

Emily Petroff

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PhD Candidate in Astrophysics

Swinburne Centre for Astrophysics and Supercomputing (CAS)

CSIRO Astronomy and Space Science (CASS)

ARC Centre of Excellence for All-Sky Astrophysics (CAASTRO)

Education

- 2012–2015 **PhD in Astrophysics**, Swinburne University of Technology, Hawthorn, VIC, Australia.
Thesis title: *The Dynamic Galaxy*, Expected completion date: October 2015.
- 2008–2012 **Bachelor of Arts – Magna Cum Laude**, Carleton College, Northfield, MN, USA, GPA – 3.87.
Major: Physics and Astronomy, Thesis (with honors): *The Physics of the Interstellar Medium*

Research Experience

Observational Astrophysics, fast radio bursts, high time resolution radio surveys, pulsar astronomy, high performance computing, multi-wavelength transient observations, precision pulsar timing.

Principal investigator, 3 successful proposals for the Parkes radio telescope, awarded over 250 hours of telescope time over two observing semesters.

Co-investigator, 12 successful proposals on world-class telescopes: Parkes Radio telescope (7 proposals), Australia Telescope Compact Array, DECAM, SkyMapper, XSHOOTER, VIRCAM, FORS2, HESS. ToOs: ATCA, *Swift*, GMRT, Efflesberg, Magellan, PTF, Swope, SkyMapper, GROND, Keck.

Leadership, Coordination of Multi-wavelength follow-up for fast radio burst events, multi-telescope triggering of real-time fast radio burst discoveries, and multi-wavelength collaboration management. Multi-institutional collaboration in follow-up and publication of the first real-time detection of a fast radio burst: 22 institutions, 12 telescopes.

Publications

First-author Publications

- 2015 A survey of known FRB fields: Limits on FRB repeatability. **Petroff, E.** et al. 2015, MNRAS, *in press*.
- 2015 Identifying the source of perytons at the Parkes radio telescope. **Petroff, e.** et al. 2015, MNRAS, 451, 3933
- 2014 A real-time fast radio burst: Polarization detection and multi-wavelength follow-up. **Petroff, E.** et al. 2014, MNRAS, 447, 246
- 2014 An absence of fast radio bursts at intermediate galactic latitude. **Petroff, E.** et al. 2014, ApJ, 789, L26
- 2013 Dispersion measure variations in a sample of 168 pulsars. **Petroff, E.**, Keith M. J., Johnston S., van Straten W., Shannon R. M., 2013, MNRAS, 435, 1610

Other Publications

- 2014 Fast radio bursts: search sensitivities and completeness. Keane, E. & **Petroff, E.**, 2014, MNRAS, *submitted*

- 2014 The High Time Resolution Universe pulsar survey - X. Discovery of four millisecond pulsars and updated timing solutions of a further 12. Ng, C. et al. 2014, MNRAS, 439, 1865
- 2014 A 24 Hr Global Campaign to Assess Precision Timing of the Millisecond Pulsar J1713+0747. Dolch, T. et al. 2014, ApJ, 794, 21.
- 2014 The High Time Resolution Universe Survey - XI. Discovery of five recycled pulsars and the optical detectability of survey white dwarf companions. Bates, S. et al. 2014, MNRAS, *in press*

Presentations and Meetings

- 2015 **Swinburne 3 Minute Thesis Competition – University finalist:** Astronomy in the blink of an eye: The fastest events in the universe
- 2015 **George Collins Memorial Oration – Invited speaker:** Radio astronomy in the blink of an eye
- 2015 **Curtin University, Perth, AU – Invited Colloquium:** Detection and follow-up of fast radio bursts
- 2015 **Marcel Grossmann Meeting XIV, Rome, Italy – Invited:** Real-time searches for fast radio bursts
- 2015 **7th Bonn Workshop on Neutron Stars, Bonn, Germany –** Real-time searches for FRBs in radio surveys
- 2014 **Swinburne FRB Workshop, Melbourne, AU – Invited:** An introduction to fast radio bursts: real-time detection and follow-up possibilities
- 2014 **Orange Pulsar Meeting, Melbourne, AU –** FRB search and detection in pulsar surveys
- 2014 **CAASTRO Retreat, Sunshine Coast, AU –** The first real-time FRB: and why FRBs are still pretty interesting
- 2014 **GMT Annual Science Meeting, Washington DC, USA –** Real-time discovery of Fast Radio Bursts: Polarization and Multi-wavelength Follow-up
- 2014 **Melbourne University, Melbourne, AU – Invited Colloquium:** Fast Radio Bursts: past, present, and future
- 2014 **Astronomical Society of Australia, Sydney, AU –** The First Real-Time FRB
- 2014 **Centre for Astrophysics and Supercomputing, Melbourne, AU –** Colloquium: The First Real-Time FRB
- 2013 **CAASTRO Ephemeral Universe Workshop, Perth, AU – Invited:** Searching for Fast Radio Bursts at Intermediate Latitudes
- 2013 **CAASTRO Retreat, Torquay, AU –** Searching for Fast Radio Bursts at Intermediate Latitudes
- 2013 **Swinburne Graduate Student Seminars, Melbourne, AU –** Searching for Fast Radio Bursts
- 2013 **CASS Student Symposium, Sydney, AU –** Searching for Fast Radio Bursts in the High Time Resolution Universe Survey
- 2013 **Neutron Stars, Amsterdam, NL –** Poster: Dispersion Measure Variations in a Sample of 168 Pulsars

Professional Activities

- 2015 Referee for journal *Nature*
- 2014–2015 Committee Member: CAASTRO student committee
- 2014–2015 Council member: Astronomical Society of Australia
- 2014–2015 Committee Member: CAS Equity and Diversity Committee
- 2014 Student Representative: CAS Academic Staff Committee
- 2013–2014 Student Representative: Australia Telescope Users Committee (ATUC)
- 2013 Organizer and Chair: CASS Student Symposium

2013 Director of Student Activities: Centre for Astrophysics and Supercomputing

Awards

- 2015 3 Minute Thesis – 1st place Swinburne University Grand Final
- 2015 3 Minute Thesis – 1st Place and People's Choice: Swinburne Faculty of Science Engineering and Technology
- 2014 CAASTRO Annual Retreat – Best Overall Conference Talk
- 2014 Astronomy Society of Australia Annual Meeting – Best Student Talk
- 2012 Sigma Xi, Scientific Research Society – Carleton College chapter, elected
- 2012 Phi Beta Kappa, Liberal Arts and Sciences Honor Society – Carleton College chapter, elected

Outreach

- 2015 Sienna Girls College visit to Swinburne – speaker for astronomy and physics subjects
- 2015 Public Lecture, Swinburne Public Lecture Series – Astronomy in the Blink of an Eye
- 2015 Public astronomy talk, EMDRC HAM radio club
- 2015 Conversation Article: How we found the source of the mystery signals at the Dish (11k reads)
- 2015 Conversation Article: A faster response needed to see Fast Radio Bursts in the Universe (12k reads)
- 2015 Documentary with SBS The Feed – Are We Alone? Emily Petroff at the Dish (4k views on YouTube)
- 2015 Media interactions related to FRB and peryton discoveries – ABC radio, Einstein a go go
- 2014 Preparation of media release for fast radio burst discovery – media coordination, video segment, illustrations.
- 2014 CAASTRO at Uluru Astronomer in Residence: science communicator at Voyages Resort.
- 2014 Invited public talk at Mt. Burnett Observatory for National Science Week 2014.
- 2014 Invited talk at Swinburne Open Day.
- 2011–2014 PULSE@Parkes student pulsar exploration project.

Research and Teaching Experience

- 2012–2014 **Postgraduate Research Student**, *Centre for Astrophysics and Supercomputing (CAS)*, Swinburne University of Technology, Melbourne, Australia.
Research towards a PhD in Astrophysics with thesis topics focused on rapid identification of fast radio bursts, multi-wavelength follow-up of radio transient events, design and implementation of high time resolution radio surveys and triggers, and discovery of new rotating radio transients.
- 2013 **Teacher**, *Swinburne Astronomy Online Masters Program*, Swinburne University of Technology. Supervisor and examiner for the courses "Interferometers" and "Pulsars and Gravitation".
- 2011 **Casual Research Officer**, *Centre for Astronomy and Space Science (CASS)*, CSIRO, Supervisor: Dr. George Hobbs.
Modeling gravitational wave burst sources and developing detection techniques with the goal of detection in the PPTA datasets.
- 2011 **Third Year Special Project**, *Sydney Institute for Astrophysics*, University of Sydney, Supervisor: Prof. Bryan Gaensler.
Project exploring new techniques for studying magnetic fields in the interstellar medium with the Canadian Galactic Plane Survey data. Concluded in a term paper and capstone presentation at the University of Sydney.

2009–2010 **Undergraduate Researcher**, *Department of Physics and Astronomy*, Carleton College, Supervisor: Prof. Joel Weisberg.
Research studying the effects of interstellar scattering and creating a computer simulation of interstellar effects on pulsar signals.

References

Professor M. Bailes, *Centre for Astrophysics and Supercomputing, Swinburne University*.
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Dr. S. Johnston, *Centre for Astronomy and Space Science, CSIRO*.
simon.johnston@atnf.csiro.au; +61 02 9372 4573