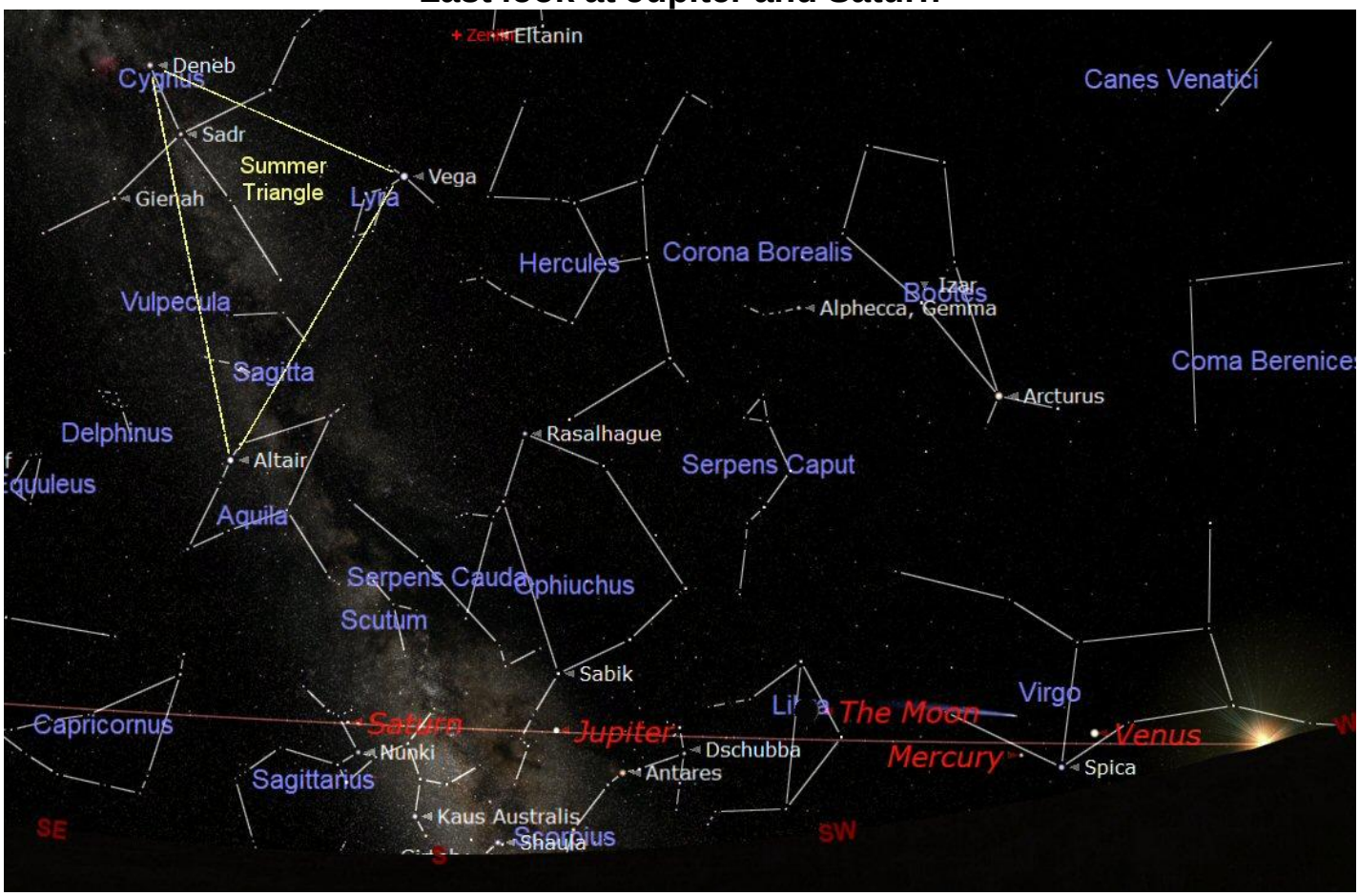
NEWBURY ASTRONOMICAL SOCIETY
MONTHLY MAGAZINE – OCTOBER 2019

Last look at Jupiter and Saturn



Jupiter and Saturn in the south west at 19:00 in the beginning of October

The two Gas Giant planets have not been good for observing this year due to their very low position above the horizon. This low altitude has spoiled the view because the air close to the ground is affected by the heat rising from the ground and producing turbulence that causes the image to wobble. The problem is compounded by the thickness of the air we have to look through. When we look directly up over our head we are peering through about 100km of atmosphere but the upper 50km is very thin. When we look through the atmosphere close to the horizon we must peer through about 300km of the thickest part of the atmosphere.

Unfortunately there is not a lot we can do about 'seeing' conditions close to the horizon and have to accept the poor quality of the view. However there are few things we can do to make the best in these bad conditions. Firstly we will need at least a small telescope to see any detail on Jupiter and Saturn.

Jupiter appears larger and brighter than Saturn so more detail can be seen. However the additional brightness will cause too much glare so an aperture reducer should be used. Most telescopes are supplied with a Dust Cover with a removable cap that can be used to reduce the amount of light entering the telescope.

The aperture reducer should not be required to observe Saturn. It may also be found that a lower magnification will improve the image and reduce the effect of air turbulence. Refraction of the light from the planet will also cause colour separation in the image. This is seen as red and blue fringes on opposite sides of the image. This effect will also be reduced by using a lower magnification.

Unfortunately Jupiter is now too close to the south western horizon and the image will be very poor. It will need to be observed as soon as it is dark enough and a clear view to the horizon is essential. Jupiter will set over the horizon at about 20:15. Saturn is about two hours behind Jupiter so it will be in view longer and will initially be higher. The ring system and moons will be difficult to resolve. Not very good prospects but it is the last chance this year.

NEWBURY ASTRONOMICAL SOCIETY MEETING

4th October The Colour of Science
Website: **www.newburyastro.org.uk**

NEXT NEWBURY BEGINNERS MEETING

16th October Chinese Astronomy
Website: **www.naasbeginners.co.uk**

OUR TILTED VIEW OF THE SKY

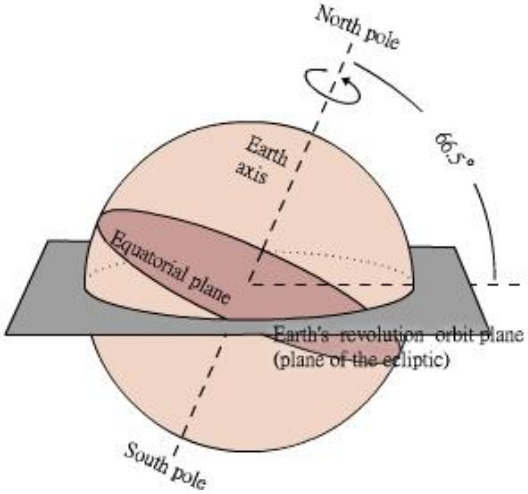
Our planet Earth and its Moon (the Moon is in the distance behind Earth)

The axis of rotation of our planet Earth is tilted over at about 23.4º so we have a rather strange view of space around us. Evidence suggests that in the early Solar System there were many more planets than the eight we have today. There may have been 30 or more and possibly as many as 80 when the Solar System formed. Many of these fledgling planets had erratic orbits leading to close encounters and collisions. Close encounters could throw planets out of their orbits and send them hurtling out into space or crashing into the Sun. It is thought that Earth suffered a collision with another planet very soon after they formed. This planet was about the size of Mars (and known as Thea).

An artist's impression of the Great Impact with Thea

Computer simulations of the Great Impact indicate that Thea hit Earth off-centre and towards the edge. The impact would have completely destroyed Thea and smashed off a huge chunk of Earth. A massive amount of hot molten material from both planets was knocked off and thrown into orbit around the shuddering, distorted and molten Earth.

Most of the heavy Iron core of Thea (that would have passed straight through Earth) and some of the Iron core from Earth would have fallen back on to Earth and been re-absorbed into the core within weeks or even days. The Moon then formed from the rocky debris in a period of less than ten years, probably a lot less. When the Moon first formed it orbited Earth much faster and was only about 15% of its current distance from Earth. The impact almost destroyed Earth leaving it spinning faster and tilted 23.4º compared to the axis of the Solar System.



Earth's axis is tilted 23.4 º from the Solar System

The tilt of Earth's axis is the reason we have the seasons that have had a major effect on the evolution of life on Earth. The presence of our large Moon has another major effect on Earth. We need to think about the dynamics of our planet Earth and how it moves around the Sun. On the previous page we considered how Earth got its tilt so now we can think about how this affects us.

Earth's axis is tilted 23.4º from the axis of rotation of the Solar System. Looking at this from another angle Earth's axis is tilted 66.6º from the plane (or equator) of the Solar System. This gives us on Earth some odd views of space around us including the Sun, Moon and the planets. The first thing we need to do is understand how this tilt works.

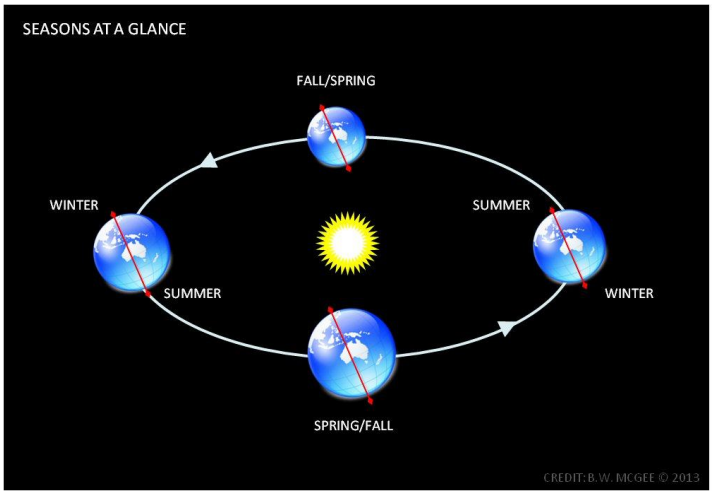


Diagram showing Earth's tilt on its orbit around the Sun

The diagram above shows how Earth orbits the Sun and how Earth's axis is always tilted in the same direction. In fact an imaginary line projected into space, from the north pole of Earth's axis, points into space at a point in the constellation of Ursa Minor. This point is called the Celestial Pole which is very close to the star Polaris. This is why we also call Polaris 'the North Star' or 'the Pole Star'.

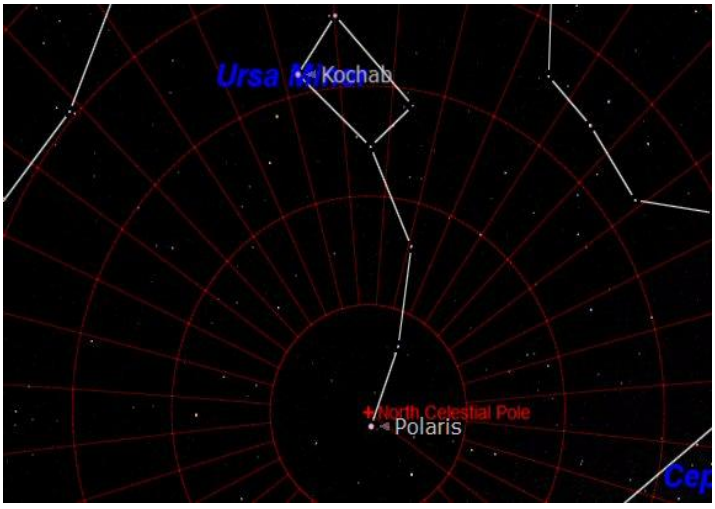
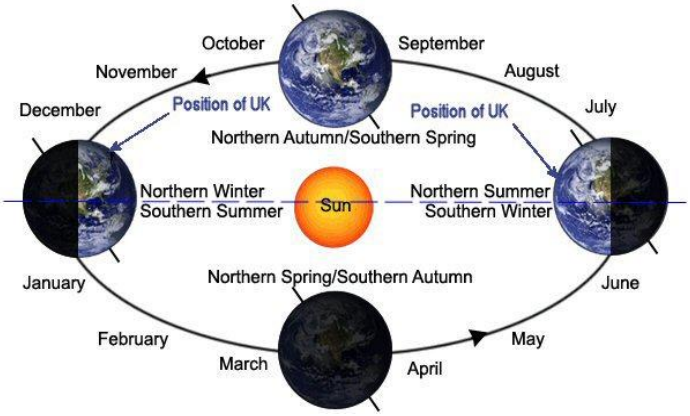


Diagram showing Polaris and the North Celestial Pole

Although the North Celestial Pole seems, to us, permanently located close to Polaris it does actually move over long periods of time. Earth has a wobble on its axis rather like a spinning top. The moving axis traces out a circle in the northern sky every 26,000 years. This wobble of the axis is called 'Procession'. At the moment the axis points close to Polaris which is good for us but in a few thousand years it will have moved away from Polaris.

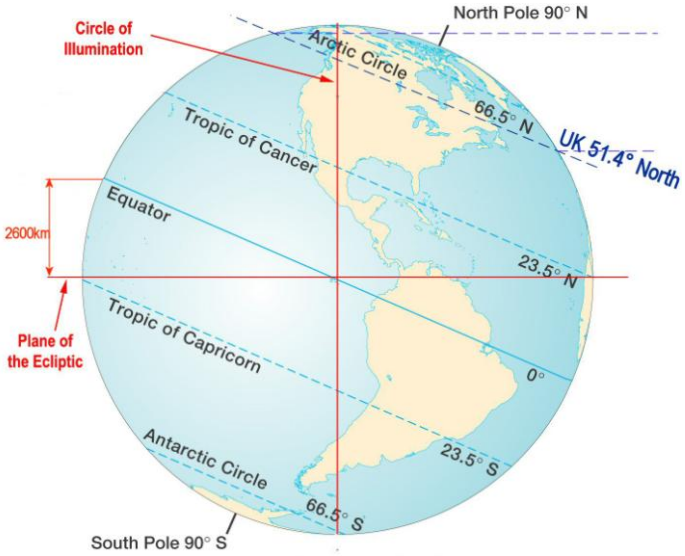
So the tilt of Earth's axis of rotation gives us a rather odd view of our surroundings in space. The first thing to grasp is the way that Earth orbits the Sun. The diagram below shows how the axis of Earth always points in the same direction in the sky as Earth moves around the Sun.



Earth's orbit around the Sun

In the diagram above, the representation of Earth on the left shows its position at northern mid-winter. So we in the UK are further above the equator due to the north pole being tilted away from the Sun. On the right the north pole is tilted towards the Sun and the UK is positioned closer to the Solar system equator (the Ecliptic) than it is in mid-summer.

What this means is the position where the Sun appears to be directly overhead at midday moves south for the northern winter (left) and north for the northern summer. The furthest position that the Sun appears to move to the north is called the Tropic of Cancer and the farthest south that it reaches is called the Tropic of Capricorn. See the diagram below.



In the diagram above it can be seen that the tropics extend 23.5° north and 23.5° south of Earth's equator. To 'put this another way' a point on the surface of Earth (for instance somewhere in the UK) will move 40055km (circumference of Earth) x 23.5°/360° which equals around 2615km from mid winter to mid-summer. So over one orbit of the Sun (1 year), the UK effectively moves 2615km south from its position relative to the Ecliptic from winter to summer and then back again. This apparent movement of the Sun in our sky and its effect on our view of the sky is explained in more detail on pages 4 and 5.

Now we can think about how the tilt of Earth's axis affects us as inhabitants of Earth and as astronomers. First we can think about how our view of the Solar System and the space around us is affected. Obviously the positions of the Sun (and the Moon) change their elevation in the sky from winter to summer. We all notice that the Sun appears higher in the sky in summer but how does this come about and how does it affect the weather?

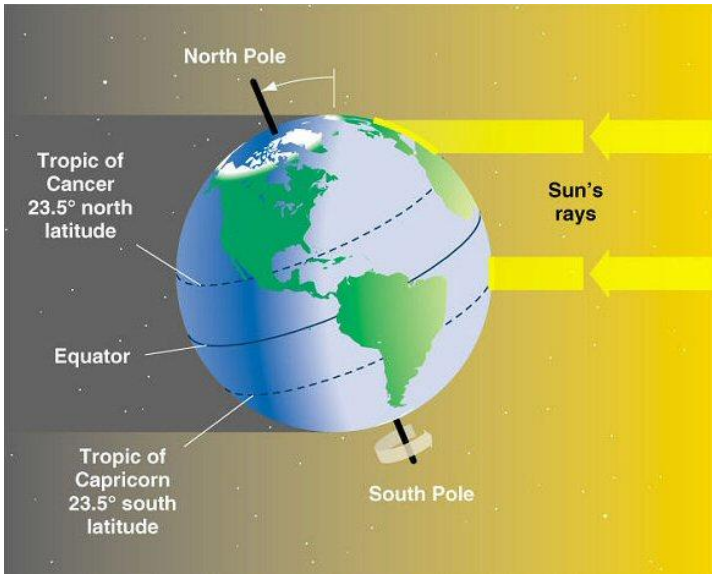


Diagram showing how Earth is illuminated by the Sun

Our summer is noticeably warmer than the winter, this happens for two reasons but both reasons are related to the tilt of Earth. In the diagram above the parallel rays from the Sun are shown coming towards Earth from the right. When Earth's axis is tilted away, as shown, the UK is located high on the sphere. The rays from the Sun are spread over a larger area of the surface due to the curvature as shown. The yellow arrows indicate the same area of light and heat coming from the Sun but the upper arrow has a larger 'footprint' on the surface. This means the energy from the upper arrow of rays will be distributed over the larger area and have just a quarter of its energy for each unit of area on the surface compared the energy delivered at the equator.

The other factor affecting the temperature is due to the amount of the atmosphere that the light and heat has to pass through to get to the surface. The higher the latitude the more air it will have to penetrate through. This is due to its angle of incidence and more of the energy will be absorbed by the atmosphere before reaching the ground.

Six months later Earth will be on the opposite side of the Sun and the north pole will be tilted towards the Sun. In the diagram above it can be seen that a country located on the Tropic of Cancer is positioned higher on the side facing the Sun. Six months later when that country is at the lower position during the day it will receive less energy from the Sun and the climate will be cooler. Another diagram showing the northern summer would have Earth positioned as in the diagram above but the Sun would be on the left. See the upper diagram on the previous column.

The UK is located approximately half way between the Tropic of Cancer and the North Pole. The diagram above shows the position of the UK at midwinter with a larger area illuminated. It can also be seen that the north pole is in permanent darkness during this time.

Another very noticeable effect of Earth's tilt is the change in the length of the day from winter to summer. The reason for this is quite easy to see on the diagram below.

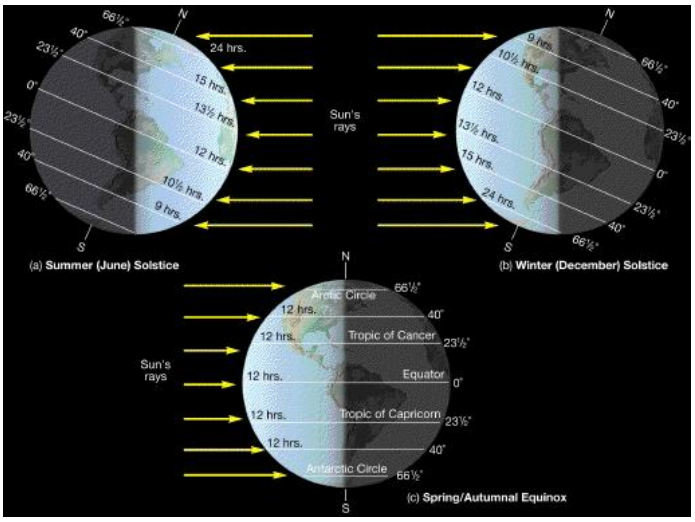


Diagram shown the change in the length of the days

The upper left diagram shows the length of the days in the midsummer period. The upper line is the 40° latitude position we in Newbury in the south of England are at 51.4° north so we would be above the 40° latitude line. Our midsummer day is about sixteen hours long. It can be seen that as the tilt increases the time that a location is in sunlight increases when the pole is tilted towards the Sun. Conversely when the pole is tilted away from the Sun that location spends less time in the illuminated area and the days are shorter, as in the upper right diagram.

The lower diagram shows how the day and night are the same length at the Spring and Autumn Equinoxes. The Equinoxes are the exact time when the Sun is moving north or south and reaches the point when it is directly overhead on Earth's Equator (0º latitude).

The diagram below shows the relationship of the Celestial Poles and the Solar Poles and the Celestial Equator and the Solar System Equator (the Ecliptic).

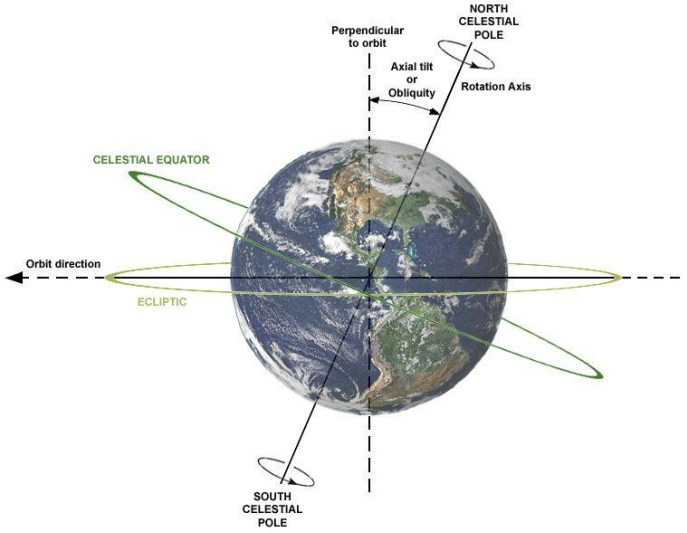
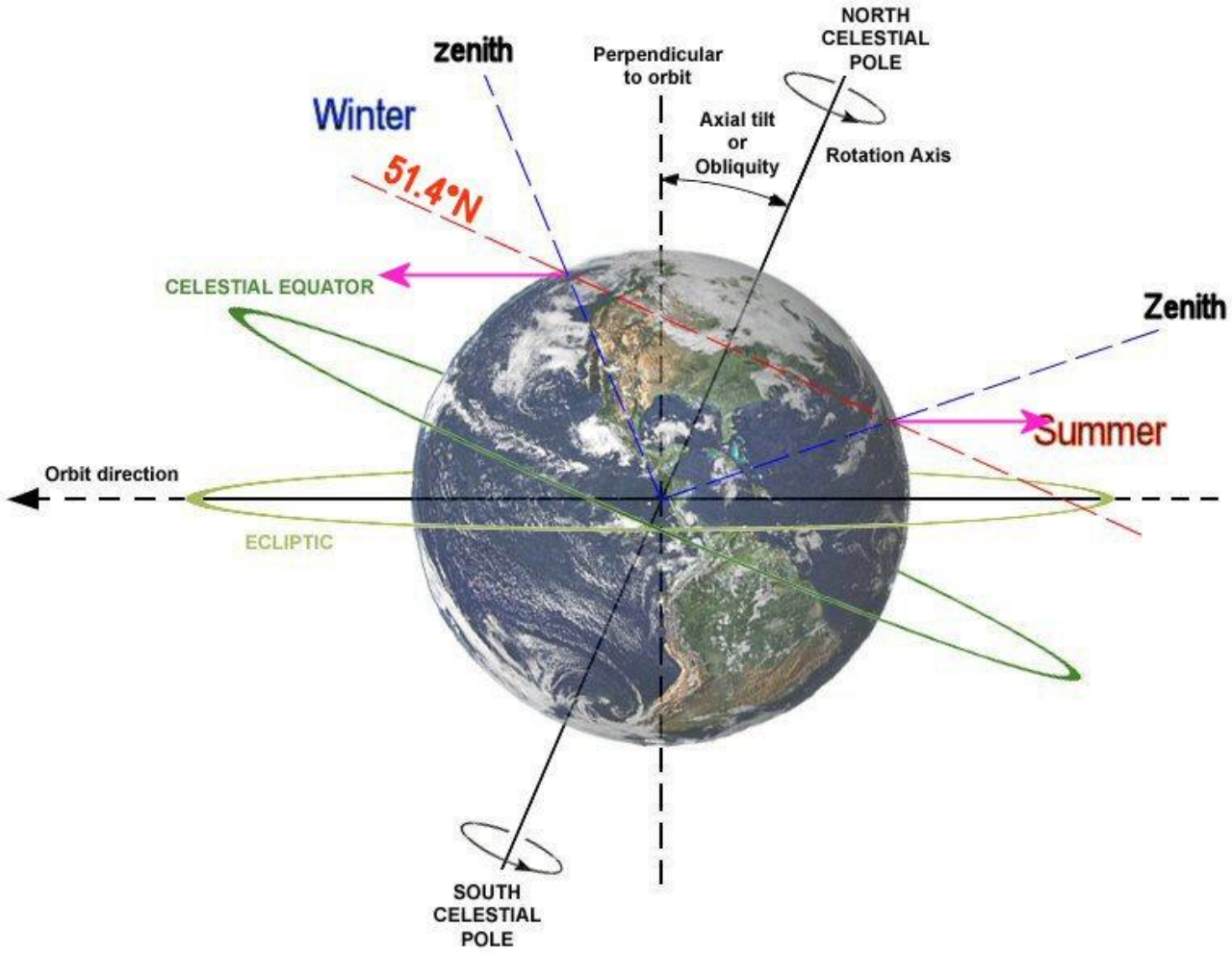


Diagram showing the Pole and Equator terminology

The Ecliptic is actually the imaginary line along which the Sun, Moon and planets appear to move across the sky. It can be thought of as the equatorial plane of the orbits of the planets and is tilted at 23.4° to the Celestial Equator.

THE EFFECT OF EARTH'S TILT ON OUR VIEW OF THE SKY



The diagram above shows how Earth's axis of rotation is tilted. The dashed black line marked as 'Perpendicular to orbit' is the axis of rotation of the Solar System around which all the planets, including Earth, orbit the Sun. The solid black line marked as: 'North Celestial Pole' and 'South Celestial Pole' is the tilted axis of rotation of Earth. The angle between Solar System axis and the Celestial Axis (Earth's axis of rotation) marked as: 'Axial tilt or Obliquity' and is the 23.4° tilt as discussed on the previous pages. The Ecliptic or Equator of the Solar System is shown as the light green horizontal ellipse with the Celestial Equator (Earth's Equator) also tilted at 23.4°.

The red dashed line towards the top of Earth is the latitude line on which Newbury is located. This is 51.4° north of the Celestial Equator (Earth's Equator) so this is our observing position when we look up into the sky. It can be seen that this line is also tilted at 23.4° to the Ecliptic (the plane of the Solar System).

We now need to imagine the diagram has two views to consider. First on midsummer day when the Sun will be off the diagram to the right and the North Celestial Pole is tilted towards the Sun. So the right side of earth will be facing the Sun and in daylight and the left side will be dark at midnight. Secondly on midwinter day the Sun will be off the diagram to the left and the North Celestial Pole is tilted away from the Sun. So the left side of earth will be facing the Sun at midday and the right side will be dark and it will be midnight.

It will be noticed that the position of Newbury on the left is higher up the surface of Earth and closer to the North Pole of the Solar System marked as 'Axial tilt or Obliquity' on the dashed black line. The direction to the Sun from the winter and summer viewing positions is indicated by the pink arrows. Now if we imagine a person standing at those positions and a line projected from their head to the point in the sky directly above that person, this is called the Zenith. This imaginary line is indicated by the blue dashed lines marked Zenith.

The important thing to notice here is the angle between the Zenith line and the pink arrows pointing towards the Sun. The angle of the pink arrow on the left side (the winter side) is much larger than the angle on the right (the summer side). So this means in the winter the Sun appears further away from the zenith (the point directly overhead) and therefore closer to the Celestial Equator (our horizon). Conversely, in the summer the angle between the Zenith line and the pink arrow pointing towards the Sun is significantly smaller. Therefore the Sun appears closer to the Zenith overhead and much higher in the sky. The Sun consequently appears much higher above the Celestial Equator (our horizon).

For astronomers the significance is: the planets and the Moon are positioned much higher in the sky during the winter months. This means the light from them has to pass through much less of our atmosphere and the images obtained are much clearer.

As astronomers we have a rather confusing view of the sky around us due to the tilt of Earth's axis. There are some very noticeable effects that we take for granted. The first is: how much the position of the Sun in the sky changes from summer to winter.

The sky at midday on midsummer day

The computer generated image above shows the sky at midday on midsummer day. The Sun is at its maximum elevation above the southern horizon. Any planets in the sky at this time will be located somewhere along the Ecliptic to either side of the Sun and therefore high in the sky as well.

The sky at midday on midwinter day

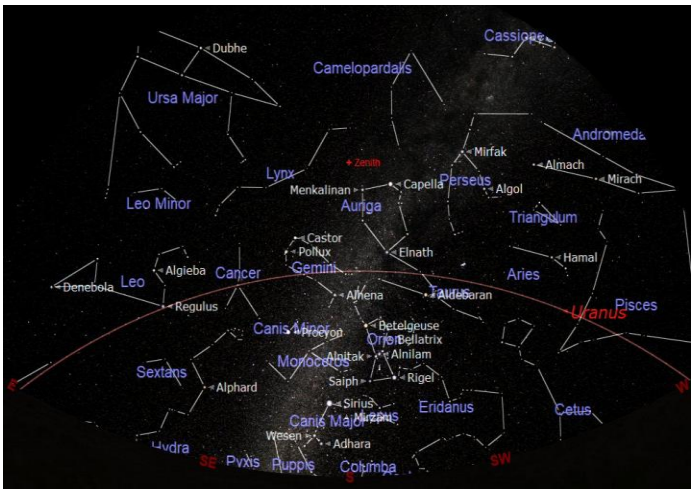
The image above shows the sky at midday on midwinter day. When compared to the image at the top, it can be appreciated just how low the Sun appears from the UK in the middle of the winter. The Ecliptic is the imaginary line that represents the equator of the Solar System. The Sun, Moon and planets appear to move along this imaginary line as Earth moves around its orbit about the Sun. As the tilt of Earth's axis always points to the same direction and the same point in the sky the Ecliptic appears to rise and fall from our point of view as explained on the previous page.

In the northern hemisphere the north pole of Earth's axis is tilted towards the Sun during the summer season. This gives the effect of a point on the surface such as the UK being closer to the equator of the Solar System that we call the Ecliptic. As a consequence the Sun will appear much higher in the sky during the summer.

However as Earth rotates on its axis once every 24 hours (1 day) that point on the surface of Earth (the UK) will rise up due to the tilt. See the red dashed line on the diagram on the previous page. At midnight when the UK is looking away from the Sun it will be at its highest point.

The sky at midnight on midsummer day

The image above shows the how the Ecliptic appears low in the sky at midnight on midsummer day when it had been high in the sky during the day. See the image in the opposite column. The Moon appears low in the sky during the summer nights and appears large as it rises over the horizon giving us the Harvest Moon effect.

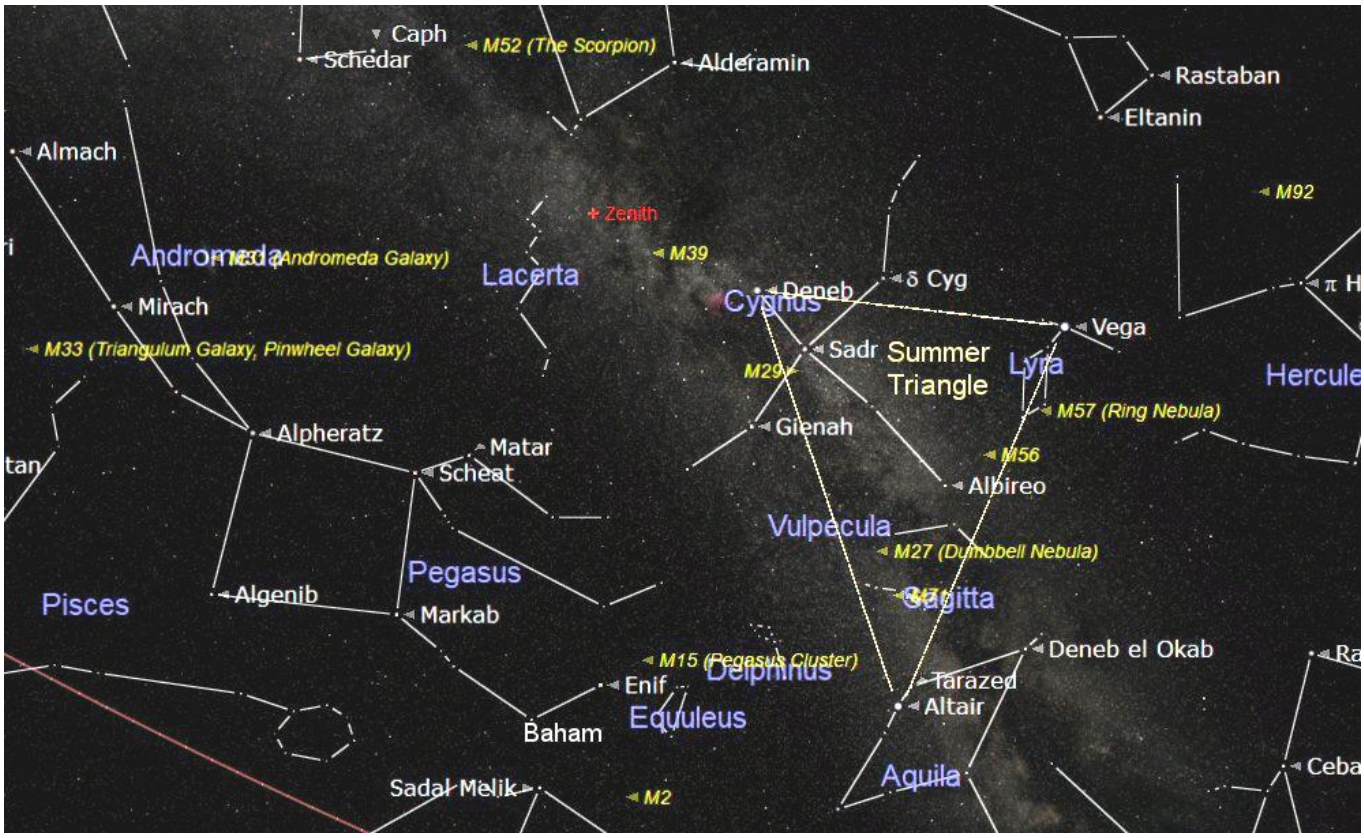


The sky at midnight on midwinter day

During the winter nights the ecliptic appears very high in the night sky as can be seen in the image above. In the northern hemisphere the north pole of Earth's axis is tilted away from the Sun during the winter season. This gives the effect of a point on the surface such as the UK being further away from the equator of the Solar System (the Ecliptic) during the day and closer to the north pole of the axis of the Solar System.

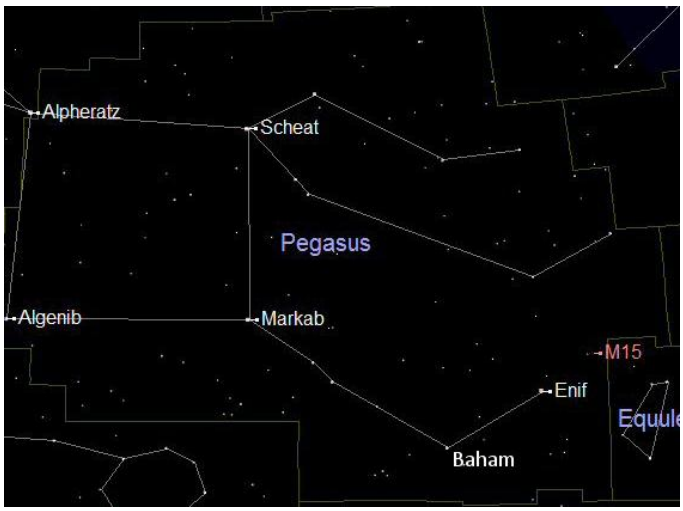
However as Earth rotates on its axis once every 24 hours (1 day) that point on the surface of Earth (the UK) will move down due to the tilt. See the red dashed line on the diagram on the previous page. At midnight when the UK is looking away from the Sun it will be at its lowest point and the Ecliptic will appear high in the sky. The winter is the best time for astronomers because the nights are long and the planets and Moon are high in the sky away from the thick and turbulent air close to the 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'. It is larger than may be expected which sometimes makes it a little difficult to initially identify. However once it has been identified it is easy to find again 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.

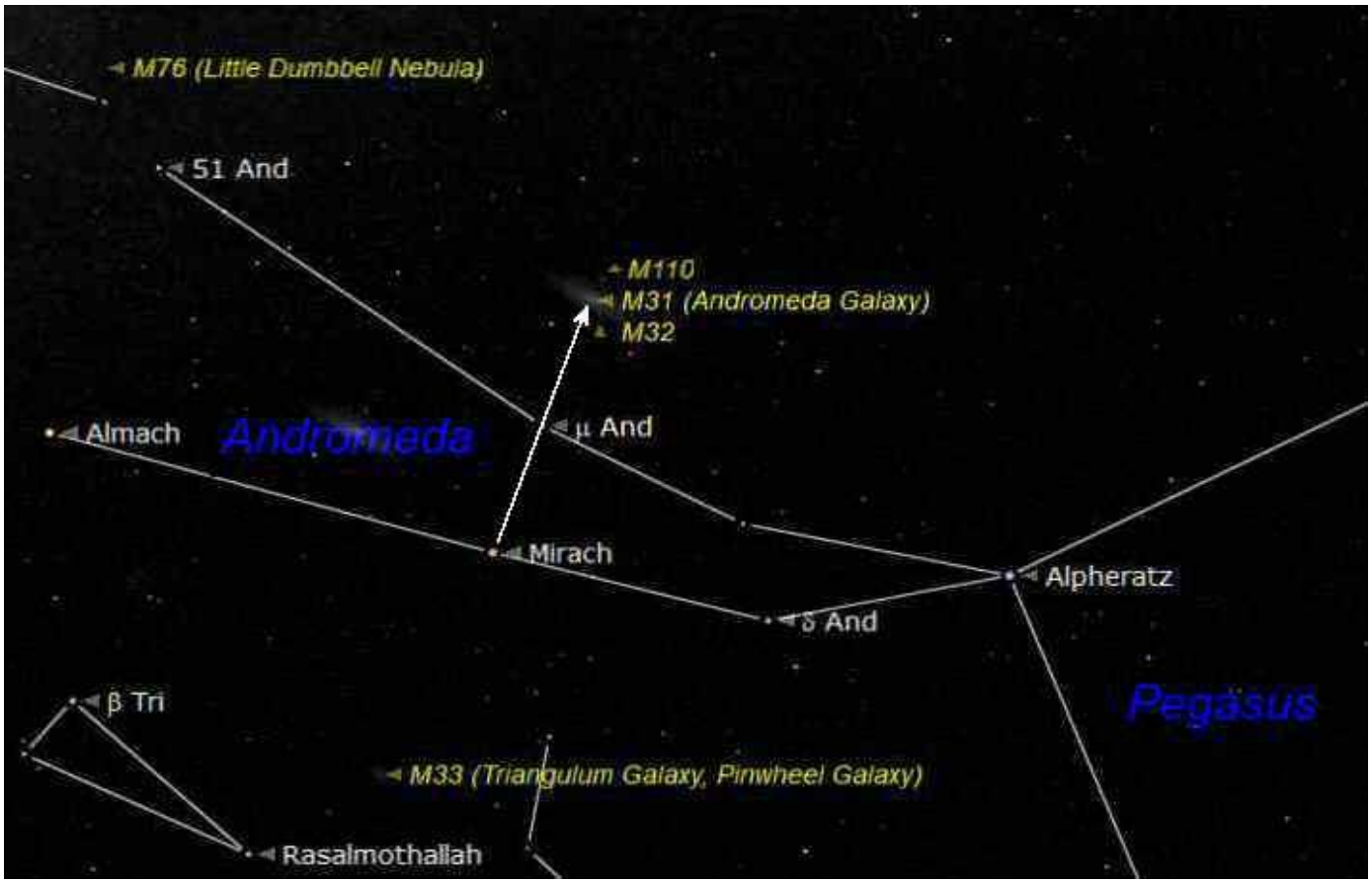
The square can be used to judge the seeing condition of the night sky. Under perfect conditions about ten stars can be seen inside the square this would indicate a very good night for observing. If three to five stars can be seen then conditions will still be good. If fewer or none can be seen then stick 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) 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 getting 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.

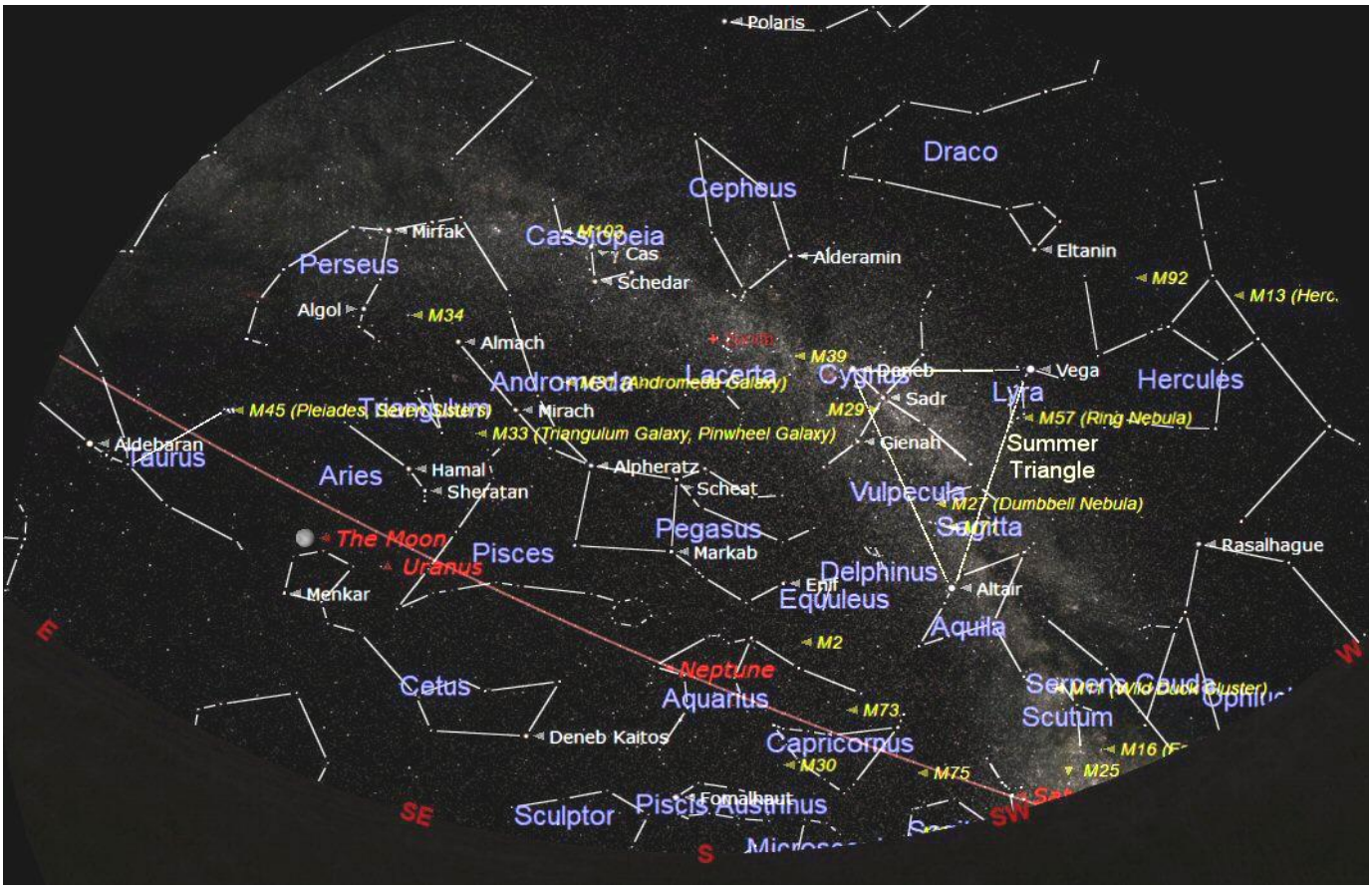
The picture in the previous column shows M31 imaged through a telescope and is much clearer than can be hoped to be seen with the naked eye. However a pair of binoculars will enable the galaxy to be seen. A small telescope will show a cigar shaped hazy patch with a brighter spot in the centre. Larger 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.

M31 The Great Spiral Galaxy in Andromeda

Almach the 'line of sight' double star in Andromeda

THE NIGHT SKY OCTOBER 2019



The chart above shows the night sky looking south at about 21:00 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 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) just moving over the western horizon, Capricornus (the Goat), Aquarius (the Water Carrier), Pisces (the Fishes), Aries (the Ram) and Taurus (the Bull) in the east.

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

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

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

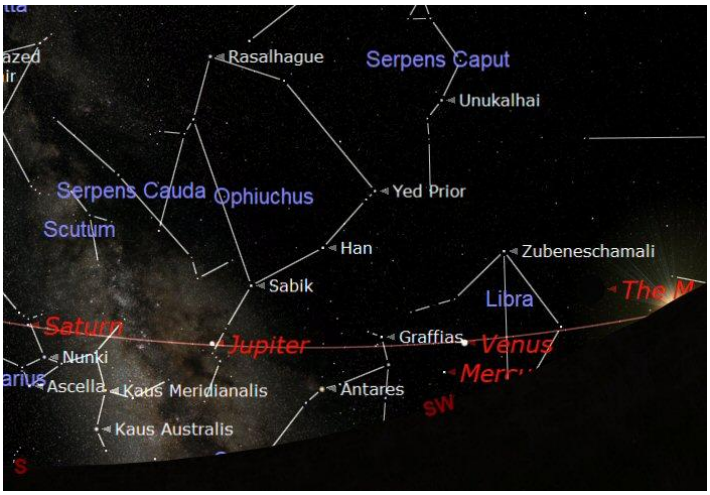
Just visible at the top of the chart above is the fairly faint constellation of Ursa Minor (the Little Bear) also called the Little Dipper by the Americans. Although Ursa Minor may be a little difficult to find in a light polluted sky it is one of the most important constellations. This is because Polaris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

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.

Coming into view in the 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 unaided eye (we call 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 Open Star Cluster Messier 45 (M45) known as the Pleiades (or the Seven Sisters). It really does look magnificent using binoculars.

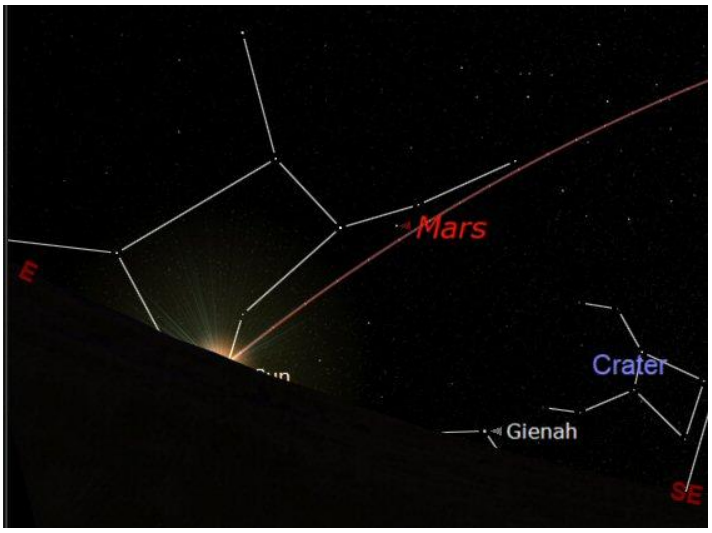
THE SOLAR SYSTEM THIS MONTH

MERCURY will not be observable this month as it will be too close to the Sun. It was in conjunction with the Sun (passing just above the Sun) on 4th September. It is very close to the southern horizon in the glare of sunset.



Mercury and Venus at sunset on 15th October

VENUS will not be observable this month as it will be too close to the Sun and very low on the south western horizon at sunset. It was in conjunction with the Sun (passed just above the Sun) on 14th August. See the chart above.



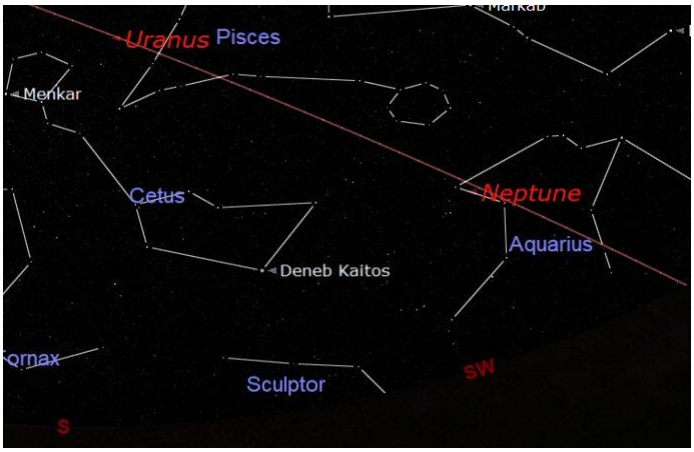
Mars rising at sunrise in the east

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

JUPITER is now past its best for this year and setting over the western horizon soon after sunset. It has been very low in the sky this year and has been rather disappointing in the dirty and turbulent air close to the horizon.

SATURN will be in the in the south as the sky darkens and is following Jupiter along the ecliptic. Saturn is also low and in the murky and turbulent air close to the southern horizon. It is still possible to see the ring system although it will appear unstable due to the air movement close to the horizon. It will require a small telescope 75mm to 100mm and a magnification of about 100x to see the rings well. Saturn's largest moon Titan will also be visible in a telescope but the fainter moons will be difficult to see even using a larger telescope. See the Mercury chart above.

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



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

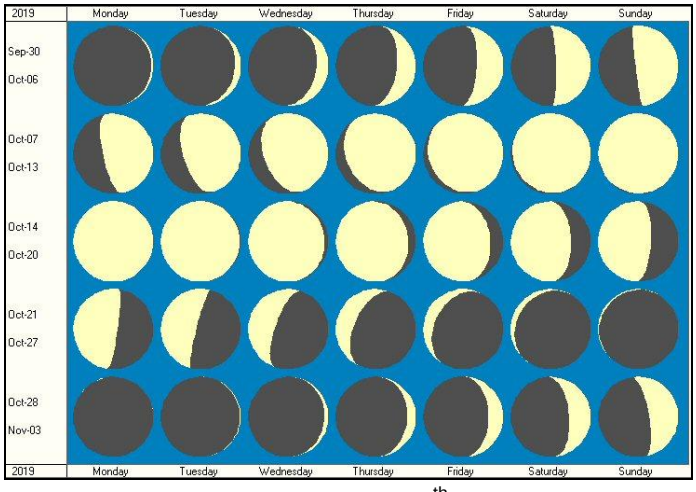
NEPTUNE was at opposition (due south at midnight – 01:00 BST) on 10th September and at its best position for observation this year. A medium sized telescope (100mm to 150mm) will be needed to show Neptune as a small blue/green disc using a magnification of 150x but it is small and difficult to find.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

THE SUN

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

The Sun rises at 07:00 BST at the beginning of the month and at 06:45 GMT by the end of the month. It will be setting at 18:35 BST at the beginning and 16:45 GMT by the end of the month. Sunspots and other activity on the Sun can be followed live and day to day by visiting the SOHO website at: http://sohowww.nascom.nasa.gov/ .

THE MOON PHASES IN OCTOBER



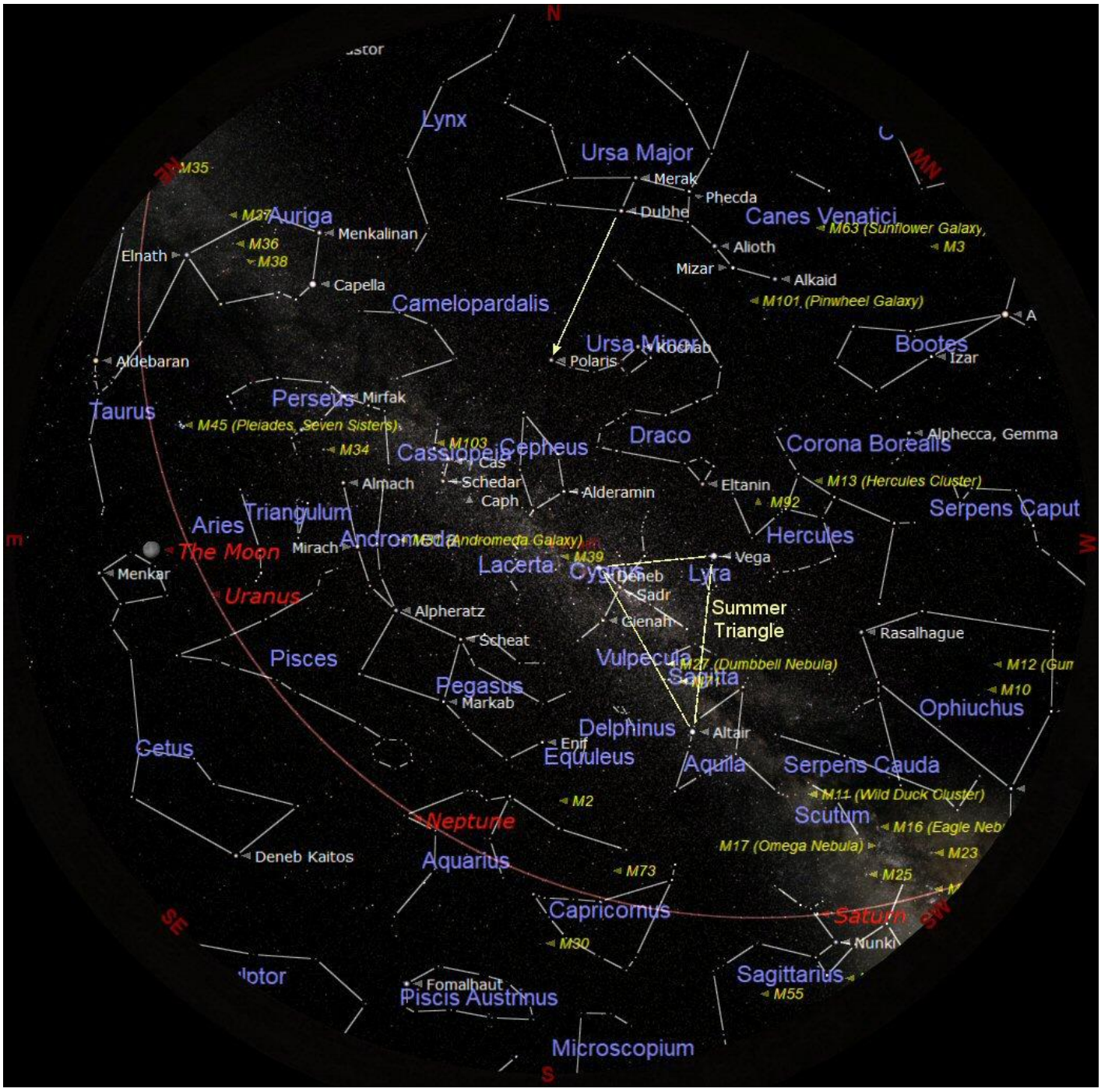
First Quarter will be on 5th October

Full Moon will be on 13th October

Last Quarter will be on 21st October

New Moon will be on the 28th October

THE NIGHT SKY THIS MONTH



The chart above shows the night sky as it appears on 15th October at 21:00 (9 o'clock) in the evening British Summer Time (BST). As the Earth orbits the Sun and we look out into space each night the stars will appear to have moved across the sky by a small amount. Every month Earth moves one twelfth of its circuit around the Sun, this amounts to 30 degrees each month. There are about 30 days in each month so each night the stars appear to move about 1 degree. The sky will therefore appear the same as shown on the chart above at 10 o'clock BST at the beginning of the month and at 8 o'clock BST at the end of the month. The stars also appear to move 15º (360º divided by 24) each hour from east to west, due to the Earth rotating once every 24 hours.

The centre of the chart will be the position in the sky directly overhead, called the Zenith. First we need to find some familiar objects so we can get our bearings. The Pole Star **Polaris** can be easily found by first finding the familiar shape of the Great Bear 'Ursa Major' that is also sometimes called the Plough or even the Big Dipper by the Americans. Ursa Major is visible throughout the year from Britain and is always easy to find. This month it is in the north west. Look for the distinctive saucepan shape, four stars forming the bowl and three stars forming the handle. Follow an imaginary line, up from the two stars in the bowl furthest from the handle. These will point the way to Polaris which will be to the north of overhead at about 50º above the northern horizon. Polaris is the only moderately bright star in a fairly empty patch of sky. When you have found Polaris turn completely around and you will be facing south. To use this chart, position yourself looking south and hold the chart above your eyes.

Remember British Summer Time (BST) ends on 27th OCTOBER