OASI News

The newsletter of Orwell Astronomical Society (Ipswich)

Outreach event at Bawdsey Radar Museum

Photo by Roy Gooding

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Produced using LibreOffice 7.4.1.2 and Affinity Photo 1.10.5

Society Notices

Dear Members,

We use a Zoom Pro account for online meetings. If you would like to join in, please email Paul Whiting, treasurer@oasi.org.uk

I would like to wish everybody clear skies, stay safe and I hope to see you soon.

Andy Gibbs, Chairman

Society Contact details

Email queries: info@oasi.org.uk

Facebook: Orwell Astronomical

Twitter: @OASIpswich

YouTube: https://www.youtube.com/channel/UCHgxe3QAeRVWf7vkjKkCl2Q

Members-only message board

https://groups.io/g/OASI

Observatory (meeting nights only)
07960 083714

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

The CLOSING date is the 15th day of the month

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 during meeting hours. Kindly check/amend the number shown on your 2021 membership card.

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. Details above.

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

Text: txt, rtf, rtfd, 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

Authors, please note that your articles will 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 2022

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

Committee Meeting

The next Committee Meeting will be on Friday 2 December at 8:00pm via Zoom. All members welcome.

AGM: 21 January 2023, face-to-face (assuming no prevalence of Covid at the time).

Welcome to new members

Stephen Barker   Susan Haywood   Alan Buttivant

OASI and BAA Events

Please note that the listed events may change depending on the progress of the pandemic. 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 r on the website Events page (bottom right of the calendar) 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/OASIpswich
Facebook page	https://www.facebook.com/pages/Orwell-Astronomical/158256464287623

Date, Time & Location	Contact	Event
Weekly, every Wednesday, from 20:15	Martin Cook, Roy Gooding	Observatory open
Monday 10 Oct 19:30 Newbourne Village Hall	Martin R-H newbourne@oasi.org.uk	OASI at Newbourne
Tue 11 Oct 2022 20:15 Orwell Park Observatory	Paul Whiting, FRAS treasurer@oasi.org.uk	**Public access event.** Observatory tour. \ Booking essential.
Thursday 20 Oct 20:00 Zoom	Martin Cook membership@oasi.org.uk	3rd Thursday Zoom meeting
Monday 24 Oct 19:30 Newbourne Village Hall	Martin R-H newbourne@oasi.org.uk	OASI at Newbourne Sky Notes
Fri– Sat 28–29 Oct 19:30 – 22:00 Orwell Park Observatory	Paul Whiting, FRAS treasurer@oasi.org.uk	**Public access events.** Observatory Open Days
Tue 8 Nov 20:15 Orwell Park Observatory	Paul Whiting, FRAS treasurer@oasi.org.uk	**Public access event.** Observatory tour. \ Booking essential.
Tue 6 December5 Orwell Park Observatory	Paul Whiting, FRAS treasurer@oasi.org.uk	**Public access event.** Observatory tour. \ Booking essential.

Meetings via Zoom

To join, please first contact Paul Whiting, treasurer@oasi.org.uk – OASI members only. Be sure to install/update to the latest version of Zoom – there's no need to set up an account. Go to https://zoom.us/join and enter the meeting ID or personal link name. You will have received a link from the meeting organiser.

As well as for some lectures & talks, we meet via Zoom on the 3rd Thursday of every month at 8pm.

OASI @ Newbourne

Martin Richmond-Hardy
newbourne@oasi.org.uk

We meet at Newbourne Village Hall, Mill Lane, IP12 4NP on the 2nd and 4th Mondays from 19:30.

Visitors are welcome but we do ask you to join the Society after two visits.

http://www.oasi.org.uk/OASI/Membership.php

Newbourne dates for 2022

October	10	24 (A)
November	14	28 (A)
December	12	

We open up for all meetings at 7:30pm. Astro News/Star Guide (A) at 7:45pm followed by any Talks (T), Workshops (W) and the occasional Quiz (Q).

Stargazer's Guide

On the last meeting each month, at 19:45, Bill Barton FRAS will give a short presentation of what can be viewed in the following 4 weeks plus a reminder of OASI events. These will be available on our website.

Paul Whiting FRAS will give occasional Astro News briefings.

Astronomy Workshops/Informal talks

Contact Mike Whybray Monday meetings start at 7:30pm. Workshops / Talks start at 8pm

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.

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

Lectures – via Zoom

Contact: Peter Richards lectures@oasi.org.uk

The start time for all talks will be 8pm and, as usual, the talks will usually be held on a Friday evening. All meetings are currently via Zoom. Contact Paul Whiting if you can't find the details.

Athaneum Astro Society

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

Meetings (http://www.3a.org.uk/programme.htm) at Whepstead Community Centre, Bury Road, Whepstead, Bury St Edmunds, IP29 4TA http://www.3a.org.uk/contact.htm .

LYRA Lowestoft & Yarmouth Regional Astronomers

For events please see http://www.lyra-astro.co.uk/events/

DASH Astro

Darsham And Surrounding Hamlets http://dash-astro.co.uk

Meetings are normally held at New Darsham Village Hall and 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. on Sundays.

Meetings https://www.dash-astro.co.uk/Events

BAA news & webinars

For full details of all meetings or cancellations, please go to https://britastro.org/meetings/2022.

The BAA Radio Astronomy Section

BAA Radio Astronomy Section have been enjoying talks, seminars and tutorials via Zoom and are available on the BAA YouTube channel. https://www.youtube.com/user/britishastronomical/playlists

BAA RA Section Autumn programme 2022		
Oct. 7th. 19:30 BST (18:30 UTC)	Dr Samuel Lander Theoretical astrophysicist. Univ. East Anglia. The main focus of research is neutron stars: the collapsed remnants of a normal star's core following a supernova.	All about Magnetars A magnetar is a type of neutron star with a particularly strong magnetic field. This field powers a range of outburst activity, from X-ray and gamma-ray bursts and flares, to the recently discovered fast radio bursts. This talk will survey the observations and give a picture of how a magnetar releases all this energy.
Nov. 4st. 19:30 GMT (19:30 UTC)	Prof. John Richer The Cavendish Laboratory Cambridge Univ. John Richer is an astrophysicist with expertise in the field of star formation, with a particular interest in radio and submillimetre observations of young stars and protostellar systems.	'On ALMA' Atacama Large Millimetre/ submillimetre Array ALMA is a submillimetre interferometer at the Chajnantor site in the Atacama Desert at 5100 metres above sea level. The principle research areas are millimetre and submillimetre imaging and spectroscopic observations of star-forming regions in our own Galaxy, in nearby galaxies, and in the very distant universe. These observations provide an unobscured view of the cold universe.

BAA RA Section Autumn programme 2022		
Dec. 2nd. 19:30 GMT (19:30 UTC)	Dr. Emma Chapman Guest star: JWST Royal Society Dorothy Hodgkin fellow based at the University of Nottingham.	Christmas Lecture 'Exploring the Dark Ages of the Universe by Radio' The first stars ever! 400 million years after the big bang. This era has never been observed and constitutes over a billion-year gap in our knowledge.

Library Quiz

Astronomy anagram. Answers

Each answer is a single word. Take the first letter of each answer, giving you when finished 6 letters. Unscramble these letters to form the name of emission stars. Clue "**pre-main sequence sources of intermediate-mass (canonically defined as 2 $M_\odot \lesssim M \lesssim 10 M_\odot$, spectral type B, A, and F)".**

Question 1 A non spherical moon originally known as Jupiter VII .

Elara

Question 2 A sensitive instrument for measuring radiant energy by the increase in the resistance of an electrical conductor.

Bolometer

Question 3 In spectroscopy it is a physical constant relating to atomic spectra.

Rydberg (Constant)

Question 4 The theoretical boundary where the Sun's solar wind is stopped by the interstellar medium.

Heliopause

Question 5 Third largest natural satellite of Saturn.

Iapetus

Question 6 Long-term variations and cyclic components of solar activity . Typical cycle length of about 88 years.

Gleissberg (cycle)

ANSWER: HERBIG (emission stars)

The Night Sky in October 2022

Martin RH

All event times (BST) are for the location of Orwell Park Observatory 52.0096°N, 1.2305°E.
Times are BST unless otherwise stated. GMT (UTC) begins Sunday 31 October

Sun, Moon and planets

Sources:
http://heavens-above.com/PlanetSummary.asp http://heavens-above.com/moon.aspx

Object	Date	Rise	Set	Mag.	Notes
Sun	1	06:56	18:33		Partial Solar Eclipse (max) 25 Oct, 12:00:16
	31 utc	06:48	16:29		
Moon	1	14:02	21:02		First Quarter 03 October 01:14 Perigee 04 October 17:34 Full Moon 09 October 21:55 Last Quarter 17 October 18:15 Apogee 17 October 11:21 New Moon 25 October 11:49 Perigee 29 October 15:36
	31 utc	13:56	21:18		
Mercury	1	05:42	18:03	1.5	Perihelion 06 October
	31 utc	06:17	16:19	-1.1	Max. western elongation 08 October
Venus	1	06:23	18:27	-3.8	Superior connjunction 22 October
	31 utc	07:01	16:32	-3.8	
Mars	1	21:22	13:38	-0.6	
	31 utc	18:36	11:13	-1.2	
Jupiter	1	18:28	06:26	-2.8	
	31 utc	15:24	03:09	-2.7	
Saturn	1	17:09	02:13	0.5	
	31 utc	14:10	23:09	0.7	
Uranus	1	19:45	10:49	5.7	
	31 utc	16:44	07:45	5.6	
Neptune	1	18:10	05:33	7.8	
	31 utc	15:11	02:32	7.8	

Partial Solar Eclipse on 25 October

Source: https://www.timeanddate.com/eclipse/solar/2022-october-25

Times are for observing in Felixstowe (add 1 hour for BST)

First location to see the partial eclipse begin	25 Oct, 08:58:21 utc
Maximum Eclipse	25 Oct, 11:00:16 utc
Last location to see the partial eclipse end	25 Oct, 13:02:11 utc

Occultations during October 2022

https://iota-es.de/moon/grazing_descrx101.html and http://www.lunar-occultations.com/iota/bstar/bstar.htm

Observers are encouraged to download and install the Occult software program [Windows only] to generate predictions for their own particular site coordinates.

Meteor showers during October 2022

Source: BAA Handbook 2021 p26-27 and https://in-the-sky.org//newsindex.php?feed=meteors

Shower	Normal limits	Maximum	ZHR at Max	Notes
October Camelopardalids	October 5–6	Oct 6	5	Significant activity reported by video observers in 2005 and 2006. Another outburst in 2016. Moonlight interferes.
Draconids	6-10 October	8-9 October	10	Associated with Comet 21/P Giacobini-Zimmer.
Orionids	2 Oct - 7 Nov	21-2 Octobe	20	Fast meteors, associated with Comet Halley, many with persistent trains. Broad maximum, with several sub-peaks. Good in 2006 and 2007. Very favourable.
Southern Taurids	10 Sep - 20 Nov	10-11 Oct	5	Very slow meteors. Double radiant, broad peak. Moonlight interferes.
Northern Taurids	20 Oct - 10 Dec	12-13 Nov	5	Very slow meteors. Unfavourble.

See also https://www.rmg.co.uk/stories/topics/meteor-shower-guide

For radio observation, use reflections from Graves radar on 143.050MHz or the Brams transmitter in Belgium on 49.97MHz and UK GB3MBA on 50.408MHz https://www.ukmeteorbeacon.org/Home

See also https://www.popastro.com/main_spa1/meteor/radio-meteor-observing-2020/.

Visible ISS passes ≥15º max altitude

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

Times are BST. Predictions are approximate (27 August) due to craft adjustments. Check the day before.

Date	Bright –ness (mag)	Start			Highest point			End		
		Time	Alt.	Az.	Time	Alt.	Az.	Time	Alt.	Az.
01 Oct	-2.7	19:29:52	10°	W	19:33:03	38°	SSW	19:36:05	11°	SE
02 Oct	-1.2	20:18:30	10°	WSW	20:20:31	15°	SW	20:22:18	11°	S
03 Oct	-1.6	19:29:17	10°	W	19:31:56	22°	SW	19:34:34	10°	SSE
21 Oct	-0.9	06:25:55	10°	S	06:27:58	15°	SE	06:30:00	10°	ESE
23 Oct	-1.9	06:23:03	10°	SSW	06:25:58	28°	SSE	06:28:54	10°	E
24 Oct	-1.5	05:35:19	15°	S	05:36:56	20°	SE	05:39:28	10°	E
25 Oct	-0.9	04:48:26	14°	SE	04:48:26	14°	SE	04:49:44	10°	ESE
25 Oct	-3	06:21:18	13°	SW	06:24:02	48°	SSE	06:27:17	10°	E
26 Oct	-2.7	05:34:17	33°	S	05:34:52	36°	SSE	05:37:59	10°	E
27 Oct	-1.2	04:47:11	19°	ESE	04:47:11	19°	ESE	04:48:35	10°	E
27 Oct	-3.7	06:20:03	21°	WSW	06:22:07	72°	S	06:25:27	10°	E
28 Oct	-3.5	05:32:52	59°	SSE	05:32:52	59°	SSE	05:36:10	10°	E
28 Oct	-3.7	07:06:09	10°	W	07:09:29	86°	S	07:12:51	10°	E
29 Oct	-1.1	04:45:37	20°	E	04:45:37	20°	E	04:46:50	10°	E
29 Oct	-3.8	06:18:28	27°	W	06:20:11	86°	S	06:23:33	10°	E
30 Oct	-3.6	04:31:11	69°	ESE	04:31:11	69°	ESE	04:34:12	10°	E
30 Oct	-3.7	06:04:11	10°	W	06:07:31	73°	S	06:10:52	10°	ESE
31 Oct	-0.9	03:43:51	18°	E	03:43:51	18°	E	03:44:51	10°	E
31 Oct	-3.8	05:16:42	31°	W	05:18:11	82°	S	05:21:32	10°	E

Starlink passes

https://heavens-above.com/AllPassesFromLaunch.aspx

For a dynamic 3-D display, see https://heavens-above.com/StarLink.aspx

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

From the Interweb

Tweet by @TamithaSkov: A glancing solarstorm will graze Earth October 1 just as fast solar wind hits. Expect enhanced aurora views down to mid-latitudes. Amateur #radio disruption & auroral propagation possible on Earth's nightside. GPS users expect reception issues near dawn, dusk & high-latitudes!

Gamma rays from a dwarf galaxy solve an astronomical puzzle

A glowing blob known as "the cocoon", which appears to be inside one of the enormous gamma-ray emanations from the centre of our galaxy dubbed the "Fermi bubbles", has puzzled astronomers since it was discovered in 2012.

In new research published in Nature Astronomy, we show the cocoon is caused by gamma rays emitted by fast-spinning extreme stars called "millisecond pulsars" located in the Sagittarius dwarf galaxy, which orbits the Milky Way. While our results clear up the mystery of the cocoon, they also cast a pall over attempts to search for dark matter in any gamma-ray glow it may emit.

NASA's Juno Shares First Image From Flyby of Jupiter's Moon Europa

https://www.nasa.gov/feature/jpl/nasa-s-juno-shares-first-image-from-flyby-of-jupiter-s-moon-europa

Images are coming back and being processed from our #JunoMission's early-morning flyby—the closest look at Jupiter's ice-encrusted moon in more than 20 years.

Gresham Astronomy Lectures in 2022-3

Cosmic Conclusions

Professor Katherine Blundell

This series includes lectures on the end of our Sun, Massive Stars and the Universe.

https://www.gresham.ac.uk/watch-now/series/cosmic-conclusions

The End of Planetary Atmospheres

David Game College, Wednesday, 28 Sep 2022 - 18:00/ Online/ Watch Later – Ticketed, free

https://www.gresham.ac.uk/whats-on/end-atmospheres

The End of Our Sun

David Game College, Wednesday, 2 Nov 2022 - 18:00/ Online/ Watch Later – Ticketed, free

https://www.gresham.ac.uk/whats-on/end-sun

The End of Massive Stars

Tbc City of London, Wednesday, 18 Jan 2023 - 18:00/ Online/ Watch Later – Ticketed, free

https://www.gresham.ac.uk/whats-on/end-stars

The End of Life on Earth

Tbc City of London, Wednesday, 29 Mar 2023 - 18:00/ Online/ Watch Later – Ticketed, free

https://www.gresham.ac.uk/whats-on/end-life

The End of the Universe

Tbc City of London, Wednesday, 31 May 2023 - 18:00/ Online/ Watch Later – Ticketed, free

https://www.gresham.ac.uk/whats-on/end-universe

Meteor Report for September

Martin Richmond-Hardy

I've installed a second camera UK0007W pointing Azimuth 60° Elevation 38°. This is above UK0056, which points due North. The camera is controlled by a second Raspberry Pi 4 (2GB RAM).

Some vegetation pruning has since been done and more is required. Networking is working but I have some issues with generating the platepar file. Platepar = plate parameters – a text file which describes the geometric distortions in the image due to the lens and relates the image to the known star field. The hard sums to generate such a file are, fortunately, done by software on the associated Rapberry Pi 4.

UK0007W mounted above UK0056 with 2.4m steerable dish behind the shed.

If you would like to learn about astrometric calibration for such Gobal Meteor Network cameras, there is a detailed YouTube video tutorial here on the SkyFit2 software, conveniently arranged in chapters.

https://www.youtube.com/watch?v=MOjb3qxDIX4&t=3946s

Theoretical introduction: 00:00
Finding exact geo coordinates of your camera: 4:57
Setting the field of view in the config file: 9:00
Creating a mask: 10:20
Astrometry calibration: 15:26
Manual reduction: 1:10:30
Making GIF animations from FR files: 1:36:50
Using video files in SkyFit: 1:46:00
Manual reduction again, this time slower: 1:49:00
SkyFit - other features: 1:56:30

Station report for Kirton at end of September 2022

Last updated: 2022-09-29

Note: the following data are released by UKMON under the CC BY 4.0 license, so if you are using the data whether for scientific or other purposes, your must reference this web site https://archive.ukmeteornetwork.co.uk/index.html and UKMON in your work.

During this period, 2555 single station detections were collected by cameras in Kirton. including 2461 sporadics. 368 of the detections matched with other stations. Orbit and trajectory solutions were calculated for these matches. The brighest up to ten confirmed matches are shown below.

DateTime	Magnitude	Shower
20220917_213418.766_UK	-3.71	spo
20220907_004628.224_UK	-3.22	OAN
20220917_213416.942_UK	-3.04	spo
20220916_030510.174_UK	-2.14	spo
20220924_021621.558_UK	-2.09	spo
20220925_002405.375_UK	-1.93	spo
20220925_022634.685_UK	-1.6	TCA
20220928_024317.000_UK	-1.59	NUE
20220915_010426.251_UK	-1.51	SPE
20220901_012222.911_UK	-1.47	spo

Some meteor shower abbreviations

https://www.ta3.sk/IAUC22DB/MDC2007/Roje/roje_lista.php?corobic_roje=&sort_roje=

https://www.ta3.sk/IAUC22DB/MDC2022/

BAU beta Aurigids

KCE kappa Cepheids

NDA Northern delta Aquariids

NDR nu Draconids

NIA Northern ita Aquariids

NUE nu Eridanids

OAN omicron Andromedids

OCH October chi Andromedids

OMG Omicron Geminids

OTA 130 Taurids

RPI rho Piscids

SOL September–October Lyncids

SPE September epsilon Perseids

spo sporadic

TCA tau Cancrids

XCD ID 810 XCD (unknown)

ZPi zeta Piscids

The latest meteor news can be found here https://www.meteornews.net/category/news/

TITAN and the DRAGONFLY

Short Article from the Library

NASA has announced that we are now bound for the second largest natural moon in the solar system, that of Saturn's largest moon, Titan. Jupiter's Ganymede taking the first place. I use the term 'bound' loosely as departure will not be until 2026, with arrival in 2034. For some of us this may be a trip too far.

Why Titan I hear, you say. Well it has been found to be ideally suited for us on Earth to go and look at something a little bit similar to our own planet. It is composed of carbon rich chemistry and has been seen to possess a stable framework of surface liquid. It is made up of crustal ice, rocky material and ammonia-rich liquid water just under its surface, and has an atmosphere that is basically 98.4% nitrogen, with a soupçon of 1.4% methane and 0.2% hydrogen. It's windy and rainy climate produces surface features such as sand dunes and liquid methane and ethane rivers and seas. It has a diameter of 5149.5 km which is slightly larger (1.06) than the planet Mercury, and is differentiated into specific layers. In the interior it may still be possible for enough heat to be generated to produce a fluid magma layer consisting of water and ammonia (a form of eutectic mixture).

Dragonfly , the name of the vessel and project is an astrobiology assignment to Titan to evaluate its early evolution and origins, as well as considering external causes that may determine ultimate events. It is the fourth in NASA's New Frontiers portfolio which has a cost cap of $850 million.(total cost will probably be about $1 billion.).

A tremendous amount of data had previously been presented by the Cassinini mission which spent 13 years exploring Saturn and its icy moons. Using this, the Dragonfly team have scheduled a satisfactory calm weather period, a landing site that is relatively safe from large rocks and boulders and an area that has scientific targets. Its first landing site is the 'Shangri – La' dune fields which demonstrate a similarity to dunes in Namibia on Earth. The Dragonfly will be powered by a large lithium-ion battery which can be recharged by a Multi-Mission Radioisotope Thermoelectric Generator (MMRTG), during down-time which would be mainly at night. This would equate to 192 Earth hours if situated on the side of Titan facing Saturn. The MMRTG is similar to that used by Curiosity rover on Mars. Both the battery and the MMTRG will be well insulated, with any heat generated being used to keep the dragonfly internally warm.

The capacity generated by this battery will allow the dragonfly to perform short- range flights, slowly increasing in distance. Each re-charge will power the Dragonfly for 10km and allow it to remain aloft for 30 minutes. Once the brief hops have been mastered, a series of short jumps in a linear direction will be performed, with a possibility of up-to 8km. At each short jump, Dragonfly will stop to pick up samples for future analysis. It is hoped that it will eventually reach the Selk impact crater, where there may be evidence of past liquid water. This crater is geologically young and is identified 800km northwest of the Huygens lander.

Rotation period (Titan day) : 15.945 days.

Atmospheric pressure: 1.47 bar. (Earths surface pressure 1.01 bar)

Atmospheric temperature: 94K

Atmospheric density: 5.4kg/m^3

Surface Gravity: 1.35m/s^2

What does the 450kg Dragonfly look like? It will be configured to a helicopter design, with four rotors. The diameter of each rotor will be approximately 1m, which will allow the craft to fly at 10m/s and reach a height of up to 4km. On Titan, there is insignificant wind, a dense atmosphere and a gravity (13.8% of Earth), that enables the rotors to propel the craft efficiently. The power source provided has been used by many other spacecraft and the operating system allows specialised algorithms to control autonomous actions performed in real-time. It is designed to function in temperatures averaging 94K. The drawbacks to flying on Titan are atmospheric drag on the craft, reduced light levels and negative temperatures.

Image credit: Dragonfly Image Gallery | NASA

Dragonfly also carries a payload of scientific instruments:

i. DraMS : Dragonfly Mass Spectrometer. This is designed to determine specific chemical constituents, especially those applicable to biological activity.

ii. DraGNS : Dragonfly Gamma –ray and Neutron Spectrometer. This piece of equipment has been designed to verify the surface structure and composition found in the area under the lander, without having to acquire regolith. It also has capability to detect less significant inorganic elements such as sodium or sulphur.

iii. DraGMet :Dragonfly Geophysics and Meteorology package. This has a solid-state hydrogen abundance sensor, which will be used to gauge hydrogen content and perhaps define where the gas originated, whether geological, biological or from Titans surface.

iv. DragonCam : Dragonfly Camera suite. These cameras are controlled by a common electronics unit that are capable of taking images both forward and downward. They are also designed for microscopic and panoramic imaging. The former for identifying materials on the surface, the latter for panoramas of the landing sites.

v. An atmospheric density study of Titan will be investigated by the onboard engineering and surveillance equipment.

There is much discussion as to the launch vehicle, but at present it has been decided to select this propulsive element at a later date. This will be a new adventure into space, especially with the use of a quad-copter, flying to areas of scientific interest and not trundling along the ground like the 'Rovers'.

References:

(PDF) Dragonfly: A rotorcraft lander concept for scientific exploration at titan (researchgate.net)

Dragonfly (spacecraft) - Wikipedia

Dragonfly, NASA's mission to Saturn's moon… | The Planetary Society

Dragonfly Image Gallery | NASA

Double Asteroid Redirection Test D.A.R.T.

Short article from the library.

Its September 2022 and DART is in the news again. It is due around the 26th of this month to crash into the 160m wide Dimorphos, the moon of the 780m wide asteroid Didymos. This is hoped that it will be a practical demonstration that DART will deflect the small moon's orbit around the larger asteroid. The following article was published in OASI magazine in July this year, and I thought that it may be prudent to re-print it.

We read on a regular basis about how close some of the foreign bodies that zoom around Earth have presented themselves. NASA, with the aid of the Applied Physics Laboratory (APL) and supported by many others including the Jet Propulsion Laboratory (JPL) and the Goddard Space Flight Centre (GSFC) has formulated a mission idea to prevent lurking asteroids from impacting on Earth. In 2018 the National Science and Technology Council's subcommittee conceived a strategy and action plan to counteract any near earth object collision threat. They then requested that any specific outcome that would effectively fit into the strategic aims be considered. The idea behind this group was to be able to establish mechanisms that would be put into operation if a Near Earth Object (NEO) was identified and that there was a chance that it would impact on Earth.

A 25-30 m Earth collision object would have an estimated damage liability of minor damage with a fireball, airburst or shockwave culminating from it.

A 140 m Earth collision object would have an estimated damage liability of devastation on either regional or perhaps national proportion.

A 300-500 m Earth collision object would have an estimated damage liability of continental destruction.

How severe the asteroid collision is, can be defined as a function of its inbound energy, which is directly proportional to its mass. From this data, asteroid impact data is generated.

A second problem to these colliding asteroids is if they crash into seas and oceans. It has been noted by earlier analysis of this phenomena that even small events could generate tsunamis that carry surprisingly large amounts of energy and cause destruction of coastal towns and cities.

DART or Double Asteroid Redirection Test is a test protocol set up for averting an impact of Earth by a NEO. The idea of DART is to show that by impacting an asteroid with a rocket in motion, it will change its course in space. This mission is managed under NASA's Solar System Exploration Program at the Marshall Space Flight Centre.

Objects that are projected to pass within 36,000 km of Earth are notified by NASA directly to the U.S.Government. Data is obtained from worldwide observatories and projected orbits are continuously re-calculated. Asteroid size and composition are also collected on a similar basis.

They established an action plan that in part took account of specific data that allowed them to make decisions, considering all types of responses. It was to include the probability of impact with degrees of damage as well as date and time of impact. From this paradigm, an operation could be set in motion to either destroy the NEO, or disturb its trajectory.

In order to interpret the physical characteristics of any NEO, systems of monitoring needed to be put into place. These include photometry, spectroscopy and radar using both visible and near infrared spectra. This is necessary for the design of the action plan.

NASA's Survey and Alert Process

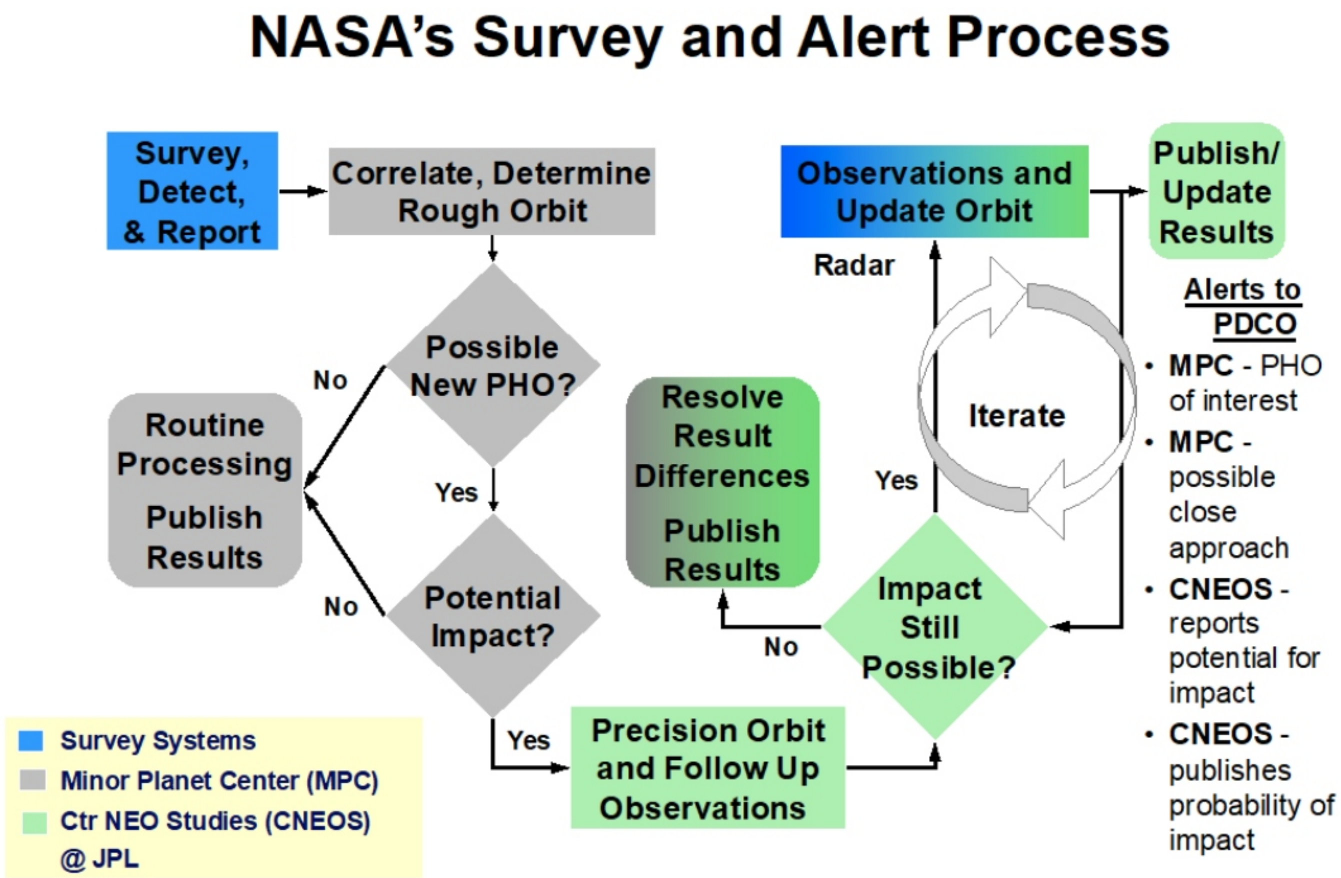


Figure 1. NASA NEO survey and alert process.

Diagram and data from: NASA Action 5.2
REPORT ON NEAR-EARTH OBJECT IMPACT THREAT EMERGENCY PROTOCOLS (archives.gov)

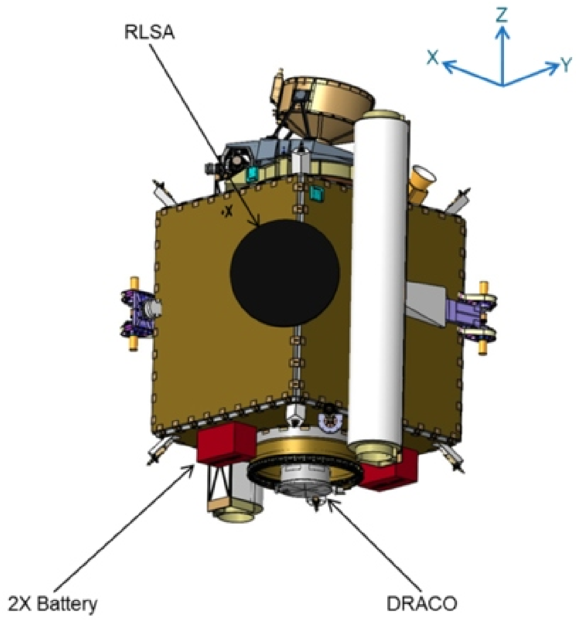
The nine member Committee on Near Earth Object Observations in infrared and visible wavelengths was presented with a myriad of ideas to combat NEO's both from the Earth, as ground based and from space based. After much consultation they decided that the best idea was using a space based thermal infrared telescope, which was the ideal weight and size for the mission. This was because :

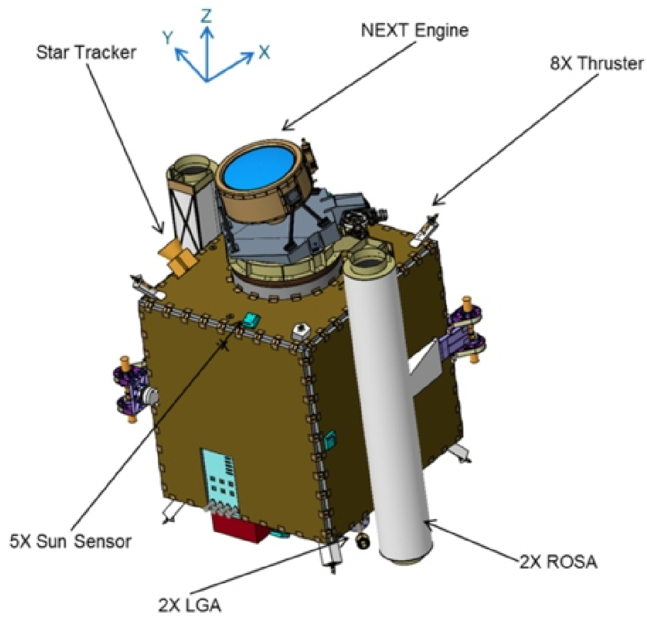
- The use of thermal infrared equipment will provide asteroid measurements, especially diameter from which mass estimation can be achieved.
- It was adjudged that optical surveys would not be able to provide this data with a similar sense of accuracy and speed.
- Ground based equipment was discarded as an idea due to Earth's day/ night cycle and its weather.

Thus the Committee decided that the space based option was the best and it was no more expensive than visible wavelength telescopes also set in space. The latter has a cost pressure brought by telescope apertures. Another feature considered by the committee was that the infrared space-based equipment would instantly provide a mass uncertainty of the asteroid within a factor of 4, whereas the ground-based visible observatory would only be able to give a preliminary mass uncertainty of within a factor of 20.

The group have decided that 65803 Didymos is a provisional target for DART. Didymos is a sub-kilometre asteroid with a secondary moonlet Diamorphos only 160 metres in size. The two are in a synchronous binary system and are observed by telescopes on Earth, currently, in order for all calculations to be at hand when awaiting the DART arrival. This mini system was discovered in 1996 by the spacewatch survey at Kitt Peak. This is an ideal contender for Earth's first attempt at asteroid defence, and as it is not on a path to strike Earth, it will not present a problem. The timing of DART to impact is September 2022. The impulse generated by DART to the asteroid system will be low and will crash into Diamorphos at approximately 6.6km/sec, changing its speed around Didymos by <1% which will cause a change of several minutes to its orbit time.

The DART spacecraft is predominantly low-cost with its main box like structure only 1.2*1.3*1.3 meters in dimension. It has two large solar arrays which when fully opened are 8.5 meters long, which will provide up to three times more power than is presently available. It is powered by solar electric propulsion. This system is called NASA's NEXT-C (Evolutionary Xenon Thruster-Commercial), an ion propulsion system. This is a gridded ion turbine supplying drive by electrostatic acceleration of ions obtained from the Xenon propellant. This system offers a much higher performance than those used on both the Dawn and Deep Space 1 missions. In order for it to identify which of the asteroids to target, algorithms have been written to provide assistance. This is called "Smart Nav". The craft also has high gain antennae allowing for high effective communication. It is due to launch on the 24th November 2021 on a two stage reusable Falcon 9 rocket from Vandenberg AFB United States. Commissioned from SpaceX.





Double Asteroid Redirection Test (DART) Mission | NASA

DRACO- Optical navigation Camera ROSA- Roll out solar array

Image credit: https://www.nasa.gov/planetarydefense/dart

The expensive craft will fly itself to the required asteroid, at this point its next job is to achieve the correct kinetic impact. This will be made easier by an onboard camera system called "DRACO" and some very impressive navigation software. It is calculated that this strike will alter the speed of the smaller asteroid, as has been stated earlier, by a fraction of 1%, changing its orbital period. The analysis of this information will be used for further missions.

References:

REPORT ON NEAR-EARTH OBJECT IMPACT THREAT EMERGENCY PROTOCOLS (archives.gov)
trumpwhitehouse.archives.gov/wp-content/uploads/2021/01/NEO-Impact-Threat-Protocols-Jan2021.pdf

https://www.nasa.gov/planetarydefense/dart
NASA'S First Asteroid Deflection Mission Enters Next Design Phase | NASA

Double Asteroid Redirection Test (DART) Mission - Albatross Eye View

Jupiter

Carl Baldwin

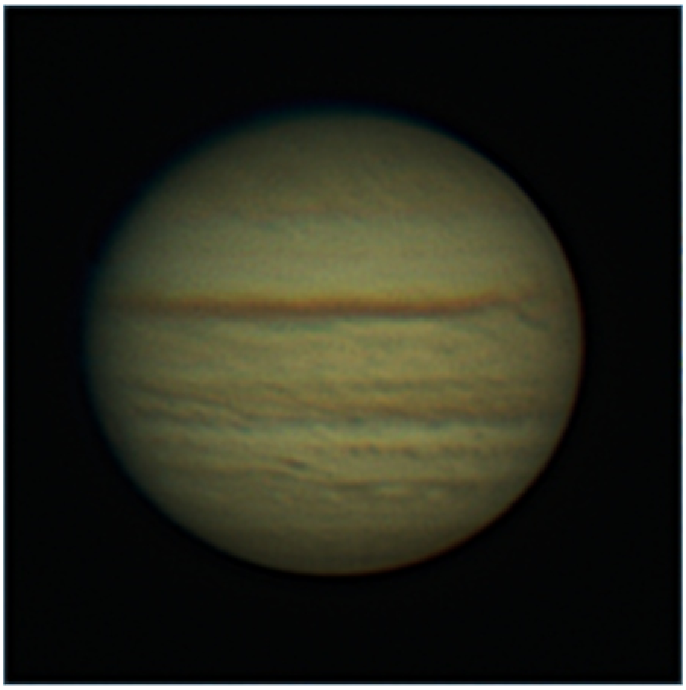
Attached are my first images with my new setup.

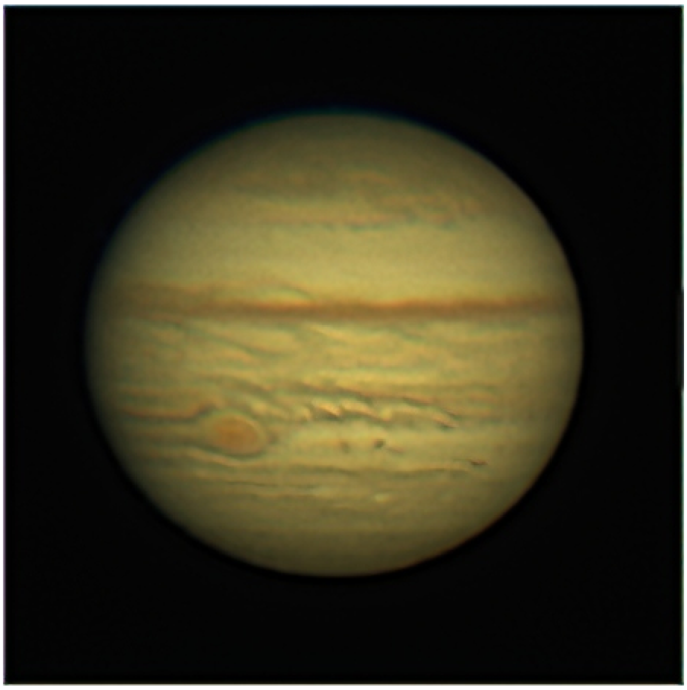
For info, I am using the Skywatcher SkyMAX 180 Pro I have had since Spring last year (a 180 mm / 7" Maksutov-Cassegrain) and now mounted on a Skywatcher EQ6-R Pro which I bought earlier this year and have finally had time to set up. The mount that was packaged with my first 'scope was straining at the limit of what it could cope with and my main aim of the upgrade was to have improved tracking and stability and hence better imaging. It is also a very good Goto mount, haven't used that yet. I use a Celestron Skyris 236C CMOS camera attached via Celestron Ultima Duo eyepieces which are designed with screw threads for attaching the camera.

The 2 images are with and without the red spot, taken at 10:35pm and midnight.

Again for info, I use SharpCap to record around 3000 frames over 3 minutes. The video is run through PIPP (Planetary Imaging PreProcessor) which centres the image in each frame - less vital with my improved tracking. The images are stacked with AutoStakkert, usually using around the best 15% of frames, and then I use RegiStax on the resulting image to adjust wavelets. These are all free software. On these images I have not used the Topaz AI software or Affiniti Photo that I have to work on them further, so maybe there are enhancements to come.

I have several more sets of frames from Saturday to work with, but these looked the best initially. Next clear night I will aim for Saturn.





The Return of Outreach Meetings in 2022

Roy Gooding

Star Party in Christchurch Park 24th February

After an interval of about two years, star party outreach meetings finally resumed on Thursday 24th February outside Christchurch Park mansion. We were very lucky this evening as the skies were clear! The event was organised by the Ipswich and Colchester Museum staff, and we acted as hosts. It formed part of the museum's school half term activities programme, which unfortunately presented us with a sky with no moon and no planets. The offer to run the event earlier in the month when the moon would be visible was rejected. Observing deep sky objects from the centre of Ipswich is some what challenging. Luckily the main entrance of the mansion looks due south, giving us a good view of M42.

The meeting was by ticket only and had a limit of 50, that was achieved. The museum staff also ran a table with tea, coffee and an assortment of nibbles. The first visitors arrived at 17:45 and were shown to the effective green waiting room for refreshments as a diversion, until it got dark. The event was scheduled to start at 18:00 but the skies did not get dark until around 18:30.

At a normal star party, we would have a number of telescopes available for the public to look through, but because of Covid and the perceived problem of sharing eyepieces, we decided to set up a telescope with a camera and projection system. The society's Celestron was setup outside the mansion's main door with a camera. The controlling laptop was also setup outside and connected to a projector in the entrance hall of the mansion,   by a 30m HDMI cable (yes they do exist). The projection system worked very well, giving a much better image than can be seen by eye. The colour of the nebulae was visible. Paul Whiting acted as master of ceremonies giving a running commentary of the image and Andy Gibbs looked after the telescope camera and laptop.

Two telescopes were setup in the mansion entrance hall. Bill Barton set up his 4" refractor and I set up my 90mm Maksutov.

Claydon Outreach Meeting 13th March

This event was held at the Kinetic Science venue at the Hill View Business Park, Claydon.

This was a low key event with just 3 members present Paul Whiting, Andy Gibbs and myself. We set up the standard indoor OASI event displays, in a room normally used as a class room.

The event was attended by only a few visitors. Towards the end of the event we attempted to draw people in by streaming various Sci-fi themes from YouTube, but this had limited success.

Andy Gibbs and Paul Whiting at Kinetic Science

Solar Event Christchurch Park 30th July

This event was the first solar one we have held in the park for several years. As with the star party in February, we hosted it and the Ipswich and Colchester Museum staff organised it as part of their events programme.

Telescopes in use were :

102 mm refractor using a Lunt Herschel wedge - Roy Gooding

8" reflector using a white light filter - Adam Honeywell

8" reflector using a white light filter - Martin Richmond- Hardy

60mm Hydrogen alpha telescope – Martin Cook.

Unfortunately the skies were cloudy most of the day.

Other members dropped in through out the day to help:

Pete and Nicky Richards   Mike Nicholls   Matt Leaks and Debra   Mike Mahoney

Apologies if I have left any one out

Bawsey Radar Museum Solar Event 28th August

This was the best supported and weather conditions we have had for an Outreach meeting for many years. The skies were clear for most of the day. The day was constantly busy with visitors. It was quite noticeable that many of the visitors had a more technical knowledge about astronomy than the usual visitor. We also had the use of a large marquee. The largest prominence, that most people could ever remember seeing, was the highlight of the day.

Telescopes in use:

102 mm refactor using a Lunt Herschel wedge - Roy Gooding

8" reflector using a white light filter - Martin Richmond-Hardy

The society's Hydrogen alpha telescope

A Questar telescope with a white light filter - Bill Barton

8" reflector using a white light filter - John Wainwright

So many members either came to help or visit that I am not sure if I can remember everyone .

Paul Whiting	Pete and Nicky Richards	Mike Mahoney
Joe Walsh	Stuart Dedman	Neil Morley

Apologies if I have left any one out

Thanks to everyone who was able to make these events a success

Telescope array at Bawdsey Radar Museum

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Honorary Secretary
Roy Gooding

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