NEWBURY ASTRONOMICAL SOCIETY
MONTHLY MAGAZINE – September 2017

STARTING OUT IN ASTRONOMY AS A HOBBY

September brings the beginning of the new astronomy season, when the evenings begin to draw in and the skies are getting dark at a reasonable time. During the summer months it has been light until after 10:30 and sky has not been completely dark even at midnight. Now we can get out for a good look at all the interesting sights of the night sky and still get enough sleep to get up in time for the things we need to do the next day. So this month we will consider what we need to start out in astronomy, what we can expect to see, where and how to find it.

When starting out in astronomy it is not necessary to have a telescope to enjoy wonderful views of the night sky. All that is needed is to go to a dark location away from the glare of street lights. Somewhere comfortable to sit will make the observing more enjoyable so a simple reclining garden chair or deckchair is ideal. A star chart is a worthwhile purchase to help find your way around the sky although a simple chart like the one on the back page of this magazine will do fine to start with.

Once the new astronomer has become familiar with the night sky and the interest has begun to develop it is worth considering obtaining a pair of binoculars or a beginner's telescope. Binoculars are not as expensive as a decent starter telescope and can be obtained second hand. They will enable many more objects to be seen.

BINOCULARS

Binoculars for astronomy should have an aperture (lens diameter) of at least 50mm but it must be said binoculars over 50mm do tend to be more expensive and heavier so 50mm is a good size to start off with. An aperture of less than 50mm will not gather enough light to give a really good view of the night sky. A magnification of 7x or 8x is the best but up to 10x can be used. The 10x may be difficult to hold steady but if mounted on a tripod or supported on a wall or fence they can be used. So look for a 7 x 50 or 8 x 50. What about cost? Normally the old adage 'you get what you pay for' is true. About £50 should provide a good quality pair but spend as much as you can afford.

The author's old 9 x 50 binoculars

STAR CHARTS

The beginner to astronomy is unlikely to have a large telescope and may have no equipment at all. This does not mean that observations cannot be carried out. A star chart is the only other equipment that may necessary to get started.

The 'all sky' chart included on the last page of this magazine can be used as a guide to the sky for the current month. More detailed charts are available from bookshops and astronomy specialist shops. Star atlases are also very useful but may be a little complicated for the beginner to astronomy.

A planisphere chart is very useful and can be obtained from W. H. Smith and other large book shops or can be bought through the adverts in popular astronomy magazines such as 'Astronomy Now'.

Another option is to use a computer planetarium application. There a number of good applications on the market but some can be quite expensive. Another option is download a freeware sky chart application from the internet. A particularly good one is called 'Stellarium'.

SETTING UP

Make sure you start off dressed in warm clothes because once the cold has taken hold it is very difficult to warm up, even when extra clothes are put on. A small torch is needed to enable the chart to be read but this must shine with only with a dimmed light. A small cycle rear light or torch with a piece of red plastic secured over the lens will give enough light but will not spoil 'night vision'. It takes about 10 to 15 minutes for our eyes to become fully adjusted to the dark but a flash from bright light will spoil night vision in an instant. If the torch is still too bright fix a piece of cardboard, with a hole in it, over the lens to reduce the light.

Next find a dark area away from any lights. This may be difficult due to street lights but a strategically positioned screen made from a blanket or a garden umbrella may help. If all fails go out of town to a dark field or hill. If you are lucky enough to have an area in the garden that is sheltered from lights, a few comforts can be indulged. The first and most important would be a reclining chair to prevent neck ache from looking up for too long. On the following pages we will see some interesting things to look for in the night sky at this time of the year. In October we will consider buying a 'starter' telescope.

NEWBURY ASTRONOMICAL SOCIETY 2017 - 2018

8th September The Giant Planet - Jupiter

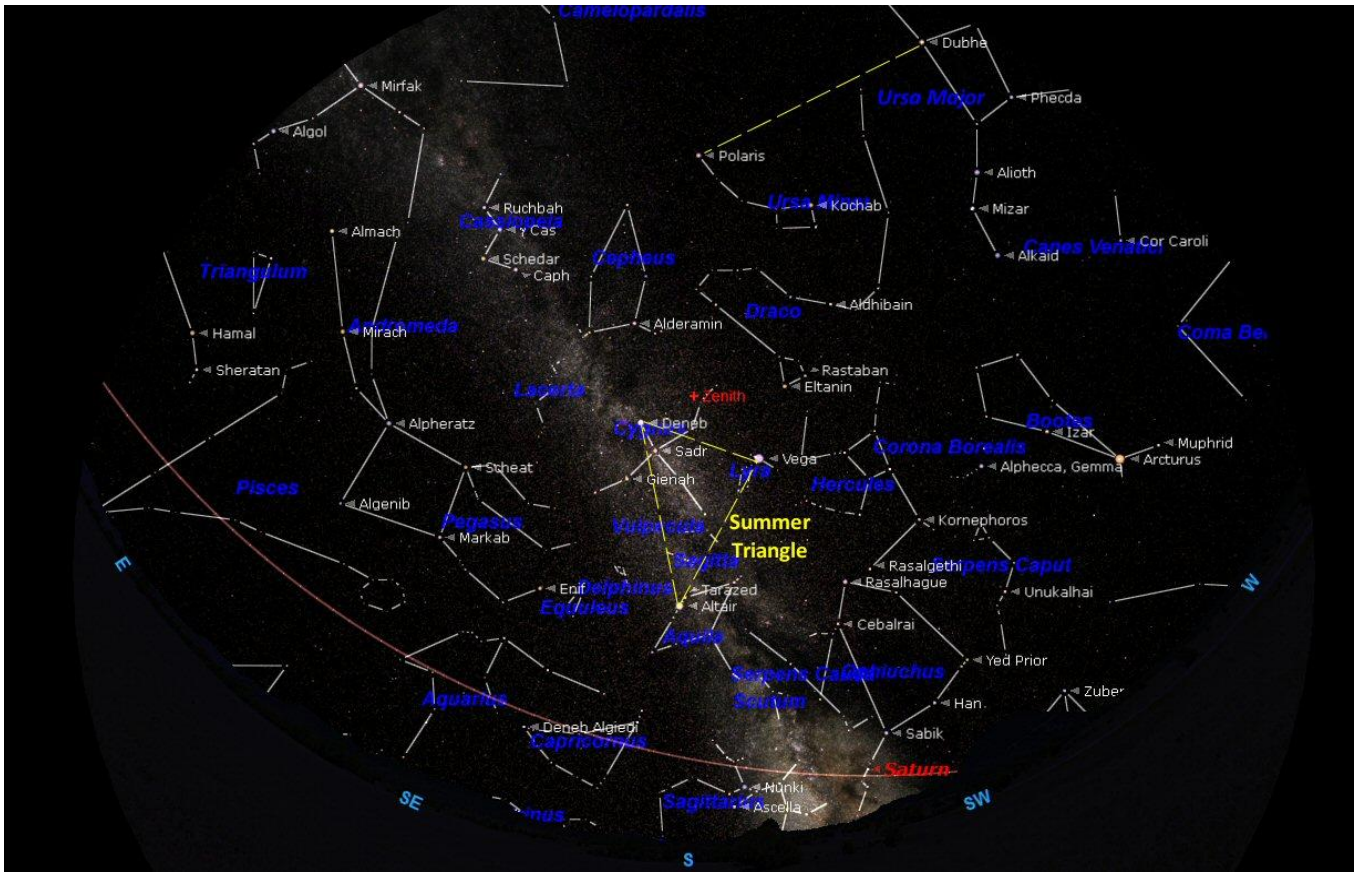
Website: **www.newburyastro.org.uk**

NEXT NEWBURY BEGINNERS MEETING

20th September Moon Shadow - The 2017 Eclipse

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

THE NIGHT SKY - SEPTEMBER 2017



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 or Nadir and is shown at the 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), Piscis (the Fishes), Aries (the Ram) and Taurus (the Bull) is 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 following pages. The Milky Way (our Galaxy) flows through the Summer Triangle passing through Cygnus, down to the horizon in Sagittarius.

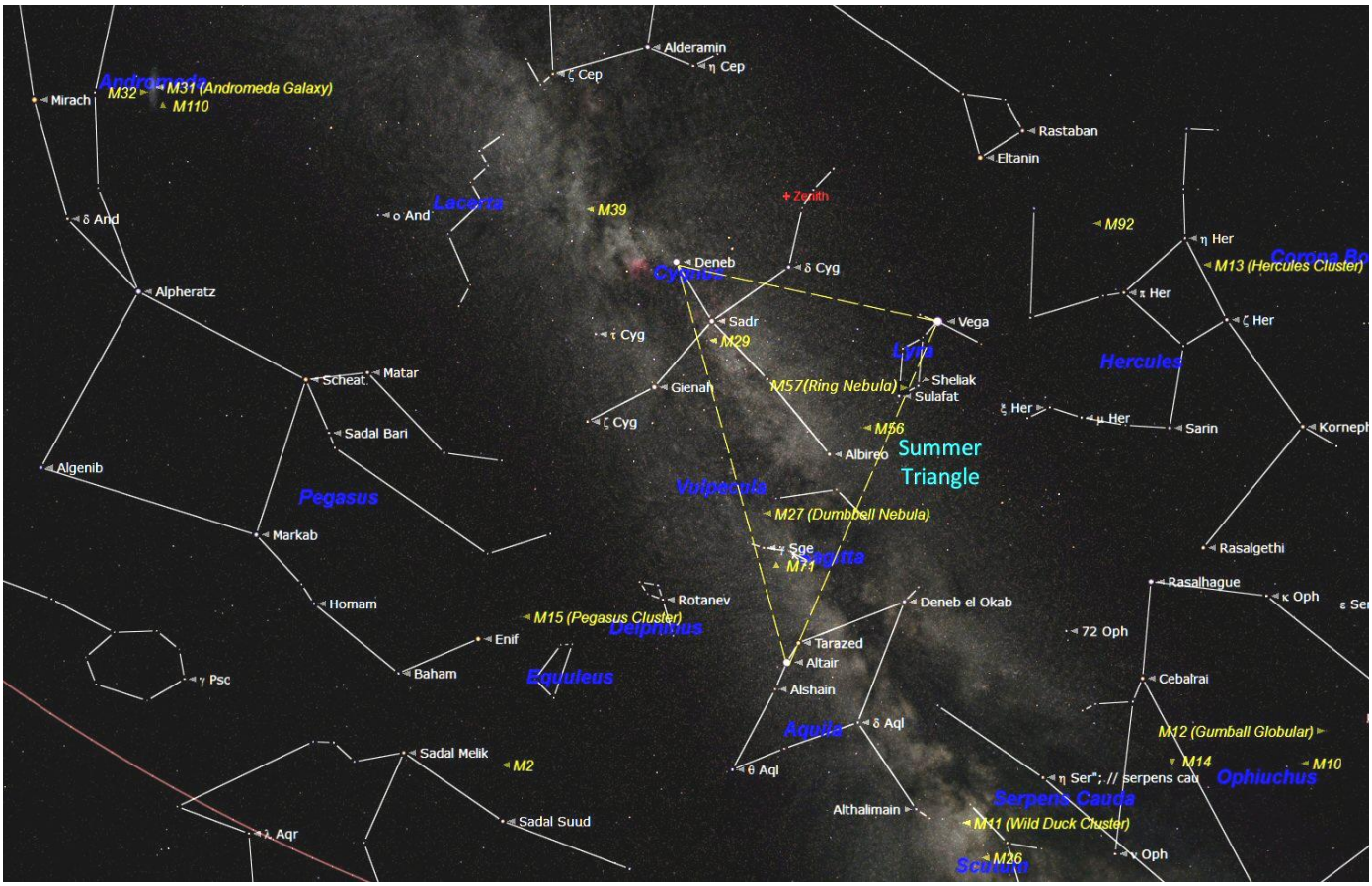
The Milky Way flows north from the Summer Triangle through the rather indistinct constellation of Lacerta (the Lizard), past the pentagon shape of Cepheus and on through the 'W' shape of Cassiopeia (the Queen).

At the top, centre 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 'Pole' or '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.

At the top right of the chart (north west) is the constellation of Ursa Major (the Great Bear). The saucepan shape of the constellation 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. 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 the chart above.

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.

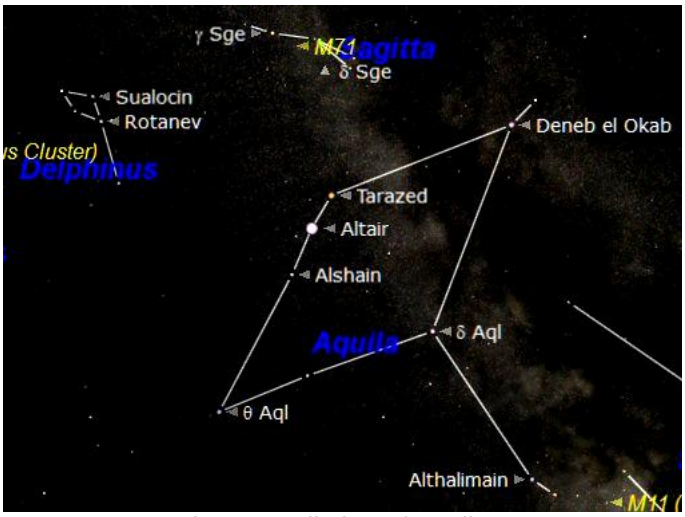
EXPLORING THE SKY AROUND THE SUMMER TRIANGLE



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)

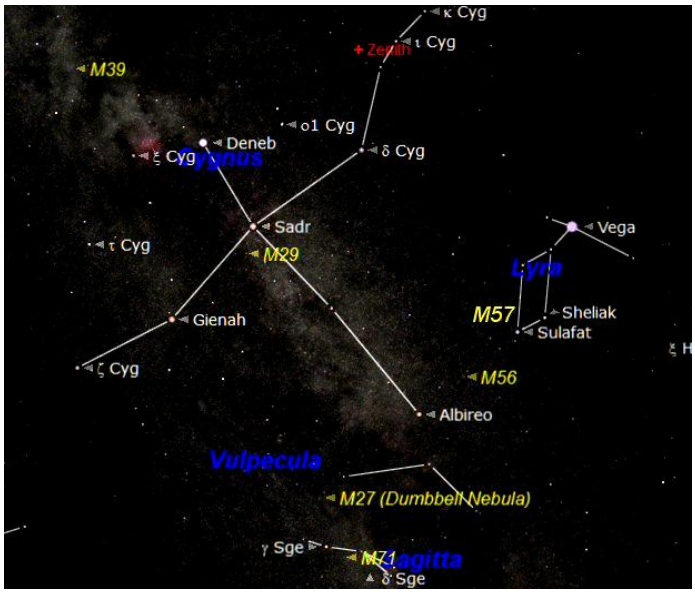
The constellation of Aquila (the Eagle) is found at the bottom corner of the Summer Triangle. There are no interesting objects in Aquila but the one bright star, Altair, has a fainter star above and below it that makes it quite easy to find.



The constellation of Aquila

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 constellations of Cygnus and Lyra

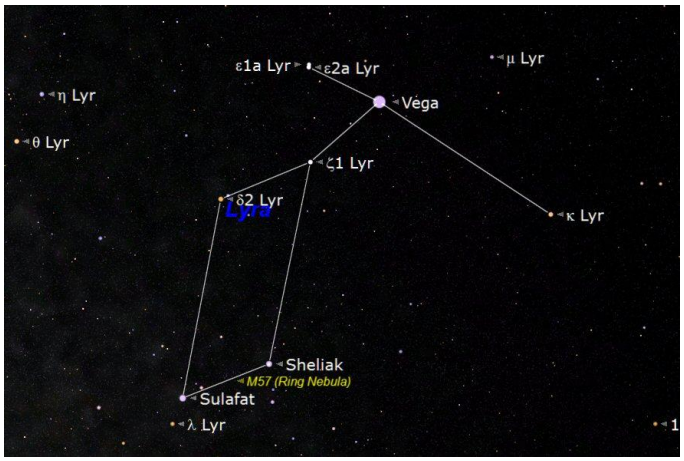
Cygnus (the Swan) does actually resemble the swan it is supposed to represent. We start at the bright star Deneb which marks the tail of the swan. From the fairly bright star Sadr the wings are spread out to each side and the long neck of the swan stretches on to Albireo.

Albirio 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, 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 a line of three stars with Vega in the centre and a group of four fainter stars that form a trapezium shape that is better known as the 'Lozenge'.

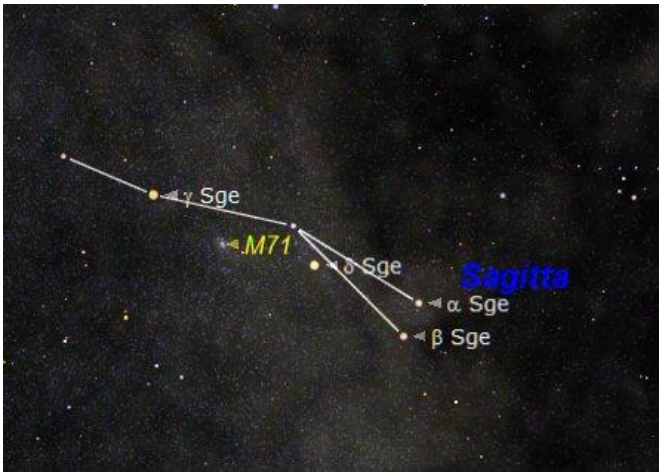
To the south east of the very bright star Vega is the lozenge shaped asterism comprised of four stars. Between the two lower stars: Sulafat and Sheliak is the Messier object M57. This is a 'Planetary Nebula' which has nothing to do with a planet. It is in fact a dying star that was similar to our Sun 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 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 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 constellation of Sagitta

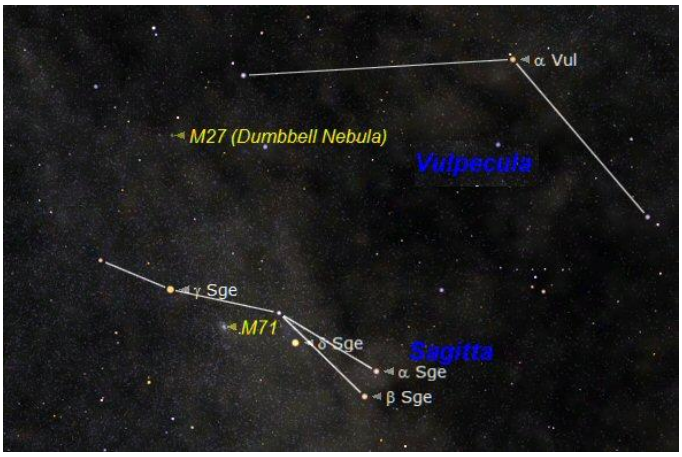
The real beauty of Sagitta is how it looks using binoculars but it does host one messier object this is M71 also known as NGC 6838. This is a rather nice but small and faint globular cluster that does need a medium sized telescope to see well.

A telescope will show Messier 71 M71 in Sagitta. It is not the most spectacular Globular Cluster but does look nice in a medium sized telescope.

Messier 71 (M71) in Sagitta

A Globular Cluster is thought to be the core of a small galaxy that has ventured too close to our large spiral galaxy (the Milky Way) and had its outer stars stripped away by the powerful gravity of the Milky Way. There about 100 Globular Clusters around our Galaxy.

VULPECULAR (the Fox)



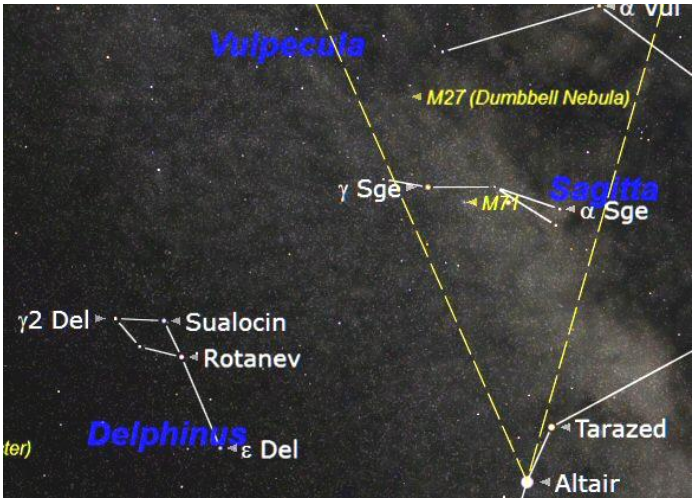
The constellation of Vulpecula

Vulpecular is a quite indistinct constellation located in the Summer Triangle, see the chart above. It has a Bright planetary nebula (M27) that can be seen using a good pair of binoculars. It is also known as the Dumbbell Nebula but looks more like a butterfly. It is a similar object to M57 but has two interesting lobes.

Messier 27 (M27) a planetary Nebula in Vulpecular

DELPHINUS (the Dolphin)

Just to the east (right) of the lower part of the Summer Triangle is the lovely little constellation of Delphinus (the Dolphin). It is small but can be seen easily with the unaided eye from a dark area when there is a clear sky.

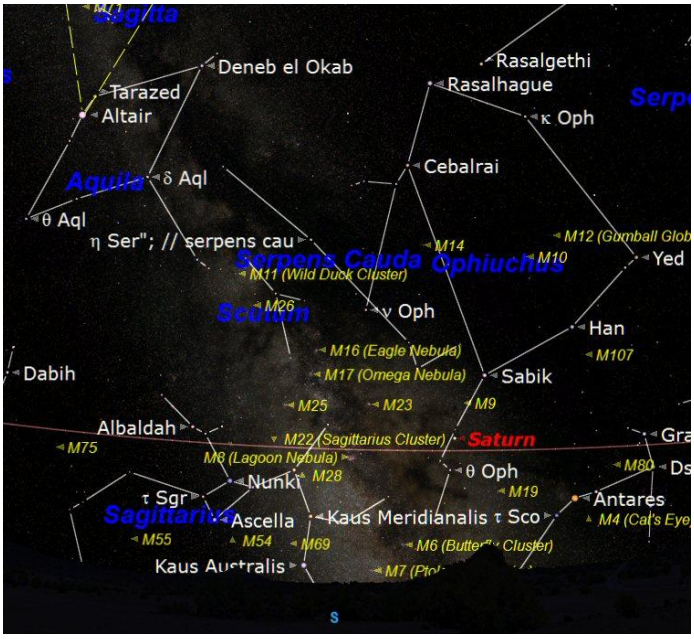


Delphinus (the Dolphin)

The asterism (shape) of Delphinus 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.

SAGITTARIUS (the Archer)

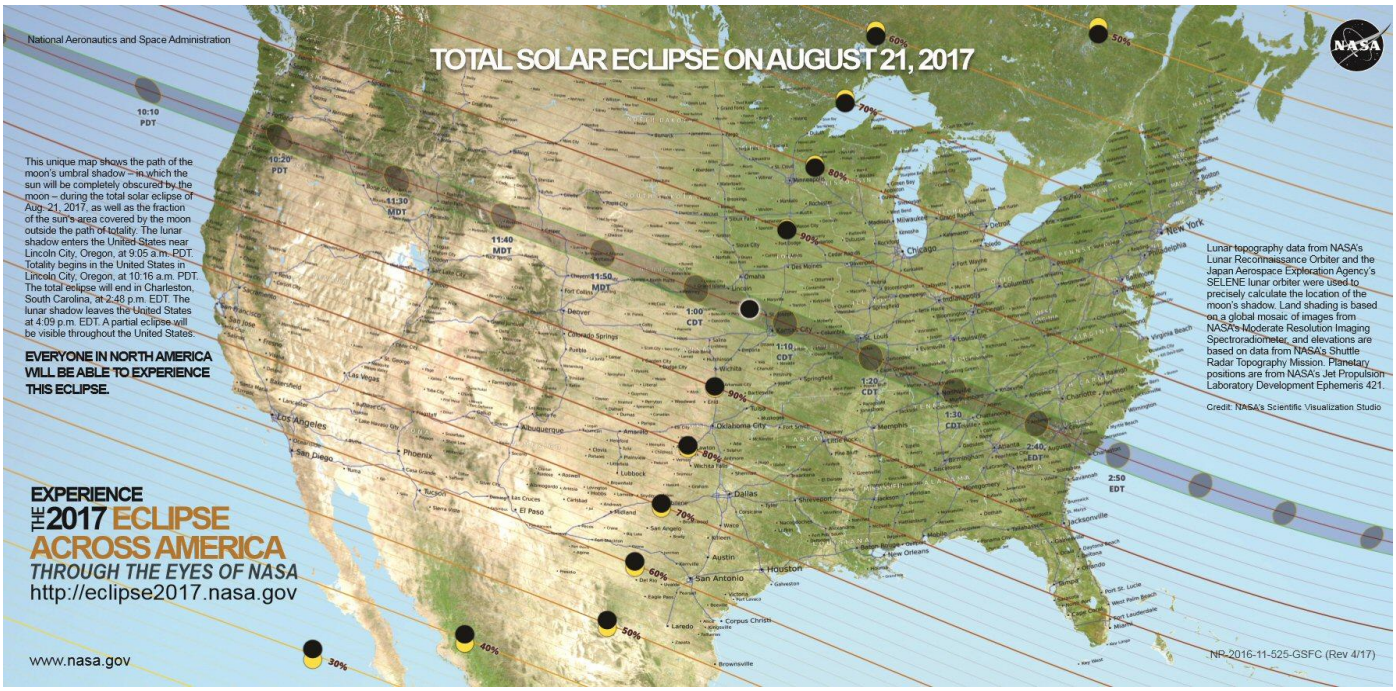
Our Milky Way Galaxy can be seen on a clear dark night looking like a cloud passing through the Summer Triangle and down the southern horizon. We see the brightest part of the Milky Way just above the horizon in the constellation of Sagittarius. Sagittarius straddles the horizon with its lower half hidden below the horizon.



Sagittarius (the Archer)

This part of the Milky Way in Sagittarius is brighter because we are looking towards the centre of the Galaxy in that direction. Saturn and the bright red star Antares can be seen in this direction. There are many beautiful and interesting Messier objects around Sagittarius. M11 the Wild Duck Cluster can be seen with binoculars.

THE GREAT AMERICAN ECLIPSE 21st AUGUST 2017

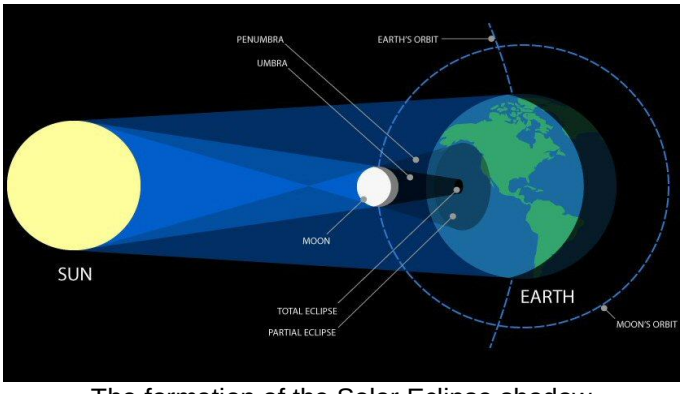


A chart showing the path of totality and partial eclipse

The chart above shows the path that the shadow of the Moon took across the USA on 21st August. This eclipse was just about as good as eclipses can be. Totality (when the whole of the Sun is covered by the Moon) was visible all the way across central USA from the Pacific coast to the Atlantic coast. Not only that, if anyone in the USA was unable to get to the path of totality the partial eclipse to the north and south of the path of totality could be observed from the whole of mainland USA but not Hawaii.

The Moon shadow came ashore at Lincoln City in the state of Oregon at 9:05 PDT (Pacific Time) and ended in Charleston, South Carolina at 4:09 EDT (Eastern Time). The total time that the Moon's shadow was on the US mainland land was about 90 minutes. The shadow was just over 112 kilometers (70 miles) wide and had a maximum totality time at Carbondale, Illinois, where the sun was completely covered for two minutes and 40 seconds.

Solar eclipses occur when the Sun, Earth and Moon are aligned in their orbits with the Moon in the middle. When this happens, the Moon passes between Earth and the Sun and the shadow of the Moon is cast on to the surface of Earth. There are two distinct parts to the Moon's shadow called the Umbra and Penumbra.



The formation of the Solar Eclipse shadow

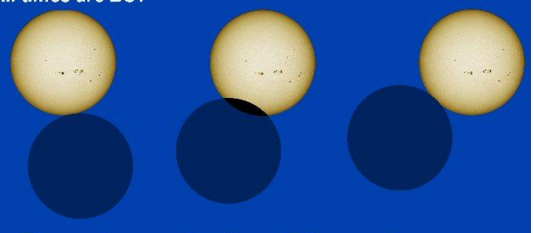
The Umbra is the dark area at the centre of the shadow where the whole of the Sun was blocked out (known as totality). The Penumbra is a much larger area where the Sun is only partially covered by the Moon. On the chart above the path of Totality is shown across a map of the USA. The actual shadow appeared much smaller than how it is represented on the chart as it was only 112 kilometers wide. This path is where the Moon was perfectly aligned with the Sun in the sky and the Sun appeared completely covered by the Moon.

To the north and south of this line the Sun and Moon were not perfectly aligned so the Sun was not completely obscured by the Moon. The further away from the Path of Totality less of the Sun was covered by the Moon. The diagonal lines drawn across the chart show the percentage of the Sun covered by the Moon. The heavy lines indicate 10% increments of coverage.

In the UK we were just on the edge of the partial eclipse so we could have seen the Moon just clip the edge of the Sun however it was of course cloudy.

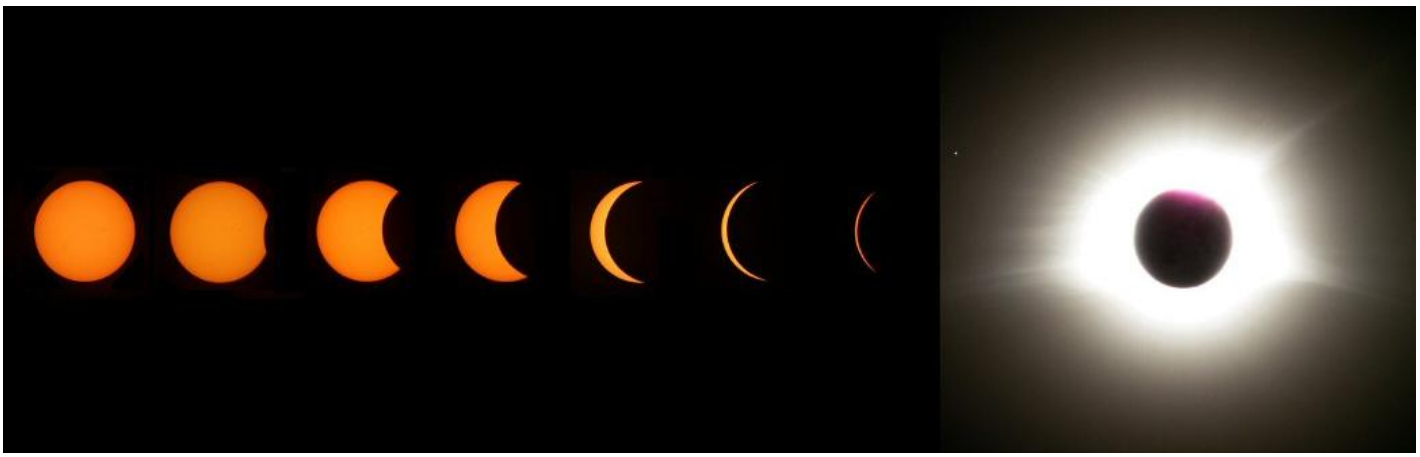
UK Eclipse Circumstances for 21 August 2017

All times are BST



Location	First contact	Maximum Eclipse	Last contact
Belfast	19:37:56	20:00:52	20:23:25
Brighton	19:40:47	20:05:37	20:29:58
Cardiff	19:41:09	20:08:20	20:34:51
Dublin	19:38:31	20:03:00	20:27:00
Edinburgh	19:38:03	19:58:15	20:18:11
Glasgow	19:37:48	19:58:34	20:19:02
London	19:40:30	20:04:35	20:28:13
Manchester	19:39:22	20:02:01	20:24:16
Norwich	19:40:11	20:20:31	20:24:28
Plymouth	19:40:30	20:07:16	20:33:25

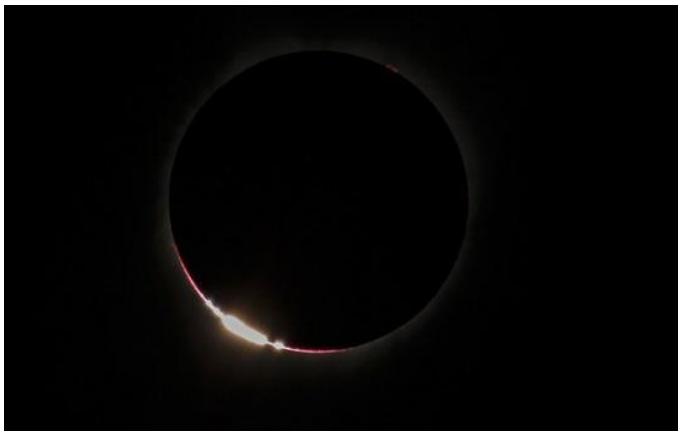
IMAGES FROM THE GREAT AMERICAN ECLIPSE 21st AUGUST 2017



A composite image showing the progress of the eclipse

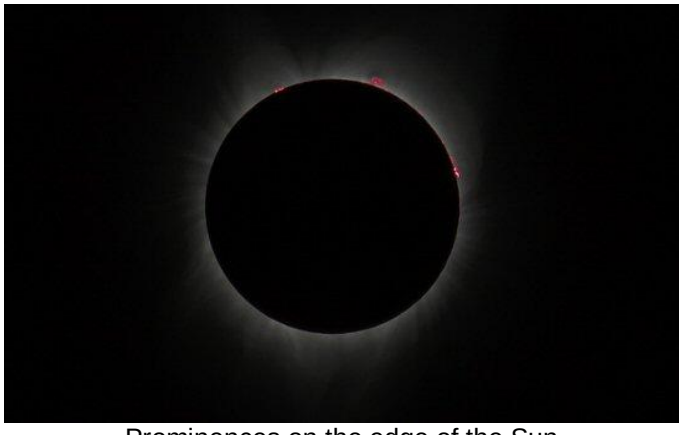
Crescent shaped shadows during partial eclipse

The Sun's Corona (atmosphere)



Baily's Beads (Sunlight shining through valleys)

Enhanced view of the Corona and magnetic field

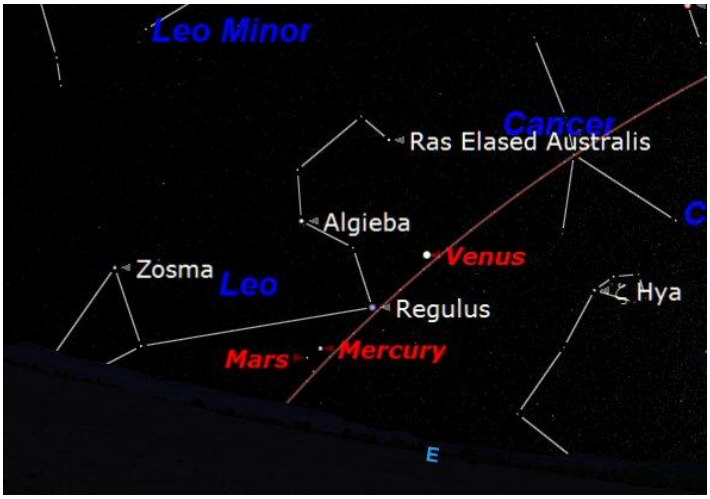


Prominences on the edge of the Sun

The 'Diamond Ring' effect

THE SOLAR SYSTEM THIS MONTH

MERCURY is an early morning object and rises in the east at 04:00 at the beginning of the month and at 04:45 at the end of the month. Its earliest rising time will be in the middle of the month when Mercury will be at its greatest apparent distance from the Sun. It will be very difficult to see low in the east as the sky begins to brighten.



Mercury, Venus and Mars in the east before sunrise

VENUS is moving back towards the Sun and will just be visible above the eastern horizon before the Sun rises. It rises at about 03:00 so will need a clear view towards the eastern horizon before the sky begins to brighten at about 04:30. See the chart above.

MARS will be rising east just an hour before the Sun rises. The Red Planet appears small at just 3.5 arc-seconds in diameter but is quite bright at magnitude +1.8. Mars will be very difficult to see just above the eastern horizon especially as the sky brightens. See the chart above.

JUPITER will be moving into conjunction with the Sun on 26th September so will not be visible this month. See the chart below. The sky has been darkened on the chart to show the location of the planets

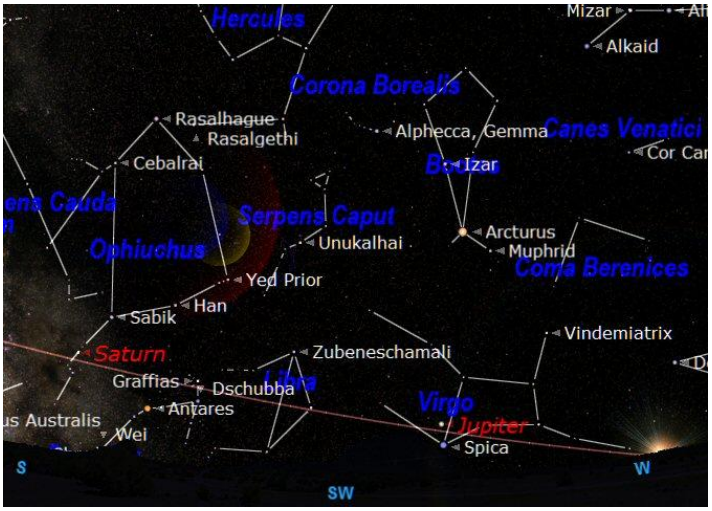
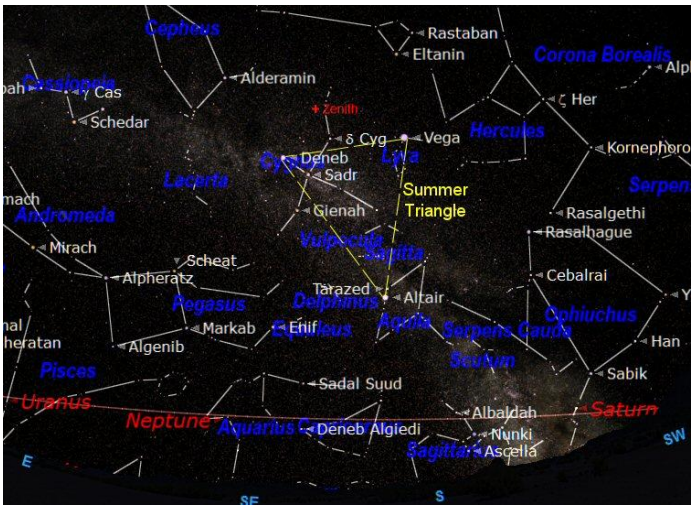


Chart showing Jupiter and Saturn on 15th September

SATURN will be in the south east as the Sun is setting and the sky begins to darken. The Ringed Planet appears small at 16.5 arc-seconds in diameter but is quite bright at magnitude +0.5. It is now moving towards the western horizon so will have to be found as soon as it is dark because it sets at 21:45. See the Uranus chart.

URANUS will be in a good observable position this month. It will be quite high in the east as soon as the sky is dark. It will be better placed later in the evening. Using a good pair of 10x50 binoculars a slightly fuzzy blue, star like, object can be seen. A telescope at a magnification of 100x will show it as a small blue/green disc.



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

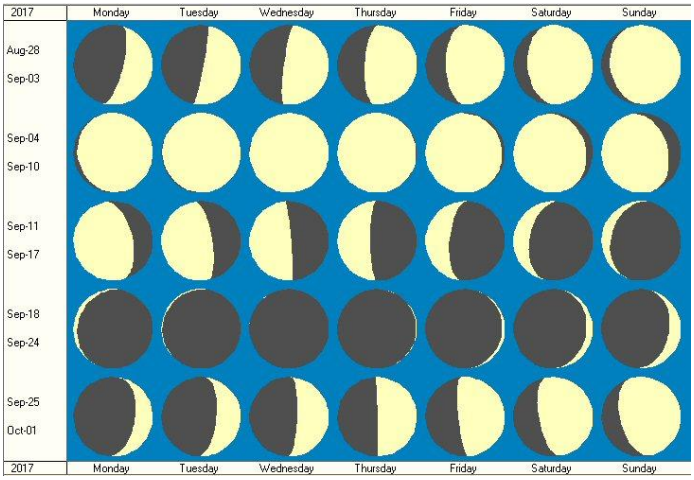
NEPTUNE will be visible in the south as soon as the sky is dark. It will be at opposition (due south at midnight – 01:00 BST) on 2nd September so at its best position for observation this year. A telescope will be needed to show Neptune as a small blue/green disc using a magnification of 100x but it is small and difficult to find.

THE SUN

There are still some sunspots to see even though the active phase of the Solar Cycle is drawing to a close.

The Sun rises at 05:10 at the beginning of the month and at 06:00 by the end of the month. It will be setting at 18:45 at the beginning and 17:40 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



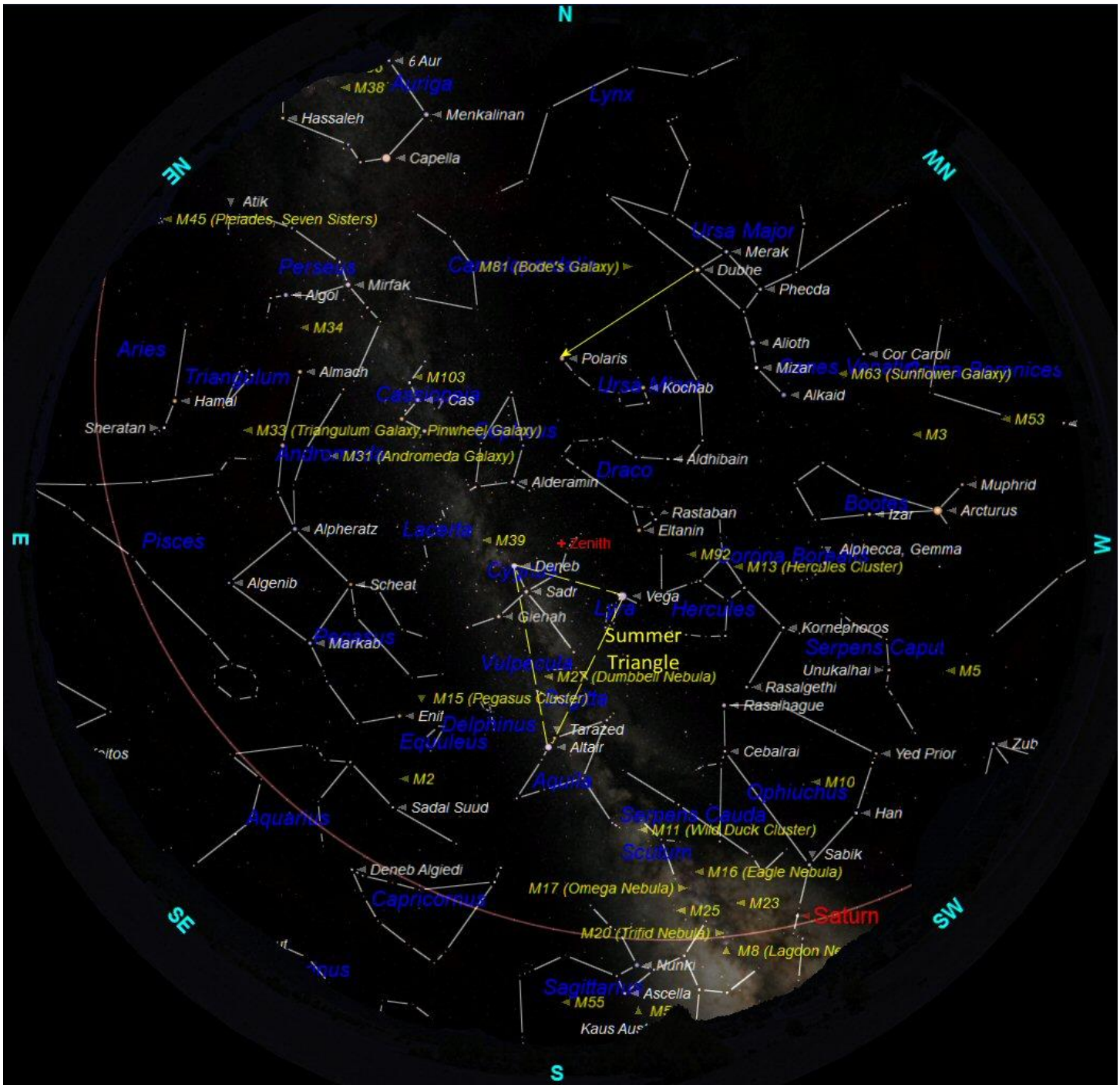
Full Moon will be on the 6th September

First Quarter will be on 13th September

New Moon will be on 20th September

Last Quarter will be on 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: Saturn (early evening) with Uranus and Neptune later in the night.