Benjamin M. Roberts

School of Mathematics and Physics, The University of Queensland, Brisbane, QLD 4072, Australia

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- Theoretical atomic and astroparticle physics: theory for precision tests of the standard model, searches for dark matter and exotic physics, atomic structure calculations, violation of fundamental symmetries
- Programming (C++, Fortran, Python, Mathematica), experience in parallel computing and statistical data analysis
- 30+ high-impact publications: *Nature Communications*, *Physical Review Letters*, several Editors' Suggestions
- Work covered in several popular science media publications: *Science*, *Cosmos*, *MIT Tech. Review*, and others
- Research profiles: ORCID: 0000-0002-0345-6375; Google Scholar: 5i5bTuwAAAAJ; InspireHEP: B.M.Roberts.1

Academic Positions

2021 – current
ARC DECRA Fellow and Senior Lecturer
University of Queensland, Australia

- ARC DECRA Fellow until May 2024, then Senior Lecturer
- Tests of fundamental physics at low-energy, searches for dark matter and exotic physics
- CI for ARC DECRA Project (DE210101026)
- and ARC Discovery Projects (DP230101685, DP250103374)
- Awarded 2023 *Big Questions Institute* Fellowship
- Lecturer for wide range of courses across all levels (particle astrophysics, quantum field theory, computational physics, data science, first-year general science)
- Course coordinator for Computational Physics
- Supervision of PhD, masters, honours, and undergraduate students
- Serve on colloquium committee; run computational workshops

2019 – 2021
Postdoctoral Researcher
University of Queensland, Australia

- Working with Dr. Jacinda Ginges
- Atomic structure theory, tests of fundamental physics at low-energy
- Supervision of several honours and undergraduate students

2018 – 2019
Postdoctoral Researcher
SYRTE, Observatoire de Paris, France

- Working with Prof. Peter Wolf and Dr. Pacome Delva
- Developed methods for dark matter detection using networks of atomic clocks

2016 – 2018
Postdoctoral Fellow
University of Nevada, Reno, Nevada, USA

- Working with Prof. Andrei Derevianko and Prof. Geoffrey Blewitt
- Using GPS atomic clock data to search for macroscopic dark matter candidates
- Assisted in supervision of several graduate and undergraduate students (received an *Exceptional Postdoctoral Mentoring* award)

Grants & Awards

2025: DP – ARC Discovery Project (DP250103374), $566K (Co-CI with Dr. Jacinda Ginges)
– *Nuclear structure and precision tests of fundamental physics in atoms*

2023: Big Questions Institute Fellowship, $15k
– *Are the laws of physics the same everywhere in the universe?*

2023: DP – ARC Discovery Project (DP230101685), $415K (Co-CI with Dr. Jacinda Ginges)
– *Probing new physics with atomic parity violation*

2021: DECRA – ARC Discovery Early Career Researcher Award (DE210101026), $440K
– *Atomic physics as a probe for fundamental physics and dark matter*

2017: Nominated by UNSW and the Australian Institute of Physics (NSW branch) for the *Bragg Gold Medal for Excellence in Physics*

2013: Australian Postgraduate Award

2012: Spruson & Ferguson Award for Innovation in Science

Teaching

2021 – current
University of Queensland, Australia

- Lecturer for wide range of courses across multiple levels
  - Computational Physics (4th year), Quantum Field Theory (4th year), Advanced Quantum Field Theory (special topics course), Frontiers in Astrophysics (4th year), Data Visualisation and Analysis (3rd year), Theory & Practice in Science (1st year)
- Course Coordinator: Computational Physics (4th year)
- Led curriculum development for Advanced Quantum Field Theory, Computational Physics
- Excellent student feedback

Research Supervision

2019 – current
University of Queensland, Australia

- Currently supervising: 4 PhD students, 1 masters student, 3 honours students
- Previously (graduated): 13 honours students, 20+ undergraduate research projects
- Excellent student outcomes: students have received awards, scholarships, and prestigious international PhD/Masters positions

2016 – 2018
University of Nevada, Reno, NV, USA
Assisted in supervision of several graduate and undergraduate students

- Received award recognising *Exceptional Postdoctoral Mentoring*

Education

2013 – 2016
Doctor of Philosophy in Physics
UNSW, Sydney, Australia

- Thesis: *Low-energy atomic phenomena: probing fundamental physics and searching for dark matter.* (Supervisors: Prof. Victor Flambaum and Dr. Vladimir Dzuba).
- Nominated by the NSW AIP branch for the *Bragg Gold Medal for Excellence in Physics*
- Several publications: *Physical Review Letters, Physical Review A* & *D* (including an Editors' Suggestion), *Annual Review of Nuclear and Particle Science*
- Invited talk at Mainz Institute for Theoretical Physics, Germany
- Invited to the Perimeter Institute for Theoretical Physics, Canada, by Prof. Maxim Pospelov to collaborate, resulting in a publication

2009 – 2012
Bachelor of Science (Advanced) with Class 1 Honours in Physics
UNSW, Sydney, Australia

- Thesis: *Parity nonconservation in atomic transitions and tests of Unification Theories* (Supervisors: Dr. Julian Berengut and Prof. Victor Flambaum).
- Received Spruson & Ferguson Award for Innovation in Science (2012)
- Work published in *Physical Review Letters*

Selected Publications

- *Empirical determination of the Bohr-Weisskopf effect in cesium and improved tests of precision atomic theory in searches for new physics*, G. Sanamyan, B. M. Roberts, and J. S. M. Ginges, **Phys. Rev. Lett. 130, 053001 (2023)**
- *Variation of the Fine Structure Constant around the Supermassive Black Hole in Our Galactic Center*, A. Hees, T. Do, B. M. Roberts, Andrea M. Ghez, S. Nishiyama *et al.*, **Phys. Rev. Lett. 124, 081101 (2020)**
- *Nuclear magnetic moments of francium 207–213 from precision hyperfine comparisons*, B. M. Roberts and J. S. M. Ginges, **Phys. Rev. Lett. 125, 063002 (2020)**
- *Search for domain wall dark matter with atomic clocks on board GPS satellites*, B. M. Roberts, G. Blewitt, C. Dailey, M. Murphy, M. Pospelov, A. Rollings, J. Sherman, W. Williams, and A. Derevianko, **Nature Comm. 8, 1195 (2017)**
- *Ionization of Atoms by Slow Heavy Particles, Including Dark Matter*, B. M. Roberts, V. V. Flambaum, and G. F. Gribakin, **Phys. Rev. Lett. 116, 023201 (2016)**
- *Limiting P-Odd Interactions of Cosmic Fields with Electrons, Protons, and Neutrons*, B. M. Roberts, Y. V. Stadnik, V. A. Dzuba, V. V. Flambaum, N. Leefer, and D. Budker, **Phys. Rev. Lett. 113, 081601 (2014)**
- *Revisiting Parity Nonconservation in Cesium*, V. A. Dzuba, J. C. Berengut, V. V. Flambaum, and B. M. Roberts, **Phys. Rev. Lett. 109, 203003 (2012)**
- Full publication list available online: broberts.io/

Selected Invited Talks

- *Seminar on Precision Physics and Fundamental Symmetries*, Physikalisch-Technische Bundesanstalt (PTB), Germany, 2024
- *Quantum sensors and new physics workshop*, MIAPbP (Munich Institute for Astro-, Particle, and Bio Physics), Germany, 2023
- *International Workshop on Atomic Parity Violation (virtual)*, 2022
- *Frontiers in Quantum Matter Workshop: Electric Dipole Moments*, Australian National University (ANU), Canberra, Australia, 2019
- 7^{th} *International Colloquium on Scientific and Fundamental Aspects of GNSS*, European Space Agency (ESA), ETH Zürich, Switzerland, 2019
- 15^{th} *Marcel Grossmann Meeting*, University of Rome (La Sapienza), Italy, 2018
- *New Directions in Dark Matter and Neutrino Physics*, Perimeter Institute for Theoretical Physics, Canada, 2017
- *The Ultra-Light Frontier*, Mainz Institute for Theoretical Physics, JGU, Germany, 2015

Selected Coverage in Popular Press

- Brisbane Times, *'Unusual' atom helps search for dark matter*, S. Layt, 28 Feb 2023
- APS Physics Synopsis, *Constants Still Constant Near Black Hole*, M. Stephens, 26 Feb 2020
- Quanta, *Ultra-Accurate Clocks Lead Search for New Physics*, G. Popkin, 16 Apr 2018
- Cosmos Mag., *GPS satellites "largest dark matter detector ever built"*, R. Lovett, 10 Nov 2017
- NBC News, *The search for dark matter just took a big step forward*, B. Bergan, 3 Nov 2017
- Science, *Hunting dark matter with GPS data*, A. Cho, 30 Jan 2017

Academic & Discipline Service

- UQ Colloquium Committee (2022 – current). Organise and run weekly physics colloquiums, host guest speakers
- Serve on committee (Vice Chair) for ATMOP Topical Group of Australian Institute of Physics
- Run computational workshops: high-performance computing, using git and GitHub
- Organised UQ hub for virtual ACAMAR meeting 2022; organised UQ leg of the 2022 AIP Women in Physics lecture; chaired several conference sessions
- Examiner for honours and masters theses; PhD review panels; chaired PhD defence
- Outreach and community engagement: presented several public outreach talks; provide comment for science journalists; lecture to year 10 students (Junior Physics Odyssey)
- Referee for peer-reviewed journals (including *Physical Review Letters*, *Physical Review A*, *Nature Astronomy*, and others), and for Australian Research Council (ARC) grants