

Ronniy Joseph

Astronomer | Problem Solver

Astronomer by training and problem solver at heart. My expertise lies in large complex multi-dimensional images and datasets, and statistical modelling. My interests lie on the interface of image analysis, tomography, machine learning, and instrumentation. My goals are to help science make an impact on the world around us through innovation, education, and science communication.

Education

- 2020 PhD Astrophysics**
Curtin University, Perth, Australia
Dissertation: *Calibration Systematics in the Search for Cosmic Reionisation*
Advisors: Dr. Cathryn Trott and Dr. Randall Wayth
- 2015 MSc Astronomy**
Leiden University, Leiden, The Netherlands
- 2013 BSc Astronomy**
University of Groningen, Groningen, The Netherlands

Research Experience

- Present – Postdoctoral Research Fellow**
2021 Oct *TSI/McGill University, Montreal, Canada*
- Led the operations on a remote and challenging science expedition in the Sub-Antarctic Ocean
 - Co-managed the collaborative development of an open-source python/SQL analysis pipeline through GitHub
 - Develop new techniques to improve data quality from novel telescopes that create deep images of the Universe
- 2020 Oct – PhD Researcher**
2016 Oct *ICRAR/Curtin University, Perth Australia*
- Developed Monte Carlo simulations to quantify the impact of antenna position errors on redundant calibration in low frequency radio interferometers.
 - Established an analytic framework that models the impact of sky model, beam model, and antenna position errors on calibration and the 21-cm power spectrum estimation.
 - Collaborated in a global team with 40+ members on 9 additional projects to improve Epoch of Reionisation signal calibration and detection pipelines.

Personal Info

E-mail

ronniy.joseph@mcgill.ca

Social

ronniyjoseph.com

github.com/ronniyjoseph

twitter.com/RonniyJoseph

Skills

Computing & Analysis Tools

Python, MATLAB, IDL, Git, Tableau, Linux, C, SQL

Data Analysis

Statistical Modelling, Monte Carlo Simulations, Image Processing

Presentations

20 Science Talks & 9 Public Talks

Writing

3 First Author Papers, 9 Co-authored papers,

Project Management

3 Scientific Projects, 1 Outreach Project, 1 Undergraduate Department

Mentoring

100+ Undergraduate Students, 50+ High School Students

Languages

English (Fluent), Dutch (Native), French (Advanced), German (Basic)

Leadership Experience

- Present – 2020 Oct** **Senior Analyst Data Strategy**
Australian Institute of Health & Welfare, Canberra, Australia
- Manage the roll-out of cloud computing platforms for the secure analysis of “Big” personal health data.
 - Develop data architectures to deliver massive and interagency linked health and welfare datasets.
 - Co-create a strategic white paper for a Big Data vision for the Australian Federal Government.
- 2016 Jan – 2015 Sep** **Programme Manager and Study Advisor**
LIACS/Leiden University, Leiden, The Netherlands
- Managed 20+ undergraduate course units within the undergraduate degree Computer Science & Economics.
 - Counselling 60+ undergraduate students on study progress and personal challenges.
 - Oversaw the development and implementation of a mobile phone compatible rostering application.
- 2012 Dec – 2010 Jan** **Student Chair Education Committee for Astronomy**
Kapteyn Astronomical Institute, Groningen, The Netherlands
- Chaired the student representative fraction of a staff and student-led body overseeing the astronomy programme.
 - Developed and delivered evaluations of the courses in the bachelor and master programme of Astronomy.
 - Collated and reported evaluation results to the staff fraction of the committee.

Teaching Experience

- 2018 Dec – 2018 Aug** **Teaching Assistant Physics of Stars & Galaxies**
Curtin University, Perth, Australia
- Led Stars & Galaxies tutorials to 20 second year students.
 - Developed Flip-the-classroom style exercises.
- 2017 Jul – 2017 Feb** **Teaching Assistant Foundations of Physics**
Curtin University, Perth, Australia
- Delivered Physics Lab tutorials to 30 first year students.
 - Graded and provided feedback on reports.
- 2016 Jan – 2014 Jan** **Teaching Assistant Physics**
SSL Leiden, Leiden, The Netherlands
- Prepared high school students for their national exams.
 - Provided 3-day crash courses to classes of 30 students.
 - Evaluated progress with both students and colleagues.
- 2015 Jul – 2015 Mar** **Teaching Assistant - Planetary Systems**
Leiden University, Leiden, The Netherlands
- Led exercise and numerical modelling workshops.
 - Graded and provided feedback on homework.

Research Interests

Astrophysics

- Cosmology
- Large Scale Structure
- Epoch of Reionisation

Observational

- Low Frequency Radio
- 21-cm Power Spectra
- 21-cm Tomography

Instrumentation

- Radio Interferometry
- Calibration
- Instrument Design

Analysis

- Mathematical Statistics
- Error Propagation
- Fourier Domain Analysis
- Machine Learning

Awards

ASA Travel Grant 2019

Awarded a \$1000 travel grant by the Astronomical Society of Australia to present my PhD work overseas.

SALF V Travel Grant 2018

Awarded a \$2500 grant from Nagoya University to attend and present my work at *Science at Low Frequencies V*.

IAU Travel Grant 2017

Awarded a \$1200 travel grant by the International Astronomical Union to present my work at *Peering Towards Cosmic Dawn*.

Curtin 3MT Finalist 2017

Competed against 30+ university-wide competitors and 10 finalists with a 3-minute pitch explaining my thesis work.

2012 Dec – Teaching Assistant - Calculus

2012 Aug *University of Groningen, Groningen, The Netherlands*

- Led exercise tutorials for undergraduate students.
- Created a refresher workshop for 80+ students of the Technology Management Student Association *Lugus*.

Community and Service Roles

Present – Astronomy on Tap Montreal Organiser

2023 Jan *Trottier Space Institute at McGill University*

- Organising scientific talks for a general audience across the Montreal area

Present – Trottier Space Institute Seminar Organiser

2022 Sept *Trottier Space Institute at McGill University*

- Organising and inviting international scientific speaker for the seminars and colloquia at McGill University

2020 Mar – Outreach Assistant

2017 Feb *International Centre for Radio Astronomy Research*

- Developed experience programmes for school students.
- Brought Astronomy to metropolitan and remote schools.
- Helped coordinate events with 2000+ visitors.

2019 Dec – Student Representative

2018 Dec *Curtin Institute for Radio Astronomy, Perth, Australia*

- Identified the need for a communications line between management and the students and created that role.
- Discussed mismatched expectations between staff and students and created clarifying guidelines.

2019 Jun - Scientific Organising Committee Harley Wood School

2018 Nov *Astronomical Society of Australia*

- Developed content for an annual national school for PhD students in Astronomy.
- Organised a mental health workshop for students.

2019 Jun - Organising Committee ICRAR Student Symposium

2018 Nov *International Centre for Radio Astronomy Research*

- Liaised with speakers for a workshop on presenting skills.
- Managed the logistical for an event with 70+ attendees.

2018 May – Development Committee

2017 May *Curtin Institute for Radio Astronomy*

- Provided advise on career development, diversity and the working environment.
- Organised workshops and events to promote diversity.

2012 Dec – Outreach Assistant

2011 Sep *University of Groningen*

- Helped organise information fairs and in-house days.
- Delivered physics workshops with the Discovery Truck.
- Tour guide on public nights at the Blaauw Observatory.

First Author Publications

Joseph, R. C., Trott, C. M., Wayth, R. B., Nasirudin, A., *Calibration and 21-cm power spectrum estimation in the presence of antenna beam variations*. Monthly Notices of the Royal Astronomical Society, Volume 492, Issue 2, Pages 2017–2028. 2020

Joseph, R. C., Trott, C.M. and Wayth, R.B., *The Bias and Uncertainty of Redundant and Sky-based Calibration Under Realistic Sky and Telescope Conditions*. The Astronomical Journal, Volume 156, Number 6. 2018

Co-Authored Publications

Trott, C. M., Jordan, C. H., Midgley, S., Barry, N., ..., **Joseph, R. C.**, et al., *Deep multi-redshift limits on Epoch of Reionization 21 cm power spectra from four seasons of Murchison Widefield Array observations*. Monthly Notices of the Royal Astronomical Society, 493, 4, p. 4711–4727. 2020

Nasirudin, A, Murray, S. G., Trott, C. M., Greig, B., **Joseph, R. C.**, Power, C., *The Impact of Realistic Foreground and Instrument Models on 21 cm Epoch of Reionization Experiments*. The Astrophysical Journal, Volume 893, Number 2. 2020

Li, W., Pober, J. C., Barry, N., Hazelton, B. J., ..., **Joseph, R. C.**, et al., *First Season MWA Phase II Epoch of Reionization Power Spectrum Results at Redshift 7*. The Astrophysical Journal, 887, 2. 2019

Barry, N., Wilensky, M., Trott, C. M., Pindor, B., ..., **Joseph, R.C.**, et al. *Improving the Epoch of Reionization Power Spectrum Results from Murchison Widefield Array Season 1 Observations*. The Astrophysical Journal, 884, 1. 2019

Beardsley, A. P., Johnston-Hollitt, M., Trott, C. M., Pober, J. C., ..., **Joseph, R. C.**, et al. *Science with the Murchison Widefield Array: Phase I results and Phase II opportunities*. Publications of the Astronomical Society of Australia, 36, id. e050. 2019

Trott, C. M., Fu, S. C., Murray, S. G.; Jordan, C. H., ..., **Joseph, R. C.**, et al., *Robust statistics towards detection of the 21 cm signal from the Epoch of Reionization*. Monthly Notices of the Royal Astronomical Society, 486, 4. 2019

Byrne, R., Morales, M. F., Hazelton, B., Li, W., ..., **Joseph, R. C.**, et al., *Fundamental Limitations on the Calibration of Redundant 21 cm Cosmology Instruments and Implications for HERA and the SKA*. The Astrophysical Journal, 875, 70. 2019

Trott, C. M., Watkinson, C. A., Jordan, C. H., Yoshiura, S., ..., **Joseph, R. C.**, et al., *Gridded and direct Epoch of Reionisation bi-spectrum estimates using the Murchison Widefield Array*. Publications of the Astronomical Society of Australia, 36, id. e023. 2019

Li, W., Pober, J. C., Hazelton, B. J., Barry, N., **Joseph, R. C.**, et al. *Comparing Redundant and Sky Model Based Interferometric Calibration: A First Look with Phase II of the MWA*. The Astrophysical Journal, 863, 170. 2018.

Mellema, G., Koopmans, L. V. E., Abdalla, F. A., Bernardi, G., ..., **Joseph, R. C.**, et al. *Reionization and the Cosmic Dawn with the Square Kilometre Array*. Experimental Astronomy, 36, Issue 1-2, pp. 235-318. 2013

Selected Science Talks

2022

October	5th Global 21-cm Workshop	Berkeley, CA, U.S.A.
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2019

December	<i>Science at Low Frequencies VI</i>	Tempe, AZ, U.S.A.
December	Engineering Seminar ASU	Tempe, AZ, U.S.A.
November	Dunlap Science Seminar	Toronto, Canada
November	MSI Science Seminar	Montreal, Canada

2018

December	<i>Science at Low Frequencies V</i>	Nagoya, Japan
February	ANITA Workshop	Perth, Australia

2017

December	<i>Science at Low Frequencies IV</i>	Sydney, Australia
October	<i>Peering Towards Cosmic Dawn</i>	Dubrovnik, Croatia
July	<i>ASA Annual Science Meeting</i>	Canberra, Australia

Selected Outreach Events

2019

October	NASA Space Apps Judging panel member on a hackathon that aimed to solve environmental issues using remote sensing infrastructure.
August	Perth Science Festival Run activities that create images of the early Universe and discuss the role of radio telescopes that observe this era.
July	Indigenous Australian Engineering School Delivered a workshop to year 11 students on the use of high precision astrometry to detect the motion of black holes.
March	Astrofest 2019

Delivered a science pitch on the Square Kilometre Array and its importance to Western Australian Astronomy.

2018

August

ICRAR Guerrilla Stargazing

Operate telescopes for spontaneous stargazing events and talk about ICRAR's role in Australia's Astronomy capabilities.

July

Science Café 2018

Meet 'n Greet year 10 students and discuss potential careers in STEM.

January

SciTech Space Academy

Talked about our search for the first lights in the Universe from the dark and isolated Western Australian desert.

2017

November

CAASTRO Astronomer In Residence

Host astronomy events over the course of two weeks with Voyages Indigenous Tourism at the Uluru resort.

August

The Science Nation's Battle of the Brains

Compete against other Perth scientist in a science quiz with questions that baffle participants and the audience.

July

Science Café 2017

Meet 'n Greet year 10 students and discuss potential careers in STEM.

Professional Development Workshops

2019

March

Gender Matters and Diversity

Mitigating unconscious bias in the workplace.

2018

October

SciCoder – Demitry Muna

Updates on the latest scientific Python tools and coding practices.

September

Cultural Intelligence - PRISMA

Tools to effectively navigate culturally diverse workplaces.

March

Inclusive Practice

Exploring unconscious bias and privilege in the workplace.

2017

November

Resilience for ECRs – University of Adelaide

Stress and time management techniques.

November

Presentation Techniques – University of Adelaide

Effective communication and body language.

June

Media Skills for Researchers – ICRAR

Interview training with journalists from Channel 9 and The West Australian.