

*The next WAS meeting will be held on Wednesday 5th August 2015 at 7:30 pm  
 at Carter Observatory, Upland Rd, Kelburn, Wellington*

## New Horizons: The space craft, the mission, the results

**Dave MacLennan**



Pluto nearly fills the frame in this image from the Long Range Reconnaissance Imager (LORRI) aboard NASA's New Horizons spacecraft, taken on July 13, 2015 when the spacecraft was 476,000 miles (768,000 kilometers) from the surface. This is the last and most detailed image sent to Earth before the spacecraft's closest approach to Pluto on July 14. The colour image has been combined with lower-resolution colour information from the Ralph instrument that was acquired earlier on July 13. This view is dominated by the large, bright feature informally named the "heart," which measures approximately 1,000 miles (1,600 kilometers) across.

Image Courtesy of NASA

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The historic first fly-by of Pluto by NASA's New Horizons spacecraft is now over, and the craft is now setting its sights on other Kuiper Belt objects. While it will be November 2016 before all the data from New Horizons is downloaded, this talk will describe the spacecraft and the mission to date and present some of the preliminary findings from the fly-by, including the latest images from Pluto.

## PRESIDENTS REPORT AUGUST 2015 GORDON HUDSON

This month of July has been a busy time with WAS acquiring the Syd Cretney Bequest and I have been involved with the South West Research Institute from Colorado looking after three teams from their visit to NZ to observe the Pluto Occultation.

The funds from the Syd Cretney Bequest have been invested in a Trust fund with the Lawyers who acted on our behalf in obtaining this Bequest.

Now the planning starts for the Gifford Observatory which is where the WAS automated telescope will be originally housed. There are many decisions to be made and possibly a new steering committee to be formed as this is going to be on going for the next year and possibly longer.

Congratulations to Edward Wilcock for his stunning photo on the

front cover of Southern Stars.

This month's talk by Dave MacLennan is well timed with the flypast of the New Horizons Spacecraft past Pluto and the Occultation of Pluto by a 12 Magnitude star. This event was also covered by the Flying Observatory Sofia.

The Pluto Occultation was well observed throughout NZ including Occultation Section members and several Americans teams excluding the group I was involved with. There was one group from MIT, based at Mount John, which was successful. Bruno Sciardo, of Paris, used the Bootes 3 telescope (now housed at Lauder near Alexander).

Membership cards were distributed to attending members at the July meeting; these should be worn at all WAS meetings. Those of you who have not picked up your card please do so at the next meeting.

Later in the year in October we will have Professor Chris Lintott visiting us and this should be quite a memorable occasion however details for this lecture are still being sorted so watch this space.

The WAS dome that has been stored at my place for 2 years is still here.

Work has begun on ground preparation for the piles and pier.

The volunteering at Carter is going well but it is mainly through the efforts of a couple of our members. We need more volunteers. We assist on Tuesdays and Saturday evenings so put your hand up at the next meeting.

The WAS observing evening once a month at Tawa College is struggling with lack of observers. Where are you all? The next observing evening at Tawa College is on Saturday 8th August starting at 7pm.

## WAS COUNCIL MEMBERS AND CONTACTS

### Council Members

The following members were elected to Council at the Nov 2014 AGM

**President:** Gordon Hudson

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**Vice President:** John Talbot john.talbot@xtra.co.nz  
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John Homes + Webmaster

Roger Butland

Frank Andrews

Murray Forbes

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## PLUTO OCCULTATION 29 JUNE MURRAY FORBES

On the morning of Tuesday 30 June, an occultation by Pluto of a 'bright' star was predicted to occur. By 'bright' I mean a star that could be seen with an amateur telescope, in this case it was UCAC4 347-165728 with a magnitude of 12.1. There was a lot of interest in observing this event as the New Horizons space probe will starting its fly-by of Pluto a few weeks' after-wards. Two professional astronomy groups were making predictions of the track across the Earth that the occultation could be seen from. However the uncertainty in these predictions meant that it could have been seen from anywhere in Australia and New Zealand.

I have recently got the use of a Meade 8" telescope and was still learning how to drive it (the controller software was different from my previous telescope). I also needed to use an integrating video camera (a Watec 120N+) to see the star (rather than my usual KT&C non-integrating camera), and had only put this together as a ready-to-go toolbox with the other equipment required (an IOTA-VTI GPS video time inserter, Digital Video Recorder and 7" TV monitor). So to try to ensure there were no instrument problems, I had been test-running this setup on every lunar occultation I could find over the weeks leading up to this event. The entire toolbox is powered by a 12V 7Ah battery, which was recharged on the Sunday before the event.

The Pluto event was predicted to occur at 4:51 am and last up to 102 seconds. So I set my alarm clock for 3:30 am, to allow plenty of time in case of problems, and went to bed at 8 pm. On getting up, I found perfect observing weather - calm, chilly and without a cloud in the sky. Frank Andrews, who was going to observe with me, arrived at 3:45 am.

Our first task was to align the telescope, by synchronising on Antares (as it wasn't far away in the sky from Pluto). This wasn't as easy as you might expect, as there was a

nearly full moon near Scorpio and I could only see a few stars in that part of the sky. After one false start, we found Antares and set the telescope's coordinates to match. I then went to my pre-point star (HD175687, a 5th magnitude star) in Sagittarius, which is a short hop from Antares. It was now a case of waiting until it was time to stop the scope's tracking and allow Pluto to drift into my field of view. I had decided on timing this so that I'd have drifted on to Pluto twenty minutes before the occultation.

With my previous telescope, I could do this procedure by simply turning off the telescope and then turning it on again at the right time and it would quietly resume tracking. However, as I'd found out during one of my tests in the preceding weeks, this method couldn't be used with the new telescope as it 'revers' the RA and Dec motors to test them when it is powered on and doesn't come back to its original position. Fortunately I had found another procedure which could be used for the pre-point/drift technique - as changing the telescope to 'Land' mode turns off the tracking in the RA motor and returning to 'polar' mode will quietly resume tracking.

So after the three and a half minutes of drifting, we were pointing at Pluto. Or were we - the stars displayed on the TV monitor didn't seem to match the star field in the planetarium program I use (C2A). After a few minutes of panic, we realised why - I had recently purchased a diagonal mirror to go in between the telescope base and the video camera (as without it, the video camera would hit the telescope's base when pointing to certain positions in the sky). This meant my view was reflected left-to-right from what I was used to. After clicking on the left-right reflection option in C2A the two star fields matched.

We did a few tests with different integration settings until we could actually see the target star (Pluto was a lot fainter at mag-

nitude 14.4) and found the 'slow 7' setting (which takes 2.56 second exposures) seemed best. I reset the IOTA-VTI to make sure it was correctly reporting the time and then started the DVR recording about seven minutes before the predicted mid-event time.

Everything looked okay until a few seconds before the event was due to start. We noticed then that the image on the TV monitor seemed to be frozen, in particular the inserted GPS time was no longer changing on the TV. It looked to be a problem with the DVR, as the IOTA VTI was still giving 1 second pulses on its LED. However it was too late to do anything at that point other than hope that, despite appearances, the DVR was recording and the problem was with the TV instead. We let it run for two minutes and then, after the event was predicted to be over, turned off the power to all the instruments and restarted them. This appeared to clear the problem, and I made another (five minute) recording.

When we went to replay the first video recording on my PC, we found the recording was corrupted near the end and wouldn't load into Tangra or Limovie. I could play it using VLC, and unfortunately found that the recording did stop about the time we noticed the problem. I used VirtualDUB to cut out the corrupted end of the recording and could now analyse it using Limovie, on the off chance that the occultation had started earlier than the predicted time. However this was not the case, as there was absolutely no sign of the target star's brightness dropping on. Similarly, the second recording didn't show any sign of the end of the event (it must have been over by then).

I plan to do some further tests on the system, to try to work out why it failed and so how to avoid it in the future.



## PLUTO EVENT FROM THE NORTHLAND ASTRONOMICAL SOCIETY'S C14 TELESCOPE

The Pluto Occultation of a 12 magnitude star was a rare event and a lot of effort was being put into observing this event. The program I was involved in was run by the South West Research Institute in Boulder Colorado. They had previously contacted me about the possible place-

ment of three Meade 14" telescopes and any other telescopes on permanent piers that may be available for use. Two of the Meade's were going to the South Island and I put them in touch with several people in the South who could help them. Mt John was already spoken for by MIT but there were several other possibilities. One went to the North Island and I sent that over to Gary Sparkes in Napier who was to look after them but unfortunately the telescope they brought with them had been tampered with and was unusable. There were no other 14" telescopes in Napier so I sent them to John Drummond in Gisborne where they had partial success.

My task upon arriving in Whangarei was to obtain the use of the Society's C14 telescope on which I mounted a ProEM camera, loaned from Princeton Instruments. This was not straight forward as the telescope had to be rebalanced and to do this I purchased a couple of bar bell weights from the Warehouse which did the trick except the holes were too small and had to be bored out. This telescope had only just been recommissioned as it had been out of use for the past two years.

We weren't even sure if it had ever been properly polar aligned! We acquired the assistance of Peter Felhoffer who is the director of the Northland Planetarium and a computer expert and we were able to

semi align the scope but it was not perfect. The clouds kept interrupting and alignment was not got well.

I arrived at the telescope at 11.30pm after much earlier in the evening setting up the camera with Tom and Bob, both who would be running the Maungatapere telescope. Around midnight the sky was clear but it would not last and during this time we tried in vain to obtain the field where Pluto was but we kept losing out to the clouds. We were using a second laptop running Stellarium as a field finder but it was difficult. The finder on the telescope needed to be larger to give a better view of where we were aiming. A bright Green Laser helped but it was still not easy. The observatory has a roll-on roll-off roof with electric motors to open and close the heavy roof; this gave a great view of the sky although at one point it did rain but that soon cleared. Although half of the sky remained clear; unfortunately by the time of the event, 4.50am, the part of the sky we were trying to observe was clouded over and therefore we were unable to obtain any data of the field. Although Peter and I were running the telescope we had assistance from two of the society members; one of them was the President Terry Hickey who was instrumental in allowing us to have full use of the telescope.



**Northland's Astronomical Societies C14 pointing into a rare clear sky**



**The C14 on a Losmandy Heavy duty mount and driven by Gemini II software in the Northland Astronomical Society dome.**

**Image courtesy of Gordon Hudson**

## PLUTO EVENT FROM MAUNGATAPERE JUNE 30TH 4.50AM GORDON HUDSON

I left Wellington on Monday June 22nd at twelve noon to fly to Auckland to meet up with four Americans who I was to look after and set two of them on their way to Napier.

I arrived in Auckland on time at 1.30pm. The first American was due to arrive at 3.30pm; however this did not happen as there was a mix up with flights and times. The first to arrive was Bob, at 5.50pm, the next to was Larry and Jason at 7.30pm.

Much of the delays were caused by Customs as they were bringing in all sorts of gear and this had to be checked before it was allowed into the country.

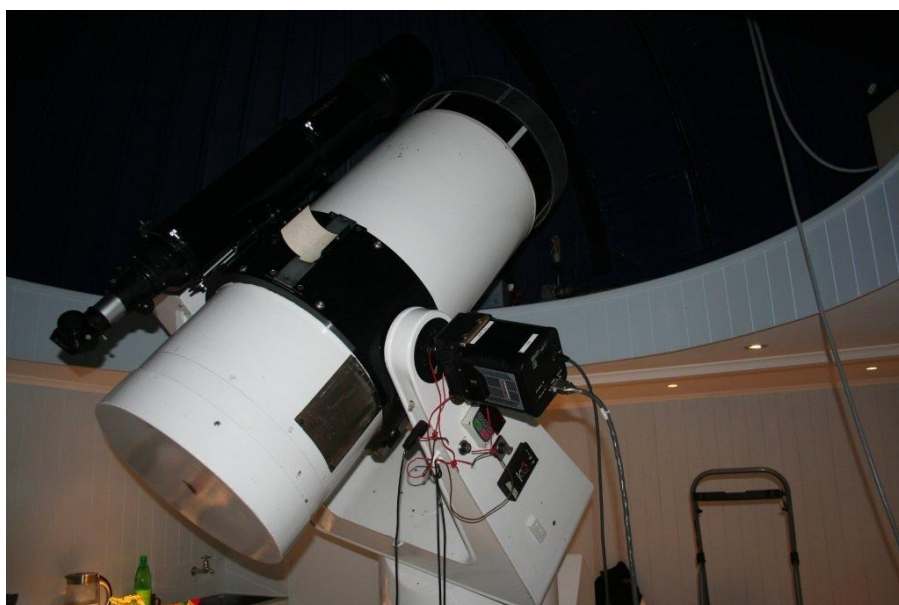
In the meantime Bob and I tried to retrieve the Nirvana IR camera from the customs agent FedEx. It turned out there was two cameras a ProEM camera as well as the Nirvana. This was turning out to be a nightmare. The camera which is an infrared camera has a value of \$120,000US and the ProEM was \$25,000US and although it was only in the country for 10 days the customs wanted GST paid on them. Fortunately Princeton Instruments has an agent in Auckland who was looking after these cameras. But they couldn't get until the GST was paid, just a mere \$17,500. Special approval had to come from Adelaide in Australia where a board meeting had to be

with Jane and Brian Painter.

The next day we drove to Maungatapere about 15km west of Whangarei and began setting up the camera on the 18" Nasmyth telescope belonging to Neil Shepherd of Maungatapere Electrical. This was not going to be straight forward as this camera weighs 5kg. The problem was how to attach it to the telescope. A special holding bracket was made in the US which would hold the camera, however it still had to be attached to the fork of the telescope. I did this using a low profile focuser of mine and a special mounting plate which I made up before I came to Whangarei. This worked perfectly. Focusing was very simple and was only 2mm out when first mounted the camera and tested. The driving system of the telescope worked well and the camera had its own Laptop with special software. This worked very well during testing, however the weather was going to play its part and this was disappointing. We worked each night through broken cloud, and sometimes rain, but we never actually got onto the field because of the cloud.

The night before the event, Sunday 28th, we stayed up all night waiting for a clear patch to appear but did not occur. The next night, Monday 29th, was the evening of the event and we first visited the Northland Astronomical Society to use their Celestron 14" and we set up the Pro-EM camera on this telescope to try for the event.

This was the telescope and camera I was would be using. Tom and I arrived at 9.30pm and we set up and then waited for the sky to clear. While waiting I took several photographs before heading to the Northland Society's telescope. At 11.30pm, I left Maungatapere and went to Manu where the Celestron C14 is housed (about 10km back towards Whangarei). The weather was going to be a problem although it did appear to be clearing. It did so for half of the sky, but unfortunately the wrong half, and at 4.50am event time it was still cloudy. The event was not observed from Maungatapere due to the of cloud, which cleared about an hour after the event. There was much searching of the images after the event in the faint hope that they might have got something through the cloud, but it was not to be.



**The 18" Nasmyth Reflector with the Nirvana IR camera attached**

Jason was bringing in, as baggage, a Princeton Instrument camera called a ProEM. This required special customs clearance as this was valued at \$25,000US and needed to be checked in and out again when it left the country.

We were booked into the Holiday Inn near the airport where we stayed the night. Next morning we went back to the airport to hire two rental cars. One car would travel with me and Bob to Whangarei while the other vehicle needed to be a 4-wheel drive as they had to pick up one of the Meade 14" telescopes which was sitting in a customs clearing shed waiting for collection. This went through without a problem so we loaded the telescope which was in a JMI carrying case into the 4-wheel drive and Larry and Jason departed for Napier.

held to pass this amount of money. In the meantime Bob and I were hanging around waiting and so we spent another night near the airport while we waited for the camera fees to be paid.

Next morning the other half of our team arrived from Singapore this was Tom who actually works for Princeton Instruments as their Asia Pacific Sales Manager. Tom was in charge of this camera and it was released to him on his arrival. We loaded it into the back of his vehicle which was a 4-wheel drive Nissan.

Eventually we left Auckland airport and headed for Northland. A brief stop at JayCar on Wairau Road to buy the adaptors and cables that might be needed for connecting the camera. We arrived in Whangarei at 5pm; where we were to stay



## Report from the Observatory Steering Group: Duncan Hall

First, the good news: WAS has received the bequest of \$250,000 from the estate of the late R. S. ('Syd') Cretney. In a letter dated June 12, the executors of Syd's estate accepted the plan (the preferred option) developed by the Observatory Steering Group (OSG) that met the conditions of Syd's bequest.

The plan is for WAS to work together with the Gifford Observatory Trust to install an automatic remote controlled internet-connected telescope (and other necessary infrastructure) at the Gifford observatory. WAS members will have preferential access and be trained to operate the observatory remotely using the Internet.

We'll acknowledge Syd's generous bequest by naming the installation after him, perhaps as the "Cretney Virtual Observatory".

Now the hard work starts.

The OSG has continued to exchange emails over the last few weeks.

The most recent face-to-face meeting was held July 1.

Syd's bequest is being held in a low risk interest-bearing account, at competitive interest rates.

The next most immediate steps are:

[1] Receive and consider advice from WAS's legal advisors in this matter (WCM Legal) as to the form of legal arrangement that would best work to create an enduring way of honouring Syd's bequest. We must be careful to follow the plan that we have agreed with the executor of Syd's estate and use the money for purposes outlined in the bequest.

[2] Enhance the physical security at the Gifford Observatory.

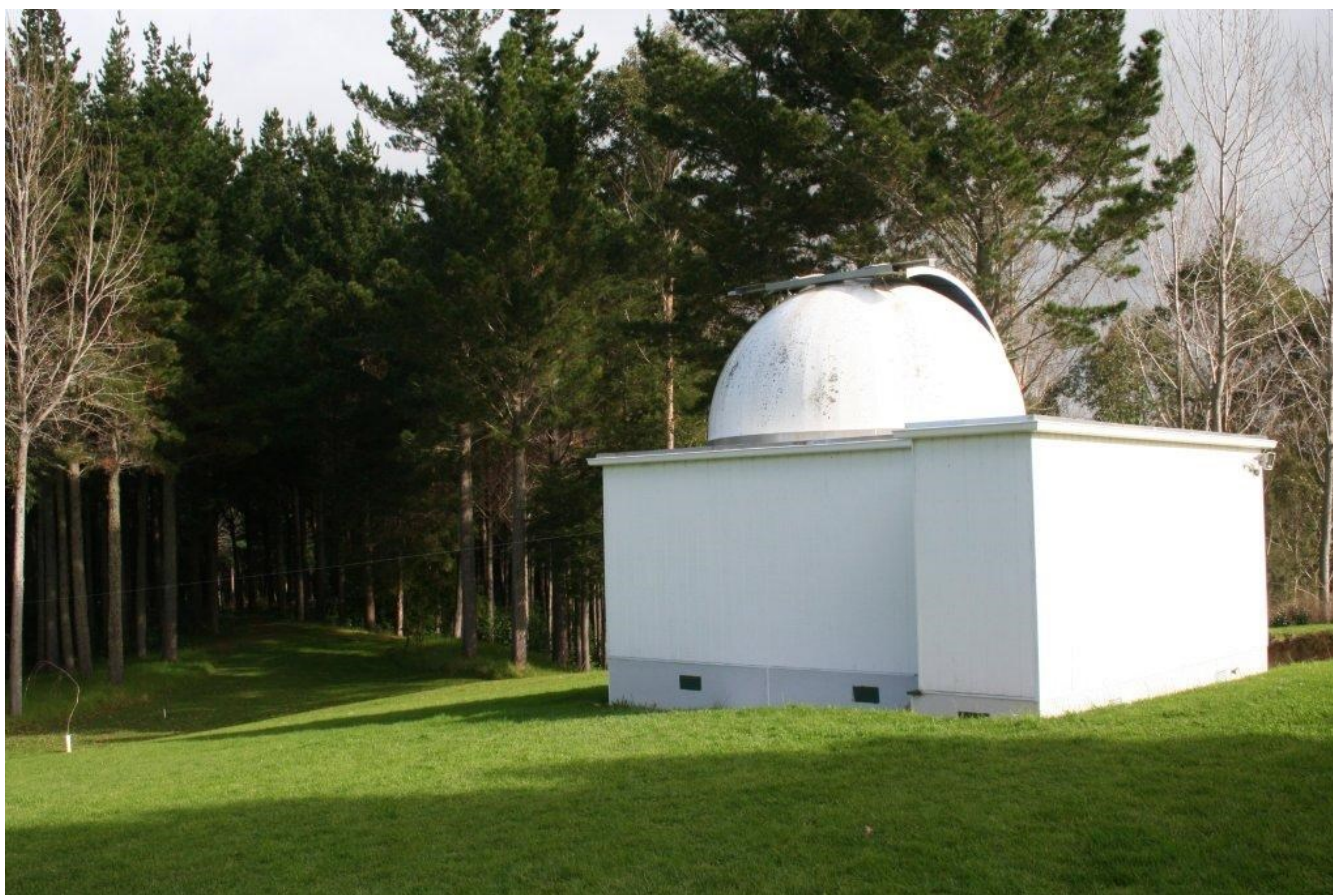
Additional external sirens and some external movement-sensitive spotlights would be good measures to start with.

[3] Replacing the existing power and security cables along with a new fibre optic Internet connection underground.

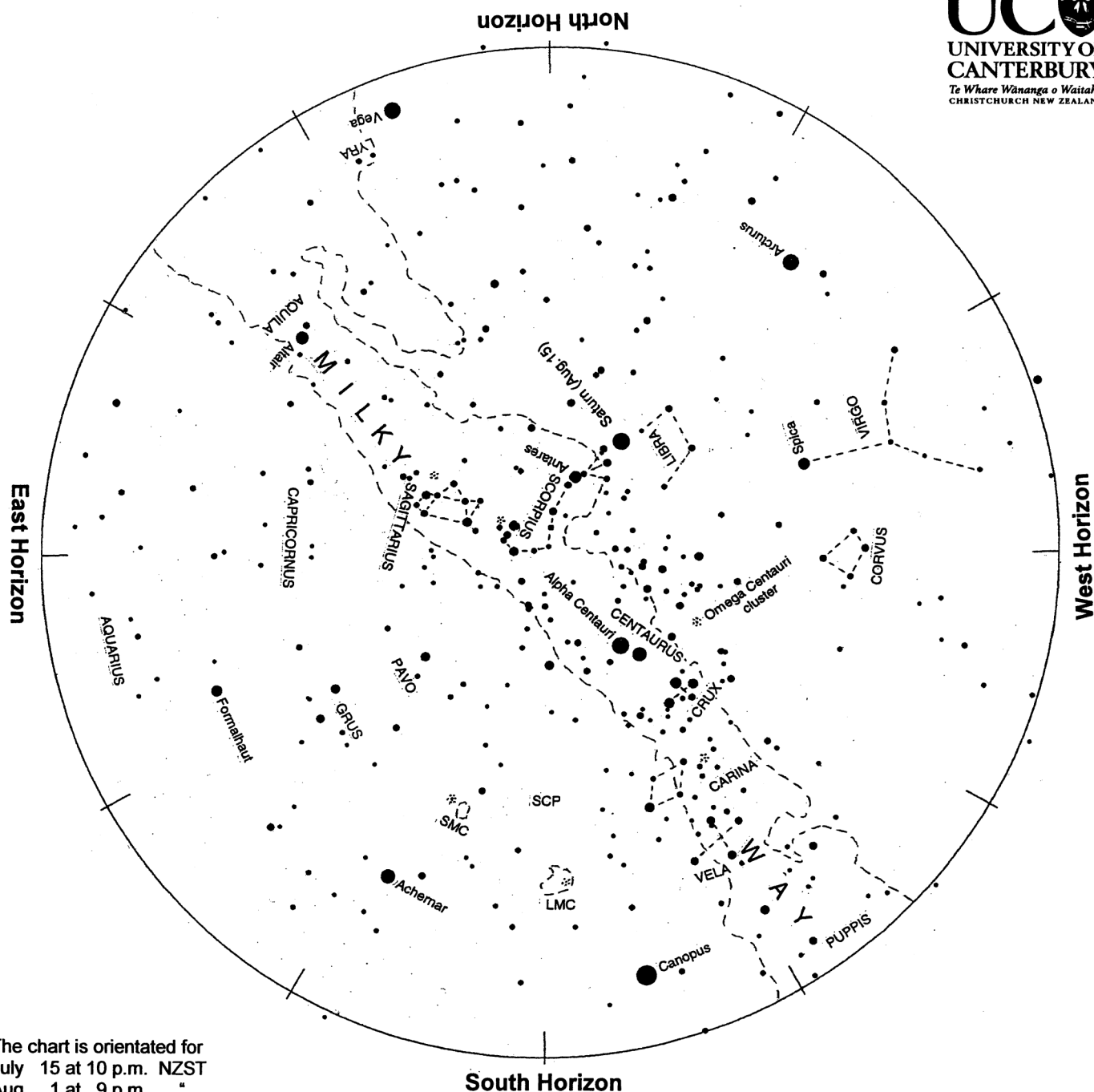
[4] Plan further details of automating the observatory. There's a lot more work here.

This project is an exciting step forward for WAS.

The plan is to deliver a facility that allows WAS members to observe from the comfort of home, driving a substantial telescope using their mouse or trackpad



Maungatapere Observatory owned by Neil Shepherd Image courtesy of Gordon Hudson



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.

## 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 bil-

lions 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<sup>13</sup> 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.

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

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