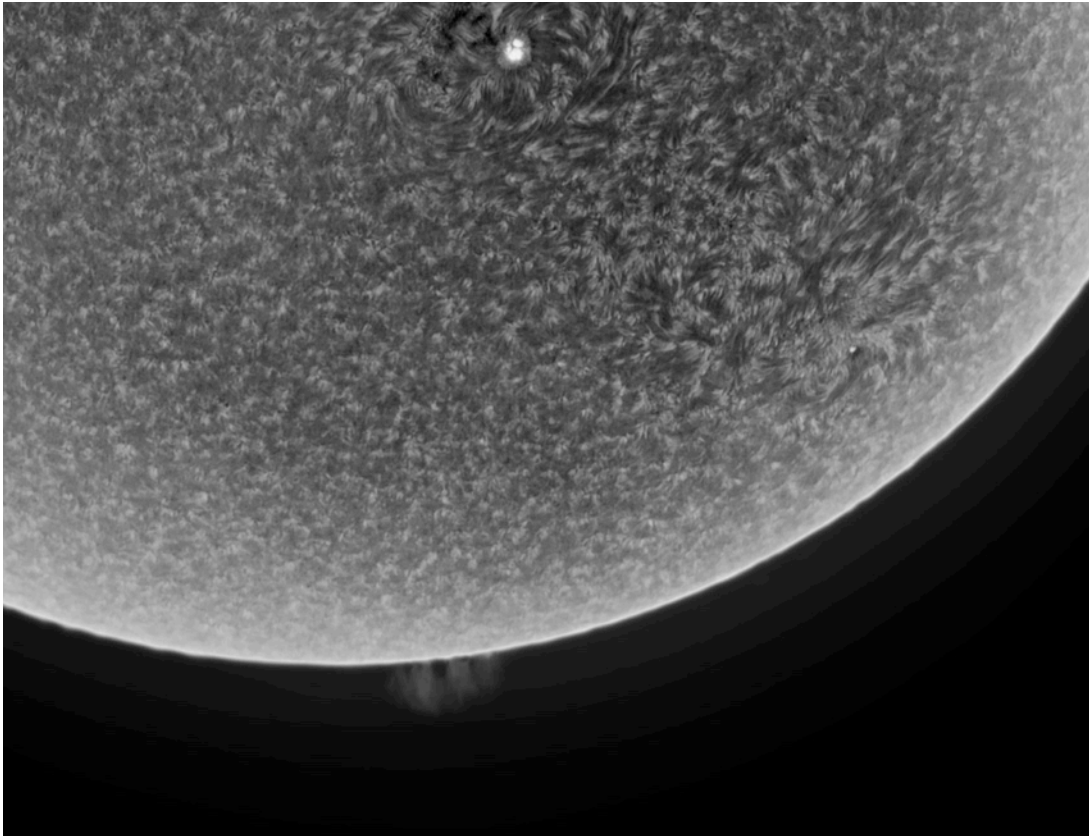
I would have finished a lot sooner but I left some dodgy settings in place on SharpCap and couldn't find the Sun for ages!

Here are two pictures. Both are compiled of two images, the first capturing the surface detail of the sun - 10ms exposure and a gain of 40.

The second captured the prominence, same exposure but the gain has been ramped up to see the prom, effectively overexposing the surface.

Both are then overlaid in Photoshop using the 'difference' layer setting coupled with some sharpening and levels adjustments.

Taken with my William Optics Z61, Daystar Quark Chromosphere, SharpCap, AutoStakkert2 and processed in Photoshop.

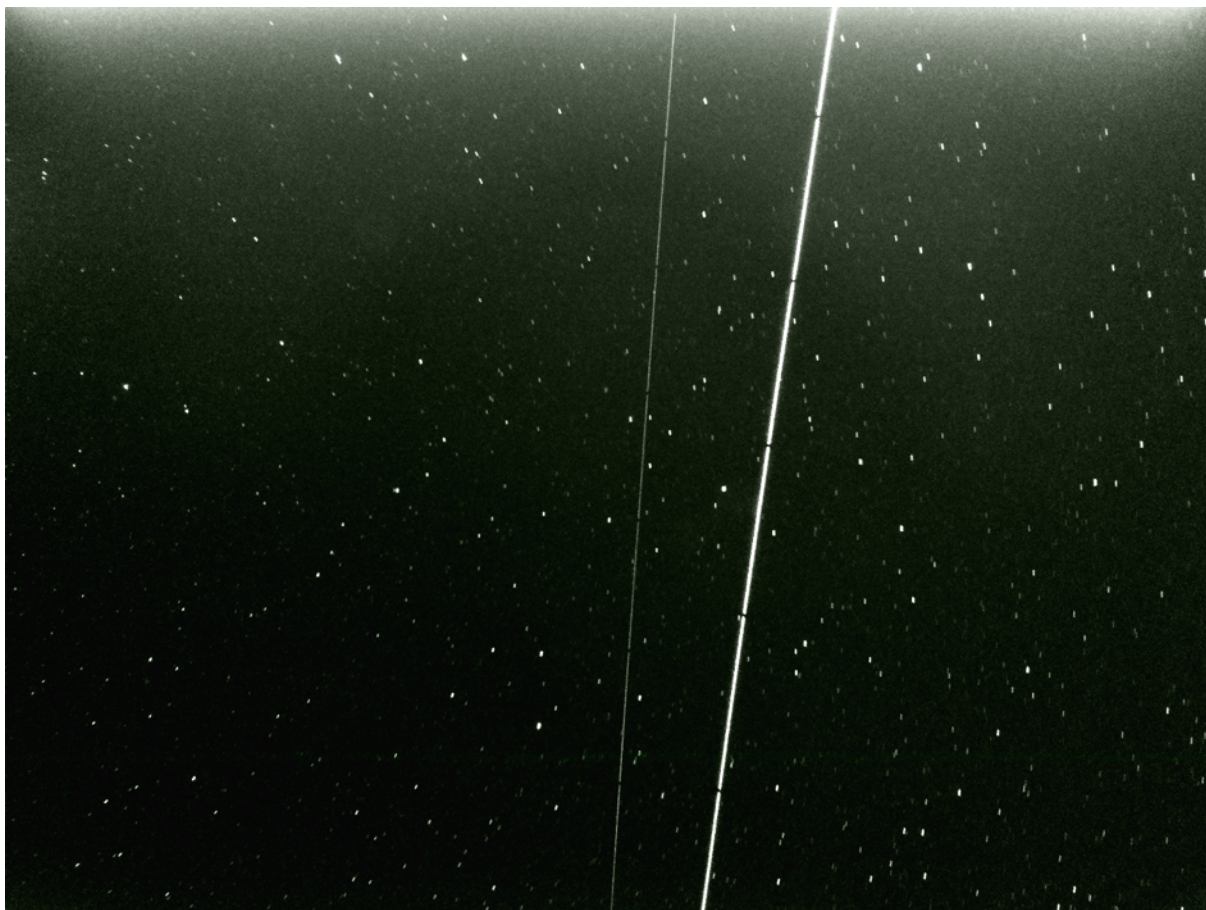


Images From Night-Sky Camera, 14 May 2019

James Appleton

The ISS leaves an unmistakable linear trail on a time-exposure photograph of the night sky. I captured the below image on 14 May 2019 with a Raspberry PiCamera (v2, NOIR). It is a stack of seven consecutive frames, significantly contrast-stretched, spanning the period from 01:08:50 to 01:09:52 UT (the nominal frame duration is 10 seconds). The ISS is the heavy track progressing down the image, from Boötes, through Corona Borealis and Hercules towards Lyra. Short gaps in the track are due to inter-frame processing by the camera.

There is another, fainter, satellite track a short distance to the left, apparently closing on the ISS.



The corresponding image from Alan Smith's all-sky camera is below. This is a stack of three consecutive frames, spanning the period 01:07:23 – 01:13:26 (6 mins), taken with a Canon 1100D and Sigma 6mm fisheye lens, f2.8, ISO800. Again, the image has been significantly contrast-stretched.



Initially, I thought that the faint trail to the left of the ISS was a supply ship approaching for docking. However, a search of NASA ISS websites revealed no such manoeuvres scheduled for the date in question. A search of the Heavens Above website (<https://heavens-above.com/>) revealed that the faint trail is in fact a burnt-out Russian SL-4 rocket booster. The following table compares key aspects of the orbits of the two bodies.

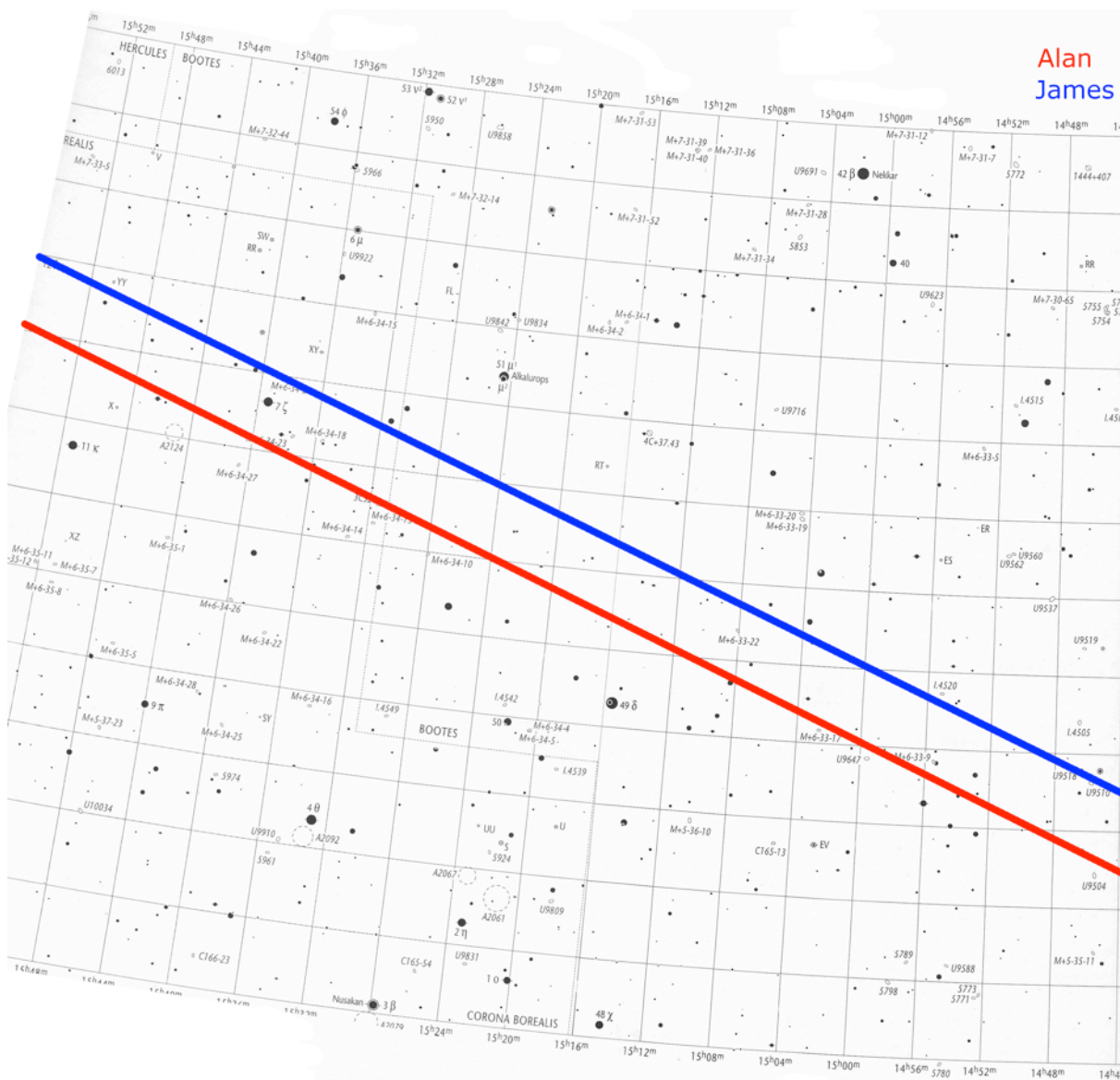
	ISS	SL-4 R/B
Peak magnitude	-4.0	1.9
Orbital perigee (km)	408	428
Orbital apogee (km)	410	668
Orbital inclination (°)	51.64	51.61
Launch date	20 November 1998	16 April 2014

The two bodies are unrelated and their apparent approach turns out to be a chance line-of-sight alignment!

The above table indicates that the orbit of the ISS is very close to circular, at an average altitude of approximately 409km. This provides an opportunity to check the algorithm used to triangulate

objects (ideally meteors!) captured by the two cameras. The algorithm is described in the February 2019 *Newsletter*.

The tracks of the ISS are shown below, overlaid on a chart from *Uranometria*, facilitating estimation of coordinates. Estimating positions on the tracks and performing the mathematics yields estimates of the altitude of the ISS in the range 387 - 394km, with a mid-point of approximately 390km. This represents an error of less than 5%, which is particularly gratifying in view of the relatively short baseline (just over 7.0km) between the two cameras.



From Arxiv.org

Fast radio bursts as synchrotron maser emission from decelerating relativistic blast waves

Brian D. Metzger, Ben Margalit, Lorenzo Sironi

Source: <https://arxiv.org/abs/1902.01866v2>

(Submitted on 5 Feb 2019 (v1), last revised 12 Mar 2019 (this version, v2))

Fast radio bursts (FRB) can arise from synchrotron maser emission at ultra-relativistic magnetized shocks, such as produced by flare ejecta from young magnetars. We combine PIC simulation results for the synchrotron maser with the dynamics of self-similar shock deceleration, as commonly applied to GRBs, to explore the implications for FRB emission. We assume the upstream environment into which the ultra-relativistic ejecta collides is a mildly relativistic baryon-loaded shell released following a previous flare, motivated by the high electron-ion injection rate $\dot{M} \sim 10^{19}\text{--}10^{21}$ g/s needed on larger scales to power the persistent radio nebula coincident with the repeating burster FRB 121102 and its high inferred rotation measure. The observed radio fluence peaks once the optical depth ahead of the shock to induced Compton scattering decreases to $< \sim 1$, a condition which places a GHz observer on the high frequency tail of the maser SED. Given intervals between ion shell ejection

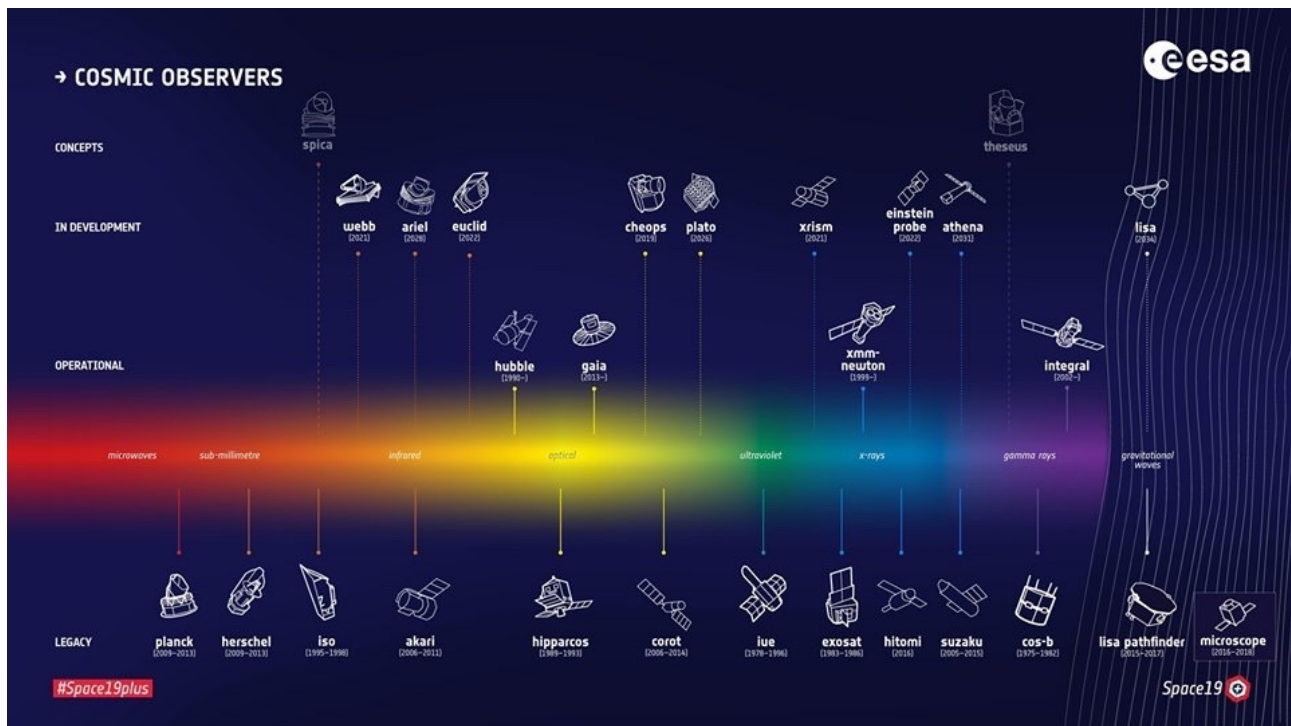
events $\sim 10^5$ s similar to the occurrence rate of the most powerful bursts from FRB 121102, we demonstrate the production of FRBs of frequency $\sim 0.1\text{--}10$ GHz, isotropic radiated energies $\sim 10^{37}\text{--}10^{40}$ erg and durations $\sim 0.1\text{--}10$ ms for flares of energy $\sim 10^{43}\text{--}10^{45}$ erg. Deceleration of the blast wave, and increasing transparency of the upstream medium, generates a temporal decay of the peak frequency, similar to the downward drift seen in the sub-bursts of FRB 121102 and FRB 180814.J0422+73. The delay $> \sim 10^5$ s between major ion-injection events needed to clear sufficiently low densities around the engine for FRB emission could explain prolonged "dark" periods and clustered burst arrival times, and lead to stochastic variation in the dispersion measure. Thermal electrons heated at the shock generate a short-lived $< \sim 1$ ms (1 s) synchrotron transient at gamma-ray (X-ray) energies, analogous to a GRB afterglow.

For other recent papers in astrophysics, see <https://arxiv.org/list/astro-ph/recent>

ESA tweets

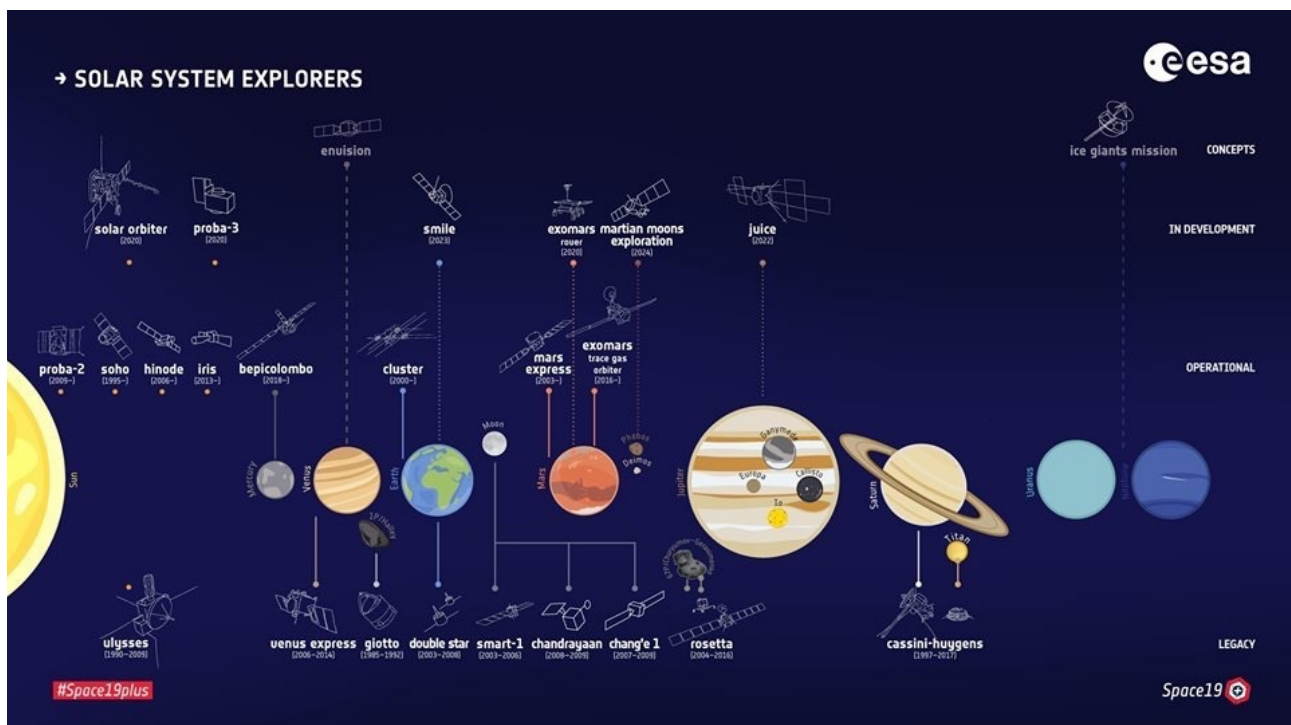
Cosmic observers

Source: ESA



Solar system Explorers

Source: ESA



Astro Items for sale

From Mike Norris 01473 726596



C90 Maksutov- Cassegrain Celestron Scope 90mm focal length 1250mm f/13.9 comes in carry case and full instructions and 32mm plossl eyepiece.

This is an excellent little scope for lunar observing but I have used it mostly for solar observing of sunspots with a Seymour Type 2 Glass Filter which gives a lovely orange/yellow image. The finder that comes with the scope is totally useless so also is included a skywatcher finder (not for solar use) and a simple solar finder which works well. This becomes a very nice sunspot

observing outfit. Cost of Scope from First Light is £165 and cost of filter from Rother Valley is £59.99. Offered as a complete kit for: £95.00 (Mount not included)



Also:

- Mains adaptor to run Skywatcher Telescope from mains. £10
- Mead Eye pieces 1.25, 15mm, 26mm, 32mm & 40mm £15 each
- 2 x Barlow £5
- Light Pollution Filter £5
- 8 other assorted filters boxed. £10 the lot

Items for Auction

These items are kindly donated to OASI by Cathy Topham in memory of her partner Nigel Stubbington who was a keen member of OASI but sadly died suddenly several years ago. **The auction is open to members of OASI only and proceeds will go to club funds.**

The items are stored at Cathy's house and hence not available to view directly but a complete set of photos in low resolution (~8 MB) and high resolution versions are available from Mike Whybray (workshops@oasi.org.uk) on request to me of specific photos (~21 MB total).

Bids must be submitted by email to the above address, or by hand or post to Mr M.

Whybray, White House, The Street, Nacton, Ipswich, IP10 0HD, to arrive by 1st June 2019

latest. I will not be bidding for anything and will adjudicate bids with another committee member who has not bid, as soon as feasible after bidding closes. Any tied bids will be settled by random selection. For transparency, the names of winning bidders and amounts bid will be published in the newsletter, as well as by contacting the winners directly.

If on receipt of any items won a bidder is unhappy with their purchase due to a significant discrepancy with the description, the OASI committee will decide whether any adjustment or refund is to be made or not.

Lot 1



- Meade 8" LX90 Schmidt-Cassegrain Telescope
- Instruction Manual & Tripod Instruction Manual
- Meade Equatorial Wedge to suit LX90
- Meade 8x50 Sighting Telescope
- Hand Control
- Meade Tripod (3 telescopic legs) and Instructions
- Meade right angle eyepiece adaptor
- Torpedo 9" spirit level

[Note: Everything in excellent condition (stored in house) apart from the tripod (stored in garage) which has rust breaking through the chrome finish on the legs, and some slight bubbling of the paintwork on the top surface]



Minimum bid: £600

(Purchase price £1795 in 2002)

Lot 2



- Large wooden crate with Russian TAJI-2 Reflector Telescope. 150mm diameter mirror inside 1200mm tube (approx.). With eyepiece adaptor.
- Heavy column with motorised equatorial mount for TAJI-2. With 3 feet and about 1200mm high.
- Smaller crate with power supply for equatorial mount.
- 8x sighting telescope for TAJI-2.



[Note – telescope stored in crates in garage and has corrosion evident on the secondary mirror mount and support vanes]

Minimum bid £100



Lot 3

Four Super Plössl eyepieces (1¼ inch) originally purchased with LX90:

7.5mm, 10mm, 12.5mm, 17mm

Minimum Bid: £40



Lot 4

Three eyepieces (probably originally purchased with Russian ТАЛ-2) (1¼ inch):

Kellner 15mm,
Plössl 25mm,
Kellner 42mm

Minimum Bid: £15



Lot 5

Celestron eyepiece 40mm Plössl (1¼ inch)

Minimum Bid: £20



Lot 6

Meade Series 4000 Super Plössl 26mm (1¼ inch)

Minimum Bid: £20



Lot 7

4x Barlow lens (1¼ inch)

Minimum Bid: £10



Lot 8

Starlight Xpress MX5 CCD 12 bit Imaging System (about 1997 USB) consisting of:

- MX5 CCD camera (1¼"),
- 12V power supply,
- USB interface box,
- instruction leaflet.

[Note: No software comes with this. In response to an email question about software, Terry Platt of Starlight Xpress wrote back: It is difficult to get working on anything more modern than Windows98. To be accurate, you can use this camera on Windows10, but the driver does not accept the presence of other HID

peripherals (USB mouse etc.). It also has problems with driver signing and so you would have to disable signing in Windows10 to get it to install. The original drivers are available from <https://www.sxccd.com/downloads/usb11.zip> and the software from <https://www.sxccd.com/downloads/Starmx5usb.zip> . The Windows10 version of drivers can be downloaded from https://www.sxccd.com/downloads/USB1_64bit_drivers.zip]

Minimum Bid: £1

