Oliver Oayda

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Personal Summary

I am a PhD student working in astrophysics and cosmology, focusing on the cosmic dipole tension. I have experience working on large datasets across the EM spectrum, collaborating with survey teams, and using cutting-edge statistical techniques to understand this challenge to modern cosmology. I am also well-practiced in both oral and written scientific communication.

Expertise Bayesian statistics • simulation-based inference • cosmic dipole excess • machine learning • large-scale galaxy surveys • survey systematics

Skills PYTHON • JAX ecosystem • SBI & custom neural flows • HPC workflows • GIT collaboration

Software dipole-ska • sbi • catsim

Education

2023–PRESENT **PhD in Physics**
Sydney Institute for Astronomy, The University of Sydney

- Thesis: *Bayesian Inference in Tests of the Cosmological Principle*
- Supervisors: Prof Geraint F. Lewis and Prof Tara Murphy
- Expected submission: July 2026

2022 **Physics Honours**
HONOURS CLASS I AND THE UNIVERSITY MEDAL
Sydney Institute for Astronomy, The University of Sydney

- Thesis: *A Novel Test of the Cosmological Principle*
- Supervisor: Prof Geraint F. Lewis

2019–21 **Bachelor of Science**
School of Physics, The University of Sydney

Publications

- Number of publications: **6**
  - First author: **5**

Cites

2026 – *Wising up to CatWISE: using simulation-based inference to interpret the ecliptic bias and confirm the cosmic dipole excess*
Oliver T. Oayda and Geraint F. Lewis
MNRAS • 10.1093/mnras/stag248

➤ Applied simulation-based inference to the cosmic dipole problem for the first time, deploying neural likelihood and neural posterior estimators in JAX.

2025 2 *Cosmic multipoles in galaxy surveys – II. Comparing frequentist and Bayesian methods*
Vasudev Mittal, **Oliver T. Oayda** and Geraint F. Lewis
The Open Journal of Astrophysics • 10.33232/001c.144907

2025 8 *Cosmic multipoles in galaxy surveys – I. How inferences depend on source counts and masks*
Oliver T. Oayda, Vasudev Mittal and Geraint F. Lewis
MNRAS • 10.1093/mnras/stae2776

➤ Introduced higher order multipoles to our Bayesian inference pipeline; explored how survey source counts and masks affect inference of the dipole and higher orders.

2024 | 26 | *A Bayesian approach to the cosmic dipole in radio galaxy surveys: joint analysis of NVSS & RACS*
Oliver T. Oayda, Vasudev Mittal, Geraint F. Lewis and Tara Murphy
MNRAS • 10.1093/mnras/stae1399

➤ Measured the dipole in two radio continuum surveys, confirming a dipole excess; showed the non-negligible effect of local clustering on the dipole amplitude.

2024 | 35 | *The cosmic dipole in the Quaia sample of quasars: a Bayesian analysis*
Vasudev Mittal, **Oliver T. Oayda** (joint first author) and Geraint F. Lewis
MNRAS • 10.1093/mnras/stad3706

➤ First optical analysis of the cosmic dipole; accounted for dust and other selection effects in our likelihood function using Quaia's selection function.

2023 | 10 | *Testing the cosmological principle: on the time dilation of distant sources*
Oliver T. Oayda and Geraint F. Lewis
MNRAS • 10.1093/mnras/stad1454

➤ Forecast for detecting the kinematic 'time dilation' dipole induced by our motion, which could be seen in e.g. quasar light curves.

In preparation

	Cites	
2026	–	*The Cosmic Radio Dipole and Observer Effects in SKA all-sky surveys* in: "Advancing Astrophysics: Preparing for Science with the SKAO" D. Bertacca, L. Böhme, [and 14 others, including **O. T. Oayda**]
2026	–	*Setting-up for systematics: calibrating cosmic dipole tensions with neural ratio estimation* Mali Land-Strykowski, Harry T. J. Bevins, **Oliver T. Oayda** and Geraint F. Lewis

Presentations

Conference Talks

Feb 2026 — **Asian-Pacific SKA Science Meeting, Thailand**
The cosmic dipole tension: view with the SKA

Dec 2025 — **MaxEnt2025, New Zealand**
Decoding the cosmic dipole with likelihood-based and likelihood-free inference

Jun 2025 — **CosmoVerse@Istanbul, Türkiye**
Confronting the cosmic dipole tension: systematics, surveys and statistics

Colloquia & Seminar Talks

Nov 2024 — **HDR Symposium, School of Physics, University of Sydney**
Runner up for best talk: *Multipoles in galaxy surveys: journeying to higher orders*

Aug 2024 — **CSIRO Space & Astronomy Colloquium**
Invited talk: *Probing the cosmic dipole in the radio sky: Using ASKAP for cosmology*

Aug 2024 — **EMU Collaboration Monthly Meeting**
Invited talk: *Probing the cosmic dipole in the radio sky*

Jul 2024 — **Astronomisches Rechen-Institut, Centre for Astronomy, Heidelberg University**

Probing the cosmological principle with galaxy surveys

May 2024 **HDR Symposium, School of Physics, University of Sydney**
Runner up for best talk: *Probing the cosmological principle with radio galaxies: RACS & NVSS*

Other

Jul 2024 **CosmoVerse@Kraków, Poland**
Presented a research poster

Apr 2024 **AIPNSW Physics Research Poster Presentation**
Presented a research poster; awarded joint 2nd place for PhD student posters

Nov 2023 **HDR Symposium, School of Physics, University of Sydney**
Awarded best research poster

Awards & Funding

2024-25 ***University of Sydney Postgraduate Research Support Scheme***
Competitive scheme for travel funding

2023–present ***University of Sydney Postgraduate Award***
Postgraduate scholarship

2023 ***Henry Chamberlain Russel Prize in Astronomy***
Awarded for the best Honours thesis on an astronomical subject

2022 ***Dean's List of Excellence in Academic Performance***

2019–21 ***Sydney Scholars Award***
Undergraduate scholarship

Experience

2023–present **Casual Academic**
The University of Sydney
- Tutor: 2nd-year Special Relativity & Cosmology
- Tutor: General education science
- Exam/assignment grading: 4th-year General Relativity & Cosmology

2019–23 **Physics Tutor & Content Developer**
Premier Tutors
- Head of high school physics tutoring

Community Involvement

Journal Article Peer Review

2024–25 *Monthly Notices of the Royal Astronomical Society*
Scientific Reports

Local Department

2025–PRESENT	**Organiser** for weekly ‘morning tea’ meetings of the Sydney Institute for Astronomy faculty, postdocs and students
2024	**Organised** the HDR Symposium, in which postgraduate students presented talks on their research problems

Science Collaborations

2025–PRESENT	**CSIRO Space & Astronomy Postgraduate Student Program** CSIRO Supervisor: Dr Stefan Duchesne
2025–PRESENT	**Legacy Survey of Space and Time Collaboration** Australian Junior Associate through Astronomy Australia Ltd.
2025–PRESENT	**Evolutionary Map of the Universe Collaboration** Team Member