NEWBURY ASTRONOMICAL SOCIETY
MONTHLY MAGAZINE – OCTOBER 2021

FUTURE MEETINGS AND NEW VENUES

BEGINNERS PROGRAMME	
15th September	Observing Jupiter
20th October	Observing Venus
17th November	Leonid Meteor Shower
15th December	The Star of Bethlehem
29th January	Birth, Life and Death of a star
18th February	The Planets and their orbits
16th March	The Spring (Vernal) Equinox
20th April	Where do the stars live?
18th May	Total Lunar Eclipse 16th May
15th June	The Summer Solstice
20th July	The Perseid Meteor Shower
17th August	Observing the Summer Sky

MAIN SPEAKER MEETING PROGRAMME	
3rd September	Latest news from Zooniverse
1st October	National Satellite Test Facility
5th November	The Great Debate
3rd December	Our Future on Mars

The last eighteen months have been difficult for everyone and everything we do. The Newbury Astronomical Society has weathered this pandemic storm and is still thriving. We have continued our meetings as 'virtual meetings' using online ZOOM which has been interesting and different. One good thing that has come out of these recent difficulties has been the development of closer ties between the local Astronomical Societies (Newbury, Reading and Basingstoke).

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 is outlined above 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 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. Details and directions can be found on the Beginners website at the address opposite.

Again the MENCAP Hall used for the Main Speaker Meetings has been a really good and convenient venue for the last few years but COVID-19 has presented us with a difficulty. As the facility is used primarily for vulnerable people there is a problem with sanitising the hall for our meetings and after we finish our meetings. So the committee has considered the risks to the vulnerable people were too great and we have decided to move to another venue.

After lengthy deliberations it has been decided to move to the Hall at St. Francis de Sale Church at Wash Common in the south end of Newbury. This facility has a good sized hall a large car park and has the benefit of dark sky if we need it. The hall also has some grounds that we can use for any outdoor events and access to a plot where there is a clear and dark view over open fields. There are also some smaller rooms that can be used for committee meetings. We are hoping to start the Main Meetings here for the January 2022 meeting.

Hopefully these arrangements will work out well but we will monitor how suitable these arrangements are and if the members are happy with the new venues. We will be maintaining the Zoom contract for the next year so we can revert to the Zoom meetings if the national guidance for COVID-19 protection is tightened again.

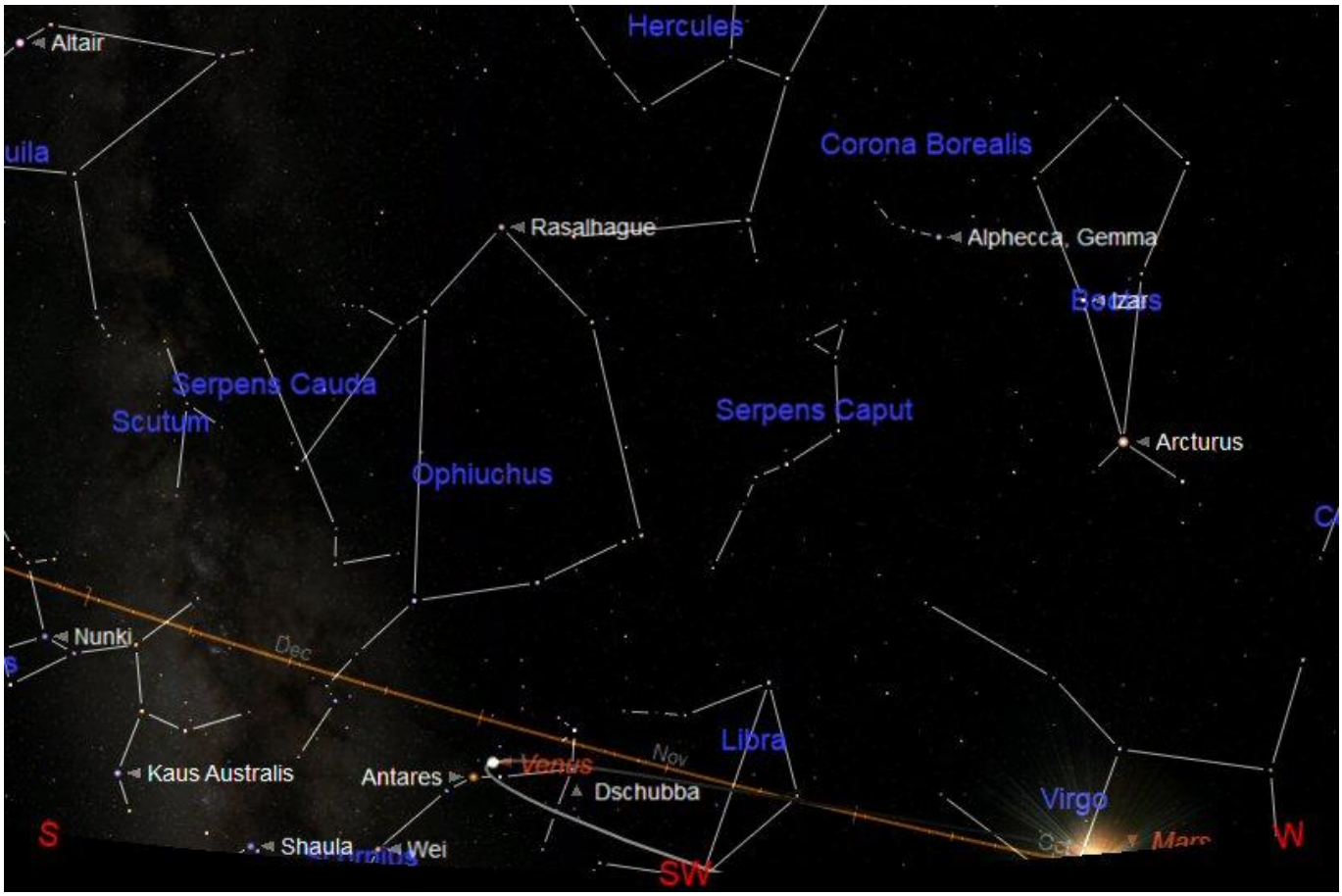
NEWBURY ASTRONOMICAL SOCIETY MEETING

1st October National Satellite Test Facility
Website: **www.newburyastro.org.uk**

NEXT NEWBURY BEGINNERS MEETING

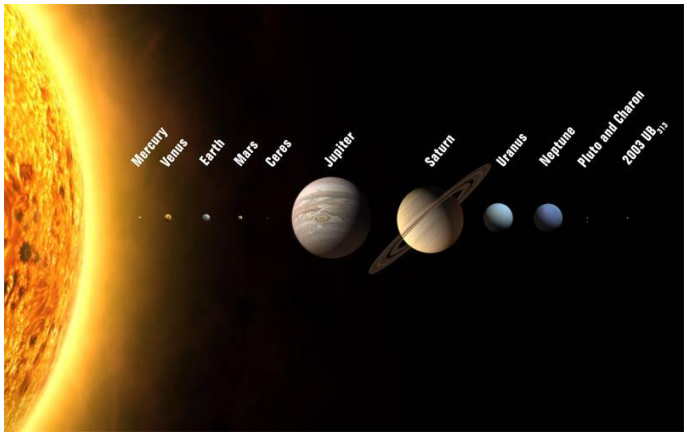
20th October Observing Venus
Website: **www.naasbeginners.co.uk**

OBSERVING VENUS IN THE EVENING



The orbital path of Venus during October

When observing a planet we need to know how that planet orbits the Sun so we can predict when the planet is in view and where it can be found. We see the two inner planets with a different perspective to the outer 'outer planets'. Our Sun has eight main planets named (on order out from the Sun): Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune. The diagram below shows the relative sizes of the planets and the Sun but the planets are shown side by side.



Our Solar System with planets shown at relative size

We divide the planets of our Solar System into three groups of different types of planets. The inner four planets Mercury, Venus, Earth and Mars are called the Terrestrial (rocky) planets. Jupiter and Saturn are called Gas Giants (because they a large and made of gas) the outer planets Uranus and Neptune are called Ice Giants because their gases are mainly frozen.

It can be seen from the table below that each planet is approximately twice as far from the Sun progressively outwards. However there is a noticeable discrepancy between Mars and Jupiter. This is where the Asteroid Belt is located between these two planets.

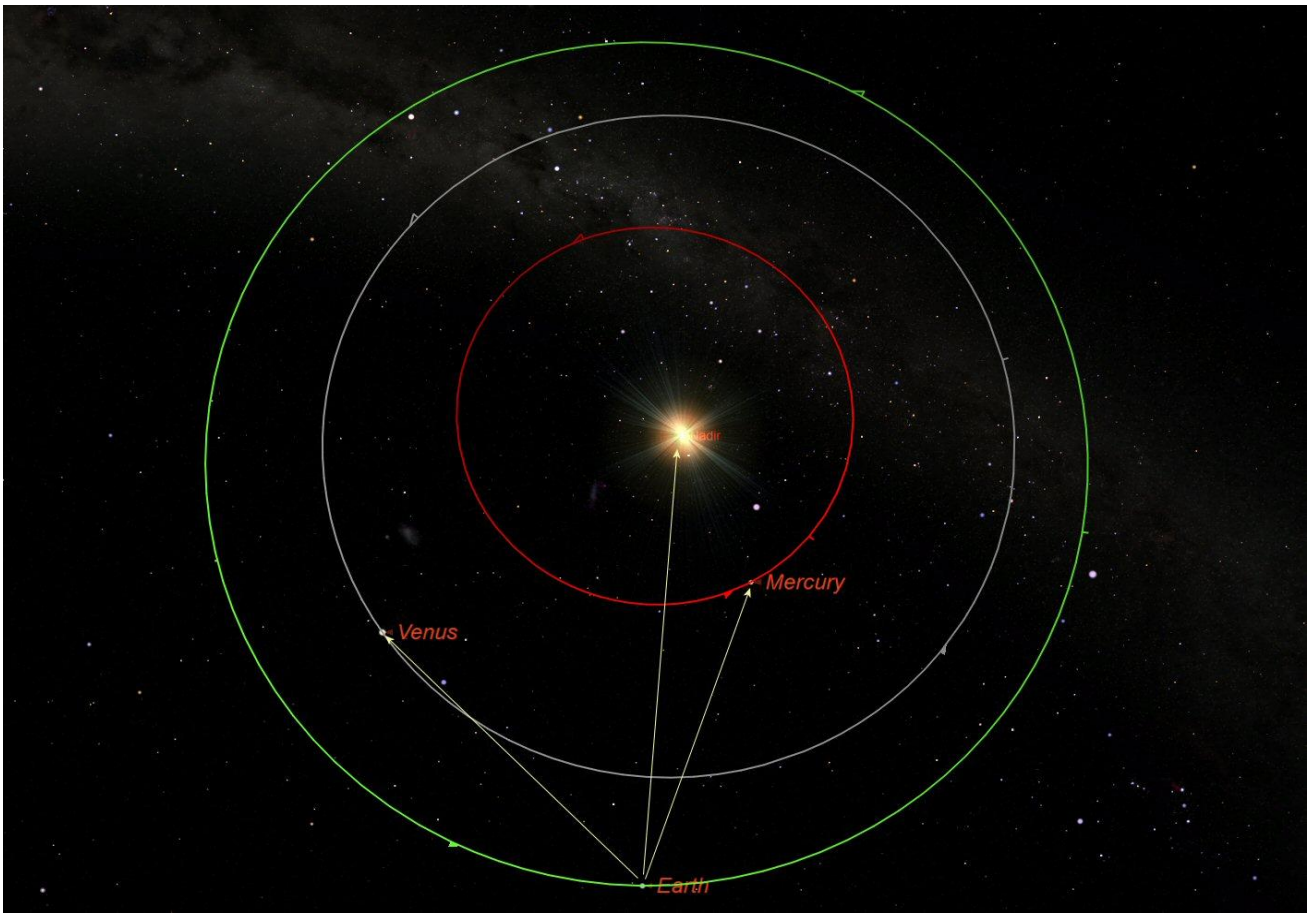
Here are the main orbital statistics of the planets:

Planet name	Dist. from Sun (Millions of km.)	Period of orbit (Earth years)
Mercury	57.9	0.24
Venus	108.2	0.62
Earth	149.6	1.00
Mars	227.9	1.88
Jupiter	778.3	11.86
Saturn	1429.4	29.46
Uranus	2875.0	84.01
Neptune	4504.3	164.79

The two inner planets, Mercury and Venus, orbit closer to the Sun than Earth and are called the Inferior Planets. This means we can sometimes see these planets pass in front of the Sun in what is called a Transit. The outer planets are called the 'Superior Planets' and they cannot pass in front of the Sun. All the planets can appear to pass behind the Sun that is called a 'Conjunction'.

The inferior planets have the shortest orbital times and they are shorter than Earth's. The Superior Planets have longer orbits and take longer to orbit the Sun. So Mercury and Venus overtake Earth (on the inside) and the outer planets overtake others further out, Earth also 'undertakes' the outer planets.

THE ORBITS OF MERCURY AND VENUS



The orbits of the Inferior (inner) planets Mercury and Venus

As Earth passes the other planets on their orbits and the planet is directly in line with Earth and the Sun, this is the moment when an inner planet overtakes an outer planet. As the outer planets take longer to complete their orbit there is an added effect on the period it takes to overtake the other planet each time. The outer planet will have moved along its own orbit so it will take the 'undertaking' planet longer to catch up. There are two terms that are used to describe the orbital periods of the planets.

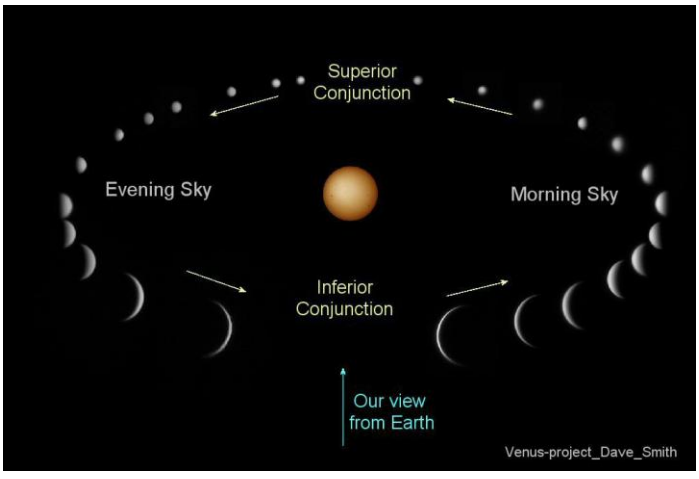
Sidereal Period – The true orbital period of a planet, the time it takes the planet to complete one full orbit around the Sun. See the table on the previous page.

Synodic Period – This is the time elapsed between two successive identical oppositions of a planet (The time taken for Earth to catch up with another planet).

The table below shows the Synodic Period of the planets (the time between successive oppositions seen from Earth) and the Sidereal Period (time taken for the planet to complete one orbit of the Sun).

Planet	Synodic Period (Earth days)	Sidereal Period Earth times
Mercury	116	88 days
Venus	584	225 days
Earth	-	1.0 year
Mars	780	1.9 years
Jupiter	399	11.9 years
Saturn	378	29.5 years
Uranus	370	84.0 years
Neptune	368	164.8 years
Pluto	367	248.5 years

The Inferior Planets (Mercury and Venus) orbit inside Earth's orbit so they pass in front and behind the Sun as seen from Earth. These two conjunctions are called Inferior Conjunction (when the planet passes in front of the Sun) and Superior Conjunction (when the planet passes behind the Sun). Unlike the Superior Planets (those with orbits outside Earth's orbit) Mercury and Venus cannot have an opposition. This is because they are always in the same direction as the Sun therefore it cannot be directly behind Earth when looking at them.



The phases of Venus as it orbits the Sun

Venus is currently bright in the west as the Sun is setting and is often called the 'Evening Star'. It is moving out from behind the Sun (Superior Conjunction). It will also appear to be moving towards us as it moves further around its orbit and away from the Sun. Therefore it will appear to become larger but partly illuminated.

OBSERVING VENUS

A comparison of the size of Venus and Earth

Venus has a very thick and clouded atmosphere that covers the whole surface. Consequently there are no surface features to see. All that is visible on Venus is the top of the thick white clouds. Some faint features can be seen in the clouds but special filters are required to see them. See the image above.

The main interest for amateur astronomers when observing Venus is to follow the progress of the phases. The two inner planets Mercury and Venus (known as Inferior Planets) are the only planets to show phases. Phases occur when these planets (and our Moon) are partially illuminated by the Sun. The phases change as the planets move around the Sun on their orbits.

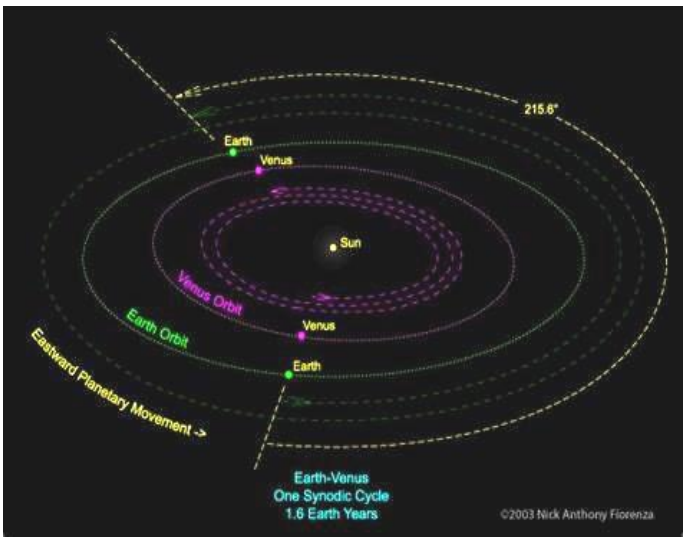
We have already seen that Venus has an orbital period (year) equivalent to 225 Earth days but its axial rotation (day) is equivalent to 243 Earth days. This means a day on Venus is, very oddly, longer than its year. However this makes no difference on the surface because the Sun is never visible due to the very thick Carbon Dioxide (CO_2) clouds.

The period taken for Earth to catch up with another planet is called the Synodic Period and the time taken for a planet to complete one orbit around the Sun is called its Sidereal Period. The table below shows the Synodic and Sidereal Periods for Earth and the other planets.

Planet	Synodic Period (days)	Sidereal Period
Mercury	116 (~3x a year)	88 days
Venus	584 (~1.5x a year)	225 days
Earth	-	1.0 year
Mars	780 (2.137y)	1.9 years
Jupiter	399 (1 year + ~34d)	11.9 years
Saturn	378 (1 year + ~13d)	29.5 years
Uranus	370 (1 year + ~5d)	84.0 years
Neptune	368 (1 year + ~3d)	164.8 years

Table showing the Synodic Periods of the planets

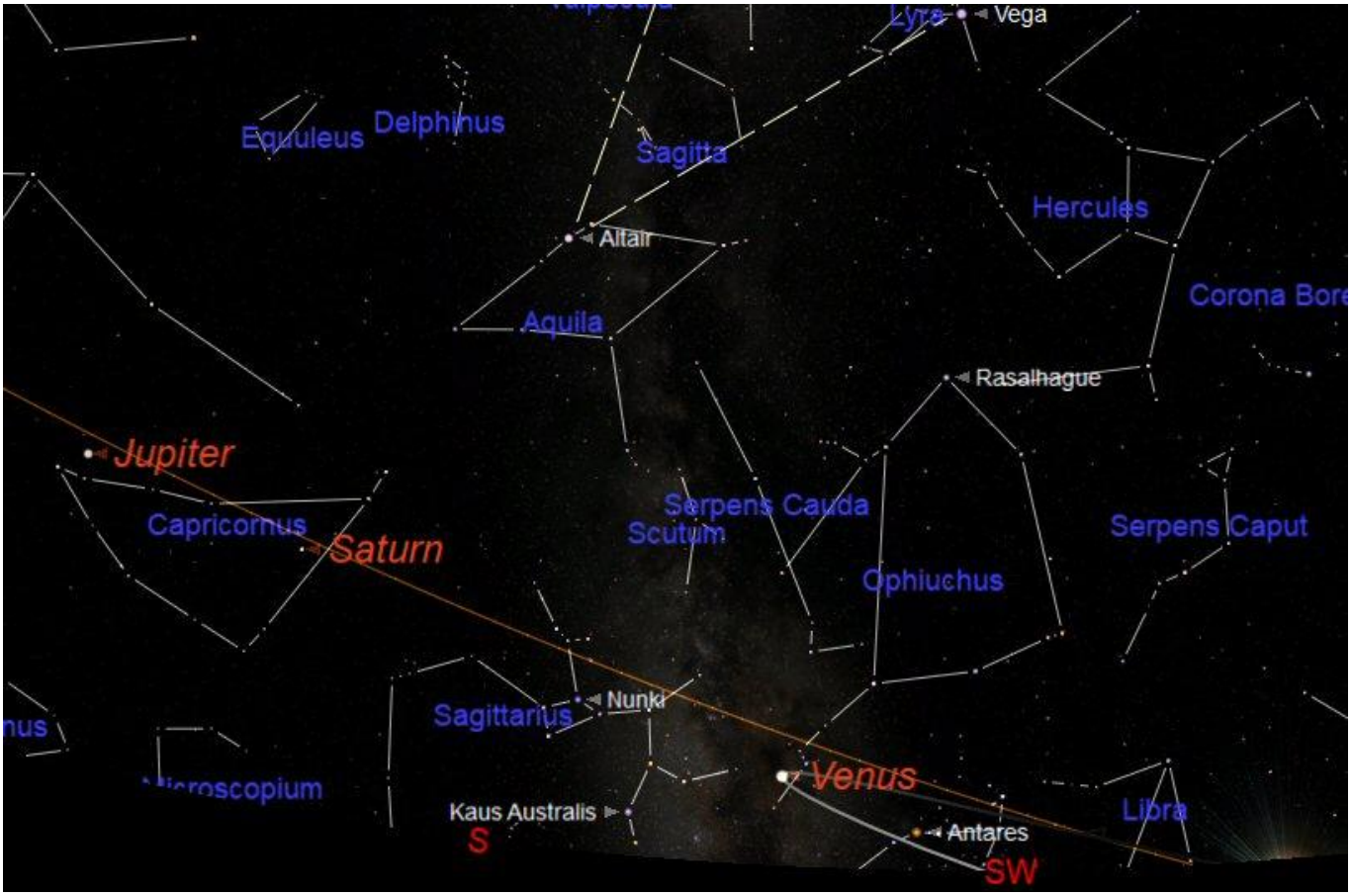
From a position where Earth and Venus are aligned with the Sun on their orbits as on the following diagram (at Inferior conjunction) Earth will take 365.25 days to return to the same spot. As the orbit of Venus is inside the orbit of Earth it completes its orbit of the Sun in just 225 Earth days. When Venus catches up with Earth it will have completed 2.6 of its own orbits (pink dotted line). Earth will have needed to move around its orbit for 584 days (yellow and green dotted line) for Venus to catch up. This is called the Synodic Period of Venus.



The orbits of Venus and Earth

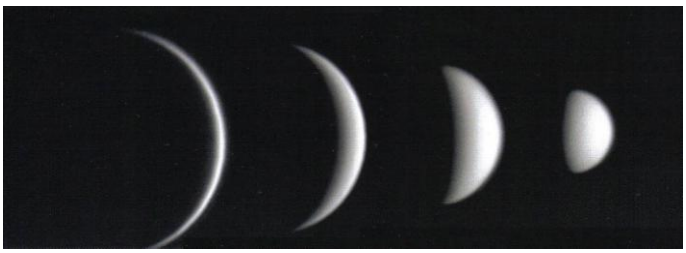
A telescope is needed to see Venus as a disc and the larger the telescope the bigger Venus will appear. Venus often appears low in sky and in the murky and turbulent air close to horizon. It is best to start with a low power eyepiece (25mm) when observing Venus then use a higher power (magnification) eyepiece (10mm) to have a closer look. If the image is too bright then a Moon filter can be used. Alternatively the Dust cap can be fitted to the telescope and the small 'Moon' cap removed to reduce the amount of light entering the telescope.

If the image looks good then a Barlow Lens can be used to effectively double the magnification of the 10mm eyepiece. When Venus is low in the sky and we are looking through more of the atmosphere some colour distortion can be seen as red and blue fringes.



Venus at Greatest Eastern Elongation 29th October 2021

When Venus emerges from its Superior Conjunction, behind the Sun, it will appear to the east of the Sun in the Evening sky at sunset. It will be small but 'full', close to the western horizon and in the bright sky after sunset. It is sometimes called the Evening Star. As Venus appears to move further east and away from the Sun it will also be moving towards Earth. It will begin to appear larger in diameter but less will be illuminated by the Sun.

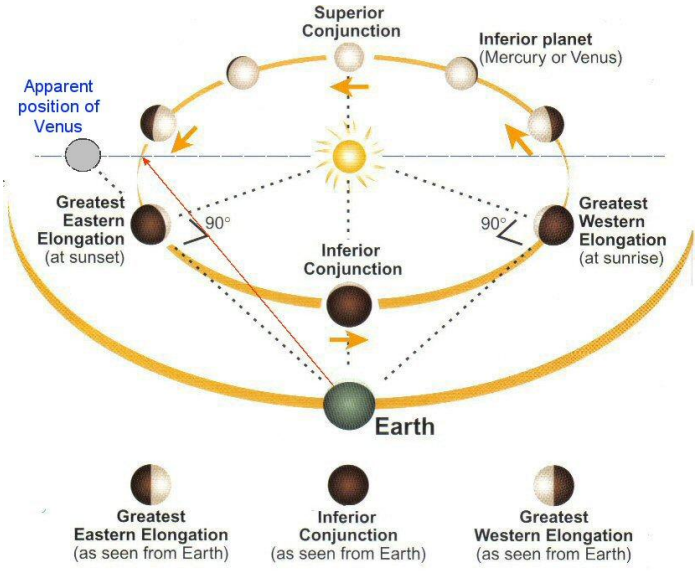


The change in diameter and phases of Venus

As Venus moves out from Superior Conjunction it appears as a full disc because it is on the opposite side of the Sun to us. From our point of view we see the whole surface of Venus illuminated. Venus then moves on its orbit around the Sun and appears to us to move away from the Sun to the east (left). As it moves further away from the Sun its orbit also brings it towards us so some of the illuminated surface begins to disappear from our view. See the images above.

After about 56 (Earth) days Venus will have moved a quarter of its way around the Sun and will be at its apparent furthest point from the Sun as we see it so we call this Greatest Easterly Elongation. At this point Venus will be the same distance from us as the Sun so we will see the half of Venus facing the Sun illuminated and appearing 'Half Moon' shaped. See the images above.

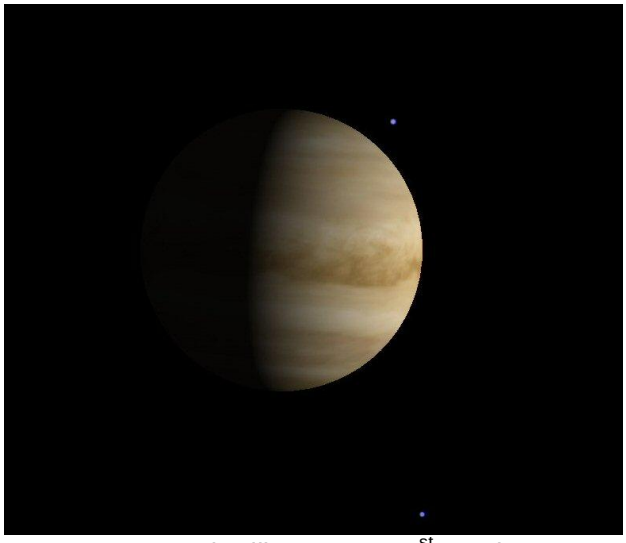
Up to this point more than half of Venus would have been illuminated and the apparent shape would have been more than half, a shape we call 'Gibbous'. Actually the Greatest Easterly Elongation occurs after the point when Venus is a quarter way around its orbit and occurs when Venus is at 90º from the Sun as we see it from Earth as shown on the diagram below (dotted lines).



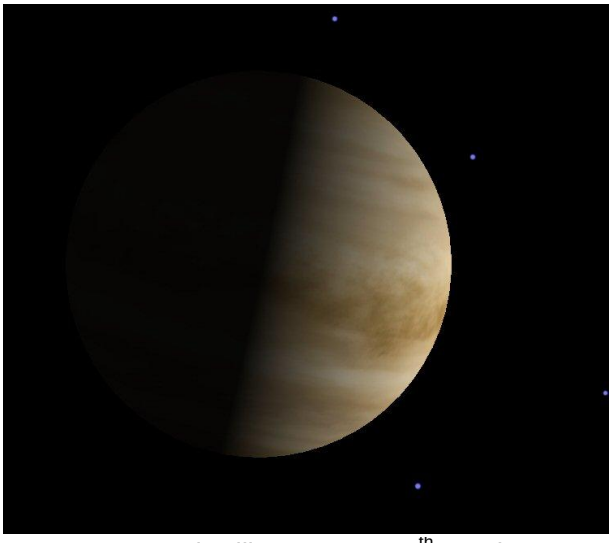
The orbit of Venus around the Sun

After Greatest Easterly Elongation, Venus will appear to start moving back towards the Sun in a westerly direction. As it is still moving closer to Earth it will appear to increase in diameter. Less and less of the illuminated side of Venus will be visible to us so it develops into a narrowing crescent. However the overall perceived brightness will remain about the same.

OBSERVING VENUS THIS YEAR



Venus as it will appear on 1st October



Venus as it will appear on 30th October

Venus was in Superior Conjunction with the Sun on 26th March this means it was passing behind the Sun from our point of view. When Venus emerged from its Superior Conjunction (behind the Sun) it would have appeared to the east of the Sun in the Evening sky at sunset. Venus would have appeared fully illuminated and would have appeared at its smallest diameter as it was at its furthest distance from us. However it was much too close to the Sun for us to have seen it.

Over the last five months Venus moved further away from the Sun until it has now moved far enough to be seen to the east (left) of the Sun after sunset. It has been difficult to see because it has been very low and close to the western horizon. During this time it appeared small but full, close to the western horizon and in the bright sky after sunset. Its appearance this year has occurred in the summer when the Ecliptic is low in the sky.

As Venus moved further east and away from the Sun it also moved towards Earth. It began to appear larger in diameter but less was illuminated by the Sun so it developed a Gibbous shape (between full and half full).

The phases from Gibbous and Crescent

The previous images show the development of the phases of Venus as seen in 2004 and show how the planet appears bigger as it moves towards Earth. It also becomes narrower as less of the illuminated part of the surface is visible. Despite the obvious changes in size and illumination the overall brightness remains about the same. In fact Venus is the brightest object in the sky except for the Sun and the Moon. Jupiter is about magnitude -2.8 and Venus was about -4.0 on 1st September, -4.1 on 15th and -4.2 on 30th September.

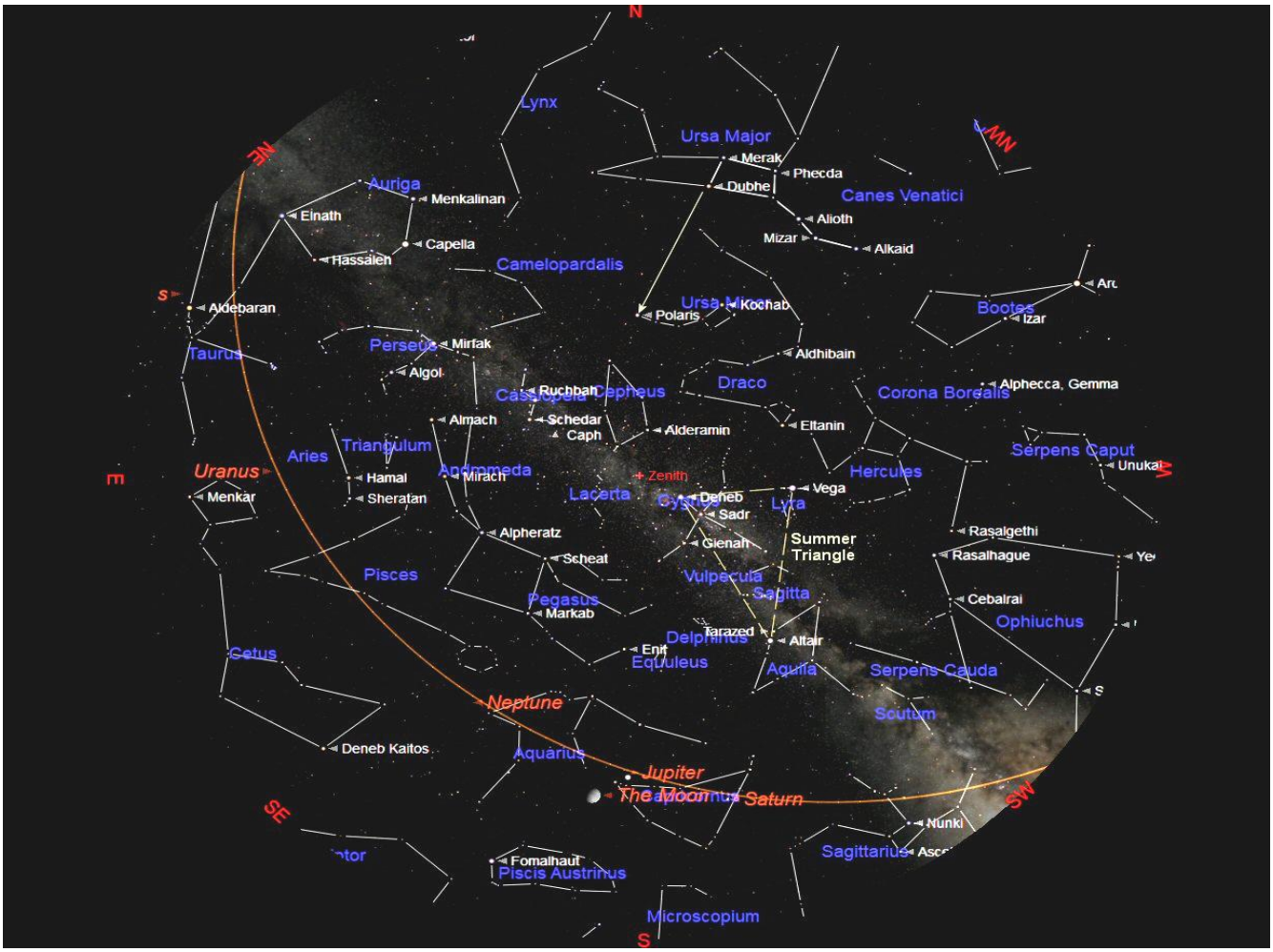
Magnitude is the measure of brightness used for astronomical objects. The larger the magnitude number the fainter the object will appear. So a minus magnitude indicates the object is brighter than most of the stars seen in the sky. The bright star Vega in the constellation of Lyra (in the Summer Triangle) is a star that has a magnitude of 0.0 so is a good comparison star. A difference of one magnitude means there is an increase or decrease in brightness of 2.5 times (actually 2.512). The brightest star visible from the UK is Sirius at -1.46.

A telescope is required to see Venus as a phased shape but it also appears very bright in a telescope so even a small telescope will make it appear quite dazzling. Observing Venus does require some slightly special observing techniques. Venus is often close to the Sun so care must be taken to make sure the Sun light does not enter the telescope. If the Sun is close then we must wait for the Sun to move below the horizon or behind a building or other immoveable object.

This year Venus appears low in sky and in the murky and turbulent air close to horizon. It is best to start with a low power eyepiece (25mm) when observing Venus then use a higher power (magnification) eyepiece (10mm) to have a closer look. If the image is too bright then a Moon filter can be used. Alternatively the Dust cap can be fitted to the telescope and the small 'Moon' cap removed to reduce the glare and have a better view.

If the image looks good then a Barlow Lens can be used to effectively double the magnification of the 10mm eyepiece. When Venus is low in the sky and we are looking through more of the atmosphere some colour distortion can be seen as red and blue fringes. No surface features can be seen so the main interest in observing Venus is just the phases.

THE AUTUMN CONSTELLATIONS



Last month on the 22nd September it was the day of the Autumn Equinox. This was the time when we were half way between midsummer 21st June (Summer Solstice) and midwinter 21st December (Winter Solstice). This also means that at this time the length of the day and night are the same, 12 hours. The term Equinox actually means Equal Night.

The chart above shows the Autumn Night Sky on and around 15th October at about 21:00 BST. North is to the top, South at the bottom, East to the left and West to the right. The point in the sky directly overhead is known as the Zenith and is shown (in red) at the upper centre of the chart. Also see the chart on the next page.

Mapping the night sky is actually rather difficult as there are only the stars to use as reference features and stars all look quite similar. The only difference to the untrained eye is that some stars appear brighter than others. With our unaided eyes (astronomers call 'naked eye') we can see about 6000 stars in a good dark sky. The brighter stars do seem to form (all be it, sometimes indistinct) groups and patterns in the night sky.

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

At the centre of the chart is the Summer Triangle. 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.

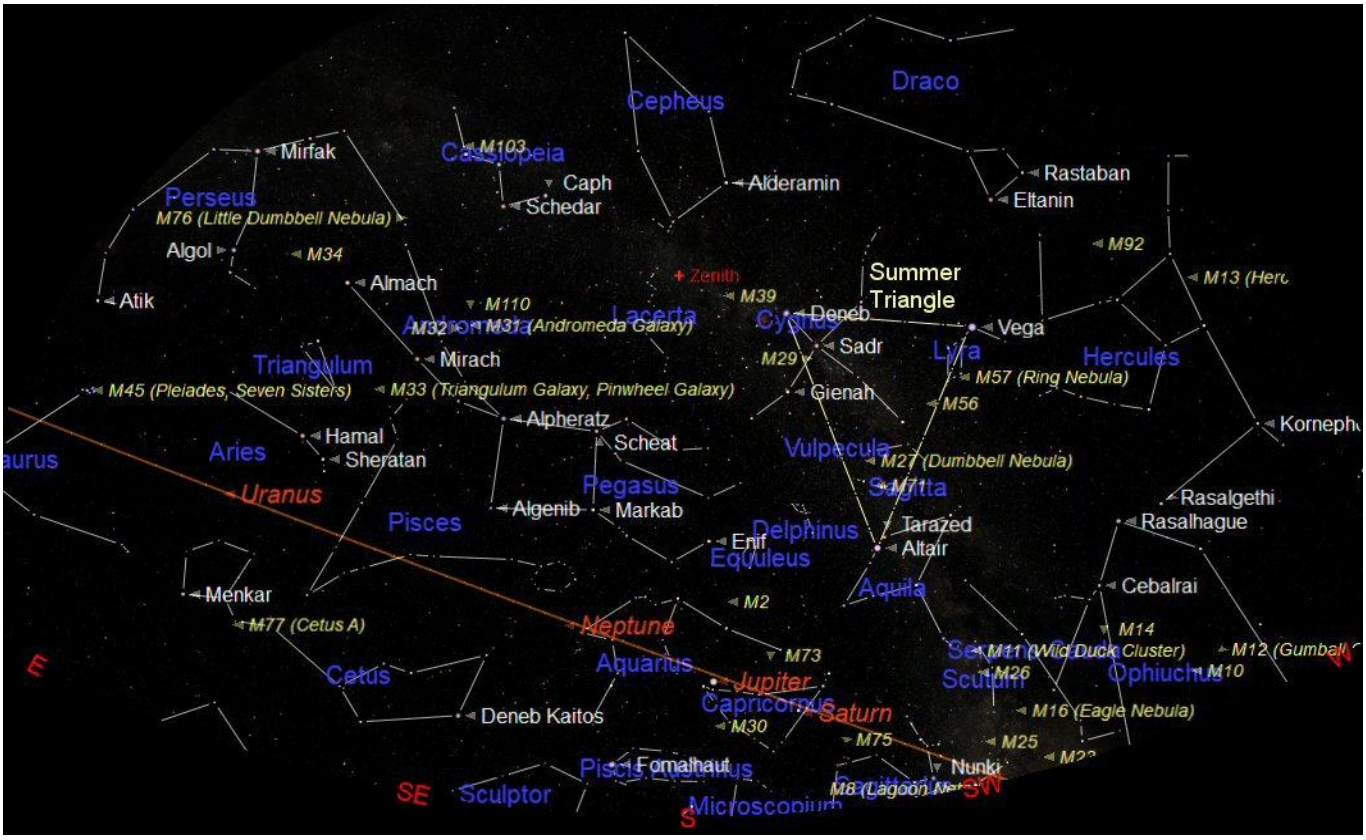
The Summer Triangle is easy to find so once it is identified we can use it to lead us to other constellations around it and we can follow the constellations to find other constellations. This can help us to become familiar with the night sky and lead us to the many interesting things to search out and observe.

A number of other constellations are quite easy to find and identify and once found can also lead us to other constellations. One of the best known is Ursa Major (the Great Bear) that we sometimes call 'the Plough' and the Americans call 'the Big Dipper'. It actually looks remarkably like a large saucepan. At this time of the year it is 'sitting' on the northern horizon.

Ursa Major can be found at top (North) of the chart above. The seven brightest stars of Ursa Major make a pattern (that we call an Asterism) that looks very much like a saucepan. Ursa Major is 'circumpolar, that means it can be seen in the sky all through the year.

The sky appears to rotate due to the rotation of Earth and its orbit around the Sun. As Earth rotates once a day its northern axis points to a point in the sky close to the star Polaris in the constellation of Ursa Minor (the Little Bear). This point is very important and can be found by following the two stars of the 'pan' opposite the handle in the saucepan shape of Ursa Major. We call these two stars 'the Pointers'.

A TOUR OF THE NIGHT SKY - OCTOBER 2021



The chart above shows the night sky looking south at about 22:00 BST on 15th October. 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: Sagittarius (the Archer), Capricornus (the Goat), Aquarius (the Water Carrier), Pisces (the Fishes), Aries (the Ram) and Taurus (the Bull).

Prominent in the southern sky is the Summer Triangle that dominates the Summer Sky and was described in detail previous pages. 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 west (right) of the Summer Triangle and almost overhead is the constellation of Hercules (the Strong Man). Hercules has a distinctive distorted square shape, at its centre, called the 'Keystone'. This is due to its resemblance to the centre stone of an arch or bridge. The jewel of Hercules is without doubt the Great Globular Cluster, Messier 13 (M13) that can be found in the western vertical imaginary line forming the 'Keystone'.

It is just visible using a good pair of 9 x 50 binoculars. The spherical cluster, of about a million stars can be seen using a 90mm *f*10 telescope but will look even more impressive when using a larger telescope.

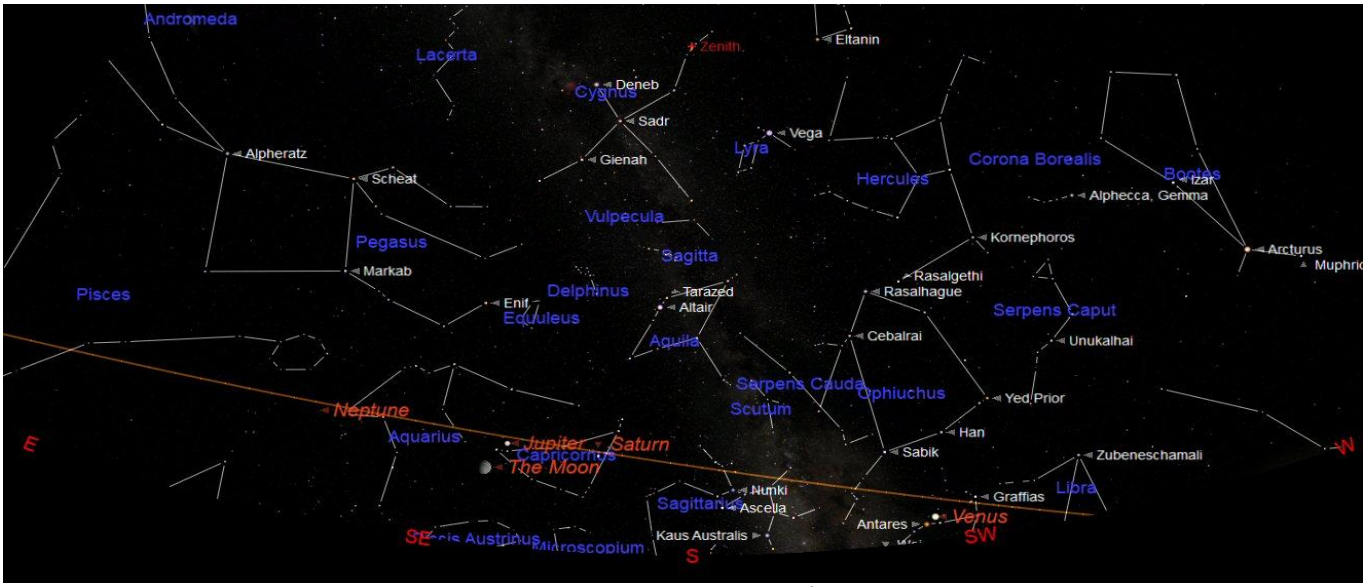
To the west of Hercules and close to the western horizon is the bright orange coloured star called Arcturus in the constellation of Boötes. Arctaurus is a star similar to our Sun but more advanced and is developing into a Red Giant star that is nearing the end of its 'life' as a normal star. It has used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

To the East 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.

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

THE SOLAR SYSTEM - OCTOBER 2021

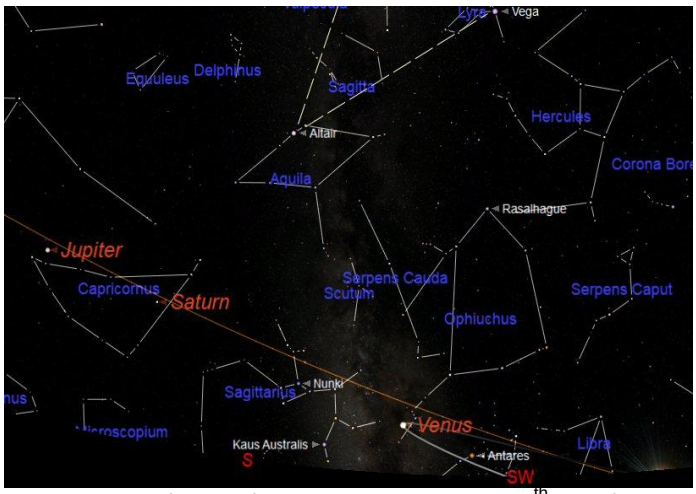


The planets at 22:00 on 15th October

The chart above shows the location of the planets along the Ecliptic. The sky has been darkened to make the planets visible. The planets to the west of the Sun (right) will be visible late evening and early morning sky before sunrise. The planets to the east of the Sun (left) will be visible in the early evening sky after sunset as above.

MERCURY will be very close the Sun after sunset 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 western horizon. Venus is emerging from its excursion behind the Sun when it was in 'Conjunction' with the Sun. It will appear at its Greatest Easterly Elongation on 29th October when it will be at it furthest distance from the Sun. See Pages 2 to 6.



Venus, Jupiter and Saturn at sunset on 29th October

MARS has now moved out of view and will not appear in the evening sky again until September 2022. It can be seen very close to the Sun in the chart above but it will be too close to the Sun and too small in diameter to be observable.

JUPITER will be rising in the east at about 16:30 and will be visible in the south as the sky darkens. Jupiter was at opposition and its best on 20th August. See the September issue for more advice on observing Jupiter.

SATURN will be rising in the east at about 18:00 but will be more difficult to observe than Jupiter in the turbulent air close to the horizon. Saturn rises before Jupiter in the east and was at its best for this year on 2nd August when it was at opposition.

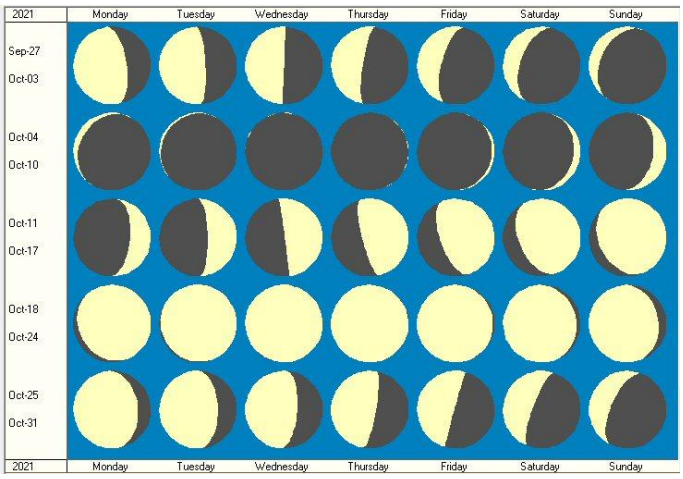
URANUS will be observable this month and will be best at 02:00 when it will be due south and at its highest point above the horizon but is small and faint at +5.7.

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

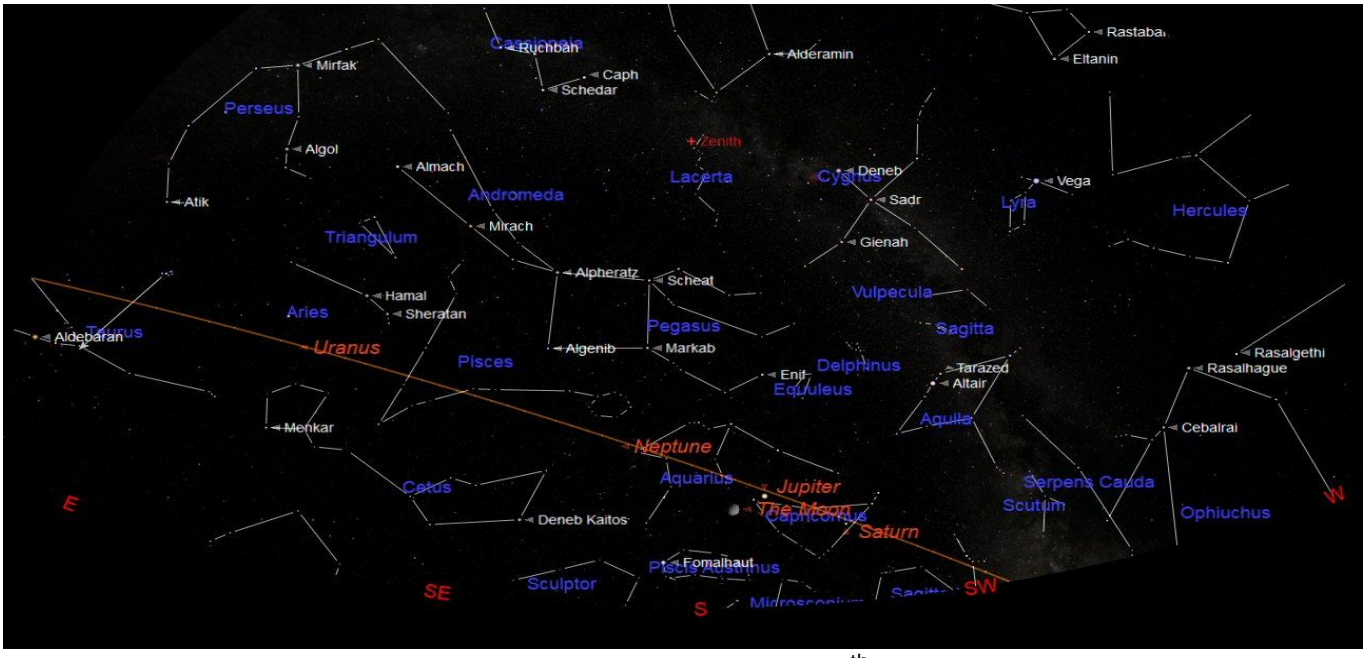
The Sun rises at about 07:00 at the beginning of the month and 07:45 by the end. It sets at 18:35 at the beginning of the month and 17:40 at the end of the month. It reached its highest point in the sky on 21st June which was the Summer Solstice and will be at the Autumn Equinox on the 22nd September. There have been a few Sunspots between July and September.

THE MOON PHASES DURING OCTOBER



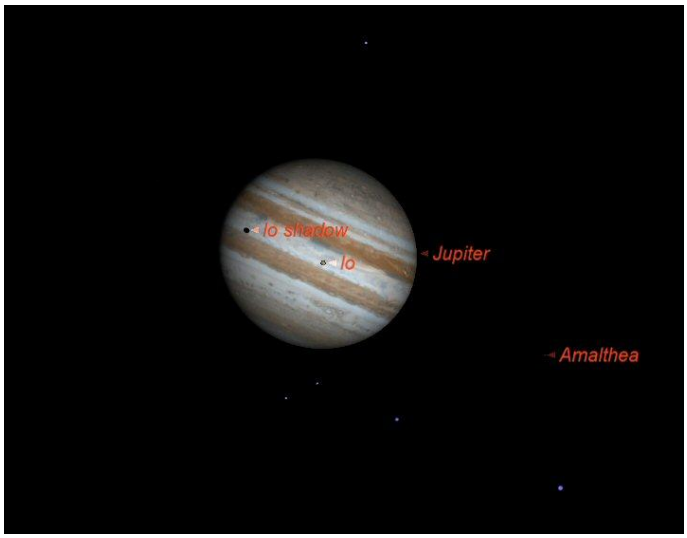
New Moon will be on 6th October
First Quarter will be on 13th October
Full Moon will be on 20th October
Last Quarter will be on 28th October

OBSERVING JUPITER AND SATURN - OCTOBER 2021



Jupiter and Saturn at 22:00 on 15th October

Jupiter will look brilliant and interesting on any clear night but some nights there may be something special to see. The computer generated chart below shows Jupiter on 7th October with Io in transit (passing in front of Jupiter) and its shadow projected on to the surface. Io starts its transit at 20:47 and reaches the mid-point of the transit at 21:49 when Io's shadow also reaches the edge of Jupiter. Io will finish the transit at 23:00. The shadow will leave the face of Jupiter two minutes after midnight.



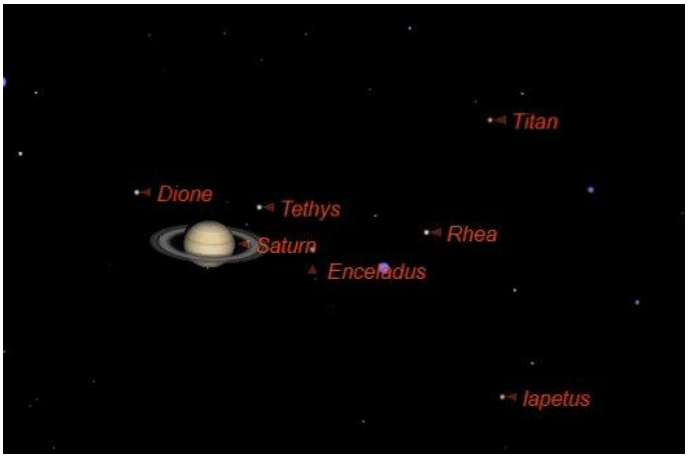
Moon Io and shadow in transit on 7th October

Jupiter and Saturn can be seen using a smaller telescope of the sort that a beginner to astronomy might have been advised to buy as a first telescope by experienced astronomers. It will not be possible to see the moons when they are in transit (passing in front of Jupiter) because they will be hidden by the glare of the brightness of Jupiter. The moon shadow will appear black against Jupiter and will be visible so it can be tracked and timed as it crosses the face of Jupiter.

A planetarium application like Stellarium can be used to search for these special events and the times can be predicted by the application. We must however ensure our computer time has been set accurately.

The movement of Jupiter's moons can be predicted using a Planetarium Application on a computer. We are able to predict when a moon will pass in front (transit) or behind the planet (occultation). An accurate clock will also be required to monitor the times of these events.

Saturn is more difficult to observe so a high magnification must be used and on a good clear and still night when the view will be very rewarding. These charts show the sort of things that can be seen using telescopes but a better view will always be obtained when using a larger aperture telescope. A telescope with a longer effective focal length will also produce a larger image.

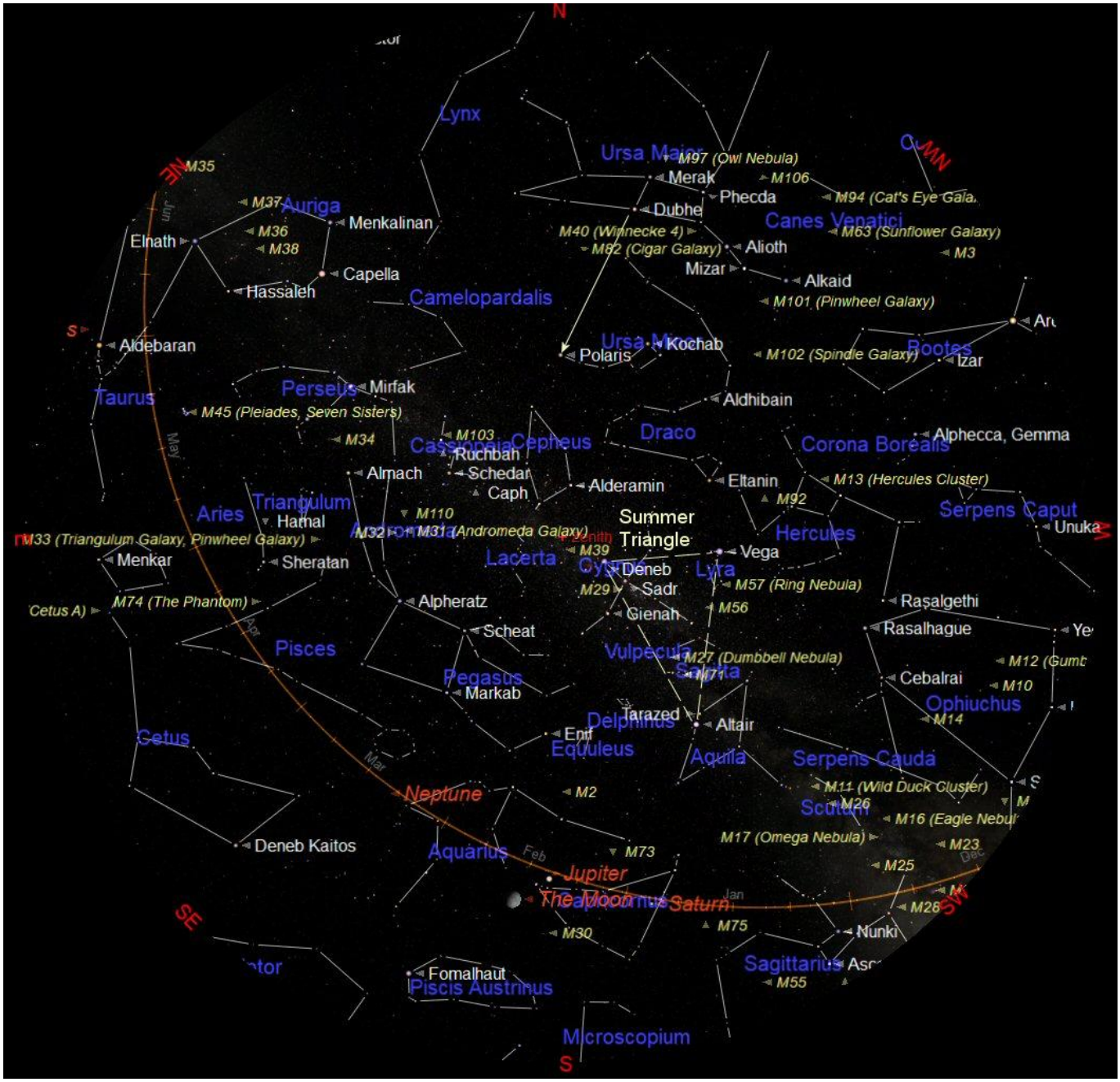


Saturn and its brightest moons

As Saturn is twice as far away as Jupiter it appears only half the diameter and quarter of the area. At twice the distance of Jupiter the amount of sunlight (per unit of area) reaching Saturn is a quarter of what Jupiter receives. Also the amount of light that we see reflected back from Saturn is also four times less that reflected by Jupiter. In total this means that Saturn not only appears much smaller but also receives and reflects less sunlight therefore appears 16 times fainter (4 x 4) than Jupiter.

So that is the bad news but this is compensated for by the magnificent ring system of Saturn. The ring does add a little to the brightness and can be seen even using a smaller telescope.

THE NIGHT SKY – OCTOBER 2021



The chart above shows the whole night sky as it appears on 15th October at 22:00 (10 o'clock) British Summer Time (BST). As the Earth orbits the Sun and we look out into space each night the stars will appear to have moved across the sky by a small amount. Every month Earth moves one twelfth of its circuit around the Sun, this amounts to 30 degrees each month. There are about 30 days in each month so each night the stars appear to move about 1 degree. The sky will therefore appear the same as shown on the chart above at 9 o'clock BST at the beginning of the month and at 11 o'clock BST at the end of the month. The stars also appear to move 15º (360º divided by 24) each hour from east to west, due to the Earth rotating once every 24 hours.

The centre of the chart will be the position in the sky directly overhead, called the Zenith. First we need to find some familiar objects so we can get our bearings. The Pole Star **Polaris** can be easily found by first finding the familiar shape of the Great Bear 'Ursa Major' that is also sometimes called the Plough or even the Big Dipper by the Americans. Ursa Major is visible throughout the year from Britain and is always quite easy to find. This month it is 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.

British Summer Time (BST) ends on 31st October so the clocks go back one hour.