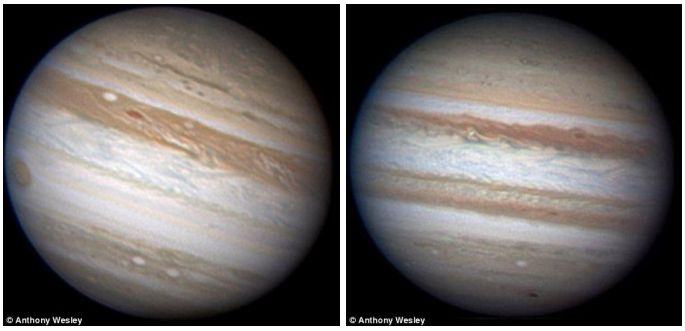
NEWBURY ASTRONOMICAL SOCIETY
BEGINNERS SECTION MAGAZINE – SEPTEMBER 2010

JUPITER BACK IN VIEW

Jupiter is just starting to rise above the eastern horizon at a reasonable time for observing. The king of the planets was last seen low in the western sky in January as it moved into conjunction with (passed behind) the Sun. It has now emerged from behind the Sun and has taken on a rather strange appearance; it has lost one of its most prominent cloud bands.



The South Equatorial Belt has been obscured by white clouds of Ammonia ice crystals higher in the atmosphere. This should be a temporary feature that occurs on average every 15 years so make the best of it and have a look before the belt reappears.

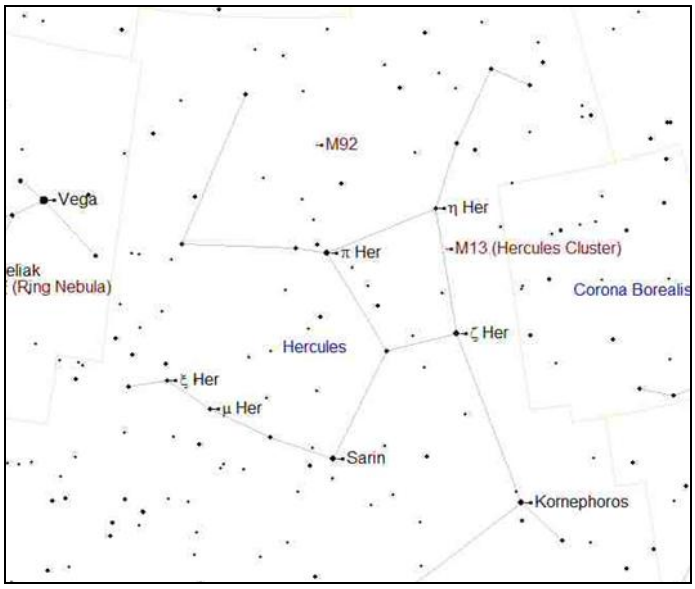
Jupiter is in the constellation of Pisces will be in a reasonable position for observing by 20:30 in middle of September see the chart on page 5. Jupiter actually climbs over the eastern horizon at 19:30, which is after sunset. At locations with a clear view towards the east Jupiter should be visible by 20:00. Being so low in the sky any detail on the planet will be difficult to discern but the four largest moons should be visible. By 22:30 Jupiter should be in a good position for good observing.

Jupiter and the four brightest moons

The picture above shows how Jupiter appears in more favourable seeing conditions. The seeing conditions are a little more challenging at the moment but will improve later in the year as the giant planet climbs higher in the sky and rises even earlier.

Jupiter is a great target for a modest sized telescope. It is large, bright and is never the same from one night to the next. The moons appear in different positions as they move around their orbits. They sometimes pass in front of the planet and cast a shadow on the surface. The cloud patterns also change continuously as the planet rotates on its axis every 10 hours.

THE CONSTELLATION OF HERCULES



Hercules is quite easy to find as it is positioned just to the west of Lyra which has the brightest star in the Summer Triangle Vega.

One of the most beautiful objects in the sky is just moving towards the west at this time of the year in the constellation of Hercules. This is Messier 13 (M13), the Great Globular Cluster of stars in the constellation of Hercules. To find M13 locate the two stars forming the longer right side of the lopsided square 'keystone' at the centre of Hercules. (A 'Keystone' is the centre stone of a stone arch.) Then look about one third of the way down between these stars and there you will see a small hazy patch of light. M13 is one of the finest star clusters in the northern sky and can be glimpsed with small pair of binoculars on a clear dark night and is easy to find using 10 x 50 binoculars. To see M13 in its full glory does of course require a modest telescope but even using a small instrument or binoculars it can still be seen. See the article on globular clusters on pages 3 and 4 and M13.

Although there are about 200 globular clusters in our galaxy they are not common and many are too faint to see in modest sized telescopes. Others are hidden by the stars and dust in the Milky Way itself. It is therefore quite surprising that there is a second globular cluster in the constellation of Hercules. The second is known as M92 and is located above (to the north) of the 'keystone' (see the chart above). M92 is further away than M13 and therefore appears smaller and fainter. It requires a slightly larger telescope to see in detail. It appears neater than M13 being more circular in shape and very beautiful to look at. See page 4.

NEWBURY ASTRONOMICAL SOCIETY BEGINNERS

15th September Globular Clusters

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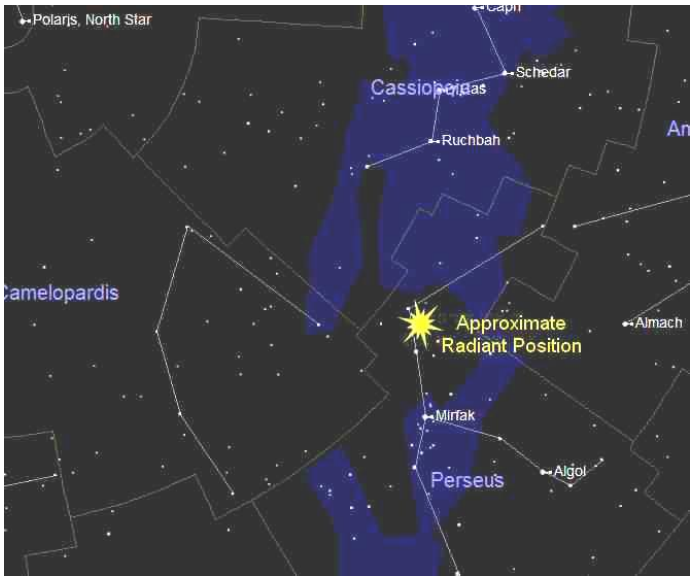
THE PERSIED METEOR SHOWER

One of the best meteor showers of the year occurred during the month of August. This time of year it comes with the added bonus that it is not freezing cold to go out and watch it. The shower is called the Perseid shower because the meteors appear to radiate from a point within the constellation of Perseus. A peak in activity of the shower was predicted between 23:00 on Thursday 12th August and 03:00 on Friday 13th August. The shower normally begins a week or so before and continues a week or more after the peak. A significant increase in the number of meteors can be expected during the peak period.

Perseus is located in the north east at this time of the year and is quite easy to find. Look for the familiar saucepan shape of Ursa Major also called the Great Bear or the Plough. Take an imaginary line from the two stars that form the side of the 'bowel' of the saucepan furthest from the handle. Follow the line of the stars up out of the saucepan, through the pole star Polaris and on to the 'W' shape of Cassiopeia. Follow the misty line of the Milky Way down to the north east and there will be a line of fairly bright stars leading down towards the horizon this is the constellation of Perseus.



The Radiant Position in Perseus

The meteors in the Perseid shower were created when dust particles that originated in the tail of the famous Comet Swift-Tuttle crash into our atmosphere. As a comet approaches the Sun the ice that the comet is composed of melts and is blown away by the Solar Wind to form a tail. The ice is very dirty so as it melts the particles of dust in the ice are released and are also pushed off into space to form part of the tail. As the dust is heavier than the gaseous material it tends to follow a similar path to the main body of the comet. Gradually the dust becomes spread out around the Sun along the orbit of the comet. Once a year Earth may pass through part of the ring of dust left over from the comet.

It is difficult for us to comprehend that the planet that we live on is travelling at about 61,000 mph in its orbit around the Sun. When Earth ploughs head on into this stream of dust particles, the combined speed of the collisions can be up to 120,000 mph. At this speed, the particles burn up violently as they hit the top of the atmosphere about 100 kilometres above us. We see the trail of the tiny piece of dust (a Meteoroid) as a streak of light crossing the sky that we call a Meteor.

Members of the Newbury Astronomical Society were joined by members of the Reading Astronomical Society for a Meteor Watch at the Wilcot Village Hall near Pewsey in Wiltshire. Richard and Nicky Fleet had booked the hall in the village where they live so we could share the evening with people from the village and friends. The evening started at 22:00 (10 o'clock) on Thursday evening 12th August and finished at about 03:15 with a very welcome cup of tea.

Despite threatening clouds the sky cleared by about 22:15 and the darkness of the unpolluted sky in the Wilcot area began to show. People grabbed their seats and garden loungers if they had brought one with them and moved into the field next to the village hall. Straight away the meteors started to be seen. There were groups of people around the field but they could not be seen because only heard because it was so dark. Every few minutes there were gasps of delight out of the darkness as the bright meteors streaked across the sky. At 22:50 everyone took a welcome break to enjoy some of Nicky's delicious hot soup and a bread roll then hurried back to meteor watching. On returning to our seats there was a great cheer from the dark field as one of the brightest meteors of the evening (a fireball) flashed across the sky at 23:31.

The Fireball Imaged by Richard Fleet

David Boyd recorded the time each meteor was seen between 21:45 and 01:45 and an estimate of its brightness.

15min intervals	Perseid	Sporadic
21:45	5	
22:00	5	1
22:15	7	2
22:30	4	
22:45	5	
23:00		
23:15	3	
23:30	7	
23:45	10	1
0:00	6	1
0:15	5	4
0:30	11	
0:45	11	
1:00	8	1
1:15	18	1
1:30	13	
1:45	13	
Total	**131**	**11**

Table of the Meteor count by David Boyd

GLOBULAR CLUSTERS

We generally think of stars as being a giant sphere of very hot Hydrogen gas that is producing energy and shining brightly due to nuclear fusion at its centre. This is of course true but it is not so widely appreciated that many stars and possibly most stars reside in groups. These groups may be made up from just a pair of stars to vast swarms of stars numbered in their billions or even trillions.

The smallest groups are pairs or small groups of perhaps four or five stars that are gravitationally bound together. They actually orbit each other as a pair or a pair of pairs all of which may orbit a larger star. The star Mizar in the handle of the saucepan shape of Ursa Major (The Great Bear) is a five star system. Those people with reasonably good eyesight will be able to see that Mizar has a naked eye companion called Alcor. Using a telescope Mizar its self can be seen to be a double star. If the light from the Mizar pair is analyzed using a spectrograph, to separate the colours of its light, there appears to be four separate spectrums. This indicates that each of the stars making up Mizar is an even closer binary system. This makes Mizar and Alcor a five star system.

An artist's impression of Mizar and Alcor in the distance

All stars are thought to have been created in vast clouds of hydrogen such as the one that can be seen in Orion's sword (M42). Gravity causes the gas to form into denser regions. As the density increases the increased gravity causes more gas to be pulled into the region. Eventually the density and increased pressure at the centre of the now spherical cloud causes the central core to become so hot that the Hydrogen atoms are fused into a larger and heavier atom of the gas Helium. This fusion process produces energy in the form of radiation at the centre and a star is born. This process may produce tens or hundreds of new stars depending on the size of the original cloud. As the stars form their intense radiation blows away the surrounding gas and the stars emerge from the cloud. With the surplus gas blown away a group of stars known as an Open Star Cluster will have been formed.

M45 The Pleiades (Seven sisters) Open Star Cluster

The largest groups of stars are known as Galaxies. There are a range of types and sizes but the best known is the Spiral galaxy and this is the type we will be considering in this article. Spiral galaxies look like a huge spinning disc with a central bulge. They are typically like our own galaxy 'The Milky Way' and contain about 200 billion to 400 billion stars. They have curved spiral arms arching out from the core to the edge. Often they have smaller galaxies known as 'Irregular Galaxies' associated with them. Many Irregular Galaxies get pulled into the much larger Spiral by the powerful gravitational field. The Irregular Galaxies are stripped of their stars as they are cannibalized by their giant neighbour.

M31 the Great Spiral Galaxy in Andromeda

Our final type of star group is the Globular Cluster. These are among the most beautiful objects to be seen when looking into the night sky with a telescope. They appear as a spherical ball comprised of between 10,000 and 1,000,000 stars. The stars become denser towards the centre of the cluster. The structure of some of the closer Globular Clusters can be made out using a medium sized telescope (150mm aperture). Some of the outer stars may also be separated on a good clear night.

M13 The Great Globular Cluster in Hercules

Globular clusters are associated with spiral galaxies like our own Milky Way Galaxy and are found in a spherical halo above and below the main swirling disc. There are about 200 of these objects identified in our galaxy and they have also been found in other galaxies. M13 in the constellation of Hercules is quite typical among globular clusters in having several hundred thousand stars and has been estimated to be about 170 light years across. What makes M13 special to us is its proximity, being only 25,000 light years away it is one of the closest. See page 1.

Globular Clusters are not only beautiful but they are also mysterious objects. The stars in globular clusters are very old, first generation stars. This means they do not have the heavier elements (produced by supernovae and other dying stars) which are present in the stars located in the main disc of the galaxy. Many indications suggest that most of the stars in Globular Clusters are almost as old as the universe itself. Most of these stars appear to be over 10 billion years old. The majority of the stars in our galaxy are less than half this age.

One suggestion to the origin of Globular Clusters is that they may be the cores of small galaxies that have ventured too close to larger galaxies and had their outer stars stripped away. The heavier cores may have had enough mass and internal gravity to resist the pull of larger galaxies and avoided the fate of their outer members.

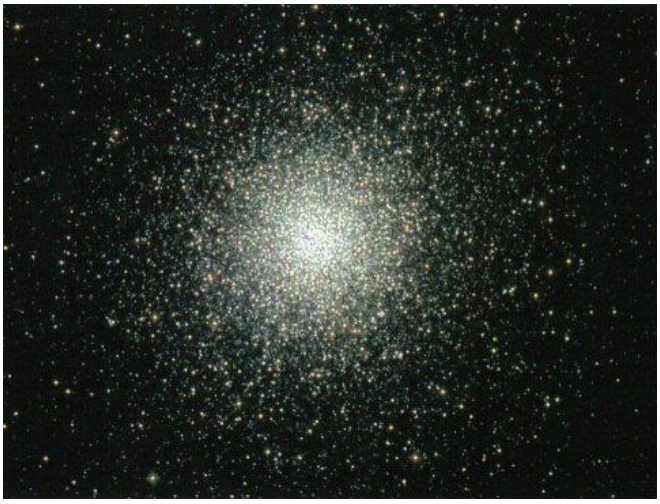
Globular Galaxies are found in halos around spiral galaxies like our own galaxy that we call the Milky Way. Our galaxy has about 200 globular clusters and we can see that M31 the Great Spiral Galaxy in Andromeda has slightly more. The stars and open clusters that are located in spiral galaxies are predominantly found in the flat disc and central bulge. They also rotate around the centre of gravity (the centre of the bulge) en mass within the rotating disc. Globular clusters are quite different as they have more random orbits around the centre of the galaxy. Rather than adhere to the main orbital plane of the disc they move in orbits that pass above and below the disc. Amazingly they can and do pass through the disc structure and suffer very few collisions with the stars in the disc.

The closest of all the globular clusters in our galaxy is Omega Centauri or NGC 5139 (NGC - New General Catalogue). This is the closest (15,800 ly), brightest and the most impressive but unfortunately it is not visible from Britain as it is too far south.

Omega Centauri in the southern constellation of Centaurus

The brightest globular cluster that can be seen from Britain is M13 in the constellation of Hercules (see pages 1 and 3). It is possible to see M13 using binoculars as a small hazy patch of light but it does need a telescope to see in any detail. A small telescope of about 100mm aperture will show it as a ball of stars. A larger telescope of about 150mm to 200mm will show some of the outer stars as individual stars.

The second globular cluster in Hercules is M92 which is smaller and fainter.



M92 in Hercules

Globular clusters are still enigmatic objects that provide astronomers with questions that they still cannot answer. Probably the most asked questions are ‘What are globular clusters?’ and ‘How did they form?’

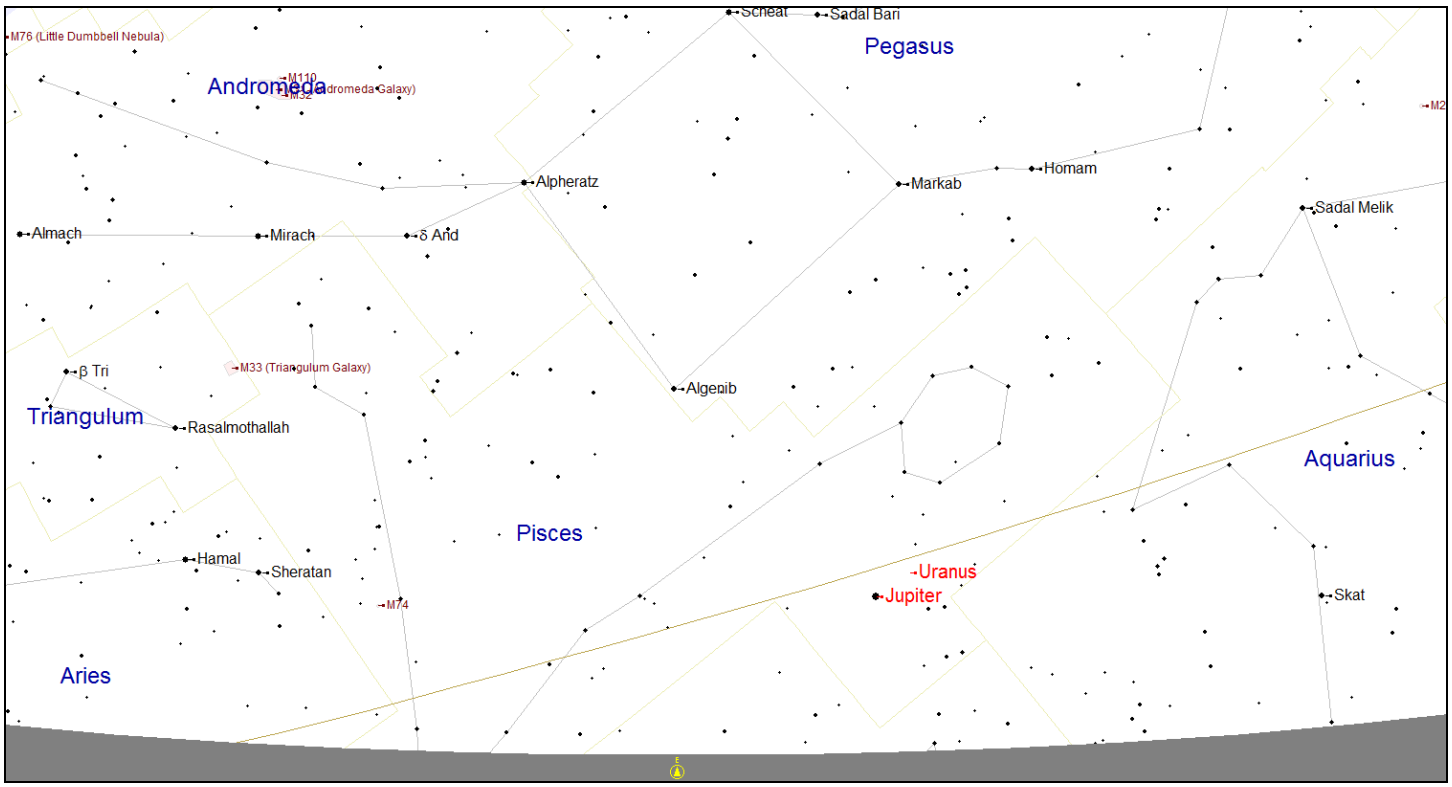
As suggested in the previous column, it is thought that they may be the central cores of small galaxies that have had their outer stars ripped off by their larger neighbour. The stars that globular clusters are comprised of are much closer together than the stars in our neighbourhood. The nearest star to our Sun is about 4.2 light years away and our other close neighbours much further than this. Stars in towards the centre of globular clusters may be as little as 0.25 of a light year apart. This means that if our Sun was in a globular cluster there might be tens of thousands of dazzling stars shining brighter than Venus in our sky.

Another hint to the origin of globular clusters is hidden in the stars of these clusters. They are almost entirely comprised of very old stars in excess of 10 billion years old. This is a similar composition to the stars in the central bulge of larger galaxies. Theses stars also have low or even very low ‘Metalicities’. This is a term astronomers use to describe the proportion of heavier elements present in the stars. The amount of heavier elements (heavier than Hydrogen and Helium) give a measure of when the stars formed.

The first stars that formed after the universe was created were comprised predominately of Hydrogen and a small proportion of Helium. Many of these stars were very large and soon exploded as a supernova. As they exploded they fused atoms together to create heavier atoms and distributed them into the surrounding clouds of Hydrogen. These heavier atoms were incorporated into new stars as they formed. As later stars exploded the created more heavy elements and lead to younger stars having even more of the heavy elements.

The stars in globular clusters have very low proportions of the heavier elements so they are very old, early generation stars. Recently a few bright blue stars have been found in globular clusters. These initially appeared to be young stars and completely out of place. It is now thought these stars were formed when two old stars combined to form a powerful new hot star which is called a Blue Straggler.

Other quite bright globular clusters to search out are: M2, M3, M4, M5 M10, M12, M14, M15, M56, M71, M72 and M80.



The positions of Jupiter and Uranus in the south east

MERCURY will be in conjunction (passing in front of the Sun) on 3rd September. Following the conjunction the inner most planet will begin to creep up over the eastern horizon just before sunrise. It will reach greatest elongation on 19th September and will be at its best for observing about a week before and until about a week after. A telescope will show a thin crescent from around 7th September that will thicken through the month of September. However Mercury will get smaller as the month progresses as it moves further away.

VENUS is not really observable this month but it may just be seen low in the south west after sunset.

MARS is disappearing over the south western horizon just after sunset. It is not only very low but it is also getting very small at just over 4 arc seconds.

JUPITER is just coming into prominence in the eastern sky. It rises at 20:00 at the beginning of the month, 19:30 in the middle of the month and 18:45 by the end of the month. It will be in good a position for observing by about 21:30 at the beginning and about 20:00 by the end of the month. See the special article on Page 1 and the chart above.

SATURN is too close to the Sun and will not be observable this month. It is moving into conjunction with the Sun and will appear as an early morning object later in the year. The ring is opening out now after it had been closed up and almost disappeared last year. It will be looking much more like we expect when it reappears this time around.

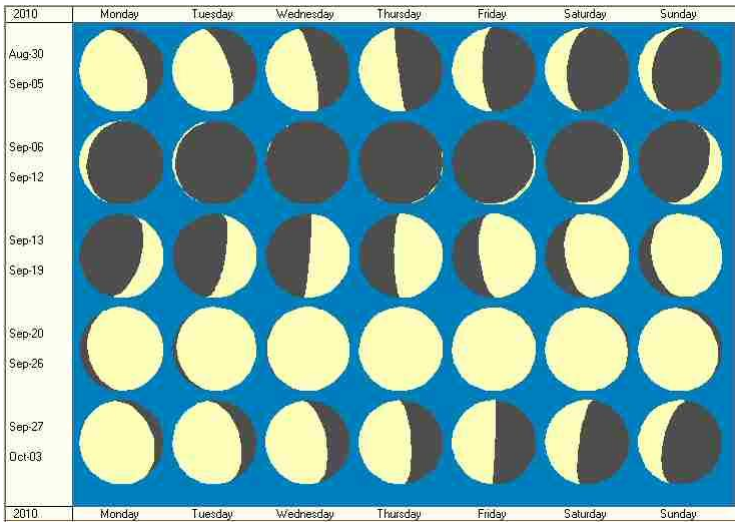
URANUS is close to Jupiter throughout the month and is in a very good position to make it easy to find. Uranus is just 51 arc seconds to north (above) Jupiter this is only just short of two Moon diameters away. Uranus will appear as a rather smudged looking blue star. Once centred in a telescope use a higher magnitude eyepiece and possibly a Barlow to zoom in and a small blue disc will be seen. See the chart above.

NEPTUNE is at its best this month and can be found, perhaps with some difficulty, due south at about 23:00.

THE SUN There have been a few very nice Sunspots appearing over the last few months so it would appear the Solar maximum may have started. The Sun has an eleven year cycle of increasing sunspot activity. We should now be well into a period of maximum activity but the activity has been very sparse until the last few months with just a few medium sized spots starting to appear. Sun spots are caused by the lines of force in the magnetic field of the Sun as they break through the outer layers.

A special solar filter must be fitted to a telescope to view sunspots or alternatively the image can be projected on to a screen. **DO NOT LOOK DIRECTLY AT THE SUN AS IT WILL CAUSE BLINDNESS**.

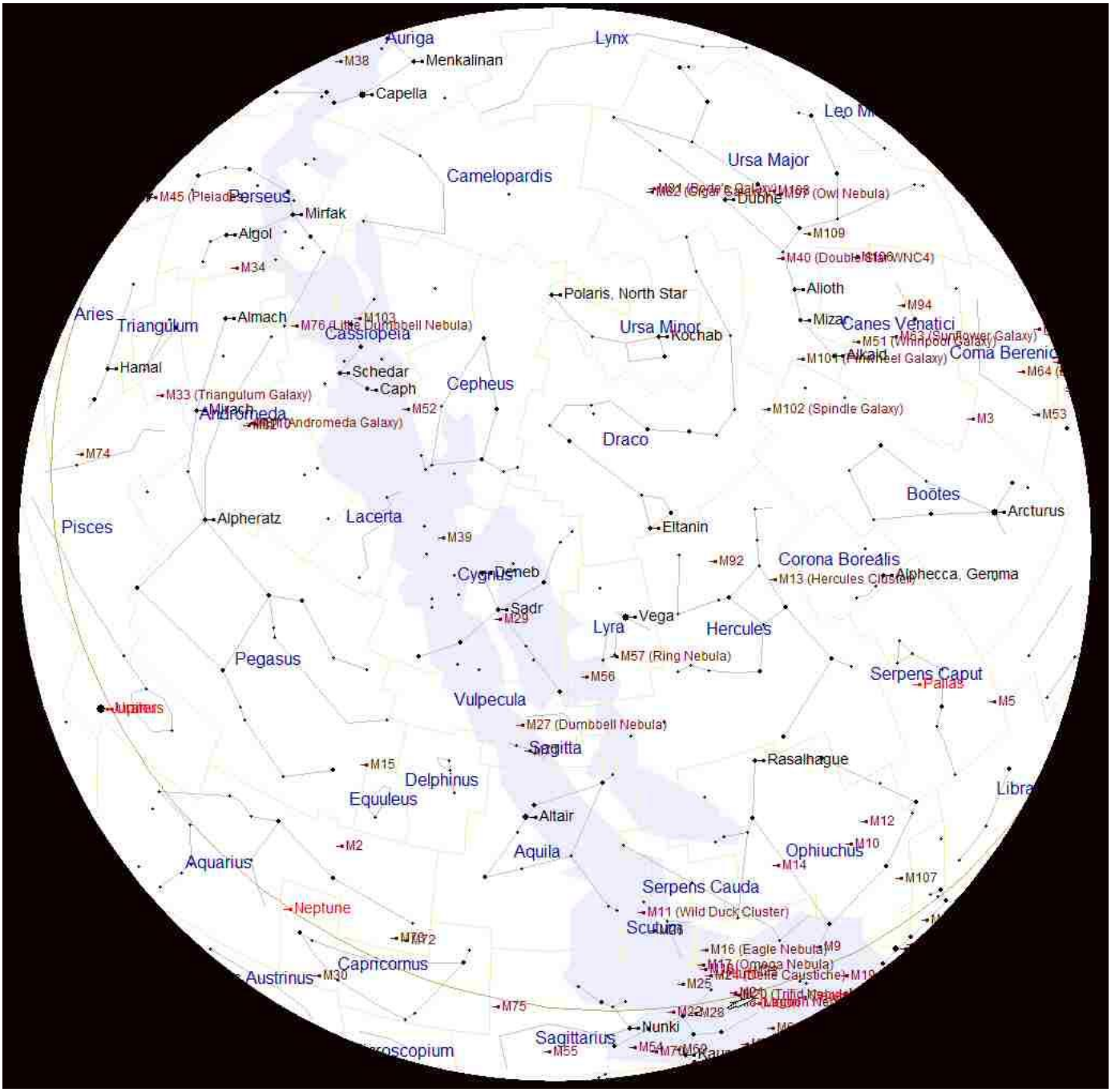
THE MOON The phases of the Moon this month:



Objects on the 'Terminator' (the line between light and dark) are in the best position to observe because they cast long shadows that give relief to the features.

METEORS There are no significant meteor showers this month.

THE SKY THIS MONTH



The chart above shows the night sky as it appears on 1st September at 9 o'clock 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 8 o'clock BST at the middle of the month and at 7 o'clock BST at the end of the month. Due to the Earth rotating once every 24 hours, the stars also appear to move 15º (360º divided by 24) each hour from east to west.

The centre of the chart will be the position in the sky directly overhead. 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 in the north west. 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 50º 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.