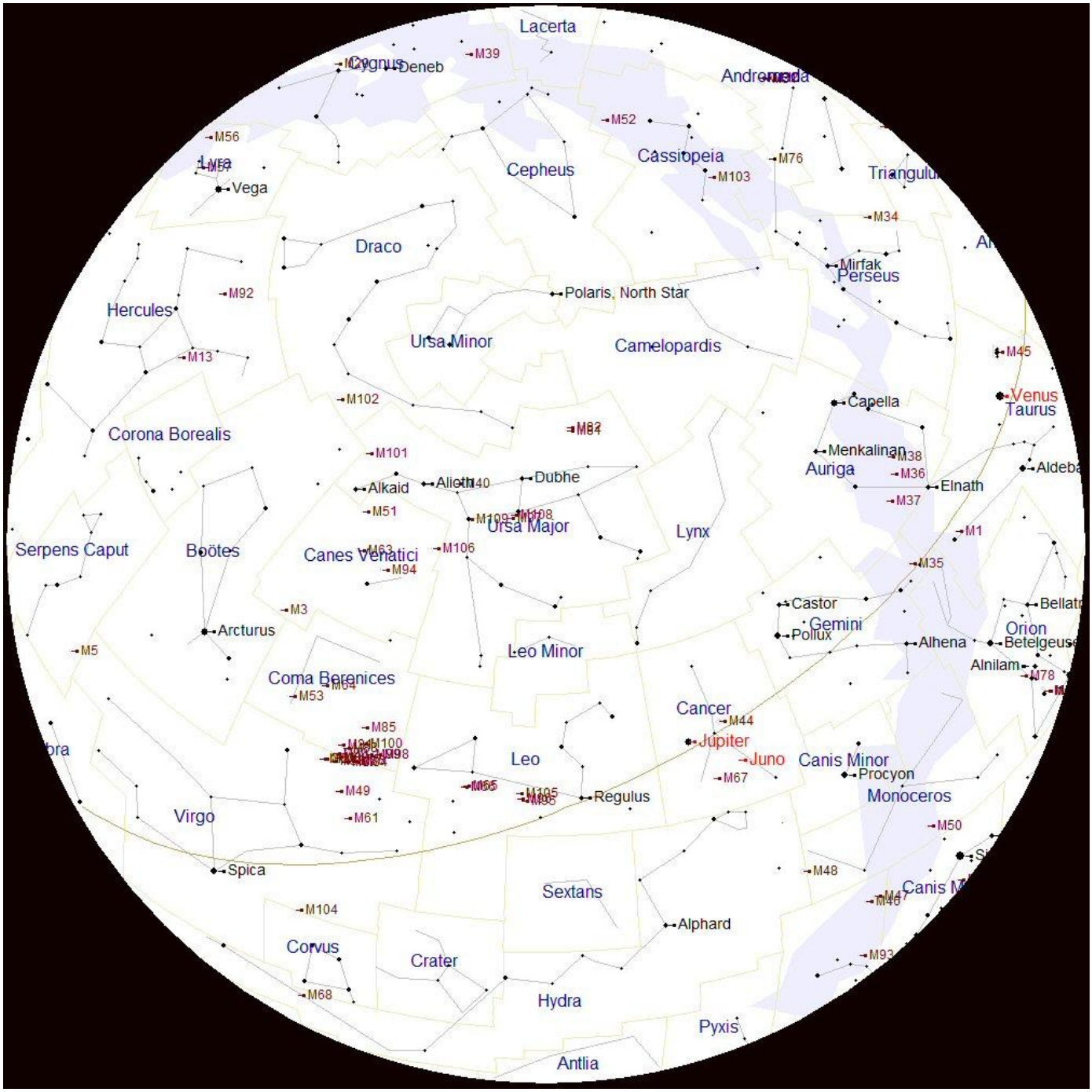
WHAT'S UP – APRIL 2015

These pages are intended to help you find your way around the sky this month



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

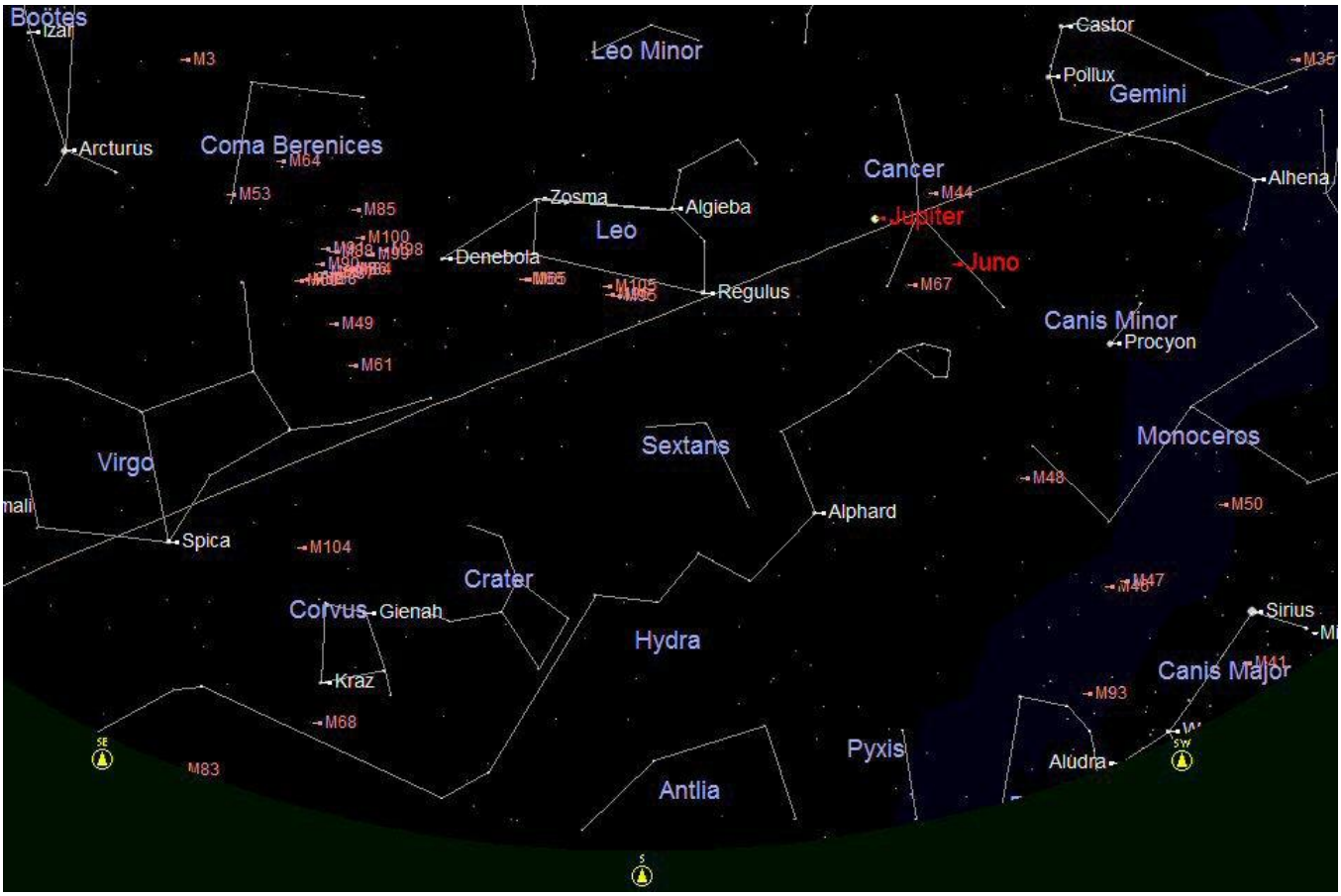
The centre of the chart will be the position in the sky directly overhead, called the Zenith. First we need to find some familiar objects so we can get our bearings. The Pole Star **Polaris** can be easily found by first finding the familiar shape of the Great Bear 'Ursa Major' that is also sometimes 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 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.

Planets observable in the night sky: Jupiter, Mars and Venus. Saturn can be seen in the early morning.

EXPLORING THE NIGHT SKY THIS MONTH

GUIDE TO THE NIGHT SKY - APRIL 2015



The night sky looking south on 15th April

The chart above shows the night sky looking south at about 21:00 on 15th April. West is to the right and east to the left. The curved line across the sky is the ecliptic. This is the imaginary line along which the Sun, Moon and planets appear to move across the sky. The constellations through which the ecliptic passes are known as the constellations of the 'Zodiac'.

The beautiful winter constellation of Orion (the Hunter) has now moved into the south western sky. It can still be seen in the south western sky as soon it is dark at around 18:00. Orion is still observable in the evenings as it moves into the south western sky. The two stars representing Orion's hunting dogs, Sirius in Canis Major and Procyon in Canis Minor are to the west (right) of the chart above.

The constellation of Taurus is located to the west of Gemini along the ecliptic just off the top right of the chart but is still prominent in the early evening. Located at the centre of Taurus is the bright red giant star Aldebaran which is surrounded by the dispersed stars of the large Open Cluster 'the Hyades'. In the north west of Taurus is the beautiful Open Custer Messier 45 (M45) also known as the Pleiades or (the Seven Sisters).

To the east (left) of Taurus is the constellation of Gemini (the Twins) with its lovely open cluster M35 located just off the end of the upper line of stars. Gemini is followed along the ecliptic by the constellation of Cancer. Cancer is quite indistinct but is worth tracking down with binoculars to find the lovely open cluster M44 which is also known as Praesepe or the Beehive Cluster. The giant 'king of the planets' Jupiter is located in Cancer.

Just coming into prominence now is the distinctive shape of Leo (the Lion) looking rather like the crouching Sphinx in Egypt. The brightest star in Leo is Regulus located almost on the ecliptic. Because it is located very close to the ecliptic it is often occulted by the Moon. This occurs when the Moon passes in front of Regulus. It is an interesting thing to observe and follow.

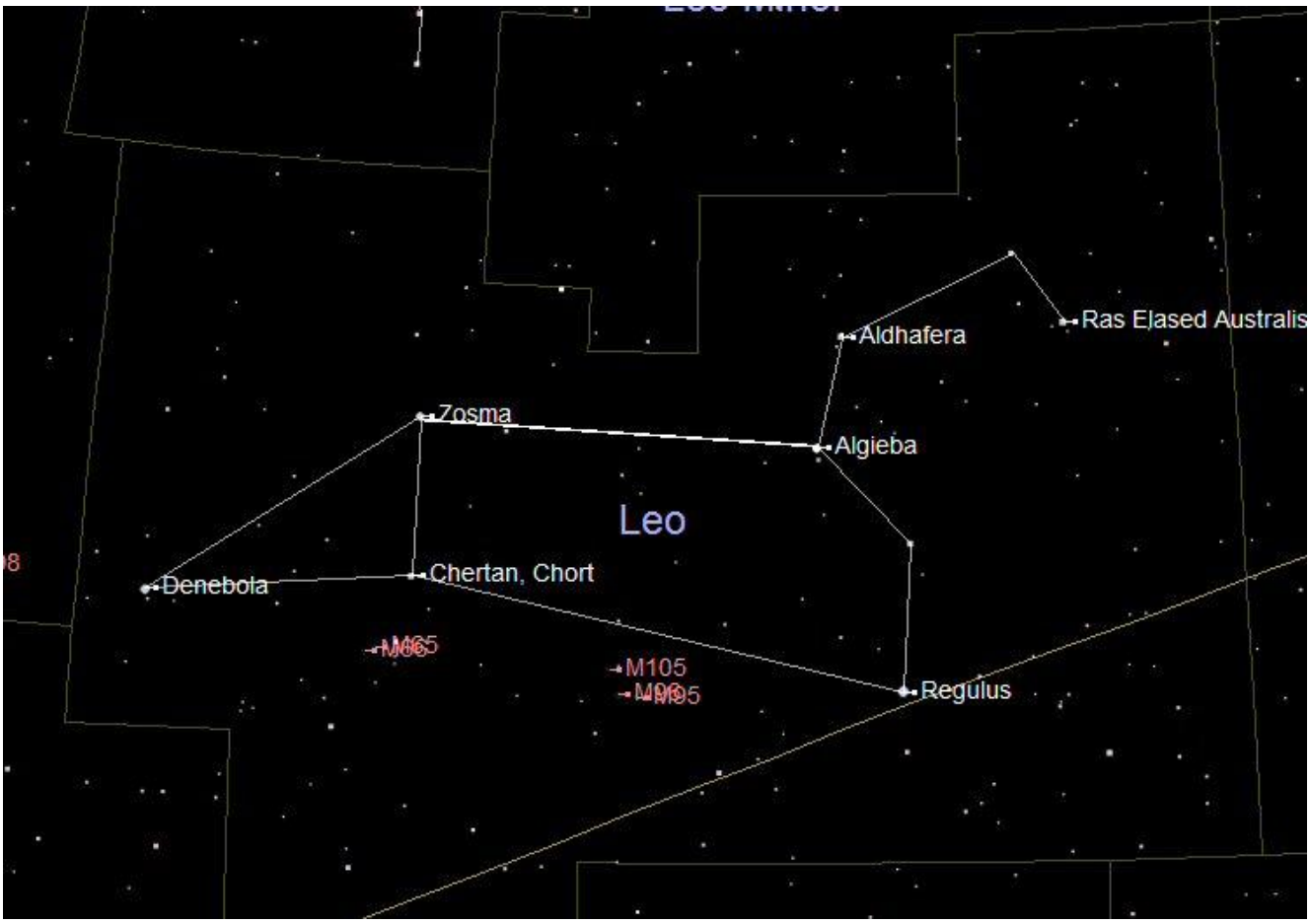
The most obvious feature of Leo is the distinctive back to front question mark '?' pattern of stars above Leo. This is known as the 'Sickle' due to its resemblance to the curved blade of the sickle tool used to cut corn and other crops. The constellation of Leo is quite large in the sky which may make it just a little difficult to find for the first time especially in a light polluted sky. However once it is found it is much easier to locate. The rest of Leo to the east (left) of the 'Sickle' resembles the body and hind quarters of a resting lion.

Leo hosts four of the brightest galaxies in our sky only the Great Spiral Galaxy (M42) is brighter. The galaxies M65, M66, M95 and M96 can be seen using a moderately sized telescope, located below Leo. See the Leo chart below.

To the east of Leo are the constellations of Virgo and Coma Berenices. Coma Berenices has no bright stars and no distinctive shape but on a clear night the three brighter stars can be made out. Virgo has one bright star called Spica that twinkles close to the horizon.

The whole area of sky around Leo, Coma Berenices and Virgo hosts many galaxies. These are the galaxies of our 'local group' of nearby galaxies close to our own galaxy that we call the Milky Way.

THE CONSTELLATION OF LEO



The Constellation of Leo

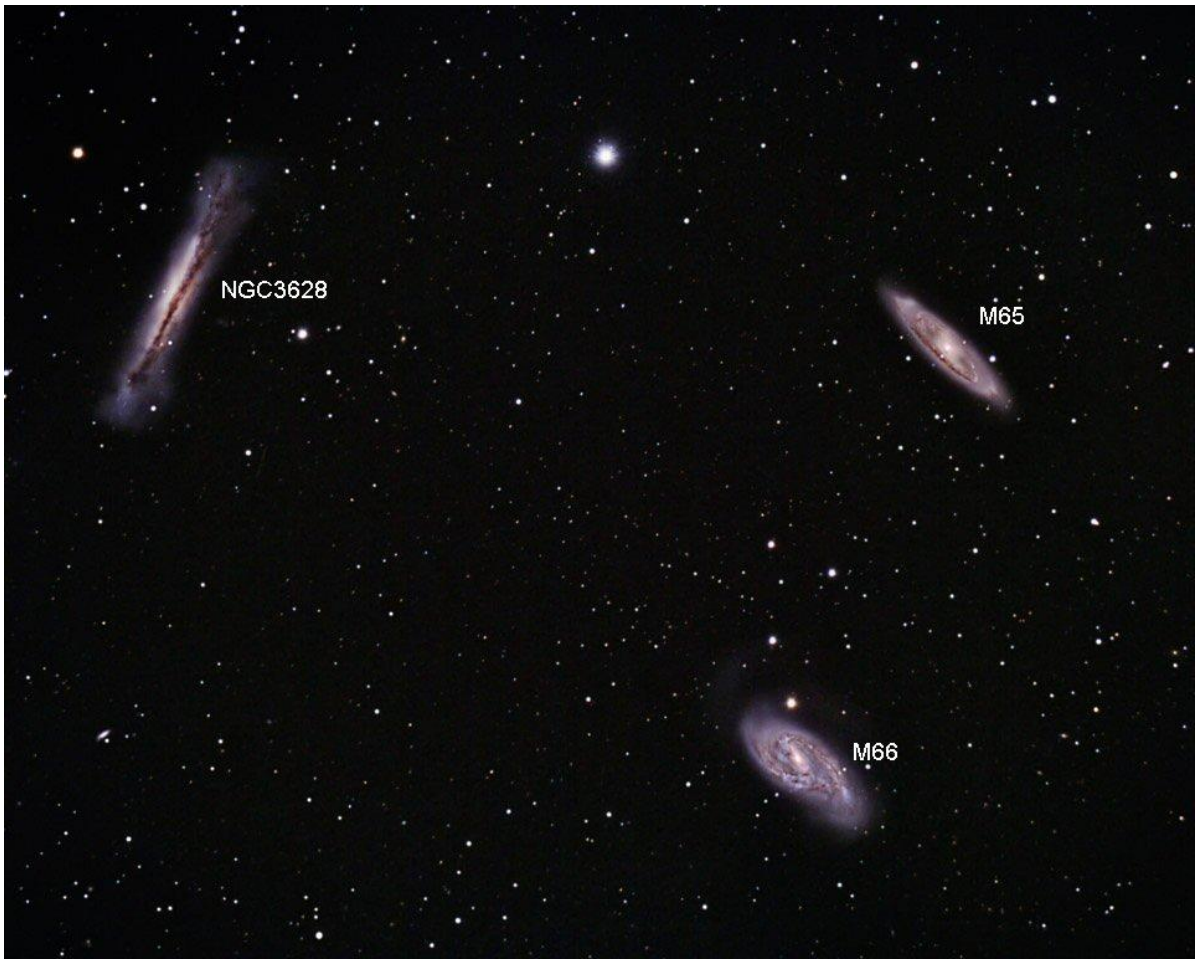
Leo is quite distinctive with the sickle shaped pattern of stars looking much like the head of the lion that Leo represents. In fact the traditional drawn shape of Leo as shown on the chart above does look rather like the lion's body or the Sphinx in Egypt. The 'sickle' is also described as looking like a backwards question mark (?). Leo does look unexpectedly large in the sky and may be difficult to find for the first time.

All the stars of the 'sickle' are quite bright but the bottom (most southerly) is noticeable brighter. This star is referred to as α (Alpha) Leonis and by its proper name Regulus. Regulus is a large blue / white star approximately 160 times brighter than our Sun and lying at a distance of 69 light years. When viewed through a small telescope a smaller companion star can be seen close by making Regulus a double star. Regulus sits virtually on the ecliptic line. This is the imaginary line along which the Sun, Moon and planets appear to move across the sky. Leo is therefore one of the 12 constellation of the Zodiac. Every 18 years Regulus is 'occulted' by the Moon every month for a period of 18 months. An occultation occurs when the Moon passes in front of the star so the star disappears behind the Moon. The last series of occultations occurred around 2007 and the next series will be around 2024.

The star Algieba, located above Regulus on the 'Sickle', is a very nice double star located about 75 light years from us. The two stars orbit each other around their common centre of gravity every 620 years and have magnitudes of +2.2 and +3.5 which give them a combined magnitude of +1.98.

Spring time is regarded as the season of galaxies and Leo is on the edge of a large group of galaxies. The main group is located in the neighbouring constellations of Virgo and Coma Berenices to the east (left) of Leo. See the 'Night Sky' chart above.

However Leo does have five bright galaxies of its own, these are M65, M66, M95, M96 and M105. These can be found directly below Leo shown on the chart above. A 100mm to 150mm aperture telescope will be required to see the faint 'misty' outline of these galaxies. There is a third galaxy close to M65 and M66 called NGC3628 these three are known as the Leo Triplet.



The Leo Triplet M65, M66 and NGC3628

THE SOLAR SYSTEM THIS MONTH

THE LYRID METEOR SHOWER IN APRIL

There will be a meteor shower during April from 18th until 25th April with a noticeable peak on the evening of 22nd and morning of the 23rd April. There is expected to be a sharp rise in meteor numbers to a shower maximum around midnight on the 22nd April. Away from light pollution and with a clear sky it should be possible to see up to 12 meteors per hour especially around midnight on 22nd April. The Moon is favourable for this shower and will be a thin crescent in the west in the early evening which will have moved below the western horizon in time for the expected maximum. The Lyrid meteors are typically quite bright and fairly fast with many leaving persistent long trains (trails) across the sky. There may even be the occasional very bright meteor known as a 'Fireball'.

The 'Radiant' of the shower (the point in the sky where all the meteors appear to radiate from) is to the south west of Vega the brightest star in the constellation of Lyra. The constellation of Lyra is a summer constellation with its brightest star 'Vega' marking one of the corners of the 'Summer Triangle'. Lyra does not rise over the north eastern horizon until after 21:00 when the sky is beginning to fully darken. Consequently the meteors will predominately appear to be rising from the east and crossing the sky to the west and across to the north. It will therefore be best to be positioned with a view somewhere between the south east and east. For comfort a garden lounger can be used which will give a good view of the sky from the horizon between east and south and up through the sky to Zenith (the point directly overhead), without straining the neck. Most of the Lyrid meteors should be seen across this quadrant of the sky.

By midnight Vega will be high in the east so the meteors may be seen radiating in all directions away from the radiant point.

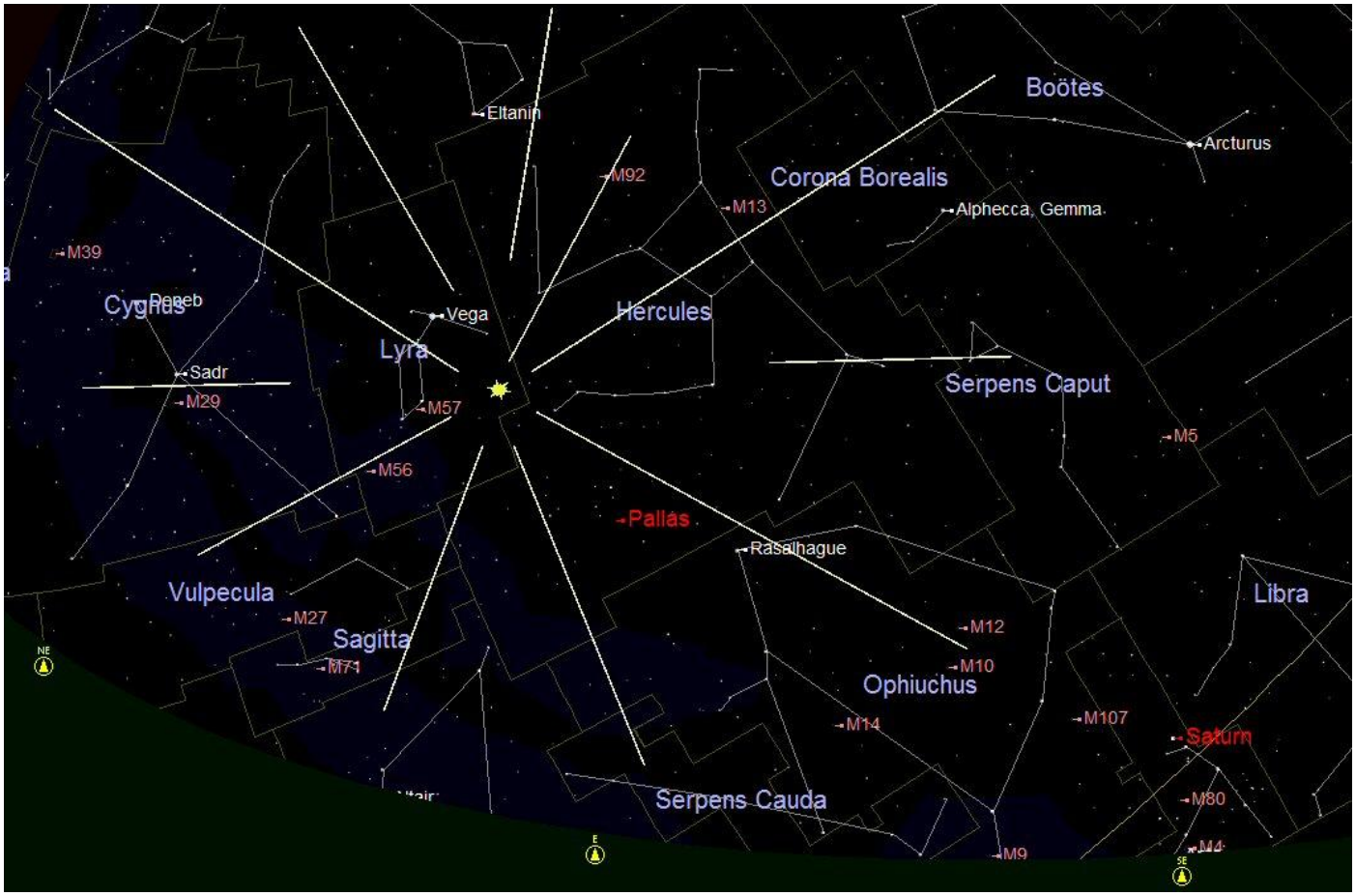
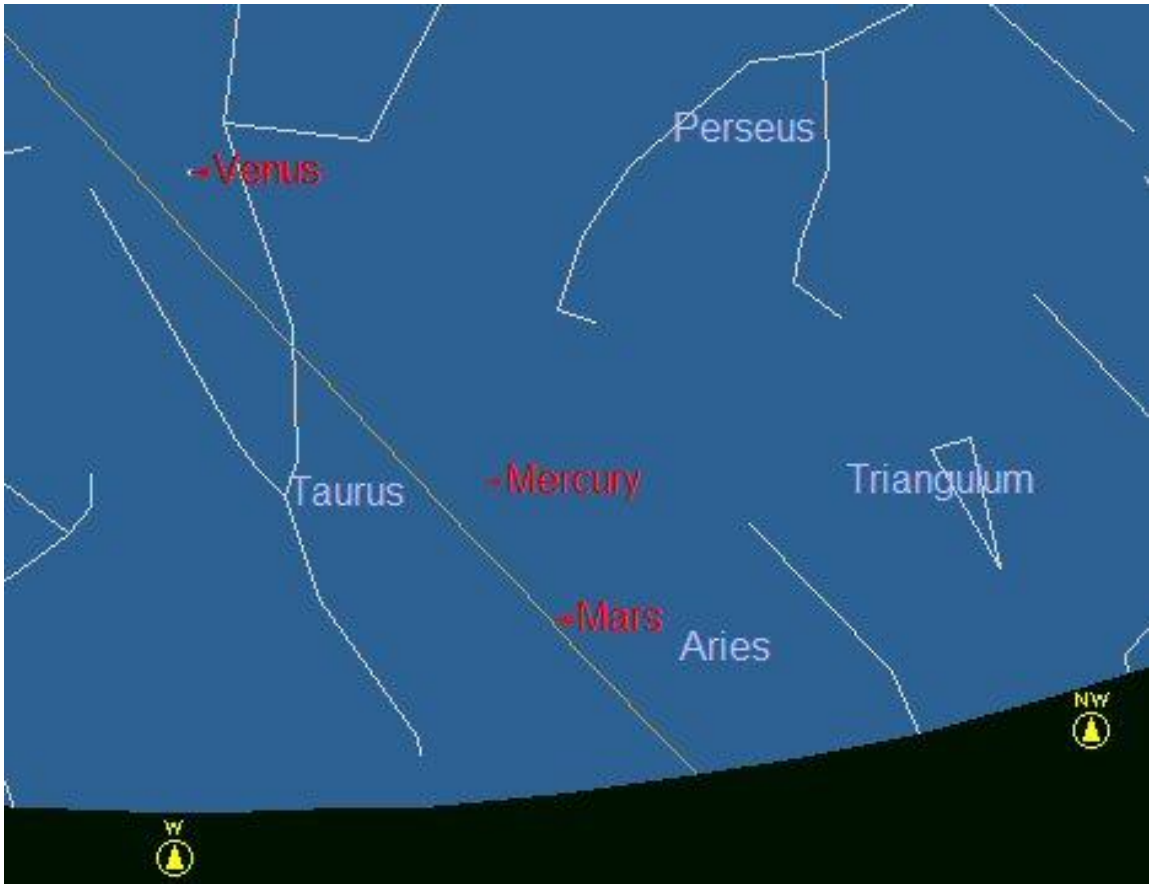


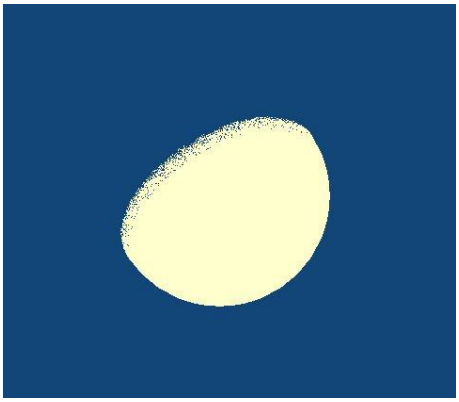
Chart showing the 'Radiant' of the Lyrid Meteor Shower

MERCURY will be coming into view towards the end of this month and will be visible low in the west after sunset. The smallest planet will be just two degrees away from the Pleiades (Seven Sisters) star cluster.

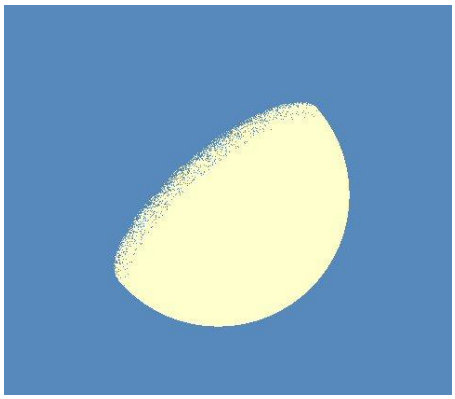


Mercury, Venus and Mars in the west at sunset

VENUS is rising higher above the south western horizon in the evening sky over the next few months. It is so bright at magnitude -4.0 that it cannot be missed. As Venus moves further out from the Sun it is moving closer to us and will appear larger. However as it gradually gets larger it will become crescent shaped. Venus will not reach its greatest eastern elongation (and its thinnest crescent) until 6th June when it will be at its greatest apparent distance from the Sun. The images above show how Venus will be appearing larger but narrower through the month of April.



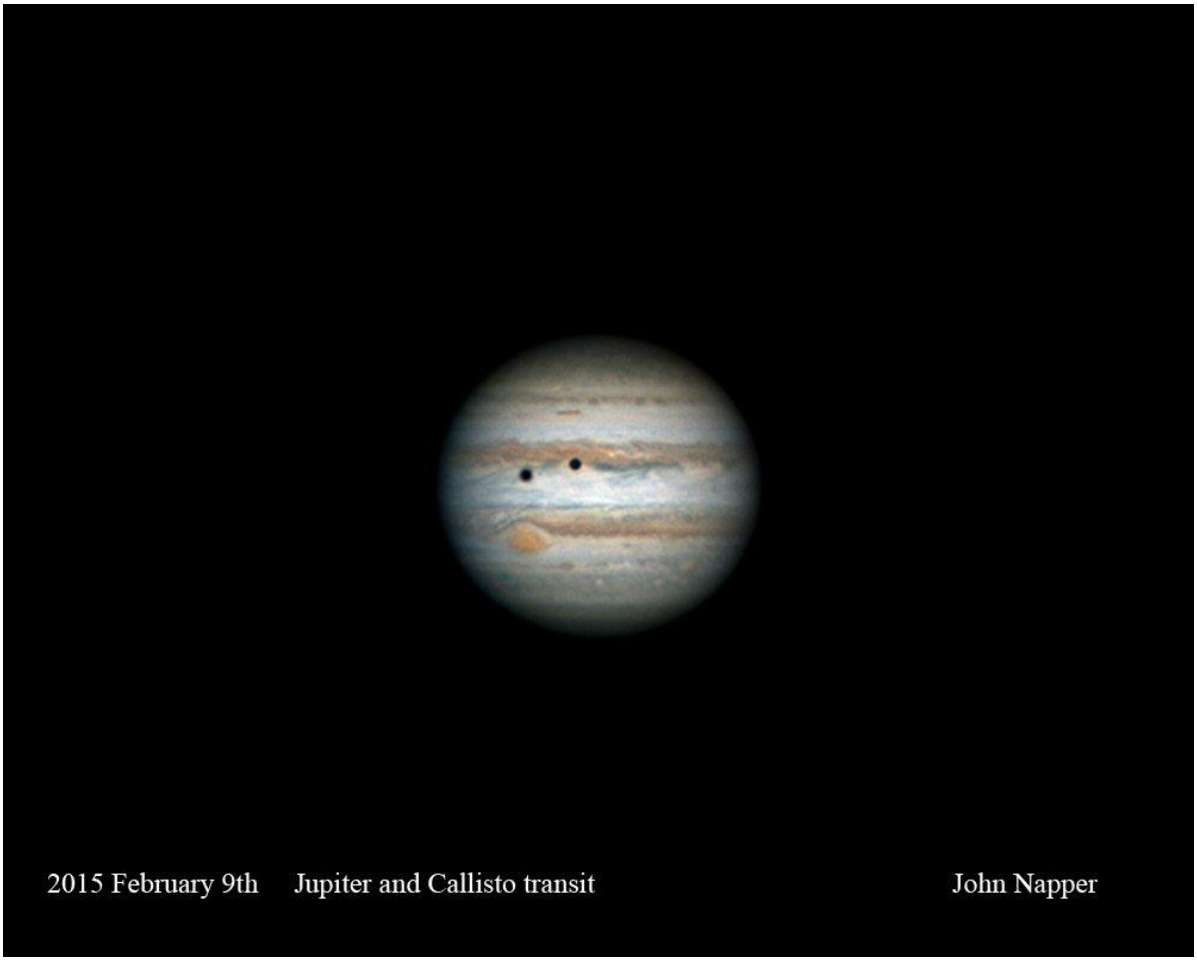
Venus 1st April



Venus 30th April

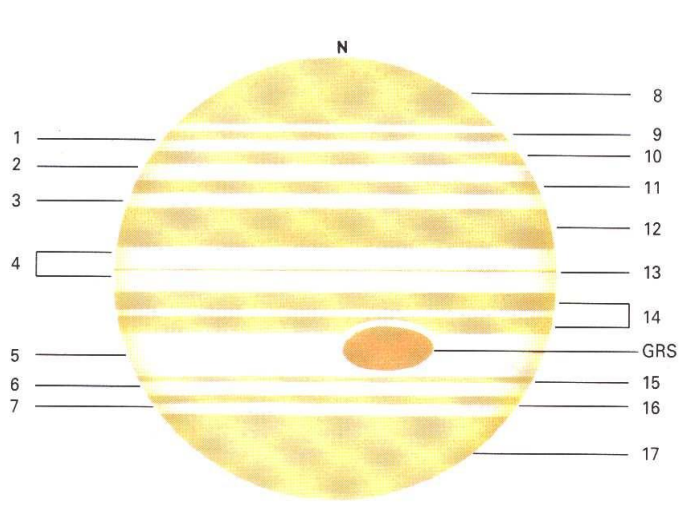
MARS will set over the western horizon at around 21:20. It may just about be visible low in the south west in the constellation of Pisces. Mars is a long way from Earth at the moment so will look very small at just 3.8 arc-seconds in diameter. It may just be visible above the south western horizon after the Sun sets. See the Mercury chart above.

JUPITER is located in Cancer and will be in the south as the sky darkens. It will be visible all night and sets in the east at 04:30. The cloud belts and zones can be seen using a small telescope. Jupiter is still in a really good position for observing. We are still looking straight down on the equator and therefore see the moons passing in front and behind the planet. This means we see the moons cast an eclipse shadow on to the planet as can be seen in the image below.



Jupiter and with Callisto and its shadow imaged by John Napper

For those who are lucky enough to have a larger telescope a closer study of the features in Jupiter's cloud system can be achieved. The darker bands on the clouds are known as 'Belts' and the lighter ones known as 'Zones'. The belts are numbered 9 to 16 in the diagram below and the most prominent (North and South Temperate Belts) 12 and 14 can be seen using a small telescope. A larger telescope is required to make out the details of the other less prominent belts.



1 — North North Temperate Zone
2 — North Temperate Zone
3 — North Tropical Zone
4 — Equatorial Zone
5 — South Tropical Zone
6 — South Temperate Zone
7 — South South Temperate Zone
8 — North Polar Region
9 — North North North Temperate Belt
10 — North North Temperate Belt
11 — North Temperate Belt
12 — North Equatorial Belt
13 — Equatorial Band
14 — South Equatorial Belt
15 — South Temperate Belt
16 — South South Temperate Belt
17 — South Polar Region
GRS — Great Red Spot

The cloud markings on Jupiter

The Belts and zones are regions of higher and lower atmospheric pressure. The lighter coloured 'Zones' are regions of rising gas caused by convection of heat from the core of Jupiter. The darker 'Belts' are regions of falling gas and are approximately 20 kilometres lower in altitude than the zones. In the regions where the belts and zones meet, huge storms are created as the belts and zones move at different speeds and directions. A larger telescope will allow some of detail of the storm patterns to be seen. For those who are lucky enough to have a larger telescope a closer study of the features in Jupiter's cloud system can be achieved. The darker bands on the clouds

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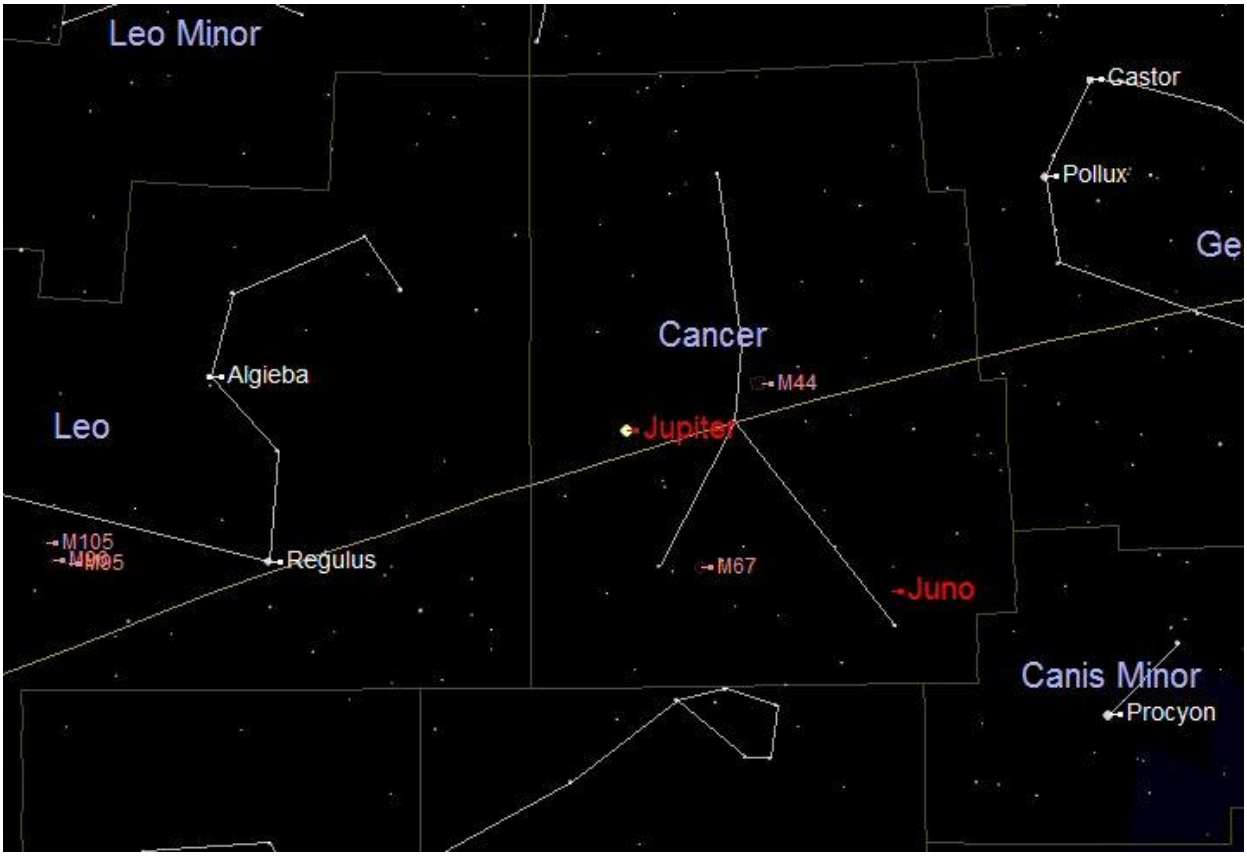
The most famous feature in the cloud system is the ‘Great Red Spot’ (GRS). This huge storm has been raging for at least 350 years. We know this because it was recorded by astronomers in 1664 using some of the earliest telescopes. The GRS does change colour and shape but it is always there. Its colour may fade from its pink to nearly white when it may almost disappear. The colour is thought to be caused by Phosphorus welling up from deep in Jupiter’s atmosphere.

The GRS is not the only storm feature to be seen. There are white spots and even mini red spots. These tend to be transient and last from just a few days or weeks but others may persist for up to fifty years. Spots can combine with other spots as they move along the boundaries between the belts and zones. Some larger spots have even been swallowed up by the GRS. Over the last couple of years there was a lot of turbulence around the GRS with eddies running along the South Tropical Zone and around the GRS.

The four biggest and brightest moons (Io, Europa, Ganymede and Callisto) are known as the Galilean moons after Galileo Galilei who first reported seeing them. They can easily be seen using a modest telescope (90mm aperture) or even a good pair of binoculars. The two inner moons Io and Europa appear to move quite quickly especially when they are positioned close to the planet. They can be seen to have moved in periods of about 10 to 15 minutes.



Jupiter located just inside Cancer on the border with Leo

Io is the closest of the large moons to Jupiter. Its orbit is 421,000 km from Jupiter and takes just 1.77 Earth days to circle the planet. Io is 3,630 km in diameter which is a little larger than our Moon (3,476 km).

Europa is a little smaller than Io and our Moon at 3,138 km in diameter. It orbits Jupiter every 3.55 Earth days on an orbit of 670,900 km.

Ganymede is the largest moon in our Solar System with a diameter of 5,262 km. It orbits Jupiter at 1,070,000 km from the planet and takes 7.16 days.

Callisto is 4,800 km in diameter and takes 16.69 days to orbit Jupiter a distance of 1,880,000 km

The four Galilean moons (Io, Europa, Ganymede and Callisto) can easily be seen using a modest telescope (90mm aperture). The two inner moons called Io and Europa appear to move quite quickly especially when they are positioned close to the planet. They can be seen to have moved in periods of about 10 to 15 minutes. The position and motion of the Moons can be monitored recorded using sketches. If an accurate clock is used the time that the moons disappear behind or reappear from behind Jupiter can be compared to the time predicted using a computer planetarium application.

Jupiter is now appearing 'side on' as we look at it from Earth. This means we see the orbits of the moons in a flat plane which is almost aligned to the equator of Jupiter. As a consequence the moons pass in front or behind Jupiter on every orbit and not above or below as they do most of the time. This makes observing Jupiter very interesting. We can watch the moons approach the planet to disappear and then watch them reappear an hour or two later. We can also see their shadows as they pass in front and project their shadow on to the planet.

When we see the orbits of the moons edge on, as we can now, Mutual Events of Jupiter's moons (eclipses, occultations and transits) can be followed. An eclipse occurs when one moon casts its shadow on to another moon. Occultations occur when one moon passes behind another moon and is hidden from view. A Transit is one moon passing in front of another. More details to help observing these events are given below:

With the help of a computer planetarium application the events happening around Jupiter can be predicted and followed using a telescope. There are computer planetarium applications such as 'Stellarium' that can be downloaded free from the internet. These applications can be used to predict what is going to happen around Jupiter during any clear night before observing is started.

Some interesting phenomenons to look for on the surface of Jupiter are:

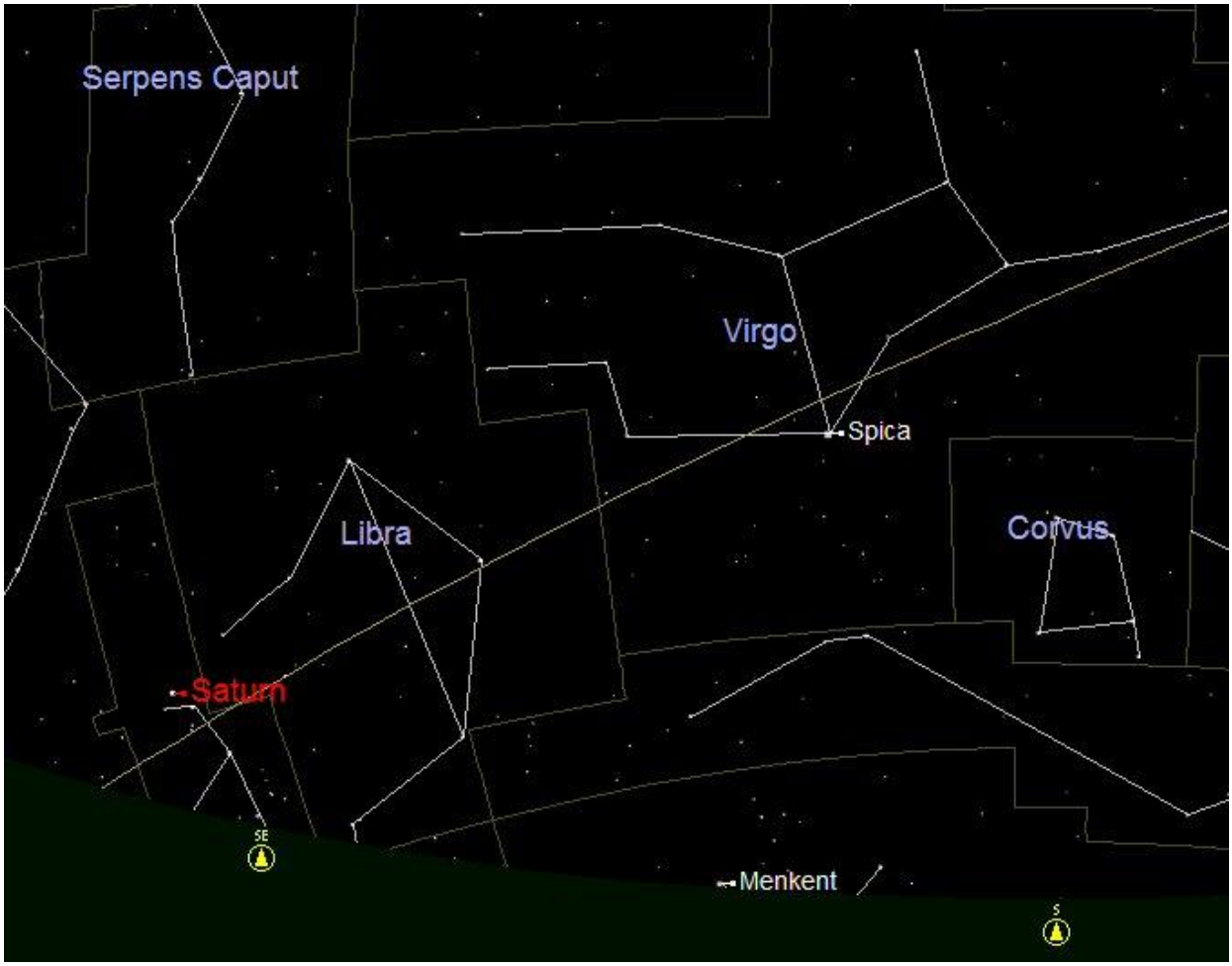
Eclipses these occur when a moon casts its shadow on to Jupiter. It is the easiest of the phenomenon to see because the eclipse shadow looks like a black full stop on the planet. The eclipse shadows may be small so they are best seen when Jupiter is well above the horizon and a high magnification is being used. The seeing conditions of the sky can also be important. If there is a lot of air turbulence then the planet will appear to 'shimmer' and make the image blurred.

Transits are when a moon passes in front of Jupiter. The moon is actually very difficult to see while it is in front of the planet and is lost in the glare from the surface. However transits are still very interesting to follow. A planetarium application will predict the time that the transit will start and finish. With the aid of an accurate clock the transit can be followed and the moon can be watched as it approaches the limb of Jupiter. The time when the moon makes contact with the edge of the planet can be recorded and compared with the prediction from the planetarium application. Similarly the emergence of the moon from the other side of the planet can be timed and compared to the prediction.

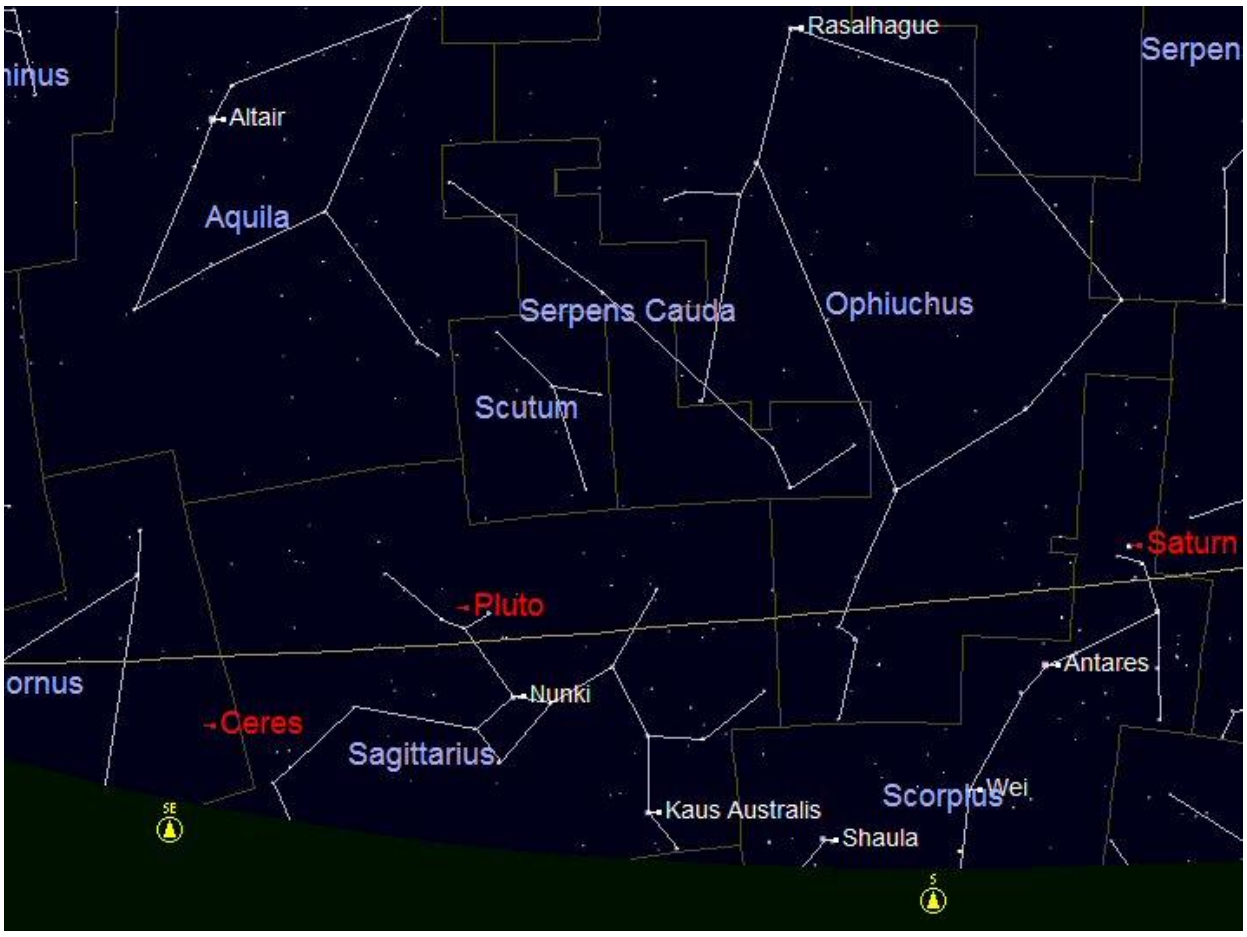
Occultations occur when a moon passes behind the planet and can be predicted then followed and timed in a similar way to the eclipses and transits.

Mutual Events occur when the moons Eclipse, Transit or Occult another moon. These events are much rarer and only occur when the planet is seen 'edge on' to us. That is when we are looking at the planet directly on to its equator, as we are now. These events can also be predicted and followed using a planetarium application.

SATURN rises at about 23:00 mid-month and will be well positioned for observing quite low in the south from about 01:00 until the sky begins to brighten. Saturn can be seen in the south at 04:00 and will still be observable until after 05:30 when the sky brightens before dawn. For those who stay up to make observations of the beautiful ringed planet in the hours after midnight there is the reward of seeing the rings system wide open.



Saturn rising in the south east at midnight



Saturn in the south at 04:30 just before the sky begins to brighten

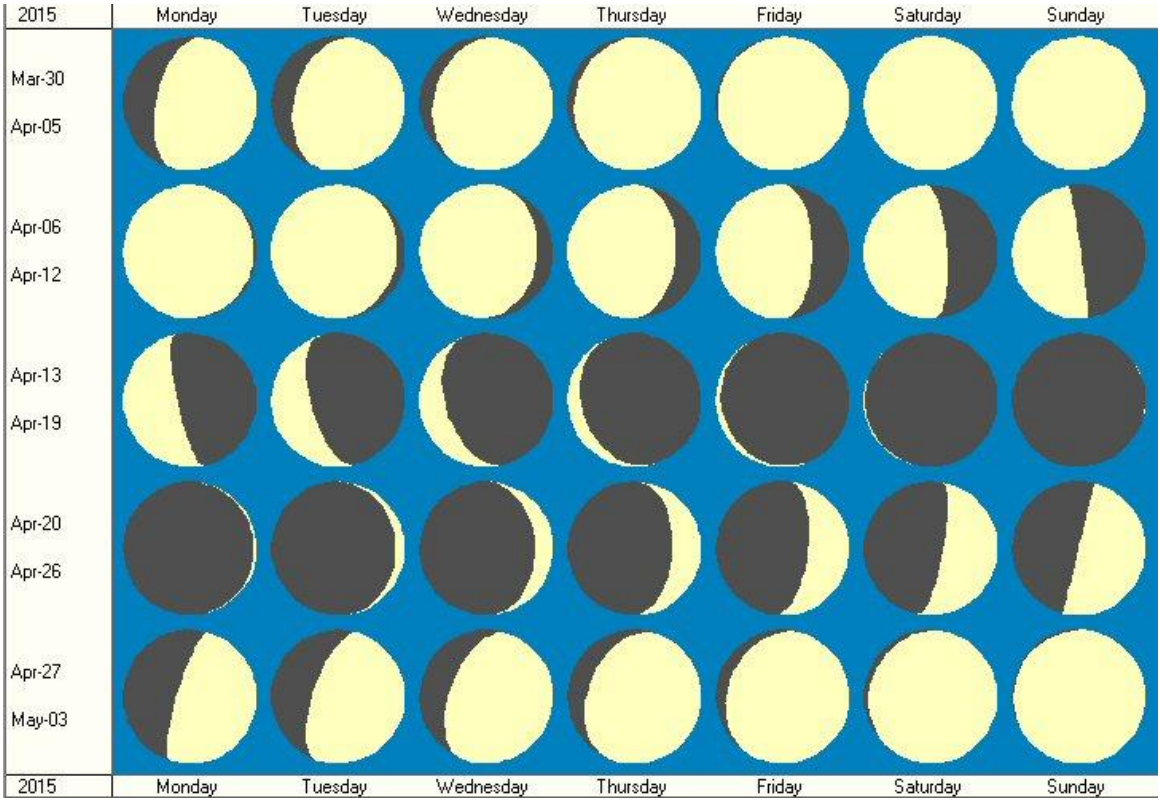
It is possible for the early riser to get out before breakfast (at about 04:00) for a quick look before the sky begins to brighten. Some observations of the beautiful ringed planet can now be made with the ring system nearly wide open.

Saturn imaged last time its rings were wide open

URANUS rises in the east just before the Sun so will not be observable this month.

NEPTUNE rises in the east at about 05:00 just as the sky is beginning to brighten so will not be observable this month.

THE MOON PHASES IN APRIL 2015



Full Moon will be on 4th April

Last Quarter will be on 12th April.

New Moon will be on the 18th April.

First Quarter will be on 25th April

THE SUN

The Sun rises at 06:20 at the beginning of the month and at 05:50 by the end of the month.

Sunspots and other activity on the Sun can be followed live and day to day by visiting the SOHO website at: http://sohowww.nascom.nasa.gov/ .

A special solar filter must be fitted to a telescope to view the Sun or alternatively the image can be projected on to a screen.

DO NOT LOOK DIRECTLY AT THE SUN AS IT WILL CAUSE BLINDNESS