



BALLARAT  
ASTRONOMICAL  
SOCIETY

**28<sup>TH</sup> NATIONAL AUSTRALIAN  
CONVENTION OF AMATEUR  
ASTRONOMERS**

# NACAA Secretariat

Brett McMillan, *General Secretary*

Donna Burton, *Deputy General Secretary*

Peter Northfield, *Treasurer*

Judith Bailey, *Assistant Secretary (Communication)*

Peter Skilton, *Assistant Secretary (Archives)*

Trevor Kay, *2018 Convenor*

Sandy Galos, *2016 Convenor*

Saeed Salimpour, *Programme Committee Chair*

## 2018 Programme Committee

Saeed Salimpour *Chair*

David O'Driscoll

Donna Burton

Ray Johnston

James R Murray

John Wilkinson

Jacque Milner

Barry Adcock

## 2018 Local Organising Committee

Trevor Kay, *Convenor*

Judith Bailey, *Publicity*

Barry Adcock

Doug Stenhouse

Svantje Mertens

# NACAA

# XXVIII

BALLARAT, VIC

30 March – 2 April 2018

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Friday	Saturday	
<p>Note that lunch and morning/ afternoon teas marked ** are only for those registered for the relevant workshop, symposium etc.</p>	<p>Welcome and Keynote Address</p>	09:00
		09:15
		09:30
	132 Years of Astronomy in Ballarat	10:00
	Morning Tea	10:30
	Looking at the Sky Through a Glass Ceiling	11:00
		11:15
	Astronomy and the Gold Rush	11:30
		11:45
	Big Skies Collaboration	12:00
	LUNCH	12:30
	AD Canis Minoris: a delta Scuti star in a binary system	13:30
	Photometry, spectroscopy and radial velocities of the near contact binary V0775 Cen and the contact binary TW Cru	14:00
	Heritage value of Melbourne Observatory	14:30
		15:00
	Afternoon Tea	15:15
	Perdrix Address NACAA Past, NACAA Recent, and NACAA Future	15:30
		16:00
NACAA AGM	16:30	
BREAK	17:00	
The Welcome Function is a BBQ at the observatory. BYO alcohol	Convention Dinner Presentation of the Berenice and Arthur Page Medal After Dinner Speaker:	18:30

	Sunday	Monday	
		IDA	TTSO
	Astrophysics with small telescopes	Reception	Occultation highlights from 2016/17 for Australia and New Zealand.
		Welcome	
	CMOS Cameras For Astronomy Education & Research	Planetary Illuminations	Double Star Occultations
	A visit to the Very Large Telescope	Dimming Sydney's sky	Running occultation programs with Linux?
	Morning Tea	Morning Tea **	
	Bendigo:- A case study in LED streetlights and light pollution.  The variation of sky brightness with latitude and sidereal time in the absence of Moon or clouds  The estimation of astronomical seeing for sites in Australia	Ballarat Sky Quality Survey	Lucky Star
		Workshop: how to influence government	Experiences of a novice occultation observer
			Future Occultations for 2018
	Cassini: the Grand Finale	Melbourne Light Pollution	Occultation Section discussion
	LUNCH	LUNCH **	
	JK-LC Time of Minimum Measurement	Measuring the Night Sky Brightness	Limovie workshop
	Solar Astronomy - highlights of cycle 24.	Aoraki Mackenzie International Dark Sky Reserve	
	Timeballs and Telegraphs	River Murray Dark Sky Reserve	
	Afternoon Tea	Closing and Afternoon Tea **	Afternoon Tea **
	From point of light to astrophysical model - the research reach of the modern amateur		Workshop: 1) Making predictions with Occult and adding to OccultWatcher. 2) Video processing with Tangra, analysis with AOTA and reporting.
	The Magellanic Cloud Luminous Blue Variables		
	Infrared Studies of the Outer Planets		
	BREAK		
	Farewell Function BBQ, BYO alcohol		

**AWARDS** At recent NACAAs, the Astronomical Society of Australia has presented the *Berenice and Arthur Page Medal* to recognise the contributions of Australian amateur astronomers to astronomical science.

2016	<i>Mr Roy Axelsen</i>	for his work on photometry of variable stars.
2014	<i>Mr Tim Napier-Munn</i>	For work on binary stars systems and for demonstrating a deep understanding of observational techniques and processes that will progress the field.
2012	<i>Mr Anthony Wesley</i>	High quality observations of the Jovian and Saturnian atmospheres and the discovery of an impact cloud and atmospheric flash on Jupiter.
2010	<i>Mr David Gault</i>	For his observations of stellar occultations by Pluto.
2008	<i>Mr John Broughton</i>	For his systematic survey for southern declination Near Earth Objects, including numerous occultation timings.
2006	<i>Dr Tom Richards</i>	For broad ranging CCD photometry light curve observations, particularly of minor planets, variable stars and in exoplanet searches.
2004	<i>Mr Colin Bembrick</i>	For photometric light curve observations of minor planets and derivation of their rotation periods.
2002	<i>The Reynolds Amateur Photometry Team</i>	For their substantial contribution to photometric observations of variable stars.
2000	<i>Mr Andrew Robert Pearce</i>	For significant and extensive visual observations of comets, variable stars and novae.
1998	<i>Mr Gordon Garradd</i>	For significant contributions in the observation of asteroids, comets, novae and supernovae.
1996	<i>Mr Peter Williams</i>	For his extensive on-going visual observations of variable stars, especially the R Coronae Borealis variables.
1994	<i>Mr Paul Camilleri</i>	For discoveries of novae and Mira variables and the development of simple photographic techniques for nova searches.
1992	<i>Dr Mal Wilkinson</i>	For the design and construction of a radio-telescope and subsequent observations of the Io-Jupiter system and for his development of a model for the emissions.
1990	<i>Mr Barry Adcock</i>	For telescope design work and planetary observations.
1988	<i>Mr Robert McNaught</i>	For photographic nova and supernova observations and discoveries.
1986	<i>The Rev. Robert Evans</i>	For visual discoveries of supernovae.
1983	<i>Mr Byron Soulsby</i>	For work on the oblateness of the umbral shadow.
1981	<i>Mr Bill Bradfield</i>	For the discovery, up to that time, of 11 comets.
1975	<i>Mr David Herald</i>	For observations of Baily's Beads in the solar eclipse of 20 June 1974.
1973	<i>Mr SJ Elwin</i>	For photometric observations of the occultation of Beta Scorpii by Jupiter.

The *Astral Award* (originally sponsored by John Perdrix's Astral Press) is given for the best paper presented at the convention.

2016	Donna Burton	Dating Active Young Stars
2014	Saeed Salimpour	Captain Henry Evans Baker: A Star, Nerd or Futurist?
2012	Anthony Dutton, Gregorie Bond & Julian West	Near Infrared Phase Lag of Mira Variable R Carinae
2012	Ray Johnston and Rick Stevenson	Fire in the Sky
2010	David O'Driscoll	Robotic Research for the Amateur Astronomer
2008	Surjit Wadhwa	Light Curve Analysis of Contact Binary Stars
2006	Jeff Byron	Itokawa, YORP and the Cecil Sayers Observatory
2004	Tom Richards	Amateurs getting violent: black holes, synchrotrons and magnetic flares
2002	Colin Bembrick	Minor planet light curve determination
2000	Stephen Russell	Chasing shadows: photographing solar eclipses
1998	Vello Tabur	Computer-aided comet hunting
1996	Zac Pujic	The Cookbook CB245 CCD camera: evaluation of performance
1994	Fraser Farrell	The recruitment and supervision of amateur variable star observers
1992	Peter Nelson and Jim Park	Observing mutual phenomena of Jupiter's moons 1991
1990	Peter Nelson, JL Blanksby, and AW Kruijshoop	Recent planetary and lunar occultations by the Occultation Section of the ASV
1988	Peter Jones	Computer star maps
1986	Tom Cragg	CV Aquarii

## WELCOME AND KEYNOTE ADDRESS

Professor Virginia Kilborn

Sat, 09:00 Conservatory

### A GOLDEN AGE FOR ASTRONOMY IN AUSTRALIA

Australian astronomy's decadal plan from 2016 detailed five ambitious research areas as the highest priority to tackle in the coming years. These include how planets, stars and galaxies form and evolve, and the nature of dark matter and dark energy. Solving these most fundamental questions in modern astronomy requires state-of-the-art observing and supercomputing facilities. With Australia's investment in multi-wavelength astronomy, including radio (MWA, ASKAP and the SKA), and optical facilities that are now available with the new agreement between ESO and the Australian government, Australian astronomers are able to see the universe in more detail than ever before. I will outline some of the key facilities, recent research, and future opportunities in Australian astronomy.

*Virginia Kilborn is a radio astronomer with the Centre for Astrophysics and Supercomputing at Swinburne University. Her primary research interests include tracing galaxy evolution by studying the neutral hydrogen gas in galaxies, and she is now working towards preparations for surveys with the next generation radio telescopes, such as the Australian SKA Pathfinder (ASKAP) and the SKA. Virginia undertook her PhD studies at the University of Melbourne, and following a post-doc at Jodrell Bank observatory in the UK, she returned to Melbourne to take up an ARC-CSIRO linkage fellowship at Swinburne in 2003. Virginia was deputy director of the Centre for Astrophysics and Supercomputing from 2011-2013, and acting director for CAS in 2013.*

*In 2015 Virginia took on the role as Chair of the Department of Physics and Astronomy at Swinburne University. Virginia is an enthusiastic educator and has taught into the Swinburne Astronomy online program since 2006, as well as undertaking numerous public outreach opportunities. Virginia is active in the Australian Astronomical community and is immediate past President of the Astronomical Society of Australia.*



## NACAA AFTER DINNER SPEAKER

A/Prof. Emma Ryan-Weber

Saturday, 19:30 Eureka Ballroom

What we know about Big Bang Cosmology and our Milky Way Galaxy from the naked eye.

*Associate Professor Emma Ryan-Weber is an astronomer and QEII Research Fellow leading the intergalactic medium research group at Swinburne. This science focuses on detecting metals in absorption at very high redshifts.*

*Dr Ryan-Weber and her team conduct this research using near-infrared spectroscopy towards high redshift quasars on the world's largest telescopes including Keck and the VLT. They also work on high redshift galaxies and examine their influence on reionization, including their escaping fraction of ionizing radiation.*

*Dr Ryan-Weber's doctoral research focused on HI in the local universe – a field where she continues an active interest.*

## 132 YEARS OF ASTRONOMY IN BALLARAT

*Judith Bailey*

Sat, 10:00 Conservatory

The Ballarat Municipal Observatory is a unique science resource in Ballarat, Victoria and Australia. Why is this observatory different? Creating bridges to enable everyone to enjoy science opens the path towards understanding, which in turn leads to respect for Science in general and our Planet in particular.

*Judith Bailey has been a member of BAS for 32 years and ASV 22 years. A love of Science in general and Planetary Science, Solar Cycles, Aurora, Comets, Plate Tectonics, Meteor Showers and Environmental issues on a Planetary Scale, Light Pollution and further study in these areas has provided the background to be involved with observation and education for many years. Currently the Manager of the Ballarat Municipal Observatory and Museum, Judith likes nothing better than to be grounded by the perfect stillness of the night and to share with like minded people and those new to the science of astronomy the great wonders of life in the Universe.*

## LOOKING AT THE SKY THROUGH A GLASS CEILING

Donna Burton

Sat, 11:00 Conservatory

A look at women in astronomy through the ages. Women have made significant contributions to the development of astronomy as a science, yet their work has been restricted, unregarded and little recognized. I will outline some significant careers and show how these talented and determined women overcame the restrictions on their lives to make their marks. Their solid achievements came at considerable cost and attracted little professional recognition.

*Donna Burton lives in northwest NSW, Australia, at Coonabarabran the Astronomy Capital of Australia. Donna has always been in love with the sky. She fell in love with the sky at an early age growing up across the inland of Australia as a "Drover's Brat", learning the constellations and various skylore stories. She has been a passionate amateur astronomer for most of her life. Donna is undertaking a PhD in AstroPhysics at the University of Southern Queensland. For many years, Donna worked at the Siding Spring Observatory as an Operations Support Officer and Support Astronomer for the Australian National University where she was involved in outreach, telescope system support and training observers how to use the University's telescopes. Donna is the Australian National Coordinator for the group Astronomers Without Borders. She became the first Australian woman to discover a comet in 2006 and followed it up with another in 2007. Donna now operates the Milroy Observatory in Coonabarabran which hosts Australia's largest publicly available telescope the original 40 inch telescope from Siding Spring Observatory.*

## ASTRONOMY AND THE GOLD RUSH

*Darren Bellingham*

Sat, 11:30 Conservatory

As the 2018 NACAA will be held in Ballarat, a city with a rich gold mining history, it is appropriate to do a presentation that shows some of the obvious and the more tenuous links between Gold and Astronomy. The presentation will be rich with facts but also presented in a lighthearted and approachable way.

*I am an ASV member of 25 years and BAS 7 Years, born in Ballarat, strong interest in history and astronomy. Worked at Melbourne Observatory as a tour guide from 1999-2016. Currently work as a Gold Mine tour guide at Sovereign Hill in Ballarat, a major award winning outdoor museum showcasing the history of the Victorian gold rush in the second half of the 19th Century.*

## BIG SKIES COLLABORATION

*Dr Merrill Findlay*

Sat, 12:00 Conservatory

The Big Skies Collaboration brings together arts practitioners, astronomers, and local communities within a region I've defined as southeastern Australia's 700 Kilometre Array of astronomical observatories, which extends from CSIRO's ATCA near Narrabri, in NW NSW, to Mt Stromlo and Tidbinbilla in the ACT. Our current creative interventions include the Inland Astro Trail, the Skywriters Project, the Wiradjuri Astronomy Project, the Wiradjuri Skywriters Pilot Project, and the Big Skies theatre production to be toured in 2019, the 50th anniversary of the Apollo 11 moon landing. I will be discussing these and other projects and will be inviting NACAA members to be involved. For more, please see [bigskiescollaboration.wordpress.com](http://bigskiescollaboration.wordpress.com) and explore the drop-down menus.

*Merrill Findlay is a writer and cultural development practitioner now based in Forbes, NSW. She grew up on a farm between two very significant astronomical sites, the iconic Parkes Radio Telescope and Seven Sisters Ridge, a Wiradjuri site associated with the Seven Sisters of the Pleiades. Both these sites and the communities around them have been inspirational factors in the development of the Big Skies Collaboration. Merrill has written several books (both fiction and nonfiction), many feature articles for the mainstream press, academic articles for international publications. She has a Masters in Social Science and a PhD in Communication. For more, see [merrillfindlay.com](http://merrillfindlay.com)*

# AD CANIS MINORIS: A DELTA SCUTI STAR IN A BINARY SYSTEM

Roy Andrew Axelsen and  
Tim Napier-Munn

Sat, 13:30 Conservatory

Our understanding of the delta Scuti star AD CMi has evolved as observational data since 1959 has gradually accumulated to present a more or less complete picture of its behaviour. Its period is approximately 2 hr 57 min. Data obtained between 1959 and 1992 revealed an O-C (observed minus computed) diagram described by a quadratic function which suggested that the period of the star was increasing slowly at a constant rate. However, the addition of further data, to 2006, revealed a more complicated O-C diagram with a quasi-sinusoidal shape, described by a combined quadratic and trigonometric function. The data implied that, although the pulsational period of the star was indeed increasing at a slow constant rate, the O-C diagram was modulated by the light time effect of a binary system. Data published in 2007 included 81 times of maximum (TOM). We performed photoelectric photometry on one night in 2011 and DSLR photometry during 7 nights in January and February 2016, by which time 9 years had elapsed since the last publication of data in a refereed journal. The literature to 2007 contained 81 TOM, subsequent literature and the AAVSO international database added another 28, and 9 TOM were contributed by our own observations, yielding a total of 118 TOM, by far the largest database in the literature on this star. Assuming a linear ephemeris, the period of AD CMi was calculated to be 0.122974511 (4) d, almost identical to that quoted in earlier literature. Analysis of the O-C diagram confirmed the results of previous authors, and updated most of the coefficients of the function fitted to the diagram. The values of all of the coefficients were statistically significant. We calculated the pulsational period of AD CMi to be increasing at a constant rate of  $dP/dt = 6.17 (+/- 0.75) \times 10^{-9}$  d yr<sup>-1</sup> or  $dP/Pdt = 5.01 (+/- 0.61) \times 10^{-8}$  yr<sup>-1</sup>. Because estimates of the period of the binary system range from 27.2 y to 42.8 y across four different published papers, it may be decades before an accurate determination of the orbital period can be made from photometric data.

*Roy has studied variable stars, particularly pulsating variable stars of delta Scuti type, for a number of years, and has several refereed publications in the Journal of the AAVSO in this area. He has been an active member of the Astronomical Association of Queensland for about 15 years, and is currently the General Secretary. When not doing variable star photometry, he images nebulae using a spectrum-modified Canon DSLR.*

# PHOTOMETRY, SPECTROSCOPY AND RADIAL VELOCITIES OF THE NEAR CONTACT BINARY V0775 CEN AND THE CONTACT BINARY TW CRU

David J. W. Moriarty

Sat, 14:00 Conservatory

Photometric and spectroscopic analyses of V0775 Cen, a near contact binary with a period of 16 hours and TW Cru, a contact binary with a period of 9 h, indicate both are triple systems. The V0775 Cen spectra are consistent with catalogue values of F0 IV for the primary component; its mass is 1.6 solar and radius 1.7 solar. The effective temperature of the secondary star indicates it has a spectral type of about K4, and its mass is 0.5 solar, yet with a radius of 1.1 solar, it has evolved well past terminal age main sequence. Episodes of emission in the H Balmer and metal lines of TW Cru confirm the conclusion from previously published photometric studies that it is chromospherically active.

*Astronomy: Amateur astronomer since 1956; member Astronomical Society of South Australia 1957 - 1969. Member of Astronomical Association of Qld since 1982. Currently, Emeritus Professor, Honorary Senior Fellow with the Astrophysics group at The University of Queensland (UQ).*

*1966 – 1969 Ph.D. thesis studies on oxidation of inorganic sulphur compounds by thiobacilli. 1969-1973: Biochemist-Microbiologist quantifying carbon and nitrogen cycles in Lake George, Uganda, with the Royal Society African Freshwater Biological Team, and at Nottingham University, UK. 1973-1975: Queen's Fellow in Marine Science at UQ. 1975 - 1993: Researcher with the CSIRO Marine Divisions. 1992: Guest Professor in Marine Microbiology, Gothenberg University, Sweden. 1997-2013 Honorary Professor, Centre for Marine Studies, UQ. Qualifications: B.Ag. Sc. (Hons.); Ph.D., D.Sc. FASM*

## HERITAGE VALUE OF MELBOURNE OBSERVATORY

*Dr Barry Clark*

Sat, 14:30 Conservatory

Williamstown Observatory (1853-1863) succeeded greatly in assisting the Colony of Victoria with timekeeping, telegraphy and surveying. Its reward in 1863 was Melbourne Observatory, which increased the benefits flowing to the colony. The widespread availability of precise time has recently been shown to have increased society's acceptance of increasing punctuality and regimentation, a profound change. The 1869 Great Melbourne Telescope was renowned as the world's largest for much of the next three decades. In the 1880s, the Observatory was the first in the country to publish daily weather forecasts, but the second Government Astronomer disliked doing these and managed to have meteorology split off from the State observatories in 1907 to form the Bureau of Meteorology, a great success. In 1898, the Observatory employed six young women to measure star positions in photographs made for an international project. The project is now recognised as successful and women were empowered by being able to take on technical work generally. The Observatory's professional operations ended in 1945 as an economy measure. The Astronomical Society of Victoria has kept the Observatory's facilities operational in public and educational astronomy ever since. The State-level cultural heritage significance of the Observatory and its activities is assessed to guide heritage conservation and utilisation of the Observatory and in formulating a more comprehensive version of the Statement of Significance for the Melbourne Observatory entry in the Victorian Heritage Register.

*Barry has used the telescopes at Melbourne Observatory since 1955. His career was in defence science and technology, specialising in optics and vision research.*



## PERDRIX ADDRESS NACAA PAST, NACAA RECENT, AND NACAA FUTURE

Stephen Russell

Sat, 15:30 Conservatory

I've been involved with NACAA since I attended my first event in Wollongong in 1970. In this talk, I would like to reflect on two phases of NACAA's history: the early years where attempts to create a national body failed, and the formation of NACAA Inc more recently.

I believe that the INC phase of NACAA has been a success, thanks to the hard work of several people. It hasn't all been plain sailing, though. Some things didn't go at all as I expected, mostly due to my own naivety. There are lots of war stories that I could talk about, but I'll concentrate on the incidents that have taught me a lesson or two.

Finally I would like to present how I hope that the future INCs can avoid the mistakes that I made, and provide advice on the challenges that I think NACAA faces in the future.

*I attended my first NACAA in 1970. I've only missed two NACAAs since then, though I missed a lot of NACAA XXVII due to illness. In 1976 I became the first NACAA Secretariat, which sounds more significant than it turned out to be. More recently I've served in various positions on the NACAA Inc committee, including a few years as its General Secretary. In my retirement, I continue to look after the NACAA web site, with increasing assistance by some wonderful helpers.*

# **National Australian Convention of Amateur Astronomers (NACAA) Inc.**

## **Annual General Meeting Agenda**

1. Treasurer's Report
2. Motion to lodge documents with NSW  
Dept of Fair Trading
3. General Secretary's Report
4. Announcement of the NACAA 2020 host
5. Election of officers for 2018–20

N.A.C.A.A. Incorporated –

<b>Profit &amp; Loss Jan – Dec</b>	2017	2016
<b>Income</b>		
Conference Income		
Full Conference Registration	900.00	16,225.00
Day Registrations	-	3,820.00
Half Day Registrations	-	560.00
Dinner and associated function	85.00	2,805.00
Lunches & sundry meals	-	120.00
Workshop registration	95.00	4,845.00
Excursions	-	240.00
Sponsorship and Donations		
Interest	6.61	12.96
Total Income	1,086.61	28,627.96
<b>Expenses</b>		
Venue & Conference Expenses		
Venue Hire	3,465.00	7,514.00
Food & Catering	-	27,558.50
Excursion expenses	-	270.00
Conference bags & accessories	-	40.00
Programs & Proceedings	-	440.00
Hire of equipment	-	303.60
Equipment purchased	-	435.40
Administration Expenses		
Merchant card fees	29.28	657.38
Insurance	234.85	234.85
Printing & Stationery	-	507.21
Incorporation Expenses	44.00	54.00
Telephone & Teleconference	-	83.42
Internet expenses	-	42.09
Videotaping & Photography	-	1,410.22
Total Expenses	3,773.13	39,550.67
Net Profit/(Loss)	(2,686.52)	(10,922.71)
<hr/>		
<b>Balance Sheet December</b>	2017	2016
<b>Assets</b>		
General Cheque Account	5,011.15	8,748.39
Paypal Account	1,050.72	0
Total Assets	6,061.87	8,748.39
Total Liabilities	0	0
Net Assets	<u>6,061.87</u>	<u>8,748.39</u>
<b>Equity</b>		
Retained Earnings	8,748.39	19,671.10
Current Earnings	-2,686.52	-10,922.71
Total Equity	6,061.87	8,748.39

## ASTROPHYSICS WITH SMALL TELESCOPES

*Michael Brown*

Sun, 09:00 Conservatory

I will discuss how amateur telescopes can be used to retrace the past 150 years of astrophysics. Amateur telescopes combined with modern detectors are now more capable than professional equipment from a century ago. Amateur astronomers can thus observe the consequences of stellar evolution, the passage of near-earth asteroids, transits of extra-solar planets and the expansion of the Universe. Even the creation of new black holes, via the merger of neutron stars, may now be observable by amateur astronomers. I will discuss the equipment required to make these observations, and show that some observations can be made with relatively basic kit.

*Dr Michael Brown is a professional astronomer at Monash University, who has expertise in multi-wavelength astronomical surveys, galaxy evolution and active galactic nuclei. He has experience using 8" to 14" telescopes and CCDs to teach undergraduate astrophysics.*

# CMOS CAMERAS FOR ASTRONOMY EDUCATION & RESEARCH

Steve Fleming and Tex Moon

Sun, 09:30 Conservatory

The Internet has brought with it new opportunities for public participation in scientific research. Initiatives such as 'Zooniverse' bring together a large community of interested 'Citizen Scientists' whose efforts are coordinated by front-line researchers. The catch words for such initiatives include people-powered, discover, teach and learn. Astronomy is one of the flagships of the Citizen Science movement. Automated survey instruments that accumulate large amounts of data, the small numbers of professionally-employed astronomers, and strong public interest in astronomy all provide a strong impetus for citizen science research in astronomy.

Many of the citizen science initiatives require only Internet access with the computer being the research tool. Interests among citizen scientists, however, vary widely with some enjoying being able to collect their own data and make the specialised measurements needed to confirm or augment discoveries made by professional astronomers. Citizen Science accommodates this wide range of interests but a stumbling block for many of those interested in collecting data is the cost of equipment. For example, astronomical CCD cameras with filter wheels and specialised filters cost several thousands of dollars. To properly use such instruments also requires more expensive telescopes and specialised supporting software.

In the past few years there has been a revolution in sensor technology that has seen the introduction of cheap CMOS astronomical cameras. CMOS technology offers not only a cheaper alternative to CCDs but has some other useful advantages including higher quantum efficiency and fast download times for images.

Latrobe University (LTU) runs a first-year astronomy course aimed at a broad cohort of students. Underlying the teaching of this course are the core elements of citizen science – discover, teach, learn; the emphasis being on engendering a lasting interest in astronomy and imparting the basic skills needed for students to participate in citizen science. This paper outlines work at LTU on CMOS cameras for Education and Research in Astronomy.

*Terry Moon (Tex) was awarded his BSc (Hons) from Monash University in 1975, MSc from the University of Melbourne in 1979 and PhD from Monash University in 1984. In 1975 and 1976 he worked in the Infrared Astronomy group at Melbourne University. From 1978 to 1980 Terry worked in Solar Energy technology at University of Sydney. During 1984 and 1985 undertook postdoctoral work in Astronomy at University College London. In 1986 Terry joined the Defence Science & Technology Organisation and enjoyed a multi-disciplinary career spanning electro-optical, infrared and radar technologies, operations research, systems engineering, complexity and network science and food science. He retired in 2015.*

*Since late-2002 Terry has been undertaking research into variable stars as a citizen scientist. The cornerstone of this research is the measurement of southern semi-regular variables (red giants) from his home observatory, first in Adelaide then Georgetown, South Australia and now Scottsdale, Tasmania. A recent interest is the measurement and analysis of symbiotic stars.*

## A VISIT TO THE VERY LARGE TELESCOPE

*Chris Morley*

Sun, 10:00 Conservatory

ESO's Very Large Telescope facility in Chile has played a pivotal role in many recent discoveries. Just four days after I toured the facility in February 2016, it was announced that seven Earth-sized planets orbiting a cool star (TRAPPIST 1) had been discovered. As well as general technical information about the facility, the talk highlights the contribution made by the VLT and explores the workings of the particular scientific instrument that was used.

*Chris Morley is a retired Electrical Engineer who has been interested in astronomy since early childhood. Acquiring his own telescope just 12 years ago, he soon built an observatory where he and his wife enjoy showing family and friends the wonders of the night sky. Chris also enjoys astro-photography and identifying objects of special interest in the sky. Chris is secretary of the Latrobe Valley Astronomical Society in Gippsland.*

## **BENDIGO:- A CASE STUDY IN LED STREETLIGHTS AND LIGHT POLLUTION.**

*Mike Chapman*

Sun, 11:00 Conservatory

Light emitting diode (LED) technology has brought significant innovation to the lighting industry. The benefits of high efficacy LED street lighting has encouraged government sponsored programs to reduce power consumption, lower maintenance costs, reduce greenhouse gas emission and reduce sky glow. In the case of sky glow and light pollution there are no standardised or quantitative method of measurement. Some controversy such as health aspects as cited by the American Medical Association (AMA) exist around these retrofit programs. Presented here is the result of a time series analysis of data from the Suomi/VIIRS satellite from South-East Australia where LED street lights replaced mercury vapour and compact fluorescent lighting. A town in Victoria, Australia, Bendigo is selected as a case study of radiance. Using a simplified inventory of the prior street lighting the total luminous flux of the lighting inventory is compared to the radiance images from Suomi Day/Night Band (DNB) and compared to the expected results of the sky-glow modelling software Illumina. Discussion is focussed on the use of the Suomi/DNB sensor as a detector and as an estimator of light pollution. Using a simplified model of light in the atmosphere this paper suggests the short wavelength spectral component of the LED luminaires remains in the lower atmosphere and that a greater component of this blue spectrum than the original lighting inventory is produced in the wavelength range specified by the AMA as a blue light hazard.

*Michael is a long time amateur astronomer. He has a long time association with the Sydney City Skywatchers and has been awarded Life Membership of the association. He also is a founding member of Sydney Outdoor Lighting Improvement Society (SOLIS). His interest in astronomy led to involvement in challenging issues with lighting and is a recent graduate from Sydney University with a Masters in Architectural Studies (Illumination Design) and is pursuing further research in light pollution.*

# THE VARIATION OF SKY BRIGHTNESS WITH LATITUDE AND SIDEREAL TIME IN THE ABSENCE OF MOON OR CLOUDS

*James Irish*

Sun, 11:30 Conservatory

The “New world atlas of artificial sky brightness” (Falchi et al., 2016) assumes that night sky brightness at dark-sky sites when the Moon is not visible and there are no clouds is 22.0 magnitudes per square arc second for the V spectral band. However, this depends on the solar cycle and, especially for sites in the southern hemisphere, latitude and sidereal time. Results will be presented, together with a model, for sky brightness in eastern Australia. The model is applicable to any site between latitudes 20 and 43 degrees South, and can be generalized to sites affected by light pollution.

*James Irish is a retired environmental engineer, whose interests in astronomy therefore extend to pollution. Jim was disappointed when he settled in Melbourne in 2016 by sky brightness, even in the outer suburbs, after living under the heavily-polluted atmosphere of eastern China for a decade. His other astronomical interests are in the physics of the upper atmosphere and its interaction with sky brightness and with astronomical ‘seeing’.*



## THE ESTIMATION OF ASTRONOMICAL SEEING FOR SITES IN AUSTRALIA

*James Irish*

Sun, 11:45 Conservatory

Large optical telescopes are preferentially sited where astronomical 'seeing' is generally of the order of one arcsecond or better. This requires a site altitude of about 2,000 metres or more. Such sites are unavailable in Australia, yet professional optical astronomers in Australia have contributed beyond what might be expected from our population. Amateur astronomers used to be diffraction-limited, but the large telescopes now available to amateurs and especially to societies means that site seeing characteristics (alongside cloudiness and light pollution) are now important. Seeing varies throughout each night, but the median is a site characteristic (possibly seasonally variable). Ways to measure seeing and the data currently available for sites in Australia will be described. Ways in which amateur astronomers can contribute to ongoing measurements will be presented.

*James Irish has begun a project to estimate the optical 'seeing' in the northern half of Australia at sites with less cloudiness than is generally available in Victoria. He's a retired engineer, an amateur astronomer still learning the craft. His longstanding interest in atmospheric physics began with extreme flood estimation. Since it is costly to measure seeing at multiple sites over multiple nights, Jim is using modelling and climate data to refine the search for sites where the seeing may be better than predicted from altitude and latitude.*

## CASSINI: THE GRAND FINALE

*Dr John Wilkinson*

Sun, 12:00 Conservatory

One of the most amazing space missions in history was the Cassini mission to explore Saturn and its moons. After almost 20 years in space NASA's Cassini spacecraft completed its mission in September 2017. The Grand Finale took place between April and September 2017. This presentation is a review of the mission especially focusing on the ten most significant discoveries of the mission. The last images of Saturn will be shown.

*Dr John Wilkinson is a science educator and amateur astronomer who has written over 100 science textbooks including several on Astronomy. His main interests include the solar system, sun and moon. John is now retired but operates an observatory from Central Victoria. He is a member of the ASV and Bendigo Astronomical Society. He is a former science education lecturer at Latrobe University and teacher of Physics and Chemistry.*

## THE GREAT AMERICAN ECLIPSE

*Dr Russell Cockman*

Sun, 13:30 Conservatory

In August 2017 Russell travelled to the USA to observe the total solar eclipse on August 21 over Douglas, Wyoming - a day that was record breaking and memorable on all levels of human experience.

In this talk he briefly describes how the day unfolded and the sheer thrill of standing again in the moon's shadow

*Dr Russell Cockman is ASV Vice President, Solar Section Director and President of IDAVictoria. He has been an avid observer and photographer of all things astronomical for many years and has travelled widely in pursuit of astronomical adventure. He loves nothing better than standing under the stars and marvelling at the beauty and vastness of the Universe.*

## SOLAR ASTRONOMY – HIGHLIGHTS OF CYCLE 24.

*Dr John Wilkinson*

Sun, 14:00 Conservatory

Observation of the Sun has gained increased interest in recent years because of the availability of specialised telescopes for amateurs to use. Activity on the sun follows an 11 year cycle and we are currently in cycle 24 and heading towards a solar minimum. This talk will examine the various features of the Sun worth viewing, methods used, as well as the highlights of solar cycle 24 and what is to be expected for cycle 25. The presenter will use NASA solar images and those taken by himself from his own observatory.

*Dr John Wilkinson is a retired science educator / former lecturer and teacher of science and physics from La Trobe University. He is also an author of over 100 science textbooks including four on the solar system, sun and moon. He operates an observatory from his home in central Victoria. His main interests are in studying the sun, moon and taking deep sky photographs.*

## TIMEBALLS AND TELEGRAPHS

*Ian Sullivan*

Sun, 14:30 Conservatory

In the era of Captain Cook, navigation became a major scientific endeavour, and to measure longitude at sea, the chronometer was invented in England in 1773. Cook first sailed with one on his second voyage, and by 1830s, ships of all nations were similarly endowed, and in need of a time service in all major ports. In 1830 an English RN Captain Wauchope tested the first TIMEBALL at Portsmouth, a hollow copper ball up to a metre in diameter, from a height at an appointed hour, and 1 pm was chosen. A nearby observatory sent a the time signal by telegraph and ships could sight the drop by telescope to correct their chronometers. Nearly 200 timeballs were constructed worldwide, and about sixty still exist as historic relics from the 1920s - as radio supplanted timeballs and telegraphs. Telegraph developed in parallel with timeballs, having a much larger commercial value. Undersea cables, like the Atlantic in 1866 , proliferated and circled the globe. All six colonies of Australia still retain old timeballs and telegraph stations.

*LIFE MEMBER of ASV and MPAS and a former Vice Pres. of both . Worked as industrial chemist then Science teacher with Diploma from RMIT, and BA from Melb Univ. Took CAE Classes in Astronomy 1980 - 2000*

# FROM POINT OF LIGHT TO ASTROPHYSICAL MODEL - THE RESEARCH REACH OF THE MODERN AMATEUR

Thomas J Richards,  
Colin S Bembrick

Sun, 15:30 Conservatory

Modern software is enabling the amateur astronomer to make significant, publishable research results - not just piling up observations. This paper will present and discuss the research pipeline for eclipsing binary photometry. I will begin with a dot on an image, and show how its analysis leads to a comprehensive determination of the physical parameters of the binary - and even a 3D model.

*Dr Tom Richards is a retired mathematical logician, computer science professor and commercial software developer/entrepreneur. Col Bembrick became interested in astronomy while still at high school, but spent most of his career exploring the geology of NSW. For about 6 years he wangled a job with the University of NSW, looking after their new Automated Patrol Telescope at Siding Spring. Shortly after that he retired to a farm near Bathurst and built an observatory in the paddock. From there he continues to undertake CCD photometry of asteroids and (when he has time) variable stars. Col is working with the VSS team to investigate eclipsing binary systems which are very poorly studied in the southern hemisphere. Both Tom and Col have been actively involved in Variable Stars South for some time, with a particular interest in eclipsing binary systems*

# THE MAGELLANIC CLOUD LUMINOUS BLUE VARIABLES

*Alan Plummer*

Sun, 16:00 Conservatory

NACAA 2016 saw a presentation on the visual observation of stars in the Magellanic Clouds. This talk follows on from that, focusing on the Luminous Blue Variables, also called the S Doradus stars, and the suspected, or 'candidate' population. Discussion of their evolutionary status, lightcurves, and fields is continued and updated. Feedback from the American Association of Variable Star Observers show these objects to be among the most important targets to observe. Certainly, they are the most challenging and rewarding.

*Alan is a visual observer, monitoring variable stars from Linden Observatory in the Blue Mountains west of Sydney. He is a contributing editor to Australian Sky & Telescope, has published in Astronomy & Astrophysics, Astrophysical Journal, Journal of the AAVSO, various newsletters and blogs, and starting soon, the Sky & Telescope website. And his favourite, a VSOing piece in Analog Science Fiction and Fact.*

## INFRARED STUDIES OF THE OUTER PLANETS

*Barry Adcock*

Sun, 16:30 Conservatory

The outer planets Jupiter, Saturn, Uranus and Neptune have been imaged using a set of infrared bandpass filters each with a band width of 40 nm. Modern infrared digital cameras allow the opportunity to acquire images into the micrometre region of the spectrum. The subtle differences between images using a range of bandpass filters is not obvious. Two methods have been developed to highlight the differences. On a gaseous surface the brightness of a feature at a given wavelength is closely related to temperature. The resulting images show the development and evolution of storms and festoons on Jupiter and lead to a better understanding of the dynamics of the Jovian atmosphere. Infrared photography also provides a platform for imaging the planets during daylight hours. This is important if a particular feature is to be observed when the planet is near superior conjunction.

*Honorary life member of both ASV and BAS. Berenice Page medal 1990, member of ASA. Director of the ASV Lunar and Planetary section for 40 years. I use my own home made telescopes.*

# DARK SKY SYMPOSIUM

Mon 9:00 – 15:30 Observatory

Start	Presenter	Title
9:00 - 9:15		Reception
9:15 - 9:30	Dr Russell Cockman (President IDAVic)	Welcome
9:30 - 10:00	Marnie Ogg	Planetary Illuminations
10:00 - 10:30	Dr Nick Lomb	Dimming Sydney's sky: early efforts to fight light pollution in the city
10:30 - 11:00	MORNING TEA	
11:00 - 11:15	Judith Bailey	Case Study - Ongoing Awareness Campaign and Ballarat Sky Quality Survey
11:15 - 12:00		Workshop
12:00 - 12:30	Dr Barry Clark	Melbourne Light Pollution - What of the Future?
12:30 - 13:30	LUNCH	
13:30 - 14:00	Mike Chapman	Measuring the Night Sky Brightness and Instructional Kit on Light Pollution
14:00 - 14:30	John Hearnshaw	The Aoraki Mackenzie International Dark Sky Reserve Professor
14:30 - 15:00	Andrew Cool	The River Murray Dark Sky Reserve (RMDSR)
15:00 - 15:05	Dr Russell Cockman	Closing Remarks
15:05 - 15:30	AFTERNOON TEA	



## PLANETARY ILLUMINATIONS

Marnie Ogg

9:30 - 10:00

For the past 11 years, Marnie has been masterminding Fred Watson Tours, a travel company dedicated to bring science and tourism together. With her partner, astronomer, Fred Watson Marnie has taken over 600 people to see observatories, the Aurora Borealis and other wondrous corners of the globe. During her travels she has come to realise something so special and unique to Australia, she helped create a designated park to it: Darkness. During this fully illustrated talk, Marnie reflects on Australia's First Dark Sky Park in the Warrumbungles and other successful night sky ventures around the world and discusses ways you too can help preserve the night sky.

### **DIMMING SYDNEY'S SKY: EARLY EFFORTS TO FIGHT LIGHT POLLUTION IN THE CITY**

Dr Nick Lomb

10:00-10:30

Sydney Observatory's fight against light pollution began in April 1994 when the floodlighting of the concrete sides of the nearby aap building was switched on. The 190-metre tall skyscraper was just 500 metres away from the Observatory and its light was a serious disruption to public evening viewing sessions. In this talk Nick, the former curator at Sydney Observatory, tells of battles over this building and over other buildings that caused similar concern in subsequent years. With assistance from the like-minded members of the Sydney Outdoor Lighting Improvement Society (SOLIS), some notable successes were achieved.

*After obtaining a PhD in astronomy from the University of Sydney, Nick joined Sydney Observatory as a research astronomer. A few years later when the Observatory came under the auspices of the Museum of Applied Arts and Sciences, he was appointed as Curator of Astronomy. Trying to preserve the environment of the Observatory from increasingly bright city lights gradually assumed an increasingly important part of his role. Nick left the Observatory in 2009, after 30 years there, to move to Melbourne. He now researches the history of Australian astronomy as well as continuing to prepare the annual Australasian Sky Guide.*

### **CASE STUDY - ONGOING AWARENESS CAMPAIGN AND BALLARAT SKY QUALITY SURVEY**

Judith Bailey

11:00 - 11:15

Over a number of years light pollution levels have been measured in a number of locations around Ballarat. Some of the positive gains from the considerably long campaign on the light pollution issue have resulted in increased Community awareness and generational long term achievements.

*Judith Bailey joined the Ballarat Astronomical Society in 1985 and the ASV in 1995 and is currently the Manager of the Ballarat Observatory and has had an interest in Light pollution issues since 1988. Working with the late Geoff Dudley (ASV) a Sky Quality Meter was used to start a Survey of lighting levels around Ballarat.*

## **WORKSHOP**

11:15 - 12:00

'How to influence government', 'How to get the dark sky message to the public', 'Next Steps'.

### **MELBOURNE LIGHT POLLUTION - WHAT OF THE FUTURE?**

*Dr Barry Clark*

12:00 - 12:30

Artificial skyglow brightness measured in the northern suburbs of Melbourne is well below exponential growth predictions made two decades ago. Regardless, deep-sky observers keep complaining that nebulae are still getting harder to see. The most plausible explanation is that the overall correlated colour temperature of lighting is rising as a result of the widespread adoption of LEDs that rely on blue-stimulated fluorescence. For a given photopic level of skyglow, visibility of faint low-contrast celestial objects will be most affected by artificial skyglow with a high correlated colour temperature, ie blue-rich skyglow.

It is mainstream science that the blue content of ambient artificial light at night carries health risks for humans and is a major biodiversity threat. Some sections of the community are campaigning for change but the majority appears to be unaware and unconcerned. Blue light emission at night should be reduced greatly. It would be helpful for indoor lighting in daylight hours to be bright and blue-rich, and at night, dimmer and blue-poor. Reduced lighting at night is more likely to result in crime reduction than crime increase.

*Barry Clark joined the Astronomical Society of Victoria in 1955 and is an honorary life member. His research career in defence science and technology (1959-1996) was in the fields of optics and vision. He was the founding Director of the ASV's Outdoor Lighting Improvement Section nearly two decades ago.*

### **MEASURING THE NIGHT SKY BRIGHTNESS AND INSTRUCTIONAL KIT ON LIGHT POLLUTION**

*Mike Chapman*

13:30-14:00

*Michael is a long time amateur astronomer. He has a long time association with the Sydney City Skywatchers and has been awarded Life Membership of the association. He also is a founding member of Sydney Outdoor Lighting Improvement Society*

*(SOLIS). His interest in astronomy led to involvement in challenging issues with lighting and is a recent graduate from Sydney University with a Masters in Architectural Studies (Illumination Design) and is pursuing further research in light pollution.*

## **THE AORAKI MACKENZIE INTERNATIONAL DARK SKY RESERVE PROFESSOR**

**John Hearnshaw**

**14:00-14:30**

The Aoraki Mackenzie International Dark Sky Reserve (AMIDSR) is the world's largest dark sky reserve at 367 sq km. It is in the central South Island of New Zealand and was created in 2012 with accreditation from the International Dark Sky Association. It was the first IDSR in the southern hemisphere, the first in the world to be accorded gold tier status and the third in the world to be recognized. I will describe the creation of the reserve, its management, its activities and the strong impetus to astro-tourism it has provided. About 200,000 tourists a year now to see the pristine starlit skies of the Mackenzie District.

*I was born in Wellington in 1946, with an English father and Aussie mother, but I grew up in the NW of England from 1948 after my father got a job there after the war. My education was in the UK where I lived for 19 years, but after graduating from Cambridge with a science degree in 1967, I did a PhD in astronomy at the Australian National University in Canberra from January 1968. I married Vickie, a Kiwi girl, in the middle of my doctoral work in December 1969 (we met in Panama when I sailed on a P&O liner from the UK in 1967). After finishing a doctoral thesis I had two short research fellowships, the first at the Paris Observatory (1972-74) and the second one at Harvard and the Smithsonian Institution in Cambridge, Mass (1974-76). In 1976 I returned to New Zealand to a lecturing position at the University of Canterbury. I was promoted to a professorship at Canterbury in 1995 and eventually retired in 2014 after 38 years. For 25 of those years I served as director of Mt John Observatory at Lake Tekapo, in three different periods. I spent a lot of time developing new instruments to use at Mt John and training graduate students in astronomy (PhD and MSc). During my time at Canterbury I wrote six books on astronomy, most of them on the history of stellar astrophysics in the last 200 years. I have also been active working for the International Astronomical Union (and still am); the IAU is the society for professional astronomers with about 12000 members world-wide. From 2003 to 2012 I chaired the IAU Program Group for the World-wide Development of Astronomy, a job that entailed travelling to developing countries to give lectures, to advise on teaching astronomy and to promote research collaborations. My travels took me to Mongolia, Cuba, Venezuela, Uzbekistan, Tajikistan, Mauritius, Fiji, North Korea, Uruguay, Paraguay, Trinidad and Tobago and Thailand.*

## THE RIVER MURRAY DARK SKY RESERVE (RMDSR)

Andrew Cool

14:30- 15:00

The scientific data acquired in the last 18 months at the River Murray Dark Sky Reserve (RMDSR) and about the project generally. Andrew with the RMDSR team has made extensive SQM readings in the RMDSR and modelled atmospheric and cloud conditions with all-sky cameras in the region. He has extensive experience in this field working for DSTO. RMDSR are awaiting a decision from IDA for accreditation for the RMDSR - hopefully Gold standard.

*Andrew Cool has worked for the Defence Science & Technology Group at Edinburgh Adelaide for 30 years, in the field of Ionospheric Physics as it pertains to the JORN Over the Horizon Radars. For the past 7 years he has run several airglow cameras systems to photograph Atmospheric Gravity Waves in the Ionosphere, the movement of which can be correlated to disturbances in the Ionosphere.*

*He led the DST team that conducted a Site Seeing Survey for DARPA's 3.5metre Space Surveillance Telescope at the Harold E. Holt Naval Communications Base at Exmouth in WA in 2013. More recently Andrew commissioned a 20" Officina Stellare telescope at DST Edinburgh that will be part of the Falcon Telescope Network.*

*Andrew is co-author of a paper in Nature on Light Pollution, has published on airglow research, and along with other Australians is listed as a co-author on a paper detailing the Paris Observatory collaboration to observe the occultation of the TNO Chariklo with its twin ring system.*

*Andrew has run The Heights Observatory in Adelaide since 2007, where he mentors High School students in astronomy and astrophotography. He is also known as the man behind the SkippySky Astronomy weather forecast website. Since late 2016, Andrew has been involved in setting up the River Murray Dark Sky Reserve, providing advice on astronomy, guiding the collection of SQM data across a 2000sqkm area, and producing software to analyse the data. Andrew is a Member of the Astronomical Society of Australia and a Fellow of the Royal Astronomical Society. He is married to Jo, and has two University student daughters who are still sponging off him...*

## TWELFTH TRANS-TASMAN SYMPOSIUM ON OCCULTATIONS

*Steve Kerr, Convenor*

Mon 9:00 – 17:00 at the observatory

Start	Presenter	Title
09:00	Steve Kerr	Occultation highlights from 2016/17 for Australia and New Zealand with a summary of the best events from around the world.
09:30	Brian Loader (via MeetCheap)	Double star occultations
10:00	Murray Forbes	Running occultation programs with Linux?
10:30		Morning Tea
11:00	Steve Kerr	Lucky Star
11:20	Dean Hooper	Experiences of a novice occultation observer
11:40	Steve Kerr	Future Occultations for 2018
12:00	Occultation Section discussion	
12:30		Lunch
13:30	Murray Forbes & Steve Kerr (on behalf of Brian Loader)	Limovie workshop
15:00		Afternoon Tea
15:30	Dave Herald (via MeetCheap)	Workshop: 1) Making predictions with Occult and adding to OccultWatcher. 2) Video processing with Tangra, analysis with AOTA and reporting.
17:00		Close

# POSTER PAPERS

## **INFRARED STUDIES OF JUPITER'S GREAT RED SPOT**

*Barry Adcock*

Poster outlines the level of radiation of Jupiter's great red spot as a function of radiation in the infrared region of the electromagnetic section.

## **THE GREAT MELBOURNE TELESCOPE EYEPIECES**

*Barry Adcock*

Poster paper outlines the design and construction of the Great Melbourne Telescope eyepieces.

## **NEGLECTED SOUTHERN BINARIES – ASTROPHYSICAL MODELLING**

*Colin Berbrick and Thomas Richards*

There are many neglected eclipsing binary stars in the southern hemisphere which are badly in need of updated times of minima and complete light curves, to enable preliminary astrophysical modelling. Here we present some examples of amateur collaboration in this interesting field of research.

## PREVIOUS NACAAs

2018	Ballarat	Ballaarat Astronomical Society
2016	Sydney	Sutherland Astronomical Society
2014	Melbourne	Astronomical Society of Victoria
2012	Brisbane	Astronomical Association of Queensland
2010	Canberra	Canberra Astronomical Society
2008	Penrith	NACAA Inc
2006	Frankston	Mornington Peninsula Astronomical Society
2004	Hobart	Astronomical Society of Tasmania
2002	Adelaide	Astronomical Society of South Australia
2000	Perth	Astronomy WA
1998	Sutherland	Sutherland Astronomical Society
1996	Brisbane	Astronomical Association of Queensland Southern Astronomical Society Brisbane Astronomical Society Southeast Queensland Astronomical Society
1994	Canberra	Canberra Astronomical Society
1992	Adelaide	Astronomical Society of South Australia
1990	Frankston	Astronomical Society of Frankston Astronomical Society of Victoria
1988	Sydney	Astronomical Society of New South Wales British Astronomical Association (NSW Branch) Sutherland Astronomical Society
1986	Hobart	Astronomical Society of Tasmania
1984	Perth	Astronomical Society of Western Australia
1982	Brisbane	Astronomical Association of Queensland
1980	Geelong	Astronomical Society of Geelong
1978	Canberra	Canberra Astronomical Society
1976	Sydney	Astronomical Society of New South Wales
1974	Adelaide	Astronomical Society of South Australia
1972	Melbourne	Astronomical Society of Victoria
1970	Wollongong	Illawarra Astronomical Society
1969	Ballarat	Ballaarat Astronomical Society
1968	Port Macquarie	Port Macquarie Astronomical Association
1967	Canberra	James Cook Astronomers Club Pacific Astronomical Society

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