



### ANU COLLEGE OF SCIENCE

#### Have you considered acquiring research training during your degree?

During the 2023-2024 summer break, the Research School of Biology is offering Summer Research Scholarships (SRS) and Summer Research Internships (SRI) for ANU students. The program is designed for talented students interested in trialling research or/and considering honours. It is a 9-week program running from Mon 20<sup>th</sup> Nov to Fri 19<sup>th</sup> Jan 2024 with a Christmas/New Year break between Friday 22<sup>nd</sup> Dec to Tue 2<sup>nd</sup> Jan 2024 with pay.

For information, see <https://biology.anu.edu.au/education/summer-research-scholarships>.

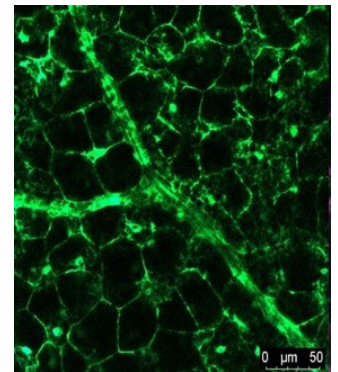
Apply [here](#). **Application Deadline: 31<sup>st</sup> August** (late applications not accepted)

Please email [rsb.studentadmin@anu.edu.au](mailto:rsb.studentadmin@anu.edu.au) if you have any queries or troubles with the online application process.

#### Available research themes and projects (click on names for website links)

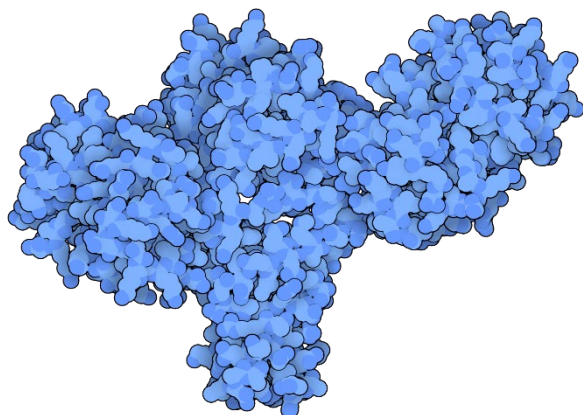
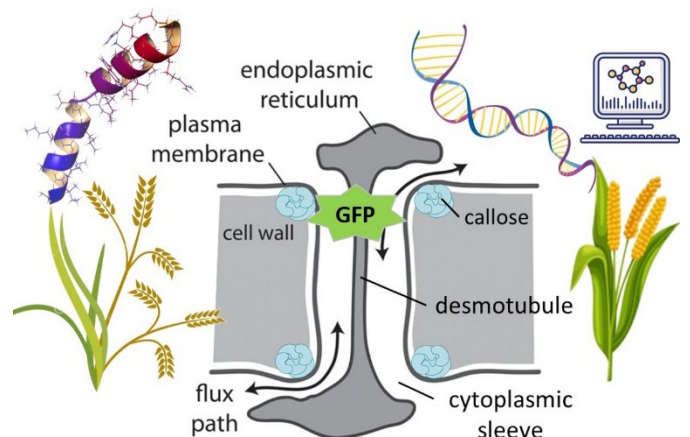
##### Kai Chan *Decrypting chloroplast signalling networks at cell type-resolution*

Chloroplast signalling is a well-established stress response in plants performing C<sub>3</sub> photosynthesis (found in 97% of land plants). Understanding how this process is altered by specialisation of cell type and chloroplasts in plants performing stress-tolerant C<sub>4</sub> photosynthesis is critical for engineering stress-tolerant photosynthesis into our crops. In this project, you will contribute to uncovering chloroplast signalling pathways in a stress-tolerant C<sub>4</sub> plant, both at the whole-leaf level and in extracts enriched in different cell types. These results will give the first insights into how chloroplast signalling might intersect with cell type specialisation for environmentally resilient photosynthesis.



##### Florence Danila *Mapping the genetic mechanism of plasmodesmata formation and regulation to improve crops*

Plasmodesmata are nano-channels in plants that facilitate macromolecule transport between cells. Their functional roles span short and long-distance transport, circadian signal transport, lateral gene transfer, stress signalling, immunity and photosynthesis. Despite their importance in plant growth and development, little is known about the genes involved in their formation and regulation. Projects are available in either bioimaging analysis (i.e., confocal microscopy, electron microscopy) of fluorescent protein tagged-plasmodesmata lines and/or complementary multi-'omics approaches (transcriptomics, proteomics and bioinformatics) to map the genetic mechanism of plasmodesmata formation and regulation in model crops.



##### Emily Furlong *Redox pathways in pathogenic bacteria*

Redox pathways play important roles in bacteria and the disruption of these pathways results in reduced bacterial growth and virulence. This project will involve characterisation of key proteins involved in redox pathways within the periplasm of gram-negative bacteria. Throughout this project you will be trained in recombinant protein expression, protein purification, redox biochemical assays, and structural biology methods.



**Nicotra Lab: Measurement of microclimate parameters and establishment of environmental monitoring plots for snow gum dieback.**

Projects are available to contribute to the establishment of long-term monitoring plots aimed at studying snow gum woodlands and the factors driving the rapid dieback of these woodlands. Work will include field deployment of microclimate sensors, characterisation of plants and soils, as well as collection, preparation and analysis of biological samples. Opportunities also available to measure drivers of phenotypic plasticity in plant and invertebrate species using field and laboratory methods. These projects involve many field trips to Kosciuszko National Park as part of a team of enthusiastic researchers.

**Megan Head: Adapting to rapid environmental change**

Our lab is interested in how animals respond and adapt to new and changing environments. We have several projects available using fish and invertebrate models systems to study how different aspects of these animals environment (e.g. food availability, temperature, drought, disease) affect important fitness related traits (e.g. life-history traits, performance traits and reproductive behaviour). If you are interested in ecology and evolution of animals, check out our website and get in touch to find out more about the projects on offer.

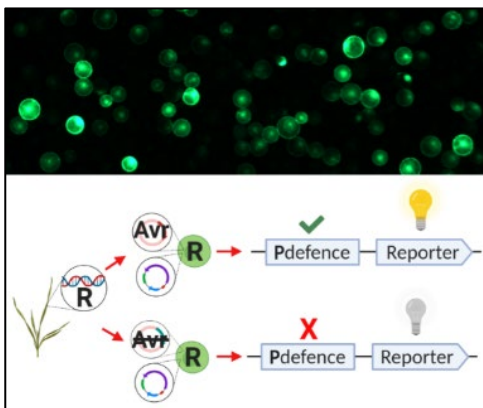
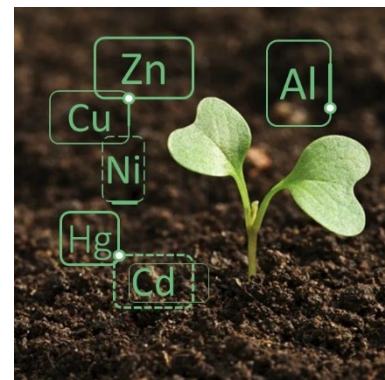


**Karen Ford: Monitoring threatened wildlife and their habitat**

Effective conservation and management strategies for threatened species rely on accurate information on their distribution, habitat, and response to threats. A variety of survey techniques can be used to gather these types of information. Students can join our research team in field or lab-based projects using different survey techniques to fill key knowledge gaps for the endangered koala and greater glider.

**Spencer Whitney: Designing synthetic biological sponges for heavy metal phytoremediation.**

This project seeks to use of protein nano-compartments produced in bacteria and re-purpose them into biomanufacturing nanobodies equipped with customized biological 'metal binding' protein cargo. The protein cargo content and the porosity of the 'biological sponges' will be tailored to selectively bind toxic heavy metals such as nickel, cadmium, mercury, aluminum, zinc and copper. Projects are available for proof of concept studies undertaken in *E. coli* and transiently in plant cells. Projects are tailored to areas of research training (molecular engineering, SynBio, enzyme biochemistry, plant transformation or/and physiology) of interest to students.



**Benjamin Schwessinger: A synthetic biology approach to improve crop biosecurity**

This project combines a novel synbio approach with the ongoing genomic revolution to improve biosecurity for important Australian crops. You will be able to apply the latest synbio approach to detect the recognition of pathogen molecules in wheat protoplast. You will contribute to bridging the gap between bioinformatic prediction and functional validation of immune response triggering pathogen molecules.

[Kavya Yalamanchili and Robert Furbank](#) ***Redesigning rice photosynthesis***



Enhancing photosynthetic efficiency of globally important crops is crucial to meet the growing agricultural demand, as photosynthesis serves as the foundation of the global food chain. The C<sub>4</sub> rice project aims to boost rice productivity by introducing the necessary photosynthetic machinery for more efficient C<sub>4</sub> photosynthesis in C<sub>3</sub> rice. Opportunities are available to analyse transgenic rice lines engineered to boost the C<sub>4</sub> enzyme levels and/or lines containing key genes encoding biochemical and anatomical traits

required to support the C<sub>4</sub> photosynthetic mechanism. You will gain hands-on experience in molecular, biochemical and plant physiological analysis and contribute to the development of rice varieties that exhibit enhanced photosynthesis, higher yields, and improved resilience.

[Sasha Mikheyev](#) ***BeePocalypse Now: How the arrival of parasitic bee mites will change Australia's ecosystems and agriculture.***



Varroa mites, a recent parasite of honey bees, have caused global bee population declines. Their detection in Australia presents a unique opportunity for a natural experiment to study ecological and evolutionary changes. Research goals include understanding Varroa's impact on bee populations, viral communities, native bees, and competition dynamics, with the aim of protecting pollinators and ensuring food security.

Other RSB labs may have available projects – you must organise a project with them directly before you apply.