NEWBURY ASTRONOMICAL SOCIETY
MONTHLY MAGAZINE – SEPTEMBER 2022

THE NEW SESSION 2022 - 2023

Welcome to the Newbury Astronomical Society Beginners Section monthly magazine. The 2022 - 2023 session begins on 1st September and runs through until June 2023 then we have a two month summer break. The Newbury Astronomical Society has two monthly meetings these are:

The Main Speaker – 1st Friday of every month at 19:30

The Beginners – 3rd Wednesday of every month at 19:00

Our Beginners Programme for this session is shown below. The title shown in black print is the theme planned for the evening. Text shown in blue is the Beginners guide to astronomy that will be published monthly in this magazine. This may also be included as a presentation at the beginners meeting.

Beginners Programme 2022 – 2023 Session

2022

21 September	Where are the planets this month?
	Jupiter and Saturn the Gas Giants
19 October	Constellations and Sky Charts
	How to use binoculars
16 November	Leonid Meteor Shower 18th November
	Mars – closest approach 1st December
21 December	The Winter Solstice tonight
	Star Clusters

2023

18 January	Basic introduction to telescopes
	Observing the Moon
15 February	Venus in Superior Conjunction
	Our Planets and their Orbits
15 March	The Spring (Vernal) Equinox
	Explaining the Equinox & Solstice
19 April	Are all stars the same?
	Our Star the Sun
17 May	Space Telescopes
	Formation of our Solar System
21 June	Perseid Meteor Shower 12th - 13th August
	Imaging the night Sky

The monthly theme presentations may be changed if a specific theme is requested by a member.

During the winter months, on clear evenings, we will have observing sessions outside using the Society telescopes and those with their own telescope are invited to bring it along to use. On these occasions we will include a 'live' guide to the night sky outside given by one of our members.

Our Beginners Meetings are held at The Village Hall, Stockcross, Church Lane, Postcode: RG20 8LN.

There is no age limit for membership or attendance but children under the age of 16 must be accompanied by a responsible adult. We charge £2 for adults visiting meetings but there is no charge for children visiting the meetings with a paying adult.

Annual membership is £20 for adults and no charge for children. This subscription covers attendance at all Beginners, Main Meetings and other special meetings. We may however ask for a donation for some special meetings to help cover the costs of hiring the venue.

Our Beginners meetings are set at a level suitable for the complete novice and those with little or no knowledge of astronomy. It is also open who have some experience in astronomy as a hobby. No equipment is needed for the beginners meetings as binoculars and telescopes will be available for use outside, with help and guidance from the more experienced members. These meetings are informal, friendly and very sociable. Subscriptions include a free drink and doughnut during the evening.

During the session we also arrange observing evenings, telescope workshop evenings and astro-imaging classes for those who would like to image the night sky. These occasional meetings are included in the membership subscription but a donation may be requested towards the hire of the facility. Telescope Workshops are informal chat type evenings to give advice to those who have a telescope or are thinking about purchasing one. If clear we will have assisted observing outside and provide the opportunity to use a variety of different telescopes.

All members of the Beginners Section are welcome to attend the Main Speaker Meetings at no additional charge. The speakers at these meetings are experts in their field but talks are always presented at a level that can be followed by most people.

Main Speaker Meeting Programme 2020 – 2023

2022

2 September	The Planet Venus
7 October	The Square kilometre Array
4 November	Paul Eccleston
2 December	
17 December	Society Christmas Dinner

2023

3 January

7 February

6 March

27 March

1 May

5 June

NEWBURY ASTRONOMICAL SOCIETY MEETING

2nd September The Planet Venus – Paul Abel

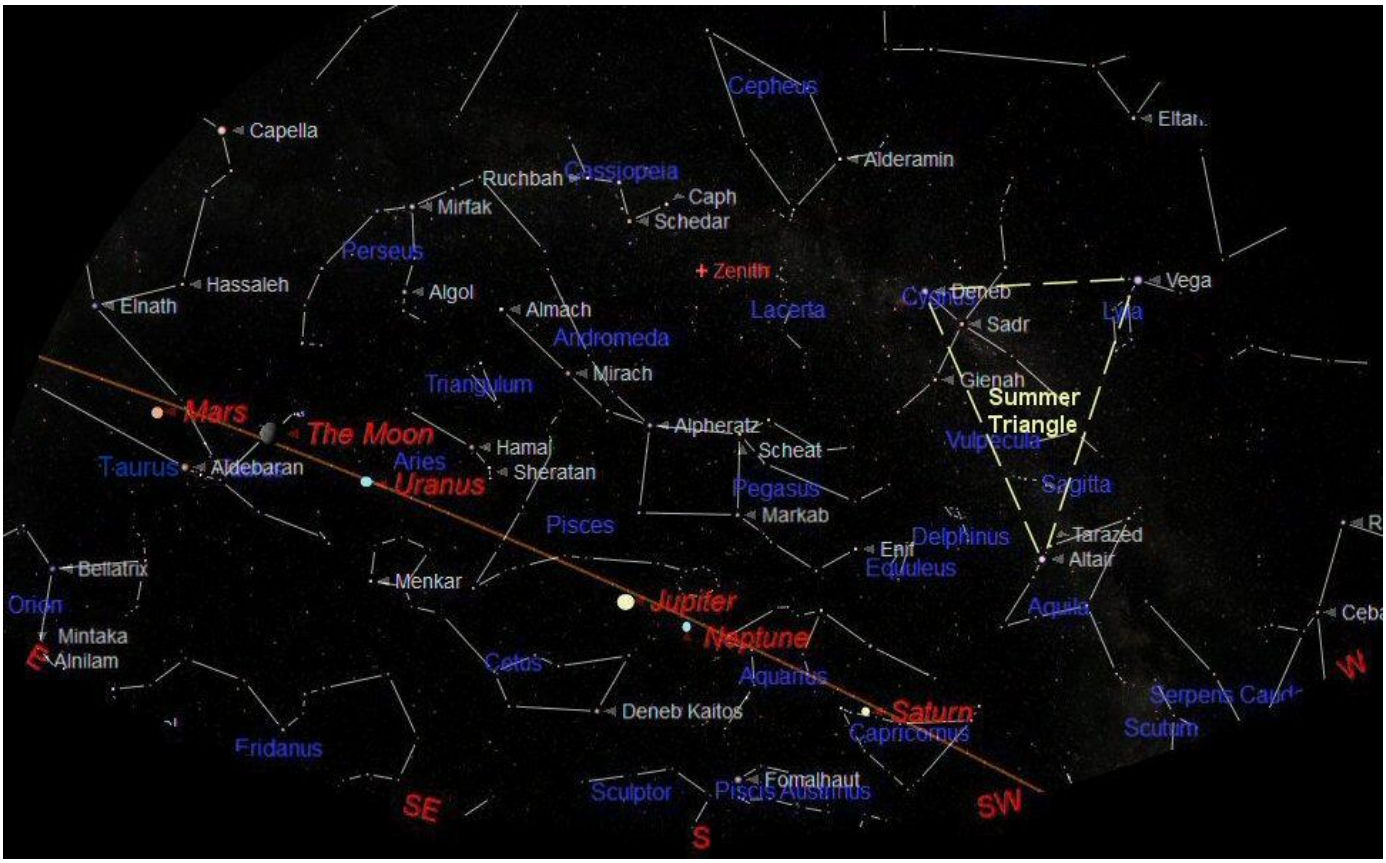
Website: **www.newburyastro.org.uk**

NEXT NEWBURY BEGINNERS MEETING

21st September Where are the Planets this month

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

OBSERVING THE PLANETS THIS MONTH



The outer (Superior) planets in the evening sky mid September at midnight

During the summer nights being short and the days have been long most astronomers usually have taken a break from observing the night sky and possibly follow other 'summer' pursuits. However, for the determined astronomer there are still some interesting astronomy related things look out for and other things that are more loosely linked to astronomy.

Solar observing is one particular area where astronomical interest could continue throughout the year. This summer has been particularly good due to the long sunny days. Sun spots can be observed using very modest equipment. Most telescopes can easily be converted for solar observing by fitting a special solar filter. Alternately the Sun can be observed by directing the image from the eyepiece on to a white card screen. Remember the Sun must never be observed directly even just looking directly at it with our eyes can be dangerous.

The Moon can also be observed throughout the summer and is bright enough to be seen during the day. The summer nights are good for just looking at the full Moon. The Ecliptic (the imaginary line along which the Sun, Moon and planets appear to move across the sky) is very low and close to the horizon during the summer nights. It is however high in the daytime sky as can be seen by the Sun being close to overhead in the middle of the day. When we see the full Moon rising over the eastern horizon during the summer evenings it looks particularly large. We call this the 'Harvest (or Super) Moon'.

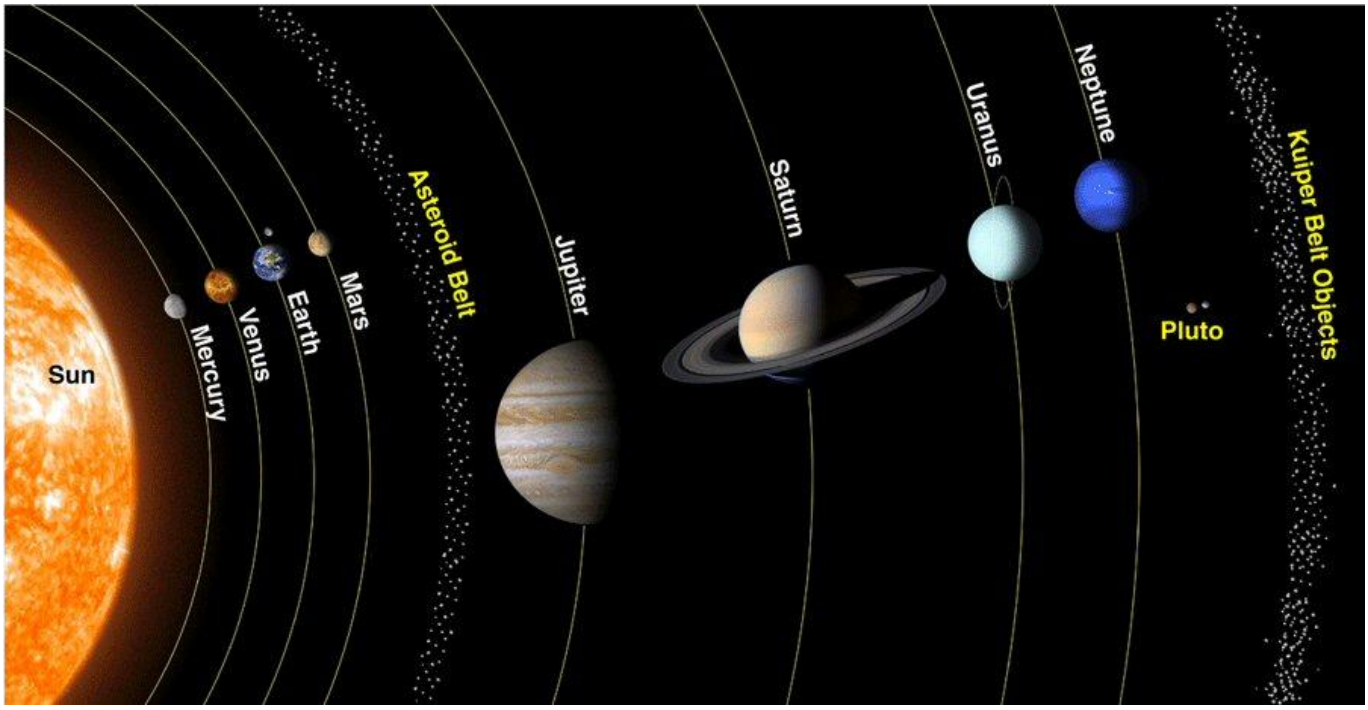
As the Sun was only just over the northern horizon during mid-summer, the sky did not appear to be completely dark. Even at midnight there will some brightness towards the north. This is because the Sun was only just below the horizon. During the month of June there was also the opportunity to see some very rare and beautiful cloud formations. These are known as Noctilucent Clouds (Night Clouds).

Noctilucent Clouds can only be seen at night and only in the weeks before and after Midsummer Day. km above the surface of Earth. This is so high that the clouds still illuminated by the Sun even though it was below the horizon. This is not strictly an astronomical subject but astronomers are well placed during June to see these rare displays of nature. These clouds are very high in the atmosphere at about 80 and have a beautiful 'Mother of Pearl' appearance.

As astronomers spend a lot of time looking into the night sky they tend to spot satellites passing overhead but most people don't notice them. For those who take the time to lookout for satellites there is a surprisingly lot of them. In fact in a fairly dark night sky there are usually 3 to 5 brighter satellites in view at any time. In reality there are dozens up there in view at any one time if they are actively sought out. It is actually quite good fun to do a satellite spotting hunt with friends, it is not astronomy but it is good fun anyway.

As the year moves on towards autumn the planets will begin to appear in the darkening evening sky but during this summer we needed to get up in the early morning to see them. Mars, Jupiter, Saturn, Uranus and Neptune can now be observed before midnight and before retiring to bed for a reasonable time of sleep as can be seen from the chart above. All the Superior Planets (those with orbits outside the orbit of Earth) are well positioned for observing this month. So we will now have a closer look at what we will be able to see and what equipment we need to observe the planets.

GETTING TO KNOW OUR SOLAR SYSTEM



The structure of our Solar System showing the orbits and Zones

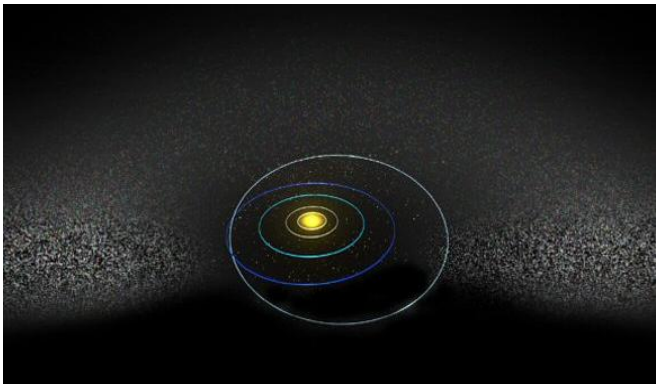
The chart above shows the Sun, main planets and minor planets that make up our Solar System. Planets are objects that orbit a star and have cleared paths from the original disc and have become massive enough to become spherical. Our Solar System has eight main planets that, in order out from the Sun, are called: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune. See the diagram above.

There are also smaller objects orbiting the Sun that we have called Minor Planets. These objects mainly orbit in specific zones around the Sun. Minor Planets that are large enough to become Spherical (over 300 to 500 km depending on composition) are called Dwarf Planets.

ASTEROIDS are mostly found between the orbits of Mars and Jupiter in what is known as the Asteroid Belt but there are some special groups of asteroids that orbit outside this zone. The sizes of these objects are from a few metres to a few hundred kilometres. They are mainly comprised of rock and Iron.

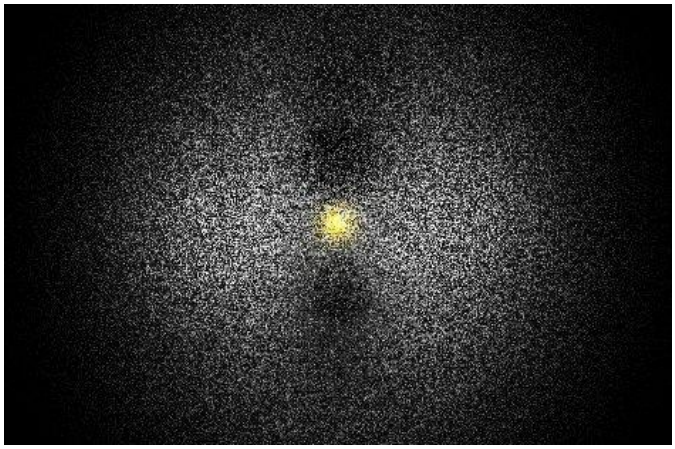
DWARF PLANETS are found beyond the orbit of the outermost main planet Neptune. These are composed mainly of water ice and frozen gases. When the Solar System first formed the Sun was more powerful than it is now and produced powerful ultraviolet radiation. Any volatile materials on the inner planets were vaporised by the radiation and blown away into the outer reaches of the developing Solar System. Here these volatile materials cooled and froze into ice and accumulated into objects up to a few thousands of kilometres in size.

There are vast numbers of these Dwarf Planets orbiting the Sun beyond the orbit of the outermost main planet Neptune so Pluto is just the closest of these objects.
This Minor Planet Zone beyond the orbit of Neptune is called the Kuiper Belt and may contain millions of icy objects with many around the size of Pluto. This is why the decision was made to reclassify Pluto. So far there have been over 6000 objects, like Pluto and around that size that have been found, identified and named.



The Kuiper Belt beyond the orbit of Neptune

There is also thought to be a halo of icy objects beyond the Kuiper Belt and surrounding the Sun that is called the Oort Cloud but these objects are too far away to detect.

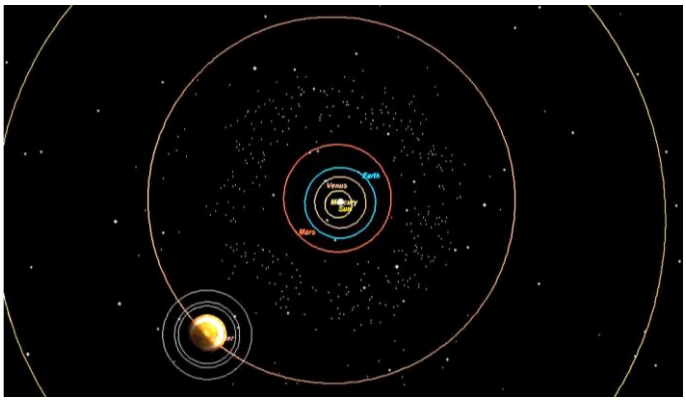


The Oort Cloud

COMETS originate in the Kuiper Belt when two objects have a close encounter. Their orbits can be disturbed so consequently they can be sent spiralling towards the Sun. These objects are primarily composed ice that begins to melt and produce a tail. Dust suspended in the ice is released to produce meteors.

THE PLANETS OF OUR SOLAR SYSTEM

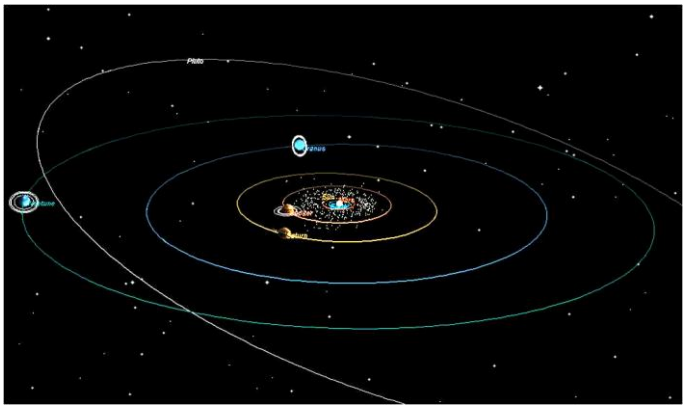
We have seen in the previous pages how our Solar System was formed now we will look in a little more detail at the various objects that populate this system. We have seen that the Sun is a star and it is by far the largest and most important thing in the Solar System. Its gravity holds the Solar System together and its energy powers the various processes that are active within the system.



The inner Terrestrial Planets

The four inner planets Mercury, Venus, Earth and Mars are the smallest and are comprise of rock with an Iron core. They are clustered closely around the Sun with their orbits spaced about 50 million kilometres apart. They are called the 'Terrestrial Planets' because they are 'Earth like'. Earth is the only Terrestrial Planet with a significant Moon but Mars does have two small moons. Moons are objects that orbit the planets.

There is a large gap between the Terrestrial Planets and the next two planets out from the Sun. In this gap there are millions of small lumps of rock and Iron we call these Asteroids. A few of these larger asteroids are big enough to become spherical and can be seen using a medium sized telescope.



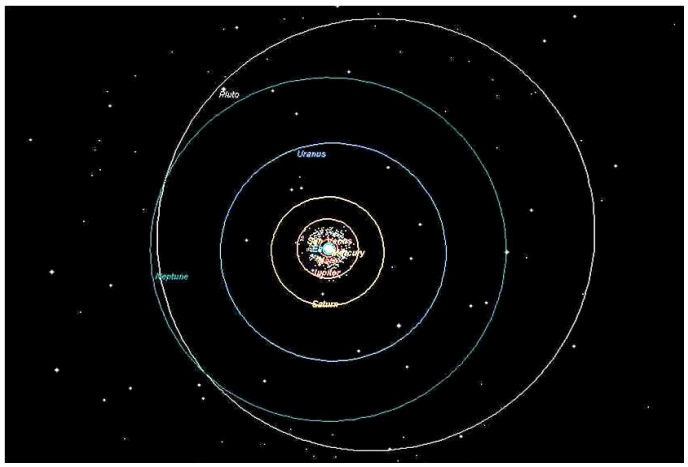
The Gas and Ice Giant Planets

Beyond the Asteroid Belt are the two Gas Giant Planets Jupiter and Saturn. Jupiter is the largest planet and is comprised mainly of Hydrogen gas with traces of other gases. Jupiter has beautiful cloud formations that can be seen using a telescope. These features can be seen even using a small telescope (100mm to 150mm aperture) but more detail will be seen using larger telescopes. Jupiter has four large moons that can be seen using the smallest telescopes and even a good pair of binoculars. It has many smaller moons but these are too small and faint to be seen using modest telescopes.

Saturn is the second largest planet and is famously the one with a beautiful ring system. The ring system and one of Saturn's many moons called Titan are visible using the smaller telescopes previously mentioned. Saturn is also comprised mainly of Hydrogen gas and has surface markings but they are not as noticeable as those seen on Jupiter. Details in the ring system can be seen using a larger telescope and five or six of the smaller moons may visible on a clear night.

The orbits of the outer planets are much further apart than the Terrestrial Planets so there is a noticeable difference in brightness and size between Jupiter and Saturn. This is because the orbit of Saturn is about as far from Jupiter as Jupiter is from us therefore Saturn appears less than half the diameter and much fainter.

The outer most planets are Uranus and Neptune that are known as the Ice Giants. Jupiter and Saturn are over ten times the diameter of Earth but Uranus and Neptune are about four times the diameter of Earth so are still regarded as giants. Both of the Ice Giants appear blue but look more like 'fuzzy stars' than the other planets.



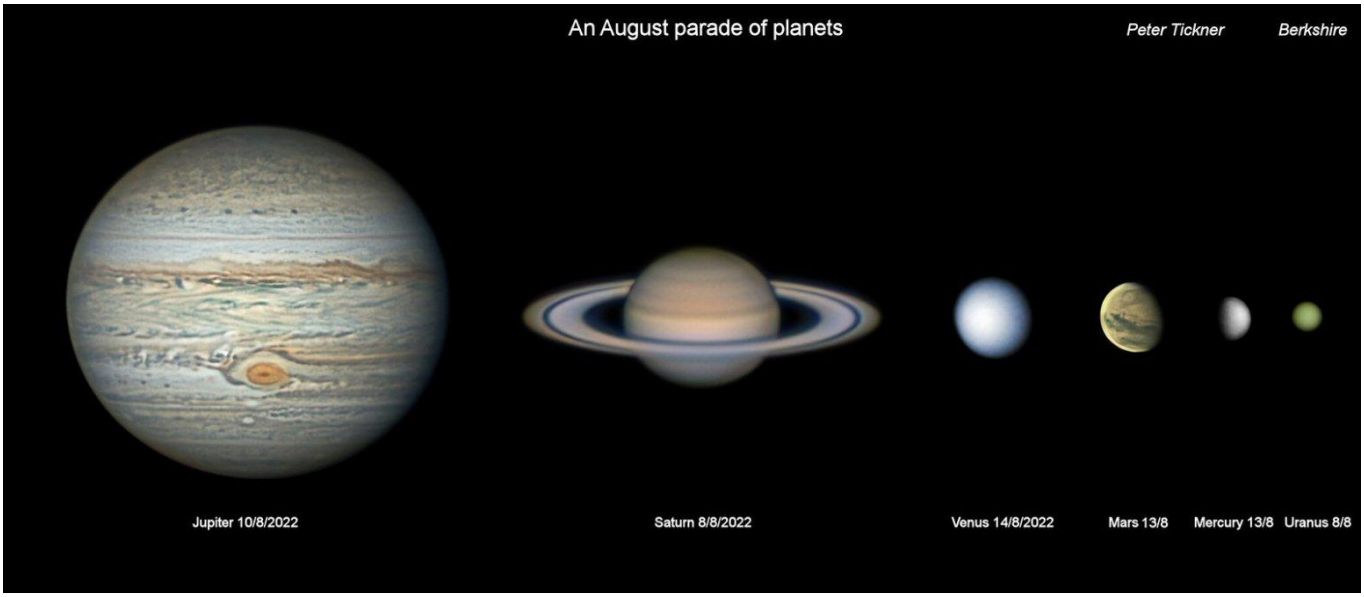
The planets and Pluto

Beyond the orbit of the outer planet Neptune is an area called the Kuiper Belt. In this area is a huge ring (torus) of icy minor planets orbiting the Sun at vast distances. There are millions of these objects but they are very widely separated in space. Occasionally they may have a close encounter and could be slightly nudged by gravity out of their orbit. This may send one on a new path that may take it spiralling in towards the Sun.

As this object that we now call a Comet moves closer to the Sun its ice will begin to melt. The melt will form a halo around the comet that we call the Coma. Radiation from the Sun known as the Solar Wind will push the lighter gas from the melt into a tail pointing away from the Sun. This tail can be millions of kilometres long and can sometimes be seen from Earth as a tailed comet.

Some gas may be ionised by the solar wind and form a second straight (usually blue) tail. Particles of dust can be released from the 'dirty' ice as the comet melts. As these dust particles are heavier than the gas released they tend to carry on along the same path as the comet. We call these particles 'Meteoroids'. If the comet crosses the orbit of Earth a trail of meteoroids can be left in the path of Earth. When Earth passes through this trail of dust the particles will burn up as they hit the upper atmosphere as a 'Meteor'. Earth travels at about 100,000 km/h along its orbit so there is a lot of Kinetic Energy in the particle to heat the atmosphere.

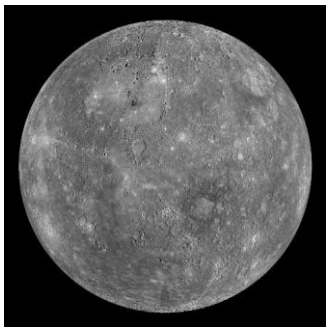
THE PLANETS AND THIER MOONS



The visual size of the planets imaged by Peter Tickner from Reading Astronomical Society

The images above were taken using the same camera, with the same settings, to show the comparative size of the planets as we see them. We have seen our Sun as a star that is the dominating central object of the system with the Planets, Dwarf Planets, Asteroids and Comets having primary orbits around the Sun. Now we can consider the planets and their moons that have secondary orbits around them. We call these Moons as they orbit around planets that in turn orbit the Sun.

There are two planets that do not have moons these are MERCURY and VENUS they are the two innermost planets of the Solar System. Venus is completely covered in white cloud that reflects sunlight so it is the brightest of the planets. As both of these planets orbit inside Earth they have phases similar to our Moon.



Mercury

Venus

MARS has two moons but they are very small and are thought to be asteroids that have been captured by the gravity of Mars and are now in orbit around the planet. Phobos is 22.2 km wide and Deimos is 12.6 km wide.

The moons of Mars Phobos and Deimos

Mars is now coming in to view just midnight and is a little better than its last appearance two years ago. Due to the different orbits the distance between Mars and Earth can vary considerably causing the apparent size to vary too. This year Mars is about half of the largest and smallest apparent size so it will be looking quite good in the eyepiece of our telescopes.

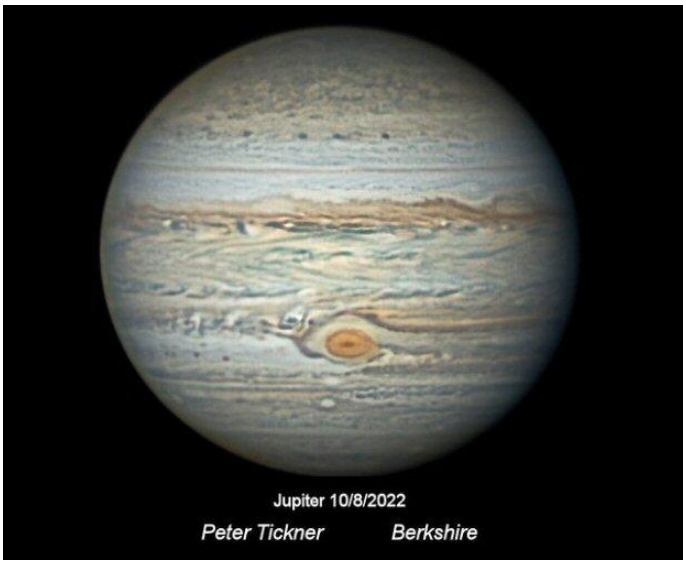
Mars imaged by Peter Tickner last month

The image above was taken by Peter Tickner from the Reading Astronomical Society. Dark markings can be seen on the surface.

EARTH has the largest moon compared the size of its parent planet of all the planets and is sometimes said to be almost a double planet system. Observing the Moon will be discussed later in the January issue.

Earth and Moon comparison of size

JUPITER is the largest planet with a diameter of 142,984 km (Earth is 12,756 km) and classified as is a Gas Giant Planet. It has no solid surface but the coloured bands of the cloud tops are great to see using you telescope.



Jupiter imaged by Peter Tickner last month

Jupiter has about 80 moons but only four can be seen through a modest telescope. They are large and about the same size as our Moon and are called Io, Europa, Ganymede and Callisto. These four largest moons are known as the Galilean moons as they were discovered by Galileo Galilei in 1610. Ganymede is the largest moon in the Solar System at 5262 km in diameter (our Moon is 3,476 km). The Galilean moons can be seen in any telescope and even using larger binoculars.

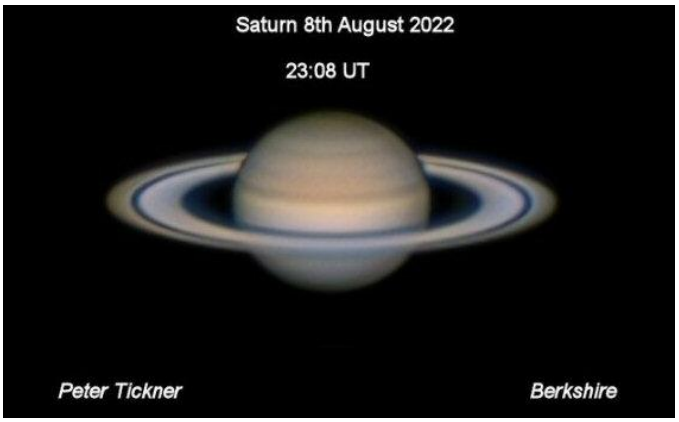
Jupiter's Galilean moons are very different to each other in size and appearance. Io is the inner moon and is covered in active volcanoes. Europa is the smallest and mainly water ice. Ganymede is the largest moon and Callisto has the oldest surface in the Solar System.

Jupiter's largest 'Galilean Moons'

The movement of the moons can be followed using a small telescope. The outer moons can be seen to have moved from one night to the next but the inner moons can be seen to move in minutes especially when close to Jupiter. A high magnification eyepiece will be needed to see details on the surface and movements of the moons.

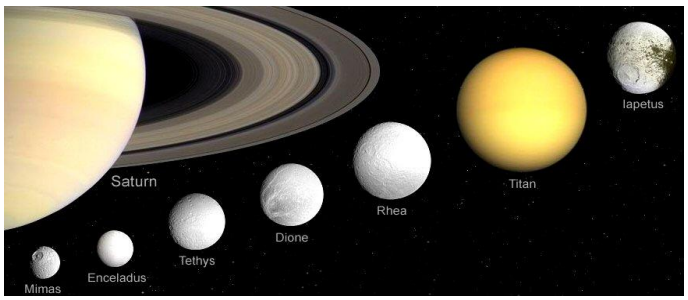
Sometimes the shadow of a moon can be seen crossing the face of Jupiter. It is also interesting to watch a moon disappear behind Jupiter but it very difficult to see a moon moving across the bright face of the planet. The movements of the moons can be predicted using a computer planetarium application. Stellarium is a good one and it is free to download from the internet.

SATURN is more difficult to observe using a small telescope but it is still possible. Saturn is a little smaller than Jupiter with a diameter of 120,536 km but it twice as far away from us. This means it appears to be half the diameter of Jupiter so that means it has about ¼ of the area of Jupiter. At this distance Saturn only receives about ¼ of the sunlight compared to Jupiter and we only receive about ¼ of the light reflected from Saturn compared to Jupiter so it looks a lot dimmer. The extra light reflected by the ring system does help a little though.



Saturn imaged by Peter Tickner last month

Saturn has 82 moons but most are quite small. One moon Titan is 5150 km in diameter. It is the second-largest moon in the Solar System after Jupiter's moon Ganymede. The other moons are smaller but Titan can be seen in a small telescope and three or four of the other moons can be seen using a medium sized (150 – 200mm) telescope.



The largest of Saturn's 82 moons

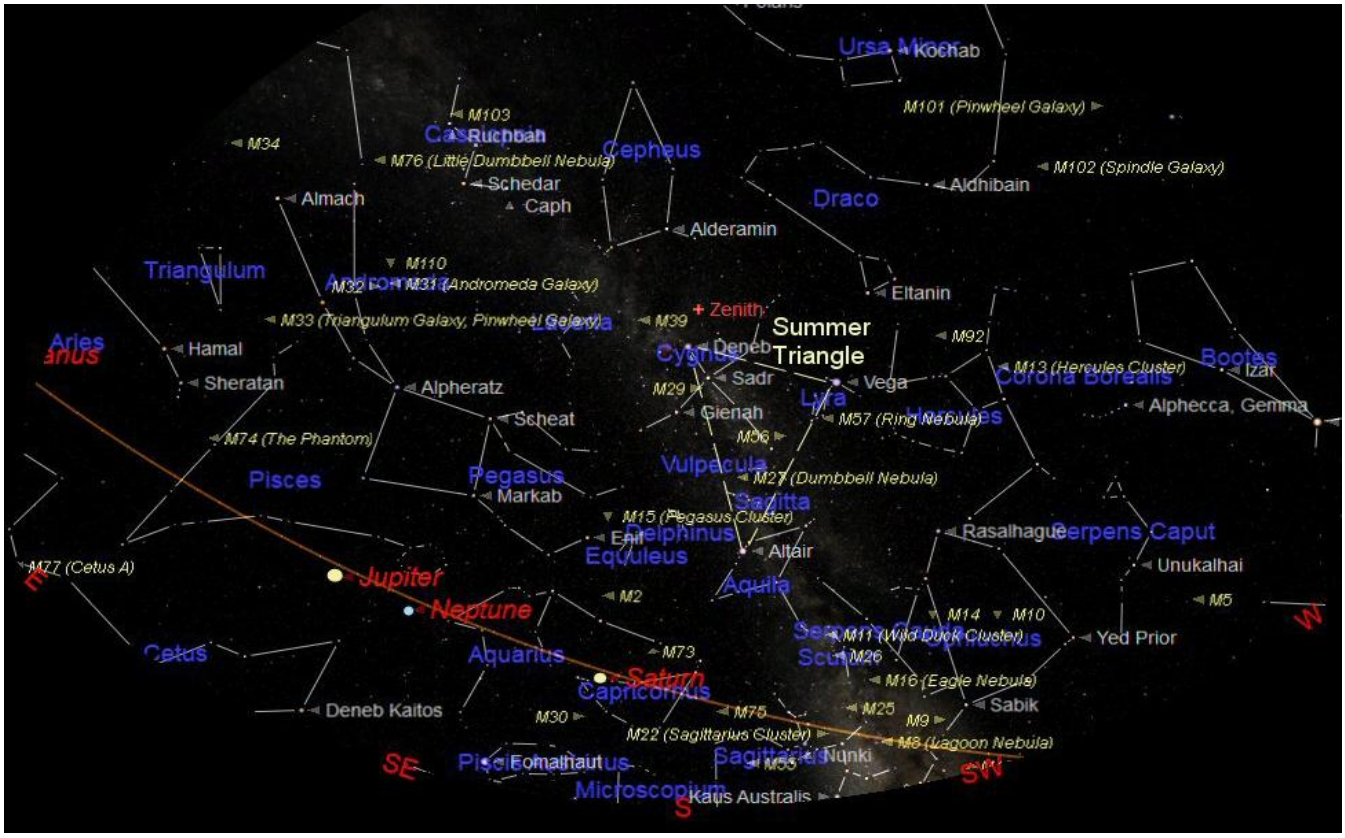
URANUS is 51,118 km in diameter but is twice as distant as Saturn so appears small but can be seen in a telescope as a small 'fuzzy' blue star. The largest moon is Titania which is 1580km with Oberon almost as large at 1524km in diameter. All of the moons of Uranus are too small and faint to be seen using a telescope but can be imaged using a much larger telescope.

Uranus

Neptune

NEPTUNE is almost the same size as Uranus at 49,528 km in diameter. It is twice as far away from us as Uranus so is difficult to see in a small telescope. It has 13 known moons including one large moon called Triton. Triton was a surprise to scientists when the first close up images were returned to Earth. It was shown have a geologically active surface. None of the moons can be seen using an amateur astronomer's telescope.

A TOUR OF THE NIGHT SKY - SEPTEMBER 2022



The chart above shows the night sky looking south at about 22:00 BST on 15th September. West is to the right and east to the left. The point in the sky directly overhead is known as the Zenith and is shown (in red) at the upper centre of the chart. The curved brown line across the sky at the bottom is the Ecliptic or Zodiac. This is the imaginary line along which the Sun, Moon and planets appear to move across the sky. The brightest stars often appear to form a group or recognisable pattern; we call these 'Constellations'.

Constellations through which the ecliptic passes this month are: Libra (the Scales), Scorpio (the Scorpion) Sagittarius (the Archer), Capricornus (the Goat), Aquarius (the Water Carrier), and Pisces (the Fishes).

Prominent in the southern sky is the Summer Triangle that dominates the Summer Sky and is described in detail on the following pages. The term Summer Triangle was first suggested by Sir Patrick Moore and is defined by three obvious bright stars: Deneb in the constellation of Cygnus, Vega in Lyra, and Altair in Aquila. The Milky Way (our Galaxy) flows through the Summer Triangle and passes through Aquila and Cygnus. The Summer Triangle is bigger than may be expected but once it has been found it is very easy to find again.

As the Summer Triangle is so easy to find it is very useful to use as a starting place for finding our way around the night sky. See Pages 5 and 8.

To the west (right) of the Summer Triangle and almost overhead is the constellation of Hercules (the Strong Man). Hercules has a distinctive distorted square shape, at its centre, called the 'Keystone'. This is due to its resemblance to the centre stone of an arch or bridge. The jewel of Hercules is without doubt the Great Globular Cluster, Messier 13 (M13) that can be found in the western vertical imaginary line forming the 'Keystone'. It is just visible using a good pair of 9 x 50 binoculars. The spherical cluster, of about a million stars can be seen using a 90mm *f*10 telescope but will look even more impressive when using a larger telescope.

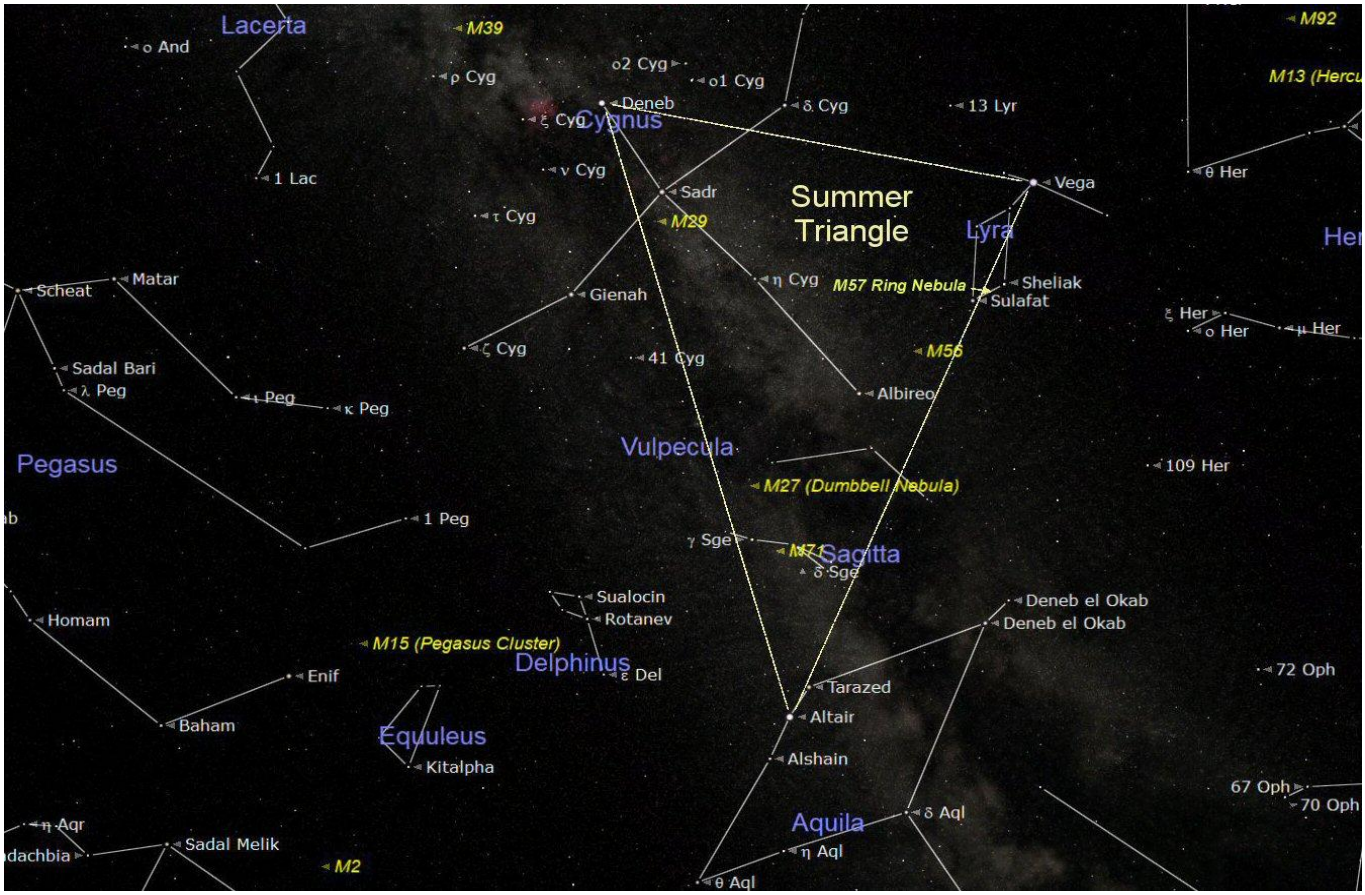
To the west of Hercules and moving towards the western horizon is the bright orange coloured star called Arcturus in the constellation of Boötes. Arctaurus is a star similar to our Sun but more advanced and is developing into a Red Giant star that is nearing the end of its 'life' as a normal star. It has used almost all of its Hydrogen fuel and has expanded to become a Red Giant, 25 times the diameter of our Sun. At the moment it shines 115 times brighter than our Sun but it is destined to collapse and become a White Dwarf and Planetary Nebula.

To the East (left) of the Summer Triangle is the constellation of Pegasus (the Winged Horse). The main feature of Pegasus is the square formed by the four brightest stars. This asterism (shape) is known as the Great Square of Pegasus. The square is larger than might be expected but once found is easier to find again.

The square can be used to judge the seeing condition of the night sky. Under perfect conditions about ten stars can be seen inside the square this would indicate a very good night for observing. If three to five stars can be seen then conditions will still be good. If fewer or none can be seen then stick to looking at the Moon or planets. There is a very nice Globular cluster in Pegasus it is known as Messier 15 (M15) and is a lovely sight to see in a medium to large telescope.

The Ecliptic is low in the sky during the summer months so the Moon and planets appear close to the southern horizon. Saturn and Jupiter are well placed but due to their low altitude will not be at their best for observation this year. However the thick, murky and turbulent air will cause the planets to appear quite unsteady.

EXPLORING THE SKY AROUND THE SUMMER TRIANGLE



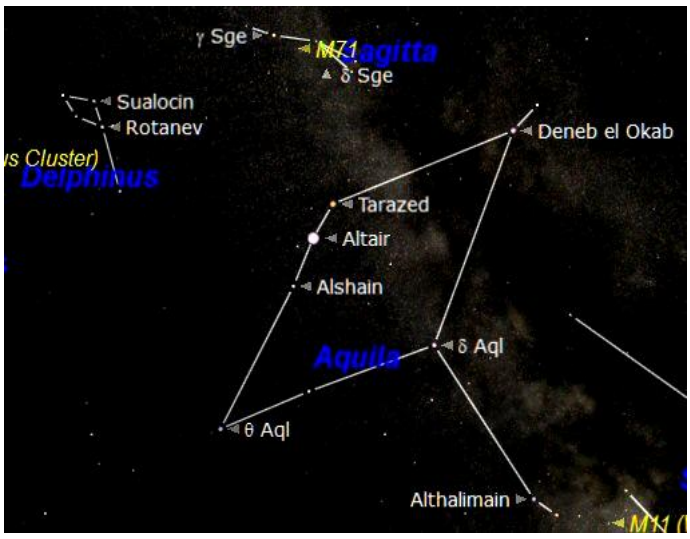
The chart above shows the sky around the Summer Triangle. The term 'Summer Triangle' was suggested by Sir Patrick Moore and has now become the best known feature of the summer night sky. The corners of the imaginary triangle are positioned on the three obvious bright stars: Deneb in the constellation of Cygnus, Vega in Lyra, and Altair in Aquila. The Milky Way (our Galaxy) flows through the Summer Triangle and passes through Aquila and Cygnus.

THE CONSTELLATION OF AQUILA (the Eagle)

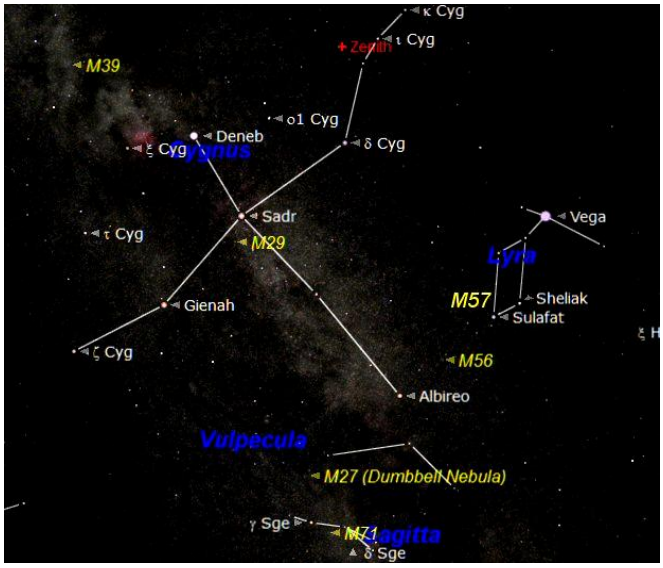
The constellation of Aquila (the Eagle) is found at the bottom corner of the Summer Triangle. There are no interesting objects in Aquila but the one bright star, Altair, has a fainter star above and below it that makes it quite easy to find.

THE CONSTELLATION OF CYGNUS (the Swan)

The constellation of Cygnus (the Swan) is located at the top of the Summer Triangle. The brightest star in Cygnus is Deneb which denotes the upper point of the Summer Triangle and represents the Swan's tail. The wings spread from the star Sadr and the head is marked by Albireo. Deneb is one of the largest and brightest stars in our vicinity in our galaxy the Milky Way and is classified as a Supergiant. It is about 25 times more massive than our Sun and has a diameter 60 times that of our Sun. It is located 3000 light years away. As it is so much larger than our Sun it consumes its Hydrogen fuel much faster and consequently shines 60,000 times brighter.



The constellation of Aquila



The constellations of Cygnus and Lyra

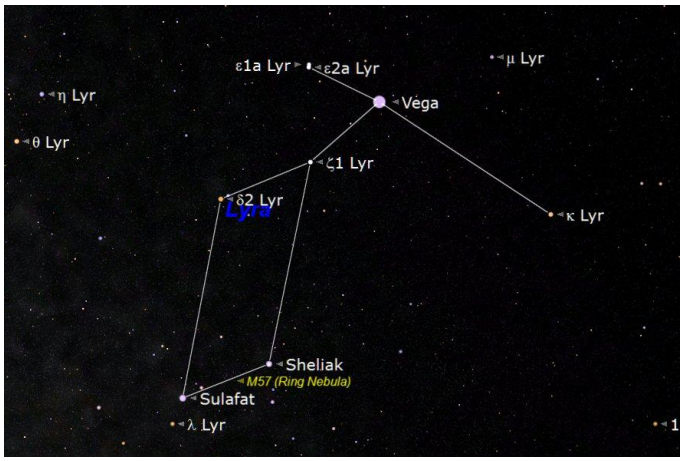
Cygnus (the Swan) does actually resemble the swan it is supposed to represent. We start at the bright star Deneb which marks the tail of the swan. From the fairly bright star Sadr the wings are spread out to each side and the long neck of the swan stretches on to Albireo.

Albireo can be seen as a beautiful double star when viewed through a telescope. One star is bright and gold in colour the other is fainter and distinctly blue. This is not a true pair they just happen to be in the same line of sight. Although the blue star is much bigger and brighter than the golden coloured star it is a lot further away from us. This type of double star is much rarer than a pair of stars that are associated and linked by their common gravity and orbiting a common centre of gravity.

The double star Albireo in Cygnus

THE CONSTELLATION OF LYRA (the Harp)

The constellation of Lyra (the Harp) is located to the west (right) of Cygnus but is much smaller. The most obvious feature of Lyra is the very bright star Vega that is located the top right corner of the Summer Triangle. Vega is the fifth brightest star in our sky with a magnitude of 0.4. It is located at a distance of 25.3 light years from us and is thought to be 3.2 times the diameter of our Sun and 58 times brighter. Inferred detectors on the IRAS satellite have detected a ring of dust around Vega that may indicate planets are forming around the star.



The constellation of Lyra (small harp)

The main asterism (shape) of Lyra is composed of a line of three stars with Vega in the centre and a group of four fainter stars that form a parallelogram shape that is better known as the 'Lozenge'.

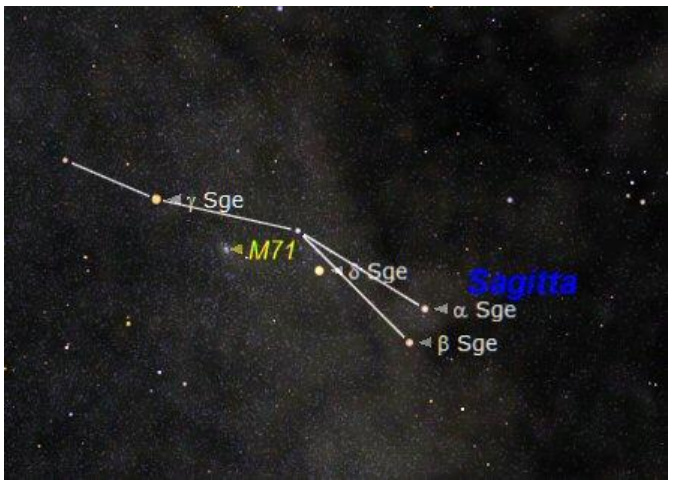
To the south east of the very bright star Vega is the lozenge shaped asterism comprised of four stars. Between the two lower stars: Sulafat and Sheliak is the Messier object M57. This is a 'Planetary Nebula' which has nothing to do with a planet. It is in fact a dying star that was similar to our Sun but older. The star had used most of its Hydrogen fuel and expanded to form into a Red Giant. After passing though that red giant phase it gently collapsed to become a White Dwarf. The very thin outer mantle of the red giant drifted away into space as the star collapsed. The white dwarf is now surrounded by a bubble of gas and dust. It looks like a small 'smoke ring' when seen through a telescope but can't be seen using normal binoculars.

Messier 57 (M57) the Ring Nebula

There are two other constellations that are located within the Summer Triangle. They are both small and comprised of relatively faint stars but are worth seeking out using binoculars.

SAGITTA (the Arrow)

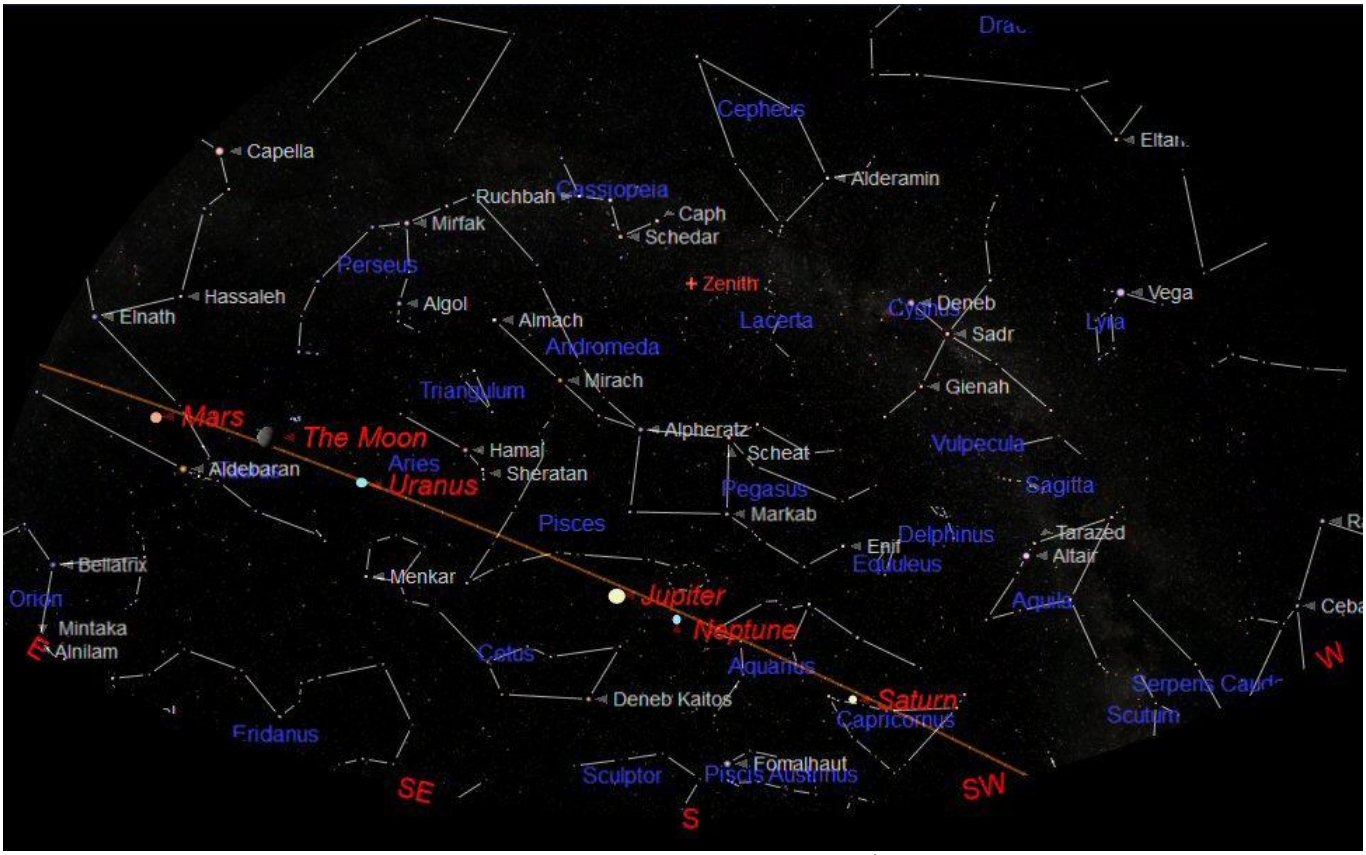
Sagitta is good fun to find using small binoculars because it really does look like an 'arrow'. It is composed of three stars that look like the shaft of the arrow and two stars that resemble the flight feathers.



The constellation of Sagitta

The real beauty of Sagitta is how it looks using binoculars but it does host one messier object this is M71 also known as NGC 6838. This is a rather nice but small and faint Dwarf Globular Cluster that does need a medium sized telescope to see well.

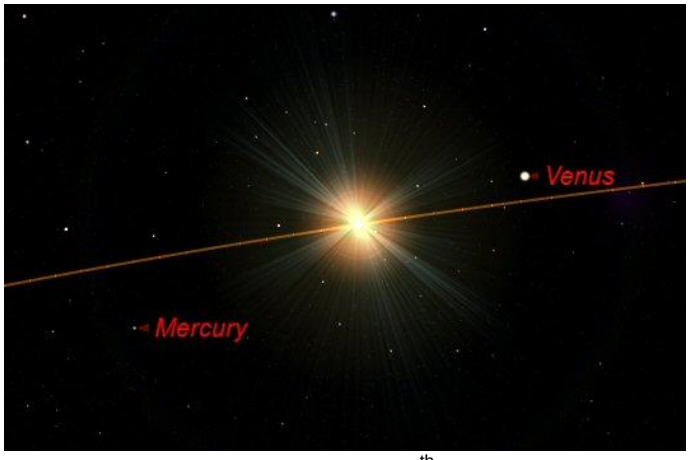
THE SOLAR SYSTEM - SEPTEMBER 2022



The location of the planets at midnight on 16th September 2022

The chart above shows the location of the planets along the Ecliptic in the early morning sky. The sky has been darkened to make the planets visible. The planets are: (in order as they appear) Saturn, Neptune, Jupiter, Uranus and Mars. Venus and Mercury are close to the Sun this month. The planets appear low in the sky, in the bright morning or evening sky so are not well positioned for observing.

MERCURY will be at Inferior Conjunction with the Sun on 23rd September this means it will be passing in front of the Sun. After conjunction it will move into the morning sky and will rise just before the Sun. Mercury will be at its greatest westerly elongation on 8th October when it will be at its apparent furthest point from the Sun.



Mercury and Venus on 15th September

VENUS rises about one hour before the Sun climbs over the eastern horizon at the beginning of the month. It is looking very bright but low in the east before sunrise. It is moving back towards the Sun and Superior Conjunction (behind the Sun) on 22nd October so it appears smaller and will appear in its gibbous phase. As it is located on the other side of the Sun it appears small and will be close to the Sun and quite difficult to see.

MARS will be best seen from midnight in the east until sunrise. It is still some distance away but is approaching its closest position when it will be at Opposition on 8th December. The image below gives an approximation of how Mars will appear using a medium sized telescope.

Mars imaged by Steve Harris

Mars will be at its best during December when it will be at or close to its opposition. Although Mars will not be as close to Earth as it can be, it will be high in the sky and away from the turbulent and contaminated air close to the horizon. So we should be able to obtain some good views of the Red Planet around Christmas time.

JUPITER will be at Opposition (directly in line with the Sun and Earth) at midnight on 26th September. At this point Jupiter will be at its best position for observing and will be a little higher in the sky than it was last year. So it will be a little clearer as it will be higher above the horizon and in slightly clearer and less turbulent air. The cloud markings and the four brightest (Galilean) moons will be visible, using a smaller telescope, even with the turbulent air above the horizon.

The image below shows the kind of view we can expect using a medium sized telescope (150mm) using a high magnification eyepiece on a good night. For those with a smaller telescope, do not feel disappointed that the view is not as good as shown in magazines or on the internet. The important thing is that we are using 'our own' telescope to see this beautiful object. The light from the planet has travelled through space and has entered our eye to produce a real image on our retina.

Jupiter and one of its Moons imaged by Steve Harris

SATURN is the first planet to rise over the eastern horizon so it will be seen very low in the south eastern sky as soon as it gets dark. It will be very low over the south eastern horizon at the beginning of September but it will become darker earlier and appear higher towards the end of the month.

Saturn imaged by Steve Harris

Saturn will look small in a small telescope and not much bigger in a medium sized telescope but the ring will be visible even using a small beginner's telescope. The view of Saturn is very dependent on the seeing conditions. This is the term used by astronomers to describe how clear the sky appears. This depends on the brightness of the sky and how transparent it is and how steady the atmosphere is. The image above was taken on a night when the 'seeing' was very good. The shadow of the planet can be seen on the ring to the left.

The Cassini Division (gap in the ring) can be seen quite clearly. The ring is easier to see when Saturn is at its maximum tilt but becomes very difficult to see when the tilt is at minimum. When our view is edge on the ring becomes very difficult to see and all but disappears for a few of days. Although the ring is 282,000 km in diameter it is only about 100 metres thick.

URANUS is just observable this month as it was in conjunction with the Sun on 5th May. It rises in the east just as the sky darkens. Uranus will be best seen later is the night as it rises higher in the sky. It will be best at about 04:00 and just before sunrise.

NEPTUNE rises at about 19:10 so will be moving into the sky as the Sun sets. It will still be difficult to see in the bright late summer sky and will need a telescope to see looking like a small blue 'fuzzy' star.

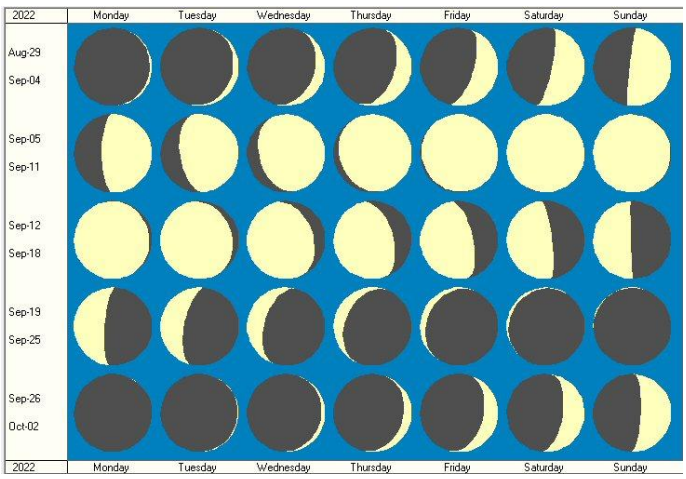
THE SUN

The Sun rises at about 06:20 BST at the beginning of the month and 6:50 BST by the end of the month. It sets at 19:30 at the beginning of the month and 18:50 at the end of the month. There have been a lot of very nice Sunspots and even some impressive groups of sunspots recently.

Sun spots can be seen and studied using most telescopes. However the telescope must be fitted with a special Solar Filter. This filter must be a specially manufactured solar filter and no other type of filtering device can be used. This special filter fits over the front of the telescope to hugely reduce the amount of sunlight that can enter the telescope. The telescope can be used as normal but only the Sun can be visible through the filter.

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/.

THE MOON



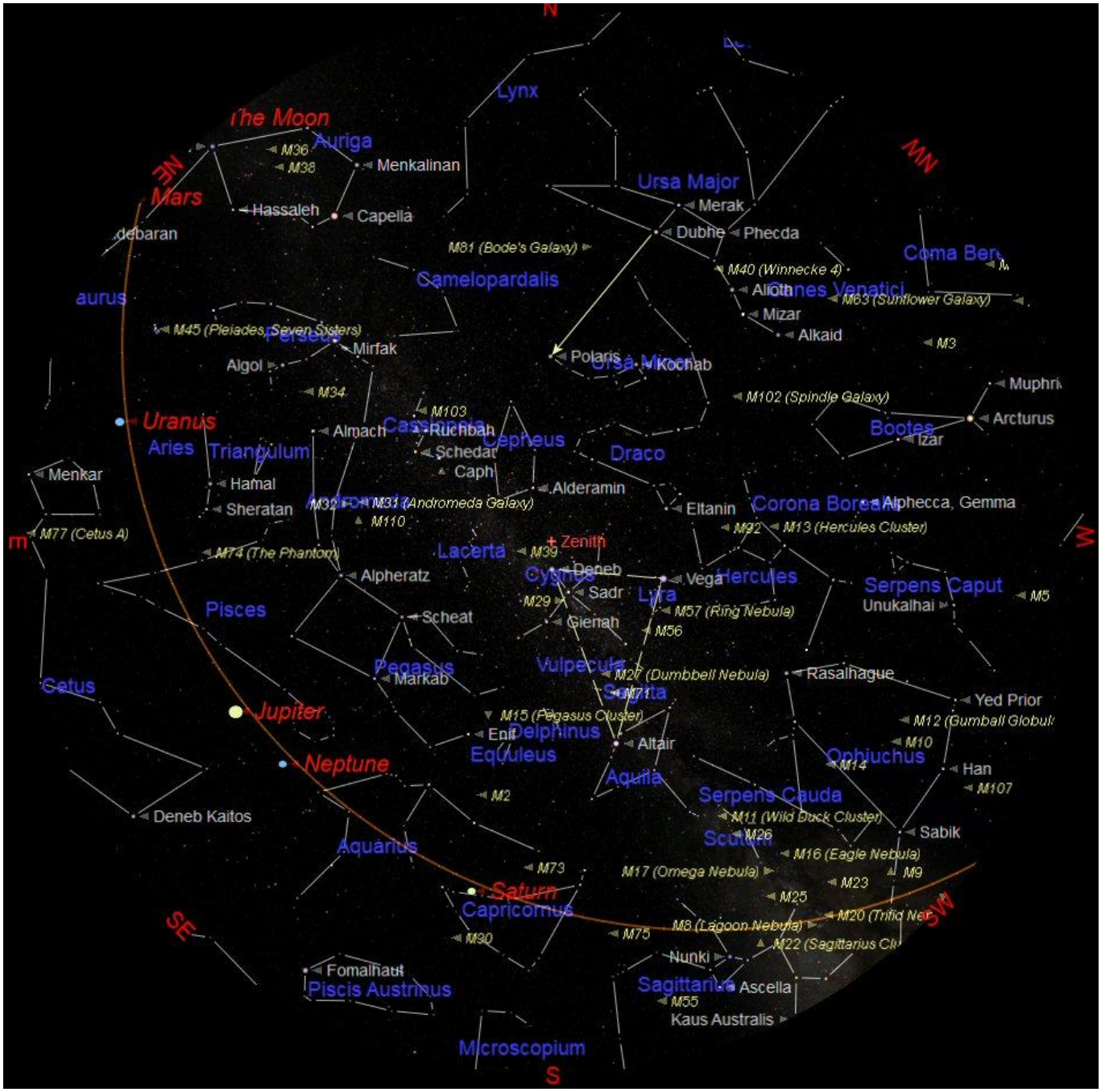
First Quarter will be on 3rd September

Full Moon will be on 10th September

Last Quarter will be on 17th September

New Moon will be on 25th September

THE NIGHT SKY – SEPTEMBER 2022



The chart above shows the whole night sky as it appears on 15th September at 22:00 (10 o'clock) British Summer Time (BST). As the Earth orbits the Sun and we look out into space each night the stars will appear to have moved across the sky by a small amount. Every month Earth moves one twelfth of its circuit around the Sun, this amounts to 30 degrees each month. There are about 30 days in each month so each night the stars appear to move about 1 degree. The sky will therefore appear the same as shown on the chart above at 9 o'clock BST at the beginning of the month and at 11 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 located high in the North West. Look for the distinctive saucepan shape, four stars forming the bowl and three stars forming the handle. Follow an imaginary line, up from the two stars in the bowl furthest from the handle. These will point the way to Polaris which will be to the north of overhead at about 50º above the northern horizon. Polaris is the only moderately bright star in a fairly empty patch of sky. When you have found Polaris turn completely around and you will be facing south. To use this chart, position yourself looking south and hold the chart above your eyes.

The planets visible in the evening sky this month: Saturn, Neptune, Jupiter, Uranus and Mars.