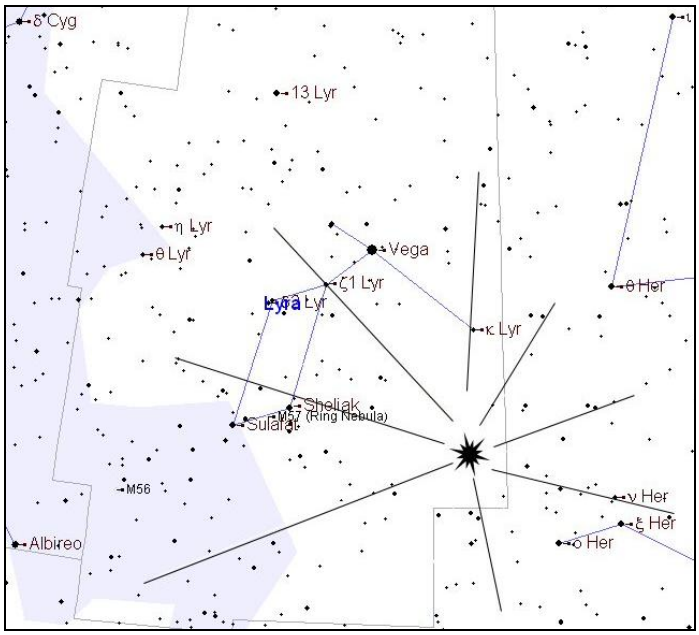
NEWBURY ASTRONOMICAL SOCIETY
MONTHLY MAGAZINE - APRIL 2014

THE LYRID METEOR SHOWER

During April every year there is an increase in the number of meteors that can be seen, normally between 19th and 24th, this increase in numbers is known as a Meteor Shower. The April shower is known as the Lyrids. The best time to watch for the Lyrids will be the evening of 22nd and morning of 23rd April especially around 01:00 when the shower should be at its peak.

The types of meteors that occur in showers originate from comets and are much more common than the 'Fireballs' that originate from asteroids. As a comet approaches the Sun, the frozen gases and water boil off and are blown away by the radiation from the Sun. Dust particles released in the melt are heavier and therefore continue more or less on the same orbital path. These particles spread out along the orbital path and may eventually form a complete ring around the Sun. Once a year the earth may pass through this stream of particles that then enter the atmosphere as meteors. Travelling at between 11 and 76 kilometres per second they burn up in the thin atmosphere at a height of about 100 kilometres.

Different particle streams may be inclined at different angles to the Earth's orbit, therefore meteors can enter the atmosphere at almost any angle but each stream always appears to radiate from the same area of the sky each year. The shower this month will appear to radiate from the constellation of Lyra which is why it is called Lyrids.

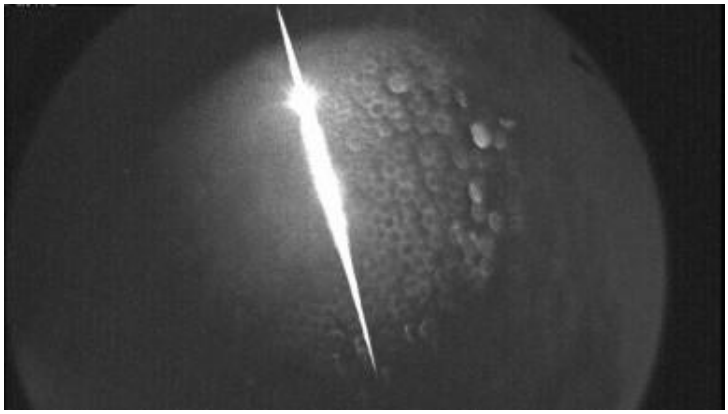


The Lyrid radiant point

The Radiant point of the Lyrid meteor shower is always located to the west (right) of the familiar shape of Lyra and its very bright star Vega. Although Lyra does not appear over the eastern horizon until 10 o'clock BST meteors may be seen rising up over the horizon before the constellation appears. The number of meteors is usually at its highest after midnight because at this time Earth is ploughing headlong into the particle stream.

ANOTHER LARGE METEOR HITS EARTH

A massive fireball which streaked across the Canadian sky, lighting up the ground, has sparked a massive hunt for the remains of a possible small asteroid.



Scientists were said to be rushing to the site of the impact, which is thought to be somewhere south west of Ontario. The fireball was seen at 10.24p.m. by several cameras in the area, all operated by Western University's Southern Ontario Meteor Network on 18th March.

The fireball is suspected to have exploded about 75 kilometres above Earth and broke up 30 kilometres later to the west of Toronto.

Scientists said the remnants would probably be small, and embedded in the soil but could provide valuable insights about their origins.

Officials at the Western University said "Meteorites may best be recognized by their dark and scalloped exterior and are usually denser than normal rock. They may often attract a fridge magnet due to their Iron content."

They also called on anyone who "may have witnessed or recorded this event, seen or heard unusual events at the time or who may have found possible fragments of the freshly fallen meteorite" to come forward.

These bright meteors originate from collisions between lumps of rock and metal called asteroids which mostly orbit in an area called the Asteroid Belt between Mars and Jupiter. When a collision occurs pieces of the asteroids are broken off and are sent flying off in all directions. Some pieces may eventually head towards Earth. They then break up in the upper atmosphere as very bright 'Fireball' meteors. These are generally very bright and normally appear singly. The types of meteors that occur in showers originate from comets and are much more common than the 'Fireballs' that originate from asteroids. See the previous column.

NEXT NEWBURY ASTRONOMICAL SOCIETY MEETING

4th April — Observing the Moon

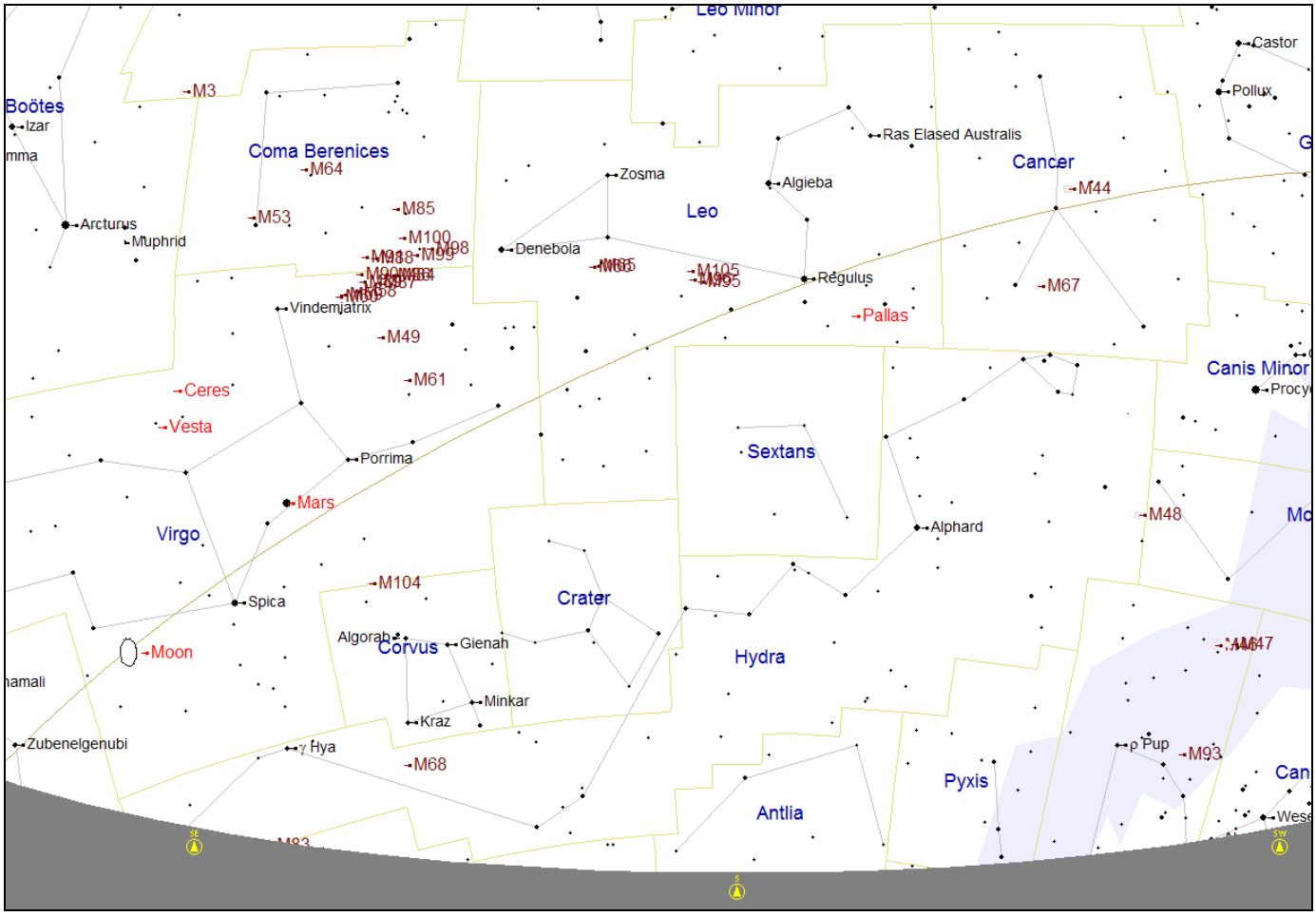
Website: **www.newburyas.org.uk**

NEXT NEWBURY BEGINNERS MEETING

16th April — Hopping around the night sky

Website: **www.naasbeginners.co.uk**

LOOKING FOR GALAXIES



The southern sky during April

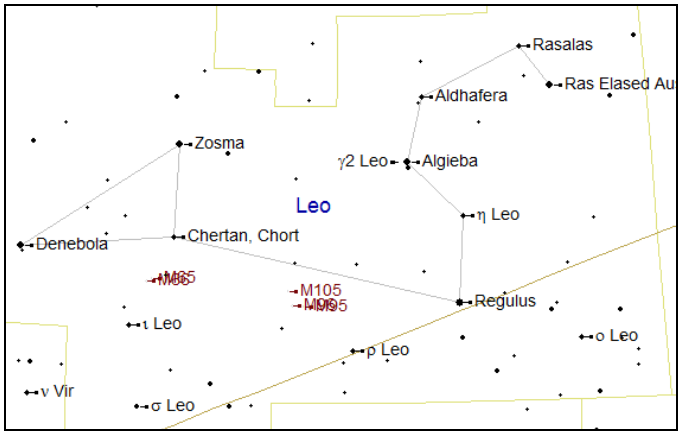
The familiar winter constellations of Orion, Taurus and Gemini have now moved towards the western horizon to give way to the Spring Constellations of Cancer, Leo, Virgo and Bootës.

The constellation of Leo now dominates the southern sky. It is one of the few constellations that do actually look, with a bit of imagination, like what it is supposed to represent that is a Lion. The lion's head can be easily identified by is resemblance to a back-to-front Question Mark '?'. It is often referred to as 'the Sickle' because of its resemblance to the curved blade and handle of a sickle. The rest of the brighter stars are to the east (left) of the Sickle and mark out the body of the resting Lion.

At the bottom of the 'Sickle' is the brightest star in Leo which is named Regulus. This is one of our brightest stars at magnitude 1.4. It is an intrinsically bright, bluish white star, 160 times brighter than our Sun and has a surface temperature of 13,000ºK. It is about 5 times the mass of the Sun and is located at a distance of around 78 light years from us. Regulus is one of the few bright stars that is located very close (0.5º) to the ecliptic (the imaginary line along which the Sun, Moon and planets appear move across the sky). This means it often has close encounters with the Sun, Moon and planets and is sometimes occulted by the Moon (the Moon passes in front of Regulus).

Binoculars or a small telescope will show that Regulus has a small 8th magnitude companion.

The star known as γ (gamma Leonis) real name Algieba (the Lion's Mane) is a beautiful double star. It is shown on the charts above and below as the second star up the Sickle from Regulus. The pair of yellow giants are 2nd and 3rd and can be separated using a small telescope. A good pair of binoculars or a low powered wide field telescope will show a third unrelated 5th magnitude star close by.



A more detailed chart of Leo

Located below the resting lion shape of Leo are a number of quite bright galaxies. M65 (9th Mag) and M66 (8th Mag) are located below the lion's hind quarters. M95 (10th Mag.) and M96 (9th Mag.) are located below the lion's belly. There is another galaxy M105 located just above this pair.

The two brightest galaxies in the constellation of Leo are Messier 65 (M65) and Messier 66 (M66).

Galaxies M66 and M65 in Leo

Messier 66 (also known as NGC 3627) is a barred spiral galaxy about 36 million light-years away in the constellation Leo. M66 has an apparent magnitude of 8.9. It was discovered by Charles Messier in 1780. M66 is about 95 thousand light-years across with striking dust lanes and bright star clusters along sweeping spiral arms.

M66 showing the Spiral Arms at the end of a bar

Messier 65 (also known as *NGC 3623*) is a spiral galaxy about 35 million light-years away in the constellation Leo. We see it slightly tilted away from us. It was also discovered by Charles Messier in 1780

M65 showing a dust lane in the Spiral Arms

There is another beautiful pair of galaxies M95 and M96 further to the west (right) of M65 and M66 below Leo.

Galaxies M96 and M95 in Leo

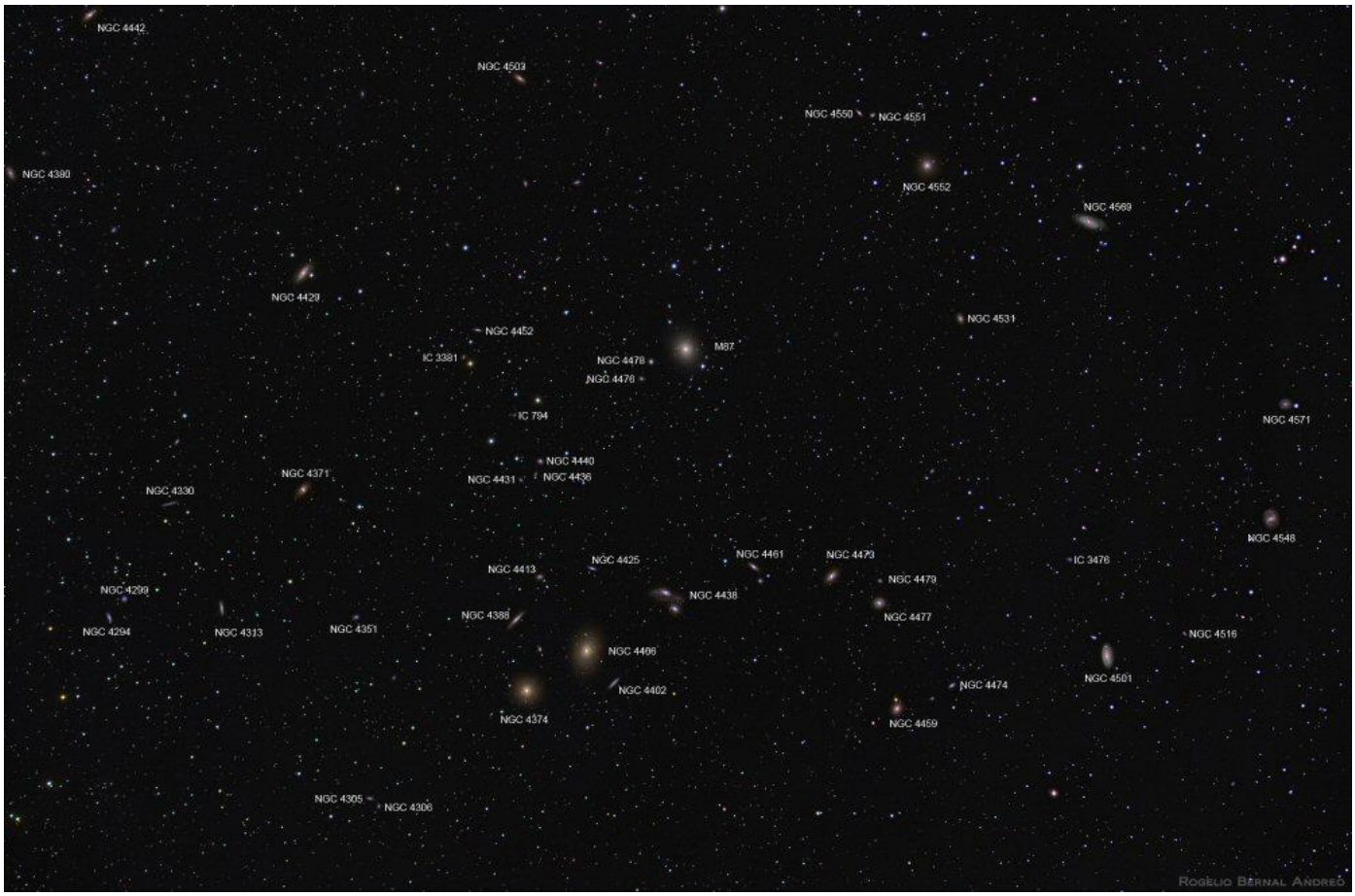
Messier 96 (also known as M96 or NGC 3368) is a spiral galaxy about 31 million light-years away in the constellation Leo. M95 and M96 were discovered by Pierre Méchain in 1781 and catalogued by Charles Messier four days later.

M96 has a deformed arm (top)

Messier 95 (also known as M95 or NGC 3351) is a barred spiral galaxy about 38 million light-years away in the constellation Leo.

M95 is seen almost ‘face on’ to us

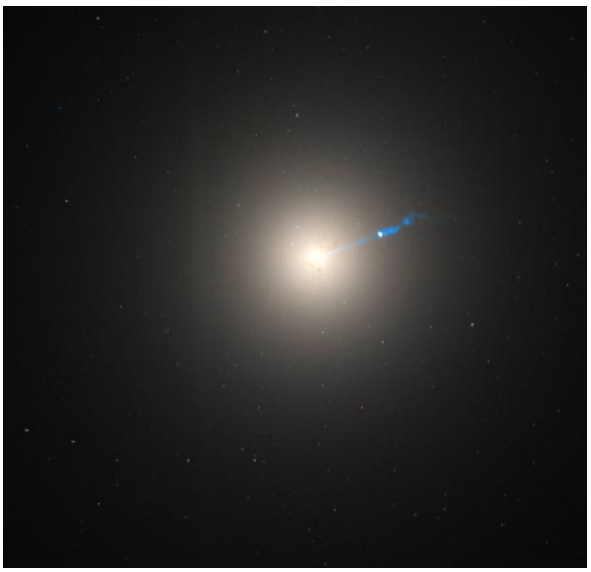
THE VIRGO – COMA GALAXY CLUSTER



Part of the Galaxy Cluster in Virgo and Coma Berenices with M87 towards the centre

To the east (left) of the constellation of Leo is a cluster of Galaxies known as the Virgo – Coma Cluster. The centre of the cluster can be seen on the chart at the top of page 2 and on the image above. The cluster does actually spread over into Leo and further into Virgo and Coma Berenices than is indicated by the identifications shown. In fact the whole area covered by these three constellations is filled with galaxies.

The cluster is centred on a giant elliptical galaxy known as Messier 87 (M87) or NGC4486. See the chart above.



M87 a giant Elliptical Galaxy with a 'Jet'

Messier 87 is the biggest galaxy in our region of the universe. This giant elliptical galaxy is thought to be at the centre of a super cluster to which our local group belongs. M87 is estimated to be about 53.5 million light years from us. It is believed to have been formed by the merger of a number of normal spiral galaxies and many smaller irregular galaxies over many millions of years.

The dimensions of M87 are difficult to comprehend. Some estimates suggest M87 has a mass that may be as much as 2.8 trillion times the mass of our Sun. It may be as large as 500,000 light years in diameter. Like all large galaxies M87 has a Super Massive Black Hole at its centre. Given the massive size of M87 we would expect that it would have a massive black hole and it does. The Black Hole at its core has a mass estimated to be in excess of 7 billion times that of our Sun.

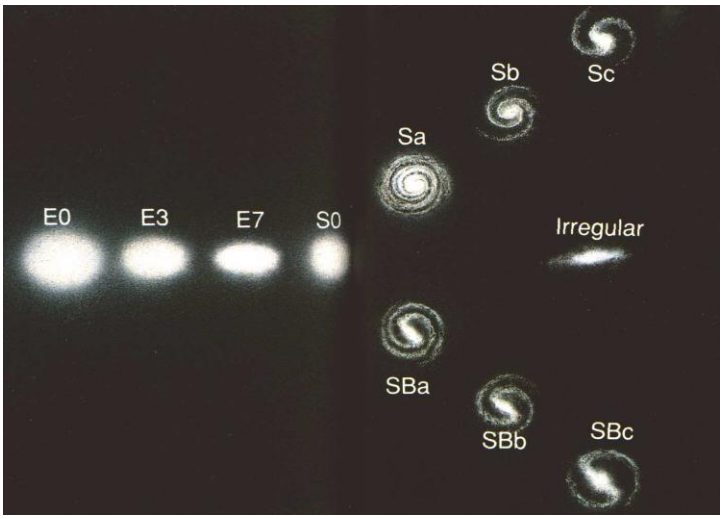
Unlike Spiral Galaxies the Giant Elliptical Galaxies appear to have very little star formation and are largely populated by old stars. However M87 does have a very active Black Hole at its centre. The black hole must be consuming vast amounts of gas and dust and possibly even whole stars. It has been found that there are very powerful X-Rays being emitted from the area around the central black hole. This indicates that material is being heated and destroyed as it spirals in towards the black hole.

The consumption of all this material causes the Black Hole to produce powerful jets from its poles. One of these jets can be seen in the image opposite. The jets spiral out along powerful magnetic fields.

Galaxies are the largest formations or groups of individual SPIRAL GALAXIES

stars that we know. All the stars we see in the night sky are part of a huge family of stars that form our galaxy which we call the Milky Way or 'the Galaxy' (with a capital 'G'). We see the nearest stars to us as individual stars but as we look at those further away they tend to merge into the fuzzy glow of the Milky Way. This effect is rather like standing in a pine wood, the trees nearest to us are seen as individuals but in the distance they merge into just a solid mass of trees.

Galaxies are classified into four types, these are: Elliptical, Spiral, Barred Spiral, and Irregular. Elliptical galaxies are generally the largest and Irregulars the smallest. The great American astronomer Edwin Hubble (whom the Hubble Space Telescope is named after) devised a theory about how galaxies formed. The 'Y' shaped diagram that Hubble produced to demonstrate his theory is still used today to classify galaxies and is shown below.



Edwin Hubble's classification of galaxies

ELLIPTICAL GALAXIES

These are huge balls of stars that do not have spiral arms and are elliptical (egg shaped). Many of these Elliptical Galaxies are the largest of all star groups, some having thousands of billions of stars. Elliptical Galaxies are classified according to how flattened they are, nearly round ones are known as E0 and sausage shaped ones E7. Most Elliptical Galaxies are far away and therefore appear very faint and need a telescope to see them. There are some indications that the giant elliptical galaxies grew from the collision of two or more smaller galaxies. There are indeed some galaxies which can be seen in the process of colliding and combining.

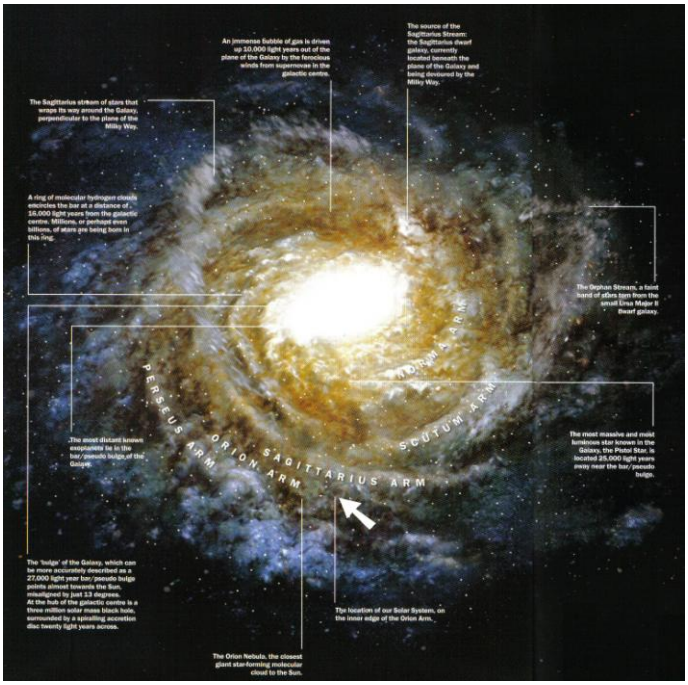
IRREGULAR GALAXIES

These galaxies are as the name implies large groups of stars but with no classifiable shape, in other words they may be any shape. Our spiral galaxy and the other close large spiral known as M31, or The Great Andromeda Galaxy, have smaller irregular galaxies associated with them as satellite galaxies. Two of the irregular galaxies associated with our galaxy can be seen from the southern hemisphere as islands broken off the Milky Way. These are known as the Large and Small Magellanic Clouds. There are other small galaxies within our spiral galaxy that have been pulled in by gravity and are in the process of being absorbed by the larger galaxy. We can also see the same process occurring in M31.

Like our galaxy the Milky Way, many galaxies have spiral arms. Some have arms like curved spokes in a wheel, some gently curved, some tightly wrapped around the central ball. Others have what looks like a straight bar of stars extending out from the central ball with the spiral arms attached to ends of the bar, these are the Barred Spiral Galaxies. The class is preceded by S' for Spiral and 'SB' for Spiral Barred. Spiral and Barred Spiral galaxies are further divided into three subdivisions a, b and c depending on how tightly the arms are wound. They are therefore referred to as Sa, Sb and Sc or SBa, SBb and SBc. The Great Andromeda Galaxy is our closest spiral neighbour and can even be seen with the naked eye on a very clear night and from a dark location.

Spiral Galaxies generally have star formation in the arms and this can be seen as blue colour in the arms of the galaxies in the images on page 3. Spiral galaxies rotate as a solid disc and not faster towards the centre due to the influence of huge amounts of dark matter. The arms are actually more like waves moving through the disc. As the wave passes through the disc, gas is compressed and stars are formed. Elliptical Galaxies have little or no star formation.

Our galaxy forms part of what is known as the 'local group' of galaxies comprised of about 30 members. The local group is dominated by two large spiral type galaxies, ours and M31 the Great Galaxy in the Constellation of Andromeda which can be seen with the naked eye on a very clear night. The Milky Way has more than 200 billion stars and the Andromeda galaxy is about twice the size with about 400 billion stars. All the other members of the local group are smaller and many are located like satellites around the large spirals.



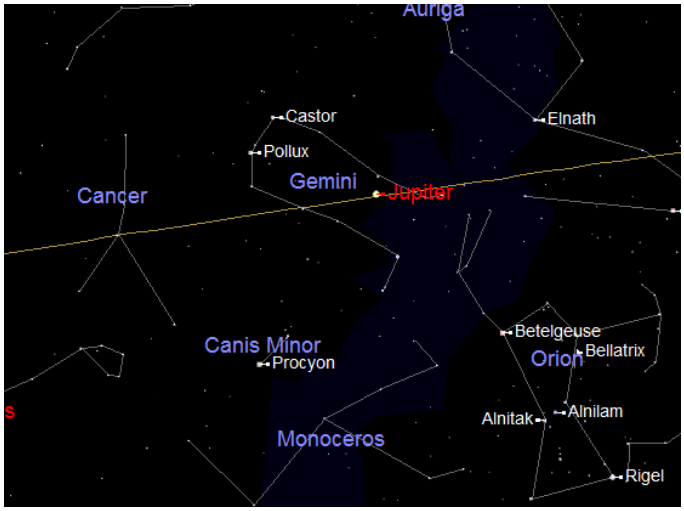
An artist's impression of the position of our Sun (arrowed)

As amazing as it seems there are clusters of galaxies and even super clusters of clusters of galaxies. Billions of galaxies can be seen stretching out into the universe as far as our most powerful telescopes can see.

OBSERVING THE PLANETS THIS MONTH

JUPITER

Jupiter is still at its best at as soon as it is dark enough to see at about (8 o'clock). It is then its highest in the sky in the south west. It is located in the centre of the constellation of Gemini.

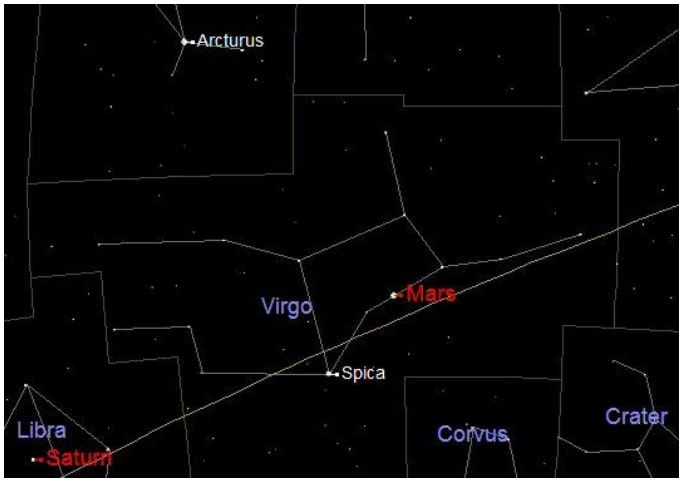


Jupiter in the south at 20:00 (8 o'clock)

Gemini is easy to find not least because Jupiter is shining very brightly at its centre. The familiar outline of Orion can be seen at the bottom right (south west) of the chart above and is often used to find Gemini when Jupiter is not within its bounds. Gemini is found to the north east (upper left) of Orion. A small telescope or even a good pair of 9 x 50 binoculars will show the four largest and brightest of Jupiter's moons. The moons are named (from the inner most out): Io, Europa, Ganymede and Callisto. A small telescope will show the cloud belts and the moons passing in front and behind the planet. With a medium sized telescope it is possible to see the shadow of a moon cross Jupiter in an 'Eclipse'.

MARS

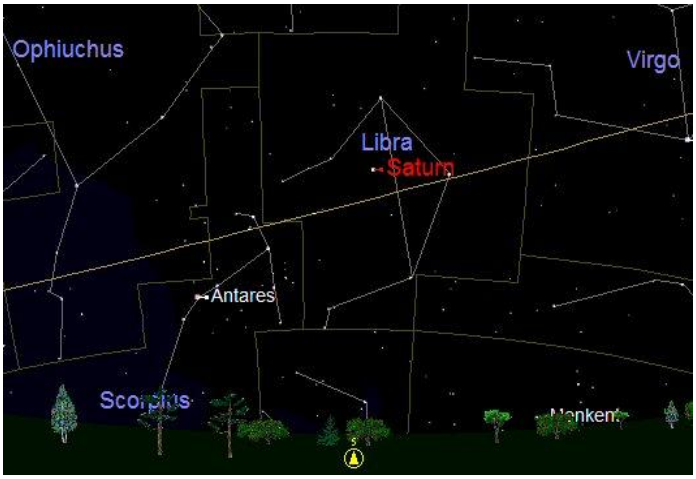
Mars rises over the eastern horizon at 18:45 mid April and will be in daylight so will not be visible until after the Sun sets at about 20:00 (8 o'clock). It will not be at its best for at least another hour when the sky will be dark and Mars will have moved out of the dirty and turbulent air closer to the horizon. Mars will be due south in Virgo and at its best around about midnight, mid month.



Location of Mars and Saturn at midnight facing south

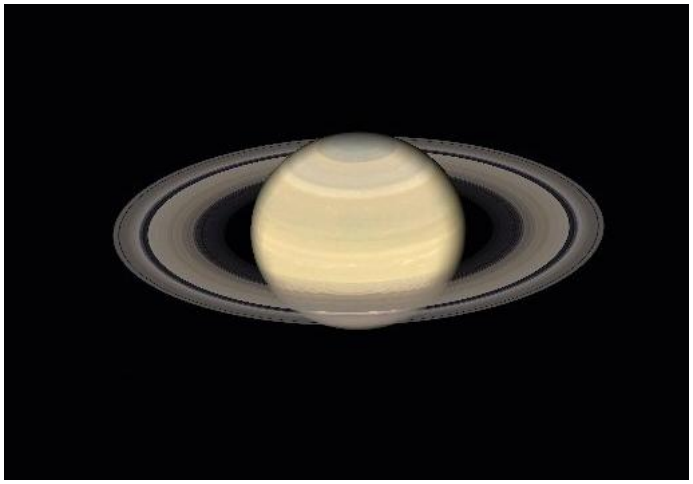
SATURN

Saturn rises over the eastern horizon at about 22:45 at the beginning of the month and at about 21:30 by the end of the month. It will be about midnight before Saturn is high enough and above the dirty and turbulent air near the eastern horizon to start giving a good view through a telescope.



Saturn in the south at 03:00

It will perhaps be better to get up early in the morning when the beautiful ringed planet is at its best. . Saturn is moving into a position when it can be observed without losing too much sleep. It can be seen in the south west just before the Sun rises at about 06:00. The chart above shows the position of Saturn in the south at 3 o'clock in the morning when it will be at its highest and best.



Saturn imaged in February 2014

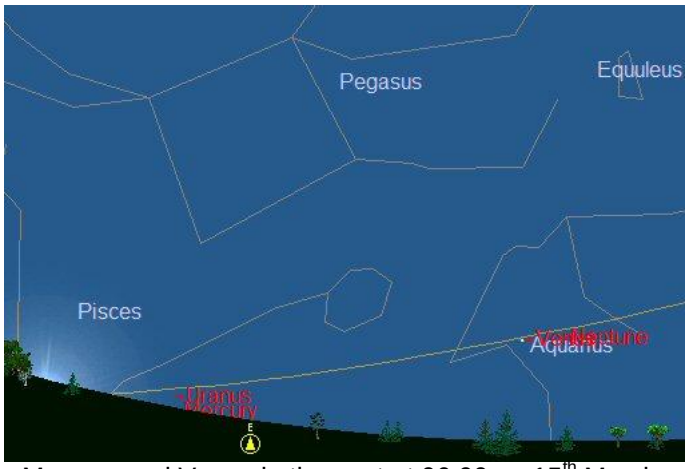
The rings of Saturn will not be visible using a pair of 9 x 50 binoculars but will appear as a bright and slightly yellow extended star (not a point source). A small telescope will show the rings but scant detail. A medium telescope 100mm refractor or a 150mm reflector will show the Cassini Division (the gap in the rings that can be seen in the image above) and the planet's shadow on the ring may be seen. A high magnification will be required 150x or more so a Barlow lens may also need to be used.

It will be possible to see Saturn's largest moon Titan using a medium sized telescope on a good clear night when the sky is dark. A larger telescope will enable two or three of the smaller moons to be seen, more detail on the rings and possibly some detail on the planet too.

THE SOLAR SYSTEM THIS MONTH

MERCURY rises at about 06:00 and sets about 19:00 so it is in the sky during daylight and not visible.

VENUS rises at about 05:00 at the beginning of the month and about 04:30 at the end of the month. This means Venus will appear over the eastern horizon about an hour before sunrise. It will be close to the horizon and with be lost in the brightening sky by 06:00.



Mercury and Venus in the east at 06:00 on 15th March

Venus appeared from inferior conjunction with the Sun in January so is now getting smaller as it moves further from us but the crescent is widening and now appears slightly 'fuller' than 'half moon' shape.

MARS rises at about 19:45 at the beginning of the month and at 17:30 by the end of the month. It will be observable in the east, in the constellation of Virgo, close to the bright star Spica, in the early evening until sunrise. It has been rising earlier in the east as we have moved into 2014 but will remain distant and looks small at just 15 arc-seconds diameter. It will be at its best at opposition on 8th April. See page 6.

Mars imaged by Choon Kiat Lim on 19th March 2014

JUPITER rises in the east at around 10:40 at the beginning of the month and 9:30 by the end of the month. It will be positioned high in the south west as darkness falls. It will look large, at 37 arc-seconds in diameter. Its four largest moons are easy to see and Jupiter is observable until it sets at about 02:30. See page 6.

SATURN is in the constellation of Libra rising at about 22:00 in the east and will be at a good elevation for observing from 23:00 until sunrise. See page 6.

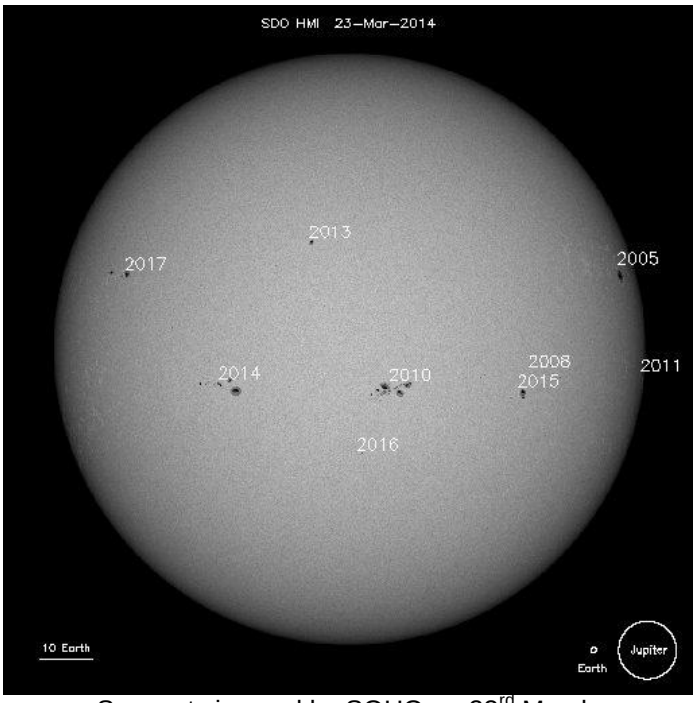
URANUS rises in the east at about 06:40 in daylight and will not be observable.

NEPTUNE rises at about 05:50 in daylight so will be too close to the Sun and will not be observable.

THE SUN

The Sun rises at 06:30 at the beginning of the month and at 05:50 by the end of the month. This month the Sun will set later at 19:35 BST on the 1st and 20:20 BST at the end of the month.

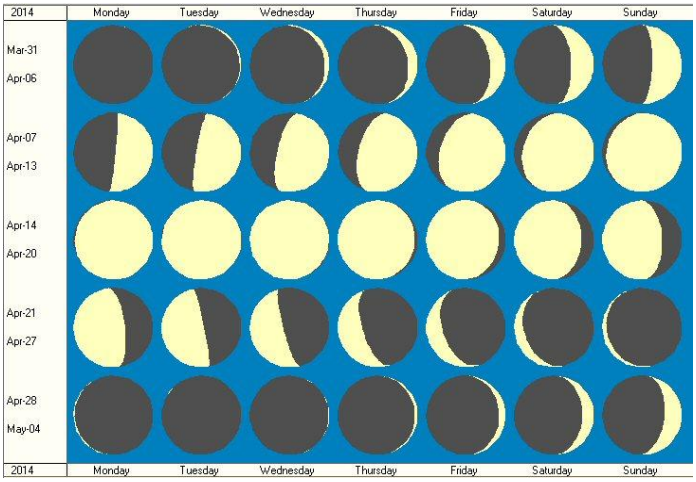
Solar activity has been relatively low during this cycle with fewer sunspots. However there has been a significant increase in activity over the last few months.



Sunspots imaged by SOHO on 23rd March

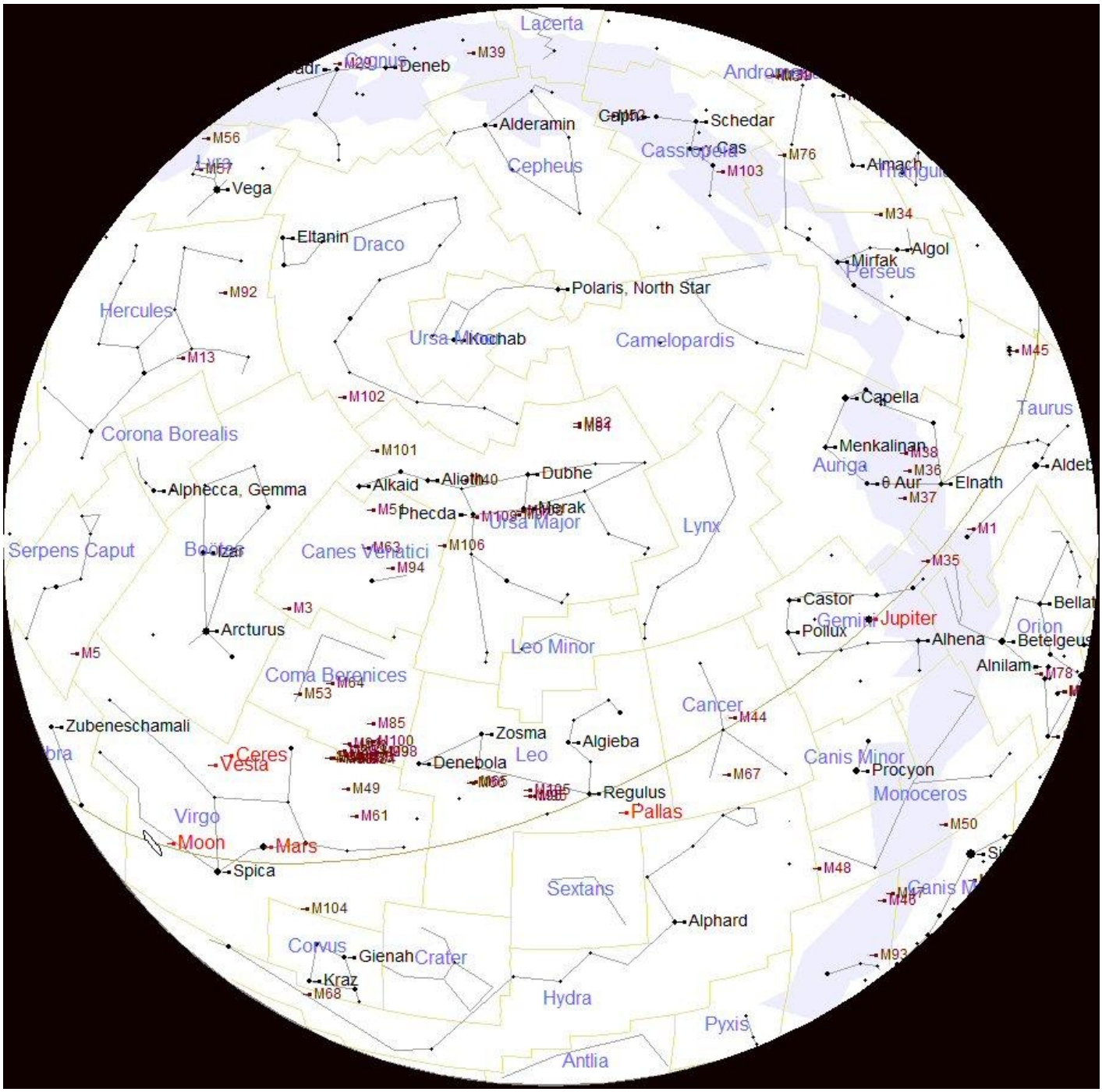
Sunspots are caused by the magnetic force lines breaking the visible surface of the Sun to expose a deeper and cooler layer below.

THE MOON PHASES IN APRIL 2014



The very thin crescent of the new Moon may be spotted in the west on the evenings of the 1st and 2nd April. First Quarter will be on 7th April, Full Moon will be on 15th April and Last Quarter will be on 22nd April.

THE NIGHT SKY THIS MONTH



The chart above shows the night sky as it appears on 15th April at 10 o'clock in the evening British Summer Time (BST). As the Earth orbits the Sun and we look out into space each night the stars will appear to have moved across the sky by a small amount. Every month Earth moves one twelfth of its circuit around the Sun, this amounts to 30 degrees each month. There are about 30 days in each month so each night the stars appear to move about 1 degree. The sky will therefore appear the same as shown on the chart above at 11 o'clock BST at the beginning of the month and at 9 o'clock BST at the end of the month. The stars also appear to move 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 almost 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 Saturn (late) with Venus in the early morning.