

Jacob Peter Kia Ngaha

POSTDOCTORAL RESEARCH FELLOW

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Experience

Research Assistant

Auckland, New Zealand

THE UNIVERSITY OF AUCKLAND

Jun. 2025 - Oct. 2025

In this short-term role, I contributed to the final stages of a publication on phase resetting in the Yamada model of a Q-switched laser. My work focused on refining numerical results, preparing the manuscript for submission, and initiating a study of the model's two-dimensional isochrons to further understand the system's phase structure and sensitivity to perturbations.

Post-Doctoral Research Fellow

Auckland, New Zealand

THE UNIVERSITY OF AUCKLAND

May. 2023 - Apr. 2025

I worked in the Department of Mathematics with Professors Bernd Krauskopf and Neil Broderick under the "Quantum effects in coupled nano-lasers" project. The focus of my research was on *phase resetting* of stable oscillations in the Yamada model of a Q-switched laser. Given an induced perturbation into such systems, the dynamics are temporarily disrupted, but will eventually reset back to its original stable oscillations. However, this reset induces a phase shift relative to the unperturbed oscillations. In this project, I employed numerical continuation techniques to systematically study phase response for arbitrary perturbations at a range of timings, contributing to the theoretical understanding of timing control and synchronisation of these laser systems.

Science Outreach Assistant - Science Wānanga

New Zealand

THE UNIVERSITY OF OTAGO

2018 - 2025

Science Wānanga is the University of Otago's Science outreach program aimed specifically at Māori youth, typically aged between 10 - 16. As part of this program, we stay on a marae (Māori community house) with the children for two-three days, teaching and engaging them in different science fields. I specifically worked with the Physics team, where we run several different workshops/demonstrations showing some properties of light and lasers, and how they can be applied to measurements. In particular, we showcase a cost effective water quality measuring kit, which ties in the concepts of light, absorption, measurement, and a dash of chemistry.

Graduate Teaching Assistant

Auckland, New Zealand

THE UNIVERSITY OF AUCKLAND

Jul. 2017 - Nov. 2022

Over my various years of postgraduate study in the Department of Physics, I have worked in several teaching assistant roles:

- Marked tests and assignments for a first-year astronomy course: Physics 107 - Planets, Stars and Galaxies. (Jul. 2017 - Nov. 2017)
- Lab demonstrator for the Stage II and III laboratory students. This involves helping students with the experimental equipment and theory and marking reports and providing feedback. (Feb. 2018 - Nov. 2022)
- Tutor for the Physics Tuākana drop in tutorials for Māori and Pasifika students. I would help students from all stages of physics with concepts from their classes, their assignments, as well as test preparation. (Jul. 2018 - Nov. 2022)
- Student coordinator for the Physics Tuākana program. I would organise tutorial times, assist the main coordinator with administration tasks, and attend monthly Faculty meetings with other departments. Occasionally I would also offer pastoral care to students in need. (July. 2020 - Nov. 2022)
- Marker and tutor for postgraduate courses on quantum mechanics and quantum optics: Physics 703 and 760, respectively. (Feb. 2022 - Nov. 2022)

Education

New Zealand Diplomas in Te Reo Māori (Rumaki) (Levels 5-7)

Auckland, New Zealand

TE WĀNANGA O AOTEAROA

2022 - 2024

These diplomas were awarded after three separate years of full immersion learning of Te Reo Māori in the courses: *Te Rōnakitanga ki te Reo Kairangi* (2022), *Te Aupikitanga ki te Reo Kairangi* (2023), and *Te Pinakitanga ki te Reo Kairangi* (2024).

PhD – Doctor of Philosophy in Physics

Auckland, New Zealand

THE UNIVERSITY OF AUCKLAND

Sep. 2019 - Sep. 2023

Supervised by Professor Howard Carmichael and Associate Professor Scott Parkins, I researched frequency filtering techniques in a quantum optical setting. We developed a theoretical model – the *multi-mode array filter* – which has an approximately rectangular frequency response, enabling much more precise measurements and calculations of frequency-filtered photon correlations.

New Zealand Certificates in Te Reo (Rumaki, Reo Rua) (Levels 1-4)

Auckland, New Zealand

TE WĀNANGA O AOTEAROA

2020 - 2021

These certificates were awarded after two separate years of introductory Te Reo Māori through the *Te Ara Reo Māori* courses: *He Pī Ka Pao* (2020) and *He Pī Ka Rere* (2021).

MSc – Master of Science in Physics

THE UNIVERSITY OF AUCKLAND

Auckland, New Zealand

Feb. 2018 - Mar. 2019

Under the supervision of Professor Howard Carmichael, I applied open quantum systems techniques to study the fluorescence spectrum and photon correlations of a resonantly driven, three-level ladder-type atom. As a research masters program, the results of this project were then presented as a thesis, as part of the degree’s requirements.

BSc (Hons) – Bachelor of Science (Honours) in Physics

THE UNIVERSITY OF AUCKLAND

Auckland, New Zealand

Mar. 2017 - Nov. 2017

The Honours degree consisted of a mix of course work and a year long research project, supervised by Professor Howard Carmichael. For the project, I explored the effects that spontaneous emissions, quantum dephasing, and thermal photon generation has on the generation of sub-Poissonian light in a maser model.

BSc – Bachelor of Science

THE UNIVERSITY OF AUCKLAND

Auckland, New Zealand

Mar. 2014 - Nov. 2016

Double major in Physics and Mathematics.

Publications

Two-photon resonance fluorescence in a three-level ladder-type atom

J. NGAHA, S. PARKINS, AND H. J. CARMICHAEL

[Preprint on arXiv](#)

Submitted Mar. 2025

Submitted to Physical Review A (arXiv:2503.16772)

Multimode array filter of resonance fluorescence

J. NGAHA, S. PARKINS, AND H. J. CARMICHAEL

[Physical Review A](#)

Aug. 2024

Phys. Rev. A 100, 023719 (2024).

Frequency-Filtered Photon Correlations

J. NGAHA

[ResearchSpace@Auckland](#)

Jun. 2023

PhD. Thesis

Two Photon Resonance Fluorescence in a Ladder System

J. NGAHA

[ResearchSpace@Auckland](#)

Feb. 2019

MSc. Thesis

Select Presentations & Conferences

NZMS Joint Meeting

PHASE-RESETTING IN THE YAMADA MODEL OF A Q-SWITCHED LASER

Auckland, New Zealand

Dec. 2024

Presentation

Optics Division Seminar

TWO-PHOTON RESONANCE FLUORESCENCE IN A THREE-LEVEL LADDER-TYPE ATOM

University of Strathclyde, Glasgow

Oct. 2024

Seminar

Nonlinear Photonics (NP)

PHASE-RESETTING IN THE YAMADA MODEL OF A Q-SWITCHED LASER

Quebec City, Canada

Jul. 2024

Presentation

CLEO-EQEC

MULTI-MODE FREQUENCY-FILTERED PHOTON CORRELATIONS OF A DRIVEN THREE-LEVEL ATOM

Munich, Germany

Jun. 2023

Presentation

Dodd-Walls Centre Symposium

HUNTING FOR PHOTON CORRELATIONS

Rotorua, New Zealand

Jun. 2023

Presentation

Konference on Optics, Atoms, and Laser Applications (KOALA)

FREQUENCY-FILTERED PHOTON CORRELATIONS

Adelaide, Australia

Dec. 2022

Poster

Skills

Technical Skills

Computational simulations of physical systems, numerical continuation of dynamical systems, open quantum systems, cavity quantum electrodynamics (QED).

Programming Languages

Fortran, Python, MATLAB, $\LaTeX$

Soft Skills

Leadership, decision making, time management, teaching.

Committee Memberships

Te Ao Māori Rōpū - Māori Development Group

Te Whai Ao – The Dodd-Walls Centre

AUCKLAND, NEW ZEALAND

Dec. 2021 - Present

The Te Ao Māori Rōpū is an organising committee for Māori staff, student, and research development in the Dodd Walls Centre. Māori are the indigenous people of Aotearoa / New Zealand, and are severely underrepresented in the sciences. One of the main goals of this rōpū is to help develop processes, and research, to achieve a better representation.

Faculty of Science Research Fellow Society

Auckland, New Zealand

THE UNIVERSITY OF AUCKLAND

Mar. 2024 - May. 2025

This is a society consisting of research fellows from the Faculty of Science at the University of Auckland. I represent the research fellows from the Department of Mathematics.

Scholarships

Oct. 2021 Frederick Douglas Brown Postgraduate Science Research Scholarship

The University of Auckland

Sep. 2019 The University of Auckland Doctoral Scholarship

The University of Auckland

Feb. 2018 The Dodd-Walls Centre Masters Scholarship

Te Whai Ao – The Dodd-Walls Centre