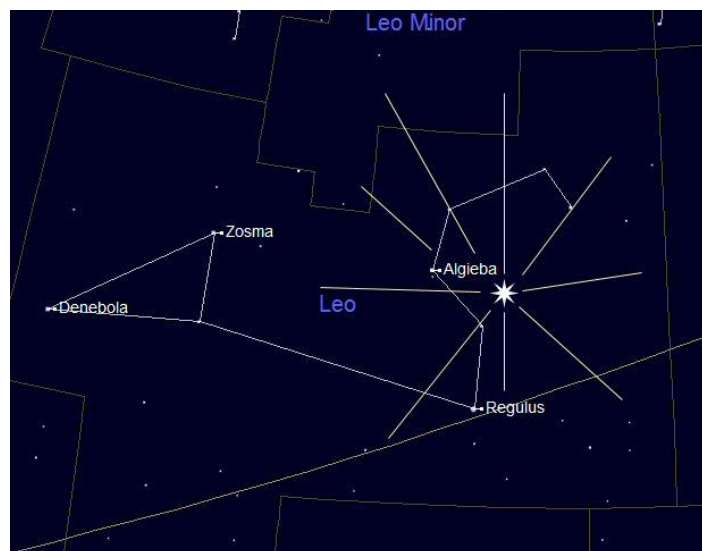


NEWBURY ASTRONOMICAL SOCIETY

BEGINNERS SECTION MAGAZINE – NOVEMBER 2010

THE LEONID METEOR SHOWER THIS MONTH

In the middle of this month, around 15th to 25th November, there will be an increase in meteor activity known as the Leonid Meteor Shower. The best time of all to watch for the meteors will be the night of 17th and early morning of 18th November when the shower should produce its expected peak of activity.



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 radiant is the point in the sky where the meteors of the shower appear to originate. It has a similar effect to driving in a snowstorm when the snowflakes appear to radiate from a point directly in front of the windscreen. 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 over the horizon from about 21:00 on 17th November. The shower will be best seen around and after midnight.

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, these are known as ASTEROIDS. Most asteroids orbit the Sun in a belt between Mars and Jupiter and may be what is left from a planet that did not form properly. 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 or up to metres across and are known as METEORIDS. They are quite rare and are seen as individual 'fireballs' sometimes impacting the ground as METEORITES and if big enough may even cause craters. As the high speed particle hits the top of our atmosphere it burns up and is seen as a streak of light we call a METEOR.

The second type of meteor originates from a COMET and they are much more common. Comets are large lumps of ice, typically a few tens of kilometres across, that reside beyond the orbits of the main planets. There are millions of these objects out there, some up to the size of Pluto, 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, that can be thought of as a giant dirty snowball, approaches the Sun the water and frozen gases begin to boil off and are blown away by radiation from the Sun. This gas and specs of dust that were imbedded in the ice produce the familiar twin tails we associate with comets.

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

PERIOD	SHOWER NAME	MAXIMUM
Jan 1 - 4	Quadrantids	Jan 3
April 10 - 22	Lyrids	April 2
May 1 - 8	Eta Aquarids	May 4
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
Oct 15 - 25	Orionids	Oct 21
Oct 26 - Nov 16	Taurids	Nov 3
Nov 15 - 25	Leonids	Nov 18
Dec 9 - 14	Geminids	Dec 13
Dec 17 - 24	Ursids	Dec 23

The last heavy Leonid shower occurred in 1991 when Earth passed through one of the denser dust particle filaments left by Comet Tempel-Tuttle. Leonid meteors tend to be very fast and leave a long trail across the sky. Unfortunately the shower this year occurs at an unfavourable time when the Moon is nearly full. With a bright but hopefully clear sky the prospect for seeing some of the brighter meteors of the shower of meteors is hopeful.

To observe the shower we do not need any special equipment, just our 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 from 21:00 on the 17th through to the early morning on 18th. The shower will be visible for a few days before and after the peak but with possible increased activity on that night.

Don't forget to dress in warm clothes.

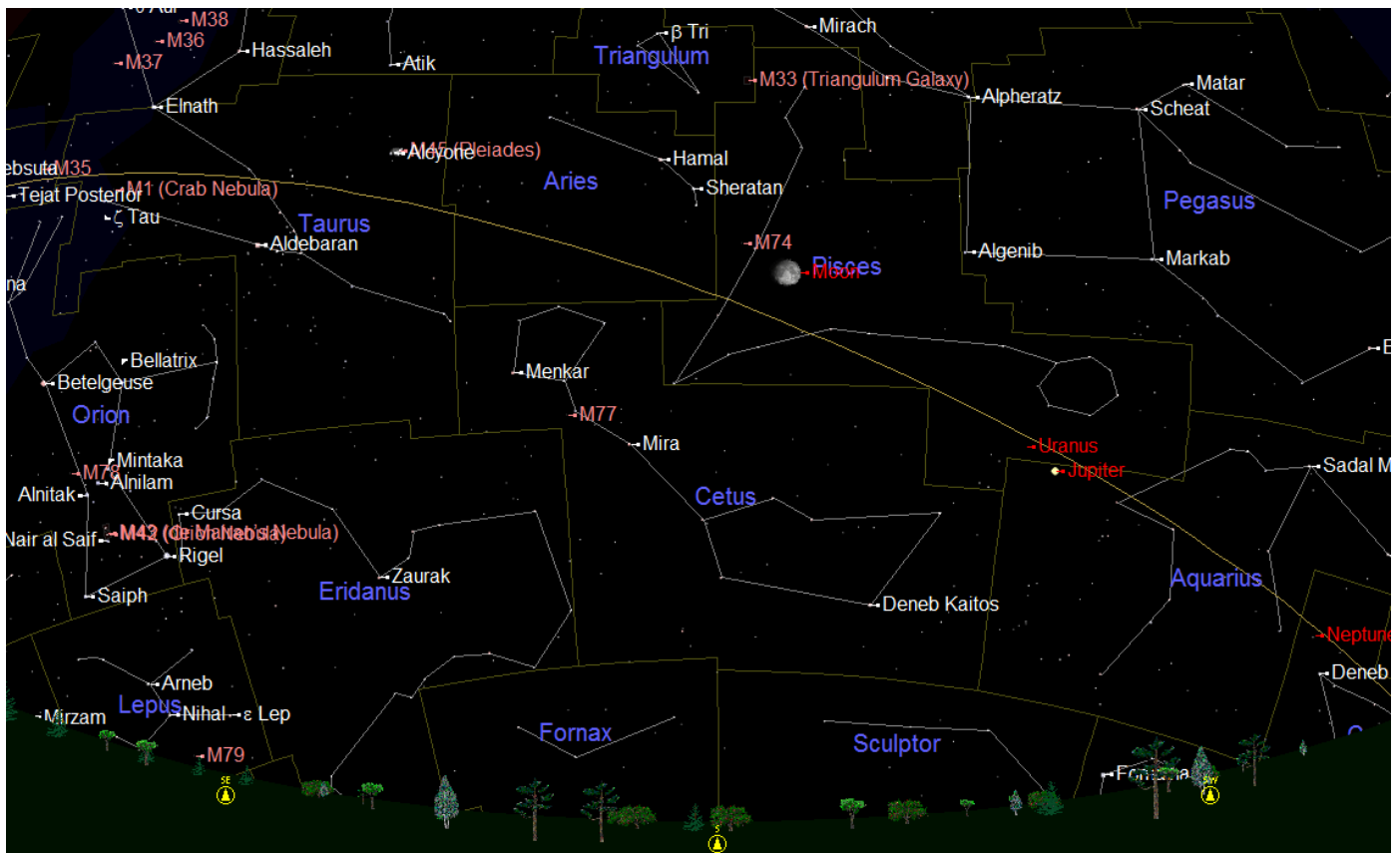
THE NEXT BEGINNERS MEETING

17th November Jupiter (with observing if fine)
 Website: www.naasbeginners.co.uk

NEWBURY ASTRONOMICAL SOCIETY MEETING

5th November 10 sights to see (in the night sky)
 Website: www.newburyas.org.uk

THINGS TO LOOK FOR IN THE NIGHT SKY 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 chart on page 6.)

The summer constellations are beginning to disappear over the western horizon to be replaced by the winter constellations in the east. 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 Neptune 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 (as we look at him) 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. Embedded in the line is M42, The Great Orion Nebula. M42 can just be seen with the naked eye but binoculars show a misty patch of light. 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.

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, which is why it appears so bright. It also sparkles because it is low in the sky.

Located to the north of Orion is the constellation of Taurus (The Bull). Taurus has 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. 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 very 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.

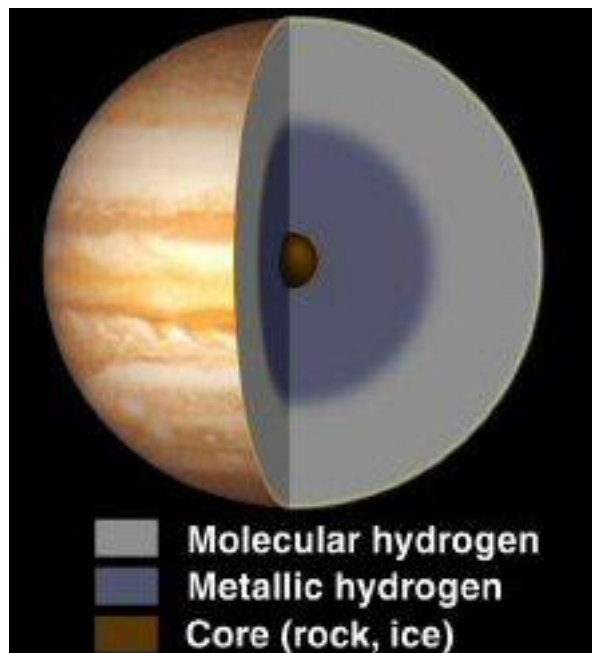
Right in the middle of the chart above in the constellation of Cetus is a naked eye bright red star called Mira. Although bright at the moment Mira is not always so bright, in fact in six months time it will have disappeared altogether from naked eye visibility. The reason for this is it is a variable star. Mira is a star of about the same mass as our Sun but much older. It has passed the end of its time as a normal star and become a Red Giant. It is very unstable and is swelling and shrinking in a 331 day cycle which causes it to brighten and fade. In the middle of October it was as bright as it can get but it is now starting to get fainter. So search it out because in a few months it will be gone.

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. See page 5 for details of the planets.

JUPITER, KING OF THE PLANETS

JUPITER has been in view throughout the summer months but the king of the planets has been very low in the evening sky. Jupiter has now moved into a much better observing position and is observable almost as soon as it is dark but the view does get better as the evening progresses.

Jupiter is the largest of all the planets and is nearly twelve times the diameter of Earth. Unlike the inner planets Jupiter has no solid surface. It is comprised almost entirely of gas although it may have a small rocky and metallic core.



Jupiter has an orbit approximately 778 million km from the Sun (Earth 150 million km) and its diameter at the equator is 142,984 km (Earth 12,756 km). Its volume is large enough to swallow all the other planets. Despite being so large Jupiter rotates very fast, in fact, a day on Jupiter is equivalent to only 9.9 Earth hours. This is so fast that the centrifugal force of the spin causes the planet to bulge noticeably at its equator.

The surface of the planet has many bands or 'belts' of different colours, some of which can be seen even in a small telescope. These belts are mainly different shades of browns with variations from white through orange to chocolate brown. There are even reds especially in the famous giant Red Spot although it is in fact more pink than red. The Red Spot is a massive storm larger than the size of the Earth. It has been raging since before the invention of telescopes and was observed by Galileo using his first telescope 400 years ago.

Jupiter has many moons and more are being discovered all the time, more than 60 so far. Many are small and may be captured asteroids but four are large and easy to see in a telescope. Galileo was the first person to observe Jupiter using a telescope and discovered the four brightest moons that are now called the Galilean moons in his honour.

With a larger telescope it is possible to see the moons disappear and reappear or even see their shadows as they pass in front of Jupiter to produce an eclipse on the cloud tops. A computer planetarium application can be used to predict the times of the disappearance and re-appearance of the moons. It is easy to plot their positions from night to night or even hour to hour. The plots can then be compared to the computer programme predictions.

Jupiter is the best of all the planets to observe with a small telescope of 100mm aperture or less. 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 telescope is required to see the coloured cloud bands. A small to medium sized telescope (100mm to 150mm aperture) could give a view something like the image shown below.



Jupiter and two of the Galilean Moons imaged in 2010

The Galilean moons can be seen changing position to either side of Jupiter so it is good fun to track them from night to night or even through the night. Sometimes there may be only three moons visible when one is passing in front or behind the planet. They can be distributed in any pattern and may even all be gathered to one side at times.

Jupiter is interesting at the moment because the South Equatorial Belt is missing; see the image below (South is at the top).



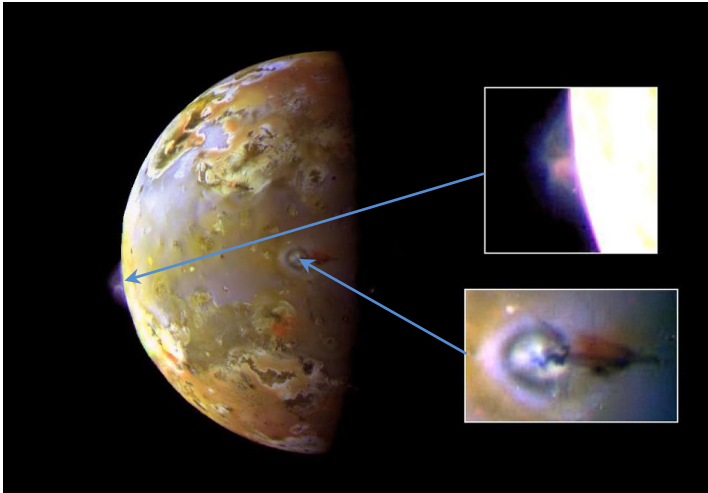
Jupiter imaged on 2nd September 2010 by Steve Harris

This has happened before but it is well worth having a look because it does not happen very often. The last time this happened was over 15 years ago. The Great Red Spot is normally embedded in the South Equatorial Belt but can now be seen against nothing but white clouds. The moons in the image are Io closest to Jupiter and Europa further out.

The Moons, particularly the inner two Io and Europa, move quite quickly and can be seen to change position hour by hour and even within 10 minutes when close to Jupiter. The orbits of the moons take: (Earth days)

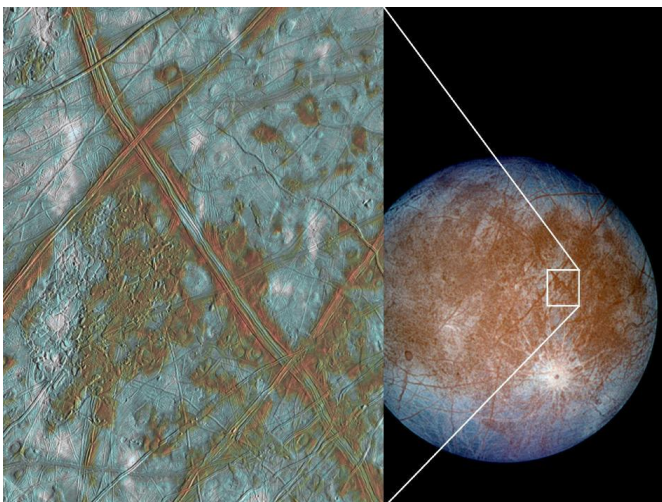
Io	1.77 days	Europa	3.55 days
Ganymede	7.16 days	Callisto	16.69 days

Io is the innermost of the four large moons that Galileo discovered and is 3,630km in diameter. This is slightly larger than Earth's moon which is 3,476km. When seen up close the surface resembles a pizza. Io is the most volcanically active body in the Solar System. Io is so close to Jupiter that it is nearly torn apart by the gravitational forces of Jupiter and the larger moons orbiting outside it. Gravitational forces stretch and squash Io, producing tides that cause the rocky surface to rise and fall by about 100m every 9 hours. This produces enormous pressure and friction forces that generate heat inside the moon. This internal heat causes continuous volcanic action on the surface. The volcanic activity was not known about until the Galileo probe took close up images in 1995. Huge plumes from erupting volcanoes were seen around the edge of the moon.



Images of Io taken in 1995

Europa is 3,138km in diameter which makes it the smallest of the four Galilean moons. The ice on the surface reflects 10 times more of the sunlight than the surface of our moon, making its surface the brightest of Jupiter's moons. Europa is believed to have a 75 to 100km thick layer of water and ice that covers the surface of this, the smoothest moon in the solar system. The surface is criss-crossed with huge cracks probably caused by powerful tidal forces produced by the gravity of Jupiter. Radar scans have indicated that there may be a liquid salty ocean beneath the 20km thick ice crust.



The image above shows how the surface is cracked, with the cracks coloured on either side. This effect is seen on Earth where pack ice cracks and the sea wells up through the crack and freezes on the surface leaving a stain caused by bacteria in the sea.

Ganymede is the largest moon in the solar system (5,263km in diameter). The surface has many fault lines, resembling a ploughed field. These strange 'furrow' like features are 100m high and 10km wide and caused by movements on the surface. From a distance it resembles our Moon with large dark areas and smaller lighter patches. However its density is much less and appears to have a large proportion of its mass made of ice. Radar probes have revealed that there are large pieces of rock suspended in the ice layers. This indicates that the water is frozen solid and there may be no liquid ocean.



Ganymede showing the light and dark features

Callisto, unlike the other three moons, appears not to have any noticeable internal activity or source of heat. Consequently the surface is old and has one of the most heavily cratered surfaces in the Solar System. Callisto is a large moon with a diameter of 4,800km and orbits Jupiter at 1.8 million km.



Callisto showing the heavily cratered surface

THE SOLAR SYSTEM THIS MONTH

MERCURY sets in the west shortly after the Sun towards the end of the month. It then moves back towards the Sun and will be in conjunction with the Sun in early December. However it will be too close to the Sun for any useful observing this month.

VENUS rises over the eastern horizon at about 07:00 at the middle of the month and 06:00 at the end of the month.

MARS has all but disappeared over the south western horizon and will not be visible until it reappears as a morning object next year.

JUPITER is in a good position in the south eastern sky as the Sun sets. By 20:00 it will be due south. It will be setting in the west around midnight. See pages 3 and 4.

SATURN rises over the eastern horizon at about 07:00 just before at the beginning of the month and 05:00 at the end of the month. The rings are opening out now after being closed up and almost disappeared last year. Saturn 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 east (above and left) of 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.

NEPTUNE is in a good position this month and can be found, perhaps with some difficulty, due south at about 18:00.

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.

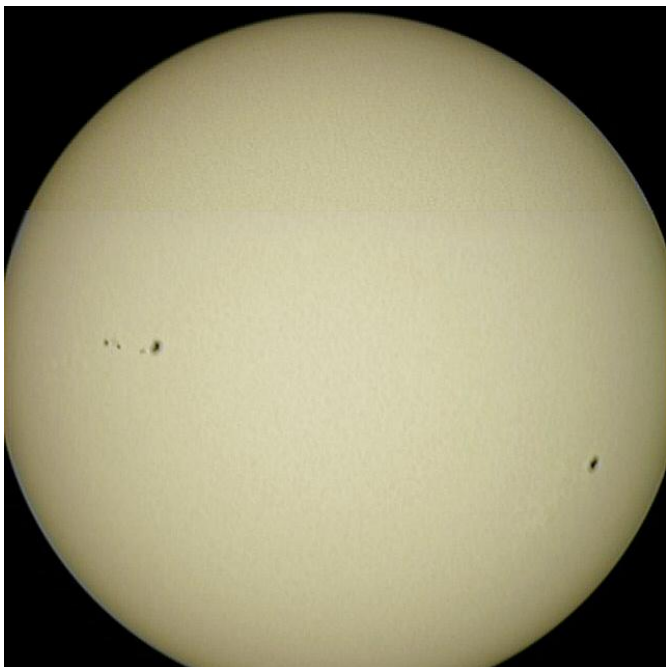
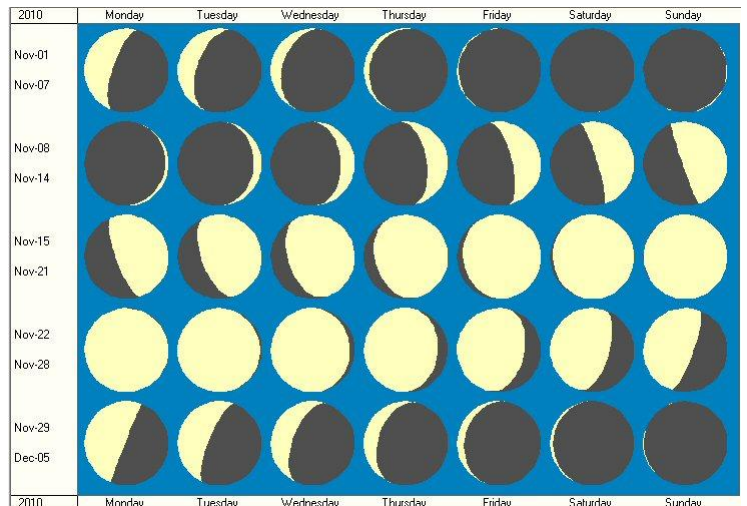
THE MOON is always a good target for binoculars or a small telescope. It is also the first object for a beginner to go for because it is large and bright. During the late summer and early autumn the Moon has been skirting along just above the horizon but it is now beginning to rise higher in the sky. When using a telescope it may be useful to fit a mask over the end of the telescope to reduce the glare caused by too much light. The dust cover on some telescopes may have a smaller cap fitted which can be removed and the dust cover left in place as a mask. Alternatively a cardboard mask can be made and fitted.

The best time to observe objects is when they are on the 'Terminator' (the line between light and dark). This is best because the objects are in the position of sunset and cast long shadows that give relief to the features. At full moon the Sun is shining straight down so there is no shadow and features are difficult to see.



The Moon imaged by Steve Harris on 21st September 2010

The phases of the Moon this month:

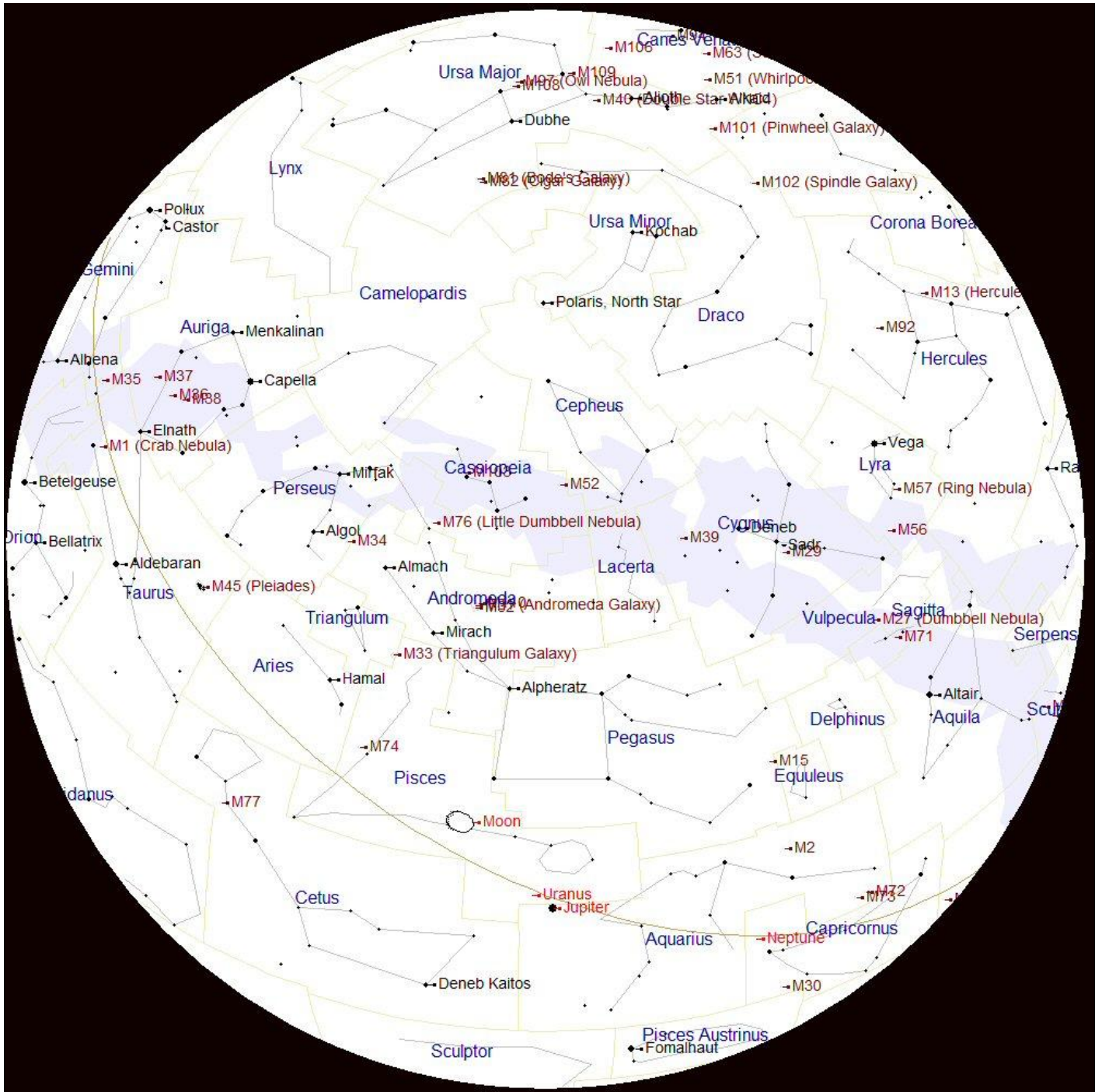


Sunspots imaged by Steve Harris on 25th September 2010

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.**

METEORS. There is a major meteor shower this month. It is the Leonids that can be seen between November 15th and 25th with a noticeable peak on night of the 17th. See page 1 for more details.

THE SKY THIS MONTH



The chart above shows the night sky as it appears on 17th November at 9 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 10 o'clock GMT at the beginning of the month and at 8 o'clock GMT at the end of the month. 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 close to the northern horizon. Look for the distinctive saucepan shape, four stars forming the bowl and three stars forming 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.

The planets observable this month are: Jupiter, Uranus and Neptune. Saturn and Venus are observable just before sunrise.