



November/December 2023

Astronomy Section Meetings for November and December 2023

Unless otherwise noted we meet at 8.00 pm and talks start at 8.30pm.

31st October - NASA NSN Webinar - Europa Clipper Updates

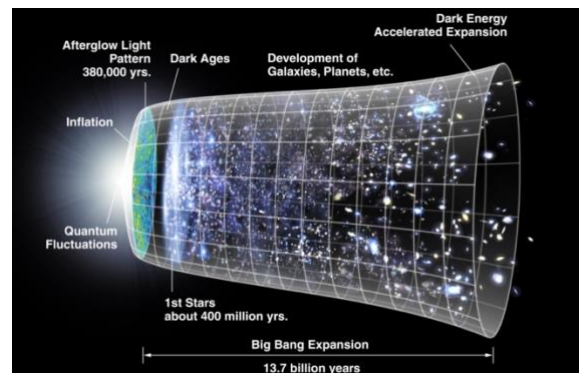
NASA's Europa Clipper will conduct detailed reconnaissance of Jupiter's moon Europa and investigate whether the icy moon could harbour conditions suitable for life.

Speaker: Dr Cynthia Phillips

14th November – *First Light: Birth of the Earliest Stars in the Universe*

This talk is by Astronomy Section member Thomas Harvey FRAS, who will be talking live from the University of Manchester. There will be an opportunity for members of the audience to ask Tom questions about his research.

The talk will explore what we have learned about the earliest galaxies from recent observations with the James Webb Space Telescope. We will look at when the first galaxies formed, how they compared to the Milky Way galaxy and how they evolved into the galaxies of today. We will explore the lifecycles of the massive first stars, which formed directly out of the primordial gas and died in dramatic explosions known as supernovae. Recent observations show these early galaxies also contained active supermassive black holes, and the talk will discuss how these black holes formed and grew so quickly! Finally, we will discuss what open questions still remain and what discoveries we expect to make in the near future.



28th November

Von Karman Lecture – *How do missions get formed?*

We'll talk to one of our robotics engineers about project formulation and demonstration, looking at the process of generating ideas - from napkin sketch to prototype to development and testing. We'll also look at how they figure out the right questions to ask in order to understand what technologies are needed to get the job done using real life experiences and stories about the Mars Rovers and Mars Sample Return Mission.

Speaker: Paulo Younse, Robotics Engineer, NASA/JPL

12th December - Mince pies and members favourite astronomy image

This is a chance for members (new and old) to share their favourite image. It can be one you have seen in the media, an APOD perhaps or one from a space telescope.

It can be of anything astronomy related, a newly discovered object, something that has led to new theories or a well-known object that simply inspires you, deep space or planetary, or perhaps an historical image, the choice is yours.

Or it can be one you have taken yourself; it could be your latest image, a work-in-progress, or your very first astrophotography image.

There is no specific time limit, just describe what the object is and why you have selected it. There is no time constraint, you can take just a few minutes or 15+ minutes.

Bring the image on a USB stick, or email it to me and I will put it into a Power Point slide so it can be projected, (astronomy.secretary@societe.org.gg).



This is the last meeting before Christmas – members are invited to bring along a few nibbles to share.

Notice of the Astronomy Section Annual Business Meeting

This will be held on the 9th January at 7.30pm at the David Le Conte Astronomical Observatory.

Please could those who wish to continue on the committee let me know.

The Committee is fairly informal, we usually discuss any items at 8pm on the regular Tuesday evenings. If you would like to help and join the Committee then please come and chat to me. Positions that need filling include someone to organise the grass cutting, editing the bi-monthly bulletin and imaging officer.

Thanks - Jean

Meeting dates for January and February 2024 are:**9th January – Annual Business Meeting**

All members are invited to attend. We appoint a new committee, and briefly discuss the events from the previous year and what events we will hold in the forthcoming year. This is your opportunity to also give your input into the activities of Astronomy Section.

Meetings are also scheduled for:

23rd January

6th and 20th February

Stargazing:**Winter Asterisms and Constellations**

The Plough is easy to find, it is circumpolar so it is always in the night sky. It looks like an old fashioned plough, or a ladle with a bucket shaped end. An imaginary line drawn between the two stars on the end of the bucket, Merak and Dubhe, points to Polaris, the pole star which marks the celestial north pole.

Cassiopeia is also circumpolar and makes a distinctive “W” (or “M”) shape. It sits roughly opposite the Plough.

Orion, the hunter, is a splendid winter constellation and full of riches. The top left star of this constellation is Betelgeuse, a red supergiant star, a thousand times bigger than the Sun. Although only some 10 million years old, it is expected to end its life in a spectacular supernova explosion (see below). At the bottom right of Orion is Rigel, a blue-white supergiant star, 21 times more massive than the Sun. The three middle stars, Alnitak, Alnilam and Mintaka form a line and make up the hunter's belt. In the sword, hanging from the belt, is the superb Orion Nebula which is clearly visible with binoculars. It is a huge cloud of hydrogen gas and dust, and a stellar nursery where new stars are being formed. At the centre sits the Trapezium open star cluster, named after their trapezoidal alignment, which is a collection of massive stars that were born together within the stellar nursery.

Auriga, the charioteer, is an irregular pentagon shape with Capella, the sixth bright star in the night sky forming one of the corners. During winter this constellation is almost directly overhead.

Gemini, the twins, is a zodiac constellation and it makes a fine sight in the night sky. The two brightest stars are Castor and Pollux, the latter being the brightest of the two. Castor is a multiple star system; its two brightest components (one orange and the other blue) make a lovely sight in a telescope.

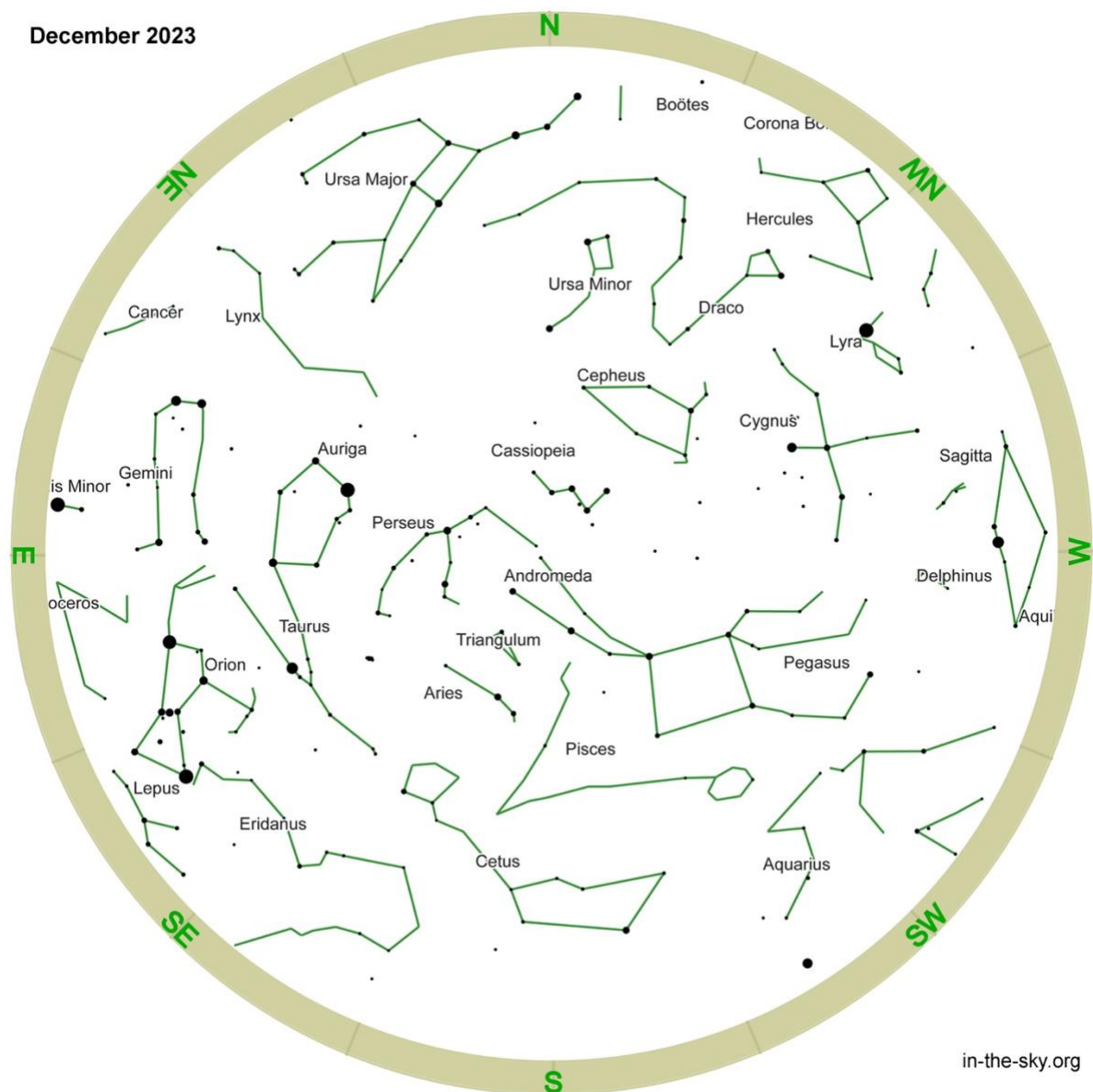
Canis Major, the greater dog, sits low on the horizon and contains Sirius, the brightest star in the night sky. Sirius is a binary star which comprises a main-sequence star Sirius A and a faint white-dwarf companion called Sirius B, colloquially they are known as the dog star and pup.

Open Star Clusters

There are several notable open clusters. The most stunning is the Pleiades where the brightest stars are named after seven sisters and their parents from Greek mythology. It forms a magnificent cluster of bright blue/white stars which are illuminating the interstellar dust that currently surrounds them, creating reflection nebulosity. In Taurus the Hyades spans ten light years and forms a distinctive "V" shaped cluster and includes a prominent red/orange star named Aldebaran. There is also the Double Cluster in Perseus which comprises two relatively young star clusters close together, the Beehive Cluster in the constellation of Cancer which is relatively near to Earth at only 577 light years away, the lovely Christmas Tree Cluster in Monoceros, and the Pinwheel Cluster in Auriga which resembles a mini-Pleiades configuration.

Galaxies

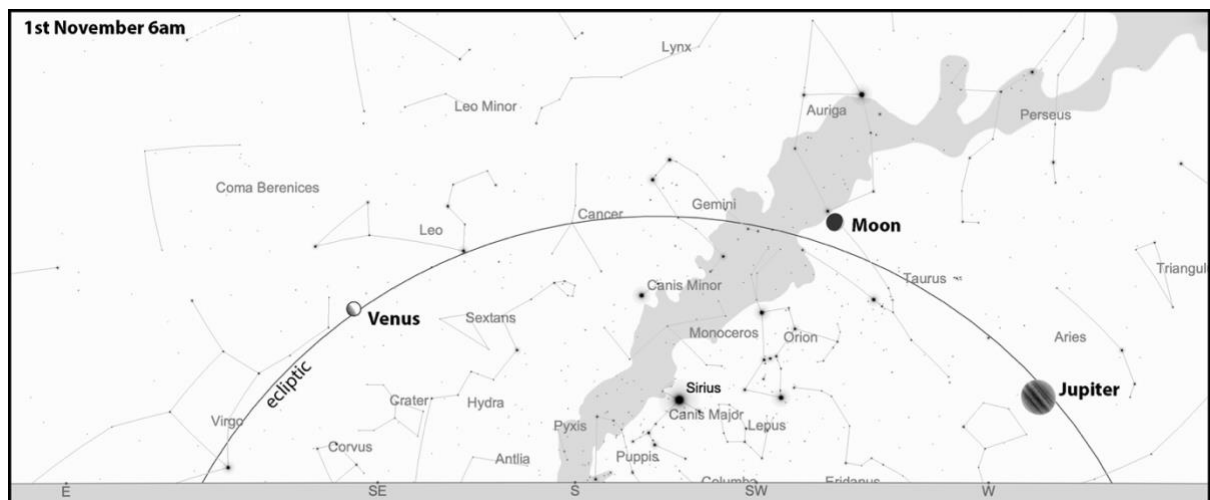
The Andromeda Galaxy is a classic spiral galaxy and the most distant object visible with the naked eye at 2.5 million light years away (one “light year” is about 5.9 thousand billion miles). Another prominent spiral galaxy is Bode’s Galaxy which is much further away at 12 million light years and is fainter so you will need binoculars or a telescope to see it.



Instructions: Hold the chart so the direction you are facing is at the bottom. The lower half of the chart shows the sky ahead of you. The centre of the chart is the point directly above your head.

Saturn and Jupiter

The planets Jupiter and Saturn are easy to identify in southern sky as they are bright and stand out against the stars. With a pair of binoculars, you will be able to make out some of their many moons. Venus becomes a morning object, with gradually increasing illumination.



Astronomical Events

November

1	Jupiter at perigee
3	Jupiter at opposition
4	Saturn ends retrograde motion
5	Moon at Last Quarter
9	Conjunction of the Moon and Venus Close approach of the Moon and Venus
12	Northern Taurid meteor shower 2023
18	Leonid meteor shower 2023 M45 is well placed Moon at First Quarter
20	Conjunction of the Moon and Saturn Close approach of the Moon and Saturn
22	α -Monocerotid meteor shower 2023
25	Close approach of the Moon and Jupiter Conjunction of the Moon and Jupiter
27	Close approach of the Moon and M45 Full Moon
28	November Orionid meteor shower 2023

December

4	Mercury at greatest elongation east
10	Mercury at highest altitude in evening sky
5	Moon at Last Quarter
6	December ϕ -Cassiopeid meteor shower 2023
8	Mercury at dichotomy Close approach of the Moon and Venus
9	Monocerotid meteor shower 2023 Conjunction of the Moon and Venus
12	σ -Hydrid meteor shower 2023
14	Geminid meteor shower 2023
16	Comae Berenicid meteor shower 2023
17	Conjunction of the Moon and Saturn Close approach of the Moon and Saturn
19	Moon at First Quarter
20	December Leonis Minorid meteor shower 2023 December solstice
22	Close approach of the Moon and Jupiter Conjunction of the Moon and Jupiter
23	Ursid meteor shower 2023
24	Close approach of the Moon and M45
27	Full Moon
31	Jupiter ends retrograde motion

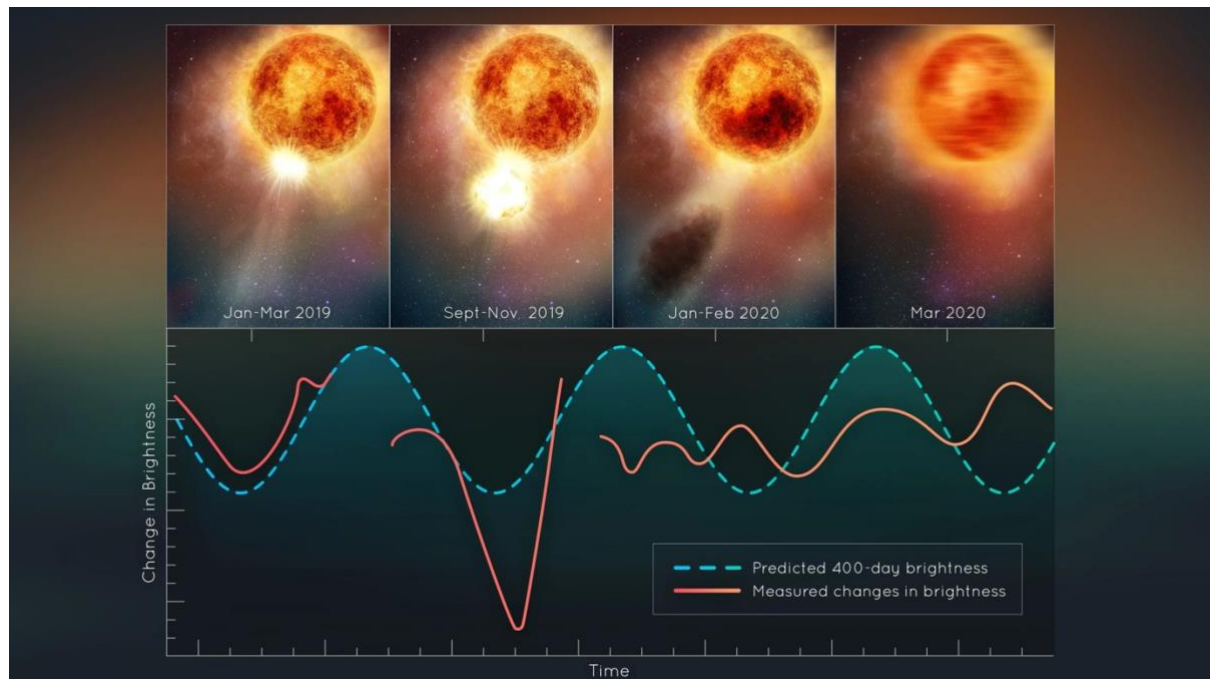
When will Betelgeuse explode as a supernova?

Over the last few years, the red supergiant Betelgeuse has been behaving erratically, dimming and then brightening again.

In 2019 data from the Hubble Space Telescope and several other observatories recorded the star quite literally blowing its top, losing a substantial part of its visible surface and producing a gigantic Surface Mass Ejection (SME). This is something never before seen in a normal star's behaviour.

Our Sun routinely blows off parts of its tenuous outer atmosphere, the corona, in an event known as a Coronal Mass Ejection (CME). But the Betelgeuse SME blasted off 400 billion times as much mass as a typical CME!

The monster star is still slowly recovering from this catastrophic upheaval. "Betelgeuse continues doing some very unusual things right now; the interior is sort of bouncing," said Andrea Dupree of the Centre for Astrophysics at Harvard.



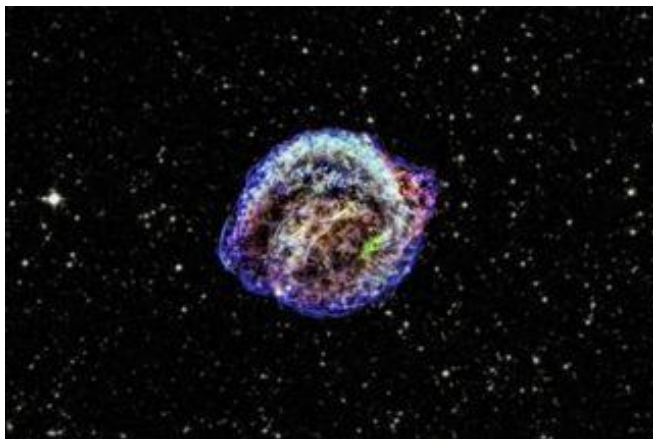
Changes in the brightness of the red supergiant star Betelgeuse, following the titanic mass ejection of a large piece of its visible surface. The escaping material cooled to form a cloud of dust that temporarily made the star look dimmer, as seen from Earth. This unprecedented stellar convulsion disrupted the monster star's 400-day-long oscillation period that astronomers had measured for more than 200 years. Image credits: NASA, ESA, Elizabeth Wheatley (STScI).

These new observations yield clues as to how red stars lose mass late in their lives as their nuclear fusion furnaces burn out, before exploding as supernovae. The amount of mass loss significantly affects their fate.

There is a suggestion by a team of astronomers led by Hideyuki Saio from the Tohoku University in Japan that Betelgeuse is larger than what most researchers believe, thus indicating it is in a later stage of its life. It might already have burnt its helium and now burning carbon. The helium burning stage lasts about 700,000 years where helium is fused into carbon. Then the carbon burning and fusing to create oxygen lasts can take just 600 years. The next stage is oxygen

burning which lasts about 6 months and results in silicon, then the final stage of fusing silicon to iron lasts about 1 day, ending with core collapse and a supernova explosion in about ¼ second!

If Betelgeuse is already burning carbon, it may only have a few hundred years before it explodes. It would certainly be an exciting event to view with the supernova visible in the daytime sky for a few weeks. The last time a nearby star went supernova was in 1604, the star was named Kepler's Supernova, after the German astronomer Johannes Kepler who thought he was looking at a new star.



The remnant of Kepler's supernova, the famous explosion that was discovered by Johannes Kepler in 1604. The red, green and blue colours show low, intermediate and high energy X-rays observed with NASA's Chandra X-ray Observatory, and the star field is from the Digitized Sky Survey.

Image credit: X-ray: NASA/CXC/NCSU M.Burkey *et al*; Optical: DSS

Safe return of asteroid Bennu sample

A capsule released from the OSIRIS-REx (Origins, Spectral Interpretation, Resource Identification, and Security – Regolith Explorer) spacecraft containing a 250g sample from asteroid Bennu touched down safely in the Utah Desert on 24th September after completing a 7-year, 1.2 billion mile journey. Asteroids are time capsules from when the Solar System was forming some 4.6 billion years ago. Carbonaceous asteroids such as Bennu contain water and carbon, making them the most likely source of these components on Earth. Studying samples can help answer questions such as the formation the Solar System and the evolution of life on our planet.

There have been two other successful sample returns from asteroids by the Japanese Space agency (JAXA), one from siliceous (stony) asteroid Itokawa in 2010 and the other from carbonaceous asteroid Ryugu in 2018. Examination of material from Ryugu shows that it contains thousands of different carbon-based molecules (organic molecules), prebiotic carbon compounds, amino acids, aromatic hydrocarbons and other elements crucial for life such as sulphur, nitrogen and iron. Minerals found in Ryugu indicate that they formed in the presence of water, another essential for life. Early indications using scanning

electron microscopy analysis of the Bennu material indicates that it also rich in carbon, water and organic molecules.



Left: Near-Earth asteroid Bennu which is about half a kilometre at its equator. Image credit: NASA. Right: The charred sample return capsule in the Utah desert. Image credit: NASA and Keegan Berber.

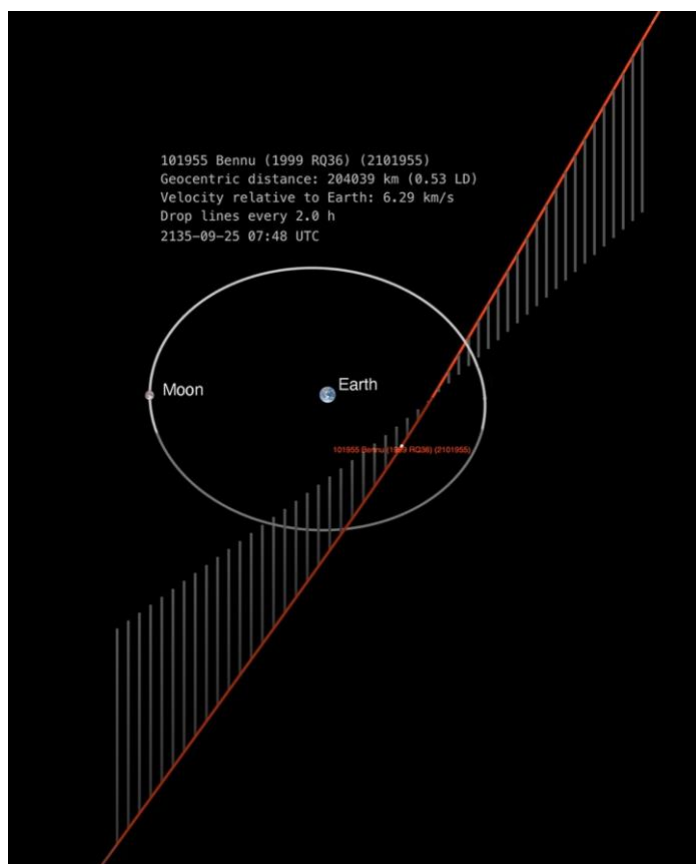


Close up of asteroid Bennu sample. Image credit: NASA

The name Bennu is appropriate as it represents an Egyptian deity linked with the Sun, creation and rebirth. It measures about 500 metres across and is classed as a Potentially Hazardous Asteroid (PHA) because it makes close approaches to Earth. On the 25th September 2135 it will make a particularly

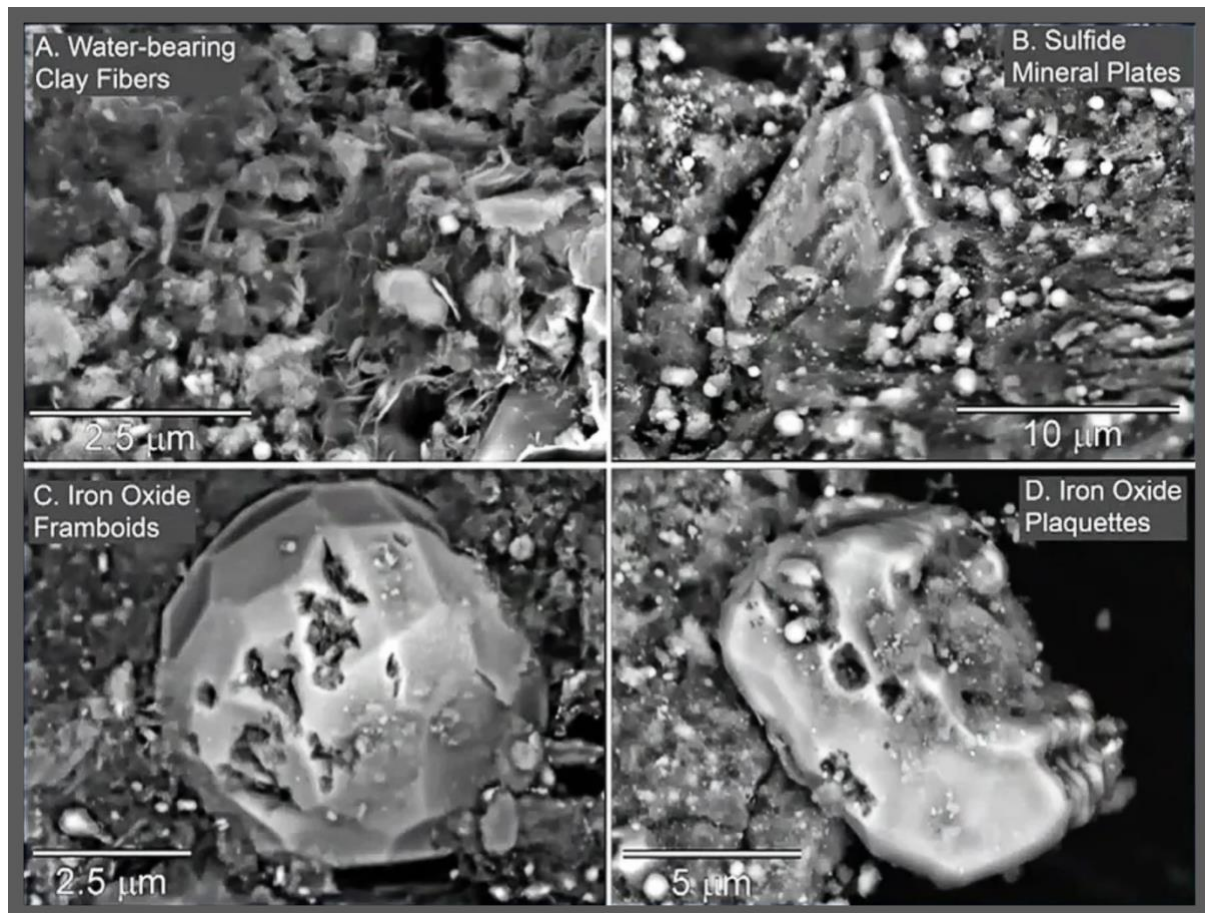
close approach of about 121,000 miles (half the Earth-Moon distance). This will be perfectly fine, providing the orbit of Bennu does not change for the worse, putting it on a collision course.

Asteroid orbits are generally easy to calculate, but they are subject to the very unpredictable Yarkovsky effect, which is when the asteroid surface heats up during the day and cools down at night, giving off radiation that can act in a similar manner to a mini-thruster, altering the orbit over time. Part of the OSIRIS-Rex mission was to study and better understand this effect. Currently there are 2,305 known PHA's which are closely monitored by the Centre for Near-Earth Objects (NEO's) at NASA/JPL.



Orbit of Bennu and close approach in 2135. Image credit: CNEOS/JPL

Once releasing the sample return capsule towards Earth, OSIRIS-REx then fired its engines to send it on a heading to intercept the asteroid Apophis (also a PHA/NEO) when it makes a close approach to Earth in 2029. Apophis is classed as an S-type asteroid, which is made of silicate (or rocky) materials and a mixture of metallic nickel and iron and estimated to be about 340 metres long. The mission has been renamed as OSIRIS-APEX (OSIRIS-APophis EXplorer).



Scanning electron micrographs of sample from asteroid Bennu. Image credit: NASA.

Summer Outreach

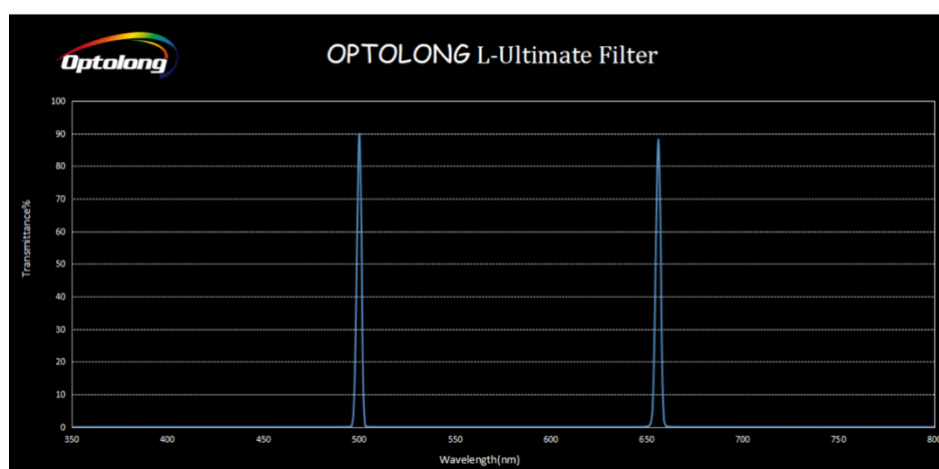
Over the summer months we hosted three Rocket Ship Ride events around the Solar system for young children, giving them a bag of goodies to take home that included a set of Solar System cards, rocket ship glider, spectral grating and stickers. We also hosted three Introduction to Stargazing lectures for older children and adults. Finally, we hosted an Introduction to Astrophotography. A big thank you to the two Steph's, James, Jason, Dorothy, Peter and Jacques for helping out. We raised just under £790 for the Section. We also hosted a visit from a group led by Professor Watson, Australia's Government Astronomer who were treated to clear skies and good views through the Meade.

Most recently we hosted a short-notice public open evening which was attended by over 100 children and adults and raised a further £100. A huge thank you to Stephanie LeT, James, Jason, Jacques, Carol and Ashe who all helped make it an absolutely brilliant night of stargazing. The public looked at Saturn, Jupiter, Andromeda galaxy, Ring Nebula and Hercules globular cluster.

For the remainder of the year weather-permitting we aim to hold 2 or 3 more open evenings. Holding them at short notice guarantees clear skies and good viewing.

Equipment Purchases

The money raised this summer has been spent on three items. The first is an Optolong L-Ultimate dual 3nm OIII and Ha narrow filter for the cooled astrophotography camera. In addition, we bought a bahtinov mask to help with focussing when using a narrow band filter.



We have also ordered an iOptron SkyGuider Pro package, including a sturdy Skywatcher tripod for it to sit on. Although it can be used with a photo tripod if desired. This will be particularly good for members to use when photographing the Milky Way and larger deep space targets with their own DSLR and lenses. More on this below.



For more information here is an excellent guide to the [SkyGuider](#).

Introduction to deep space astrophotography with an iOptron Skyguider Pro

The SkyGuider makes an excellent platform for widefield astrophotography on large and relatively bright deep space targets. It is suitable for cropped and full format DSLR sensors and use with lenses from about 14mm to 200mm focal length. Winter has some excellent targets such as the Orion Nebula, the Pleiades open cluster and the Andromeda galaxy. All these targets are easy to locate with the naked eye.

The most important aspect of astrophotography is a sound polar alignment to allow long exposures. The SkyGuider comes with a modern, illuminated clock face polar scope. To use this an app, here are some examples for different platforms:

[Mac and iOS](#)

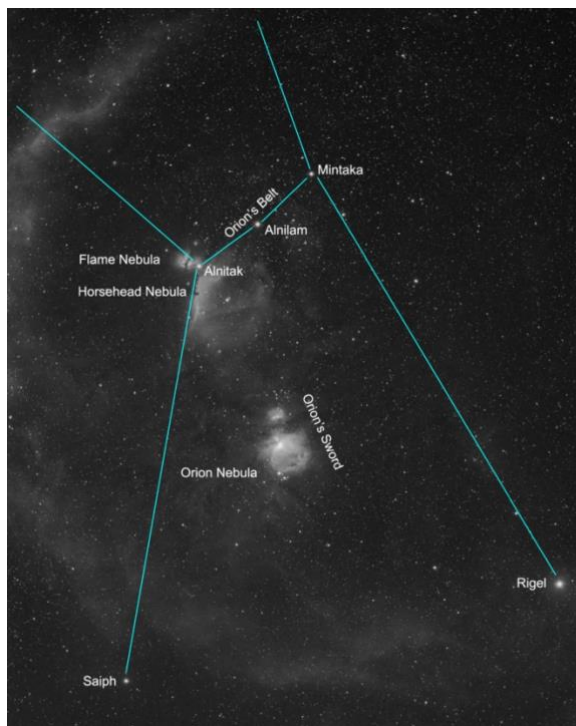
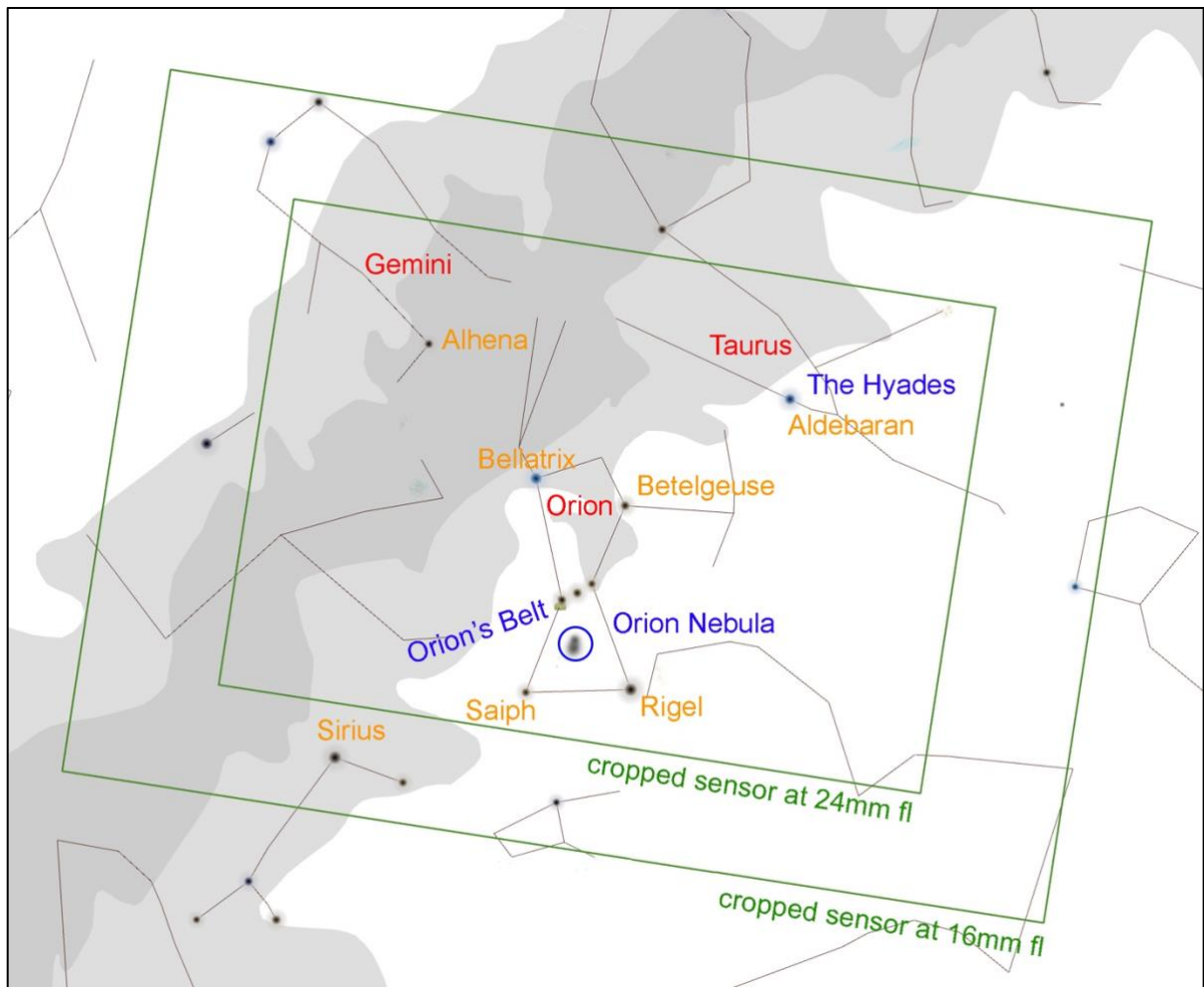
[Android](#)

[Windows](#)

To see what your field of view and framing would be like with specific camera/lens/target combinations this is a very useful calculator:

<https://astronomy.tools>

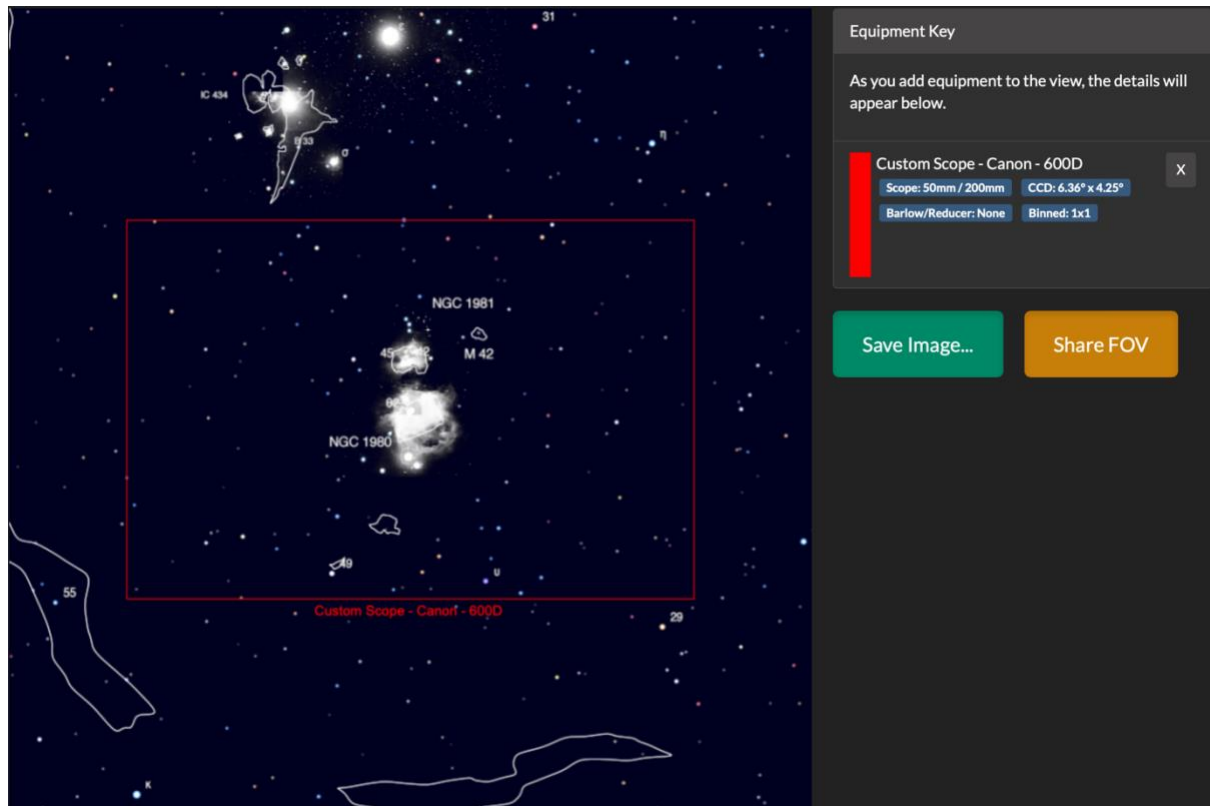
Start with an ultra-widefield of view, such as 14 or 16mm. This is very forgiving of any slight errors in the polar alignment, then as you improve start to increase focal length. For ultra-widefield try imaging whole constellations, such as the Orion nebula. For example, at 16mm and a cropped sensor you should get Orion nicely, but also the bright and contrasting colourful stars of Sirius, Aldebaran and Alhena. Then try zooming in a bit to say 24mm to focus just on the Orion constellation, you should start to pick up some faint red from the Orion Nebula, also called Messier 42.



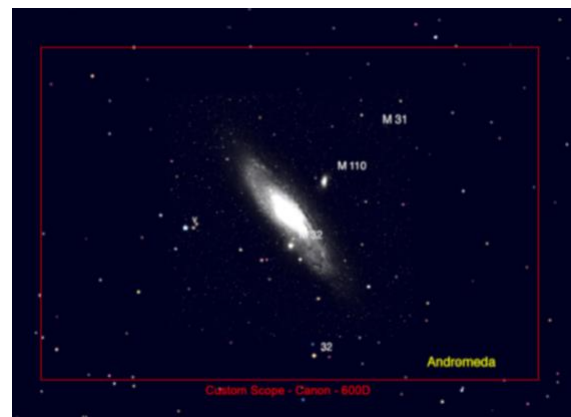
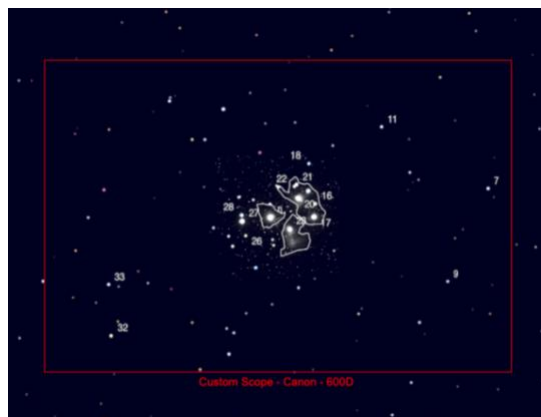
To find the Orion Nebula, look for Orion's Sword just below his belt. It appears as a faint "fuzzy" patch. A pair of binoculars will help you locate it. Once you know where it is then in future you will find it easily.

Image credit: JM Dean

Here are some more field of view examples, all a cropped sensor at 200mm focal length [Astronomy Tools](#).



Orion Nebula, Messier 42



Left: The Pleiades, Messier 45 and Right: Andromeda Galaxy, Messier 31.

If you would like to learn how to use the iOptron SkyGuider then please email [Jean](#) and you will be added to an open email group. You do not need to have your own DSLR to learn how to use the tracker.

Stay in Touch with Activities

Our website can be found here: [Astronomy Guernsey](#) and the Astronomy Section members only Facebook group: [Members FB Group](#).

To stay up to date and receive email notifications of public events please follow us on Eventbrite: [Astronomy Guernsey Eventbrite](#).

Clear Skies

Astronomy Section Committee

If you wish to opt out of the Bulletin and/or other emails regarding upcoming events then please contact the Secretary: Astronomy.Secretary@societe.org.gg

For enquiries, please contact the following:

General Enquiries	send email
Treasurer	send email
Membership Enquiries	send email
Equipment – help and advice	send email
Group Visits	see website
Website & IT	send email