

Faculty of Science ARC Postgraduate Research Scholarship August 2026

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. Dr Linh Nghiem - School of Mathematics and Statistics

Project title:

Statistical methodologies for complex data settings

Project summary:

We are seeking up to two PhD students to join our team in developing new theory, methods, and applications of statistical dimension reduction for data with complex structures, including but not limited to, multi-way clustered, spatial-temporal, and network dependence. The student will be undertaking research in connection with the Australian Research Council Discovery Project (DP260100579), addressing important challenges of distilling high-dimensional regression and classification relationships, with little to no loss of information, into results readily understood by domain experts.

The supervision team will include Dr Linh Nghiem, Dr Shila Ghazanfar, A/Prof Rachel Wang (all from the School of Mathematics and Statistics, University of Sydney), and A/Prof Francis Hui from the Australian National University.

Requirements:

- Minimum USyd requirements for all PhD candidates, typically by completing an undergraduate Honours or Master's degree with a research component of at least 25% in the final year of study.
- Pre-requisite courses:
- Calculus-based probability (equivalent to USyd STAT2x11), introductory statistical inference (equivalent to STAT3x23)
- At least two courses in applied statistics or relevant, e.g., linear models, statistical/machine learning, deep learning, correlated data analysis
- Familiar with R and/or Python, Latex, and GitHub
- Desirable: A (mathematical) real analysis course (measure theory is optional).

4. A.Prof. Michele Barnes – School of Life and Environmental Sciences

Project title:

Social Networks for Disaster Preparedness and Climate Resilience

Project summary:

As climate change intensifies the frequency and complexity of disasters, communities are increasingly exposed to compound risks such as sequential floods, storms, or heatwaves interacting with ecological and social systems. While infrastructure and early-warning systems are critical, people's personal networks — the informal and formal relationships that connect individuals and communities — are among the most powerful, yet least understood, resources for building resilience. This project aims to understand how personal social networks and human–environment relationships influence how people prepare for and respond to compound environmental hazards. The successful PhD candidate will focus on advanced social network modelling to examine how network structures influence disaster preparedness and climate resilience, and how these relational structures shape feedbacks between social systems, environmental risk, and adaptive responses. The project will also provide opportunities to contribute to methodological advances in statistical network modelling, particularly in relation to analysing large-scale personal network data in complex social–ecological systems.

5. Prof. Christopher McErlean – School of Chemistry

Project title:

Rise of the molecular machines: A synthetic ribosome for peptide assembly.

Project summary:

This project aims to create a small-molecule molecular machine that mimics the ribosome's function to assemble peptides and proteins. This advancement will enable the production of diverse peptides and proteins, extending nature's ribosomal biosynthetic machinery through the ability to incorporate both natural and non-natural amino acids.

6. A.Prof Ellis Patrick - School of Mathematics and Statistics

Project title:

Statistical methods for the analysis of spatial omics technologies

Project summary:

We invite applications for a fully funded PhD position to join an ARC-funded project developing statistical and computational methods for the analysis of emerging spatial omics technologies. These technologies map the molecular profiles of individual cells directly within tissue, revealing how cells organise, communicate and change in health and disease. As datasets become increasingly large and complex, there is a growing need for rigorous statistical approaches that can meaningfully characterise the structure of these cellular environments.

This project will focus on creating new analytical frameworks that help researchers interpret complex spatial relationships between many types of cells, compare these patterns across heterogeneous tissues, and understand how upstream processing decisions influence biological conclusions. All methods will be released as open-source software to support widespread adoption in biology, medicine and data science.

The PhD candidate will be jointly supervised by Dr Shila Ghazanfar and A/Prof Ellis Patrick and will join an active research environment spanning statistics, bioinformatics and biomedical collaboration. The School of Mathematics and Statistics and the Sydney Precision Data Science Centre offer strong mentoring, regular training activities and opportunities to connect with leading researchers in spatial omics.

This scholarship is ideal for candidates with a background in statistics, data science, computer science or bioinformatics.

7. Prof. Thomas Robert – School of Life and Environmental Sciences

Project title:

Local, tacit and Indigenous socio-ecological knowledges of native grains and grasses on Gamilaroi and Wiradyuri Country

Project summary:

This PhD project, supported by ARC Discovery grant DP250101050, will be grounded in co-design processes to generate collective local, tacit and Indigenous landscape-scale knowledges of the environmental variability of native grains and grasses across Gamilaraay and Wiradyuri Nations.

The successful candidate will collate these knowledges alongside Gamilaraay researchers by targeting Indigenous and non-Indigenous landowners, landholders, land managers and other local stakeholders involved in regeneration and restoration of native grasses at specific locations. The knowledge the successful candidate will synthesise will focus on environmental histories and local observations to further our understanding of the socio-ecological geographies of native grains and grasses. Questions of access, governance, conservation and use of native grains and grasses will be overlaid on this data and analysed alongside local environmental knowledges. On a theoretical level, it is expected that this research will contribute to new ways of thinking about the diverse ontologies and epistemologies associated with grassland and grassy woodland Country. The PhD student will make contributions to scholarship on co-design processes and outcomes in environmental studies in Australia.

The successful candidate is expected to work closely with Gamilaraay researchers, including the Gamilaroi Grains Custodians, who represent Indigenous stakeholders in the University of Sydney's native grains research program. Gamilaraay researchers and custodians will co-design, co-execute and co-evaluate this project to co-shape the enquiry and analysis, and to ensure Indigenous Cultural Intellectual Property protocols are upheld and inform culturally appropriate dissemination of results.