

Justin Clancy

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RESEARCH INTERESTS

• Analysis methods in astrophysics and cosmology • Observational cosmology • Cosmological foregrounds & polarization
• Cosmic microwave background anisotropies • Astronomical instrumentation & pipeline development • Time-domain astrophysics • Astrophysical transient detection and classification • Instrumental simulations • Statistical forecasting • Simons Observatory (SO) • Cosmological simulations

Current Research Projects

- Leading the construction of a pipeline for blind detection of astrophysical transients in time-ordered data with the Simons Observatory large aperture telescope
 - Forecasting the rapid transient detection capabilities of the above instrument
- Simulating the observable effects of the relativistic Sunyaev-Zeldovich effect on galaxy cluster catalogue creation and parameter estimation

For details, please visit the corresponding page on the github.io website linked at the top.

EDUCATION

Ph.D Physics, School of Physics, University of Melbourne Feb 2021 — Current
Research Topics: Cosmology & Extragalactic Astronomy, Astronomical Instrumentation and Time-Domain Astronomy
Thesis: *Searching for millimeter-wave transients with the Simons Observatory*
Supervisor: Christian Reichardt

M.Sc Physics (With Distinction), School of Physics, University of Melbourne Feb 2020 — Nov 2021
Thesis Title: *Measurement of Beam Functions with Compact Objects for the Simons Observatory*
Supervisor: Christian Reichardt

B.Sc Science (Major in Physics), University of Melbourne Feb 2016 — Nov 2018

PROFESSIONAL ACTIVITIES AND RESPONSIBILITIES

Member of the Simons Observatory Collaboration Since 2020

- Led the statistical analysis of the first measurements of polarization fraction from Galactic cold clumps in *Planck* satellite data and forecasts for observing these with the Simons Observatory. This was the first publication from the Sources and Transients analysis working group within the Simons Observatory.
- Engaged in ongoing simulations, forecasting and software development for transient detection pipelines to be used by the Simons Observatory large aperture telescope
- Leading the development of a time-domain based detection pipeline for the above project

Organiser of the astrophysics department weekly meetings & presentations, University of Melbourne Since 2023
Organiser of the astrophysics segment for the Victorian year 10 work experience program, University of Melbourne 2022
Member of the CMB-S4 collaboration Since 2022

SKILLS

- Programming: Python (Advanced), R (Intermediate), Julia (Intermediate), C (Basic), HTML & CSS (Basic)
- Technical & Software: HEALPix, pip distribution, multiprocessing (mpi4py & python multiprocessing), Machine Learning (scikit-learn), pandas, data visualisation (matplotlib & Seaborn)
- Supercomputing: MPI, clusters used: NERSC (USA), Princeton – Simons1, Tiger, Della (USA)
- Statistical Interpretation & Signal Processing: Fourier, Bayesian, Power Spectrum Analysis
- Software Development, Git
- Independent Problem Solving, Management and training, Administration

TEACHING EXPERIENCE

Tutor - Teaching Assistant

University of Melbourne

2022 — Current

- PHYC10003 — Physics 1
- PHYC10004 — Physics 2: Physical Science & Technology
- Examination Marking

Lab Demonstrator

University of Melbourne

2020 — 2021

- PHYC10003 — Physics 1
- PHYC10008 — From the Solar System to the Cosmos
- MULT10011 — Introduction to Life, Earth and Universe
- Examination Marking

RESEARCH PROJECTS & EXPERIENCE

Quantifying the observational impact of the relativistic Sunyaev-Zeldovich Effect on galaxy cluster catalogue creation & parameter estimation.

Melbourne, Australia

Melbourne-Manchester-Toronto (MMT) Research Collaboration — Ph.D project at the University of Melbourne

2024 —

Current

Using the *WebSky* suite of cosmological simulations we are investigating how the relativistic Sunyaev-Zeldovich effect will impact the creation of galaxy cluster catalogues in comparison to standard cosmological contaminants such as instrumental noise, foregrounds and the CMB.

Advisors: Christian Reichardt, Adam Hincks, Jens Chluba

Detection and Classification of transients with the Simons Observatory.

Melbourne, Australia

Simons Observatory Collaboration — Ph.D project at the University of Melbourne

2023 — Current

Leading the development of a pipeline to detect rapid astrophysical transients in time-ordered data obtained by the Simons Observatory large aperture telescope.

Advisors: Christian Reichardt, Adam Hincks, Carlos Hervias

Measuring the Polarization fraction of Planck Galactic cold clumps and forecasts for the Simons Observatory.

Melbourne, Australia

Simons Observatory Collaboration — Ph.D project at the University of Melbourne

2022 — 2023

Measured the mean-squared polarization fraction of a sample of Galactic cold clumps from the *Planck* satellite, tested for statistical dependencies and forecasted observational constraints for the Simons Observatory.

Publication: Clancy, J. et al. 2023

Advisors: Christian Reichardt, Giuseppe Puglisi

A Muse study of an extreme cluster merger.

La Serena, Chile

Cerro Tololo Inter-American Observatory & Gemini South

2019

Research Assistant — Self-organised unpaid internship

Obtained spectroscopic redshifts, galaxy velocity dispersions and galaxy spectra to define spectral classifications and features. Measured galaxy cluster merger dynamics and created Gemini Multi-Object Spectrograph (GMOS) masks.

Publication: Hernandez-Lang, D. et al. including Clancy, J. 2022

Advisors: Daniel Hernandez-Lang, Alfredo Zenteno

AWARDS AND SCHOLARSHIPS

Laby PhD Travelling Scholarship (*University of Melbourne*)

2024

Melbourne Research Scholarship (*University of Melbourne*)

2022

Research Training Program Scholarship (*University of Melbourne & Australian Government*)

2022 —

Klein Prize in Experimental Physics (*University of Melbourne*)

2022

PUBLICATIONS

Clancy, J. et al., (2023).

Polarization fraction of Planck Galactic cold clumps and forecasts for the Simons Observatory.

Published in Monthly Notices of the Royal Astronomical Society, doi: 10.1093/mnras/stac2099

Hernandez-Lang D. et al., including Clancy, J. (2022).

Clash of Titans: A MUSE dynamical study of the extreme cluster merger SPT-CL J0307-6225

Published in Monthly Notices of the Royal Astronomical Society, doi: 10.1093/mnras/stac2480

SCIENTIFIC PRESENTATIONS, COLLOQUIA AND SEMINARS

Invited Talks:

- May 2023. Pan-Experiment Galactic Science Group Talks, *virtual*, various institutions.
Polarization fraction of Planck Galactic cold clumps and forecasts for the Simons Observatory.
- Sep 2023. Astrophysics Seminar, *University of Melbourne*, Melbourne, Australia.
Exploring Millimeter Transients: Opportunities and Insights from Modern CMB Experiments and the Simons Observatory.
- Mar 2023. Astrophysics Seminar, *University of Melbourne*, Melbourne, Australia.
Polarization Fraction of Planck Galactic Cold Clumps and Forecasts for the Simons Observatory.
- Jul 2022. Astrophysics Seminar, *University of Melbourne*, Melbourne, Australia.
Polarization of Galactic Cold Clumps in the CMB.
- May 2021. Astrophysics Seminar, *University of Melbourne*, Melbourne, Australia.
Next Gen. CMB: The Future of Looking Back.

Contributed Talks:

- Dec 2024. 25th Congress of the Australian Institute of Physics (AIP), *Melbourne Convention and Exhibition Centre*, Melbourne, Australia.
Exploring Millimeter Transients: Opportunities and Insights from Modern CMB Experiments and the Simons Observatory.
- Jan 2024. Transients Down Under, *Swinburne University*, Melbourne, Australia.
Exploring Millimeter Transients: Opportunities and Insights from Modern CMB Experiments and the Simons Observatory.

Outreach Talks:

- Jun/Jul [2022, 2023, 2024]. Victorian Year 10 Work Experience Physics Lecture on Cosmology, *University of Melbourne*, Melbourne, Australia.

Posters:

- Jul 2024. Simons Observatory All-Hands Meeting, *University of Chicago*, Chicago, USA.
Finding Transients in Time Ordered Data.
- Jul 2023. Astronomical Society of Australia Annual Science Meeting, *Macquarie University*, New South Wales, Australia.
Polarization Fraction of Planck Galactic Cold Clumps and Forecasts for the Simons Observatory.
- Jul 2022. Simons Observatory All-Hands Meeting, *University of California, San Diego*, California, USA.
Polarization of Galactic Cold Clumps in the CMB.
- Jun 2022. Astronomical Society of Australia Annual Science Meeting, *University of Hobart*, Tasmania, Australia.
Polarization of Galactic Cold Clumps in the CMB.

REFERENCES

Please contact me via email for references.