CAASTRO Newsletter Edition 18, December 2016

INTRODUCTION FROM CAASTRO DIRECTOR

Since the publication of the last CAASTRO Newsletter, we have enjoyed a congenial and stimulating Annual Retreat at Abbey Beach in Western Australian and a very successful ACAMAR workshop with our Chinese colleagues in Suzhou. Planning for the new ARC Centres of Excellence CAASTRO-3D and OzGRav is now well underway, with recruitment of the first staff in progress at both Centres. Many thanks to all those who have worked so hard this year to make our activities successful.

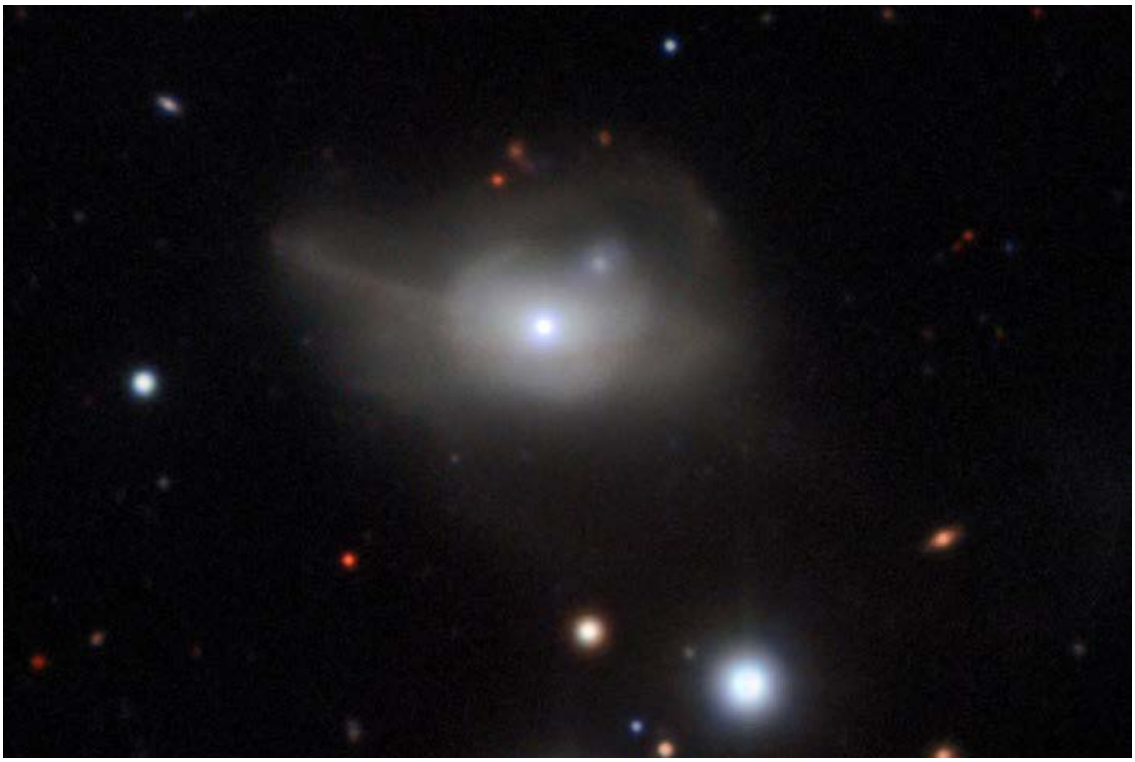
This has been another busy year for CAASTRO, and I hope you will enjoy reading about some of our latest activities in this Newsletter. I wish all of you a happy and restful end of year break, and I look forward to working with you again in 2017.
Elaine Sadler
Director, CAASTRO

RESEARCH UPDATE

Starving Black Hole Returns Galaxy to the Shadows

For the second time since it was first observed in 1974, a nearby galaxy has mysteriously changed its look – making it one of only very few known cases, and the most dramatic one by far.

Galaxy Mrk 1018, with a supermassive black hole at its centre, had been on the radar of astronomers since the mid 80s when they first noticed that it had brightened so much within five years that it had to be re-classified. Read more



This image from the MUSE instrument on ESO's Very Large Telescope shows the active galaxy Markarian 1018, which has a supermassive black hole at its core. The faint loops of light around the galaxy are a result of its interaction and merger with another galaxy in the recent past. Credit: ESO/CARS survey.

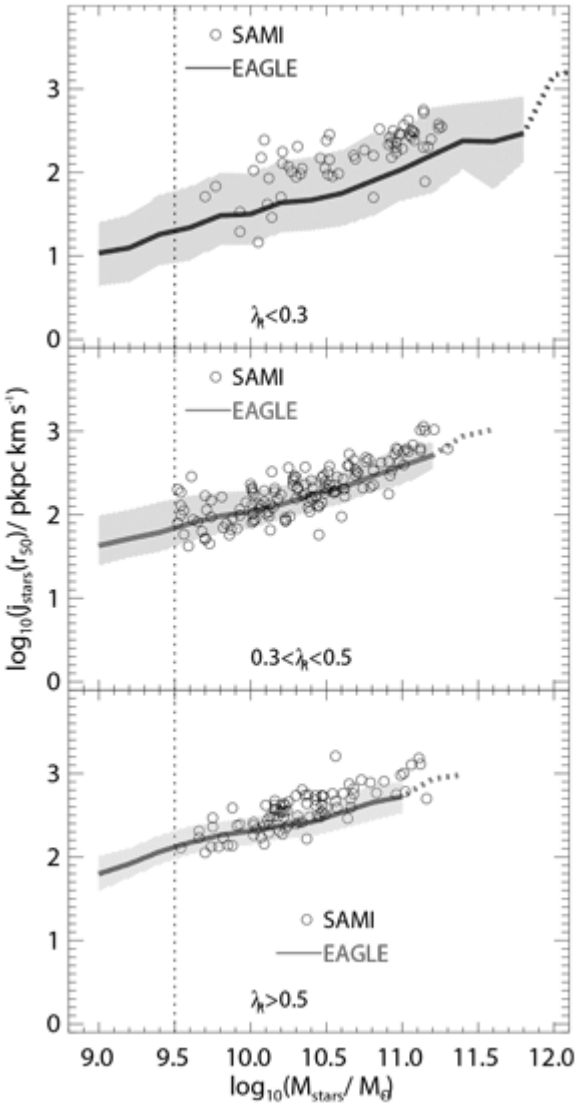
Publication details:

McElroy et al. (A&A Letters 2016): "The Close AGN Reference Survey: Mrk 1018's return to the shadows after 30 years as a Seyfert 1**" and Husemann et al. (A&A Letters 2016): "**The Close AGN Reference Survey (CARS): What is causing Mrk 1018's return to the shadows after 30 years?**"**

EAGLE simulation shows gain & loss of galaxies' angular momentum

CAASTRO member Dr Claudia Lagos (ICRAR-UWA) and colleagues analysed the evolution of the angular momentum of galaxies in the EAGLE hydrodynamical simulations. EAGLE is a state-of-the-art simulation that has a unique compromise between the resolution required to study the structural properties of galaxies (spatial resolution of 700 pc) and the simulated cosmological volume (100 Mpc box side length). This allows for the study of about 13,000 galaxies in the simulation-equivalent of the local Universe. EAGLE is unique in its accurate reconstruction of galaxy properties across multiple research studies, predicting galaxies of roughly the right sizes, morphologies, colours, gas contents and star formation throughout cosmic time. Read more

Specific angular momentum of stars as function of stellar mass in the simulation-equivalent of the local Universe and SAMI survey (top = slow rotating, middle = bulge-dominated,



bottom = spiral galaxies). Modified Fig.4 in Lagos et al. (MNRAS 2016)

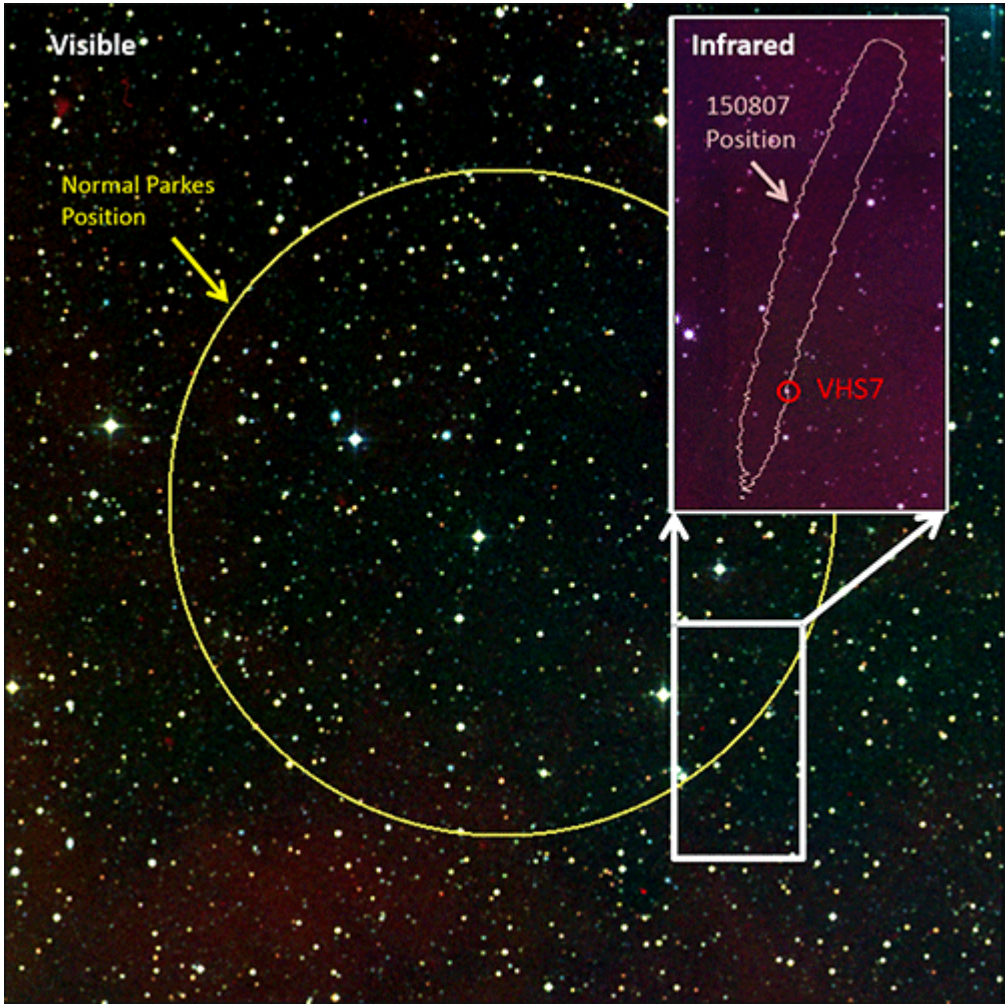
Publication details:

Claudia Lagos et al. in the Monthly Notices of the Royal Astronomical Society (2016): Angular momentum evolution of galaxies in EAGLE

Flash of Invisible Light Helps Map the Cosmic Web

A brief but brilliant burst of radiation that travelled at least a billion light years through Space to reach an Australian radio telescope last year has given scientists new insight into the fabric of the Universe.

ICRAR-Curtin University's Dr Ryan Shannon, who co-led research into the sighting along with the CAASTRO Alumni Dr Vikram Ravi, from California Institute of Technology, said the flash, known as a Fast Radio Burst (FRB), was one of the brightest seen since FRBs were first detected in 2001. Read more



The location of the FRB 150807: the yellow circle shows the typical location of the FRB. There are thousands of stars and galaxies in this direction. Because the burst was very bright we were able to locate it to a small region near the edge of that circle, shown as the pink banana-shaped region in the inset. In this region there are only 6 detected galaxies. The position of the most likely host galaxy, VHS7, is highlighted on the plot. Credit: Dr Vikram Ravi (Caltech) and Dr Ryan Shannon (ICRAR-Curtin/CSIRO)

Publication details:
"The magnetic field and turbulence of the cosmic web measured using a brilliant fast radio burst"

CAASTRO EDUCATION AND OUTREACH

We are delighted to see our next two big legacy projects well and truly on the home stretch. The CAASTRO "Bright Stars" wall calendar is currently being printed and will soon be distributed to CAASTRO nodes, high schools, the "Telescopes in Schools" program and amateur astronomy societies. They will also be available at CAASTRO public events, such as Perth Astrofest (18 March 2017) and the Uluru Astronomy Weekend (20-22 October 2017).

Our comic book "The Cosmic Adventures of Alice & Bob" is in the near-final stages of artwork, in time for print early next year and for its official launch at Perth Astrofest. The book will be accompanied by free online teaching notes to track down the secret clues that are hidden in the main story.

Meanwhile, a new "CAASTRO Reader's Digest" has also been produced, uploaded to the website, printed and distributed to our nodes. This is the sixth edition of our

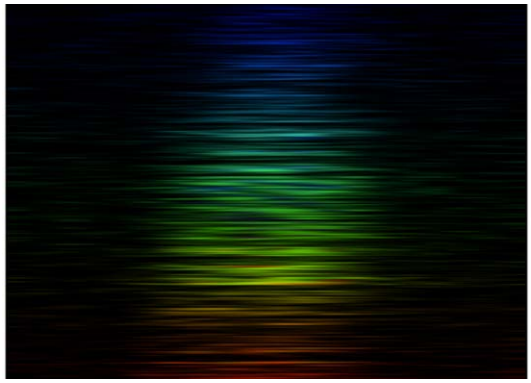
collection of research stories, bringing the total to over 100 CAASTRO papers over four years that have been presented to students and members of the public.

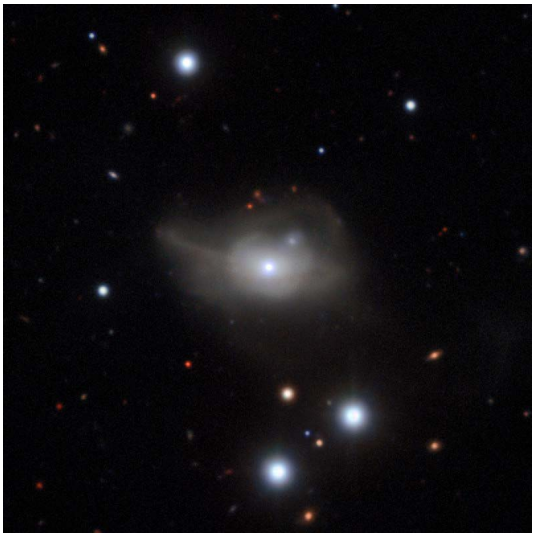
In collaboration with the CAASTRO Student and Post-Doc Committees, we also created a presentation template for “Career seminars” with a lot of valuable advice on job applications and career decisions. This presentation can be given at any CAASTRO node and to external audiences.

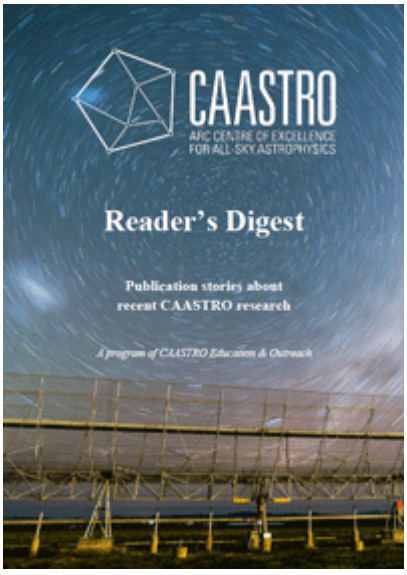
But there was as much activity in the Education & Outreach portfolio on stage as there was behind the scenes: following the CAASTRO Annual Retreat, we hosted the 2-day professional development workshop at Curtin University. This year, we had organised four half-day modules with contents specifically tailored to our audience of student and post-doc members. Workshop topics included leadership, creative thinking, difficult conversations and ‘Open Science’.

We led the collaborative efforts to produce two major international press releases – for University of Sydney student Rebecca McElroy’s ‘changing look galaxy’ in September (including collaborators at ESO, the European Southern Observatory) and for the Fast Radio Burst paper in Science in November by ex-CAASTRO member Vikram Ravi and many CAASTRO members at Swinburne University and Curtin University. We further collaborated with university media offices on two other press releases (SAMI in September and GLEAM in October).

A further press release that we had worked on with Think Inc. promoted CAASTRO “Dark Universe” theme leader Tamara Davis who hosted the Australian tour of world renowned US particle physicist Lisa Randall . In addition, CAASTRO student Sam Hinton conveyed his enthusiasm for science as the opening act at the Brisbane event.







CAASTRO IN THE CLASSROOM

CAASTRO in the Classroom is finishing a big year of creating new content and reaching a record number of school students. Over the past few months, excellent video conferencing sessions have been run for school students, with Dr Christene Lynch (USyd), Stephanie Bernard (UMel) and Steven Murray (Curtin) presenting curriculum-focused sessions for Year 7, Year 5 and Year 12 respectively. A new type of session has been trialed with scientists connecting directly with one school at a time via Skype and answering questions prepared by students. These interactive sessions have proven to be a great experience for the students, teachers and presenters. Thank you to Christene Lynch, Josh Calcino (UQ) and Nuwanthika Fernando (USyd) for pioneering this new style of offering for schools which will continue into 2017. Jenny Lynch has presented workshops for teachers, including two sessions at the Annual Conference of the Victorian Science Teachers' Association and a joint CAASTRO/ASELL (Advancing Science & Engineering through Laboratory Learning) workshop that was delivered via video conference to five locations. To see more about what CAASTRO in the Classroom has to offer schools see the links below:

- Classroom Astronomy Part 1 – CAASTRO Research: https://youtu.be/gX57il1xWIg
- Classroom Astronomy Part 2 – Classroom Resources: https://youtu.be/rRe9-vn57JM
- Women in Physics - Girls and Physics in High School and University (panel discussion): https://youtu.be/wXVPfP8-DJI

Map showing CAASTRO in the Classroom locations in 2016

MEMBERSHIP UPDATE

CAASTRO now has 184 members. We welcome most recent members:

- Mr Mason Ng, ANU Pre-PhD Student
- Mr Matthew Alger, ANU Pre-PhD Student
- Miss Georgina Taylor, ANU Pre-PhD Student
- Mr Lincheng Li, UWA PhD student

CAASTRO MEMBER PROFILES

Kathryn Plant (Swinburne University of Technology) Student

I joined CAASTRO in August and I'm working at Swinburne University on a one-year pre-PhD project in the pulsar/FRB group, before beginning my PhD at Caltech in September of 2017. I'm currently testing a new digital receiver for the Molonglo Observatory

Synthesis Telescope. I’m interested in Fast Radio Bursts, signal processing, and in particular in ways that new instrumentation can address the challenges of detecting these brief radio transients.

My current project focuses on FPGA programming in order to acquire spectra at high frequency resolution and high time resolution, and I’m now testing at Molonglo the digital receiver that I’ve programmed. At Caltech, I’m interested in applying similar technology at the Deep Synoptic Array, which is currently under construction at the Owens Valley Radio Observatory and will be capable of precisely localising the FRBs it detects.

AWARDS

CAASTRO has been successful in attracting a $250,000 government grant to expand our school engagement program to include "Women in STEM careers and entrepreneurship" sessions. The grant will support our 'CAASTRO in the Classroom' program and the 'CAASTRO Galaxy Convention'. The classroom program is an existing outreach activity designed to link high school students with CAASTRO's research scientists and PhD students. This grant will extend the program to add a new exclusive girls session. The convention is a multi-day workshop for PhD candidates, university researchers, high school and university students to work with innovators and entrepreneurs to develop business ideas.

CAASTRO LEGACY ITEMS

At the end of its funding period (2017-2018) CAASTRO is keen to leave behind a legacy of useful items for future researchers, outreach and professional staff members working within astrophysics. This may take us a while to establish, so we are keen to start early.

The purpose of this survey is to collect information on the legacy items that we have developed within CAASTRO.

We would like all CAASTRO members to think about what we are doing well and

complete this form. http://goo.gl/forms/tK0byVsxy6
These items could include:

- Intellectual property
- Software (we will ask you more questions later on this topic)
- Data product & simulations
- Case studies
- Policies – membership, publications, gender etc
- Outreach programs
- Tool kits
- Other programs – ECR, mentoring, busy weeks
- Templates – annual report, other reporting (project, KPI, budget), presentations etc
- Processes & procedures
- Event planning and systems
- Committee items and ideas – student, postgrads, etc

Don't worry about duplication.
Thank you for your contribution!

GENDER ACTION

The CAASTRO Gender Action Committee met in November for its half day meeting in Canberra with the meeting chaired by CAASTRO Chief Investigator Brian Schmidt. We were joined by new committee members Anais Moller, Bonnie Zhang, Steven Tremblay and Danail Obreschkow. Cath Trott has retired from the committee, and we want to thank her for the hard work she has done on the Committee since its inception.
The Committee discussed the challenges that the community is facing with sexual harassment allegations, and we want all CAASTRO members to know that all issues that are reported within CAASTRO are dealt with swiftly and decisively. If you need assistance and advice please ask us for help. In 2017 we plan to undertake a survey of our membership on this topic.

Equity, Access and Diversity - Support and Advice
There are times when sometimes you need some informal advice on day to day issues. Feel free to contact us for this advice. While each University or organisation has their own support programs and specific policy responses to issues of diversity, harassment and gender issues, CAASTRO is happy to help you navigate through any challenges you may be facing. Please contact us now by clicking on the link on the CAASTRO intranet page http://www.caastro.org/gender-action-committee or you can contact any member of the Gender Committee directly.

If you would prefer to report an issue *anonymously*, you can describe it on "I need support now**"**

You are also welcome to discuss any matters related to the Gender Action Committee and its activities with the **co-chairs**, Brian Schmidt and Rachel Webster. Also, the Director, Elaine Sadler is always open to any staff member or student with an issue to discuss.

POST DOCTORAL COMMITTEE REPORT

The CAASTRO Post-Doctoral Committee created comprehensive fact sheets about the application processes for ARC DECRA and Future Fellowship grants and shared this new resource with CAASTRO members in October. The fact sheets contain valuable advice on how and when to set yourself up for a successful application. Files were distributed via email and have also been uploaded to the CAASTRO intranet.

The Committee invited the new ARC Centre of Excellence directors Lisa Kewley (CAASTRO-3D) and Matthew Bailes (OzGRav) to join the October meeting, to discuss the roles and opportunities for post-docs in these two new centres, starting in 2017. Both directors detailed their plans for new post-doc jobs, fellowships, outreach projects, professional development, gender action and family-friendly workplaces. A short summary of these conversations has been uploaded to the CPDC intranet page, as part of the October meeting minutes.

At the CAASTRO Annual Retreat, the Committee hosted an expert panel discussion on careers inside and outside of astronomy research. Invited CAASTRO panellists Carole Jackson, Tara Murphy and Rachel Webster were joined by Kate Brooks (Centre for University Teaching and Learning at Murdoch University, Perth; previously CASS, Sydney). The discussion began with a set of five questions to all panel members, prepared by the Committee, and ended with all session attendees being invited to ask questions. Despite the early hour, the session was reasonably well attended and well received. A summary of the discussion has been emailed to CAASTRO ECRs and is also available on the intranet.

CAASTRO Postdoctoral Staff at Annual Retreat, Abbey Beach

Photo credit: Pete Battye

STUDENT COMMITTEE REPORT

Throughout 2016, the student committee has focussed on the development of resources for students, specifically in the form of two workshops. The first is a workshop on preparing for interviews developed by Wiebke Ebeling. The committee

is helping to shape the scope and content of this workshop by providing regular feedback as the materials come together. The second is a workshop on paper writing, which is a collaborative effort between Christian Wolf, Caitlin Adams and Jack Line, with input from the committee. A selection of materials from this workshop was presented to students at the retreat, and the organisers received excellent feedback from the attendees. We are working hard and aiming for the workshop materials to be sent to CAASTRO nodes early next year! If you have any ideas for workshops or materials that might be useful for students, we would love to work with you and help make it happen -- please contact Caitlin Adams at cadams@swin.edu.au.

CAASTRO Students Annual Retreat, Abbey Beach

Photo credit: Pete Battye

UPCOMING EVENTS

- CAASTRO-CoEPP Joint Workshop: Connecting Astrophysical Dark Matter with Direct Detection**,** 30 January - 1 February 2017, School of Physics, University of Melbourne, Melbourne, VIC, Australia
- Mock Perth: Challenges for Simulations in the Era of SKA and Large IFU Surveys, 20-22 March 2017, ICRAR, University of Western Australia, Perth
- 3rd Oz SKA Meeting, 2-3 May 2017, Sutherland Room, Holme Building, University of Sydney, Sydney, NSW, Australia
- From Black Hole to Environment: Galaxy Evolution across Multiple Wavelengths, 21-24 August 2017, Australian National University, Canberra, Australia
- 7th CAASTRO Annual Retreat, September 2017, Novotel Barossa, Adelaide, SA, Australia
- 3rd ACAMAR Meeting, Hobart, Tasmania Australia
- Uluru Astronomy Weekend, 20-22 October 2017, Uluru, NT, Australia

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PAST EVENTS

Diving into the Dark: Bridging Cosmological Theory & Observation
18-22 July 2016, Pullman Cairns International Hotel 2016 CAASTRO Annual Scientific Conference

From 18 to 22 July over 60 astronomers met to consider *Diving into the Dark: Bridging Cosmological Theory and Observation*. The conference will covered a diverse range of scientific topics including large-scale structure, gravitational lensing, peculiar velocities, and supernovae as cosmological probes. The program allowed some free form discussion and collaboration sessions to consider some key questions:

- Which combinations of observable signatures are most interesting for distinguishing between models?
- How can we mitigate systematic errors in these measurements?
- What are the most exciting new theoretical developments?

The delegates were treated to some unpredictable tropical weather and also a trip to Green Island to explore the reef.

Diving into the Dark Group Photo
Photo Credit: Josh Calcino

The Changing Face of Galaxies: Uncovering Transformational Physics, 19-23 September 2016, Wrest Point, Hobart, Tasmania, CAASTRO Annual Scientific Conference

140 Astronomers from 12 countries met at Wrest Point Conference and Events Centre in Hobart to discuss *The Changing Face of Galaxies: Uncovering Transformational Physics* from 19-23 September 2016. The conference covered 70 talks and 58 posters over 5 days. Key themes considered, each representing months or even years of work, were:

- What are the physical reasons behind morphological transformations?
- What drives the kinematic transformation of galaxies?
- What are the processes controlling the quenching of star formation?
- What is the role of AGN and star-formation feedback?
- How does gas accretion and the refuelling of galaxies modulate star formation?
- What is the relative importance of external vs. internal processes in galaxy formation?
- How do the key physical processes of galaxy formation change with cosmic time?

The conference dinner was held at the Museum of Old and New Art (MONA), located within the Moorilla winery on the Berriedale peninsula in Hobart. After a ferry ride at sunset, delegates were treated to a private tour of the museum followed by a 2 course dinner. Another highlight was a Ghost Tour of Port Arthur where delegates were treated to spooky tales and a different view of the historic site.

The Changing Face of Galaxies Group
Photo Credit: Dilyar Barat

2nd ACAMAR Meeting 5-7 December, Jinling Guanyuan International Hotel Suzhou, China

Australia-ChinA ConsortiuM for Astrophysical Research (ACAMAR, which is also θ Eridani, 天園六) held its second joint China-Australia Workshop in Suzhou from 5-7 December 2016. About 90 people attended the meeting, 27 of whom were Australians. The welcome drinks and dinner was held at the University of Sydney's new Suzhou Centre, and we are very grateful for the sponsorship that the University of Sydney provided. Both the Chinese and Australian participants commented that it was good to know the University of Sydney has a presence in China, and to have the opportunity to see it.

The scientific programme placed emphasis on FAST, SKA and pathfinders, pulsars, big data, Antarctica and 12-m spectroscopic capability. There was time was devoted to breakout discussions to foster further collaboration, and this will continue at future meetings in an enhanced form. The collaboration goes from strength to strength, and the third ACAMAR Workshop has been tentatively scheduled for Tasmania in September or October 2017.

In addition to this the ACAMAR 2017 China SKA PhD scholarships has started to rollout to CAASTRO universities plus the University of Tasmania. Seven applications were received by the deadline of 4 November, and these are progressing. In 2017 a Chinese proposal for a combined PhD scholarship and postdoc scheme has been approved by the Chinese Academy of Science. The proposal will allow for 20 international positions, 15 in Australia, three of which will be postdocs. An MoU between NAOC and CAASTRO was required to facilitate this.

Left: Kate Gunn and Li Lin

Right: Australian Consul-General Graham Meehan and Sean Starmer from the Australian Embassy with the ACAMAR collaborators

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