

The chart is oriented for
 Dec. 1 at 1 a.m. NZDT
 Dec. 15 at midnight *
 Jan. 1 at 11 p.m. *
 Jan. 15 at 10 p.m. *

Evening sky in January 2018

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 or westward rotation from night to night as we orbit the sun.

Sirius, the brightest star, is high in the east at dusk. Left of it is Orion, containing 'The Pot', with Taurus and the Pleiades/Matariki star cluster further left toward the north. Canopus, the second brightest star after Sirius, is southeast of the zenith. Crux, the Southern Cross, and the Pointers are low in the south. From northern New Zealand the bright star Capella is near the north skyline. There are no bright planets in the evening sky until the end of the month when Venus appears low in the twilight. The other planets are in the morning sky.

The Evening Sky in January 2018

Bright stars appear in the eastern half of the evening sky in January. **Sirius** is the brightest. Left of Sirius are bluish **Rigel** and orange **Betelgeuse**, the brightest stars in **Orion** the hunter. Between them, but fainter, is a line of three stars making Orion's belt. To southern hemisphere star watchers, Orion's belt makes the bottom of 'The Pot' or 'The Saucepan'. A faint line of stars above and right of the belt is the pot's handle or Orion's sword. The sword has a glowing cloud at its centre: the Orion Nebula. There are no bright planets in the evening sky except at the end of the month when **Venus** might be seen setting 20 minutes after the sun.

Left of Orion is the V-shaped pattern of stars making the face of **Taurus** the Bull. The V-shaped group is called the Hyades cluster. It is 150 light years away. Orange **Aldebaran**, making one eye of the bull, is not a member of the cluster but on the line of sight, half the cluster's distance.

Left again, toward the north and lower, is the **Pleiades/Matariki/Seven Sisters/ Subaru** star cluster. Pretty to the eye and impressive in binoculars, it is 440 light years* from us. From northern NZ the bright star **Capella** is on the north skyline. It is 90,000 times brighter than the sun and 3300 light years away.

Low in the south are **Crux**, the Southern Cross, and Beta and **Alpha Centauri**, often called 'The Pointers'. Alpha Centauri is the closest naked-eye star, 4.3 light years away. Beta Centauri, like most of the stars in Crux, is a blue-giant star hundreds of light years away. **Canopus** is also very luminous and distant: 13 000 times brighter than the sun and 300 light years away.

The **Milky Way** is in the eastern sky, brightest in the southeast toward Crux. It can be traced towards the north but becomes faint 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. Binoculars show many star clusters and a few glowing gas clouds in the Milky Way, particularly in the Carina region. The Milky Way is faint left, or north, of Orion because we are looking toward its thin outer edge. The centre region of the Galaxy, in Sagittarius, is hidden by the sun at this time of year.

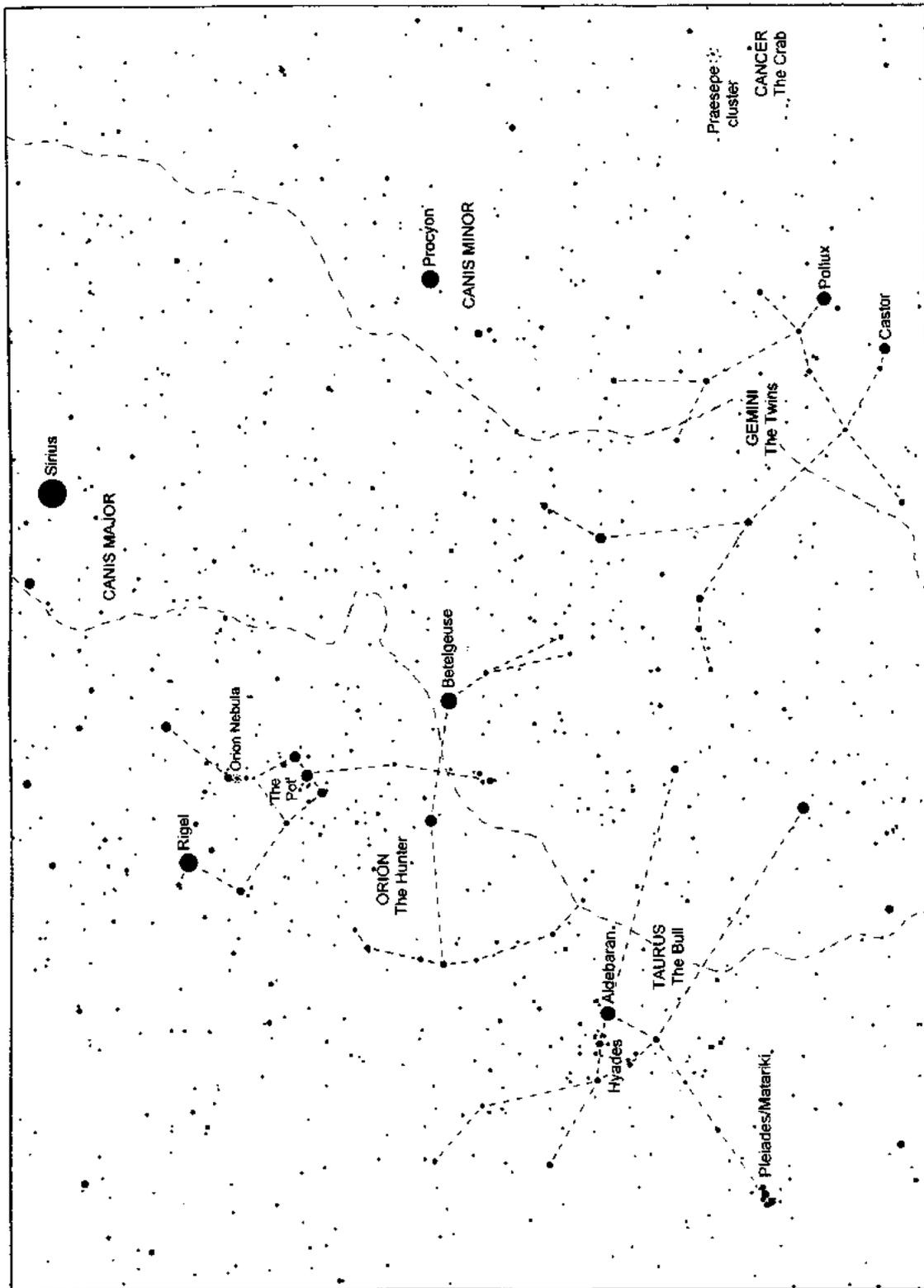
The Clouds of Magellan, **LMC** and **SMC**, are high in the southern sky and easily seen by eye on a dark moonless night. They are two small galaxies about 160 000 and 200 000 light years away.

A **total eclipse of the Moon** begins on the 31st just before midnight NZDT but isn't immediately obvious. The Moon will be moving through the outer part of Earth's shadow till 12:48 a.m. on February 1, when it begins to move into the darker part. By 1:51 it will be totally in the dark central part of the shadow, the umbra. It should be darkest around 2:30. It begins to exit the umbra at 3:08 and is fully out of it by 4:11. It leaves the outer part of the shadow, the penumbra, at 5:08.

All the bright planets are in the morning sky except Venus which is behind the Sun most of the month. At the beginning of the month golden **Jupiter** rises after 2:30 and is the brightest 'star' in the morning sky. Above and left of it, and much fainter, is reddish **Mars**. Jupiter and the background stars rise earlier each morning but Mars moves more slowly. This causes Jupiter to overtake Mars, the two will be close around the 7th. Their apparent closeness is a line-of-sight effect: Mars is 285 million km from us and Jupiter is 880 million km away.

Mercury is bright in the morning sky for most of the month. In early January it is rising 90 minutes before the Sun, toward the southeast. **Saturn** rises slowly out of the dawn twilight in the first fortnight. On the 14th it is beside Mercury and the fainter of the two. At that date Mercury is 182 million km away and Saturn 1640 million from us. Mars, Jupiter and Saturn continue to rise earlier each day as we catch up on them. Mercury, much faster than us, slips lower in the dawn as it moves to the far side of the Sun.

*A **light year** 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 sunlight four years to reach the nearest star, Alpha Centauri.



Northeast Evening Sky in January

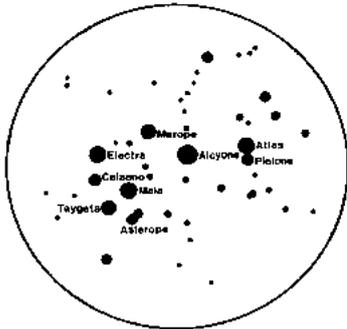
The chart shows our northern sky in the evening. The chart may need to be tilted to the left or right to match the sky, depending on the time of night. Interesting objects are described on the other side of this page.

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 the Summer North Sky

Taurus the Bull and **Orion** the Hunter are prominent in our northern evening sky. Fainter and lower are **Gemini** the Twins and **Cancer** the Crab. The constellation pictures are upside to us; they were devised by northern hemisphere skywatchers. The face of Taurus is outlined by the V-shaped **Hyades** cluster. The brightest star in this group is orange **Aldebaran**, making one eye of the bull. Taurus's long horns extend down our sky. The **Pleiades/Matariki** cluster rides on the Bull's back.

The V-shaped **Hyades** cluster is 152 light years away. Its brightest stars (not Aldebaran!) are about 70 times brighter than the sun. The cluster is about 700 million years old. **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 **Pleiades / Seven Sisters / Matariki / Subaru**, and many other names, is a cluster of stars well known in both hemispheres. Six stars are easily seen by the naked eye; 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 (10^{13} km) or 6 million million miles. Light from the sun reaches us in 8 minutes. Light from the moon gets here in 1 second. Sunlight takes 4 hours to reach Neptune, the outermost significant planet, and 4 years to reach Alpha Centauri, the nearest star.

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, hanging from his belt. To most southern hemisphere sky watchers the belt and sword form **The Pot** or The Saucepan.

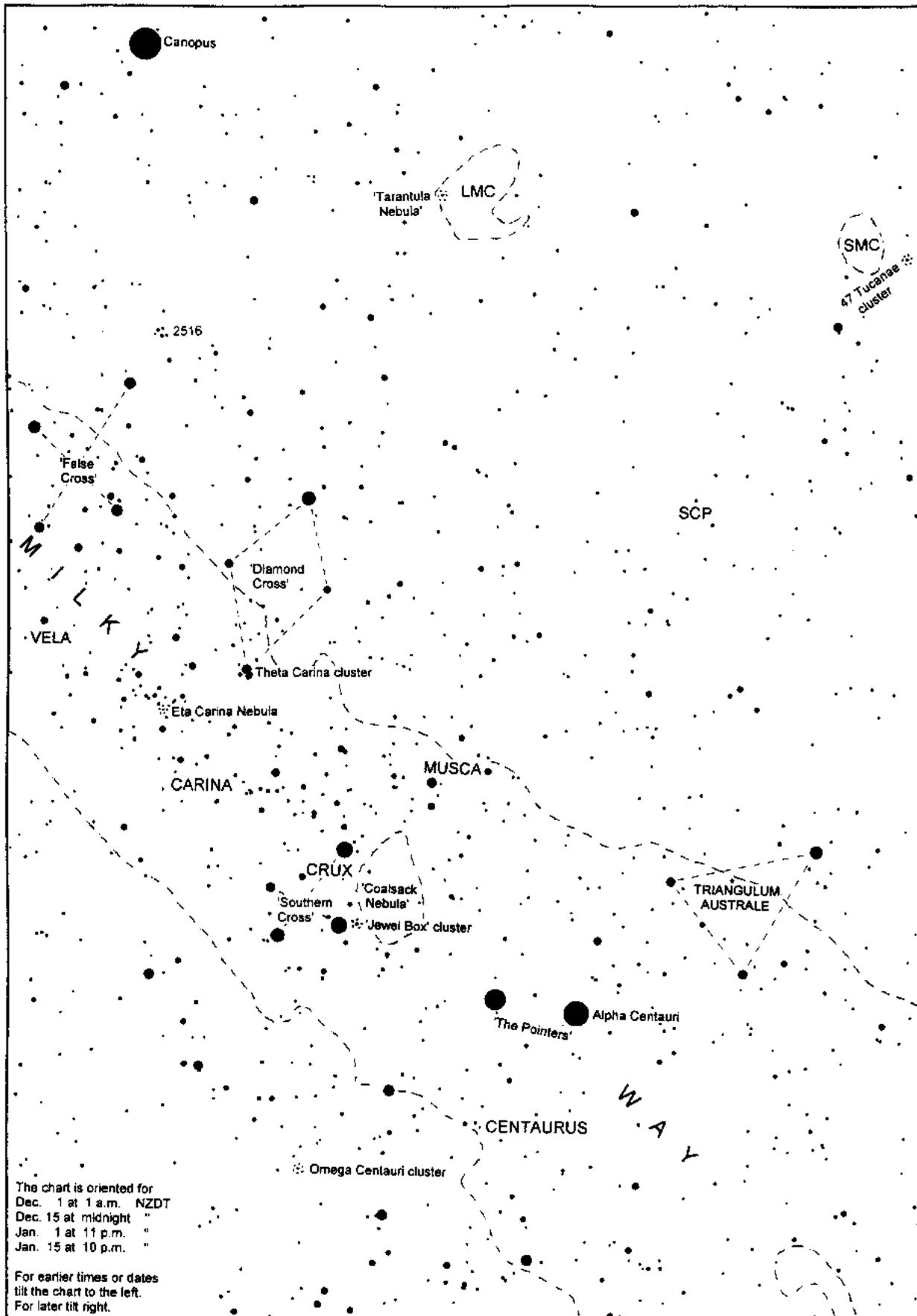


The **Orion Nebula** is visible in binoculars as a misty glow around the middle stars of Orion's Sword or the handle of The Pot. It is a vast cloud of dust and gas about 1300 l.y. away and more than 20 l.y. across. Ultra-violet light from a massive, extremely hot star in the cloud causes it to glow. Some stars in this region are around 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 Venus and Jupiter, and sometimes Mars, are brighter. Sirius appears bright because it is both brighter than the sun -- 22 times brighter -- 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.

The **Praesepe cluster** or Beehive cluster, low in the northeast in the later evening, marks the shell of **Cancer** the crab. The cluster is some 600 light years from us. It formed in a gas cloud about 700 million years ago.



Southern Evening Sky in January

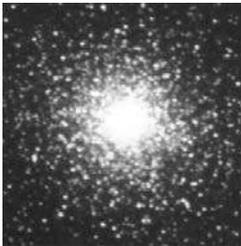
The chart shows the lower southern sky. Interesting star clusters and nebulae are indicated with asterisks. They are described on the other side of this page.

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. 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**, 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. They presently appear close together; not easily split in most telescopes. (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 about 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 a binary star: two massive stars orbiting each other in 5.5 years. The bigger star is 80 times heavier than the Sun; the smaller is 60 times the Sun's mass. Together they are about five million times brighter than the Sun but are dimmed by dust clouds around them. The bigger star 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** at one point of the 'Diamond Cross'. It is also known as the 'Five of Diamonds' cluster, the reason obvious when it is seen in a telescope. A newish name is 'Southern Pleiades', though this cluster appears much fainter and smaller than the real Pleiades in Taurus. The cluster is about 500 light years away and is around 10 million years old.

NGC 2516, above the Diamond Cross, looks like a faint comet without a tail. It is a star cluster nicely seen in binoculars. It is 1200 light years away.