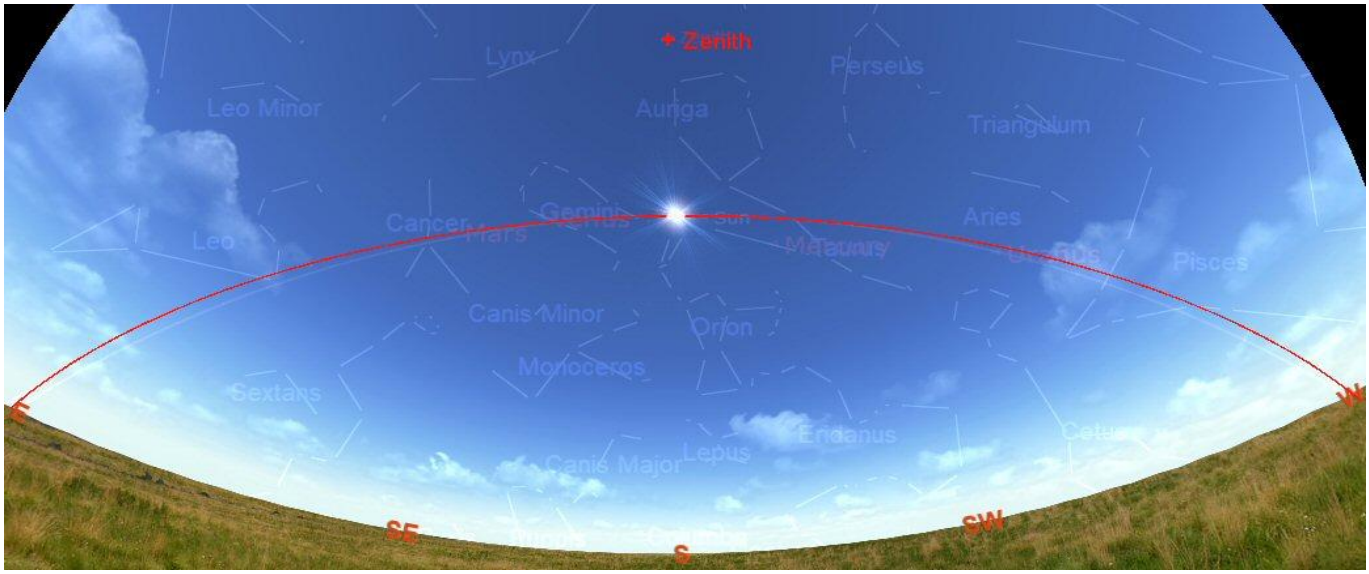
NEWBURY ASTRONOMICAL SOCIETY
MONTHLY MAGAZINE – JUNE 2022
This will be the last magazine until September

THE SUMMER SOLSTICE (Midsummer Day)

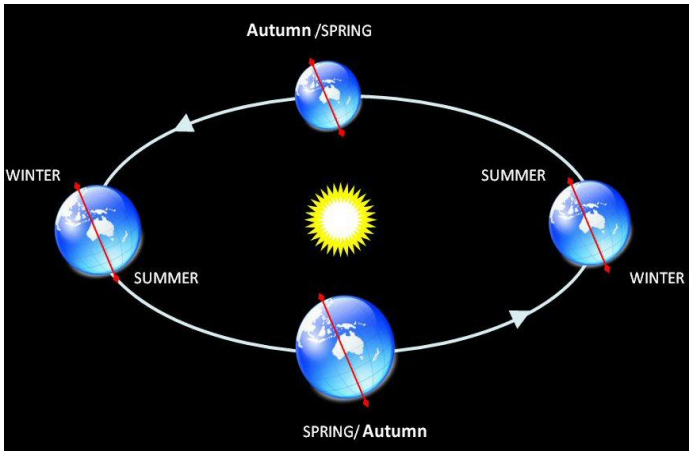


The Summer Solstice (Midsummer Day) 21st June

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.

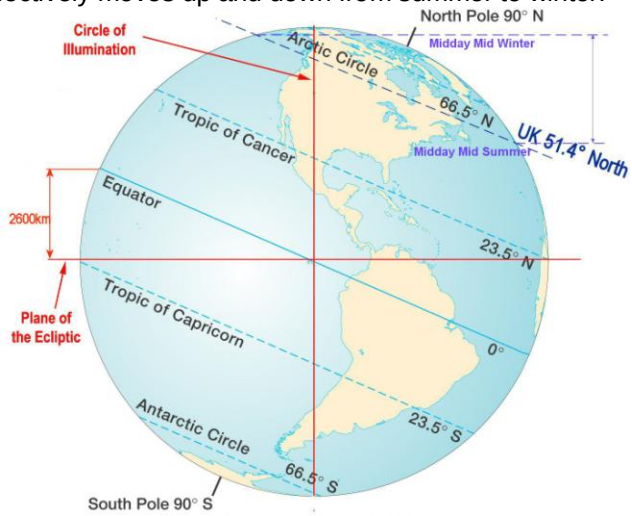
The chart above shows the sky at midday on Midsummer Day. The Sun appears at its highest point in the Sky on 21st June at 13:00 BST (12:00 GMT) so for the UK this is the astronomical middle of summer. The Zenith is the point directly overhead from Newbury, England and is marked as a red cross on the chart above.

The Ecliptic (red arc) 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 towards the same point in the sky, the Ecliptic appears to rise and fall from our tilted point of view on Earth.



Earth is always tilted in the same direction

Another affect caused by the tilted Earth is that our sky appears to move up and down as Earth's Equator effectively moves up and down from summer to winter.



The movement of Earth's Equator

Our summer occurs when the Equator moves up to the Tropic of Cancer position or down to The Tropic of Capricorn for winter. Britain will be closest to the Equator on 21st June so the Sun will appear at its highest point in the sky at midday on 21st June, the Summer Solstice.

There will be no meetings in July and August

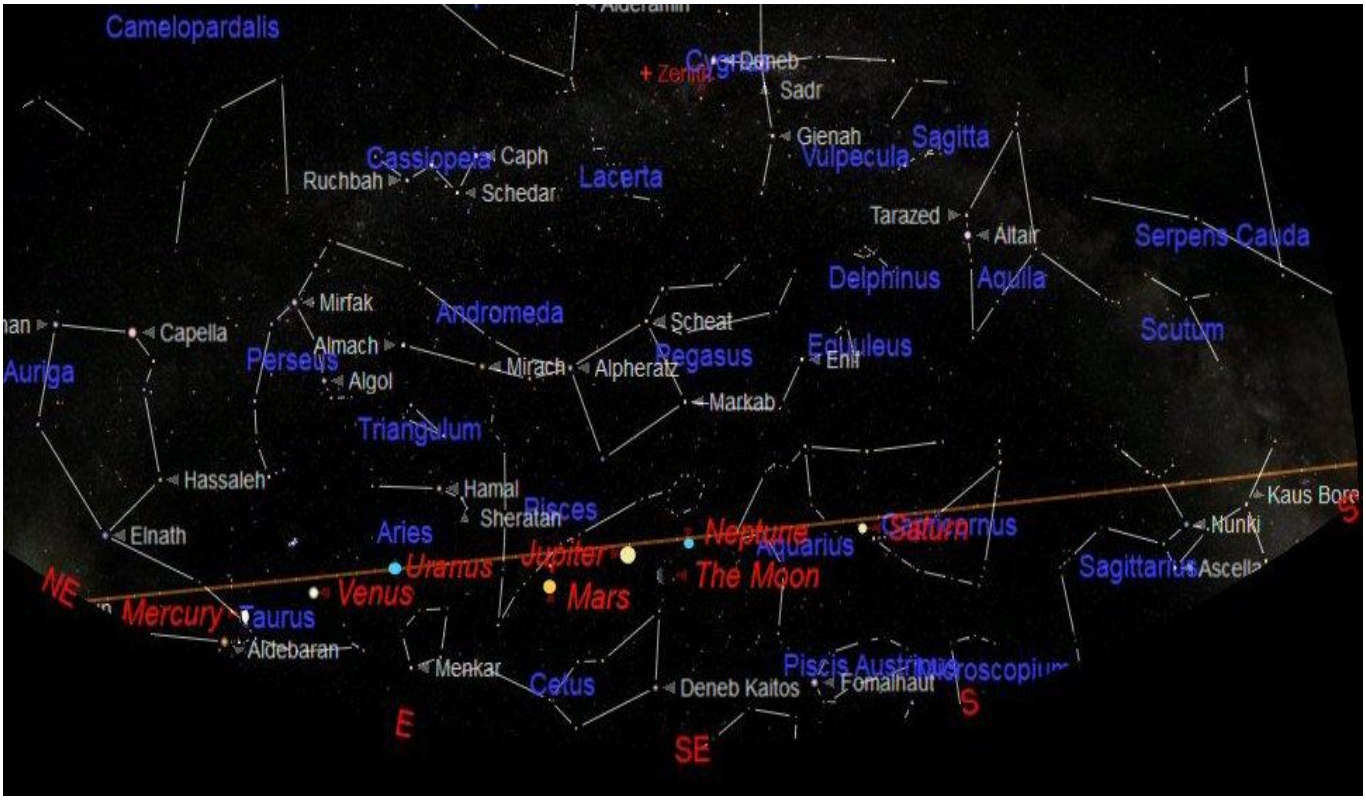
NEWBURY ASTRONOMICAL SOCIETY MEETING

10th June Space Weather Forecasting
Website: www.newburyastro.org.uk

NEXT NEWBURY BEGINNERS MEETING

15th June Observing the sky during the summer
Website: www.naasbeginners.co.uk

OBSERVING DURING THE SUMMER



The planets in the morning sky in mid June at about 04:30 (before sunrise)

With the nights being short and the days being long during the summer astronomers usually take a break from observing the night sky and possibly follow other 'summer' pursuits. However, for the determined astronomer there are still some interesting astronomy related things look out for and other things that are more loosely linked to astronomy.

Solar observing is one particular area where astronomical interest continues throughout the year and is particularly suited to the longer, brighter and warmer days of summer. Sun spots can be observed using very modest equipment. Most telescopes can easily be converted for solar observing by fitting a special solar filter. Alternately the Sun can be observed by directing the image from the eyepiece on to a white card screen. Remember the Sun must never be observed directly even just looking directly at it with our eyes can be dangerous.

The Moon can also be observed throughout the summer and is bright enough to be seen during the day. The summer nights are good for just looking at the full Moon. The Ecliptic (the imaginary line along which the Sun, Moon and planets appear to move across the sky) is very low and close to the horizon during the summer nights. It is however high in the daytime sky as can be seen by the Sun being close to overhead in the middle of the day. When we see the full Moon rising over the eastern horizon during the summer evenings it looks particularly large. We call this the 'Harvest Moon'.

As the year moves on towards autumn the planets will begin to appear in the darkening evening sky but this summer we will need to get up in the early morning to see them. The planets Mercury, Venus and Uranus will be difficult to see as they rise as the sky is beginning to brighten just before sun rise. Jupiter, Saturn, Mars and Neptune can be observed before midnight and before retiring for a reasonable time of sleep.

Venus will be bright in the morning sky but will be moving towards the Sun so will be appearing smaller but will be displaying a fuller phase. Venus remains at about the same brightness (magnitude) through its cycle of phases. When it appears as a thin crescent it also appears with a much larger diameter. As the phase progresses through a widening crescent and gibbous phases the apparent diameter becomes smaller as it moves further from us and journeys around behind the Sun. It therefore remains at about the same magnitude -4.2.

As the Sun is only just over the northern horizon during mid-summer the sky will never be completely dark even at midnight there will some brightness towards the north. This is because the Sun is only just over the horizon.

As astronomers spend a lot of time looking into the night sky they tend to spot satellites passing overhead but most people don't notice them. For those who take the time to lookout for satellites there is a surprisingly lot of them. In fact in a fairly dark night sky there are usually 3 to 5 brighter satellites in view at any time. In reality there are dozens up there in view at any one time if they are actively sought out. It is actually quite good fun to do a satellite spotting hunt with friends, it is not astronomy but it is good fun anyway.

During the month of June there is also the opportunity to see some very rare and beautiful cloud formations. These are known as Noctilucent Clouds (Night Clouds). They can only be seen at night and only in the weeks before and after Midsummer Day. Again this is not strictly an astronomical subject but astronomers are well placed during June to see these rare displays of nature.

GETTING TO KNOW OUR MOON

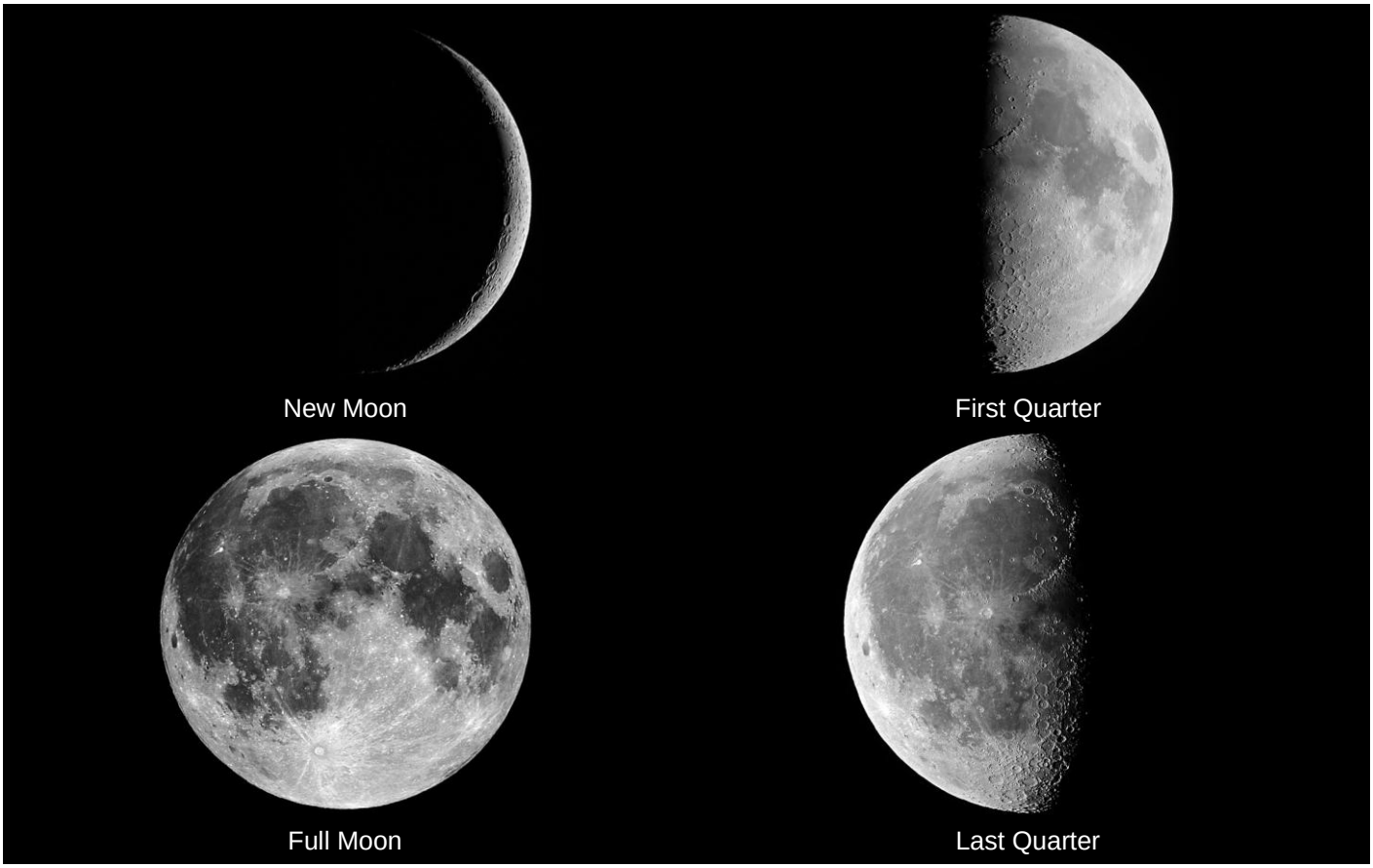


Chart showing the phases of the Moon

The images above show the four 'cardinal' phases of the Moon, known as: 'Quarters'. Each of the four quarters appears approximately seven days after the previous phase. So 'First Quarter' appears seven days after 'New Moon', 'Second Quarter known as 'Full Moon' appears another seven days later and 'Last Quarter seven days after Full Moon. The final quarter occurs seven days later when the Moon is in the same direction as the Sun and cannot be seen. This final quarter phase does not have a real name but is so close to the next New Moon that it is considered to be the same phase.

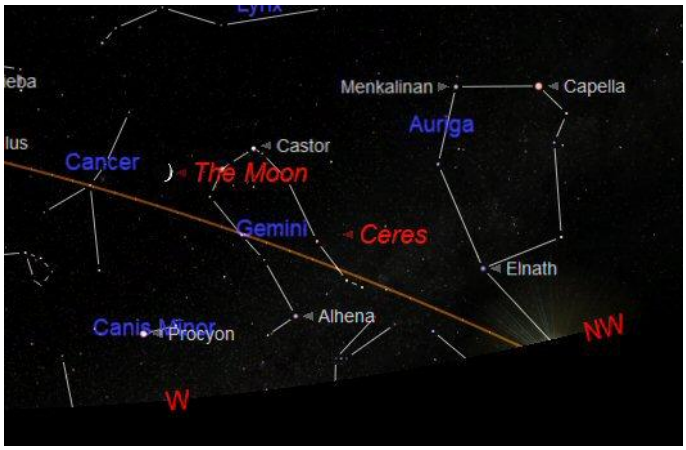
It is no coincidence that the phase cycle of the Moon takes one month to complete and there are twelve months in a year. This time period was named after the ancient term 'moonth' obviously referring to the time the Moon takes to orbit Earth. We will discuss different terms used for a number of aspects of the actual orbit later.

Our observations of the Moon can begin when the 'New Moon' is first seen in the sky. Some keen Moon observers like to spot the Moon at its very earliest appearance when it is a very narrow crescent. So this begs the question, why do we get a New Moon?

For a start let's clear up one obvious point, the Moon is never new, it is over 4 billion years old and we see the same Moon every month. When the Moon is in direct line with the Sun in the sky we cannot see it. This is firstly because the sky close to the Sun is so bright we would not be able to see the Moon anyway. Also the side of the Moon facing the Sun is illuminated so the side facing us on Earth is in shadow and dark (Night) so we could not see it even if the sky around the Sun was not so bright.

As the Moon moves away from its conjunction (alignment) with the Sun it appears to be moving eastwards when viewed from the surface of Earth. This is because the Moon moves along its orbit anticlockwise when viewed from above the North Pole. Therefore it appears to move from west to east (to the left) about 12° each day. Therefore one day (24 hours) after conjunction with the Sun the Moon will have moved 12° east (left) of the Sun.

The New Moon would normally not be visible until the 2nd or 3rd day after conjunction with the Sun. This is because the Moon is too close to the Sun and the sky is too bright. We would need to wait until the Sun is below the horizon to enable the thin crescent Moon to be seen in the darkening sky. It may be possible to see the New Moon in the west on 18th April just after the Sun has set.



The position of the New Moon on 3rd June at sunset

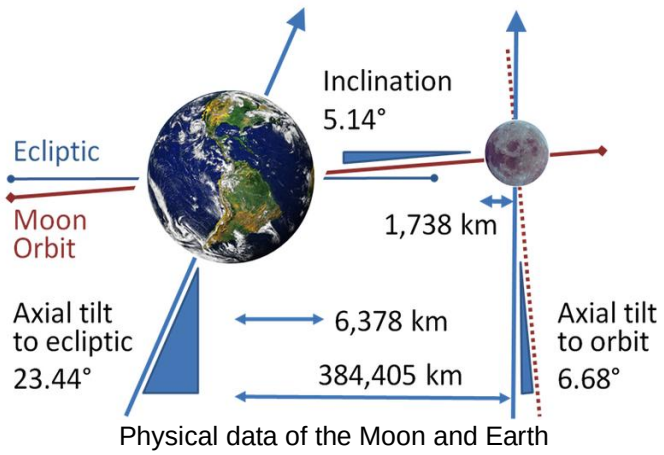
As the Moon continues to move from west to east around its orbit, more of the bright (day) side is revealed and the illuminated side appears as a wider crescent shape. When the Moon has reached approximately a quarter of the way around its orbit, in 7 days, it will appear as the 'Half Moon' or 'First Quarter'. The Half Moon will be located in the south as the Sun sets in the west.

After the first quarter, the crescent shape gives way to the shape known as the 'Waxing Gibbous' phase. This phase is produced when the Moon is positioned in its orbit where we can see between a quarter and all of the sunlit side (Full Moon). After 14 days the Moon is positioned directly opposite to the Sun and the whole of the sunlit side is visible so we see the 'Full Moon'. The Full Moon will rise in the east as the Sun sets in the west.

As the Moon continues on its orbit around Earth, the dark half of the Moon begins to appear and the sunlit side begins to move out of view. This is called the 'Waning Gibbous' phase. After about 21 days, only the left half of the Moon appears illuminated which is called the 'Last Quarter'. The final phase is the 'Waning Crescent' as less and less of the sunlit side is visible from Earth. Finally after 28 days the Moon moves back into direct line with the Sun and none of the sunlit side is visible.

The Moon takes approximately one month to complete its orbit around Earth; this is where the unit of time we call the month was derived from. The Moon takes 27.32 days to complete one orbit which is called a Sidereal Month. However, because Earth is also moving around the Sun, the Moon actually travels further and takes slightly longer to complete its cycle from one new moon to the next. The actual period it takes is 29.53 days and this is called a Synodic Month or Lunar Cycle.

The Orbit of the Moon is tilted at 5.14° to Earth's orbit so eclipses do not occur every month. Most months the Moon passes above or below the Sun and only occasionally passes in front of the Sun. Solar eclipses always occur when the Moon is directly between Earth and the Sun and the dark side of the Moon is facing Earth. The opposite is the case for Lunar Eclipses. These occur when the Moon is on the opposite side of Earth to the Sun and passes through Earth's shadow. The Moon will always be full during Lunar Eclipses and they always occur at night. The diagram below shows the relative tilts of Earth and the Moon. It also shows the Earth – Moon average distance at 384,405 km and the equatorial radii of the two bodies.



Physical data of the Moon and Earth

We can only see one side of the Moon from Earth because the rotation of the Moon has been locked due to the gravity of Earth. The Moon does appear to rotate once every Month when seen from outside the Earth Moon system. A number of factors enable us on Earth to actually see about 59% of the surface of the Moon in a process called 'Librations'.

The major part of the effect is due to the orbit of the Moon being slightly elliptical (oval). As the Moon passes through the major axis of its orbit (most distant) it moves slower around the orbit. This is rather like throwing a ball high into the air. As the ball rises it slows at the top of its arc then begins to accelerate as it falls back to Earth. The Moon slows as it moves further from Earth then accelerates as it is pulled back towards Earth. However the 27.32 day rotation time is constant causing the Moon to appear [from Earth] to rock back and forth as it moves around its orbit.

Other minor effects that allow a little more of the 'far side' of the Moon to be seen are due to the relative tilts in the orbits of Earth and the Moon. This allows us to see a little further over the poles of the Moon. When the Moon is at the lowest point on the tilt, the Moon appears slightly lower from Earth and we can see a little further over the top of the Moon. Conversely when the Moon is at the highest point on the tilt, the Moon appears slightly higher from Earth and we can see a little further around the bottom of the Moon.

Another effect that helps see the poles is the 23.44º axial tilt of Earth. Somewhere like the UK has a variation in 'relative height (from the Ecliptic)' of about 4000 km due to the change of position on the sphere of Earth from summer to winter. This gives us a slightly higher and lower vantage point from summer to winter.

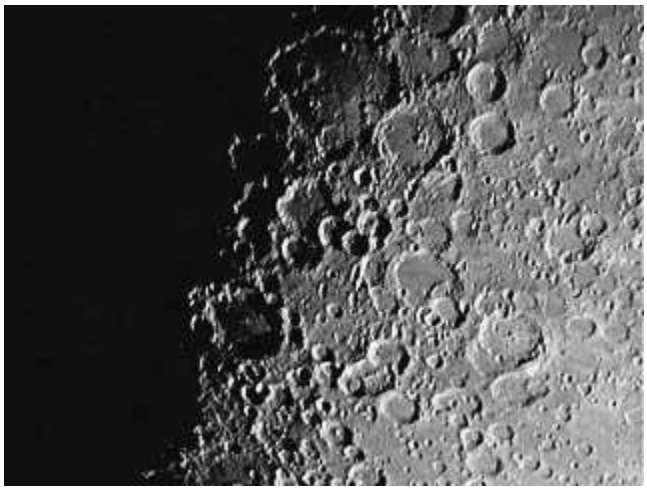
Many astronomers enjoy the challenge of looking for features that are normally hidden just over the edge of the Moon when they briefly appear thanks to the librations.

The 'far side' of the Moon had never been seen until early space flights took cameras around the Moon and transmitted the images back to Earth. Strangely the far side looks quite different to the near side. The far side has almost no Maria (seas) but does have an enormous multi ringed crater that looks like an eye. It is interesting to wonder what our ancestors would have made of this 'eye' like feature looking down from the sky, if it had been on the near side.

Observing the phases of the Moon does not need any optical aid and can be followed just using the naked eye. At full Moon the Maria (seas) can also be seen but to see the true shapes and some detail, binoculars or a telescope must be used. Binoculars will reveal the shape of the Maria and allow the smaller Maria to be seen. A larger pair of binoculars will show the larger craters and mountain ranges.

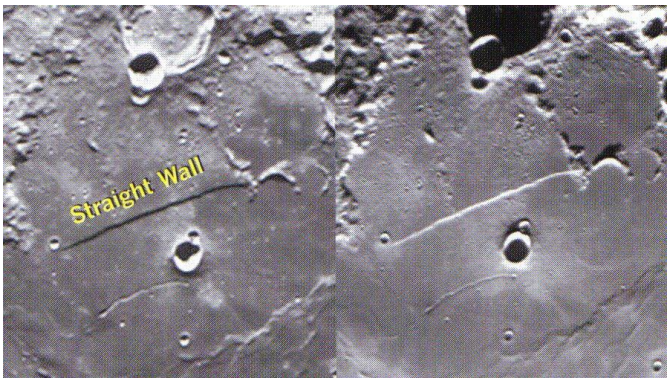
A small telescope will be needed to show any detail of the craters and the other interesting surface features such as Mountains, Cracks and ripples and rills on the smooth surfaces of the Maria. Maria (seas) are very old giant impact craters that have filled with lava from below the surface when the interior was still molten.

Some areas of the Moon are more cratered than others. There are large areas that have so many craters that there appear to be no smooth areas at all. Other areas, particularly Maria, have almost no craters.

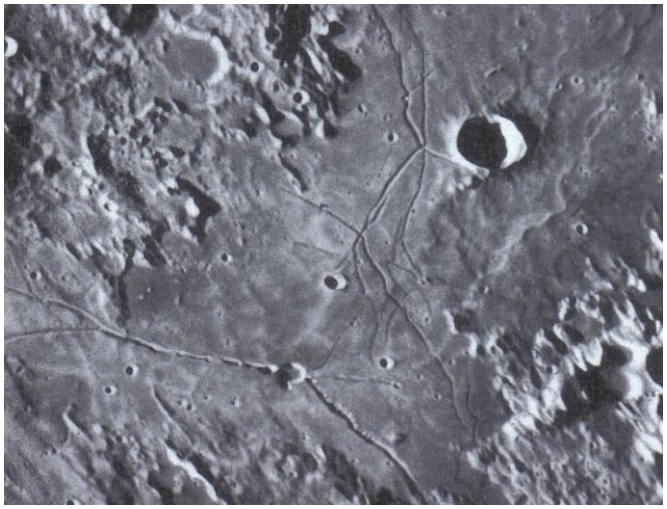


A heavily cratered area near the terminator image

There are also mountain ranges that are often named after mountain ranges on Earth. Most of these mountain ranges appear to be the walls of vast craters that have all but disappeared under ancient lava flows and the effect of later meteor impacts. There are however some that appear to be natural mountain ranges.

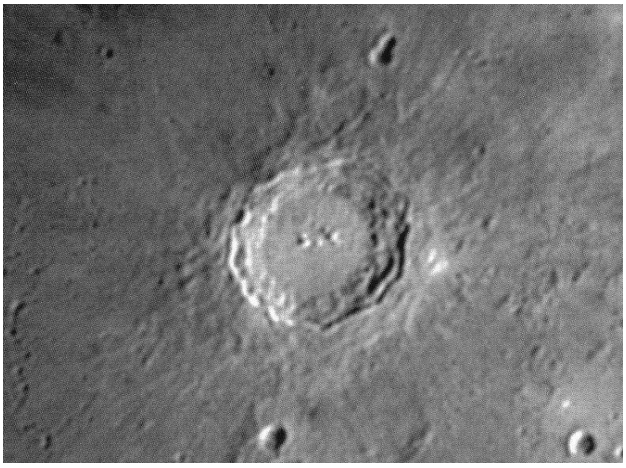


In the images above is a feature called the Straight Wall. This is a common type of feature known as a 'Rill' and appears to be a vast cliff face caused by a crack in the ground. In the left image the Sun is shining from the top casting a shadow towards the bottom but in the right image the Sun is shining from the direction of the bottom so the cliff face is illuminated and there is no shadow.



Cracks and rills on a smooth surface

Craters are especially spectacular when viewed using a telescope (see the images below). Some of the larger craters may have terraced walls both inside and outside the main rim. There may even be smaller craters on the floor of the large crater or another craters may cut through the wall of a large crater. It is possible to work out the relative age of some craters. If one crater has cut through the wall of another then it must be younger than the one that has had its wall damaged.

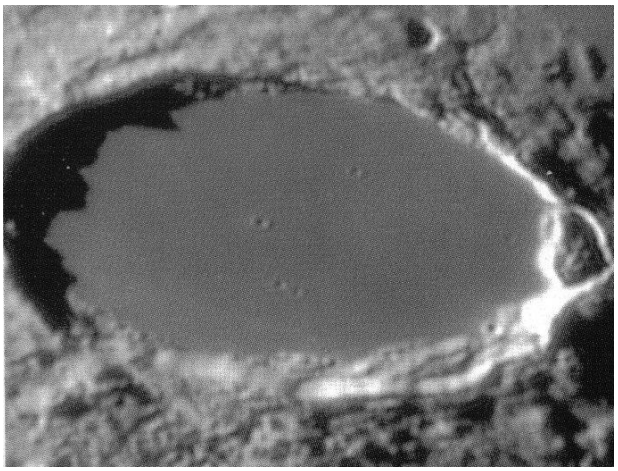


Copernicus showing the terraced walls and central peaks

Other craters have radial lines called rays stretching for many hundreds of kilometres where debris was thrown out by the impact when these craters were created.

Crater Tycho showing the prominent ray structure

Other interesting things to look for are smaller craters inside larger and impacts that have created craters on top of earlier craters.



The lava filled Crater Plato with the shadow of the rim

LOOKING FOR SATELLITES

Most people are completely unaware that satellites can be seen at any time when the sky is dark and clear. All that is needed is the time to take a look around the night sky. Amongst the background of 'fixed' stars we sometimes see one that appears to be moving across the sky, this may be a satellite. However we must be careful because there are many airliners high in the sky especially in the main air corridors like we have across Southern England. Luckily we can easily distinguish the planes because they have flashing lights but satellites do not. A pair of binoculars will greatly assist in distinguishing one from the other.

At any one time a keen observer may be able to pick out quite a number of satellites moving through different parts of the sky. They can be seen everywhere and moving in different directions but one type can be distinguished from the others. These are the Polar Orbiting Satellites that move in a north - south or south – north direction and are mainly Global Surveying types. They use this special orbit, passing over the poles.

Earth rotates under the orbit and allows the satellite to scan a different (north – south) strip on each orbit. Some of these satellites can survey the whole Earth each day. Satellite orbits vary greatly and depend on the purpose of the satellite. Satellites are classified in a number of different ways. Well-known (overlapping) classes include low Earth orbit, polar orbit and geostationary orbit (satellites that appear stationary in the sky).

In the context of spaceflight, a satellite is an object which has been placed into orbit by humans. Such objects are sometimes called artificial satellites to distinguish them from natural satellites such as the Moon. Satellites are used for a large number of purposes. Common types include military and civilian Earth observation satellites, communications satellites, navigation satellites, weather satellites, and research satellites. Space stations and human spacecraft in orbit are also satellites.

A long exposure image of the ISS

The easiest satellite to see is the International Space Station (ISS). It is by far the largest and brightest satellite in orbit. The ISS always moves from west to east but moves further south and north so is not always visible from the UK. A very good website to find out about the times and position where satellites will be visible is: www.heavens-above.com. By signing up to the site the observing location can be entered so the times and co-ordinates of any satellite that can be seen from your location can be detailed.

Although, strictly speaking, satellites are not astronomic objects they are interesting to see. Astronomers can't help but notice them as they look up into the night sky. The appearance of all satellites can be predicted so we can look out for them as they appear in the sky. Some satellites have large shiny parts on them that can reflect sunlight down to Earth and make them easy to see. Heavens-above will give the exact time and place where the bright flash can be seen. This can impress people who don't know about it.

An image of a satellite flare

Heavens-above will be able to give details of satellites that can be seen from your location. It will give the exact location in the sky and the exact time that the satellite will appear. So with an accurate clock and pre-knowledge of the position in the sky where it will appear the bright light in the sky can be mysteriously predicted.

It can be fun to just sit out under a dark sky and look for satellites. As an astronomer it is only right that we first have a look around the sky for any interesting astronomical objects and generally enjoy looking at the stars. Then we can get down to looking out for satellites. As with all night watching activities it always pays to be comfortable so a nice comfortable garden lounger will do nicely. Also make sure you have warm clothes on because it can soon get cold even on a warm summer evening.

All we need to do is look up into the sky and it does not matter which direction we look. Most satellites will look just like a moving star. Make sure it does not flash and it will likely be a satellite and not a plane.

An image of a satellite to the left of Orion

NOCTILUCENT CLOUDS (night clouds)

An image showing Noctilucent Clouds

Every year around mid-summer the Northern Hemisphere sky-watchers can catch a glimpse of the rare and very beautiful night clouds known as: Noctilucent Clouds. These mysterious, thin veils of clouds appear to form around Earth's upper atmosphere in the mesosphere, the highest level of Earth's atmosphere. At these heights near the edge of space, around 80 kilometres up, temperatures are a bone-chilling minus 100°C and the air is a million times drier than any desert.

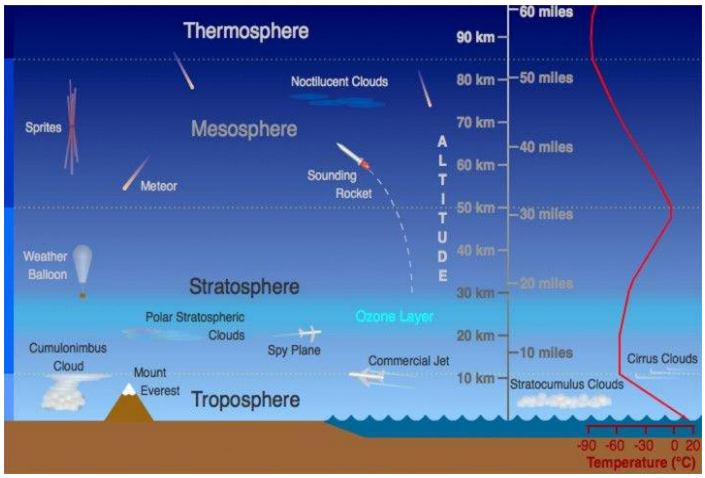


Diagram of Earth's atmosphere showing layers

Under these extreme conditions, water vapour freezes on to any dust particles floating in the region, seeding the ice crystals that form the tendrils and filaments of noctilucent clouds. Around dusk and dawn, the Sun is just over the northern horizon and brings the clouds to life, making them glow against twilight skies for observers further south. As the clouds are so high, they can be seen from hundreds of kilometres away. They are in sunlight high above Earth and they can be seen glowing like Mother of Pearl from over the horizon where it is midnight and dark.

Noctilucent clouds were first recorded in 1885 after a volcanic eruption on the Indonesian island of Krakatau which sent a massive ash cloud into the upper atmosphere that circled Earth for months. Spectacular red sunsets and the distinctive glowing clouds persisted for years. While such large volcanic eruptions are not all that frequent, nearly a hundred tons of meteoritic dust falls on Earth every day and this meteor dust largely seeds the formation of noctilucent clouds.

People living in latitude areas between 50º and 70º north have the best chance of seeing noctilucent clouds. Over the last century, the unusual sight has been reported more frequently. While it is a mystery why the clouds appear to be spreading, some scientists have suggested there is a link to climate change or rocket trails.

To catch sight of this beautiful seasonal phenomenon, look toward the north when the sun is below your horizon about an hour after local sunset. You can also look for them in the mornings in the north east about an hour before local sunrise.

In the image above the noctilucent clouds can be seen glowing in the sky above the northern horizon. Normal clouds are in the dark so are seen silhouetted against the bright sky above the local northern horizon. The noctilucent clouds are so high they are still in sunlight as the Sun is just 15° below the northern horizon as seen from southern England, see the diagram below.

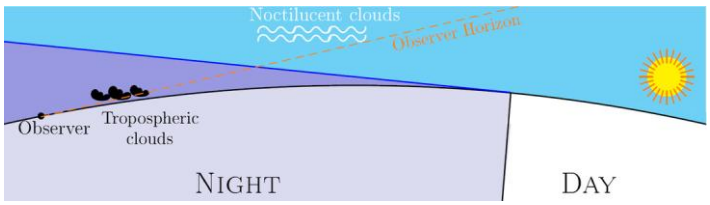


Diagram showing how the clouds are illuminated

SUN PHENOMENA TO LOOK OUT FOR

Sun Pillar imaged from Gibraltar by Dylan Correia

Sun pillars are beams of light that extend vertically upward from the Sun after it has set over the western horizon. They can be 5 to 10 degrees tall and sometimes even higher. They might even lengthen or brighten as you gaze at them. They are beautiful to see but for those who are not familiar with them, they can appear a little creepy and sometimes mistaken for UFO activity.

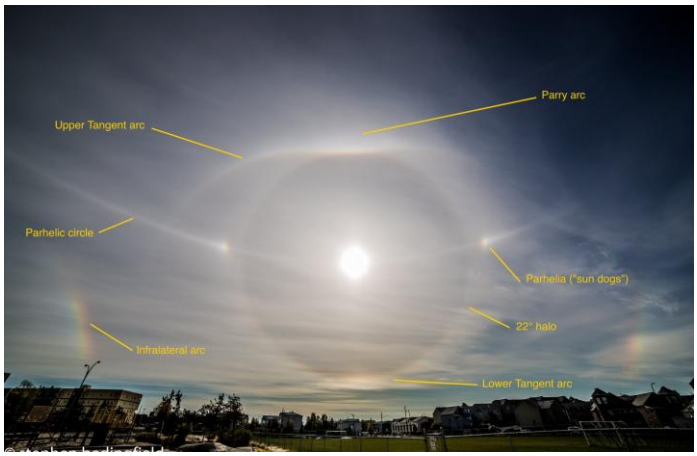
Sun pillars or light pillars form when sunlight reflects off the surfaces of millions of falling ice crystals associated with thin and high-level clouds for example, cirrostratus clouds. In the right conditions, vertical shafts of light can be seen extending upward from the Sun. These sun pillars are caused by light reflecting off hexagonal ice crystals drifting in Earth's atmosphere. The ice crystals are very small and have roughly horizontal faces so they act like millions of tiny mirrors. They are falling through Earth's atmosphere, rocking slightly from side to side.

So when is the best time to see a sun pillar and the best place to see sun pillars? It is necessary to have a clear view to the north western horizon where the Sun is setting. You will most often see sun pillars when the sun is low in the western sky just before and after sunset or low in the east just after the breaking of dawn. The sun pillar is normally brightest and most noticeable just after the Sun has set over the western horizon.

No special equipment is required to see sun pillars but if binoculars are used, to have a closer look, we must wait until the Sun has completely set below the horizon. Any camera can be used to take pictures but again it is necessary to wait until the Sun is completely below the horizon. The view of Sun pillars can be considerably enhanced when seen through Polaroid sunglasses.

A sundog in the clouds

Sundogs are what look like a bit of a rainbow appearing in misty clouds around the Sun. Most people will not notice sundogs unless they know about them. They are part of a much larger family of halos that can form around the Sun.



The full set of Sun Halos labelled

If we are very lucky we may be treated to an amazing display of Sun Halos. These mostly appear in regions of cold weather when ice crystals form in higher level clouds. It is very unusual to see the full array of halos but separate parts of the halo system appear more often.

Diagram showing a pair of sun dogs

In southern England we are sometimes treated to a display of the pair of sun dogs on each side of the Sun. It is not unusual to only see one sun dog on just one side. They can be quite faint but occasionally are quite bright.

A TOUR OF THE NIGHT SKY - JUNE 2022

The chart above shows the night sky looking south at about 22:00 BST on 15th June. 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 Gemini (the Twins), Cancer (the Crab), Leo (the Lion), Virgo (the Virgin), Libra (the Scales), Scorpio (the Scorpion) and Sagittarius (the Archer) just coming into view in the east.

The constellation of Gemini (the Twins) is moving over the western horizon. The two brightest stars in Gemini are Castor and Pollux that are named after mythological twins. Auriga (the Charioteer) is also moving west. The brightest star in Auriga is the brilliant white star Capella which is still visible in the west in the early evening.

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

The constellation of Leo (the Lion) follows Cancer along the Ecliptic and is a very interesting constellation. It does actually look a little like a lion or the Sphinx in Egypt. Around and between Leo and the neighboring constellation of Virgo is a cluster of galaxies. Our Milky Way galaxy and our local group of galaxies are members of this larger group of galaxies called the Virgo Cluster. A medium sized telescope (150mm to 200mm) and a dark sky is required to see these faint objects.

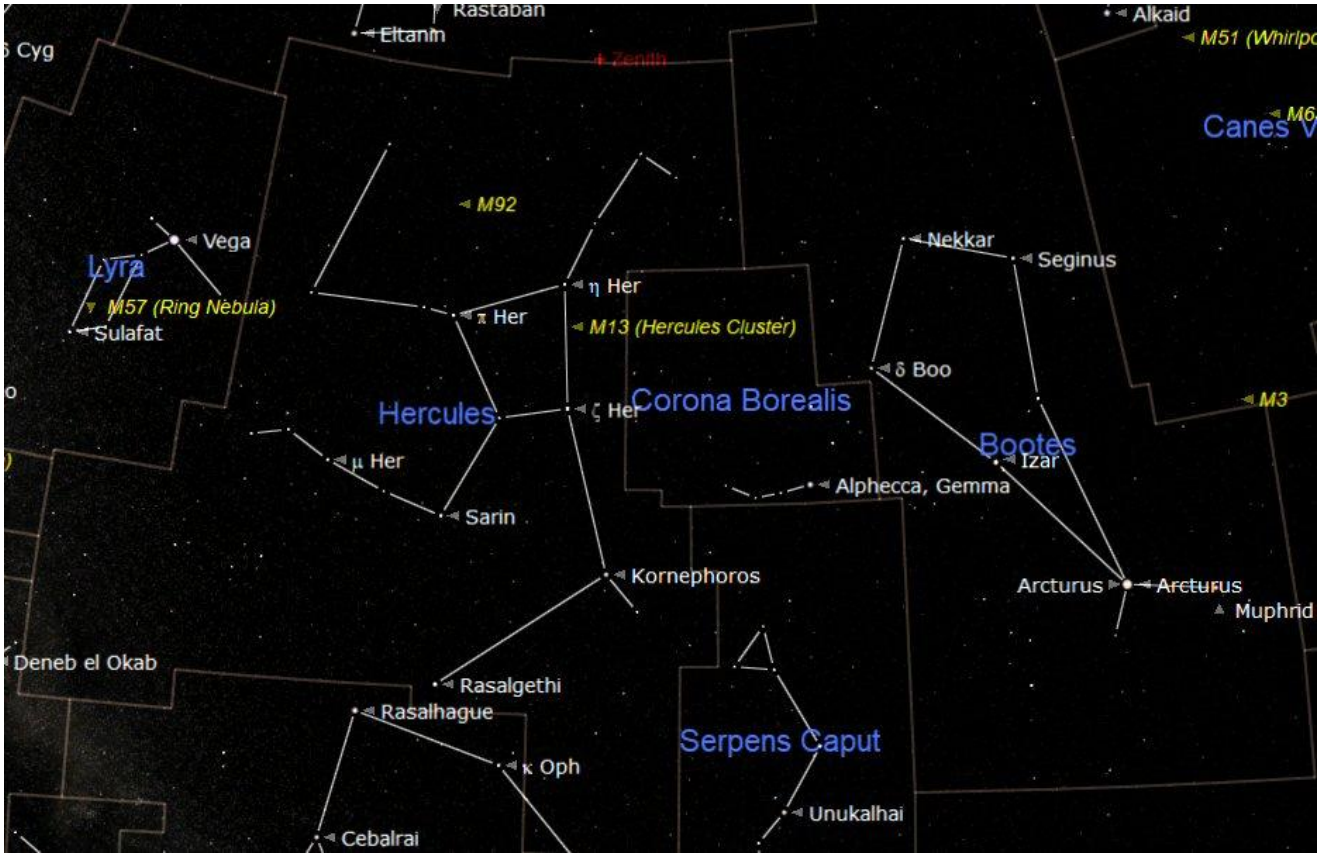
Following Leo is the less obvious constellation of Virgo but it does have one fairly bright star called Spica. Virgo gives its name to a large cluster of Galaxies that is also spread over into the neighbouring constellations of Coma Berenices (Berenices' Hair) and into Leo.

To the north of Virgo is the bright orange coloured star called Arcturus in the constellation of Boötes. Arctaurus is 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.

Higher in the south east is the constellation of Hercules (the Strong Man). Hercules has a rather 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 is the Great Globular Cluster, Messier 13 (M13). M13 can be found in the western (right) vertical imaginary line of the 'Keystone'. It is just visible using a good pair of 9 x 50 binoculars. The spherical cluster, of about a million stars that can be seen using a 90mm *f*10 telescope but will look even more impressive when using a larger telescope. See page 9.

Just moving into the eastern sky is the Summer Triangle that will begin to dominate the Summer Sky.

THE CONSTELLATIONS OF HERCULES AND BOÖTES



The constellations of Hercules and Boötes

The chart above shows the constellation of Hercules and its location to the west (right) of the bright star Vega in the Summer Triangle. Hercules is the great strongman from Greek mythology. He is usually illustrated in the sky (sometimes up-side-down) as the strong man with a club held above his head. The 'Keystone' asterism (shape) can be a little difficult to identify in a light polluted sky but easy to find again.

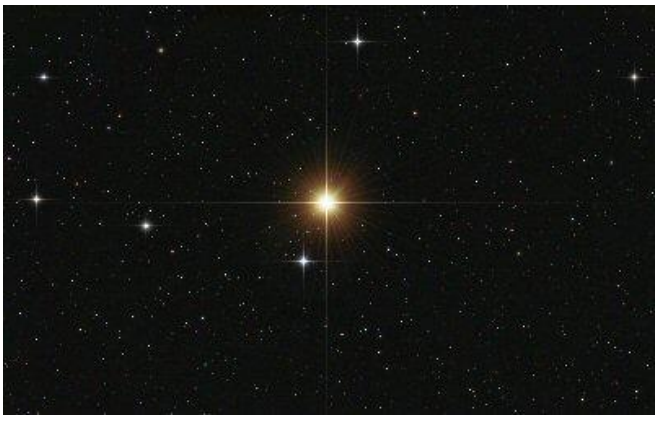
The jewel of Hercules is without doubt is the Great Globular Cluster, Messier 13 (M13). M13 can be found in the western (right) vertical imaginary line of the 'Keystone'. It is just visible using a good pair of 9 x 50 binoculars. The spherical cluster, of about a million stars, can be seen using a 90mm *f*10 telescope but will look even more impressive when using a larger telescope.

The Great Globular Cluster in Hercules

Globular clusters are thought to be the cores of small galaxies that have ventured too close to a Giant Spiral Galaxy like our Milky Way. The outer stars of these smaller galaxies have been stripped away, by the gravity of the giant spiral. This process has left the dense cores as clusters of between 100,000 and a million stars. There are about 100 Globular Clusters in a halo around our Milky Way. There is another Globular Cluster in Hercules called M92 but it is further away and needs a telescope to see.

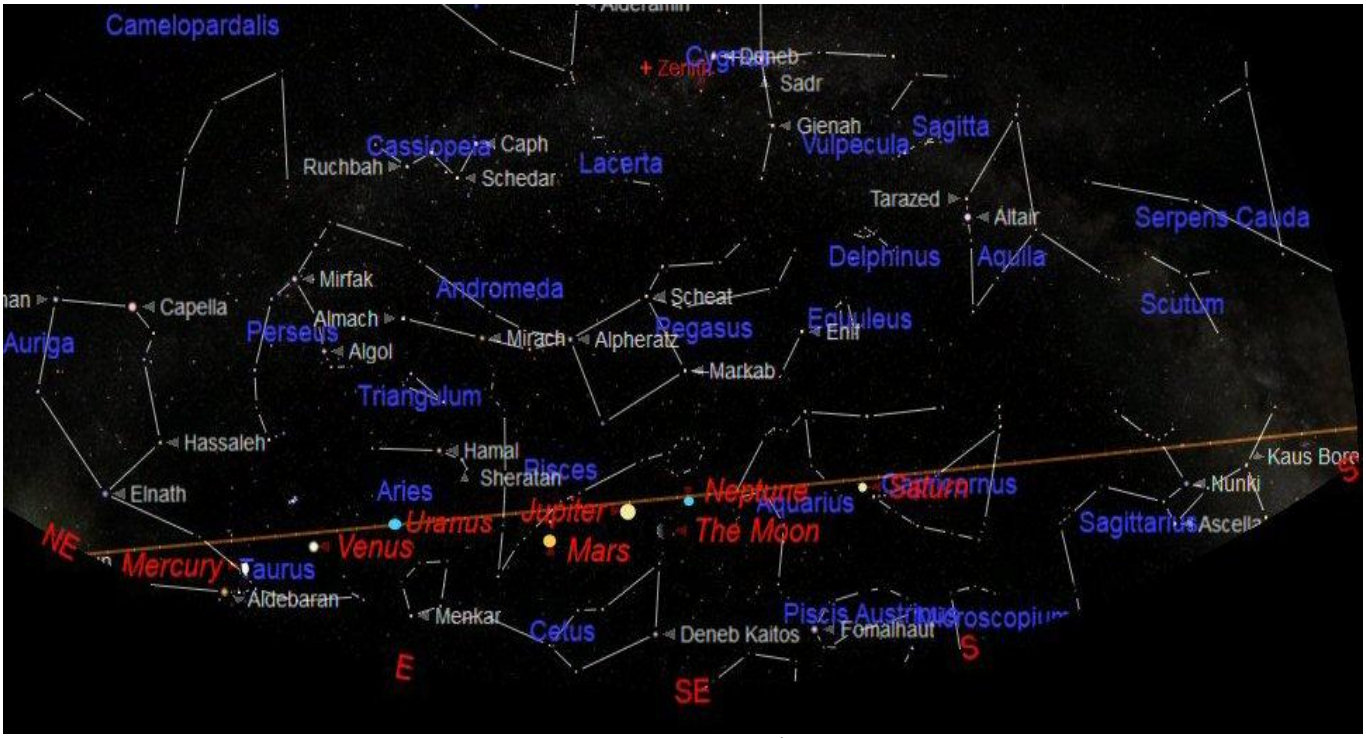
To the west of Hercules is the bright orange coloured star called Arctaurus in the constellation of Boötes the Herdsman. Arctaurus is the only bright star in Boötes, the other stars are fainter and form the shape of an old fashioned diamond shaped kite with Arctaurus located where the string of the tail would be attached.

Arctaurus is a Red Giant star that is slightly larger than our Sun but older 7 billion years. It has used almost all of its Hydrogen fuel and has expanded in diameter to around 25x that of our Sun. At the moment it shines 115 times brighter than our Sun but it is destined to collapse to become a White Dwarf and a Planetary Nebula.



The beautiful Red Giant Star Arctaurus in Boötes

THE SOLAR SYSTEM - June 2022



The location of the planets at 04:30 BST on 21th June 2022 the Summer Solstice

The chart above shows the location of the planets along the Ecliptic in the early morning sky. The sky has been darkened to make the planets visible. The planets are: (in order as they appear before sunrise) Saturn, Neptune, Jupiter, Mars, Uranus, Venus and Mercury. The planets appear low in the sky, in the bright morning or evening sky so are not well positioned for observing.

MERCURY was at Inferior conjunction with the Sun on 22st May. After conjunction it moved into the morning sky and is now rising just before the Sun. Mercury will be at its greatest westerly elongation on 16th June when it will be at its apparent furthest point from the Sun.

VENUS rises about one and a half hours before the Sun climbs over the eastern horizon. It is looking very bright in the east before sunrise. It is moving back towards the Sun so it will appear to be getting smaller and will appear as widening from crescent to its gibbous phase.

MARS is still on the other side of the Sun (so appears very small) and still appears close to the Sun and will be quite difficult to see. Mars rises at about 02:00 over 2 hours before the Sun and will not appear in the evening sky again until after September 2022.

JUPITER rises over the eastern horizon at about 01:30. It is bright and observable but is low over the eastern horizon before sunrise. The cloud markings will just be visible on its shimmering disc in the turbulent air.

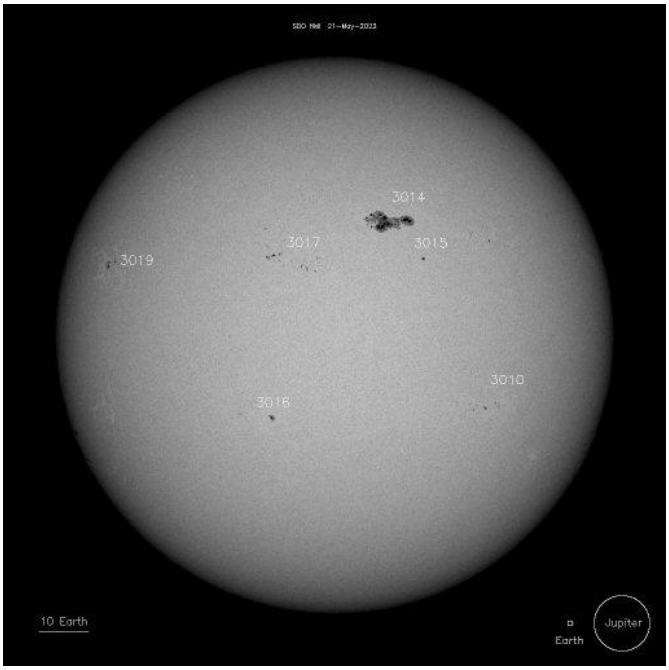
SATURN is the first planet to appear over the eastern horizon so will be appearing in the morning sky soon after midnight. It will be very low over the eastern horizon in the brightening sky and difficult to see but will be moving into the evening sky later in the summer.

URANUS will not be observable this month as it was in conjunction with the Sun on 5th May. It rises at about 03:00 in the early morning sky just before the Sun. Uranus will be close to Venus on 12th June so will be a little easier to find.

NEPTUNE rises at about 01:30 so will be in the sky three hours before sunrise. It will still be difficult to see in the bright midsummer sky and will need a telescope to see as a small blue disc.

THE SUN

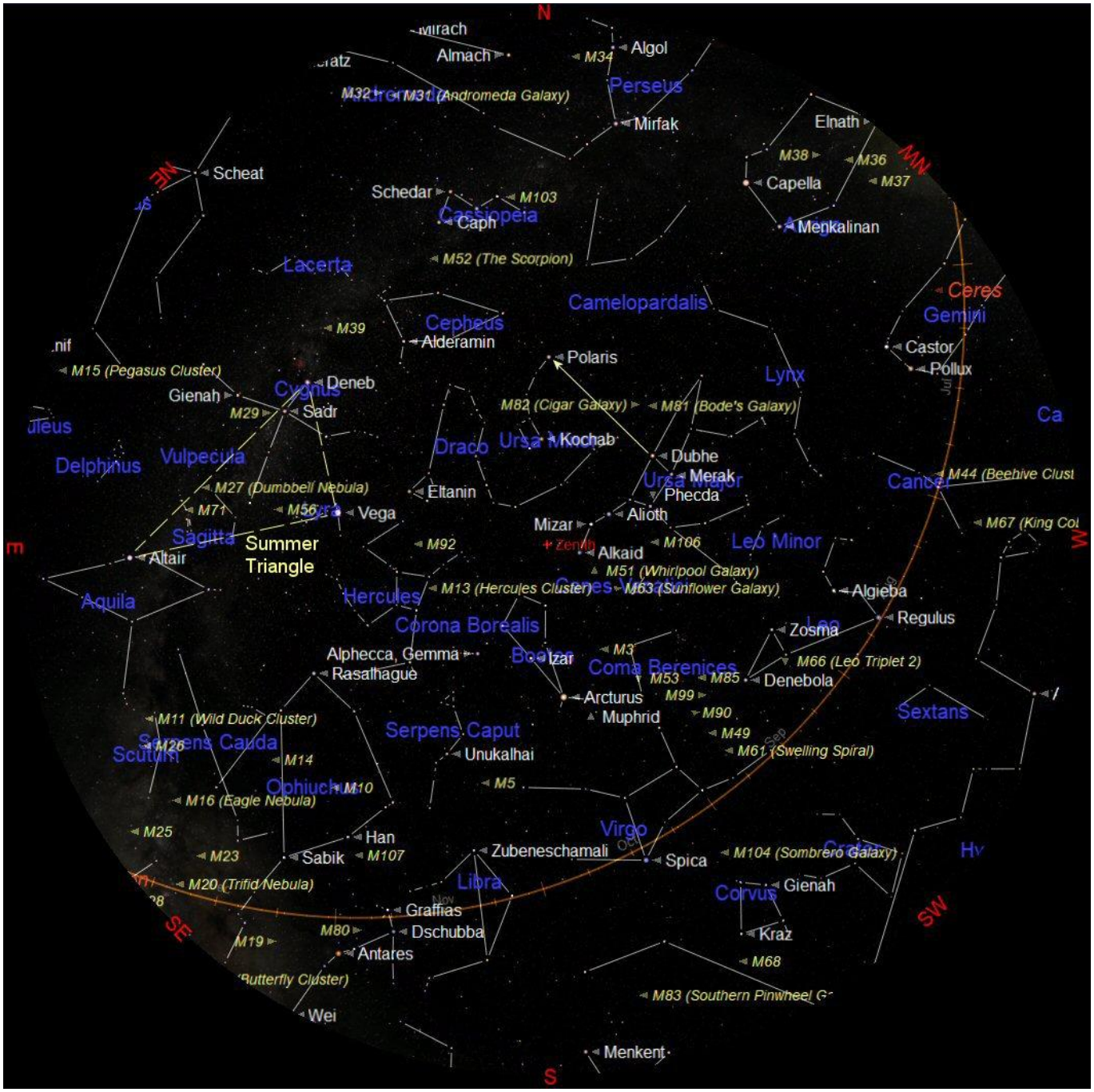
The Sun rises at about 04:46 BST at the beginning of the month and 04:44 by the end of the month. It sets at 21:12 at the beginning of the month and 21:20 at the end of the month.



Sunspots imaged by SOHO on 21st May

There have been a lot of very nice Sunspots and even some impressive groups of sunspots recently. 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 NIGHT SKY – JUNE 2022



The chart above shows the whole night sky as it appears on 15th June at 21:00 (9 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 8 o'clock BST at the beginning of the month and at 10 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 located high 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.

There are no planets visible in the evening sky this month.