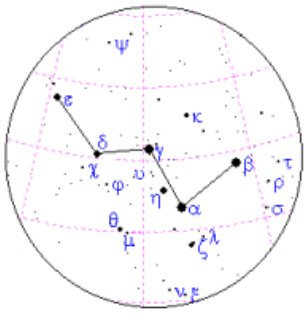


Wadhurst Astronomical Society Newsletter JULY 2016

MEETINGS

COMMITTEE MEETING

Members of the Committee are respectfully reminded that there is a meeting of the Committee at Phil's house on Tuesday the 5th of July starting at 1930.

THE JUNE MEETING

The Society's Secretary, Phil Berry opened the meeting by welcoming members and visitors and mentioned that the Society has a library of interesting books on astronomy at the meetings and it is well worth looking through the list. Eric Gibson looks after it and has a form to sign when a book is borrowed.

Further to the on-going saga with the tennis court lights at the recreation ground in Wadhurst, Phil said that after three judicial reviews rejecting the proposal over the years, Wealden District Council has still given the go-ahead to have them installed.

This evening we are going to have three short talks by members and Phil introduced the first, given by our own Chairman and Director of Observations, Brian Mills.

Using Stellarium to Navigate Round the Night Sky
Brian Mills FRAS

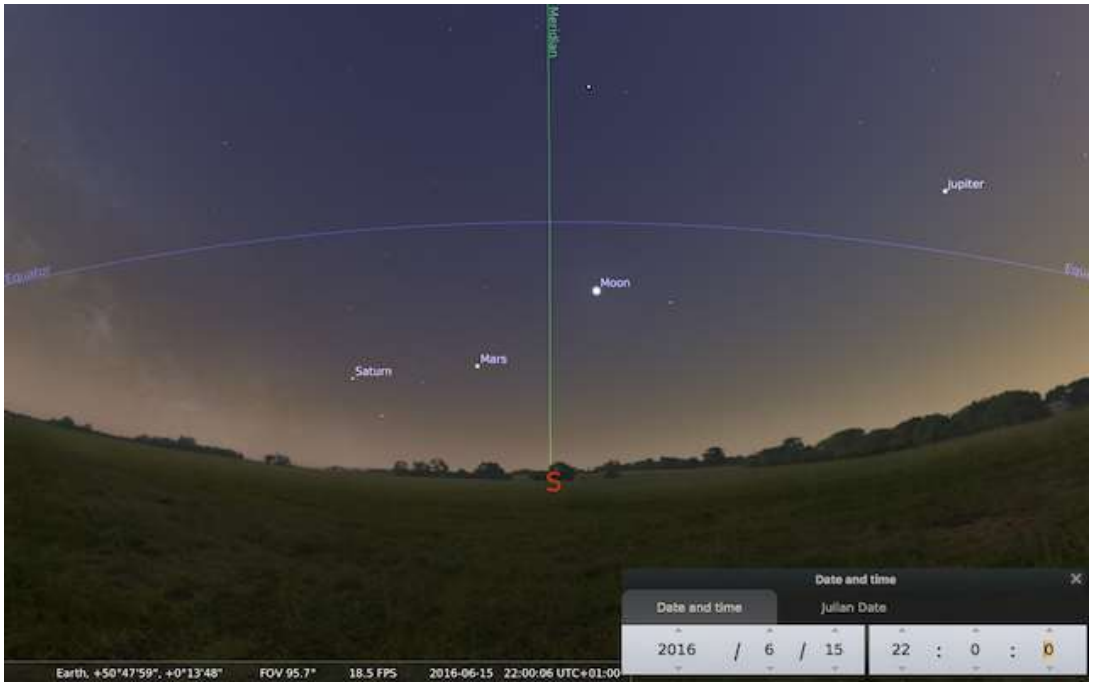
Stellarium is a comprehensive astronomical programme and is free to download in most forms and Brian said it is the tool he uses in his Sky Notes each month.

Tonight he said he is going to describe how the programme can be used to navigate round the sky both in daylight and at night using the many available facilities.

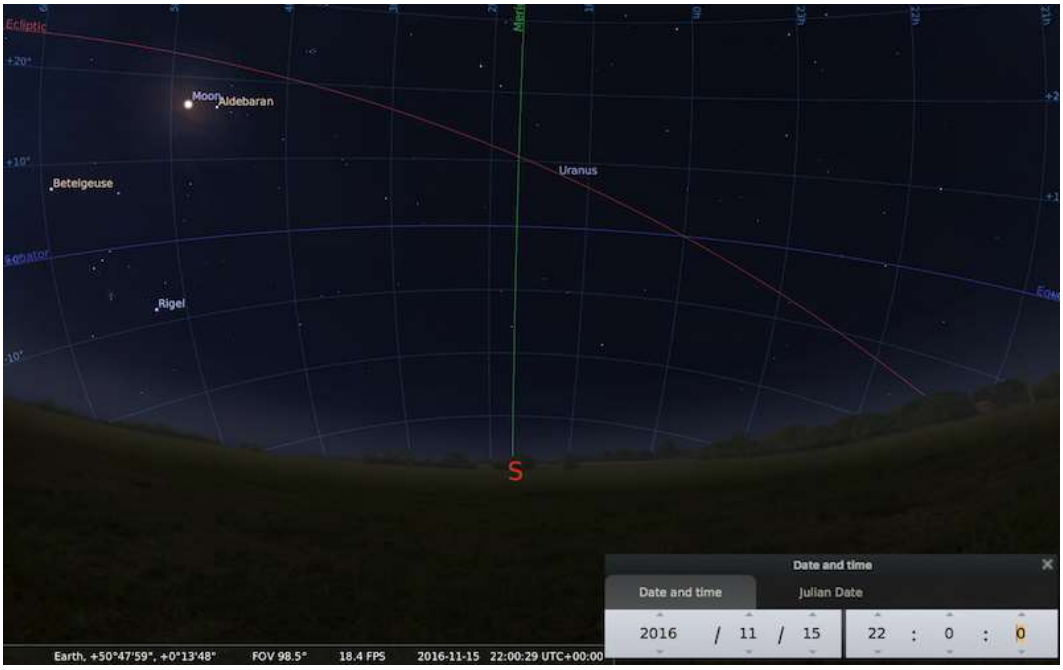
He began by saying that the programme produces a flat representation of the sky and is really like looking at the inside of a huge sphere so there is bound to be slight distortion towards the edges as there is with other similar projections.

Using Stellarium we were shown the night sky looking towards the south as it will appear later this evening; then Brian superimposed the meridian line which stretched from due south, overhead, past Polaris and to the horizon due north.

Next the celestial equator was displayed and we were told that this is really the Earth's equator projected out onto the background sky. The angle from the horizon to where the equator crosses the meridian line is constant throughout the year when viewed from one location and only varies dependent on the observer's latitude.



The next line to be superimposed was the Ecliptic, which Brian explained was the Earth's plane around the Sun although from the Earth looks as though this is the path the Sun takes across the sky in a year. Because the planets orbit the Sun in almost the same plane as the Earth, they also appear to closely follow the line of the Ecliptic.



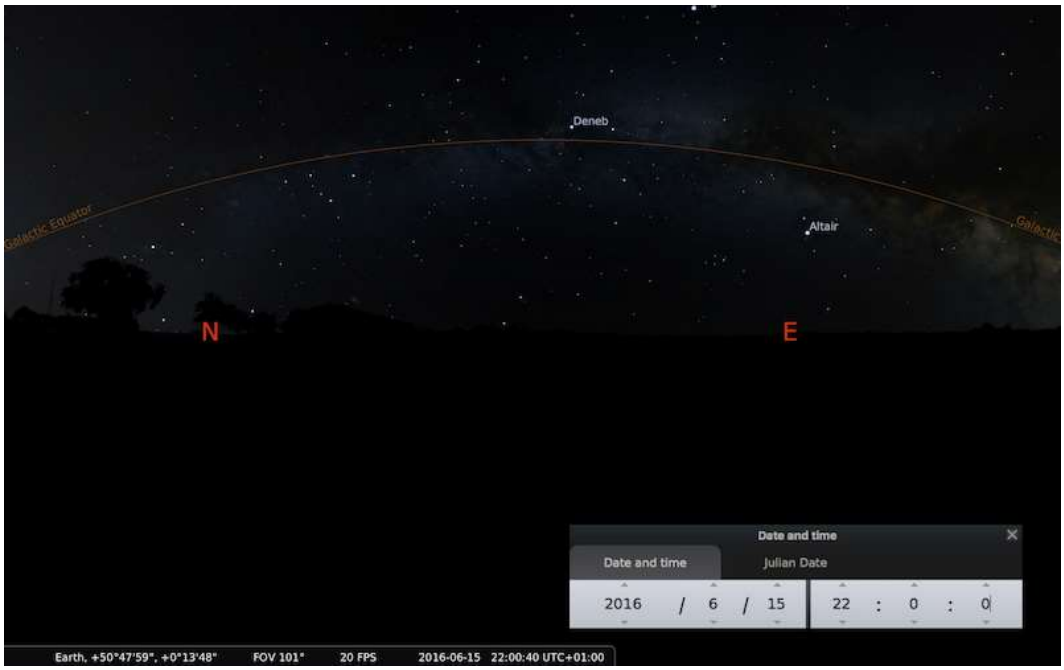
The Celestial Equator is also the line from which we measure the angle of an object above and below and is called the + or - angle of Declination.

Brian next looked at another of the important points in the sky for expressing the positions of objects east and west. It is the exact point where the Ecliptic crosses the Celestial Equator and is the point defining zero hours Right Ascension. This is called the First Point of Aries, although as Brian pointed out, because of precession, the First Point of Aries is now in Pisces. Precession is the gyration of the axis of the Earth's poles, taking about 26,000 years to complete one revolution.

As the Earth orbits the Sun, so this reference line also moves to the west, so that Right Ascension increases in hours to the east.

Using both Declination and Right Ascension we can precisely define any point in the sky.

Finally, Brian superimposed the line of the Galactic Plane which he told us was the line around the centre of the galaxy on which all the material surrounding its centre lies. The centre of the Galaxy is in the direction of Sagittarius although to us this is quite low down in the sky.



Brian's introduction to using Stellarium to find our way round the sky gave a good insight into using a programme that is free to download and can be found by going to www.stellarium.org and is available for most operating systems.

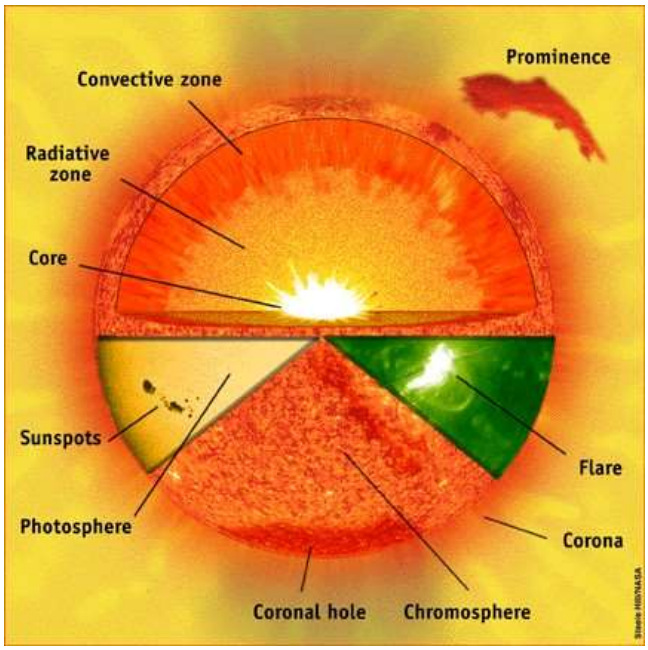
Our second talk was given by our Treasurer.

Solar Observing
John Lutkin

We were told that there are three basic methods amateurs can use to look at the Sun; white light, Hydrogen Alpha and the Calcium II K-line. But before going further John said it is most important to warn observers of the dangers when viewing the Sun and to never to look directly at it because this can cause permanent damage in an instant.

He compared the Sun to a Football where the Earth would be just 2.2 mm in diameter and followed this by saying that events on the Sun happen in a very big way.

We looked at the composition, starting at the outer Photosphere which John described as being a little like an atmosphere. Under this is the Chromosphere which is more solid but then at the middle is the core which is under incredible pressure at huge temperatures. He said this was still a gas but under all that pressure is still quite solid.

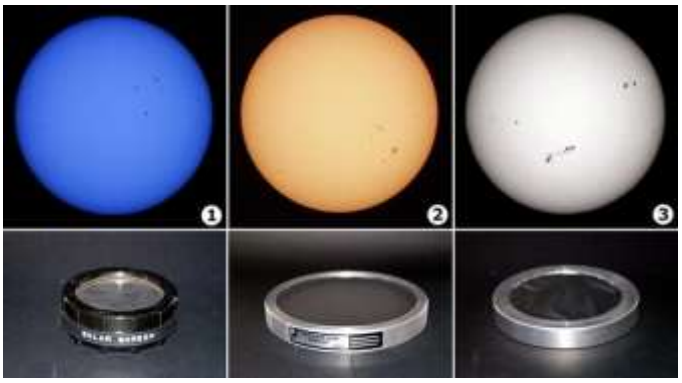


Interior of the Sun

When observing the Sun, a finder scope can't be used for obvious reasons. One solution is to use projection behind the telescope and another useful way is to use a device attached to the telescope where the Sun shines through a small aperture onto a tiny screen

a few inches behind. Once aligned this method can take a lot of frustration out of locating the Sun when observing through a telescope.

The image using the projection technique requires good shielding to keep stray light away and improve contrast, although we were told that this method is not the best way to see the Sun yet it should be possible to see sunspots.



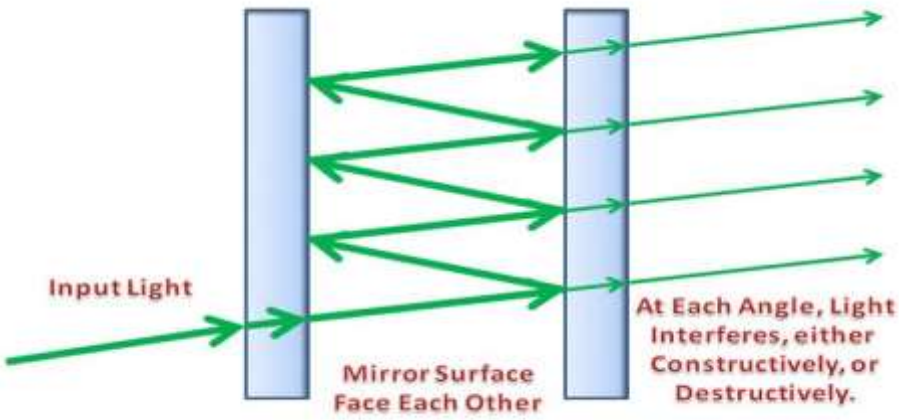
Calcium ll K filter, Hydrogen-alpha filter and Baader Solar filter

Care is needed when attaching sheet

A better way is to use a solar filter material such as Mylar sheet although this gives a bluish image. Another filter is the Thousand Oaks Solar filter with a reddish image and the final one John mentioned was the Baader Solar filter sheet giving a white image. What they all have in common is the ability to cut down the light from the Sun to a safe level, although he stressed the importance of making sure the filter remains in place and cannot fall off when observing.

One method that is popular for white light observing is the Herschel Wedge which uses a partly silvered mirror that reflects about 4% of the Suns light; the rest being reflected out beneath the wedge, although he did warn of trousers catching fire… A more modern method uses a ceramic plate to absorb the unwanted light safely in an enclosed box.

To view the Sun in Hydrogen-alpha wavelengths, one way is to use a Fabry-Perot interferometer and John described how this method uses two reflective surfaces with a gap of a fraction of the wavelength of light so that reflections between the surfaces interfere with each other in a constructive or destructive way. If the gap is at the right distance the only wavelength that passes through is hydrogen-alpha. As John said, it is quite astonishing that so accurate a gap could have been made in the late 1800s but Fabry and Perot made their interferometer work.



The principle of the Fabry-Perot

Many manufacturers now make what are now known as Etalon filters although we were told that today slightly different techniques are used which has brought the price down considerably.

Using hydrogen-alpha filters it is then possible to see solar prominences and flares in only that wavelength.

This led John to talk about the Calcium K emission lines, of which there are two. These are much more at the blue end of the spectrum and towards ultra violet. Different solar features can be resolved with these filters, although he did say that some people find it difficult to see much in the blue region particularly as they grow older.

The Sun in visible light, Calium II K emission lines and hydrogen alpha

To finish his talk, John said that observing the Sun is always interesting but emphasised the importance of taking great care.

The last of our three talks was given by our Secretary, Phil Berry, who introduced members to some of the astronomy tools available as 'Apps' on mobile smart phones and he ingeniously called his talk Appstronomy…

Appstronomy
Phil Berry

Phil began by saying there are very many astronomy applications available for a smart phone running Android and only a little less for the iPhone. Tonight he was looking at those astronomy apps for the Android.

Some time ago all that was available to the amateur was something like the Celestron Sky Scout where the observer looked through the eyepiece, aligned it with an object, pressed the button on top and the Sky Scout would then present lots of information about it.

Very quickly the smartphone superseded these devices with their 'applications' called apps which, when downloaded, gave an icon on the screen that, when clicked on, entered the programme. Phil explained that it is very simple to find these apps. One way is to visit 'Google Play' on the internet, enter the subject you are interested in; in this case astronomy, and a list of available apps is displayed. Some have to be paid for but as he said, they are nearly always less than £5 and many of them are free. Importantly, they can also be easily uninstalled when no longer required.

Phil introduced us to two apps he finds very useful. The first is 'LunarMap HD' which is made up of many scans of the Moon's surface made by NASA and other institutions.

The Moon showing the Meridian Line

The Moon in enhanced colours to show altitudes of some features

We were shown some of the high definition images of the surface of the Moon and told that one can move this image around to see more of the surface. Another page used enhanced colour to show different heights of mountains and craters together with their names and other features. By 'clicking' on an object the programme will display a great deal of data on it.

Secondly, Phil described 'Mobile Observatory' which he said was his favourite programme and contained an enormous amount of useful features. We were shown the opening page that showed many of the tools available. By scrolling down, even more could be found.

Main menu

A page from Sky View

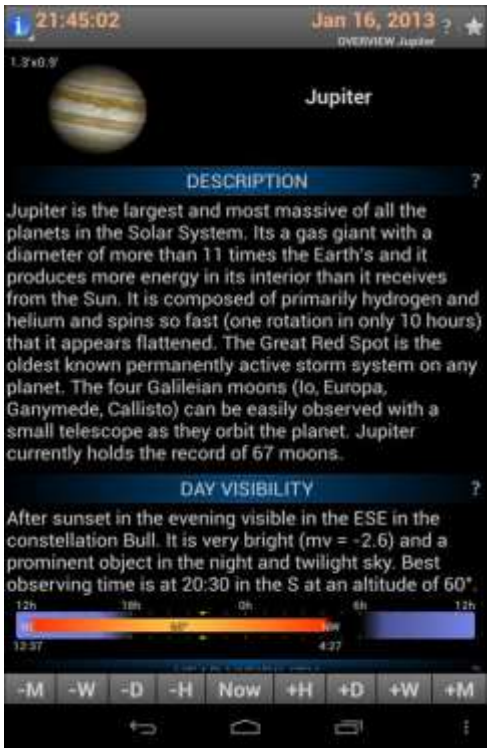
We looked at one of them, 'Sky View' which, rather like Stellarium, shows the sky. The GPS in the smartphone will enable the view from wherever you are in the world at the time. It is also possible to see the sky from any other part of the world by selecting another location. You are also able to advance or retard the time and show the sky for another time.

'Live View' allows you to hold the phone up in the direction you are interested in and then details of what is to be seen are displayed.

'Top View' allows one to the see the Solar System in plan-view, showing the position of the planets for any time.

'The Moon' gives details about the moon such as when it rises and sets etc.

'Solar System' allows you to pick on any planet and its details will be displayed. It also carries a feature so that it is possible to set up an alarm on the smartphone to alert you when an event you might want to watch such as, for example, the position of the moons of Jupiter, is about to occur.



An example of a page from Solar System

Phil went on to describe many other functions of Mobile Observatory which helped explain why this was his favourite Appstronomy app.

Following the coffee break, John Wayte gave another of his talks

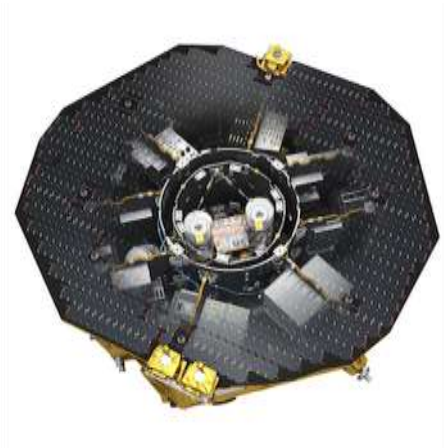
Snippets from the World of Science
John Wayte

LISA

Last year when the weather was rainy and cold and we were waiting for Santa, I did a little thing on LISA.

Now if you remember LISA (Laser Interferometer Space Antenna) is a space craft with two high precision gold cubes floating in space under the influence of gravity alone.

ESA says that results following two months of science operations have shown that the two cubes freely falling through space influenced only by gravity and unperturbed by any external forces have a precision five times better than originally required.



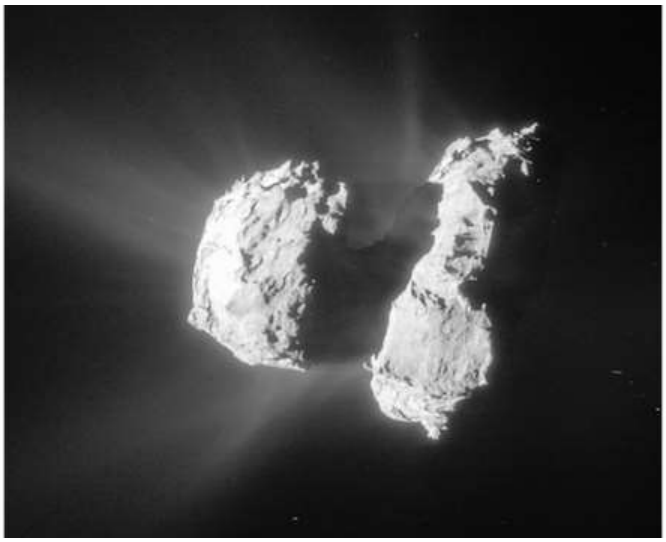
Part of the interior of the LISA space craft

No doubt you will all remember that the launch of LISA is to test the system to measure gravitational disturbance created by massive instabilities in space including supernovae and merging black holes. This is planned for the 2030s and I hope to be around to report on the results.

Three spacecraft will be involved although the technology required for this mission has not yet been developed.

Rosetta

And just a quickie about Rosetta.



Meteor 67P

Rosetta is still alive and is flying around 67P Churyumov-Gerasimenko at a height of about 5 kilometres. At this height it is in a better position to detect more gasses.

A frosty comet could have delivered the ingredients for life on Earth. The detectors have spotted an amino acid on 67P confirming that it contains one of the major building blocks for life.

Rosetta has definitively seen amino acid glycerine in the gas cloud surrounding the comet; a component of DNA. Phosphorus has also been confirmed.

Previously alcohols, sugars and oxygen compounds have also been detected. So all the major types of prebiotics have been discovered.

Could a comet like this have seeded our Earth with life many years ago?

My own personal comment is that if life wasn't self-seeded then what originally seeded the comet? It must have started somewhere!

The meeting concluded with Brian Mills presenting the Sky Notes in July, that follow later in the Newsletter.

JULY MEETING

20th July 2016 – William Joyce brings us up to date with "Astronomy of the Moon".

Meetings will take place in classrooms IL5 and 6 which are in the blue walled classroom block at the far end of the drive from the main gate of Uplands College and up by the tennis courts. Signs will direct you. There is car parking near the block. The postcode is TN5 6AZ.

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

Anyone is welcome but non-members are asked if they wouldn't mind contributing £3 towards costs.

FUTURE MEETINGS

21st September 2016 – Professor Louise Harra tells us about the latest news of "Solar Activity".

19th October 2016 – Dr David Whitehouse returns to tell us about what we might encounter on a "Journey to the Centre of the Earth".

16th November 2016 – Jan Drozd tells about "A History of Man's Understanding of Our Universe".

14th December 2016 (NB the second Wednesday of this month) – Brian Mills FRAS tells us about "Local Astronomers".

SKY NOTES FOR JULY 2016

Planets

Mercury reaches superior conjunction on July 7th, when it will be on the opposite side of the Sun from the Earth. It then moves east of the Sun to become an evening object although from the UK it will be a very poor apparition, despite the smallest planet being as much as 27° away from the Sun at the time of greatest elongation (August 16th). This is caused by the shallow angle that the ecliptic makes with the horizon which creates the problem of the two bodies setting a short time apart. Mercury has therefore set before there is time for darkness to fall. Once the Sun has set on the last day of the month, the planet is just 6° above the north western horizon. The next apparition is, of course, a morning one which should provide a better opportunity to see this elusive member of the Solar System despite elongation only being 18°.

Venus suffered a superior conjunction on June 6th and is still too close to the Sun for observation.
It will not be visible to us in the UK until mid to late August.

Earth reaches aphelion (the point in its orbit when it is farthest from the Sun on July 4th at 17.24. At that moment in time the two bodies will be a little over 152 million kilometres apart.

Mars is still a conspicuous object in the south-south-west as soon as darkness falls. It was at opposition in late May, so it is well past its best now and setting at midnight by the end of the month. By then the red planet's apparent size will have fallen to 13.1" (arc seconds) and its brightness to –0.8. Mars is now moving direct (west to east) in Libra following its second stationary point being reached on June 30th. Fig 1 shows its position at 22.00 in the middle of the month when it lies just past due south.

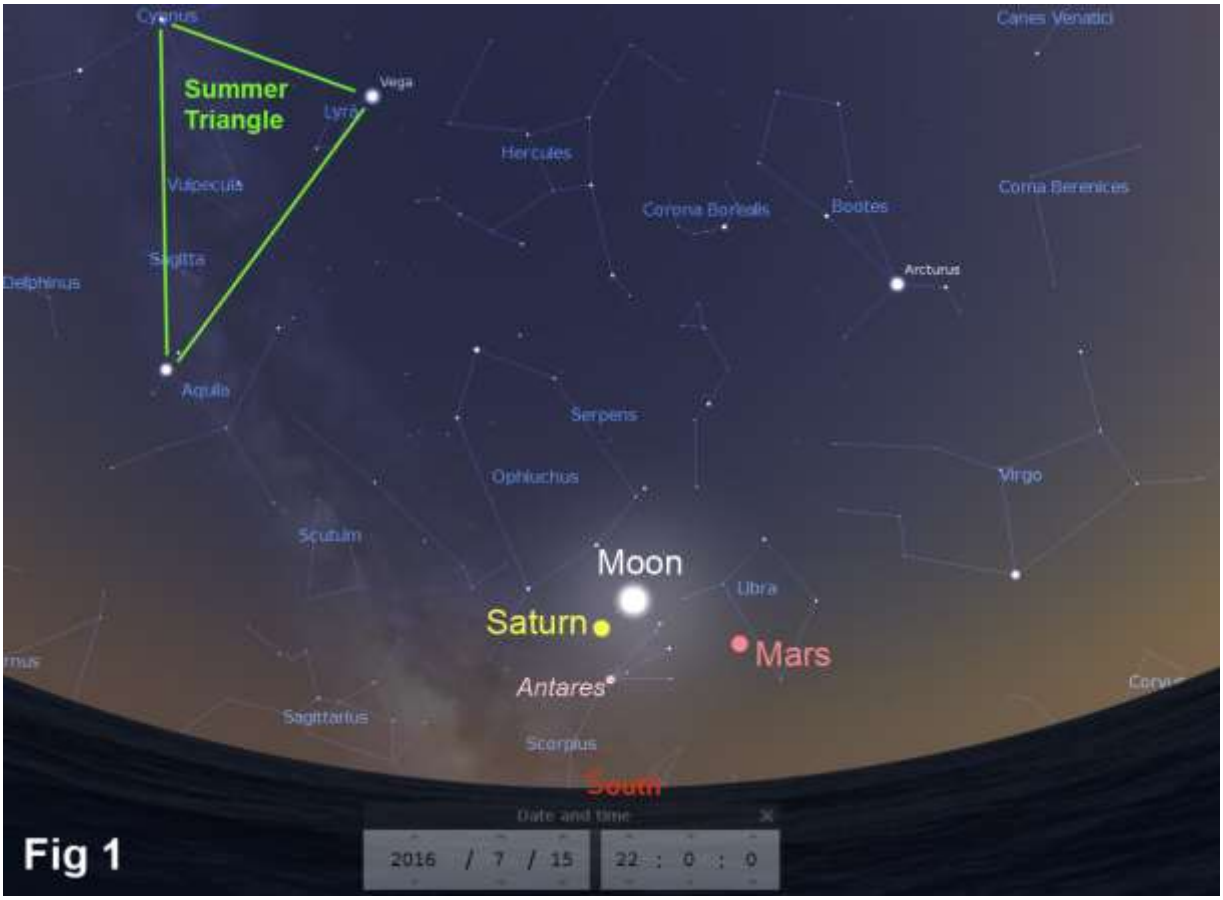


Fig 1

Jupiter is still a brilliant evening object visible in the western sky, drawing conspicuously closer to the Sun over the course of the month. By the end of July it will be, in angular terms, just over 40° from our parent star and will set just 1½ hours after it. Despite Jupiter's decreasing altitude it is still fascinating to follow the changes in surface detail and the continuous dance of the four Galilean moons. The planet will be lost in the evening twilight by early to mid August and will be in conjunction with the Sun at the end of September. Although it will move swiftly west of the Sun to become a morning object, it will be the end of January 2017 before we see Jupiter in the evening skies once more. Fig 2 shows the position of Jupiter at 22.00 at the start of the month. Use the front two stars in the bowl of the plough to help with identification as shown.

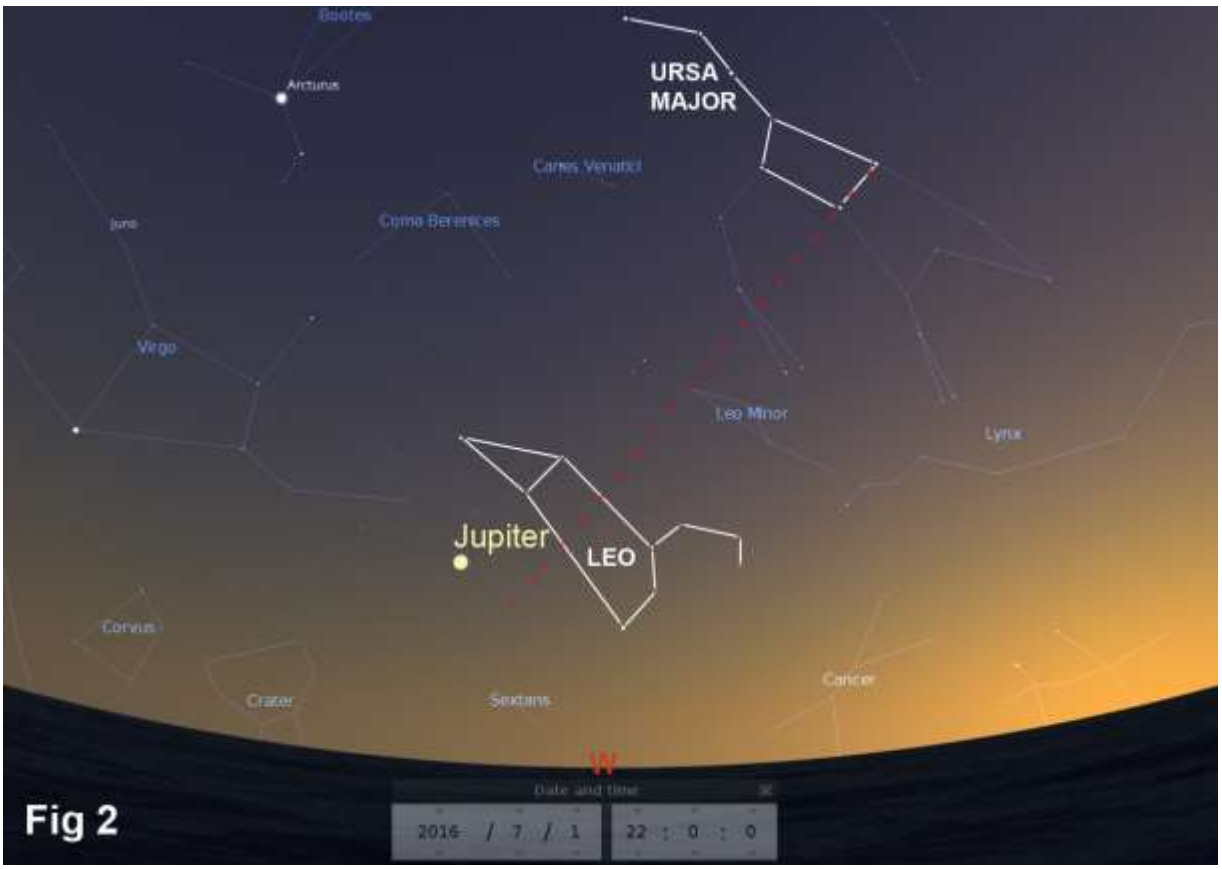


Fig 2

Saturn was at opposition last month, but despite that its period of visibility is quite short. This is due to the ecliptic being very low in the late evenings at this time of year and the ringed planet having a declination of –20° (minus twenty degrees). This causes it to culminate, or cross the meridian due south, at a height of just 18° and to set by the end of the month at 01.00. Saturn at magnitude +0.1 is still moving retrograde through Ophiuchus and will continue to do so until mid August. The north pole of the planet remains tilted towards Earth at an angle of 26° providing us with excellent views of the ring system. Fig 1 gives its location for the middle of July, not far from Mars and the red star, Antares.

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 = **d**isappearance at the **d**ark limb whilst RD = **r**eappearance at the **d**ark limb. The column headed "mm" (millimetres) shows the minimum aperture telescope required for each event. **Times are in BST.**

July	Time	Star	Mag	Ph	Alt °	% illum.	mm
July 13	22.06	ZC 2097	6.8	DD	22	67	70

Phases of the Moon for July

New	First ¼	Full	Last ¼
4th	12th	19th	26th

ISS

Below are details for passes of the International Space Station (ISS) that occur before midnight and are magnitude –1.5 or brighter. The details of all passes, including those visible after midnight, can be found at www.heavens-above.com. Please remember that the times and directions shown below are for when the ISS is at it's ***maximum*** elevation, so you should go out and look at least five minutes beforehand. **Times are in BST.**

July	Time	Mag.	Alt°	Az.		July	Time	Mag.	Alt°	Az.
26th	21.53	-1.6	15	SE		29th	22.25	-3.4	61	SSE
26th	23.29	-3.3	56	SSE		30th	21.32	-2.9	42	SSE
27th	22.35	-2.9	38	SSE		30th	23.09	-3.3	83	N
28th	21.42	-2.3	25	SSE		31st	22.15	-3.4	85	SSE
28th	23.19	-3.5	80	SSE		31st	23.52	-3.4	83	N

Iridium Flares

The flares that I've listed are magnitude –2.0 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. Note that the events on the 2nd, 14th, and 15th are for flares close to maximum brightness, so it is worth making a special effort to observe them. **Times are in BST.**

July	Time	Mag.	Alt°	Az.°		July	Time	Mag.	Alt°	Az.°
2nd	22.19	-7.7	45	42 (NE)		15th	21.19	-8.3	65	56 (ENE)
3rd	22.13	-6.4	47	44 (NE)		19th	22.39	-5.5	37	41 (NE)
5th	23.33	-5.6	13	17 (NNE)		24th	22.18	-7.7	45	48 (NE)
7th	21.58	-3.7	53	47 (NE)		25th	22.12	-4.3	46	49 (NE)
8th	21.52	-3.9	55	48 (NE)		26th	23.29	-5.3	9	15 (NNE)
9th	23.20	-3.3	22	26 (NNE)		30th	21.51	-4.0	54	56 (NE)
14th	21.25	-8.2	63	55 (NE)		30th	23.16	-5.7	17	26 (NNE)
14th	22.59	-4.0	29	34 (NE)		31st	21.45	-2.2	53	58 (ENE)

The Night Sky in July (Written for 22.00hrs BST mid month)

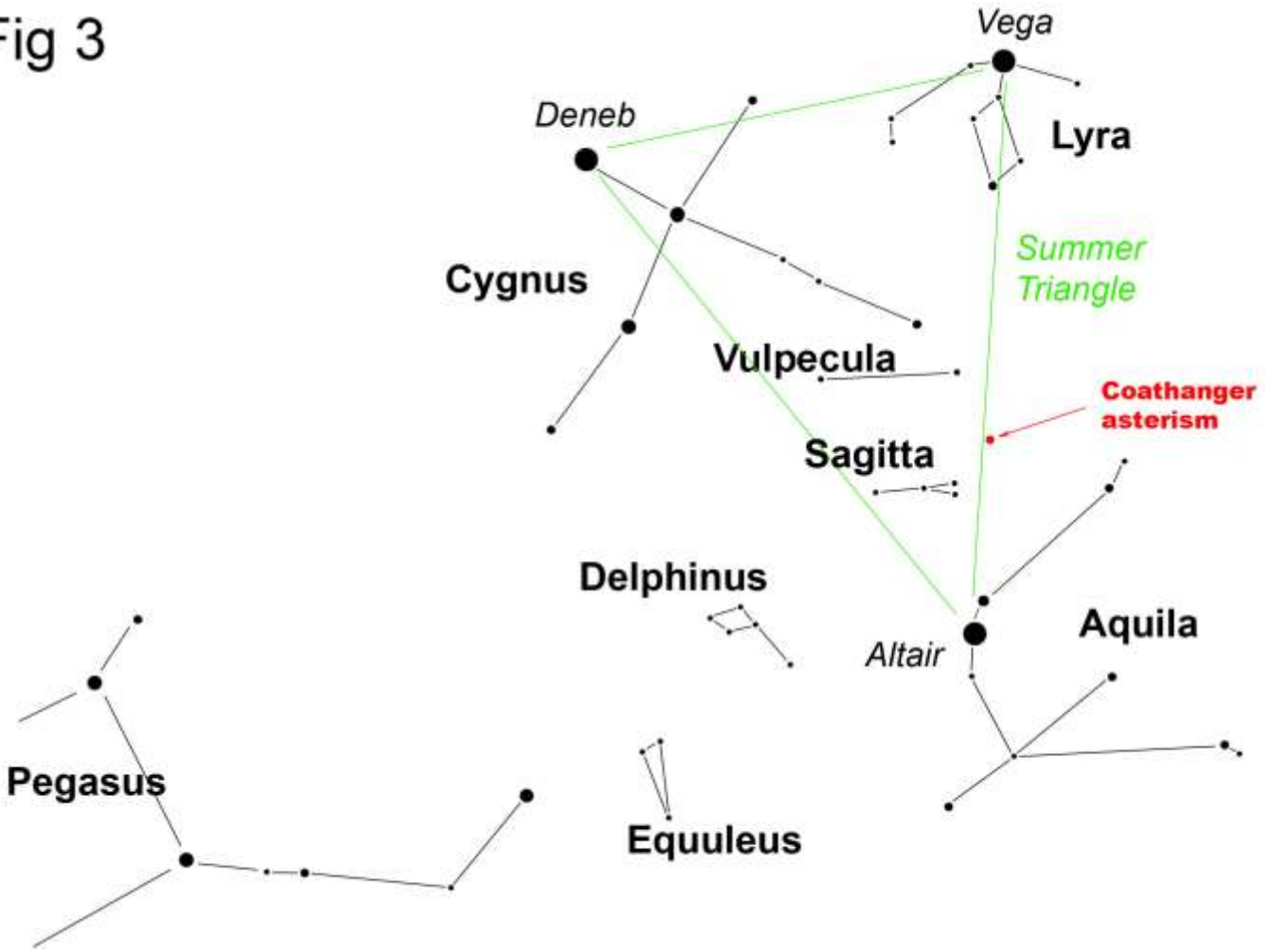
In the south, Hercules is close to the zenith and straddling the meridian. Within it is that jewel of a globular cluster, M13, which is thought to contain around 300,000 stars and lie at a distance of 25,000 light years. Despite its distance it is just on the limits of naked eye visibility from a dark site, although it is an easy binocular or telescopic object. Below the strong man we find the faint constellations of Ophiuchus and Serpens. The latter is the only constellation in the entire sky to be made up of two entirely separate entities. The boundaries of all constellations were fixed by the International Astronomical Union, IAU, in 1930, when Serpens was split in two with Ophiuchus (the serpent bearer) coming between the now severed tail and head of the mythological serpent. Moving closer still to the horizon brings us to Scorpio which contains the red star Antares whose name means "Rival of Mars". The "fan" shape of stars north and west of Antares is quite obvious despite the low altitude of the constellation. Sagittarius which lies within the plane of the Milky Way is a little to the east and will be on the meridian two hours later with its rich star fields. Sadly because of its declination of around –30° we never see them to best effect. Pluto, at magnitude +14.4, currently lies within the boundaries of Scorpio and will continue to reside there until the end of 2023.

Looking west we see that Leo and Virgo are still just above the horizon along, of course, with the planet Jupiter. The bright star Arcturus in Boötes is still nearly 50° in altitude and can be found by drawing a curved line through the tail of Ursa Major and continuing it on towards the horizon.

In the north the head of Draco, the dragon, lies just 8° from the zenith which means that it is ideally positioned for its twists and turns to be identified. Ursa Minor is standing on its tail and arching northwards and westwards in the direction of its larger relation, Ursa Major. The Great Bear is now west of the meridian and pointing down towards the horizon with the top two stars in the bowl of the plough showing the way, in general terms, to the bright star Capella in Auriga. To the east of the meridian Perseus is becoming more prominent in preparation for the meteors that appear to radiate from it in July and August.

Towards the east, the Square of Pegasus is almost fully risen, along with a number of small constellations that lie between it and Lyra. Fig 3 shows the positions of these groups and also the location of the asterism called "The Coathanger" which certainly deserves its name, although it is upside down. Binoculars will show it easily, almost on a line between Vega and Altair and nearly equidistant from Sagitta and Vulpecula. Incidentally the stars belong to the latter constellation. Above the winged horse we find the stars of the Summer Triangle now very prominent with Vega, the brightest of the three at an altitude of over 65°.

Fig 3



Meteors

The Perseids are active from July 23rd until August 20th with maximum occurring on August 12th. The Moon will interfere in the later stages of the shower although on the night of maximum it sets at 01.00. At this time of night, and of the year, the ecliptic is low so that at least the altitude of our nearest neighbour will be limited.

Advance Warning

The Perseids reach their peak at 12.00 on August 12th.

Brian Mills

SPACEPLACE - NASA

This article is provided by NASA Space Place.
With articles, activities, crafts, games, and lesson plans, NASA Space Place encourages everyone to get excited about science and technology.
Visit **spaceplace.nasa.gov** to explore space and Earth science!

Hubble's bubble lights up the interstellar rubble
By Ethan Siegel

When isolated stars like our Sun reach the end of their lives, they're expected to blow off their outer layers in a roughly spherical configuration: a planetary nebula. But the most spectacular bubbles don't come from gas-and-plasma getting expelled into otherwise empty space, but from young, hot stars whose radiation pushes against the gaseous nebulae in which they were born. While most of our Sun's energy is found in the visible part of the spectrum, more massive stars burn at hotter temperatures, producing more ionizing, ultraviolet light, and also at higher luminosities. A star some 40-45 times the mass of the Sun, for example, might emits energy at a rate hundreds of thousands of times as great as our own star.

The Bubble Nebula, discovered in 1787 by William Herschel, is perhaps the classic example of this phenomenon. At a distance of 7,100 light years away in the constellation of Cassiopeia, a molecular gas cloud is actively forming stars, including the massive O-class star BD+60 2522, which itself is a magnitude +8.7 star despite its great distance and its presence in a dusty region of space. Shining with a temperature of 37,500 K and a luminosity nearly 400,000 times that of our Sun, it ionizes and evaporates off all the molecular material within a sphere 7 light years in diameter. The bubble structure itself, when viewed from a dark sky location, can be seen through an amateur telescope with an aperture as small as 8" (20 cm).

As viewed by Hubble, the thickness of the bubble wall is both apparent and spectacular. A star as massive as the one creating this bubble emits stellar winds at approximately 1700 km/s, or 0.6% the speed of light. As those winds slam into the material in the interstellar medium, they push it outwards. The bubble itself appears off-centre from the star due to the asymmetry of the surrounding interstellar medium with a greater density of cold gas on the "short" side than on the longer one. The blue colour is due to the emission from partially ionized oxygen atoms, while the cooler yellow colour highlights the dual presence of hydrogen (red) and nitrogen (green).

The star itself at the core of the nebula is currently fusing helium at its centre. It is expected to live only another 10 million years or so before dying in a spectacular Type II supernova explosion.

Image credit: NASA, ESA, and the Hubble Heritage Team (STScI/AURA), of the Bubble Nebula as imaged 229 years after its discovery by William Herschel.

CONTACTS

General email address to contact the Committee
wadhurstastro@gmail.com

Chairman	Brian Mills
Secretary & Events	Phil Berry 01892 783544
Treasurer	John Lutkin
Membership Secretary	John Wayte
Newsletter Editor	Geoff Rathbone 01959 524727
Director of Observations	Brian Mills 01732 832691 email: brianm@wkrcc.co.uk
Committee Members	Jim Cooper Eric Gibson

Wadhurst Astronomical Society website:
www.wadhurstastro.co.uk

SAGAS web-site:
www.sagasonline.org.uk

Any material for inclusion in the August 2016 Newsletter should be with the Editor by July 28th 2016