

James J. Vandeleur

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Sep 2025

Overview

I am currently a PhD student at UNSW in Sydney, Australia. I study theoretical particle physics with a particular interest in how we can exploit the large separation of scales in yet to be measured physical theories to build effective field theories that develop our understanding of the properties of neutrinos (extremely light, neutral particles) and novel interactions of leptons (slightly heavier, charged particles). I am also a keen electrical engineer by hobby and enjoy public speaking and performing music.

Key Skills

- **Technical Expertise.**
 - My primary field is theoretical particle physics. In particular, I am very familiar with EFT techniques.
- **Public speaking and communication.**
 - confident and engaging speaker.
 - can accurately present complex ideas at appropriate levels for audiences.
- **Programming and computer systems.**
 - very familiar with quantitative computational tasks across a range systems and computational languages.

Research Experience

- **Effective field theory techniques for neutrino masses.**
PhD Project.
Supervised by A/Prof. Michael Schmidt at UNSW, I am currently working on effective field theory (EFT) techniques for describing neutrino masses in the context of next generation precision neutrino experiments. I have also collaborated internationally, studying lepton flavour violation in effective field theories.
- **Bohr-Weisskopf effect in muonic and H-like ions.**
Honours Project.
Supervised by Prof. Jacinda Ginges at UQ, my Honours thesis focused on contributions to atomic hyperfine structure. These results pave the way for refining our precision of atomic hyperfine structure calculations relevant to growing interest in novel, low-energy tests for new physics.
- **Emergence in spin chains and lattices; Superfluid Vortex Pinning.**
Summer Research Projects.
While at UQ, I engaged in short-term research projects in condensed matter physics with Prof. Ben Powell and superfluid dynamics with Dr Matt Reeves.

Employment

- 2024- present **Casual Academic (Class Tutor) @ UNSW**
I am currently employed as a class tutor under the School of Physics, UNSW. Depending on the term, I run tutorial sessions for first, second and third-year courses.
- 2018 - present **Private Tutor**
- 2023 **Casual Academic (Class Tutor) @ UQ**
- 2021 - 2023 **UQ Science Demo Trouper**
I performed with the UQ Science 'Demo Troupe' - a science communication group performing engaging and informative shows for school and community groups of all ages at various public and private events.
- 2021 - 2023 **Primary School STEM Instructor**

Qualifications

- (2023) **Bachelor of Advanced Science with Honours Class I.**
Major in Physics.
The University of Queensland (UQ), Australia.
- (2018) **AmusA, Diploma in Music Performance.**
Trumpet.
Australian Music Examinations Board (AMEB).

Awards

- (2024-27) Australian Government Research Training Program (RTP) Stipend.
- (2020-23) UQ Vice-Chancellor's Scholarship.
Numerous Dean's commendation awards for outstanding achievement during semester.
- (2019) QCAA 'Outstanding Academic Achiever' award for the best year 12 in Queensland.
- (2019) Full Rotary scholarship to the Australian National Youth Science Forum (NYSF).

Conferences, workshops, schools...

I have presented talks at:

- **International Joint Workshop on the Standard Model and Beyond 2024**
A Full EFT Approach to Radiative Neutrino Mass.

- **AIP Summer Meeting 2023, AIP Congress 2024**
Nuclear Structure effects in the Hyperfine Interaction in Muonic and Electronic Atoms.

I have attended:

- **International Center for Theoretical Physics (ICTP) Particle Physics Summer School, Trieste, 2025.**

Publications

- [1] L. Calibbi, C. Hagedorn, M. A. Schmidt, and J. Vandeleur, "Selection rules for charged lepton flavour violating processes from residual flavour groups," arXiv:2505.24350 [hep-ph].
- [2] J. Vandeleur, G. Sanamyan, B. M. Roberts, and J. S. M. Ginges, "Hyperfine anomaly in mercury and test of the Moskowitz-Lombardi rule," *Phys. Rev. A* **111** no. 5, (2025) L050801, arXiv:2411.09912 [physics.atom-ph].
- [3] J. Vandeleur, G. Sanamyan, O. R. Smits, I. A. Valuev, N. S. Oreshkina, and J. S. M. Ginges, "Smallness of the Nuclear Polarization Effect in the Hyperfine Structure of Heavy Muonic Atoms as a Stimulus for Next-Generation Experiments," *Phys. Rev. Lett.* **134** no. 9, (2025) 093003, arXiv:2408.16516 [physics.atom-ph].