Newsletter

WELLINGTON ASTRONOMICAL SOCIETY

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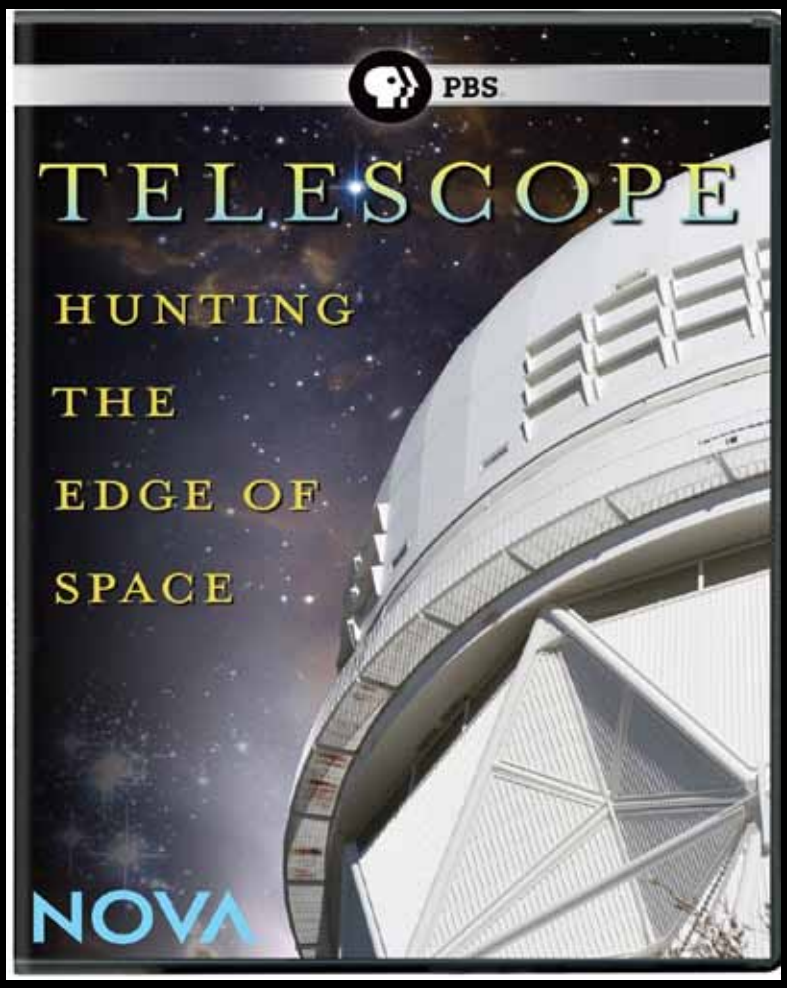

THIS MONTH'S

MEETING FEATURES

Telescope Hunting the Edge of Space - DVD

Wednesday, 4th of May,
7:30 PM at Carter Observatory

05-2011

In this issue:

Wellington Astronomical Society

Presidents Report for May 2011

Last months talk by Roland which was about some of the Astronomical History of Saturn. This talk was most informative and especially about the Rings and the Divisions in the Rings of Saturn.

Saturn is well placed for observing at present.

On April 9th a few of our members attended the Levin Stargazers Astro Camp. On the Friday evening the weather clear in Levin and everyone has good views of the Night Sky.

Hari, Frank and me arrived on Saturday morning to a partly cloudy day but that soon bunt off. Hari made he presentation about her visit to the Mars station in the dessert in the USA at 11am and I made my talk about collimating at 2 pm. Frank made his presentation at 4pm. The barbecue was fired up at 5pm and that was excellent. The sky was clear. Unfortunately Hari and I had to leave to go to Tawa college and be there by 7pm. We arrived at 6.45pm. Chris had 5 telescopes already setup on the cricket field and we had good views of the moon until it set.

Waiting for ISS at Tawa College

We waited for the International Space Station to go overhead at 7.35pm and then we went inside to listen to Hari's talk again about her Mars simulation event in the USA. Each time Hari did this talk it was different to the other presentations she had made.

Supper at the school seemed to be on going as the students heated up Pizzas and served us with hot chocolate drinks. There were about 30 students at this event. After Hari's talk some of us went back outside to observe Saturn which had risen over the trees. The Smidt telescopes had fogged up but the 13" dobby was great.

Mars in Focus at the Astronomy Club Tawa

The observing at the Pauatahanui Observatory is not until the 30th of April just after you receive this newsletter. The May observing evening will be on the 21st but this is only 4 days after full moon but that should be ok. There will not be a back up day for May as it would class with the RASNZ conference which is on May 28th.

We are not having a very good run for any observing at Pauatahanui over the last 12 months when the observatory was only used three times last year.

We are considering moving the observatory to a more accessible site which would mean it would get more use but not necessarily a better sky as it is more light polluted but it is better to have a light polluted sky rather than not get used at all. Watch for further developments on this.

Observing at the Thomas King Observatory is every Friday evening but ring Ross Powell first.

The WAS Dobsonian telescopes are being recalled at present so that they can be checked and readied to be sent out to other members who have requested them.

Anyone wanting to borrow one of the societies Dobsonians should call Chris Monigatti.

Next months talk will be presented by me and it will be a stretched out version of the Peter Read presentation that I am going to give at the RASNZ conference next month.

Remember the RASNZ conference coming up in May in Napier and now is a good time to register.

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OBSERVING AT PAUATAHANUI

The next observing evening at Pauatahanui is on May 21st starting at 7.00 pm. **If doubtful please ring Chris Monigatti on his mobile 021 890 222 to see if the session is going ahead.**

OBSERVING AT THOMAS KING

All public observing evenings will be held at the Thomas King Observatory run by our Observatory Director Ross Powell. from 7:00 pm. **Ring Ross on 389 9765 t**o check if there are public observing evenings on most FRIDAYS, starting as soon as it gets dark depending on the weather and Ross's availability.

WAS May's talk resumee

Presenter: : DVD - Nova:

Telescope - Hunting the Edge of Space

Duration: approx. 120 minutes

DVD Release Date: June 29, 2010

Abstract:

NOVA celebrates the 20th anniversary of the Hubble Space Telescope with a comprhensive look at how a simple instrument, the telescope, has fundamentally changed our understanding of our place in the universe. Hunting the Edge of Space takes viewers on a global adventure of discovery, dramatizing the innovations in technology and the achievements in science that have marked the rich history of the telescope. Then NOVA turns its attention to a new generation of ever-larger telescopes, poised to reveal answers to longstanding questions about our universe and, in turn, to raise new questions.

Research Astronomy Group

The main areas we have decided to focus on are Variable Stars and Occultations. Many of the group already observe one or both.

Murray Forbes is leading the Variables group and set us home work to map and locate a known eclipsing binary variable star RS Cha (Chameleon) also known s Tycho 9403-1987-1 at RA 8:43:12, Dec -79:04. This should be visible above 0 deg altitude year round so is not season dependant. John Talbot is leading the Occultation group and is publishing predictions for the Wellington area on our web site at http://was.org.nz/01Occs.html.

These include both Lunar events that should be visible in a 6 inch telescope and Minor Planet events that may be a bit dimmer but which have high probability of being seen. Even if you do not have recording equipment it can be fun in the evening to observe a star disappearing behind the dark edge of the moon during the first half. Or if you like getting up real early and want a harder challenge try for some bright reappearances during the second half of the cycle.

The Research group meets each month at 6:30pm before the main meeting.

Please feel free to come along and join in if you are interested. This is also a good time to bring along that telescope or observing problem you may have for discussion.

April Crossword answers

Across

2. HST, an orbiting telescope; 8. VEGA, alpha Lyr; 9. PERIHELION, Point in an object's solar orbit that is closest to the Sun; 10. PANDORA, a shepherd satellite of Saturn's F ring, also the first women in Greek mythology; 12. ION, an arrested atom; 13. PEGASUS, The winged horse constellation; 14. POLARIS, The North Star; 16. ALGOL, Demon star; 18. FUSION, process that powers stars; 20. KIWI, New Zealander; 22. LMC, could be mistaken for a cloud; 25. HOUR, unit of time; 28. DENEB, alpha Cygnus; 31. SMC, satellite galaxy to the Milky Way; 32. APOGEE, When the Moon is furthest from the Earth; 34. SEYFERT, type of galaxy with unusally bright nucleus; 35. SETI, A serious search for aliens (abbrev); 37. SCORPIUS, constellation with a sting; 43. PERIGEE, When the Moon is closest to the Earth; 44. SOHO, satellite observatory studying the Sun; 46. EQUINOX, 23rd September; 47. LOKI, volcano on Io; 48. PAVO, The Peacock constellation; 49. PROCYON, brightest star in Canis Minor; 51. MASS, I weight 6 times less on the Moon, but still have the same ???; 52. GAS, solid, liquid or ...;

Down

1. ICE, frozen liquid; 2. HALO, angels and galaxies both have one; 3. KEPLER, Early German astronomer - formulated 3 laws of planetary motion; 4. LEO, A lion circling the Earth; 5. REDPLANET, Mars; 6. SIDEREAL, star time; 7. ANTARES, heart of the scorpion; 8. VENUS, a very cloudy planet; 11. NOVA, a new star; 14. PLEIADES, The Seven Sisters; 15. DIFFRACTION, Bending of light around the edge of an obstruction; 17. TAURUS, You don't want this constellation in a China shop; 19. NOON, mid-day; 21. IO, One of the Galilean satellites; 23. CLUSTER, An open or globular ...; 24. NUTATION, Causes small changes in RA and Dec coordinates; 26. DEIMOS, One of the Moons of Mars; 27. CRESCENTMOON, men's concerto (anagram); 29. BREMSSTRAHLUNG, 'braking radiation' produced by the rapid decleration of an electron; 30. ZODIAC, also a small inflated rubber boat; 33. UFO, flying saucer; 36. EARTH, Tellus; 38. REFLECTOR, type of telescope; 39. DEWCAP, used to prevent moisture condensing on a telescope; 40. ASTEROID, road site (anagram); 41. CANOPUS, Autahi; 42. ECLIPSE, to block light from another object; 43. PELE, volcano on Io; 45. ATOM, smallest indivisible piece of a element; 50. DAY, 24 hours;

Levin Stargazers Astrocamp at Tatum Park a stellar time!

Happy Stargazers at Tatum Park

The Levin Stargazers and WAS had a combined Astrocamp recently at Tatum Park Holiday Camp, about 10 km north of the Manakau/ Waiterere Beach township. Organised by the team in Levin there were a range of speakers and opportunity for plenty of observing.

I travelled up on Saturday morning, with clear and sunny skies all the way. Tatum Park has a number of building and facilities that are great for weekend events; it used by the Scouts/Guides for annual jamboree events. There is plenty of room for tents, telescopes and a variety of accommodation options from flash to rustic to tent. I arrived in time for Haritina's presentation on her "Mars" experience in the US. With amazing images and interesting narrative it provided a great insight in to the challenges of exploring the red planet. After Haritina's presentation it was lunch time and after watching a number of rocket launches for the younger members I went to the Manakau Hotel for a divine lunch of fresh Groper and chips that I shared with the owner's cat. The afternoon talks included presentations by Mike White and his amazing collapsible 8-inch telescope that can fit in airline overhead storage locker... a work of art! Michael Stapel gave a well researched and resourced presentation on starhopping. Following the afternoons presentations there was time for some solar observing through a Coronado PST allowing us to see solar prominences and other features; another telescope had a glass filter so we could observe a number of sunspots. It is great to see the Sun becoming active again!

As the Sun slipped towards the horizon it was time to fire up the BBQ for dinner. Whilst the cooks prepared dinner Frank gave a presentation on gravity and time, which was only ended by the call that the food was getting eaten/cold! The stars started coming out and a number of telescopes were set up in the large grass area by the lecture room. With scopes from 4.5 – inch Go-To up to a 10-inch dobsonian we were spoilt for choice! The views through all were great with views of galaxies, star clusters, nebulae and Saturn getting great responses from both the children and adults. I took up one of Carters 6-inch dobbies and observed the Sombrero and Centaurus A Galaxies, Eta Carina, Southern Pleiades, Alpha Centauri and Orion Nebula and others. I also took some images of the children with their light sticks and some unguided images of the stars. The sky at the location is dark and gives great views, although dew became a problem on some finderscopes (Friday night they observed until 3 am without any dewing!). Frank and I travelled back to Wellington in the late evening after a great day/evening of talks/observing and camaraderie. A big thanks to the organisers for putting this weekend together; I look forward to the next one!

by John Field

Astro-Geographical Mapping of the Ancient Skies's Myths and Legends

What happens when the traditions that are defining our culture are losing their meaning as soon as they are taken out of the context that created them? For instance how would you feel if you would have to put the Christmas tree up in the Summertime? At least silly?

Yeah Right!

Yet half the globe does it. How much would you be willing to pay so that you can have a drop of alcohol in the middle of the desert? The Muslim religion forbids it and yet if you drink alcohol on that temperature it would harm your body so much! What if you drink it in a Dubai hotel where the temperature is regulated by air conditioners?

What if culture is in deed just a set of instructions assembled together by our ancestors to make sure that we, their offsprings survive? Aren't survival of the individual in order to ensure the survival of the species the first two laws of life? We follow traditions and rules, we cook in a certain way, we marry, give birth and bring our kids up following our own traditions. These are what define us as humans, what we makes us different. Some other things like love, respect and loyalty remain constant no matter where we go. Then who are we and when do we cross the lines between our feelings and our cultural restraints? And if we do for how long can we sustain the conflict arisen from processing two contradictory informations about the same thing?

When in Rome do as Romans do.

The star lore was written a long time ago when humankind was still in the cradle. In the same way in which embryogenesis follows ontogenesis we could say that the development of a child into adult follows the development of intelligence of the human race. Stories we were telling 2000 years ago about the stars were a naive attempt to explain the celestial phenomena with the tools we had handy. Once the cyclicality of the sky was observed, people considered the asterisms to be good reminders for the most important moments of their lives - harvest, middle of the cold season. But for each culture, the moments in which the same constellations appeared onto the sky were different, because their geographical location was different. The activities they were performing in those conditions were different. That is why we have one sky yet the diversity of our star lore is exhaustive.

For example, the star lore of the New Zealand Maori reflected their unique astro-navigation techniques in the Pacific Ocean. The star lore of ancient Romanians, the Dacian people was entirely agricultural. Both nations had advanced astronomical knowledge. The stories they told about the same stars were just different.

Most of the starry stories cypher instructions essential for the survival of a particular cultural group. Some races had to rely on stars more than other. Two of these races are the Polynesians, navigators throughout Pacific and the Arabs, navigators (at night) through the Sahara Desert. That is why their starlore is so rich and the astronomical knowledge is probably each in its own way, very advanced. All races produced stories about the stars. All relied on the stars to measure the time. But few had to fine tune their knowledge to that extreme and that happened because their life depended on the stars.

This is the case of the people of the Pacific who navigated by the patterns of the waves, birds and stars. In order to remember the navigational stars to perfection the Polynesians invented stories they related to as mnemonic. Today, some of these stories, handed down from generation to generation, labeled as cultural information have lost their original meaning. The people of the Pacific don't have to navigate anymore on a daily basis from island to island using the stars. They simply could take the plain or use the GPS, and so can we, the rest of us.

In the Northern Hemisphere, the celebration of Haloween was a reminder of the dead souls. Autumn (when Haloween

takes place) is the time of the year when nature looked like it was dying. It is possible that Haloween was actually a reminder to prepare for the cold season. The celebration was associated with the star cluster Pleiades in the autumn sky. The same star cluster is used to mark the Maori New Year in Aotearoa - New Zealand. Matariki (Maori New Year) is the time of the year when tradition says to remember those who are gone. This occurs around the Winter Solstice of the Southern Hemisphere, during the longest nights and shortest days and when nature is at its minimum activity, in July.

It is possible that by understanding why these sky legends were marked so important in the ancient times, we will be able to safeguard their original meaning. By doing that we could also safeguard our cultural heritage. Furthermore, what we call culture nowadays, and what differentiates us countries and people, could be in fact a mixture of instructions left by our ancestors in order to ensure our survival in specific geographical conditions. The example of Christmas being initially the celebration of the winter Solstice in the Northern Hemisphere is a classical one. Celebration of the Winter Solstice for the ancient Europeans, Christmas gave them the indication they were half way through the cold season. Knowing when winter would finish was vital for planning the food provisions. They marked that by celebrating

as well as decorating the coniferous trees with ornaments that would remind them of the Summertime flowers. The Winter Solstice celebration was so important that it was also adopted by the Christians. Through the centuries, with the appearance of the written calendars it has lots it's initial meaning and it become a major religious marker. Today, at antipodes, Christmas is celebrated on the beach mostly by having a barbecue as it occurs in the middle of the summer. People dress up Christmas trees that are inconspicuous amongst the beauty of the endemic trees flowering exactly at that time.

By studying the ancient lore and map the legends of our sky according to the geographical conditions in which they originated, we could understand the premises in which they were created, why that particular information was considered so important to our ancestors that was cyphered in the stars. We could find out that some of these legends contained in deed vital information about our ancestors' survival or could simply give us more clues to understand their way of life. Either or, in today's context of globalisation and informational overload this could be an important aide to keep and strengthen our cultural identity. Our diversity has always been the condition for survival, it is encoded in our genes and in our diverse cultural approach of the same subject. By deciphering the legends about the stars we could decipher some of the history of our survival as human race. United in our diversity, under the same sky, we could understand what makes us so unique even if the geographical premises are removed and give us more understanding of our heritage and it's importance. "

By Haritina Mogosanu

The Southern Binaries Programme

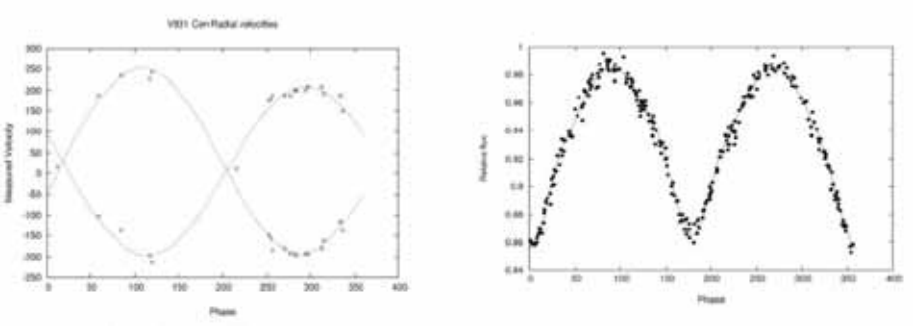
by Roger Butland

There are still many binary stars, south of approximately declination -20 degrees, for which their absolute parameters have yet to be determined accurately. Photometric measurements of eclipsing binaries combined with their spectroscopic radial velocities allow the calculation of masses, radii and luminosities which are of basic astrophysical significance.

HIPPARCOS satellite in the Large Solar Simulator ESTEC (1988) via Wikipedia

The better understanding of multiple star system formation and the relation to the parent galactic environment is the long term goal of this programme.

Moderately bright stars (apparent visual magnitude ~ 3 to 8) have been chosen to allow high signal/noise spectroscopic images to be obtained without unduly long exposures. These include V822 Aql, QS Aql, R Ara, V486 Car, υ Cen, V716 Cen, V831 Cen, V883 Cen, V964 Cen, AT Cir, HZ CMa, α^3 Cru, λ Cru, W Cru, CH Cru, PP Hya, β Hyi, BG Ind, λ Lib, γ Lup, σ Lup, GG Lup, KT Lup, V727 Mon, η Mus, FH Mus, KR Mus, 7 Oph, U Oph, δ Ori, ψ Ori, V1371 Ori, TV Pic, AE Pic, V410 Pup, δ Sco, μ_1 Sco, V718 Sco, V1003 Sco, μ Sgr, ν Sgr, RS Sgr, PT Vel, HR 6003, NSV 20610.



Measured Radial Velocities and Relative Flux in Conjunction with Optimised Fitting Functions for V831 Cen

The world class HERCULES spectroscope and the 1m McLellan telescope at Mt John University Observatory together with photometric and/or astrometry data from the HIPPARCOS satellite has been used successfully to date. More recent ground based photometric data would also be very useful.

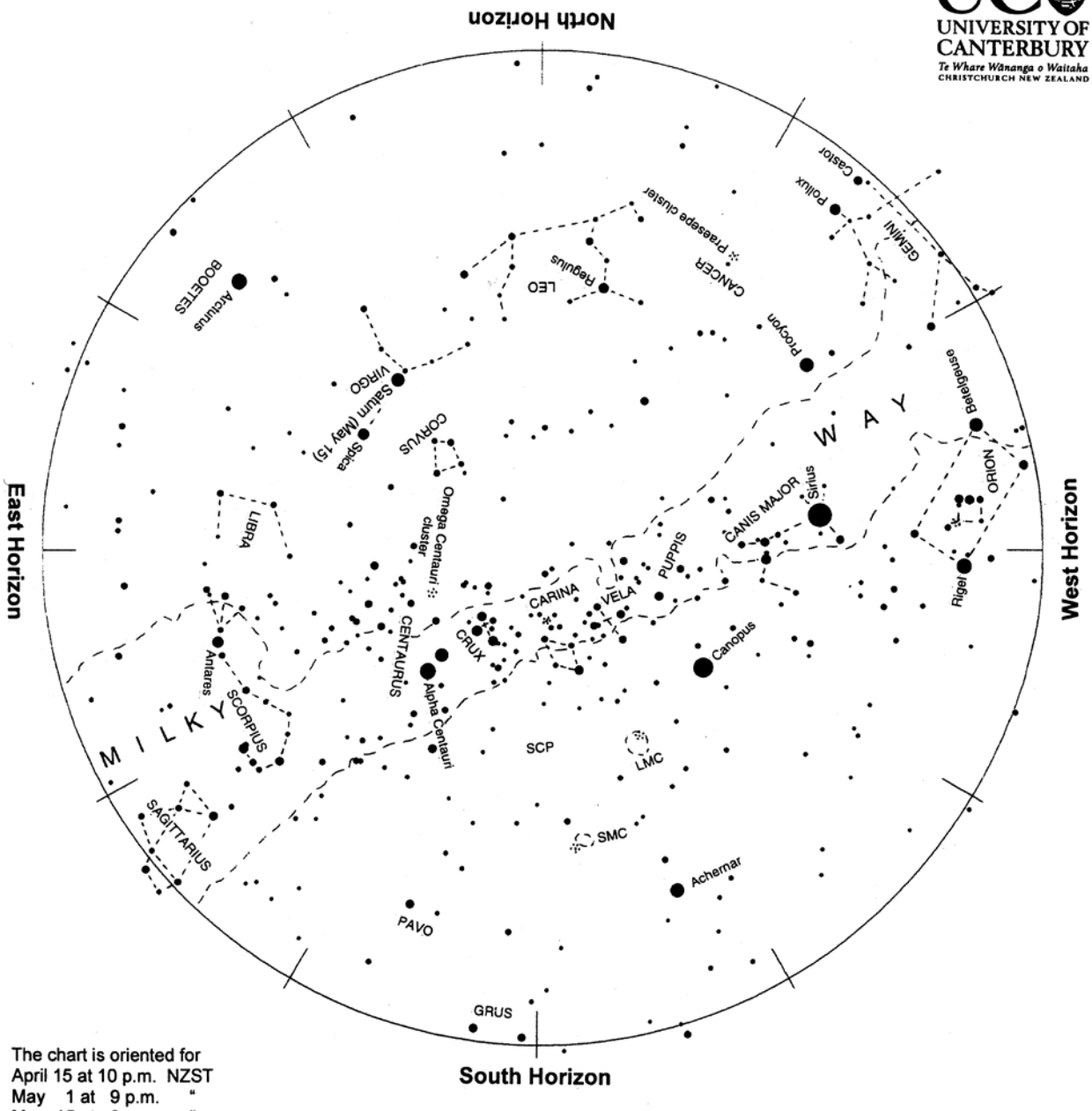
Synthetic numerical models are used which take into account such diverse effects as tidal distortions, reflections, limb darkening, gravitational brightening (darkening), hot or cold spots as well as the orbital and spin parameters. The model is optimized to fit as closely as possible the measured photometric & radial velocity values.

A number of stars being studied, for example V 831 Cen, are members of the relatively close but puzzling Gould's Belt. This structure is characterized by young stars formed within a few 10^7 years and forms an elliptical flat belt inclined to the Galactic plane by about 17 degrees. It's height is 60 pc with semi-major axis of 354 x 232 pc. The initial kinetic energy required is typical of multiple, rapidly succeeding supernovae or a hypernova.

[1] **E. Budding**, "The Southern Binaries Programme of CONZ and CAAM", Proc. 10th Asian-Pacific Region IAU Meeting 2008, 1-7 (2008)

[2] **E. Budding, R. Idaczyk, N. Erkan, O. Demircan**, "Absolute Parameters of Young Stars: V 831 Centauri", RASNZ Annual Conference, 22-24 May 2009, Wellington

[3] **I. A. Grenier**, "The Gould Belt, star formation, and the local interstellar medium", arXiv.astro-ph/0409096



The chart is oriented for
April 15 at 10 p.m. NZST
May 1 at 9 p.m. "
May 15 at 8 p.m. "
June 1 at 7 p.m. "

Evening sky in May 2011

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.

Sirius, the brightest star, is midway down the western sky. Directly below it is Orion with bright stars Rigel and Betelgeuse, and 'The Pot'. Canopus, the second brightest star, is southwest of overhead. Saturn and Spica make a medium-brightness pair in the northeast. Below them is Arcturus often twinkling red and green. Crux, the Southern Cross, and The Pointers are southeast of the zenith. The Scorpion, on its back, is rising in the southeast. The Milky Way spans the sky.

Chart produced by Guide 8 software; www.projectpluto.com. Labels and text added by Alan Gilmore, Mt John Observatory of the University of Canterbury.. www.canterbury.ac.nz

The Evening Sky in May 2011

As the sky darkens Sirius appears in the west with Orion below it. Canopus is southwest of the zenith. Crux, the Southern Cross, and the Pointers are southeast of overhead. High in the north east sky is Saturn making a widely-spaced pairing with Spica, the brightest star in Virgo. Below them, low in the northeast is Arcturus, a bright orange star whose colour is often separated into flashes of red and green.

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', now tipped on its side. Sirius, 'the Dog Star', marks the head of Canis Major the big dog. Sirius is the brightest star in the sky though planets Venus, Mars and Jupiter can be brighter.

Crux, the Southern Cross, is southeast of the zenith. Left of it are Beta and Alpha Centauri, often called 'The Pointers'. Alpha Centauri is the closest naked-eye star, 4.3 light years away. It is a binary star: two sun-sized stars orbiting each other in 80 years. 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.

Low in the east is the orange star Antares, marking the heart of the Scorpion. Antares means 'rival to Mars' in Greek. It is a red giant like Betelgeuse; 600 light years away and 19 000 times brighter than the sun. Arcturus, in the northeast, is the brightest red star in the sky but, at 37 light years, is much closer than the red-giants previously mentioned. It is about 120 times brighter than the sun.

The Milky Way is brightest in the southeast toward Scorpius and Sagittarius. In a dark sky it can be traced up the sky past the Pointers and Crux, fading toward Sirius. 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 nearby outer edge is by Orion. A scan along the Milky Way with binoculars shows many clusters of stars and some glowing gas clouds, particularly in the Carina region, to the right of Crux, and in Scorpius.

The Clouds of Magellan, LMC and SMC, are midway down the southern sky, easily seen by eye on a dark moonless night. They are small galaxies. The Large Magellanic Cloud is about 160 000 light years away and is about 5% the mass of our Milky Way galaxy. The Small Cloud is around 200 000 light years away and 3% the mass of our galaxy. That's still many billions of stars.

Saturn is the only planet in the evening sky and a great sight in a telescope. Its rings are 'opening' after being nearly edge-on in recent years. Saturn is 1330 million km from us mid month.

The naked-eye planets Mercury, Venus, Mars and Jupiter make an eye catching group low in the eastern dawn sky. At the beginning of the month brilliant Venus is the first up, rising around 5 a.m. A little below and right of it is Mercury. An hour later Jupiter appears, shining with a steady golden light. Close to it, but much fainter and reddish, is Mars. On May 2nd the thin crescent moon will be below the planet group. In the first week of May Mercury moves level with Venus and stays there till mid month. Together Venus and Mercury slip down toward Jupiter. Around May 10th Jupiter, Venus and Mercury will be close together with Mars below them. Jupiter moves up the sky while the other three sink lower at different speeds. By the last week of May Jupiter is on its own. Below it Mars, Venus and Mercury make a line down the sky. The moon is near them on the 30th and 31st.

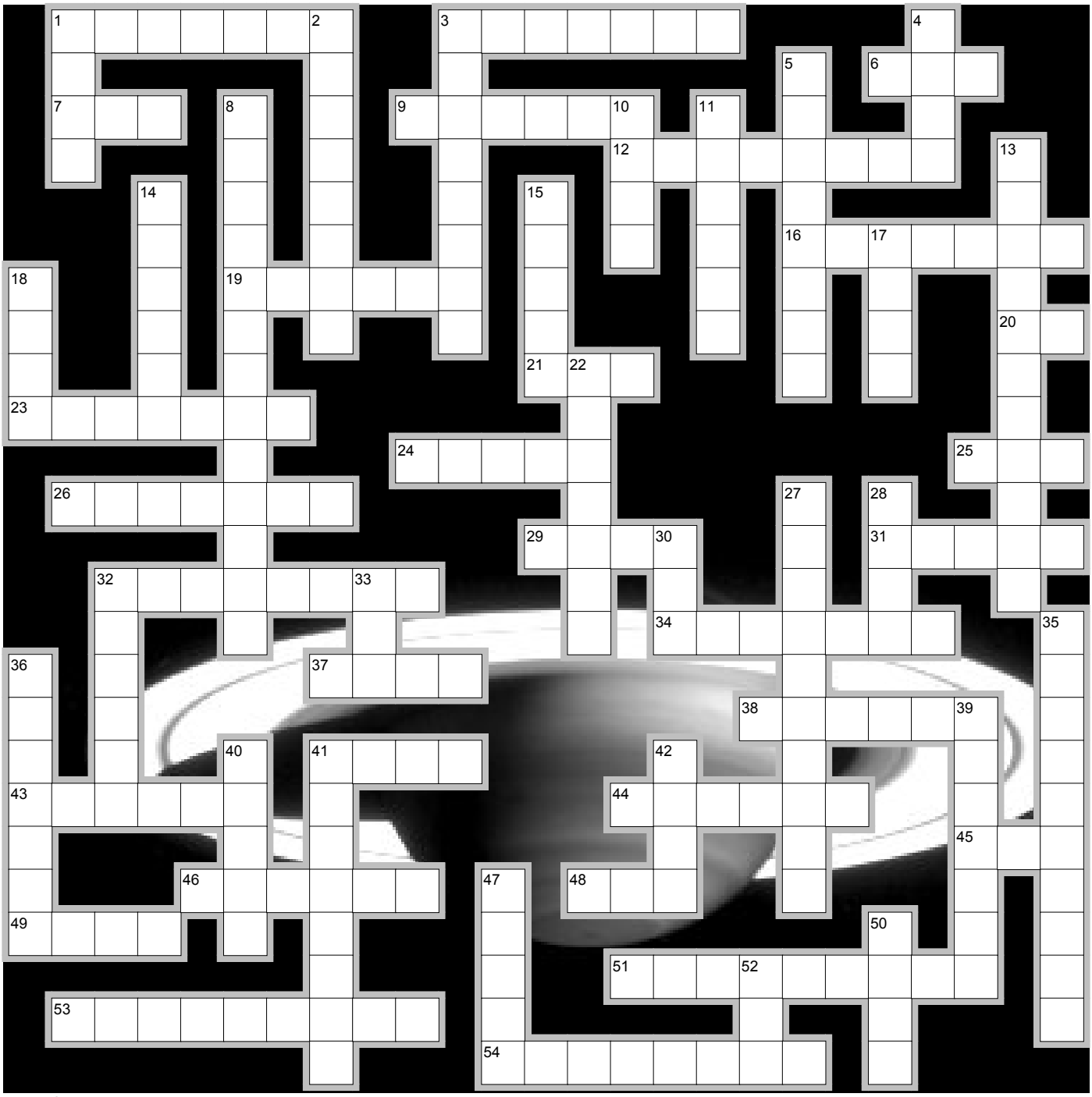
The apparent grouping of the planets is just a line-of-sight effect, of course. Mercury and Venus, on inside tracks, are leaving us behind and moving to the far side of the sun. At mid month Mercury is 140 million km away and Venus is 230 million km away. We are catching up on Jupiter. It is 870 million km away. Mars is on the far side of the sun, 350 million km away in mid May.

**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
110206

Cross Word with Murray Forbes



EclipseCrossword.com

Across

1. brightest star in Canis Minor; 3. The North Star; 6. an arrested atom; 7. could be mistaken for a cloud; 9. used to prevent moisture condensing on a telescope; 12. one phial (anagram); 16. a shepherd satellite of Saturn's F ring, also the first women in Greek mythology; 19. When the Moon is furthest from the Earth; 20. One of the Galilean satellites; 21. an orbiting telescope; 23. horizontal angle around the sky; 24. thorn (anagram); 25. 24 hours; 26. type of galaxy with unusally bright nucleus; 29. New Zealander; 31. Demon star; 32. constellation with a sting; 34. 23rd September; 37. unit of time; 38. also a small inflated rubber boat; 41. volcano on Io; 43. A meteor that appears to explode; 44. proposed theory of evolution; 45. satellite galaxy to the Milky Way; 46. process that powers stars; 48. solid, liquid or ...; 49. A serious search for aliens (abbrev); 51. type of telescope; 53. end clause (anagram); 54. Once in a ...;

Down

1. volcano on Io; 2. Causes small changes in RA and Dec coordinates; 3. The Seven Sisters; 4. mid-day; 5. plane of Earth's orbit around the Sun; 8. A cosmological model; 10. The Peacock constellation; 11. A Moon of Mars; 13. A dark, triangular plateau near the Martian equator; 14. second most common element; 15. Tellus; 17. a new star; 18. alpha Lyr; 22. type of telescope; 27. The intrinsic brightness of a star; 28. angels and galaxies both have one; 30. frozen liquid; 32. type of galaxy; 33. flying saucer; 35. High energy particles that impact the Earth at near light-speed.; 36. a phase of the Moon; 39. An open or globular ...; 40. a very cloudy planet; 41. allow some leeway; 42. I weight 6 times less on the Moon, but still have the same ???; 47. alpha Cygnus; 50. smallest indivisible piece of a element; 52. A lion circling the Earth;