

NEWSLETTER

Dark Energy talk

Wednesday 7th March 2012 at 7:30 pm

at Carter Observatory, Upland Rd, Kelburn, Wellington



Our **next meeting** on Wednesday March 7th at 7:30pm at Carter Observatory will be by Prof David Wiltshire of Canterbury University. He will be telling us about "Dark energy and cosmic structure". David did his PhD at Cambridge under Stephen Hawking and has just returned from visiting the UK for Prof Hawking's 70th birthday.

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by Aline Homes
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Stop Press

The final Audited Accounts for WAS 2010-11 can be downloaded via link at the bottom of our web page at: <http://was.org.nz/01aboutus.html>



Variable Stars

By Aline Homes

Two Luminous Blue Variables in Carina.

Last month we looked at the bright Cepheid. Still staying in the same general area of sky, we'll take a look at a couple of extreme stars, eta- and AG Carinae.

Eta-Carinae is quite easy to find. It sits in the brightest part of a huge nebula that is easily visible to the naked eye, even under suburban skies. Although eta is now a naked eye star, because of the nebula and the dense surrounding star fields, you will probably need binoculars to observe it. To find eta-Car in binoculars, first focus on theta Carinae and the Southern Pleiades that mark the eastern point of the Diamond Cross. From there, move one binocular field-width north. This should bring you to the eta-Carinae nebula. Look for a Y-shaped asterism of bright stars within the nebula. Eta lies at the junction of the arms of the Y. As an additional check, the star should look reddish.

AG Carinae lies in the same field as eta-Car. To find it, scan southwards from eta-Car to the bright star w Carinae at the foot of the Y, and then east following a line of 6th to 8th magnitude stars to the next bright star beyond the end of the line. Just north-east of this star is a line of three 8th magnitude stars. AG Car lies just north of the middle star in the line.

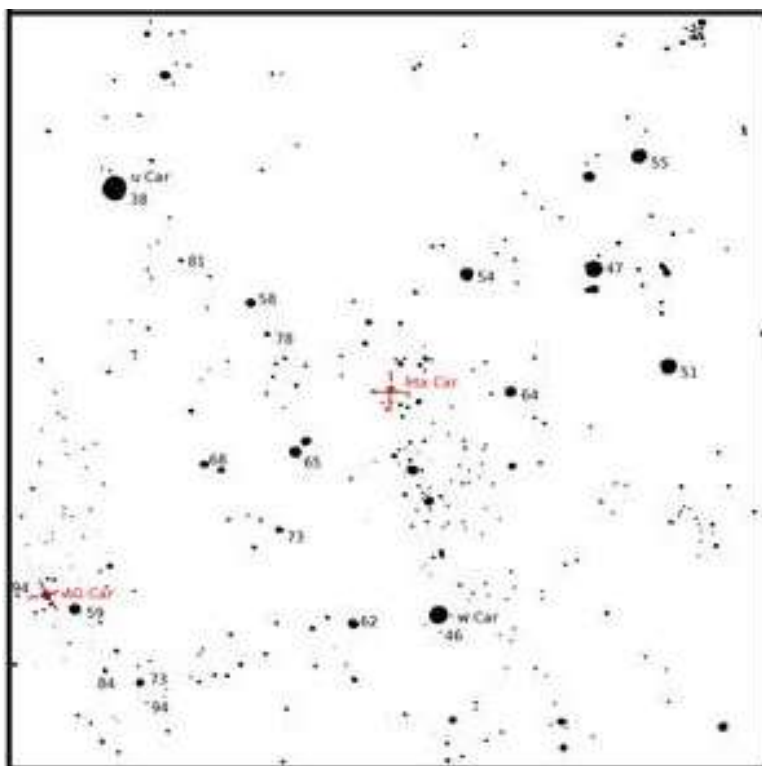
Observing.

The chart (Fig 1) shows eta- and AG-Car and some suitable comparison stars with their magnitudes. In this chart, magnitudes are only given to one decimal place and as is usual the decimal point has been left out, so to pick an example from the chart, 46 means the photometric magnitude of that star is 4.6, 51 is 5.1 and so on.

Orient the chart. Remember the charts are drawn with respect to the celestial poles, not the geographic poles. Study the star field and compare it with the chart. Make sure you can recognise the stars you are looking for. The chart area is small enough that all the stars marked will fit into a single binocular field. Take your time, it's a crowded field. It helps to steady your binoculars on some sort of support.

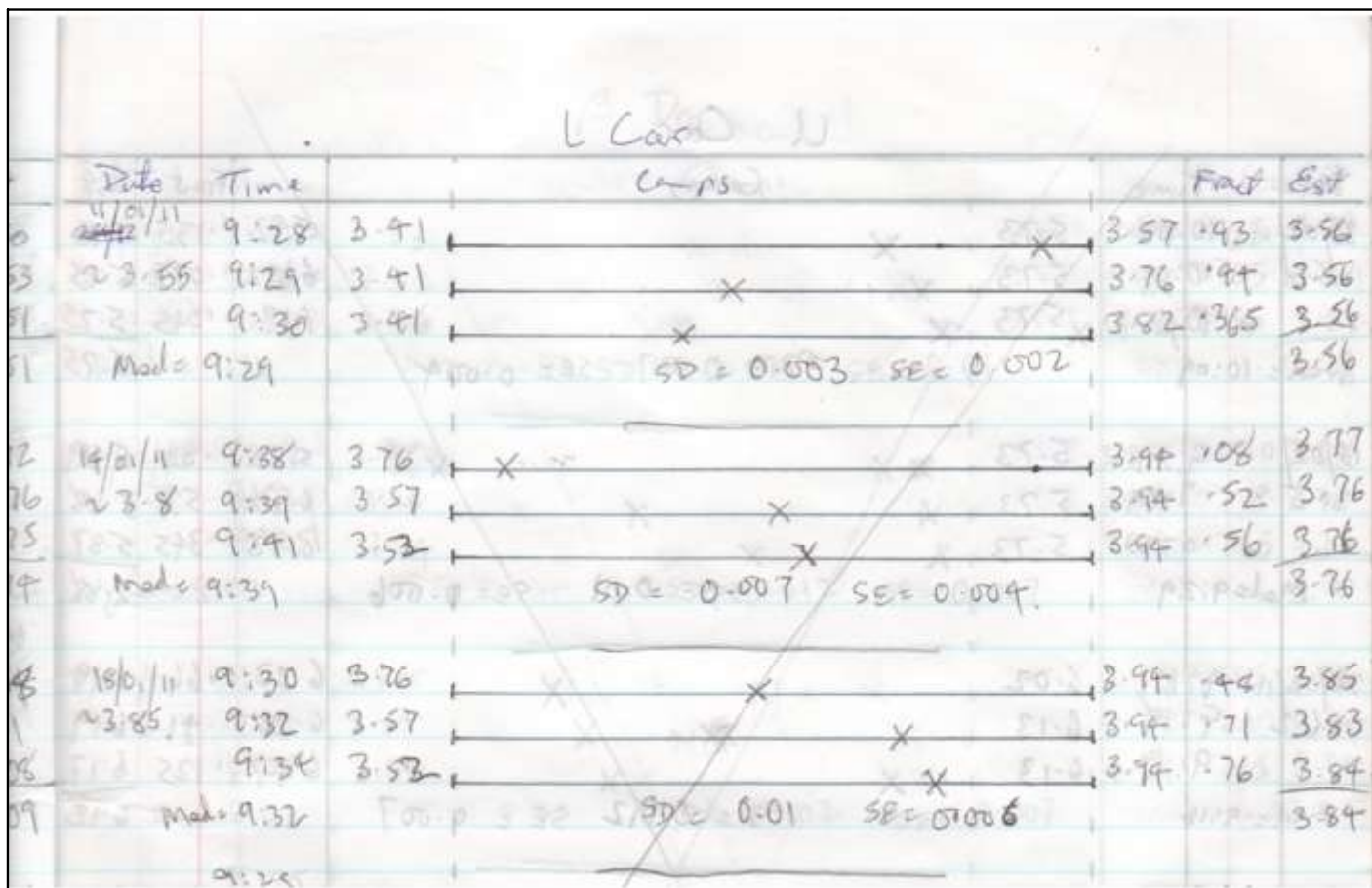
Make your measures using the method devised by Glen Schrader that I described in last month's newsletter. To recap: make a preliminary estimate of the target star's magnitude, then pick three pairs of stars that bracket it, one brighter and one fainter. Put the brighter at the left-hand end of a 100mm long line and the fainter at the right, and estimate how far along the line between the two comparison stars the target lies. Mark the position on the line. Make two more observations in the same way. Be sure to record the time you made each observation. Every fine night, make a similar set of observations. Fig. 2 shows part of my log for eta-Car as an example.

About eta- and AG Carinae.



Both stars are evolved blue supergiants that were close to the Eddington Limit when they were born. Eta Car is now known to be a multiple star with at least two components, the secondary being an exceptionally hot star in a highly elliptical orbit period about 5 years. The total mass of the system is about 120 solar masses. AG Car is probably a single massive star. Eta Car lies at the heart of the eta-Carinae nebula, about 7500 - 8000 light years away, AG Car is over twice as distant even though the two stars look close to each other from our viewpoint. Both are extremely luminous, something like a million times as bright as the sun.

If eta- and AG Carinae are blue stars, why is it they appear reddish? The reddening is due to the fact that we are seeing them through dense clouds of dust and gas, some of which has come from the stars themselves. Stars this massive are inherently unstable. Intense radiation pressure drives violent stellar winds, non-radial pulsations, rapid mass-loss and semi-regular variability across all time-scales. In addition to this low-level variability, they undergo eruptive events resulting in a temporary brightening of a



magnitude or so and the expulsion of a shell of gas and dust.

Occasionally something even more dramatic happens. In 1843, after several episodes of brightening and dimming, eta-Car staged a massive eruption - a supernova impostor event. At its brightest it reached Mag -0.8 to -1.0, second only to Sirius (Mag -1.4). Afterwards it faded to below naked-eye visibility until the late 1990's, when a brightening trend that began in the 1950's accelerated, and eta again became a naked eye star. During the great eruption 2-3 solar masses of dust and gas were expelled from the star's poles, forming the Homunculus nebula. It is this nebula that stops us seeing exactly what is going on, hence the debate as to whether eta is a single star or a multiple. A ring nebula surrounding AG Car suggests that this star, too, may have undergone a supernova impostor event in the more distant past.

What Lies in Store?

The LBV phase is thought to last only about 40,000 years, beginning shortly after a massive blue supergiant

leaves the main sequence. Theory once held that such stars would shed their outer envelopes and become Wolf-Rayet stars (stripped stellar cores fusing helium and heavier elements) and eventually explode as type 1b or 1c supernovae. Recent observations, however, suggest that stars can explode as supernovae while still in the LBV phase, and that they may undergo one or more supernova impostor events before doing so. Eta Car has recently been brightening across all wavelengths, indicating an intrinsic brightening of the star itself. Neither eta- nor AG Car have much more than a million years left before they go supernova, but it could happen much sooner.

Amateur observers are needed to track LBVs, as this is no longer being done professionally. If you see either of these stars doing anything interesting like sudden brightenings (or dimmings) of more than a couple of magnitudes, contact VSS or the AAVSO, so that professional astronomers can be alerted. The chart (Fig 1) shows eta- and AG-Car and some suitable comparison stars with their magnitudes. In this chart, magnitudes are only given to one

decimal place and as is usual the decimal point has been left out, so to pick an example from the chart, 46 means the photometric magnitude of that star is 4.6, 51 is 5.1 and so on.

Crossword by Murray Forbes

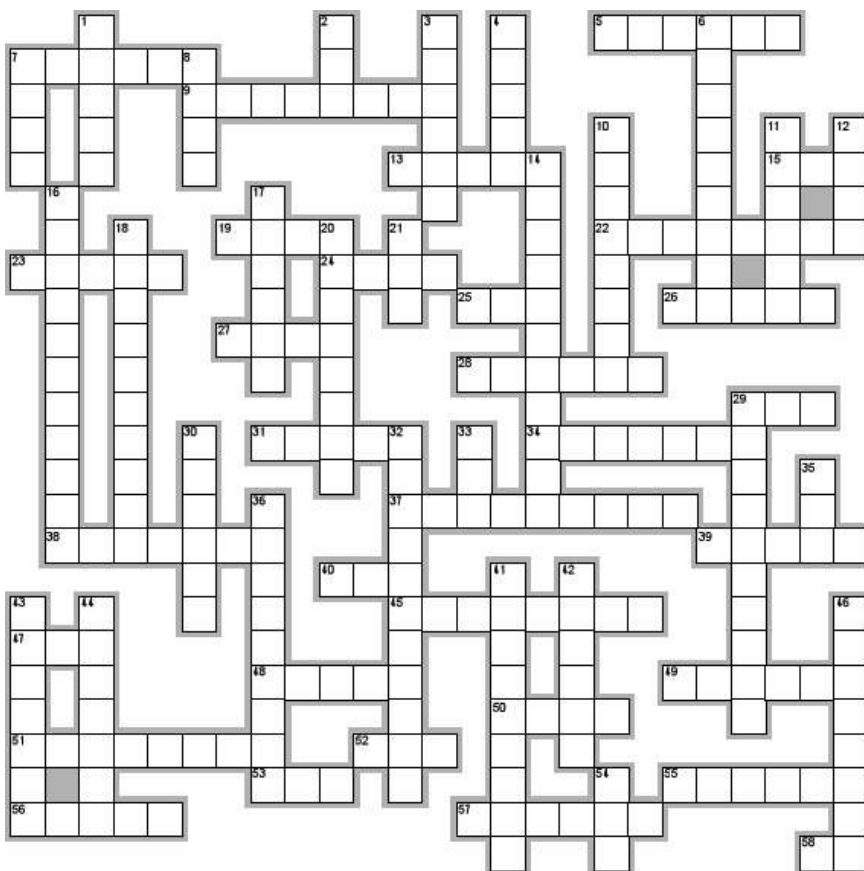
Across

- 5. Andromeda is one
- 7. Pluto's Moon
- 9. The water constellation
- 13. shout (anagram)
- 15. flying saucer
- 19. God of war
- 22. lighter shadow of an eclipse
- 23. once thought to be seas on the Moon
- 24. unit of time
- 25. frozen liquid
- 26. sisters in M45
- 27. tide
- 28. a fishy constellation
- 29. an orbiting telescope
- 31. Constellation with Spica
- 34. "2001, A Space ..."
- 37. non-circular orbit, also like some of my clues
- 38. a catalogue
- 39. triangular shaped glass used to refract light
- 40. satellite galaxy to the Milky Way
- 45. allow some leeway
- 47. acronym for aliens
- 48. Maxwell Smart's nemesis
- 49. type of galaxy

- 50. rats (anagram)
- 51. leap on hi (anagram)
- 52. A lion circling the Earth
- 53. 24 hours
- 55. shapes (anagram)
- 56. Tellus
- 57. large moon of Neptune
- 58. One of the Galilean satellites

Down

- 1. predicted the neutrino
- 2. some spiral galaxies have one
- 3. process that powers stars
- 4. path of one object around another
- 6. 1/60th of a degree
- 7. at the heart of the matter
- 8. space agency
- 10. pen a diet (anagram)
- 11. discovered universe was expanding
- 12. a new star
- 14. Full Moon in October
- 16. sky simulator
- 17. The Crab
- 18. great for visual observing
- 20. astronaut



EclipseCrossword.com

Chairman's Report for March 2012

The last meeting, on Wednesday February 1st was by Prof. Denis Sullivan of Victoria University. He gave us an update on the search for "Extra Solar planets" and especially the microlensing technique which he has been using in the MOA project. The total number of known extra solar planets now number around 1000 and there is even some speculation that every star probably has at least one planet.

You may be interested in listening to a discussion between our next speaker David Wiltshire and Kim Hill, first broadcast in Feb 2008 on Dark Energy. This can be heard at

<http://www.radionz.co.nz/national/programmes/saturday/audio/1330842/david-wiltshire,-on-dark-energy>.

He has since developed the ideas and has published several papers on the subject so we can look forward to his latest thinking on the subject.

WAS Research Astronomy Group

The Research Group meets each month at 6:30 p.m. before the main meeting. These meetings are open to all WAS members.

Occultation Reports There were 5 positive asteroidal occultation events reported for Australia and New Zealand in January. All from amateur astronomers.

Occultation predictions for the Wellington area are published on our web site at <http://was.org.nz/01Occs.html> or look at the RASNZ Occultation Section web site at <http://occsec.wellington.net.nz> for both predictions and results from the Australia/New Zealand region.

Variable Stars. We have also been working through a series of tutorials by Murray Forbes on processing images with IRIS software in order to get accurate star magnitudes from CCD or Digital Camera images. We hope to have these put into a single document that can serve as an introduction to photometry for variable star observations. Remember visual observing of variability with naked eye or binoculars can also be valuable and a good introduction to the activity.

We would welcome other observers to these meetings including those who would like to introduce us to their favourite astronomical research topics.

Thomas Cooke Telescope Volunteers

Our quid pro quo in getting free rent of the Carter meeting room is to provide support for Carter staff on Saturday evening observing following their planetarium show, so please put your hand up to do a shift one Saturday evening. A list of dates will be at the next meeting so please come and sign on. I will be doing a couple of nights. It is actually quite fun to work the TCO and it really does need two people to manage the scope and the people. You do not need to know a lot about astronomy to be able to answer most of the questions and there will always be the Carter Representative to help with the ones you can't answer. It is a great way to learn a bit more yourself.

Wellington Festival Event "The Galileo Project" March 16th

Toronto's Tafelmusik Baroque Orchestra is bringing "The Galileo Project" to Australia and New Zealand in March; it will be at **Wellington Town Hall on March 16, 2012**. Details can be found at

<http://festival.co.nz/music/the-galileo-project-music-of-the-spheres/?fs=1>

Book at <http://premier.ticketek.co.nz/Shows/Show.aspx?sh=MUSICOFT12&v=WTH&p=EWFA2012680>

Dear Colleagues,

With the site decision on the Square Kilometre Array (SKA) radio telescope only weeks away, I thought it would be helpful to provide a short summary of the status of the Australia-New Zealand SKA site bid and some further information on possible discussion topics relating to the site decision. I hope that this will assist you in any discussions you may have in the lead-up to the decision.

If anything is unclear at all, or if you have any media enquiries about the SKA site decision that you wish to pass on, please refer them to Dr. Lisa Harvey-Smith, CSIRO SKA Project Scientist (Lisa.Harvey-Smith@csiro.au<mailto: Lisa.Harvey-Smith@csiro.au>) or to Prof. Brian Boyle, the Australia-New Zealand SKA Director (Brian.Boyle@csiro.au<mailto: Brian.Boyle@csiro.au>).

Lisa Harvey-Smith
CSIRO SKA Project Scientist

Antikythera to the Square Kilometre Array

Few of us could attend this conference, but the summary is fascinating;

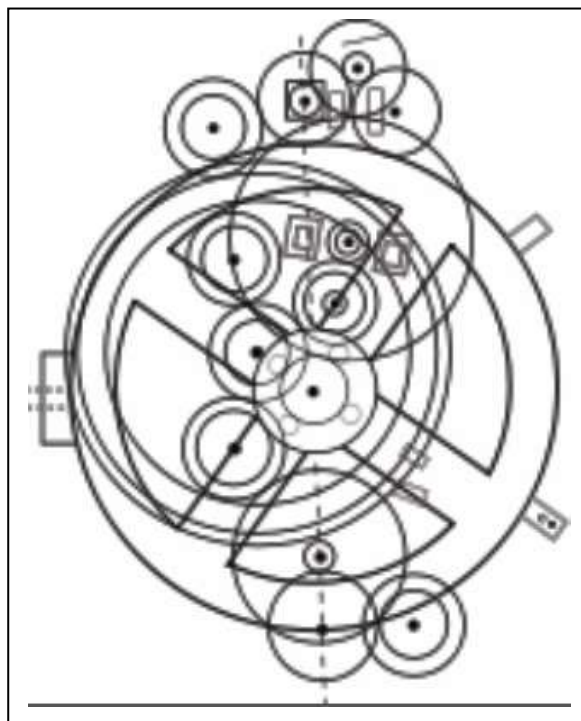
Lessons from the Ancients

More than a hundred years ago an extraordinary mechanism was found by sponge divers at the bottom of the sea near the island of Antikythera in Greece. This Antikythera mechanism is an ancient computer from about 100BC which uses bronze gears to make astronomical calculations based on cycles.

Third International Starlight Conference

The Starlight Conference is at Lake Tekapo, 11-13 June 2012. The website is accepting registrations and on-line requests to give an oral or poster paper. Visit www.starlight2012.org for full details.

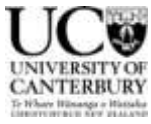
It will be a multidisciplinary conference on the scientific and cultural benefits of observing dark starlit skies. The meeting will be of interest to RASNZ members and to many other interest groups in education, tourism, environmental protection and to those interested in the cultural and ethnic aspects of astronomy. As participation will be limited, early registration is encouraged.



of the Solar System. Now, more than 2000 years after the device was lost at sea, scientists have used the latest techniques in X-ray computed tomography and reflectance imaging to understand its intricate workings.

In June 2012 we plan to hold a workshop linking modern and ancient astronomical technology through the Antikythera theme.

The Evening Sky in March 2012



Four planets enliven the early evening sky. Venus and Jupiter make an eye-catching pair low in the western twilight. They set as the sky darkens. Venus is the brighter of the two. At the beginning of the month it is lower than Jupiter. Venus keeps much the same angle from the sun, setting around two hours after the sun through March and April. Jupiter slips steadily lower as we move to the far side of the sun from it. It passes to the left of Venus at mid month. In a telescope Venus looks like a first-quarter moon. Jupiter shows a disk with its four bright 'Galilean' moons lined up on either side. Jupiter is 840 million km from us in March. Venus is 120 million km away mid-month.

Mars is mid-way up the northeast sky, shining with a reddish-orange light. We pass closest to it at the beginning of March. This 'closest' is much further away than the best, though. On March 5 Mars will be 101 million km from us. A telescope will show it as a small disk one-third as big as Jupiter. Mars appears to move westward, leftward, against the background stars as we pass it by.

Saturn is in the east at dusk. It is a little brighter than Spica the brightest star in Virgo, above Saturn. A telescope magnifying 20x shows Saturn's rings. Its largest moon, Titan, is four ring-diameters from the planet. Saturn is 1330 million km away in mid March.

Sirius is the brightest star in the sky though fainter than planets Venus and Jupiter. It appears at dusk, northwest of overhead. It is quickly followed by Canopus, southwest of the zenith. Below Sirius are Rigel and Betelgeuse, the brightest stars in Orion. Between them is a line of three stars: Orion's belt. To southern hemisphere star watchers, the line of three makes the bottom of 'The Pot'. Orion's belt points down and left to a V-shaped pattern of stars making the face of Taurus the Bull. Further down and left, low in the northwest, is the Pleiades or Matariki star cluster, setting early.

Sirius is the brightest star in the sky both because it is relatively close, nine light years* away, and 23 times brighter than the sun. Rigel, above and left of Orion's belt, is a bluish supergiant star, 40 000 times brighter than the sun and much hotter. It is 800 light years away. Orange Betelgeuse, below and right of the line of three, is a red-giant star, cooler than the sun but much bigger and 9000 times brighter. It is 400 light years from us. The handle of "The Pot", or Orion's sword, has the Orion Nebula at its centre; a glowing gas cloud many lightyears across and 1300 light years away.

Near the north skyline are Pollux and Castor marking the heads of Gemini the twins. Right of them and higher is the star cluster Praesepe, marking the shell of Cancer the crab. Praesepe is also called the Beehive cluster, the reason obvious when it is viewed in binoculars. It is 500 light years away. Young clusters, like the Pleiades/Matariki cluster have bright stars in them. The bright stars burn out after a 100 million years or so. Old clusters like Praesepe have no bright stars.

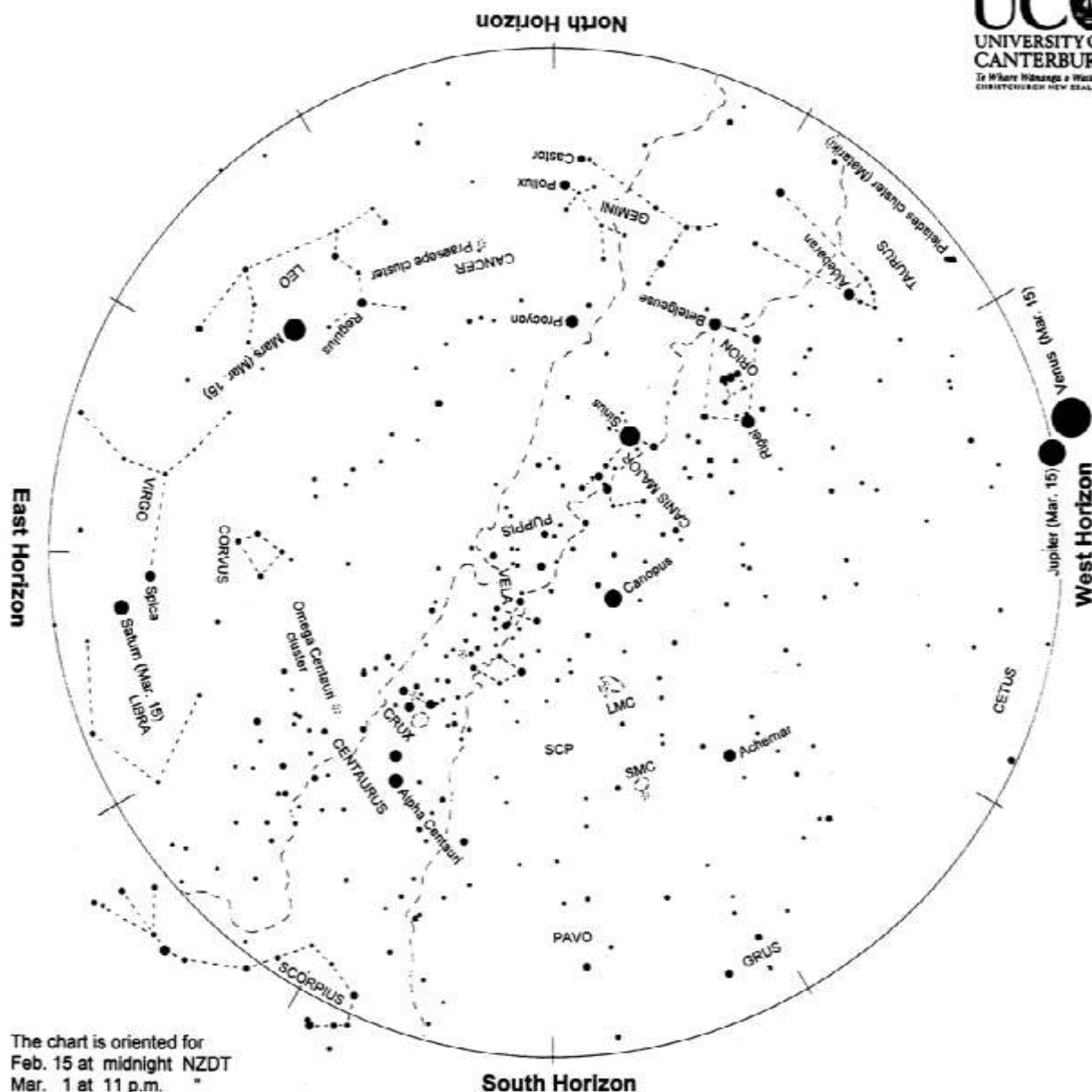
Crux, the Southern Cross, is in the southeast. Below it are Beta and Alpha Centauri, often called 'The Pointers'. Alpha Centauri is the closest naked-eye star, 4.3 light years away. Beta Centauri, like most of the stars in Crux, is a blue-giant star hundreds of light years away. Canopus is also a very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

The Milky Way is brightest in the southeast toward Crux. It becomes broader lower in the southeast toward Scorpius. Above Crux the Milky Way can be traced to nearly overhead where it fades. It becomes very faint in the north, right of 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 Clouds of Magellan, LMC and SMC are high in the south sky, easily seen by eye on a dark moonless night. They are two small galaxies about 160 000 and 200 000 light years away.

*A light year (l.y.) is the distance that light travels in one year: nearly 10 million million km or 10¹³ 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.

Notes by Alan Gilmore, University of Canterbury's Mt John Observatory, P.O. Box 56, Lake Tekapo 7945, New Zealand. www.canterbury.ac.nz 120202



The chart is oriented for
 Feb. 15 at midnight NZDT
 Mar. 1 at 11 p.m. "
 Mar. 15 at 10 p.m. "
 April 1 at 9 p.m. "

Evening sky in March 2012

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 westward shift each night as we orbit the sun.

Four planets grace the evening sky. The brightest are Venus and Jupiter, low in the west at dusk. They set early. Mars is the bright orange-red 'star' in the northeast. Medium-bright Saturn is the lower 'star' of a similar pair in the east. Sirius is the brightest true star, northwest of overhead. Canopus, the second brightest star, is southwest of overhead. Orion, containing 'The Pot', is below Sirius in the northwest sky with Taurus and the Pleiades/Matariki cluster lower again. The Southern Cross and Pointers are midway up the southeast sky. Nearby galaxies, the Clouds of Magellan, LMC and SMC, are high in the south sky. The Scorpion rises in the southeast later.

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

RASNZ now has for sale its Safe Solar Viewers for the upcoming Transit of Venus (June) and Partial Eclipse (November). Prices and details included in the flyer. These handy viewers have been safety tested for RASNZ by Associate Professor Ralph Chou (School of Optometry, University of Waterloo, Ontario, Canada) for use during the Transit of Venus on the 6th of June and the Partial Eclipse on November 14th this year. Your society or group may like to place an order to sell the viewers to the local community - a perfect way to fundraise, to promote your group, or to use during your own organised events. There is nothing like exciting astronomical goings on to stir the public's imagination and to get everyone along to check out what your group gets up to....

WAS is planning to purchase a batch of these. If interested please put your name on the list at the meeting or email john.talbot@xtra.co.nz

RASNZ SAFE SOLAR VIEWER



View the 2012 Transit of Venus and Partial Eclipse of the Sun

Everyone can view this year's Transit of Venus on June 6th and the Partial Eclipse of the Sun on November 14th by ordering the Royal Astronomical Society of New Zealand's specially designed Solar Viewers for these two exciting events. Perfect for use at Home, in Schools, Clubs, the Workplace, or anywhere you happen to be under clear skies.

DON'T MISS THESE RARE EVENTS, PLACE YOUR ORDER NOW!

www.rasnz.org.nz

ALL PRICES INCLUDE POSTAGE

1 - 9 Solar Viewers	\$2.50 each
10 - 99 Solar Viewers	\$2.00 each
100+ Solar Viewers	\$1.50 each

TO PLACE AN ORDER

Online: www.rasnz.org.nz/Sales/SolarViewers.html

Email: president@rasnz.org.nz

Phone: (04) 460 0569 **FAX:** (04) 498 3535

Post: RASNZ Solar Viewers

P.O.Box 3181, Wellington



Each Solar Viewer comes with a helpful information pamphlet about both events.

Or you can purchase direct see <http://www.rasnz.org.nz/Sales/SolarViewers.html>

As these events will take place during the working week, family, friends, workmates and local schools might like to order a few, so please pass on the information.

Thanks everyone, Jennie McCormick, For RASNZ

Council Members of the WAS council for 2010-11 elected at recent AGM;

Executive:

President; John Talbot john.talbot@xtra.co.nz

Vice President; Gordon Hudson gordon@kpo.org.nz

Secretary; Chris Monigatti chrismon@xtra.co.nz

Treasurer; Lesley Hughes hpwas@hugpar.gen.nz

Curator of Instruments; Gordon Hudson Website; John Homes

Telescope Custodian; Chris Monigatti

General Council Members- Frank Andrews, Roger Butland, Aline Homes, John Homes and Bill Parkin,

Terry Butt (co-opted).

Newsletter Editor; Vicki Irons