

# NEWBURY ASTRONOMICAL SOCIETY

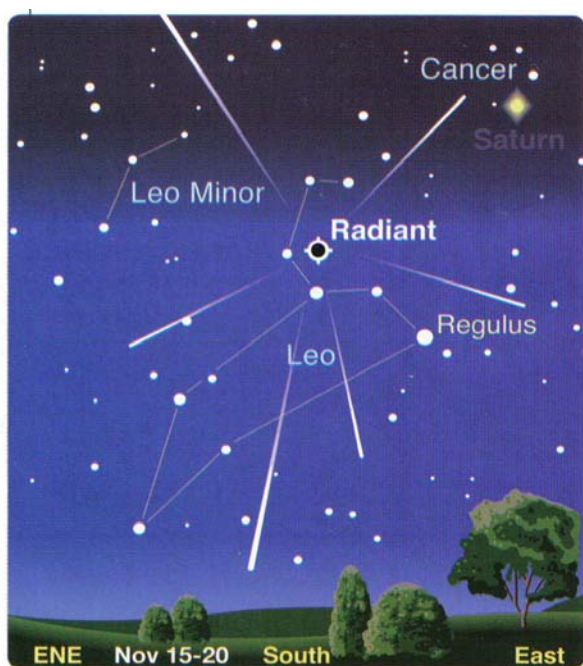
## BEGINNERS SECTION MAGAZINE – NOVEMBER 2009

### LEONID METEOR SHOWER THIS MONTH

In the middle of this month, around 7<sup>th</sup> to 28<sup>th</sup> November, there will be a meteor shower known as the Leonid Shower. The best time of all to watch for the meteors will be the night of 17<sup>th</sup> and morning of 18<sup>th</sup> November when the shower should produce its expected peak of activity.

Some bright meteors originate from collisions between lumps of rock and metal called asteroids; these are generally bright and usually appear singly. There is another type of meteor that occurs in showers, these originate from comets.

The shower this month will appear to radiate from the constellation of Leo that is why it is called the Leonid Shower.



The Leonid radiant point

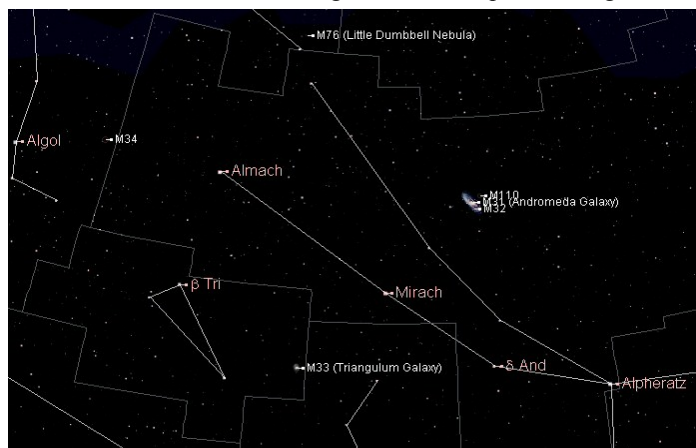
The Radiant point of the Leonid meteor shower is located in the middle of the 'sickle' or 'back to front' question mark shape of the head of Leo. The head of the 'lion shape' of Leo does not appear over the eastern horizon until after midnight however some meteors may be seen rising up over the horizon before Leo appears. The shower will be best seen around and after midnight on 17<sup>th</sup> November.

The last heavy Leonid shower occurred in 1991 when Earth passed through one of the filaments left by Comet Tempel-Tuttle. Leonid meteors tend to be very fast and leave a long trail across the sky. The shower this year occurs at a favourable time when there is no Moon. With a dark and hopefully clear sky the prospect for a good shower of meteors is hopeful.

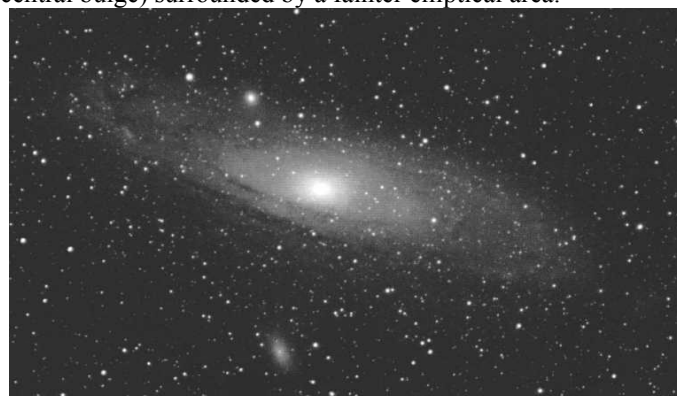
To observe the shower we do not need any special equipment, just our own eyes. The best thing to do is to sit on a garden recliner chair that has been set up so that the observer can see the sky towards the east. Make sure there are no lights shining in your eyes. If there are lights then try to cover the light source or set up a screen to block the light. Look to the east at about 45° above the horizon. The best time to look out for the meteors will be after midnight on the 17<sup>th</sup>. The shower will be visible for about a week or so before and after the 17<sup>th</sup> November but with a peak on that night. **Don't forget to dress in warm clothes.**

### THE CONSTELLATION OF ANDROMEDA

Alpheratz is officially part of Andromeda and forms the join between the two lines of stars that make up the accepted 'dot-to-dot' figure of Andromeda. However it is also the top left star of the much easier to recognise 'Great Square of Pegasus'.



By far the most interesting object in Andromeda is the Great Spiral Galaxy, also known by its reference in Charles Messier's catalogue as entry number 31 (M31). It is the closest large spiral galaxy to our own Milky Way Galaxy. In fact it could be referred to as The Milky Way's big sister. It is about twice the size as our galaxy with an estimated 400 billion stars. To find M31 it is best to first locate the Great Square of Pegasus. From the top left star of the square (Alpheratz) follow the line of three stars to the left:  $\delta$ , Mirach and Almach. Follow a short line from Mirach up to the slightly fainter star above then on to the next one above that, just to the right of the third star is M31. On a clear night it is possible to see M31 with the naked eye but it is a very obvious fuzzy grey patch when seen through a pair of binoculars. A telescope will show a bright central area (the central bulge) surrounded by a fainter elliptical area.



M31 is the most distant object that can be seen directly with the human eye at 2.3 million light years (9.3 Trillion kilometres).

### THE NEXT BEGINNERS MEETING WILL BE

16<sup>th</sup> December Observing with a Telescope

### THE NEXT SPEAKER MEETING WILL BE

4<sup>th</sup> December Climate Change (At Rutherford Lab)

For all the latest news, don't forget to visit our website on:  
[www.naasbeginners.co.uk](http://www.naasbeginners.co.uk)

## OBJECTS IN THE NIGHT SKY

One of the questions someone new to astronomy may ask a more seasoned amateur astronomer is 'what is there to look at in the night sky?' This is a very good question. The answer is there is much more than meets the eye. Most people know about the Moon, planets and stars but this article will talk about some of the other objects astronomers look at through their telescopes.

Looking up into the night sky using just the optical instrument that nature has given us (the Mk.I eye ball) we can see about 6000 stars. These stars are the brightest and closest to us in our part of the universe that we call the Milky Way Galaxy. A galaxy is a vast swirling mass comprised of billions of stars, gigantic clouds of gas mixed with huge amounts of dust. Within galaxies stars are born, live and eventually die.

Due to the proliferation of lights in our towns and cities it is difficult to see the Milky Way. On a clear night when the sky looks black, not grey or orange from streetlight pollution, it is possible to see it as a misty band crossing the whole sky. Away from light pollution our galaxy is much easier to see. The position of the Milky Way is shown on the sky chart on Page 6.



Part of the Milky Way imaged from the Canary Islands

To the naked eye all stars look very much the same except some appear brighter than others. They appear brighter because some are further away so they look fainter but some are bigger and brighter than others. There are two main types of big bright stars. The first is a very massive star that may be up to 10 times the mass of our Sun which is about average size. A star 10 times the mass (the amount of stuff it is made of) may be a thousand or more times brighter than our Sun. There are very rare stars that may be up to 50 times the mass of the Sun and these may be millions of times brighter. Giant stars appear bluish in colour when viewed through a telescope because they are so hot. Rigel in Orion is one of this type of giant star.

The second type of bright star is similar in mass to our Sun or a little larger but approaching the end of its life. At the end of their life these stars have a final fling and begin to produce more energy. The extra energy pushes outwards from the core and they become swollen and expand to hundreds of times their original size. These stars are called Red Giants.

Not all stars are single like our Sun. Some are double or triple systems. One example is the star in the middle of the 'handle' of the familiar 'saucepan' shape of Ursa Major (The Plough). To the naked eye the star called Mizar looks normal but a careful examination may reveal a second, fainter star very close to Mizar. A pair of binoculars will show the companion which is called Algor very clearly. If a medium sized telescope is trained on to Mizar it will be seen to be comprised of twin stars. Beyond the resolving power of any telescope both the of Mizar twins are also very close orbiting doubles



The four stars of Mizar with Algor in the distance

Stars also occur in groups known as 'Open Clusters'. When these open clusters formed they were imbedded in vast clouds of gas and dust known as a 'Nebula'. Gravity caused the gas atoms to be drawn together into denser clumps. As the gas became denser it pulled even more gas towards it. Eventually the gas became so dense and hot that stars formed and began to shine. The powerful radiation from these young stars blew away the remaining gas to reveal a cluster of young stars. One beautiful example is M45 the Pleiades also known as 'The Seven Sisters' in the constellation of Taurus.



The Pleiades Open Cluster in Taurus

The Pleiades can be seen easily with the naked eye on a clear night. Most people can make out six stars but those with good eyesight may be able to pick out the seventh sister. Binoculars or a short focal length telescope with a low magnification eyepiece will show this cluster at its best. A telescope will reveal many fainter stars crowded around the seven bright sisters. In fact there are about 300 stars in this beautiful cluster of young stars.

There is another kind of star cluster known as a 'Globular Cluster'. These are very different to an Open Cluster. Globular Clusters are associated with large spiral galaxies like M31 shown on Page 1 and our own Milky Way Galaxy. Unlike open clusters, globular clusters do not reside in the spiral arm structure of spiral galaxies. About 100 of these clusters can be found in our galaxy and a similar number have been found in M31. They move around the galaxies in quite random orbits centred on the centre of the spiral structure. Most of these globular clusters pass through the spiral arms regularly about every 100 million years or so. Their orbits take them above and below the main spiral arm structure so they form a sort of halo around the galaxy.

Each globular cluster is composed of about 1 million very old stars and they are thought to be the cores of smaller galaxies that have been captured by the larger spiral galaxy. Their outer stars have been systematically stripped away by the combined gravity of the billions of stars in the spiral arms as they pass through.



M13 the great globular cluster in Hercules

M13 in the constellation of Hercules is the closest globular cluster that we in the northern hemisphere can see. It is bright enough to be seen with the naked eye on a clear night from a dark location. It can be found easily using binoculars and looks spectacular in a telescope. Another is M15 in Pegasus.

Perhaps the most interesting objects to see are a number of different types of object collectively known as 'Nebulae' the plural of 'Nebula'. The main types are the gas clouds like the ones previously mentioned from which stars form. There are also types formed by aging and dying stars.

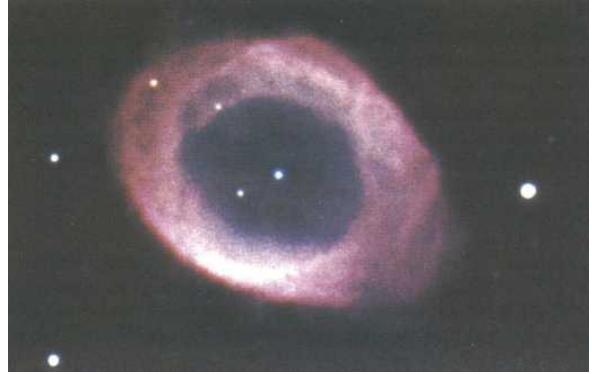
Of the first type M42 known as the Great Orion Nebula is the most spectacular and most famous.



M42 the Great Orion Nebula

Gaseous nebula like M42 are vast clouds of mainly Hydrogen gas found in the spiral arms of large spiral galaxies. Stars form in these nebulae and as they begin to shine they light up the dark gas clouds. There are two processes that illuminate the nebula these are reflection and emission. Reflection is simply the light from young stars being reflected off the gas and dust in the nebula. Emission is a little more complicated but much more interesting. When light, particularly ultra violet light, hits the atoms in the nebula it can be absorbed by the atom. The energy in the absorbed photon of light causes an electron in the atom to jump out of its orbit around the nucleus and into a different orbit. The atom becomes unstable and to regain stability it ejects another photon allowing the electron to drop back into its natural orbit. The photon released is always at a specific wavelength for the element of the atom that ejected it. This means it has a specific wavelength or colour enabling astronomers to identify the different elements in the nebula.

The other two main types of nebula are related to the death of stars. When a star similar to our Sun begins to run out of its fuel supply, Hydrogen gas, it expands into a Red Giant. Towards the end of this process the star begins to lose its outer layers which drift off and form a vast bubble like halo around the star. This halo is different for each star and often forms a beautiful ring or 'hour glass' shape.

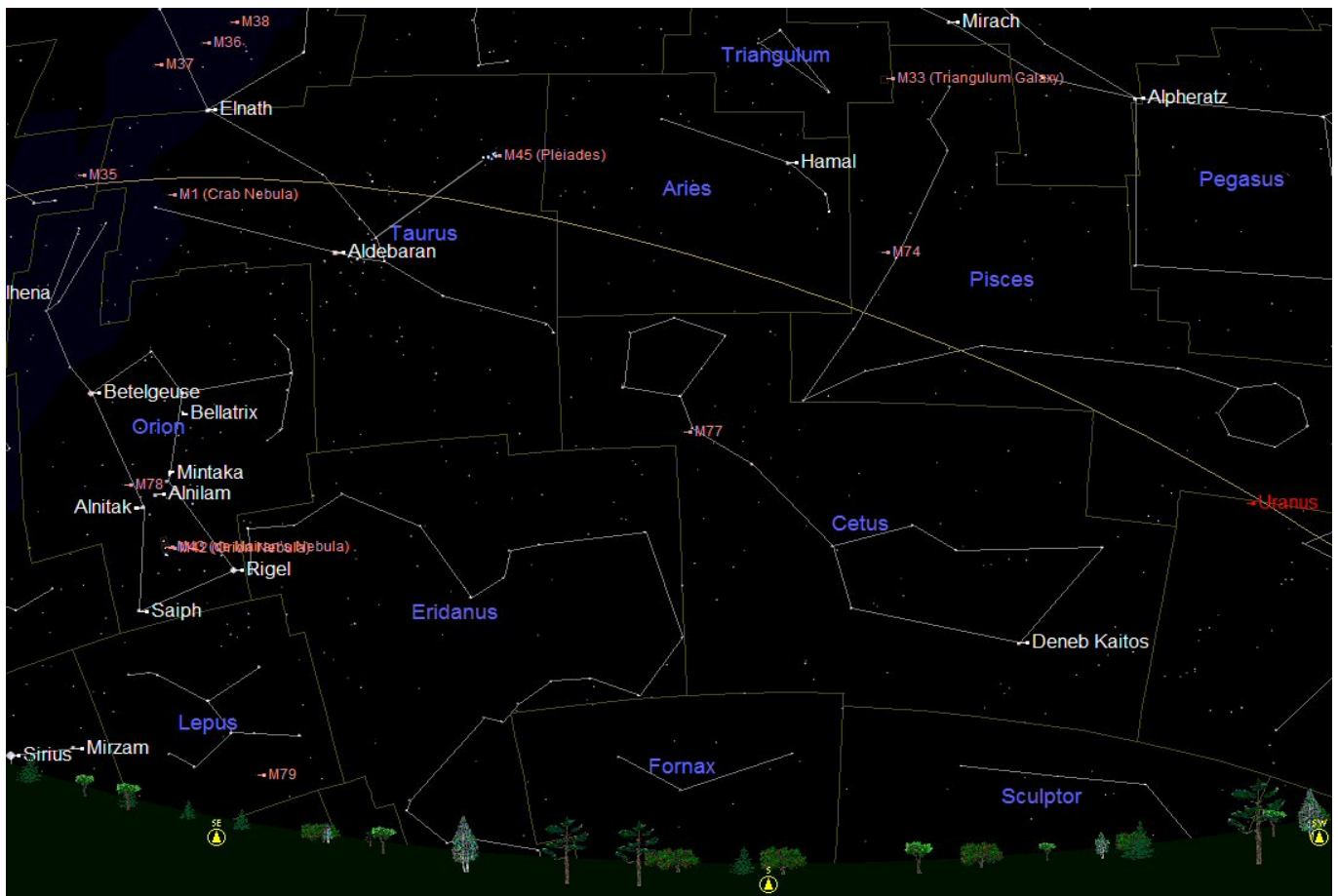


M57 the Ring Nebula in Lyra

Larger stars end their lives in a much more dramatic way. The Helium gas that was produced as a by product of the nuclear fusion process would have built up in the core of the star. A large star (more than five times the mass of the Sun) will produce high enough pressure and temperature in its core to enable the Helium to be used as fuel. The Helium will be fused into progressively heavier elements like Nitrogen, Oxygen, Carbon, Silicon until eventually it will produce Iron. The production of Iron causes the star to explode as a Super Nova and produces a nebula called a Super Nova Remnant.



M1 the Crab Nebula 'Super Nova Remnant' in Taurus



### INTERESTING THINGS TO FIND THIS MONTH

The chart above shows the southern night sky as it will appear at about 10 o'clock in the middle of November. Earlier in the evening all the objects shown will appear further to the east (left) and later they will appear further to the west (right). This is due to the rotation of Earth. (See the charts on pages 5 and 6).

The summer constellations are beginning to disappear over the western horizon and the winter constellations are beginning to appear over the eastern horizon. The ecliptic is shown as the orange line arching across the top of the chart. This is the path that the Moon and planets follow across the sky. The planet Uranus is shown on the extreme west (right) of the ecliptic.

The south eastern sky is dominated by the familiar constellation of Orion the Hunter. Look for the straight line of three bright stars that make up Orion's Belt. Orion is a large constellation made up from seven bright stars. At Orion's left shoulder is the red giant star Betelgeuse which appears distinctively orange especially when seen using binoculars. This star has the largest diameter of all the stars close to us. At the bottom right of Orion's tunic is the bright white super giant star Rigel. This is a hot massive star producing thousands of times the energy of our Sun. Below the three stars of Orion's belt is a vertical line of stars known as Orion's Sword. When using a pair of binoculars the sword is seen as a beautiful line of stars. Imbedded in the line is M42 The Great Orion Nebula described on page 3. M42 can just be seen with the naked eye. A telescope will reveal the four stars of the 'Trapezium'. These very young stars have formed in the nebula and are now illuminating it with their powerful radiation as described on page 3.

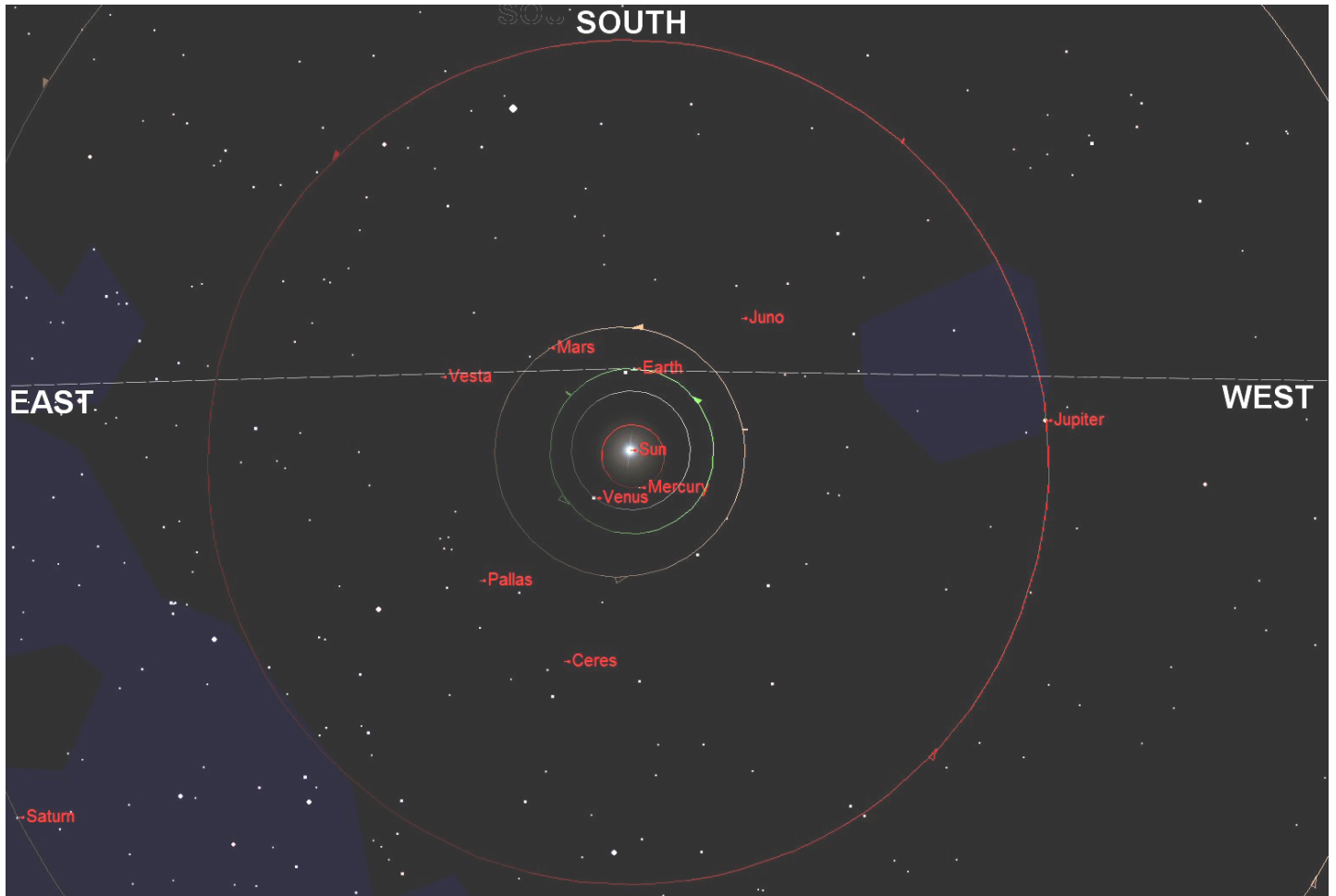
Following an imaginary line down to the south east from Orion's belt a bright sparkling star will be seen. This star is Sirius in the constellation of Canis Major, Orion's larger Hunting Dog. Sirius is the closest star that we can see from this country at just 8.8 light years distance that is why it appears so bright.

Located to the north of Orion is the constellation of Taurus (The Bull). Taurus bears little resemblance to a bull and is more of a cross shape. At the centre of the cross is the large open cluster called The Hyades. The bright orange looking 'red giant' star Aldebaran sits in the Hyades but is not a true member of the cluster. It is much closer to us and just in the same line of sight. The Hyades is an old open cluster so the stars are quite scattered as they have begun to move apart.

At the end of the upper right arm of the cross shape of Taurus is the much younger open cluster M45 The Pleiades also known as the Seven Sisters. See page 2. M45 is the closest open cluster to us and is easily visible to the naked eye. The keen sighted observer should be able to pick out the six brightest members of the group and the keenest sighted may even pick out the elusive seventh sister. A pair of binoculars will show this cluster at its best. It is too large to fit into the field of view of most telescopes.

Diametrically opposite to the arm containing M45 is the lower left arm of Taurus. At the end of this arm of the cross shape is the Supernova remnant type of nebula M1 'The Crab Nebula'. This is the remains of a giant star that destroyed itself when it exploded as a supernova about 7000 years ago. The light from this massive explosion took about 6000 years to reach Earth and was seen by astronomers in 1054 AD. Chinese astronomers recorded seeing it shining bright enough to be seen in daylight. After about three months it had faded to below naked eye visibility. Today it can be seen in a medium sized telescope appearing as a fuzzy patch of light. See page 3 for a Hubble image of M1.

At the top left of the chart is part of a line of 4 open clusters: M35 in Gemini and M36, M37 and M38 in Auriga. Binoculars will show them but a 100mm telescope will be required to see the individual stars clearly in this beautiful line of open clusters.



### THE PLANETS THIS MONTH

The chart above shows the inner Solar System as it would appear looking down on the north pole of the Sun.

**MERCURY** is hidden behind the Sun and will not be observable this month.

**VENUS** rises over the eastern horizon at about 06:00 and will be very bright until the sky brightens at dawn. Venus is very close to the eastern horizon and will soon pass behind the Sun. Through a telescope it will appear gibbous (nearly full as with the Moon) but quite small at just 10 arcseconds in diameter.

**MARS** rises in the east at 21:40. It still appears small but will be in a good position in the south east by about midnight.

**JUPITER** rises over the eastern horizon at 13:00 (1 o'clock midday) and will be in view from sunset until about 22:30 GMT. However it will be low in the southern western sky by mid evening located in the constellation of Capricornus. The four brightest moons Io, Europa Ganymede and Callisto will be visible even in a small telescope and are very interesting to observe. The moons often pass in front of Jupiter in a transit and may cast a shadow on the planet causing an eclipse. Moons can also pass behind the planet (occultation) or disappear into its shadow. Occasionally the moons pass close to each other and sometimes even eclipse each other. Eclipses will become more difficult to see as the planet creeps ever closer to the south western horizon.

**SATURN** Rises at 02:20 by the middle of the month and will be high enough for viewing by 03:30. The ring system is just starting to open out again after appearing edge on all this year. It will be a couple of years before it returns to its full glory. Saturn's moon Titan will be visible in a 100mm telescope.

**URANUS** is fairly well placed in the south at 22:00 in the constellation of Pisces. A telescope of over 100mm aperture gives Uranus the appearance of a slightly out of focus small blue disc.

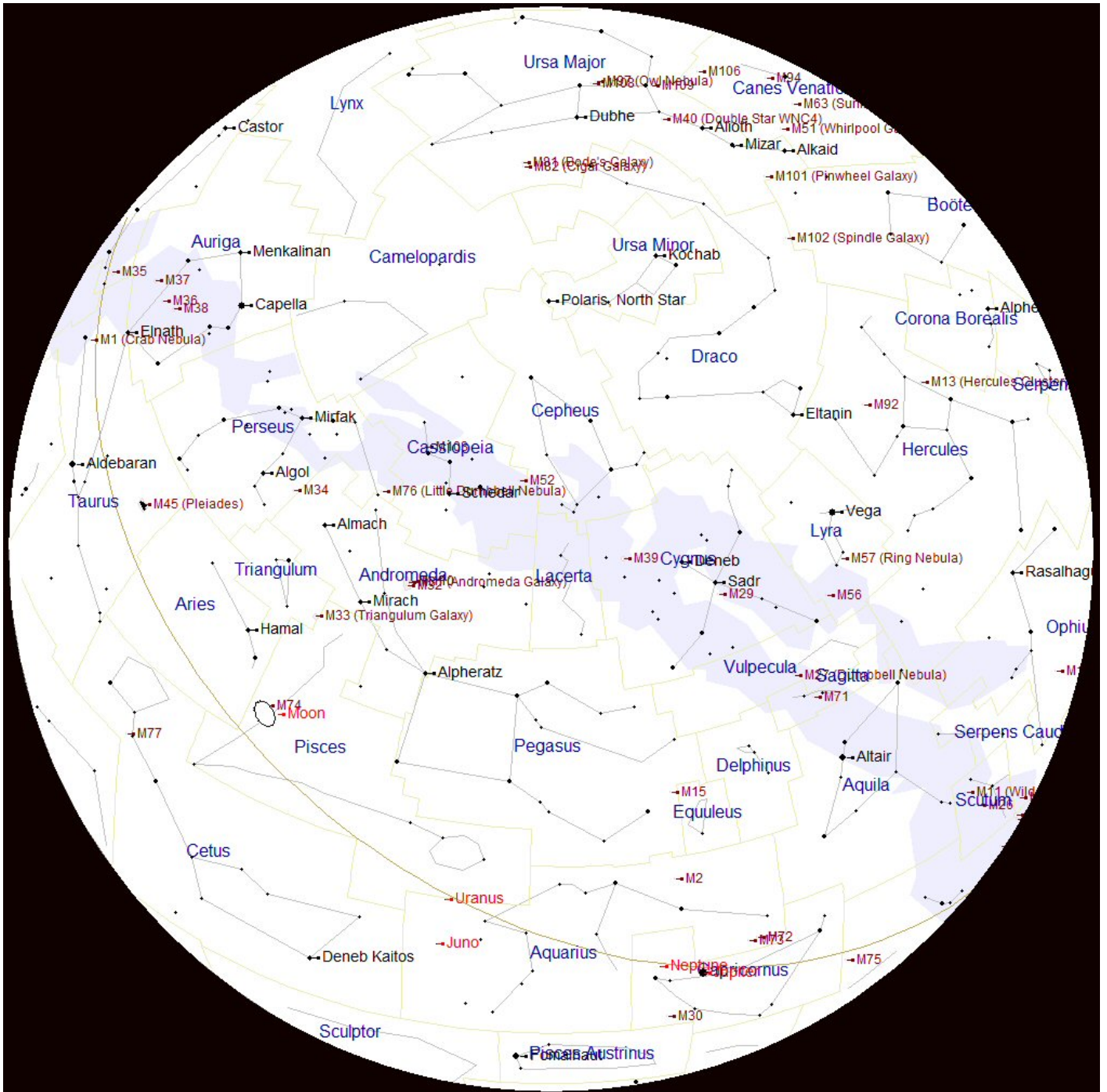
**NEPTUNE** is well placed close to Jupiter in the constellation of Capricornus. Viewed through a telescope of over 100mm aperture it appears as a slightly out of focus blue star.

**SUN** is still very quiet but some small prominences have been seen recently. To see these 'flame like' features around the edge of the Sun requires a telescope with a very special Hydrogen  $\alpha$  filter.

**MOON** The phases of the Moon this month:

2009	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Oct-26							
Nov-01							
Nov-02							
Nov-08							
Nov-09							
Nov-15							
Nov-16							
Nov-22							
Nov-23							
Nov-29							
Nov-30							
Dec-06							
2009	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday

# THE SKY THIS MONTH



The chart above shows the night sky as it appears on 1<sup>st</sup> November at 10 o'clock Greenwich Mean Time (GMT). 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 9 o'clock p.m. GMT at the beginning middle the month and at 8 o'clock am GMT at the end. Due to the Earth rotating once every 24 hours, the stars also appear to move 15° (360° 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 towards the northern horizon. 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.