



# ROYAL ASTRONOMICAL SOCIETY OF NEW ZEALAND CONFERENCE 2021

*Celebrating the Centenary of RASNZ*

**9 - 11 JULY 2021**

Held at Te Wharewaka Function Centre on the  
Wellington waterfront

*(Followed by a Dark Sky Workshop - 12 July)*



**HOSTED BY THE  
WELLINGTON ASTRONOMICAL SOCIETY**

Promoting astronomy in and around the Wellington region

# RASNZ CONFERENCE 2021



## CONFERENCE HOST

### THE ORGANISERS GRATEFULLY ACKNOWLEDGE THE ASSISTANCE OF OUR CONFERENCE HOST



The Wellington Astronomical Society is an incorporated society for anyone who is interested in stars, planets, space or any other topic related to astronomy.

Members include experienced and distinguished astronomers, but they also cater for the interest of beginners who come from a diverse range of age groups and professions.

The aim is to let people enjoy astronomy through a friendly and helpful atmosphere.

They have regular meetings, with talks on astronomy topics. The talks are suitable for all audiences.

Observation evenings are held once a month at Tawa college. Both members, non members are welcome to attend. Children are welcome. At these evenings there are a number of different telescopes available to try.

Their newsletter is full of articles by members and developing news about the society and astronomy. Find out more at [was.org.nz](http://was.org.nz)

## CONFERENCE PARTNER

THE HOST ORGANISATIONS, RASNZ AND WAS, GRATEFULLY ACKNOWLEDGE OUR CONFERENCE PARTNER



Astronz supports the New Zealand astronomical community, providing quality equipment at affordable prices. Their team of experienced astronomers provides advice and support, furthering astronomy and science education.

- High quality telescopes, including; Newtonian, Schmidt, Cassegrain & Ritchey-Chretien
- Equatorial, Alt-Az and automatic "Go-To" and tracking mounts for telescopes
- Camera and binocular tripods
- Wide range of astrophotography accessories and tracking mounts for DSLR cameras
- See their range of well priced products for beginners

Drop by the Astronz display during the Conference to try out their demo equipment and find out about their special Conference Deals.

## CONFERENCE SPONSORS

THANKS ALSO TO ANNE FRENCH CONSULTING LTD FOR SPONSORING THE NOTEPADS & CRANIUMS FOR SPONSORING THE PRINTING OF THE PROGRAMME

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## INVITED SPEAKERS

## DR HÉLOÏSE STEVANCE



Originally born and raised in France, H lo se moved to the UK to study Physics and Astronomy at the University of Sheffield. After working as a support astronomer at the Isaac Newton Group in La Palma for a year, she obtained her Master of Physics in 2015.

H lo se subsequently started a PhD studying the 3D shape of core collapse supernovae and earned her title in Spring 2019. In July of that year, she joined the University of Auckland as a Research Fellow to research the evolution of massive stars to better understand how they die and produce supernovae and kilonovae.

H lo se also started her public outreach work during her doctorate studies in early 2016 and hasn't stopped since

## DR PAULINE HARRIS



Dr Pauline Harris is from the tribes Rongomaiwahine, Ng ti Rakaipaka and Ng ti Kahungunu. She is a Senior Lecturer for the Centre for Science and Society at Victoria University of Wellington (VUW). Dr Harris is an astrophysicist who has specialized in high energy neutrino production and inflationary cosmology.

Dr Harris' research currently focuses on m tauranga M ori associated with M ori astronomy, M ori calendars called maramataka, as well as climate change. Currently, Dr Harris is the Chairperson of the Society for M ori Astronomy Research and Traditions (SMART). She is also the Principal Investigator for the Marsden funded project called Ng  Takahuringa   te Ao: The Effect of Climate Change on Traditional M ori calendars.

Most recently Dr Harris has been appointed to the Matariki Advisory Group to determine the date and advise on the Matariki holiday.



John Drummond has been fascinated with astronomy ever since his mother pointed the 'Pot' in Orion out to him when he was ten. John soon developed an interest in photography, and it wasn't long before the two passions were combined into astrophotography.

He has been involved in astrophotography for many years and has had photos published in books and magazines around the world – and even on some New Zealand stamps.

He has used his telescopes at Possum Observatory, near Gisborne, (E94) to image targets for Ohio State University in order to co-discover exoplanets via the microlensing method. He helped discover one of the first known Earth-mass planets orbiting one member in a binary star system, which was published in Science. John also does astrometry of newly discovered comets – as well as those of more well-known orbits.

John completed his MSc (Astronomy) in 2016 with Swinburne University of Technology. Currently he is doing his PhD with the University of Southern Queensland's (USQ) Centre for Astrophysics. His work is on New Zealand's historical role in the observation and study of comets. He is also heavily involved with the Royal Astronomical Society of New Zealand and was made a Fellow in 2018. He teaches science at high school and runs an astrotourism business – Gisborne Astro Tours ([www.gisborneastrotours.co.nz](http://www.gisborneastrotours.co.nz)).

He uses a 0.5-m (20") GoTo Dobsonian telescope and a 0.4-m (16") Dobsonian telescope for these visual tours of the universe.

## MIHI WHAKATAU

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The hui (conference) will be opened on Saturday morning with a Mihi Whakatau. This is a form of welcome that follows tikanga Māori (principles and values):

- to mihi is to acknowledge and greet
- whakatau is to settle

The Mihi Whakatau process has as its intention in the coming together of two groups to unite as one.

The Mihi Whakatau will be given by kaumatua Matua Matiu Julian, Kaikorero, Te Wharewaka o Pōneke

## RASNZ CONFERENCE CODE OF CONDUCT

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We are dedicated to providing a harassment-free conference experience for everyone regardless of gender, gender identity and expression, sexual orientation, disability, physical appearance, body size, race, age or religion.

We do not tolerate harassment of conference participants in any form. Sexual language and imagery is not appropriate for any conference venue, including talks.

Conference participants violating these rules may be sanctioned or expelled from the conference without a refund at the discretion of the conference organisers.

## RASNZ COUNCIL MEETING

10:00am – 3:00pm

SpacePlace Library

## GUIDED WALKING TOUR OF ASTRONOMY

1:00pm – 3:00pm

### Wellington Botanic Gardens

Meet under the sails next to Wellington Museum and the TSB Arena. Bring a face mask and be aware that unless you have a SuperGold card the Cable Car fare is \$5.

## AFFILIATED SOCIETIES MEETING

4.00pm – 5:00pm

Te Wharewaka Function Centre

## SESSION 1 – CHAIR : PETER FELHOFER

7:00pm – 9:00pm

- Welcome: RASNZ President and WAS Representative (5 min)
- Official Opening: A Constellation of former RASNZ Presidents (10 min)
- Fellows' Address: John Drummond: Some pot got me into astronomy (45 min)
- Refreshments and socialising

## SWAPA BREAKFAST

7:30am

Venue: *The Dwellington*

## SESSION 2 - CHAIR : NICK RATTENBURY

9:00am - 10:40am

9:00am - **Mihi Whakatau**: Kaumatua Matua Matiu Julian, Kaikorero, Te Wharewaka o Pōneke

9:10am - **SWAPA mini-session 1 (2020 cohort)**

9:30am - **Nalayini Brito**: The Story of ASTRONZ's unique contribution to NZ Astronomy

9:50am - **Ilija Tolich**: New Space New Zealand

10:10am - **Richard Easther**: Lighting the dark: Understanding the early universe

10:30am - **Andrew Buckingham**: ASTRONZ presentation

## MORNING TEA

10:40am - 11:10am

## SESSION 3 - CHAIR : ROLAND IDACZYK

11:10am - 12:55pm

11:10am - **SWAPA mini-session 2**

11:30am - **Andrew Rakich**: Telescope metrology on large telescopes and next-generation active optics

11:50am - **Cameron McEwing**: Calculating extragalactic distances using remote online telescope services

12:10pm - **Héloïse Stevance**: The most luminous supernovae: It takes two to tango

## CONFERENCE PHOTO

12:55pm

## LUNCH

1pm - 2pm

## SESSION 4 - CHAIR : STEVE BUTLER

2:00pm - 3:30pm

2:00pm - **Chris Gordon**: The effect of kick velocities on the spatial distribution of millisecond pulsars and implications for the galactic centre excess

2:20pm - **Petra Nianqi Tang**: Estimating power spectral density parameters of the stochastic gravitational wave background for LISA

2:40pm - **Hamish Barker**: Spectroscopy of suspected giant eclipsing binary ASASSN-21co

3:00pm - **John Hearnshaw**: The New Zealand Astronomical Society: The first 50 years

## AFTERNOON TEA

3:30pm - 4:00pm

## RASNZ ANNUAL GENERAL MEETING

4:00pm - 5:00pm

## MEETING OF SWAPAS AND GUEST SPEAKERS

4:00pm - 6:00pm

## PRE-DINNER DRINKS TO VIEW THE MATARIKI FIREWORKS DISPLAY

6:15 pm - 7:00pm (Fireworks start at 6:30pm)

Join us upstairs at Te Wharewaka Function Centre for the best view in town for Wellington's biggest fireworks display of the year! Entry with dinner tickets only.

## CONFERENCE DINNER

7:00pm

Presentations and Awards will be announced during the evening.

- Murray Geddes Prize
- President's Award
- Bright Star Award
- After Dinner Speaker: Tipi Wehipeihana

The theme for this year's dinner is constellations - come dressed as your favourite constellation from any culture for a chance to win a prize!

Please note that your registration for dinner will be checked as you enter the event.

**SESSION 5 - CHAIR : NALAYINI BRITO***9:00am - 10:20am**9:00am - **Aayushi Verma**: Characterising the activity of new comets and active asteroids observed in the LOOK Project**9:20am - **Nick Rattenbury**: The Kerr-Tinsley Centre of Research Excellence**9:40am - **Ed Budding**: Dark secrets in close binaries**10:00am - **JJ Eldridge**: Understanding the stars that make ripples in gravity***MORNING TEA***10:20am - 11:00am***SESSION 6 - CHAIR : FINLAY MABLY***11:00am - 12:30pm**11:00am - **John Drummond**: New Zealand Observations of the Great Comet of 1881**11:20am - **Amelia Cordwell**: Asteroid lightcurves in the MOA-II Survey**11:40am - **Pauline Harris**: The Revitalisation of Matariki and Puanga and the establishment of a National Holiday***LUNCH***12:30pm - 1:30pm***SESSION 7 - CHAIR : MARILYN HEAD***1:30pm - 3:00pm**1:30pm - **Glen Rowe**: The multidisciplinary domain of the astronomers on Cook's three voyages to the Pacific: a New Zealand perspective**1:50pm - **Wouter van Zeist**: Riroriro: A tool for simulating gravitational waves and evaluating their detectability**2:10pm - **Euan Mason**: A statistical model of sunspot cycles II: How good was the prediction and what is predicted for the next cycle?**2:30pm - **Yvette Perrott**: An unusual high-frequency galaxy cluster minihalo**2:50pm - **Peter Felhofer**: Presentation of 2022 RASNZ Conference from the Northland Astronomical Society**3pm - **Conference Closure*****PUBLIC TALK - DR HÉLOÏSE STEVANCE***4:00pm - 5:00pm - Te Wharewaka**Wibbly Wobbly Smashy Crashy: Black hole and Neutron Star mergers*

## DARK SKY WORKSHOP

9am - 12:30pm

Te Wāhanga Atawhai Mercy Conference Centre  
15 Guildford Terrace, Thorndon, Wellington



## HÉLOÏSE STEVANCE (SESSION 3)

*The most luminous supernovae: It takes two to tango*

When massive stars reach the end of their lives they undergo a supernova explosion powered by the collapse of their core. In the past decade and a half, a small subset of these events have been found to be brighter and more powerful: they are called super-luminous supernovae. Work is ongoing to understand the power source of these extreme transients and in particular here focus is on SN 2017gci which showed evidence for a central magnetar and potential shells of hydrogen around the progenitor systems. State of the art binary models were used to search for star systems that could evolve to re-create this explosion.

## PAULINE HARRIS (SESSION 6)

*The Revitalisation of Matariki and Puanga and the establishment of a national holiday*

The revitalization of Māori astronomy has led to the growing desire for communities to reconnect and reclaim ancestral knowledge of the sun, moon and stars. Within Māori astronomy sits a framework of time called the maramataka, the Māori calendar system, that alongside celestial knowledge, weaves environmental and ecological knowledge which is used to understand and track time. Matariki and Puanga are some of the main stars within the maramataka that signify the Māori New Year.

As New Zealanders learn and engage in Matariki and Puanga celebrations, Māori communities are growing and regaining their knowledge and cultural practices associated with these stars. With the Prime Minister earlier this year announcing that Matariki is to be a national holiday, Pauline will discuss the different ways that Māori and non-Māori communities are currently celebrating this time and how New Zealanders can learn to celebrate and honour the Māori New Year together with greater cultural understanding.

## JOHN DRUMMOND - FELLOWS' TALK

*Some pot got me into astronomy*

One summer night, many years ago, John's mother pointed 'The Pot' in Orion out to him. At that instant, it was as if the celestial heavens were opened and poured into John's young soul. John has been obsessed with astronomy ever since. This talk is a light-hearted meander from that night until the present, where the highs and lows of John's astronomical (and personal) journey will be reminisced upon...

## SWAPA SESSION 1 (2020 COHORT)

- Chester Hall-Fernandez    Astrophotography
- Krisha Kumar                A journey through time
- Max Bateman                Astronomy in New Zealand
- Laura Doyle                 Universal unknowns

## NALAYINI BRITO

*The story of ASTRONZ's unique contribution to NZ Astronomy*

This talk is about ASTRONZ's place within the NZ astronomical community, what it offers both expert and hobbyist astronomers, its operating model, what sponsorship and charitable activities it funds and plans to fund and what its vision for the future is.

## ILIJA TOLICH

*New Space New Zealand*

Set up in 2016, the New Zealand Space Agency is the lead government agency for space policy, regulation and sector development. This talk will outline the NZSA's role in supporting the New Zealand space sector, our ongoing projects, and the issues arising from a rapidly changing global space sector.

## RICHARD EASTHER

*Lighting the dark: Understanding the early universe*

The visible universe is roughly 60 orders of magnitude larger than the Planck length, where classical spacetime gives way to quantum foam. With the addition of dark matter and dark energy, established physics can give a solid account of the evolving universe for all but first trillionth of a second following the Big Bang. However, much of the growth of the universe happens in this first trillionth of a second and it plays a key role in "setting the stage" for the subsequent evolution of the universe. In particular, during this epoch the universe may be filled with self-gravitating quantum matter whose rich and complex dynamics are largely unexplored. Understanding this phase is the focus of much of the Auckland cosmology group's current work, which has the goal of producing a complete account of the evolving universe from the Big Bang to the present day.

## SWAPA SESSION 1 (2021 COHORT)

- Saniya Kansal           Black holes
- Iris Royds               Youth and the second space age
- Sanat Singh             Using science for social enterprise
- Emily Bergman         Astronomy and me

## ANDREW RAKICH

### *Telescope Metrology on large telescopes and next-generation active optics*

The Giant Magellan Telescope (GMT) is a 25 m telescope composed of seven 8.4 m “unit telescopes”, on a common mount. Each primary and conjugated secondary mirror segment will feed a common instrument interface, their focal planes co-aligned and co-phased. During telescope operation, the alignment of the optical components will deflect due to variations in thermal environment and gravity induced structural flexure of the mount. The ultimate co-alignment and co-phasing of the telescope is achieved by a combination of the Acquisition Guiding and Wavefront Sensing system (AGWS) and two segment-edge-sensing systems<sup>2</sup>. An analysis of the capture range of the AGWS indicates that it is unlikely that that system will operate efficiently or reliably with initial mirror positions provided by open-loop corrections alone.

Since 2016 GMT have been developing a telescope metrology system, that is intended to close the gap between open-loop modelling and AGWS operations. A prototyping campaign was initiated soon after receipt of laser metrology hardware in 2017. This campaign is being conducted in collaboration with the Large Binocular Telescope Observatory (LBTO), and hardware was first deployed on the LBT in August 2017. Since that time the system had been run and developed over some hundreds of hours on-sky. It has been shown to be capable of reliably measuring the relative positions of the main optics over ~ 10 m to a repeatability of ~ 1-2 microns RMS. This paper will describe the prototyping campaign to date, the basic design of the system, lessons learned and results achieved. It will conclude with a discussion of future development efforts

## CAMERON MCEWING

### *Calculating extragalactic distances using remote online telescope services*

With the advent of affordable remote online telescope services that are accessible over the internet, the possibility for amateur astronomers and students to do authentic science and add to our knowledge of the universe has significantly expanded. This paper will look at the practicalities of using images collected from online remote telescope services, along with photometric tools (like AAVSO's VPhot,) to calculate extragalactic distances by capturing the early lightcurves of Type 1a supernovae.

**CHRIS GORDON**

*The effect of kick velocities on the spatial distribution of millisecond pulsars and implications for the galactic centre excess*

Recently it has become apparent that a galactic centre excess (GCE) of gamma rays is spatially correlated with the stellar distribution in the galactic bulge. This has given extra motivation for the unresolved population of millisecond pulsars (MSPs) explanation for the GCE. However, in the "recycling" channel the neutron star forms from a core collapse supernovae that undergoes a random "kick" due to the asymmetry of the explosion. This would imply a smoothing out of the spatial distribution of the MSPs. The team use N-body simulations to model how the MSP spatial distribution changes. The probability distribution of natal kick velocities are estimated using the resolved gamma-ray MSP proper motions, where MSPs have velocities relative to the circular motion of  $77 \pm 6$  km/s. It is found that, due to the natal kicks, there is an approximately 10% increase in each of the bulge MSP spatial distribution dimensions and also the bulge MSP distribution becomes less boxy but is still far from being spherical.

**PETRA NIANQI TANG**

*Estimating power spectral density parameters of stochastic gravitational wave background for LISA*

Complementary to electromagnetic waves, the detection of gravitational waves (GWs) can lead astrophysics to dive deeper to the understanding of our Universe. Only until the last decade the detections of GWs have become possible. As we expand our search we bring on more challenges. One of these challenges is how do we resolve stochastic gravitational wave background (SGWB). My research uses the Bayesian parametric algorithms to unfold the properties of GW signals. More specifically, my research estimates the power spectral density of mock SGWB signals for the Laser Interferometer Space Antenna (LISA) in the millimeter frequency band. In this talk I will discuss my computational models and some current results using Bayesian parametric models using a Python package PYMC3 and end with further research ideas.

**HAMISH BARKER**

*Spectroscopy of suspected giant eclipsing binary Asassn-21co*

Transient Asassn-21co (at coordinates corresponding to GAIA DR2 source id=6647970630972147840) has been observed with low resolution slit spectroscopy ( $R =$  approximately 350) using a 200mm reflector and Littrow spectrograph. Observations commenced from middle to end of an apparent 80 day eclipse duration. A spectrum similar to a Pickles database type M3iii has been observed during eclipse, with observations and analysis of post-eclipse spectra not yet clearly indicating the likely spectral type of the possible eclipsed body.

**JOHN HEARNshaw**

*The New Zealand Astronomical Society: The first 50 years*

I will trace the founding and development of the NZ Astronomical Society from 1920 to about 1970, using the society's minute books as a key source. The main people involved with the early society will be discussed.

## AAYUSHI VERMA

*Characterising the activity of new comets and active asteroids observed in the LOOK project*

Comets and active asteroids are small worlds in the Solar System that change rapidly on timescales of hours to days, requiring monitoring by telescopes spaced around the world. The LCO Outbursting Objects Key (LOOK) Project is a three-year Key Project, using the many robotic telescopes of the Las Cumbres Observatory (LCO) network to study the behaviour of dynamically new comets and to determine the frequency and nature of outbursts on small bodies across the Solar System.

Ayushi's Master in Astronomy research will bring the first data from the 1.8 m telescope at UC's Mt John Observatory into the LOOK collaboration, developing automated 1.8 m data reduction and providing calibrated photometry for LOOK targets observed during 2020-2021.

## NICK RATTENBURY

*The Kerr-Tinsley Centre of Research Excellence*

I present here a summary of the application made by NZ academic astronomers for funding the Kerr-Tinsley Centre of Research Excellence. The CoRE application has five themes, extending from cosmological research, through stellar population, computational astrophysics to proposing New Zealand's first space telescope mission.

## ED BUDDING

*Dark secrets in close binaries*

Black Hole (BH) stellar binaries are normally associated with exotic high-energy sources, but are there BHs lurking among 'classical' close binary systems? How surprised should we be about last year's discovery of a BH 'hiding in plain sight' alongside the double star HR6819? Is this a special case, or are there others even closer? We tagged a closer and brighter southern binary system for this arrangement, but there's doubt about its candidacy, so let's take a look at the evidence. Can such sneaky BHs give us any anxieties about the stability of our Galactic locality?

## JJ ELDRIDGE

*Understanding the stars that make ripples in gravity*

The 3rd observing run by the gravitational wave observatories of the LIGO/VIRGO consortia provided significant more information on the transient sources we observe in the Universe. We'll report on our work at the University of Auckland to understand the progenitors of gravitational wave events and how we can track back the initial masses of the stars and when in the Universe those stars were formed.

## JOHN DRUMMOND AND WAYNE ORCHISTON

*New Zealand Observations of the Great Comet of 1881 (C/1881 K1 Tebbutt)*

Comet C/1881 K1 was discovered on 22 May 1881 by Australia's leading nineteenth century astronomer, John Tebbutt, and went on to become a spectacular naked-eye object and one of the 'Great Comets' of the nineteenth century. In addition, its appearance was impeccably timed, and it ended up making major contributions to cometary photography and spectroscopy.

This paper will summarize observations of this comet made by New Zealand astronomers, including Archdeacon Arthur Stock, the astronomical observer at the Colonial Observatory in Wellington, who independently discovered it just one day after John Tebbutt. In order to provide an international context, the photographic and spectroscopic observations made by northern hemisphere astronomers will be outlined after this comet left New Zealand skies.

## AMELIA CORDWELL

*Asteroid lightcurves in the MOA-II survey*

The Microlensing Observations in Astrophysics (MOA-II) survey has performed high cadence, wide field observations of the Galactic Bulge since 2005 from the University of Canterbury Mt John Observatory.

Asteroid lightcurves can be used to determine their shapes, rotation rates and solar phase dependence. These are necessary for correctly interpreting other physical parameters and can tell us about the evolution of the asteroid population.

Amelia will discuss her work using existing MOA-II survey data to determine asteroid lightcurves and rotation rates.

**GLEN ROWE**

*The multidisciplinary domain of the astronomers on Cook's three voyages to the Pacific: a New Zealand perspective.*

It is commonly known that the main purpose of James Cook's first voyage to the South Pacific Ocean was to observe the transit of Venus in 1769. Although Cook himself was an accomplished astronomer, four other astronomers accompanied him during the course of his three voyages to the Pacific. What is less commonly known is that these astronomers also carried out observations other than celestial ones. This presentation will introduce the astronomers, their astronomical instrumentation and observations and provide an overview of the tidal, gravity and meteorological observations that they undertook in New Zealand, including the instrumentation used.

**WOUTER VAN ZEIST**

*Riroriro: A tool for simulating gravitational waves and evaluating their detectability*

Riroriro is a Python package that simulates gravitational waves from merging black holes or neutron stars and evaluates how detectable these would be for the LIGO/Virgo observatories. It is publicly available and published in JOSS. In this talk, we present the functionality of Riroriro, its usage in research involving stellar population synthesis to predict mass distributions, and ongoing research to extend Riroriro to simulate white dwarf binaries that would be observable by the under-construction space-based observatory LISA.

**EUAN MASON**

*A statistical model of sunspot cycles II: How good was the prediction and what is predicted for the next cycle?*

At the May 2010 RASNZ Conference I presented a statistical model of the magnitudes and shapes of past sunspot cycles, and then made a prediction for cycle 24. I'll compare the prediction with what actually happened and then make a prediction for cycle 25.

**YVETTE PERROTT**

*An unusual high-frequency galaxy cluster minihalo*

Relaxed clusters of galaxies sometimes host radio minihaloes at their centres -- small diffuse clouds of synchrotron emission produced by a population of high-energy electrons, the origin of which is still debated. This emission is much brighter at lower radio frequencies and is generally only detected up to ~1 GHz, but we have detected it at 15 GHz in one unusual case. This detection may discriminate between some of the mechanisms put forward as possibilities for producing the high-energy electrons.

### WAYNE ORCHISTON

*Politics, personalities and astronomy: Farewelling the historic Carkeek Observatory*

In 1867 Stephen Carkeek, the Collector of Customs in Wellington, took early retirement and moved to Featherston in nearby Wairarapa, where he planned to combine farming with his passion for astronomy. Accordingly, he built a commodious wooden observatory with a hexagonal dome room and an adjacent transit room and office.

The remains of this observatory—the oldest surviving example of an astronomical observatory in New Zealand—was ‘discovered’ in 1987 by the late Sid Cretney and Tony Dodson and its condition has been monitored ever since. For more than three decades the Carkeek Observatory continued to deteriorate, then in 2020 it was reviewed by Heritage New Zealand and described as an important component of the nation’s scientific heritage. Research by Heritage New Zealand historians also revealed that this may be the last surviving example in the world of a Romsey-style observatory.

In this poster paper we report on the current status of Carkeek Observatory and assess its international significance. We also discuss the major lessons we learnt as astronomers in delaying a formal heritage listing of Carkeek Observatory for so long.

### WAYNE ORCHISTON

*The marine telescope made by J.H. Marriott in 1844: New Zealand's first telescope*

New Zealand’s first professional manufacturer of telescopes was an Englishman, James Henry Marriott (1799–1886), who learnt his trade from his father before settling in Wellington in January 1843. Between 1849 and 1873 Marriott placed no less than 242 advertisements in one of the local newspapers, and from 1853 listed himself as a “Telescope Manufacturer”. It is interesting that none of these advertisements specifically mentions ‘astronomical’ telescopes, notwithstanding the succession of naked eye comets, not to mention the 1874 transit of Venus, that graced New Zealand skies at this time.

In this poster paper Marriott’s training as a scientific instrument-maker in England and the extent to which he put these skills into practice while living in New Zealand is discussed before describing the sole Marriott telescope which has been tracked down. This is a marine telescope that was made in 1844, is now owned by the author of this paper, and is believed to be the first telescope ever made in New Zealand.

### JOHN DRUMMOND AND WAYNE ORCHISTON

*Seven hundred and fifty years of cometary astronomy in Aotearoa New Zealand*

'Great Comets'—spectacular comets of naked eye magnitude with impressive evolving tails and entertaining heads that throw off filaments as they rotate—have peppered the skies of Aotearoa/ New Zealand ever since our island-subcontinent gained its first human inhabitants around AD 1250. Before the arrival of Cook in 1769 it is known that about 25 Great Comets were enjoyed by Maori astronomers, and after European settlement Great Comets made an appearance in 1843, 1845, 1858, 1861, 1865, 1874, 1880, 1881, 1882, 1887 during the nineteenth century alone. More have greeted us during our lifetimes. Some of these, for example Comet 1P/Halley, are regular visitors, while others, like the amazing Kreutz Sungrazers of 1843, 1880, 1882, 1887, 1963, 1970 and 2011 are but fleeting visitors.

In this poster paper we will explore some of these comets and observations made of them by NZ astronomers, amateur and professional, and also meet comets discovered by New Zealanders.

### WAYNE ORCHISTON

*Introducing William Mein Smith: Wellington's first resident European astronomer*

Wellington received its first influx of Western settlers in the early 1840s, and amongst these were two trained surveyors, William Mein Smith and Robert Sheppard, who had an interest in astronomy, and a professional telescope-maker, James Henry Marriott. Smith reported observations of the Great Comets of 1843 and 1844–1845 in local Wellington newspapers, while Sheppard submitted a report on the latter comet in one of these newspapers and also a short report that was published in Monthly Notices of the Royal Astronomical Society. In this poster paper we identify William Mein Smith as Wellington's first European astronomer, and we discuss his observations of the two Great Comets.

### WAYNE ORCHISTON AND DARUNEE LINGLING ORCHISTON

*From taro to kumara: the changing ecology and astronomical system of the initial Polynesian settlers of Aotearoa New Zealand*

When Europeans first settled Aoteroa/New Zealand in the nineteenth century they found that the indigenous people, the Māori, had an astronomical system that was closely linked to human ecology and was used to track the seasons and regulate horticultural, fishing, bird-hunting and other ecological activities.

In this poster paper we will begin by outlining how the Māori astronomical system found in the nineteenth century was related to kumara cultivation. We will then look at the initial Polynesian settlement of Aotearoa/New Zealand about 770 years ago, and explore ways in which the ancestral astronomical system that was brought from the Society Islands-Marquesas area of the Central Pacific with the first occupants had to evolve in response to the major ecological changes that were required for survival in this strange new land.

### WAYNE ORCHISTON AND GLEN ROWE

*New Zealand observations of the total solar eclipse of 1885: an amazing widely observed public spectacle*

On 9 September 1885 a total solar eclipse was visible across the centre of New Zealand, with the path of totality extending from Waipawa and near Wanganui in the North Island to Blenheim and just south of Wakefield in the South Island. The centre-line ran through the following towns: Masterton, Otaki, Paraparaumu and Collingwood. This eclipse followed the landmark solar eclipses of 1868 and 1871, and it was expected that photographic and spectroscopic observations would lead to further breakthroughs in solar physics, but in fact this did not come pass. Instead, clear skies greeted those resident within or visiting the path of totality, and thousands of New Zealanders enjoyed the unforgettable spectacle of a total solar eclipse.

In this poster paper we will summarise and explain the unsuccessful scientific observations, before describing public views of this eclipse—the first visible from New Zealand following European settlement of the country.

### WAYNE ORCHISTON AND JOHN DRUMMOND

*Ronald McIntosh and the role of the amateur in New Zealand meteor astronomy*

Ronald McIntosh (1904–1977) was a journalist with a passion for astronomy, and in 1928 was the founded Director of the Meteor Section of the New Zealand Astronomical Society (later the Royal Astronomical Society of New Zealand). Supported by a small but very active group of fellow-observers, between 1929 and 1946 McIntosh published a succession of research papers in local and international astronomical journals (including the prestigious Monthly Notices of the Royal Astronomical Society), thereby demonstrating that amateur astronomers could still make a major contribution in this area of astronomy.

In this poster paper we provide biographical material on McIntosh, discuss his meteor observations and publications, and comment briefly on important non-meteor contributions he made to New Zealand astronomy.

### WAYNE ORCHISTON AND GLEN ROWE

*New Zealand's first astronomical observatories: the tent observatories used on Cook's voyages to the South Seas*

Following the success of Cook's First Voyage to the South Seas, two further expeditions to the Pacific were planned. Astronomers went on both voyages, and were supplied with telescopes, quadrants, astronomical clocks, chronometers and other instruments, as well as pre-fabricated tent observatories. In this poster paper we describe these portable observatories, and then relate how they were used by Bayly and Wales in 1773 and 1774 during the various Second Voyage stop-overs in New Zealand, and by Bayly, Cook and King during the Third Voyage stop-over in 1777.

### WAYNE ORCHISTON AND JOHN SEYMOUR (DECEASED)

*Captain J.D.R. Hewitt and amateur astronomy in Palmerston North*

Captain J.D.R. Hewitt was born in northern Ireland in 1840 and from 1852 served in the Royal Navy. He saw active service in the Baltic, North America and Africa, before settling in New Zealand 1873 and joining the Survey Department of the Wellington Province. Whilst so employed he conducted astronomical observations, including of the transit of Venus of 7 December 1882. Then when the Manawatu Philosophical Society acquired a 6.5-inch reflecting telescope in 1906 and set this up in a public observatory in downtown Palmerston North, Captain Hewitt became their resident 'astronomer', and he conducted public viewing sessions until his death in 1913. In this poster paper we review Captain Hewitt's astronomical observations and the role that he played in promoting public astronomy in Palmerston North.

### WAYNE ORCHISTON AND MARILYN HEAD

*Introducing 'Uncle Charlie': Algernon Charles Gifford, amateur astronomer extraordinaire*

Algernon Charles Gifford (1861–1948) was one of New Zealand most accomplished astronomers in the days when posts in professional astronomy were almost non-existent, and had to be content with a career as a secondary school teacher. While teaching at Christ's College in Christchurch (1889–1892) he came under the spell of the University's charismatic Professor A.W. Bickerton and spent several decades trying to provide mathematical proof of Bickerton's 'Partial Impact' theories. Quite separately, in 1924 and 1930 he published two papers—that later were highly acclaimed—about the meteoritic origin of lunar craters. At that time, most astronomers assumed lunar craters were volcanic in origin.

While at Wellington College (1895–1927), Gifford was recognised as a gifted teacher, and he inspired an astronomical interest in a generation of students, many of whom went on to distinguish themselves in amateur or professional astronomy. He also established the Wellington College Observatory, which opened in 1911 with a splendid 13-cm Zeiss refractor, and later was renovated as the 'Gifford Observatory'. Meanwhile, Gifford took astronomy beyond the confines of Wellington College through his column in the Evening Post newspaper, which eventually was reprinted as the 14-volume book *In Starry Skies*. In 1930 he founded a popular national astronomical society, 'Students of the Starry Skies', with the objective of establishing a research observatory in Central Otago with a 40-inch telescope. The Great Depression intervened, however, and when Gifford died in 1948, the society was wound up and its funds were transferred to Carter Observatory and used to purchase telescopes for schools. In this poster paper we outline the many achievements of this remarkable New Zealand astronomer in research, education and outreach.

### AAYUSHI VERMA

*Development of a data reduction pipeline for the 1.8-m Telescope at Mt John*

In this poster, I will be outlining my work developing an automated data reduction pipeline to reduce large datasets using the 1.8-m telescope at Mt John Observatory for non-MOA program datasets.

### JOHN HEARNshaw AND NALAYINI DAVIES

*The Aotearoa Astrotourism Academy*

We have formed AAA, the Aotearoa Astrotourism Academy, as an organization that will be delivering courses for the training of astrotourism night-sky guides, or for anyone who is interested in navigating the night sky. The courses will be delivered over two and a half days and cover all the basics for stargazing and for those excited by the beauty of the dark night sky. The elements of astrophotography will be included. The first course will be in Tekapo in September, and several courses a year in different venues around Aotearoa are planned. <https://aaanz.org>.

### DJANA BOGUNOVIC ET AL

*KiwiStar Optics' high resolution, low radial velocity spectrographs for exoplanet research*

The field of exoplanet detection has exploded since Mayor and Queloz reported a Jupiter-mass companion around the star 51 Pegasi in the Pegasus constellation in 1995. The discovery was enabled by ingenious optical engineering that implemented high precision calibration of the starlight delivered through an optical fibre into a thermally stabilized spectrograph (ELODIE spectrograph).

KiwiStar Optics has been involved in the manufacture of spectrographs and spectrograph components since the 2000s, when the Cassegrain echelle spectrograph at Mt John Observatory was replaced with HERCULES, New Zealand's only fibre-coupled Echelle spectrograph.

For the past 20 years KiwiStar has designed, manufactured, and installed optical components for spectrographs around the world including SALT HRS, HERMES, Espresso, Moons, and 4MOST; and the turnkey solution for the Hanle Echelle Spectrograph (HESP) for the Indian Institute for Astrophysics (IIA) at the 2 m Himalayan Chandra Telescope (HCT), India. The experience with HERCULES led to the NZ Foundation for Research, Science and Technology funding development of KiwiSpec, a spectrograph with an asymmetric white pupil design with small footprint. The initial prototype was trialed at Mt John in 2012; subsequent contracts have evolved the base KiwiSpec design into custom-made, high resolution, low radial velocity spectrographs that are ideal for exoplanet research on small to medium telescopes (1-4m) and in some cases even larger. These include:

- Minerva North Spectrograph for the Harvard & Smithsonian Center for Astrophysics at the Fred Lawrence Whipple Observatory at Mt. Hopkins, Arizona (an array of four 75cm telescopes)
- Minerva South Spectrograph for the University of Southern Queensland at Mt. Kent Observatory (an array of six 75cm telescopes)
- MAROON-X spectrograph for the University of Chicago at Gemini Observatory, Hawaii (8m Gemini telescope).

### **ALINE HOMES AND THE WAS-RAG COLLABORATION**

*Wellington Astronomical Society Research Astronomy Group (WAS-RAG)*

WAS-RAG is a group of members and non-members of WAS as well as several affiliates from beyond the Wellington region. Their aim is to contribute to scientific knowledge by active research and to facilitate an environment suitable to training and fostering new researchers, young and old. Most members of WAS-RAG are also associated with one or more sections of the Royal Astronomical Society of New Zealand (RASNZ), e.g. the Occultation Section or Variable Stars South (VSS).

Their main research activities include occultations (minor planet occultations and lunar occultations) and variable stars, in particular eclipsing binary stars. Techniques in use range from video monitoring to photometry, using either CCD cameras or DSLRs, and spectrometry.

This paper gives a brief overview of their current activities and some preliminary results.

## NOTES

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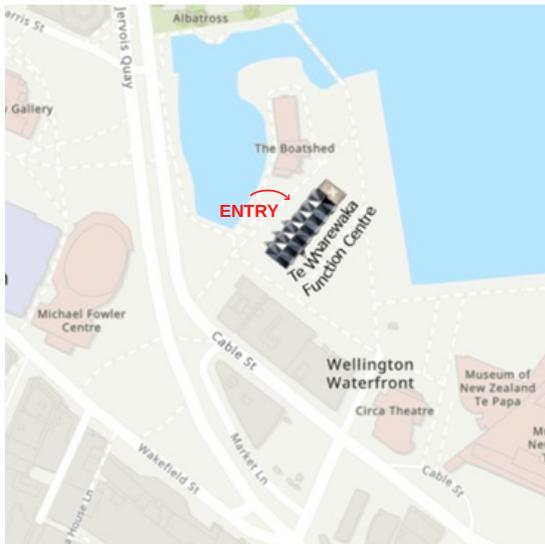
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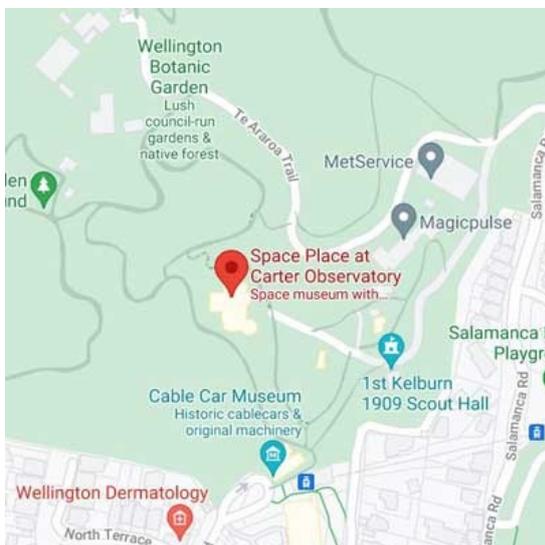
<b>Code</b>	<b>Organisation</b>	<b>Code</b>	<b>Organisation</b>	<b>Code</b>	<b>Organisation</b>
AAS	Auckland Astronomical Society	HAS	Hamilton Astronomical Society	SAS	Southland Astronomical Society
AAVSO	American Association of Variable Star Observers	IAU	International Astronomical Union	SWAPA	Students with a Passion for Astronomy
AMIDSR	Aoraki Mackenzie International Dark Sky Reserve	KSO	KiwiStar Optics	TDST	Twinkle Dark Sky Tours (Stewart Island)
ASTRONZ	Astronz	NAS	Northland Astronomical Society	UC	University of Canterbury
AU	University of Auckland	NPAS	New Plymouth Astronomical Society	WAS	Wellington Astronomical Society
CAS	Canterbury Astronomical Society	NSS	Nelson Science Society	WDS	Wairarapa Dark Sky Association
DAS	Dunedin Astronomical Society	NZSSA	New Zealand Student Space Association	WHAS	Whakatane Astronomical Society
GAS	Gisborne Astronomical Society	RASNZ	Royal Astronomical Society of New Zealand		

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