

The chart is orientated for  
 Sep. 15 at 10 p.m. NZST  
 Oct. 1 at 10 p.m. NZDT  
 Oct. 15 at 9 p.m. "

### Evening sky in October 2017

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 makes a small extra clockwise rotation each night as we orbit the sun.

Jupiter is the 'evening star' at the beginning of the month, appearing near the western horizon soon after sunset. By mid-month it is fading into the twilight. Saturn is mid-way down the western sky, looking like a cream-coloured bright star. Orange Antares is well below and left of it. Canopus is low in the southeast, twinkling colourfully. Vega sets on the north horizon. Crux, the Southern Cross, and the Pointers are in the south-west. The Milky Way spans the sky from north through west and into the south. The Magellanic Clouds, nearby galaxies marked as LMC and SMC on the chart, are misty glows above Canopus.

## The Evening Sky in October 2017

**Jupiter** is the 'evening star' at the beginning of the month when it appears on the west horizon in the early twilight and sets around 8 p.m. It falls lower in the twilight night to night, disappearing around the middle of the month. Jupiter is on the far side of the Sun from us, 960 million km away.

**Saturn** is midway down the western sky at dusk, the brightest 'star' in that region. Well below and left of it is the orange star Antares. Saturn sets in the southwest after midnight at the beginning of October; before 11 pm by the end. It is 1570 million km away mid-month. Saturn appears oval-shaped in binoculars and small telescopes as the planet and the rings blend together. Larger telescopes show the rings, currently at their most 'open' or most tilted to our view. Saturn's biggest moon, Titan, looks like a star four ring-diameters from the planet. Smaller, fainter moons are closer in. The crescent moon will be below Saturn on the 24th.

**Antares** marks the body of the Scorpion. The Scorpion's tail loops up the sky in the evening, making a back-to-front question mark with Antares being the dot. The curved tail is the 'fish-hook of Maui' in Maori star lore. Antares is a red giant star: 600 light years\* away and 19 000 times brighter than the sun. Red giants are dying stars, wringing the last of the thermo-nuclear energy from their cores. Massive ones like Antares end in a spectacular supernova explosion. Antares is about 20 times heavier than the sun. Above and right of the Scorpion's tail is 'the teapot' made by the brightest stars of **Sagittarius**. It is upside down in our southern hemisphere view.

**Canopus** is low in the southeast at dusk often twinkling colourfully. It swings up into the eastern sky during the night. Canopus is 13 000 times the sun's brightness and 300 light years\* away. On the north skyline is **Vega**, setting in the early evening. It is 50 times brighter than the sun, 25 light years away and the 5th brightest star in the sky. From northern New Zealand the star **Deneb** is on the north skyline.

In the southwest are 'The Pointers', Beta and **Alpha Centauri**, making a vertical pair. They point down to **Crux** the Southern Cross. Alpha Centauri, the top Pointer, is the closest naked eye star at 4.3 light years away. Beta Centauri is a blue-giant star, very hot and very luminous, hundreds of light years away.

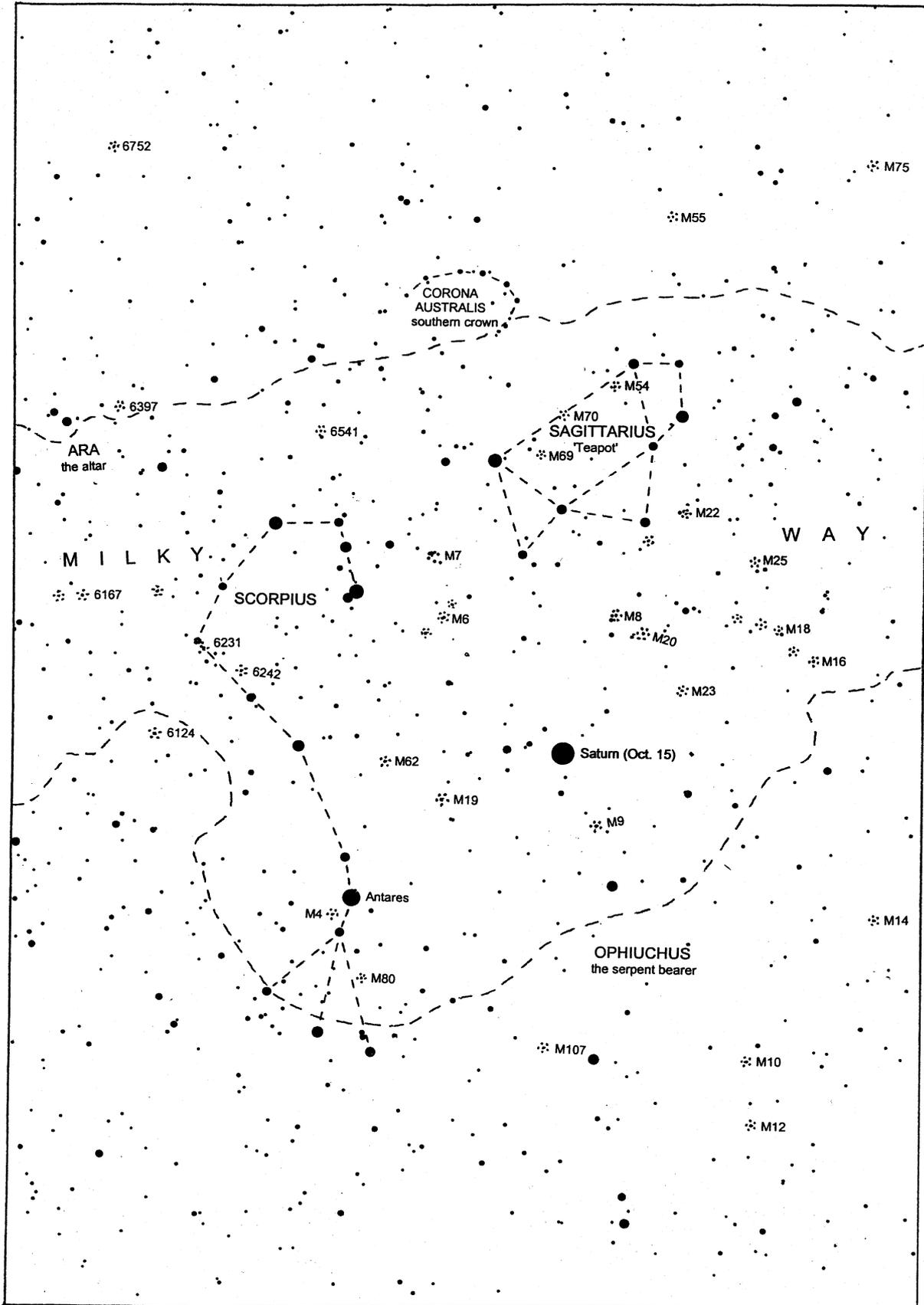
The **Milky Way** is brightest and broadest in Scorpius and Sagittarius. In a dark sky it can be traced down to the south. In the north it meets the skyline right of **Vega**. From northern New Zealand the star **Deneb** can be seen near the north skyline in the Milky Way. It is the brightest star in **Cygnus** the Swan. 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 actual centre, with a black hole four million times the sun's mass, is hidden by dust clouds in space. Its direction is a little outside the Teapot's spout. The nearer 'interstellar' clouds appear as gaps and slots in the Milky Way. The dust and gas has come from old stars that have thrown much of their material back into space as they faded or blew up. New stars eventually condense from this stuff. A scan along the Milky Way with binoculars shows many clusters of new stars and some glowing clouds of left-over gas. There are many in Scorpius and Sagittarius and in the Carina region.

The Large and Small Clouds of Magellan, LMC and SMC, look like two misty patches of light in the southeast sky. They are easily seen by eye on a dark moonless night. They are galaxies like our Milky Way but much smaller. The Large Cloud is about 5% the mass of our Galaxy and the small one 3%. That is still many billions of stars in each. The LMC is around 160 000 light years away; the SMC around 200 000 l.y.

On moonless evenings in a dark rural sky the **Zodiacal Light** is visible in the west. It looks like late twilight: a faint broad column of light tilted toward Antares, fading out at the Milky Way. It is sunlight reflecting off meteoric dust in the plane of the solar system. The dust may have come from a big comet, centuries ago.

Brilliant Venus (not shown) might be seen on the eastern horizon at dawn. At the beginning of the month it rises 50 minutes before the Sun. It sinks lower in the twilight as it moves to the far side of the Sun from us.

\*A **light year (l.y.)** is the distance that light travels in one year: nearly 10 million million km or  $10^{13}$  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.



### The Western Evening Sky in October 2017

The chart shows the region low in the west at dusk. Saturn, off-white in colour, is the brightest 'star' in the region. Below and left of it, and fainter, is the orange star Antares. Many star clusters and a few nebulae are seen in this region, some obvious to the naked eye. Those visible in binoculars or small telescopes are indicated with asterisks. They are described on the accompanying commentary.

Chart produced by Guide 8 software; [www.projectpluto.com](http://www.projectpluto.com). Labels added by Alan Gilmore, University of Canterbury's Mt John Observatory, P.O. Box 56, Lake Tekapo 7945, New Zealand. [www.canterbury.ac.nz](http://www.canterbury.ac.nz)



**Saturn** is the brightest 'star' in the region. It is off-white in colour and shines with a steady light. It sets in the southwest after midnight at the beginning of the month; before 11 p.m. at the end. A small telescope shows Saturn's rings and its largest moon Titan four ring diameters from the planet. Large telescopes show the fainter moons closer to the planet.

Well below and left of Saturn is the orange star **Antares**, a little fainter than Saturn. It marks the body of **Scorpius**. The Scorpion is head-down, tail-up in the evening sky now. Antares and the tail make a back-to-front question mark. In Maori star lore the tail is the fish-hook of Maui.

Antares is a red-giant star: 600 light years\* away, 19 000 times brighter than the sun, and big enough to fill Earth's orbit. Its mass or weight is about 20 times that of the sun, so the star is mostly extremely thin gas spread around a hot dense core. Red giant star is the last stage in the life of a star. The hot dense core of the star is wringing the last of the thermo-nuclear energy from helium to form heavier elements. For massive stars like Antares a core of iron (gas!) is finally formed. This leads to a collapse of the core into a neutron star or a black hole. In the resulting explosion -- a supernova -- chemical elements heavier than iron are made. The rich amount of heavy elements on earth shows that we are made of the matter that has been processed in two supernova explosions since the beginning of the universe.

This part of the Milky Way is broad and bright as we are looking to the centre of the galaxy. The actual centre, 27 000 light years away, is hidden from our view by intervening dust clouds. The nearer clouds make gaps and slots along the Milky Way. Some of the central bulge of the galaxy is glimpsed in gaps between the clouds, making brighter areas of Milky Way in this region. The dust is from old stars giving off clouds of gas rich in carbon (forming soot, roughly speaking) and silicon (making fine sand).

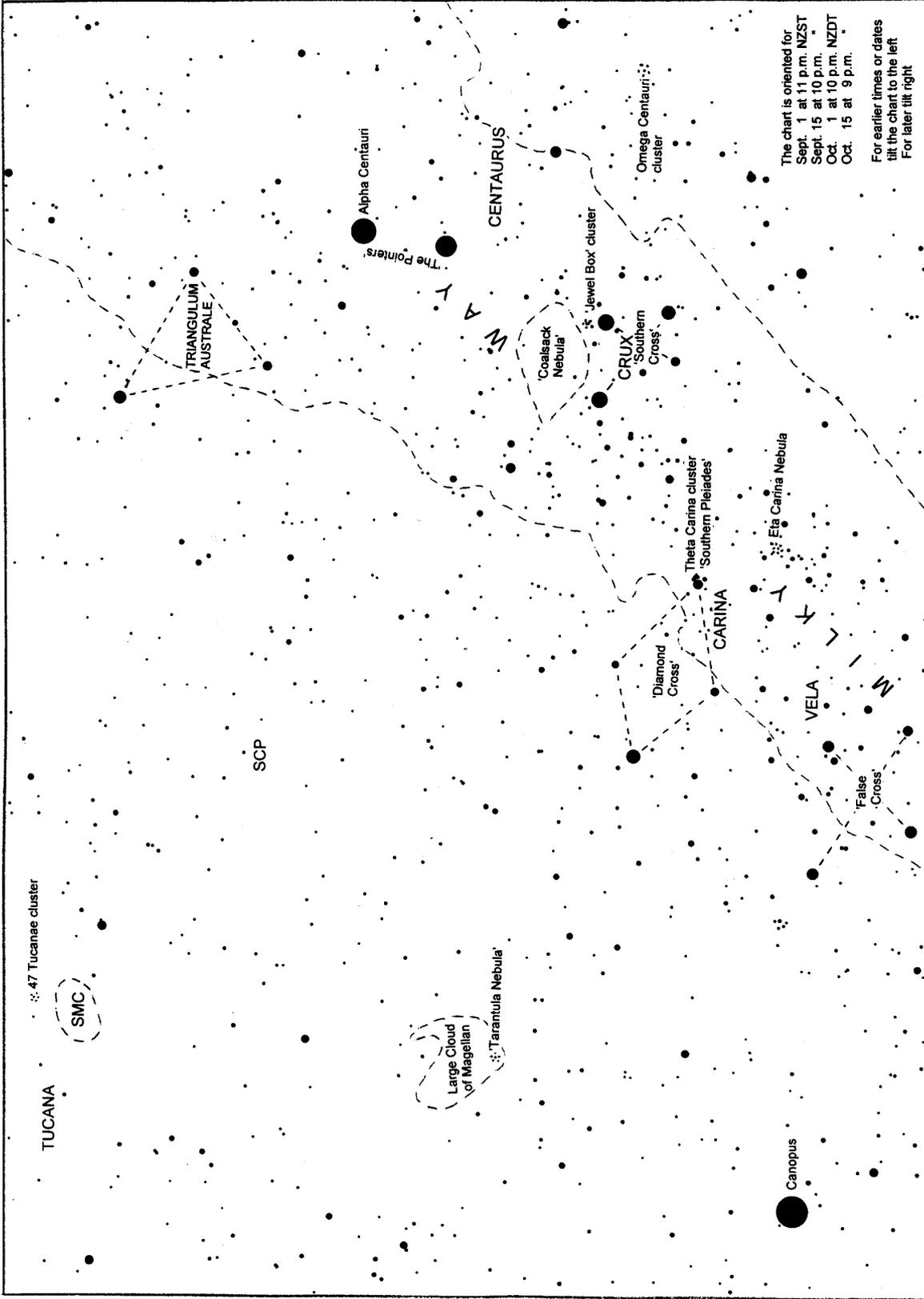
On the chart the direction to the centre of the galaxy is below the Teapot's spout and left of M8. Infrared telescopes, peering through the dust between us and the centre, show stars orbiting the invisible black hole at high speed. From the speed and orbits of these stars it is found that the central black hole is four million times heavier than the sun. Infra-red and x-ray 'flares' are seen from the region, as clouds of matter fall into the black hole. These confirm that the black hole is smaller than Earth's orbit, ruling out the possibility that the four million solar masses are just a dense cluster of stars.

At the right-angle bend in the Scorpion's tail is a large and bright cluster of stars (NGC **6231**) looking like a small comet. It is around 6000 l.y. away. Its brightest stars are 60 000 times brighter than the sun. Right of the Scorpion's sting is **M7** a cluster obvious to the eye and nicely seen in binoculars. M7 is about 800 l.y. away and around 220 million years old. Below M7 and fainter is **M6**, the 'butterfly cluster', around 1600 l.y. away. Other clusters worth a look in binoculars are **M23**, NGC **6167**, and NGC **6193**. The 'M' objects were listed by the 18<sup>th</sup> Century French astronomer Charles Messier (1730-1817). He hunted comets, so catalogued fuzzy objects that could be mistaken for comets. The NGC (New General Catalogue) objects were too far south to be seen from Paris.

Below Sagittarius's 'Teapot' is the glowing gas cloud **M8**, commonly called the Lagoon Nebula from the dark lane of dust that crosses it. The gas is glowing in ultra-violet light from very hot stars. These stars have formed within the cloud in the past two million years. M8 is about 140 light years across and 5200 light years away. Nearby is **M20**, called the Trifid Nebula from its three-lobed appearance. It is seen as a small glowing patch in binoculars. **M16** and other nebulae are also found in this area.

Globular clusters, spherical clouds of ancient stars, are found throughout the region. The brightest is **M4** by Antares. It is also one of the closest at 7 000 l.y. away but is dimmed by a dust cloud between us and it. In binoculars and small telescopes globular clusters appear as round fuzzy spots. Others marked on the chart, with their distances in light years, are **M10** (14 000 l.y.), **M12** (19 000), **M19** (27 000), **M22** (10 000), **M55** (20 000), **M62** (22 000), **M80** (30 000) and NGC **6541**. The concentration of globular clusters in this part of the sky was an early clue that the centre of the galaxy lay in this direction and was a long way from us.

\*One light year (l.y.) is about 10 000 billion km,  $10^{13}$  km, or 6 000 billion miles. Sunlight takes 8 minutes to reach us and 4 hours to get to Neptune the most distant big planet. Light takes 4 years to get to the nearest star.

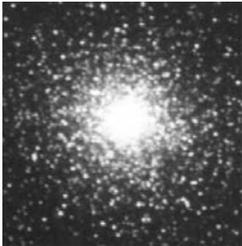


**Southern Evening Sky in October**  
 The chart shows the southern and southwest sky. Interesting star clusters and nebulae are indicated with asterisks. They are described on the other side of this page.

Chart produced by Guide 8 software; [www.projectpluto.com](http://www.projectpluto.com). Labels and text added by Alan Gilmore, Mt John Observatory of the University of Canterbury, P.O. Box 56, Lake Tekapo 7945, New Zealand. [www.canterbury.ac.nz](http://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. The LMC is about 160 000 light years away and the SMC 200 000 l.y away, both 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**, right of the Pointers, 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 in the summer sky) 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, in the eastern dawn sky, is the brightest star in the sky. The planets Venus and Jupiter are brighter.

**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 50x 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 600 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 around 16 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 80 times heavier than the sun and four 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** is a cluster on the west end of the 'Diamond Cross'. It is also called the 'Five of Diamonds' cluster, the reason obvious when viewed in a telescope. It is much fainter and smaller than the real Pleiades in Taurus but a nice sight in binoculars. The cluster is about 500 light years away and is around 30 million years old.