CAASTRO
ALL-SKY ASTROPHYSICS

CAASTRO Newsletter Edition 14, September 2015

INTRODUCTION FROM CAASTRO DIRECTOR

I'd like to start by offering warmest congratulations to three members of the CAASTRO Executive who are about to take up new positions.

Brian Schmidt is the newly-appointed Vice-Chancellor of the Australian National University, and will take office from 1 January 2016. I'm sure all of you will join me in congratulating Brian and wishing him well in this new role. I'm delighted to say that Brian will retain his role as a CAASTRO Chief Investigator, and will continue to be involved in CAASTRO's Gender Action Committee.

Steven Tingay has accepted a position as Director of the Italian national radio astronomy program under INAF (including their national SKA activities), and will move to Italy later this year. This is an important role, and Steven will also serve as an Italian member of the SKA Board (joining former CAASTRO Director Bryan Gaensler, who is now a Canadian SKA Board member!). Steven has made tremendous contributions to CAASTRO as the MWA Director, as a CAASTRO Executive member and through his leadership and advocacy of our Outreach program. I'd like to thank Steven for all of this, and to wish him all the very best in his new job.

Congratulations also go to Matthew Bailes on the award of a 2015 ARC Australian Laureate Fellowship for his project "Exascale astronomy: real-time analysis of the transient radio universe". Matthew will retain his current roles in CAASTRO, and will use this new Fellowship to develop and deploy a generic supercomputing solution for the study of pulsars and fast radio transients with SKA precursor telescopes.

It's been a busy few months of CAASTRO activities and meetings, including the annual Women in Astronomy workshop (which this year took place in Brisbane), the ASA Annual Scientific Meeting in Fremantle and the IAU General Assembly in Honolulu, USA. All of these were great opportunities to meet and talk with colleagues as well as listening to a wide range of talks and presentations.

In Honolulu, CAASTRO hosted a reception to allow our overseas Partner Investigators to meet and talk with Australian researchers. Those attending included CAASTRO Partner Investigators Prof. Michael Kramer (MPIfR, Germany), Dr Mara Salvato (MPE, Germany) and Prof. Ravi Subrahmanyan (Raman Inst., India) and CAASTRO Advisory Board member Prof. Ron Ekers.

CAASTRO PI Dr Mara Salvato (facing camera) talking to Lisa Kewley and Karl Glazebrook at the CAASTRO reception in Hawaii

In July, I was lucky enough to make my first visit to the Murchison Radio Observatory (MRO) in Western Australia, hosted by our partner institution CSIRO Astronomy and Space Science. It was great to be able to visit the MWA and ASKAP telescopes, along with the main control building, and very impressive to see how much infrastructure is already in place at the MRO.

A few days ago, CAASTRO Executive members Brian Schmidt, Lister Staveley-Smith, Kate Gunn and I (together with Michael Burton from UNSW and Mita Brierly from AAL) travelled to Beijing for the launch and inaugural meeting of ACAMAR, the Australian-ChinA ConsortiuM for Astrophysical Research. ACAMAR will be a "virtual" centre, to serve as an umbrella and coordination point for bilateral astronomical collaborations between Australia and China. We had a very cordial and productive meeting with our Chinese colleagues, and a full account of the ACAMAR launch will appear in the next CAASTRO Newsletter.

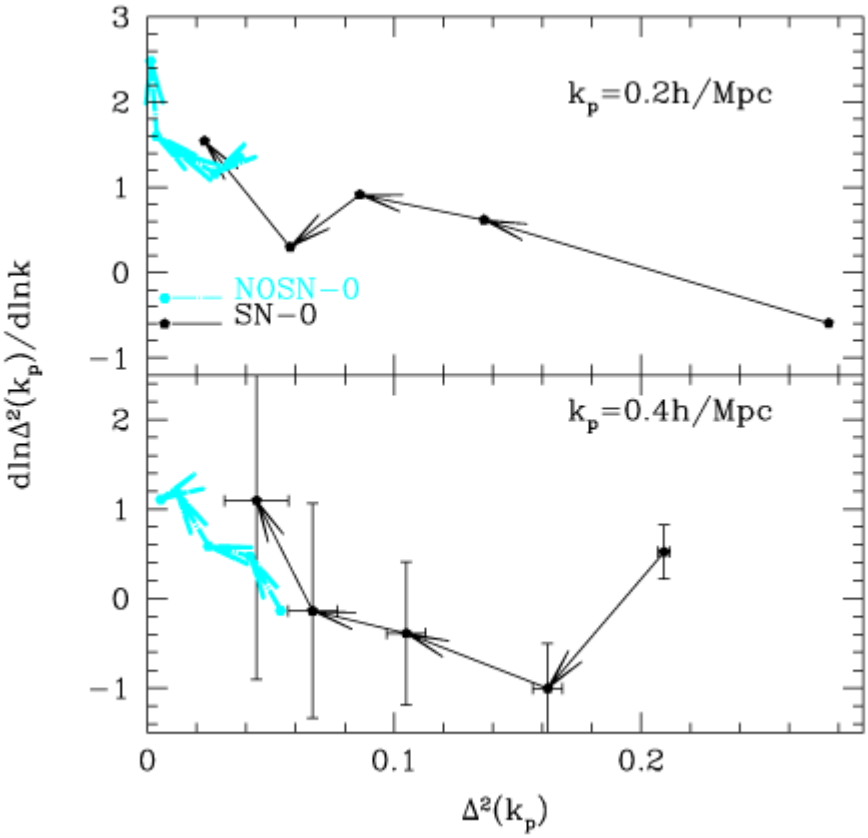
The CAASTRO Executive held their latest face-to-face meeting in Perth on 16-17 September. CAASTRO now has two and a half years left to run, and it is important that we do all we can to maximize the impact and legacy of the Centre. Over the next couple of months, we will be revising the CAASTRO Strategic Plan to make sure that we identify and carry out all the highest-priority CAASTRO science over the next couple of years.

The 2015 CAASTRO Annual Retreat is coming up fast, and I look forward to seeing many of you when we meet at Leura in the Blue Mountains, from 16-18 November.

RESEARCH UPDATE

Escaping photons affect galaxy formation but supernovae dominant

The new generation of low-frequency radio telescopes, including MWA (Murchison Widefield Array), LOFAR (LOw Frequency Array), PAPER (Precision Array for Probing the Epoch of Reionisation) and SKA (Square Kilometre array), will enable us to observe the evolution of neutral hydrogen during the reionisation of the Universe. The resulting measurements of the timing and structure of reionisation promise to probe the properties of the first galaxies. Read more



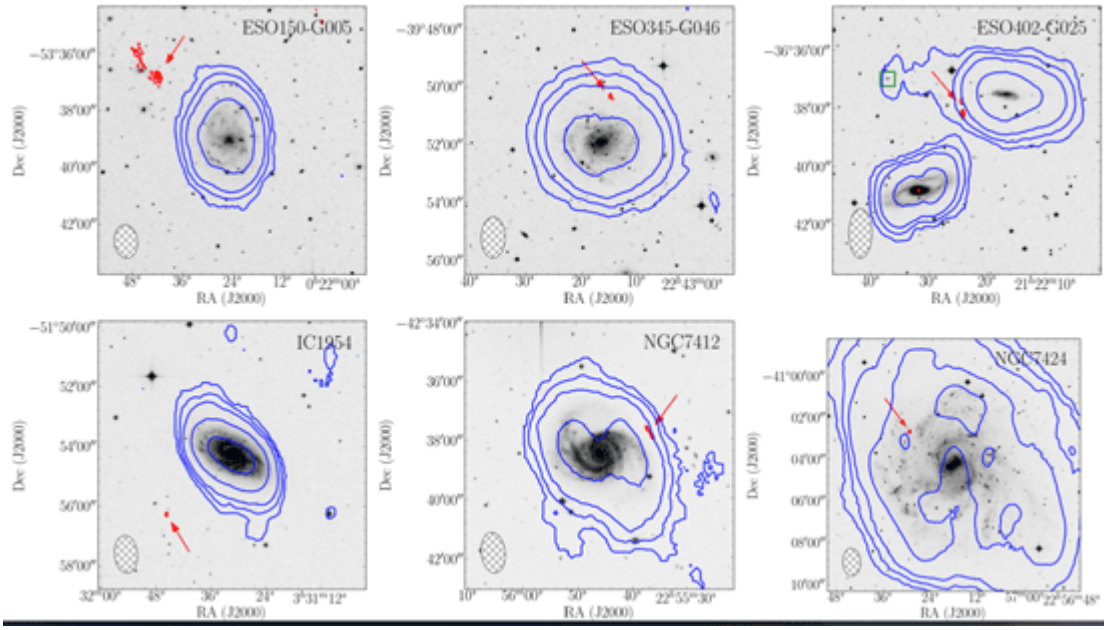
Points in the parameter space of 21 cm of power spectrum amplitude and slope. Fig 5 in Kim et al (MNRAS, 2013)

Publication details:

Han-Seek Kim, J. Stuart B. Wyithe, Jaehong Park, C. G. Lacey in MNRAS "Variation in the escape fraction of ionising photons from galaxies and the redshifted 21-cm power spectrum during reionization"

Pilot study data prepare astronomers for future blind HI surveys

Next-generation radio telescopes will make it possible to conduct the first large-scale HI absorption-line surveys, which will enable us to study the evolution of neutral gas in galaxies over a large range of cosmic time. However, we don't currently have the understanding to derive physical galaxy properties from absorption-line data alone. Read more



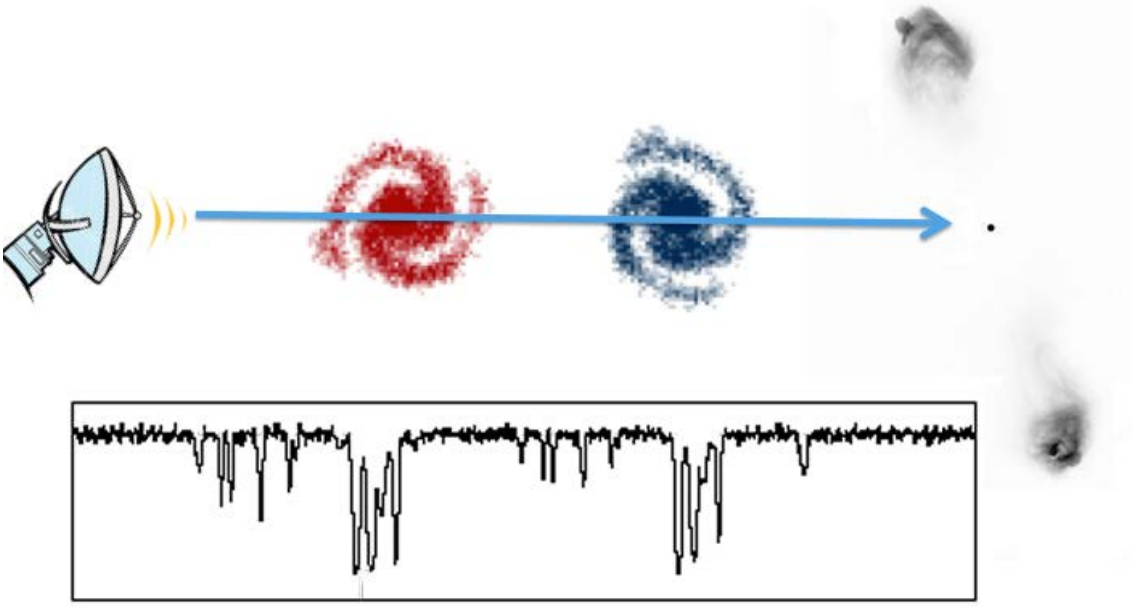
SuperCOSMOS B-band images (Hambly et al 2001) overlaid with HI contours (blue) Fig 2 from Reeves et al (MNRAS 2015)

Publication details:

S. N. Reeves, E. M. Sadler, J. R. Allison, B. S. Koribalski, S. J. Curran, and M. B. Pracy in MNRAS (2015) "HI emission and absorption in nearby, gas-rich galaxies"

Cosmic magnetic fields in ancient galaxies surprisingly strong

Magnetic fields influence the physics of exploding stars, galaxies, and even the cosmic large-scale structure. One of the most central questions is how they reached their current strength. It is believed that the amplification of galactic magnets happens through the so-called "dynamo effect". The simplest version of this theory predicts that magnetic field strengths in galaxies should be continually evolving and should be much weaker in the cosmic past. Observational tests of the dynamo model could therefore hold the key to answering basic questions of fundamental physics during the history of the Universe. Read more



Cartoon of line of sight technique used by Farnes et alto detect MgII absorption. Credit for Cygnus A image: NRAO/AUI

Publication details:
J. S. Farnes, S. P. O'Sullivan, M. E. Corrigan, B. M. Gaensler in ApJ (2014): "Faraday Rotation from Magnesium II Absorbers towards Polarized Background Radio Sources"

ACMAR Signing in Beijing

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CAASTRO EDUCATION AND OUTREACH

PROGRAM

Our 2015 portfolio highlights the strength of our collaborative approach. Fostering good internal communication and working closely with our junior researchers, we have composed 22 stories about hot-off-the-press CAASTRO papers to share our science with the public. We are currently preparing our fourth edition of the CAASTRO Reader's Digest booklet to go into print. As always, these booklets will be distributed to our nodes, partners and Advisory Board members, as well as to outreach collaborators and science initiatives across the country. Dr Wiebke Ebeling (CAASTRO Education & Outreach, Curtin University) and Jacinta den Besten (Telescopes in Schools, University of Melbourne) are currently driving a new "teen version" of these stories to provide career advice to high school students. Read more here

Our MWA demonstrator tool in action at the Uluru Astronomy Weekend. Credit: Kate Gunn

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CAASTRO in the Classroom goes National!

There are exciting times ahead for the highly successful outreach program, CAASTRO in the Classroom. Thanks to an Australian Government grant through the Australian Maths and Science Partnerships Program, CAASTRO will be expanding CAASTRO in the Classroom over the coming months.

In recent times, CAASTRO in the Classroom has provided a very popular set of curriculum revision lectures for Year 11 and 12 Physics students in New South Wales. The sessions have been delivered via video conferencing to up to 20 schools at a time. Future CAASTRO in the Classroom sessions will focus on the areas of the school science curriculum that are most relevant to astronomy, with content designed specifically for students in Year 5, Year 7 and Year 10, in addition to sessions for Senior Secondary Physics. In each session, the presenter will provide students with a picture of who they are, what their job involves, and how their research is connected to the ideas students are introduced to in the science classroom.

With the role-out of the Australian Curriculum in the past few years, this is a fantastic time to be able to provide relevant content for schools all over Australia. CAASTRO's existing video conferencing system will continue to be used to deliver the program, along with web-based streaming, to reach as many schools as

possible.

To complement the video conferencing sessions, a set of classroom resources is being developed. Science teachers will be employed to work on developing and trialling classroom resources and evaluating the content of the video conferencing sessions.

In 2016, CAASTRO in the Classroom will offer teacher professional development workshops in a number of capital cities. The face-to-face sessions will be developed into web-based professional development modules for teachers.

If you have any suggestions for the future development of CAASTRO in the Classroom or you wish to express an interest in being involved, please contact the CAASTRO School Education Officer, Jenny Lynch (jennifer.lynch@sydney.edu.au). Jenny will be in touch with CAASTRO members in the coming weeks and months, seeking volunteers who are willing to present video conferencing sessions to schools or to talk about their research at teacher workshops.

CAASTRO student Joseph Callingham in action

Science and Maths Exposed

Christene Lynch and Jennifer Lynch had a great day at Science and Maths Exposed at the University of Western Sydney, Parramatta campus, on Friday 14 August 2015.

Christene did a fantastic job showing students and teachers the solar telescope, and they were all really interested in it and very enthusastic about their free CAASTRO rulers!

- 1000 students from Western and South-Western Sydney schools attended the event (most seemed to be in Year 9)

- 200 CAASTRO rulers were handed out to students who looked at the solar telescope (so we had direct interaction with all of these students)
- -6 CAASTRO in the Classroom Fact Sheets were handed to individual teachers

Many thanks to Christene for doing a great job on the day and to Tom for lending us the telescope.

Photo credit: Jennifer Lynch

Christene Lynch and student at Science and Maths Exposed

MEMBERSHIP UPDATE

CAASTRO has 178 members. We welcome our latest team members:

Igor Andreoni, Swinburne University of Technology
Julie Banfield, Australian National University
Dilyar Barat, Australian National University
Stephanie Bernard, University of Melbourne
Josh Calcino, University of Queensland
Christopher Curtin, Swinburne University of Technology
Diane Salim, Australian National University
Mia Walker, Curtin University

CAASTRO MEMBERS PROFILES

Jenny Lynch, University of Sydney, School Education

Officer, CAASTRO in the Classroom

I joined CAASTRO in June this year to work on expanding the CAASTRO in the Classroom program with support from an Australian Maths and Science Partnership Program grant from the Australian Government.

My background is in Science Communication, Medical Physics and vocational training and assessment. I worked with Questacon for ten years, managing, developing and presenting outreach programs in Sydney and in regional and rural parts of Australia. Prior to that I worked as a hospital technical officer in radiation oncology, a research assistant in electrophysiology, and recently I have been running a freelance science communication business.

I am very excited about CAASTRO in the Classroom reaching schools all over Australia and developing quality classroom resources for teachers.

Student: Igor Andreoni, Swinburne University

I am a PhD candidate at Swinburne University, supervised by Dr Jeff Cooke and Prof Matthew Bailes. My interests include the detection and the science of transient events, which perfectly fit the CAASTRO *dynamic* theme. Also, I am interested in “multi-messenger” studies to search for electromagnetic (and neutrino) counterparts to gravitational wave signals. My PhD project is joint to a new, unique program that we named “Deeper Wider Faster”. The program aims to explore the fast (seconds to hours timescale) transient Universe with a multiwavelength approach in time-domain, via simultaneous observations with radio, optical, UV, X-ray and gamma ray telescopes. One big goal of our program is to use these coordinated, fast cadenced observations to search for optical counterparts to fast radio bursts. My work focuses mainly on the optical data acquisition with the DECam (CTIO), their real-time analysis and the study of detected transients.

Research Staff: Julie Banfield,

Australia National University

I began my position in the evolving Universe theme of CASSTRO at ANU in July 2015. I previously had a postdoctoral position at CSIRO Astronomy and Space Science as part of the Evolutionary Map of the Universe (EMU) team. I received my PhD from the University of Calgary, Canada in 2011 under the supervision of Russ Taylor on the polarisation properties of extragalactic radio sources and I am continuing my work on magnetism and the role magnetic fields play in radio galaxy environments. I am also one of the Project Scientists in the citizen science project Radio Galaxy Zoo and I am interested in the challenges faced by EMU and how citizen science can help to solve the radio source morphology and cross-identification challenges.

AWARDS AND RECOGNITION

Congratulations to three members of CAASTRO whose research achievements have been recognised by national awards:

1) Professor Tamara Davis, CAASTRO CI and leader of the Dark theme, was awarded the Nancy Millis Medal of the Australian Academy of Science. This award recognises exceptional leadership by a female mid-career researcher, see http://www.caastro.org/news/2014-tamara-davis-award

2) CAASTRO student Cleo Loi has been awarded the Astronomical Society of Australia's 2015 Bok Prize for her outstanding Honours research "Waves in the Sky: Probing the Ionosphere with the Murchison Widefield Array". This is a remarkable piece of work, and I would encourage you to view the wonderful video describing Cleo's results if you have not already had a chance to do so - see http://www.caastro.org/news/2015-tubes and https://www.youtube.com/watch?v=ymZEOihlIdU&feature=youtu.be

3) Dr Morag Scrimgeour, a former CAASTRO PhD student, has been awarded the ASA's Charlene Heisler Prize for 2015 in recognition of her outstanding PhD thesis "Cosmology with Large-scale Structure and Galaxy Flows".The Charlene Heisler prize is awarded annually for the most outstanding Australian PhD thesis in astronomy or a related field, see http://www.caastro.org/news/2015-heisler

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RECENT WORKSHOPS

Women in Astronomy Workshop:

22-23 July 2015, Women's College, University of Queensland

For 2-days 90 members of the astronomy and scientific community met to discuss such diverse topics as unconscious bias, dealing with conflict, projecting your voice and the challenges faced by members affected by mental health issues. Inspiring presentations were given by Professor Meg Urry (Yale, past president of the American Astronomical Society), Professor Judy Raper (DVC-R, Wollongong), Dr Sue Meek (CEO, Australian Academy of Science), Professor Polly Parker (Professor in Leadership, UQ) and Louise McSorley (Director of the Workplace Gender Equality Agency). A representative from Beyond Blue shared her very personal story of how anxiety and depresssion had shaped her life and Professor Brian Schmidt (Australian National University) challenged much discussion and debate with his Challenging Conversation Session.

The workshop was followed by an amazing outreach event showcasing the talents of four world renowned female astronomers with 4 short lectures followed by a 45 minute panel Q&A. The event attracted over 200 people and we had to extend the program by 1 hour to accommodate all the audience questions.

Photo credits: Anjanette Webb

Left: WiA Group, Right: Lisa Harvey-Smith, Amanda Bauer and Meg Urry at Universe in a Nutshell Outreach Event, University of Queensland

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Pulsar Scintillometry Workshop

From 25-28 April we held a workshop on 'Pulsar Scintillometry' at the Algonquin Radio Observatory right in the middle of the Algonquin Provincial Park in Canada. The event attracted not only members from the scientific community but also members from industry. Our group of 14 participants had an excellent gender balance with six of us being female. The mixture of theoreticians,observers, engineers and a total of five students, both graduates and under-graduates allowed for input from different perspectives in the lively discussions. The contributed presentations and following discussions can subdivided into four major topics:

1. The observational characteristics and the physical explanations of pulsar scintillation
2. Data analysis methods

3. The development of appropriate software tools
4. Future observations

One highlight of the workshop were the observations of the Crab nebula that we had in parallel with the GMRT, Jodrell Bank (13m) and the ARO dish. At ARO, two of our students (Ni and Liu) stayed up all night and ran the actual observations

Photo credit: Franz Kirsten

OzSKA: radio astronomy in the next decade

Workshop ReportSchool of Physics, University of Melbourne, 8-10 April 2015
A CAASTRO sponsored event

The Square Kilometer Array (SKA) will herald a new era in radio astronomy, with the construction of the world's largest radio telescope in Australia and South Africa. The conference provided an opportunity to explore the new science that will be possible with the increased sensitivity, with a particular emphasis on exploring opportunities for young scientists to become engaged with new projects and ideas. The science themes explored included the formation of the first stars and galaxies, galaxy evolution, cosmic magnetism, the nature of gravity and exploring life beyond the Earth. Other topics included the impact of enabling technologies, including the processing and management of 'big data', new signal processing and detector technologies and the role of 'blue sky' science in the education of our wider community. As the future custodians and users of this new infrastructure, young researchers were particularly encouraged to attend and contribute their ideas. Read more

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UPCOMING EVENTS

- ADASS XXV: The 25th Annual Astronomical Data Analysis Software and Systems Conference: 25-29October 2015, Sydney, NSW, Australia
- Molonglo Reborn: the Dawn of a New Era of Discovery, 3 December 2015
- CAASTRO Annual Retreat, 16-18 November 2015, Leura, NSW, Australia
- 2016 CAASTRO Scientific Conference Series: Diving into the Dark: Bridging Cosmological Theory and Observation,17-22 July 2016, Cairns, QLD,

Australia
- 2016 CAASTRO Scientific Conference Series: Galaxy Transformations, 18-23 September, Hobart, TAS, Australia

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eROSITA Bulletin

The latest eROSITA Bulletin is available for download here:

http://www.mpe.mpg.de/~am/public/Bulletin/eROSITA_Bulletin6.pdf

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