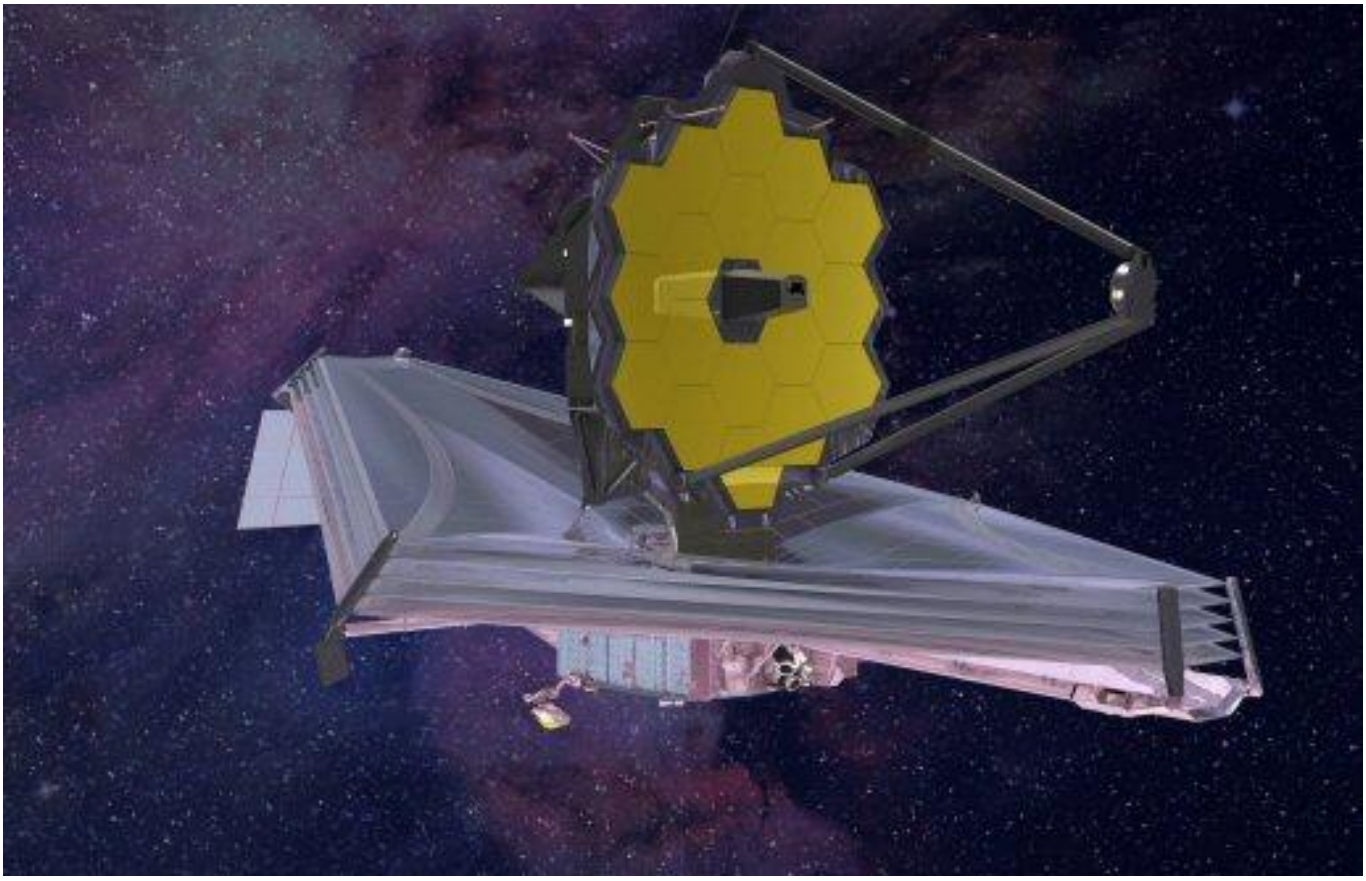
NEWBURY ASTRONOMICAL SOCIETY
MONTHLY MAGAZINE – NOVEMBER 2021

JAMES WEBB SPACE TELESCOPE NEARLY READY FOR LAUNCH



An artist's impression of the James Webb Space Telescope

On 12th October 2021 the European Space Agency (ESA) released the news that the $9.7 billion James Webb Space Telescope (Hubble's successor) has arrived safely at Pariacabo Harbour in French Guiana. The telescope had to be transported by ship through the Panama Canal to the launch site because it was too large to be transported overland.

The European Space Agency (ESA) has said it is now working in close collaboration with NASA to prepare what it called a 'once-in-a-generation mission' for the launch on an Ariane 5 rocket from Europe's Spaceport in French Guiana. Launch processing teams need to prepare and configure the Webb for flight. This involves post-shipment checkouts and carefully loading the spacecraft's propellant tanks with fuel. The engineering teams will then mate the James Webb Space Telescope (JWST) to its launch vehicle an Ariane 5 rocket, provided by ESA. They will carry out a 'dress rehearsal' before it is rolled out to the launch pad two days before launch.

Few space science missions have been so eagerly anticipated as the James Webb Space Telescope. As the next great space science observatory following Hubble, the JWST is designed to resolve unanswered questions about the universe. It will see farther into our origins: from the formation of stars and planets to the birth of the first galaxies in the early universe.

Every launch requires meticulous planning and preparation. For JWST, this process began about 15 years ago. Its arrival at Pariacabo Harbour is a major milestone in the Ariane 5 launch campaign. JWST arrived from California on board the MN Colibri which sailed through the Panama Canal to French Guiana.

NASA has now confirmed that the long-delayed James Webb Space Telescope has a new end-of-year launch date. In conjunction With the European Space Agency and Canadian Space Agency, NASA will launch the new telescope from a South American launch site in Kourou, French Guiana, on 18th December 2021.

NEWBURY ASTRONOMICAL SOCIETY MEETING

5th November The Great Debate (see page 11)
Website: **www.newburyastro.org.uk**

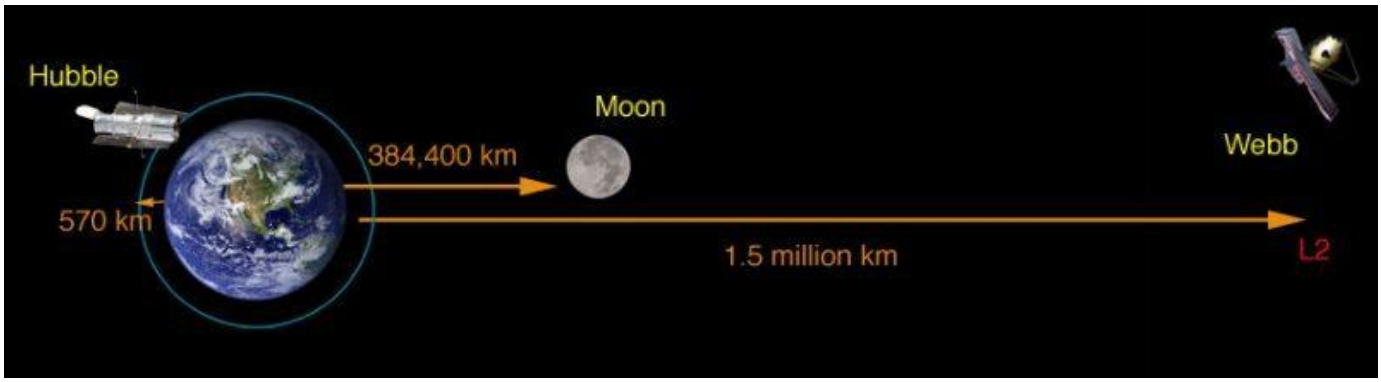
SPECIAL TELESCOPE WORKSHOP

10th November Special Open Telescope Workshop (See pages 3 and 11)
Website: **www.newburyastro.org.uk**

NEXT NEWBURY BEGINNERS MEETING

17th November Do you need a telescope? (on Zoom)
Website: **www.naasbeginners.co.uk**

THE JAMES WEBB SPACE TELESCOPE MISSION

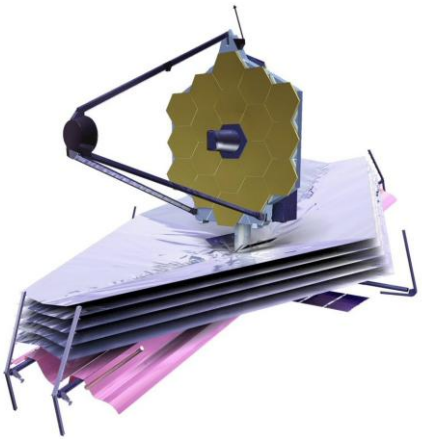


The destination of the JWST at the second Lagrange Point 'L2'

Following launch, JWST will take about a month to fly to the L2 point in space. The JWST will be located near the second Lagrange point (L2) of the Earth-Sun system. This is 1,500,000 km from Earth and directly opposite to the Sun. Normally an object circling the Sun farther out than Earth would take longer than one year to complete its orbit. However near the L2 point the combined gravitational pull of the Earth and the Sun allow a spacecraft to orbit the Sun in the same time it takes Earth to orbit the Sun and will appear to be stationary.

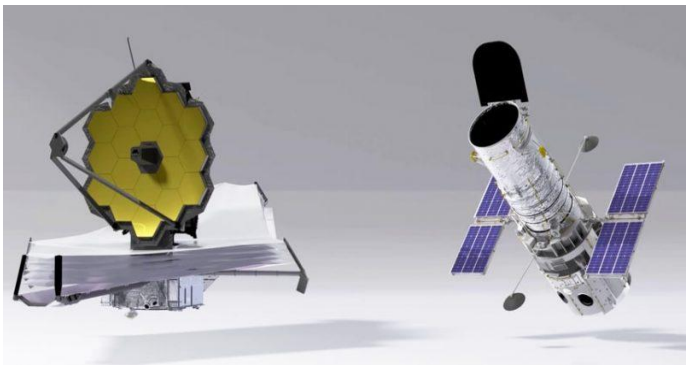
The telescope will circle about the L2 point in a halo orbit which will be inclined with respect to the ecliptic, have a radius of approximately 800,000 km and take about half a year to complete. As L2 is an equilibrium point with no gravitational pull, a halo orbit is not an orbit in the usual sense. The spacecraft will actually be in orbit around the Sun and the halo orbit can be thought of as controlled drifting to remain in the vicinity of the L2 point.

As JWST travels to L2 and beginning a few days after launch, it will start to slowly unfold its most worrying and biggest feature, this is its tennis court-sized sunshield. The sunshield is designed to reduce the sun's heat by more than a million times to 220ºC. The James Webb mirror and instrumentation have to be kept cold. If they were to be heated up by the sun, they would give off infrared radiation. It is this faint infrared wavelength of light from the distant cosmos that the Webb has been designed to observe.



An artist's impression showing the heat shield

After orbital insertion and after the telescope has cooled down and stabilized at its frigid operating temperature, the mission team will spend several months aligning its optics and calibrating its scientific instruments. Then JWST will begin studying the cosmos in infrared light using its dazzling golden mirror.



A comparison of the JWST to the HST

One of the JWST's most important and identifiable attributes is its 6.5-meter-wide primary mirror. A reflecting telescope's primary mirror determines how much light it can collect and therefore how deeply it can see into the universe. JWST's mirror is nearly three times wider than Hubble's primary mirror and about ten times the light capturing area.

The JWST mirror is often referred to as the JWST golden mirror. The mirror is actually multiple mirrors. It's composed of 18 separate hexagonal-shaped segments made of very strong, ultra-lightweight beryllium which will unfold after launch. Each of the telescope's mirror segments is covered in a microscopically thin layer of gold. This gold covering optimizes the mirror segments for reflecting infrared light which is the primary wavelength of light this telescope will observe.

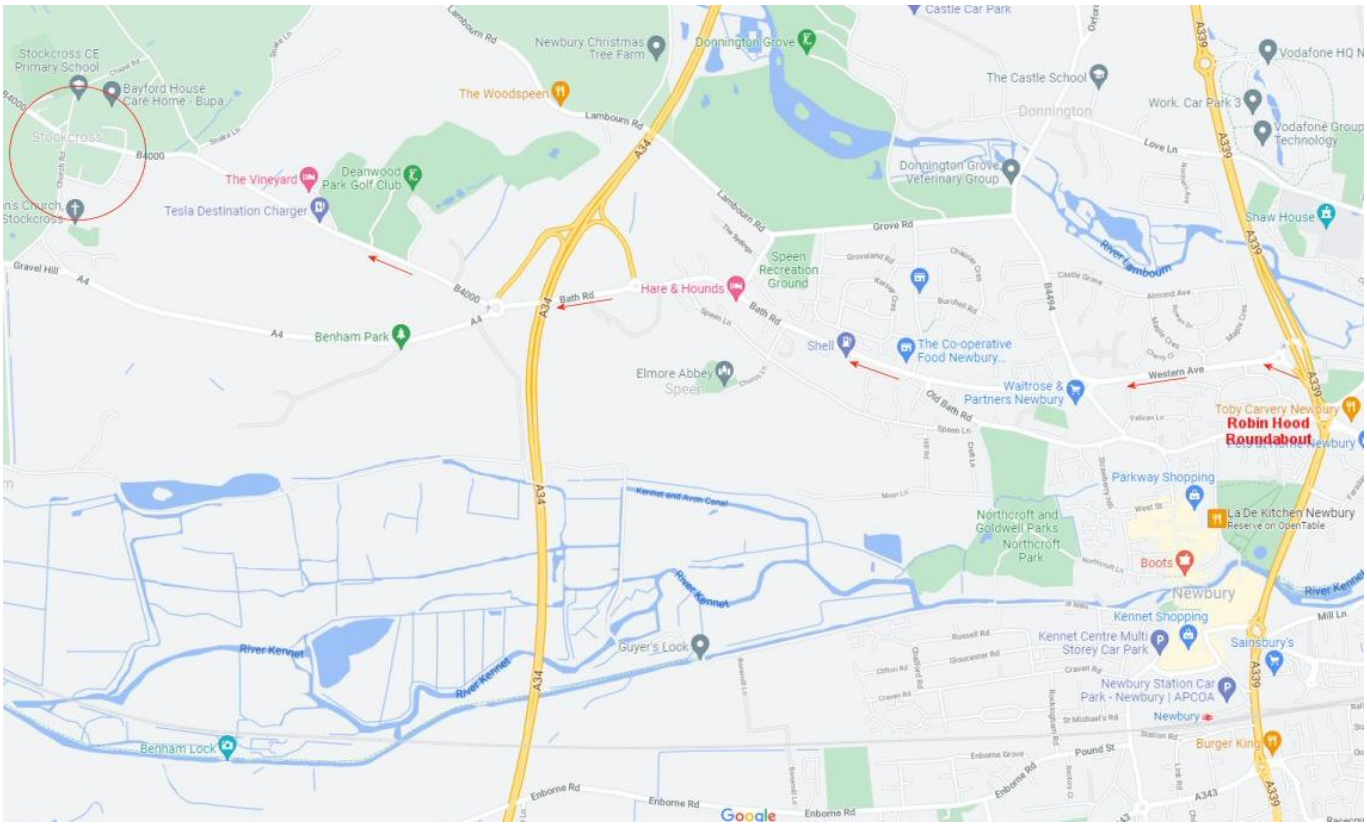
TECHNOLOGIES HAVE ADVANCED

As you would expect, the capabilities of the Webb extend way beyond those of the Hubble Space Telescope. NASA has always said that the James Webb is not a direct *replacement* for Hubble but rather a *successor*. The two telescopes will collaborate side by side for a while, with a planned overlap.

The JWST will observe further into the infrared regions of the electromagnetic spectrum than Hubble was able to do. It will observe even deeper into space than Hubble and thus will look farther into the past. It will be able to see inside stellar dust clouds where the very first stars and star systems formed.

The James Webb Space Telescope is the world's most complex infrared telescope. The telescope has now arrived in French Guiana, where it is planned to be launched on an Ariane 5 rocket from Europe's Spaceport on 18th December 2021.

SPECIAL BEGINNERS TELESCOPE WORKSHOP



Directions to Stockcross Village Hall (Sutton Hall)

We will ask visitors to comply with COVID safety guidance at this meeting

We will be holding a Telescope workshop for beginners on Wednesday 10th November starting at 19:30.

This will be a special evening open to anyone, members and non-members, to give advice on using a telescope or what to buy. These meetings will go ahead regardless of the weather but do bring warm clothing in case the sky is clear and we go outside.

There will be help available for anyone who is thinking about buying a telescope or is experiencing problems with their telescope or just in need of some advice.

If the sky is clear we will go outside to use telescopes so bring your own telescope if you have one or use some of the other member's telescopes.

There will also be the opportunity for astro chats over tea and snacks in the hall as usual.

We ask for a donation of £2 towards the cost of hiring the Hall. There is parking at the Village Hall (see picture below).

Sutton Hall, Stockcross postcode RG20 8LN

We will, as national arrangements permit, be holding our future meetings 'face to face' in meeting halls where possible. However we will endeavour to maintain a live online Zoom connection for those members who cannot or wish not to join the 'face to face' meetings. The provisional programmes for the Session September 2021 to June 2022 were outlined in the October 2021 magazine but may be changed as things develop.

There have been developing problems with the venues we have been using for the past few years so it is with some regret we have decided to change the venues starting in January 2022. The Beginners meetings at St. Mary's Church have been very happy and its facilities have been very good for us. However car parking has been difficult at times and now a new housing development is being built adjacent to the church. This will make our already difficult observing sessions even more difficult.

We will therefore be moving to the Village Hall at Stockcross. This venue is a little further out of the centre of Newbury but it does have a number of advantages for us. First the hall has excellent facilities with a large car park and can accommodate up to about 100 people. It also has the advantage of dark skies and no street lights. Detailed directions can be found on the Beginners website at www.naasbeginners.co.uk .

This Telescope Workshop will give the regular members of the Beginners Section and prospective new members the opportunity to have a look at the new Beginners venue. The first Beginners meeting of 2022 will be on Wednesday 19th January and will be our first face to face meeting since the beginning of the COVID-19 pandemic.

BINOCULARS FOR ASTRONOMY

Binoculars 8 x 50 (left) 15 x 70 (middle) 7 x 25 (right)

Nearly all amateur astronomers will have a trusted 'pair of binoculars' and will often recommend to a beginner that it should be the first instrument to be purchased. This article will endeavour to give some guidance in purchasing binoculars and using them to observe the night sky.

The typical light path through a binocular

The objective lens gathers light and focuses it into an image. The eyepiece is used to magnify the image and direct the light into the eye. Prisms are introduced into prismatic binoculars to enable the body to be physically reduced in length compared to that of a telescope. Prisms also ensure that the image is orientated the right way up and the right way round. It also reduces the spacing of the light paths to suit the spacing of our eyes.

Binoculars come in many different designs to suit the purpose or requirements of the user. The picture at the top of this page shows a small selection of the very large variety of the range of binoculars available.

Binoculars for astronomy use should have an aperture (lens diameter) of at least 50mm (the second number in the descriptions seen earlier). The 7 x 25 instrument shown on the right of the picture above is too small to be much use for astronomy. An aperture of less than 50mm will not gather enough light to give a really good view of the night sky. Binoculars over 50mm like the 15 x 70 example above do tend to be more expensive and heavier so 50mm is a good size to start with.

A magnification of 7x to 9x is the best but up to 10x can be used. The 10x may be difficult to hold steady but if supported on a wall or fence they can be used. So look for a 7 x 50 to 9 x 50. What about cost? Normally the old adage 'you get what you pay for' is true. About £35 to £50 will provide a fairly good quality second hand binocular but spend as much as you can afford.

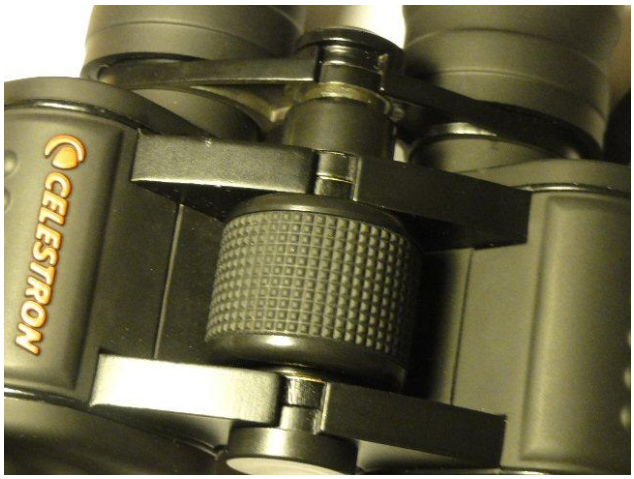
The binocular shown in the image below is a typical example of a good 10 x 50 instrument. Modern versions may be lighter than older versions but the important features are much the same.

Typical 10 x 50 binoculars

The most important feature is of course the optical quality but most modern instruments costing around £70 (before special offer price reduction) are of a reasonable quality. Binoculars with an aperture of less than 50mm are not best suited for astronomy as they cannot capture enough light. Most binoculars have the following features that are designed into the instrument to allow it to be adjusted to suit the user and the purpose of use.

The two optical bodies are hinged together to allow them to be adjusted to the relative positions of the user's eyes. By adjusting the angle of the hinge the eyepieces can be moved closer or further apart to achieve the most comfortable position to suit the user's eye spacing. See the image below.

Incorporated into the hinge between the two optical bodies is a focus adjuster often in the form of a rotating barrel. (The central focusing wheell can be clearly seen in the image below.) Rotating the wheel moves the two eyepieces in and out of the bodies. This allows the binocular to be focus on objects at different distances.



Focus adjuster

The right hand eyepiece can be rotated to adjust the focus of each optical body to suit both eyes this is called 'diopter adjustment'. See the image below.

Diopter adjustment

The way to do this is to find a bright star in the binoculars (or any distant object can be used during the day). Close the right eye and adjust the focus to suit the left eye using the central focusing wheel. When the sharpest image is achieved (for a star the smallest point of light) open the right eye and close the left.

Now adjust the right eyepiece by rotating the diopter adjuster each way until the sharpest image is achieved. Open both eyes and adjust the focus to suit both eyes working together using the central focusing wheel to check the quality of the view.

Finally binoculars are usually supplied with a strap for hanging the instrument around the neck. It is very important to leave this on and use it all the time. It saves putting the binoculars down when not being used, it may be difficult to find again in the dark. It is also useful for resting the arms after holding them up for some time. Most of all it stops the binocular falling to the ground and being damaged if accidently dropped.

Some binoculars may have rubber cups fitted to the eyepieces. These are good because they help by excluding unwanted light from street lights or other sources. Lens covers may also the supplied to prevent dust accumulating on the glass so if supplied they should be fitted when the binoculars are not in use.

Some cheaper binoculars may display a flare or spikes around the stars but this is not a big problem as long as the effect is not too noticeable. Using binoculars will mainly be to show the positions and patterns of stars so some distortion of the star images can be acceptable. Binoculars can show the large features on the Moon but not fine surface details on the Moon or the planets. So let us move on to using the binoculars for astronomy.

The first thing to consider is getting comfortable for observing. All the usual advice given to beginners to astronomy applies. That is: dress to keep warm, make yourself comfortable and avoid lights that shine directly into your face. Little needs to be said about dressing to keep warm except to start observing in warm clothes and don't wait until cold has set in before dressing up.

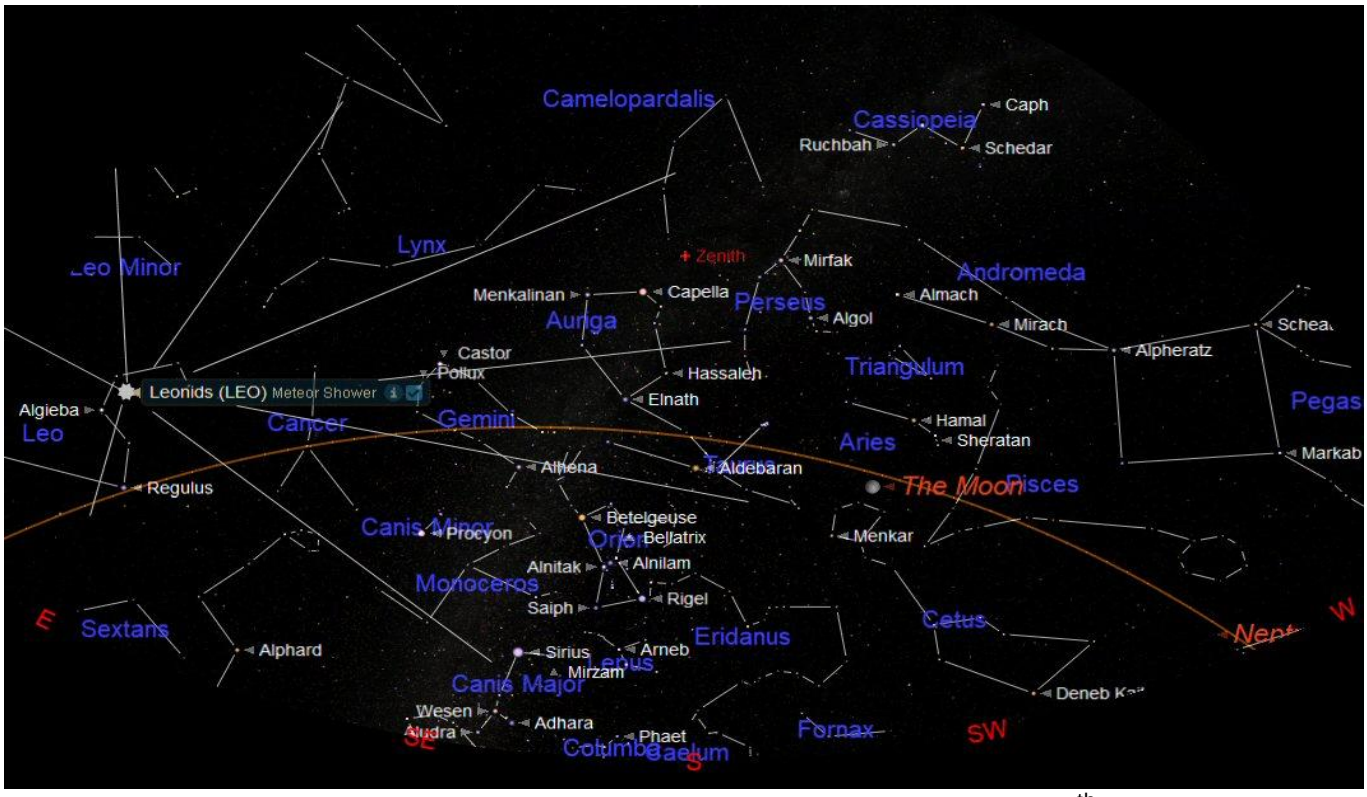
To be comfortable a reclining garden chair will allow views of the sky overhead to be obtained without a resulting neck ache. It also avoids the feeling of swaying or falling over when looking up into the sky for a while. It is also more comfortable. If a star chart is to be used with the binoculars a small side table is handy and a not too bright red light should be used to read it.

Before starting to use the binoculars have a look around the night sky for a few minutes to allow your eyes to adapt to the dark. This will take at least ten minutes. Pick out the brightest stars and try to identify them on the chart. Familiarise yourself with the positions of those bright stars because they do appear to move quite noticeably from east to west as Earth rotates.

Start at one of the bright stars then try to identify the star patterns on the star chart. This could be difficult at first because more stars will be seen when using binoculars than are shown on the chart. It takes a while to match the slightly brighter ones to the stars shown on the chart.

The good thing is, binoculars always show the stars the right way up and in the correct orientation. Gradually work outwards from the bright stars and you will soon start to become familiar with that part of the sky. Do stop occasionally and just sweep across the sky and marvel at the thousands of stars to be seen. Do the same for other bright stars. The bright stars of the Summer Triangle or the constellation of Orion in the winter are good places to start.

THE LEONID METEOR SHOWER – November 17th and 18th



The Radiant of the Leonid Meteor Shower at its peak at 01:00 on 18th November

Meteor showers are notoriously unpredictable. The exact time of any spectacular increase in numbers or if the meteors will be bright is as difficult to predict as is the clear weather needed to see them. However every year on the evening of the 17th and morning of 18th November there is usually a spectacular display from the peak of activity during the Leonid Meteor Shower.

Unfortunately this year the Moon will be a in the sky so some of the fainter meteors may not be seen. The meteors of a shower appear to radiate from a point in the sky that is called the 'Radiant'. The meteors of this particular shower appear to originate from a 'Radiant' point in the constellation of Leo. See the chart above.

The radiant point of the Leonid Meteor Shower is shown close to the star Algieba. The paths of the meteors are shown by the straight lines emanating from the direction of the radiant point. The meteors are small specks of dust debris from the Comet Temple Tuttle.

During the evening of 17th November the constellation of Leo will be below the eastern horizon so any Leonid meteors will appear to originate from over the horizon. This means all the meteors will be moving up from the eastern horizon and in a 'fan' shape across the sky. Leonid meteors tend to be fast and relatively bright so look anywhere from the eastern horizon to overhead.

If the trail of any meteor that is seen can be tracked back and found to have originated from this radiant point it will be a Leonid Meteor. A few meteors might appear to originate from other directions so these are the meteors that might be seen randomly and not part of any named shower. These are known as Sporadic Meteors.

Make sure you are dressed warmly with a hat and gloves and sitting comfortably. A garden lounger chair will allow the observer to lay back and have their head supported to avoid getting a neck ache from looking up.

On any clear night if you sit back and look up into the night sky for a while you will more than likely see a streak of light speed across the sky - this will be a METEOR or shooting star. It is not a star at all it is just a small speck of dust known as a METEOROID entering the Earth's atmosphere at very high speed.

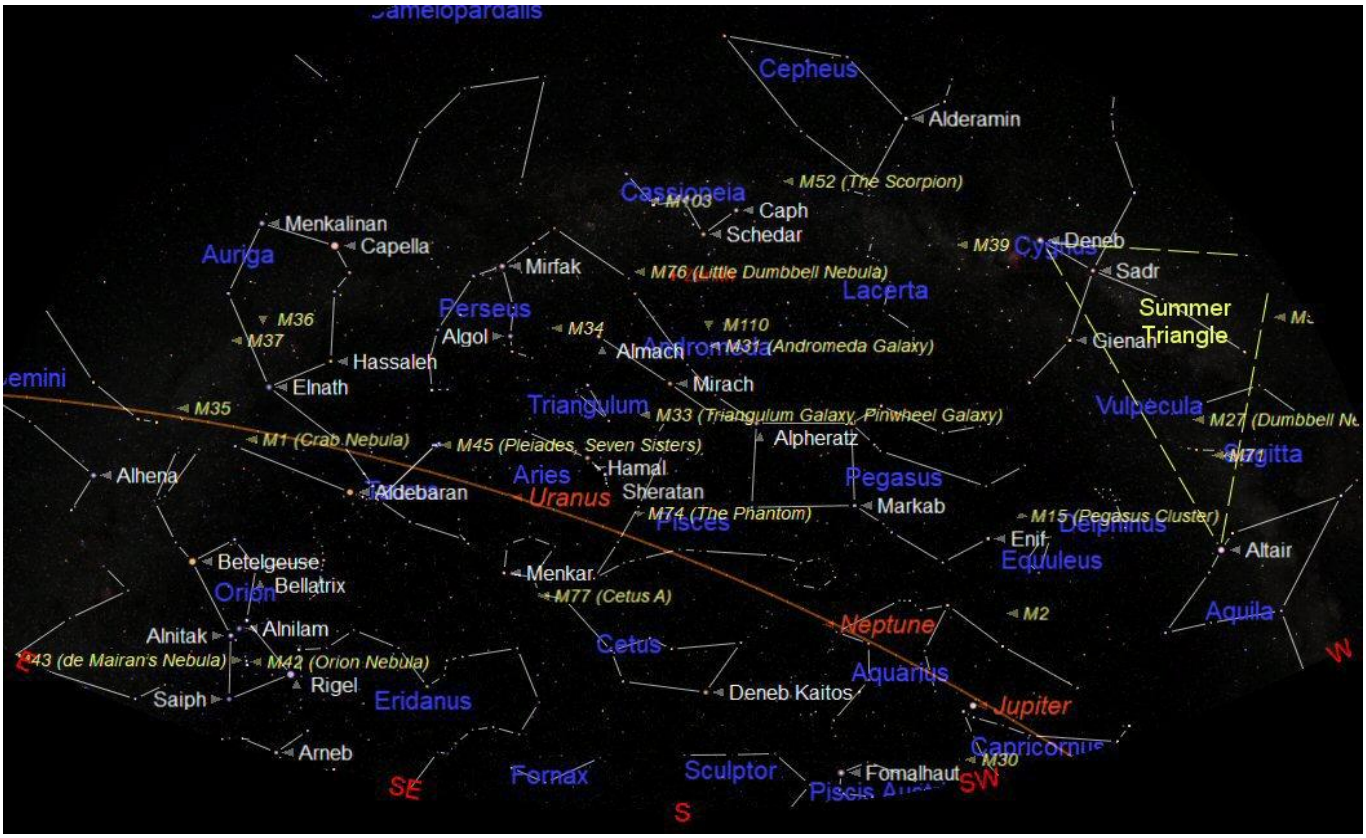
Just as the space shuttle or other space craft become very hot as they re-enter the atmosphere at about 30 thousand km/h. However these dust particles get even hotter at their re-entry speed of up to 270 thousand km/h. At this speed the dust is vaporised by the heat and the surrounding air is also heated until it glows in a similar way to a fluorescent light.

There are two types of Meteor, the first is thought to originate from the large lumps of rock and iron left over when the planets formed, known as ASTEROIDS. Most asteroids orbit the Sun in a belt between Mars and Jupiter. The huge gravitational forces exerted by Jupiter may have pulled the rocks apart before they could accumulate into a planet.

Very rarely two asteroids may collide but when they do, chips of rock and Iron are thrown off and occasionally may head towards Earth. These can be a few millimetres across or up to tens or even hundreds of metres across. They are quite rare and are seen as individual 'fireballs'. Large ones can sometimes impact the ground as METEORITES and may even cause craters.

The second type of meteor originates from a comet and is much more common. Comets are large lumps of ice, typically between five and thirty kilometres across. They orbit the Sun in an area beyond the orbits of the outer planets called the Kuiper Belt. There are millions of these objects just sitting there quietly orbiting around the Sun at enormous distances. This is the kind of meteor seen in the Leonid Shower.

A TOUR OF THE NIGHT SKY - NOVEMBER 2021



The chart above shows the night sky looking south at about 21:00 GMT on 15th November. 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: Capricornus (the Goat), Aquarius (the Water Carrier), Pisces (the Fishes), Aries (the Ram), Taurus (the Bull) and Gemini (the Twins).

Moving towards the western horizon is the Summer Triangle that dominates the Summer Sky and was described in detail in September issue of this magazine. The triangle 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.

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. There is a very nice Globular cluster in Pegasus it is known as Messier 15 (M15). It is a lovely sight to see in a telescope.

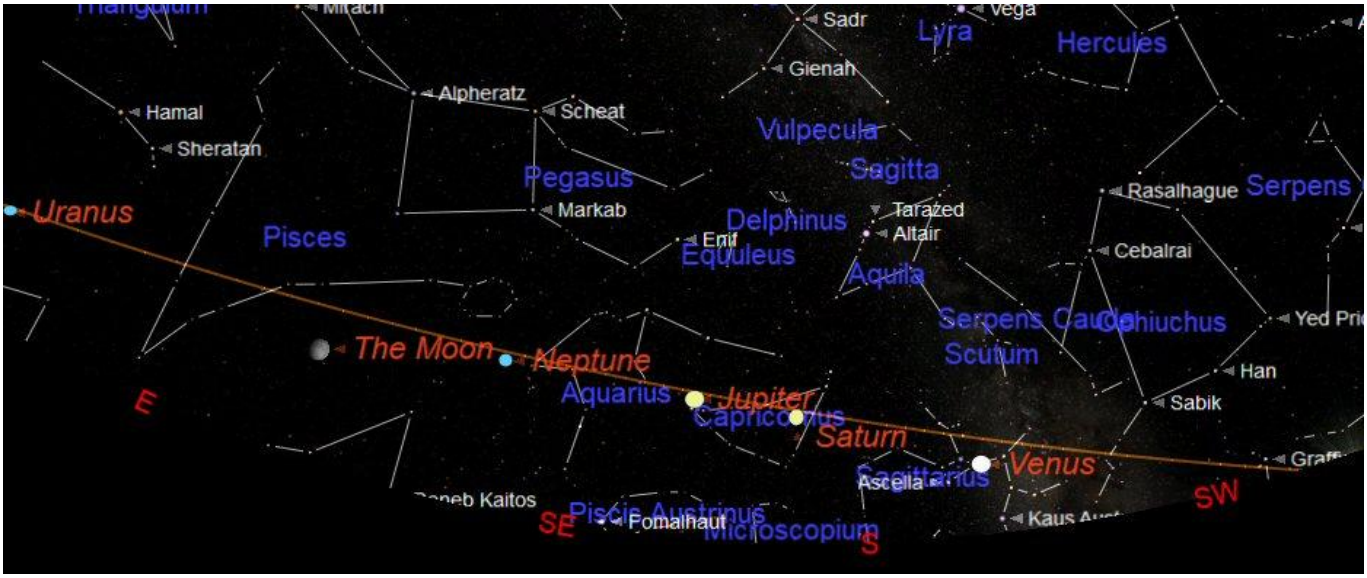
Coming into view in the south east is the constellation of Taurus (the Bull). The most obvious star in Taurus is the lovely Red Giant Star called Aldebaran. It appears slightly orange to the 'naked eye' but it is very obviously orange when seen using binoculars or a telescope. Aldebaran is located at the centre of the 'flattened' X shape formed by the brightest stars in Taurus. At the end of the top right (upper west) arm of the 'X' is the beautiful 'naked eye' Open Star Cluster Messier 45 (M45) known as the Pleiades (or the Seven Sisters). It really does look magnificent using binoculars.

Following Taurus is the constellation of Gemini (the Twins). The two brightest stars in Gemini are Castor and Pollux and they are named after mythological twins. To the north of Taurus is the odd pentagon shape of Auriga (the Charioteer). Dominating Auriga is the brilliant white star Capella which is almost directly overhead. For those with a telescope there is a line of lovely open clusters to search out in Taurus and Auriga. These are M35 in Taurus and M36, M37 and M38 in Auriga.

To the east (right) of Taurus is the rather indistinct constellation of Cancer (the Crab). The stars of Cancer are quite faint and can be difficult to discern especially in a light polluted sky. It is really worth searching out Cancer using binoculars or a telescope to see the Open Cluster M44 (the Beehive Cluster). M44 is older and further away than M45 (the Seven Sisters) so is fainter than M45 but still looks lovely. It has a group of stars that resemble an old straw Beehive with bees around it.

The Ecliptic was low in the sky during the summer months so the Moon and planets appeared close to the southern horizon. Saturn and Jupiter are well placed and the outer 'Ice Giant' planets Neptune and Uranus are well placed for those who are fortunate enough to have access to a telescope. Due to their low altitude, the planets will not be at their best for observation this year. The thick, murky and turbulent air will cause the planets to appear quite unsteady.

THE SOLAR SYSTEM - NOVEMBER 2021

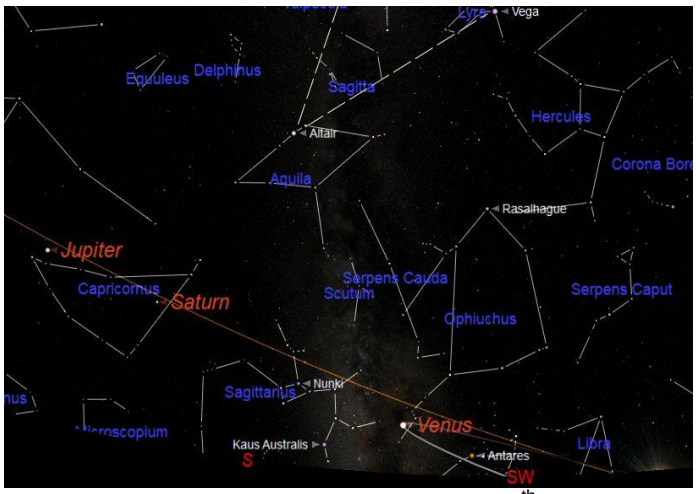


The planets at 16:30 GMT on 15th November

The chart above shows the location of the planets along the Ecliptic. The sky has been darkened to make the planets visible. The visible planets: Venus, Saturn, Jupiter, Neptune and Uranus are visible along the Elliptic from the West (right) to East (left). The planets appear low in the sky and are not well positioned for observing.

MERCURY will be very close the Sun before sunrise in the east and will not be visible this month.

VENUS will be visible in the early evening sky after sunset. It will be easy to find but will it require a clear view to the south western horizon. Venus has emerged from its excursion behind the Sun when it was in 'Conjunction' with the Sun. It appeared at its Greatest Easterly Elongation on 29th October when it was at its furthest distance from the Sun.



Venus as it appeared after sunset on 29th October

MARS has now moved out of view and will not appear in the evening sky again until September 2022. It is very close to the Sun this month will be too close to the Sun and too small in diameter to be observable.

JUPITER will be rising in the east at about 01:30 and will be visible in the south west as the sky darkens. Jupiter was at opposition and its best on 20th August. It will be at its best in the south at about 18:00 but it will be moving towards the western horizon in the evening.

SATURN will be rising in the east at about 12:30 but will be more difficult to observe than Jupiter in the turbulent air close to the horizon. Saturn will be at its best as soon as it is dark and in the south. It will be moving west and will set over the western horizon at about 21:30.

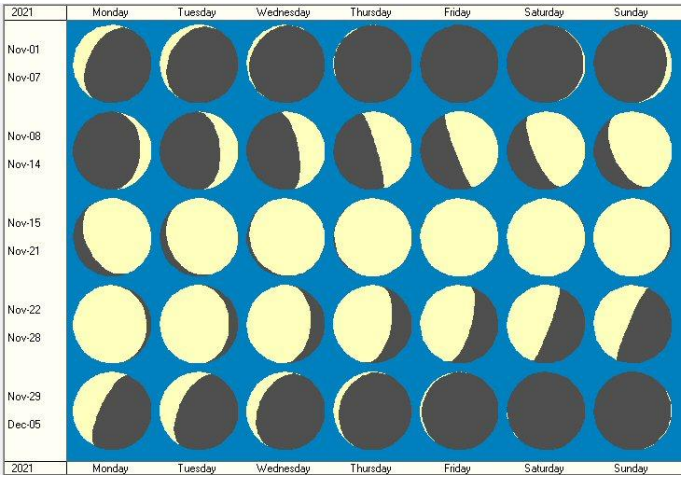
URANUS will be observable this month and will be best at 23:00 when it will be due south and at its highest point above the horizon but is small and faint at +5.7.

NEPTUNE will be just visible to the east of Jupiter (see the chart above). It is small a difficult to see at only 2.4 arc-seconds in diameter and at magnitude +7.7.

THE SUN

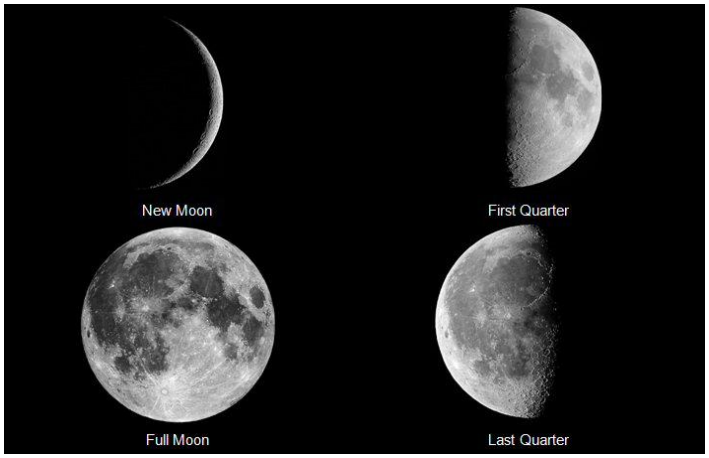
The Sun rises at about 07:00 at the beginning of the month and 07:35 by the end. It sets at 16:30 at the beginning of the month and 16:00 at the end of the month. It reached its highest point in the sky on 21st June which was the Summer Solstice and will be at the Autumn Equinox on the 22nd September. There have been a few Sunspots during September and October.

THE MOON PHASES DURING NOVEMBER



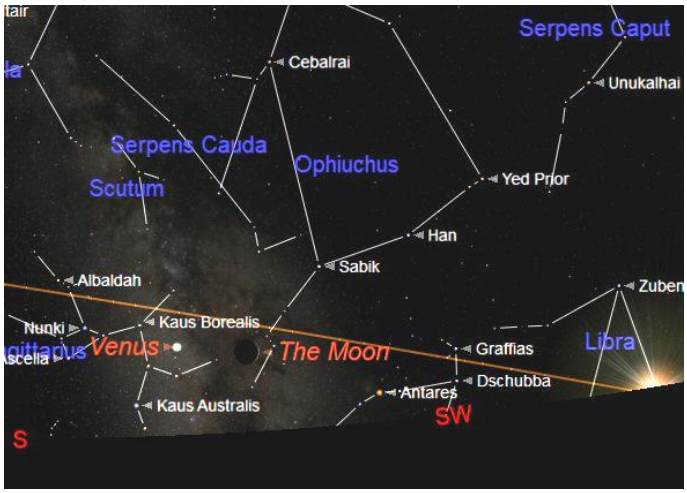
New Moon will be on 4th November
First Quarter will be on 11th November
Full Moon will be on 19th November
Last Quarter will be on 27th November

LOCATING THE MOON - NOVEMBER 2021



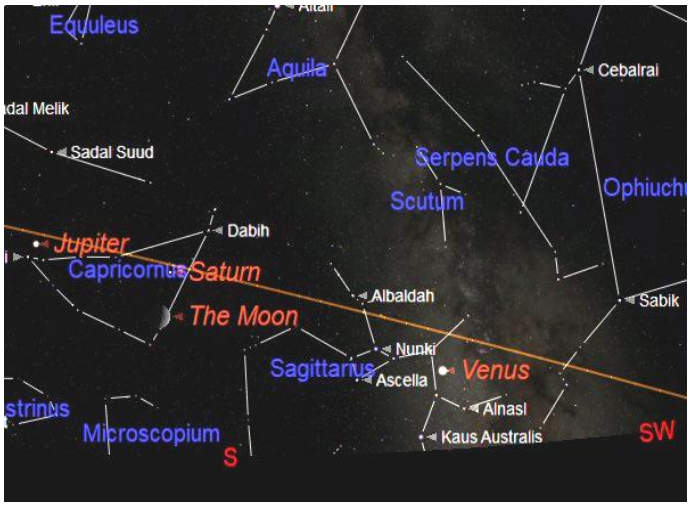
The phases of the Moon

The chart above shows the phases of the Moon during the month of November 2021 as shown on the previous page. But to follow the phases we need to know where the Moon will be in the sky during the month. So let's start with the New Moon and where we must look for it.



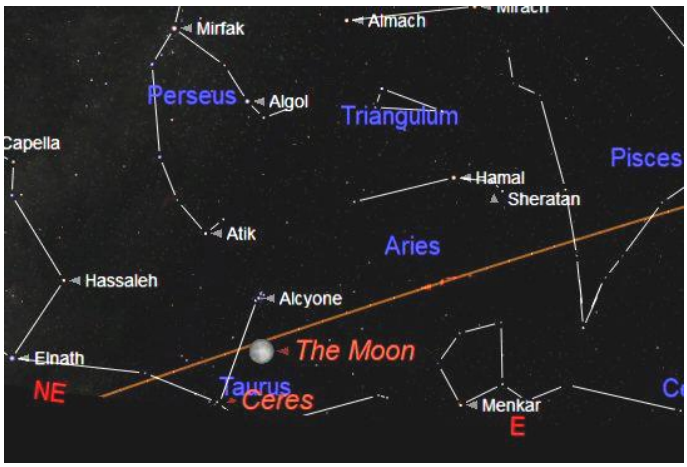
New Moon occurs on 4th November

Although the New Moon actually occurs on 4th November it will not be visible to us until the 7th or 8th November. This is because the Moon will be very close to the Sun in the bright western sky above the horizon at sunset. The Moon passes the Sun (from our point of view) at 22:00 on 4th November but will not be far enough from the Sun for us to see it until the 7th or 8th November.



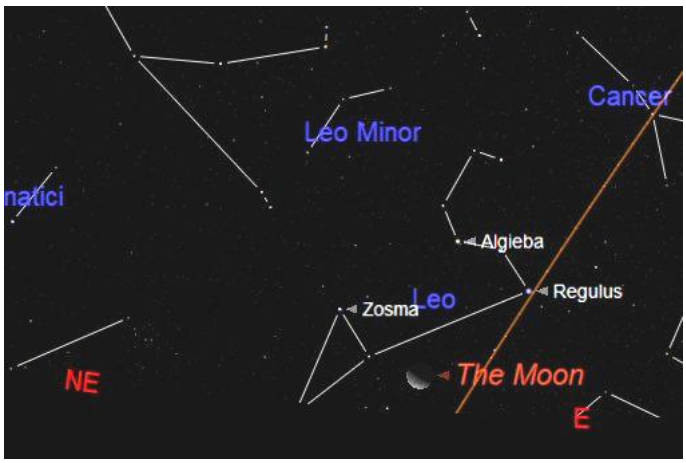
The First Quarter (Half Moon) 11th November

As the Moon moves along its orbit around Earth we see it rise over the western horizon as the New Moon. Because it has been passing in front of the Sun, the side facing the Sun is fully illuminated and the side facing towards us is dark so we can't see it. As the Moon moves away from the Sun a thin crescent of the bright illuminated side of the Moon begins to show. The Moon appears to move along the Ecliptic (the imaginary line along which the Sun, Moon and planets appear to move across the sky) from west (our right) to east (our left). It moves about 15º further towards the east each day.



Full Moon rises in the east at 16:30 19th November BST

On about the 7th day after the actual New Moon has occurred (Conjunction with the Sun) the crescent will have widened to give us the Half Moon in the south on 11th November. The Half Moon (First Quarter) will continue to widen through its 'Gibbous' phase until it reaches Full Moon after 14 days on 19th November.

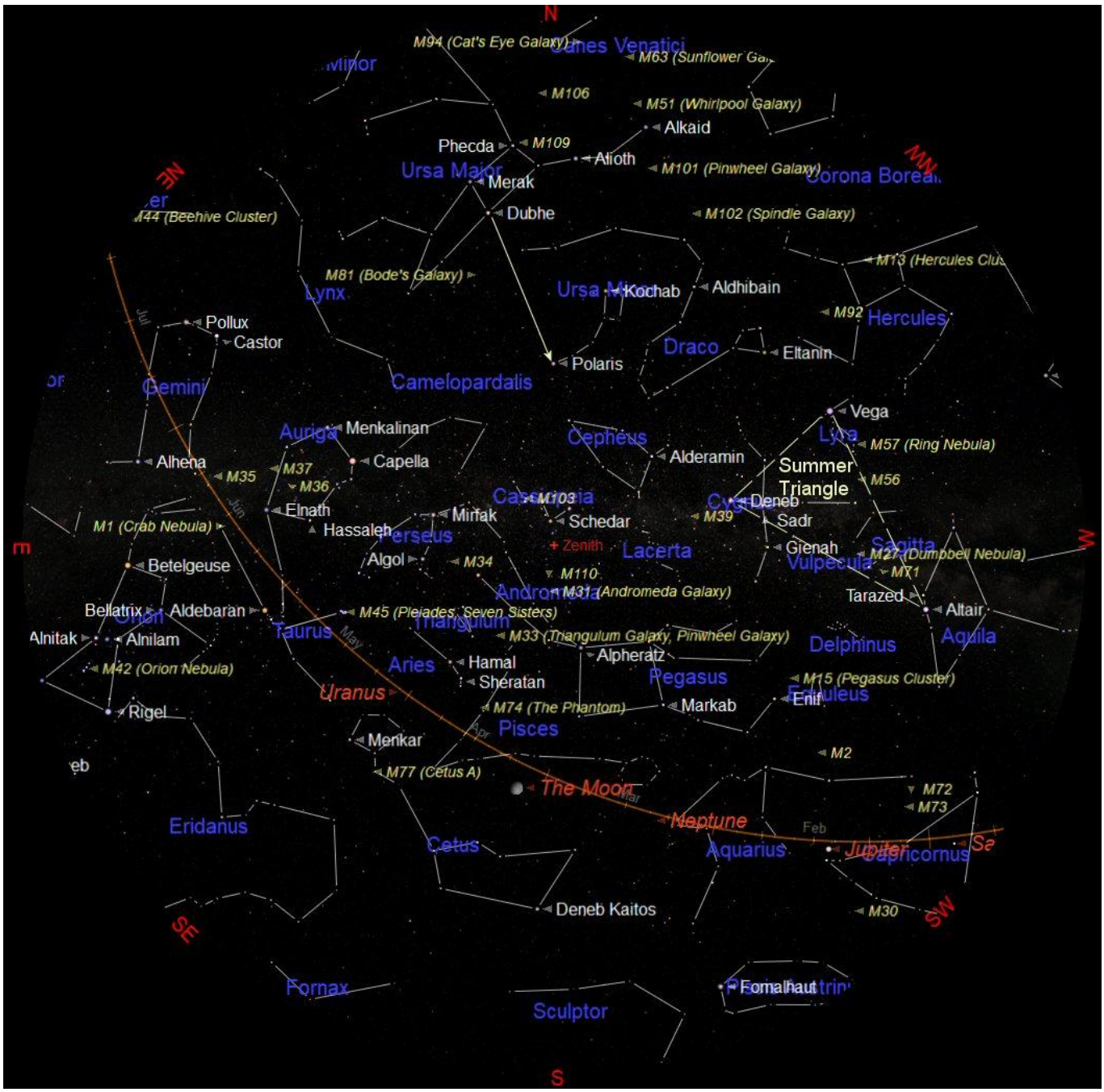


The Last Quarter occurs on 27th November

The Last Quarter occurs about 21 days after the New Moon but it is not visible until after midnight when the Moon rises over the eastern horizon at 00:30 on 28th November. The Moon will now be starting to approach the Sun for its next 'Conjunction' when it will pass in front of the Sun and then it will be the next New Moon.

After the Moon has passed through the Full Moon phase, on 19th November, it will start to become visible in the early morning sky. First the nearly Full Moon will be in the west in the early morning then it will become a thinner crescent as the moves 15º across the morning sky towards the east each day. Eventually it will be a thin crescent low in the east just before sunrise.

THE NIGHT SKY – NOVEMBER 2021

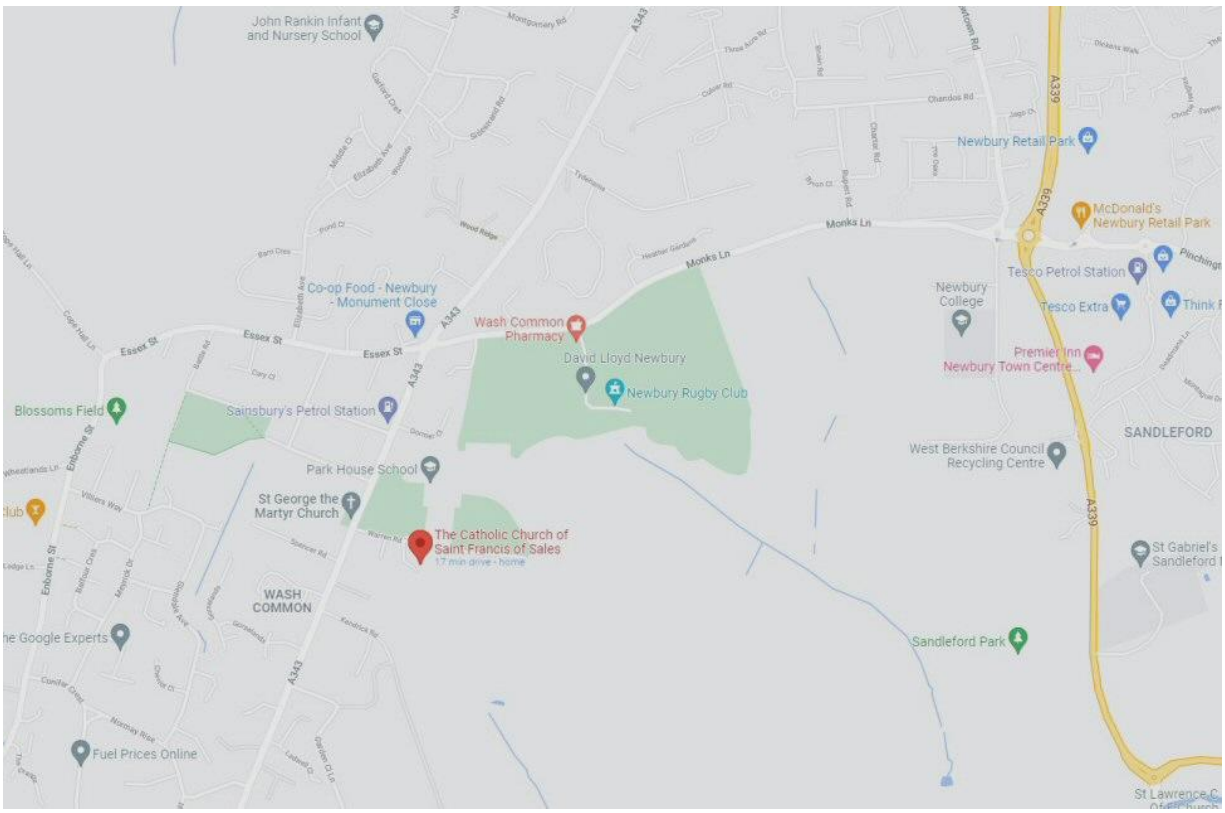


The chart above shows the whole night sky as it appears on 15th November at 21:00 (9 o'clock) Greenwich Mean Time (GMT). As the Earth orbits the Sun and we look out into space each night the stars will appear to have moved across the sky by a small amount. Every month Earth moves one twelfth of its circuit 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 8 o'clock GMT at the beginning of the month and at 10 o'clock GMT 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 just above the Northern horizon. Look for the distinctive saucepan shape, four stars forming the bowl and three stars forming the handle. Follow an imaginary line, up from the two stars in the bowl furthest from the handle. These will point the way to Polaris which will be to the north of overhead at about 50º above the northern horizon. Polaris is the only moderately bright star in a fairly empty patch of sky. When you have found Polaris turn completely around and you will be facing south. To use this chart, position yourself looking south and hold the chart above your eyes.

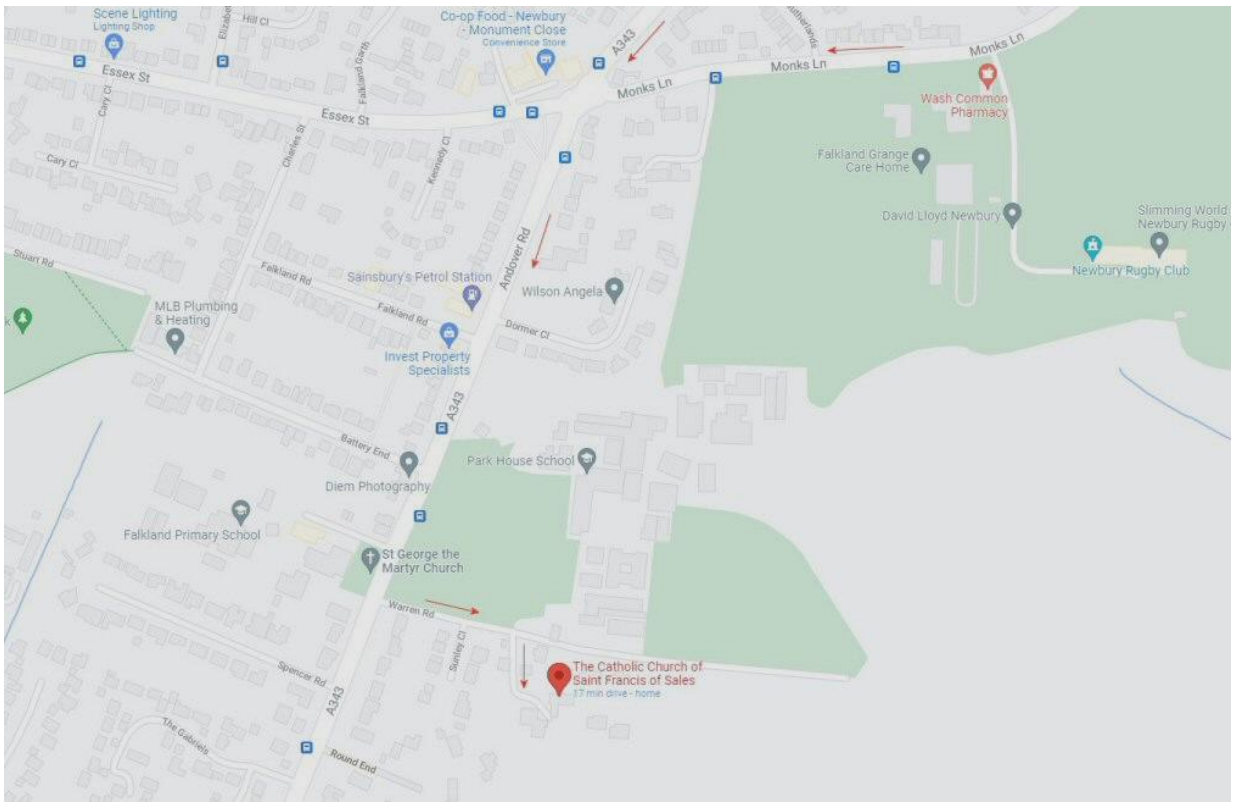
Planets observable in the evening sky: Venus early evening with Saturn, Jupiter, Neptune and Uranus later.

THE NOVEMBER MEETINGS



Map showing directions to the new Main Meeting Venue

The November Main Meeting will be held at a new venue. The venue is at St. Francis de Sales Church Hall, Wash Common, Newbury, RG14 6NH. The meeting will begin at 19:00. For more detailed directions please visit the Beginners website at www.naasbeginners.co.uk .



Map showing directions to the new Main Meeting Venue in Wash Common

The Beginners meetings will continue on Zoom until the 19th January when we will start 'face to face' (including a Zoom link) meetings at the Stockcross Village Hall (also called Sutton Hall).