

Wadhurst Astronomical Society Newsletter November 2013

MEETINGS

OCTOBER MEETING

Phil Berry opened the meeting with general news including the reminder that the petition for the continuance of the "Sky At Night" television series, which has reached the stage where the BBC are considering whether or not to continue making the programme and, if so, what the format should be. Typing in 'Sky At Night Petition' in your computer search facility will bring up the petition option. About 40,000 people have signed it so far. Mention was made that once you have done so, a number of spam emails can be expected but these are not persistent and deleting them works quite well and they soon stop.

Subsequent to this meeting, the BBC have announced that "The Sky at Night" half-hour programme will move to BBC4 in February with a repeat on BBC2. Kim Shillinglaw, BBC head of commissioning science and natural history, said: "Sir Patrick Moore inspired generations of astronomers and I hope that alongside the BBC's other astronomy content 'The Sky at Night' will enthuse further generations about the wonder of the night sky." (Editor)

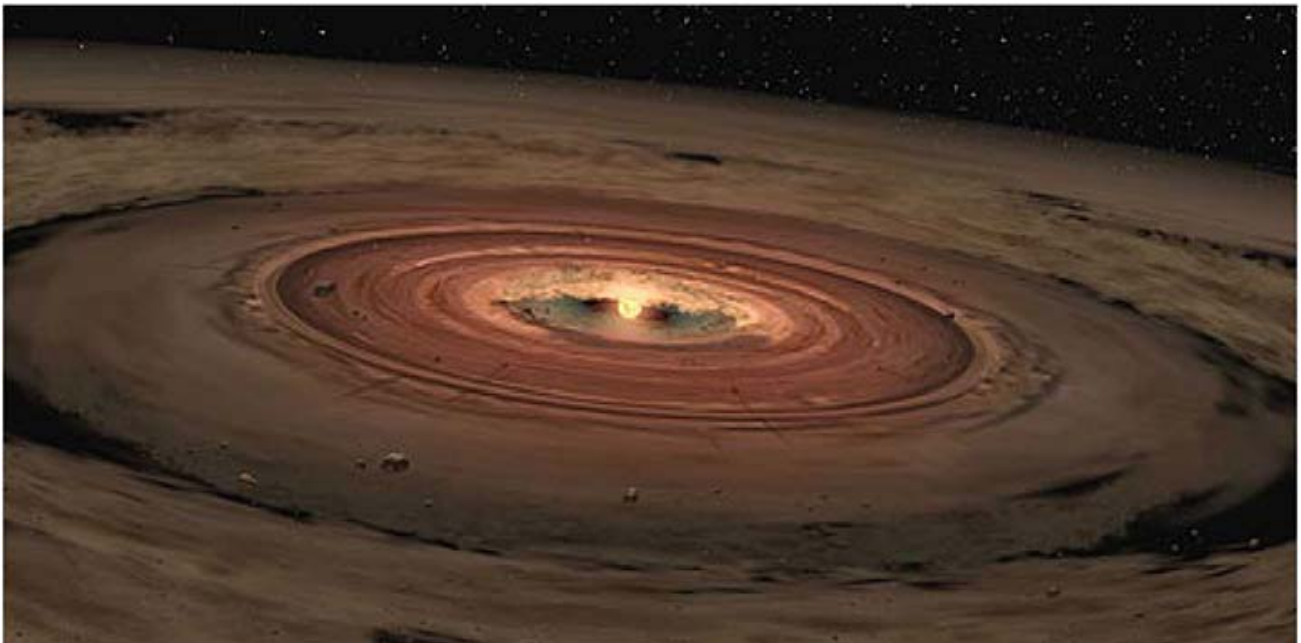
Phil asked for a show of interest for outings such as Greenwich Observatory etc. Enough interest was shown for plans to go ahead with these. Interest in either of these visits can also be expressed at the November meeting.

Phil then introduced our guest speaker for the night – James Fradgley FRAS whose subject was The Birth of the Solar System.

The Birth of the Solar System

James Fradgley

James started by giving details of some of the theories on how the Solar System began and explained that as we are looking at what is there at present and then trying to work out how we got there, a number of theories, whilst good at the time, have since been discounted. One of the main problems is that, as stars go, our sun is not that big and in comparison to other stars, spins quite slowly. One theory was that heavy metals form only from Super Novae. This is not true. Some do but most are from normal stars getting near to the end of their life. Various historical theories were discussed and discounted, although James pointed out that the theories we have today might look very amateurish in 300 years time!



An artist's impression of material that formed the Solar System Credit NASA

A lot of the basic material that form planets seem to come from discs around stars at their formation. In order for this material to form into planets it needs considerable time. However, research into other stars show that these discs only last for two or three million years – insufficient time for planets like our solar system to be created. James described that around stars was an ice line inside which were the rocky planets and outside were the so-called gas giants. Looking at the way our gas giants – Jupiter, Saturn, Uranus and Neptune behaved, there is evidence that there might have originally been five rather than four; one being broken up and absorbed by others.

He touched upon moon formation and the latest theory is that our moon, which most people accept was caused by an impact upon the earth by an outside body and must have been a very low velocity collision. Otherwise, it would have shattered the earth rather than creaming off some material to form the moon. Possibly this could have been a body in similar orbit to the earth. Our

moon's crust is thicker on the far side than the side nearest to us although we don't know why. He then discussed in depth the make-up and behaviour of the moons of the other planets with various theories as to how they were acquired.

The asteroids were dealt with and the Kuiper belt was mentioned as a possible source of short term comets with the long term comets possibly coming from the Oort Cloud which lies beyond the Kuiper belt.

Regarding the inner planets, he mentioned that Earth was formed at about 1000 degrees centigrade, which was too hot for water and much "tooth sucking" has taken place amongst the scientific community regarding how we have water on Earth. One theory that seems more likely than most others is that an impact upon the Earth by an icy asteroid took place some 4.6 billion years ago.

James talked about the theory that stars are born in embedded clusters and looked at the Orion nebula in relation to this, giving a number of theories on formation; some more fanciful than others.

Overall the talk gave a good deal of understandable information for beginners whilst containing enough theoretical "meat" for more experience members of the audience.

Jim Cooper

Satellites

John Wayte

In 1989 ESA launched a satellite called *High Precision Parallax Collecting Satellite* or Hipparcos for short. Over 3.5 years it measured the positions of 120,000 stars to an accuracy of one milliarc-second which is the angular diameter of a grain of sand at 1 kilometre distance. In other words, not a lot.

This satellite performed much better than the original specifications despite a boost rocket failing to put it into the correct position that left it in a highly eccentric orbit. The data was published in 1997 and contained the stellar positions, distances and motions that were 200 times better than previously.

However this was not deemed accurate enough and so its successor was proposed. Its name was taken from a 17th-century astronomer called "Rømer", the first person to measure the speed of light. However in ESA's infinite wisdom it was re-named toGlobal Astrometric Interferometer for Astrophysics or GAIA.

- It will map 1 billion stars in 3D (this represents about 1% of our Milky Way's stars).
- Its accuracy will be about 40 times as great as Hipparcos.
- 40 million measurements will be taken each day.
- The CCD array measures half a square meter and contains a billion pixels.
- During its planned life of 5 years it will scan each star 70 times.
- It has 2 primary mirrors, each one approximately 1.5 x .5 meters in size.
- The angle between these two mirrors is 106.5°
- This angle must be known to picometre accuracy. A human hair is about 10 million picometres wide!

Also...

- It will discover up to 8 extragalactic supernovae every day.
- GAIA will observe about half a million asteroids, including potentially hazardous near Earth objects.
- It will find hundreds of Kuiper Belt objects.
- It is hoped to find new variable stars, novae and supernovae.
- GAIA is expected to find up to 30,000 exoplanets. Not by transit (light dipping as Kepler) nor by radial velocity variations but by Reflex motions – slight wobbles caused by the gravity swing around a parent sun.
- Because of its super accuracy GAIA is easily expected to recognise old stellar streams – remains of dwarf galaxies that have been absorbed by our Milky way.

And finally, where do you put this satellite?

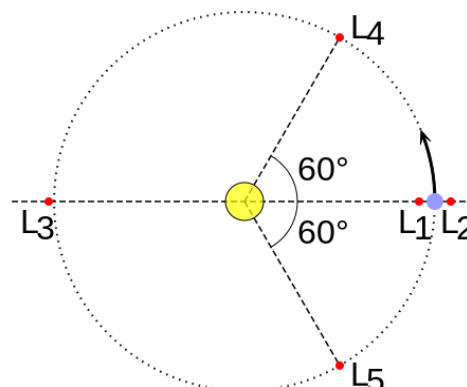
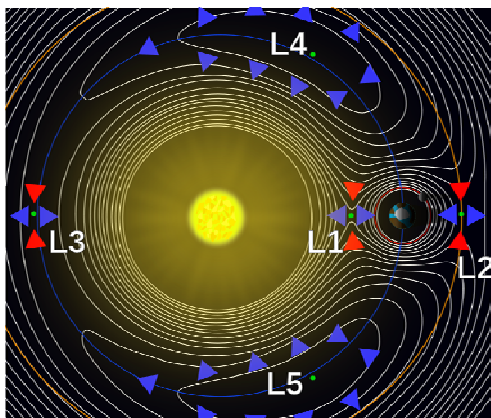
Well obviously you put it at a Lagrangian point.

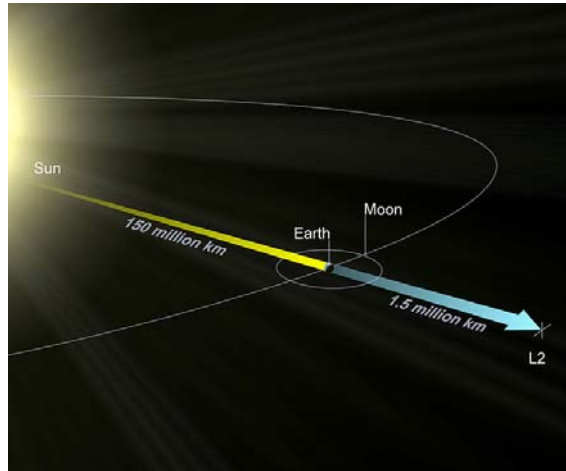
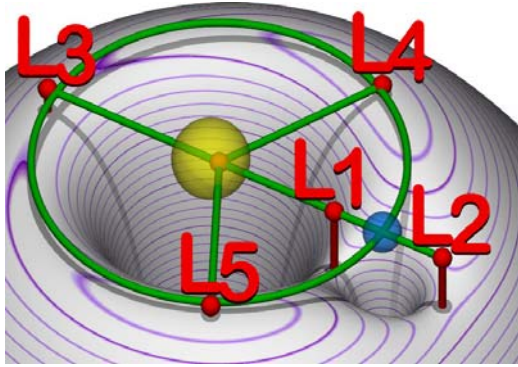
There are five locations around a planet's orbit where the gravitational forces and the orbital motion of the spacecraft, Sun and planet interact to create a stable location from which to make observations.

These points are known as Lagrangian or 'L' points, after the 18th century Italian astronomer and mathematician Joseph-Louis Lagrange (born Giuseppe Luigi Lagrancia).

L2 is the best location for this type of satellite

It will be sent to a location one and a half million kilometres away.





And so is it lonely at this position?

No, not at all

WMAP – NASA - Cosmic microwave background – Moved to a heliocentric “graveyard” orbit in October 2010

Planck – ESA - Cosmic microwave background – refinement of WMAP

Herschel – ESA – Observed infrared & submillimeter wavebands and witnessed galaxy and star formations (shutdown due to lack of coolant in April 29th 2013).

The James Webb Space Telescope planned for launch 2018.

Practical Ideas for Observing and Photography Projects within WAS

Brian Mills

This month Brian showed what information is available to the amateur for observing and DSLR photography beginning with workshops run by the British Astronomical Association. He also referred to a website: www.grelf.net which contains a considerable amount of information and useful advice.

The website is run by Graham Relf who developed his own software for processing astro-images. He calls it GRIP (Graham Relf's Image Processor) and is free.

The meeting was shown a 15 second exposure image taken with a DSLR camera and compared it with 20 x 15 second exposures which were then stacked to show how much more detail can be detected. Longer individual exposures would begin to show star-trails and on Relf's web site he includes a calculator to predict the length against exposure of such a trail in pixels.

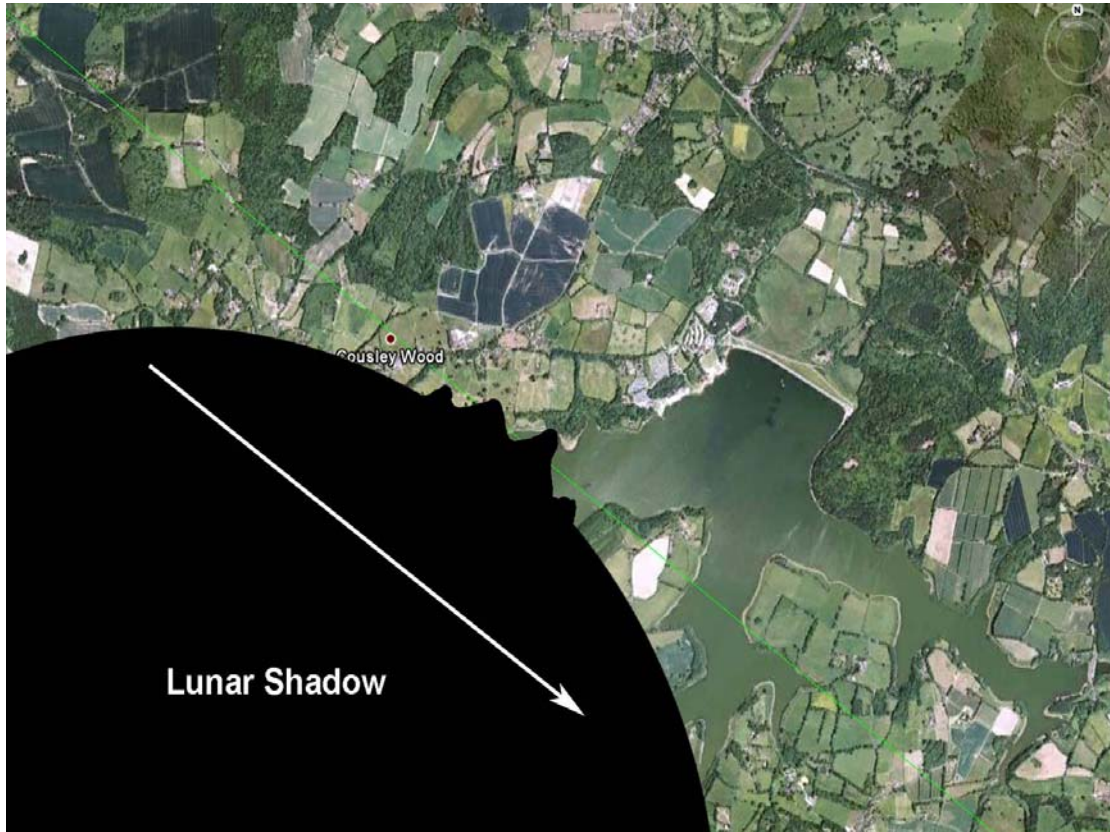
Brian also mentioned camera mounts that track the night sky and help to eliminate star trails. The meeting was shown a short exposure of the Milky way and then the same area with a much longer tracked exposure or composite using computer software to combine images and the detail now was considerably improved. Also shown were driven mounts that could take several cameras at the same time.

Then Brian went on to suggested ideas for practical sessions members could attend such as a WAS Photographic Evening where members could bring their cameras or join with others to take part in photographing the night sky. Another idea would be a “web-cam” evening, taking and storing images and then combining them using free software called Registax.

Another project could be occultations, where the moon passes in front of a known star. This is one area where the amateur still has a roll to play and Brian is well recognised for his experience in observing and reporting timings from observed occultations. He explained how accurate timings of the start of the occultation and the reappearance of a star can help determine very accurate shapes of features at the rim of the moon.

One particular event is known as a “Grazing Occultation”. Here, measurements are taken by a number of observers along a line at right angles to the predicted path of the ‘shadow’ of the rim. One such occultation took place in 2011 over the Bewl Water area when Brian led a number of WAS members in the project. Observers were spread along the line crossing the expected path with sites being carefully chosen so that some observers would see a normal occultation and hopefully at least one would witness the very edge of the shadow of the rim.

On that occasion, one member did see the star wink in and out as the lunar mountains on the rim passed in front. This was Phil Berry who was able to take accurate timings of each of the sightings.



An exaggerated graphic image indicating how the shadow of the moon would appear if lit by the occulted star. Because of the extreme remoteness of the star, the 'shadow' would be virtually the same size and shape as the Moon.

Grazing occultations in our region by stars that are relatively bright are rare but as Brian announced, there will be one at 2208 BST on Monday the 5th of May 2014 involving a 7.8 magnitude star and will be occulted as seen at a position fairly close to Wadhurst, between Forest Row and Rotherfield. Members of East Sussex Astronomical Society are interested in a joint observation. A minimum 4-inch aperture telescope would be needed and the Society can help there, and the Society also holds a number of stop-watches for those members interested in taking part.

Brian ended by suggesting that members interested in any of the above projects fill in their names on a sheet which will also be available at our next meeting.

NOVEMBER MEETING

Wednesday 20th November 2013 – Tony Roberts FRAS tells the fascinating story of “The History of the Telescope up to 1960”

Meetings begin at 1930 although members are invited to arrive anytime after 1900 as this is a good time to exchange ideas and discuss problems and also relax before the meeting.

The venue as always is held in the Upper Room of the Methodist Church at the east end of Wadhurst Lower High Street, opposite the entrance to Uplands College. (For those with SatNav – the post code is TN5 6AT)

Anyone is welcome but non-members are asked if they wouldn't mind contributing £2 towards costs.

FUTURE MEETINGS

Wednesday 11th December 2013 – (the second Wednesday of this month only) Our Director of Observations, Brian Mills FRAS takes as his theme “The Star of Bethlehem”. This will be followed by mince pies, tea and coffee.

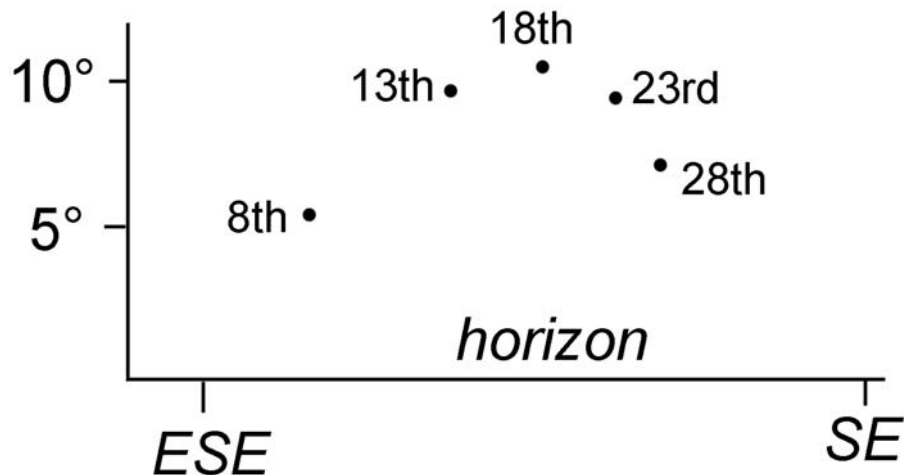
Wednesday 15th January 2014 – We begin with a brief AGM and this will be followed by a talk by our own Phil Berry about “Totality” of a solar eclipse.

SKY NOTES FOR NOVEMBER

Planets

Mercury passes through an inferior conjunction on November 1st, after which it moves to the west of the Sun to become a morning object. Greatest western elongation then follows on November 18th when the planet will, in terms of angular distance, be some 19° from the Sun.

Position of Mercury - November 2013



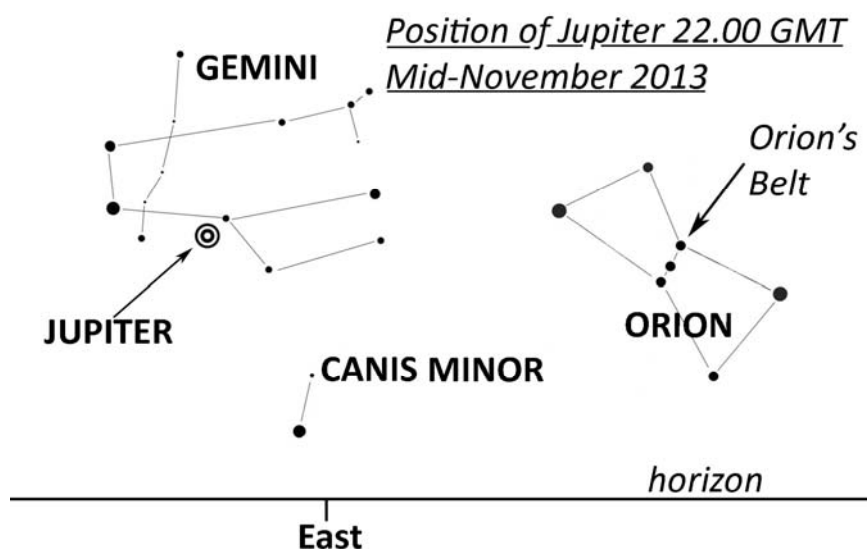
At the time of elongation its magnitude will be -0.6 although it will brighten a little more as the distance between Mercury and Earth decreases.

This will be the most favourable morning apparition of the planet in 2013. It will be followed by a very good evening apparition in January 2014.

Venus will reach greatest eastern elongation on November 1st (at 47° east of the Sun) and will become a far more conspicuous object after sunset than recently. On the date of greatest elongation it sets more than $1\frac{1}{2}$ hours after the Sun but by the middle of the month this has increased to over two hours. On the last day of November it has stretched to over $2\frac{1}{2}$ hours. It may seem strange that its period of visibility is increasing after greatest elongation. The reason is that the angle the ecliptic makes with the horizon is becoming steeper and although the planet is moving gradually towards the Sun it is doing so from an increasing elevation as viewed from Earth. This means it is above the horizon for longer. Its magnitude at elongation is -4.3, but this will continue to rise into December as its angular size increases.

Mars is a morning object in Leo but moves into Virgo as the month progresses. At the start of November it rises just after 01.00 GMT, although by month's end this has only improved by about 15 minutes due to the planet's swift westward motion. Its brightness increases from +1.5 to +1.2 during the month and continues to do so as it approaches opposition in April 2014.

Jupiter is now a brilliant evening object in the east rising at 20.45 GMT as the month begins. By the last day of November it is visible from 18.45 GMT.



The planet spends the entire month in Gemini reaching its first stationary point on the 7th after which it begins to move retrograde. It will continue to increase in brightness from its present magnitude of -2.4 as Jupiter approaches opposition on January 5th 2014.

Because of Jupiter's mass and speed of rotation it is not truly spherical but is instead an oblate spheroid. Put simply this means it is slightly squashed at the poles with centrifugal force causing it to bulge around its equator. Therefore when astronomers talk about the planet's apparent size in the sky they tend to give both polar and equatorial measurements. I will just use the apparent equatorial size as a rough indication about how it will increase as we get closer to opposition. On November 1st that measurement is 41.1 arc seconds, on December 1st it will be 44.8 and on the night of opposition it will have risen to 46.8 arc seconds. This will make it a very inviting target for amateur imagers everywhere.

Saturn will be in conjunction with the Sun on November 6th and therefore not suitably placed for observation this month. It will become visible as a morning object in December although it won't be an evening object until mid February 2014.

Lunar Occultations

In the table below I've listed events for stars down to magnitude 7.0 that occur before midnight although there are many others that are either of fainter stars or occur at more unsociable hours. DD = disappearance at the dark limb. The column headed "mm" (millimetres) shows the minimum aperture telescope required for each event. Times are in GMT.

Please remember that the Society has telescopes that members can borrow, all of which are suitable for the following events.

Nov.	Time	Star	Mag	Ph	Alt °	% illum.	mm
7th	16.52	SAO 161842	6.9	DD	18	22	70
7th	17.36	ZC 2733	6.8	DD	15	22	50
10th	19.16	46 Capricorni	5.1	DD	19	56	40

Phases of the Moon for November

New	First ¼	Full	Last ¼
3rd	10th	17th	25th

ISS

There are no evening passes of the International Space Station during November, only ones in the early hours of the morning. To see a full list go to www.heavens-above.com

Iridium Flares

The flares that I've listed are magnitude -2 or brighter although there are a lot more that are fainter or occur after midnight. If you wish to see a complete list, or obtain timings for somewhere other than Wadhurst, go to www.heavens-above.com

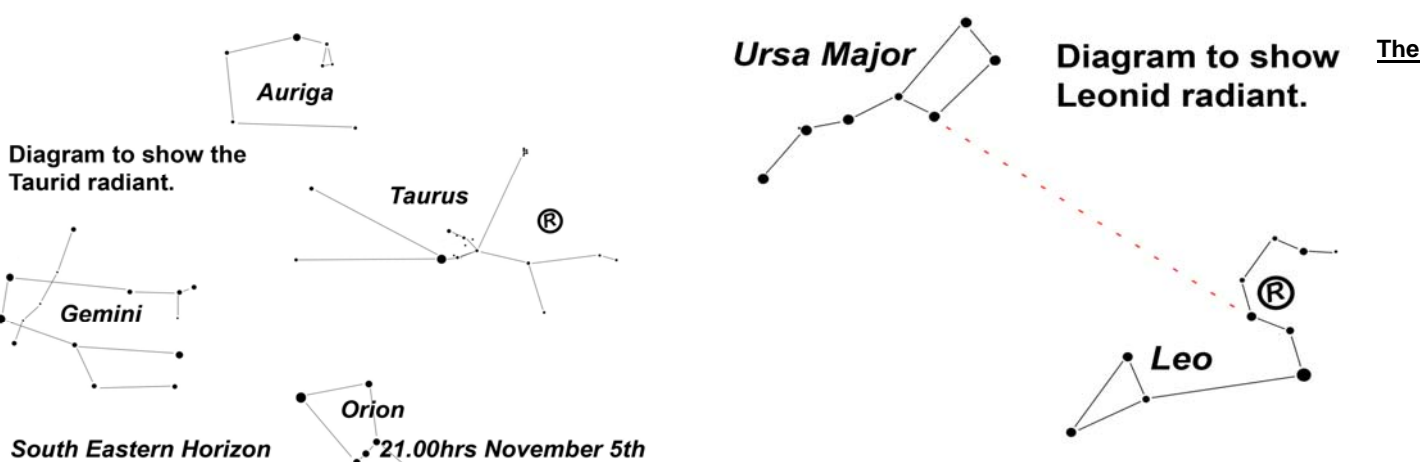
Remember that when one of these events is due it is sometimes possible to see the satellite before and after the "flare", although of course it will be much fainter at those times. Times are in GMT.

Nov.	Time	Mag.	Alt°	Az°	Nov.	Time	Mag.	Alt°	Az.
3rd	17.03	-7.0	36	195 (SSW)	26th	18.30	-5.4	36	149 (SSE)
7th	16.48	-4.4	30	203 (SSW)	27th	17.00	-6.5	26	198 (SSW)
10th	16.39	-6.5	26	208 (SSW)	27th	17.09	-6.4	27	195 (SSW)
11th	17.59	-3.4	40	162 (SSE)	27th	18.26	-7.6	35	151 (SSE)
20th	17.24	-3.6	34	182 (S)	30th	16.51	-4.3	23	203 (SSW)
22nd	16.00	-6.5	30	275 (W)					

Meteors

The Taurids are active from October 20th until November 30th with twin maxima occurring on November 5th and 12th. The ZHR is expected to be around 10, although these meteors are normally slow with a large number of bright events.

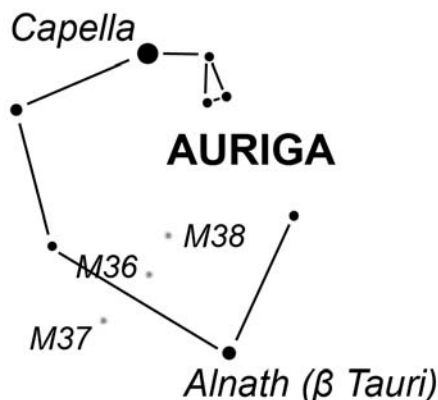
The Leonids are the second shower that come to maximum during November. They are active from November 15th to 20th with what is normally a brief spike in activity at 19.00 GMT on November 17th. Unfortunately for the UK the radiant doesn't rise until 23.00 GMT, as well as there being a full Moon on that night. However, if it is clear it is always worth a casual look. The radiant points for both showers are shown in the diagrams.



Night Sky in November (Written for 22.00hrs GMT mid month)

In the east the winter favourites of Orion and Gemini have cleared the horizon giving a reminder, if it were needed, that shirtsleeve observing is over for another year. The Hunter contains two stars, both much larger than the Sun, in the form of Alpha and Beta Orionis, better known to us as Betelgeuse and Rigel. Despite their Greek alphabet designations, Rigel is in fact the brighter of the two at magnitude +0.12 and is part of a triple star system. It is a blue supergiant with a radius in the order of 75 times that of the Sun. Betelgeuse, varying between magnitudes +0.2 and +1.2, is much larger still with a diameter some 1,000 times that of our own star. Above Orion lies Taurus containing two of the best known open clusters, the Hyades and the Pleiades with the later being far

more photogenic than the former. It used to be thought that the hot blue stars of the Pleiades had formed in the nebulosity that we see around them but we now know that the star group is merely "passing through" that part of the interstellar medium.



The brilliant Capella is now nearly 70° in altitude and on its way to pass close to the zenith in early January. On the subject of open clusters Auriga contains three; M36, M37 and M38 with visual magnitudes of 6.3, 6.2 and 7.4 respectively. Also just visible to the naked eye from a really dark site is M34, another open cluster than lies just within the borders of Perseus.

Looking to the south we see that Pegasus has passed the meridian, but M31 lies close to it and only 10° from the zenith. It is of course a favourite with imagers along with its two brightest satellite galaxies M32 and M101, both of which are thought to have had some degree of interaction with their much larger neighbour. Below The Square is the most obvious part of Pisces known as the "Circlet" forming the head of one of the fishes and made up of five, third and fourth magnitude stars. The head of the other fish sits below Andromeda and is less well defined. Due to the effects of precession, the Vernal Equinox currently lies in Pisces although it is gradually drifting towards Aquarius. Low down and just west of the meridian is the brightest star in Pisces Austrinis - Fomalhaut - that in mythology is said to represent the mouth of the southern fish. It is one of Ptolemy's original 48 constellations. Just to the east of Fomalhaut lies the small and rather faint group of stars that make up Sculptor which seems to have no claim to fame other than it is the location of the south galactic pole.

In the west the three bright stars of the Summer Triangle are still on show although part of Aquila has already set. The brightest star in the Swan may well be Deneb at the tail but surely much more pleasing to the eye is the lovely double star Albireo that signifies the head. It is made up of blue and yellow components, the latter of which is itself a binary. Within the boundary of Cygnus lie a number of open clusters, the brightest of which are M39 at magnitude +4.6 and NGC6871 at magnitude 5.2.

Towards the north the larger of the two bears is just beginning to climb away from the horizon whilst its smaller namesake points downwards towards it. Draco is still well positioned if you want to follow its twists and turns between Ursa Major and Minor. The head of the dragon lies close to both Hercules, which is now setting, and the bright star Vega. Cassiopeia is on the meridian and close to the zenith with Cepheus to her west and Camelopardalis to her east. The latter is one of several faint constellations that lie close to the celestial pole, the other being Lynx. Camelopardalis is the 18th largest by area in the sky despite having no stars brighter than magnitude 4, although it does boast of the asterism Kemble's Cascade. This is a straight line of twenty stars that cover approximately five Moon diameters, and range in magnitude between 5 and 10. They are named after the Franciscan Friar who found them whilst scanning the sky with binoculars.

Total Solar Eclipse November 3rd 2013

As I mentioned last month our Secretary Phil Berry is aboard a cruise ship that will rendezvous with the Moon's shadow somewhere off the African coast. For those of us who are not so lucky it may be possible to watch the event live via the internet as has been the case previously. On this occasion the huge majority of the event takes place over the ocean, so whether there will be coverage is unclear at the moment. It will be worth an internet search to see if any live feeds are available. The eclipse begins at 10.04 and concludes at 15.28 GMT.

<http://phys.org/news/2013-11-slooh-total-solar-eclipse-kenya.html>

Practical Observing and Imaging Evenings

At the last meeting I spoke about our plans to hold a series of evenings to offer assistance to members who need help in a number of areas that were highlighted in the recent questionnaire.

The following practical evenings were suggested:-

DSLR imaging

Processing of DSLR images using Deep Sky Stacker

Web-cam imaging

Processing of web-cam images using Registax

Mount and telescope setup

Constellation recognition

Occultations

Graze occultations.

If you are interested but didn't sign the form, it will be available at the November meeting. If you can't be there but would like your name added for any (or all) of the above please let me know.

We have received an apology from NASA to say that owing to the United States federal government's messing about and the shutdown of US government offices in early October, they were unable to deliver their SpacePlace article for our November Newsletter.

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Any material for inclusion in the December 2013 Newsletter should be with the Editor by November 28th 2013