Kris Walker

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kriswalker
Website

Education

PhD Astrophysics — Perth, Australia
University of Western Australia — Feb 2022 – Mar 2026
Advisors: Chris Power, Aaron Ludlow
Thesis: The phase-space decomposition of dark matter halos in cosmological simulations

BSc (Hons First Class) — Melbourne, Australia
Monash University — Feb 2018 – Nov 2021
Advisors: Daniel Reardon, Eric Thrane, Rory Smith
Thesis: Orbital variations and extreme scintillation of PSR J1603–7202

Publications

K. Walker, A. Ludlow, C. Power, A. Knebe, W. Cui
The Three Hundred Project: deducing the stellar splashback structure of galaxy clusters from their orbiting profiles.
2026 MNRAS 547, stag357

S. Balu, C. Power, **K. Walker**, J. S. B. Wyithe
The DORCHA suite: nature, nurture, and the phase space distribution of the Milky Way's high redshift progenitors today.
2026 MNRAS 547, stag292

M. Zhang, **K. Walker**, A. Sullivan, C. Power, W. Cui, Y. Li, X. Zhang
The Three Hundred Project: The Relationship Between the Shock and Splashback Radii of Simulated Galaxy Clusters.
2025 PASA 42, e008

K. Walker, R. Smith, E. Thrane, D. Reardon
Precision constraints on the neutron star equation of state with third-generation gravitational-wave observatories.
2024 PRD 110, 043013

R. Haggar, Y. Amoura, C. T. Mpetha, J. E. Taylor, **K. Walker**, C. Power
Constraining Cosmological Parameters Using the Splashback Radius of Galaxy Clusters.
2024 ApJ 972, 28

K. Walker, D. Reardon, E. Thrane, R. Smith
Orbital Dynamics and Extreme Scattering Event Properties from Long-term Scintillation Observations of PSR J1603-7202.
2022 ApJ 933, 16

Research experience

PhD project Feb 2022 – Dec 2025

Supervised by: Prof. Chris Power and Dr. Aaron Ludlow

OzGrav Internship and Honours project Feb – Nov 2021

Supervised by: Dr. Daniel Reardon, Prof. Eric Thrane, Dr. Rory Smith

- Contributed to the development of the Python package SCINTOOLS, which has since been used in a number of peer-reviewed publications. Continued this work for my Honours research project on the scintillation of pulsar J1603–7202. Used signal processing techniques to extract physical properties from pulsar dynamic spectra. Results published in *ApJ*.
- Simulated gravitational waves from a mock population of binary neutron star mergers. Predicted the capabilities of next-generation observatories in constraining the neutron star equation of state. Results published in *PRD*.

ICRAR Summer Studentship Nov 2020 – Feb 2021

Supervised by: Prof. Natasha Hurley-Walker

Processed 21 cm radio emission data from the Murchison Widefield Array (MWA) to try to detect HI absorption in high-z radio galaxies. Placed constraints on the optical depth and hydrogen column density for the observed sources.

Monash University Research Project Jul – Nov 2019

Supervised by: Dr. Valentin Christiaens and Dr. Carlos Gomez

Evaluated the effectiveness of the SODINN supervised neural network pipeline at detecting exoplanets in high-contrast imagery. Experience with the TensorFlow library and HPC job submission workflows.

Swinburne University Research Scholarship Nov 2018 – Feb 2019

Supervised by: Dr. Michelle Cluver and Dr. Edward Taylor

Used SQL to compile and integrate data from multiple galaxy surveys to optimise field selection for the planned Taipan Galaxy Survey.

Talks & seminars

- **"Expanding the Boundaries of Dark Matter Halos" workshop** Jiao Tong University, Shanghai
  Talk on the link between stellar and DM splashback in simulated galaxy clusters May 2025
- **The Three Hundred Project Collaboration meeting** La Cristalera, Madrid
  Talk on the orbit decomposition of Three Hundred Project galaxy clusters Jun 2024
- **LIGO Extreme Matter telecon** Remote
  Talk on next-generation GW measurements of the neutron star EoS. Dec 2023
- **PPTA/IPTA d2 Update, Australasian Pulsar Meeting** Swinburne University, Melbourne
  Talk on the scintillation and extreme scattering of PSR J1603–7202. Nov 2019

Mentoring & leadership

- **Co-chair, ICRAR-UWA Theory Group meetings** Mar 2022 – Nov 2023
  Organised weekly meetings and moderated research discussions.
- **Monash Programming bootcamp tutor** Aug – Oct 2019
  Tutored first-year undergraduate students on the basics of Python programming.

Affiliations

- ***The Three Hundred Project* collaboration** 2023 – present
- **ARC Centre of Excellence for All Sky Astrophysics in 3 Dimensions (ASTRO 3D)** 2022 – 2024
- **International Centre for Radio Astronomy Research (ICRAR)** 2022 – present
- **ARC Centre of Excellence for Gravitational Wave Discovery (OzGrav)** 2019 – 2024

Skills

- **HPC systems:** Experience with Pawsey, OzSTAR, and Gadi (NCI), including job submission with Slurm and PBS, software setup, and handling of large datasets.
- **Platforms:** Linux (Ubuntu), Windows, macOS
- **Misc:** Bash, Git, TensorFlow, Jupyter, TOPCAT, Mathematica, LaTeX

Languages

- **Python:** Extensive experience in data analysis and visualisation. Authored or collaborated on several packages.
- **C++ & Fortran:** Written basic N-body and fluid (SPH) simulation codes.
- **SQL:** Retrieved and compiled data from galaxy surveys.