

NEWBURY ASTRONOMICAL SOCIETY

BEGINNERS MAGAZINE - SEPTEMBER 2011

ASTRONOMY AS A HOBBY

Welcome to the 2011 / 2012 session when binoculars and telescopes can be turned to the night sky again. With the dark evenings closing in, interest in the dark night sky can be renewed and the wonders of the night sky enjoyed again.

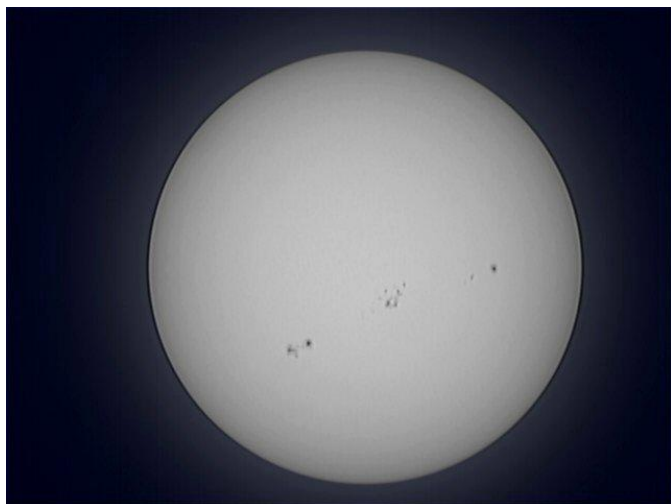
Although the sky has been bright during the summer nights there have still been interesting things to see. Saturn was visible for most of the night during late spring and early summer although it has now disappeared over the western horizon and is too close to the Sun to be seen until next year.



Saturn imaged in May 2011

The image above was taken by Steve Harris on a slightly misty night using a webcam attached to a telescope. The image quite closely represents how Saturn appeared at the eyepiece. Saturn really does have the wow! factor for almost everyone who has the chance to look at it through an astronomical telescope.

With the sky being light until around 22:30 and around mid-summer the night sky not getting completely dark at all, some astronomers took to daylight observing. By fitting a special filter to a conventional telescope or using a specially designed telescope the Sun could be observed safely.



Some very nice sunspots imaged on 1st July 2011

This session will see a slightly different emphasis to the meetings and this magazine. There will be the usual features covering the many aspects of astronomy with special regard to the beginner to astronomy. There will also be a monthly series of articles providing advice and help on the various instruments and equipment available to the modern amateur astronomer.

This month we will be thinking about observing the Moon with basic equipment namely the Mk.1 eyeball and binoculars. Binoculars are also featured as the first piece of equipment available to the beginner to the hobby of astronomy. Advice on using binoculars can be found on pages 3 and 4.

There will be the usual astronomical news items and the What's Up information pages giving monthly guidance about what there is to see and where to find it.

Jupiter is now coming into view at a much more convenient hour so this will be a major interest well into next year.

Jupiter is the best of all the planets to observe with a small telescope (100mm aperture or less). It is large and bright with lots of detail and even colour on the surface. It is even possible to make interesting observations of the positions of the moons using a reasonably good pair of 10 x 50 binoculars. A medium sized telescope is however required to see the detail in the cloud belts. The South Equatorial Belt has returned after its disappearance last year. The image below shows the Red Spot which is usually imbedded in the South Equatorial Belt.



Jupiter imaged on 2nd September 2010 (south at the top)

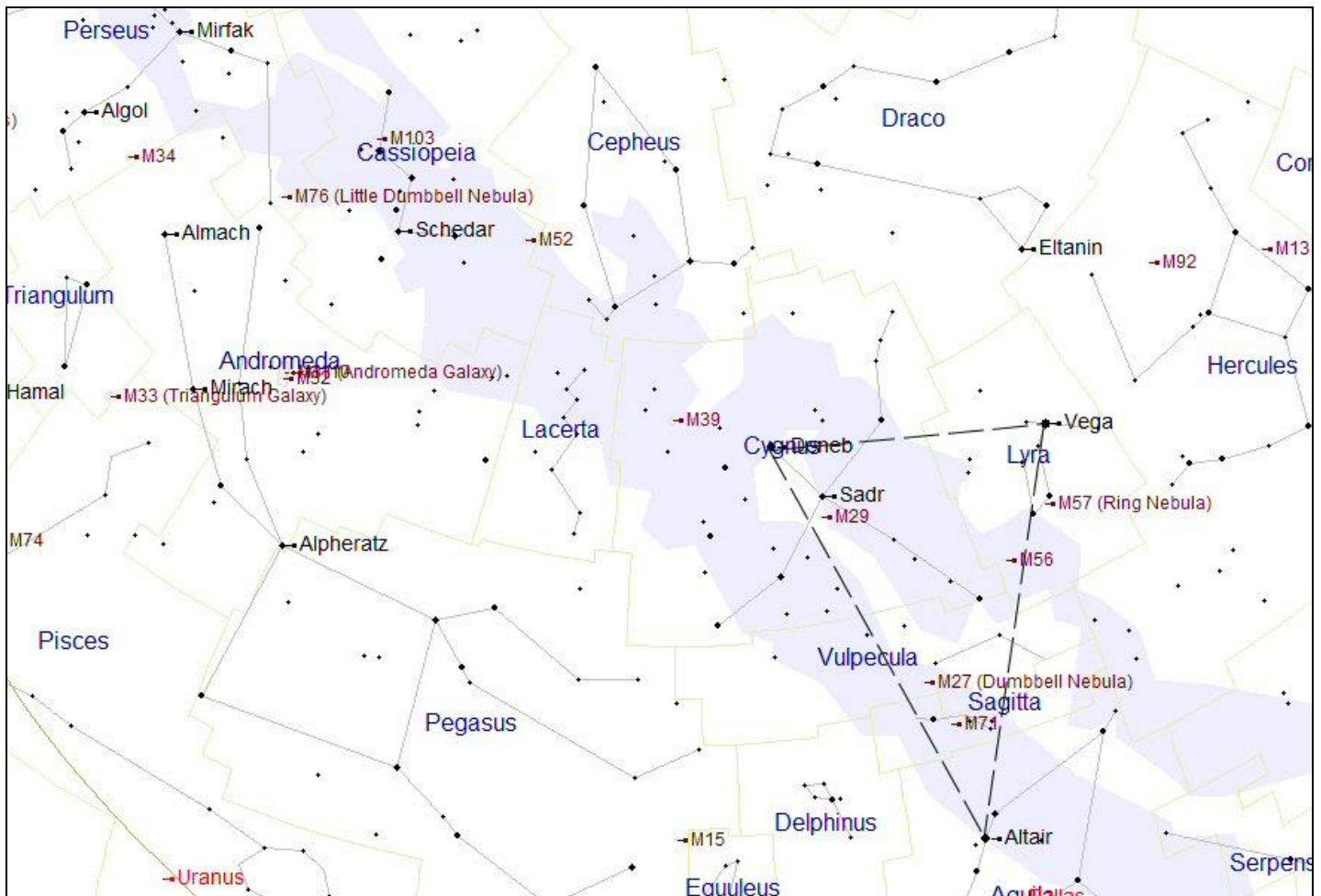
NEWBURY ASTRONOMICAL SOCIETY MEETING

2nd September Sophisticated Small Satellites
Website: www.newburyas.org.uk

THE NEXT NEWBURY BEGINNERS MEETING

21st September Star Spotting and Using Binoculars
Website: www.naasbeginners.co.uk

THE AUTUMN NIGHT SKY



The Summer Triangle is still prominent but moving steadily towards the western horizon. There is still time to enjoy all the interesting objects within and around the triangle. These objects were described in detail in the May 2011 issue of this magazine which can be found along with all recent back issues on the Beginners website (see page 1).

For autumn observing we must look to the east of the Summer Triangle for the constellations coming into view over the next three months. The main constellations on view at this time are the conjoined constellations of Pegasus (the Winged Horse) and Andromeda (the Queen).

The most striking feature of Pegasus is the 'Great Square' that can be seen in the chart above. Strangely the star Alpheratz at the top left of the square is in fact a member of Andromeda and not Pegasus but it is always joined (dot to dot) to form the Great Square of Pegasus. Pegasus has no interesting objects within the square but the square does have an interesting use for the amateur astronomer. There are up to five stars that can be seen reasonably to the naked (unaided) eye depending on the seeing conditions. If it is a misty evening then no stars will be seen other than the four making up the square and seeing faint objects is likely to be difficult. If two or three stars can be seen then the viewing for the evening should be quite good and some of those eagerly sought after faint objects may be within our light grasp. If four or five stars can be seen then observing is likely to be as good as it gets in this country. So a quick look at the Square of Pegasus before dressing up to keep warm or setting up the telescope could give an indication as to whether it is going to be worthwhile.

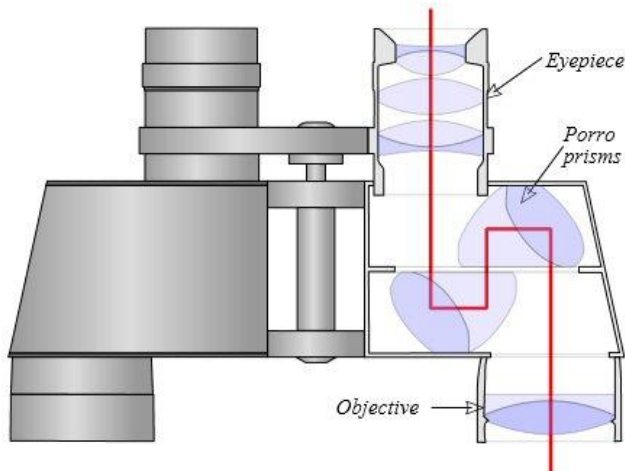
M15 shown at the bottom centre of the chart is a very nice Globular Cluster. This stunning ball of about 100,000 stars is visible in a pair of 10 x 50 binoculars as a small fuzzy patch of light. A small telescope will show it as a ball of stars but a larger telescope will reveal its true glory and even show individual stars on the edge of the cluster. Globular Clusters are thought to be the remains of smaller galaxies that have ventured too close to our galaxy and had their outer star ripped off by gravity.

The constellation of Andromeda is joined to the Square of Pegasus at the star Alpheratz and is comprised of two lines of moderately bright stars that converge on Alpheratz. The brightest of all the galaxies (except our own galaxy, the Milky Way) is found in Andromeda. To find the Great Andromeda Galaxy, known as Messier 31 (M31), start at Alpheratz. Follow the lower line of stars that form Andromeda to the second star called Mirach. From Mirach move up to the star in the upper line then on an equal distance to a second star. Just to the right of this second star is a fuzzy patch of light, this is M31. M31 can be seen with the unaided eye on a good clear night but is quite obvious when seen through binoculars. A telescope will show the bright central region and the fuzzy form of the spiral arms surrounding it.

Another beautiful object can be found in Andromeda. The star at the end of the lower line of stars is called Almach. When viewed through a telescope Almach is seen to be comprised of two stars, one is gold coloured the other is blue. Looking much like Albireo in Cygnus Almach is one of the most beautiful double stars in the night sky.

USING BINOCULARS FOR ASTRONOMY

Nearly all amateur astronomers will have a trusted 'pair of binoculars' and will often recommend to a beginner that it should be the first instrument to be purchased. This article will endeavor to give some guidance in purchasing binoculars and using them to observe the night sky.



The typical light path through a binocular

The objective lens gathers light and focuses it into an image. The eyepiece is used to magnify the image and direct the light into the eye. Prisms are introduced into prismatic binoculars to enable the body to be physically reduced in length compared to that of a telescope. They also ensure that the image is orientated the right way up and the right way round.

Binoculars come in many designs to suit the purpose or requirements of the user. The picture below shows a small selection from the range of binoculars that are available.



Binoculars 8 x 50 (left) 15 x 70 (middle) 10 x 25 (right)

Binoculars for astronomy use should have an aperture (lens diameter) of at least 50mm (the second number in the descriptions above). The 10 x 25 instrument shown on the right is too small to be much use for astronomy. An aperture of less than 50mm will not gather enough light to give a really good view of the night sky. Binoculars over 50mm do tend to be more expensive and heavier so 50mm is a good size to start with. A magnification of 7x or 8x is the best but up to 10x can be used. The 10x may be difficult to hold steady but if supported on a wall or fence they can be used. So look for a 7 x 50 or 8 x 50. What about cost? Normally the old adage 'you get what you pay for' is true. About £35 to £50 will provide a good quality pair but spend as much as you can afford.

The binoculars shown in the image below are typical of a good but rather aging 10 x 50 instrument. Modern versions would be lighter than this model but the salient features are much the same.



A typical 10 x 50 binocular

The most important feature is of course the optical quality but most modern instruments costing around £50 (before special offer price reduction) are of a reasonable quality. Binoculars with an aperture of less than 50mm are not best suited for astronomy as they cannot capture enough light. Most binoculars have the following features that are designed into the instrument to allow it to be adjusted to suit the user and the purpose of use.

The two optical bodies are hinged together to allow them to be adjusted to the positions of the users eyes. By adjusting the angle of the hinge the eyepieces can be moved closer or further apart to achieve the most comfortable position to suit the user's eyes.

Incorporated into the hinge between the two optical bodies is a focus adjuster often in the form of a rotating barrel. (The central focusing barrel can be clearly seen in the image above.) Rotating the barrel moves the two eyepieces in and out of the bodies. This allows the binocular to be focus on objects at different distances.

The right hand eyepiece can be rotated to adjust the focus of each optical body to suit each eye this is called 'diopter adjustment'. The way to do this is to find a bright star in the binocular (or any distant object can be used during the day). Close the right eye and adjust the focus to suit the left eye using the central focusing barrel. When the sharpest image is achieved (for a star the smallest point of light) open the right eye and close the left. Now adjust the right eyepiece by rotating the dioptre adjuster each way until the sharpest image is achieved. Open both eyes and adjust the focus to suit both eyes using the central focusing barrel to check the quality of the view.

Finally binoculars are usually supplied with a strap for hanging the instrument around the neck. It is a very important to leave this on and use it all the time. It saves putting the binocular down when not being used, it may be difficult to find again in the dark. It is also useful for resting the arms after holding them up for some time. It also stops the binocular falling to the ground and being damaged if accidentally dropped.

Some binoculars may have rubber cups fitted to the eyepieces. These are good because they help by excluding unwanted light from street lights or other sources. Lens covers may also be supplied to prevent dust accumulating on the glass so if supplied they should be fitted when the binocular is not in use.

Some cheaper binoculars may display a flare or spikes around the stars but this is not a big problem as long as the effect is not too noticeable. Using binoculars will allow the positions and patterns of stars to be appreciated so some distortion of the star images can be acceptable. So let us move on to using the binoculars for astronomy.

The first thing to consider is getting comfortable for observing. All the usual advice given to beginners to astronomy applies. That is: dress to keep warm, make yourself comfortable and avoid lights that shine directly into your face. Little needs to be said about dressing to keep warm except to start observing in warm clothes and don't wait until cold has set in before dressing up.

To be comfortable a reclining garden chair will allow views of the sky overhead to be obtained without a resulting neck ache. It also avoids the feeling of swaying or falling over when looking up into the sky for a while. It is also very comfortable. If a star chart is to be used in conjunction with the binocular a small side table is handy and a not too bright red light should be used to read it.

Before starting to use the binocular have a look around the night sky for a few minutes to allow your eyes to adapt to the dark. This will take about ten minutes. Pick out the brightest stars and try to identify them. Familiarise yourself with the positions of those bright stars because they do appear to move from quite noticeably from east to west as Earth rotates.

Start at one of the bright stars then try to identify the star patterns on the star chart. This could be a little difficult at first because many more stars will be seen than are shown on the chart. It takes a while to match the slightly brighter ones to the stars shown on the chart. The good thing is binoculars always show the stars the right way up and in the correct orientation. Gradually work outwards from the bright stars and you will soon start to become familiar with that part of the sky. Do stop occasionally and just sweep across the sky and marvel at the thousands of stars. Do the same for other bright stars. The bright stars of the Summer Triangle are a good place to start. See the chart on Page 2.

When you feel ready to search for something interesting have a look at the chart and find an interesting object. It is useful to make a list of objects before moving out to observe. These objects can be checked in books or on the internet to see if they are within the grasp of binoculars. It is also useful to have an idea what the object you are looking for actually looks like. Two objects to start with are M27 the Dumbbell Nebula in Vulpecula and M31 the Great Galaxy in Andromeda. See Page 2.



M27 the Dumbbell Nebula in Vulpecula

While looking for M27 you will pass through the beautiful star fields of our Milky Way galaxy. The shaded band running from the lower right to upper left of the chart on Page 2 shows the position of the Milky Way.

A typical 8 x 50 or 10 x 50 binocular will not show detail on any astronomical target other than the Moon. The true purpose of binoculars is to enhance the wide view of the night sky. Stars will appear brighter and many more will be seen than is possible with the unaided eye. So the main aims of using binoculars are: to study the star patterns, seek out the brighter deep sky objects and transient objects like comets.

Binoculars larger than 50mm aperture are heavier and generally have a higher magnification (higher than 15x). These two factors make it more difficult to keep a target steady and in clear view. It is therefore necessary to have additional support for the binocular. A simple support can be used by utilising a suitable wall or even a long handled broom. There are custom made support frames available to buy or for manufactured by those with a little DIY knowledge and skill. The device below is a proprietary binocular support mounted to a tripod. It has a counter balance weight and a parallelogram frame that allows the binocular to be raised or lowered while maintaining the same line of sight. The binocular can be elevated or lowered and the frame can be rotated on the tripod to enable any object to be viewed.



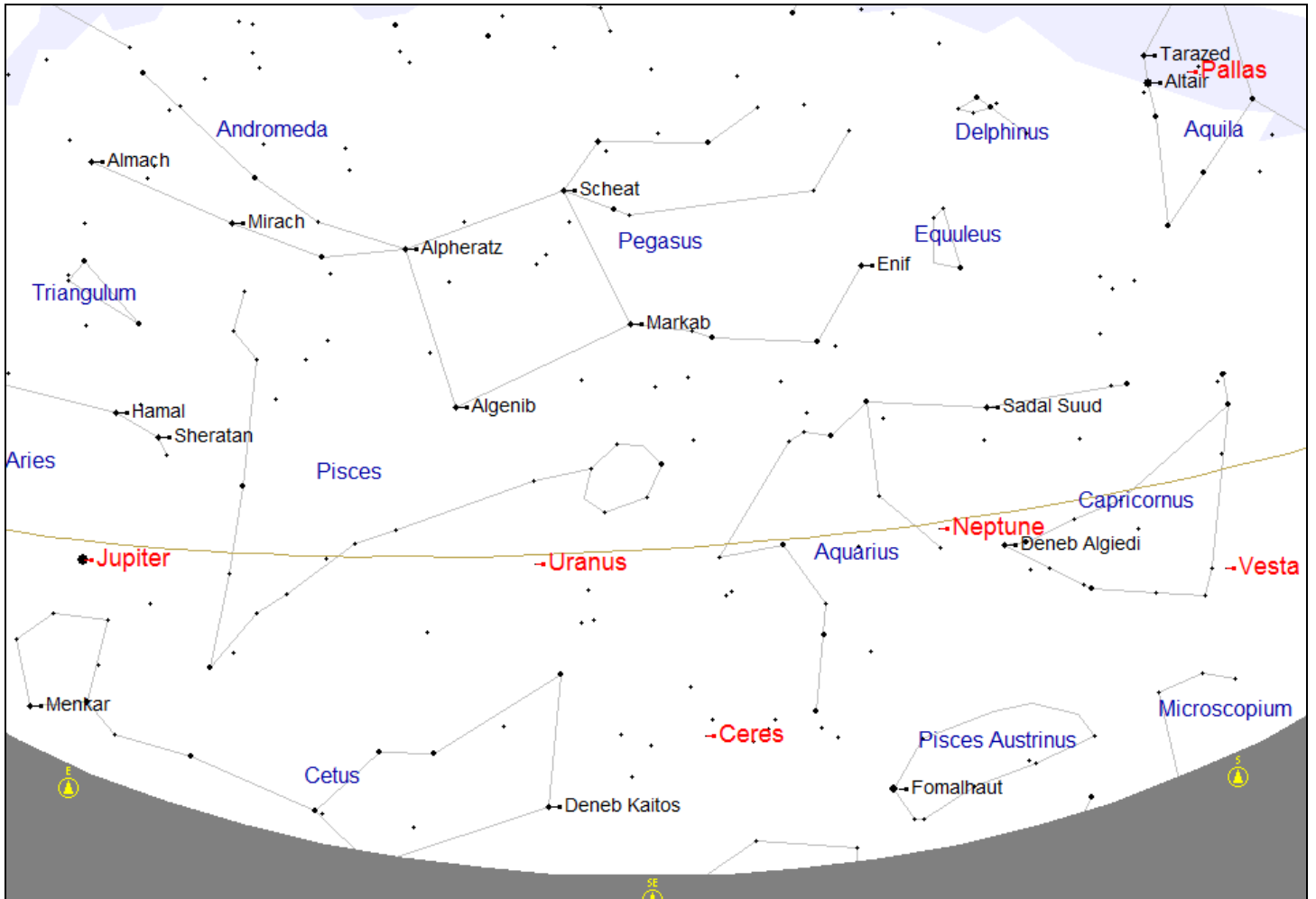
A Parallelogram Binocular Support with 15 x 70 fitted

Some objects are best seen using binoculars because they appear so large in the sky that a telescope cannot fit the whole object into its field of view. One such object is M45 the Pleiades (Seven Sisters star cluster) in the constellation of Taurus. Another cluster best seen using Binoculars is M44 the Beehive Star Cluster in the constellation of Cancer.

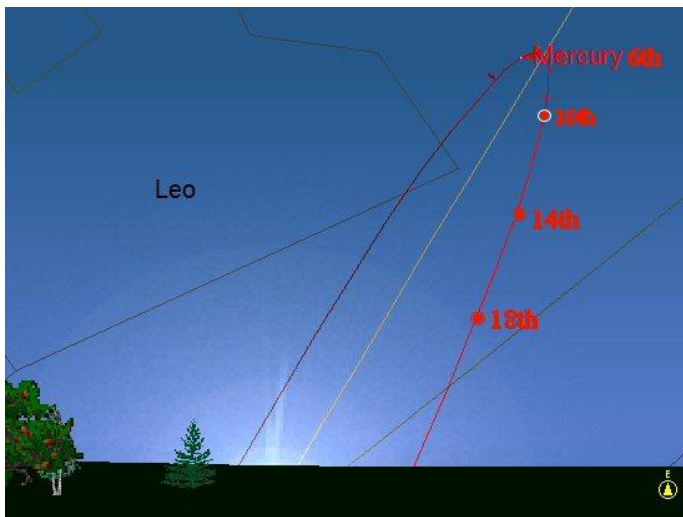


M45 the Pleiades (Seven Sisters star cluster) in Taurus

THE SOLAR SYSTEM THIS MONTH



The positions of Jupiter, Uranus and Neptune at 22:00 BST (21:00 GMT) on 19th September



JUPITER rises at 21:21 on 1st September, 20:41 on 15th and 19:00 on 30th. It will be low in the east at the time shown in the chart above but will be observable for the rest of the night in the constellation of Aries. Jupiter will be featured next month.

SATURN rises at 09:22 on 1st September, 08:49 on 15th and 08:16 on 30th but will be in daylight and so will not be observable.

URANUS rises at 19:29 and will be observable all night this month. It will be at opposition (due south at 24:00 GMT) on 26th September and as so will be at its best. A telescope will show Uranus looking like a rather fuzzy blue tinted star in the constellation of Pisces.

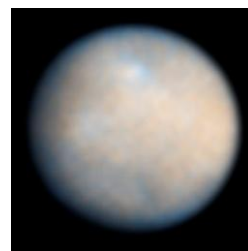
NEPTUNE rises at 18:28 and will be observable all night this month. It looks rather like Uranus in a telescope but smaller and fainter. It is located in the constellation of Aquarius.

Dwarf planets **CERES** and **VESTA** will be visible in the southern sky this month. These are the two largest objects in the asteroid belt. More about the space craft ‘Dawn’ and Vesta in December.

MERCURY rises at 04:36 on 1st September, 05:23 on 15th and 06:30 on 30th but will be close to the rising Sun. The smallest planet will be at greatest western opposition on 3rd and will be just be observable in the east before sunrise. **Do not sweep across the sky looking for Mercury with binoculars or a telescope when the Sun is above the horizon.**

VENUS rises over the eastern horizon at about 07:00 in daylight and will not be observable this month.

MARS rises at 01:27 on 1st September, 01:21 on 15th and 01:16 on 30th but is still too small and will not really be observable.

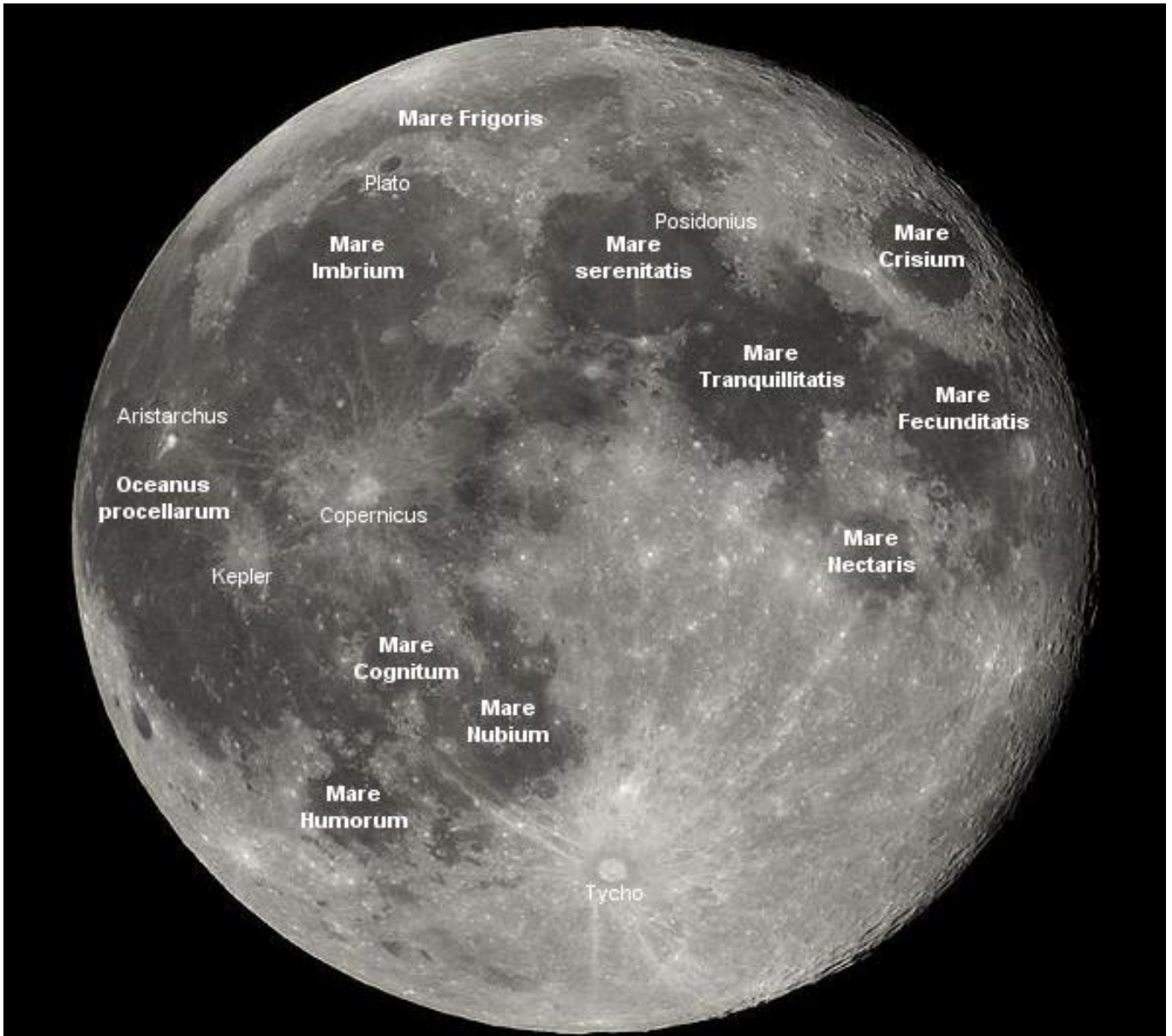


Ceres (dia 950 km) mag +7.6



Vesta (dia 530 km) mag +5.6

SPECIAL FEATURE ON THE MOON THIS MONTH



The Full Moon Showing the Seas (Maria) and Large Craters

For a beginner to astronomy the Moon is an excellent place to start. It is large, bright, easy to find and covered in interesting things to see. It may still be necessary to locate the Moon using the finder but a seasoned observer may be able to find it straight away without using the finder. The full Moon is most impressive to the naked eye but is probably least rewarding through a telescope. At full Moon the Sun is shining straight down on the surface and casts very few shadows. The best time to see a specific feature is as the terminator (the line between night and day) passes over that feature. The full Moon is so bright that it may be uncomfortable to the eye in a telescope. Filters can be bought and attached to the eyepiece to reduce the brilliance and improve contrast. A cheaper option is to make a cardboard mask to cover the end of the telescope tube. Into this mask a hole of about 30 to 50mm can be cut to reduce the amount of light entering the telescope.

Depending on the viewing conditions a high magnification can be used. First centralise the object or region of the Moon to be observed using the finder and a low power eyepiece. Carefully replace the low power eyepiece with a higher magnification (shorter focal length) eyepiece and refocus if necessary.

The object will appear larger and more detail on the Moon's surface will be seen. As the magnification is increased the size of the hole in the mask may have to be increased to allow more light into the telescope to improve the contrast.

Maria (singular, mare) or seas are not seas at all, they are large areas that have been covered by molten rock in the distant past but later than the main crater forming era. To the naked eye the maria appear as darker areas but through a telescope they are seen as relatively smooth plains with just a sprinkling of smaller craters. The Moon does not rotate as seen from the surface of Earth and always keeps the same view towards us. A terminator will therefore cross over a feature on the surface twice every month. Close to the terminator it will be sunset or sunrise so the shadows of features such as crater rims, mountains and valleys will be elongated. This gives a greater perspective and contrast to the features so they appear more three dimensional and with much more detail. The centres of craters are very interesting especially if they are the type filled with lava. What appears to be a smooth surface is actually rippled and fractured due to contraction as the lava cooled. Many features seen on lava fields on Earth can also be found in these craters on the Moon.

OBSERVING THE MOON

The Moon is always a good target for astronomy whether it is summer or winter. It can even be observed during daylight. Even with the unaided eye the dark areas called Maria (seas) can be seen but these are of course not seas at all. They are in fact large impact sites that filled with molten rock from below as a result of the impact. Some of the largest craters may also be seen using binoculars. A small telescope will show breathtaking detail on the surface. The views of the Moon are always interesting with different features coming into view as the line between sunlight and night moves across the surface from night to night.



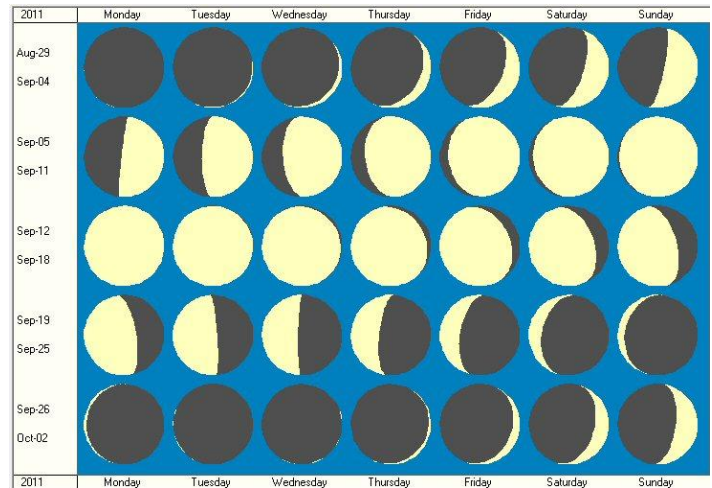
Craters are especially spectacular near the terminator because sunlight will illuminate the outside of one wall and the inside of the wall on the other side of the crater, with the opposite side of each wall in shadow. Some craters have a central peak and may have terraced walls. Other craters have radial lines called rays stretching for many hundreds of kilometres where debris was thrown out by the impact of the meteor.



Some of the larger craters may have terraced walls both inside and outside the main rim. There may even be smaller craters on the floor of the large craters or another crater may cut through the wall of a large crater. This effect can be used to work out the chronological sequence of the formation of the craters.

Some areas of the Moon are more cratered than others. There are large areas that have so many craters that there appear to be no smooth areas at all. Other areas have almost none, while some craters appear to have been filled with lava and have smooth dark floors.

It is an interesting project to try to sketch what can be seen on the Moon in as much detail as possible. This can be done first with the naked (un-aided) eye. In some ways it is best to do this when the Moon is full. When the Moon is full it can be too bright for using binoculars or a telescope but naked eye views are best when the Moon is full. After sketching the Moon with an un-aided view try doing it again using a binocular. The best way to do this is to make a rough 'first look' sketch and add more and more detail to it. When you have finished check your sketch by comparing it to the image on this page and the one on page 6. Use the chart below to choose the best nights to view features.



The phases of the Moon during September 2011

FINALLY THE SUN THIS MONTH

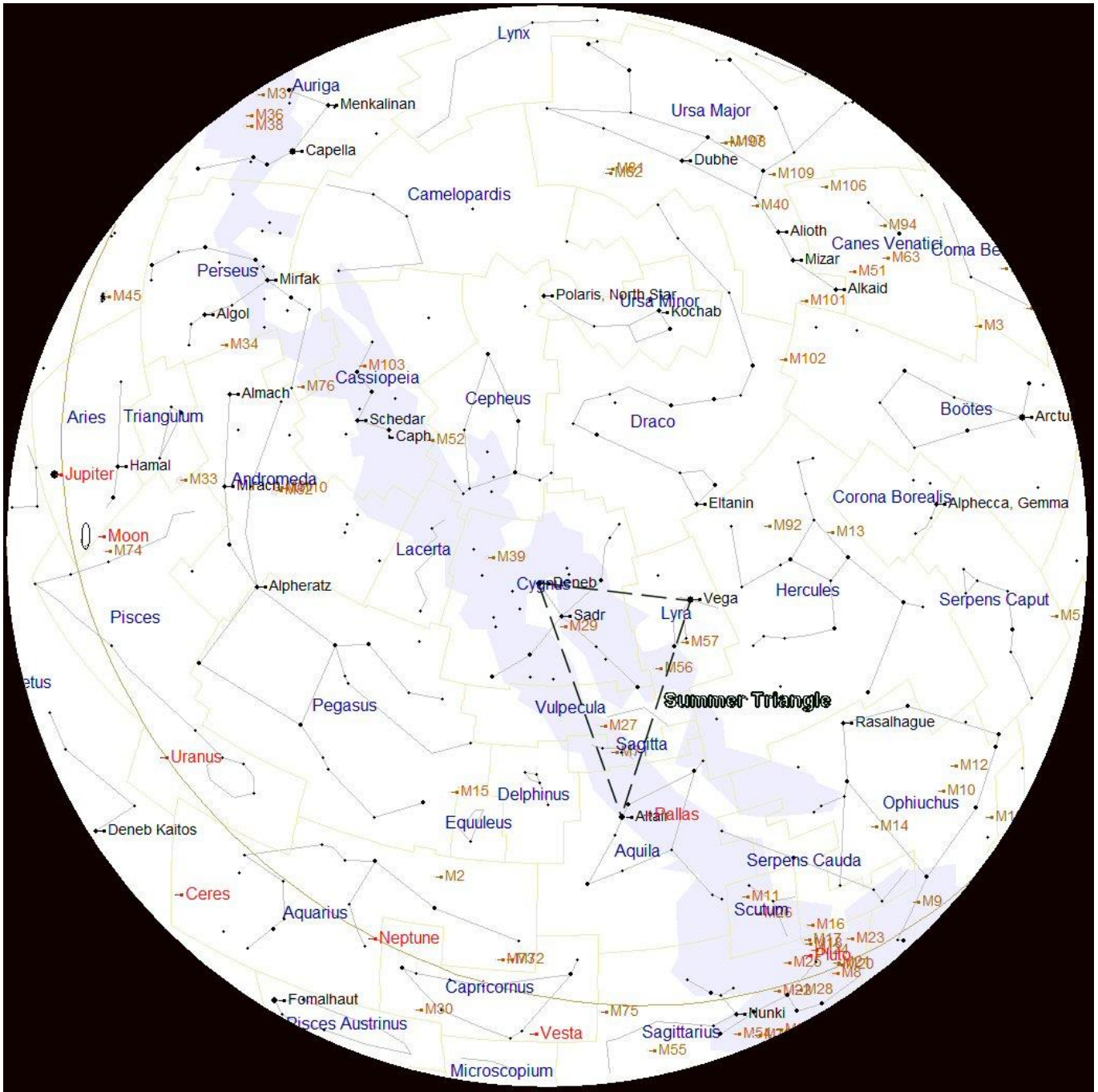
Observing the Sun is a very interesting thing to do especially in the summer when the sky is light until 10:30 or even 11:00 around mid-summer. Like the Moon the Sun is a large target and is of course very bright. Here we must mention safety. Never use a telescope or binoculars to look directly at the Sun. This must only be done when a special solar filter is fitted or if the image of the Sun is projected on to a screen.



Sunspots imaged on 1st July 2011 by Steve Harris

The Sun has an eleven year cycle of increasing sunspot activity. The build up to the next maximum activity has been slow to start and sunspots have been few and far between. However a number of large spots appeared during late June and early July. The Solar maximum should reach its expected peak during 2013 when there should be more activity and more Sun Spots.

THE SKY THIS MONTH



The chart above shows the night sky as it appears on 15th September at 9 o'clock in the evening British Summer Time (BST). As the Earth orbits the Sun and we look out into space each night the stars will appear to have moved across the sky by a small amount. Every month Earth moves one twelfth of its circuit around the Sun, this amounts to 30 degrees each month. There are about 30 days in each month so each night the stars appear to move about 1 degree. The sky will therefore appear the same as shown on the chart above at 10 o'clock BST at the beginning of the month and at 8 o'clock BST at the end of the month. The stars also appear to move 15° (360° divided by 24) each hour from east to west, due to the Earth rotating once every 24 hours,

The centre of the chart will be the position in the sky directly overhead, called the Zenith. First we need to find some familiar objects so we can get our bearings. The Pole Star **Polaris** can be easily found by first finding the familiar shape of the Great Bear 'Ursa Major' that is also sometimes called the Plough or even the Big Dipper by the Americans. Ursa Major is visible throughout the year from Britain and is always quite easy to find. This month it is close to the north eastern horizon. Look for the distinctive saucer shape, four stars forming the bowl and three stars forming the handle. Follow an imaginary line, up from the two stars in the bowl furthest from the handle. These will point the way to Polaris which will be to the north of overhead at about 50° above the northern horizon. Polaris is the only moderately bright star in a fairly empty patch of sky. When you have found Polaris turn completely around and you will be facing south. To use this chart, position yourself looking south and hold the chart above your eyes.

Planets in the morning sky are: Mercury and Mars Planets in the night sky are: Jupiter, Uranus and Neptune.
The planets not visible this month are: Venus and Saturn