

The chart is orientated for
 Nov. 1 at 1 a.m. NZDT
 Nov. 15 at midnight "
 Dec. 1 at 11 p.m. "
 Dec. 15 at 10 p.m. "

Evening sky in December 2009

To use the chart, hold it up to the sky. Turn the chart so the direction you are looking is at the bottom of the chart. If you are looking to the south then have 'South horizon' at the lower edge. As the earth turns the sky appears to rotate clockwise around the south celestial pole (SCP on the chart). Stars rise in the east and set in the west, just like the sun. The sky also shows a small extra clockwise rotation each night as we orbit the sun.

Jupiter is the first 'star' out after sunset. It sets in the southwest around midnight. Mercury sets in the southwest twilight. Sirius, the brightest star, is due east, twinkling like a diamond. Left of it is Orion, with 'The Pot' at its centre. Further left is Taurus and the Pleiades/Matariki/Seven Sisters star cluster. The Pointers and Crux, the Southern Cross, are low in the south. The Milky Way is bright along the skyline from southwest to southeast but becomes fainter below Orion and into the north. Two nearby galaxies, the Clouds of Magellan -- LMC and SMC on the chart -- are high in the south but need a dark sky to be seen as does the Andromeda Galaxy low in the north.

The Evening Sky in December 2009

Jupiter continues to be the 'evening star' in the western sky at dusk, setting in the southwest around midnight. Jupiter slips lower in the sky, and sets earlier, as we move to the opposite side of the sun from it. **Mercury** makes an evening sky visit, setting in the southwest twilight. The thin crescent moon will be near Mercury on the 18th. At mid-month Mercury is about 160 million km away while Jupiter is 810 million km from us.

The brightest stars are in the east and south. **Sirius**, the brightest of all the stars, is due east at dusk, often twinkling like a diamond. Left of it is the bright constellation of **Orion** with 'The Pot' at its centre. Further left, in the northeast is the V-shaped pattern of stars making the face of **Taurus** the Bull with the **Pleiades/Matariki/Seven Sisters** cluster to its left. **Canopus**, the second brightest star, is high in the southeast. On the southern skyline are **Crux**, the Southern Cross, and the Pointers, Alpha and Beta Centauri.

The **Milky Way** is low in the sky, visible around the horizon from the west, through south into the eastern sky. The broadest part is in **Sagittarius** low in the west, fading in the twilight. It narrows toward Crux in the south and becomes faint in the east below Orion. The Milky Way is our edgewise view of the galaxy, the pancake of billions of stars of which the sun is just one. The thick hub of the galaxy, 30 000 light years* away, is in Sagittarius. The nearby outer edge is the faint part below Orion. A scan along the Milky Way with binoculars will show many clusters of stars and a few glowing gas clouds.

The Clouds of Magellan, **LMC** and **SMC**, high in the southern sky, are two small galaxies about 160 000 and 200 000 light years away. They are easily seen by eye on a dark moonless night. The larger cloud is about 1/20th the mass of the Milky Way galaxy, the smaller cloud 1/30th. That's still many billions of stars in each.

Low in the south are the Pointers, Beta and **Alpha Centauri**, and **Crux** the Southern Cross. In some Maori star lore the bright southern Milky Way makes the canoe of Maui with Crux being the canoe's anchor hanging off the side. In this picture the Scorpion's tail can be the canoe's prow and the Clouds of Magellan are the sails.

Left of Sirius is the constellation of **Orion**. The line of three stars makes Orion's belt in the classical constellation. To southern hemisphere skywatchers they make the bottom of 'The Pot'. The faint line of stars above and right of the three is the Pot's handle. At its centre is the Orion Nebula, a glowing gas cloud nicely seen in binoculars. **Rigel**, directly above the line of three stars, is a hot blue-giant star. Orange **Betelgeuse**, below the line of three, is a cooler red-giant star.

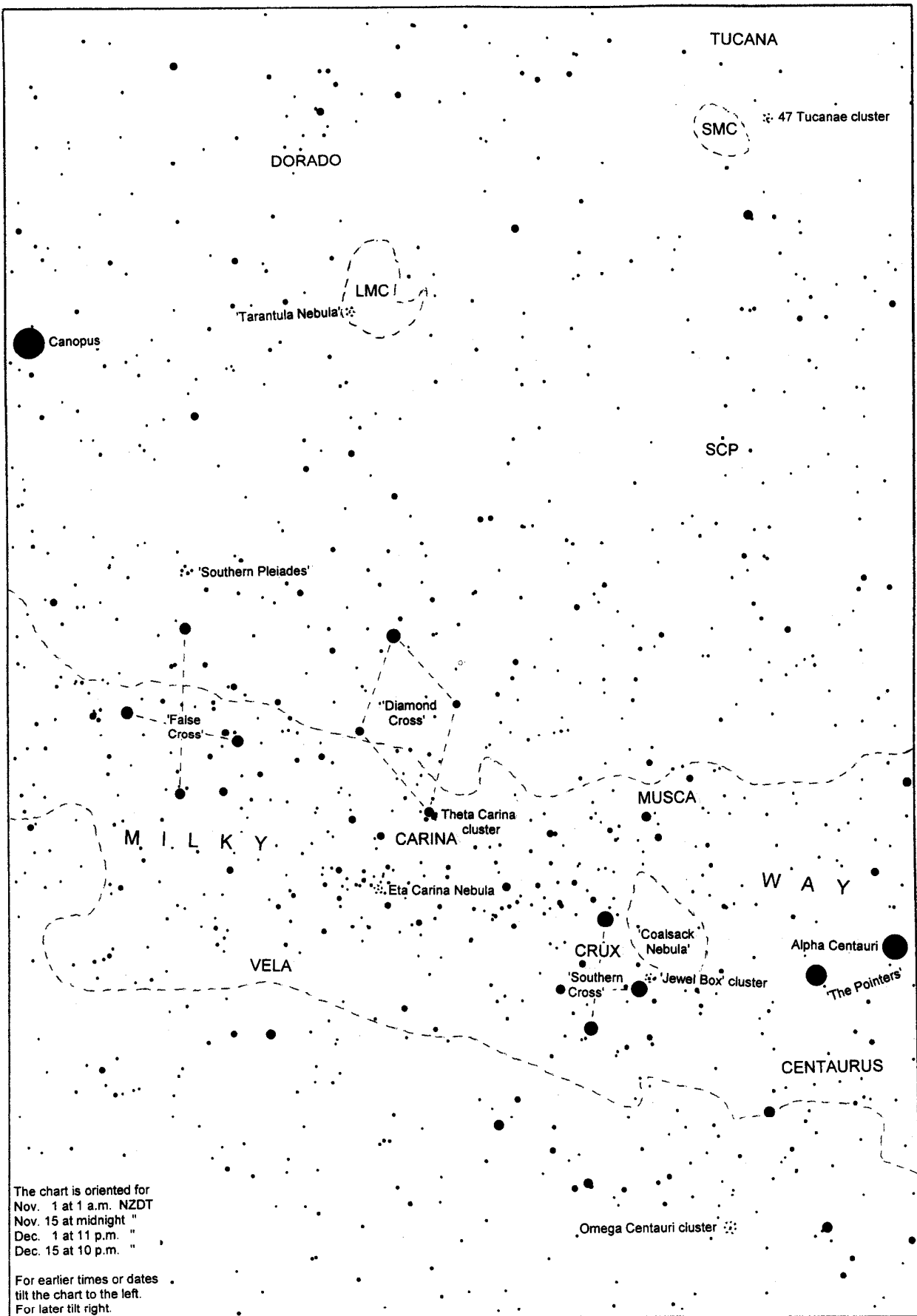
Left of Orion is a triangular group making the upside down face of **Taurus** the bull. **Aldebaran**, is the brightest star in the V pattern. The name is Arabic for 'the eye of the bull'. Still further left is the **Pleiades/Matariki** cluster, also called the Seven Sisters, impressive in binoculars.

Very low in the north is the **Andromeda Galaxy**, easily seen in binoculars on a dark night and faintly visible to the eye. It appears as a spindle of light. At three million light years distance it is the closest galaxy that is comparable to our Milky Way galaxy.

The Geminid meteor shower may be seen in the morning hours around December 14. The meteors appear to come from the constellation of Gemini, in the NE at first, moving to the north by dawn.

Mars (not shown) rises in the northeast around midnight. It is now a bright orange 'star' but still around 130 million km away, so small in a telescope. As we catch up on Mars it will rise earlier. It will be prominent in the northern evening sky in late January and February as we pass it by.

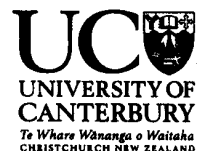
*A **light year (l.y.)** is the distance that light travels in one year: nearly 10 million million km. Sunlight takes eight minutes to get here; moonlight about one second. Sunlight reaches Neptune, the outermost major planet, in four hours. It takes four years to reach the nearest star, Alpha Centauri.



Southern Evening Sky in December

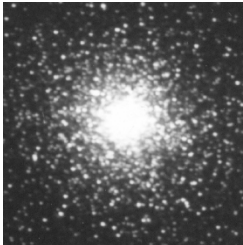
The chart shows the lower southern sky. Interesting star clusters and nebulae are indicated with asterisks. They are described on the other side of this page.

Chart produced by Guide 8 software; www.projectpluto.com. Labels and text added by Alan Gilmore, Mt John Observatory of the University of Canterbury, P.O. Box 56, Lake Tekapo, 8770, New Zealand. www.canterbury.ac.nz

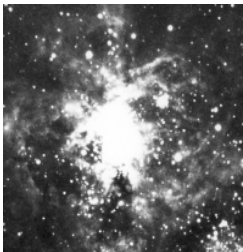


Interesting Objects in the Southern Sky

Large & Small Clouds of Magellan (LMC & SMC) appear as two luminous patches, easily seen by eye in a dark sky. They are two galaxies like the Milky Way but much smaller. Each is made of billions of stars. The Large Cloud contains many clusters of young luminous stars seen as patches of light in binoculars and telescopes. Both clouds are about 160 000 light years away, very close by for galaxies. (1 light year is about 10 000 billion km, 10^{13} km.)



47 Tucanae, looks like a faint fuzzy star on the edge of the SMC. It is a globular cluster, a ball of millions of stars. A telescope is needed to see a peppering of stars around the edge of the cluster. Though it appears on the edge of the SMC it is one-tenth the distance, 15 000 light years away, and is has no connection to the Small Cloud. Globular clusters are mostly very old, 10 billion years or more; at least twice the age of the sun. **Omega Centauri**, very low in the south, is a similar cluster.



Tarantula nebula is a glowing gas cloud in the LMC. The gas glows in the ultra-violet light from a cluster of very hot stars at centre of the nebula. The cloud is about 800 light years across. It is easily seen in binoculars and can be seen by eye on moonless nights.

This nebula is one of the brightest known. If it was as close as the Orion nebula (in The Pot's handle) then it would be as bright as the full moon.

Canopus is the second brightest star. It is 14 000 times brighter than the sun and 300 light years away. Sirius, low in the east on spring evenings, is the brightest star in the sky.

Alpha Centauri, the brighter Pointer, is the closest naked-eye star, 4.3 light-years away. Alpha Centauri is a binary star: two stars about the same size as the sun orbiting around each other in 80 years. A telescope that magnifies 30x splits the pair. (A very faint and slightly closer star, Proxima Centauri, orbits a quarter of a light-year, or 15 000 Sun-earth distances, from the Alpha pair.)

Coalsack nebula is a cloud of dust and gas about 300 light years away, dimming the more distant stars in the Milky Way. Many similar 'dark nebulae' can be seen, appearing as slots and holes in the Milky Way. These clouds of dust and gas eventually coalesce into clusters of stars.

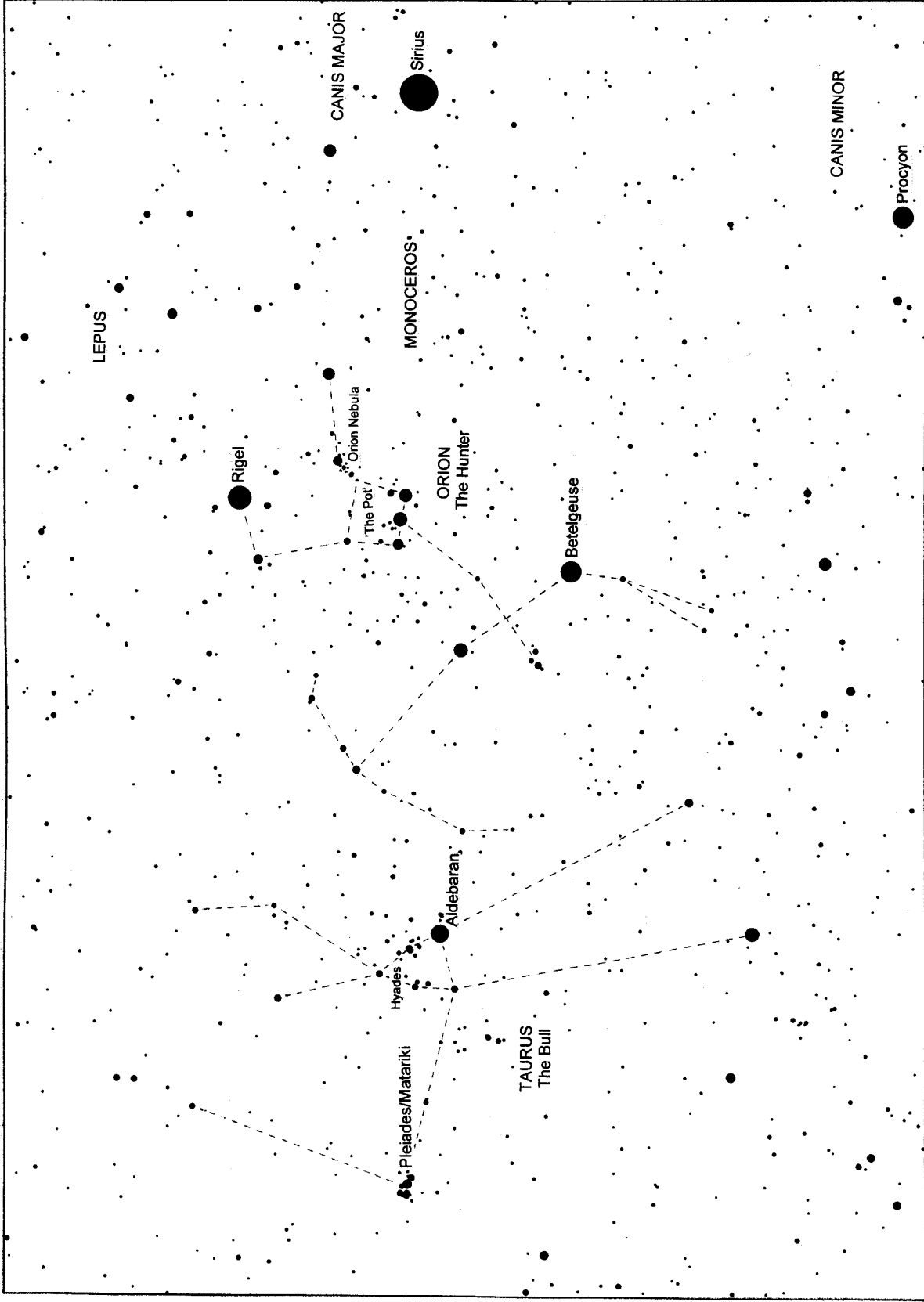
The Jewel Box is a compact cluster of young luminous stars about 7000 light years away. The cluster formed less than 10 million years ago. To the eye it looks like a faint star.



Eta Carinae nebula is a glowing gas cloud about 8000 light years away. The golden star in the cloud, visible in binoculars, is Eta Carinae. (Eta is the Greek 'e'.) It is estimated to be to be 60 times heavier than the sun and a million times brighter but is dimmed by dust clouds around it. It is expected to explode as a supernova any time in the next few thousand years.

Many star clusters are found in this part of the sky.

The **Theta Carina cluster** or **Southern Pleiades**, also called the Five of Diamonds cluster, is a bunch of bright stars on the bottom end of the Diamond Cross. The cluster is about 500 light years away and around 10 million years old. It is a nice sight in binoculars and telescopes.



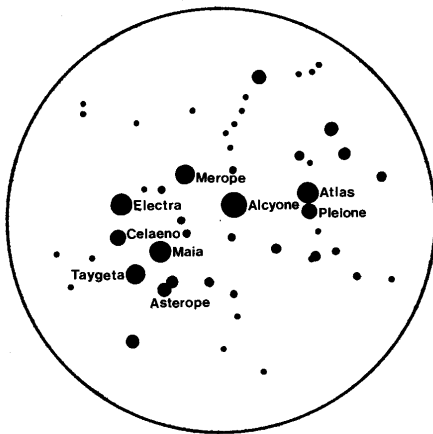
Eastern Evening Sky in Early Summer
 Tilt the chart to the left as the region rises in the sky. Orion and Taurus are seen upside down from the southern hemisphere. Interesting objects are described on the other side of this page.

Chart produced by Guide 8 software: www.projectpluto.com. Labels and text added by Alan Gilmore, Mt John Observatory of the University of Canterbury, P.O. Box 56, Lake Tekapo 8770, New Zealand. www.canterbury.ac.nz

Interesting Objects in Orion and Taurus

Taurus the Bull and **Orion** the Hunter are constellations recognised by most northern hemisphere cultures. To see the northern hemisphere pictures turn the chart upside down. The face of Taurus is outlined by the V-shaped **Hyades** cluster. The brightest star in this group is orange **Aldebaran**, the name meaning 'the eye of the bull' in Arabic. Taurus's long horns extend down our sky. The **Pleiades** cluster rides on the Bull's back.

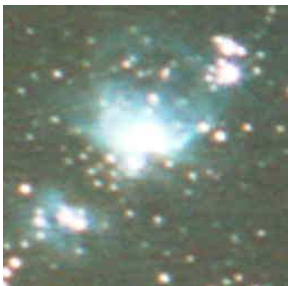
Orion, in the northern hemisphere view, has a shield raised toward Taurus and a club ready for action. The line of three stars makes **Orion's Belt**. The line of faint stars above and left of the belt form **Orion's Sword** in the northern view, dangling from his belt. To most southern hemisphere sky watchers the belt and sword form **The Pot, The Iron Pot, or The Saucepan**.



The **Pleiades / Seven Sisters / Matariki / Subaru**, and many other names, is a cluster of stars well known in both hemispheres. Though often called the Seven Sisters, most modern eyes see only six stars. Dozens are visible in binoculars. The cluster is about 440 light years away. Its brightest stars are around 200 times brighter than the sun.

One **light year (l.y.)** is the distance light travels in one year: about 10 million million km or 6 million million miles. Light from the sun reaches us in 8 minutes; from the moon in 1 second. Sunlight takes 4 hours to reach Neptune, the outermost significant planet, and 4 years to reach Alpha Centauri, the nearest star.

The **Hyades** cluster is 160 light years away. Its brightest stars (not Aldebaran!) are about 70 times brighter than the sun. **Aldebaran** is not a member of the cluster but simply on the line of sight. It is 65 l.y. away and 150 times brighter than the sun. Aldebaran is a giant star about 25 times bigger than the sun though only five times heavier. Its orange colour is due to its temperature, around 3500°C. The sun is 5500°C.



The **Orion Nebula** is visible in binoculars as a misty glow around the middle stars of Orion's Sword or the handle of The Pot. It is a vast cloud of dust and gas about 1900 l.y. away and more than 20 l.y. across. Ultra-violet light from a massive, extremely hot star in the cloud causes it to glow. Some stars in this region may be less than a million years old. The sun, by contrast, is 4.6 billion years old. Stars continue to form in a giant cloud behind the glowing nebula. There are many bright and dark nebulae in this region. The Horsehead nebula, a favourite of astronomy books, is beside the right-hand star of Orion's Belt, but too faint to be seen in small telescopes.

Rigel is a blue 'supergiant' star around 40 000 times brighter than the sun and 800 l.y. away. Its surface temperature is around 20 000°C, giving it a bluish colour.

Betelgeuse is a red giant star 250 times bigger than the sun -- wider than earth's orbit! -- but only around 20 times heavier, so it is mostly very thin gas. It is around 10 000 times brighter than the sun, about 400 l.y. away, and has a surface temperature around 3000°C.

Sirius is the brightest star, though the planets Venus and Jupiter, and sometimes Mars, are brighter. Sirius appears bright because it is both brighter than the sun and relatively a close 8.6 l.y. away. Sirius was often called 'the dog star' being the brightest star in Canis Major, one of the two dogs that follow Orion across the sky.