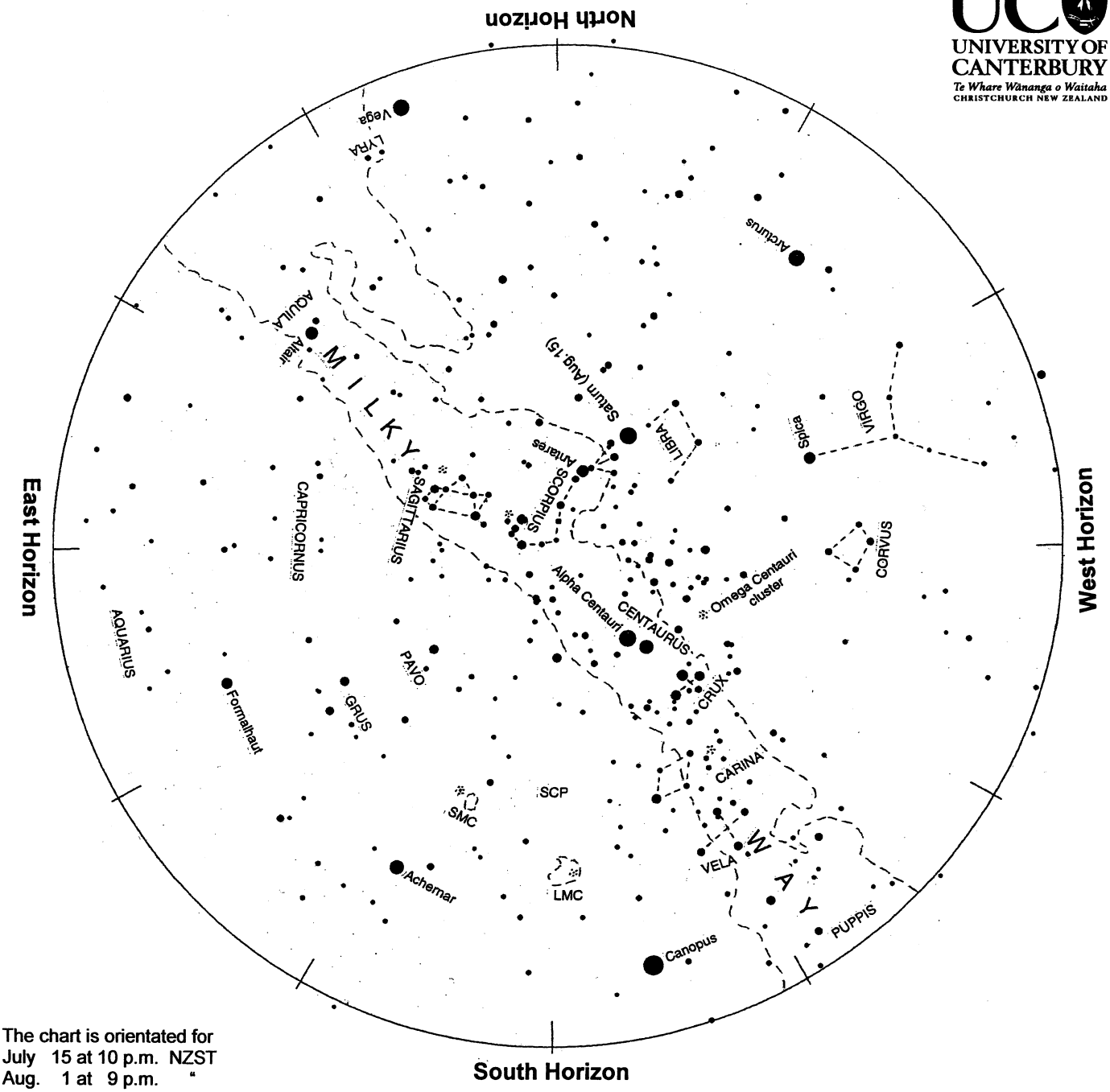

The chart is orientated for
July 15 at 10 p.m. NZST
Aug. 1 at 9 p.m. "
Aug. 15 at 8 p.m. "
Sep. 1 at 7 p.m. "

Evening sky in August 2015

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.

The bright planets Venus, Jupiter and Mercury appear low in the western sky soon after sunset at the beginning of the month. (They set before 8 pm, so aren't on the chart.) Saturn is a bright 'star' northwest of the zenith with orange Antares above it. Below them is orange Arcturus, often twinkling red and green. The Pointers and Crux, the Southern Cross, are midway down the southwest sky. Canopus, low in the south, twinkles all colours. Opposite it, low in the north, is Vega. The Milky Way spans the sky from northeast to southwest with its broad centre overhead. Binoculars show many clusters of stars along the Milky Way.

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 7945, New Zealand. www.canterbury.ac.nz

The Evening Sky in August 2015

At the beginning of the month three bright planets appear low in the western evening sky soon after sunset. Brilliant silvery **Venus** is brightest and highest. Golden **Jupiter** is below and right of Venus. **Mercury** is well below the two bright planets on August 1st. It moves quickly up the sky, night to night, as Venus and Jupiter sink lower. On the 7th Mercury is just a full-moon's width to the right of Jupiter. Venus is left of the close pair of planets. All three set about 70 minutes after the sun. Mercury continues its ascent of the evening sky through August while Venus and Jupiter disappear in the twilight. By the 31st Mercury is setting due west after 8 pm, making its best evening sky appearance of the year. At month's end the bright orange star **Arcturus** is setting in the northwest, well to the right of Mercury, often flashing red and green as it goes. Mercury is a small and unimpressive planet in a telescope. It is one-third Earth's diameter and 180 million km away mid-month.

Cream-coloured **Saturn** is the only bright planet in the late-evening sky. It is just north of overhead. Orange **Antares** is in the same area of sky but fainter than Saturn and closer to the zenith. Well down the northwest sky is orange **Arcturus**, mentioned above. Low in the north is white **Vega**, making a brief appearance in our sky. Exactly opposite Vega, low in the south, is **Canopus** twinkling colourfully. In the southwest are 'The Pointers', Beta and **Alpha Centauri** with **Crux**, the Southern Cross, below them.

A small telescope shows Saturn's ring system and biggest moon, Titan, looking like a star about four ring-diameters from the planet. The moon appears near Saturn on the 22nd.

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. It is a relatively cool 3000 C, hence its red-hot colour. 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.

Midway down the southwest sky are 'The Pointers ', Beta and **Alpha Centauri**. They point down and rightward to **Crux** the Southern Cross. Alpha Centauri is the third brightest star and the closest of the naked eye stars, 4.3 light years away. 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.

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 truly bright: 13,000 times brighter than the sun and 310 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. Vega is 52 times brighter than the sun and 25 light years away.

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. At the very centre is a black hole four million times the sun's mass. Dust clouds near us appear as gaps and slots in the Milky Way. Binoculars show many clusters of stars and some glowing gas clouds in the Milky Way.

The Large and Small Clouds of Magellan **LMC** and **SMC** look like two misty patches of light low in the south, 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.

After passing between us and the sun mid-month, **Venus** appears in the eastern dawn twilight. By the 20th it is rising in the east an hour before the sun. Venus remains the 'morning star' for the rest of the year.

*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 for sunlight to reach the nearest star, Alpha Centauri.

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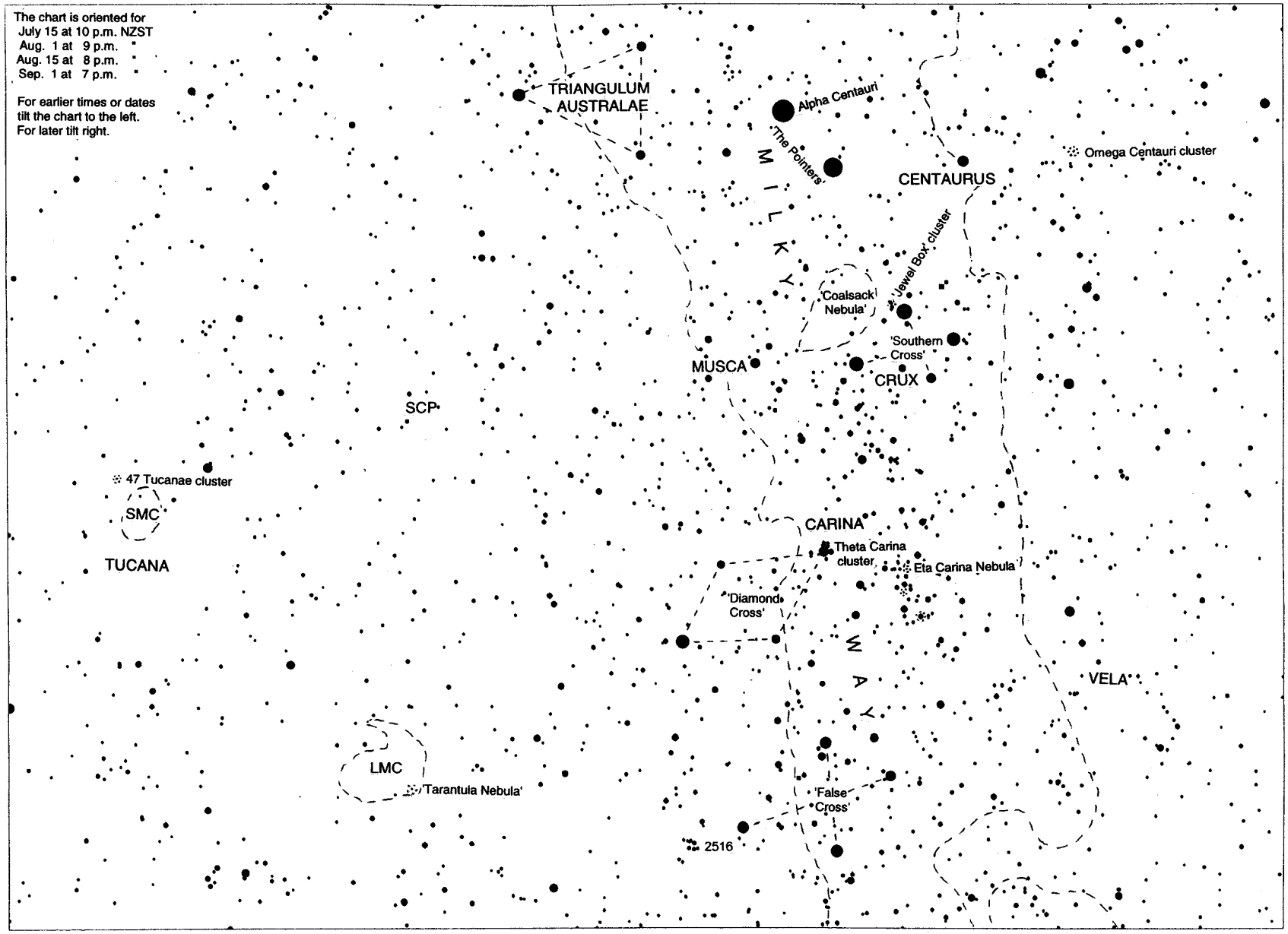

Southern Evening Sky in August

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
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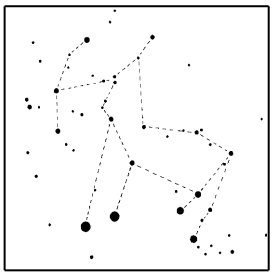
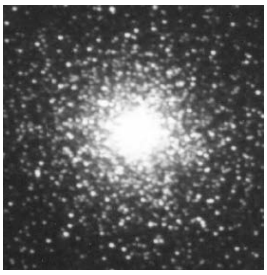
Interesting Objects in the Southern Sky



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.

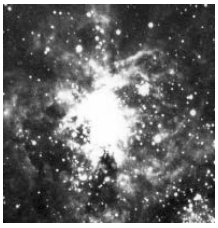
Coalsack nebula, above and left of Crux, looks like a hole in the Milky Way. It is a cloud of dust and gas 300 light years away, dimming more distant stars. Many 'dark nebulae' can be seen along the Milky Way, appearing as slots and holes. These clouds eventually form new stars.

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.

*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.

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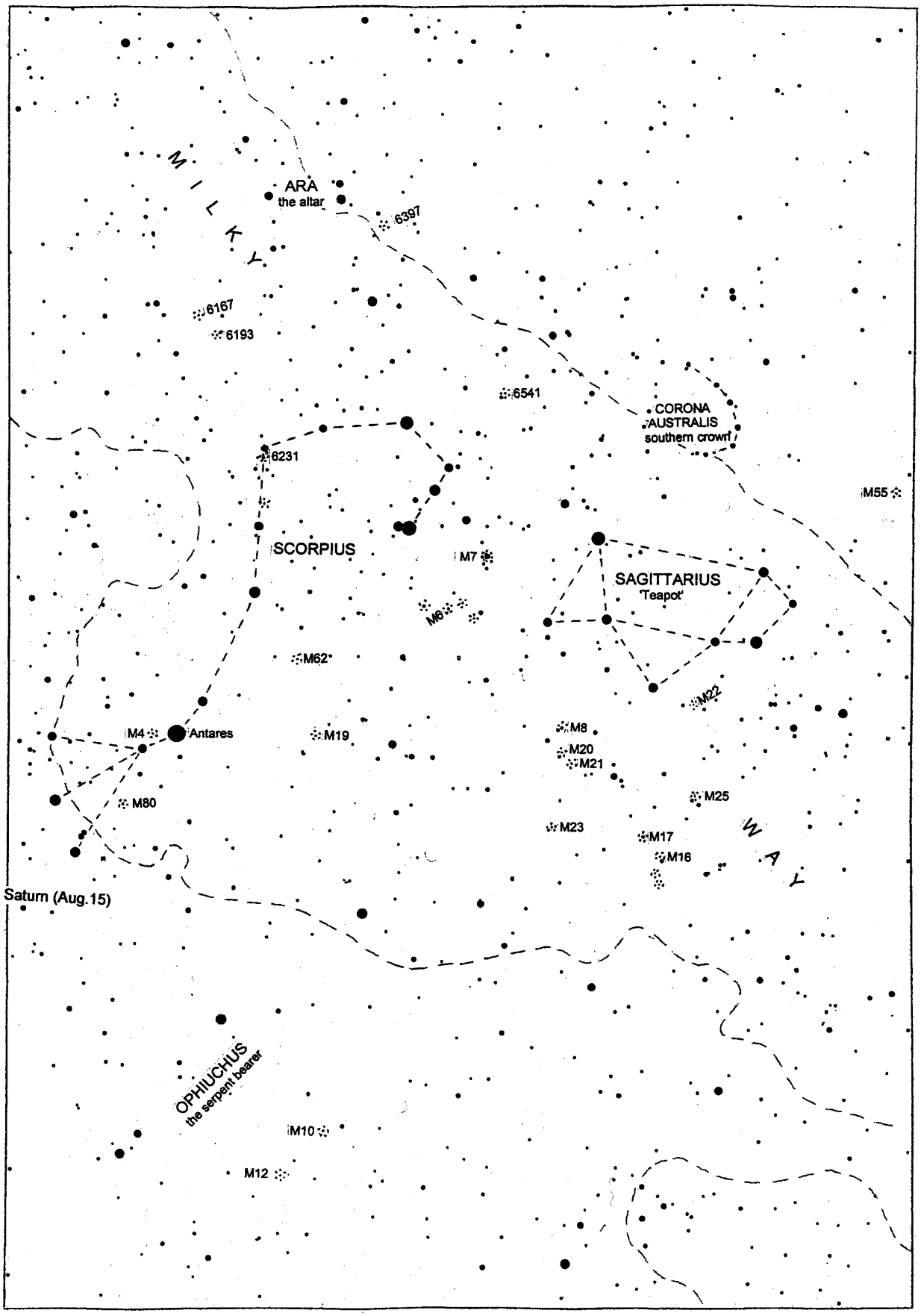

The Sky North of Overhead at Evening in August 2015

The chart shows the sky north of the zenith at nightfall. Saturn is the brightest 'star' in the region. 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 in the chart notes.

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

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Interesting Objects North of Overhead in August 2015

Saturn is the brightest 'star' north of the zenith. It shines with a steady off-white colour. Above it, but fainter, is **Antares**. 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 at 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 than M7 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 to 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 'globs' 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.

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