



The Night Sky (January 2021)

(Universal Time) is used this month.

Northern Horizon



Eastern Horizon

Western Horizon

Southern Horizon

22:00 at beginning of the month.
21:00 in middle of month.
20:00 at end of month

The General Weather Pattern

January is often a windy month. Rain is usually less than in the previous month, but it is the third wettest month of the year. January is typically the coldest month of the year and normally gets colder as the month ages; it can therefore be very cold at night, often reaching freezing temperatures with clear skies. Snow can be expected in cold years. Wrap up warm with a warm hat, gloves, socks and shoes and wear multiple layers of clothes; wind chill is a factor in January. An energy snack and a flask containing a warm non-alcoholic drink wouldn't go amiss.

Should you be interested in obtaining a detailed weather forecast for observing in the Usk area, log on to https://www.meteoblue.com/en/weather/forecast/seeing/usk_united-kingdom_2635052

The sixtieth anniversary of the first human orbital space flight takes place in April this year.

From Earth

The winter sky, dominated by Orion, presents itself in the south, each clear evening this month. In the above star chart it can be seen that the Milky Way stretches right across the sky from south-east to the north-west through the zenith throughout this month.

As commented on last month, it is often observed that the winter stars from the UK appear to be much brighter than the summer stars. At night in the summer we observe skies towards the centre of our galaxy in Sagittarius, some 26,000 light years away; fainter stars which are embedded in the haze of the Milky Way. In the winter we observe in the opposite direction and out along the "Orion Spur" part of a spiral arm of the galaxy. Many of these stars are older, larger and therefore intrinsically brighter and relatively close so look brighter again, there are also far fewer stars in that direction so

they stand out. A few showpiece constellations such as Orion, Taurus and Gemini really emphasise this effect, and are best observed on clear, still nights.

Should you be interested in observing the International Space Station or other space craft, carefully log on to <http://www.heavens-above.com> to acquire up-to-date information for your observing site.

Sun

The apparent diameter of the Sun is at its greatest on the 2nd because the Earth is at perihelion at 13:51UT. That is the time when Earth at 147,093,163 km, is closest to the Sun in its orbit. The word perihelion derives from the Greek words, peri meaning 'near' and Helios the Greek god of the sun.

Due to the equation of time the latest sunrise of the year occurs on New Year's Eve; 31st December and the mornings start to lighten, but you may not notice until near the end of January.

The Sun moves from Sagittarius to Capricornus on the evening of the 19th. It is also beginning its journey towards more northerly latitudes once more this month, and will eventually become better placed for observing as the days get longer. Use appropriate, safe methods to observe the Sun and notify other members if you observe any sunspot activity. Even though Solar Cycle 25 has arrived, Auroral activity is always quite transient, so share information with other members ASAP.

Moon

The Last Quarter Moon is on 6th at about 09:35 in the constellation of Virgo.

The New Moon is on 13th at about 05:00 in the constellation of Sagittarius.

The First Quarter Moon is on 20th at about 21:00 in the constellation of Pisces.

The Full Moon is on 28th at about 19:15 in the constellation of Cancer.

The Moon is at perigee (nearest Earth) on the 9th. The Moon is at apogee (most distant from Earth) on the 21st.

The Planets

The only conspicuous planet in the evenings of January is Mars, and that is fading.

A planetary conjunction will take place on the 10th of January when Mercury will join Jupiter and Saturn in a near isosceles triangle at sunset, and forming a right-angled triangle the next evening.

Mercury (Me) will start the month in the very bright morning twilight heading eastward away from the Sun each day. It can be found briefly accompanied by Jupiter and Saturn in the west-south-west on the 10th and on the 11th. By the 24th it will be at greatest eastern elongation and the 30th will see it at a stationary point, during which time it will be best, but still poorly placed for observing. Find a high vantage point with a low horizon.

Venus (V) will be at its most brilliant in December this year. Unfortunately, this month, Venus emerges just before and in the glare of the morning twilight; a dangerous combination!

Mars (Ma) can be found high in the south early in the evenings in the constellation of Pisces at the start of January; it crosses into Aries for the rest of the month at noon on the 5th. The Earth, on its inner orbit to Mars, is increasing the separation between them, and consequently Mars is reducing in apparent diameter. However, it can be observed with satisfaction using a 150mm telescope for the rest of January, but is best observed early in the month. The Moon, just past first-quarter, lies to the south east of Mars on the evening of the 21st with Uranus not 2° to the south of Mars.

Jupiter (J) may be found setting just after the Sun, low down in the evening twilight at the beginning of January, and is best observed with Mercury and Saturn on the 10th. Jupiter will be lost to us as it approaches conjunction on the 29th to be next observed as a morning object. It is in opposition on the 20th August, so better observing to be had later this year.

Saturn (S) may also be found with Mercury and Saturn on the 10th. It is in conjunction with the Sun on the 24th and being fainter than Jupiter is more difficult to observe for most of January. It is in opposition on the 2nd August, so better observing to be had later this year.

Uranus (U) appears to have Mars converge on it early in the month, and by the 19th they rest 1.7° apart. In general Uranus is best observed early to mid-month; it can be found in the constellation of Aries at RA 2h 18m 13s, Declination 13° 20' 47". At a magnitude of 5.76 it may well be found with a good pair of binoculars. You may also just see the planet's cyan (blue-green) hue in a small telescope. Uranus usually has few features visible at such a distance, so little else may be seen even with a larger amateur instrument or by astrophotography.

Neptune (N) is best observed early in the month, low down in the south-west, early evening, but is not best placed for as it moves closer to the Sun from our vantage point, and will be lost to the evening twilight by early February. It can be found in the constellation of Aquarius all month, and on the 1st it will be at RA 23h 19m 24s, Declination -5° 32' 39", at a magnitude of 7.92.

Meteors

For more information about meteors, visit the article entitled 'Observing Meteor Showers' on this web site.

One of the best showers seen from the UK, the **Quadrantids (QUA)** can be seen from 1st to 6th January. The Quadrantids' associated parent body is not known for certain, however, 2003 EH1 (an asteroid) is a strong contender. The ZHR varies between 40 and 110 and is expected to be 80 or higher this year. The radiant, in northern Boötes, is circumpolar and lies towards the star Alkaid in Ursa Major, in a part of the sky that once contained a constellation called Quadrans Muralis; the Mural Quadrant! At about 40 km/s (147,600km/h), these meteors are relatively slow, but brighten just after maximum with occasional green, yellow or blue hues. This year, however, a waning gibbous Moon 45° west of its radiant hinders observations of the less bright meteors, and the peak which only lasts a couple of hours at around midday obviously occurs in daylight. You might get most joy around the morning and evening hours of the 3rd.

Constellation Culminations from Usk

The article entitled 'Culminations of Constellations' found on this web site offers detailed information.

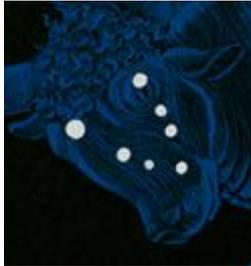
Taurus (Tau) (Pronounced TOR-us) - The "Bull".

In Welsh

Y Tarw (*nm*), literally 'the Bull', the IAU name as used in Welsh.

Astronomy

Some say that the constellation of the Bull was depicted in caves by humans tens of thousands of years ago to the extent that even the Pleiades were shown. What is certain is that Taurus the Bull, with the Scorpion and the Lion, was portrayed over 6000 years ago in the Euphrates Valley, in ancient Mesopotamia as one of the constellations found in the zodiac; the band of stars through which the Sun, Moon and planets pass.

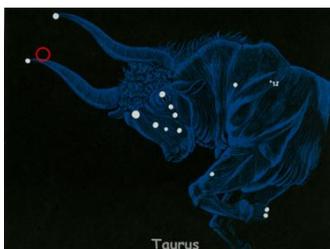


The vee-shaped face of the bull is a very clear asterism and finding it should be no problem. It is due south at nine in the evening in mid-January. You can also follow the line of the belt of Orion towards the north-west and locate it just before reaching the Pleiades. The asterism is known as the Hyades. Viewing it with even modest binoculars will reveal its true nature, a wonderful open cluster; the nearest to us. Careful examination will show many easy double stars. In fact it is so packed with stars the "V" shape is lost with even very low magnification. The brightest star in Taurus; the red giant star Aldebaran, is prominent in the vee and is described as the right eye of the bull, even though its name means the 'follower' of the Pleiades in medieval Arabic. As an open cluster many of these stars have similar distances and are moving with similar proper motions through space.

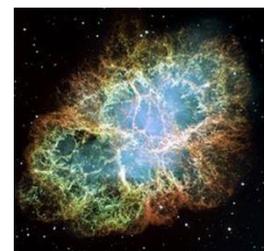
The Pleiades are another example of an open cluster and is worthy of some attention with binoculars, if you have no telescope. Although they are also known as the Seven Sisters and M45 (Messier 45), there are more than 1000 stars in this cluster which lies around 440 light-years away. The oldest of them are about 150 million years old and the slight haze that you see around the stars is a gas and dust cloud through which they are moving. The light from the nearest stars which shines away from us is reflected back towards us off this cloud which then glows producing a spectacle known as a reflection nebula. This reflection nebula is very easy to photograph if you have the kit and is a popular target, but it can also be seen in modest telescopes on good clear nights. The brighter stars appear to have a faint mist around them; many will mistake it for an eyepiece that needs cleaning. Compare the view with other bright stars away from the Pleiades and you should see the mistiness disappear (if it doesn't your eyepiece does need a clean!)



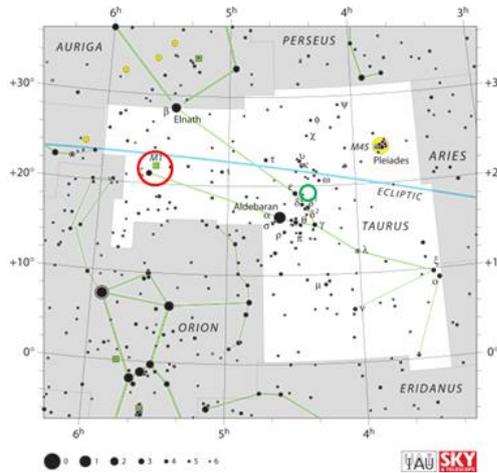
The ecliptic (the path of the Sun) passes between these clusters; within 5° or so of both, and the Moon and sometimes the planets can present a lovely photo-opportunity. A lunar occultation can be particularly satisfying to observe.



At the end of the right horn of the Bull, in the east of Taurus is M1 (Messier 1) (O). It was here in 1054 that Chinese astronomers saw a new star, a *stella nova*. Its remnant, known as the Crab Nebula, is very hard to see even with big binoculars unless the transparency is exceptional, it has a low surface brightness and being a supernova remnant nebula (e.g. UHC or OIII) filters do not enhance it. Try searching for it with a 100mm (4") telescope which should readily show it using low power. Find Elnath at the end of the horn and M1 is just above and



to the west. It has a magnitude of 8.40. At its core lies a neutron star spinning at 30 times per second, spraying out radiation like a lighthouse; a pulsar. This is the first supernova remnant to be identified with its historic supernova explosion.



North-west of Aldebaran, next to the Bull's left eye, Ain, is a variable star called T Tauri (O) which is the prototype of a class of pre-main-sequence stars. Near T Tauri is NGC 1555, a reflection nebula known as Hind's Nebula or Hind's Variable Nebula is illuminated by T Tauri, and thus also varies in brightness.

T Tauri stars are around 100 million years old when they go through this phase, just prior to main sequence burning.

It is in this locality of Taurus and into Auriga to the north that we find one of the closest regions of active star formations.



Greek Myths

As you may recall Zeus was not shy of women, but he did have to resort to subterfuge at times to fulfil his needs. According to Greek mythology Zeus disguised himself as a bull to further pursue Europa, the princess of Phoenicia. He mingled with a herd near her and soon attracted her attention for he was the most handsome of creatures.

His hide was pure white like virgin snow, and his muscular neck held his head high with horns like burnished metal. She was taken with his gentle nature and was tempted to ride into the sea on his back. It was only when they reached Crete that Zeus made known his identity. One of their offspring was said to be king Minos of Crete who created the palace at Knossos where the bull games were enacted.

Some say the image of the constellation of Taurus shows no rear-end because the bull is immersed in water.

Others say the Pleiades appear to be flies on the back of the Bull.



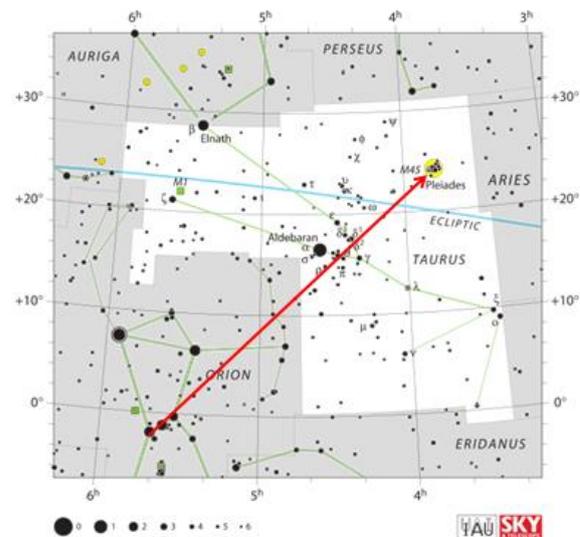
The Pleiades (pronounced ply' uh deez) - The "Seven Sisters".

In Welsh - y Saith Seren Siriol, literally 'The Seven Bright Stars', some say cheerful stars.

Y Saith Chwaer, literally 'The Seven Sisters), revealing its classical origins.

The Pleiades are an example of an open cluster.

Follow the line of the famous Orion's Belt north-westerly through the vee-shaped asterism in Taurus, to find the Pleiades nebula, a magnificent open cluster.



The name Pleiades has multiple roots. One derivation is from the Greek πλεῖν plein, meaning 'to sail', since the heliacal rising of the Pleiades in May marked the beginning of the ancient navigation season. However, the Greek pleios, or 'many', would also appear to have a strong and logical influence on the naming of this asterism, or star group. Nine of the most visible stars have a Greek name after seven ancient Greek mythical sisters and their parents. Today, the Pleiades are designated M45 in the Messier catalogue.



Although only six stars are readily visible to the naked eye, they comprise part of a relatively young, open cluster of something like a 1000 to 3000 stars situated at about 440 light-years distance from us; one of the closest to us. 25% of the cluster consists of brown dwarfs; objects not massive enough for nuclear fusion reactions to take place. Very few are likely to be born as stars as we think of them. Dominating the Pleiades are hot, blue and extremely luminous stars some of which may be up to 100 million years old and stellar radiation pressure should have dissipated the original gas and dust. If these stars were human beings, they would be middle aged.

However, long exposure photography shows large bright areas of nebulosity surrounding the brightest stars, revealing a dust cloud through which the cluster is moving; towards southern Orion. Strong radiation from these young stars repels the dust

particles; large particles less than small, generating stratification and filaments. The clouds behind the stars reflect the cluster's starlight producing this beautiful blue reflection nebula, popular with amateur astronomers.

At the end of the age of the dinosaurs, the Pleiades would have looked something like the Orion Nebula does to us today. It is estimated that this cluster will endure for maybe 250 million years, before it dissipates under the influence of interstellar interactions.

Myths and Legends

Greek

Irrevocably attached to the legend of the great hunter are the seven daughters of Atlas and Pleione; Sterope, Merope, Electra, Maia, Taygeta, Celaeno, and Alcyone. The parents Atlas and Pleione are themselves not Pleiades, but are stars included in the constellation named in honour of their daughters. Orion pursued them with intentions less than honourable for seven years until, out of exasperation, Zeus turned them into doves and set them in the sky to save them from the great hunter. So their name may also derive from *πελειάδες* *peleiaades*, meaning 'flock of doves'. According to legend, Orion's position in the heavens is not co-incidental, having been arranged so that he may pursue the beautiful star cluster forever without hope of catching them.



However, an alternative legend has it that the seven sisters were so distressed by the death of the Hyades, their half-sisters (who were also fathered by Atlas) that they all killed themselves and were placed in the heavens by sympathetic gods.

Yet another variation on the story, however, suggests that Zeus, far from being saviour of the seven sisters, was actually guilty of the same intentions as Orion towards Taygete, one of the seven. Before her escape to the heavens with her sisters, she was turned into a deer to escape her erstwhile suitor, one explanation why only six of the 'seven sisters' are readily visible to the naked eye.

In another myth, Orion lost his life to the Scorpion Scorpius, and was placed in the heavens. To give the hunter some sport in his permanent abode the gods thoughtfully provided him with Taurus the bull to fight, and Canis Major and Minor, his loyal hunting dogs for company. The Pleiades are sometimes said to be the flies on the back of the bull.

Japanese

In Japan this part of the sky is known as Subaru. This make of car has the Pleiades on its badge!

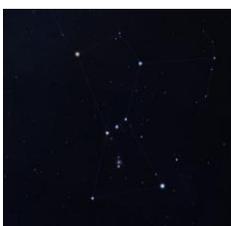
North American

Some North American Indians used the Pleiades as an eyesight test; those who could see more than six stars were used as scouts and lookouts. If they could not clearly see these stars, they were given other tasks according to their skills. The Blackfoot tribe see lost children forced to search for food and who found succour amongst the stars. The Pleiades are home to the star spirits for the Cherokee.

The Inuit regard them as hunters with their dogs pursuing the (Great) bear into the sky.

Orion (Pronounced oh-RYE-un)

In Welsh Orion (*nm*).



Astronomy Orion is a magnificent constellation, which stands out amongst the southern stars in winter time. Finding Orion should be no problem; its stars are some of the most familiar in all the heavens and lie due south at 22:00 in mid-January. The famous Orion's Belt marks the centre of



Photograph Credit: Nick Busby

the constellation and helps us find other stars of interest. When Orion is orientated in this way, follow the line of the belt south-easterly to find Sirius, the brightest star in the night sky, and north-westerly to find the Pleiades nebula, a magnificent open cluster.

As well as dominating the winter sky with its size, and definition of shape, Orion has more to offer the observer than most other constellations. Observe the glorious red giant Betelgeuse, the equally brilliant blue-white giants, Rigel and Bellatrix, and the nebulous beauty of the Great Orion nebula in the sword.

Orion's bright, right shoulder is famously called Betelgeuse, one of the largest and most luminous of observable stars. Betelgeuse is frequently described as the 'Armpit of the central one'; however modern authorities suggest the name derives from the Arabic *Jad al-Jauza* meaning 'Hand of *al-Jauza*' (the Arabic name for Orion). Betelgeuse, which lies about 640 light years away, is a red supergiant with a luminosity some 100,000 times that of the Sun and a diameter 1,000 times that of the Sun.

Betelgeuse is reaching the end of its life and pulsates, both in size and brightness. Right now it is the dimmest it has been in a hundred years. Kean observers may wish to chart its brightness at this interesting time.

Another famous star in Orion is his left foot, Rigel, from *Ar-risha* meaning 'the foot'. This bright star is different to Betelgeuse as it shines blue rather than red. This is due to the surface temperature of the star, blue stars are much hotter, and Rigel is about 16,000 °K, whilst cooler Betelgeuse averages 2,700 °K. Rigel is part of a multiple star system and in a telescope of around 75 mm aperture or more it is easy to spot one of its companions 9.5" away and with a magnitude of 6.5 it is 400x dimmer than Rigel itself, but not difficult to spot.

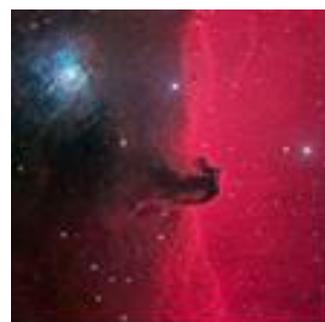
Take a look at the three stars that make up the belt, the one on the right is known as Mintaka, and the one on the left is Alnitak. Both names derive from the Arabic meaning 'the Belt'. Alnilam, the central star means 'The string of pearls'.



Photograph Credit Tony Pearce 2017

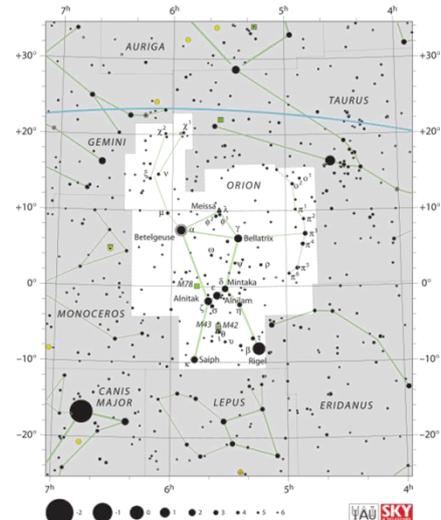
Even with the naked eye, it can be seen that the central 'star' in the three 'stars' marking the dagger hanging from Orion's belt appears to be a fuzzy patch rather than a star. This is the Orion Nebula (M42), perhaps the most photographed deep sky object in the heavens, a vast nebula of gas and dust exquisitely lit by the internal and surrounding stars. This is a stellar maternity ward, in which more young stars will appear from this wealth of cosmic matter during the next tens of millions years. Take a pair of binoculars to this part of the sky, inside the nebula can be found a small, fascinating four-star asterism known as The Trapezium.

There are many nebulous (cloudy) regions in and around Orion. Barnard's loop, the Horse head and many other nebulae are all part of the huge molecular cloud situated in that part of the sky. Unfortunately with the exception of the Great Orion Nebula, they are all quite difficult to observe by eye. That is because the eye is not very sensitive to the wavelengths of the emitted light. However modified digital SLR (internal filters removed) cameras are very sensitive to these wavelengths and photographing the nebulae with an ordinary camera lens is easier than you might think.



1500 light years from Earth. It is one of the most identifiable nebulae because

In larger telescopes the semi-circular Barnard's Loop and just a smidgen south of Alnitak, the Horsehead Nebula present rewarding challenges for the observer. The prominent horse-head portion of the nebula is a popular target for amateur astronomers. The Horse Head was first recorded in 1888 by Scottish astronomer Willamina Fleming on photographic plate B2312 taken at the Harvard Observatory. The Horsehead Nebula is approximately



of the shape of its swirling cloud of dark dust and gases, which bears some resemblance to a horse's head when viewed from Earth. The Horsehead Nebula appears to be a region devoid of stars, surrounded by a distinguishing cloud of stars. However, in reality, this is a dark molecular cloud which is obscuring the starlight from the brighter nebula, IC 434, situated beyond it. It is a region within the larger Orion molecular cloud of ionised atomic hydrogen called HII regions.

The Great Orion Nebula was the first such HII region (pronounced "H two") discovered (1610). Such zones are important star-forming regions and can readily be seen in other active galaxies because they tend to be very large. The Horse Head, Great Orion and Running Man nebulae, to mention a few are examples of HII regions.

Associated with it and enveloping it is Barnard's Loop, which can be seen extending from the centre of the picture, around toward the bottom. Although it was named the 'Orion Loop' by E. E. Barnard, and then renamed in his honour for its discovery, it was possibly detected by William Herschel in 1786.

Positioned about 1600 light years away and stretching several hundred light years across, there are a number of speculations as to the origin of this huge bubble. It may be a supernova remnant or possibly it was formed by a series of supernova explosions. It could also have developed when a density wave, associated with the structure of the Milky Way, moved through the Galactic disk. While difficult to observe visually, it can be effectively photographed on long exposures as can be seen in the above (top) image by Nick Busby, chair of Usk Astronomical Society.

Many amateur astronomers use special ultra-high contrast filters (UHC) to enhance views of such regions. In particular they emphasises ionised oxygen (OIII) which has a greenish colour. Although intended to be screwed onto the barrel of the eyepiece they can also be held between the eyepiece and the eye and moved in and out to reveal the nebulae and are highly recommended

Incidentally, the Orionid meteor shower can be seen emanating over the eastern horizon at about 11.00 pm between 16th to 27th October.

Myths

An ivory carving dated to around 35000 BCE seems to illustrate that the stars of Orion have long been associated in the minds of humans, and by 4000 BCE, over 6000 years ago, the patterns of the Bull, Lion, Scorpion and 'Goat-horned' Capricornus were first characterized in Mesopotamia. A belief that Orion's name originated with the Sumerian sun-god Uru An.na, meaning 'light of the heaven' is largely unsupported.

Babylonian star catalogues from the Late Bronze Age identify MULSIPA.ZI.AN.NA, "The Heavenly Shepherd" or "True Shepherd of Anu" (Anu being the chief god of the heavenly realms) as the most likely origin.



One of two MUL.APIN cuneiform tablets consisting of lists of astronomical data, seen right



In 1100 BCE *Amenhotep* produced a 'Catalogue of the Universe' listing five constellations including Orion and the Great Bear. In mythology, the Orion region has been associated with the human form since ancient times. In Egyptian mythology, Sah (Orion) was syncretized with Osiris. His consort was Sopdet, the goddess of the flood, personified by the star Sirius. Both held an important role in Egyptian mythology, and the corresponding deities were associated with Osiris and Isis.

Sah was frequently mentioned as "the Father of Gods" in the Old Kingdom Pyramid texts. Pharaoh was thought to travel to Orion after his death.



It is in Greek myth we find a man of gigantic stature, unrivalled good looks and a hunting prowess celebrated throughout the ancient world and named Orion. There are many legends and versions of legends regarding Orion.

He was, according to Eratosthenes, the son of Euryale and Poseidon and consequently could walk on water. One day, on a visit to the island of Chios he fell in love with Merope, beautiful daughter of Queen Helike and King Oenopion. Orion sought her hand in marriage and was promised this in return for ridding the island of the many dangerous beasts that troubled the inhabitants.

Orion exercised his skills with great success against the wildlife of the island but Oenopion began to delay the marriage by inventing more and more tasks for Orion to undertake. Eventually, in a fit of desperation and self-pity Orion consumed a flask of his unwilling father-in-laws most potent wine. With his senses dulled by the wine, Orion forced his intended to consummate the marriage prematurely. Incensed by this, Oenopion plied Orion with even more wine until the great hunter was insensible, and then put out his eyes.

Orion sought the help of the oracles to regain his sight and was instructed to seek the morning sun. He set off with his loyal crew of sailors for the east and docked at the Isle of Lemnos, where Vulcan, the gods' blacksmith, aided him. He gave him Cedalion, an apprentice, to sit on his shoulders and guide him to the furthest ocean, where he found the sun god Helios. Orion appealed to Helios to restore his sight. His plea was granted and with his sight restored Orion enjoyed a love affair with Eos, sister of Helios and goddess of the Dawn.

Eventually his desire for Eos was overtaken by his desire for revenge against Oenopion and Orion once more set off on his journey. In Crete he met Diana, goddess of the moon and also an ardent hunter. They rejoiced in their common love of hunting and Diana now accompanied Orion on the chase. However, their closeness caused great concern to Apollo, Diana's brother, who feared that his sister would become Orion's next conquest, and he waited for an opportunity to discredit the hunter.

Orion had one great weakness. He boasted injudiciously about his achievements and claimed that there was no animal that he could not slay. Apollo seized his opportunity and repeated these boasts to Mother Earth. She was not only annoyed at his wantonness, but also fearful that he would destroy all predators (as he had on the island of Chios) and decided to halt his exploits by producing a monstrous scorpion under his feet, covered in armour so thick that it could never be slain.

For the first and last time in his life Orion was totally defenceless and died from the sting of the terrible beast. Diana was distraught at the loss of her friend and companion and begged the gods to allow her to immortalise Orion among the stars. Her wish was granted and Orion was sent to the mid-heavens.

As a reward for conquering such a hero, the scorpion was also granted immortality, but was sent to the southern skies so that the two enemies should not be seen in the sky at the same time, and Orion should not be reminded of his ignoble defeat. To give the hunter some sport in his permanent abode the gods thoughtfully provided him with Taurus the bull to fight, and Canis Major and Minor, his loyal hunting dogs for company.