

Current Projects

1. Prof. Manfred Lenzen and Dr Mengyu Li – School of Physics

Project title:

Post-growth futures

Project summary:

This PhD project is situated within an ARC Discovery Project involving collaboration with University of New South Wales and Monash University. It investigates post-growth and alternative economic futures, focusing on how deep socio-economic transformations might unfold beyond conventional growth-centric paradigms.

The project will employ a suite of modelling approaches—such as Integrated Assessment Modelling, multi-region input–output analysis, and representations of carbon–social interactions—to examine post-growth scenarios for Australia, with scope for global extensions. A particular emphasis is placed on non-technological drivers of change, including behavioural shifts, institutional reform, geopolitical realignment, and changing social norms. The research may explore how such drivers reshape energy demand, production systems, trade patterns, and emissions trajectories, and how they interact with technological transitions.

Requirements:

Applicants must demonstrate strong programming skills (e.g. MATLAB or Python) and an aptitude for systems-level thinking, including the design and linkage of different model classes. A background in economics, environmental modelling, systems science, or a related field is desirable. Applicants should have excellent analytical reasoning, strong English writing and communication skills, and an interest in post-growth, degrowth, or sustainability transitions literature. Initiative, intellectual curiosity, and the ability to work across disciplinary boundaries are essential.

This project is open to both Master of Research and Doctor of Philosophy (PhD) candidates, with successful applicants commencing at the School of Physics, Faculty of Science, The University of Sydney.

2. Prof. Manfred Lenzen and Dr Mengyu Li – School of Physics

Project title:

Sustainability and resilience under climate stress

Project summary:

This project examines emerging patterns of economic fragility and failure in a warming world. Recent trends indicate that mean global temperatures are entering ranges that significantly affect crop yields and human habitability, particularly in the Global South. These pressures interact with existing vulnerabilities—such as weak institutions, inequality, demographic change, and geopolitical tension—to produce compound risks that challenge economic stability and social cohesion.

The project will combine global, desktop-based analyses of failing or fragile economies with targeted field studies of communities under climate stress. Case-study applications may include China, Southeast Asia, and Pacific Island regions. Research themes may include climate-driven livelihood collapse, migration pressures, adaptive capacity, and the gendered and cultural dimensions of economic stress and resilience.

Requirements:

Applicants should demonstrate strong cultural and gender awareness, excellent English writing skills, and high-level conceptual and critical thinking ability. Quantitative skills such as programming, data processing, or modelling (e.g. MATLAB or Python) are highly desirable, alongside an openness to integrating qualitative and field-based insights. Experience or interest in development economics, climate impacts, political economy, or human geography will be advantageous. A proactive, independent research style and strong communication skills are essential.

This project is open to both Master of Research and Doctor of Philosophy (PhD) candidates, with successful applicants commencing at the School of Physics, Faculty of Science, The University of Sydney.

3. A.Prof Maureen O'Malley - School of History and Philosophy of Science

Project title:

Symbiotic Synergies

Project summary:

This project aims to investigate how developments in today's microbiology arose from earlier microbiology. The focus is human-relevant microbiology, especially in relation to health and disease. The perspective will be historical, philosophical and social, with a range of interdisciplinary skills relevant to the project goals.

You'll be working with a philosopher of biology (Maureen O'Malley) and two historians of biology and medicine (Nic Rasmussen UNSW, Claas Kirchhelle INSERM). We expect you to gain a PhD by publication (3-4 articles).

Start date: Any time from August 2026 to January 2027.

Eligibility/skills:

- Open to both domestic and international applicants
- Strong Honours or Master's (MA) degree
- Relevant academic background, with a willingness to develop new skills
- Demonstrated interest in microbiology
- Must be residing in NSW for the duration of the project

4. A.Prof Ting Rei - School of Physics

Project title:

Engineering Light–Atom Interactions for Qudit Control in Trapped-Ion Quantum Computers

Project summary:

This project will develop experimental methods for precise control of qudits encoded in trapped-ion energy levels. By engineering tailored light–atom interactions, the student will design, implement, and benchmark laser-driven operations that access multi-level quantum states beyond conventional qubits. The work will combine optical control, pulse shaping, calibration protocols, and Hamiltonian engineering to realize robust qudit gates and state preparation. These tools will be applied to quantum information processing and analog/digital quantum simulation of chemically relevant systems, where higher-dimensional encodings can reduce resource overheads. The project offers training in trapped-ion experiments, quantum control theory, and programmable quantum computing hardware and measurement techniques.

This Scholarship is funded by the Australian Research Council (ARC) and aims to support a PhD candidate undertaking research within the School of Physics, Faculty of Science, at the University of Sydney.

5. Dr Serafima Guseva - School of Life and Environmental Sciences

Project title:

How DNA controls transcription factor activity

Project summary:

Gene expression is controlled by transcription factors, proteins that recognise short DNA sequences to activate or repress target genes. DNA is not a uniform helix, sequence affects its local structure and directly influences how transcription factors bind. Yet most research has focused on the protein side of this interaction, and the role of DNA remains poorly understood. Many fundamental questions remain open: how do transcription factors select specific binding sites from thousands of similar sequences across the genome? How does the same transcription factor activate different genes in different cell types? This project addresses these questions by combining bioinformatics, structural biology and cellular biology to determine how DNA structure and dynamics drive transcription factor activity and gene regulation.

The position offers training in high-field NMR spectroscopy (including 800 MHz), X-ray crystallography, biophysical methods, and molecular biology. Candidates should hold (or expect to complete) a Master's or Honours degree in biophysics, biochemistry, chemistry or a related field. Experience with NMR or crystallography is advantageous but not essential.

This Scholarship is funded by the Australian Research Council (ARC) and aims to support a PhD candidate undertaking research within the School of Life and Environmental Sciences, Faculty of Science, at the University of Sydney.