

ORI

ORION

ORIONIS



Orion is arguably the most prominent constellation in the entire sky. It straddles the celestial equator and is visible from every inhabited country in the world. In the UK Orion is best seen during winter evenings.

In Greek mythology Orion was the son of Poseidon (the Sea God) and a supernaturally effective hunter. In one story the goddess Gaia was angered by his boasting and sent a scorpion to kill Orion. Although the attempt unsuccessful – Orion and the Scorpion were ultimately placed on opposite sides of the sky!



Figure 1 The Orion Nebula. The large fan-shaped region is M 42. The smaller, round region near the top is M 43. The four stars of The Trapezium are visible near the middle of the picture.



Figure 2 (Left) The Horsehead Nebula is centre. The multiple star Sigma Orionis is seen near the top-centre. The Flame Nebula is below the bright star Alnitak, lower left. (Right) The 37 Cluster (NGC 2169).

## STARS

$\alpha$  Orionis (**Betelgeuse**, mag. 0.0 to +1.4) is a red supergiant star at a distance of about 640 light-years (although there is considerable uncertainty in this estimate). Betelgeuse is a star nearing the end of its life. With an estimated mass of between 15 to 20 times that of the Sun – it will eventually explode as a type II supernova.

At present the star is very large and the outer layers are held weakly by gravity. The star has been losing mass for thousands of years and it is surrounded by a complex environment of gas and dust.

Betelgeuse varies in brightness and is classed as a semi-regular variable star. It is usually slightly fainter than Rigel but can occasionally surpass it in brightness. At the start of 2020 the star is around magnitude +1.4. Brightness variations with periods of 400 days and 2,100 days (superposed) have been estimated.

$\beta$  Ori (**Rigel**, mag. +0.1) is a blue supergiant star and is usually the brightest star in Orion (being occasionally surpassed by Betelgeuse at maximum brightness). Rigel is about 860 light-years away. It has a faint companion (mag. +6.9) which appears to be genuinely associated and is separated from Rigel by about 10 arcseconds. The brightness of Rigel makes this a tough split with smaller telescopes.

$\gamma$  Ori (**Bellatrix**, mag. +1.6) is a massive blue-white main sequence star at a distance of about 250 light-years.

$\delta$  Ori (**Mintaka**, mag. +2.2) is the westernmost star of Orion's Belt. Small telescopes easily show a 7<sup>th</sup> magnitude companion star with a wide separation of 52 arcseconds. The primary is actually a spectroscopic binary consisting of a blue, bright-giant star with a close, slightly less massive star orbiting with a period of just 6 days.

$\epsilon$  Ori, (**Alnilam**, mag. +1.7v) is the middle star in Orion's Belt. It is a blue-white supergiant at an estimated distance of 2,000 light-years and perhaps 40 times the mass of the Sun.

$\zeta$  Ori (**Alnitak**, mag. +1.8) is a blue supergiant and the brightest spectral type O star in the sky.

$\lambda$  Ori (**Meissa**, mag. +3.4) is a multiple star system marking the head of Orion. It lies at a distance of approximately 1,100 light-years. The primary star is a blue giant 28 times the mass of the Sun. It has a 5<sup>th</sup> magnitude blue-white companion 4 arcseconds away. A fainter 11<sup>th</sup> magnitude companion lies 30 arcseconds from the primary.

$\sigma$  Ori (mag. +3.8) looks to the eye to be a single star just south of Alnitak. Telescopes reveal it to be a showpiece multiple star with 4 components. The primary (mag. +3.8) is flanked by two stars of 7<sup>th</sup> and 10<sup>th</sup> magnitude (separated by 13 and 12 arcseconds respectively). A fourth star (6<sup>th</sup> magnitude) lies 42 arcseconds from the central group. The four stars don't lie on a straight line – but it is pretty close! In fact the primary is triple consisting of a spectroscopic binary and a companion orbiting this pair with a separation of just 0.3 arcseconds (beyond the reach of amateur telescopes)

In the same field of view – just 3 arcminutes northwest – is another double star: Struve 761 is a pair of 8<sup>th</sup> magnitude stars and an easy split in any telescope. In the 1990s the stars of Sigma Orionis and Struve 761 were shown to be the brightest members of a newly formed open cluster.

## DEEPSKY OBJECTS

**Orion Nebula / M 42 and M 43** (mag. +4.0) is a cloud of glowing gas and dust at an estimated distance of 1,500 light-years. It appears as a misty patch of light to the eye, covering an area several times larger than the full moon. Binoculars show the nebula well along with several stars apparently embedded in the nebulosity. Telescopes of any size show the broad fan-shape of M 42 with intricate tendrils of gas extending from the brighter regions. M 42 is separated from the smaller, rounder nebulosity of M 43 by a lane of dust nicknamed the Fish Mouth. The Orion Nebula is glowing because hydrogen atoms are excited by a quartet of hot, young stars known collectively as The Trapezium Cluster. Larger telescopes are able to resolve fainter members than the four bright Trapezium stars.

**M 78** (mag. +8.0) is a reflection nebula roughly 2.5° north of Alnitak. The nebula is illuminated by the light of a pair of 10<sup>th</sup> magnitude stars seemingly embedded within it.

**NGC 1977** (mag. +7.0) lies to the north of the Orion Nebula. It is a reflection nebula surrounding the open cluster **NGC 1981**. The region is best viewed with binoculars or telescopes at low magnification.

**NGC 2024** (mag. +10.0) is popularly known as the Flame Nebula. It lies immediately east of Alnitak and shines because energetic photons from that star are exciting the hydrogen gas. Dark dust clouds in front of the nebula are prominent in larger instruments and in photos of the nebula.

**NGC 2169** (mag. +5.9) is an open cluster containing about 30 stars at a distance of 3,600 light-years. It is nicknamed the "37 Cluster" because the brightest stars appear to form those numerals.

**B 33** (Barnard 33) is a dark nebula popularly known as the Horsehead. It was discovered in 1888 by Williamina Fleming on a photographic plate. Very dark skies are required to give good contrast between the dark nebula and the slightly brighter background nebula.

**Cr 69** (mag. +2.8) is an open cluster about 1,100 light-years away containing about 20 stars. The brightest member is 3<sup>rd</sup> magnitude Meissa. It is also known as the Lambda Orionis Association.

**Cr 70** (mag. +0.4) is an association of stars best seen with binoculars and which contains the three bright stars which make up Orion's Belt: Alnitak, Alnilam and Mintaka.