


James W. Gardner

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Education

Doctor of Philosophy (PhD) in Physics 2022–present

The Australian National University (ANU), Canberra ACT, Australia[†]

[†] Involving close collaboration and a majority of the time spend at The California Institute of Technology (Caltech), Pasadena CA, USA.

Bachelor of Philosophy (Honours) in Science with First Class Honours in Physics 2018–2021

The Australian National University (ANU), Canberra ACT, Australia

Improving future gravitational-wave detectors using nondegenerate internal squeezing

Thesis available at <https://jamesgardner.info/>

Awards and scholarships

ARC Centre of Excellence for Gravitational Wave Discovery (OzGrav) Travel Grant 2022

Yale Physics PhD offer (with funded tuition and stipend) 2022

Australian Government Research Training Program Domestic Scholarship 2022

ANU Supplementary Scholarship 2022

ANU First Class Honours 2021

ANU Achievement Prize for Third Year Physics 2020

ANU Dean’s Science Education Commendation Award 2020

ANU National University Scholarship 2018–2021

Employment

Research Officer Grade 5/6 (35 hours per week)

ANU Centre for Gravitational Astrophysics (CGA)

Benchmarking of future gravitational-wave detector networks February–June 2022

Summer Research Intern (35 hours per week)

ANU Centre for Gravitational Astrophysics (CGA)

Analytic modelling of quantum optics configurations

Experimental optics work in the CGA GW Laboratory

December 2021–January 2022

December 2020–February 2021

Teaching

Science Mentors ACT (pro bono)

2019

Research

Research interests

Quantum optics, gravitational waves, quantum squeezing

Publications

James W. Gardner, Min Jet Yap, Vaishali Adya, Sheon Chua, Bram J. J. Slagmolen, David E. McClelland, 2022, *Nondegenerate internal squeezing: an all-optical, loss-resistant quantum technique for gravitational-wave detection*, Phys. Rev. D **106**, L041101. Letter available upon request or at <https://doi.org/10.1103/PhysRevD.106.L041101>

James W. Gardner, Hannah Middleton, Changrong Liu, Andrew Melatos, Robin Evans, William Moran, et al., 2022, *Continuous gravitational waves in the lab: recovering audio signals with a table-top optical microphone*, American Journal of Physics **90**, 286. Paper available upon request or at <https://doi.org/10.1119/10.0009409>

Presentations and posters

Gordon Research Conference - Mechanical Systems in the Quantum Regime June 2022
Two-mode squeezing for gravitational-wave detection
Presented jointly with Mr Daniel Gould.

[Poster] Gordon Research Conference and Seminar - Mechanical Systems in the Quantum Regime June 2022
Nondegenerate internal squeezing: an all-optical, loss-resistant quantum technique for gravitational-wave detection

LIGO-Virgo-KAGRA Collaboration - Joint meeting of the advanced interferometer configurations, quantum noise, and laser and auxiliary working groups March 2022
Nondegenerate internal squeezing

OzGrav - Data/Astrophysics meeting February 2022
Continuous gravitational waves in the lab: recovering audio signals with a table-top optical microphone

LIGO-Virgo-KAGRA Collaboration - Interferometer simulation group December 2020
Verification of the newly-added non-linear element in Finesse for optical modelling of advanced gravitational-wave detector configurations

Membership

The Australian Institute of Physics (AIP) 2022–present

The Cosmic Explorer Consortium (ANU group) 2022–present

The LIGO Scientific Collaboration (LSC - OzGrav - ANU group) 2022–present

The ARC Centre of Excellence for Gravitational Wave Discovery (OzGrav - ANU node) 2020–present

The Centre for Gravitational Astrophysics 2020–present
Research School of Physics and Research School of Astronomy and Astrophysics, ANU

Media

SciTechDaily April 2022
Continuous Gravitational Waves in the Lab

Outreach

OzGrav/CGA Student Symposium May 2022
From vacuum fluctuations to the next generation of ground-based gravitational-wave detectors