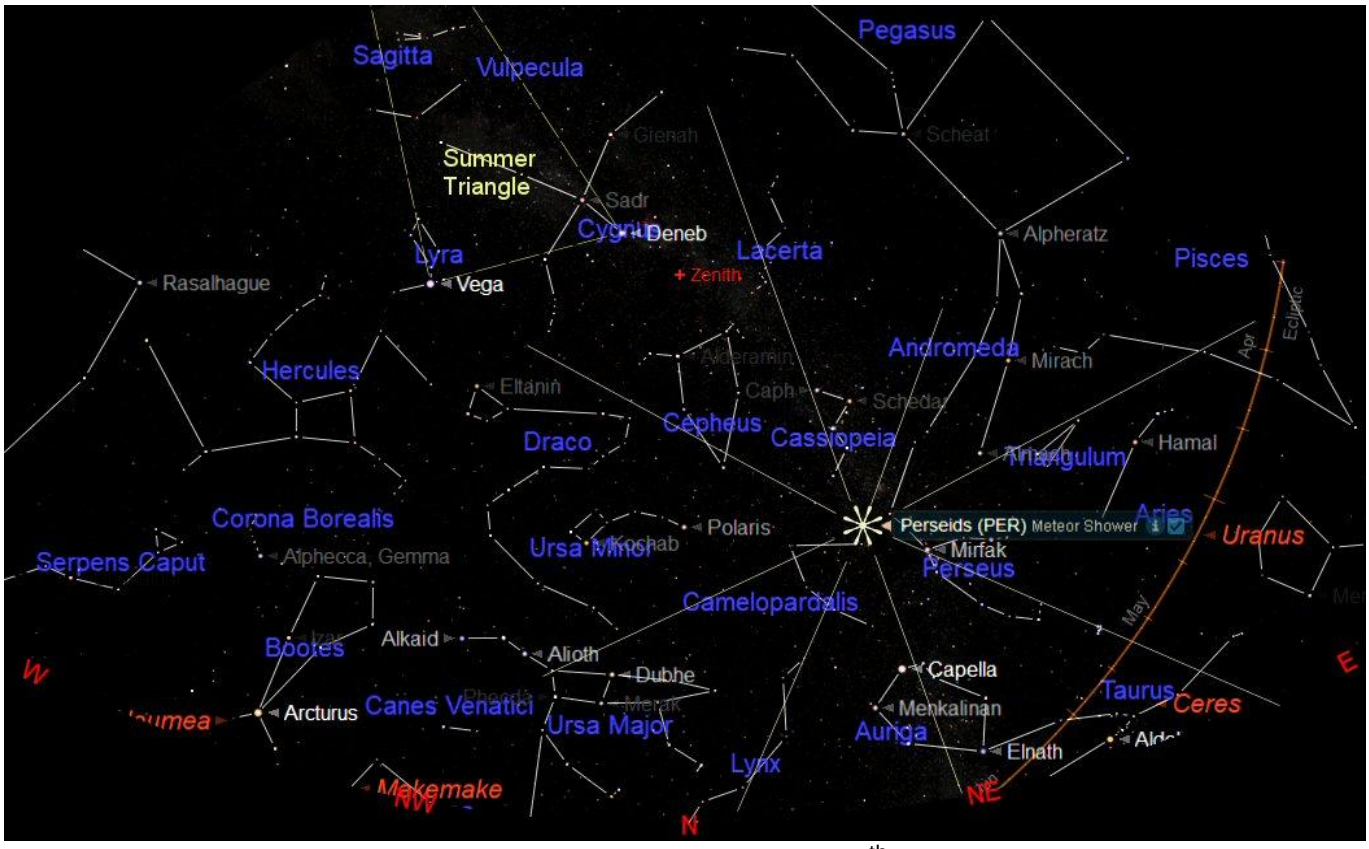
NEWBURY ASTRONOMICAL SOCIETY
MONTHLY MAGAZINE – AUGUST 2021

THE PERSEID METEOR SHOWER



The Perseid Meteor Shower Radiant at 01:00 13th August looking north

Meteor showers are notoriously unpredictable. The exact time of any spectacular increase in numbers or if the meteors will be bright is difficult to predict as is the clear weather needed to see them. However every year on the evenings of the 12th and 13th August there is always a spectacular display from the Perseid Meteor Shower.

Fortunately this year the 3 to 4 day old Moon will setting in the west soon after sunset on the 12th August so even the fainter meteors may be seen in the dark sky away from street lights. 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. See the chart above.

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 tars stretching from the very distinctive 'W' shape of Cassiopeia and down towards the bright star Capella. The brighter stars of Perseus appear to mark out the rough shape of a horse riding spur.

If the sky is clear the Milky Way (our galaxy) can 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.

Observing can start as soon as it is dark but there is likely to be more meteors after midnight. Position a lounger chair so 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 faint and difficult to see from a well-lit area in the towns. Any bright meteors will be seen even from fairly light polluted skies. These may appear 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.

NEWBURY ASTRONOMICAL SOCIETY MEETING

6th August	To be announced
Website:	www.newburyastro.org.uk

NEXT NEWBURY BEGINNERS MEETING

18th August	Astronomy for beginners
Website:	www.naasbeginners.co.uk

WHAT IS A METEOR?

Driving into a snowstorm

A meteor shower radiant

On any clear night if you sit back and look up into the night sky for a while you will more than likely see a streak of light speed across the sky - this will be a METEOR also called a 'shooting star'. It is not a star at all it is just a small speck of dust known as a METEOROID entering the Earth's atmosphere at very high speed.

We all know how a space capsule or other space craft become very hot as they re-enter the atmosphere at about 27,000 km/h. However these meteoroid dust particles get even hotter at their re-entry speed of up to 270,000 km/h. At this speed the dust is vaporised by the heat and the surrounding air is also heated until it glows in a similar way to a fluorescent light.

There are two types of Meteor, the first is thought to originate from the large lumps of rock and iron left over when the planets formed and are known as ASTEROIDS. Most asteroids orbit the Sun in a belt between Mars and Jupiter. The huge gravitational forces exerted by Jupiter may have pulled the rocks apart before they could accumulate into a planet.

Very rarely two asteroids may collide but when they do, chips of rock and Iron are thrown off and occasionally may head towards Earth. These can be a few millimetres across or up to tens or even hundreds of metres across. They are quite rare and are seen as individual 'fireballs'. Large ones can sometimes impact the ground as METEORITES and may even cause craters.

The second type of meteor originates from a comet and is much more common. Comets are large lumps of ice, typically between five and thirty kilometres across that reside beyond the orbits of the outer planets. There are millions of these objects just sitting there quietly orbiting around the Sun at enormous distances.

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

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

Comet Hale Bopp 1998

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

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

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

WHAT ARE METEORS AND COMETS?

Throughout history comets have been regarded as bad omens and harbingers of doom. They have been depicted on paintings and other works of art and shown as being in the sky when important events have occurred. Probably the best know is on the Bayeux Tapestry which shows the events around the invasion of England by William the Conqueror in 1066.

Halley's Comet shown on the Bayeux Tapestry

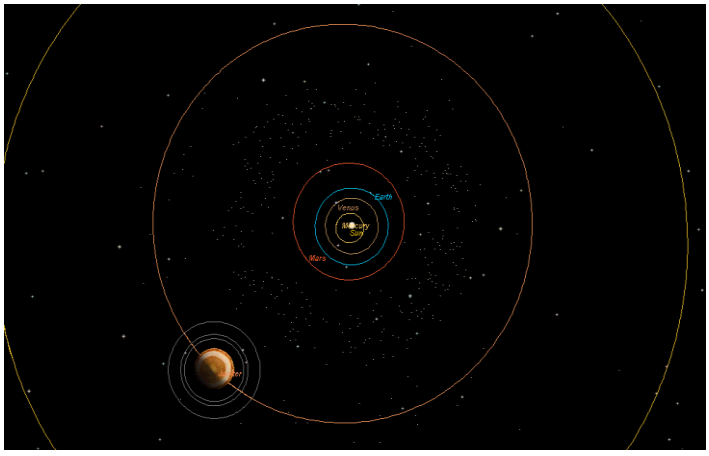
The men on the left of the image above are pointing at the comet so it was obviously regarded as something important in relation to the invasion.

With the tremendous advances in modern science and technology we now know what comets are, where they come from and how they appear in our sky. In this article we will be looking at where the comets originate how they formed in the first place and how they become visitors to our sky.

WHERE DO COMETS COME FROM?

Comets come from the outer reaches of our Solar System and there are millions of potential comets out there. They reside in two areas outside the orbit of the most distant planet Neptune.

The four inner planets of our Solar System are: Mercury, Venus, Earth and Mars and are all 'Rocky' planets with an Iron core. They orbit relatively close to the Sun and are known as the 'Terrestrial' (Earth like) Planets.

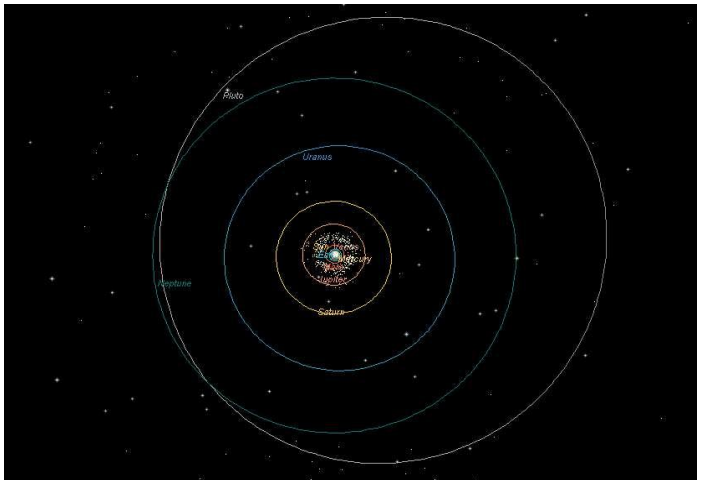


The Inner Solar System and Jupiter

The terrestrial planets, shown at the centre of the diagram above, have orbits that are comparatively close together and almost equally spaced from each other.

Between the orbits of the inner 'Terrestrial' planets and the outer four planets there is an orbital space but there is no planet. However this space is occupied by many thousands of lumps of rock, Iron and Nickel that we call the Asteroid Belt.

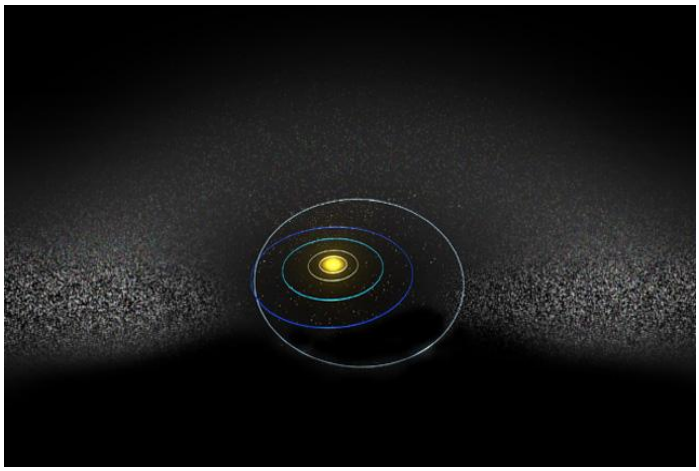
The orbits of the four outer planets are much further apart. The first two of outer planets: Jupiter and Saturn are classified as Gas Giants. This is because they are very large and are comprised almost entirely of gas (mainly Hydrogen). The two outer planets: Uranus and Neptune are called Ice Giants because most of the gases that they are comprised of are frozen.



Our Solar System out to the orbit of Neptune

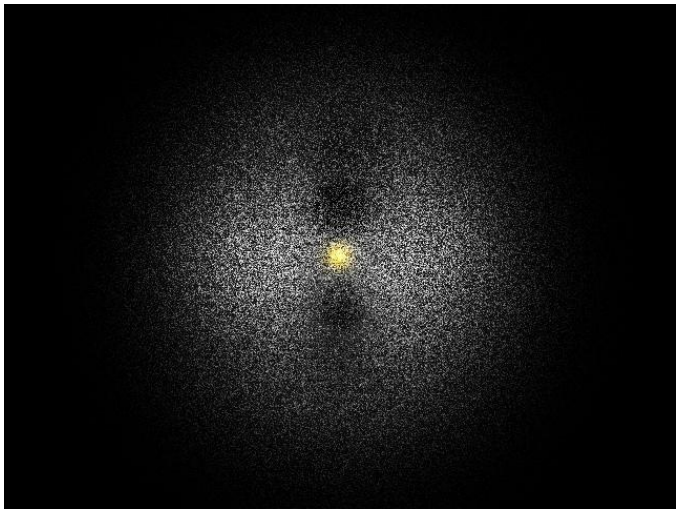
In the diagram above the 'Dwarf Planet' Pluto is shown as the white outer orbit. Pluto was originally classified as one of the (then nine) main planets but was reclassified by the International Astronomical Union (IAU) in 2006 and re-classified as a 'Dwarf Planet'. The main reason for this was the discovery of a large number of similar objects even further out from the Sun. These objects are now also classified as Dwarf Planets or Minor Planets.

Most Dwarf Planets are smaller than Pluto (a few are larger) but all are thought to be comprised mainly of water ice and frozen CO_2. It is now accepted that these Dwarf Planets are almost certainly the largest and closest of what may be millions of similar objects orbiting the Sun far beyond Neptune. These objects form a belt around the Sun in the same plane as the main planets. This region is known as the Kuiper Belt.



An artist's impression of the Kuiper Belt

To complete the Solar System family we must journey beyond the Kuiper belt, out to the limits of the gravitational influence of our Sun. Beyond the Kuiper Belt there is thought to be a vast halo of icy bodies perhaps stretching half way to our nearest neighbouring stars (out to about two light years). This halo of icy bodies is known as the Oort Cloud.

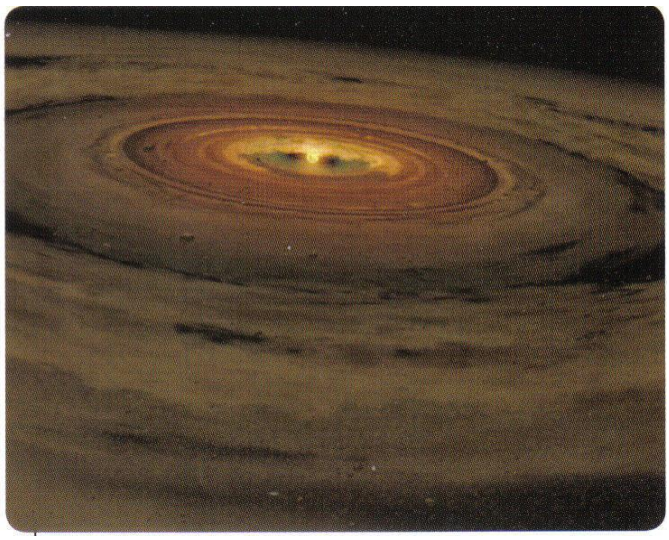


An artist's impression of the Oort Cloud

We have no way to confirm that the Oort cloud exists but the theory is generally accepted. The Oort Cloud and the Kuiper Belt are thought to be where our comets originate.

HOW DID THE COMETS GET OUT THERE?

When our Solar System formed from a vast 'Nebula' (cloud) of Hydrogen gas and dust, about 4.3 billion years ago, gravity created a rotating disc of the gas and dust. At the centre of the disc a denser bulge formed and pulled in more and more material. Eventually the bulge became so massive and dense that the extreme pressure and heat at the centre caused the Hydrogen atoms to fuse into Helium atoms. This Nuclear Fusion process produced enormous amounts of energy that caused the central bulge to light up and become a star – Our Sun.



An artist's impression of the very early Solar System

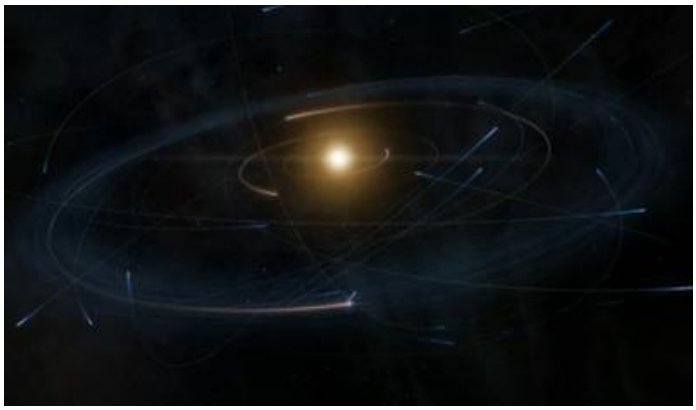
While the central bulge was forming, turbulence in the disc caused other smaller denser regions to form within the disc. These grew to form planets that can be seen represented in the picture above as lumps orbiting the Sun and creating gaps in the disc.

As the Sun burst into life it produced enormous amounts of radiation in the form of Ultraviolet light. This was so intense it blasted any gas and volatile materials away from the centre of the disc. The inner proto-planets were stripped of much there early atmospheres and any water was boiled away and pushed to the outer regions of the disc. In the cold of the outer disc the gases froze to form the lumps of ice of the Kuiper Belt and Oort Cloud.

During the period from 4.1 to 3.8 billion years ago millions of these lumps of ice returned to bombard the centre of the Solar System in what is called the 'Late Heavy Bombardment' (LHB). It is thought that the Oort Cloud may have been disturbed at this time, perhaps by the gravity of a star that may have formed in the same nebula as the Sun then passed close to our Sun.

An alternative theory is that many more planets formed around proto-stars including our Sun which may have originally had 80 or more. Initially many of these newly formed planets would have been in unstable orbits and may have had close encounters with other planets. There were likely to have been collisions like the one involving our Earth and a Mars sized planet called Thea. This collision is thought to have created of our Moon.

As a result of these close encounters and collisions some planets may have been thrown out into the Kiuper Belt and the Oort cloud. Here they may have disrupted the orbits of the 'lumps of ice' out there. Many of these lumps of ice would have been moved into trajectories that took them in towards the Sun and the planets.



There were many comets during the LHB period

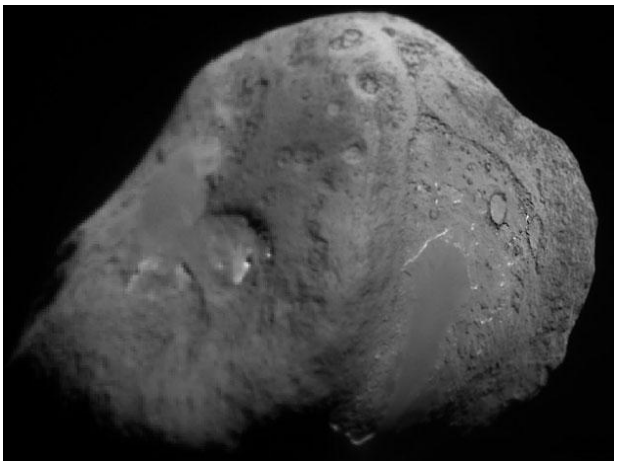
The planets and moons we see in the Solar System today show signs of the Late Heavy Bombardment on their heavily cratered surfaces. It is thought that most of the water found on our planet may have originated from the huge number of water laden comets that hit the Earth during this Late Heavy Bombardment period.

WHY DO COMETS COME IN TO VISIT US?

The Late Heavy Bombardment finished about 3.8 million years ago but we still have occasional visits by comets but these are a tiny fraction of the activity during the LHB. It is likely that there are still close encounters and even collisions of the Dwarf Planets in the Oort Cloud and the Kuiper Belt. Any close encounters are likely to disturb the fragile orbits of these icy bodies. The effect of the gravity of the Sun is extremely weak at these vast distances. However just a tiny change to the path of one of the objects could send it on a course towards the Sun and its planets. These journeys into the Sun may take many thousands or even millions of years.

WHAT MAKES A COMET?

A comet is a lump of ice mainly comprised of water ice with frozen Carbon Dioxide (CO_2) as the second largest constituent. It will also have traces of many other frozen gases and dust particles from the nebula (cloud of gas and dust) in which the Sun formed. When the comet is in the outer reaches of the Solar System it does not have a tail and resembles our much closer neighbours the Asteroids. A solid lump of material that has the close encounter with the Sun is called the Nucleus and is typically around 3 to 30 km in diameter.



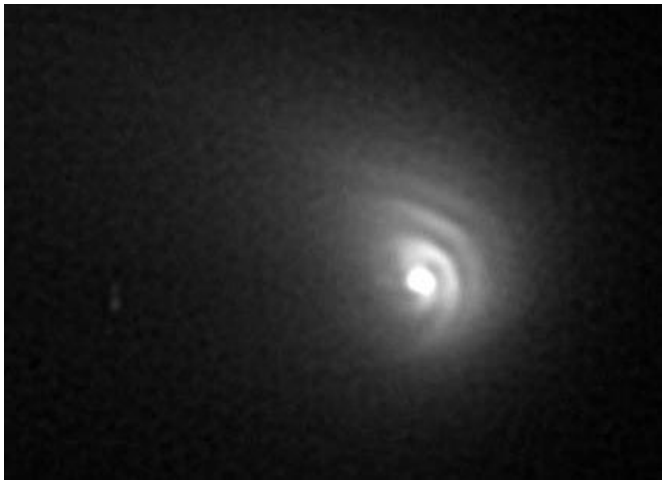
Comet Temple-1 imaged by Deep Impact

The image above was taken by a probe called Deep Impact that was sent to have a close encounter with Comet Temple-1. On 4th July 2005 Deep Impact sent a Copper projectile crashing into the nucleus of Comet Temple-1 then analysed the ejected material from the impact. The results showed that the constituents of the comet nucleus were much as expected (mainly water) but the outer region was much softer and lighter than expected.

As the comet nucleus approaches the Sun the frozen gases begin to sublime (melt directly into gas and not form a liquid) and form a cloud around the nucleus called the 'Coma'. Between the orbits of Jupiter and Mars is the point when the Carbon Dioxide (CO_2) on the surface begins to sublime. As the comet moves across the orbit of Mars there is enough heat from the Sun to sublime the water ice into the coma.

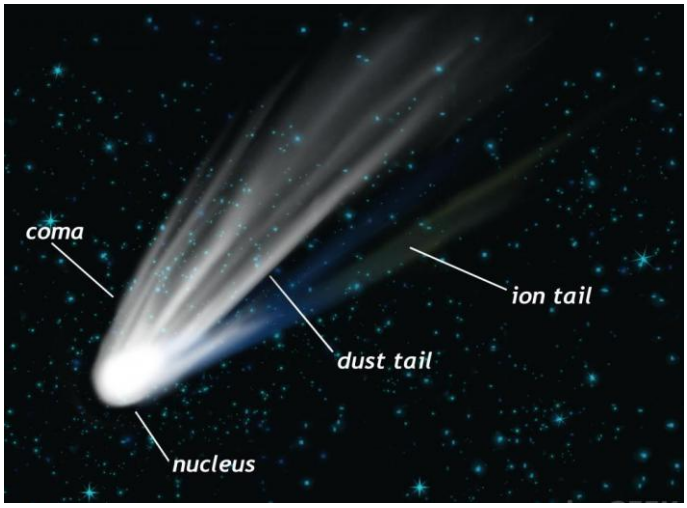
Halley's Comet Nucleus imaged by Giotto in 1986

The coma of a comet is extremely tenuous but may be very large, often over 100,000 kilometres in diameter.



The coma of Hale-Bopp with jets spiralling out

As the comet approaches the orbit of Mars the radiation from the Sun will begin to sweep the material of the coma into a long tail that trails away from the Sun. When the comet has looped around the Sun and is moving back to the outer Solar System the tail will still point away from the Sun (in front of the nucleus/coma).

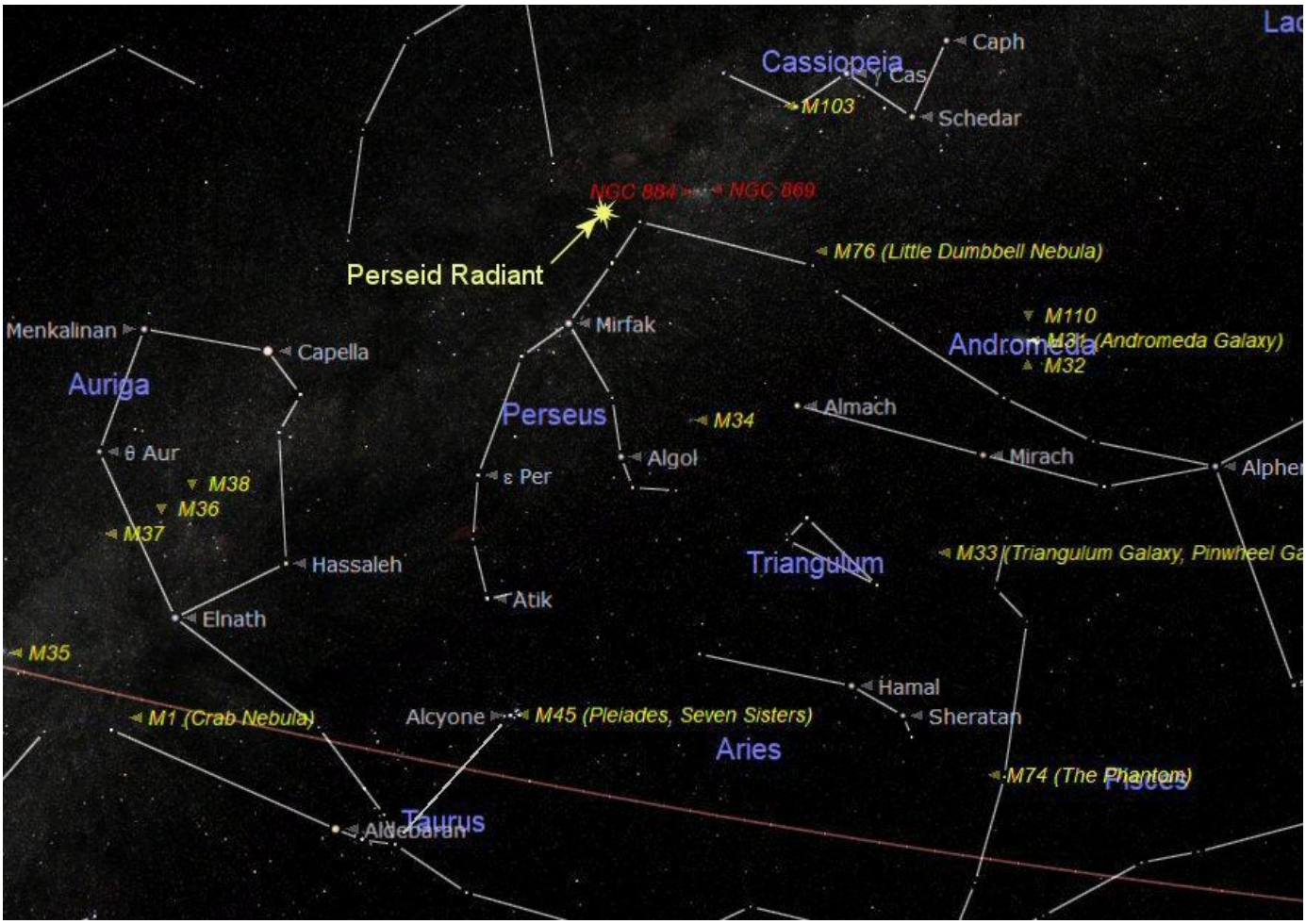


The named parts of a comet

Often a comet will produce two or more tails. Comet DeCheseauxklinkenberg seen in 1744 was very bright and had six tails. However two tails are most common. Comet Hale-Bopp (1998) which was the brightest comet seen in recent years had two very distinct tails, see the picture on page 2. The white tail that can also be seen in the diagram above is the Dust Tail. It is formed by particles of ice and dust that in most cases have the consistency of cigarette ash. These particles are pushed away from the coma by the Solar Wind (radiation from the Sun) and normally form an arc behind the coma. The dust tail is illuminated by the reflecting light from the Sun.

The blue tail shown in the diagram above is the Gas Tail. This is created, as the name implies, by gas being ejected from the nucleus into the coma. The Solar Wind pushes the lighter gas from the coma in a straight line away from the Sun. The gas is ionised by the ultraviolet radiation from the Sun and glows in much the same way that a Neon light glows. The tails of a comet may be tens of millions of kilometres long.

The constellation of Perseus



Perseus is our constellation of special interest this month because it is host to the Radiant of the Perseid Meteor shower. The other articles in the magazine this month give the details of the Perseid Meteor shower but the constellation of Perseus has interesting things to see as well.

The asterism (stick figure shape) looks rather like a horse riding stirrup. The two brightest stars Algol and Mirfak along with the fainter star Atik mark out the 'V' main shape with another line of stars pointing from Mirfak towards the very obvious 'W' shape of Cassiopeia.

Other constellations around Perseus are: Cassiopeia to the north, Andromeda to the west (right) Auriga to the east (left) and Taurus to the south (below). Continuing the line of stars from Mirfak to Atik the beautiful Open Cluster of stars Messier 45 (M45) the Pleiades also called the Seven Sisters can be found in the constellation of Taurus (the Bull).

During the summer months Perseus is located in the north close the horizon so that is where it can be found this month. During the winter it is located almost overhead and during November and December is actually host to the Zenith (the point in the sky directly over head).

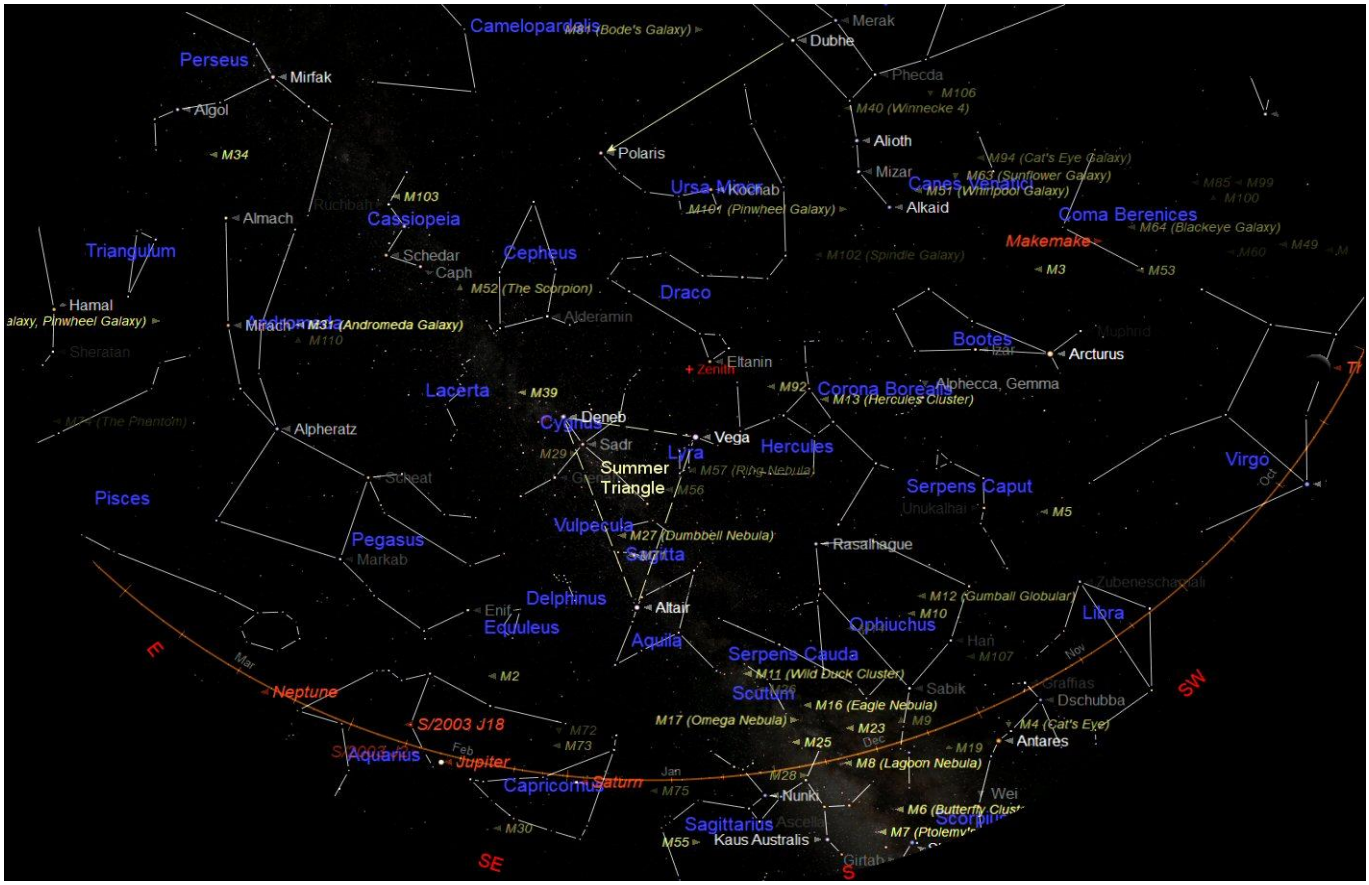
Perseus is also host to two Messier 'deep sky' objects Messier 34 (M34) and Messier 76 (M76). M76 is a rather nice Planetary Nebula which is sometimes called the Little Dumbbell. This is a star similar to our Sun that has collapsed to become a White Dwarf and has developed a 'bubble' of gas around it. It does need a medium sized telescope to see.

Messier 34 is a fairly bright Open Cluster comprised of about 80 stars. It can be seen as a small 'fuzzy' patch of light using binoculars but does need a telescope to see as a cluster of stars. However there is another Open Cluster or rather two clusters called the Double Cluster that are listed in the New General Catalogue as NGC 869 and NGC 884 and shown in the image below.

NGC 869 and NGC 884 the Double Cluster

The Double Cluster can be seen on a clear dark night with the 'Naked Eye' as a 'fuzzy patch of light in the line of stars leading from the star Mirfak up towards the constellation of Cassiopeia. It is best seen using binoculars or a small telescope fitted with a low power eyepiece (25mm or 32mm). It is not clear whether this is a true associated double cluster or just a 'line of sight' coincidence.

A TOUR OF THE NIGHT SKY - AUGUST 2021



The chart above shows the night sky looking south at about 22:00 BST on 15th August. 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: Virgo (the Virgin), Libra (the Scales), Scorpio (the Scorpion) Sagittarius (the Archer), Capricornus (the Goat) and Pisces (the Fishes) rising in the east.

The constellation of Perseus appears in the north east (upper left) of the chart above but by midnight it will have moved to the northern horizon. During the summer months Perseus is located in the north close the horizon so that is where it can be found this month when we are looking out for the Perseid Meteor Shower. During the winter however it is located almost overhead and during November and December is actually host to the Zenith (the point in the sky directly over head).

In the west 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 star similar to our Sun but more advanced and is developed into a Red Giant star that is nearing the end of its 'life' as a normal star. It has used almost all of its Hydrogen fuel and has expanded to become a Red Giant, 25 times the diameter of our Sun. At the moment it shines 115 times brighter than our Sun but it is destined to collapse and become a White Dwarf.

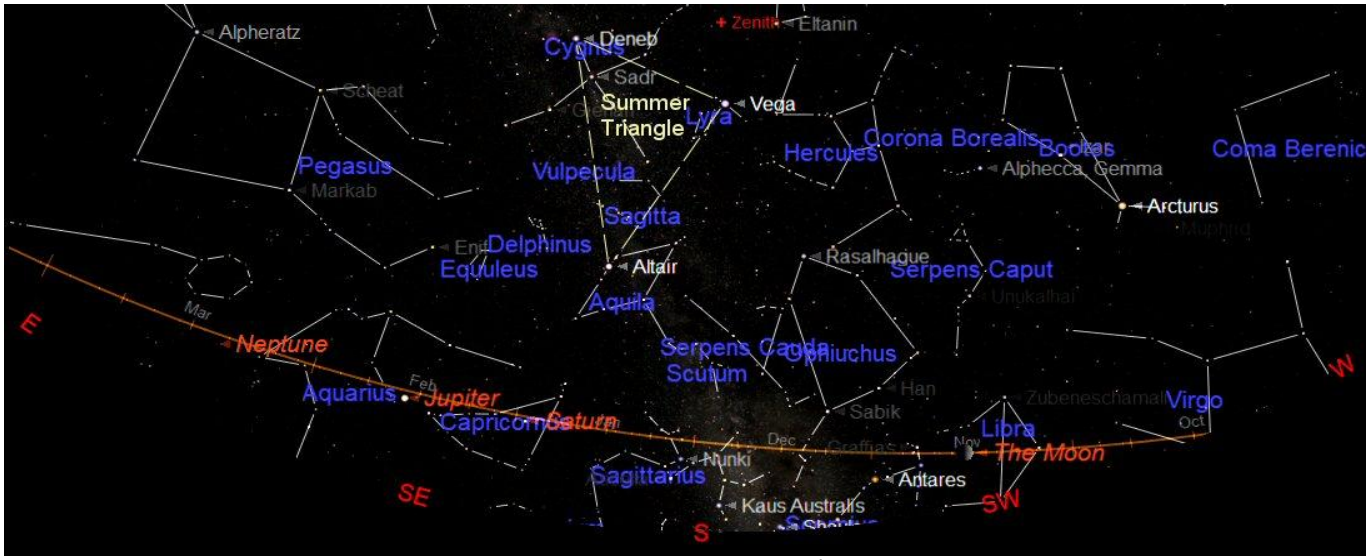
Almost overhead is the constellation of Hercules (the Strong Man). Hercules has a rather distinctive distorted square shape, at its centre, called the 'Keystone'. This is due to its resemblance to the centre stone of an arch or bridge. The jewel of Hercules is without doubt is the Great Globular Cluster, 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 can be seen using a 90mm *f*10 telescope but will look even more impressive when using a larger telescope.

Prominent in the southern sky is the Summer Triangle that dominates the Summer Sky and was described in detail in the July magazine. The triangle is defined by three obvious bright stars: Deneb in the constellation of Cygnus, Vega in Lyra, and Altair in Aquila. The Milky Way (our Galaxy) flows through the Summer Triangle and passes through Aquila and Cygnus. The Summer Triangle is bigger than may be expected but once it has been found it is very easy to find again.

As the Summer Triangle is so easy to find it is very useful to use as a starting place for finding our way around the night sky.

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

THE SOLAR SYSTEM - AUGUST 2021

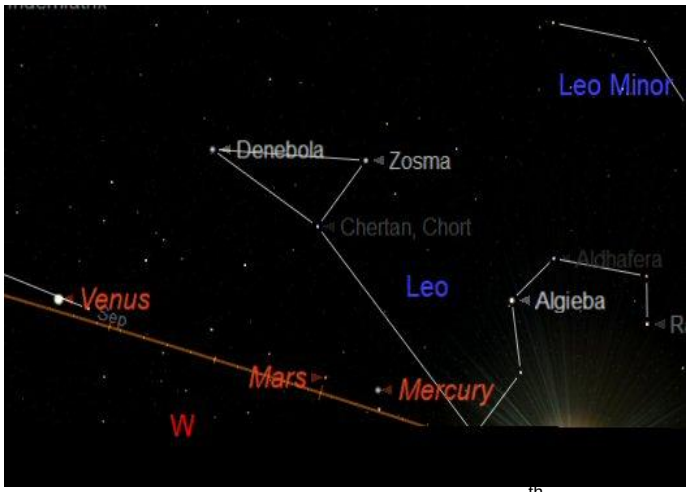


The planets at 22:00 on 15th August

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

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

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



Venus, Mars and Mercury at sunset on 15th August

MARS can still be seen in the evening sky after the Sun has set and the sky darkens. It is looking small at about 3.6 arc-seconds as Earth pulls further away. Mars sets at about 21:00 and will be moving ever closer to the south western horizon.

JUPITER will be rising in the east at about 20:30 and will be visible in the south east by midnight. Jupiter will be at opposition on 20th August. See page 9 for more advice on observing Jupiter.

SATURN will be rising in the east at about 19:45 but will be more difficult to observe than Jupiter in the turbulent air close to the horizon. Saturn rises before Jupiter in the east and will be at its best this year on 2nd August when it will be at opposition and will be due south at midnight. See page 10 for more details.

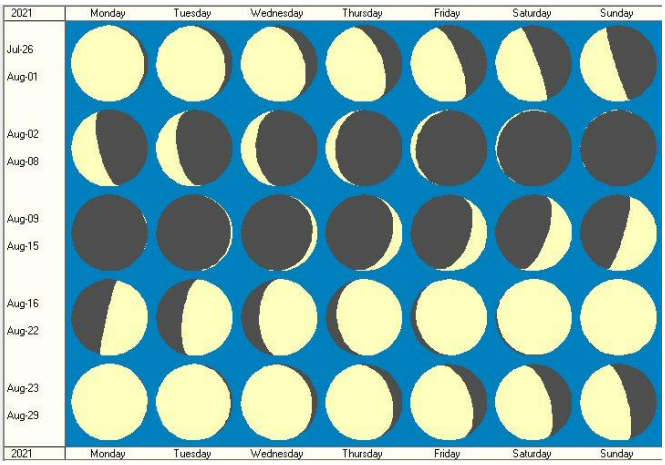
URANUS will not be observable this month as it will mainly be in the sky during daylight. This month it will rise at 23:00 and will be in the brightening morning sky.

NEPTUNE will be just visible this month to the east of Jupiter (see chart). It will be difficult to see in the brightening morning sky as it is only magnitude +7.7.

THE SUN

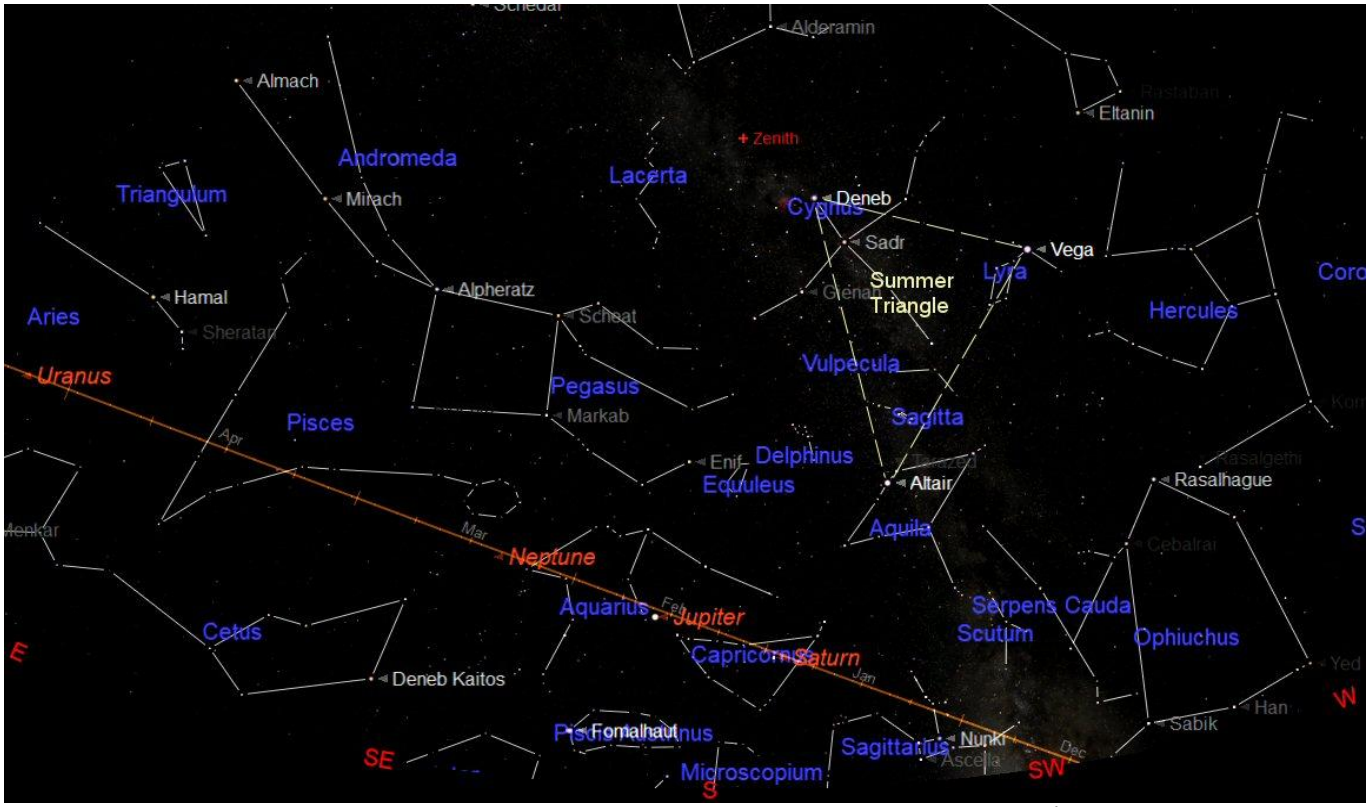
The Sun rises at about 05:30 at the beginning of the month and 06:10 by the end. It sets at 20:45 at the beginning of the month and 20:00 at the end of the month. It reached its highest point in the sky on 21st June which was the Summer Solstice and is heading towards the Autumn Equinox on the 22nd September. There have been a few small Sunspots during July.

THE MOON PHASES DURING AUGUST



New Moon will be on 8th August
First Quarter will be on 15th August
Full Moon will be on 22nd August
Last Quarter will be on 30th August

JUPITER AND SATURN AT OPPOSITION - AUGUST 2021

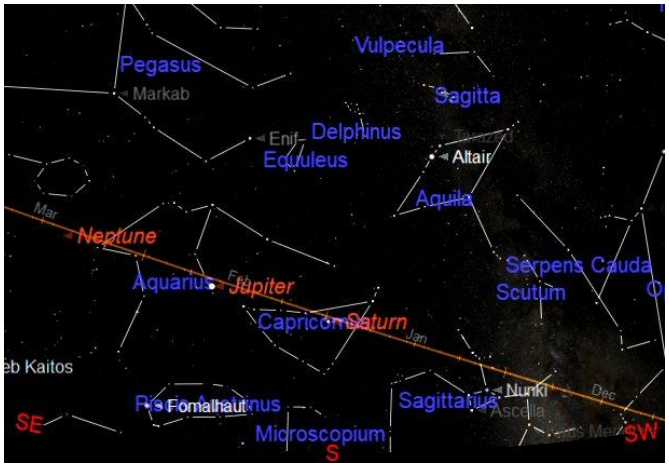


The planets Jupiter, Saturn (and Neptune) at midnight on 15th August

The two brightest 'superior' (outer) planets Jupiter and Saturn are at their best positions this month for observing. Both planets will be at opposition during August. Saturn will be rising in the east at about 20:00 on 2nd August when and will be at opposition due south at midnight. Jupiter will be rising in the east at about 20:30 and will be at opposition on 20th August.

Opposition is the time when Earth will pass the outer planets on their orbits around the Sun. At this time the planets will appear due south at midnight 24:00 GMT (01:00 BST).

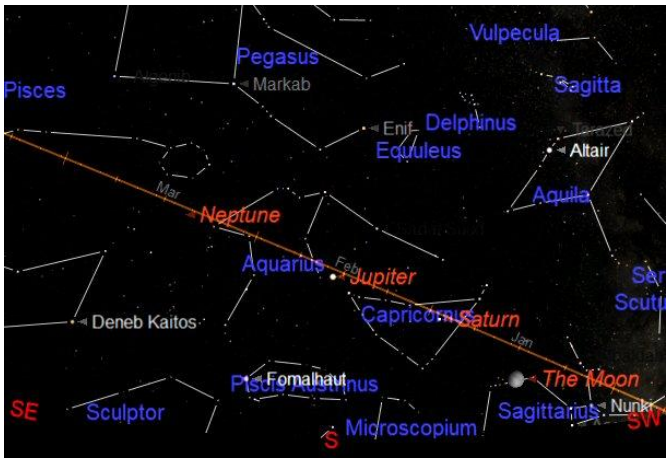
SATURN requires a small to medium sized telescope (90mm to 120mm) to see the ring system and the brightest moons but will be unsteady due to the murk and turbulence close to the horizon.



Saturn at opposition at 01:00 BST on 2nd August

The two or three brightest moons may be visible using a 90mm aperture telescope (with some difficulty) but a 120mm or larger telescope will show another 2 or 3 fainter moons. The ring system will be discernible but colours and detail will be difficult.

JUPITER appears much larger and brighter than Saturn because it is only half the distance away from us – 778.3 million km compared with 1429 million km.



Jupiter at opposition at 01:00 BST on 20th August

Any good quality telescope will reveal the brown and white cloud bands on the surface of Jupiter. The four brighter moons Io, Europa, Ganymede and Callisto will also be observable using any telescope.

It is however very interesting to follow the movement of the four Galilean moons from night to night and even during the course of one observing period. When the inner moons Io and Europa move close to Jupiter they can be seen to move in short periods of time. They can be watched as they approach Jupiter and disappear in front (a transit) or behind (an occultation) of the planet. The times of these events can be predicted using a planetarium application on a PC or laptop.

OBSERVING SATURN

Saturn can be seen with our 'naked' eyes as a bright and slightly yellow looking star. This year it is close to much brighter Jupiter so that will help to find the ringed planet. A pair of binoculars will show Saturn looking brighter and that it is not a star as it will appear slightly 'fuzzy' but the ring system will not be visible. However a telescope is required to see it well.

Saturn is one of the most beautiful and impressive objects to look at through a telescope and really does have the 'Wow!' factor, when seen using a larger telescope. Even using a small telescope the ring system can be made out but a high magnification is required on any telescope. For many people their first sight of Saturn was the thing that encouraged them to buy their first telescope.

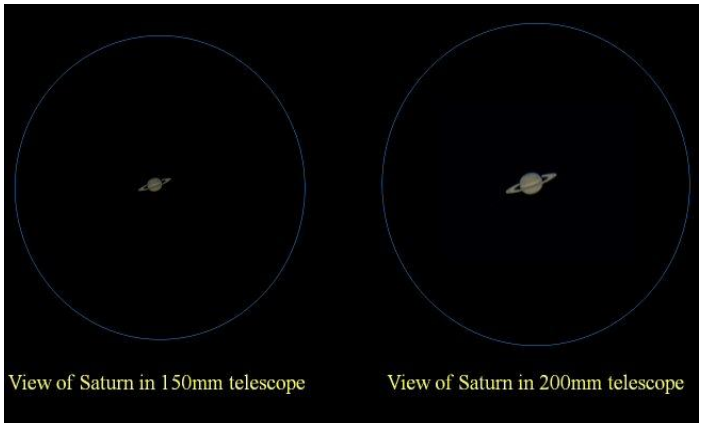
Jupiter the 'King of the Planets' and Saturn are close together in the early morning sky. In some ways our expectations of observing Saturn could be diminished by the stunningly bright and colourful views of Jupiter that we have been accustomed to. Jupiter is much more impressive than Saturn for a number of reasons.

First Jupiter is bigger than Saturn. Jupiter is 142,984 km in diameter and Saturn is 120,536 km but this is not the full story. Saturn is also about twice as far away from the Sun compared to Jupiter. Jupiter orbits at 778 million km whereas Saturn's orbit is 1429 million km from the Sun. This means that Saturn receives only a quarter of the amount of light, per square metre, that Jupiter receives.

The greater distance of Saturn also means that the amount of light that we see reflected back from Jupiter is four times that reflected by Saturn. In total this means that Saturn not only appears much smaller but is also more than 16 times fainter than Jupiter. So that is the bad news but this is compensated for by the magnificent ring system of Saturn that does add a little to the brightness and can be seen even in smaller telescopes.

Saturn can be seen in a smaller telescope of the sort that a beginner to astronomy might have been advised to buy as a first telescope by experienced astronomers. This sort of telescope would be a 100mm refractor or a 150mm reflector with a focal length of about 1000mm.

A high magnification must be used and on a good clear and still night the view will be very rewarding. The picture below shows the sort of image that can be expected in one of these first telescopes along with an example of the view through a larger aperture telescope and with a longer effective focal length.

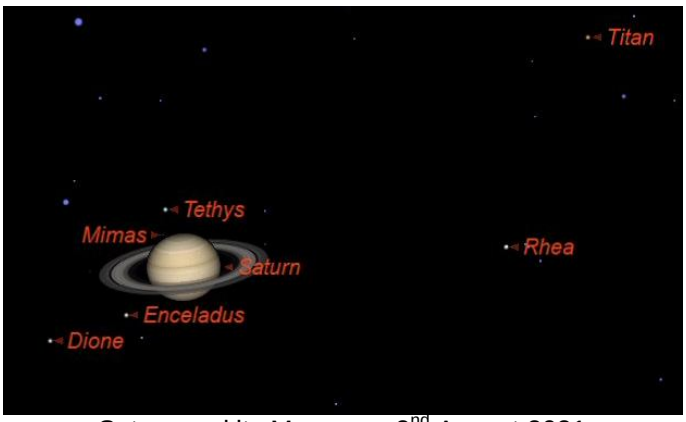


The view through a 150mm and a 200mm telescope

As with all targets, finding Saturn with a telescope starts by locating the planet with the finder. Next use a low power eyepiece (e.g. 25mm) and centralise Saturn in the field of view of the main telescope. Carefully remove the low power eyepiece and fit a high power (10mm) eyepiece into the focuser. Again centralise the planet and adjust the focus until the image is as clear as possible. Saturn may be difficult to focus due to air turbulence close to the horizon or above roof of a nearby house. The image should improve slightly as Saturn rises higher in the sky and as the telescope cools.

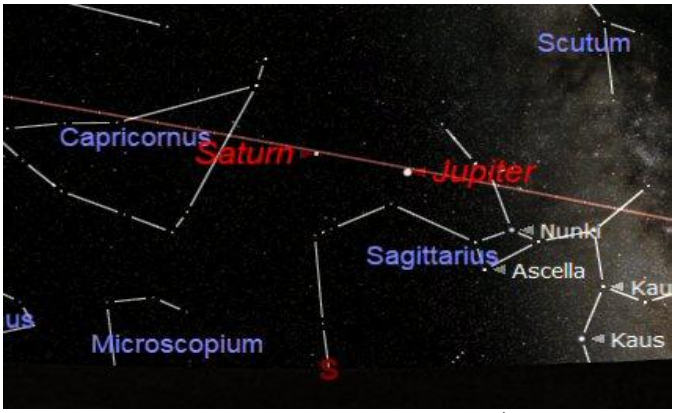
If the seeing conditions are good it may be possible to remove the high power eyepiece and fit a Barlow Lens into the focuser and then refit the high power eyepiece into the Barlow. The focuser will need to be moved in about a centimetre to compensate for the Barlow then refocused. The Barlow will have the effect of doubling the magnification of the eyepiece and therefore double the size of Saturn.

Up to six of Saturn's moons may be visible, distributed around the planet. The largest moon Titan is the easiest to see. Some of the others may be difficult (but possible) to see in a smaller telescope. On a good clear night it may be possible to see Titan and two or even three others in a 90mm refractor or a 113mm reflector. The other two will need a larger telescope to see.



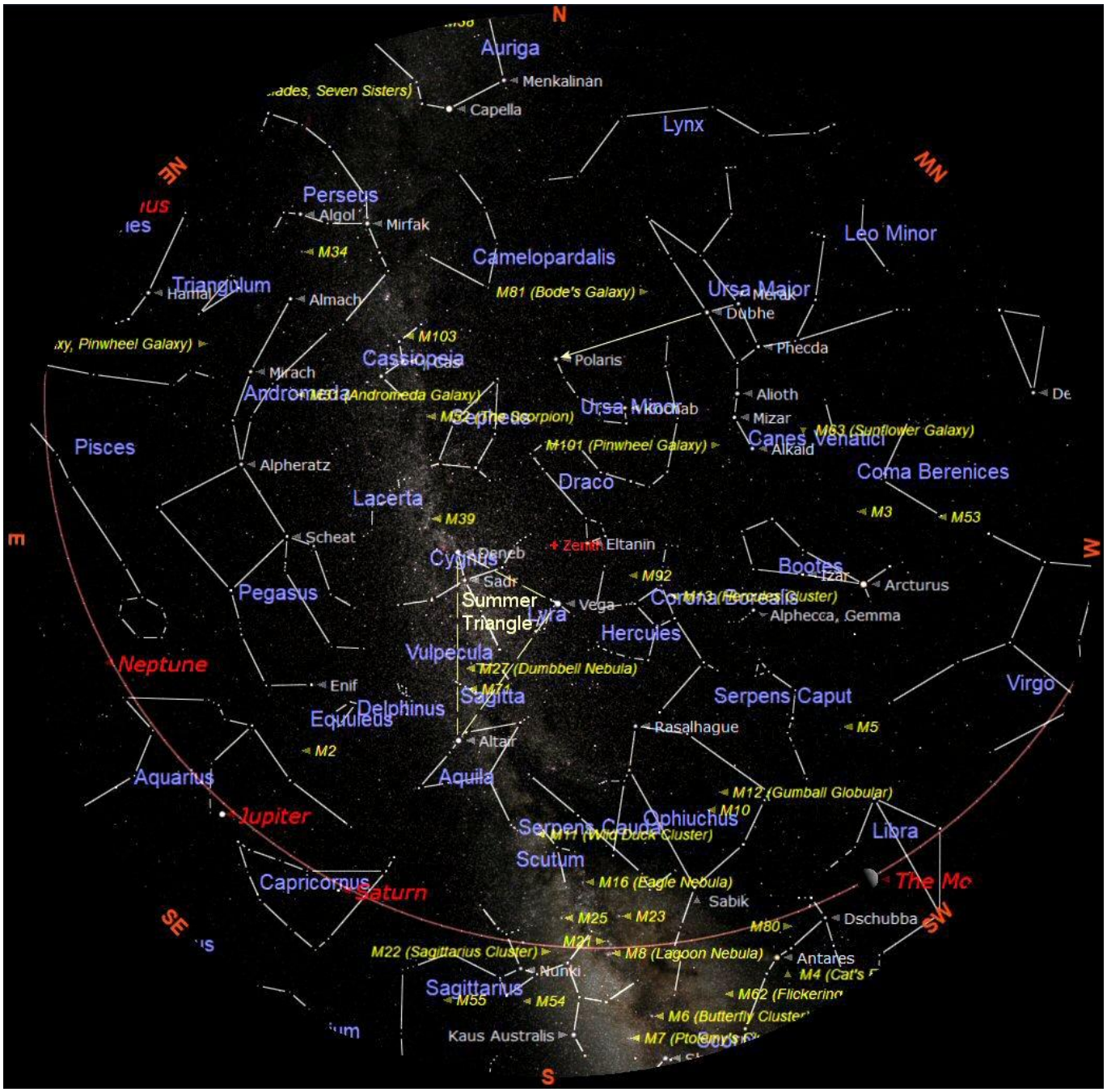
Saturn and its Moons on 2nd August 2021

The chart below shows the position of Saturn and Jupiter on 2nd August at midnight and is the time when Earth will be overtaking Saturn. For about one hour the rings will brighten because the sunlight will be reflected directly back towards the Sun and Earth. This is called the Seeliger Effect. Unfortunately opposition actually occurs at 06:00 GMT so we in the UK will not be able see the Seeliger Effect, observers in the USA will be more lucky.



Saturn at Opposition at 01:00 on 2nd August

THE NIGHT SKY – AUGUST 2021



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

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

Planets observable in the evening sky: Venus early evening with Saturn and Jupiter later.