

# NEWBURY ASTRONOMICAL SOCIETY

## BEGINNERS MAGAZINE - June 2013

### THE NIGHT SKY DURING THE SUMMER

The warm summer nights are not the best for astronomers as from May through to the end of July the sky does not get completely dark. The summer night sky will never look as black as we see it in the winter. During the midsummer months the Sun is only just below the northern horizon, even at midnight. Even from southern England the sky to the north retains a hint of blue.

However there are still interesting things to see in the night sky. Sometimes at sunset, just as the Sun dips below the north western horizon a pillar of red light may be seen rising up from the position where the Sun is below the horizon. This is called a Sun Pillar and it can be quite spectacular.



A Sun Pillar with two side pillars

Another interesting and elusive phenomenon to look out for is the appearance of Noctilucent Clouds. These are very unusual clouds located high in the upper atmosphere. Most clouds are found in the 10 kilometres or so above sea level but these special clouds are at the very top of the atmosphere up to 80 kilometres above sea level. When the Sun is below the horizon and all other types of cloud are in darkness, they may be seen in silhouette against the night sky in the north after sunset and through the night. The Noctilucent Clouds are so high they remain in sunlight and appear as spectacular silver wisps and ripples.



Noctilucent Clouds imaged from Wiltshire by Richard Fleet:

Anyone who spends time looking up at the night sky will see lots of lights moving in all directions across the sky. Many of these objects will of course be aeroplanes which can normally be identified by having flashing lights. Some objects however do not have flashing lights and appear very star like but move quite quickly across the sky, these are almost certainly satellites of one kind or another.

Although not astronomical objects, astronomers regularly come into contact with satellites as they zip through the field of view of telescopes. Even through a telescope they look small and very much like a fast moving star. On a clear night a satellite can be seen with the naked eye every few minutes. There are now so many objects orbiting Earth that at times there may be three or more visible at the same time. Some are faint but some are really quite bright. It is easy to say to oneself "wouldn't it be good to know what they are?" As it happens, we can easily find out.

With a computer connected to the internet we can log on to a site called [www.heavens-above.com](http://www.heavens-above.com). From the home page click on 'select observing site - from database'. Select United Kingdom then enter your town or a town close to you i.e. Newbury or Thatcham. You can change the coordinates to your own house if you wish and if you chose to subscribe to the website (free) it will remember your location. Some of the best known and brightest orbiting objects are listed so just click on the highlighted name from the list. The times that the International Space Station (ISS) will pass over your position can be listed. The site will tell you the time of its appearance, position and its path across the sky and even how bright it will be (in magnitudes, lower numbers are brighter).

A good party trick to try out on friends is to look up the times that an 'Iridium' satellite will pass over your position. These are an array of about 80 communication satellites. Each satellite has large shiny surfaces that reflect sunlight down on to the ground like a mirror. If the path of the centre of the reflected light passes through your position the satellite can appear very bright for a few seconds. List the Iridium passes for a week or so and pick one with a minus magnitude number (perhaps -4 to -8). At the predicted time invite family or friends out look up to the prescribed position in the sky and start a countdown using an accurate clock. They will be amazed as to how you were able to make this bright flash appear in the sky.

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THIS IS THE LAST MAGAZINE UNTIL SEPTEMBER

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#### NEWBURY ASTRONOMICAL SOCIETY MEETINGS

6<sup>th</sup> September Visual Planetary Observing - Paul Abel  
Website: [www.newburyas.org.uk](http://www.newburyas.org.uk)

#### THE NEXT NEWBURY BEGINNERS MEETING

18<sup>th</sup> September The Autumn Night Sky and Hercules  
Website: [www.naasbeginners.co.uk](http://www.naasbeginners.co.uk)

## ANNULAR SOLAR ECLIPSE OVER AUSTRALIA

On 10<sup>th</sup> May 2013 there was an Annular Solar Eclipse visible across Australia and the Pacific Ocean. At the peak of the eclipse which lasted up to six minutes, the Moon was directly between Earth and the Sun. However the Moon was just about at its furthest from Earth on its orbit and consequently appeared smaller than the Sun. As a result the outer edge of the Sun was still visible around the edge of the Moon. This is what is known as an 'Annular Eclipse'.



The Annular Eclipse imaged from Australia

The eclipse began in Western Australia and tracked over Northern Territory where it left the coast and continued its journey out across the Pacific Ocean. It did not cross any other land and ended its track in the middle of the Pacific Ocean. See the chart below.



A chart showing the track of the annular eclipse

Annular eclipses occur when the eclipse coincides with the Moon being at its most distance point in its orbit so it looks comparatively small. For the best and longest eclipse of this type Earth must also be at its closest approach to the Sun so that the Sun appears larger to us. At this time the Moon appears smaller than the Sun and will not completely cover the Sun's disc.

As can be seen from the image above the view is quite impressive. The edge of the Sun was still visible around the outside of the Moon leaving a bright ring in the sky. However it does not get completely dark during an annular eclipse and there is no corona visible around the Sun.

In the very distant future, as the Moon moves further away from Earth, it will never be able to completely cover the Sun and then only annular eclipses will occur.

## ANOTHER ASTEROID CLOSE ENCOUNTER

An asteroid approximately 2.7km in length (nine times the length of the QE2 cruise ship) passed by Earth at the end of May, according to NASA. We did not need to worry though, for the giant space rock didn't come any closer than 5.8million kilometres, or 15 times the distance from Earth to the Moon. Its surface was covered in a sticky black substance similar to the greasy soot found at the bottom of a barbecue. If it had impacted with Earth it would probably have resulted in a global extinction event. It was a good thing that it was just making a fairly close flyby.

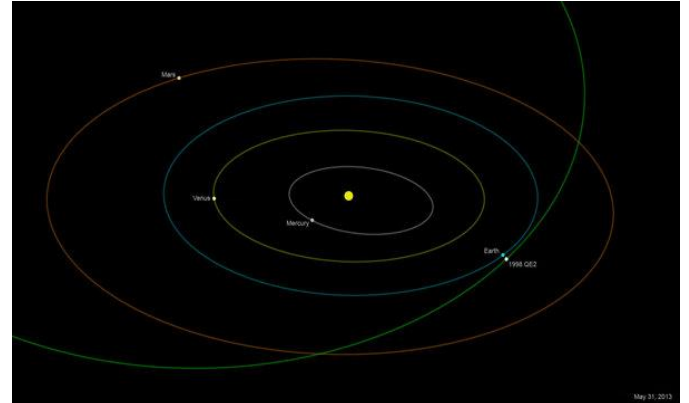


Chart showing the path of Asteroid 1998 QE2

Scientists are not sure where this unusually large space rock which was discovered 15 years ago, originated from. The mysterious sooty substance on its surface could indicate it may be the result of a comet that flew too close to the sun. It might also have leaked out of the asteroid belt between the orbits of Mars and Jupiter.

The asteroid that was named Asteroid 1998 QE2, gave astronomers the chance to get a close look at the size, shape and features of this type of asteroid and they hope to be able to find out more about its origin.

NASA astronomer Lance Benner said: "Asteroid 1998 QE2 will be an outstanding radar imaging target at Goldstone and Arecibo [observatories] and we expect to obtain a series of high-resolution images that could reveal a wealth of surface feature information."

"We will also use new radar measurements of the asteroid's distance and velocity to improve our calculation of its orbit and compute its motion farther into the future than we could otherwise."

The asteroid was discovered in 1998 by the prestigious Massachusetts Institute of Technology and despite the comparisons it was not named after the QE2 cruise ship. Its size has instead been more accurately compared to San Francisco's Golden Gate Bridge.

The asteroid was at its closest at 9:59pm on Friday 31<sup>st</sup> May and will not be as close again for nearly 200 years. There was no chance that Asteroid 1998 QE2 could collide with Earth on this encounter and its next close approach won't be until 2119. This was a really big asteroid, similar in size to the one that killed off the dinosaurs and it was quite close to us. Fortunately its orbit has been very carefully tracked so we know with great certainty it will not hit us when it returns, at least not in the predictable future.

## OBSERVING METEORS THIS SUMMER

Before rushing out into the garden to look for meteors, there are a few things to consider for your own comfort, the first and most important is clothing. The nights, even in summer, can be cold so it is essential to dress in warm clothes. A number of layers of clothes are often better than one overcoat. A vest or tee shirt, a long sleeved shirt and a jumper, perhaps a body warmer and then an outer jacket should be considered. Two layers on the legs are also necessary. Long leg thermal pants are excellent for men or women but track suit bottoms are also good as an under garment. Then jeans or a thick pair of trousers should be worn over the top. Water proof trousers and jackets are also good for keeping the damp and wind out. Two pairs of socks are a good idea and warm shoes. Most trainers these days are padded and are quite warm. A woolly or padded hat is essential because a lot of the body heat is lost from the head but peaked hats should be avoided. Finally a pair of gloves must be worn. It is always best to start warm and stay warm because once the cold has set in it is very difficult to get warm again.

A garden 'lounger' chair is an excellent piece of equipment especially the type that can be reclined into a near horizontal position. This will help avoid neck and back ache when looking up. When sitting in a garden chair a blanket or old quilt can also be used for additional warmth. A sky chart, like the one at the end of this magazine, will be useful to locate the part of the sky where the meteor radiant will be located. To read the star chart in a dark garden will require a torch but a bright white light should be avoided. A red lamp such as a rear cycle lamp is better, to avoid ruining the dark adaptation of the eyes. Even this may prove too bright so a piece of card can be used to shutter off some of the light. The card can be secured over the lamp with tape or an elastic band. A 10mm hole cut in the card should provide enough light to read the chart and not ruin the night vision. Turn off any light that you can and set up a screen to hide street lights to stop them dazzling you.

You may wish to take notes of what you have seen or even mark the positions of the meteors on your star chart so a pencil should be taken out to the observing spot. If you intend to have a long observing session, especially for a meteor watch, then a hot drink in a flask would prevent missing some of the show and avoid losing dark adaptation by going indoors to make a hot drink.

Most importantly ensure that you are comfortable before you start observing and have everything you need to hand. It is very irritating to have to keep getting up to try to find something you have forgotten especially if you need to go indoors to get it. Once you are comfortable and settled, with everything you need, then you are ready to start the meteor watch session.

Now on to where to position yourself. Use the patio or path if possible, they are more comfortable and less prone to dampness from dew. Obviously try to set up away from trees or buildings but this may not be possible so set up in the best place to view your intended target, you can always move to another position later. Make sure you have everything to hand, a small table or box by your side will provide a convenient place to put your chart, torch, spectacles or even a hot drink and will save fumbling around on the ground for things.

To start viewing allow about five minutes for your eyes to become adapted to the dark. This period can be used to familiarise yourself with the sky and work out where everything is. Try to turn off all lights around you. If there is a street light bothering you, it may be possible to erect a screen around yourself using garden canes, step ladders, washing poles, string and old sheets, curtains, towels or even newspapers. Even lights which appeared dim when you first began your session seem to get very bright when your eyes are fully adjusted to the dark.

It is useful if you can observe from your own back garden because you can quickly get used to the positions of stars from one night to the next. It is not always possible to use your own garden due to the dazzling effect of street lights or perhaps trees or buildings blocking the view. It may be necessary therefore to go to a darker area away from lights. If this is the case it is much better to go with a friend, if possible, as it will be safer and more enjoyable. A remote observing site also has the disadvantage of having to transport any equipment. If it is decided to try a remote site, always check the weather forecast first - this might save a lot of travelling and anguish when the sky clouds over shortly after all has been set up.

After making yourself warm and comfortable and allowing enough time for your eyes to become adapted to the dark it is time to start observing. The first thing to do is to look around the sky to find familiar objects. The most common thing used is the constellation of Ursa Major also called the Plough. Use the instructions on the back page to align the chart. Now position your star chart just above your eyes ensuring that the south position on the map is at the bottom. What you see represented on the chart should be what you see in the sky. Once the orientation is complete the chart can be lowered into a convenient reading position.

Observing can start before midnight but there will most likely be fewer meteors at this time. There are two reasons for this, first the radiant might be below the horizon so fewer meteors will appear above the horizon and secondly after midnight Earth will be ploughing head on into the main meteor stream. It is normally best to look up at an angle of around 45° above the horizon and 30° to 90° from the radiant point. It will also be useful to familiarise yourself with the positions of the constellations in the direction you are looking while you are waiting for the meteors.

If you feel quite enthusiastic about observing the meteors, you may wish to make a log of every one you see - this can be done in two ways: Notes can be made on a pad detailing the time, direction and brightness. It will be necessary to note which constellations the meteor passes through or at least where it ended. These notes can then be plotted on to the chart later. You could alternatively draw the path on your chart and note the time and brightness on the line. The latter should be more fun because if the shower is good you will soon see a pattern developing where the lines trace back to a common point. There may also be some sporadic meteors which are not members of the shower and do not originate from the same place. These are also interesting when marked on the chart.

The clarity of the sky will make a significant difference to the number of meteors that can be seen. Any mist or hazy cloud will severely reduce the chance of seeing the fainter meteors especially if observing from a light polluted area. If it is cloudy there is of course less chance of seeing any meteors at all. It is never possible to predict exactly when the maximum peak might appear and sometimes it may not appear at all. This is because the dust from the comet that produces the meteors moves through space in wisps and filaments. All depends on whether Earth passes through a filament and how thick that filament is.

The only thing that is predictable about meteor showers is they will always be unpredictable. Just hope for clear skies and a good shower.

### So what are Meteors?

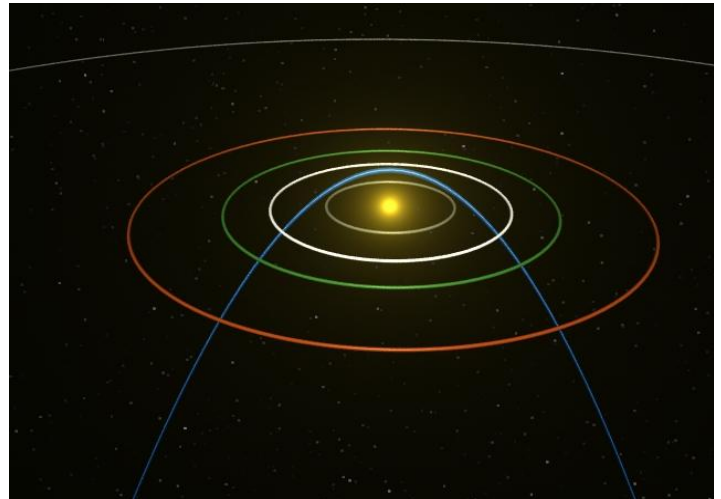
On any clear night if you sit back and look up into the night sky for a while you will more than likely see a streak of light speed across the sky - this will be a METEOR or shooting star. It is not a star at all it is just a small speck of dust known as a METEOROID entering the Earth's atmosphere at very high speed. Just as the space shuttle or other space craft becomes very hot as it re-enters the atmosphere at about 30 thousand km/h these dust particles get even hotter at their re-entry speed of up to 270 thousand km/h. At this speed the dust is vapourised by the heat and the surrounding air is also heated until it glows in a similar way to a fluorescent light.

There are two types of Meteor, the first is thought to originate from the large lumps of rock and iron left over when the planets formed, known as ASTEROIDS. Most asteroids orbit the Sun in a belt between Mars and Jupiter. The huge gravitational forces exerted by Jupiter may have pulled the rocks apart before they could accumulate into a planet. Very rarely two asteroids may collide but when they do, chips of rock and Iron are thrown off and occasionally head towards Earth. These may be a few millimetres across or up to tens or even hundreds of metres across. They are quite rare and are seen as individual 'fireballs' sometimes impacting the ground as METEORITES and if big enough may even cause craters.

The second type of meteor originates from a comet and is much more common. Comets are large lumps of ice, typically between ten and thirty kilometres across that reside beyond the orbit of the planets. There are millions of these objects just sitting there quietly orbiting around the Sun at enormous distances. Occasionally one of these objects may be nudged out of its orbit by a close encounter with another object and may begin to move in towards the Sun. As a comet, which can be thought of as being like a giant dirty snowball, approaches the Sun, the water and frozen gases begin to boil off and are blown away by the radiation from the Sun. This gas and dust form the familiar twin tails associate with comets.

Dust particles released by the melt are heavier and therefore continue more or less on the same orbit. These particles spread out along the orbital path and may eventually form a complete ring around the orbit. Once or twice a year Earth may pass through this stream of particles that then collide with the atmosphere as Meteors. Meteoroid dust particles are usually small and very light as they have the consistency of cigarette ash.

Travelling at between 11 and 76 km per second they have a lot of kinetic energy (energy due to velocity) and burn up in the thin atmosphere at a height of about 100 km.



The path a comet might take as it loops around the Sun. Different particle streams may be inclined at different angles to Earth's orbit therefore meteors can enter the atmosphere at almost any angle. The speed of entry varies enormously depending on the angle of entry. Those entering the atmosphere head on to Earth's orbit have the highest combined speed and appear to streak across the night sky fastest.

Meteor showers occur at the same time each year and appear to radiate from the same point in the sky so each shower is named after the constellation in which the radiant point is located. The Perseid shower that peaks on the 12<sup>th</sup> August appears to radiate from the constellation of Perseus and is usually the best shower to watch out for. The best time to look will be after 23:00 on 11<sup>th</sup> to 13<sup>th</sup> August. Perseid meteors are associated with the periodic comet Swift Tuttle discovered in July 1862.

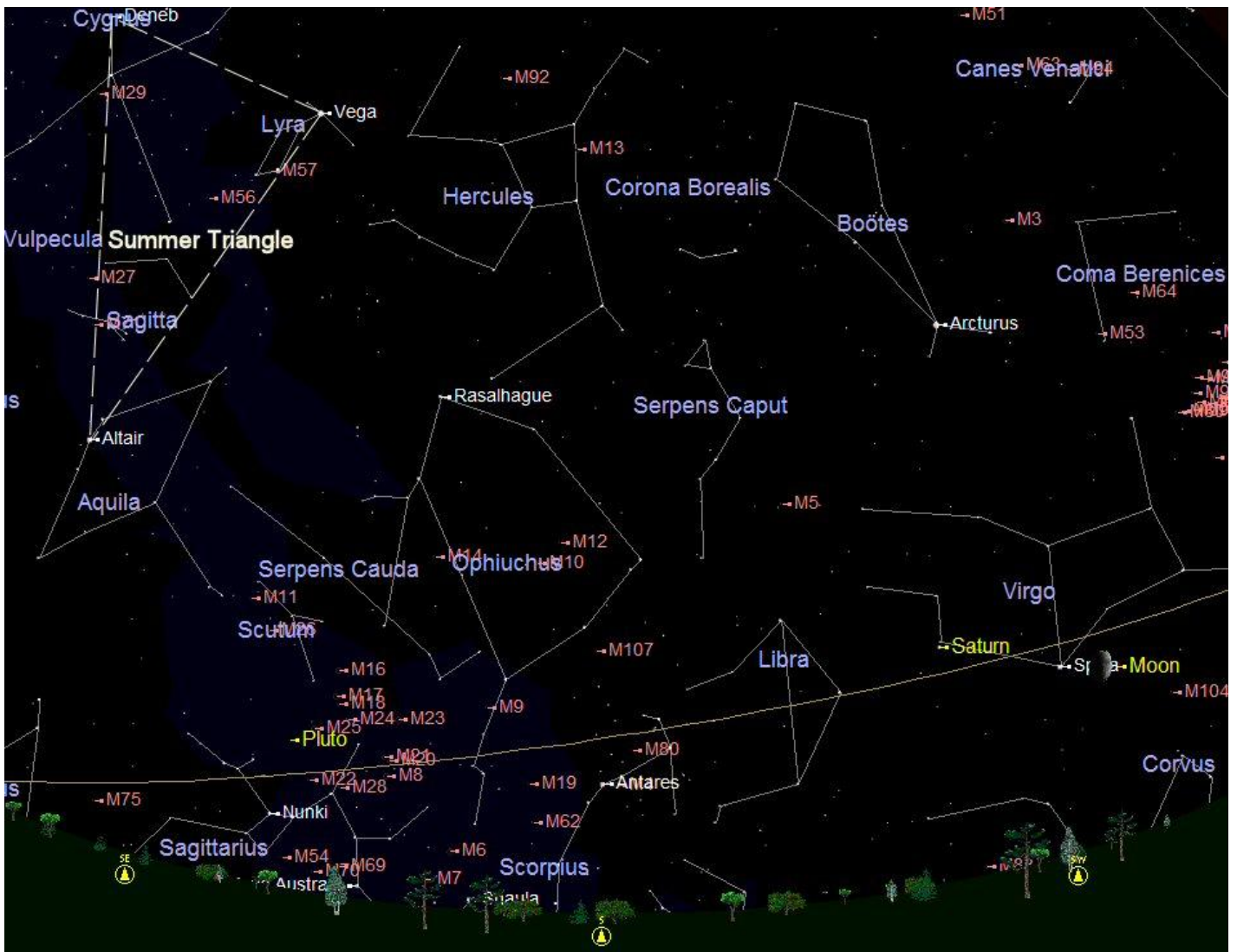
The following table lists the main summer meteor showers and the date of the peak of activity.

PERIOD	SHOWER NAME	MAXIMUM
June 17 - 26	Ophiuchids	June 19
July 15 - Aug 15	Delta Aquarids	July 27
July 15 - Aug 20	Piscis Aquarids	July 31
July 15 - Aug 25	Capricornids	Aug 2
July 27 - Aug 17	Perseids	Aug 12

Meteors originating from comets are completely harmless and seldom reach closer than 80 kilometres above the surface of Earth. Meteor showers are best observed after midnight. The reason for this is the point on Earth where we are sitting starts to face toward the direction Earth is travelling around the Sun. At dawn we face directly forward. Earth is travelling at nearly 100,000 km/h in its orbit around the Sun, so as Earth ploughs head on into the stream of dust particles (meteoroids) the combined speed of the collisions can be up to 270,000 km/h.

The reason the meteors appear to radiate from a point in the sky is because of the effect of perspective. It is rather like when a car is driven in a snow storm and the snowflakes seem to radiate from a point directly in front of the windscreen. When the radiant is below the horizon we will only see the meteors that head upwards and they appear to shoot up from below the horizon.

## EXPLORING THE NIGHT SKY THIS MONTH



The chart above shows the summer night sky, looking south, at about 22:00 (10 o'clock BST) around the middle of July. During June the constellations will be further east (left) and during August they will be further to the west (right). During the summer months the sky does not get completely dark and the stars may not be visible until quite some time after 22:00.

The Spring constellations are moving off the chart to the right and the summer constellations are moving into view from the left. The familiar Summer Triangle is appearing in the south east and is shown at the top left of the chart. The Summer Triangle is made up of the three bright stars: Deneb in Cygnus, Vega in Lyra and Altair in Aquila. M57 in Lyra is the beautiful 'Ring Nebula' which is the remnant of a star similar to our Sun that has reached the end of its time as an active star. M27 is also a 'Planetary Nebula' similar to M57 but is 'Butterfly' shaped rather than resembling a smoke ring.

To the west (right) of the Summer Triangle is Hercules with its brightest stars marking out the shape of a 'keystone' (the central stone in a stone bridge or arch). The stars of the 'keystone' are not particularly bright but are worth searching out. Located in the western vertical side is the beautiful Globular Cluster M13. This is a compact ball of around a million stars. M13 is visible using a pair of 10x50 or 8x50 binoculars but better seen

through a telescope.

Further still to the west is Boötes which has a shape that resembles a triangular 'kite' with Arcturus at the lower point of the kite where the tail would be fixed. There are no bright interesting objects in Boötes but Arcturus a Red Giant star is the fourth brightest star and looks distinctly orange through binoculars or a telescope.

Saturn will be in a good position for observing throughout the summer months. During June it will be in the south as the sky darkens but will be further west through July and August. Saturn will not reach a high altitude because the Ecliptic (the imaginary line along which the Sun, Moon and planets appear to move across the sky) is always low in the south during the summer months. Saturn will be close to the bright star Spica in the constellation of Virgo. Its position is shown at the centre right in the chart above.

Further east along the ecliptic in the constellations of Scorpius and Sagittarius there are many Messier objects to search out. Some are objects that can be seen using binoculars but look really beautiful through a telescope. M11 in the small constellation of Scutum is perhaps the best open cluster of the Messier objects to look at using binoculars. It is quite high above the horizon and its component stars are bright. The cluster is also known as the Wild Duck Cluster because to some observers it does resemble a flying duck.

# THE SOLAR SYSTEM THIS MONTH

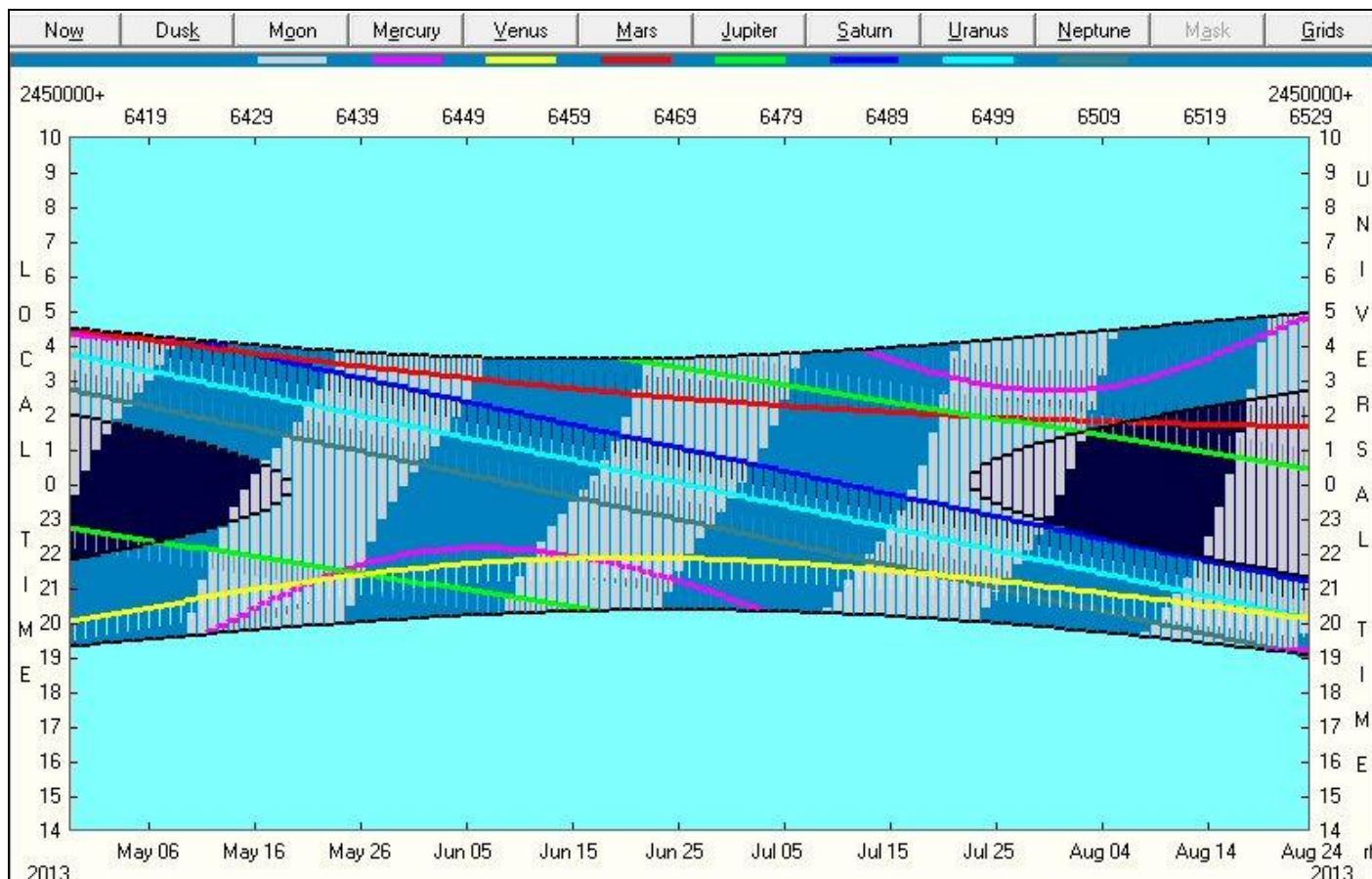


Chart showing the availability of the planets for observing during the summer months

The chart above is from Richard Fleet's Graphdark application and shows graphically the positions of the planets during the summer months. Along the top of the chart is the key to the colour of each planet on the chart. The vertical bars above a planet line indicate the planet will be visible from the time inferred by that line until dawn. Bars below the planet line indicate the planet is visible until the time inferred by the line.

The curved black line at the bottom shows when night begins and the top line when night time ends. The white and blue areas show when the Moon is in the sky (white) or is not in the sky (blue). The areas where the Moon is shown black indicate that the sky does get completely dark. The chart shows the sky does not get completely dark from the middle of May until the end of July.

**MERCURY** is observable in the evening twilight as it follows the Sun down over the western horizon during June. It will then be observable during July and August before sunrise in the east.

**VENUS** after joining Mercury and Jupiter just above the western horizon at the end of May, Venus will be visible all summer in the west after sunset.

**MARS** will be gradually moving into view during the summer as it moves away from conjunction with the Sun. It will rise progressively earlier than the Sun in the east but remains distant and looks very small.

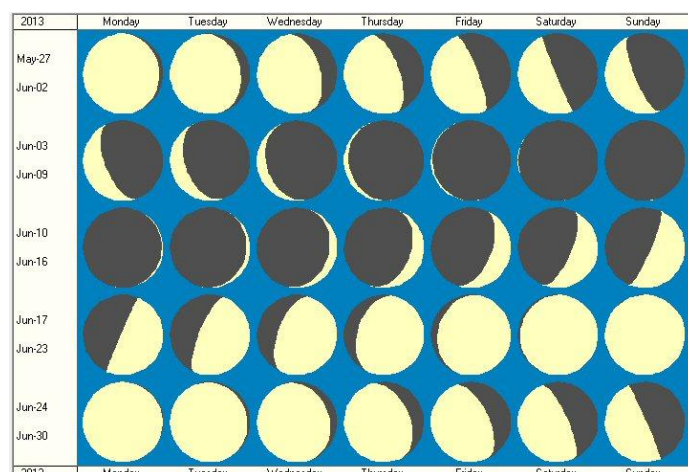
**JUPITER** will be in conjunction with the Sun during late June and early July but will start to become visible in the early morning from late August.

**SATURN** will be observable throughout the summer months with the ring nicely opened up. (See page 5.)

**URANUS** will be observable all night throughout the summer months.

**NEPTUNE** will be observable all night throughout the summer months.

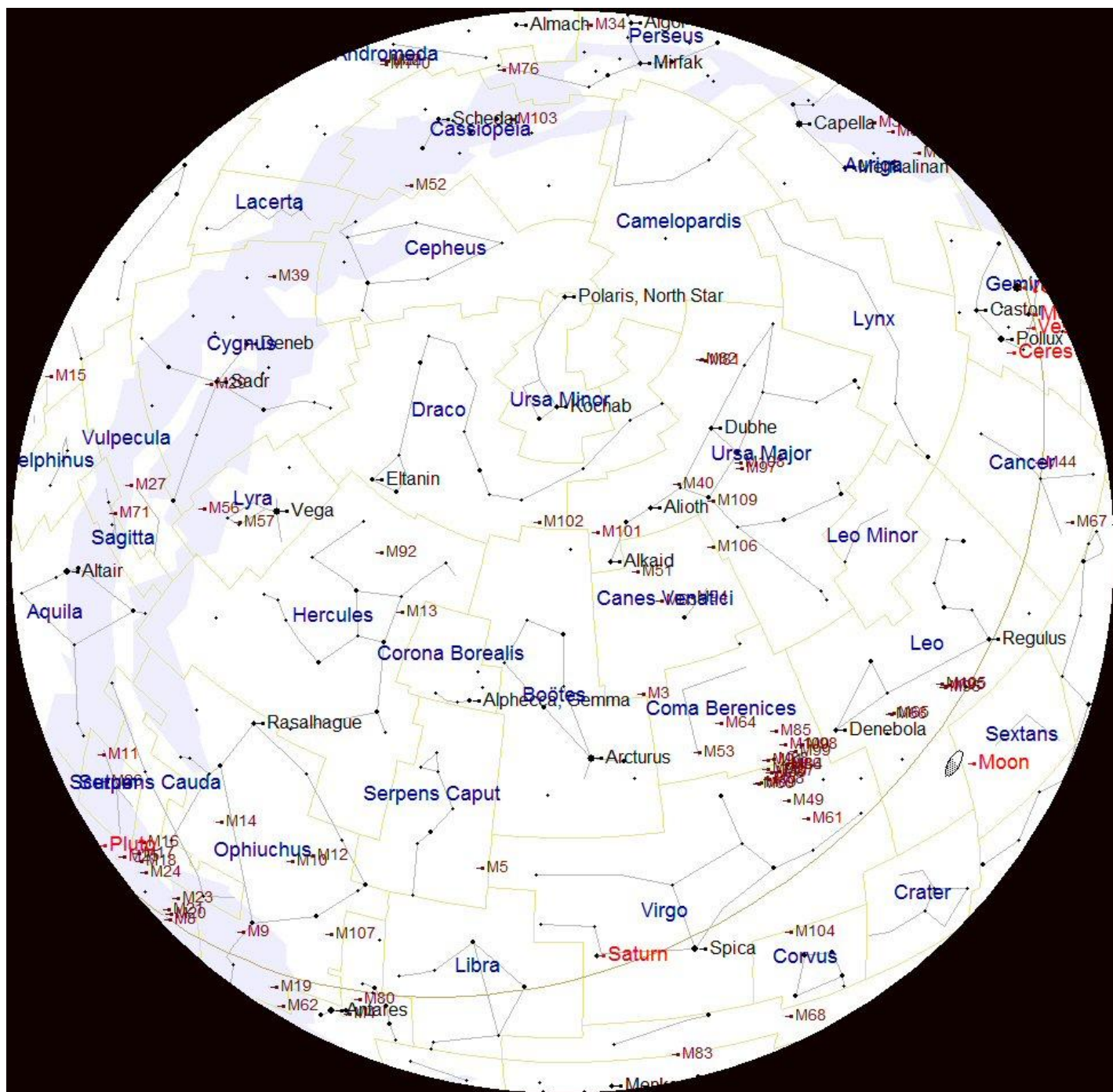
## THE MOON PHASES JUNE 2013



The best views of the Moon are obtained when it is not full and the terminator is crossing the surface.

The full Moon will look very impressive as it rises over the eastern horizon during the summer months due to an optical illusion effect that makes it look much bigger.

## THE NIGHT SKY THIS MONTH



The chart above shows the night sky as it appears on 15<sup>th</sup> June at 10 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 11 o'clock BST at the beginning of the month and at 9 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 directly overhead. Look for the distinctive saucepan 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.