

# NEWSLETTER

**The next WAS meeting which is the 2012 AGM  
will be held on Wednesday 7<sup>th</sup> November 2012 at 7:30pm  
at Carter Observatory, Upland Road, Kelburn, Wellington**

**AGM Agenda: 2012 AGM 7.40pm**

**Apologies**

**Minutes of the last AGM.**

**Presidents Report (text p2)**

**Treasurers Report**

**Auditors Report (if completed in time)**

**Election for Council**

(We have sufficient nominees so you are safe to attend)

**Election of Auditor**

**General Business.**

**Following the AGM there will also be two short talks:  
Results from the Transit of Venus by John Talbot  
and  
More on Dark Skies by Gordon Hudson**

## **UPCOMING EVENTS:**

**The next observing evening** at the Tawa College observatory will be on:  
Saturday 10<sup>th</sup> November (reserve day 17<sup>th</sup>).

Text Chris Monigatti on his mobile 021 890 222 if you want to attend.

## **Solar Eclipse**

On **Wednesday 14<sup>th</sup> November** Wellington will have a partial Solar Eclipse in the morning. WAS will have a team at the City to Sea bridge from Civic Square from about 9:00 am to about 11:50 am for public viewing. The maximum drop is predicted to be at about 0.76 magnitude drop at 10:29:27 am (Summer times).

If you are observing make sure you take precautions **not to look directly at the Sun**. We will be using the same telescope, Sun Funnel (see April Newsletter), and set up as we intended to use for the Transit of Venus on 6<sup>th</sup> June. We will attempt to take enough photos to enable us to measure the progress across the Sun and compare the measurements with the predictions. We will have another batch of RASNZ Solar Viewers available at the AGM. Again if it is wet we will retreat to the Library.



Page 1- Next meeting Upcoming events Solar eclipse		Pages 7 Starting with DSLR Photometry Part 2 - by Aline Homes
Page 2 – Subs are due Chairman’s annual Report		Page 9-10 WAS unaudited accounts
Page 5 - WAS Research Astronomy Group Report		Page 11 Sky features for November Page 12 Sky chart for November

### Thomas Cooke Telescope Volunteers

Thanks to the members who have volunteered to help with Saturday evening viewing following the planetarium show. We need more volunteers for November, 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.

### Subscription time

The end of the WAS financial year fell on Friday 31<sup>st</sup> August. That means the new subscription year started in September. WAS Council considered the subscription rates at our last meeting and decided that they should remain the same for another year. A renewal form was attached to Page 10 at the end of the October newsletter or can be down loaded from <http://was.org.nz>. If you have not already paid please bring subs to November meeting or post to the address on the form or pay by online banking (please put your name or phone number as a reference) and email a copy of the filled-in renewal form to Lesley Hughes [hpwas@hugpar.gen.nz](mailto:hpwas@hugpar.gen.nz).

**Remember, for you to count to count to the quorum, and to be able to vote, at the AGM, you need to be a Financial or Life member.**

### Chairman’s Report for Year 2011-2012

At the AGM last year a new Council was elected; Frank Andrews was elected to the status of Life Member of WAS at the AGM. Frank has been a member since we literally don’t know when but certainly for decades. A resolution to donate the antique Dollond telescope, that had previously been given to WAS by the Powells family, to Carter Observatory as part of the Wellington Museums Trust, was passed. As approved, the Dollond was handed on to Carter Observatory on the 7<sup>th</sup> March. A plaque was attached to the wooden case to make sure that the history and provenance of this rare antique is maintained.

The speaker for the evening was Gary Sparks from Napier who described his special interest in collecting Stamps with a Space or Astronomy theme.

In February 2012 Terry Butt was co-opted to Council giving us another experienced observer on Council.

The **December** speaker was Haritina Mogosanu. She told us about Early Polynesian Navigation and, how they used the stars to steer their waka over vast ocean voyages at a time when other cultures were still hugging coastlines.

We started the New Year with 3 Professors.

The **February** talk 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 was now around 1000 and there is even some speculation that every star probably has at least one planet. I note that just two weeks ago it was announced that one of our closest stellar neighbours Alpha Centauri has been shown to have an Earth sized planet.

In **March** Prof. David Wiltshire of Canterbury University described recent work that helps to confirm his ideas about "Dark energy and cosmic structure" in which he looks at the detailed structure of galactic structures rather than treating the whole universe as a uniform average when solving Einstein's field equations for the expansion of universe. This approach gives significant differences in the age of the universe depending on where you observe from. In particular he showed that our Milky Way galaxy sees a younger universe than if we were observing from one of the many voids that separate galaxy clusters. It also removes some of the dark energy required to explain the accelerating expansion of the Universe.

There was an interesting discussion between David and Kim Hill, first broadcast in Feb 2008 on Dark Energy. This can be heard online 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.

The **April** talk was by WAS member Emeritus Prof. John Harper of Victoria University. He explained the reason for the importance of observing the Transit of Venus in the 17<sup>th</sup> and 18<sup>th</sup> centuries which was to establish the size of the Solar System and specifically the distance of Earth from the Sun. Many countries spent huge sums in sending expeditions around the World to make the observations at widely separated locations. Hence, Capt Cook's voyage to Tahiti, for the 23 April 1769 transit, and the later transit of Mercury in New Zealand. John explained the two main methods of measuring the parallax that were used. He also described his observations in 2004 while at Cambridge University.

Staying with the Transit of Venus theme in **May** we had Luca Quaglia who described the Huddle method of observing the Transit of Venus in which a series of pictures is taken of the Sun over as long a period as possible and then the distance from Venus to the centre of the Sun is measured. The square of the distance is then plotted against time and a least squares fit curve is plotted to the data. The minimum distance is calculated from the equation of the curve and the distance and time are noted. A second set of observations at a different latitude then allows the parallax angle to be calculated. This method is easy to observe and avoids the uncertainties of timing ingress and egress caused by the black drop effect. However as we will see later there are some interesting maths problems to contend with.

John Talbot brought a simple Sun Funnel that he had made, and Gordon Hudson brought one made from a “Trainer Cone” from a sports shop. Each cost less than \$20 for materials and took little time to assemble.

The second speaker was Gordon Hudson. He described how to collimate a telescope using a small low power laser in a fitting that is inserted into the eyepiece tube and another that shines a bright diffuse light into the eye piece tube. In each case there are a number of adjustments that may be needed to correctly align your optical path. All instruments can get slightly out of optimum adjustment over time and Gordon had several simple tips on what to look for.

At the end of **May**, Prof. John Harper of Victoria University gave a public lecture at the Wellington Central Library on the Transit of Venus. This was very well attended with over 100 people attending.

And again in **June** meeting focussed on the Transit of Venus. We had hoped to observe that day but as there were few results to talk about, we watched a good DVD on earlier attempts at this rare event.

WAS had planned to hold a public observation in Wellington Civic Square near the Pyramid on top of Capital E. Wellington had what can only be de-scribed as miserable weather, cold and wet, and we did not see anything of the sun all day. We spent most of the day in the Library watching the NASA live feed from Moana Lua, Hawaii. We had about 100 people stop and chat about the event.

Thanks to Roger Butland, Bill Parkin and Lesley Hughes, who helped me with is exercise and we look forward to doing something similar for the Partial Solar Eclipse next week, on 14th November (It will be total in North Queensland.) . We will try to observe from about 9:00 am to just before noon local time.

In **July** we were treated to a wonderful talk by amateur astronomer Stuart Parker from Canterbury who told us about his “Supernova Factory”. He uses two telescopes with computer controlled pointing and CCD cameras that take approximately 30 to 50 pictures a minute of southern galaxies during clear conditions and then repeats the same sequence of objects some days later. The pairs of pictures are then compared using software that “blinks” between the two pictures which makes it easier to spot a change. Any candidates then need to thoroughly checked, to make sure that the changed object is not an asteroid, known variable, or similar object. If that test is passed then he notifies members of his Boss Team (Backyard Observatory Supernova Search) <http://www.bosssupernova.com> who take independent pictures to confirm that they too can see the object.

If that is confirmed then they can report to Central Bureau for Astronomical Telegrams (CBAT) for further investigation by professional astronomers and their resources which may occasionally include Hubble telescope time.

Just 3 days after his talk to us Stu found another supernova PSN J00563888-0954091 (2012dt). Congratulations Stu and thanks for letting us in on how it is done. Also see <http://www.bosssupernova.com/confirmingimages.htm> where Stu has made a confirming observation of another new supernova.

In **August**, WAS Vice –President Gordon Hudson gave a short report on his attendance at the Starlight Conference at Tekapo in June, where the confirmation of the Tekapo basin as a World Heritage dark skies site was announced. This should protect the area as a good site for observing, especially at Mt John, for future generations.

We then watched a streamed version of “The City Dark” video from USA PBS. This concentrated on the problems of excessive light in New York City. One person said the only time they had been able to see the Milky Way in New York was during a major power cut that affected most of the city.

In **September**, WAS Council member Dr Aline Homes of School of Geography, Environmental and Earth Sciences, Victoria University of Wellington, New Zealand asked “Is Anybody Out There?” She explained what we might mean when asking the question “Is there life on other places than Earth?” Essentially this is the study of something we don't know exists yet. She examined the need for a more inclusive definition of life. In particular recent work in Astrobiology and related fields, considers how this might affect our assessment of the likelihood of detecting life on other worlds. There are several solar system bodies such as the moons of Jupiter that seem to hold some promise of having at least microbial life. Exoplanets around other stars are another target for searches where the main thrust has been trying to identify small planets in the Goldilocks zone where they have a good chance of having liquid water on or under the surface.

In **October** WAS Life member John Field, described the processes required to make good astro photographs. This is a non trivial exercise but if you follow his advice you should be able to start getting some of those great pictures we see in some of the books and calendars.

I would like to thank all council members for help and support but particularly to Lesley Hughes who has done dual roles of Treasurer and with the help of Bill Parkin has continued to provide and deal with the refreshments.

### **WAS Research Astronomy Group Report**

I make no apologies for trying to have talks with a strong bias in favour of topics that are related to research. Astronomy by its very nature is a Science, and has been from the mists of human history. In Science we make observations and dream up theories. It does not matter which comes first but we look for theories that fit the observations and discard, or modify, those theories which don't fit. These days the theories will mostly come from professional scientists and academics. The observations however can be made by almost any one. We have heard from Stuart Parker who has discovered a number of Supernovae. He is primarily a dairy farmer, but with those discoveries he and his BOSS team have contributed significantly to the work of professional astronomers who are trying to better understand the theories of the expansion of the Universe, Dark Energy and related matters.

If, like me you had bought a telescope and were looked at a few things and had wondered “What can I do now?” please consider having a go at some “real” astronomy and try to measure something. Position, time, brightness, what has changed,... In my case I was inspired by a talk on Occultations by Graham Blow back in about 2004. I had a go and got hooked.

**Warning** you may find yourself wanting to spend a lot more on extra kit like camera(s); Timers, Video recorders, ... . Please talk to members of the group before making big purchase so that you make good decisions.

The WAS Research Group was formed over two years ago, to help members who would like to make observations that contribute to other research programs. We need to understand what observations are

needed and how to make sure the results of our observations are of some use to the rest of the world's astronomers.

The group has met each month at 6:30 pm before the main meeting. These meetings are open to all WAS members. We regularly have 6 to 12 people attend these and would welcome more people who even think they might like to try some research type observing to attend these.

Our main topics so far have been: observing Occultations and Variable Stars and more recently the Extinction Events of Jovian moons. In particular I would like to thank Dr Murray Forbes and Dr Aline Homes for their support and ongoing talks in this group and for their contribution to this news letter.

All of these can be achieved with simple telescopes and either digital cameras or sensitive video cameras plus some accurate timing mechanism.

**Occultations** both Lunar and Asteroidal, are best observed with a telescope and video camera with a GPS video time inserter to get highly accurate times, but even binoculars and a stop watch can be used for bright events.

These observations also include the possibility of observing or discovering close double stars which are otherwise difficult or inaccessible to amateur equipment.

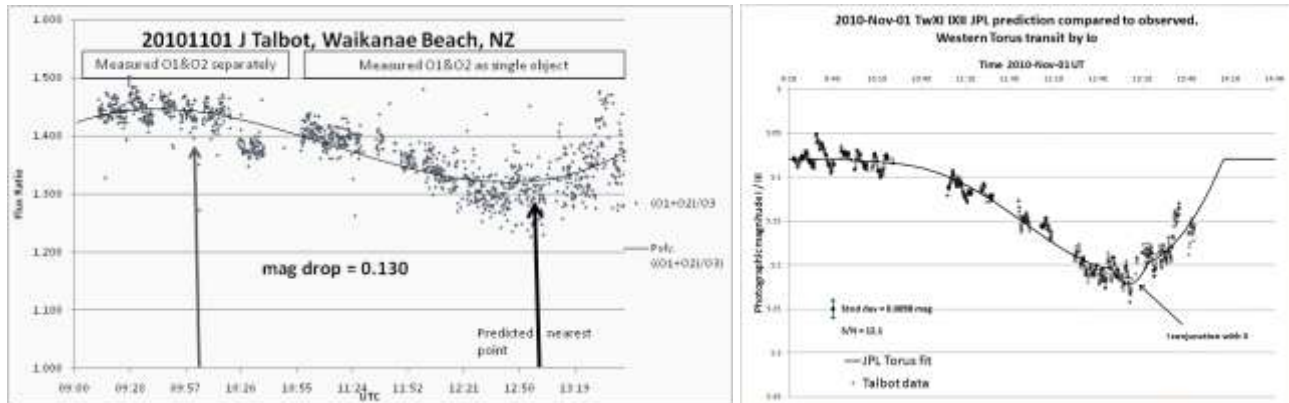
Predictions for the Wellington area are published on our web site at <http://was.org.nz/01Occs.html> or look at the RASNZ Occultation Section web site at <http://occsec.wellington.net.nz> for both predictions and results from the Australia New Zealand region where there have already been 43 positive observations so far this year – all made by amateur astronomers. That data may be used for refining the orbital parameters of the objects, determining if a close double star is a true binary star or a pair of stars that just happen to be at the same place in the sky and will diverge again over the next epoch. Lunar occultations originally proved that the Moon is slowly moving away from Earth as its energy is transformed into tidal motion. If many observers record the same event we may be able to find the shape and size of an asteroid and also refine the predicted albedo, before any other method. There is an example result at [http://occsec.wellington.net.nz/planet/2011/results/20110418\\_516\\_Amherstia\\_Rep.htm](http://occsec.wellington.net.nz/planet/2011/results/20110418_516_Amherstia_Rep.htm)

The other main topic has been observing **Variable Stars**. These come in a number of types. The main things we need are the ability to estimate or measure relative brightness of two or more stars and the time of the observation to about 1 minute rather than the sub-second accuracy needed for occultations. Modern digital (DSLR) cameras on the back of a telescope provide a good way of starting to do this work as Aline continues to describe in this month's article below.

We have been working through a series of tutorials by Murray on processing of images with IRIS software in order to get accurate star magnitudes from CCD or Digital Camera images. We hope to have these talks put into an observer's manual.

**Jupiter Extinction Events** (JEE) are a relatively new program that originated from amateur observers reporting anomalies in the light curves from the 2009-2010 Galilean Moon mutual eclipse and occultation season when the moons orbits were very close to edge on towards Earth. These observations can be done with

either of the above types of equipment. Only a small telescope is needed (so much so that I have had to put a 38mm aperture in front of my 250mm scope to dim the image enough to measure the changes). The main requirement is to be able to observe for several hours at a time so a tracking mount (Motorised Equatorial or GoTo) is almost imperative. More information about this program and several files containing predictions can be found at <http://scottysmightymini.com/JEE/>



The observation above was made after a crude prediction that Io may show self extinction of the torus. The right hand graph shows an accurate JPL ephemeris prediction as solid line.

There are plenty of other areas that may interest you. **Astrophotography** is one that many people work at. Try taking regular pictures of the same objects and see what changes. Eg Moon phases, Jupiter's Red Spot and other features, Supernova in a galaxy, a new comet or asteroid. Always make sure you know the date and time of any picture you take – it may contain critical data of some new discovery.

If you think you have found something check that it really is new – consult with others, check in a planetarium program like C2A or Stellarium, before you shout from the roof tops.

Whatever you do, please don't buy a big telescope and then never use it.

## Variable Stars

Aline Homes

### Beginning DSLR Photometry Part 2

So you have some RAW image files - biases, darks, flats and star-fields. What do you do with them? They will need to be downloaded, decoded and processed. The instructions I am giving are for IRIS, because that is the package I am familiar with, and the one Murray chose for the Research Group training program. IRIS is available for free download from... <http://astrosurf.com/buil>

The first step is to get the pictures out of your camera and on to your PC. You can connect the camera directly via the USB cable, or from the memory card via a card reader. It is important to use the Utilities software provided with your camera, especially if you want to check your images. The default image-viewer

in Internet Explorer cannot handle RAW files. Download your pictures into a directory called IRIS\_data or similar, and rename them so that you know what each sequence is eg: bias-1... for bias frames, flat-1... for flats and so on. Don't use leading zeros or leave the default sequential numbering, IRIS expects image sequences to begin at 1.

To decode your images, first have an Internet Explorer window open with your picture files displayed. Start IRIS and from the tool bar click on Settings. Set the working path which tells IRIS which directory to look for your files in. You can call up the directory tree by clicking on the button beside the working path window. Set the File Type to Pic for DSLR images. You can leave everything else at default.

Next, click the on the camera icon to open Camera Settings, select your camera's make and model. Then set binning to 1x1 and RAW Interpolation to Linear. Open Digital Photo on the tool bar and select Decode Raw Files. This opens a window into which you can drag and drop your files from Explorer. Drag across your bias files, specify an output name, say "bias" and click the CFA button. When the conversion is complete, click one "done" to return to IRIS. You will now have a set of decoded files called bias-1.pic and so on. Repeat the process for your dark, flat and image files. We will cover the next steps next time

### **QZ Carinae – a Possible Research Project**

This star was first proposed as a VSS research project in 2010, but the campaign seems to have faltered. In early October it was proposed that the project be revived, this time to include DSLR photometry, in attempt to resolve some of the issues with this system. It could be a suitable project for the WAS research group and other interested parties to undertake. I have put my hand up to get involved in any case. You no longer have to be a member of VSS to contribute to its projects.

QZ Carinae lies in the eta-Carinae nebula not all that far from eta Car itself. It is the brightest member of the open cluster Cr 228, and is about 2600 parsecs from Earth. QZ is a multiple system comprising four very hot, massive young stars. The total mass of the system is approximately 96 solar masses. It is a source of UV, IR and X-rays

The star varies between 6.2 and 6.5 over a period of roughly 6 days, with two marked eclipses. It has been classed as an EB type eclipsing system but the eclipses are long and often somewhat distorted. The brightness makes it suitable for DSLR photometry, but marginal for CCDs without stopping down. The QZ Car system resolves into two pairs. The primary is a non-eclipsing spectroscopic binary, period 20.74 days, that may itself be slightly variable. The main variability is due to the eclipsing secondary pair. More details on the system can be found in the QZ Car background document on the VSS website.

The project will involve imaging the system at three-hourly intervals, and only B and V measures are needed. For DSLRs these approximate to the blue and green channels, which can be extracted from your colour images. The output of eclipse light curve is important. The eclipses themselves last approximately 6hrs.

Please feel free to discuss this as a project, and let me know. I will not be at the next meeting, I will be in Cairns for the solar eclipse, but I can be contacted on [fossil.leaf@actrix.co.nz](mailto:fossil.leaf@actrix.co.nz). There is plenty of time to prepare. The system is too low in the south at the moment, and will not become suitably placed for early evening observation until late November at the earliest.

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Victoria University Community Continuing Education is offering a course called **Space Race Politics: Rockets & Rhetoric**, by Matthew Cunningham, starting on 6 November.

Tuesdays 6, 13, 20 November, 6pm–8pm, Fee: \$70 (\$63)

See Vic website for more information and to enrol: <http://cce.victoria.ac.nz/courses/14-space-race-politics-rockets-rhetoric>



## Unaudited WAS Accounts

Wellington Astronomical Society Incorporated			
Statement of Financial Performance			
For the Year to Date 31-August-2012			
INCOME:	Note#	2012	2011
Subscriptions Renewals in year	2	\$ 2,210.00	\$ 2,070.00
New Subscriptions	2	\$ 785.00	\$ 480.00
Interest		\$ 143.69	\$ 141.47
Donations		\$ 1,120.50	\$ 1,170.00
Grants	4	\$ 200.00	\$ -
RASNZ Conference		\$ -	\$ -
Astrophotography Workshop fees		\$ -	\$ -
Telescope Hire	14	\$ -	\$ -
Depreciation recovery Sold Items.	10	\$ -	\$ -
Solar Viewers		\$ 257.00	
Other	5	\$ 80.00	\$ -
<b>Total Income</b>		<b>\$ 4,796.19</b>	<b>\$ 3,861.47</b>
<b>EXPENDITURE:</b>			
Affiliation Fees to RASNZ		\$ 177.00	\$ 198.00
Auditor		\$ 47.56	\$ 40.97
Bank Fees & Cheque book		\$ 52.50	\$ 50.00
Insurance	6	\$ 410.55	\$ 410.55
IYA Expenses		\$ -	\$ -
Post Office Box Hire		\$ 160.00	\$ 160.00
Newsletter Printing	7	\$ 211.73	\$ 327.22
Postage	8	\$ 120.00	\$ 281.50
Room Hire	9	\$ -	\$ -
Speakers		\$ 1,064.00	\$ 10.99
Astrophotography Workshop costs		\$ -	\$ -
Maintenance on Equipment		\$ 235.97	\$ -
Solar Viewers		\$ 195.00	\$ -
Miscellaneous		\$ -	\$ -
Web Site		\$ 199.71	\$ 275.41
Capital Items		\$ 63.00	\$ 55.00
<b>Total Expenditure</b>		<b>\$ 2,937.02</b>	<b>\$ 1,809.64</b>
<b>Cash Income less Expenditure</b>		<b>\$ 1,859.17</b>	<b>\$ 2,051.83</b>
<b>Accrual adjustments</b>			
Reverse of previous years AP	12	\$ 99.80	\$ 117.94
Less current Accounts Payable		-\$ 34.30	-\$ 99.80
Reverse of previous years DR		-\$ 162.21	
Plus Debtors		\$ 185.33	\$ 162.21
Reverse previous years Telescope Deposits		\$ -	\$ -
Reverse Capital Items	10	\$ -	\$ 118.00
Less Depreciation	10	-\$ 1,423.17	-\$ 2,484.48
<b>Excess Expenditure over Income</b>		<b>\$ 524.62</b>	<b>-\$ 134.30</b>

Wellington Astronomical Society Incorporated  
Statement of Financial Position  
As at 31 August 2011

Current Assets	Note#	2012	2011
Bank Accounts		\$ 11,128.07	\$ 9,268.90
Accounts Receivable		\$ 185.33	\$ 162.21
<b>Total Current Assets</b>		\$ 11,313.40	\$ 9,431.11
<b>Property, Plant &amp; Equipment from Dep Sc</b>	10	\$ 9,412.81	\$ 10,835.99
<b>Total Assets</b>		\$ 20,726.21	\$ 20,267.10
<b>Liabilities</b>			
Accounts Payable	12	\$ 34.30	\$ 99.80
Telescope Deposits	11		
<b>Total Current Liabilities</b>		\$ 34.30	\$ 99.80
<b>Net Assets</b>		\$ 20,691.91	\$ 20,167.30

Movement in Members Funds	2012	2011
Total Assets Opening	\$ 20,167.30	\$ 20,301.60
Less Expenditure over Income	\$ 1,859.17	\$ 2,051.83
Assets Purchased	\$ -	\$ 118.00
Assets sold		
Depreciation	-\$ 1,423.17	-\$ 2,484.48
Reverse of previous years AP	\$ 99.80	\$ 117.94
Less current Accounts Payable	-\$ 34.30	-\$ 99.80
Reverse Previous years Accounts receivable/prepaid	-\$ 162.21	
Plus Accounts receivable/prepaid	\$ 185.33	\$ 162.21
Reverse previous years Telescope Deposits	\$ -	\$ -
<b>Total Assets Closing</b>	\$ 20,691.92	\$ 20,167.30

Bank Accounts	2012	2011				
Cheque	\$ 3,748	\$ 4,031				
Simple Sa	\$ 7,380	\$ 5,238				
<b>Total</b>	\$ 11,128	\$ 9,269				
<b>Movement in Bank A</b>	<b>Opening Bal</b>	<b>Deposits</b>	<b>Interest</b>	<b>Withdraw</b>	<b>Closing Bal</b>	
Cheque	\$ 4,031	\$ 4,653	\$ 1	\$ 4,937	\$ 3,748	
Simple Saver	\$ 5,238	\$ 2,000	\$ 142	\$ -	\$ 7,380	
<b>Total</b>	\$ 9,269	\$ 6,653	\$ 144	\$ 4,937	\$ 11,128	

Full audited accounts will be made available on our web site when Audit is complete

### The Evening Sky in November 2012

Bright stars and even brighter Jupiter light up the eastern evening sky. Midway up the southeast 'sky' is **Canopus**, the second brightest star. **Sirius**, the brightest star, rises in the later evening at the beginning of the month. It is in the sky at dusk by month's end, twinkling like a diamond. Similarly **Jupiter**, brighter than all the stars, rises in the northeast about 11 pm early in November but is up at dusk later on.

**Mercury** (not shown) ends an evening sky appearance in the first half of the month. At the beginning of November it is setting in the southwest at 10:30 p.m., looking like a bright white star below orange **Antares**. It quickly sinks into the twilight as it moves between Earth and Sun. **Mars**, looking like a medium bright star with a reddish-orange tint, begins the month above and right of orange Antares. By the end of the month it is by the Teapot's lid in Sagittarius.

Left of Sirius is the constellation of **Orion**, with 'The Pot' at its centre. **Rigel**, a bluish supergiant star, is directly above the line of three stars; **Betelgeuse**, a red-giant star, is straight below. Left again is orange **Aldebaran**. It is at one tip of a triangular group called the Hyades cluster. The Hyades and Aldebaran make the upside down face of **Taurus** the bull. Still further left is the **Pleiades** or **Matariki** star cluster, also called the Seven Sisters, Subaru and many other names. Six stars are visible to the eye; dozens are seen in binoculars. The cluster is 400 light years\* away and around 70 million years old.

Low in the south are the Pointers, Beta and **Alpha Centauri**, and **Crux** the Southern Cross. In some Maori star lore the bright southern Milky Way makes the canoe of Maui with Crux being the canoe's anchor hanging off the side. In this picture the Scorpion's tail can be the canoe's prow and the Clouds of Magellan are the sails. Alpha Centauri is the closest naked-eye star; 4.3 light years away.

The Clouds of Magellan, (**LMC** and **SMC**), high in the in the southern sky, are two small galaxies about 160 000 and 200 000 light years away, respectively. They are easily seen by eye on a dark moonless night. The globular star cluster 47 Tucanae appears near the SMC but is 'only' 16 000 light years away. Globular clusters are spherical clouds of stars many billions of years old.

Very low in the north is the **Andromeda Galaxy**, easily seen in binoculars on a dark night and faintly visible to the eye. It appears as a spindle of light. It is similar in shape to our galaxy but a little bigger and nearly three million light years away.

Brilliant **Venus** rises into the dawn twilight about an hour before the sun. **Saturn** moves up and out of the twilight during November, passing left of Venus in the last week of the month. **Mercury** appears low in the dawn below Venus at the end of the month.

There is an **eclipse of the sun** on November 14. From NZ about three-quarters of the sun will be covered; more in the north, less in the south. The eclipse begins around 9:30 a.m. NZDT and ends before noon. Details of start and finish times for NZ places can be found at <http://www.rasnz.org.nz/>

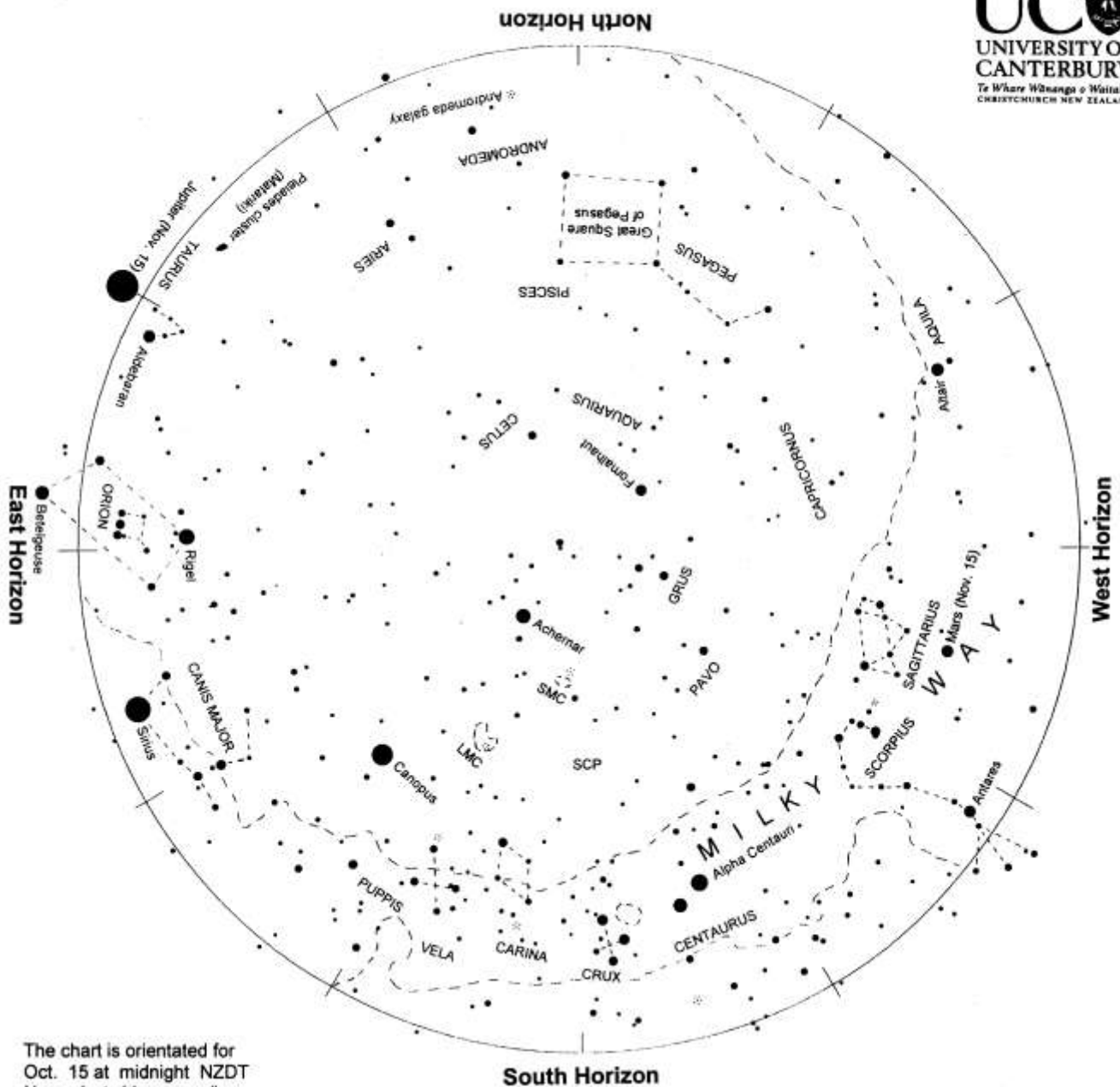
Safe methods must be used to view the Sun. Viewing the Sun directly can result in instant blindness. The safest way is to project the image of the Sun onto a suitable screen. Alternatively a specially designed solar filter may be placed in front of the telescope. It is NOT safe to use a filter at the eyepiece as the focused heat from the Sun could shatter it. If unsure of safe methods consult your local astronomical society about suitable ways of observing the sun. Safe solar viewers are sold by WAS, the Auckland Astronomical Society and Wellington's Carter Observatory. For Auckland phone 09 473 5877 or email [treasurer@astronomy.org.nz](mailto:treasurer@astronomy.org.nz), [www.astronomy.org.nz](http://www.astronomy.org.nz). For the Carter Observatory phone 04 910 3140 or see [www.carterobservatory.org](http://www.carterobservatory.org). Both offer bulk discounts to astronomical societies and educational groups.

The full moon passes through the outer edge of the Earth's shadow around 3:30 a.m. on the 29th. This **penumbral eclipse** will cause the moon to look a little darker on its lower edge.

Notes by Alan Gilmore, University of Canterbury's Mt John Observatory, P.O. Box 56, Lake Tekapo 7945, New Zealand.  
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\*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 chart is orientated for  
 Oct. 15 at midnight NZDT  
 Nov. 1 at 11 p.m. "  
 Nov. 15 at 10 p.m. "

**Evening sky in November 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 clockwise rotation each night as we orbit the sun.

Bright stars and even brighter Jupiter light up the eastern night sky. Jupiter rises in the northeast around 11 p.m. at the beginning of the month but is up at dusk by the end. Along with it rise Sirius, the brightest star, twinkling like a diamond, Orion (containing 'The Pot'), Taurus and the Pleiades/Matariki star cluster. The Pointers and Crux, the Southern Cross, are low in the south. The north sky is empty but for the Great Square of Pegasus with the Andromeda galaxy nearby. Venus is the brilliant morning star, pairing with Saturn late in the month. There is an eclipse of the sun on the morning of November 14. Much of the sun will be covered from NZ

Chart produced by Guide 8 software; [www.projectpluto.com](http://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](http://www.canterbury.ac.nz)