DOI: 10.18727/0722-6691/5143

Report on the ESO Workshop

Linking Galaxies from the Epoch of Initial Star Formation to Today

held at Rydges World Square Center, Sydney, Australia, 18–22 February 2019

Tayyaba Zafar[1]
Carlos De Breuck[2]
Magda Arnaboldi[2]

[1] Australian Astronomical Optics, Macquarie University, Sydney, Australia
[2] ESO

We report on the first joint Australia–ESO conference since the start of the Strategic Partnership. The conference was supported by ESO, the Australian Academy of Science (under a research grant from Elizabeth & Frederick White), the Australian Government Department of Industry, Innovation and Science, the Independent Research Fund Denmark, Macquarie University, the International Centre for Radio Astronomy Research, CSIRO Astronomy and Space Science (CASS), and Astronomy Australia Limited. The scientific organising committee (SOC) took several measures to tackle unconscious bias while preparing an exciting programme with good gender balance and greater representation from early career researchers. We detail our approach here with the aim of helping organisers of future conferences.

Over the last two decades, surveys mapping the Universe have made clear that star formation activity peaks at redshift $z \sim 2.5$ (known as "cosmic noon"). The driver of this cosmic behaviour is still an open area of research. A better understanding of star-forming regions and physical processes is required to explain the rise and fall around the cosmic noon. With existing observational resources, we are able to resolve many detailed questions about the physical processes driving galaxy formation and evolution, including:

– The enrichment of the interstellar medium with metals and dust and the subsequent effects on star formation.
– Gas infall from, and outflow to, the intergalactic medium.
– The role of galaxy environment and mergers.
– Triggering mechanisms of starbursts, and active galactic nuclei and their feedback to the surrounding medium.
– The role and impact of gas dynamics and stellar kinematics.

Cosmological simulations (Illustris[1], EAGLE[2], FIRE[3]) indicate that the interstellar medium and its constituents are important to understanding galaxy formation but are vastly unconstrained observationally. The discrepancy between observations and simulations is because the roles and physics of the above-mentioned processes are not well constrained.

The five-day conference attracted a wide cross-section of the international astronomical community and included representatives from 19 countries making up a total of 162 attendees (see Figure 1) with the aim of better understanding star-forming regions and the various physical processes in galaxies. Of particular interest was the availability of 3D data allowing the stellar and gas kinematics to be spatially resolved, as well as other physical tracers (for example, metallicity). This has become possible thanks to large surveys with integral field unit (IFU) spectrographs, for example, the survey with the Sydney-AAO Multi-object Integral field spectrograph (SAMI), Physics at High Angular resolution in Nearby GalaxieS (PHANGS), survey with the Multi Unit Spectroscopic Explorer (MUSE) on the VLT and TYPHOON (D'Agostino et al., 2018). There is a very strong synergy between these surveys — many of which are conducted in Australia — and current and future ESO facilities. One important aspect is the complementarity between the programmes and science data products in the ESO science archive facility and the AAO data centres; many of these have become available thanks to the ESO public surveys and the reprocessing of surveys carried out with Australian facilities. The collaboration between these two data centres allows for the cross matching of resources for a multi-wavelength exploration of the objects in our Universe.

The conference offered an opportunity to summarise the current status of the field of galaxy formation and evolution and to discuss how to maximise the scientific return in the future. In addition, several updates on small and large ongoing surveys were provided. After a comprehensive range of talks the main scientific outcome of the conference was that spatially resolved observations and simulations of the galaxies are being extended to the circumgalactic medium of galaxies. In addition, the spatial resolution and sensitivity of the current generation of instruments is powerful enough to trace multiple physical parameters of galaxies (for example, gas and stellar dynamics, metallicity, and age) out to the edges of the galaxies.

The workshop webpage[4] has many more details, including more information

Figure 1. Conference photo.

about the programme, participants and organising committees. The talks have been collected and are available using Zenodo[5].

Demographics

As this was the first ESO-supported conference held in Australia, it was important to attract both the ESO and Australian communities. The timing was carefully chosen to be at the end of the Australian summer break, coinciding with winter vacations in several European countries. The support provided by our eight sponsors allowed us to keep the registration fee relatively low. As shown in Figure 2, these factors helped to achieve our goal, with more than half of the participants coming from overseas — not easy, given the time and costs associated with travel between Europe and Sydney.

During the organisation of the conference, we paid particular attention to including as many participants from the community as possible by controlling various biases in the selection of participants (for example, gender, seniority, and geographic distribution). The SOC decided to anonymise the contributed abstracts prior to ranking them in order to avoid unconscious bias. Furthermore, the SOC members were asked to declare any conflicts of interest with abstracts and excluded from reviewing them. In addition, votes from the SOC themselves were anonymised — i.e., the votes cast for a particular abstract were not associated with the corresponding SOC members. All of these measures served to reduce hidden biases.

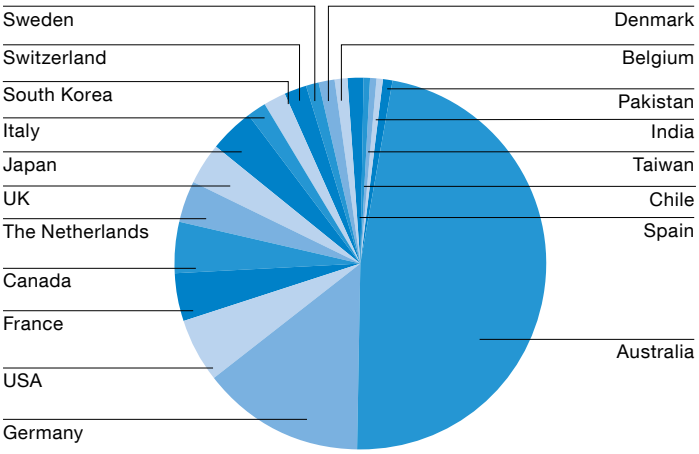


Figure 2. Chart showing the fraction of attendees from various countries; there were 162 attendees in total.

The conference had 26 invited and 73 contributed talks and 23 poster presentations ("sparklers"). Thanks to the anonymous voting, the conference achieved a very good gender balance, and there were several science presentations from students and early-career researchers (see Figure 3). This gives one of the best examples of an astronomy conference which set out to improve representation, particularly amongst female and young/early career researchers. We note that this selection did not compromise on the science; on the contrary, many participants found it enlightening and refreshing to see so many new faces and topics amongst the speakers.

Acknowledgements

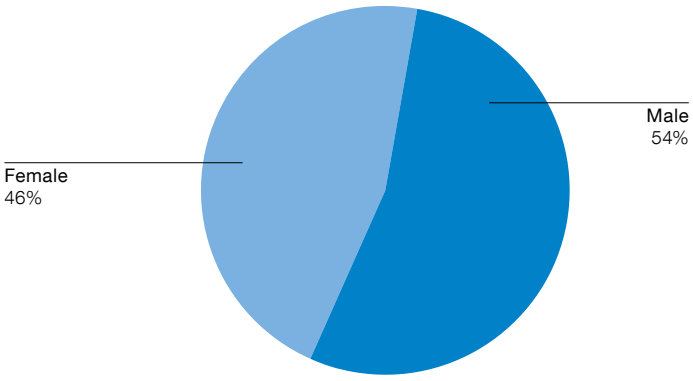
We would like to acknowledge financial support for this meeting from the Australian Academy of Science (AAS), the Independent Research Fund Denmark, the Department of Industry Innovation and Science Australia, ESO, the Research Centre for Astronomy, Astrophysics & Astrophotonics, Macquarie University (MQAAAStro), the International Centre for Radio Astronomy Research (ICRAR), CSIRO Astronomy and Space Science (CASS), and Astronomy Australia Limited (AAL).

References

D'Agostino, J. J. et al. 2018, MNRAS, 479, 4907

Links

[1] Illustris simulation: http://www.illustris-project.org
[2] Evolution and Assembly of GaLaxies and their Environments (EAGLE): http://icc.dur.ac.uk/Eagle
[3] Feedback In Realistic Environments (FIRE): https://fire.northwestern.edu/about-fire
[4] The workshop homepage: https://www.aao.gov.au/conference/australia-eso-conference-2019
[5] The collection of presentations (via Zenodo): https://zenodo.org/communities/esoaus2019



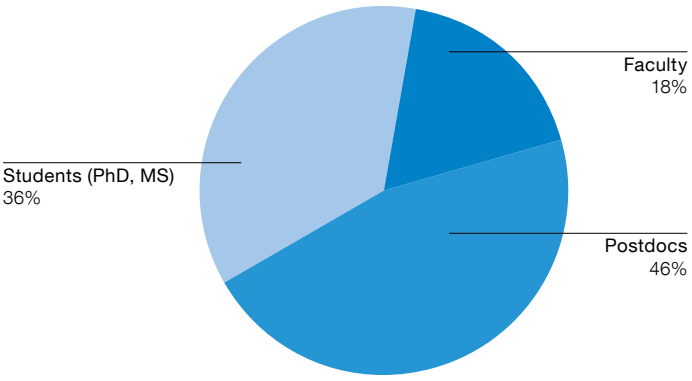


Figure 3. Left panel: The gender ratio amongst participants. Right panel: The distribution according to career level for all invited and contributed talks, and poster presentations.