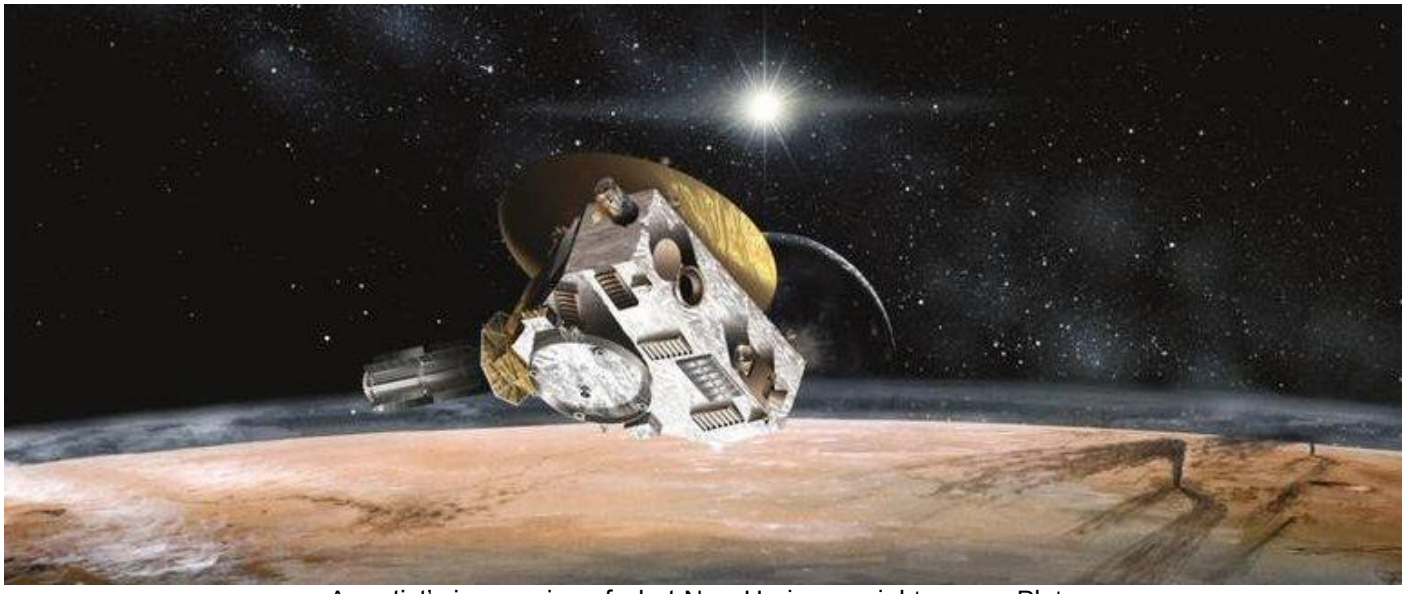
NEWBURY ASTRONOMICAL SOCIETY
MONTHLY MAGAZINE - JUNE 2015

This will be the last magazine of this session – Next issue September 2015

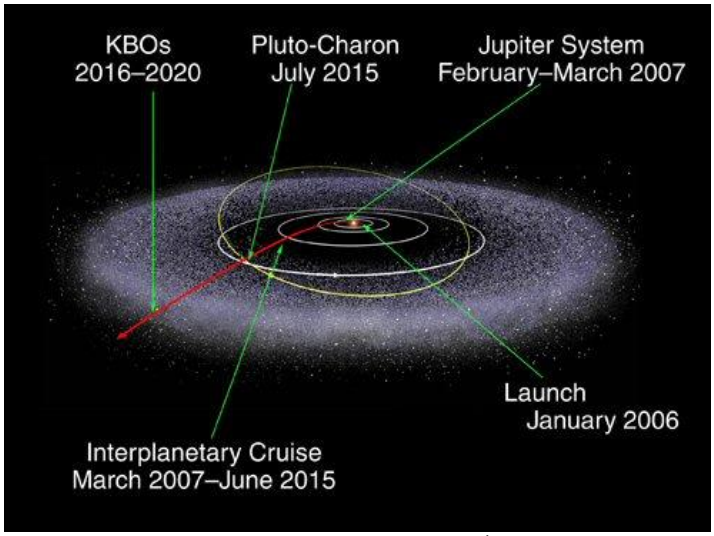
NEW HORIZONS ARRIVES AT PLUTO 14th JULY



An artist's impression of what New Horizons might see on Pluto

NASA's 'New Horizons' Probe is now approaching Pluto and will arrive at its closest approach to the Dwarf planet on 14th July. The probe was launched on 6th January 2006 on an Atlas V 551 rocket from Cape Canaveral, Florida bound for Pluto and beyond. At its closest approach with Pluto it will be just 10,000 kilometres from the surface of Pluto and will take the first detailed images of the Dwarf Planet.

The image above is an artist's impression of what New Horizons might encounter on its very brief encounter with Pluto. Some surface features have already been detected during testing of the onboard cameras. Lighter patches on the surface may be evidence of some kind of geological eruptions but may also be the result of recent impacts on the surface. There have also been hints of a possible thin atmosphere around Pluto.



The journey taken since launch on 6th January 2006

Pluto is thought to be a giant snowball 2300 kilometres in diameter comprised mainly of frozen Nitrogen, water ice and a possible rocky core. Pluto's largest satellite Charon is 1200 kilometres in diameter and also thought to be comprised mainly of water ice.

In the 1840s, using Newtonian mechanics, Urbain Le Verrier, a French mathematician, predicted the position of the then-undiscovered planet Neptune after analysing perturbations in the orbit of Uranus. Subsequent observations of Neptune in the late 19th century caused astronomers to speculate that the orbit of Uranus was being disturbed by another planet beyond the orbit of Neptune.

Pluto was discovered by a young researcher Clyde Tombaugh on 18th February 1930, after nearly a year of searching at the Lowell Observatory in Flagstaff, Arizona. Tombaugh discovered a possible moving object on photographic plates taken on 23rd January and 29th January of that year but a lesser-quality photograph taken on 21st January helped confirm the movement. Pluto was originally classified as the 9th planet in the Solar System but was re-designated as a Dwarf Planet after the discovery of many similar objects beyond Neptune.

Watch out for the first images on the news and the NASA 'New Horizons' website around the 14th July.

NEXT NEWBURY ASTRONOMICAL SOCIETY MEETING

4th September To be decided
Website: **www.newburyas.org.uk**

NEXT NEWBURY BEGINNERS MEETING

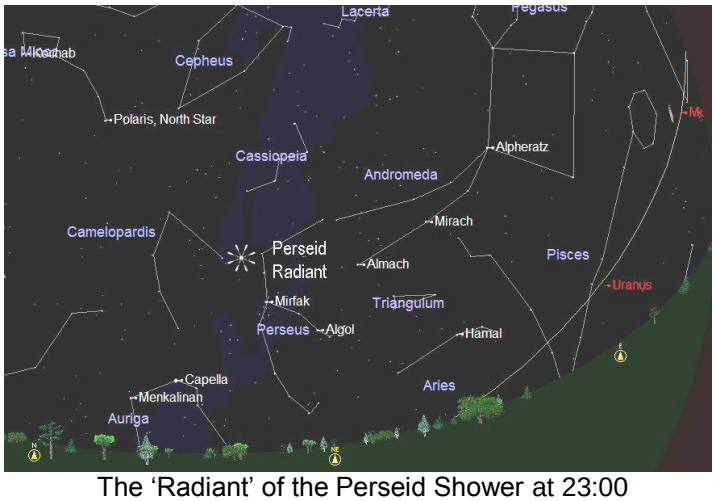
16th September Starting in Astronomy and The Autumn Sky
Website: **www.naasbeginners.co.uk**

THE PERSEIDS, THE FIRST METEOR SHOWER OF THE 2015 – 2016 SEASON

Meteor showers are notoriously unpredictable. The exact time of any spectacular increase in numbers or if the meteors will be bright is almost impossible to predict as is the clear weather needed to see them. However every year on the evening of the 12th August there is a spectacular display from the Perseid Meteor Shower.

Fortunately this year there will be no bright Moon on the 12th August so even the fainter meteors should be visible. The meteors of a shower appear to radiate from a point in the sky that is called the 'Radiant'. The meteors of this particular shower appear to originate from a 'Radiant' point in the constellation of Perseus. If the trail of any meteor that is seen can be tracked back and found to have originated from this radiant point it will be a Perseid. A few meteors might appear to originate from other directions so these are the meteors that might be seen randomly and not part of any named shower. These are known as Sporadic Meteors.

From a clear dark site, the constellation of Perseus can be clearly seen as a line of stars stretching from the very distinctive 'W' shape of Cassiopeia towards the northern eastern horizon. See the chart below.



The 'Radiant' of the Perseid Shower at 23:00

If the sky is clear the Milky Way (our galaxy) will be seen rising up from the northern horizon passing through Perseus, Cassiopeia and right across the sky though Cygnus and the Summer Triangle. The bright star Capella in the constellation Auriga will be twinkling noticeably close to the northern horizon.

No special equipment is required to see meteors but it does pay to make yourself comfortable for a meteor watch. It is essential to dress to keep warm. A warm coat should be worn along with a good thick pair of trousers or perhaps an extra pair of trousers or long legged underwear can be worn for additional comfort. It can get very cold during the night even in the summer. A garden lounger will make the observer much more comfortable and avoid getting a stiff neck from looking up for too long. It will also allow an extra blanket to be used if it is chilly.

Observing can start as soon as it is dark but there is likely to be more meteors during the hour or two after midnight. Position the lounger so that the northern horizon can be seen. Look at about 45º above the horizon and anywhere between west, through north and to the east. Meteors will appear as a fast streak of light flashing across the sky.

One or two meteors every five to ten minutes may be seen. Some might be quite faint and may be difficult to see from a well-lit area in the towns. Some quite bright meteors will be seen even from fairly light polluted skies. These may appear any anywhere in the sky from close to the radiant in the north to directly overhead. With a clear sky it may be possible to follow the tracks back through the constellations they passed through to the radiant point in Perseus.

Richard Fleet from the Newbury Astronomical Society captured many of the Perseid meteors last year on his DSLR camera from his home in Pusey, Wiltshire. Here are a couple of Richard's pictures:

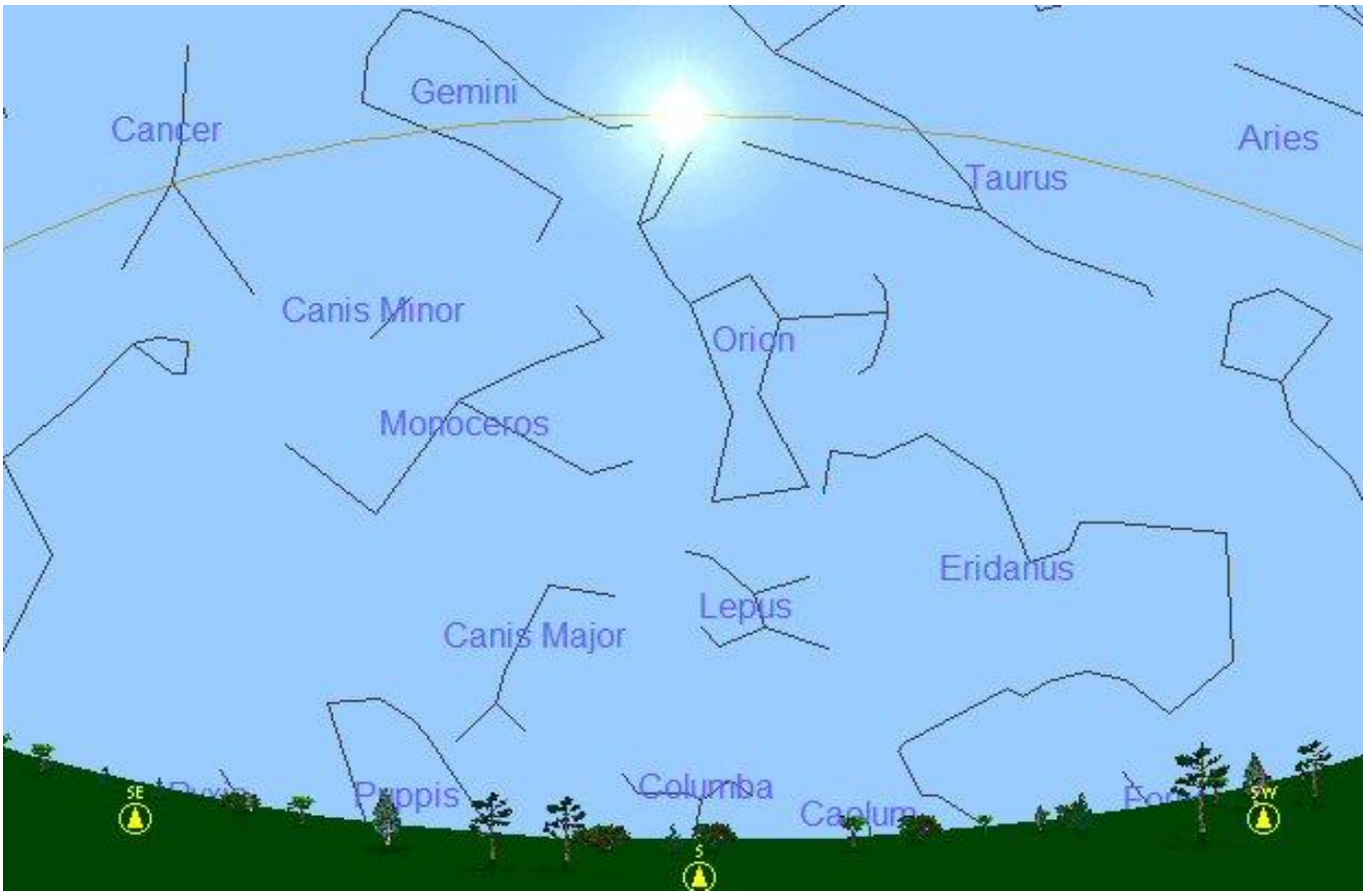
A Perseid meteor heading towards the Seven Sisters

A composite of all Richard's images

Other annual meteor showers are:

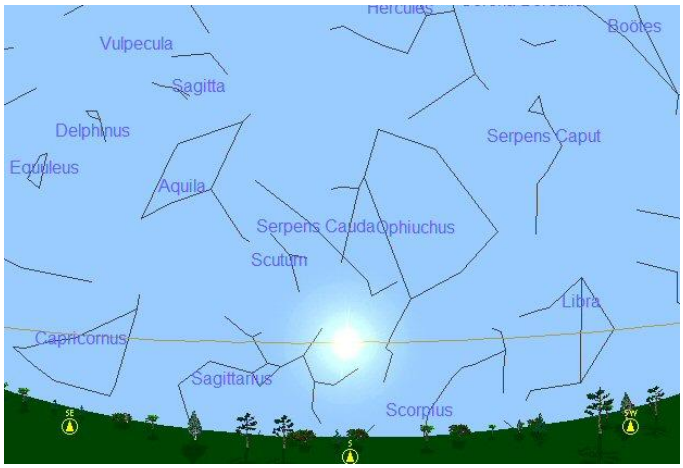
PERIOD	SHOWER NAME	MAXIMUM
Jan 1 – Jan 4	Quadrantids	Jan 3
April 10 – April 22	Lyrids	April 2
May 1 – May 8	Eta Aquarids	May 4
June 17 – June 26	Ophiuchids	June 19
July 15 - Aug 15	Delta Aquarids	July 27
July 15 - Aug 20	Piscis Aquarids	July 31
July 15 - Aug 25	Capricornids	Aug 2
July 27 – Aug 17	**Perseids**	**Aug 12**
Oct 15 – Oct 25	Orionids	Oct 21
Oct 26 - Nov 16	Taurids	Nov 3
Nov 15 – Nov 19	**Leonids**	**Nov 18**
Dec 9 – Dec 14	Geminids	Dec 13
Dec 17 – Dec 24	Ursids	Dec 23

WHAT MAKES OUR SEASONS



The daytime sky at midday on 21st June midsummer day (Summer Solstice)

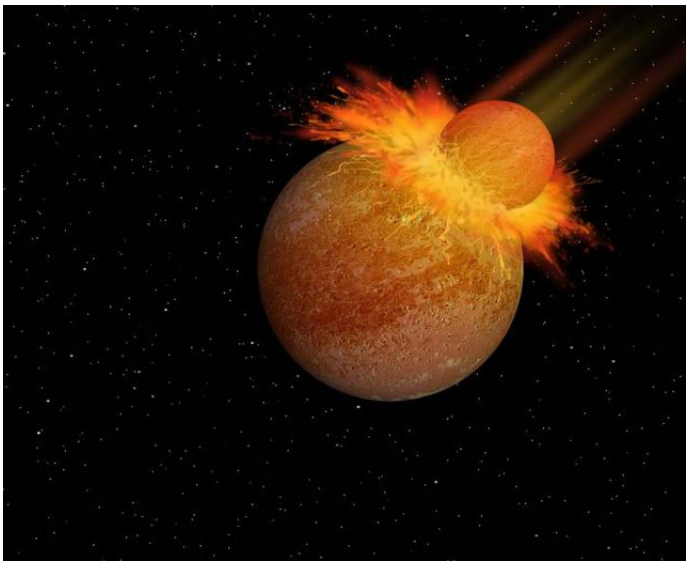
In many of our articles and in astronomical presentations we refer to the Ecliptic (the imaginary line along which the Sun, Moon and planets appear to move across the sky) but what exactly is the Ecliptic? Another question we need to consider is: why does the Ecliptic appear higher in the sky during the day in the summer and high in the night sky during the winter. The chart above shows the position of the Ecliptic on midsummer day this year with the Sun appearing very high in the sky. The diagram below shows the position of the Sun on the Ecliptic on midwinter day, 22nd December this year.



The Sun on the Ecliptic on midwinter day

In the night sky the height of the Ecliptic is reversed so it appears higher in the winter night sky and lower in the winter daytime sky. This is of course due to the seasons which are caused by the tilted axis of rotation of Earth.

The tilt of Earth's axis is thought to have been caused soon after the Sun and Planets were formed some 4.3 billion years ago. It is thought that another newly formed planet, about the size of Mars, collided with Earth and created our Moon. The impact completely destroyed the other planet that we call Thea and almost destroyed Earth. Fortunately for us the impact on Earth was off-set from the centre and a large mass was knocked off the edge to create the Moon. In the process Earth was pushed over and the 23.4º tilt we see today was created.

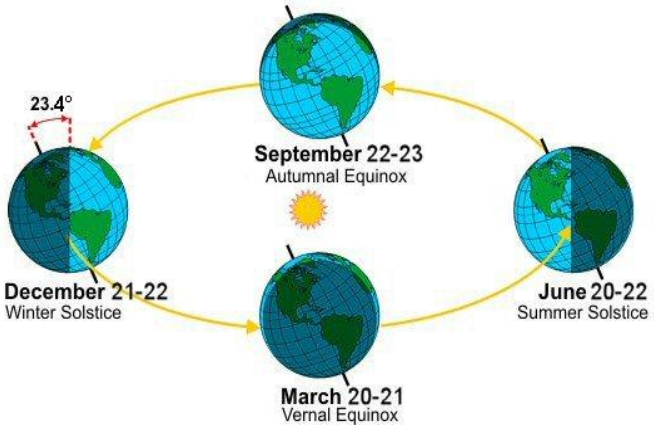


An artist's impression of the Thea impact

The 23.4º tilt gives us our seasons and presents us with a slightly more complex view of the solar system, the stars and the rest of the universe around us.

We all know that the Earth makes a complete revolution around the Sun (orbit) once every 365 days, following an orbit that is elliptical in shape. This means that the distance between the Earth and Sun which is 145 million kilometres (93 million miles) on average, varies throughout the year. During the first week in January Earth is about 2.5 million kilometres (1.6 million miles) closer to the sun. This is referred to as the perihelion. The aphelion or the point, at which the Earth is about 2.5 million kilometres farther away from the Sun, occurs during the first week in July.

This may sound a bit at odds to what we know about the seasons in the Northern Hemisphere but actually the difference in distance is not significant in terms of changing the climate and is not the reason why we have seasons. Seasons are caused by the fact that the Earth is tilted on its axis by 23.4°. The orientation of the tilt with respect to space does not change during the year and always points to a fixed point amongst the fixed background of stars. The Northern Hemisphere is tilted toward the Sun in June and away from the Sun in December, as shown in the diagram below.



The position of the tilt produces the seasons

The winter solstice marks the shortest day and longest night of the year. In the Northern Hemisphere, it occurs when the Sun is directly over the Tropic of Capricorn which is located at 23.4° south of the equator and runs through Australia, Chile, southern Brazil, and northern South Africa. At this time the northern axis (North Pole) is tilted away from the Sun so at midday the UK is at its most northerly position above the plane of the Solar System 'the Ecliptic'. The Sun therefore appears to be at its lowest position in the sky.

The summer solstice marks the longest day and shortest night of the year. The Sun is directly over the Tropic of Cancer, located at 23.4° north of the equator and runs through Egypt, United Arab Emirates, India, and Mexico. At this time the northern axis (North Pole) is tilted towards the Sun so at midday the UK is at its most southerly position above the plane of the Solar System 'the Ecliptic' and the Sun is at its highest position in the sky. It is the tilt of Earth's axis that causes the Ecliptic (the plane of the Solar System) to appear tilted at 23.4º across our sky.

This year, the Northern Hemisphere summer solstice will occur at 16:38 GMT on 21st June. The winter solstice will occur at 04:38 GMT on 22nd December.

CELESTIAL POLE the axis of rotation projected from the surface of Earth into the sky.

CELESTIAL EQUATOR the plane projected from the surface of Earth at 90º between the Celestial Poles. (Earth's true equator tilted at 23.4º to the Solar System).

ECLIPTIC the plane of the orbits of the planets of the Solar System (and our Moon). Superimposed on our sky it is the imaginary line along which the Sun, Moon and planets appear to move across the sky.

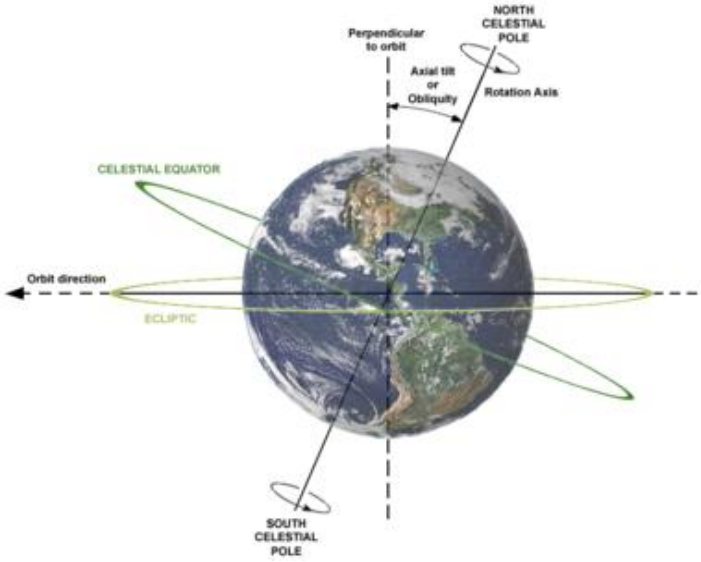
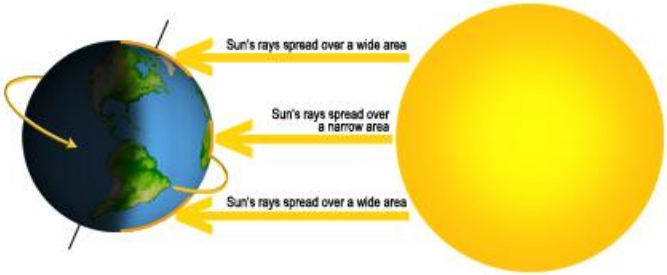


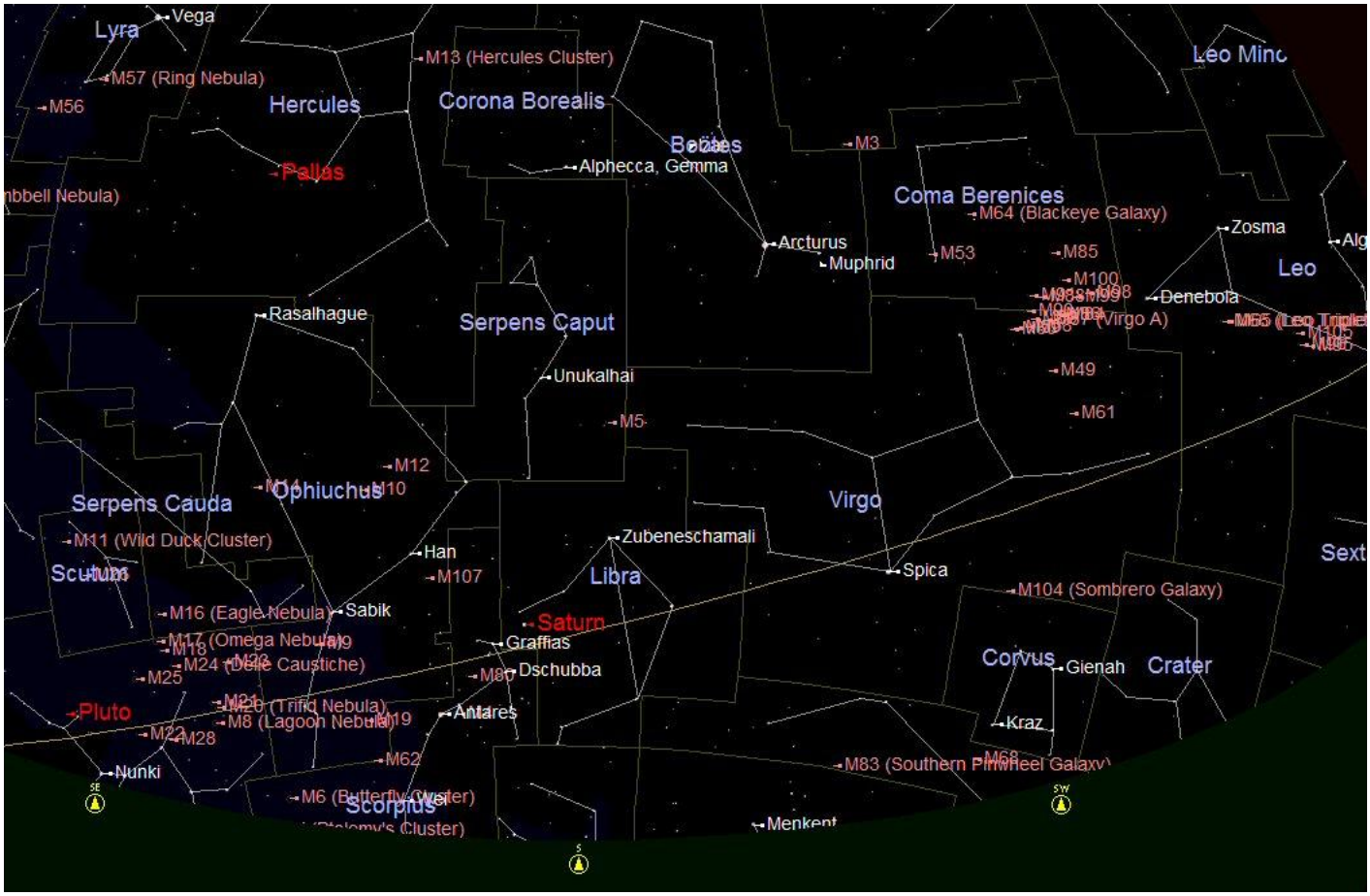
Diagram showing the tilt of Earth's axis.

There are two reasons why it is warmer in the summer. Firstly the heat from the Sun is concentrated over a smaller area at the equator because the rays are hitting the surface at a higher angle. During the winter, the UK is located further north during the day so the rays are spread over a larger area on the curved spherical surface. A square metre illuminated by the Sun directly overhead (at Earth's equator) may be spread over two square metres further to the north therefore each square metre will receive only half the heat from the Sun. Secondly the light from the Sun has to pass through more of the atmosphere during the winter before reaching the surface.



The main effect of the seasons on astronomers is the shorter nights in the summer. During the mid-summer months the sky does not get truly dark in the UK because the Sun is only just below the northern horizon even at midnight. Although the ecliptic is high in the sky during the day in summer, it is very low in the southern sky during the summer nights. This reduces the seeing (clarity of the view) when observing planets and the Moon during the summer because we will be looking through more of our atmosphere which is also more turbulent and polluted closer to the horizon. Deep sky objects such as nebulae and galaxies become more difficult to see due to the reduced contrast of the lighter summer night sky.

THE SUMMER NIGHT SKY 2015



The chart above shows the night sky looking south at about 23:00 on 15th June. The sky has been darkened on the chart to allow interesting objects to be displayed because the sky will not get fully dark. West is to the right and east to the left. The curved line across the sky is the ecliptic. This is the imaginary line along which the Sun, Moon and planets appear to move across the sky. The constellations through which the ecliptic passes are known as the constellations of the 'Zodiac'.

Constellations through which the ecliptic passes are (west to east): Leo (the Lion), Virgo (the Virgin), Libra (the Scales) Scorpius (the Scorpion), Orphiuchus (the Serpent bearer) and Sagittarius (the Archer) is just appearing over the south eastern horizon.

The most striking constellation now is the distinctive shape of Leo (the Lion) looking rather like the crouching Sphinx in Egypt. The brightest star in Leo is Regulus located almost on the ecliptic. Because it is located very close to the ecliptic it is often occulted by the Moon. This occurs when the Moon passes in front of Regulus. It is an interesting thing to observe and follow.

The most obvious feature of Leo is the distinctive back to front question mark '?' pattern of stars above Leo. This is known as the 'Sickle' due to its resemblance to the curved blade of a sickle tool used to cut hay and grass.

Although the constellation of Leo is quite large in the sky it may be just a little difficult to find for the first time especially in a light polluted sky. However once it is found it is much easier to locate. The rest of Leo to the east (left) of the 'Sickle' resembles the body and hind quarters of a resting lion.

To the east of Leo are the constellations of Coma Berenices and Virgo. Coma Berenices has no bright stars and no distinctive shape but on a clear night the three brighter stars can be made out. Virgo has one bright star called Spica that twinkles close to the horizon.

The whole area of sky around Leo, Coma Berenices and Virgo hosts many galaxies. These are the galaxies of our 'local cluster' of nearby galaxies. Our own 'Local Group' of galaxies is grouped around two large spiral galaxies one of which is our own Milky Way. The other is M31 the Great Spiral Galaxy in Andromeda. Our local group of 'close-by' galaxies are part of this larger group of galaxies which in turn is part of a super cluster of galaxies.

Further east is the rather faint constellation of Libra which is well placed over the south eastern horizon. Libra is of special interest this year because the beautiful ringed planet Saturn is resting within its bounds.

To the east of Libra are the southern constellations of Scorpius (the Scorpion) and Sagittarius (the Archer) the upper regions of these two constellations are visible above the southern horizon. North of Scorpius and Sagittarius are the large constellation of Orphiuchus (the Serpent) and the small constellation of Scutum. The sting and tail of Scorpius can be found by looking for the beautiful bright red star Antares. This is the 7th brightest star in the sky and appears distinctly red to the naked eye. It is a Red Super Giant with a diameter of about 880 times that of our Sun and is around 10,000 times brighter.

There are lots of Messier objects in this area with many being a 'must to look at' with a telescope. M11 the Wild Duck Cluster in Scutum is a lovely Open Cluster.

THE SOLAR SYSTEM THIS MONTH

MERCURY is very difficult to see very low in the east before dawn. Not really observable.

VENUS is now just about as high as it gets above the south western horizon in the evening sky. It is so bright at magnitude -4.4 that it cannot be missed.

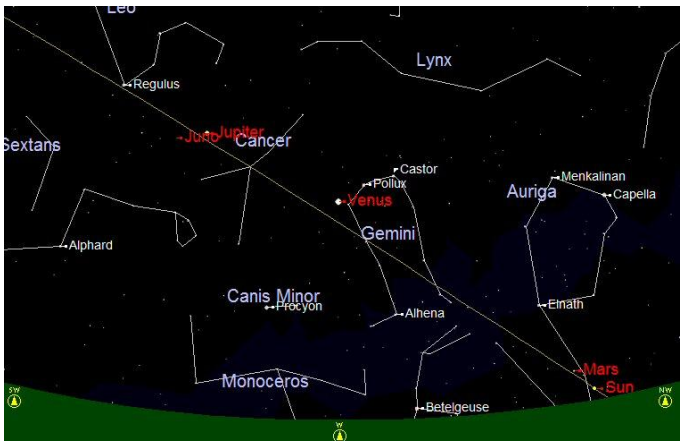
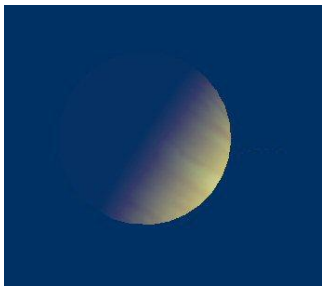


Chart showing Venus at sunset

As Venus moves further out from the Sun it is moving closer to us and will appear larger. However as it gradually gets larger it will become a thinner crescent shape so its brightness will remain almost the same. Venus will reach its greatest eastern elongation (and will appear 'half Moon' shaped) on 6th June when it will be at its greatest apparent distance from the Sun.



Venus at 21:00 1st June

Venus at 21:00 30th June

The images above show how Venus will be appearing larger but narrower through the month of June.

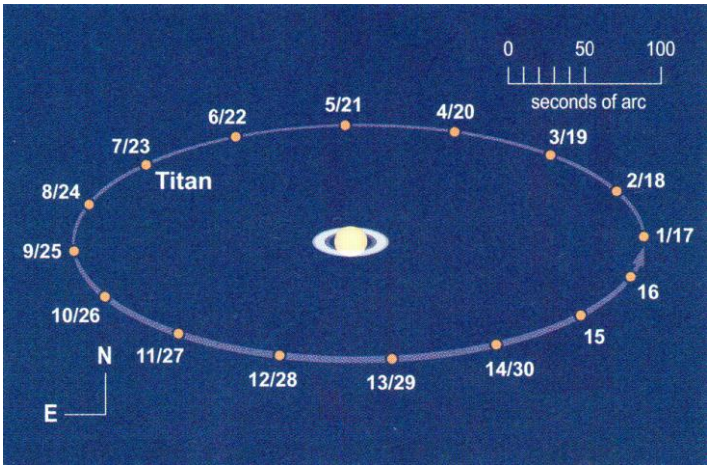
MARS will not be visible this month as it will be lost in the twilight glare as the Sun sets. See the Venus chart above.

JUPITER is located in Cancer and will be in the south west as the sky darkens. It will be visible until it sets in the west at 23:00. See the Venus chart above. The cloud belts and zones can be seen using a small telescope. See the advice for observing Jupiter using a telescope in the March issue of this magazine.

Jupiter is really past its best for this year but still in a reasonably good position for observing in the west as soon as the Sun sets. We are still looking straight down on the equator and therefore see the moons passing in front and behind the planet. This means we see the moons cast an eclipse shadow on to the planet.

June will be the last time to have a worthwhile look at Jupiter before it moves into conjunction with the Sun. We will then have to wait until early next year before it returns to the morning sky in the east.

SATURN rises at about 17:45 mid-month and will be well positioned for observing quite low in the south from about midnight until the sky begins to brighten. Saturn can be seen in the south and will be observable until about 02:30 when it sets in the west. Although the ring system is wide open the views of Saturn will not be great because it is located very low on the ecliptic in the south For those living in the southern hemisphere the views will be breathtaking with Saturn high on their winter ecliptic. It is also possible to see Saturn's largest moon Titan using a small telescope and up to six moons using a larger telescope.



The position of Titan during June 2015

URANUS rises in the east at about 01:00 so will be just observable in the early morning before sunrise.

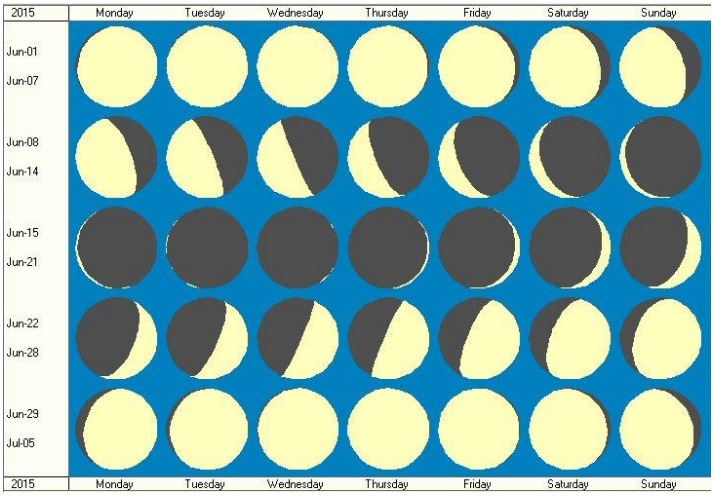
NEPTUNE rises in the east at about 23:55 so will be well placed for observing in the early hours this month.

THE SUN

The Sun rises at 03:45 at the beginning of the month and at 03:44 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 JUNE 2015



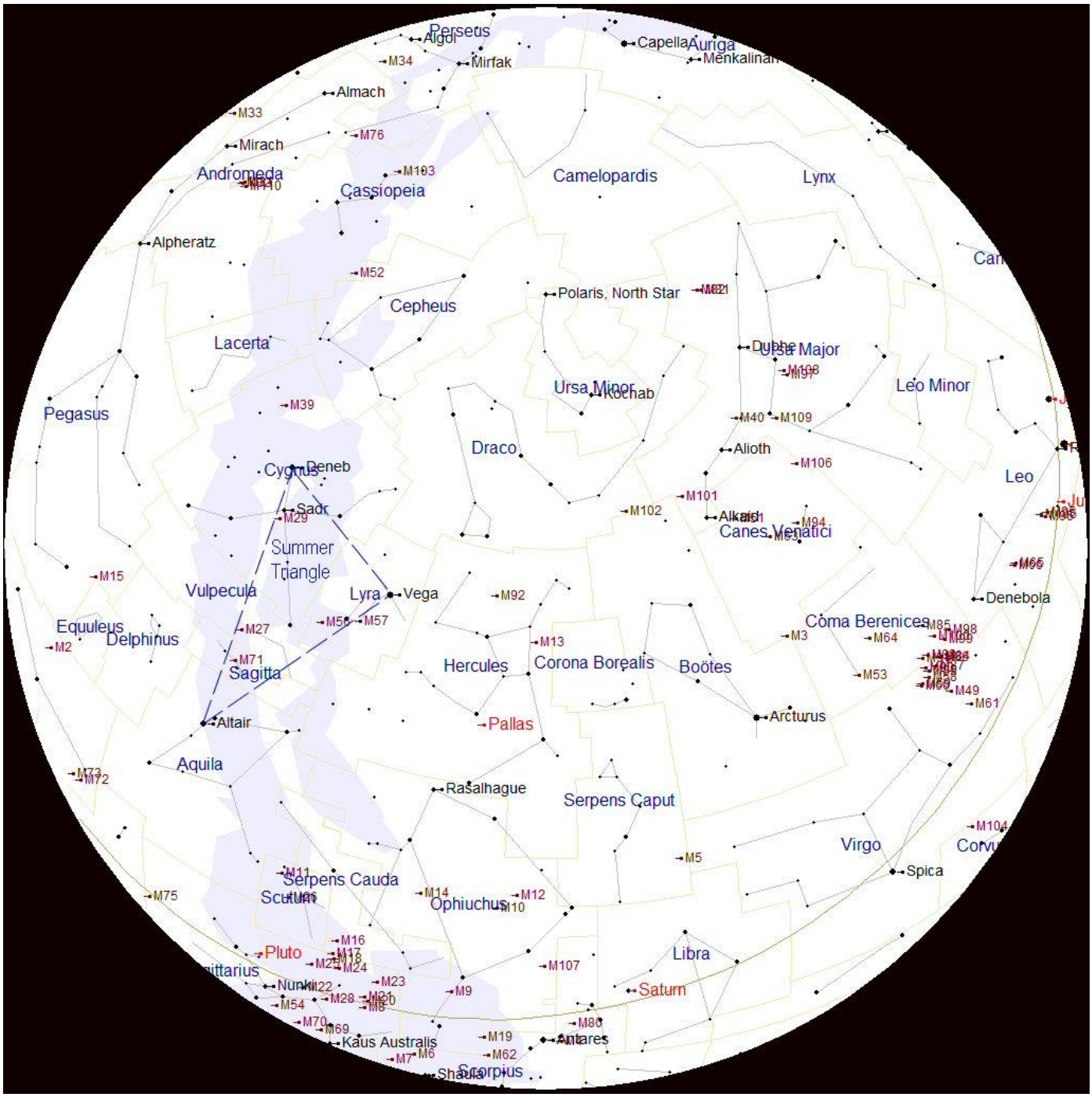
Full Moon will be on 2nd June

Last Quarter will be on 9th June

New Moon will be on the 16th June

First Quarter will be on 24th June

THE NIGHT SKY NEXT MONTH - JULY



The chart above shows the night sky as it appears on 15th July at 10 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 11 o'clock BST at the beginning of the month and at 9 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 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.

Planets observable in the night sky: Venus and Saturn.