Wadhurst Astronomical Society Newsletter
June 2012 Issue

MEETINGS

MAY MEETING

The May meeting was introduced by Phil Berry who announced that the British Astronomical Society is holding a Summer Meeting on Saturday 7th of July between 1000 and 1730. The meeting is designed to investigate Europe's developing role in Solar System exploration and is in fact called "Exploring the Solar System". The meeting is open to non-members of the BAA. There is more information on the SAGAS website.

Three weeks later, SAGAS is running its own Summer Meeting held at the Chichester Planetarium. Phil said he will update this information later. There will also be further information soon on the SAGAS website.

Phil then introduced tonight's speaker, Brian Mills, our Director of Observations.

Astronomy, its Relevance and its Women
Brian Mills

After an amusing explanation as to why Brian came to prepare this talk as given to Tunbridge Wells Girl's Grammar, he turned to the subject of Time and Astronomy's role in its measurement and use.

The Royal Greenwich Observatory was founded in 1675 to improve the accuracy of star charts and aid navigation with the main aim of finding a method of solving the longitude problem at sea.

Brian explained that determining latitude was easy by using the Sun during the day and the Pole star at night. Early methods of finding longitude were very complex such as the lunar distance method, observing the satellites of Jupiter and others which often lead to ships being lost.

In 1707 Sir Cloudsley Shovel mistakenly lost his ship far from where he thought it was with the loss of 2,000 men. This disaster had a lot to do with setting up the Board of Longitude, offering prizes for an accurate method of calculating Longitude at sea. Less than 1^o accuracy had a prize of £10,000; a huge amount in 1714. Less than $2/3^o$ would earn £15,000 and less than $1/3^o$, £20,000.

An accomplished clock maker, John Harrison suggested that if a clock could be made accurate enough and was set at the port of origin, it would be possible to determine, from observations how far east or west the clock was from its origin.

Harrison's first clock built to go to sea and later called H1, was placed aboard a ship bound for Lisbon. The clock performed well but failed to win any of the prizes. H2 was not used and it took him 19 years to build H3 but this clock also did not go to sea. The next clock to go to sea was H4 which looked more like a very large pocket watch.

H4 was accompanied by Harrison's son on a ship bound for the West Indies. Over the whole journey it was found to be out by just 5.1 seconds, proving that this method of navigation worked.

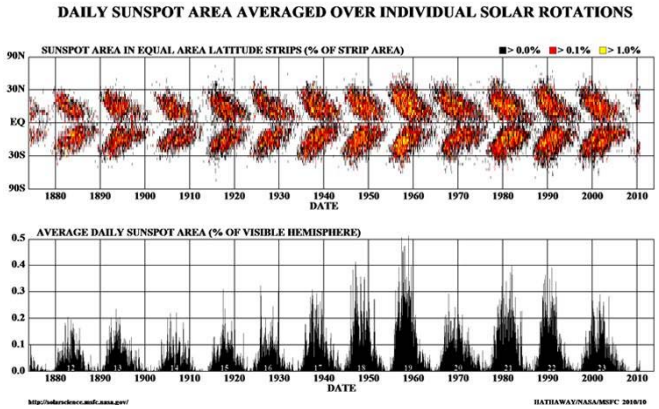
Once this method was established, a time ball placed on top of a tower above the Greenwich Observatory and was dropped at exactly 1-o'clock each day to enable ships on the Thames to see it and set their chronometers.

Brian related an amusing story about the somewhat battered looking red time ball. A few years ago, the observatory was refurbished and the builders used it as a rather large football and kicked it around the yard not realising that it was intended to be re-installed above the tower and not to be replaced with a new one.

The next part of Astronomy's Relevance that Brian looked at was Solar Activity; in particular, sun-spots.

Solar activity seems to be on the increase at the moment and we looked at sun-spots, caused by massive magnetic fields. They often appear in pairs each with opposite polarity. They look dark from Earth but in fact they only look darker than the surrounding surface because they are about 2,000 C^o cooler than the surrounding area at 6,000 C^o. We were told that they are so large that possibly as many as 30,000 Earths would fit inside the larger ones!

Sun-spot activity appears to follow many different cycles but the most dominant is the eleven year cycle and Brian showed a diagram of the number and position relative to the sun's equator of spots over a 400 year period. A graph of several cycles looked like a series of butterflies, hence the name given to the graph.



Sometimes mass ejections of material from the surface of the sun pour out into space and Brian talked about the effect when one of these mass ejections comes towards the Earth. The Magnetosphere which helps protect the Earth is distorted due to the vast amounts of energy. This radiation can cause danger to humans that might be in space at the time. There is more about this in NASA's SpacePlace item at the end of this Newsletter.

Radio communication can be affected, satellites have been damaged and power distribution systems on Earth have also been disrupted on occasions.

Ladies who have contributed to astronomy were covered next in Brian's talk, starting with Henrietta Leavitt who worked as one of Professor Pickering's "computers" at Harvard University in the late nineteenth century.

Her job was to record data from photographic plates of variable stars in the Magellanic Clouds and she discovered a relationship between the brightness of some variables with their period between maxima, and in 1908 she published a paper noting this correlation.

A particular type of variable, Delta Cepheid was already known in the Milky Way and so they could be used as a standard brightness. Henrietta Leavitt used this standard to estimate the distance of these stars in the Magellanic Clouds and Hertzprung used this idea to determine the rough shape of

our galaxy. This also enabled Hubble to determine that the Andromeda Galaxy was in fact a separate "island" galaxy at a great distance.

Sadly Leavitt died before she could receive recognition fo her work.

Finally, Brian related the contribution to astronomy made by Jocelyn Bell-Burnell.

Whilst gaining her PhD at Cambridge, Jocelyn Bell built a huge 4 ½ acre radio telescope, studying the recently discovered Quasars under Professor Hewish at Cambridge. She was solely responsible for operating and analysing data from the array and pen recorders produced 96 feet of paper a day.

One day Bell saw a bit of "scruff" on the paper and on looking back at previous data she discovered similar "scruff" not previously recognised. It kept sidereal time and gave pulses 1.3 seconds apart. After eliminating all of other possibilities and measuring the dispersion it was found to be beyond the solar system but within our galaxy.

At first it was called LGM 1 – Little Green Men number 1, but another source, pulsing at 1.2 seconds was detected in another part of the sky. Other radio telescopes were requested to look at the same positions in the sky and this confirmed that the sources were genuine and not LGMs.

At first Bell was told to disregard the data, but after more were discovered, it was realised that the sources were in fact revolving highly magnetised neutron stars emitting a beam of very powerful electromagnetic radiation on most wavelengths; radio, visible, gamma and x-ray.

A neutron star is the remnants of a supernova and Brian said that what we were in direct line with this beam every time the star rotated it caused a pulse to be detected on Earth. There could be millions of them but as Brian said, they are only found if the narrow beam is in our direction.

The Nobel Prize was awarded for their discovery to Professor Hewish and Sir Martin Ryle but Jocelyn Bell-Burnell says she holds no hard feelings because they would have taken the blame if there was any to be taken!

JUNE MEETING

Wednesday 20th June 2012 – This is Society's "Open Evening" when there will be short talks and demonstrations of equipment and software. The meeting is open to anyone with an interest in astronomy and there is an invitation to bring along telescopes and discuss their set-up and use.

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 18th July 2012 – John Strachan talks about "Amateur Astronomical Spectroscopy". This is fast growing area of astronomy that amateurs are becoming interested in. This talk should be well worth attending.

Saturday 25th August 2012

There is no Society meeting in August but Michael Harte has kindly offered to let us hold our Astro-barbecue at Greenman Farm again. This will be on Saturday 25th August 2012. More details will follow in a later Newsletter.

All members are invited with families and friends to what has been a very pleasant evening in the past.

A number of telescopes will be there and members are encouraged to bring theirs as well and after the barbecue we can us Michael's dark skies to observe the night sky.

The moon will be visible although rather low at this time of year but there will be plenty more to see.

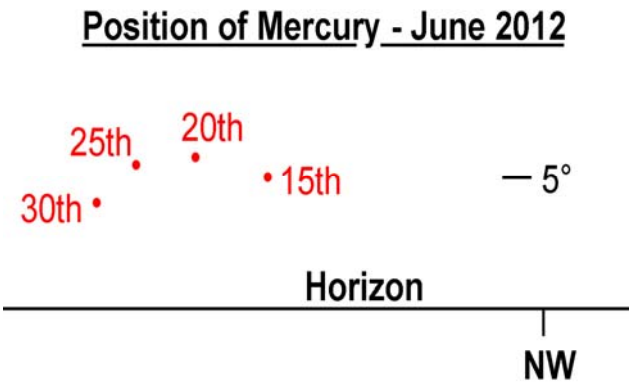
Wednesday 19th September 2012 – Details to follow.

OTHER NOTES AND INFORMATION

SKY NOTES FOR JUNE

Planets

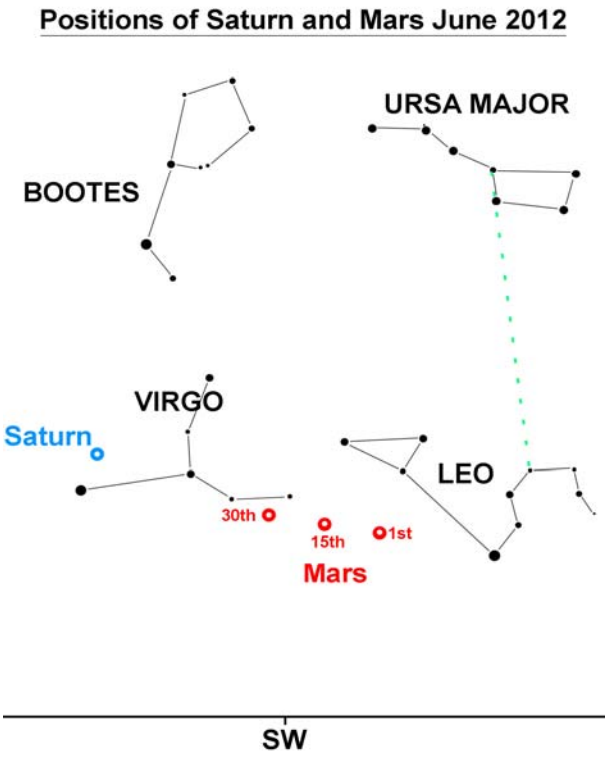
Mercury will be an evening object in the latter part of the month, heading towards greatest eastern elongation on July 1st. The planet may be glimpsed just above the north western horizon at a maximum height of 6° around June 20th between 22.00 and 22.30 hrs BST. It will not be easy to locate without binoculars but please remember - **do not sweep for Mercury with any optical aid until after the Sun has set.**



Venus suffers an inferior conjunction on the 5th/ 6th when it will be seen to pass it transit across the face of the Sun (see details later in these Sky Notes). After that it quickly moves west of the Sun to become a morning object, although from the UK it will be too low in the sky to be readily seen until next month. This is due to the shallow angle that the ecliptic makes with the horizon in the early mornings at this time of year.

Earth reaches the summer solstice on June 20th around midnight. This is the when it has reached its most northerly point in declination or to put it another way it is as far north of the celestial equator as it can get, giving us maximum daylight on that day.

Mars can be found in the south west at sunset but by the end of the month it will itself set by around midnight. Its apparent size decreases during the month from 7.8 to 6.7 arc seconds whilst its magnitude also falls from +0.4 to + 0.9. Its position is shown in the map below for 22.00hrs BST on the 1st, 15th and 30th of the month.



Jupiter is a magnitude -2.0 morning object in Taurus, but despite rising nearly two hours before the Sun by the end of the month it will only be 17° high at sunrise. However, it quickly moves west of the Sun to make observation easier from these latitudes.

Saturn lies on the meridian at 22.00 hrs on the first of the month shining at magnitude +0.5. It is moving retrograde for most of the month but on the 25th it reaches its second stationary point and then resumes direct motion from west to east. The planet is currently in Virgo, where it has been all year, and will remain there until the second week of December when it crosses the border into neighbouring Libra. Its position is shown on the map for Mars.

Lunar Occultations

Unfortunately there are only two reasonably bright occultations that occur before midnight this month although there are many others that are either of fainter stars or take place at more unsociable hours. DD = **d**isappearance at the **d**ark limb. **Times are in BST.**

Jun	Time	Star	Mag	Ph	Alt °	% illu
25th	22.12	SAO 138004	7.4	DD	14	36
30th	22.40	SAO 183837	7.6	DD	17	89

Phases of the Moon for June

Full	Last ¼	New	First ¼
4th	11th	19th	27th

ISS

Below are details of passes of the International Space Station (ISS) that occur before midnight and are brighter than magnitude -3. The details of all passes including those visible from other areas 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 a few minutes before. **Times are in BST.**

June	Mag	Time	Alt°	Az.
7th	-3.5	23.51	78	SSE
8th	-3.4	22.57	56	SSE
9th	-3.4	23.38	85	N
10th	-3.5	22.43	79	SSE
11th	-3.3	23.25	78	N
12th	-3.3	22.30	84	N
13th	-3.3	23.11	81	N
14th	-3.2	22.16	78	N
14th	-3.4	23.52	64	SSW
15th	-3.5	22.57	84	SSW
16th	-3.3	22.02	82	N
17th	-3.3	22.43	62	SSW

Iridium Flares

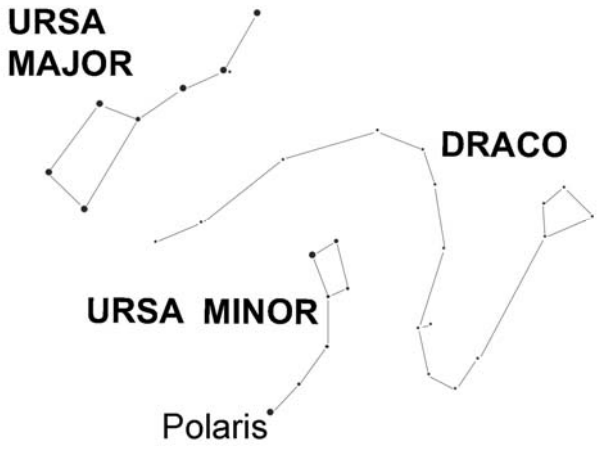
The flares that I've listed are magnitude -3 or brighter although there are a lot more that are fainter, occur after midnight or at a lower altitude. If you wish to see a complete list, or obtain timings for somewhere other than Wadhurst, go to:
www.heavens-above.com

Remember that when one of these events is due it is sometimes possible to see the satellite in advance of the "flare", although of course it will be much fainter at that time. **Times are in BST.**

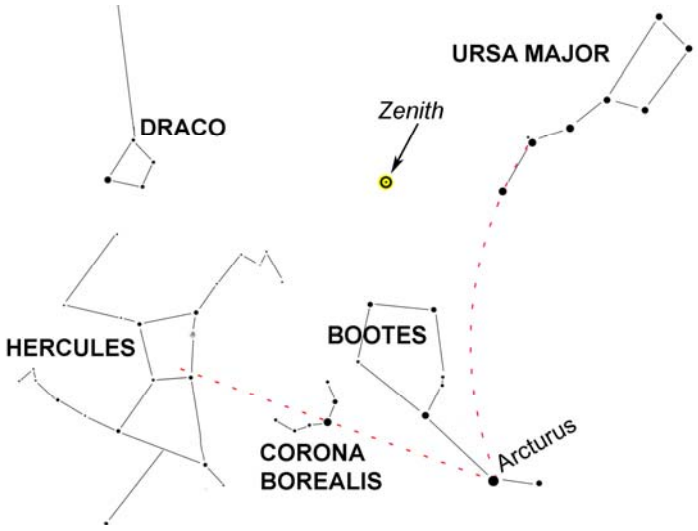
June	Time	Mag	Alt°	Az.
3rd	21.59	-8	50	NE
4th	21.53	-3	51	NE
5th	23.20	-3	17	NNE
8th	23.12	-6	23	NNE
9th	21.32	-8	59	NE
9th	23.10	-3	24	NNE
12th	22.57	-5	30	NNE
16th	22.43	-3	37	NE
17th	22.37	-7	38	NE
22nd	22.16	-8	46	NE
28th	21.49	-4	54	NE

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

Looking north Ursa Minor points to the twelve o' clock position, whilst Ursa Major has passed the overhead point and is now on its way down towards the horizon. Now is a good time to identify the constellation of Draco, the Dragon, as it winds its way between the two bears and on towards Hercules.



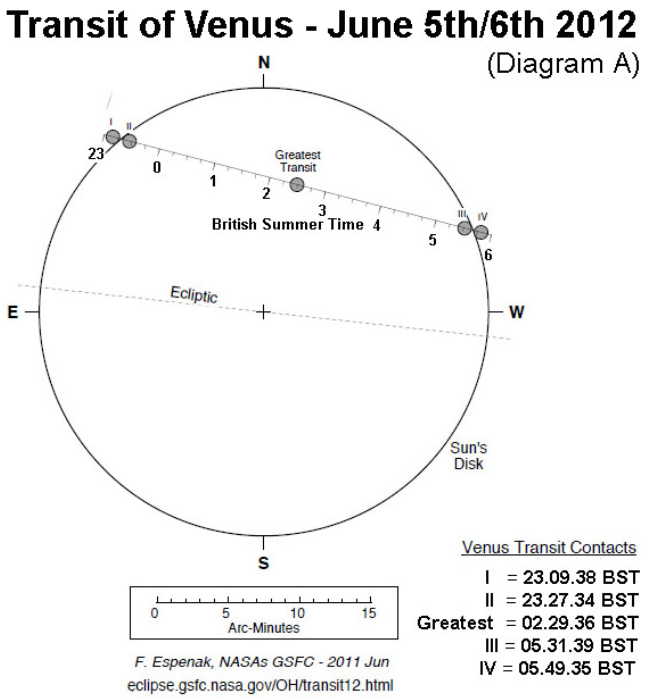
The three bright stars that make up the Summer Triangle, Vega (in Lyra), Altair (in Aquila), and Deneb (in Cygnus), lie almost due east. Between Vega and the pole is the constellation of Hercules whose shape is not obvious but can be easily identified if you use Ursa Major and Arcturus to star hop following the dotted lines as shown. Note: Ursa Major may look upside down to you because although the bottom of the diagram is in the south east it passes the overhead point (zenith) after which things appear the wrong way up.



In the south Arcturus (in Boötes) has just passed the meridian along with Corona Borealis and Virgo.
Towards the west Leo and the head of Hydra are moving towards the horizon, whilst some of the fainter constellations close to Ursa Major (Leo Minor, Coma Berenices and Canes Venatici are well placed for identification.

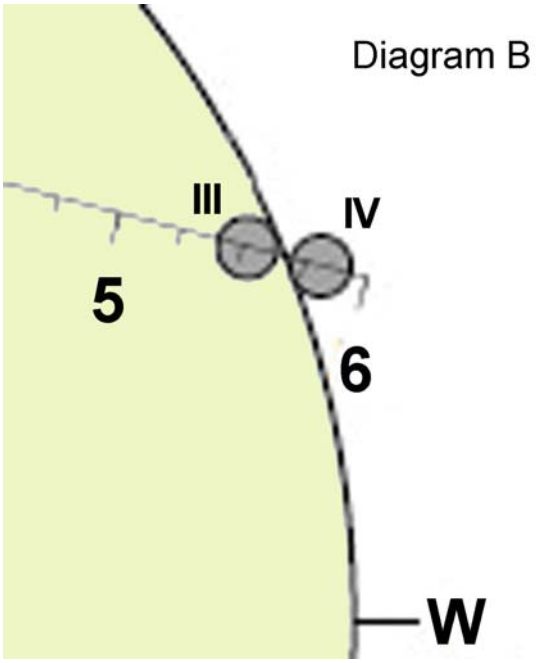
Transit Of Venus

At sunrise on June 6th there will be the opportunity to see the last transit of Venus for more than a century. The Sun will be low and only the very end will be seen in the UK. The diagram shows the path of Venus across the Sun in naked eye orientation. Sunrise is at 04.46 hrs BST and occurs almost exactly in the north east, in fact 46° in azimuth to be precise. Last (4th) contact occurs at 05.49 hrs BST (when Venus is a fraction under 8° above the horizon) giving the UK just over an hour to view one of the rarest of astronomical events. This means that the choice of location with a low horizon will be crucial.



When we talk about 1st, 2nd, 3rd or 4th contact we are referring to the moments in time when the edge of Venus appears to touch the edge of the Sun. The first two will be invisible from the UK so lets look at the last two.

From diagram B, (an enlargement of the western side of diagram A) you can see that 3rd contact (III) is when the leading edge of Venus contacts the western edge of the Sun. Similarly 4th contact (IV) marks the final moment of the event when the trailing edge of Venus is just about to break contact with the solar disk. The numbers 5 and 6 that you can see refers to the time in hours BST.



An interesting phenomenon seen at 2nd and 3rd contacts is something called the “black drop” effect. Its cause is still a matter of debate, as astronomers are not clear whether it is an effect caused by the atmosphere of the Earth or Venus, or an optical effect attributable to the telescope being used or indeed a mixture of all of these.

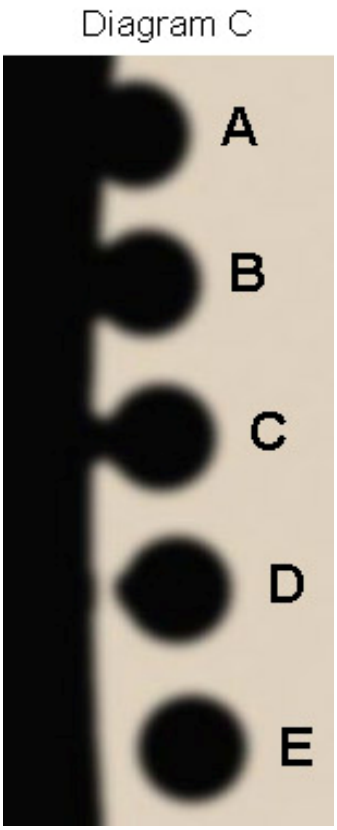
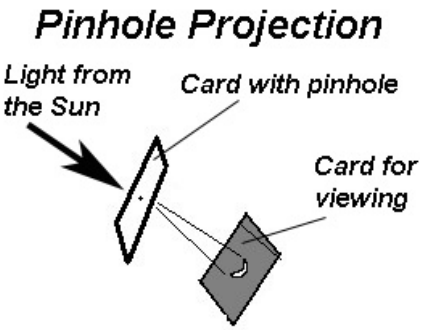


Diagram C shows the start of a transit with Venus just beginning to encroach onto the Sun’s disk. With Venus in position B there seems to be a broad “attachment” between the planet and the Sun’s limb (edge) which narrows at position C and has all but disappeared apart from some distortion at point D.

There are several methods, outlined below, that can be employed to **safely** observe the transit.
Please remember that if you look directly at the Sun with any optical instrument for even a brief moment you risk permanent blindness.

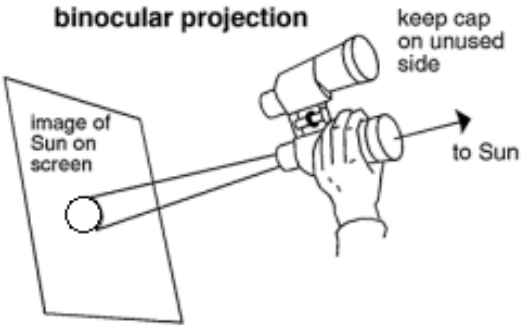
1. Naked Eye. This can be achieved by using the "eclipse glasses" that were sold in 1999 for the total eclipse. They usually consist of cardboard frames with a reflective film taking the place of the lenses. Make sure that the film is not damaged before you attempt to use them - if it is then discard the glasses. Using old pieces of film negative, or staring at the Sun through sunglasses are **NOT** safe ways to observe.

2. Pinhole projection. This method involves making a small hole in a piece of card and allowing the Sun's rays to pass through the hole and fall onto another card you are holding or have propped up behind the first. You will see a small (upside down) image of the Sun and hopefully the small black dot of Venus.

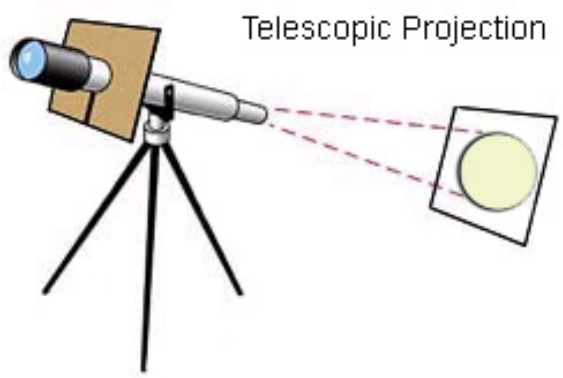


Above is a photograph that I took to demonstrate the principle of pinhole projection. I used an empty A4 paper box with a sheet of white paper in the bottom and made a 3mm hole in the lid. I am holding the lid just over two metres away and keeping it in such a position that the box is completely in its shadow. This makes the image easier to see although it is quite small.

3. Binocular Projection. This method is possible with the binoculars "hand held" but is much easier if they can be mounted on a tripod. You should keep one of the objectives (the lenses at the front) covered so you are only using half of the binocular, and project the image onto a white card. Try and make up a piece of card to fit over the binoculars to cast a shadow as shown it the diagram on telescope projection.



4. Telescopic Projection. This is essentially the same as the binocular method above but assumes that the telescope is mounted on a tripod. If the telescope has a small "finder" on it, that **must** have a cap fitted at the front. **Do not** look through the finder to locate the Sun. Instead look at the shadow that the telescope casts and move the 'scope so that the shadow is as small as possible. It will then be pointing directly at the Sun.



5. Telescope with solar filter. This is where a standard telescope is used with a filter fitted over the objective lens (at the front) which blocks 99.9% of the solar light and heat to allow you to look at the Sun directly. There are two options when using this method - buy a custom made filter to fit your telescope or buy a sheet of the "film" that looks like aluminium foil and make a fitting to hold it yourself. This is what I have done for eclipses and transits in the past and found that it works well. If you want to make your own filter (this is applicable to binoculars as well) you can buy "Baader Astro Solar Film" in A4 sheets from telescope shops, as well as from Amazon for around £20 per sheet. The picture below shows one that is made commercially, but the important thing is that you need to be able to fix it firmly to whatever instrument you are using. It is imperative that it cannot fall or be blown off by the wind - tape it on if necessary. **This is the only safe way to look at the Sun directly apart from using a solar telescope or a Herschel Wedge.**

Please be aware that there have been filters available (some of them glass) that were sold as solar, or Sun, filters that fitted over the *eyepiece* end of the telescope. **Do not use these**. They have been known to shatter in use because of the

intense heat focussed on them. The only safe place for a filter is over the object lens (at the front) of the telescope.

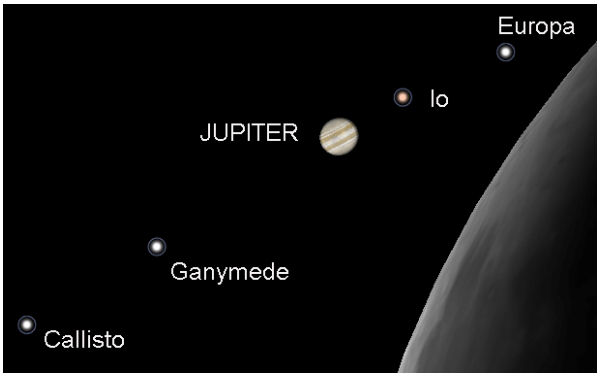
6. Hydrogen alpha (Ha) Solar Telescope. This is a purpose built telescope for direct viewing of the Sun in one particular wavelength of light - hydrogen alpha. This allows not only the Sun and sunspots to be seen, but also shows other solar phenomena such as granulation and prominences. The most popular is the Coronado Personal Solar Telescope (PST) as shown in the picture. Unfortunately they are not cheap and retail for around £500 to £600.

The picture below is one that I took through Phil Berry's PST and shows some prominences that were visible around the edge of the Sun.

7. Herschel Wedge. This is an attachment containing a specifically shaped wedge of glass that fits at the eyepiece end of the telescope. It reflects almost all of the light and heat safely away allowing only a small portion to be directed to the viewing position. You can see from the photograph the location of the eyepiece with relation to the opening underneath where the excess light and heat exits. These are not suitable for reflecting telescopes and anyway a filter is still required to be used.

Advance Warning for July

July 15th - grazing occultation of Jupiter and its moons. This occurs in the early hours of the morning and should be an interesting spectacle as the four brightest moons and the giant planet itself disappear behind the limb of the Moon. From locations north of us this will be a graze occultation with not all of the planet/moons being totally occulted. The screen shot from "Stellarium" shows the situation a few minutes before Europa is obscured, which will happen at 02.53 hrs BST. More details next month.



Brian Mills

NASA'S SPACE PLACE

Thank Goodness for Magnetism
By Dr. Tony Phillips

Only 93 million miles from Earth, a certain G-type star is beginning to act up.

Every 11 years or so, the solar cycle brings a period of high solar activity. Giant islands of magnetism—"sunspots"—break through the stellar surface in increasing numbers. Sometimes they erupt like a billion atomic bombs going off at once, producing intense flares of X-rays and UV radiation, and hurling massive clouds of plasma toward Earth.

This is happening right now. Only a few years ago the Sun was in a state of deep quiet, but as 2012 unfolds, the pendulum is swinging. Strong flares are becoming commonplace as sunspots once again pepper the solar disk. Fortunately, Earth is defended from solar storms by a strong, global magnetic field.

In March 2012, those defences were tested.

At the very beginning of the month, a remarkable sunspot appeared on the Sun's eastern limb. AR1429, as experts called it, was an angry-looking region almost as wide as the planet Jupiter. Almost as soon as it appeared, it began to erupt. During the period March 2nd to 15th, it rotated across the solar disk and fired off more than 50 flares. Three of those eruptions were X-class flares, the most powerful kind.

As the eruptions continued almost non-stop, Earth's magnetic field was buffeted by coronal mass ejections or "CMEs." One of those clouds hit Earth's magnetosphere so hard, our planet's magnetic field was sharply compressed, leaving geosynchronous satellites on the outside looking in. For a while, the spacecraft were directly exposed to solar wind plasma.

Charged particles propelled by the blasts swirled around Earth, producing the strongest radiation storm in almost 10 years. When those particles rained down on the upper atmosphere, they dumped enough energy in three days alone (March 7-10) to power every residence in New York City for two years. Bright auroras circled both poles, and Northern Lights spilled across the Canadian border into the lower 48 states. Luminous sheets of red and green were sighted as far south as Nebraska.

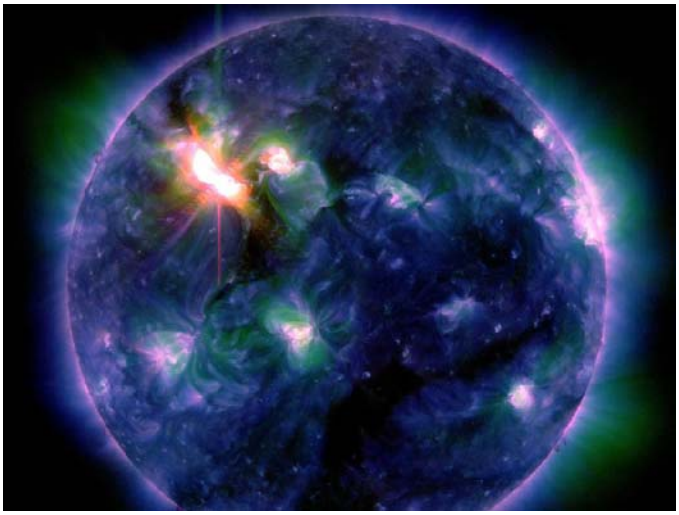
When all was said and done, the defences held—no harm done. This wasn't the strongest solar storm in recorded history—not by a long shot. That distinction goes to the Carrington Event of September 1859 when geomagnetic activity set telegraph offices on fire and sparked auroras over Mexico, Florida, and Tahiti. Even with that in mind, however, March 2012 was remarkable

It makes you wonder, what if? What if Earth didn't have a magnetic field to fend off CMEs and deflect the most energetic particles from the Sun.

The answer might lie on Mars. The red planet has no global magnetic field and as a result its atmosphere has been stripped away over time by CMEs and other gusts of solar wind. At least that's what many researchers believe. Today, Mars is a desiccated and apparently lifeless wasteland.

Only 93 million miles from Earth, a G-type star is acting up. Thank goodness for magnetism.

With your inner and outer children, read, watch, and listen in to "Super Star Meets the Plucky Planet," a rhyming and animated conversation between the Sun and Earth, at: http://spaceplace.nasa.gov/story-superstar.



Multiple-wavelength view of X5.4 solar flare on March 6, captured by the Solar Dynamics Observatory (SDO) in multiple wavelengths (94, 193, 335 angstroms). Credit: NASA/SDO/AIA

This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

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www.wadhurst.info/was/

SAGAS web-site www.sagasonline.org.uk

Any material for inclusion in the July 2012 Newsletter should be with the Editor by June 28th 2012