NEWBURY ASTRONOMICAL SOCIETY
MONTHLY MAGAZINE – FEBRUARY 2017

THE BEAUTIFUL DOUBLE CLUSTER IN PERSEUS

The Double Cluster in Perseus

It is not always necessary to have a telescope to see deep sky objects (outside our Solar System). There are some beautiful objects that can be seen using a pair of binoculars or even just our naked eyes. The Double Cluster in the constellation of Perseus is one such object that can be seen in the night sky at this time of year. In fact it is almost directly overhead.

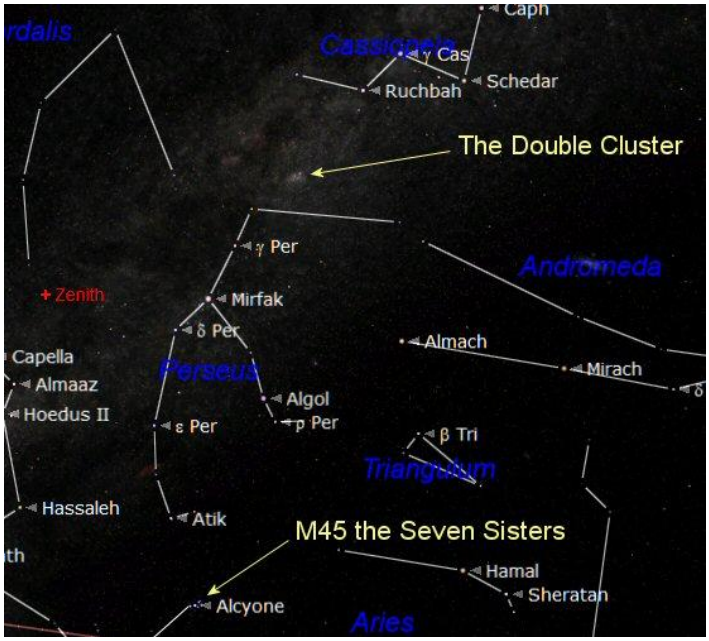


Chart showing the location of the Double Cluster

Open Clusters are groups of stars that have formed from the gas and dust in a Nebula (a large cloud of mainly Hydrogen gas, traces of other gases and dust). The best known nebula is Messier 42 (M42) the Orion Nebula, featured in the January 2017 magazine.

Gravity draws the atoms of Hydrogen gas together and as the gas gets denser it pulls in even more until huge contracting spheres of gas are formed. As the pressure in the core of the spheres increases the temperature rises to tens of millions of degrees and the Hydrogen atoms begin to fuse together to form atoms of Helium. This heats the spheres and they begin to shine as bright new stars that blow away the remaining gas.

On a clear night the Double Cluster can be seen with the naked eye as a hazy patch of light. These clusters look as if they may have formed together and are best seen using binoculars. When using a telescope the individual stars of the clusters can be seen.

NEWBURY ASTRONOMICAL SOCIETY MEETINGS

3rd February The Zooniverse - Planets to Penguins
Website: www.newburyastro.org.uk

NEXT NEWBURY BEGINNERS MEETING

15th February Dust in space
Website: www.naasbeginners.co.uk

THE CONSTELLATION OF ORION (THE HUNTER)

The constellation of Orion showing the 'stick' figure and an Illustration (repeated from last month)

Last month we looked at the Great Orion Nebula, Messier 42 (M42), this month we will have a look at some of the interesting stars in the constellation of Orion. This introduction page is repeated from last month.

Orion is one of the easiest constellations to recognise and dominates the southern sky at this time of the year. There are many depictions of Orion shown on many different star charts. Some old pictures of Orion are very beautifully drawn in fact some are so beautiful that the artists even moved the positions of some of the stars so they would fit the image they had drawn.

Orion the Hunter appears in the winter sky, with his club held over his head and his shield (sometimes shown as a lion's skin) held out in front of him. His hunting dogs, Canis Major (the star Sirius) and Canis Minor (the star Procyon) following behind him.

Greek mythology tells us that Orion was known as a great hunter. He boasted that he could rid the earth of all the wild animals. However this angered the Earth goddess Gaia so she sent a scorpion to defeat Orion. Orion tried to battle the scorpion but he quickly realised that he could not shoot his arrow through the creature's armour. To avoid the scorpion he jumped into the sea.

It was then that Apollo (the Greek god of the Sun) decided to take action. He pointed out to his twin sister Artemis a black object in the sea. Claiming it was a horrible villain he dared her to shoot it with her bow and arrow. Artemis easily hit the target. However when she swam out to retrieve her victim she discovered that the villain was in fact her friend Orion.

Artemis begged the gods to bring Orion back to life but they refused. Instead she put Orion's picture in the sky so she could always see him.

Orion is one of the few constellations that does look (with a little imagination) like what it is named after. The most obvious feature is the line of three stars, called Alnitak, Alnilam and Mintaka that make up Orion's belt. From his belt we can see two bright stars called Saiph and Rigel below. These define the bottom of his 'skirt like' tunic.

Above the belt are two stars Betelgeuse and Bellatrix that denote the position of his shoulders. Above and between his shoulders is a little group of stars that mark out the head. From his left shoulder (Bellatrix) he holds out a shield. From his right shoulder (Betelgeuse) a club is held above his head. It almost looks as if Orion is fending off the charge of the great bull Taurus who is located above and to the west (right) of Orion.

Appearing to hang down from Orion's very distinctive belt is a line of stars, ending at the star Nair al Saif that looks very much like a sword attached to his belt. Here can be found the main interest in Orion, the Great Nebula.

If an imaginary line is traced down from the belt for about six belt length towards the south eastern horizon, a bright twinkling star will be seen. This is Sirius, Orion's Large Hunting Dog in the constellation of Canis Major. It is the brightest and closest star to be seen from the UK at just 8.6 light years from us. It is also the brightest star in the whole of the night sky. It shines with a magnitude of -1.4 and is almost pure white. Sirius is 1.8 times as massive as our Sun and 23 times brighter. To Orion's left (east) of Betelgeuse, a bright star in a rather large empty area of sky can be seen. This is Procyon in Canis Minor, Orion's Small Hunting Dog. Coincidentally both of these 'Dog Stars' are double stars that have a small, very massive but invisible white dwarf companion. See pages 2, 3 and 4 for more about the stars in the constellation of Orion.

THE STARS OF ORION (the Hunter)

The constellation of Orion imaged by Nicky Fleet from her garden

As well as being one of the most spectacular and beautiful constellations, Orion is also very interesting because we can see evidence of all the stages of the life cycle of stars from birth to death. Obviously we can't see the life cycle of an individual star but we can observe stars at various stages of their existence in Orion.

Stars are not actually living things like us but they do exist in various stages of evolution that resemble the life cycle of living entities. We saw in the January issue of this magazine that stars are being 'born' in the stellar nursery in Orion's sword in the Great Nebula M42. These stars are still very young and at this stage are very active. After a few tens or hundreds of millions of years they will settle down to live the longest stage of their lives as normal 'Main Sequence' stars. Our Sun is about 4.3 billion years old and approaching half way through its main sequence. We can see many stars at this stage in Orion and others older and many much younger.

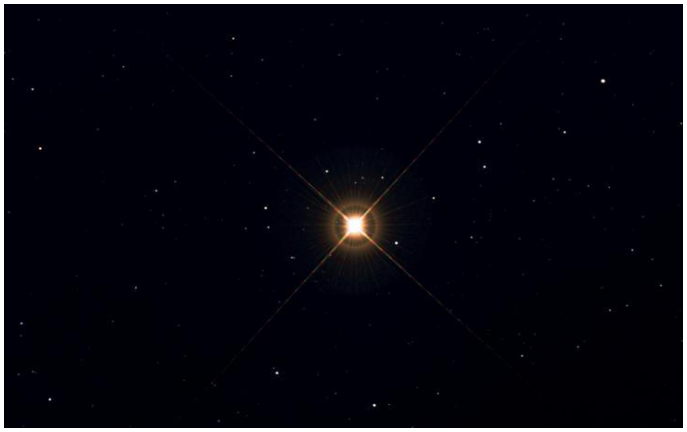
There is another factor that affects the life span of a star and that is its mass (the amount of Hydrogen gas it is made of). Large stars have denser and hotter cores and their nuclear fusion process produces more energy and consumes the Hydrogen at a much faster rate. These large stars use up the fuel supply very quickly and therefore have short lives (some less than 5 million years). There are two bright stars in Orion that demonstrate this very well. The first is Rigel at the bottom right of Orion. This is a star about 30 times the mass of our Sun and about 120,000 times more powerful than our Sun.

A star like our Sun will fuse Hydrogen into Helium and towards the end of its life will begin to fuse some of the Helium. A larger star like Rigel will be able to fuse the Helium and then manufacture other heavier atoms until Iron is produced. At this point it will have become a Red Giant and will eventually explode as a Super Nova.

Rigel as seen using a telescope

Rigel is currently a star in its prime, very powerful and mature and perhaps just moving towards the end of its middle age. Another star Betelgeuse, located at the top left of Orion is much further along its pathway of 'life'. It is approaching the last phases of its existence as a normal star and has grown into a Red Giant with a diameter greater than the orbit of Jupiter in our Solar System.

Betelgeuse is so big and unstable that it pulsates and wobbles rather like a water filled balloon. By carefully observing the brightness of Betelgeuse it can be seen to brighten and fade. At its brightest it can be as bright as magnitude 0.2 and at its dimmest only magnitude 1.2. It is quite difficult to determine the cycle of the pulsations and brightening because there seems to be a number of intertwined cycles. So it appears to vary at different rates of between 150 to 300 days.



Betelgeuse as seen using a telescope

Betelgeuse appears to be edging towards the end of its life. In fact it is the closest star to us that might explode as a super nova at any time in the near future (astronomically speaking). It could explode and destroy itself sometime in the next million years (maybe as soon as tomorrow). For all we know it may have already exploded but the light from the explosion will take 650 years to reach us.

These two stars are close enough to us and so bright that we can even see their nature with our naked eyes. Rigel is obviously very white in appearance which is even more obvious using binoculars or a telescope. This is because it is very hot with a surface temperature of about 12,000ºK compared to our Sun at about 6400ºK. This is in contrast to Betelgeuse which is only 3500ºK and looks distinctly orange to the naked eye and again more so when viewed using binoculars or a telescope. See the chart on page 6.

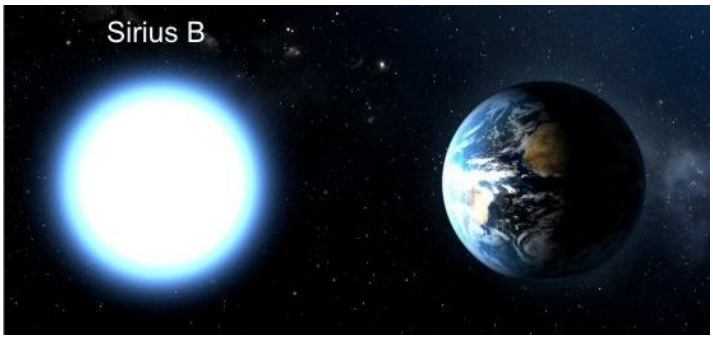
Betelgeuse looks red (orange) because it is more advanced in its life cycle than Rigel and has already moved into its Red Giant Phase. The nuclear fusion process is fusing the heaver atoms it has produced into even heavier elements, with each fusion stage contributing additional energy to power the star. All this additional energy pushes out against the force of gravity pushing inwards. The additional energy has forced the outer regions of the star to expand outwards to produce this huge (in volume) bloated and unstable Red Giant star.

An impression of what Betelgeuse might look like

Giant stars like Rigel and Betelgeuse destroy themselves dramatically in a massive super nova explosion but smaller stars like our Sun reach their end in a much less dramatic way. With less pressure and heat in their core they cannot fuse atoms heavier than Helium to create the heavier elements. They consume their fuel supply a lot slower and therefore last much longer. Our Sun had enough Hydrogen, when it formed, to last about 10 billion years and has so far, in the last 4.3 billion years, used just under half of its fuel.

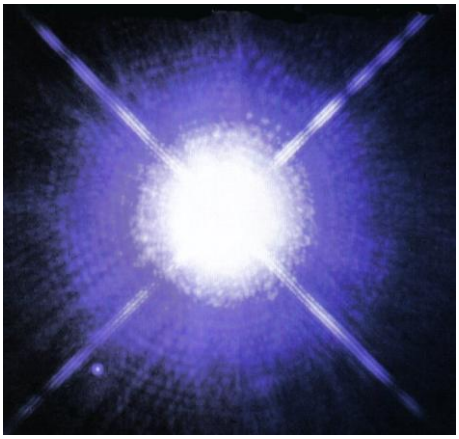
In another 4 billion years our Sun will begin to fuse the Helium that has accumulated in its core. The additional energy produced by the fusion of the Helium will cause the Sun to inflate to become a red giant. It is thought the Sun may reach a diameter equivalent to the orbit of Earth before the fuel supplies are exhausted. The outer layers will drift away into space to create a beautiful bubble called a Planetary Nebula. As fusion, in the core, begins to break down and stop, the radiation pressure that had been overcoming the force of gravity also disappears and the star will begin to collapse inwards. It will collapse into a dense sphere called a White Dwarf about the size of Earth ~12,000 km but still weighing about the same as the Sun.

In mythology, Orion the Hunter has two hunting dogs so the constellation of Orion also has hunting dogs in the form of the stars Sirius in the constellation of Canis Major (the large dog) and Procyon in Canis Minor (the little dog). Sirius can be found by following a line down from Orion's belt and Procyon can be found to the left (east) of Orion.



The White Dwarf star Sirius B compared to Earth

Both Sirius and Procyon are double stars with their companions both being White Dwarfs. The companions must have been slightly larger than the main stars we see now when they formed and used up their fuel supply quicker. The White dwarfs are too small to see but their great mass cause the stars to appear to wobble.



An image showing Sirius B (towards the lower left)

There are many other interesting stars in Orion beside the more well known stars like Rigel and Betelgeuse. It is always interesting to ponder about the true nature of these specs of light that are so far away. The stars of Orion's belt are very easy to see with our naked eyes and the distinctive line of the three stars is one of the most recognised star formations so we should consider what interesting features they may be hiding from us. See the chart on page 2.

The stars of Orion's belt

The star at the east (left) of Orion's belt is called Alnitak and is a triple star system. The system is comprised of a pair of stars of magnitude 1.9 and 5.5 orbiting around a common centre of gravity. They appear to be separated by 2.6" (arc-seconds). The third star is a fainter magnitude 10 companion orbiting 57.6" from the pair. This triple star system is thought to be about 820 light years from us.

Alnilam is the middle star of Orion's belt and is the 29th brightest star in the sky (the 4th brightest in Orion). It is a blue-white supergiant with a mass 34.6 times that of the Sun, a radius 24 times that of the Sun and 275,000 times more luminous than our Sun. It is estimated to be 2000 light years from us and relatively young with an estimated age of 5.7 million years. It is expected to develop into a Red Giant within the next million years.

Mintaka is a multiple star system with an overall magnitude of +2.23 but can vary between +2.50 and +3.90. This is because a 7th magnitude star that is currently about 52 arc-seconds away from the main component sometimes eclipses the main star. There is an even fainter star in between these two stars. The main component itself is triple star system comprised of a bright giant and a rare B class main sequence star orbiting every 5.73 days and another B class sub-giant 0.2 arc-seconds away.

There is another 7th magnitude companion that is an unusual B type main sequence star and is itself a spectroscopic binary with a faint A type companion in a 30-day orbit. This 14th magnitude star is thought to be at the same distance but it is not clear whether it is physically bound to the primary star and little is known about it.

Mintaka may be a seven star system but it is also thought to be surrounded by a cluster of faint stars that may be surrounding the whole system. The main star is estimated to be 1200 light years from our Sun. It has a surface temperature of 30,000° K, a luminosity 90,000 times the Sun and a mass of 20 times that of our Sun.

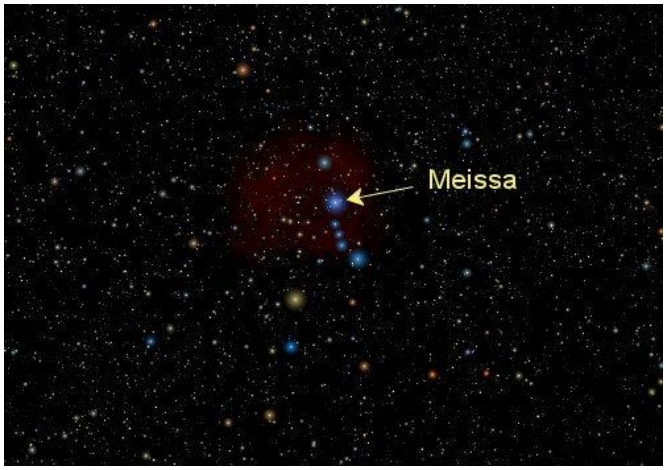
Those who have a telescope should have a good look at Rigel because it is actually an interesting double star. As the main star is a giant and very bright it is quite difficult to see the fainter companion star.

Rigel and its smaller companion

Seeing the companion is a bit of a challenge for a smaller telescope but it has been seen by the author using his new Starwatcher Evostar 90mm refractor featured in the January issue of this magazine. It appeared a lot fainter than it appears in the image above but rewarding to see.

Saiph is located at the lower left (east) Orion. It is of a similar distance and size to Rigel, but appears much fainter. This is because although it has a very high surface temperature (26,000°C) that causes it to emit most of its light in the ultraviolet region of the spectrum. Our eyes are not sensitive to ultraviolet wavelengths so it appears fainter.

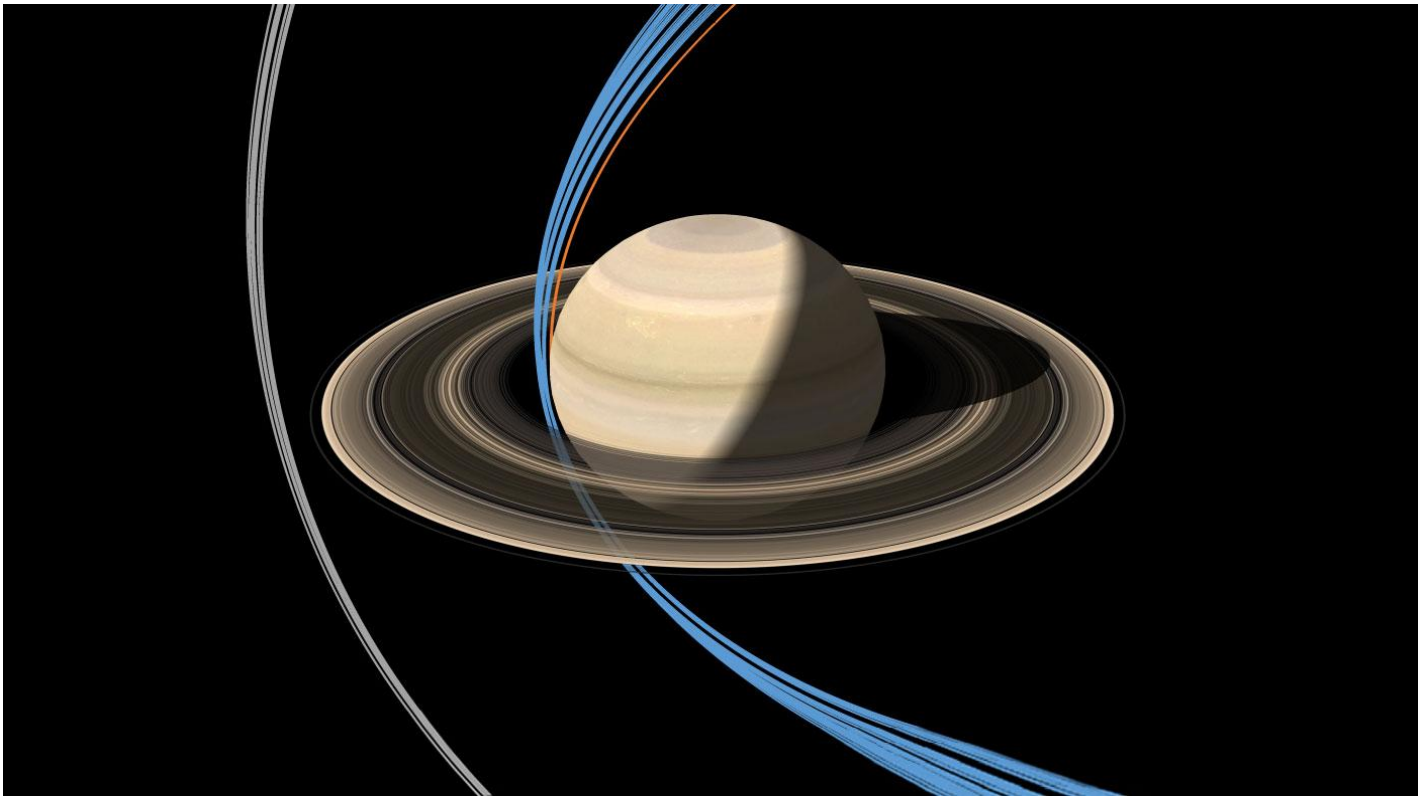
One of the stars in the small group of stars that define Orion's head is a very hot blue giant. Meissa is a giant star with a stellar classification of O8 III and has an apparent magnitude +3.54. It is an enormous star with about 28 times the mass of the Sun. It has an effective temperature of around 35,000 K, giving it a characteristic blue glow of a hot O-type star.



The giant star Meissa

Meissa is actually a double star with a companion at an apparent angular separation of 4.41 . This fainter component is magnitude +5.61 and it has a stellar classification of B0.5 V, making it a B-type main sequence star. There is another outlying component, Meissa C which is an F-type main sequence star with a classification of F8 V. This star in turn may have a very low mass companion that is probably a tiny brown dwarf star.

CASSINI'S FINAL SUICIDE MISSION



A diagram showing how Cassini will loop through Saturn's ring plane

NASA's aging Saturn probe Cassini is now in its final year of operations. On 30th November 2016 NASA's Cassini mission began a daring set of ring-grazing orbits, skimming past the outside edge of Saturn's main rings. Cassini will fly closer to Saturn's rings than it has since its 2004 arrival. It will begin the closest study of the rings and offer unprecedented views of tiny moons that orbit near them. Even more dramatic orbits ahead will bring Cassini closer to Saturn than any spacecraft has dared to go before.

Cassini was launched in 1997 and has been touring the Saturn system since arriving there in 2004 for an up-close study of the planet, its rings and its moons. During its twelve year journey, Cassini has made numerous dramatic discoveries, including a global ocean inside the moon Enceladus and liquid methane seas and rivers on Titan.

A Methane sea and shoreline seen on the moon Titan

From the beginning of this final stage on 30th November 2016 and on to 22nd April 2017 Cassini will circle high over and under the poles of Saturn. Every orbit will take seven days and will total 20 orbits and will pass through the unexplored regions at the outer edge of the main rings.

This phase has been called the Cassini's Ring-Grazing Orbits because it will be skimming past the outer edge of the rings. In addition Cassini has two instruments that can sample particles and gases as it crosses the ring plane so in a sense Cassini will also 'taste' the rings.

On many of these passes, Cassini's instruments will attempt to directly sample ring particles and molecules of faint gases that are found close to the rings. During the first two orbits, the spacecraft passed directly through an extremely faint ring produced by tiny meteors striking the two small moons Janus and Epimetheus. The ring crossings in March and April will send the spacecraft through the dusty outer reaches of the F ring. See the diagram below the F ring is to the left (outermost ring).

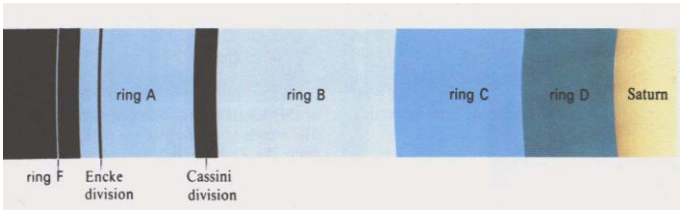


Diagram showing the structure of Saturn's rings

Even though Cassini will be flying closer to the F ring than it ever has, it will be still be more than 7,800 kilometres away. The F ring marks the outer boundary of the main ring system although Saturn has several other much fainter rings that lie farther from the planet. The F ring is complex and constantly changing. Cassini images have shown structures like bright streamers, wispy filaments and dark channels that appear and develop over a few hours. The ring is also quite narrow -- only about 800 kilometres wide. At the centre of the F Ring is a denser region about 50 kilometres wide.

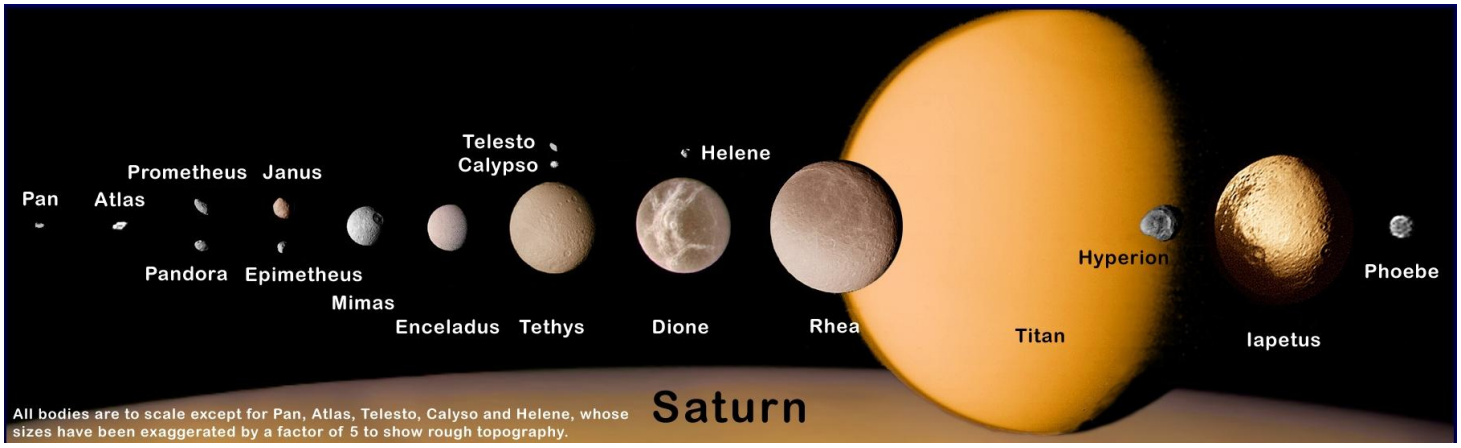
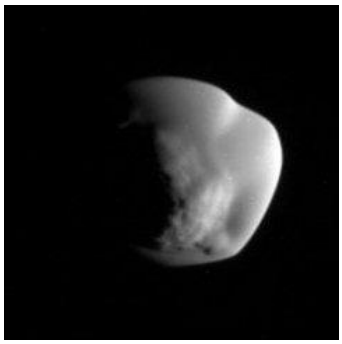


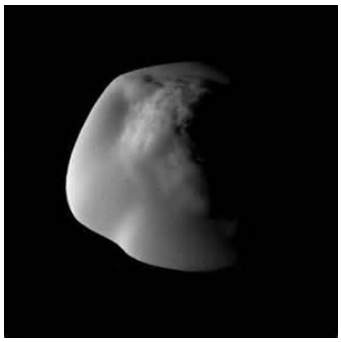
Diagram showing the relative size of some of Saturn's moons

Cassini's ring-grazing orbits offer some unprecedented opportunities to observe the menagerie of small moons that orbit in or near the edges of the rings, including best-ever looks at the small moons Pandora, Atlas, Pan and Daphnis.

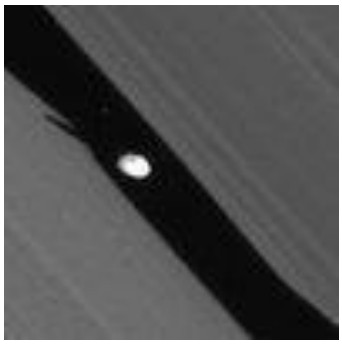
Pandora



Atlas



Pan



Daphnis

The moon Daphnis is what is known as a shepherd moon. These tiny moons are imbedded in the ring system and help maintain the structure of the ring system.

Grazing the edges of the rings will also provide some of the closest ever studies of the outer portions of Saturn's main rings (the A, B and F rings). Some of Cassini's views will have a level of detail not seen since the spacecraft glided just above them during its arrival in 2004. This mission began imaging the rings in December 2016 along their entire width. It was able to resolve details smaller than 1 kilometre per pixel and start building up Cassini's highest quality complete scan of the rings' intricate structure.

This last mission will also investigate small-scale features in the A ring called 'propellers' that may reveal the presence of unseen tiny moonlets. The airplane propeller-like shapes have been given informal names inspired by famous aviators, including 'Earhart'. By observing the propellers at high resolution it is hoped that it will reveal new detail about their origin and structure.

In March, while coasting through Saturn's shadow, Cassini will observe the rings backlit by the sun, in the hope of catching clouds of dust ejected by meteor impacts.

During these orbits, Cassini will pass as close as about 90,000 kilometres above Saturn's cloud tops. Even with all their exciting science, these orbits are merely a prelude to the planet-grazing passes that lie ahead. In April 2017 the spacecraft will begin its Grand Finale phase.

After nearly 20 years in space, the mission is drawing near its end because the spacecraft is running low on fuel. The Cassini team has carefully designed the finale to conduct an extraordinary science investigation before sending the spacecraft to crash into Saturn to protect its potentially habitable moons.

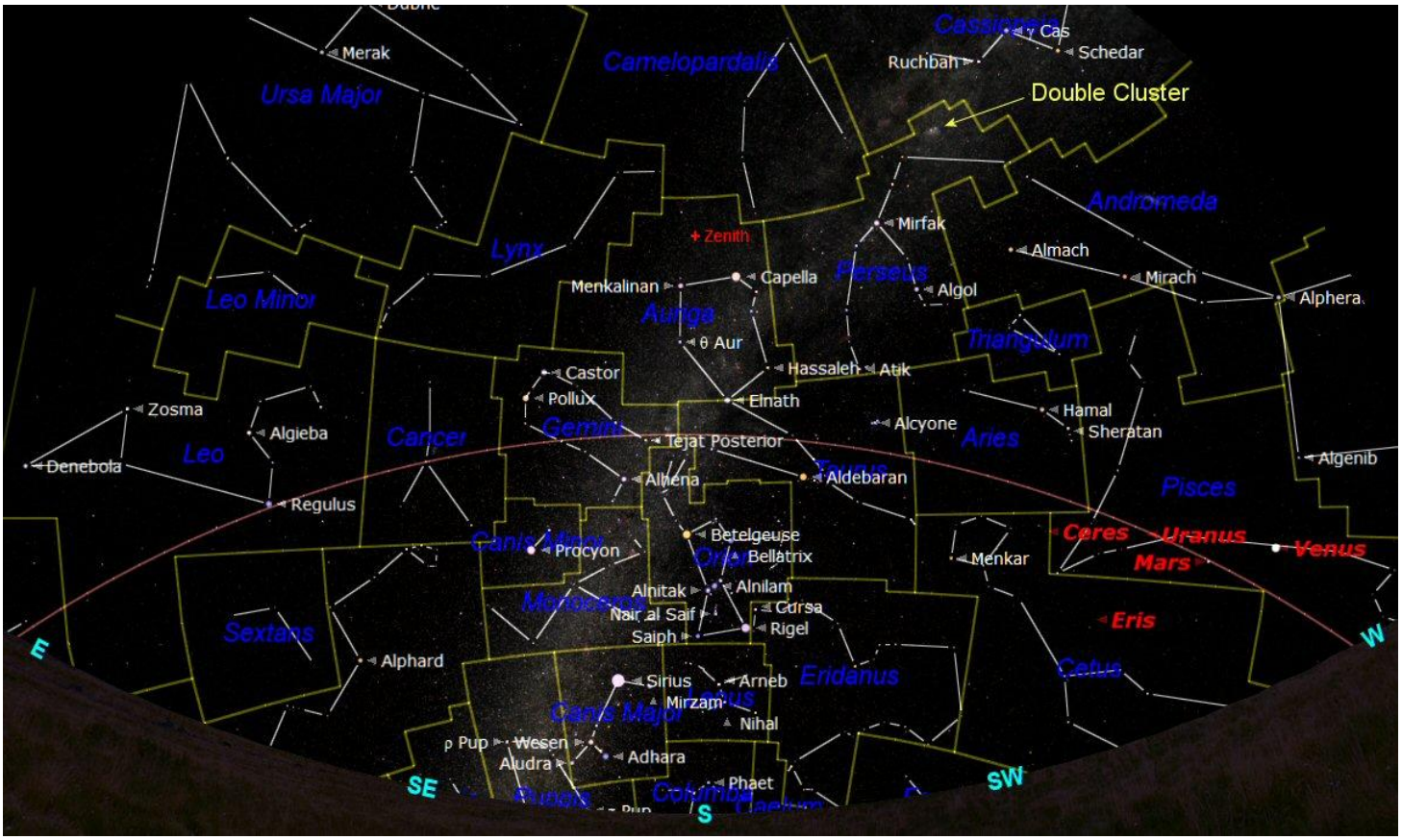
During its grand finale, Cassini will pass as close as 1,628 kilometres above Saturn's clouds as it dives repeatedly through the narrow gap between Saturn and its rings. It will complete its mission by plunging into the planet's atmosphere on 15th September 2017. Before the spacecraft can leap over the rings to begin its finale, some preparatory work remains to be done.

To begin with, Cassini was instructed to perform a brief burn of its main engine during the first super-close approach to the rings on 4th December. This manoeuvre was important for fine tuning the orbit and setting the correct course to enable the remainder of the mission. This was the 183rd and last planned firing of the main engine. Although it could still be decide to use the engine again but the plan is to complete the remaining manoeuvres using just the thrusters.

To further prepare itself, Cassini will observe Saturn's atmosphere during the ring-grazing phase of the mission to more precisely determine how far the atmosphere extends above the planet. Scientists have observed Saturn's outermost atmosphere to expand and contract slightly with the seasons since Cassini's arrival. Given this variability, the forthcoming data will be important for helping mission engineers determine how close they can safely fly the spacecraft to the cloud tops.

After skimming across the Saturn's cloud tops, Cassini will be ordered to dive into the clouds to complete its final mission. The tiny space craft will be ordered to destroy itself in a selfless act to protect the Saturn System from any possible contamination from the probe itself. Future missions may be sent to explore the moons of Saturn and will inevitably want to search for signs life. This could be compromised if Cassini was to be left to collide with a moon.

THE NIGHT SKY - JANUARY 2017



The night Sky February 2017 at 20:00 (8 o'clock in the evening)

The chart above shows the night sky looking south at about 20:00 GMT on 15th February. West is to the right and east to the left. The point in the sky directly overhead is known as the Zenith and is shown at the upper centre of the chart. The curved brown line across the sky at the bottom is the Ecliptic or Zodiac. This is the imaginary line along which the Sun, Moon and planets appear to move across the sky. The constellations through which the ecliptic passes are known as the constellations of the 'Zodiac'.

Constellations through which the ecliptic passes this month are: Pisces (the Fishes), Aries (the Ram), Taurus (the Bull), Gemini (the Twins), Cancer (the Crab), Leo (the Lion) and Virgo (the Virgin) just appearing over the eastern horizon.

The Milky Way (our Galaxy) appears to rise up from the south eastern horizon. It continues up through the constellations of Monoceros, Orion, Gemini, Auriga, Perseus and into Cassiopeia at the top right of the chart.

Mars (the Red Planet) is in Pisces and is still visible in the south west in the evening twilight. Neptune is now moving over the western horizon. Uranus is in Pisces and still in a good position for telescopic observation. Saturn is now too close to the Sun and not observable. Venus is now in Pisces and rising higher in the west in the evening over the next few months. Jupiter is an early morning object rising before midnight in the east. It is very bright and easy to find in the south until the sky brightens at about 7 o'clock.

The beautiful constellation of Orion is now dominating the southern sky. Orion is the mythical hunter with his two hunting dogs Sirius and Procyon. It is almost due south by 20:00 but can be seen in the south east and east in the earlier evening. Orion is featured again this month and is described in more detail on page 2.

The guide to Orion on page 2 is repeated from the January magazine to show the location of the stars discussed on pages 3, 4 and 5.

To the north of Orion are the fairly obvious constellations of Taurus and Gemini. To the north west and sitting astride the ecliptic is the constellation of Taurus (the Bull). The Taurus asterism (shape) looks like a squashed cross 'X'. At the centre of the cross is a large, faint Open Cluster called the Hyades. It has the bright Red Giant star Aldebaran in the centre. The real beauty of Taurus is the naked eye Open Cluster M45 the Pleiades.

To the north of M45 the Pleiades cluster in Taurus is a line of stars defining the constellation of Perseus. The whole asterism (shape) of Perseus looks like a horse rider's stirrup. At the top of the line of stars is the beautiful object 'the Double Cluster' that is best seen using binoculars.

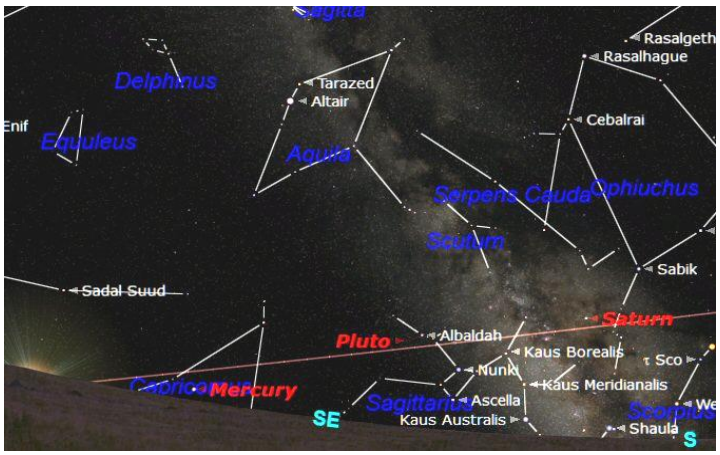
Following Taurus along the ecliptic is Gemini (the Twins). The twin stars Pollux and Castor are easy to find. There is a lovely Messier Open Cluster M35 in Gemini just off the end of the line of stars emanating from the bright star Castor. See the December magazine. Castor is a rather nice double star when viewed through a telescope.

To the east of Gemini is the faint and rather indistinct constellation of Cancer (the Crab). Even though the asterism (shape) of Cancer looks quite uninteresting it does have a very nice Open Cluster called Messier 44 (M44) Praesepe or the Beehive Cluster. M44 does look like a swarm of bees around an old style hive. It is large with dispersed stars and is best seen using binoculars.

The beautiful constellation of Leo the Lion is moving into the evening sky. It will be the constellation of next month.

THE SOLAR SYSTEM FEBRUARY 2017

MERCURY is a morning object very close to the Sun this month, rising in the east at 07:00 and will not be visible.



VENUS is very well positioned in the south as the Sun sets and very bright at magnitude -4.6. The telescopic view is now very good because Venus is higher and above the turbulent, dirty air close to the horizon. Venus appears as a very nice crescent and is getting noticeably bigger but narrower. It still requires a Moon filter to reduce the dazzling effect and improve the view. See the chart below.

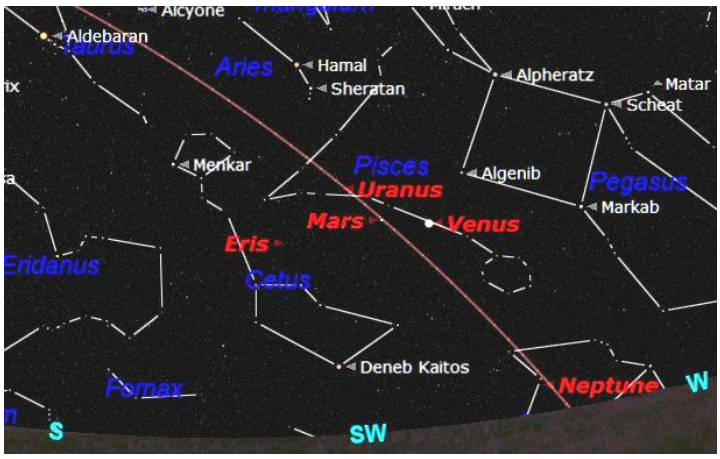
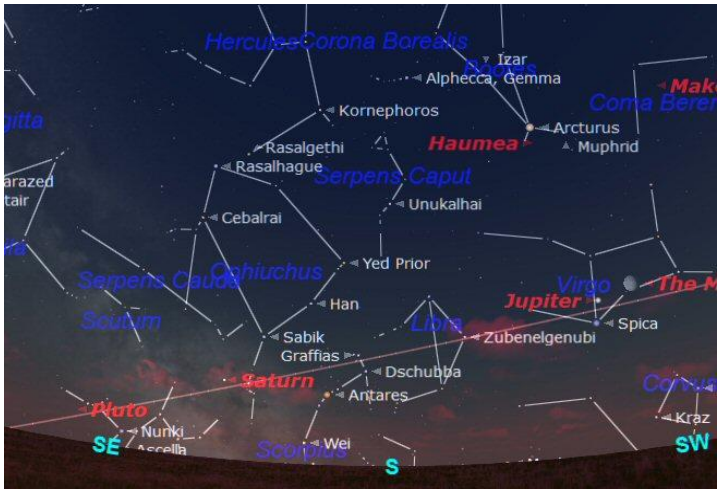


Chart showing Venus, Mars, Uranus and Neptune at sunset

MARS will be in the south as the Sun is setting and the sky begins to darken. The Red Planet appears small at just 5.0 arc-seconds in diameter and is fading to magnitude +1.2. Mars is getting low in the turbulent air near the horizon and will set at 21:40. Mars is falling further behind as we on Earth move faster along our orbit inside the orbit of Mars. We will have to wait until the end of this year before we begin to catch up with Mars again and it starts to look bigger. See the Venus chart above.

JUPITER is now a good early morning object. It rises over the eastern horizon at 22:00 and will be observable before midnight towards the end of the month. To avoid losing too much sleep, Jupiter can be observed in the morning before sunrise high in the southern sky. A pair of binoculars will reveal the four brightest of Jupiter's many moons, Io, Europa, Ganymede and Callisto. Even a small telescope will allow the moons to be seen very clearly.

SATURN will be visible towards the end of February in the brightening dawn sky close to the south eastern horizon. The ringed planet rises at about 03:30 by the end of this month, this about 2½ hours before the Sun. The view of Saturn will not be good as it is still quite close to the Sun, very low and close to the south eastern horizon in turbulent and dirty air. Saturn will remain low in the sky this year so the views will not be perfect but the rings are nearly wide open and should still look very impressive.



Jupiter and Saturn at 06:00 (6 o'clock in the morning)

URANUS will be in a good observable position this month. It will be quite high in the south as the sky darkens. It will be visible using a good pair of binoculars but a telescope at a magnification of 100x or higher will be needed to see it as a small blue/green disc. See the Venus chart.

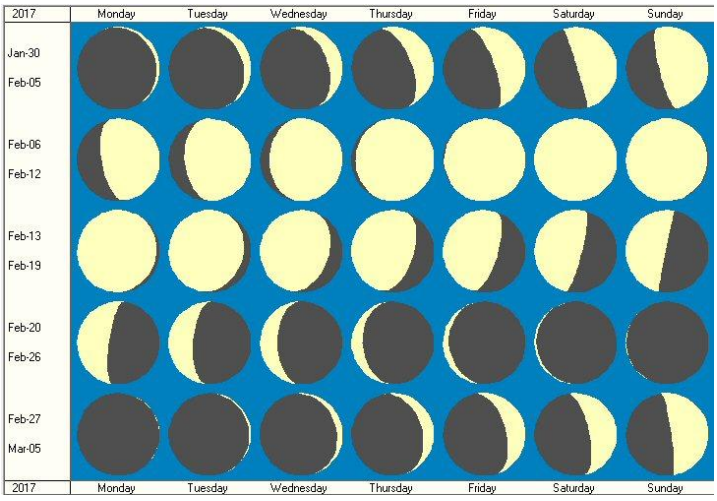
NEPTUNE will not be visible as it will be close to the western horizon as the Sun set. It will be too small and difficult to find in the bright dusk sky. See the Venus chart.

THE SUN

There are still occasional sunspots to see even though the active phase of the Solar Cycle is all but over.

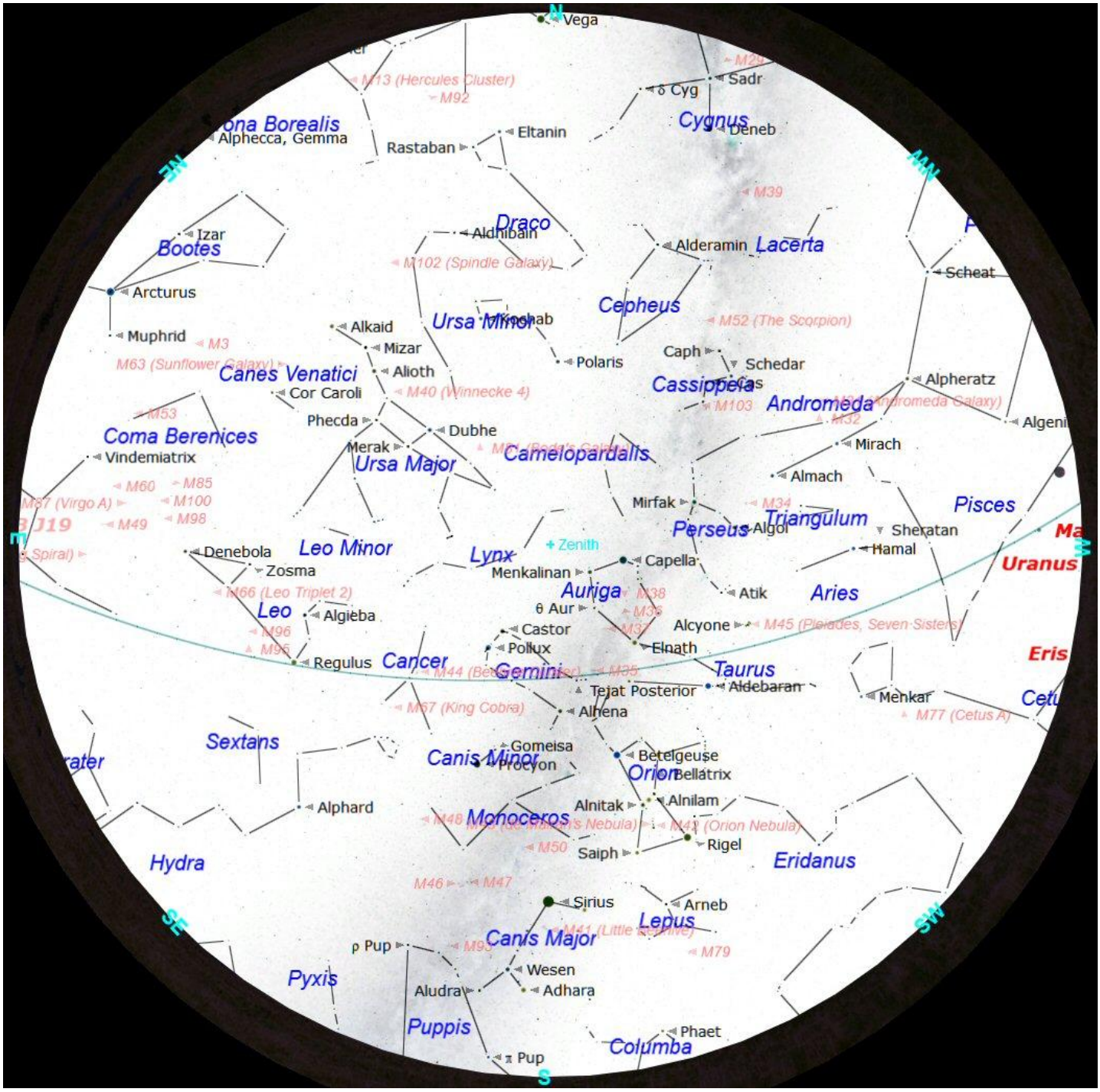
The Sun rises at 07:35 at the beginning of the month and at 06:50 by the end of the month. It will be setting at 16:55 at the beginning and 17:40 at the end of the month. Sunspots and other activity on the Sun can be followed live and day to day by visiting the SOHO website at : http://sohowww.nascom.nasa.gov/ .

THE MOON PHASES IN FEBRUARY



First Quarter will be on 4th February
Full Moon will be on 11th February
Last Quarter will be on 18th February
New Moon will be on 26th February

THE NIGHT SKY THIS MONTH



The chart above shows the night sky as it appears on 15th February at 21:00 (9 o'clock) in the evening Greenwich Mean Time (GMT). As the Earth orbits the Sun and we look out into space each night the stars will appear to have moved across the sky by a small amount. Every month Earth moves one twelfth of its circuit around the Sun, this amounts to 30 degrees each month. There are about 30 days in each month so each night the stars appear to move about 1 degree. The sky will therefore appear the same as shown on the chart above at 10 o'clock GMT at the beginning of the month and at 8 o'clock GMT 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 east. 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: Uranus, Mars, Venus and Jupiter (from midnight until dawn).