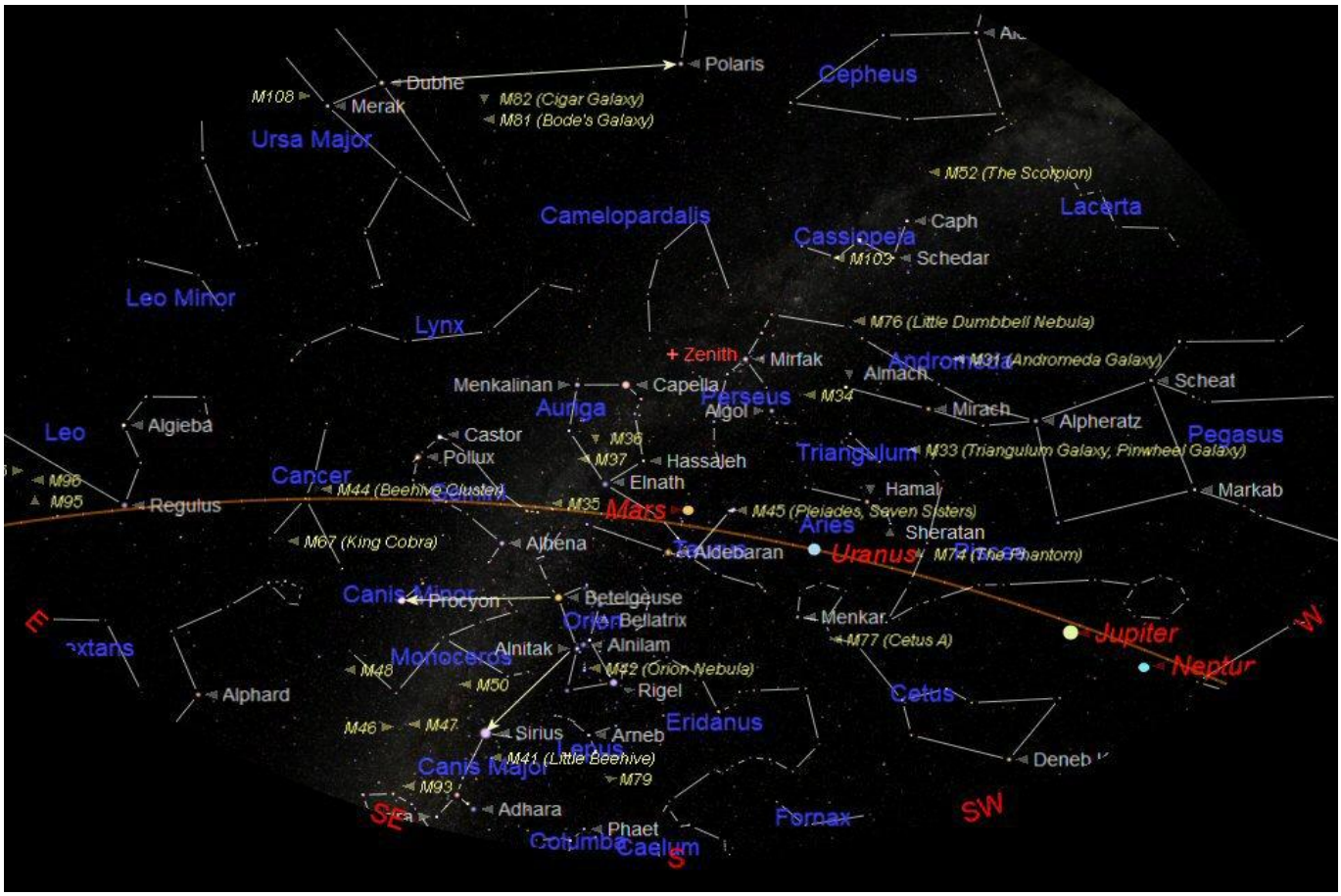
NEWBURY ASTRONOMICAL SOCIETY
MONTHLY MAGAZINE – JANUARY 2023

THE SOUTHERN NIGHT SKY – JANUARY 2023



The night sky looking south this month at 21:00 (9 o'clock)

The chart above shows the night sky looking south at about 21:00 GMT on 15th January. 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 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: Aquarius (the Water Carrier), Pisces (the Fishes), Aries (the Ram), Taurus (the Bull), Gemini (the Twins), Cancer (the Crab) and Leo (the Lion).

The southern sky is now dominated by the constellation of Taurus (the Bull). The most obvious star in Taurus is the lovely Red Giant Star called Aldebaran. It appears slightly orange to the 'naked eye' but it is very obviously orange when seen using binoculars or a telescope. Aldebaran is located at the centre of the 'flattened' X shape formed by the brightest stars in Taurus. At the end of the top right (upper west) arm of the 'X' is the beautiful 'naked eye' Open Star Cluster called Messier 45 (M45) also known as the Pleiades (or the Seven Sisters). It is best seen using binoculars.

Following Taurus is the constellation of Gemini (the Twins). The two brightest stars in Gemini are Castor and Pollux and they are named after mythological twins. To the north of Taurus is the odd pentagon shape of Auriga (the Charioteer). Dominating Auriga is the brilliant white star Capella which is almost directly overhead. For those with a telescope there is a line of lovely open clusters to search out in Taurus and Auriga. These are M35 in Taurus and M36, M37 and M38 in Auriga.

To the south of Taurus is the most recognised winter constellation called Orion (the Hunter). Orion is easily found by looking for his very obvious three stars of his belt. Orion has his Hunting Dogs Sirius (the big dog) and Procyon (the little dog) to the east (left) and following him. Orion is the featured constellation for this month, on the next page.

NEWBURY ASTRONOMICAL SOCIETY MEETING

6th January Latest Results from JWST

Website: **www.newburyastro.org.uk**

NEXT NEWBURY BEGINNERS MEETING

18th January The constellation of Orion (the Hunter)

Website: **www.naasbeginners.co.uk**

CONSTELLATION OF THE MONTH – ORION

The Constellation of Orion photographed by Nicky Fleet

Orion (the Hunter) is one of the best known constellations and one of the easiest to recognise and begins to dominate 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. 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 small black object in the sea. Claiming it was a horrible villain and 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 and remember 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 right shoulder (Bellatrix) he holds out a shield. From his left 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.

Down from Orion's very distinctive belt there 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, see the next page for details.

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. See the chart on the next page.

To Orion's left (east) of Betelgeuse a quite 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 an invisible companion. They were normal stars that had reached the end of their lives and used all their Hydrogen fuel. They have collapsed to become very compact and dense White Dwarfs stars.

M42 THE GREAT NEBULA IN ORION

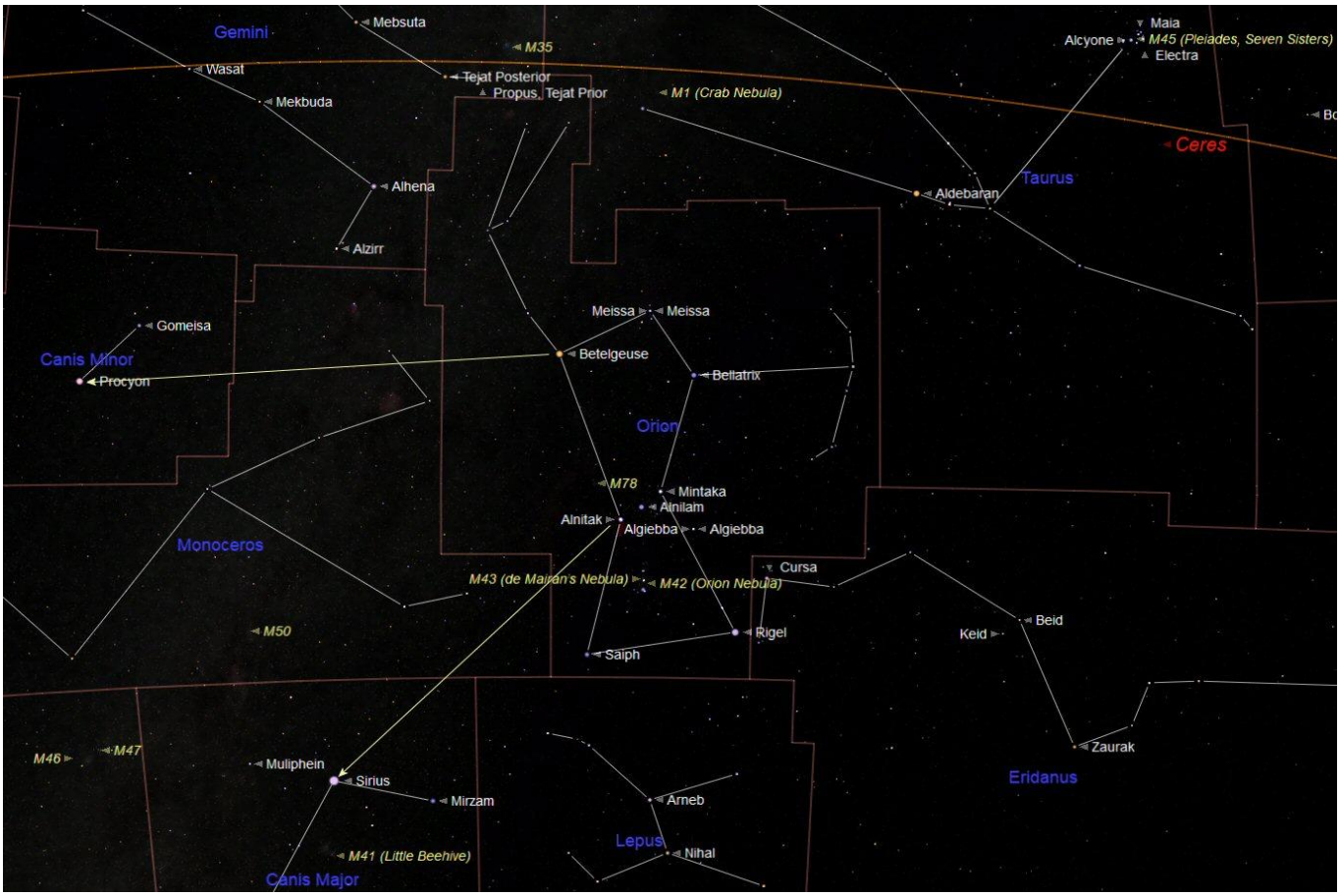
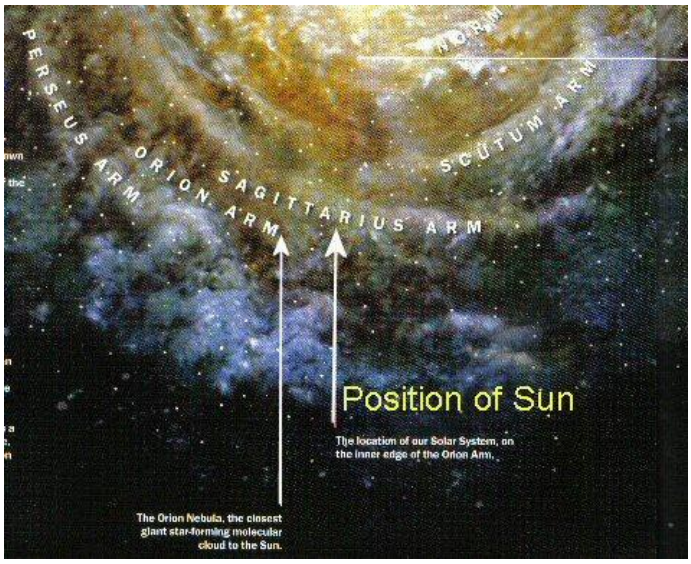


Chart showing M42 the Great Nebula in Orion

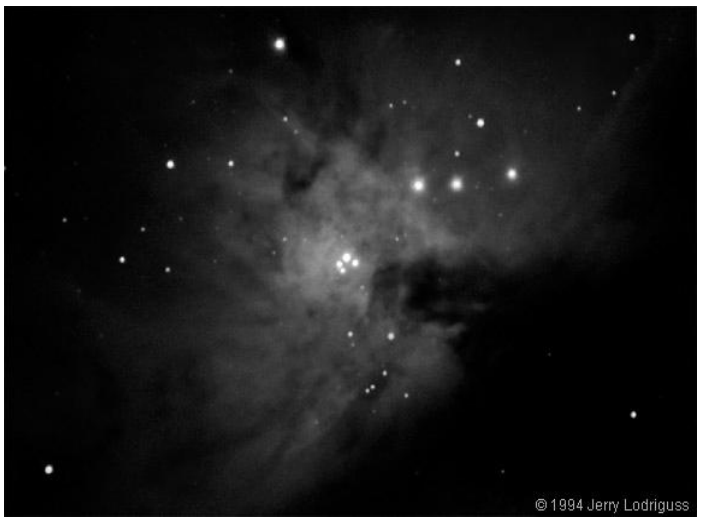
When we look towards Orion we are looking into one of the nearest spiral arms of our galaxy the Milky Way. Our Sun appears to be located in the area between two spiral arms. Towards the centre of the galaxy from our point of view is the Sagittarius Arm and looking away from the centre is the Orion Arm.



An artist impression of our position in the Galaxy

Most of the stars in Orion are located about 900 light years away from us including Rigel but Betelgeuse is much closer at only 310 light years distant. Because the stars of Orion are in a spiral arm there is a lot of gas and dust around the whole area of the constellation. Huge numbers of stars are hidden by the gas and dust.

Below the line of three stars of Orion's belt there is a vertical line of stars forming his sword (hanging below his belt). In the line of stars making up Orion's sword a hazy patch can be seen using binoculars or even with just the naked eye on a clear night. The hazy patch is known as M42 (Messier 42), the Great Orion Nebula. This Nebula is part of a gigantic cloud of Hydrogen gas mixed with other gases and dust from which new stars are being formed. Through a pair of binoculars the nebula looks like a small fuzzy patch in the line of stars.



The Trapezium cluster superimposed on M42

When seen through a telescope the 'fan shaped' cloud like structure can been made out. Swirls of gas and dust can be seen, some are lit up but some are dark and silhouetted against the illuminated clouds behind.

The cloud is actually illuminated by the young stars forming in it. Most of the energy illuminating this part of the nebula comes from a group of 4 stars known as the Trapezium. These stars have formed out of the gas and dust in the nebula; they are young, hot and very active. The Trapezium can be seen easily using a small telescope. The four stars of the trapezium (there is a fifth fainter star) are just the brightest of what is an Open Cluster in the process of forming. The Orion Nebula actually contains many more very young stars that are still hidden by the gas and dust of the nebula.

Special telescopes that can detect ultraviolet and inferred radiation can be used to penetrate the gas and dust to see the stars forming inside the nebula. The image below shows most of the stars that are normally hidden by the gas and dust clouds.

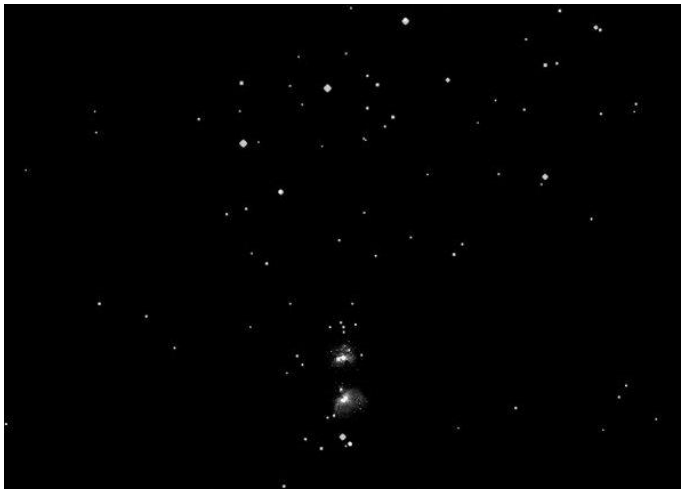
Stars forming in M42

Gravity draws the atoms of the gas together and as the gas becomes denser it pulls in even more until huge spheres of gas are formed. As the pressure in the core of a sphere increases the temperature rises to tens of millions of degrees and the Hydrogen atoms begin to fuse together to form atoms of Helium. In this process known as Nuclear Fusion a small amount of mass is lost and converted into energy in the form of a powerful flash of X-Rays. This heats the mass of gas of the sphere and it begins to shine as a bright new star.

Much of the gas and dust in the nebula shines by reflecting light from the very young stars of the Trapezium in the centre of the nebula. Some gas also produces its own light because the ultraviolet radiation energy from the powerful young stars excites the gas atoms. This causes them to glow somewhat like a fluorescent light or the Aurora (Northern Lights).

When a photon of ultraviolet light from the powerful young stars hits a gas atom it causes an electron to jump from its normal orbit to a higher orbit. After a very short time the electron jumps back to its original orbit and emits a flash of light. The colour of this light is unique to the type of atom that has emitted it. For example Hydrogen always emits red light. See the image opposite. ➔

The Orion Nebula can be seen with the naked eye from a dark location on a clear moonless night. It is easily seen using a pair of binoculars. The image below shows the sort of view seen using a pair of 8 x 50 binoculars.



Binocular view of M42 with Orion's belt at the top

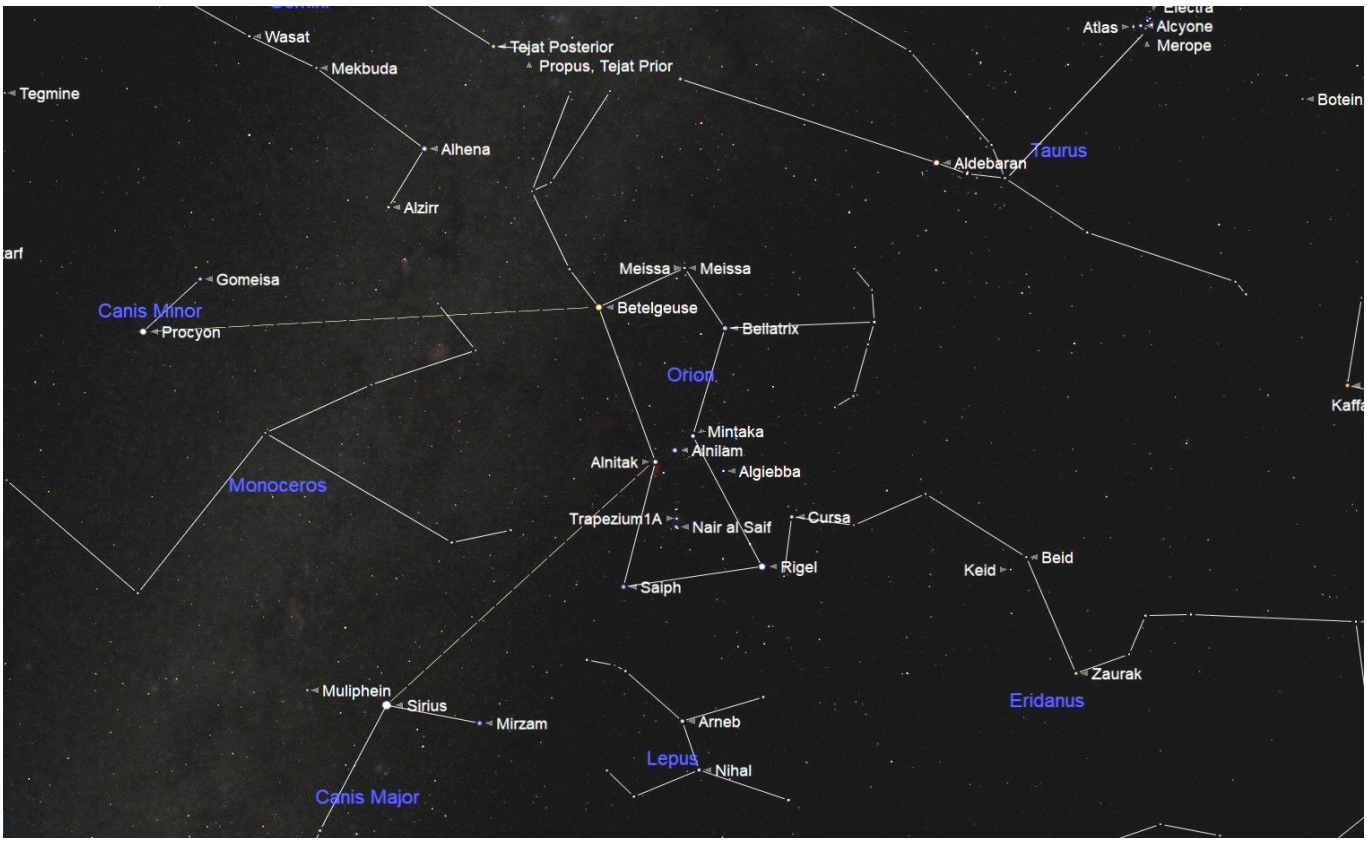
A small telescope will show a larger view and some detail in M42. Structure in the nebula can be seen with parts of the nebula illuminated and other parts appearing dark.

The sort of view seen using a small telescope

A larger telescope will show more detail in the structure with the nebula made up of wisps of gas appearing. Photographic images show much more detail including colour in the clouds of gas and dust. The red in the image below is typical of the emissions from excited Hydrogen gas in the nebula.

A photographic image of M42

Orion's interesting stars



Orion the Hunter and his Hunting Dogs

Orion (the Hunter) is one of the best known constellations and one of the easiest to recognise and dominates the southern sky at this time of the year. 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.

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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 Big 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. To Orion's left (east) of Betelgeuse a quite bright star in a rather large empty area of sky can be seen. This is Procyon in Canis Minor, Orion's Small Hunting Dog.

We tend to search out Orion to look at the famous object Messier 42 (M42) the Great Nebula. M42 is of great interest and one of the most interesting objects to see. In this article we will be concentrating on some of the very interesting stars in Orion and his Hunting Dogs Sirius and Procyon.

We start with Rigel the bright white star at the lower right of the 'stick' figure depiction shown above. Rigel denotes the bottom right (west) corner of Orion's skirt like tunic. Rigel appears bright to us because it an intrinsically bright giant star. Rigel is a massive, luminous star of the spectral type B8, indicating it is a bright supergiant appearing blue or blue-white in colour.

Rigel has a diameter almost 160 times that of our Sun and has an estimated mass of 21 solar masses. With a temperature of 12,100 K, it shines about 120,000 times brighter than our Sun. It is thought to be about 860 light years away from us.

The Rigel is actually a four star system comprised of the giant star and at least three smaller stars. The Rigel System is referred to as Beta Orionis (β Orionis) and is the second brightest star in Orion after Betelgeuse which is known as Alpha Orionis (α Orionis). Within the Star System the main biggest and brightest star is designated Rigel A (or β Ori) with the smaller stars known as: Rigel Ba, Rigel Bb and Rigel C. There is another star, fainter and at wider separation, that is a suspected component of the Rigel system.

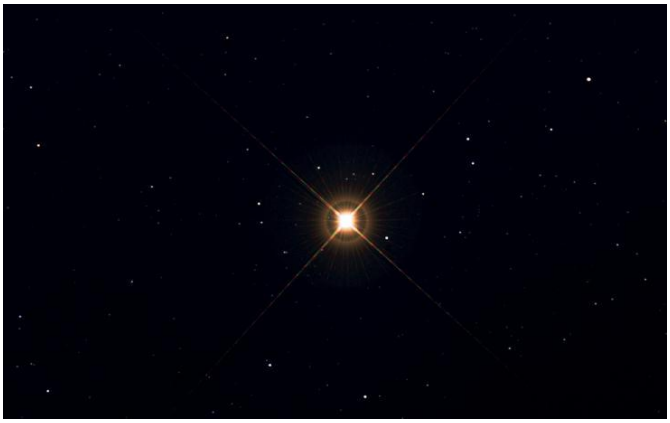
For those with a telescope Rigel (α Orionis) can be seen as a double star. The main and brightest star Rigel A is so bright that Rigel B can be difficult to see. Rigel B has an apparent magnitude of 6.7 which would make the star easily visible in small telescopes if it were not so close to Rigel A. As it is about 440 times fainter than its neighbour, Rigel B is difficult to see in telescopes with apertures smaller than 150mm (6").

Rigel A and Rigel B

The binary system is separated from the primary component by 9.5 arc-seconds that is more than 2,200 astronomical units (Earth – Sun distance). It has a similar proper motion to Rigel A and the pair has an orbital period of at least 18,000 years.

At Orion's left shoulder is the bright orange coloured star Betelgeuse which is much further along its pathway of 'life'. It is approaching the last phases of its existence as a normal star. It has grown into a (really huge) 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.



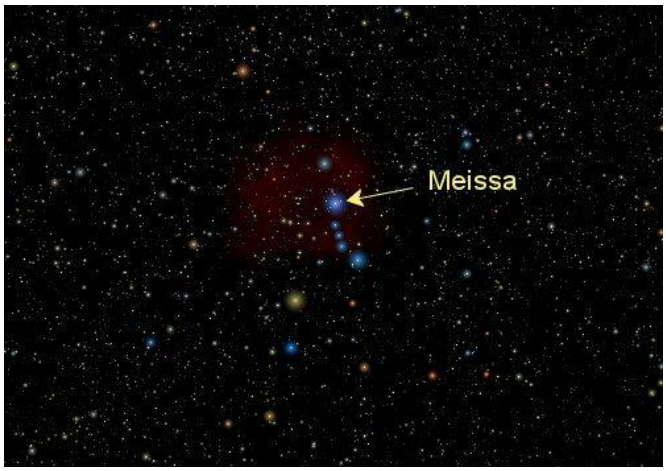
Betelgeuse as seen using a telescope

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 its light 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 is distinctly orange to the naked eye and again even more so when viewed using binoculars or a telescope.

Betelgeuse looks red (orange) because it is more advanced in its life cycle than Rigel and has 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 pulling 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.

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 actually 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. The fainter component has magnitude +5.61 and it has the 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 associated with this complex star system.

Saiph is located at the lower left (east) Orion's tunic. It is of a similar distance and size to Rigel but appears much fainter. This is because 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 than would be expected.

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 specks 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.

The stars of Orion's belt

The star at the east (lower 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, it has 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 only 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.

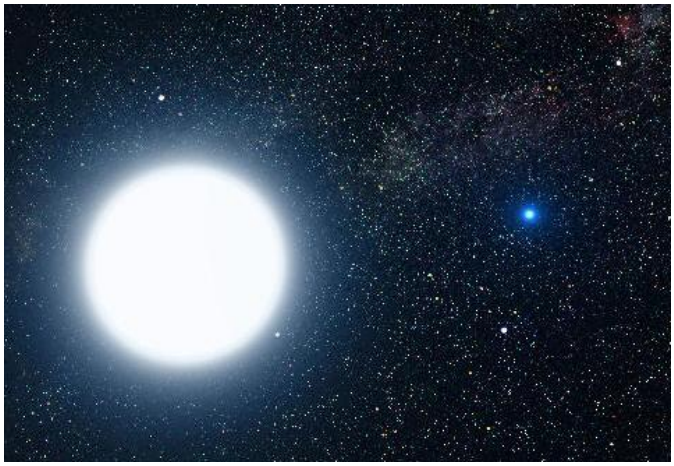
There is another 7th magnitude companion that is an unusual B type main sequence star and is itself a spectroscopic binary with a faint A type companion in a 30-day orbit. This 14th magnitude star is thought to be at the same distance but it is not clear whether it is physically bound to the primary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

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.

In mythology, Orion the Hunter has two hunting dogs so the constellation of Orion also has two hunting dogs following him in the sky. These are the stars Sirius, in the constellation of Canis Major (the large dog) and Procyon in the constellation of 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 Betelgeuse.

The charts on pages 3 and 5 show the location of Sirius and Procyon, Orion's Hunting Dogs. Although the two stars are associated with Orion through their mythological link with the Hunter and their proximity to Orion in the night sky they are actually much closer to us and not associated with the stars of Orion at all. Sirius is actually the brightest star in our sky and the brightest star in the small constellation of Canis Major (Orion's Large Dog). Procyon is the brightest star in the small constellation of Canis Minor (Orion's Little Dog).

Sirius is in fact the closest star to Earth that we can see from the Northern Hemisphere and is just 8.6 light years away. It is about twice as massive as our Sun but about 25.4 times brighter. It has a companion called 'Sirius B' that is a tiny (in diameter) star about the same volume as Earth but with a mass about the same as our Sun.



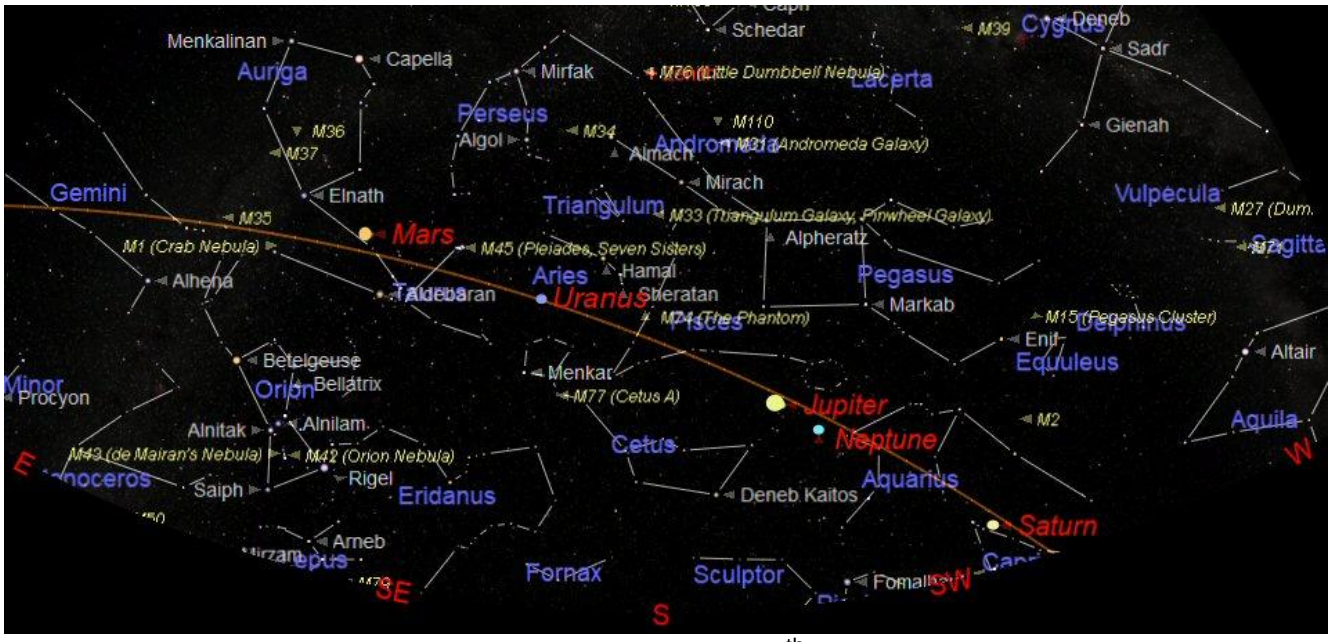
An artist's impression of Sirius A and Sirius B

Sirius B formed about 230 million years ago when it was the largest star of the original pair. It was about 5 times the mass of our Sun and fused its Hydrogen fuel into Helium very quickly. It lived out its Main Sequence phase (life as a normal star) much faster than its smaller companion. It is thought Sirius B developed into a Red Giant around 120 million years ago.

As the Red Giant collapsed to form the White Dwarf Sirius B its outer layers were stolen by Sirius A. Sirius B is now a super dense sphere of Carbon and Oxygen about 11,600km in diameter. It is very close to the brighter component (Sirius A) but is much smaller. Sirius B is considerably smaller and fainter and yet it is one of the more massive white dwarfs ever discovered.

It has a mass slightly more than the Sun's but its radius is only 0.0084 solar radii. In other words, it has the mass of the Sun packed into the size of Earth. The star's estimated surface temperature is about 25,200 K and it will continue to gradually cool over the next 2 billion years. Sirius B is a stronger X-Ray source than Sirius A so appears brighter when using a telescope that is sensitive to X-Rays.

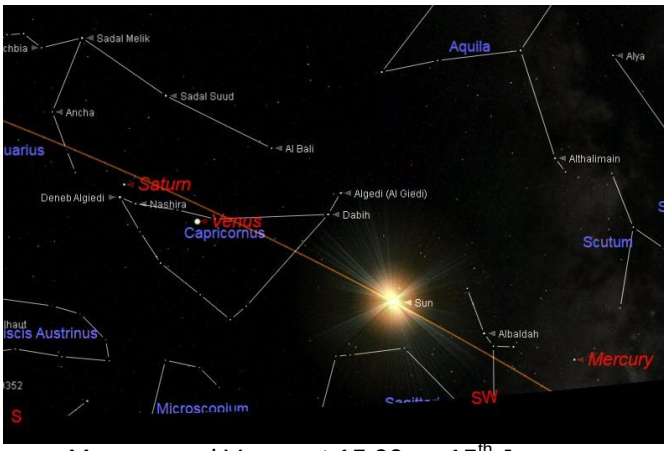
THE SOLAR SYSTEM – JANUARY 2023



The planets at 18:00 on 15th January

The chart above shows the location of the planets along the Ecliptic. The outer (Superior) planets (that orbit outside the orbit of Earth) will be visible during evening and in the early morning sky before sunrise. The inner planets are to the east of the Sun (left) and will be visible in the early evening sky after sunset.

MERCURY will appear very close the Sun just before sunrise in the east. Experts may be able to find it in the brightening morning sky but it will require a clear view to the eastern horizon. Mercury is shown below to the west of the Sun just before sunset in the west. It will then rise just before the Sun in the east in the morning.



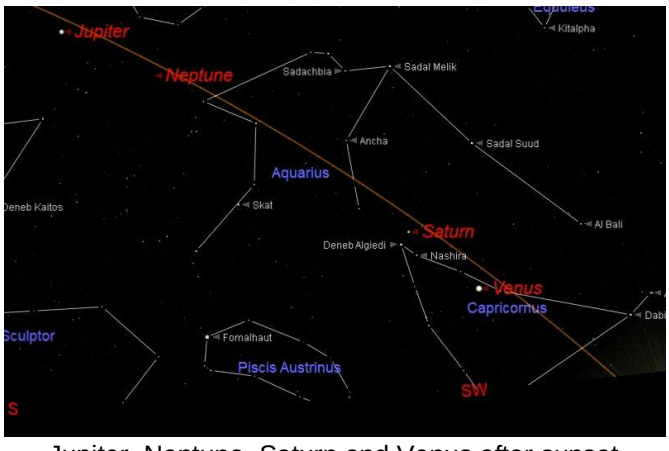
Mercury and Venus at 15:00 on 15th January

VENUS will be visible in the early evening sky as soon as possible after sunset. It will be easy to find but it will require a clear view to the western horizon. Venus was in Superior Conjunction on 22nd October and is now emerging from its excursion behind the Sun so it will be difficult to see this month. It will appear at its smallest diameter and will be fully illuminated because it is still beyond the Sun from our point of view. See the chart in the following column.

MARS can be seen high in the evening sky as soon as the Sun has set and the sky darkens. It is looking small at about 14" (arc-seconds). As Earth approaches Mars the Red Planet will appear to become bigger until Earth actually overtakes on its inner orbit. This is what astronomers call 'Opposition'. Earth overtook Mars on the inside on 8th December. Earth, Mars and the Sun were aligned with Earth between the Sun and Mars on the outside. So Mars was at its very best last month but is now starting to fall behind Earth and will start to appear smaller.

Mars was at opposition on 8th December 2022

JUPITER is past its best for this year but is still good for observing in the evening. Jupiter was at its very best when it was at opposition on 26th September. At this time it was due south at midnight 01:00 BST and appearing at its highest above the southern horizon.



Jupiter, Neptune, Saturn and Venus after sunset

Jupiter is now moving towards the western horizon during the evening. It will set over the horizon at 23:00 GMT at the beginning of this month and set by 22:00 GMT at the end of the month. In reality it will start to be unsteady up to an hour before these times due to the turbulent and muggy air closer to the horizon.

However it is still very worthwhile to observe the King of the Planets in the early evening of late for another month or so. The moons are still easy to follow and very interesting as they move around the planet. A planetarium application will show the positions of the moons the times of a transit or occultation.

The movement of Jupiter's moons can be predicted by using a Planetarium Application on a computer. The free to download application called Stellarium is very good for doing this. We are able to predict when a moon will pass in front (transit) or behind the planet (occultation). With surface markings and the movements of Jupiter's moons there will always be something interesting going on.

Jupiter imaged by Peter Tickner

SATURN has now effectively moved over the western horizon and is not observable.

URANUS was at Opposition on 9th November so was at its best position for observing this year. As Earth overtook Uranus on the inside Earth, Uranus and the Sun were aligned with Earth between the Sun and Uranus on the outside. This means Uranus was in the south at midnight 00:00 GMT and at its highest point above the southern horizon. As it is so far away from us it appears very small in fact just 3.7" (arc-seconds).

NEPTUNE will be just visible this month to the east of Jupiter using a telescope (see chart on page 8). It will be difficult to find in the sky close to Jupiter as it is very small at just 2.2" (arc-seconds) only magnitude +7.9.

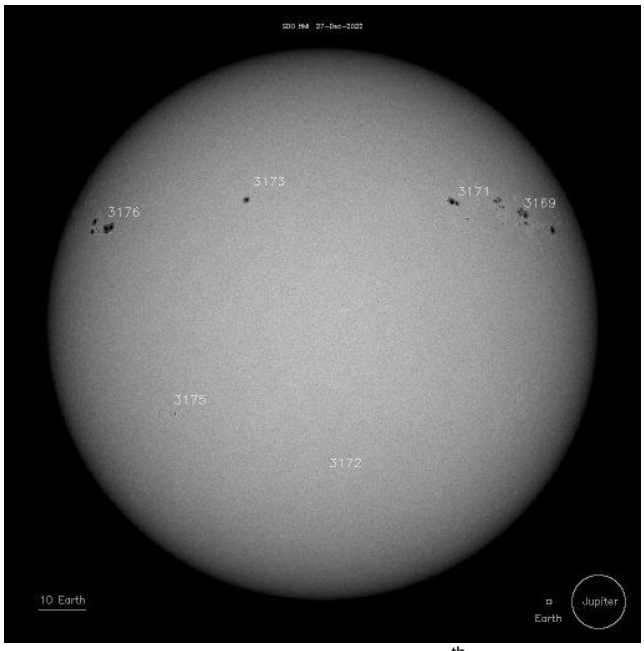
THE SUN

The Sun rises at about 08:00 at the beginning of the month and 07:50 by the end. It sets at 16:00 at the beginning of the month and 16:30 at the end of the month.

The Sun is about half way through its Active Phase when there is more activity on the surface. There is an 11 year cycle when the Sun increases and decreases activity on the surface. The most obvious change on the Sun is the appearance of Sunspots as shown on the image below. These and other activity is caused by the interaction of powerful magnetic fields in the Sun.

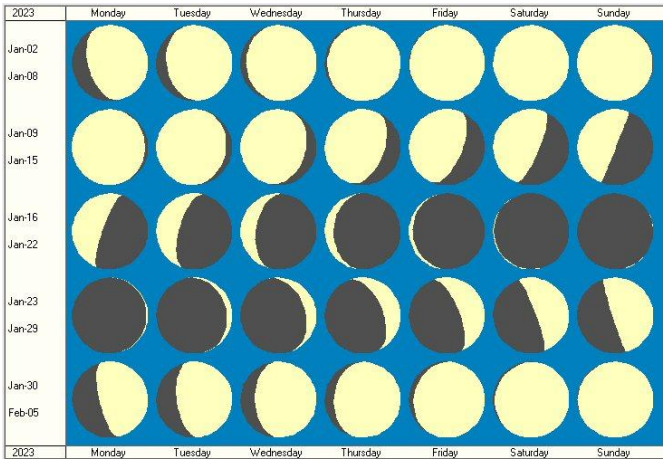
More sunspots appear and there are often huge ejections of energetic particles thrown into space. When these particles encounter the Magnetic fields surrounding Earth they are captured and drawn into the north and south poles. The energetic particles cause the upper atmosphere to glow and produce the Aurora Borealis (northern lights) and the Aurora Australis (southern lights).

Nearly all telescopes can be modified to allow the safe observation of the surface features on the Sun by fitting a special Solar Filter to the telescope. These filters reject most of the sunlight and only allow a small fraction of the light to pass through. These must be the correct approved type or permanent eye damage can occur. If a telescope is not available the Sun can still be observed by downloading daily images from NASA's orbiting Solar and Heliospheric Observatory (SOHO) at: http://sohowww.nascom.nasa.gov/.



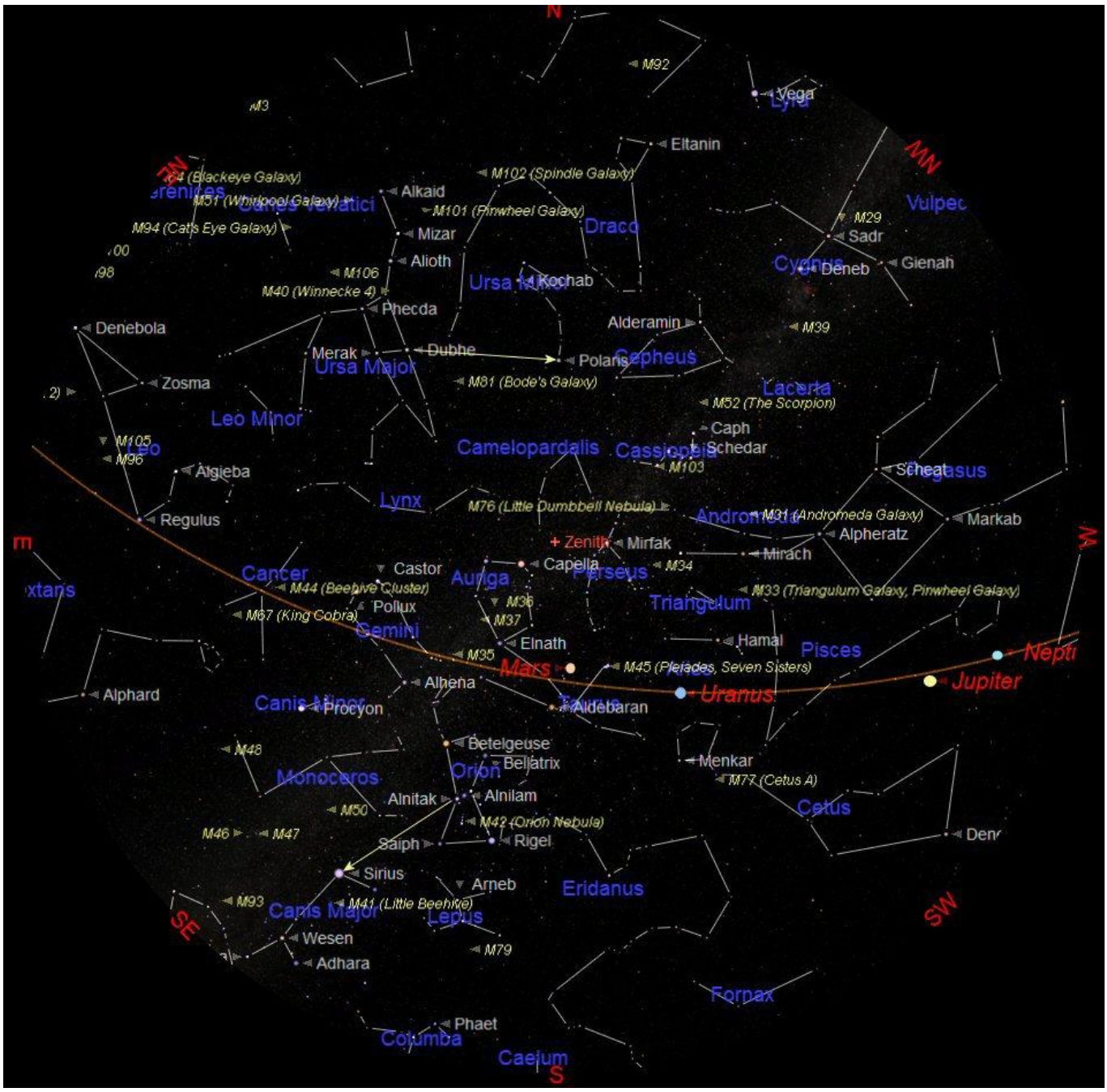
Sunspots imaged by SOHO on 27th December

THE MOON PHASES DURING JANUARY



Full Moon will be on 6th January
Last Quarter will be on 15th January
New Moon will be on 21st January
First Quarter will be on 28th January

THE NIGHT SKY – JANUARY 2023



The chart above shows the whole night sky as it appears on 15th January at 21:00 (9 o'clock) 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 8 o'clock GMT at the beginning of the month and at 10 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: Neptune, Jupiter, Uranus and Mars.