NEWBURY ASTRONOMICAL SOCIETY
MONTHLY MAGAZINE – September 2019

STARTING THE 2019 – 2020 SESSION

Welcome to the Newbury Astronomical Society Beginners Section monthly magazine. The 2019 - 2020 session begins on 1st September and runs through until June 2020 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 2019 – 2020 Session

2019	
18 September	Astronomy Projects
	Finding Constellations
16 October	Chinese
	Our tilted view of the sky
20 November	Spectroscopy
	Do I need a telescope?
18 December	Astrophotography
	Where are the Planets
2020	
15 January	The Voyager legacy
	Different types of star
19 February	Structure of the Universe
	What are star clusters?
18 March	Messier & his marathon
	Seeing double (stars)
15 April	Houston have a problem
	Observing our Moon
20 May	Light pollution
	Using binoculars
17 June	To be decided
	Astronomy in the summer

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 St. Mary's Church Hall, Greenham, postcode RG19 8RZ starting at 19:00.

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 adult and £1 for children visiting meetings. Annual membership is £20 for adults and £10 for children. This subscription covers attendance at all Beginners and Main Meetings and other special meetings.

Our Beginners meetings are set at a level suitable for the complete novice with little or no knowledge of astronomy and those who have some experience in astronomy as a hobby. No equipment is needed for the beginners meeting 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 2019 – 2020 Session

2019	
6 September	Spectroscopy
4 October	The Colour of Science
1 November	How we will live on Mars
6 December	Mysterious Binary Black Holes
14 December	Society Christmas Dinner
2020	
3 January	Members Evening
7 February	A bit of a Marathon
6 March	TBA - Prof. Tony Bell
27 March	Astrophysics at highest energies
1 May	Observing Venus
5 June	The Gaia Revolution

NEWBURY ASTRONOMICAL SOCIETY

6th September CHARM A new instrument for telescope

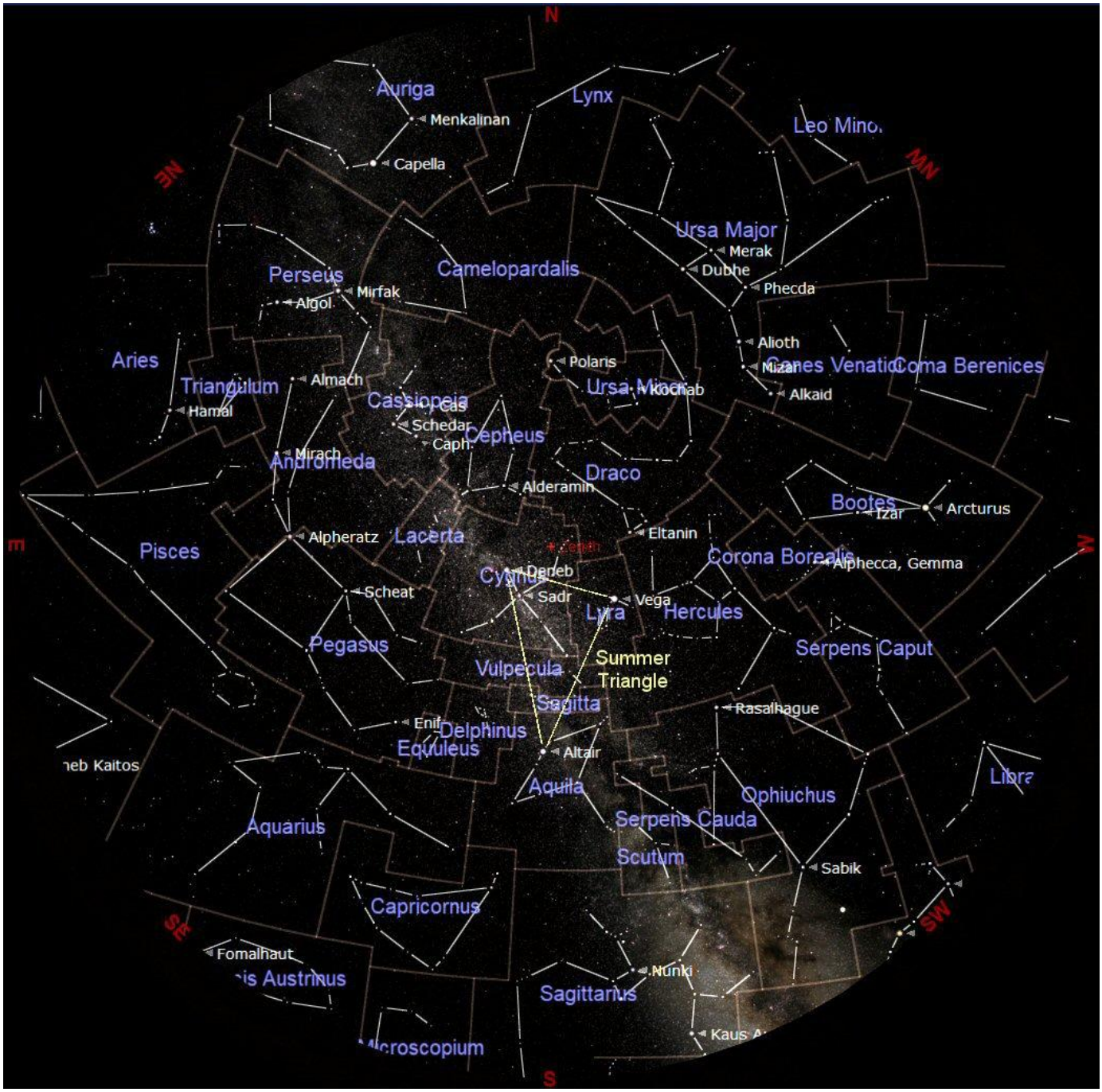
Website: **www.newburyastro.org.uk**

NEXT NEWBURY BEGINNERS MEETING

18th September Astronomy Projects for 2019-2020

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

CONSTELLATIONS - OUR MAP OF THE NIGHT SKY



The chart above shows the night sky at about 9 o'clock (21:00 BST) at the beginning of September. The Milky Way (our Galaxy) is shown stretching across the sky from the south western horizon to the north eastern horizon. At the centre of the chart is the ZENITH, marked with a red cross. This is the point in the sky directly overhead when we look up.

As humans we have the rather strange ability to see shapes and patterns when we look at things around us. A good example is when we see shapes of animals as we look at the white clouds on a bright day. Another example is when we look up into the clear night sky. The brighter stars appear to form patterns or groups. We can recognise these patterns and use them to help us find our way around the night sky.

We join these patterns 'dot to dot' to make them a recognisable shape and call them 'Constellations'.

Mapping the night sky is actually rather difficult as there are only the stars to use as reference features and stars all look quite similar. The only difference to the untrained eye is that some stars appear brighter than others.

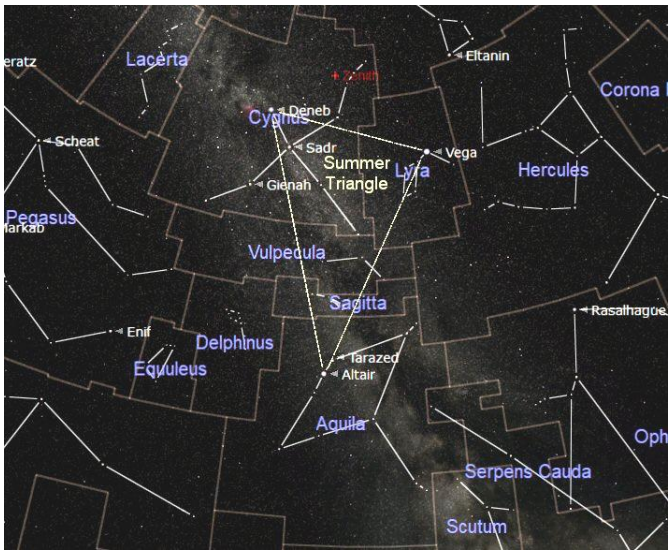
With our unaided eyes (astronomers call 'naked eye') we can see about 6000 stars in a good dark sky. The brighter stars do seem to form (all be it, sometimes indistinct) groups and patterns in the night sky.

From ancient times these patterns have been recognised by different cultures around the world and given special names. The names have traditionally been taken from characters in mythological stories and are often very old. In 1922, the International Astronomical Union (IAU) standardised the constellation names and adopted the modern list of 88 universally recognised 'Constellations'.

The following pages can be used to give us a start in finding our way the night sky.

It would not be possible to find and identify all the constellations at once so we must learn to recognise the most prominent constellations first. We can then use these to spread out and identify the surrounding and less obvious constellations. So we can begin by identifying the most obvious constellations.

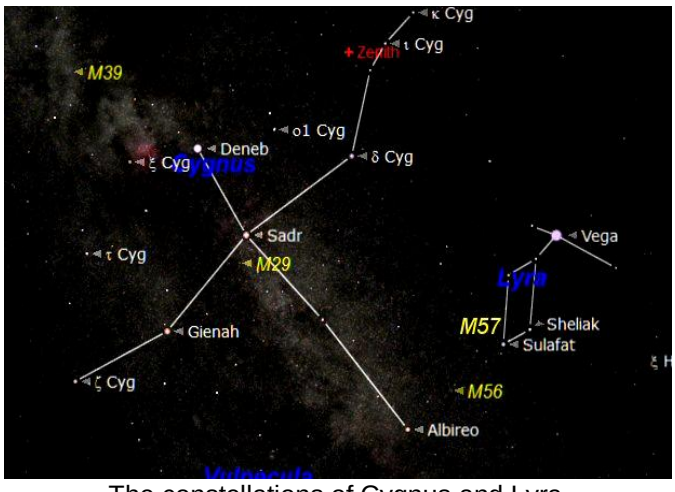
At this time of the year we are lucky to have a number of constellations with bright stars and a shape that is easy to recognise and then remember. Let us start with the best known summer constellations and the obvious place to start is the famous 'Summer Triangle'.



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 one of the most well known features in 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.

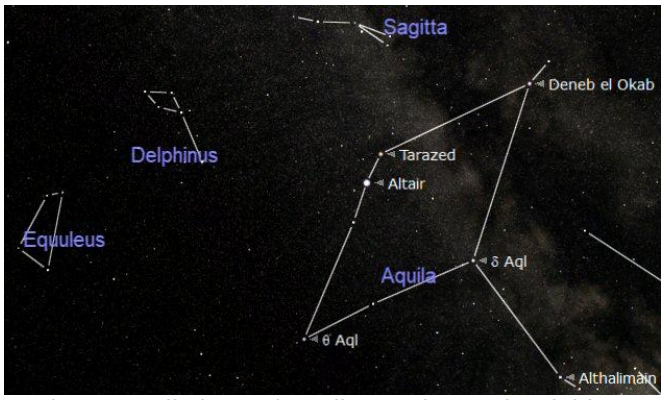
The constellation of Cygnus (the Swan) is located at the top of the Summer Triangle. The brightest star in Cygnus is Deneb which denotes the upper point of the Summer Triangle and represents the Swan's tail. The wings spread from the star Sadr and the head is marked by Albireo. Deneb is one of the largest and brightest stars in our vicinity in our galaxy the Milky Way and is classified as a Supergiant. Also see page 6.



The constellations of Cygnus and Lyra

To the west (right) is the very bright star Vega. Below Vega is a 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 much older.

The constellation of Aquila (the Eagle) is found at the bottom corner of the Summer Triangle. Aquila has one bright star, Altair that has a fainter star above and below making it quite easy to find.



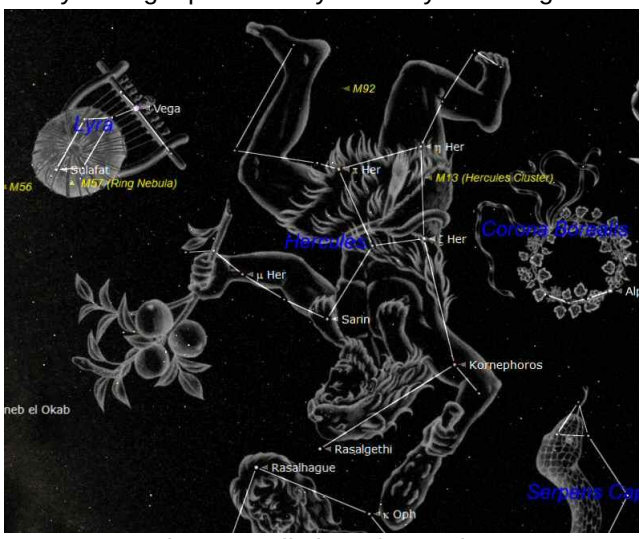
The constellations of Aquila, Sagitta and Delphinus

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

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

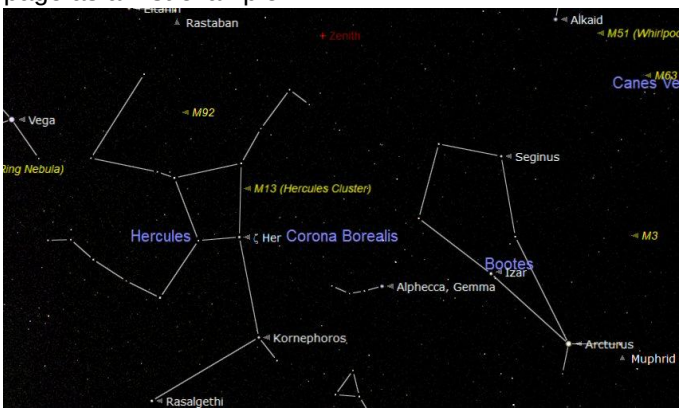
The asterism (shape) of Delphinus (the Dolphin) is comprised of a four stars that form a neat diamond shape and a fifth star a short distance from the diamond shape that completes the dolphin's body and tail. With a little imagination it does look remarkably like a dolphin leaping out of the water. It looks even more striking when using binoculars.

The Summer Triangle chart shows the constellation of Hercules located to the west of the Summer Triangle. Hercules is the great strongman from Greek mythology. He is illustrated in the picture below (up-side-down), as he appears in the sky. He can be a little difficult to identify in a light polluted sky but easy to find again.



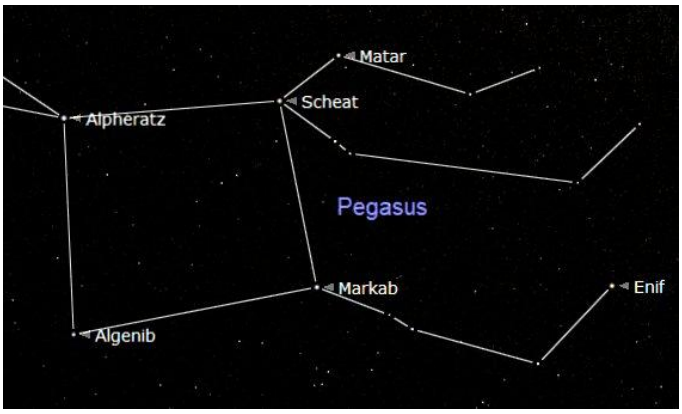
The constellation of Hercules

Once we have found and had a good look at the Summer Triangle and have become familiar with it we can use it to find some neighbouring constellations. The constellation of Hercules was mentioned on the previous page as a first example.



The constellations of Hercules and Boötes

Further to the west (right) from Hercules is the 'kite' shape of Boötes (the Hunter). The bright and noticeably orange star Arcturus is easy to find and shows us where Boötes is. Although not so bright, the other stars in Boötes do form the shape of a traditional diamond shaped kite. Arcturus is located at the bottom of the 'kite' shape where the tail would be attached. The chart above shows the location of Hercules and Boötes in relation to Vega, the bright star at the top right of the Summer Triangle (shown on the left of the chart).



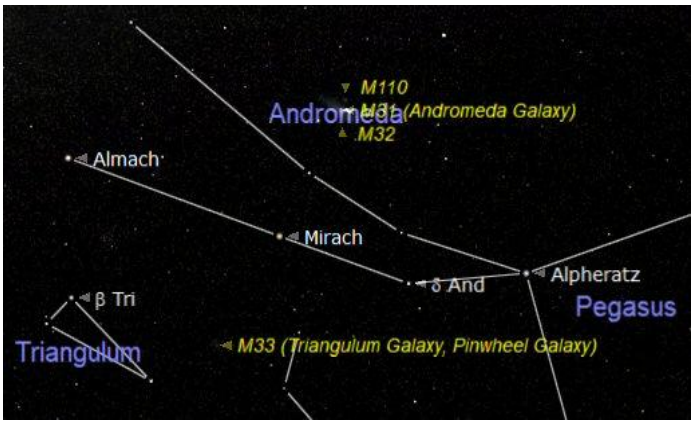
The constellation of Pegasus

To the east (left) of the Summer Triangle is the constellation of Pegasus (the Flying Horse). See the Summer Triangle charts on the previous pages. The dot-to-dot representation of Pegasus really does not look remotely like a flying horse. The four stars Alpheratz, Scheat, Markab and Algenib form the shape of a square (known as the Great Square of Pegasus). This square represents the body of the horse and the three lines joining the fainter stars to the west (right) represent three of the legs of the horse. It does however require a lot of imagination to see it as a horse shape.

The Great Square of Pegasus can be quite difficult to discern especially in a light polluted sky but once it has been found it should be easier to locate again. It is actually much larger in the sky than may be first thought when looking at a sky chart.

Once found the square can be used to judge the clarity of the sky. If five or more stars can be seen in the square then seeing should be good. If no stars are visible in the square then seeing will be poor.

Joined to the star Alpheratz at the top east (left) of the Great Square of Pegasus is the constellation of Andromeda (the ancient queen of Ethiopia).

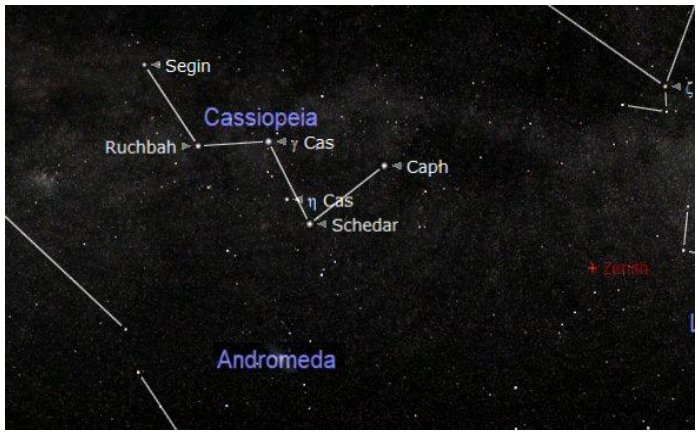


The constellation of Andromeda

Andromeda is comprised of two lines of stars converging on the star Alpheratz. This star 'Alpheratz' is officially the brightest star in Andromeda but it also forms the upper left star of the Great Square of Pegasus. Even though it is not actually a member of the constellation of Pegasus it still regarded as part of the Great Square as well.

Andromeda is famous for hosting the nearest and brightest giant spiral galaxy that is similar to our own Milky Way Galaxy. Our star the Sun is one of ~200 billion stars that comprise the Milky Way. The Great Spiral Galaxy also known as the Great Andromeda Galaxy or 'Messier 31 (M31) is thought to be larger than the Milky way hosting about 400 billion stars and is located 2.2 million light years away from us. It is the most distant object that can be seen using our unaided (naked) eyes (on a clear night from a dark location).

To the North of Pegasus and Andromeda is the quite distinct 'W' shape of the constellation of Cassiopeia (the queen of Aethiopia). See the full sky chart on page 2.

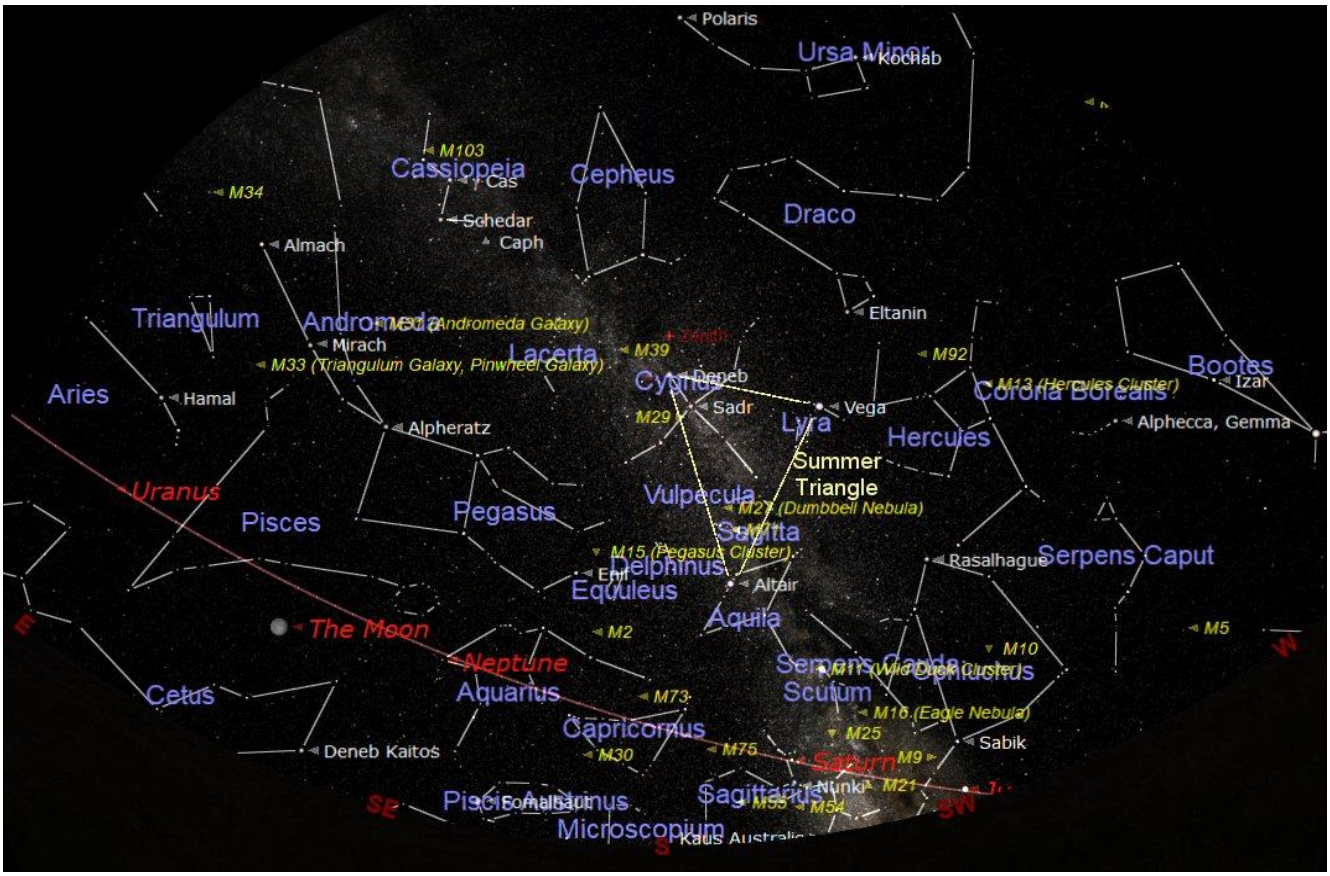


The constellation of Cassiopeia

Cassiopeia is rather impressive to see even with the 'naked eye' (not using binoculars). The 'W' shape is very obvious and makes this one of the easiest constellations to find. The five bright stars form the 'W' shape but there are lots more moderately bight stars surrounding the 'W'. The area around Cassiopeia is even better explored using binoculars. The abundance of bright stars really looks breathtaking especially against the background of the countless stars of our Milky Way Galaxy.

So let us be encouraged to go out to locate the Summer Triangle and start to find our way around the night sky.

THE NIGHT SKY - SEPTEMBER 2019



The chart above shows the night sky looking south at about 21:00 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 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 Sagittarius (the Archer), Capricornus (the Goat), Aquarius (the Water Carrier), Pisces (the Fishes), Aries (the Ram) and Taurus (the Bull) just off to the left and about to rise over the eastern horizon.

Just disappearing over the south western horizon is the constellation of Sagittarius (the Archer). It is really a southern constellation but we can see the upper part creep along the horizon during the summer. The central bulge of our galaxy is located in Sagittarius so the richest star fields can be found in the constellation along with many of the beautiful and interesting deep sky objects that we seek out.

The summer constellations are still prominent in the night sky lead by Hercules (the Hunter). Following Hercules is the Summer Triangle with its three corners marked by the bright stars: Deneb in the constellation of Cygnus, Vega in Lyra, and Altair in Aquila. The Summer Triangle is very prominent and can be used as the starting point to find our way around the night sky. See the precious pages. The Milky Way (our Galaxy) flows through the Summer Triangle passing through Cygnus, down to the horizon in Sagittarius.

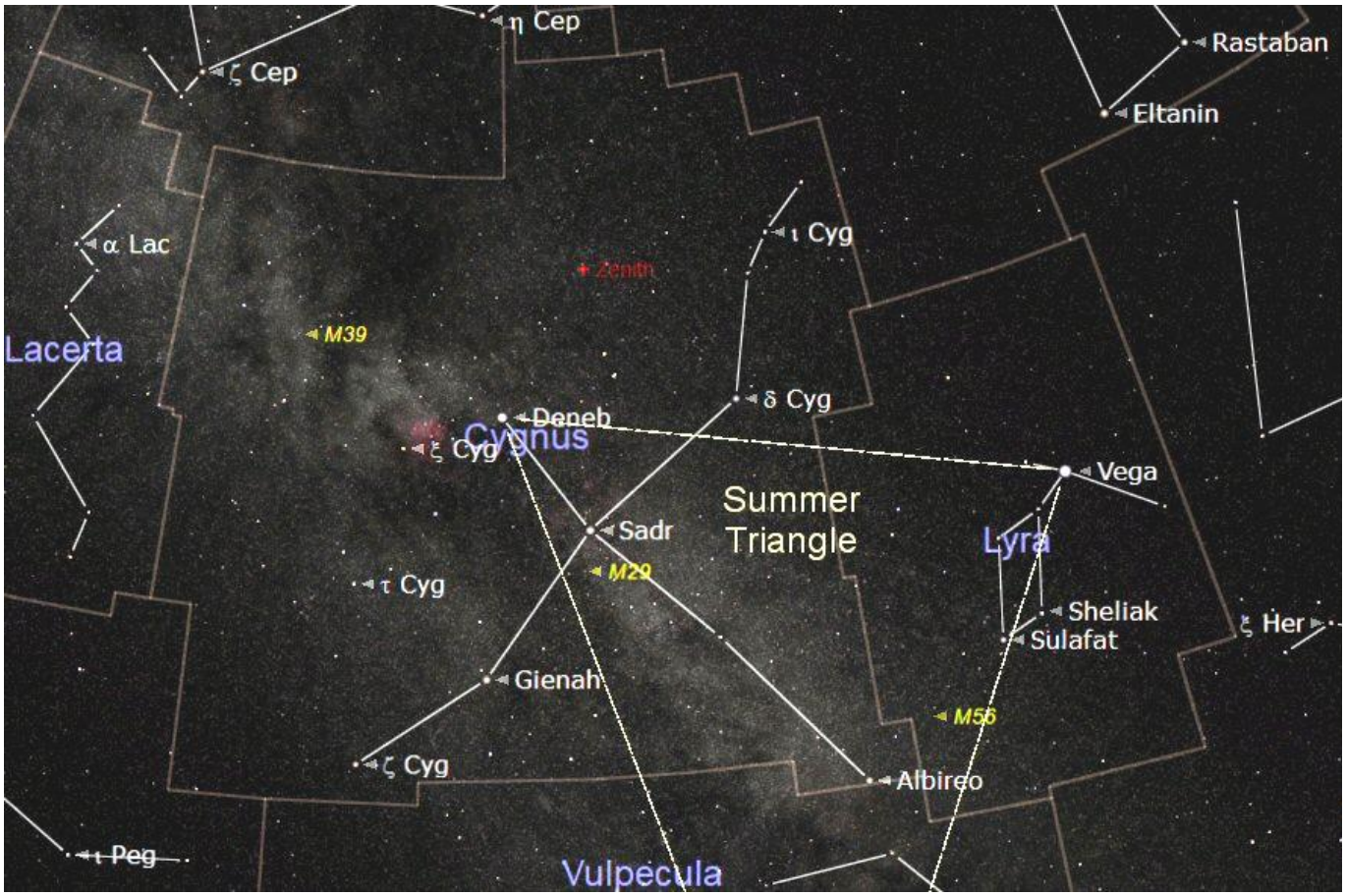
The Milky Way flows north from the Summer Triangle through the rather indistinct constellation of Lacerta (the Lizard), past the pentagon shape of Cepheus and on through the 'W' shape of Cassiopeia (a Queen).

Just off the top of the chart above is the fairly faint constellation of Ursa Minor (the Little Bear) also called the Little Dipper by the Americans. Although Ursa Minor may be a little difficult to find in a light polluted sky it is one of the most important constellations. This is because Polaris the North Star is located in Ursa Minor. Polaris is the star that is located at the approximate point in the sky where an imaginary line projected from Earth's north pole would point to. As the Earth rotates on its axis the sky appears to rotate around Polaris once every 24 hours. This means Polaris is the only bright star that appears to remain stationary in the sky.

Just off the chart to the top right (north west) is the constellation of Ursa Major (the Great Bear). The saucepan shape of the constellation of Ursa Major is often called the Plough in the UK but is also known as the Big Dipper in the USA. It does actually look remarkably like a saucepan. Ursa Major is 'circumpolar' this means it never disappears below the horizon and is always in the sky. Four bright stars represent the pan and three stars represent the handle. An imaginary line drawn from the side of the 'pan' opposite the handle points to Polaris (the Pole Star). See last page of this magazine.

To the East 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.

CONSTELLATION OF THE MONTH – CYGNUS (the Swan)



A chart the constellation of Cygnus (the Swan)

Cygnus is a beautiful constellation and has a number of interesting things to see. During late Summer and Autumn, it is almost directly overhead. It forms a distinctive cross shape that does actually look a bit like the Swan it is named after. The long neck stretches from the central star Sadr, south to Albireo. The swan's wings extend out to each side of Sadr and the tail north to the bright star Deneb.

The brightest star in Cygnus is Deneb which is one of the brightest stars that we can see in our skies. Unfortunately Deneb is in the swan's tail, if it had been in the head it would have made a great eye. It is a bright hot white star, much brighter and hotter than our own Sun at 10,000°C (the Sun is 6,400°C). Deneb forms the most northerly star of the Summer Triangle with Vega in the constellation of Lyra to the west and Altair in Aquila to the south.

When viewed through binoculars or a small telescope, the observer will be amazed by the number of stars in the field of view. This is because Cygnus sits right on the Milky Way and has a background of rich star fields.

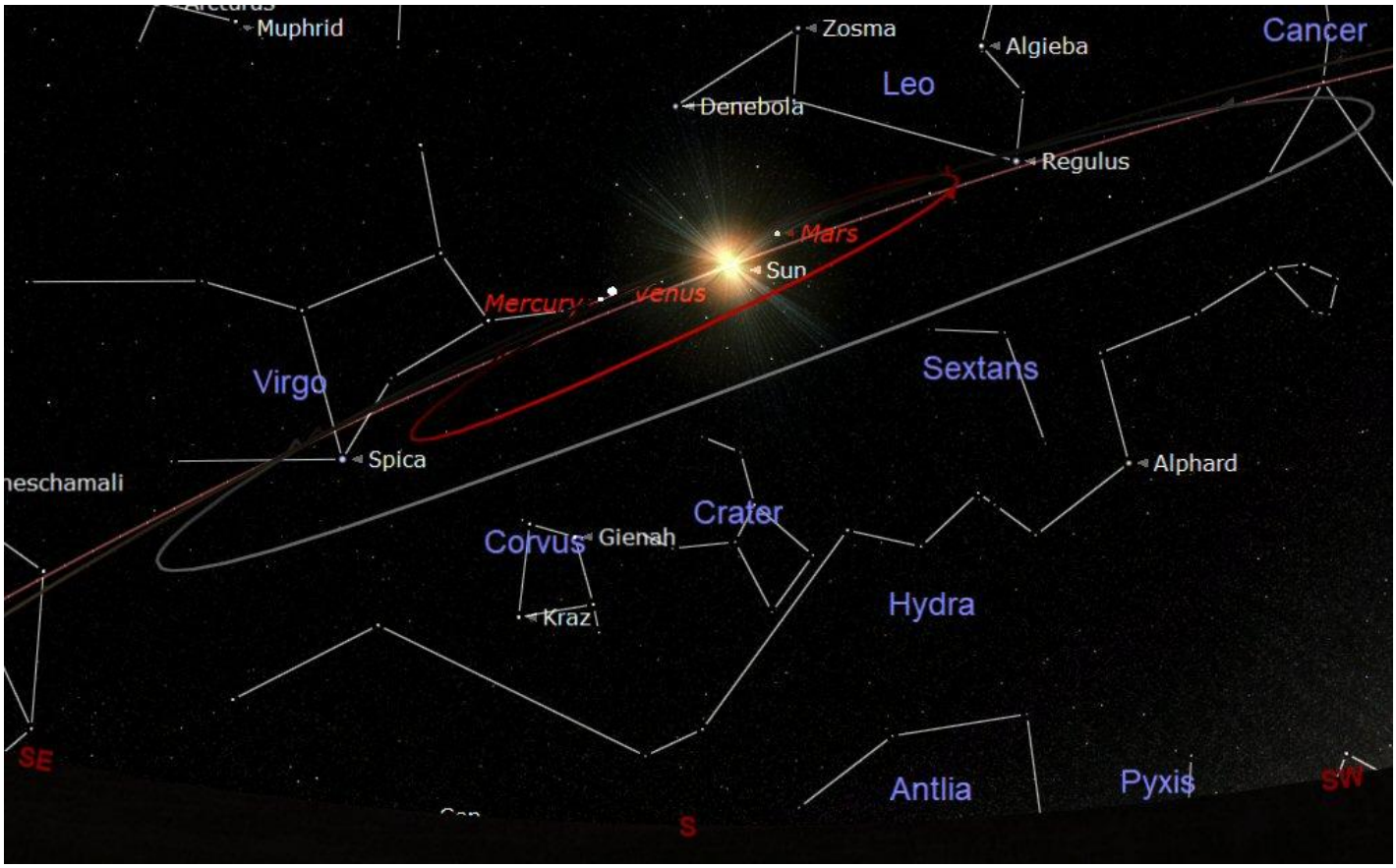
The star at the swan's head, furthest from Deneb on the centre line forming Cygnus, is called Albireo and it is beautiful to look at through a small telescope. It is actually a double star comprised of non identical twins. One star is a bright golden colour while the other is a beautiful ice blue. The colour difference is very noticeable because the stars appear so close together. However they are not actually a true double star they are thought to just be in the same line of sight. This makes it a much rarer kind of double star.

The beautiful double star Albireo

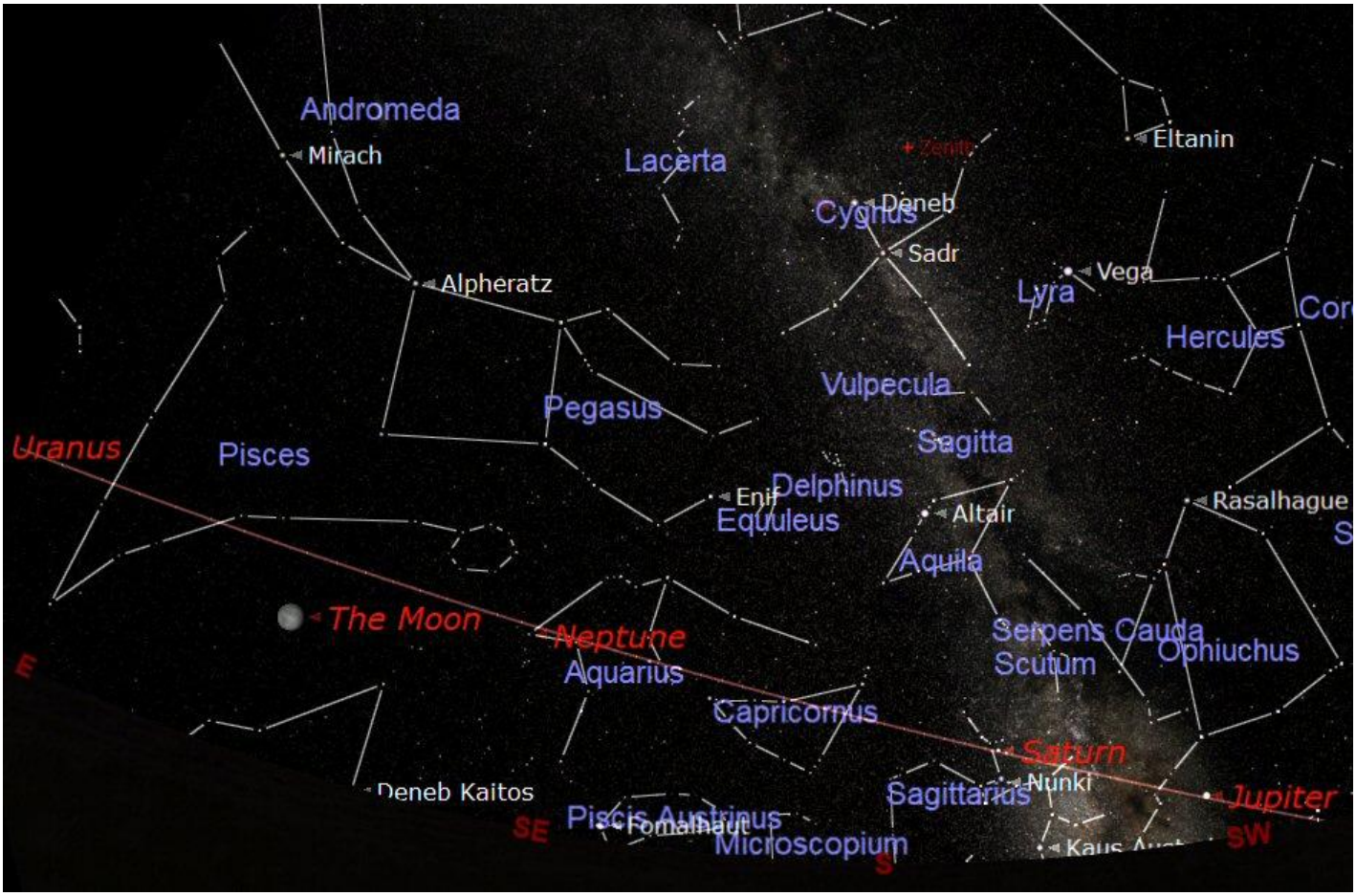
There are two interesting Messier objects in Cygnus, both are Open Clusters. The first cluster is M29 which is just south of Sadr, the central star of Cygnus. It is rather indistinct and quite difficult to pick out against the stars of the Milky Way. To the north east of Deneb is M39, this is a small open cluster of about 20 stars all at an estimated distance of 6000 light years.

Also in Cygnus are two famous Nebulae these are the 'North American Nebula' (a vast cloud of Hydrogen gas) and the 'Veil Nebula' (a supernova remnant). Both are very faint and require a dark sky and a larger telescope to see or need to be imaged. The Veil Nebula is an old super nova explosion remnant that started as a fireball then developed into a ring shaped cloud of gas and dust. It has spread out over time and is now so large and dissipated that all that remains are wisps of gas and dust distributed over much of Cygnus.

WHERE ARE THE PLANETS THIS MONTH?



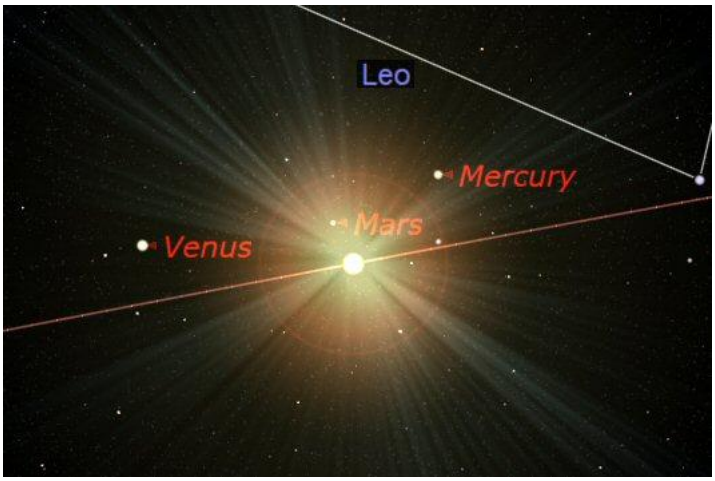
The location of Mercury, Venus and Mars at midday on 15th September (with orbital paths shown)



The location of Jupiter, Saturn, Neptune and Uranus at 21:00 on 15th September

THE SOLAR SYSTEM THIS MONTH

MERCURY will not be observable this month as it will be too close to the Sun. It will be in conjunction with the Sun (passing just above the Sun) on 4th September. See the charts below and on the previous page.

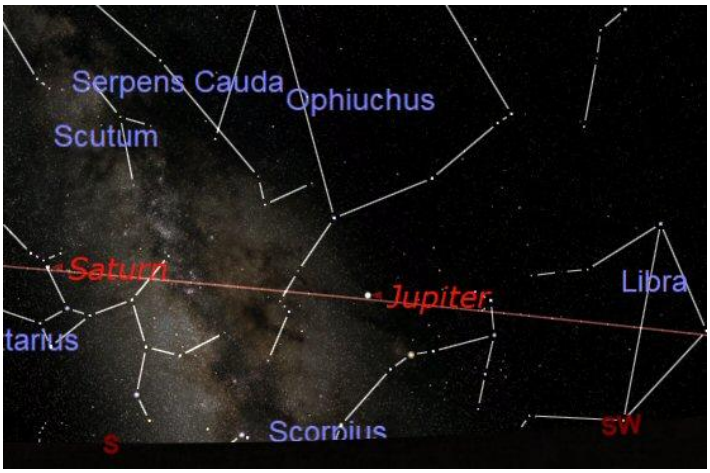


Mercury, Venus and Mars at midday on 2nd September

VENUS will not be observable this month as it will be too close to the Sun. It was in conjunction with the Sun (passed just above the Sun) on 14th August. See the chart above and on the previous page.

MARS will not be observable this month as it will be too close to the Sun. It will be in conjunction with the Sun (passing just above the Sun) on 2nd September. See the chart above.

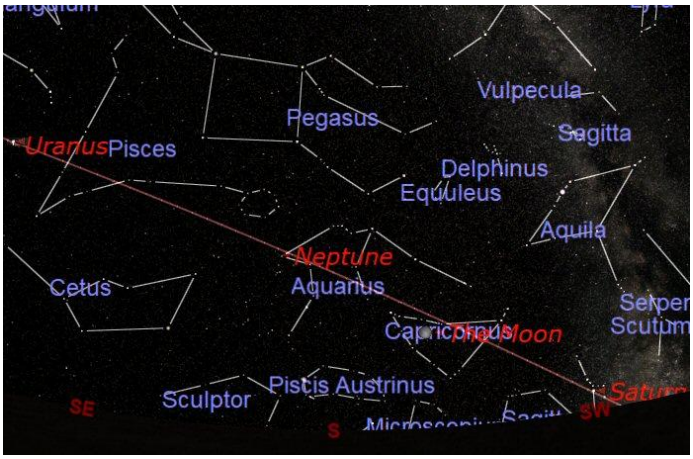
JUPITER is still in a good position for observation but is very low in the sky. See the chart below. It will be in the murky and turbulent air close to the southern horizon. The king of the planets was at Opposition (directly opposite to the Sun in the sky) and at its best on the 10th June. It is now starting to move towards the western horizon. A small telescope will reveal its cloud markings and will allow the movement of the four moons to be followed.



Jupiter and Saturn on 15th September at 20:00

SATURN will be in the in the south east as the sky darkens and following Jupiter along the ecliptic. Saturn is also very low and in the murky and turbulent air close to the southern horizon. Saturn was at Opposition (directly opposite to the Sun in the sky) and at its best on the 10th July and is still in a good position for observing. It will require a small telescope 75mm to 100mm and a magnification of about 100x to see the rings well.

URANUS is starting to move into a better position for observing this month. The Ice Giant Planet will reach opposition (due south at midnight – 24:00 GMT) on 28th October when it will be at its best position for observation this year. It will be visible later in the evening using a small telescope as a slightly fuzzy blue, star like, object. A larger telescope with a magnification of 100x will show it as a small blue/green disc. See the chart below



Uranus, Neptune and Saturn in the south at 21:00

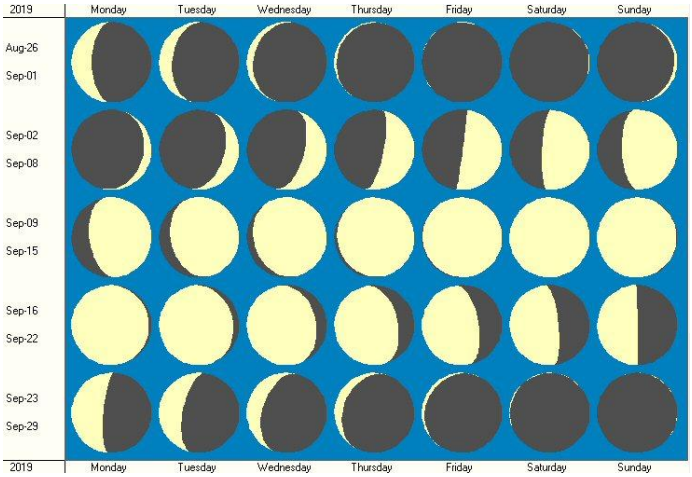
NEPTUNE will be at opposition (due south at midnight – 01:00 BST) on 10th September and at its best position for observation this year. A medium sized telescope (100mm to 150mm) will be needed to show Neptune as a small blue/green disc using a magnification of 150x but it is small and difficult to find. See the chart above.

THE SUN

There may still be some occasional sunspots to see even though the active phase of the Solar Cycle is now over.

The Sun rises at 06:18 at the beginning of the month and at 06:55 by the end of the month. It will be setting at 19:40 at the beginning and 18:50 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/ .

THE MOON PHASES IN SEPTEMBER



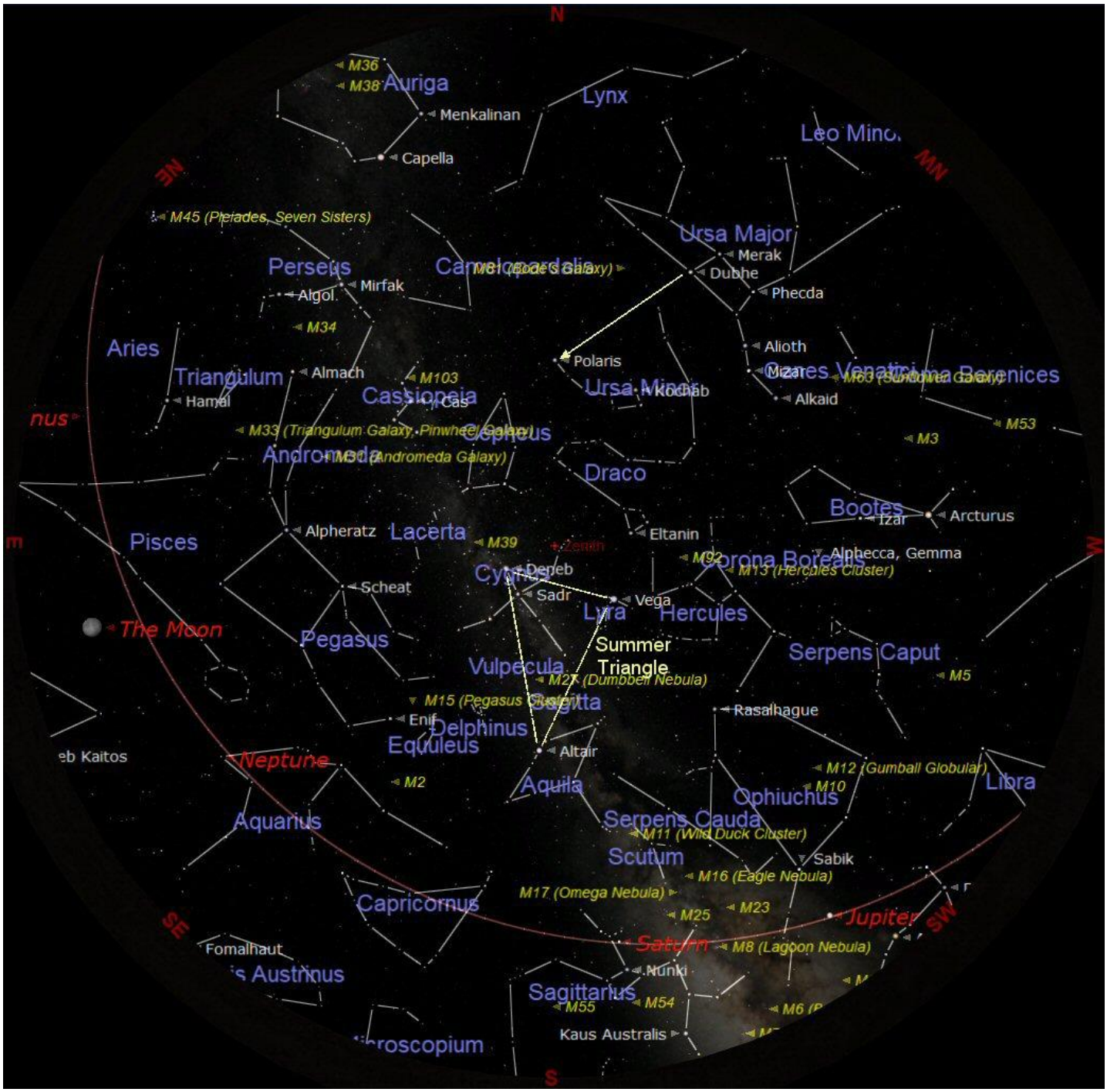
First Quarter will be on 6th September

Full Moon will be on 14th September

Last Quarter will be on 22nd September

New Moon will be on the 28th September

THE NIGHT SKY THIS MONTH



The chart above shows the night sky as it appears on 15th September at 21:00 (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 easy to find. This month it is 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.

Planets observable this month: Jupiter, Saturn and Neptune and Uranus later in the evening.