



CAASTRO Newsletter Edition 20, October 2017



INTRODUCTION FROM CAASTRO DIRECTOR

As we enter the final six months of CAASTRO's seven-year lifetime, it feels as though the Centre is busier and more active than ever. The CAASTRO Advisory Board held their last face-to-face meeting in Canberra on Tuesday 8 August, with overseas Board member Garth Illingworth flying in from the USA to join the meeting. The following morning, we enjoyed a

CAASTRO Celebration Breakfast at Parliament House hosted by the Hon Craig Laundy MP, Assistant Minister for Industry, Innovation and Science. Many CAASTRO members joined the Board and other guests at this event. Assistant Minister Craig Laundy, Australian Chief Scientist (and former CAASTRO Board Chair) Dr Alan Finkel, CAASTRO CI Prof. Brian Schmidt and current Board Chair Prof. Bob Williamson spoke about CAASTRO and its achievements.

There was a good turnout of parliamentarians and their advisors at the breakfast, and many of them stayed on to look at our research displays and talk to CAASTRO's postdocs and students about their work. Along with our scientific work, CAASTRO's gender action activities are clearly of great interest to many parliamentarians and we were commended once again for our activities in this area and our online Gender Action Toolkit. Many thanks go to Kate Gunn, Kylie Williams

and the CAASTRO admin team for their hard work in organizing this very successful event.

Warmest thanks also go to the members of the CAASTRO Advisory Board, who have consistently provided us with wise and useful advice on all aspects of CAASTRO's operations over the past seven years.

With CAASTRO's activities starting to ramp down, we will say good-bye to our Events and Communications manager, Kylie Williams, on 30 November. Kylie will be taking up the position of Senior Officer, Programs and Events, at the Sydney Dental Hospital. Many of you will have met Kylie at our CAASTRO-run events across Australia and overseas. She has done an outstanding job of running CAASTRO's events program for the past four and a half years, and I hope you will join me in wishing her all the very best for her future career.

We still have a busy program of activities to look forward to over the next few months, and I hope to see many of you in person at the final CAASTRO Annual Retreat in November.

Elaine Sadler
Director

RESEARCH UPDATE

Why massive galaxies don't dance in crowds

Heavyweight galaxies living in a dense crowd of galaxies tend to spin more slowly than their lighter neighbours, and an Australian-led team has found out why.

"Contrary to earlier thinking, the galaxy's mass determines its spin rate," said team leader Associate Professor Sarah Brough (ARC Centre of Excellence for All-sky Astrophysics and University of New South Wales).

This finding, based on a detailed study of more than 300 galaxies, has been published in The Astrophysical Journal. [Read more.....](#)



Galaxy cluster Abell 2744, imaged with the Hubble Space Telescope. The cluster lies in the constellation of Sculptor and contains several hundred galaxies. Credit: NASA, ESA, and R. Dupke (Eureka Scientific, Inc.), et al. Source: <http://hubblesite.org/image/3255/news/15-galaxy-clusters>

Publication Details

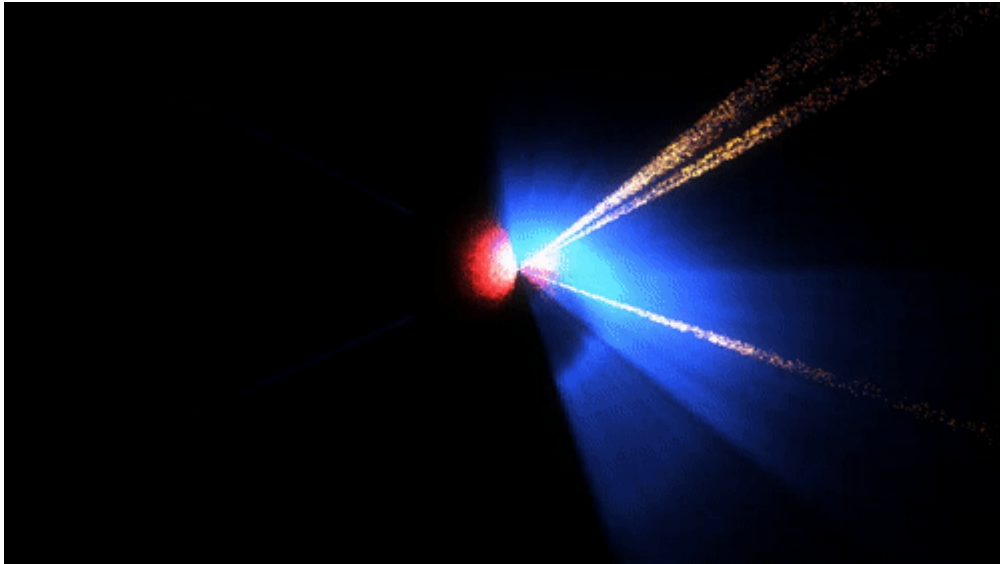
Brough, S. and 25 co-authors, “The SAMI Galaxy Survey: Mass as the Driver of Kinematic Morphology–Density Relation in Clusters”. The Astrophysical Journal, 844 (2017). Online: <https://doi.org/10.3847/1538-4357/aa7a11>.

Dark Matter, we know where you are!

New result rivals precision of cosmic microwave background measurements, supports view that dark matter and dark energy make up most of the cosmos.

An international team of scientists, including researchers from the Australian Research Council’s Centre of Excellence for All-sky Astrophysics (CAASTRO), has

just released the most detailed map of the distribution of dark matter in the universe ever made. The precision of the cosmological inferences possible from this data now rivals that from the European Space Agency's orbiting Planck observatory. [Read more.....](#)



Dark matter animation

CAASTRO EDUCATION AND OUTREACH

Every year, CAASTRO and Voyages Indigenous Tourism Australia team up to bring an astronomer out to the pristine night skies of Yulara, Central Australia, every two weeks between March and November. This year, I was lucky enough to experience the CAASTRO Astronomer-in-Residence program myself. In each of the day-to-day activities (face-to-face chats with the the public, screenings of Capturing the Cosmos and the following Q&A, the daily Night Sky Tours held just outside of town), the public consistently showed enthusiasm and avid interest in the night sky and all it had to offer, with many people being very curious about the Square Kilometre Array and the Murchison Widefield Array in particular. The CAASTRO-organised activities perform very well in the context of the resort's tourist activity portfolio, usually attracting a modest crowd. The last CAASTRO Astronomer-In-Residence for this year will be in attendance during November.

Sydney Astrofest was held on July 1st at The University of Sydney, and saw over 3500 people attending. Local telescope owners treated the public to views of the skies, while indoors there were talks, displays and activities aplenty. Despite the 4pm start time, families turned out in droves beforehand to secure a place in the inflatable planetariums and for Capturing the Cosmos-- both of which had their sessions for the night book out by 5pm. The lecture theatre was regularly filled out with few or no spare seats, while flurries of children seemed to enjoy the myriad astronomically-themed arts and crafts activities. Attendees took to social media to thank CAASTRO for the event, with a twitter user letting us know that they had a blast-- the highlight being their young "future astronomer" seeing Jupiter through a telescope. Hopefully they weren't the only "future astronomer" in attendance that evening, and hopefully Astrofest can still be here for them for years to come.

The release of Alice and Bob, the CAASTRO children's book earlier this year was hugely successful, with multiple requests coming in from individuals and schools for additional copies long after the main release was finished. Among some of the recipients, were feature scientists whose stories appeared in the comic itself. Jamie Link, whose story about smart dust is featured in the comic, was sent her own personal copy, and had this to say when she received it: *"I am so flattered that smart dust was included and so impressed with the comic! What a great publication for inspiring young scientists!"*.

Kim Steele, Education and Outreach Officer:



CAASTRO IN THE CLASSROOM

CAASTRO in the Classroom will build on the wonderful legacy left by my predecessor Jenny Lynch over the next 18 months, supported by the Department of

Education AMSPP Grant . It is now truly a national program, with schools from every Australian state participating in our recent activities.

Our Skype Q&A sessions continue to grow in popularity, particularly for students in grades 5-8. Feedback from these sessions has been overwhelmingly positive, with both presenters and students enjoying the conversation. The opportunity to have an astrophysicist virtually in their classroom is particularly appreciated by remote schools, who typically have few opportunities to host guest speakers. We're a little short on volunteer presenters, so if you'd like to offer an hour of your time once every few months, please let me know.



Scott Croom presenting "Wake up to Astronomy" during Science Week to St Joan of Arc

We've ramped up our live streaming, offering ten sessions for national schools Science Week 14-18 August. Over 2000 students tuned in to see our 15 minute "Wake up to Astronomy" morning sessions and our half hour "Lunchtime Astronomy" lectures. Despite a few technical glitches, the talks went well and feedback received thus far has been heavily weighted towards the "awesome" side of the scale. My thanks to our excellent Science Week presenters: Professor Tamara Davis, Dr James Allison, Professor Scott Croom, Nat Sommer, Stephi Bernard, Dr Nic Scott, Fiona Panther and Alex Codoreanu. More sessions are in the works. Watch this space!

Over the next few months, we'll be producing more downloadable resources, amongst other things. The biggest upcoming event for CitC is the inaugural Galaxy Convention on 4-5 December 2017, made possible through the WISE grant. This two-day event focuses on women and girls in STEM and entrepreneurship, so our speakers will mostly be female business leaders with STEM backgrounds who have successfully developed their own products and companies. Amongst our delegates, we'll be welcoming 50 female school students and around 20 teachers from all over Australia. Although the event has a female focus, anyone is welcome to attend and I encourage interested parties to register as soon as possible.

Janette Ellis

School Education Officer, CAASTRO in the Classroom

MEMBERSHIP UPDATE

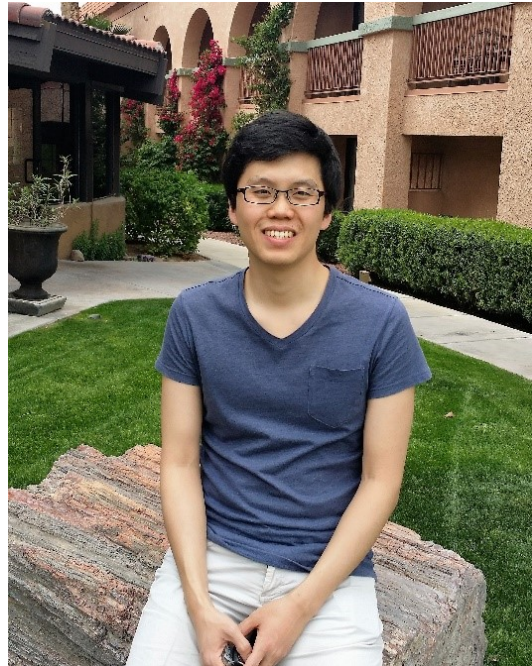
CAASTRO now has 190 members. We welcome most recent members:

- Janette Ellis, CAASTRO in the Classroom, University of Sydney
 - Lucas Grimes, PhD Student, University of Queensland
 - Clancy James, Research Staff, Curtin University
 - Dilpreet Kaur, PhD Student, Curtin University
 - Clare Kenyon, Administration Staff, University of Melbourne
 - Daniel Price, Research Staff, Swinburne University of Technology
 - Hao Qiu, PhD Student, University of Sydney
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CAASTRO MEMBER PROFILES

Seo-Won Chang, Research Staff, Australian National University

Seo-Won Chang joined CAASTRO this January and has a research background in stellar magnetic activity (M dwarfs) and its related variability (flare and starspot). He is a postdoc working with the SkyMapper Team where he is currently in charge of studying possible optical counterparts to gravitational wave (GW) events and fast radio bursts. About three weeks ago, a very exciting LIGO-Virgo observing run has drawn to close with some promising GW candidates. Stay tuned, the result is coming soon!



He is also spearheading one of SkyMapper's principal survey goals based on DR1 (or further releases) to develop a probabilistic description of highly variable or transient sources detected in our multi-epoch, multi-band data. This project will provide the capabilities of the SkyMapper Transient survey for detecting and characterizing short timescale variability, in terms of variability types, rates, Δmag or colour distributions that accessible to SkyMapper. All these efforts are part of our ongoing passion towards preparing for future time-domain surveys, in anticipation of LSST collaboration or next LIGO observing run.



Janette Ellis, CAASTRO in the Classroom, University of Sydney

I started with CAASTRO in June and, thanks to a Women in STEM and Entrepreneurship (WISE) grant from the Australian Government, my role will carry over to ASTRO 3D from next year. My background is mostly in high school science and maths teaching in NSW and Victoria. At senior high school level, I taught chemistry for the HSC, VCE and IB syllabuses. I'm happiest in the ocean, so I also helped run scuba clubs for schools.

Concurrent with my teaching work, I have a long history in educational publishing as an author, editor and photographer. Previously I've worked in pathology. I was ready for a new challenge and I'm thrilled to have the chance to continue the development of the CAASTRO in the Classroom program. I'm fascinated by space, particularly dark matter and dark energy, and I look forward to helping connect our astrophysicists to schools all over Australia during the next 18 months.

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.

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

NASA HACKATHON

On the weekend starting April 29, a team of CAASTRO members from around the country participated in the NASA space apps challenge in Sydney. The NASA space apps challenge is actually conducted simultaneously all around the world, but is hosted in select cities. Over the weekend, the hackathon has problem solvers work closely to solve one of many posed challenges using real NASA data. In this year's event, the challenges were particularly focussed on the Earth, and our CAASTRO team delivered a product titled "Polar Explorer".

The idea behind Polar Explorer was to display polar ice regions in 3D on a website, available to anyone in the world. Using the website, the viewer could see the changes in the ice profile with time, giving a sense of how the world's climate is changing. With more development time, the website could be extended into a virtual reality app, which would give a full-scale view of the ice and its shrinkage with time, available from anywhere in the world.

Polar Explorer did not place in the top 3 of 28 participating teams, but our team gave an excellent presentation on the motivation and execution of our product, and enjoyed the experience of working in a team with a tight schedule.

Christopher Jordan
Curtin University



The CAASTRO Hackathon Team

PAST EVENTS

OzSKA 3 Workshop

8-9 May 2017, University of Sydney, New South Wales

The 2017 OzSKA meeting was held on May 8th and 9th at Sydney University. There were 64 registered participants for the meeting.

Presentations included updates from the SKA Board and Australian SKA Office, progress reports from the Australian and South African precursors and

pathfinders, summaries of activities within most of the SKA Science Working Groups and Focus Groups, descriptions of the new ARC Centres of Excellence (OzGRAV and Astro 3D), introductions to a number of multi-wavelength projects, and a number of contributed talks from the community. In addition to these 17+3 minute presentations, there were two 5 minute reports from Warren Bax and Natasha Hurley-Walker, describing their experiences during their SKA Fellowship visits to the SKAO.

Five talks were presented remotely, including three by women who were, for family reasons, unable to attend in person (and were grateful for the opportunity to present remotely). Zoom was used for the remote presentations, and it worked well. Where possible, remote presentations were scheduled as the first talk after a break so that everything could be set-up and ready to go when the session started.

The meeting was endorsed by the ASA's IDEA chapter, and the gender distribution of the 35 (20-minute) presentations was 37% female, 63% male (up from 30%:70% in 2015 and 33%:67% in 2016), comparable to that of registered participants, 34% female, 66% male.

The meeting was sponsored by CAASTRO, ICRAR and CSIRO. The efforts of Kylie Williams in supporting the meeting over both days were greatly appreciated.

Phil Edwards, SOC chair





Fundamental Physics with the Square Kilometre Array Conference

1-5 May 2017, Mauritius

The conference “Fundamental Physics with the Square Kilometre Array” took place in Mauritius over May 1-5, 2017, with the goals of engaging the theoretical physics community in the science case and design considerations for the Square Kilometre Array (SKA), and of bringing together radio astronomers and theorists to jointly consider ways in which the SKA can test and explore fundamental physics. Around 70 scientists attended, from 23 countries across all six inhabited continents. We particularly wanted to engage the African scientists who will be involved in constructing the SKA; astronomers from South Africa, Mauritius, Kenya and Ghana all attended and gave invited reviews of the radio astronomy research happening in their countries. The remaining science talks were divided into four topics: “Cosmic Dawn and Reionization”, “Cosmology and Dark Energy”, “Dark Matter and Astroparticle Physics”, and “Gravity and Gravitational Radiation”. Under each topic, we had invited reviews from both the observational and theoretical side, followed by several shorter contributed talks (all talks are available for viewing at <http://skatelescope.ca/physics/presentations>). We also held breakout discussion sessions on specific questions within each topic, after which we then reconvened and discussed further in a plenary session. There was sufficient excitement and momentum emerging from the meeting that we are now in the process of writing a white paper summarising the prospects for fundamental physics with the SKA, sectioned into these same four topics, and to be submitted as a refereed manuscript to Publications of the Astronomical Society of Australia. A draft of this paper will be available to all participants by the end of August, with submission anticipated for September/October. Overall, the feedback we received is that this was a highly stimulating and enjoyable meeting, with an excellent mix of theorists vs observers, and faculty vs students. Our ambition now is that the ideas from this meeting become part of the framework and discussion around the

specifications for the full SKA, and that we potentially hold a follow-up meeting in a few years to crystallise and further develop these ideas.



Student Writing Workshop August-September 2017, Brisbane, Canberra, Melbourne, Perth, Sydney

Writing scientific papers is an integral part of working in research, but many students receive no formal training in this area. This year, the CAASTRO Student Committee aimed to remedy this by organising a day-long workshop on writing scientific papers. The workshop materials were developed by Caitlin Adams and Christian Wolf, who toured the country to present the workshop in Melbourne, Brisbane, Sydney, Canberra, and Perth throughout August and September. They were supported in by local presenters for each workshop: Michael Brown, Jack Line, Janie Hoormann, Jacobo Asorey, James Allison, Fiona Panther, Dougal Mackey, Sarah White and Paul Hancock.

Over 100 astronomy and astrophysics students, from Honours to PhD, attended the workshop to learn how to construct, edit and submit a scientific manuscript.

The workshop was hands on, with plenty of discussion and practical exercises. Students learned how to go from a detailed outline to a first draft, design clear and informative figures, remove clutter from their writing, and think about their work from a reviewer's perspective.

The feedback from attendees was incredibly positive: many students found the workshop interesting and relevant, and commented that there were useful tips on grammar and style for both native and non-native English speakers. Attendees were grateful for the hands-on approach, and their active participation made each event a fantastic success. The materials will be released as a CAASTRO legacy item so that the workshop can be run for future students!

The Local Organising Committee was Caitlin Adams, Stephanie Bernard, Natalia Sommer, Marcin Glowacki, Rebecca McElroy, Josh Calcino, Tristan Reynolds, Bradley Meyers, Kylie Williams, and Kate Gunn.

Caitlin Adams
Chair, LOC



Professor Chris Wolf presenting at the Perth workshop

From Black Hole to Environment

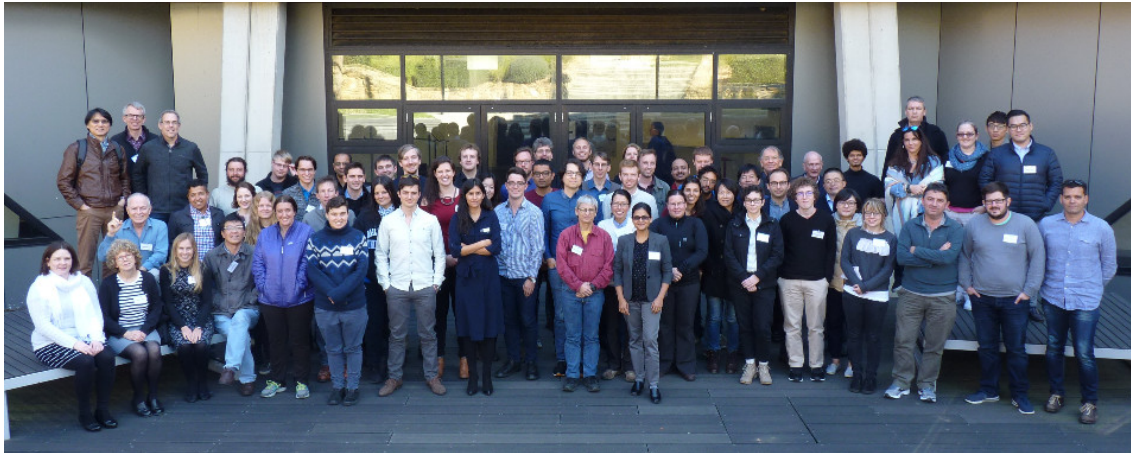
21-24 August 2017, Australian National University, Canberra

From 21-24 August 2017 the *From Black Hole to Environment Conference* met at the Australian National University. Over the 4 days 85 delegates, both our observational and theoretical, met to discuss their understanding of how galaxies evolve through feeding and feedback processes. The conference looked at these process over four themes:

- Galaxy groups, clusters, large scale structure: dynamics, mergers, interactions;
- Galaxies in the high redshift universe: AGN feedback and gaseous outflows;
- Galaxies in the low redshift universe: refuelling and feeding black holes and star formation; and

- Centres of galaxies: black hole accretion, launching jets and galactic winds, starbursts and star formation.

The meeting focused on multi-wavelength science that addressed the above science, an updates were given from members of the major galaxy surveys and galaxy simulations on their work.



UPCOMING EVENTS

- [Uluru Astronomy Weekend](#), 20-22 October 2017, Uluru, NT, Australia
- [The Dark Energy Collaboration Meeting](#), 6-10 November 2017, University of Queensland
- [Fourth CAASTRO-CoEPP Joint Workshop](#), 21 November 2017, Novotel Barossa Valley, SA, Australia
- [ECR Professional Development Workshop](#), 21 November 2017 Novotel Barossa Valley, SA, Australia
- [7th CAASTRO Annual Retreat](#), 22-24 November 2017, Novotel Barossa Valley, SA, Australia
- [Galaxy Convention](#), 4-5 December 2017, SNH Building, University of Sydney, Sydney, NSW, Australia
- [Science at Low Frequencies IV](#), 12-15 December 2017, SNH Building, University of Sydney, Sydney, NSW, Australia

- Four Pillars of Radio Astronomy, Book Launch, 9 February 2018, Holme Building University of Sydney, Sydney, Australia
- [FRB2018: Finding and Understand Fast Radio Bursts](#), 14-16 February 2018, Swinburne University of Technology, Melbourne, Australia
- [West Coast Swings: Exploring the connection between the cosmic web and galaxy evolution for next generation surveys](#), 25-30 March 2018, Trinity College, University of Western Australia