

The chart is orientated for
 July 15 at 10 p.m. NZST
 Aug. 1 at 9 p.m. "
 Aug. 15 at 8 p.m. "
 Sep. 1 at 7 p.m. "

Evening sky in August 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 makes a small extra clockwise rotation each night as we orbit the sun.

Jupiter, the brightest star-like object in the evening sky, is midway up the eastern sky at dusk. Mercury makes its best evening sky appearance of the year low in the west, moving up past Saturn mid month. Orange Arcturus in the northwest often twinkles red and green. The Pointers and Crux, the Southern Cross, are midway down the southwest sky. Canopus is low in the south. The Milky Way spans the sky from northeast to southwest with its broad centre overhead. The Scorpion's tail curls around the zenith. Vega crosses the northern sky, staying low.

The Evening Sky in August 2009

Jupiter appears in the eastern sky in the early twilight, shining with a steady golden light. Binoculars will show the disk of Jupiter and perhaps one or two of its bright moons. A small telescope easily shows all four moons and the parallel stripes in Jupiter's clouds. This year we are looking edge-on to the orbits of Jupiter's moons. So the moons frequently hide (occlude) each other and their shadows cross over (eclipse) each other. These events last only a few minutes. Some evening events visible from NZ: August 14, satellite 1 Io occults and eclipses satellite 2 Europa starting at 7:49; August 19, satellite 3 Ganymede eclipses 2 at 6:04; August 21, 1 occults 2 at 10:10, then 1 eclipses 2 at 10:37; August 26, 3 occults 2 at 9:16; August 29, 1 occults 2 at 6:41.

Mercury makes its best evening sky appearance of the year in August. At the beginning of the month it is near Regulus, and is the brighter of the two, low in the west. It climbs higher in the sky. By mid month it is passing **Saturn** on the left. Mercury continues its climb up the western sky till the end of August. After that it will slip down into the twilight as it starts to pass between us and the sun on the inside lane.

Canopus, the second brightest star, is near the south skyline at dusk. It swings upward into the southeast sky through the morning hours. Canopus is a truly bright star: 13 000 times the sun's brightness and 300 light years* away. On the opposite horizon is **Vega**, one of the brightest northern stars. It is due north in mid-evening and sets around midnight.

Midway up the southwest sky are 'The Pointers', Beta and **Alpha Centauri**. They point down to **Crux** the Southern Cross. Alpha Centauri is the third brightest star. It is also the closest of the naked eye stars, 4.3 light years away. And it is a binary star: two sun-like stars orbiting each other in 80 years. A telescope magnifying 50x will easily split the pair. Beta Centauri, like most of the stars in Crux, is a blue-giant star hundreds of light years away and thousands of times brighter than the sun..

Arcturus, in the northwest at dusk, is the fourth brightest star and the brightest in the northern hemisphere. It is 120 times the sun's brightness and 37 light years away. When low in the sky Arcturus twinkles red and green as the air splits up its orange light. It sets in the northwest around 10 pm.

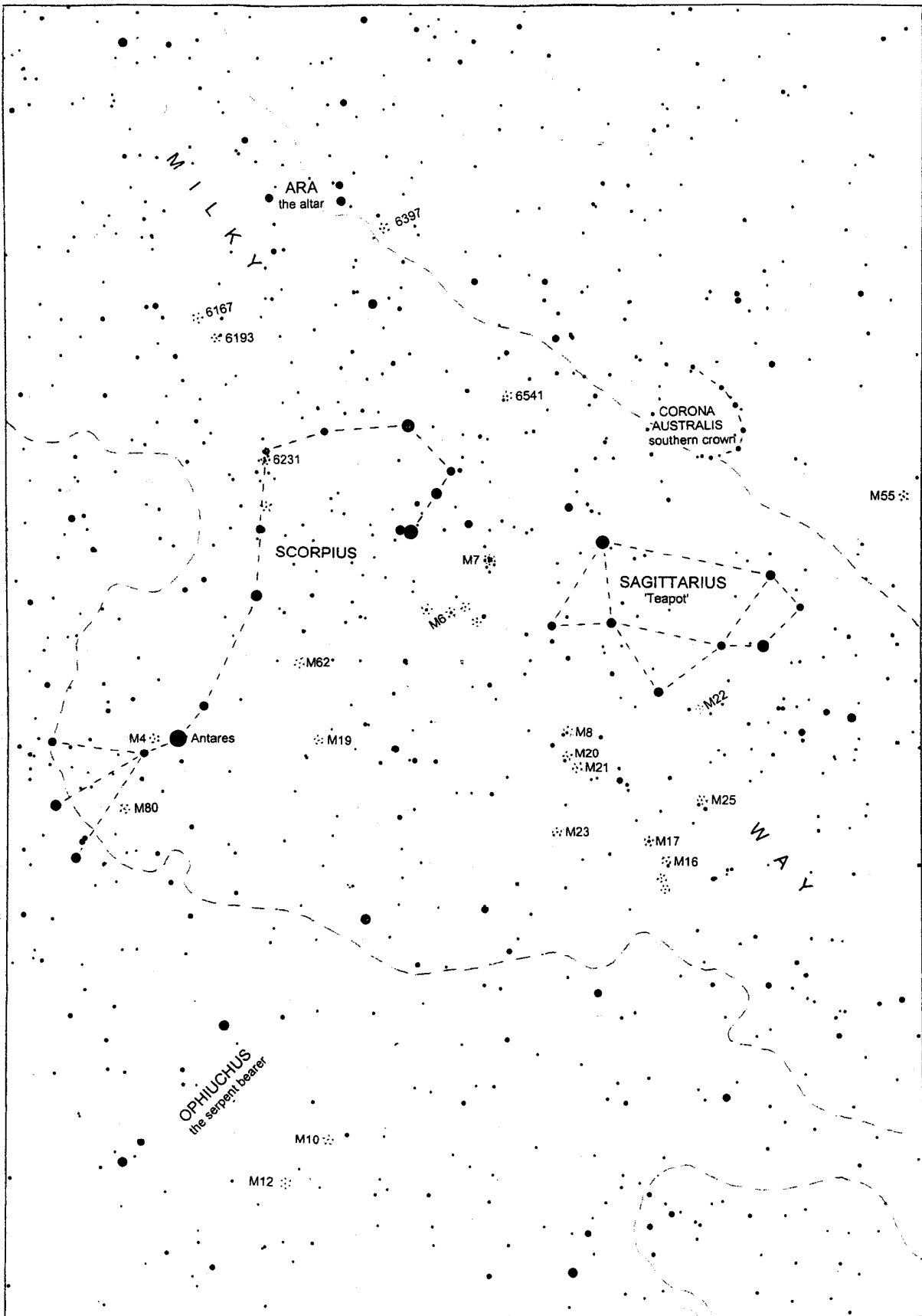
Just north of overhead the orange star **Antares** marks the heart of the Scorpion. The Scorpion's tail hooks around the zenith like a back-to-front question mark. Antares and the tail make the 'fish-hook of Maui' in Maori star lore. Antares is a red giant star: 600 light years away and 19 000 times brighter than the sun. Red giants are dying stars, wringing the last of the thermo-nuclear energy out of their cores. Big ones like Antares end in massive supernova explosions. Below or 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.

The **Milky Way** is brightest and broadest overhead in Scorpius and Sagittarius. In a dark sky it can be traced down past the Pointers and Crux into the southwest. To the northeast it passes Altair, meeting the skyline right of Vega. 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 is hidden by dust clouds in space. The nearer dust clouds appear as gaps and slots in the Milky Way. A scan along the Milky Way with binoculars shows many clusters of stars and some glowing gas clouds, particularly in the **Carina** region below Crux, and in Scorpius and Sagittarius.

The Large and Small Clouds of Magellan, **LMC** and **SMC**, look like two misty patches of light low in the south. They are easily seen by eye on a dark moonless night. They are galaxies like our Milky Way but much smaller. The LMC is about 160 000 light years away; the SMC about 200 000 light years away.

Brilliant Venus (not shown) rises in the dawn sky after 5 a.m. A fair way above and left of Venus is Mars, much fainter and reddish-coloured. Above Mars are two orange stars of similar brightness. Aldebaran, the eye of Taurus the bull, is on the left. Betelgeuse is on the right below Orion's belt or 'the Pot'.

*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 Sky North of Overhead at Evening in August

The chart shows the sky north of the zenith at nightfall. The Milky Way is here bright and broad as we look toward the centre of the galaxy. Many star clusters and a few nebulae are seen, some obvious to the naked eye. Those visible in binoculars or small telescopes are indicated with asterisks. They are described on the other side of this page.

Chart produced by Guide 8 software; 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

Interesting Objects North of Overhead in August

Antares is the brightest star in the region. It is orange coloured; being a 'red giant' star. (The 'red' of red giants is usually more an orange tint.) It is 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 most of the star is very thin gas spread around a hot dense core. Red giants are the last stage in the evolution of stars. The dense core of the star has shrunk and heated. The outer regions of the star have expanded to a very spread-out gas. The core is wringing the last of the thermo-nuclear energy out of elements like helium, carbon, oxygen and neon. In about two million years the core of Antares will run out of energy and collapse, triggering a spectacular supernova explosion. (The sun will become a red-giant in about seven billion years time but it ends up as a white dwarf star, not a supernova.)

Antares marks the heart of Scorpius. In the evening around this time of year the Scorpion has its tail curled around the zenith and its head down into the north sky. The sting is the near-vertical line of bright stars pointing toward Antares. In Maori star lore the tail's hook is the 'fish hook of Maui'.

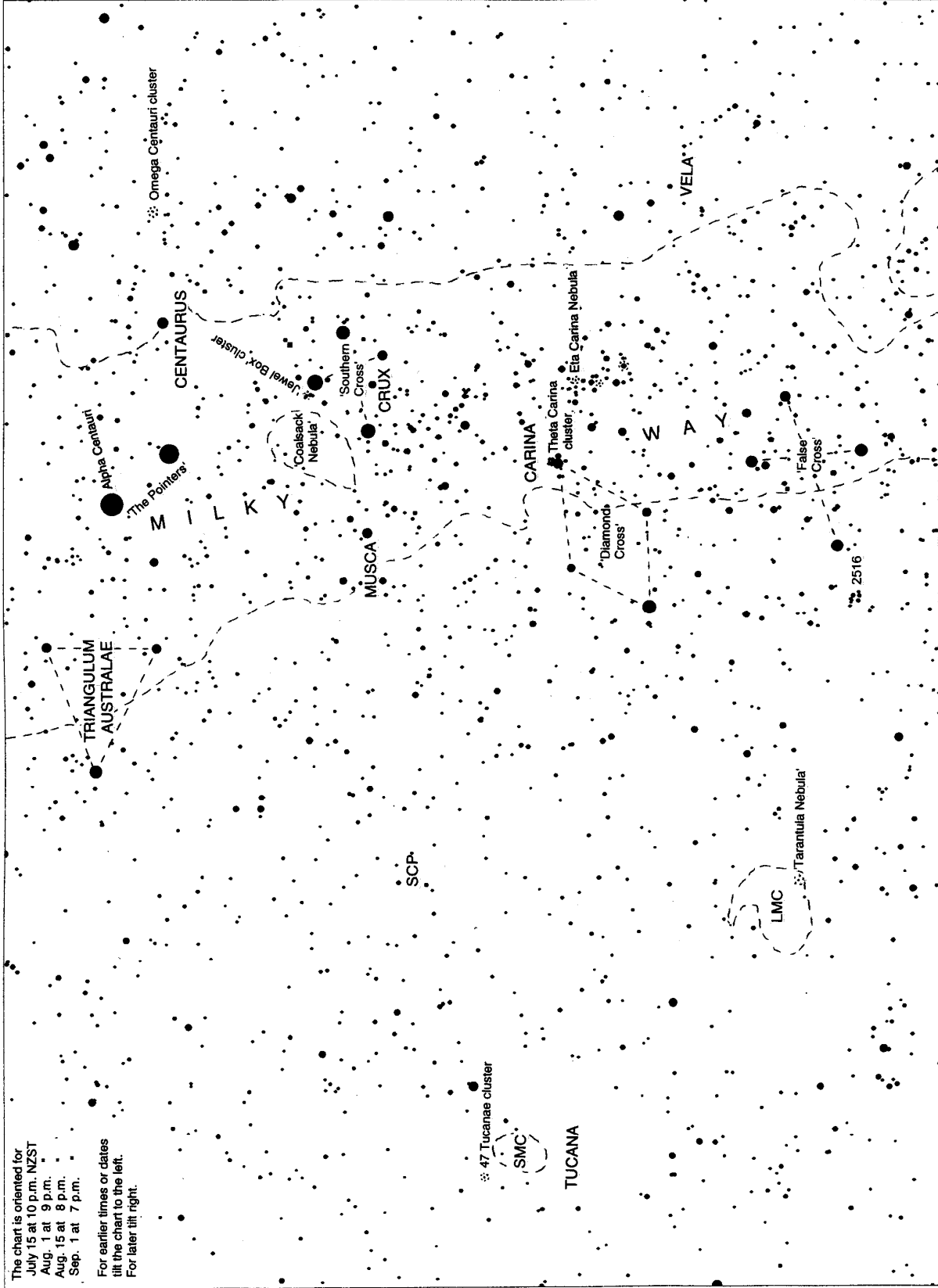
At the right-angle bend in the tail is a large and bright cluster of stars, NGC **6231**, looking like a small comet. It is around 6000 l.y. away. Its brightest stars are 60 000 times brighter than the sun. The cluster is about 8 light years across, similar in size to the Pleiades/Matariki cluster in our summer sky. Were it as close as the Pleiades (400 l.y.) then its brightest stars would be as bright as Sirius. Below and 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 260 million years old. (The older a star cluster, the fewer bright stars it has.)

Below the sting and fainter is **M6**, the 'butterfly cluster'. M6 is around 1600 l.y. away and is half the age of M7. Other clusters worth a look in binoculars are **M21**, **M23**, NGC **6167**, and NGC **6193**. The 'M' objects were listed by the 18th Century French astronomer Charles Messier. He hunted comets, so made a catalogue of fuzzy objects that could be mistaken for comets. The NGC (New General Catalogue) objects shown are bright enough to have been seen by Messier but are too far south to be seen from Paris.

Below and left of the Sagittarius 'Teapot' is the glowing gas cloud **M8**, the 'Lagoon Nebula'. It is a star-forming region where gas and dust have recently gathered into new stars. ('Recently' = the past two million years or so.) Ultraviolet light from very hot stars is lighting up the leftover gas, making it glow. On colour photos it appears pink due to hydrogen atoms fluorescing in the UV light. Below M8 is **M20**, the Trifid Nebula, small glowing patch in binoculars, also a pink hydrogen region in photos. Right alongside it is a blue reflection nebula where starlight is scattered by dust. Other nearby nebulae (gas and dust clouds) are **M16** and **M17**.

Globular clusters, spherical clusters 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. In binoculars and small telescopes 'globes' appear as round fuzzy spots. Others marked on the chart are **M9**, **M10**, **M12**, **M14**, **M19**, **M22**, **M55**, **M54**, **M62**, **M80** and NGC **6541**. The concentration of globular clusters in this area was an early clue that the centre of the galaxy lay in this direction.

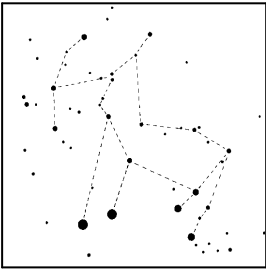
This part of the Milky Way is broad and bright as we are looking to the centre of the galaxy. The actual centre, 27 000 light years away, is hidden from our view by intervening dust clouds. The nearer clouds make gaps and slots along the Milky Way. The hub of the galaxy is a great sphere of stars, called the 'central bulge'. Some of the central bulge is glimpsed in gaps between the dust clouds. At the very centre lies a black hole four million times the sun's mass but only the size of our solar system. Infra-red telescopes, peering through the dust, show stars orbiting the invisible black hole at high speed. By plotting the movements of these stars over the past two decades, astronomers have been able to deduce the mass of the central black hole and its distance. All big galaxies have a massive black hole at their centre.



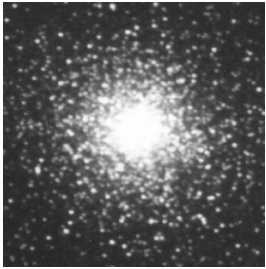
Southern Evening Sky in August
 The chart shows the southern and southwest sky. Interesting star clusters and nebulae are indicated with asterisks. They are described on the other side of this page.

Chart produced by Guide 8 software: www.projectpluto.com. 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

Interesting Objects in the Southern Sky



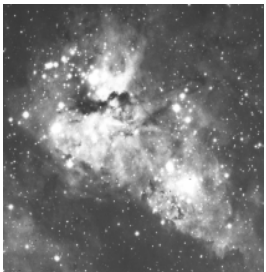
Centaurus, with the bright 'Pointers', and **Crux** the Southern Cross, are in the southwest sky. They make a tight grouping of bright stars. Originally Crux was the hind legs of the Centaur, the horse-man of Greek mythology. The complete Centaur, with bow, is outlined at left. It was only in the 17th Century that Crux was split off as a separate constellation. The slow wobble of Earth's axis allowed this part of the sky to be seen from more northerly places in ancient times. The fainter Pointer and the three bluish-white stars of the Crux are all super-bright stars hundreds of light years* away. Alpha Centauri is just 4.3 light years* away and the reddish top star of Crux is 90 light years from us.



Omega Centauri, to the right of the Pointers, is a globular cluster, a ball-shaped cluster of millions of stars. Its total mass is six million times the sun's. It is 17 000 light years away and 200 light years across. Globular clusters are very ancient, around 10 billion years old, twice the age of the sun. Omega Centauri is the biggest of the hundred-odd globulars randomly orbiting our galaxy. It may originally have been the core of a small galaxy that collided with the Milky Way and was stripped of its outer stars.

Coalsack nebula, above and left of Crux, looks like a hole in the Milky Way. It is a cloud of dust and gas 300 light years away, dimming more distant stars. Many 'dark nebulae' can be seen along the Milky Way, appearing as slots and holes. These clouds eventually form new stars.

The Jewel Box is a compact cluster of young bright stars about 7000 light years away. The cluster formed less than 10 million ago. To the eye it looks like a faint star close by the second-brightest star in Crux. A telescope is needed to see it well.



Eta Carinae nebula, a luminous spot in the Milky Way below Crux, is a glowing gas cloud about 8000 light years from us. The thin gas glows in the ultra-violet light of nearby hot young stars.

The golden star in the cloud, visible in binoculars, is Eta Carinae. It is estimated to be to be 60 times heavier than the sun. It is a million times brighter than the sun but is dimmed by dust clouds around it. It is expected to explode as a supernova in the next few thousand years. Many star clusters are found in this part of the sky. (Eta is the Greek 'e'.)

Large & Small Clouds of Magellan (LMC & SMC) appear as two luminous clouds, easily seen by eye in a dark sky. They are galaxies like the Milky Way but much smaller. Each is made of billions of stars. The Large Cloud contains many clusters of young bright stars seen as patches of light in binoculars. The LMC is about 160 000 light years away; the SMC is around 200 000 light years away, very close by for galaxies.



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 the 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 (seen in 'The Pot' in the summer evening sky) then it would be as bright as the full moon.

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