



## CAASTRO Newsletter Edition 15, December 2015



### INTRODUCTION FROM CAASTRO DIRECTOR

Congratulations to our CAASTRO Advisory Board Chair, Dr Alan Finkel AO FTSE, who will be Australia's next Chief Scientist. Alan will take over from the current Chief Scientist, Prof Ian Chubb, on 1 January 2016 and will step down as CAASTRO Board Chair at that point. We are about to start the process of appointing a new Board Chair, and expect to make an announcement about this in March/April next year.

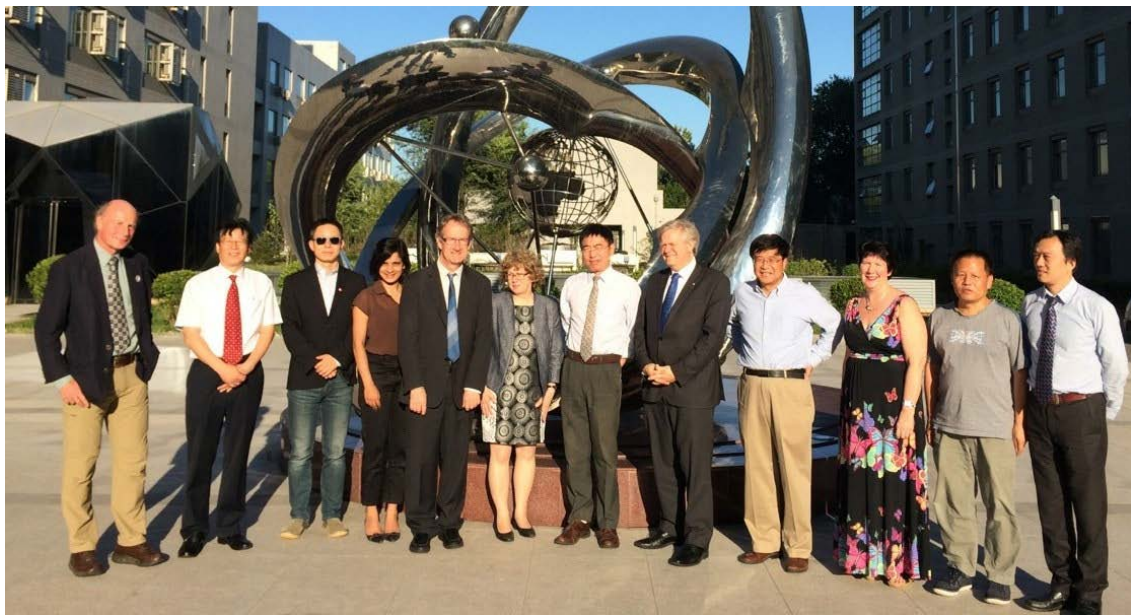
Alan's involvement with CAASTRO dates back to early 2010, and he agreed to take on the role of Advisory Board Chair even before the Centre had been funded. As Board Chair he helped to give CAASTRO the shape and structure it has today, and he has been an engaged, enthusiastic and inspiring figure throughout his involvement with CAASTRO. He has been a valued mentor to CAASTRO's founding Director, Bryan Gaensler, and to me. We will miss you, Alan, and wish you well in this important and exciting new role. Many thanks for all you have done for CAASTRO!

It was wonderful to see so many CAASTRO members at our recent Annual Retreat – held this year at Leura in the Blue Mountains where we enjoyed peaceful surroundings, fine weather and a wide range of activities. As a distributed Centre, spread across seven Australian universities and our national and international partner institutes, our Annual Retreat allows us to meet together in one place to build and strengthen our connections. Special thanks go to those who travelled long distances to attend, to our overseas guest speakers Vernesa Smolcic and Alex Kim, and to our inspiring Breakfast speaker, Prof Nalini Joshi, who spoke eloquently on gender issues and the SAGE initiative.

CAASTRO is now more than a year past its halfway point, and the Executive and Advisory Board have been discussing strategies to maximize the long-term impact and legacy of our Centre. At the same time, we are keen to identify and support new initiatives wherever possible. At this year's Retreat we held the first CAASTRO Innovation Challenge, in which small groups were invited to develop and pitch ideas that were innovative and could potentially be developed into a marketable product.

As we had hoped, there was an enthusiastic response and some excellent ideas. We will take this further in the New Year, and will be providing resources and mentors to allow some of these groups to develop their concepts in more detail.

The Federal Government's Innovation statement, released only a few days ago, contains welcome news for astronomy – in particular the announcement of long-term funding for the National Collaborative Research Infrastructure Scheme (NCRIS) and indicative funding for the Square Kilometre Array (SKA) project. The statement also included funding to promote women in science, including the pilot stage of the Science in Australia Gender Equity (SAGE) program, as well as initiatives to promote research-industry collaboration and public awareness of science. Many of these initiatives are well aligned with our current activities in CAASTRO, and should offer new opportunities for us in 2016. This welcome news allows us to end the year on a very positive note.



*Australian and Chinese delegates in Beijing after the ACAMAR signing ceremony in September (photo: Di Li, NAOC)*

For 2016, we already have a great program of meetings and workshops to look forward to. The first Australia-China ACAMAR workshop will take place in Perth from 5-7 April, following the signing of the ACAMAR agreement in Beijing last September. The Workshop themes include radio astronomy and SKA, Antarctic astronomy, astronomical instrumentation and Big Data challenges. Registration is now open via the CAASTRO web page, and I hope to see many of you there to join the discussions and meet our Chinese colleagues.

As many of you know, we will be running two major science conferences this year: *Diving into the Dark: Bridging Cosmological Theory & Observation* will be held in Cairns from 17-22 July, with CAASTRO CI Tamara Davis as the SOC Chair; followed by *The Changing Face of Galaxies* from 18-23 September in Hobart with CI Scott Croom as SOC Chair. Full details of these, and all our other workshops, are on the CAASTRO web pages.

Finally, I'd like to welcome Carole Jackson (Curtin) and Christian Wolf (ANU) as new Node Leaders and CAASTRO Executive members from 2016, and thank retiring Executive members Steven Tingay and Brian Schmidt for their hard work and inspired leadership in these roles over the past five years. I'm glad that both will

retain a close connection with CAASTRO.

This has been another great year for our Centre. Many thanks to all of you for your hard work and collegiality that makes our activities so successful. I wish all of you a restful and enjoyable end of year break with your families and friends, and look forward to working with you once again in the New Year.

**ELAINE SADLER**  
**DIRECTOR, CAASTRO**



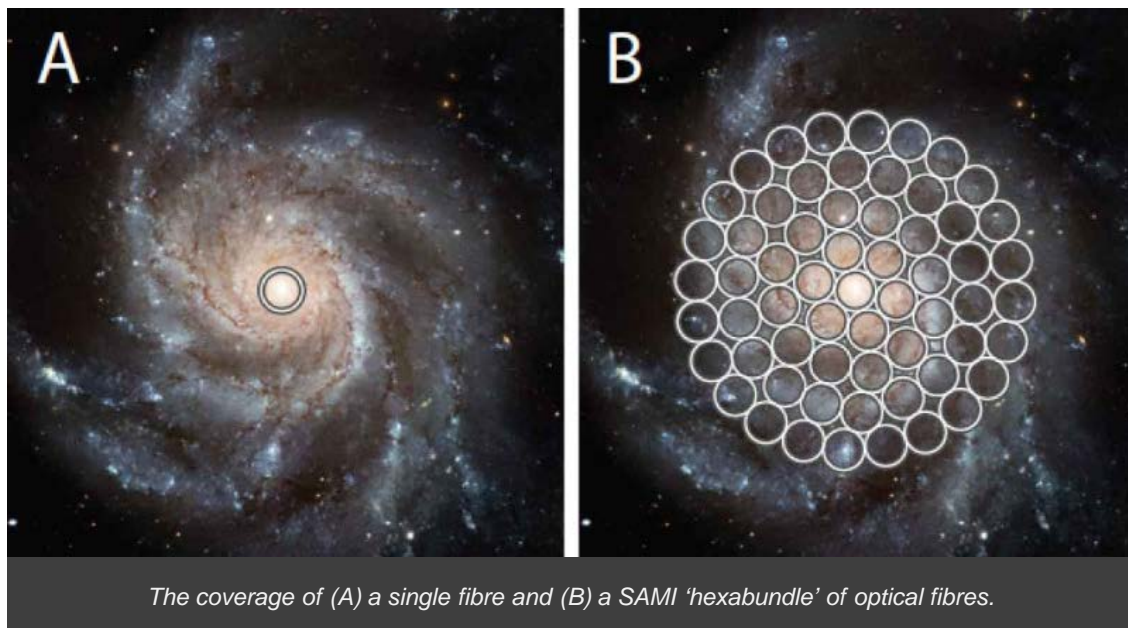
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## RESEARCH UPDATE

### **SAMI hexabundles probe bias in local star-formation rates**

Observing a nearby galaxy with a single optical fibre captures only the light from its central region. This introduces a bias into the estimation of the galaxy's star-formation rate. Elaborate methods have been used to correct for this bias. But there is a simpler way: use an optical-fibre integral field unit such as SAMI, which can capture far more of a galaxy's light.

Read more: <http://www.caastro.org/news/2015-bias>



### **Publication details**

Samuel Richards, Julia Bryant, Scott Croom, Andrew Hopkins, Adam Schaefer, Joss Bland-Hawthorn, James Allen et al. in MNRAS (2015) "[The SAMI Galaxy Survey: Can we trust aperture corrections to predict star formation?](#)"

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## Dark matter halo of dwarf galaxies shaped by supernova feedback

Just how dark matter is distributed in the centres of galaxies has been hotly debated. CAASTRO researcher Dr Se-Heon Oh (ICRAR/UWA) and colleagues recently presented high-resolution mass models of 26 dwarf galaxies and discussed the dark matter distributions near their centres. They find that these galaxies have sizeable constant-density cores, and suggest that supernovae have a role in shaping this distribution.

Read more: <http://www.caastro.org/news/2015-cusp>

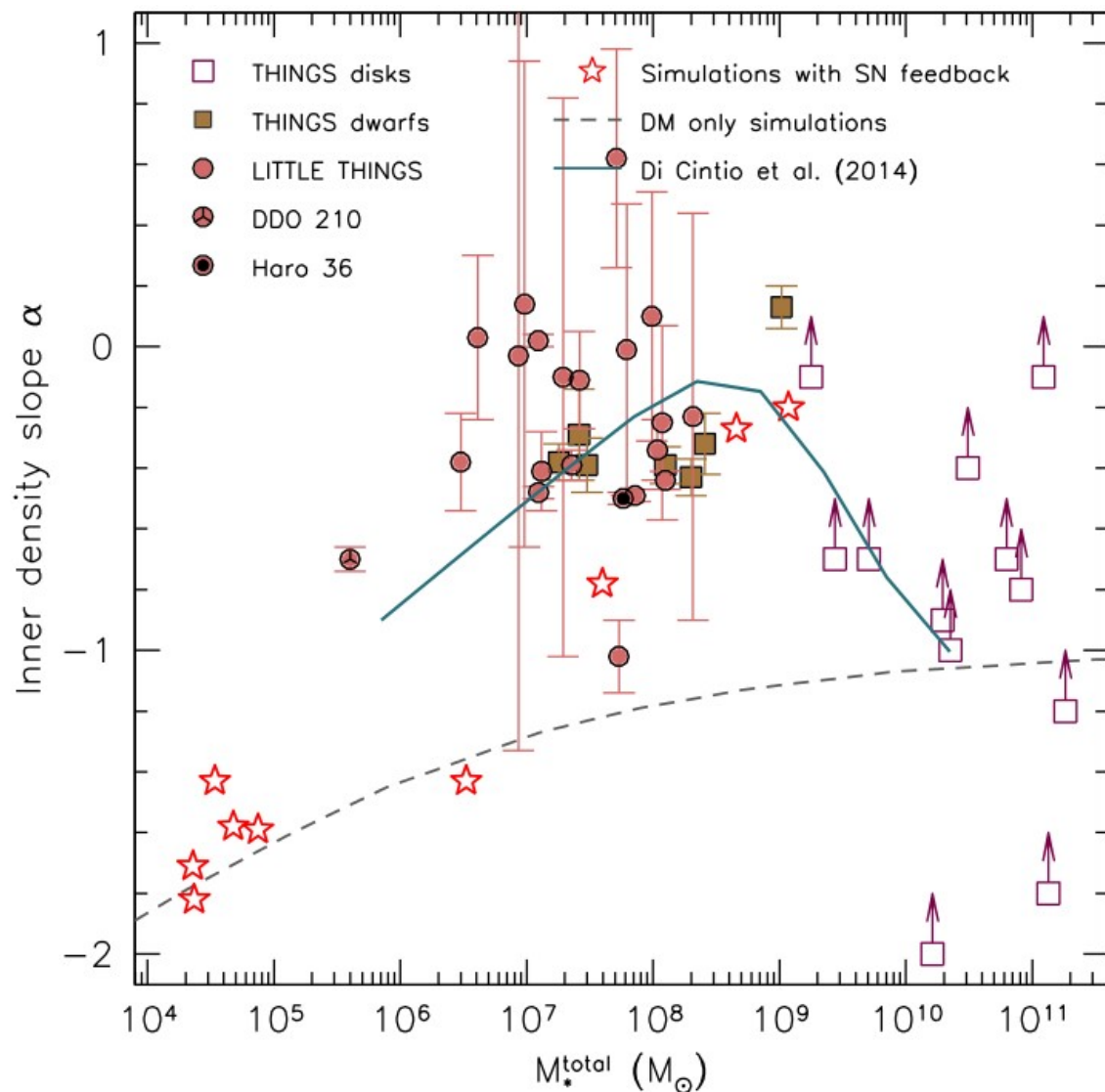


Figure 6 from Oh et al: The inner dark matter density slope of the sample galaxies from LITTLE THINGS (filled circles) and THINGS (filled squares, THINGS dwarfs; open squares, THINGS disk galaxies) against their total stellar masses.

### Publication details

Se-Heon Oh et al. in AJ (2014) "[High-resolution mass models of dwarf galaxies from LITTLE THINGS](#)"

## Rethinking GPS sources

Gigahertz peaked spectrum (GPS) radio sources have traditionally been considered to be 'young' or 'frustrated' radio galaxies. Using the Murchison Widefield Array and

the Australia Telescope Compact Array, Joe Callingham (University of Sydney) and colleagues have recently examined one such radio source, PKS B0008-421. Its spectrum calls into question the conventional model for these objects, synchrotron self-absorption, and also suggests that the source's central black hole ceased activity about 550 years ago.

Read more: <http://www.caastro.org/news/2015-gps>

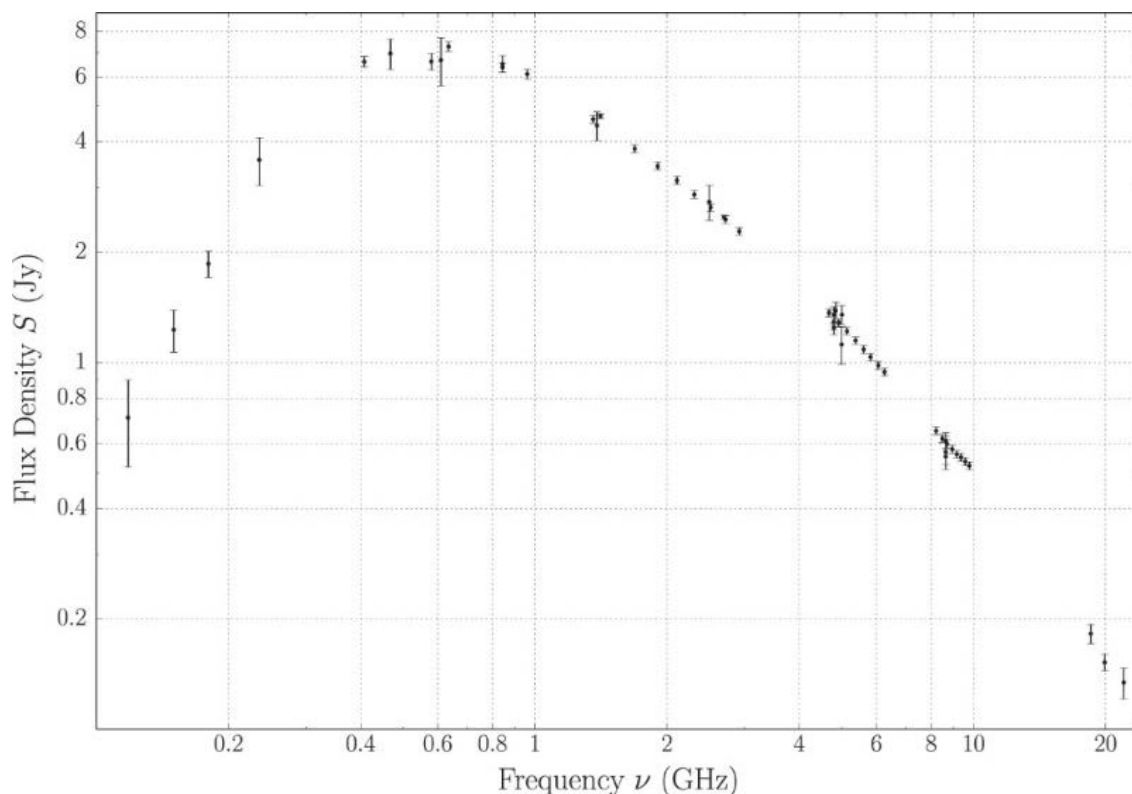


Figure 1 from Callingham et al. Spectral energy distribution for PKS B0008-421

### Publication details

J. R. Callingham and 42 co-authors in ApJ (2015). "[Broadband Spectral Modeling of the Extreme Gigahertz-Peaked Spectrum Radio Source PKS B0008-421](#)"

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### Collaboration between CAASTRO, LSST and the AAO

The Large Synoptic Survey Telescope (LSST), currently under construction in Chile, will conduct a ten-year survey of the dynamic Universe. [CAASTRO through the University of Sydney signed a Memorandum of Understanding with the LSST Corporation that provides access to LSST data. CAASTRO and the AAO are working collaboratively on this project to involve the whole community.](#)

### New Australia-China research centre

Australia and China have established a new joint virtual research centre, [ACAMAR \(the Australia-China Consortium for Astrophysical Research\)](#), which will serve as an umbrella and coordination point for bilateral astronomical collaborations. ACAMAR was launched in Beijing on 12 September 2015.

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## THEME UPDATES

Dynamic theme update 2015, Christene Lynch (University of Sydney) –

### Theme Scientist

The Dynamic theme has had many exciting new developments over this past year. The Fast Radio Burst (FRB) group has done a great deal of work to try to understand the origin of these events. To determine the repeatability of FRBs, group members carried out a survey to observe the fields of the eight known FRBs. From this work they ruled out periodic repeating sources with periods of less than 8.6 hours and periods between 8.6 and 21 hours (Petroff). Additionally, using the Parkes Radio telescope they were able to determine that 'Perytons' (signals whose frequency-swept emission mimic the dispersion observed for FRBs) are terrestrial, but rule out a similar origin for FRBs (Petroff, Barr). [Read more here](#)

### Dark theme update 2015, Ixandra Achitouv (Swinburne University) – Theme Scientist

The CAASTRO Dark Theme has been very active in 2015 from both the observational and the theoretical aspects. In the Peculiar Velocity Surveys projects, the team derived the peculiar velocities for the 2MASS Tully-Fisher Survey and described the velocity field of the nearby Universe (C. Springob *et al.* 2015). The 6dF Galaxy Survey velocities (6dFGSv) have been used to measure the bulk flow (M. Scrimgeour *et al.* 2015) and also for novel tests of model-independent gravity (A. Johnson *et al.* 2015). [Read more here](#)

### Evolving theme update 2015, Dan Taranu (UWA) – Theme Scientist

This year has seen a number of important developments and interesting science results in the Evolving theme. Beginning with Epoch of Reionisation (EoR) science, Sokolowski and colleagues produced a BIGHORNS system paper and first science results, demonstrating that the ionosphere is not a fundamental impediment to detecting an EoR signal. On a related note, Arora and colleagues demonstrated that GPS data on ionospheric conditions can be used to calibrate the Murchison Widefield array (MWA), while Trott and Tingay showed that the EoR power spectrum is detectable in the presence of interplanetary scintillation – all promising results for direct detection of the EoR. Meanwhile, the Murchison Widefield Array (MWA) EoR project announced limits on the 21 cm (neutral hydrogen) power spectrum based on 3 hours of data (Dillon+). The next 30–50 hours of data are now being processed through two independent pipelines. Encouragingly, the MWA project received a million-dollar grant from the Australian Research Council, which will be used in part to double the number of tiles (from 128 to 256), increasing the telescope's sensitivity and resolution. [Read more here](#)

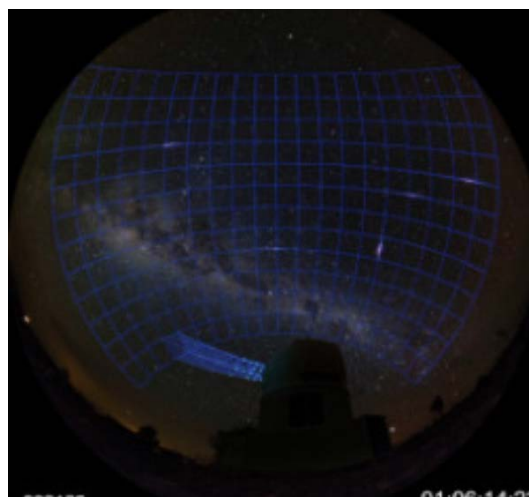
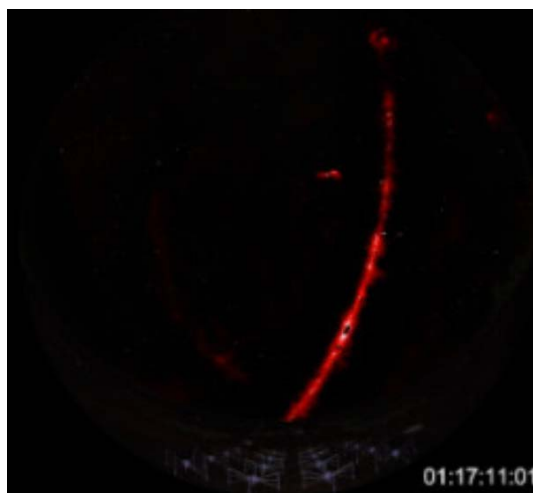
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## CAASTRO OUTREACH PROGRAM

This year has been very productive, with our flagship programs progressing and with new projects being taken on to ensure that the CAASTRO Education & Outreach portfolio is well set up for the next two years. One of our major legacies is now nearing completion: the CAASTRO planetarium show in collaboration with Museum Victoria (MV). Thanks to the fantastic team in Melbourne and to our friends at Scitech, both the CAASTRO Executive and the CAASTRO Advisory Board were able to enjoy the current production in full-dome projection during their respective meetings in Perth. This exciting project, led by Dr Tanya Hill (MV) and Dr Wiebke Ebeling (CAASTRO), is a great example of how astrophysical research can be

communicated to the public on a large scale and in a way that plays to the strengths of both collaborators. The launch will be Monday 21 March 2016 in Melbourne.

[Read more here](#)



**Top left:** SkyMapper's digital camera scans the Southern Sky in search for supernovae (credit: MV, Alex Cherney)

**Top Right:** The MWA reveals the radio sky and our galaxy's disk of hot gas (credit: MV, Alex Cherney, GLEAM collaboration)

**Bottom:** Facilitator Philip Pryor (Morphthink) with the workshop participants

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## CAASTRO IN THE CLASSROOM

It was great to see so many CAASTRO members visiting the CAASTRO in the Classroom stand at the Annual Retreat in November. In 2016 we will see some new presenters joining the program, as well as some experience presenters coming back for more.

High School Science Teacher Neill Dorrington joined CAASTRO on secondment in November and is creating some excellent classroom resources that will be shared with schools in the new year. Another two science teachers will join the team in January to work intensively with Neill on producing classroom activities that will be published on the CAASTRO website. One exciting set of classroom resource will be

a series of animations with content that is linked to the school curriculum.

On 8 December Jenny Lynch and Vanessa Moss attended the Virtual Excursions Australia conference, reVEAI2015, at the Australian Museum where they met other video conferencing providers and saw presentations on topics ranging from the educational value of video conferencing to the technical and organisational challenges in delivering programs for schools.

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## MEMBERSHIP UPDATE

CAASTRO now has 180 members. We welcome most recent members:

- Cullan Howlett, ICRAR University of Western Australia
  - Minh Huynh, ICRAR University of Western Australia
  - Katharine Kelley, ICRAR University of Western Australia
  - Claudia Lagos, University of Western Australia
  - Elizabeth Mahony, University of Sydney
  - Anais Moller, Australian National University
  - Fiona Panther, Australian National University
  - Masha Rahimi, University of Melbourne
  - Jarryd Rusti, University of Melbourne
  - Natalia Sommer, University of Queensland
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## REWARDS AND RECOGNITION

The following CAASTRO staff were recently recognised:

- Advisory Board member Professor Alan Finkel was appointed as Australia's Chief Scientist commencing from 1 January 2016.
  - Professor Matthew Bailes received an ARC Laureate Fellowship
  - Catherine de Burgh-Day: Royal Society of Victoria Young Scientist Research Prize for the Physical Sciences: <http://www.royalsocietyvictoria.org.au/2015-ysrp-finals/>
  - Ben McKinley: a DECRA award for his MWA. For more details: <https://rms.arc.gov.au/RMS/Report/Download/Report/a3f6be6e-33f7-4fb5-98a6-7526aaa184cf/6>
  - Cleo Loi (CAASTRO Alumni) was named one of the Top 25 under 25 by Triple J and won the JJJ 25 2015 Canon Extreme Imaging competition: <http://www.caaastro.org/news/2015-canon>.
  - Professor Joss Bland-Hawthorn: The Australian Optical Society has awarded Professor Joss Bland-Hawthorn the 2015 WH "Beattie" Steel Medal in recognition of his leadership and significant contribution to the field of optics, particularly in the application of photonics to astronomical and space instrumentation. He is the first astronomer to receive this award. [Read more here](#)
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# CAASTRO MEMBER PROFILES

## **Ms Helen Keys (USYD) Executive Assistant to Director and COO**

Helen Keys recently joined CAASTRO to provide executive assistance to the Director and COO. She has had extensive experience working at The University of Sydney in various roles associated with the Senior Executive Group (SEG). In 2014-15 she was seconded to Macquarie University to assist the Director of the Centre of Excellence for Core to Crust Fluid Systems (CCFS) with their ARC mid-term review.



## **Sam Hinton (UQ) PhD Student**

Sam is a PhD student at the University of Queensland, investigating supernova cosmology in a Bayesian framework with Tamara Davis and Alex Kim. He is interested in Bayesian modelling due to the limitations and restrictions imposed by traditional analyses, and look forward to seeing how far we can push a Bayesian framework with the DES supernovae.

He also have interests in Large Scale Structure, analysis software and machine learning. In his honours thesis he investigated the 2D Baryon Acoustic Oscillation signal present in the Wigglez survey, to provide cosmological constraints independent of prior measurements and CMB data. In a previous thesis, he designed Marz, a web-based browser application designed to redshift spectra. This has been a massively rewarding endeavour, as the software is now in use by multiple cosmology surveys! In the future, he would like to work towards a more autonomous scientific pipeline, wherein catalogue generation, tiling, data reduction, redshifting and data analysis form one seamless process.

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## **STUDENT COMMITTEE REPORT**

Last year the student committee focused on highlighting the current opportunities available to students, that being the scientific collaboration, workshop opportunities and mentoring schemes. This culminated in posters and flyers to give a flavour of CAASTRO. We then worked on gathering together common online resources used by students, to help pool useful tools. This 'Student Survival Toolkit' can be found on

the CAASTRO intranet. We also held node meetings, to try to gauge how students were going and what we could help with.

Taking from those meetings, in 2016 the student committee plans to try and add to the already existing workshops. Two main areas of interest were common across the nodes, that being python training, and experience in interview situations, and so this is where we will focus our efforts. The new Chair of the CAASTRO Student Committee in 2016 is Jack Line from the University of Melbourne.

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## UPCOMING EVENTS

ACAMAR China and Australia Workshop: 5-7 April 2016 in Perth

[ASKAP 2016: The Future of Radio Astronomy Surveys](#): 6-10 June 2016, University of Sydney, Sydney, NSW, Australia

[Diving into the Dark: Bridging Cosmological Theory & Observation](#): 2016 CAASTRO Scientific Conference, 17-22 July 2016, Pullman Cairns International Hotel, Cairns, QLD, Australia

[The Changing Face of Galaxies: uncovering transformational physics](#): 2016 CAASTRO Scientific Conference, 18-23 September 2016, Wrest Point Hotel, Hobart, TAS, Australia

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## PAST EVENTS

### **Molonglo Reborn: Dawn of New Era of Discovery**

On Thursday 3 December the University of Sydney's Molonglo Observatory hosted "Molonglo Reborn", an event to celebrate both Molonglo's history and its future: the 50<sup>th</sup> anniversary of its opening, in November 1965, and the upgrade that has put it on a new path for hunting transient sources, particular pulsars and 'fast radio bursts'. The 80-strong crowd included past and present students who have used the telescope; staff who have kept the place running over the years; members of the families of Bernie Mills and Michael Large; Swinburne University and ANU researchers involved with the upgrade; and other astronomers, academics and VIPs.

Dr Peter Hendy, the Federal MP for Eden-Monaro and Assistant Minister for Productivity, launched the telescope into its new role in both low-tech and high-tech ways, cutting a ribbon and tapping an iPad screen to start the telescope acquiring a pulsar signal. Professor Anne Green (University of Sydney) presided over the event as Master of Ceremonies, and the University of Sydney's Professor Duncan Ivison (Deputy Vice Chancellor, Research) and Swinburne University's Professor Aleksandar Subic (Deputy Vice Chancellor, Research and Development) spoke about the telescope from the point of view of their respective institutions. The morning's formalities were followed by lunch and an afternoon of talks about science, past and future; those who wanted to had a look-see at the new technology in the control building. The event wrapped up at 3.30 pm and the guests dispersed, slightly sunburnt in some cases, but with every appearance of contentment.







Image credits: Nick Smith

**Top:** Cutting the ribbon to relaunch the telescope. L-R: Professor Elaine Sadler Director, ARC Centre of Excellence for All-sky Astrophysics; Mr Albert Wong, President, Physics Foundation, University of Sydney; Professor Anne Green Professor of Astrophysics, University of Sydney; The Hon. Dr Peter Hendy MP, Assistant Minister for Productivity and Member for Eden-Monaro (with scissors); Professor Duncan Ivison, Deputy Vice Chancellor-Research, University of Sydney; Professor Matthew Bailes, Australian Laureate Fellow, Swinburne University of Technology; Dr Lewis Ball, Director, CSIRO Astronomy and Space Science; Professor Aleksandr Subic, Deputy Vice Chancellor-Research and Development, Swinburne University.

**Middle:** Professor Anne Green, University of Sydney being interviewed by the ABC

**Bottom:** Guests at the event

## CAASTRO annual retreat, 16–18 November 2015

Three days. Ninety scientists. How can one summarise the multifaceted CAASTRO annual retreat, held this year at the Fairmont Resort in the Blue Mountains of New South Wales, on the edge of the beautiful Jamison Valley?

The overall message was that CAASTRO is now mature. So too are most of its big survey projects, such as SAMI and GLEAM, and these are now beginning to bear fruit. The Epoch of Reionisation projects still have a way to go, but good progress was made this year in characterising and/or removing contaminating signals and setting up pipelines. [Read more here](#)





*CAASTRO Staff at the Annual Retreat, photo credit: Markus Jaaskelainen*

## **ADASS XXV 25-29 October 2016**

The annual *Astronomical Data Analysis Software and Systems* (ADASS) met in the southern hemisphere for the first time to celebrate its 25th anniversary. 300 scientists from 24 countries met in Sydney in the Rydges World Square ballroom for 4 and a half days of astronomy and software.

Key themes for this year's ADASS were: Knowledge discovery and data management tools for astronomical Big Data; LSST and lessons learned from current programs; Algorithms for astronomical data reduction; Real-time processing; Visualization and innovative user interfaces; Data pipelines. The conference kicked off with an inspiring keynote presentation by Hugh Durrant-Whyte on Data, Knowledge and Discovery. There were numerous presentations on interesting new programs, tools and facilities including ESA's Astronomy Multi-Mission Interface and ESAsky, advanced metadata facilities in ADS, the aladin HIPS tool for visualising large sky-area data sets using healpix, and the HST source catalogue.

There were many presentations discussing details of current and up-coming observational programs that generate massive volumes of data. Storing, accessing, processing and visualising big astronomical data sets was a common theme. Also emerging as an important common theme was effective use of cloud computing resources, and the emerging set of tools to deploy and manage astronomical data processing systems in the cloud.

Delegates to ADASS were treated to fine Sydney weather and amazing scenery. The icebreaking social at the historic Sydney Observatory, with lovely backdrop of the harbour and Harbour Bridge was equalled only by the amazing conference dinner with sundowners in Luna Park, overlooking picturesque Milson's Point.



*ADASS XXV Delegates outside Rydes World Square (photo credit: Andy Green)*

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Wishing all CAASTRO members happiness these holidays and for  
the year ahead

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