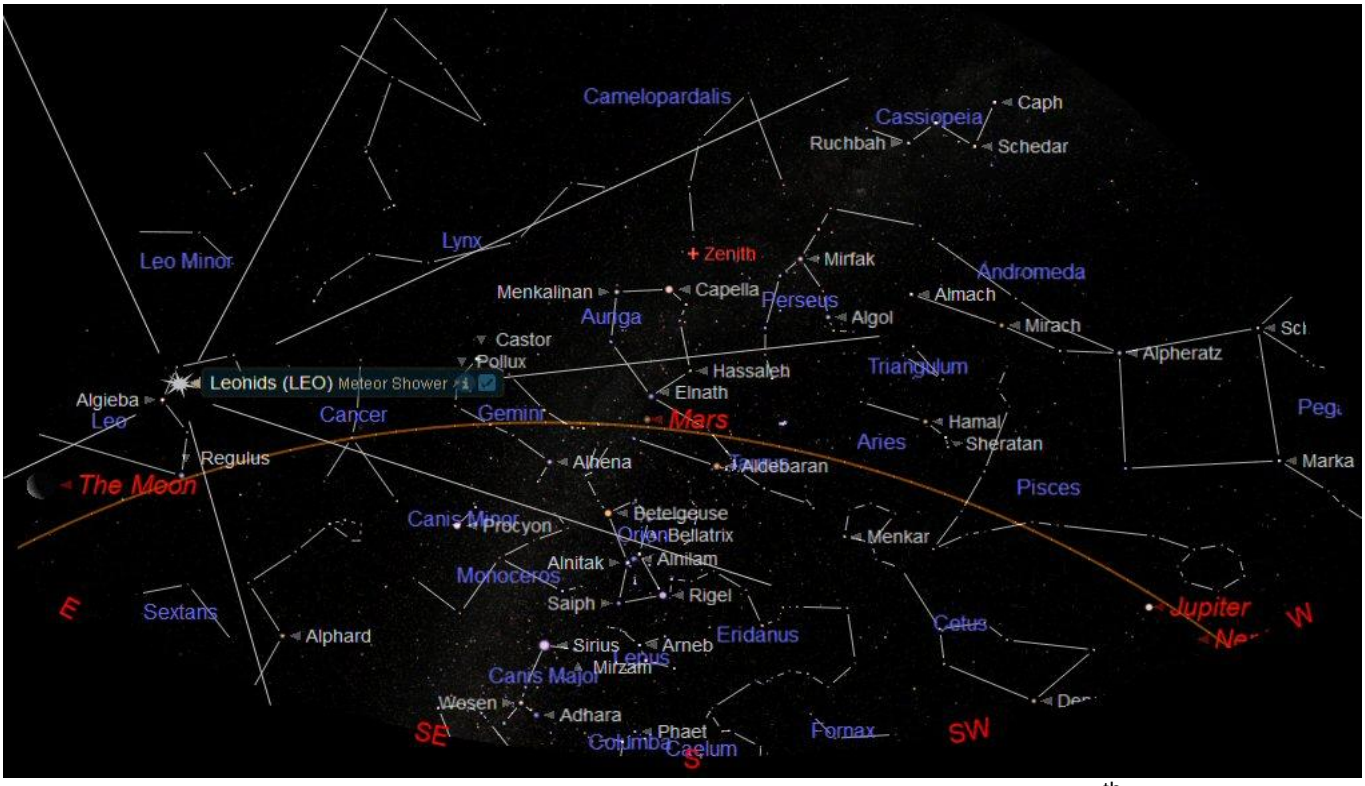
NEWBURY ASTRONOMICAL SOCIETY
MONTHLY MAGAZINE – NOVEMBER 2022

THE LEONID METEOR SHOWER – November 17th and 18th



The position of the Radiant of the Leonid Meteor Shower 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.

Fortunately this year the Moon will not be a in the southern sky so some of the fainter meteors will 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 55P / Temple Tuttle that last reached perihelion (closest approach to the sun) in 1998 and will return again in 2031.

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 north 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. The peak (maximum activity) of the Leonid shower is expected at midnight 00:00 GMT during the night of 17th and 18th November this year.

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.

So to watch out for the Leonid meteors we should first make sure we are dressed warmly with a hat and gloves and sitting comfortably. The most comfortable way to observe the sky is to use a garden lounger chair. This will allow the observer to lay back and have their head supported to avoid getting a neck ache from looking up.

The best thing to do is position the lounger with the feet to the south so the observer can see the whole sky from the southern horizon to the Zenith (the point directly overhead). The sky can be observed from the south east across to the south west. Now we can just sit and wait. Don't look at just one point in the sky from time to time look at a different part. Meteors are very fast and rarely last for more than a second so just sit and wait.

NEWBURY ASTRONOMICAL SOCIETY MEETING

2nd December	Members Presentation Evening
Website:	www.newburyastro.org.uk

NEXT NEWBURY BEGINNERS MEETING

21st December	The Winter Solstice Tonight
Website:	www.naasbeginners.co.uk

WHAT IS A METEOR?

Driving into a snowstorm


A meteor shower radiant

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 also called a '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.

We all know how a space capsule or other space craft become very hot as they re-enter the atmosphere at about 27,000 km/h. However these meteoroid dust particles get even hotter at their re-entry speed of up to 270,000 km/h. At this speed the dust is instantly 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 and are 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 another 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 that reside beyond the orbits of the outer planets. There are millions of these objects just sitting there quietly orbiting around the Sun at enormous distances.

Occasionally one of these objects may be nudged out of its orbit by a close encounter with another object and may begin to move in towards the Sun. A comet can be thought of as being like a giant dirty snowball. As it approaches the Sun, the water ice and frozen gases begin to boil off and are blown away by the radiation from the Sun. This gas and dust will form the familiar twin tails associate with comets.

Dust particles released by the melt are heavier and therefore continue more or less on the same orbit. These particles spread out along the orbital path and may eventually form a complete ring around the orbit.

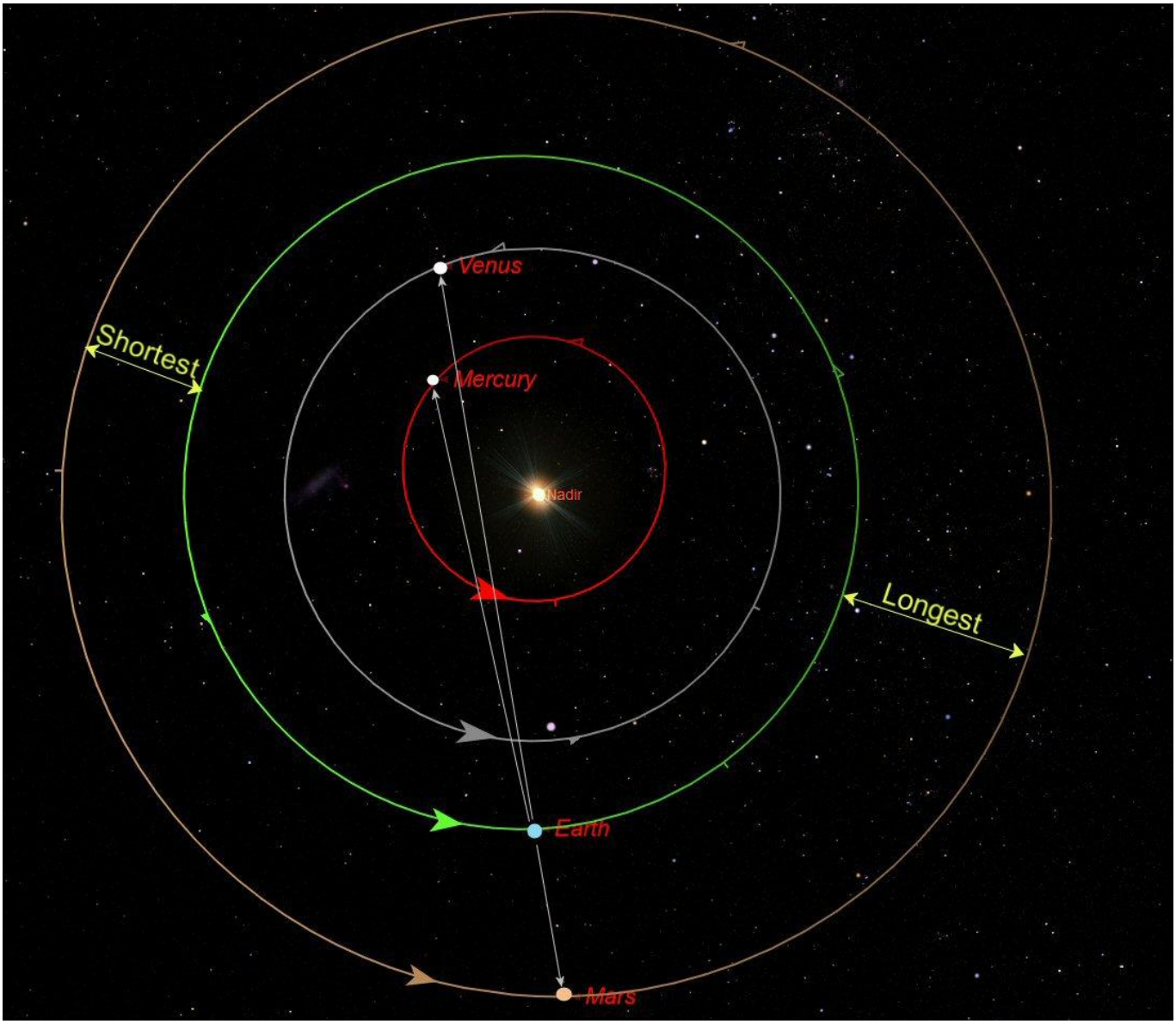

The bright Comet Hale Bopp 1998

Once or twice a year Earth may pass through this stream of particles that then collide with the atmosphere as Meteors. Meteoroid dust particles are usually small and very light and generally have the consistency of cigarette ash but are travelling very fast (>50 km/sec.). As Earth ploughs into the stream of meteoroids they appear to enter the atmosphere at a single point in the sky. This point is in the direction that Earth is travelling along its orbital path. The meteors will appear to radiate out in all direction from this point, very much like driving a car into a snow storm, see the images at the top of this page.

The clarity of the sky will make a significant difference to the number of meteors that can be seen. Any mist or hazy cloud will severely reduce the chance of seeing the fainter meteors especiallyif observing from a light polluted area. If it is cloudy there is of course less chance of seeing any meteors at all. It is never possible to predict meteor showers because the dust from the comet that produces the meteors moves through space in wisps and filaments. All depends on whether Earth passes through a filament and how thick that filament is.

With a combined impact velocity between 11 and 76 km per second meteors have a lot of kinetic energy (energy due to velocity) and burn up in the atmosphere at a height of about 100 km. Only the largest rocky or metal meteors from asteroids reach the ground. So all the meteors originating from comets burn up in the upper atmosphere and present no danger to us.

OBSERVING MARS THIS MONTH



The location of Mars and Earth on 1st December (at its closest to Earth)

Over recent months the Gas Giant Planets Jupiter and Saturn have been most prominent but they are now moving towards the western horizon. Jupiter will still be well placed for another month or so but Saturn is bidding farewell to the later night sky. It is not all bad news because Mars is now moving into its best position for observing in the southern night sky.

The chart above shows the position of the inner (Terrestrial) planets Mercury, Venus and Mars relative to our planet Earth. Mercury and Venus are located on the far side of the Sun from our point of view and appear in the early evening sky in the west just after sunset. As the two 'Inferior' planets (their orbit is inside Earth's Orbit) appear small because they are about as far from us as they can be. As they catch up with Earth on their shorter orbits they will gain on Earth to get closer and therefore appear to grow larger in diameter.

Mars the 'Red Planet' is now entering the evening sky as it climbs over the south eastern horizon. The chart above shows the orbits of the four inner planets of our Solar System as viewed from space above the North Pole of the Sun. Arrows on the orbital paths of the planets show the planets orbiting anticlockwise around the Sun. Our planet Earth takes 365.25 days to make one orbit of the Sun this is one Earth Year.

Mercury is the closest planet to the Sun therefore has the shortest orbit that takes just 88 'Earth' days to complete one orbit around the Sun. Venus has a longer orbit than Mercury and takes about 263 'Earth' days to complete one orbit. As Mars' orbit is outside of Earth's orbit it has a longer orbit and takes about 687 'Earth' days to complete its orbit. It actually takes about 780 'Earth' days to catch up with Mars that means we overtake Mars approximately every 2.1 years.

It can be seen from the chart above that Earth is approaching and will overtake Mars actually on 8th December. So as we overtake Mars (called Opposition) the two planets will be at their closest point. We can also see from the chart that Mars has a significantly elliptical orbit so on this opposition it will not be at its closest possible point between the two orbits. In 2003 opposition occurred at the point marked by the arrow and labelled 'Shortest'. On this occasion the two planets were at the closest to each other for about 61,000 years. Mars will actually be a little closer to Earth on 1st December but will be at opposition on 8th December.

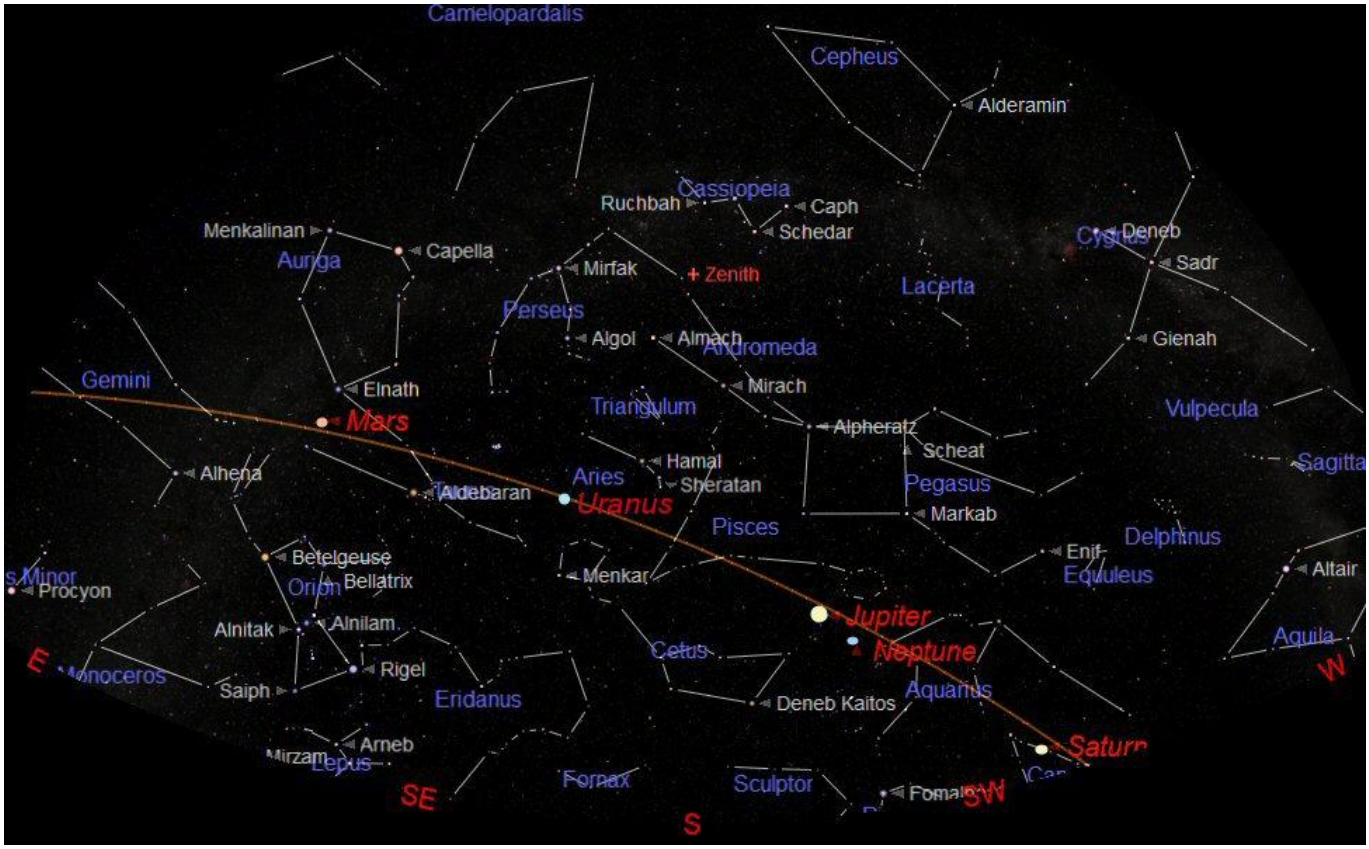
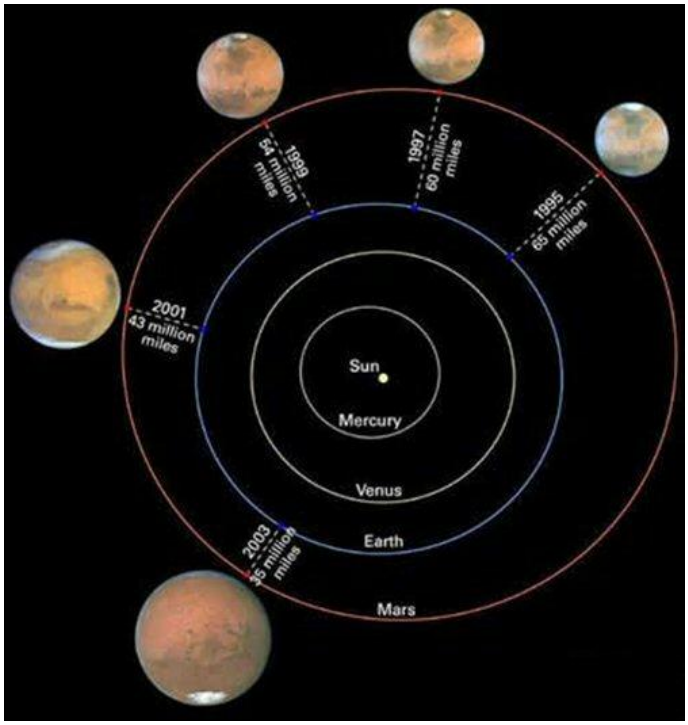


Chart showing the location of Mars on 15th November 2022 at about 22:00

The chart above shows the location of Mars in the evening sky during November. The beautiful gas giant planets Jupiter and Saturn are stealing the show in the early evening but Mars is moving in to view later in the evening. The diagram below shows how the apparent size of Mars changes due to its relative position on its orbit and at its Opposition with Earth. In 2003 Mars was at its closest possible position to Earth and appeared to be a massive 25.1" (arc-seconds) in diameter.



Mars apparent diameter 1995 to 2003

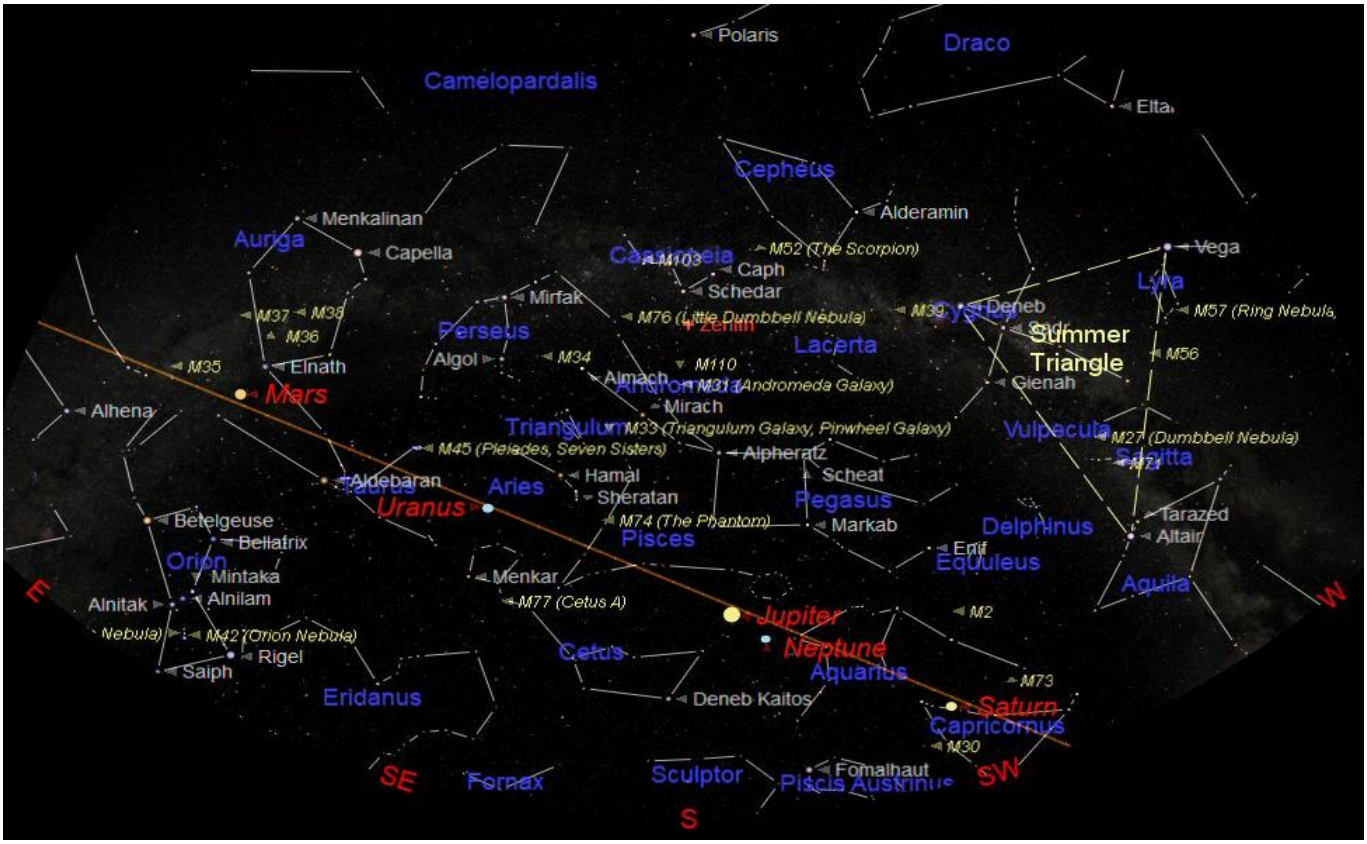
Mars begins November with an apparent diameter of about 15.5" (arc-seconds) that will increase to about 17.5" (arc-seconds) by the end of the month. This is about the size that we have been able to see Saturn. However it is somewhat less than the impressive 47.1" (arc-seconds) that we have been getting used to seeing recently on Jupiter.

So what can we expect to see on Mars this year? Mars can be quite rewarding but you will need a telescope to see any detail on its surface. A telescope with an aperture (lens or mirror diameter) of 70mm (lens) or 100mm (mirror) or larger will show some detail on the surface. It will be possible to see the red surface with darker markings and the white pole may be visible.

Mars seen using a small telescope

Observing mars is very dependent on the observing conditions of the night sky that astronomers refer to as 'seeing'. This takes account of the transparency of the atmosphere (mistiness), light pollution and air movement in the atmosphere. This aspect is difficult to define but quite rarely the image can just look very steady.

A TOUR OF THE NIGHT SKY - NOVEMBER 2022



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) (just off to the east).

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 flows through the Summer Triangle and passes through Aquila and Cygnus. The Summer Triangle is bigger than expected but once it has been found it is 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 using a telescope.

Once the square is found the pointer to Andromeda is the top left star of the square named Alpheratz. Strangely Alpheratz is officially not part of Pegasus but is designated as Alpha (α) Andromedae. The constellation of Andromeda is host to the only 'naked eye' Galaxy that is known as Messier 31 (M31). It is the most distant object that can be seen with our naked eyes (2.4 million light years away). It is quite easy to find using binoculars and is well place at this time of the year.

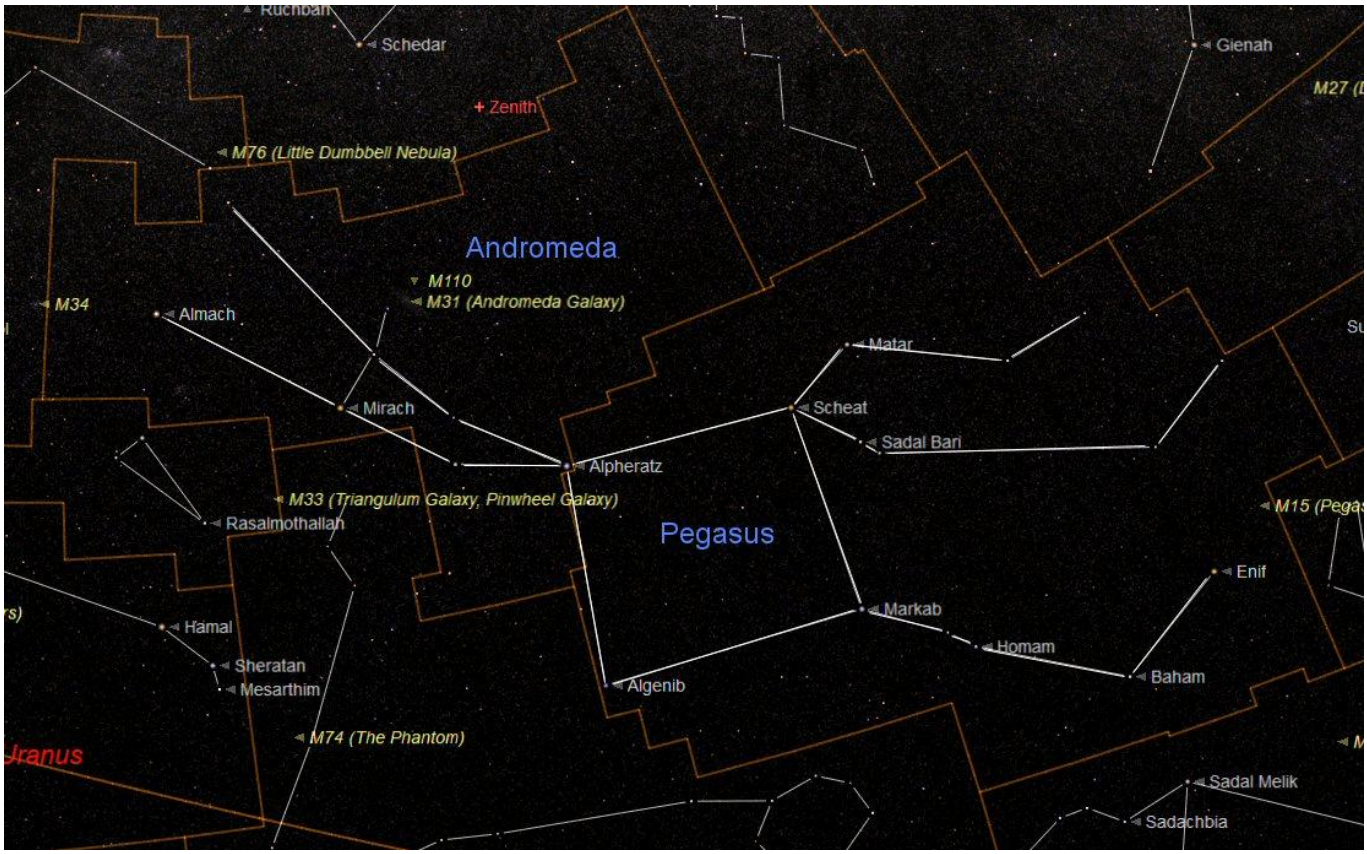
The easiest way to find M31 is to follow the line of stars from Alpheratz and locate the second star in the line which is shown as Mirach on the chart above. From Mirach follow a slightly fainter short line of stars to the north (above) Mirach to the second star. Just to the right of this star is the faint fuzzy patch of light that is M31 the Great Andromeda Galaxy. See the following pages.

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 later. 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.

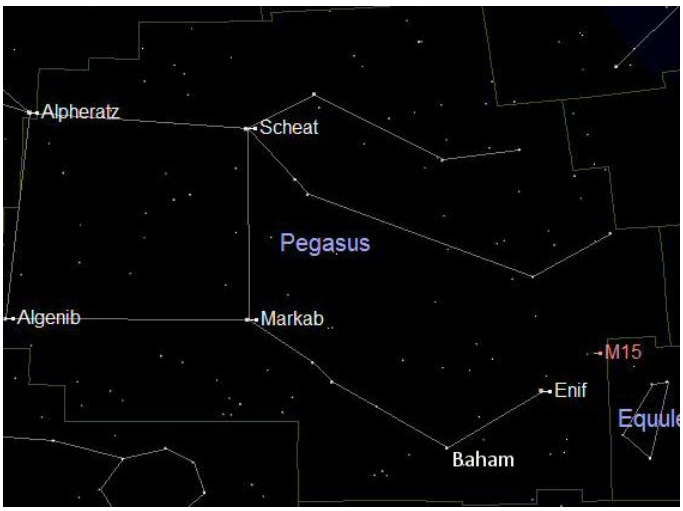
The Ecliptic was low in the sky during the summer months so the Moon and planets appeared close to the southern horizon.

CONSTELLATIONS OF THE MONTH – PEGASUS AND ANDROMEDA



The constellations of Pegasus and Andromeda to the east (left) of the Summer Triangle

The constellations of Pegasus and Andromeda share and are joined at the star Alpheratz. Alpheratz is actually designated as belonging to Andromeda but looks to be more a part of Pegasus as it is required to complete the familiar 'Great Square of Pegasus'. The Great Square is larger than may be expected which sometimes makes it a little difficult to initially identify. However once it has been identified it is then easy to find again especially in a clear dark sky.



The constellation of Pegasus

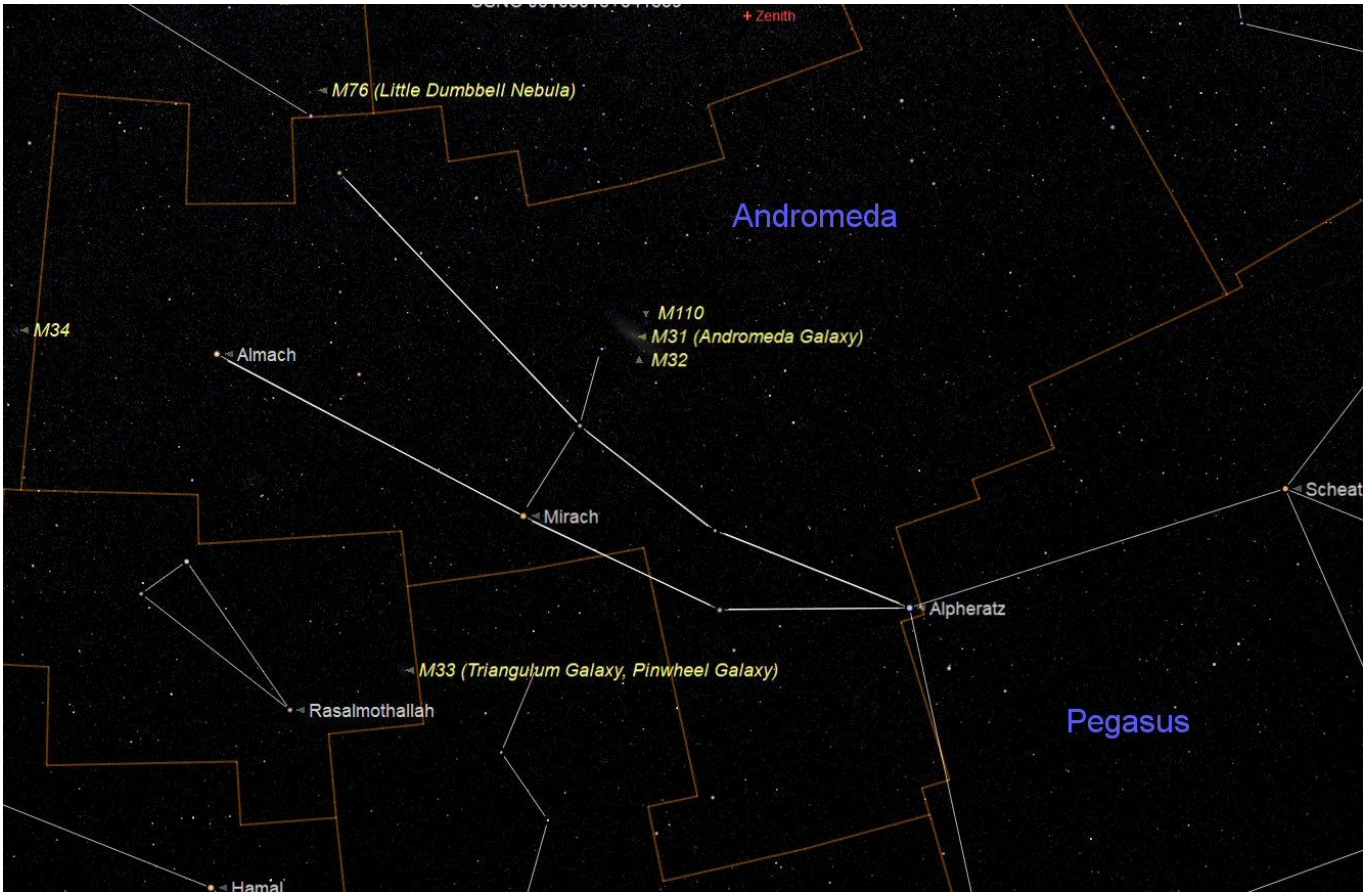
Pegasus is named after the mythical winged horse and with Andromeda included to provide the wings and a lot of imagination the stars could be said to resemble the flying horse. The square generally is used to represent the body of the horse and the three lines to the west (right) of the stars Scheat and Markab do look a little like the horse's legs. The square can be used to judge the seeing condition of the night sky. Under perfect conditions about ten stars can be seen inside the square this would indicate a very good night for observing. If three to five stars can be seen then conditions will still be good. If fewer or none can be seen then stick to looking at the Moon or planets.

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

Messier 15 (M15) A Globular Cluster in Pegasus

To find M15 start at the star Markab, located at the bottom right of the Great Square. Follow the fainter line of stars to the west (right) to the star Baham then North West (up and right) to the star Enif, see the charts above and the previous column. Continue the imaginary line on for about the same distance to find the fuzzy patch that will be the Globular Cluster M15.

SPECIAL CONSTELLATION OF THE MONTH – ANDROMEDA



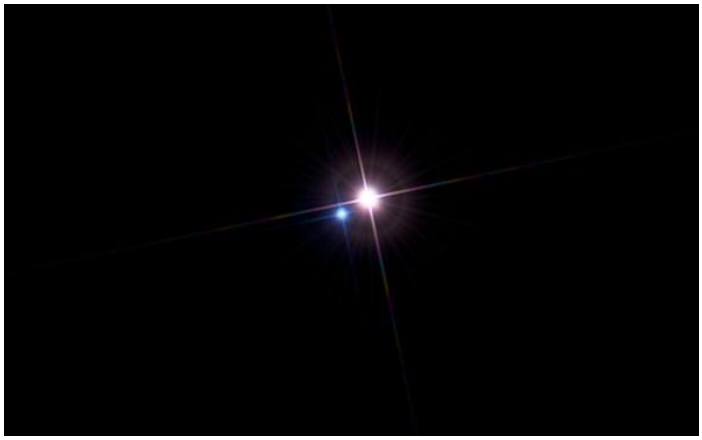
The constellation of Andromeda is host to the only 'naked eye' Galaxy that is known as Messier 31 (M31). It is the most distant object that can be seen with our naked eyes (2.4 million light years away). It is quite easy to find using binoculars and is well place at this time of year.

The easiest way to find M31 is to first locate the Great Square of Pegasus. Once the square is found the pointer to Andromeda is the top left star of the square named Alpheratz. Strangely Alpheratz is officially not part of Pegasus but is designated as Alpha (α) Andromedae. From Alpheratz follow the fairly obvious line of stars to the left (east). Locate the second star in the line which is shown as Mirach on the chart above. From Mirach follow a slightly fainter short line of stars to the north (above) Mirach to the second star. Just to the right of this star is the faint fuzzy patch of light that is M31 the Great Andromeda Galaxy. See the chart above.

M31 The Great Spiral Galaxy in Andromeda

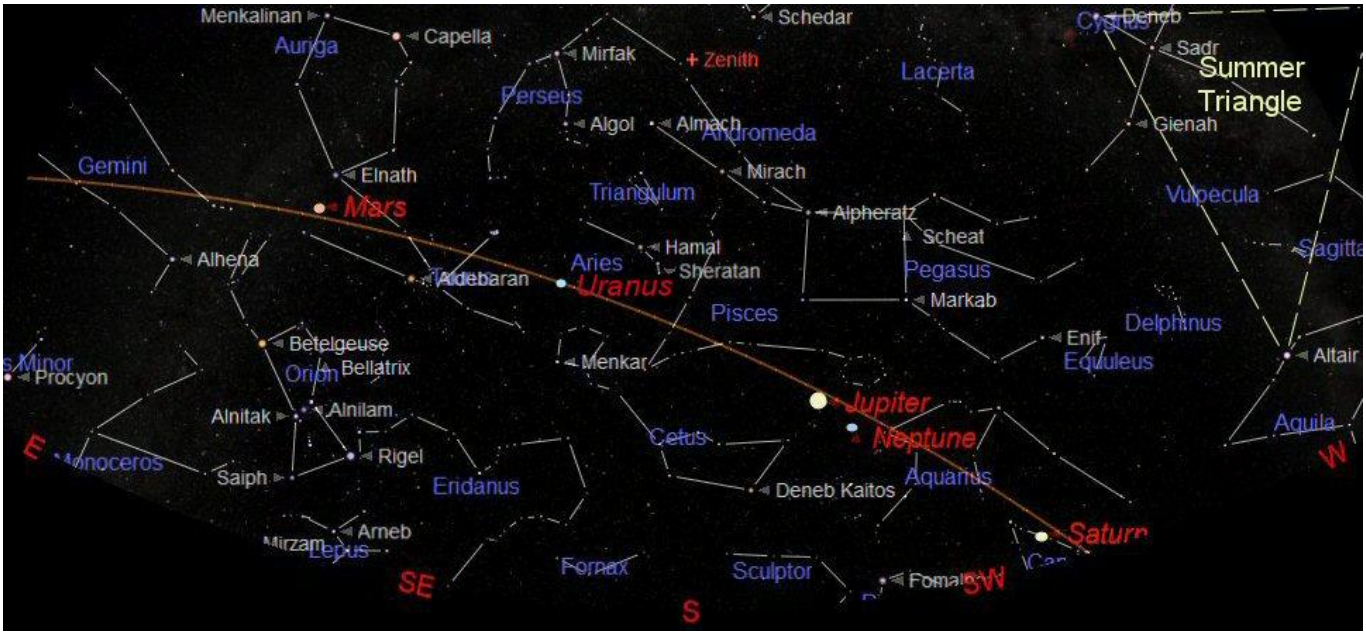
The picture in the previous column shows M31 imaged through a telescope and is much clearer than can be hoped to be seen with the naked eye. However a pair of binoculars will enable the galaxy to be seen. A small telescope will show a cigar shaped hazy patch with a brighter spot in the centre. Larger telescopes will show it more clearly but photographic imaging is required to reveal its true nature.

At the end of the lower line of stars that constitute the constellation of Andromeda is the star Almach or (Almaach). It is a beautiful example of a pair of stars that are not physically related. They are thought to be at different distances but appear to be in the same 'line of sight' as seen from Earth. The apparently brighter golden coloured star is thought to be located much nearer to us than the apparently fainter blue star. The blue star is in fact a Blue Giant, a very hot and powerful star that is many thousands of times brighter than the golden star but much further away.



Almach the 'line of sight' double star in Andromeda

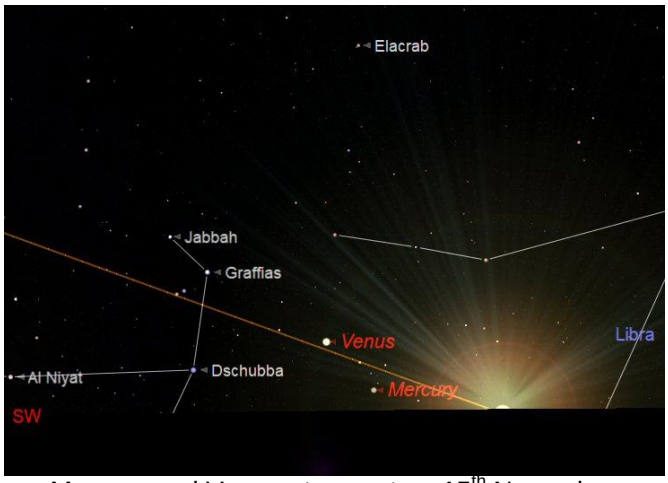
THE SOLAR SYSTEM – NOVEMBER 2022



The planets at 22:00 on 15th November

The chart above shows the location of the planets along the Ecliptic. The outer (Superior) planets (that orbit outside the orbit of Earth) will be visible during evening and in the early morning sky before sunrise. The inner planets are to the east of the Sun (left) and will be visible in the early evening sky after sunset.

MERCURY will be very close the Sun after sunset. Experts may be able to find it in the bright evening sky but it will require a clear view to the western horizon.



Mercury and Venus at sunset on 15th November

VENUS will be visible in the early evening sky as soon as possible after sunset. It will be easy to find but it will require a clear view to the western horizon. Venus is emerging from its excursion behind the Sun when it was in 'Conjunction' with the Sun. It will appear at its smallest diameter and will be fully illuminated because it is still beyond the Sun from our point of view. See the diagram on page 3 'the locations of Mercury and Venus on 1st December'.

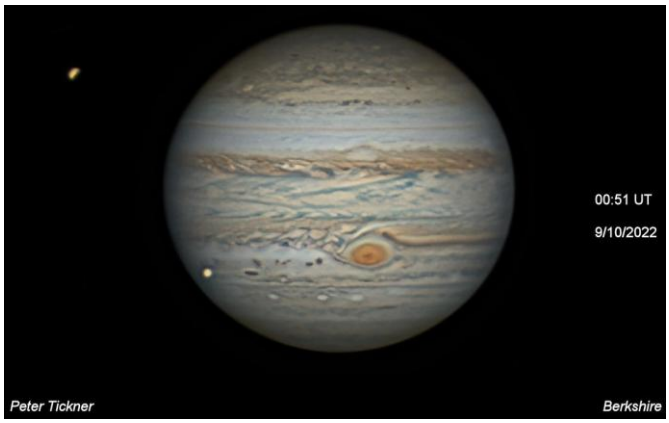
MARS can be seen in the evening sky as soon as the Sun has set and the sky darkens. It is looking small at about 16" (arc-seconds). As Earth approaches Mars the Red Planet will appear to become bigger until Earth actually overtakes on its inner orbit. This is what astronomers call 'Opposition'. As Earth overtakes Mars on the inside Earth, Mars and the Sun are aligned with Earth between the Sun and Mars on the outside. Mars will actually be at its closest to Earth on 1st December but will be at opposition when it actually overtakes Mars on 8th December (see the diagram on page 3).

Mars imaged by Peter Tickner Reading A.S.

The image of Mars above shows much more detail than can be seen using a telescope. However some of the dark markings and the white pole can be seen using a telescope under good observing conditions.

JUPITER is past its best for this year but is still good for observing in the evening. Jupiter was at its very best when it was at opposition on 26th September. At this time it was due south at midnight 01:00 BST and appearing at its highest above the southern horizon.

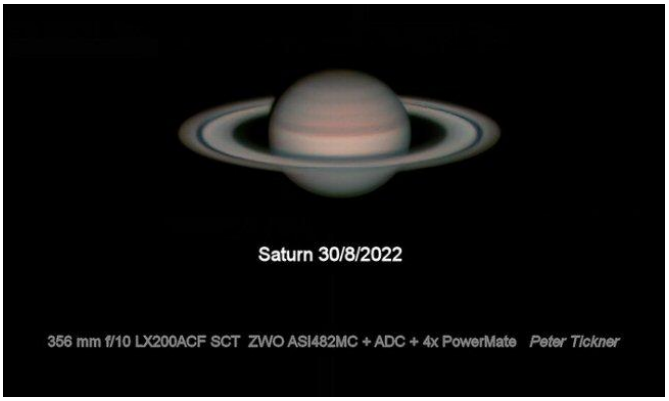
Jupiter is now moving towards the western horizon during the evening. It will set over the horizon at 03:00 GMT at the beginning of this month and set by 01:30 GMT at the end of the month. In reality it will start to be unsteady up to an hour before these times due to the turbulent and muggy air closer to the horizon. However it is still very worthwhile to observe the King of the Planets in the early evening of late autumn and early winter. The moons are still easy to follow and very interesting as they move around the planet.



Jupiter imaged by Peter Tickner

SATURN is getting more difficult to follow as it is obviously moving towards the western horizon. Saturn will be setting over the horizon at 23:00 at the beginning of November and will have set over the horizon by 21:45 at the end of the month.

As Saturn appears much smaller and fainter than Jupiter the view through a telescope will seem to deteriorate much sooner than the larger Jupiter. To get the best view of Saturn observing must start early, in fact almost as soon as it is dark enough.



Saturn imaged by Peter Tickner

URANUS Will be at Opposition on 9th November so will be in its best position for observing this year. As Earth overtakes Uranus on the inside Earth, Uranus and the Sun are aligned with Earth between the Sun and Uranus on the outside. This means Uranus will be in the south at midnight 00:00 GMT and at its highest point above the southern horizon. As it is so far away from us it appears very small in fact just 3.8" (arc-seconds).

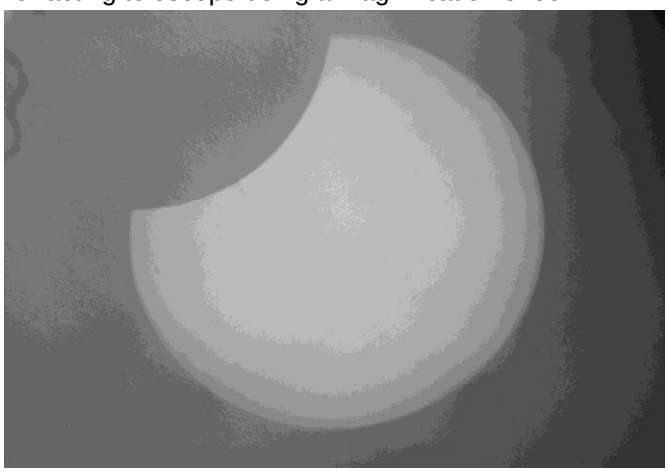
NEPTUNE will be just visible this month to the east of Jupiter (see chart on page 8). It will be difficult to see in the sky close to Jupiter as it is very small at just 2.3" (arc-seconds) only magnitude +7.9.

THE SUN

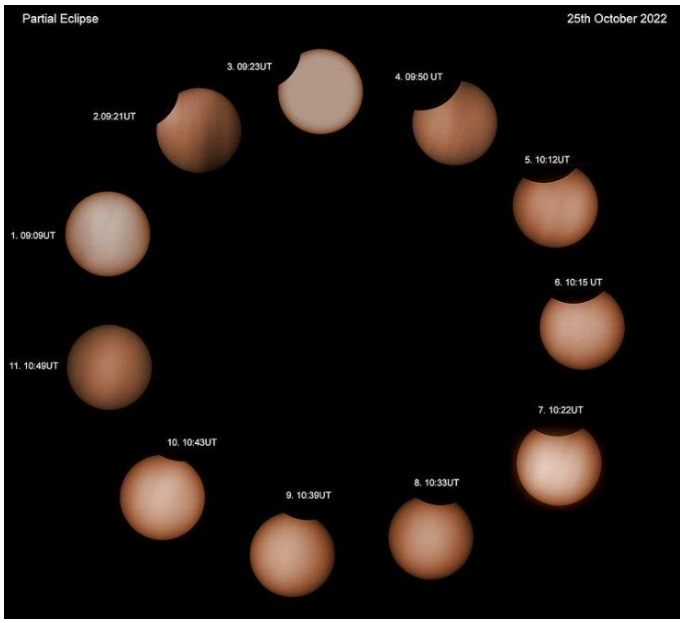
The Sun rises at about 07:00 at the beginning of the month and 07:35 by the end. It sets at 16:30 at the beginning of the month and 16:00 at the end of the month.

There was a Partial Solar Eclipse on 25th October when the Moon's silhouette covered about 25% of the Sun. Unfortunately it was cloudy but the cloud was thin enough at times to follow the eclipse. The projected image of the Sun was photographed at 11:58 when the eclipse was at its maximum cover.

The image was projected on to a white cardboard screen using a 120mm aperture x *f*5 Skywatcher refracting telescope using a magnification of 50x.

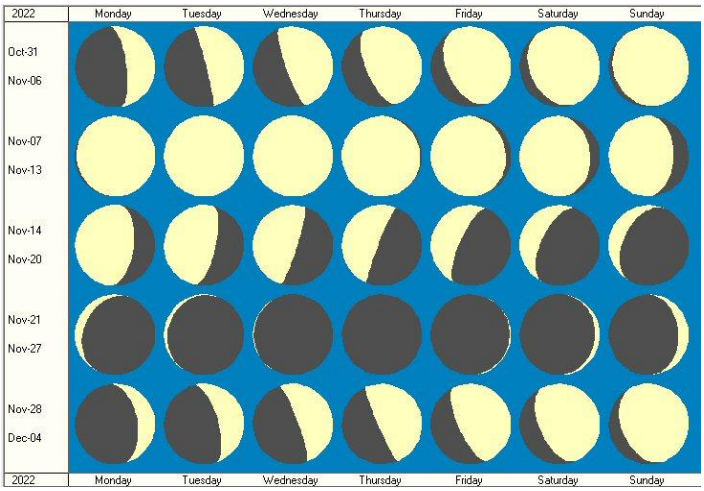


The Partial Eclipse at 11:58 through the cloud



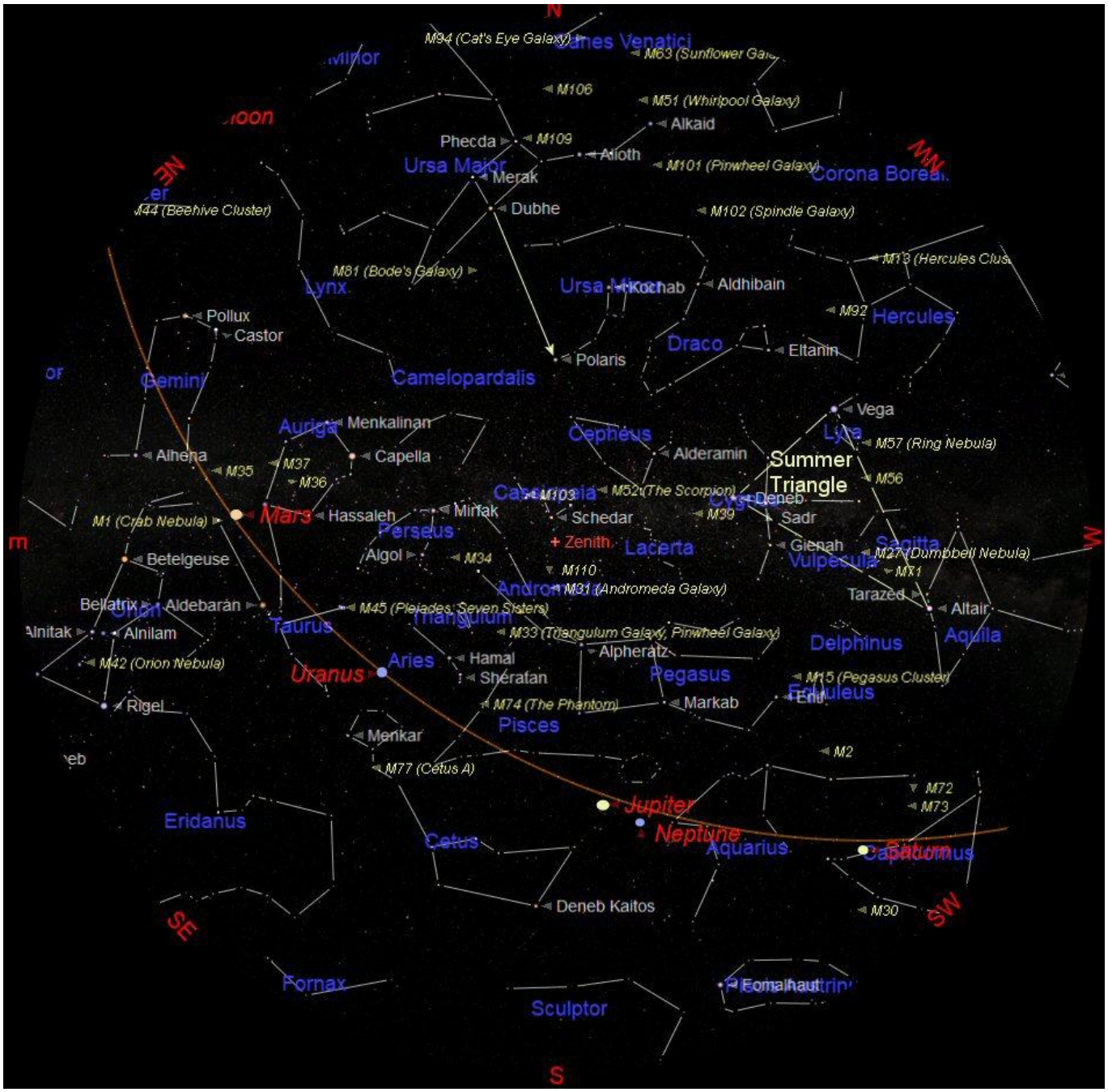
A mosaic of the eclipse progress by Peter Tickner

THE MOON PHASES DURING NOVEMBER



First Quarter will be on 1st November
Full Moon will be on 8th November
Last Quarter will be on 16th November
New Moon will be on 23rd November
First Quarter will be on 30th November

THE NIGHT SKY – NOVEMBER 2022



The chart above shows the whole night sky as it appears on 15th November at 22:00 (10 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 9 o'clock GMT at the beginning of the month and at 11 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 low over 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: Saturn, Neptune, Jupiter, Uranus and Mars.