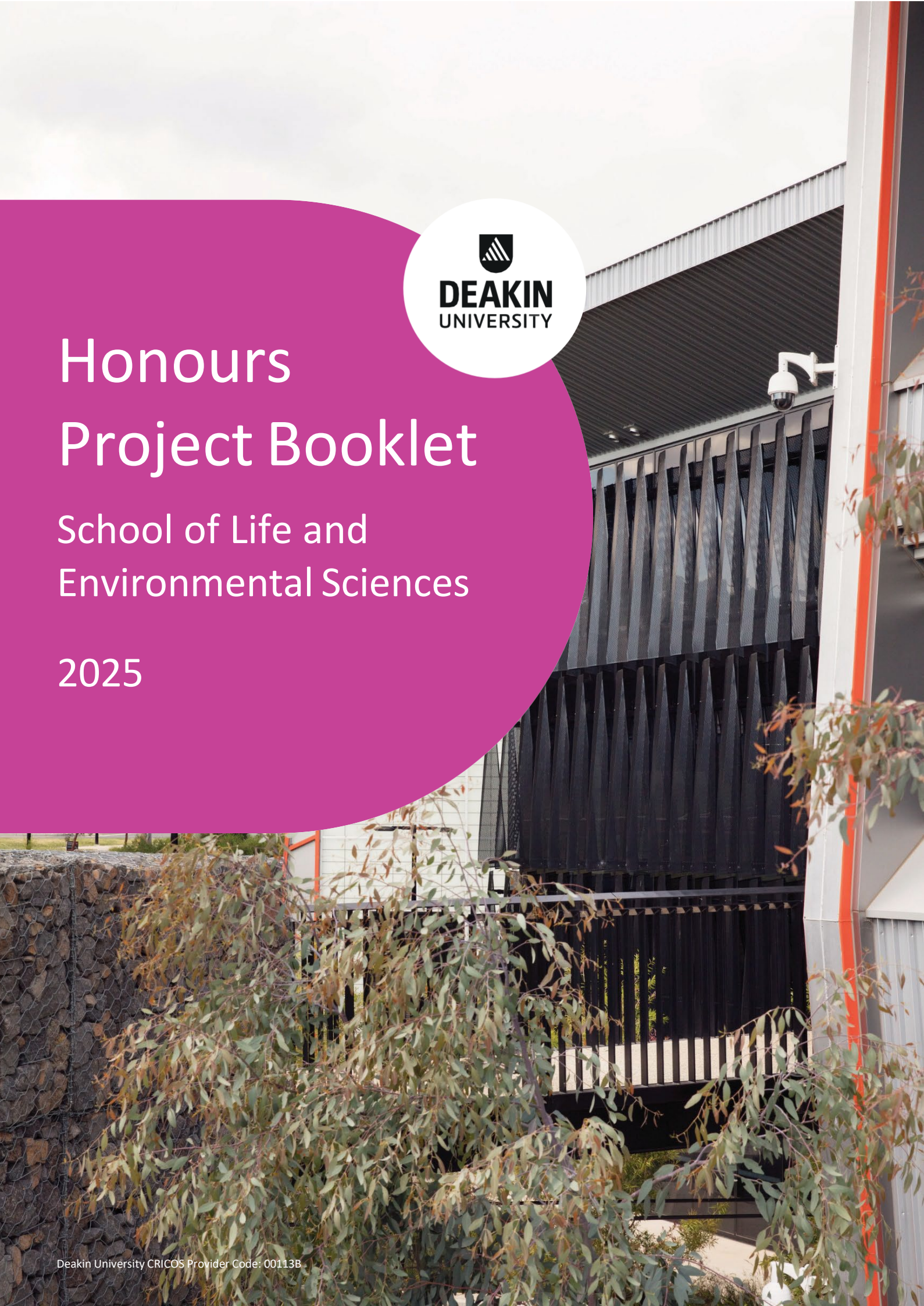


Honours Project Booklet

School of Life and Environmental Sciences

2025

Deakin University CRICOS Provider Code: 00113B

What is Honours?

During Honours, students undertake independent research, under supervision, that forms the majority (75%) of their activity for the year. The research may involve field work, laboratory work and data analysis, depending on the nature of the project. The major assessment component is the written thesis produced at the end of the year. Honours students must present their research via oral presentations. There are also two coursework units (comprising the remaining 25% of activity) which vary according to the Honours program you are enrolled in.

Why do Honours?

An Honours degree provides an important year for further acquisition of scientific skills. In addition to the specialised research training, you obtain during your research project, all Honours students gain further competence in critical thinking and data analysis, information technology, computer software, and scientific communication via oral and written presentations. These skills are recognised by external employers as essential in the workplace. Thus, completion of an Honours year will make you more employable. An Honours degree also exposes you to research of national and international significance, and is the springboard to further study as a postgraduate student undertaking Masters or PhD level research.

How do I get into Honours?

Admission to the Honours program normally requires students to have a Bachelor's degree with an average of at least 65% or greater in their level-3 units. There is an alternative entry pathway with consideration of relevant work experience through an interview process. Furthermore, admission to the Honours program is dependent on a suitable research project and the availability of a supervisor.

Honours structure

There are three Honours courses:

- S400 Bachelor of Science (Honours)
- S401 Bachelor of Forensic Science (Honours)
- S494 Bachelor of Environmental Science (Honours)

All three Honours courses run on a semester structure, with Honours requiring 2 semesters of study. In each semester you will do 4 credit points. Two of these credit points in semester 1 or semester 2 will be for the two stand-alone coursework units. The remaining 6 credit points will be for your research project running across both semesters.

Activities for Semester 1 Honours will commence on **Monday 3 February 2025** with thesis submission in early November. Semester 2 Honours commence on **Monday 7 July 2025** with thesis submission the following April 2026. You must be available to commence Honours on the specified start dates.

Applications

The first step in securing a place in the program for 2025 is to contact supervisors and discuss projects. Once you have met with a supervisor and agreed on a project, please complete the application form on the website. Application forms must be completed and signed by the nominated Supervisor and attached to your online application via the Deakin applicant portal.

Applications close on **Monday 13 January 2025** for the Semester 1, 2025 intake and **Monday 16 June 2025** for the Semester 2, 2025 intake. **Please note that late applications will not be considered.**

Further information can be obtained from your local Honours coordinator (Burwood: Dr Tricia Wevill; Waurn Ponds: Dr Andrew Oxley; Warrnambool: Assoc Prof Julie Mondon) and via the

School Honours website.

Burwood Projects

Dr Damien Callahan

Campus: Burwood

Contact details: damien.callahan@deakin.edu.au

Research area description:
The research conducted by Dr Callahan's laboratory spans environmental chemistry, chemical ecology, and advanced analytical chemistry. This includes the application of metabolomics, lipidomics, elemental profiling and trace chemical analysis. The analytical methods used are applied to projects that are focused on improving our understanding chemicals in the environment and to study the biochemical mechanisms that support extreme traits in organisms which have potential practical applications, such as, metal hyperaccumulating plants. This is multidisciplinary research and involves analytical chemistry, biochemistry and bioinformatics and has many potential applications. For this reason, the methodology applied in this research area enables a diverse collaborative research portfolio.

Specific projects on offer:

1) Pesticide profiling in Australia's creeks and rivers
2) Metabolite profiling of metal hyperaccumulating plants
3) Halocarbon production by microalgae
4) Lipidomics of oil accumulating algae
5) Per and polyfluoroalkyl substances (PFAS) are an emerging pollutant of concern and are used solar panels. This project will determine if roof top solar panels are a source for human PFAS exposure.

Dr Adam Cardilini

Campus: Burwood & Waurn Ponds will consider remote working

Contact details: adam.cardilini@deakin.edu.au Phone: (03) 9244 3083

Research area description:
My research focusses on work that will:

- Work to improve humans individual and societal relationships with animals and nature and meaningfully reduce our impacts.
- Increase moral consideration for non-human animals and enable their flourishing; and,
- Rapidly increasing levels of climate action to achieve a safe climate.

I am interested in how our knowledge of and experiences, values, and relationships with nonhuman animals and nature shapes science, the environment, and society. For animals this includes investigating issues like how concern for animals informs environmental values and practice, how to build understanding of animal perspective, and animal use in science (lab, field, and education) impacts people and animals. For climate action this includes describing models of action, understanding motivations and barriers to action, and attempting to increase peoples participation and support of effective climate action.

My research takes a social science approach which includes the use of survey, interview, and content analysis methods (among others). An understanding of, or interest and willingness to learn, social science methods will be valuable. Each project requires a critical understanding of human-animal relationships and a deep respect for non-human animals.

I welcome enquiries from students in the sciences but also those with a social science and humanities background. The list of projects below is not exhaustive, if you have an idea that aligns with these themes please get in touch and we can chat about it.

Specific projects on offer:

- Understanding and increasing climate action - Investigating and improving climate action literacy and participation at an individual, collective, or organisation level. This includes climate action broadly, in specific contexts (e.g., local government area), and/or for specific action types (e.g., climate friendly diets).
- Values, attitudes and approaches to animals in science and conservation - Investigate contemporary attitudes and approaches to animal use and it's impact on science and conservation. Investigate alternative approaches such as compassionate conservation and/or animals as partners of research.
- Including animal perspectives in deliberative processes - Investigate methods and approaches for including animal perspectives and voices in decision making processes that will impact them.
- The role and impact of animal use in higher education - Investigating whether a culture of animal use impacts higher education students' experience of their education and learning, access to conscientious object and ethical alternatives, attitudes and beliefs about animals and/or discipline, and intention and outcomes in relation to pursuing a career in science.
- The role and opportunity for animal and climate action through dietary choice (i.e., plant-based, cellular agriculture) - Investigate knowledge, perceptions, intentions, and behaviours related to plant-based diets and cellular agriculture. Understand whether and how different motivators, i.e., animal wellbeing concern or climate crisis, might impact peoples, collectives, and organisations choices.
- The role of nearby wild lives and nature in peoples lives - Investigating peoples connection to local wild lives and local green space use and whether they influences peoples lives and their intention or engagement with pro-animal, pro-environmental, and pro-climate action behaviours. Testing interventions to increase respectful connections with local wild lives and nature.

Prof Raylene Cooke

Campus: Burwood

Contact details: raylene.cooke@deakin.edu.au;

Research area description:
Our research team has a focus on raptors and how they utilize different land-use types including urban, agricultural and forested landscapes. Much of the fieldwork is undertaken at night investigating the movement and behaviour of nocturnal birds (owls and frogmouths) and their prey (possums and gliders) so a willingness to work at night is a must.

Specific projects on offer:

1) Assessing the extent of rodenticides in wildlife. Co-supervisors John White and Kaori Yokochi
2) Determining the presence of nocturnal birds across Phillip Island. Co-supervisor John White
3) Investigating the abundance of possums and gliders in different land-use types. Co-supervisors John White and Kaori Yokochi
4) Determining the spatial ecology of powerful owls using GPS technologies. Co-supervisor John White
5) Determining the diet of powerful owls through the analysis of regurgitated pellets collected from beneath their roosting sites. Co-supervisors John White and Kaori Yokochi

Dr Bernhard Dichtl

Campus: Burwood

Contact details: bernhard@deakin.edu.au Ph: 03 9251 7060

Research area description:
The Dichtl lab is investigating the function and assembly of molecular machines, please visit http://dichtllab.com for more information.

1) Function of Set1C histone methyltransferase.

Post-translational modification of histone proteins is a central regulatory mechanism of chromatin-associated processes, and we linked meiotic recombination to histone methylation (Acquaviva et al., *Science,* 2013). The Set1C methyltransferase methylates lysine 4 on histone H3 and chromosomal translocations of a human homologue of Set1, give rise to acute myeloid and lymphoid leukemia. Studying Set1C and H3K4 methylation in yeast provides

important insight into the underlying causes of cancer.

2) Alternative polyadenylation in health and disease.

mRNA polyadenylation is an essential RNA maturation step that impacts all aspects of mRNA function. The process adds a poly(A) tail to the 3' end of primary transcripts and determines the length of the 3' untranslated region (3'UTR), which is targeted by regulatory factors like miRNA and RNA binding proteins. Control of 3'UTR length via Alternative Polyadenylation (APA) is an important mechanism to control gene expression. We identified factors that mediate APA in breast cancer cells (Turner, *RNA,* 2020; Turner, *eLife,* 2021) and now study how APA is integrated with cellular signaling pathways.

Specific projects on offer:
Characterisation of potential regulators of the RNA kinase Clp1 in health and disease.

Dr Carla Archibald

Campus: Burwood
Contact details: c.archibald@deakin.edu.au

Research area description:
Harmonising the ways in which people and societies engage with biodiversity and the natural environment is one of life's great balancing acts. My current research at Deakin University focuses on understanding this balance by calculating "biodiversity footprints" of agricultural products and researching the impacts and dependencies of businesses on nature (known as "nature-related risk"). Some of my previous research projects have focused on private land conservation, wildlife management in urban areas, avian ecology, invasive species management, international conservation policy, conservation finance, and climate change.
Applicants should possess enthusiasm for writing and communicating, familiarity with data analysis and/or statistics (e.g., using Excel, R, Python, or GIS), and the ability to work independently and collaboratively within research and potential industry collaborations. For both projects listed below, applicants should expect to learn desirable skills for future employment in the sustainability field. Please note that I am always happy to discuss other project ideas that students may have, and there will be opportunities to bring on co-supervisors for additional expertise.

Specific project themes:

1) Assessing the biodiversity footprint of a large organisation: Conducting desk-based analysis to assess the biodiversity footprint of a large organisation and explore what it would take for them to become "nature positive."
2) Assessing the risk of nature loss on a large organisation: Conducting desk-based analysis to assess the "nature-related risk" for a large organisation and providing recommendations for actions they should implement to adequately mitigate the risk of nature loss to their business.

Prof Don Driscoll

Campus: Burwood

Contact details: d.driscoll@deakin.edu.au

Research area description:
I lead the Biodiversity Research and Conservation Ecology lab (BRACE). The lab has a focus on how species use whole landscapes,including animal movement and disturbances like land-clearing and fire. We test ecological theory using applied conservation problems, and work with a range of government and environmental organisations to ensure our research has real-world impact. The BRACE lab draws on cross-disciplinary expertise to help us answer complex ecological questions, including collaboration with social- sciences, engineering, and experts in artificial intelligence.

Details of BRACE lab projects can be found at dondriscoll.com.

To complete field projects, you will need to gather volunteers, and you will need a manual driver's license. Frog projects involve night work.

Specific projects on offer:

1) **Frogs versus fire?** (suits February start) *Pseudophryne semimarmorata* is listed as vulnerable in Victoria due to reported declines. In collaboration with the Ecology Centre, this project aims to discover how fire management influences this autumn-breeding frog.
2) **Frogs, drought and chytrid**. Pseudophryne bibroni is an autumn-breeding frog with concerns that it may be at risk of decline. This project will build on previous data to understand how drought, chytrid and a novel intervention interact to influence frog survival. **#Work by PhD and an intern due to finish 2023.**
3) **Threatened species distributions and monitoring with the Threatened Species Conservancy including:**

   ***3.1 Aprasia parapulchella* (pink-tailed worm-lizard) monitoring protocols using eDNA** (Feb, or midyear start)
   3.2 Breeding requirements of the endangered small ant blue butterfly (Acrodipsas myrmecophila). This project will investigate the habitat requirements for the butterfly's host species, the coconut ant and the conditions under which butterflies colonise ant colonies.

   3.3 Impact of bushfires and climate change on the endangered Otway Black Snail (Victophanta compacta) Using the established and standardised method, the project would 1) survey historical and community collected records to determine an up-to-date species range map and undertaken a comparison to assess if this has changed over time 2) Determine the species current estimated population status and 2) investigate if these species was impacted by the 2014 & 2015 bushfires that occurred within the species range near Wye River post 2 years of El Nino.
4) **Movement ecology.** In collaboration with Australian Wildlife Conservancy, this project will contribute to implementing new technology for automatically tracking wildlife to answer questions about how movement behaviour influences habitat use. Suits someone with an aptitude for data analysis.
5) **Christmas Island Reptiles.** A new management plan has just been developed that highlights some priority projects to help save extinct-in-the-wild reptiles. You would need to self-fund some of the travel, but if you are up for that, this is a very exciting project with potential to help save a species from extinction. Areas of work include:
   - **5.1** wolf snake trap trials: multiple options we have already scoped out and have some equipment to run with ie luring snakes with skink, gecko or snake scent. Multiple different kinds of traps and lures have been designed but not trialled – including terracotta pots, funnel traps, drift fences etc. All on island and ready to go!
   - **5.2** Applications of new AI-assisted cameras to detect invasive species and monitor extinct-in-the-wild reptiles
6) **Developing new monitoring tools for reptiles, frogs and invertebrates**. In this project you will collect video data using novel video traps then collate the videos, label a very large number of them, and work with IT collaborators to train machine learning algorithms.
7) **Other ideas that you are prepared to organize and lead and which fit into the scope of the BRACE lab.**

Prof Rebecca Lester, Dr Galen Holt, Dr George Cunningham & Georgia Dwyer

Campus: Burwood or Waurn Ponds (depending on project)

Contact details: Rebecca.Lester@deakin.edu.au; G.Holt@deakin.edu.au; George.cunningham@deakin.edu.au; g.dwyer@deakin.edu.au

Research area description: We are part of the Quantitative Aquatic Ecosystem Laboratory (QAEL), within which we undertake theoretical and applied research in freshwater, estuarine and marine systems. Our current research covers a broad range of ecological and population dynamics questions, focusing on freshwater and brackish systems and the effects of climatic change and other human impacts. These projects would require an enthusiastic student who is open to learning a range of skills from a variety of disciplines. Other research projects related to aquatic ecology are also feasible.

Specific projects on offer:

1) A field-based assessment of changes in biodiversity and environmental condition associated with fencing and vegetating farm dams
2) A small-scale study investigating the ability of native species to replace exotic pasture species to improve farmers ability to feed livestock during drought

3) A field-based investigation of when and where caddisflies are habitat limited when selecting sites for egg laying
4) Identify the crop types used by colonial nesting water birds for foraging using tracking data and satellite imagery
5) A field-based investigation into the impact of an emerging disease (*Saprolegnia* infection) on caddisflies and their ability to reproduce
6) Can a fungal-like disease actively seek out their hosts (caddisfly eggs)? A laboratory-based experiment investigating chemotaxis and nutrient regulation of S*aprolegnia spp*.
7) Other field, laboratory or modelling projects investigating aspects of caddisfly species coexistence, stream restoration on farms and responses to drought and climate change.

Dr Christie Lam

Campus: Burwood

Contact details: c.lam@deakin.edu.au

Research area description:
I am an environmental and development anthropologist. My research is multidisciplinary in nature, drawing on Anthropology, Environmental Sciences, and Development Studies perspectives. My particular research interests are the social dimension of natural resources conflicts (protected areas management), climate change adaptation, sustainable farming and food security, displacement and resettlement as well as post-disaster recovery. I love working with communities closely by listening to their voices and empowering them in the decision-making process through participatory research methods such as ethnography, and participatory action research to develop co-designed sustainability policies. I welcome inquiries from students who are interested in understanding environmental sustainability from the social science perspective.

Specific project on offer:

Regenerative Agriculture Project: Transforming agriculture is crucial to achieving future sustainability, and regenerative farming practices are increasingly popular as a nature-based solution to mitigate climate change, biodiversity loss, and soil degradation; however, the lack of studies on their impacts on the environment and society could pose a barrier to upscale adoption of regenerative practices among farmer communities. In this project, we will work together with industries and farmers to evaluate the impacts of regenerative practices on soil health, water health, animal health, food nutrition, biodiversity, and community wellbeing. The project aims to use rigorous evidence to inform future sustainable farming practices and policies.

Dr Agnes Michalczyk

Campus: Burwood

Contact details: agnes.michalczyk@deakin.edu.au Ph: +61 3 925 17342

Research area description:
Essential trace elements like iron (Fe), copper (Cu), magnesium (Mg), and zinc (Zn) are crucial for cellular functions, including enzymatic activity, redox balance, and metabolism. Genetic disorders like iron-refractory iron deficiency anaemia (IRIDA), Menkes disease (copper deficiency), and acrodermatitis enteropathica (zinc deficiency) cause severe metal deficiencies. In contrast, acquired deficiencies, especially of iron, zinc, and magnesium, are widespread globally due to poor diet, chronic illness, or impaired absorption. Current treatments, including dietary or intravenous supplementation, often fail to regulate metal bioavailability effectively, leading to poor absorption or toxicity from excess free metals.

This project explores pyoverdine siderophores, bacterially produced metal chelators that selectively bind essential cations. Unlike standard supplementation, pyoverdines may enhance controlled metal uptake, improving cellular function while preventing toxicity. It is hypothesised that pyoverdine-mediated metal transport can restore intracellular metal levels in a regulated, bioavailable form, offering a novel approach to treating deficiencies.

Two honours projects will investigate pyoverdine's impact on gut epithelial cell models, assessing metal transport,

absorption, and metabolic effects. Findings could inform improved supplementation strategies for individuals with genetic or acquired deficiencies. Students will develop expertise in gut cell culture, metal quantification, and molecular analysis, thereby contributing to interdisciplinary research within the fields of microbiology, biochemistry, and nutrition.

This project will also be supervised by Dr Aydin Enez and Dr Abhirami Venugopal. If you are interested, please reach out to Agnes with a copy of your CV and academic transcript.

Dr Roan Plotz

Campus: Burwood and Waurn Ponds

Contact details: **r.plotz@deakin.edu.au**

Research area description:

My research is multidisciplinary and spans the fields of wildlife and behavioural ecology (particularly escape and communication behaviour in animals), Indigenous Knowledge (particularly climate warming driving changes in animal and plant phenology), and human dimensions of wildlife interactions to improve species conservation and management.

Any students interested in my research areas or projects within my research areas are welcome to contact me. I am very happy to discuss students' area of interest and ideas and see if we can align with my research expertise.

Currently, I am looking for several honours students to work on a project looking at human fear responses in animals. Human disturbance of mammals by humans' distresses and displaces animals and constitutes a major conservation problem. The information will allow us to better understand how humans impact wildlife and develop ways to mitigate those impacts. This project involves fieldwork.

Specific projects on offer:

1) Flight Initiation Distance of World's Mammals - Investigating mammals' behaviour in response to disturbances, environmental changes, urbanization, and other threats. The scope of this research is large, innovative, and exciting, and there is possibility for multiple studies. Our team has already come up with some research topic ideas, but you are welcome to bring your own. A valid driver's license and the ability to conduct field work are required.

Co-supervised by Dr Kaori Yokochi, Dr Anthony Rendall, and Associate Professor Mike Weston.

2) Indigenous Knowledge for monitoring animal and plant responses to a changing climate - I work with Meteorological Services and regional environmental and cultural organisations to include traditional forecast knowledge into climate products. The traditional knowledge collected will also be used as a tool for communicating climate messages to local communities. There are local possibilities for research projects under this theme.

Co-supervised by Dr Lynda Chambers (Bureau of Meteorology) and partnered with EarthWatch Australia.

Dr Nicholas Porch

Campus: Burwood

Contact details: nporch@deakin.edu.au Ph: (03) 92517620

Research area description:

I am especially looking for someone to continue work on a recently funded (Hermon Slade Foundation) research project: **Conservation biogeography of the endangered invertebrate fauna of the SE Australian montane archipelago.** This project is researching patterns of species richness and endemism in the highly threatened and poorly known montane invertebrate fauna, using various sampling approaches/samples. Year 1 (2024) resulted in the discovery of hundreds of previously unknow species, all threatened by climate change. Would suit someone who wants to do fieldwork or alternatively someone who would rather be completely lab-based.

Specific projects on offer:

1) **Human Impact on Island Biodiversity**: Are you interested in islands, extinction, biological invasions,

biogeography or fossils? Projects in this area are laboratory-based investigations into the nature of the recent fossil record of plants and insects on Indo-Pacific oceanic islands. Materials for projects in this area are in-hand and projects would be based in the 'bug lab'. Projects could explore changing biodiversity using samples from **Mangaia in the Cook Islands**, contribute to the growing recognition of catastrophic insect extinction by describing **extinct beetles from Rodrigues in the Indian Ocean**, or examine recent changes in the biodiversity of **New Zealand's offshore islands**. If this area or similar types of questions in an Australian context interest you, please send me an email.

2) **Australian Terrestrial Invertebrates**: We are entering a period of history where it is increasing likely that many invertebrate species will become extinct before they are even recognised. Projects in this area could examine patterns of leaf litter **invertebrate richness & endemism on Wilsons Promontory**, or research the impact of increased alpine **fire frequency on Victoria's charismatic, but poorly known pill millipedes**. Several of these projects would require both field and 'bug lab' work; whereas others could be entirely desktop. If this general area interests you, please send me an email.

Dr Anthony Rendall

Campus: Burwood and Waurn Ponds

Contact details: a.rendall@deakin.edu.au

Research area description: My research spans the fields of invasive species ecology, island ecosystems, trophic dynamics, threatened species conservation and landscape ecology. I am always happy to speak with students about research that interests them or can discuss projects within my fields of research.

Prof Euan Ritchie

Campus: Burwood

Contact details: e.ritchie@deakin.edu.au

Research area description:

I lead the Applied Ecology and Conservation Research Group. Our research primarily focuses on wildlife ecology and conservation, with a particular emphasis on mammals, interactions between predators and their prey, fire ecology, invasive species, and ecosystem dynamics and management. This includes studies of dingoes, eastern barred bandicoots, long-nosed potoroos, and many other wonderful species. We aim to inform conservation strategies and policies to better protect and manage wildlife and natural ecosystems. Beyond the advertised projects below, I am always keen to hear the ideas of prospective students.

Specific projects on offer:

1) The movement ecology of platypus in Coranderrk creek, Victoria. Co-supervisors Anthony Rendall, and Jess Thomas (Zoos Victoria).
2) Population ecology and habitat use of eastern barred bandicoots on French and Phillip islands, Victoria. Co-supervisors Anthony Rendall, Amy Coetsee (Zoos Victoria), and Duncan Sutherland (Phillip Island Nature Parks).
3) Experimentally examining the use of different artificial tree hollow types by arboreal mammals and birds in Echuca, Victoria. Co-supervisors Amanda Lo Cascio, and Rodney Van der Ree (WSP).
4) Environmental factors affecting occupation of chainsaw hollows by arboreal mammals in Cobaw state forest and Wombat state forest, Victoria. Co-supervisors Amanda Lo Cascio, and Jo Isaac (ERAus).

Prof Matthew Symonds

Campus: Burwood

Contact details: matthew.symonds@deakin.edu.au Ph: (03) 92517437

Research area description:

In our group we work on the evolution of behaviour, morphology and physiology between closely related species of animals. Much of our research involves combing ecological and evolutionary information to answer questions about how and why traits have evolved, identifying the factors that shape evolution of the trait – with particularly interest in effects of climate and other environmental variation. I offer a mixture of field-. museum-, lab- and desk-based Honours projects – predominantly on birds, but also on insects. In additional to the projects below I'm open to suggestions! Feel free to contact me to ask me more about these. If you want to get the best idea of the breadth of my research interests and projects, look no further than the publications page on my website (www.symondslab.wordpress.com/publications/).

Specific projects on offer:

1) The evolution of body size and shape in relation to climate and climate change
2) Variation in the control of heat loss in birds, and its consequences for bird body shape
3) The evolution of sexual differences in body shape
4) Environmental predictors of anti-predator escape behaviours
5) The evolution of imperfect mimicry in insects
6) Drivers of diversity in insect chemical signals and antennae
7) Gender differences in publication output in the ecological sciences (this project is suited for a more science-policy, data-based student).

Dr Angel A.J. Torriero

Campus: Burwood

Contact details: angel.torriero@deakin.edu.au Ph: (03) 9244 6897

Research area description:

My research group operates at the dynamic intersection of electrochemistry and molecular biology. Our diverse and pioneering projects involve electrosynthesis, electrochemical biosensors and immunosensors, and the interaction of pharmacologically active molecules with cell membranes. Our work aims to develop innovative solutions to current scientific challenges, making a tangible impact on health and technology.

Specific projects on offer:

1. **Development of Electrochemical Calibration-Free Biosensors for Early Disease Detection:** This project focuses on designing and fabricating novel biosensors capable of detecting biomarkers for various diseases at early stages. Students will learn electrochemistry, bioconjugation, and data analysis techniques, providing a comprehensive skill set for careers in medical diagnostics and research.
2. **Electrosynthesis of Pharmacologically Active Molecules:** This project aims to develop new methods for synthesising pharmacologically active compounds using electrochemical techniques. The work involves collaboration with leading pharmaceutical researchers and offers hands-on experience in synthesising, purifying, and characterising new molecules.
3. **Interaction of Drugs with Cell Membranes:** Understanding how drugs interact with cell membranes is crucial for developing more effective therapies. This project combines electrochemical techniques with molecular biology to study these interactions at a detailed level, offering insights into drug design and delivery.
4. **Immunosensors for Point-of-Care Testing:** This project involves developing immunosensors for rapid and accurate point-of-care testing. Students will engage in multidisciplinary research, integrating immunology with advanced sensor technology to create devices that could revolutionise patient care.

Why Join Our Team? Our lab offers a unique opportunity to work at the forefront of scientific research with state-of-the-art facilities and a collaborative environment. Students will gain valuable experience and mentorship, preparing them for successful careers in academia, industry, or further research. We seek passionate, dedicated students eager to learn and contribute to cutting-edge research.

Assoc Prof Susanna Venn

Campus: Burwood

Contact details: susanna.venn@deakin.edu.au

Research area description:
Alpine plant ecology projects: I'm interested in testing ecological theory in the mountains and looking at ways in which alpine plant communities are coping with environmental change. This could involve focusing on community (re) assembly patterns, how snow drives community composition, ecological function or ecological processes in the mountains, treeline dynamics, vegetation responses to heat and frost, regeneration strategies of alpine plants, and experimental manipulations in the field / lab. Have a look through my webpage for some of the topics that I'm interested in, as I'm happy to discuss ideas for honours projects that overlap with any of these topics – or possibly other plant ecology projects in extreme environments.

https://susannavenn.wordpress.com
https://www.extremeplantecology.com/

Specific projects on offer:

1) Thermal tolerance of alpine plants (Labwork and some fieldwork)
2) Interactions between high light and freezing resistance (Labwork and some fieldwork)
3) Alpine seed germination (Labwork)
4) Evaluating the success of Alpine Resort revegetation projects (Fieldwork)
5) Understanding the effects of drought on alpine plants (Labwork and fieldwork)
6) Using plant functional traits to understand changes in plant community composition and interactions with snow (Desktop study)

Dr Mark Warne

Campus: Burwood

Contact details: mwarne@deakin.edu.au Ph: (03) 9251 7622

Specific projects on offer:
Early Pleistocene marine palaeoecology of the Werrikoo Limestone, western Victoria.
Early Pleistocene sedimentary rocks known as the Werrikoo Limestone occur in cliffs along the Glenelg River valley of southwest Victoria. These rocks are 2.6 to 1.8 million years old, and contain a very rich fossil fauna including abundant fossil shells of marine Ostracoda (microscopic crustaceans). This project will involve (1) the description of ostracod fossils from the Werrikoo Limestone, and (2) fossil-based interpretations of sea level history and past coastal maritime climates for western Victoria. This project offers an opportunity to develop skills in the systematic description of invertebrate taxa, and (ii) in the use of fossils for assessing coastal landscape and seascape evolution.

Dr Liz Weldon

Campus: Burwood

Contact details: l.weldon@deakin.edu.au Ph: +61 3 92517191

Research area description:
Research supervision capabilities in palaeontology, earth science, palaeobiogeography, palaeoecology, palaeoenvironmental analysis, and geoconservation.

Major themes:

1) **Geoconservation:**
   • Develop regionally and culturally appropriate quantitative methodology to assess geosites and geoheritage for geoconservation.
   • This research is suitable for both Honours and Master of Sustainability students.

2) **Marine invertebrate response to climate change and mass extinction events:**
   • Taxonomic studies and quantitative analysis of marine macro-invertebrate fossils used as bridging taxa for Gondwana-Euroamerican correlation in the Permian.
   • Understand the drivers of diversity, origination, extinction and distribution in response to palaeoenvironmental change.

3) **Quaternary Lancefield megafauna site:**
   • Investigate the processes and causes of the accumulation of an estimated 10,000 individuals from a range of extinct species in a swamp deposit.
   • Understand changing climate patterns and the impact on ecosystems over time.
   • Co-supervisor Dr Sanja Van Huet.

4) **Morphology of extinct and extant kangaroos and emus:**
   • Devise quantitative methods that determine age and gender in the fossil record.
   • Describe biotic responses to environmental change, such as dwarfism or disease.
   • Co-supervisor Dr Sanja Van Huet.

5) **Wombat palaoebiogeography:**
   • Plot the spatial and temporal distribution patterns of the Vombatidae from the Miocene (~16-19Ma) to the present.
   • Determine the impacts of varying climate, changes in vegetation, and anthropogenic factors.
   • Co-supervisor Assoc. Prof. Desley Whisson.

6) **Vertebrate and Invertebrate Palaeontology**
   • Various projects available in conjunction with the Melbourne Museum.

Assoc Prof Desley Whisson

Campus: Burwood

Contact details: dwhisson@deakin.edu.au Ph: 0407639834

Research area description:

My research focusses on understanding the spatial ecology (home range, movements, distribution) of terrestrial wildlife and impacts of landscape change and stochastic processes on species' distributions. I am particularly interested in forest ecosystems and arboreal species (koalas and gliders) but also have a strong interest in rodents including the threatened Broad-toothed Rat. Many of my projects use bioacoustics which has proven to be an efficient and reliable means of wildlife survey.

Assoc Prof John White

Campus: Burwood

Contact details: john.white@deakin.edu.au

Research area description:

I lead a long-term research project in the Grampians National Park (Gariwerd) investigating the impact of fire and climate on small mammal communities. This research offers a great opportunity to do lots of fieldwork and get valuable project management skills. A driver's license (all projects) and a commitment to being in the Grampians for up to 8 weeks is essential (projects 1 and 2).

I also have research focusing on wildlife management and increasingly also the impact of rodenticides on wildlife.

Specific projects on offer:

1) Small mammal trapping in the Grampians (Gariwerd) landscape to determine the influence of fire and climate on long-term trends in small numbers (Long-term ecological research with sites established in 2008). (Co-supervisors Raylene Cooke and Anthony Rendall)
2) Testing the effectiveness of species distribution models for small mammals across the Grampians (Gariwerd) landscape using camera trapping. Experience with GIS would be useful. (Co-supervisor: Raylene Cooke)
3) Assessing the extent of rodenticides in wildlife. (Co-supervisors Raylene Cooke and Kaori Yokochi)
4) Determining the presence of nocturnal birds across Phillip Island. (Co-supervisor: Raylene Cooke)
5) Investigating the abundance of possums and gliders in different land-use types. (Co-supervisors Raylene Cooke and Kaori Yokochi)
6) Determining the spatial ecology of powerful owls using GPS technologies. (Co-supervisor: Raylene Cooke)
7) Determining the diet of powerful owls through the analysis of regurgitated pellets collected from beneath their roosting sites. (Co-supervisors Raylene Cooke and Kaori Yokochi)
8) Investigating the management of corella damage at grain storage facilities with non-toxic repellants (Co-supervisors Raylene Cooke and Ian Temby (external)).

Assoc Prof Mike Weston

Campus: Burwood

Contact details: mweston@deakin.edu.au Ph: (03) 92517433

Research area description:

Conservation, human-wildlife interactions, solutions.

Specific projects on offer:

1. Flight Initiation Distance of world's mammals – investigating mammals' behavioural responses to disturbance/ environmental change/ urbanisation/ other threats. This is an exciting, new, large-scale research, and there is scope for multiple projects. We have some research topic ideas already, but bringing your own ideas is encouraged. Co-supervised by Dr Kaori Yokochi, Dr Anthony Rendall, and Dr Roan Plotz.
2. Flight Initiation Distances of world's birds. Antipredator behaviour is a key life history trait and underpins the key threatening process known as "disturbance". A range of projects are available, including exploring discrimination between different types of "stimuli", factors which mediate risk taking (e.g., prevailing predator environment), and the nature and form of escape.
3. Shorebird conservation, especially supporting the conservation management of resident shorebirds under pressure from human use of habitats and other stressors e.g. invasive predators. Projects include Red-capped and Hooded Plover conservation and management. Of these, one specific project is based around whether nest protection cages inhibit escape behaviour of incubating plovers and whether cage design considerations can prevent this. Another explores whether scent or other deterrents cause predators to avoid plover nests. Co-supervisors include Dr Grainne Maguire (BirdLife Australia).
4. Reintroduction of a locally extinct shorebird (Bush Stone Curlew) to Victoria. A range of projects exist to support critical information gaps in the reintroduction of this species, including elucidating breeding habitat, success, threats and solutions.

For all these projects a current driver's license and capacity to conduct field work is required.

Dr Tricia Wevill

Campus: Burwood

Contact details: tricia.wevill@deakin.edu.au

Research area description:

My research is primarily exploring the impact of altered disturbance regimes on vegetation, specifically determining

how structure, function and composition may change under altered burning regimes.
Students who are interested in working in the area of fire and vegetation management should contact Tricia Wevill to discuss their interest.

Dr Kaori Yokochi

Campus: Burwood

Contact details: k.yokochi@deakin.edu.au

Research area description:

My research interests include Urban Ecology of wildlife (including Road Ecology), mainly focusing on native mammals but I'm open to any taxa. I'm interested in how urbanisation and infrastructure impacts wildlife and exploring potential mitigation/ solutions. My current and past research includes impacts of light pollution on insectivorous bat ('microbat') communities, use of existing drainage tunnels by small mammals to cross roads, effectiveness of wildlife education on teachers' attitudes and knowledge on local biodiversity, impacts of rodenticides on wildlife, and impacts of anthropogenic factors on birds' and mammals' escape behaviours.

Specific projects available:

1) **Microbats**
   - Comparison of commonly used bat detectors and analysis protocols to assess their compatibility (S1 start unless part-time) – very important research with a wide applicability to microbat research worldwide. Proficiency with Microsoft computers and programs required. Co-supervised by Dr Lindy Lumsden (Arthur Rylah Institute).
   - Impacts of artificial lighting on microbats, and other microbat research you can think of! I'd especially be interested in impacts of urbanisation/ anthropogenic changes on the microbat communities.
2) **Flight Initiation Distance of world's mammals** – investigating the mammals' behavioural response to disturbance/ environmental change/ urbanisation/ other threats. This is an exciting, large-scale research, and there is scope for multiple projects. We have some topics in mind already (e.g., impacts of light/ noise, comparing common observation protocols), but bringing your own ideas is also encouraged. Willingness to conduct nocturnal fieldwork is required. The research team also includes A/Prof Mike Weston, Dr Anthony Rendall and Dr Roan Plotz.
3) **Assessing the extent of rodenticide exposure in wildlife** – investigating the presence of anticoagulant rodenticides in our wildlife. The research team also includes Prof Raylene Cooke, A/Prof John White and A/Prof Mike Weston.
4) **Investigating the abundance of possums and gliders in different land-use types** – then potentially linking the information to powerful owl habitat and defoliation rate of vegetation. Willingness to conduct nocturnal fieldwork is required. The research team also includes A/Prof John White and Prof Raylene Cooke.
5) **Road x coastal squeeze: Use of existing infrastructure as crossing structure by small mammals in Otways** – ability to conduct fieldwork in Otways for a few days at a time is required. Co-supervised by Dr Marissa Parrott (Zoos Vic), Dr Jemma Cripps (ARI) and Dr Barbara Wilson.

A current driver's licence, high level of organisational skills and ability to work independently are required for all projects. Please get in touch with me via email with your CV attached.

Dr Angela Ziebell

Campus: Burwood

Contact details: a.ziebell@deakin.edu.au Ph: (03) 92446240

Research area description:

My research centres around understanding Science student employability as well as understanding how students experience learning about Indigenous Science. I have a strong interest in getting students ready for the workplace and understanding how we can best do that be it in everyday laboratory classes and seminars or

in specifically designed classes.

Specific projects on offer:

1) Careers: Preparation at university for future employment, transition to employment and the first 3-5 years out in the workforce are all crucial times for young scientists. I want to make sure we understand how to prepare you best. I am following students into the workforce to understand how their learning at university impacts their career experiences and decisions later. This includes looking at whether different groups of students have different experiences and understanding them to best support current students.
2) Indigenous Science: As an important reconciliation step many universities (especially Deakin) are introducing Indigenous contexts, perspectives, and content into the curriculum. It important to ensure that this is done well and to understand the experience of all students who are learning about this material. I am using quantitative and qualitative techniques to study the experience of student undertaking a whole unit of Indigenous Science learning.

Dr Angela Ziebell and The Institute for Frontier Materials (IFM)

Campus: Burwood

Contact details: a.ziebell@deakin.edu.au Ph: (03) 92446240

Co-Supervised with; Dr. Urbi Pal, Dr Federico Maria Ferrero Vallana and Prof Jenny Pringle

Research area description:
The Institute for Frontier Materials (IFM) creates and translates knowledge to globally raise standards of living by redesigning materials for a circular economy and imparting materials that provide us with extraordinary functionality. The materials used in current batteries are hazardous, toxic, and flammable. They are also difficult to recycle. In this work, we will attempt to develop more environmentally friendly electrolytes for rechargeable lithium batteries.

Specific projects on offer:

Greener materials for rechargeable lithium metal batteries; we will be investigating the physical and electrochemical properties of these new electrolytes and testing them in lithium metal coin cells. You will get to learn from international as well as Australian battery experts including industries and will be exposed in multidisciplinary environment. Successful completion of this project may provide an opportunity for a 3-year PhD program.

Waurn Ponds Projects

Dr Jacqui Adcock

Campus: Waurn Ponds

Contact details: jadcock@deakin.edu.au Ph: (03) 52272096

Research area description:
My research focusses on lipid chemistry and lipid analysis – developing new chromatographic methods for the analysis of various oils and fats and investigating the chemistry of lipids relevant to health and the food industry. Lipids are a diverse group of molecules, with a range of important roles including cell membrane structure, energy storage, intracellular signaling, and antioxidant activity. They are present in many foods and are a vital part of a healthy diet. Analysis of lipids can be challenging, in part because of the difficulty in studying such amphiphilic molecules that can vary markedly in polarity, and often lack chromophores or other chemical features amenable to current detection methods. In my work, I aim to increase our understanding of lipids through the development of improved analytical methods relevant to industry.

Specific projects on offer:

1) Investigating the degradation of pet foods and pet food ingredients
2) Enzymatic synthesis and characterization of lipid mediators of inflammation
3) Investigation and analysis of lipid oxidation processes in food systems

Assoc Prof Luis Afonso

Campus: Waurn Ponds

Contact details: luis.afonso@deakin.edu.au Ph: (03) 55633461
Associate Supervisor – Dr Aaron Schultz aaron.schultz@deakin.edu.au depending on the project.

Research area description:
I am interested in understanding the stress response in fish to aquaculture-related and environmental stressors. An integrated and multi-level approach, including physiological, endocrine, and cellular responses, is used to: 1) examining the ability of fish to cope with stress, and 2) developing novel and reliable biomarkers of stress in fish for a variety of applications. Projects will allow learning opportunities in field sampling collection, and techniques such as standard and quantitative polymerase chain reaction (PCR), enzyme-linked immunosorbent assays (ELISAS) for determining hormone levels, other biochemical assays for determining enzyme and intermediate metabolites levels, SDS-PAGE and Western blot. Stressors to be studied include thermal stress, crowding, transport, hypoxia, and environmental pollutants.

Specific projects on offer:

1) Changes in gill Na^+,K^+ ATPase levels in Atlantic salmon (*Salmo salar*) prior to and after transfer to saltwater
2) Endocrine and molecular responses in Atlantic salmon (*Salmo salar*) exposed to short and long-term stressors
3) Sex differentiation and sex reversal in Atlantic salmon.

Dr Anne Aulsebrook

Campus: Waurn Ponds

Contact details: a.aulsebrook@deakin.edu.au

Research area description:
I am interested in how animals, particularly birds, respond to changing and extreme environments. My research tends to combine behavioural ecology, chronobiology, evolutionary biology and urban ecology. A major focus of my research is the effect of light, including artificial light at night, on animal behaviour and physiology. Another focus of my research is the evolution and ecology of sleep. If you are interested in these topics, please get in touch and we can chat about possible projects. I have described three suggested projects below, but am happy to discuss other options.

Specific projects available:

1) Do zebra finches from higher latitudes show greater flexibility in their diurnal rhythms, in response to changing daylength? This project will use birds that have already been captured in the Northern Territory and South Australia and transported to Waurn Ponds. The project will involve observation of captive birds on campus and could also involve attaching data loggers to birds, analysing accelerometry data, and collecting blood samples to examine hormone levels. This project will be co-supervised by Prof Kate Buchanan.
2) How does artificial light at night affect the daily timing of behaviour in captive zebra finches? This project will use captive-bred zebra finches at Waurn Ponds and will involve similar techniques to those described for the first project.
3) Are rural Australian magpies more sensitive to human disturbance than urban magpies? This project will involve observation of wild birds at various locations around Greater Geelong and/or Melbourne. Depending on the focus of the project, there may also be opportunities to capture wild birds and test the cognitive performance of birds.

Prof Colin Barrow

Campus: Waurn Ponds

Contact details: colin.barrow@deakin.edu.au Ph: (03) 52271318

Research area description:
Professor Barrow's research encompasses a wide range of projects in biotechnology and bioprocessing, suitable for both biology and chemistry honours students. He leads numerous collaborations with industry partners to develop advanced manufacturing capabilities and high value bioproducts for nutraceuticals, omega-3 oils, cosmetics, aquaculture feed, agrochemicals, biomaterials and more. Areas of interest include marine biotechnology, green chemistry, food manufacturing, waste processing and the circular economy.

Projects range from natural products discovery and characterization, to enzymatic biosynthesis, to pilot scale manufacturing. These projects allow students the opportunity to work on real world problems with industry partners. Selected projects are listed below.

Specific projects on offer:

1) Seaweed polysaccharide isolation and bioactivity
2) Enzymatic synthesis and/or modification of glycolipids from marine by-products
3) Phenolic compounds from food waste
4) Development of new cosmetic ingredients from natural materials

Assoc Prof Philip Barton

Campus: Waurn Ponds

Contact details: p.barton@deakin.edu.au Ph: (03) 52278191

Research area description:
I lead the Insect Lab at Deakin University Waurn Ponds campus and conduct multidisciplinary research on insect biodiversity and its role in ecosystems. A number of field, lab, or desk-based projects are available for Honours students.

Specific projects on offer:

1) **Enhancing insect biodiversity and function in farming landscapes (field based).** Insects perform a number of important roles in ecosystems, but we don't know how these roles might be managed to benefit farms. This project would suit someone interested in conducting field work to survey insect communities and their ecosystem services on farms.
2) **Understanding the roles of insect decomposers in Australia's alpine region (lab based)**. A large number of surveys of insect biodiversity have been conducted in Kosciuszko National Park, NSW. This project would suit someone interested in lab work and asking questions about the amazing variety of insect species found in Australia's alpine landscapes.
3) **Identifying insect bio-indicators of ecosystem change (desk based).** Insect biodiversity is overwhelming, complex, and critically important to the world around us. A key challenge is finding simple, user-friendly ways to measure and monitor insect biodiversity. This project would suit someone interested in desktop and statistical work aimed at developing tools for land managers.

Assoc Prof Peter Biro

Campus: Waurn Ponds

Contact details: pete.biro@deakin.edu.au

Project or research area description:
My research focuses on understanding individual variation in behaviour, physiology and life history and how these traits are related to one another in terms of function, and on factors that help maintain trait variation. I am also interested in the genetics and flexible programming of these traits, and their plasticity (i.e., 'nature vs nurture'). I also study individual variation in the behaviour of birds during reproduction, and nesting and communication strategies in birds, especially the grey fantail. Projects on individual variation in behaviour are mostly lab based, using fish or crustaceans as model animals. Bird projects are mostly field-based but can be lab based using video observations of behaviour or recordings of calls and songs.

Specific projects on offer:

1) Growing up athletic: how does early life 'exercise' program metabolism, personality, and activity rates in adult zebrafish?
2) Artificial selection on boldness: correlated responses of selection on physiology and life history traits.
3) Does early life exposure to high temperatures program reduced metabolism, behavioural activity, and boldness in pillbugs?
4) Evolution of song in female birds. Historically, bird song has been considered a male-only trait. This study will examine song in female birds.
5) Why do birds sing at the nest? Assessing the costs and benefits of vocalizations during nesting.
6) Avian nest construction. Nest structures are essential for successful reproduction in most bird species. Using an experimental approach, this study will examine the effects of nest characteristics (i.e., camouflage) on nest predation rates.
7) Noisy Neighbors: Do native birds sing less when invasive birds are singing? This project will examine the effects of invasive songbirds on the vocal activity of native Australian birds.
8) Does anthropogenic noise constrain vocal signaling in birds? This project will study the effects of off-road vehicles (i.e., motor bikes) on acoustic communication in birds.
9) Breeding dung beetle for success in agriculture: is boldness and growth related?
   This project explores if dung beetles exhibit distinct personality traits, and if boldness is related to rapid growth and high reproductive output. If so, then we can artificially select on behaviour to produce 'super' beetles that remove lots of dung from pastures, recycling nutrients, and reducing the fly problem in Australia.
10) How does ani-cancer defenses affect the behaviour and life history of invertebrates? Using pillbugs from an artificial selection experiment, we would expose slow- and fast-growing individuals to UV radiation – our prediction is that fast-growing animals have greater energy budget and can thus fuel repair processes without affecting growth or behaviour, compared to slow growers.

Prof Kate Buchanan

Campus: Waurn Ponds

Contact details: kate.buchanan@deakin.edu.au

Research area description:

I am interested in the evolution of animal behaviour and physiological mechanisms, with a strong emphasis on development. I am particularly interested in whether early life programs adult physiology and behaviour optimally for the environments in which birds live. In 2025 we have several Honours options which are loosely focused on two different study systems (chickens and zebra finches) on-going in the group. Funded by Australian Research Council we are following cryptic acoustic communication in avian nests. Funded by Velux Stiftung, we are quantifying circadian rhythms of light/dark and temperature affect embryonic birds in terms of their growth, physiology and behaviour. Whilst there are projects which may start either in February or July, seasonal restrictions exist on working with breeding birds. All projects will need to be planned around animal ethics requirements and timing. In most cases the student must be based in Geelong, excepting the final project (below), where the student could be based at Burwood or WP campus.

Specific projects on offer:

1) What role does latitudinal origin play in determining the annual cycle of moult and breeding in birds? Comparing across populations of zebra finches sourced from high and low latitude populations within

Australia we hope to test whether the daily/annual cycle of activity, seasonal moult and breeding are different according to the population of origin. This project involves bird observation on campus.

2) Do diurnal light and temperature cycles affect the timing of avian hatching, rate of growth, condition and behaviour in chickens? Building on recent work in our research group the student will have the opportunity to test whether embryos use environmental cycles to time their development and hatching. A variety of options exist including the opportunity to gather your own data from online sources, use of existing samples, or working with chicken embryos.
3) What is the impact of routinely administered antimicrobial fumigation on poultry microbiome establishment and development in commercial poultry? Working in collaboration with myself, Turosi chickens and Dr Andrew Oxley, the student will assess the impact of prehatch fumigation on the gut microflora in hatching in broiler chickens and the consequences for growth and development.
4) Embryos are busy even early in development, but there has been little study of their activity patterns. Using state of the art accelerometers we are seeking to quantify if chicken embryos are more or less active during the day or night. Students are invited for a project co-supervised by Dr Annie Aulsebrook (Deakin University Postdoctoral Fellow) to assess whether light and dark phases stimulate or inhibit embryonic activity and the possible consequences for growth, development and the timing of hatching.

Dr Tim Connell

Campus: Waurn Ponds

Contact details: t.connell@deakin.edu.au

Research area description:

My research investigates the design, synthesis and application of inorganic materials that interact with light in unique ways. Luminescent transition metal complexes exhibit improved photophysics compared to organic dyes, including large Stokes shifts (thereby minimizing inner-filter effects), long emission lifetimes and enhanced photostability. Along with emission energy, these favorable properties may be controlled by manipulating the ligands bound to the central metal atom. The rational design of tailored metal luminophores is attractive across varied applications, including: light-emitting diodes, chemical sensing, generating solar fuels and bioimaging.

The central focus of my program is photoredox catalysis, the artificial equivalent of photosynthesis in plants. Molecular photocatalysts convert visible light (~400-700 nm) into chemical energy; the catalyst absorbs a photon to populate an energetically excited state that then serves as either a potent single-electron oxidant or reductant. This photoinitiated electron transfer to a chemical substrate is followed by an additional 'dark' electron transfer, returning the catalyst to its ground state. The last 15 years have witnessed the rapid growth of this approach, fuelled by the promise of sustainable high-value chemical synthesis. While this recent renaissance generally aims to increase reaction scope, I instead seek to understand the how and why of light-driven reactions.

Specific projects on offer:

1) **Improving atom economy in photoredox catalysis.** Nature builds molecules *via* photosynthesis, exploiting the energy of sunlight under mild reaction conditions. Synthetic photoredox chemistry (a combination of light and reduction/oxidation chemistry) seeks to mimic natural systems but suffers from poor efficiency (i.e. atoms 'spent' per product). This project aims to develop new molecular additives that fuel recyclable chemical syntheses with minimal waste.
2) **Massively bipolar electrocatalysis for sustainable chemical synthesis.** Electrocatalysis offers a 'clean' source of electrons for redox chemistry but suffers from poor mass transport at the electrode surface, limiting reaction efficiency. Bipolar electrochemistry can convert any conducting object into a functional electrode without a

physical connection. This project aims to marry bipolar electrochemistry and electrocatalysis for sustainable chemical synthesis.

3) **Photolabile protecting groups for unmasking catalytic metal sites.** Fast, selective catalysis requires precise control of the reaction active site. Metal atoms with one or more vacant coordination sites offer this control but unsaturated metals are difficult to synthetically engineer. This project aims to protect metal active sites with masking ligands during synthesis, which may then be removed by irradiating with visible light.
4) **Amphiphilic luminophores for chemical sensing in water.** Chemical sensors are attractive instruments for water quality analysis. Cyclometalated iridium(III) complexes boast great photophysical properties for increased sensitivity but poor water solubility. This project will design new metal complexes that contain a hydrophobic luminescent 'head' and hydrophilic 'tails,' similar to natural phospholipids, and evaluate their sensing properties in water.

Dr Antoine Dujon

Campus: Waurn Ponds

Contact details: a.dujon@deakin.edu.au Ph: (03) 92445711

Research area description:

I am a quantitative ecologist. My research aims to understand how human activities, by increasing oncogenic threats in ecosystems, elevate the risk of cancer development in wildlife species and the implications for their ecology, evolution, and conservation. This work seeks to elucidate the mechanisms by which human-induced environmental changes drive cancer incidence in wildlife, with the ultimate goal of mitigating the negative impacts on biodiversity. For this purpose, I use a range of freshwater invertebrate species as models to gain a fundamental understanding of the effects of cancer risk on species' ecology.

The offered projects will be conducted at the Waurn Ponds campus as part of the international laboratory CANECEV (Cancer and Evolution), a collaborative effort between Australian and French researchers, with students being fully integrated into this collaborative structure. The projects are multidisciplinary, requiring curiosity and an interest in cancer processes as well as ecology. All projects involve conducting laboratory experiments and performing in-depth statistical analyses of the results using the R statistical software. Occasional fieldwork may be conducted to collect animals. These projects will provide students with a core set of transferable skills, including the ability to present results both in writing and orally, and to interact with scientists from diverse nationalities.

Specific projects available:

1) Investigate how the loss of mitochondrial function affects the activation of anti-cancer defences and its impact on animal behaviour. This project is ideal for a student interested in measuring enzymatic activities and conducting behavioural trials. Collaboration with Dr. Matt McKenzie and Prof. Frédéric from CNRS (France).
2) Explore the transgenerational effects of anti-cancer defence activation on the behaviour of sexually and asexually reproducing freshwater invertebrates. This project is suited for a student eager to learn advanced statistical models for analysing animal behaviour. The project will be conducted in collaboration with As/Prof Pete Biro and Prof. Frédéric from CNRS (France).
3) Determining the effect of artificial light at night on tumour development in freshwater invertebrates and its consequences on life-history traits. This project will require daily care of animals in the laboratory throughout the entire duration of the experiment. Project in collaboration with Dr Anne Aulsebrook and Prof Frédéric Thomas (French CRNS).

Dr Mehran Ghasemlou

Campus: Waurn Ponds
Contact details: m.ghasemlou@deakin.edu.au Ph: 0426590681

Research area description:

I am an Alfred Deakin Research Fellow working within the Centre for Sustainable Bioproducts. My work is dedicated to tackling two pressing environmental issues: food waste and plastic pollution. My research focuses on developing

innovative methods to convert food waste—such as discarded fruits, vegetables, and other organic byproducts—into valuable bioplastics. This strategy not only minimizes the volume of food waste that ends up in landfills but also produces bioplastics that degrade naturally in marine environments, reducing plastic pollution.

Specific projects on offer:

Production of PHA from sugar-based food waste

I am currently seeking a student who is interested in culturing bacterial strains on food waste to obtain PHA.
Associate or External Supervisors and their contact details: Dr. Shima Jafarzadeh from School of Engineering

Polyhydroxyalkanoates (PHAs) are an eco-friendly group of biodegradable polymers produced by a wide range of microbial strains. The use of PHA in the plastics industry has the potential to significantly reduce plastic waste, particularly in marine environments, due to their ability to biodegrade in seawater. Despite growing market interest and numerous studies, PHA production remains confined to pilot-scale operations. A major hurdle in microbial PHA production is the high cost of carbon substrates. Traditional sources like sugars, vegetable oils, and fatty acids, which are used in PHA biosynthesis, are expensive and contribute significantly to the overall cost of the final product. Moreover, the demand for these carbon sources in other sectors, such as food and biofuel production, further complicates their economic viability for PHA production. Research is actively ongoing to use a variety of sustainable food-waste carbon sources for PHA synthesis. Australia, with its extensive knowledge and expertise in biotechnology and sustainable practices, has the potential to advance this field significantly. Despite this strong foundation, the country has not yet achieved widespread commercial production of PHA. This project focuses on optimizing fermentation conditions and process parameters to enhance both the yield and quality of PHA production from food waste. This project will involve a combination of literature review and laboratory-based activities. The student will have the opportunity to spend time in the laboratory and will develop important skills in microbial culturing, and fermentation.

Prof Paul Francis

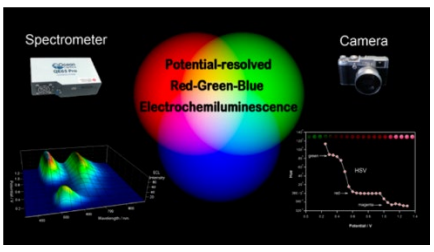
Campus: Waurn Ponds

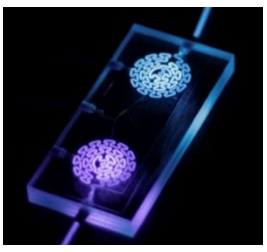
Contact details: paul.francis@deakin.edu.au Ph: (03) 52271294

Research area description:

The capacity to effectively diagnose disease in the human body and identify dangerous pollutants in our environment is fundamentally limited by the speed, selectivity, accuracy and sensitivity that we can measure molecules. We create new analytical approaches based on chemical reactions that produce light, for clinical diagnostic, environmental and forensic science applications.

Our projects involve spectroscopy, analytical chemistry, electrochemistry, inorganic chemistry and/or synthetic chemistry, and are generally of interest to students that enjoyed aspects of **SLE316 Analytical Chemistry and the Environment** and/or **SLE361 Inorganic Chemistry** in their undergraduate course.





Specific projects on offer:

1) **Exploiting 'Redox-Mediators' to Reach New Limits of Detection**. Electrochemiluminescence (ECL) is a widely use detection platform for clinical diagnostics, with over 2 billion assays performed each year. If you have had a blood test, it is likely that some of the analytes were measured using ECL detection systems. Our research group has created a new approach to enhance this mode of detection by orders of magnitude. This project aims to provide unprecedented sensitivity in ECL detection.

2) **Earth-Abundant Metal Complexes for More Sustainable Chemistry**. Complexes of precious metals such as ruthenium, iridium and platinum are widely used in technologies such as solar cells, light-emitting devices, photocatalysis, bioimaging, and chemical detection systems. This project explores luminescent complexes of widely available first-row transition metals such as iron, manganese and chromium, as cost-effective and sustainable alternatives for these important technologies.

3) **Multi-Colour Electrochemiluminescence for Rapid Detection in Portable Devices**. Molecules that emit different coloured light can be selectively switched-on or switched-off by applying different electrochemical potentials. This provides opportunities to simultaneously measure multiple different analytes for time-critical analytical applications, such as point-of-case and at-scene detection with portable analytical devices.

4) **New Flow-Cells for Chemiluminescence (CL) Detection.** Achieving the greatest sensitivity from fast CL reactions requires very efficient mixing of reactant solutions and presentation of the emitted light to a photodetector. This project involves the fabrication of new analytical components and their evaluation using various analytically important CL reactions, providing skills in high-precision machining and 3D printing processes, in addition to analytical chemistry techniques.

Dr Vipul Gupta

Campus: Waurn Ponds

Contact details: Vipul.gupta@deakin.edu.au **Ph: 0422593725**

Research area description:

My research interest lies in the use of multiple interdisciplinary fields, such as 3D printing, analytical chemistry, materials engineering, pharmaceutical sciences, and computational modelling, to develop commercially viable products and technologies. The ability to work at the interface of chemistry, engineering, and biology allows us to obtain a holistic approach towards addressing socio-economically important problems. Some of the areas of interest in our group are advanced material generation, point-of-care diagnostics, hydrogen economy, pharmaceutical and nutraceutical processing, and defence capabilities due to their industry relevance and high demand for students trained in these areas.

Specific projects available:

Specific research projects and objectives are developed based on the student's interests and available resources. Some of the currently available projects are listed below.

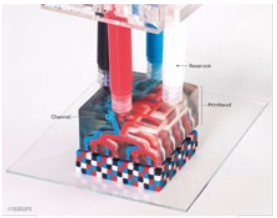
3D Printing of Glass

3D printing of plastics and metals is relatively well understood by now, and there are numerous processes and printers available to realise plastic and metallic 3D printing. However, these capabilities fail to achieve low-cost, robust, transparent, and biocompatible devices which require 3D printing of glass and other ceramics. Hence, through this project, we explore the fundamentals of 3D printing porous and non-porous glass. The objective of the project includes but is not limited to the development of novel 3D printable inks for printing multi-level porosity glass structures and developing energy, health, and analytical chemistry-based applications for 3D printed glass-based microfluidic components. The project has been funded by the Australian Research Council under the Discovery Early Career Researcher Award (DECRA) 2020 scheme.

MIT Media Lab

Multi-material High-resolution 3D Printing

Stereolithographic (SLA) 3D printing, which is one of the most widely used printing techniques for fabricating high-resolution components, such as microfluidics, is predominantly limited to the use of single materials. This severely restricts its applications where a combination of multiple material properties are desired, such as valves and pumps (require both elastic and non-elastic materials), flow cells and online detection modules (require both opaque and transparent materials), multi-coloured objects, etc. Hence, through this project, we explore the development of a multi-material high-resolution 3D printer that can break the boundaries set by conventional 3D printing techniques. This project was also funded as a part of the above-



Nature 575, 330–335 (2019).

mentioned DECRA scheme.

3D Printing of Miniaturised Analytical Devices

Conventional off-the-shelf microfluidic components offer limited capabilities and severely restrict design freedom. Moreover, they do not allow easy customisation, and their high cost often prevents their use in resource-limited settings or disposable point-of-care instruments. Hence, we are exploring the use of advanced 3D printing techniques to develop novel, high-performance, easily customisable, and low-cost microfluidic analytical devices. This project has already resulted in a spin-off company named 3D MADe (3dmade.com.au).

Anal Chim Acta. 2018;1005:81-92

I am always interested in listening to your project ideas and discussing how we can realise them with the capabilities available to us. One way for you to conceive new project ideas is to try to overcome the shortcomings or exploit the strengths of different techniques that you have learned to date.

Prof Michelle Harvey

Campus: Waurn Ponds

Contact details: michelle.harvey@deakin.edu.au

Project or research area description:
Research in the areas of entomology and forensic biology. This includes: general insect taxonomy projects, blowfly biology, attraction of insects, growth studies, maggot therapy in chronic human wounds, flystrike by maggots on sheep, bacterial relationships with insects. Forensic projects concern factors affecting field-based decomposition of remains, scavenging of remains, insect succession, effect of substances in/on remains on the development of insects and rate of decay, burial studies, vegetation and aquatic studies.

Specific projects on offer:
Projects are designed in consultation with me to best suit your interests, desired skill set for your future plans, and my own expertise. Ideas include the following, but I encourage you to approach me directly with any suggestions.
Entomotoxicology: how does the presence of a specific substance on or in remains affect fly attraction, oviposition, successional order, and development/survival of offspring? Can be laboratory based or combine an additional field element.
Blowfly competitive effects: How does the presence of one species affect another? Primary blowflies may be affected by the arrival of secondary species such as the hairy maggot blowfly. How do predatory secondary species affect developmental rates, fitness and survival of our early colonisers? Implications for PMI estimation, as well as agriculture.

Prof Luke Henderson

Campus: Waurn Ponds

Contact details: luke.henderson@deakin.edu.au Ph: (03) 52272767

Research area description: I work on the application of organic chemistry to material surfaces. I have a large focus on composite materials, any material made of two dissimilar constituents, primarily carbon fibre reinforced polymers. The surface chemistry of these materials are critical to their performance from marine structures to energy harvesting in wind energy. The primary applications we are targeting are in the installation of non-traditional functionality such as materials with high deformability and energy storage/harvesting.

We have also begun new research areas in the use of recycled materials as high value adhesives, polymers, and functional electrode materials for industrial applications. This ranges from inverse vulcanized alkenes, through

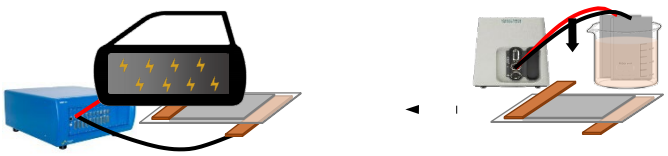
to waste silk and textiles for redeployment in biomedical and structural material applications.

Specific projects on offer:

Energy Storage using Chemically-Modified Recycled Carbon Fibres

An emerging area of the composite materials field is that of structural batteries; the process of storing energy within a structural component of buildings or vehicles. Exploring the use of recycled materials within these composites will be an important step of reducing the cost and achieving a circular economy within this area. This project will see you preparing and testing supercapacitor samples using recycled carbon fibre (rCF) nonwoven fabric and solvate ionic liquids. You will perform aryl diazonium surface modification of the rCF nonwoven fabrics

to improve their energy storage potential and evaluate these improvements through a series of electrochemical processes. Over the course of this project, you will become familiar with composite sample preparation through vacuum bagging, as well as developing experience with a variety of chemical syntheses and analytical practises.



Synthesis of novel inversely vulcanised polymer composite

Inverse vulcanization is a process in which elemental sulphur and a crosslinking molecule or blend of molecules are heated to produce sulphur-based polymers possessing unique physical and chemical properties. S-DCPD has shown interesting properties when used as a matrix material in carbon fiber composite materials (figure 1). This project will include the use of crosslinker blends to explore the changes to mechanical properties and repairability when used in the manufacture of composite laminate materials. This study will aid the understanding of the influence of the polymers network structure on the IV polymer properties.

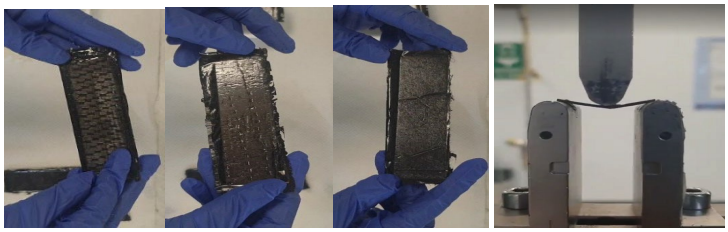


Figure 1. Carbon fibre laminate composites using S-DCPD polymer (left). Flexural testing of S-DCPD composite material (right).

S-DCPD as an adhesive

S-DCPD is a polymer synthesised using elemental sulphur (S) and dicyclopentadiene (DCPD), both by-products of the petroleum industry. The resulting polymer exhibits adhesive properties and multiple other interesting properties such as its repairable nature owing to the dynamic nature of S-S bonds in the polymers crosslinked structure and its resistance to acidic conditions and many solvents. However, the resulting polymer exhibits variable binding relative to the metal surface. Therefore, the following studies are proposed in hopes to optimize this unique polymer for use as an adhesive including surface preparations.

(A) Optimizing sulphur content in S-DCPD for improving adhesive strength

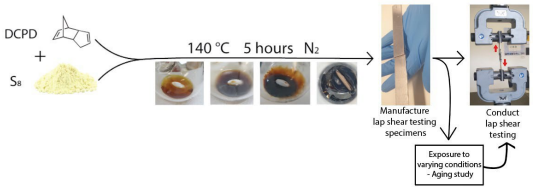
This project involves the synthesis S-DCPD in a range of different S concentrations followed by the mechanical testing and analysis of the polymers lap shear adhesive strength after multiple repair cycles. This optimization in the synthesis would aid in the synthesis of a potentially unique repairable adhesive.

(B) Surface modification of conductive surfaces for improved adhesion

This project will explore the use of electrochemical modification of conductive materials to improve the interface between the S-DCPD adhesive and the binding metal surface. This study will aid in improving adhesive properties of S-DCPD polymer.

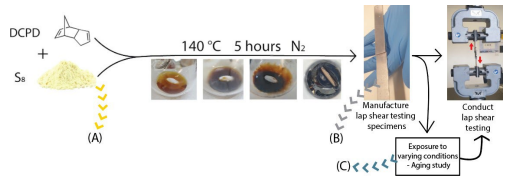
(C) Effects of various conditions on the adhesive properties of S-DCPD

This project involves synthesis of S-DCPD and lap shear strength testing specimens, the setup of an adhesive aging study to finally evaluate the effects of various conditions on the lap shear adhesive strength of the polymer. The conditions for the aging study may include acidic conditions, exposure to solvents, UV exposure, wetting/drying. This study would aid in the synthesis of a robust adhesive that could be used in harsh conditions.



Some examples of Learning Outcomes for Honours students. Not all learning outcomes will apply to every project and some will be covered by their coursework units.

1. Training in Occupational Health and Safety that is relevant to their project and which prepares them for the workforce.
2. Training in research integrity, and animal or human research ethics.
3. Training in the design, organisation and successful delivery of a laboratory and/or field-based research program.
4. Acquired skills in quantitative data analysis and/or mathematical modelling, and the use of appropriate statistical software.
5. Guidance and training in critical evaluation of discipline specific literature.



Training in developing written and oral communication skills in science, including professional and public communication, and through social media.

Dr Brendan Holland

Campus: Waurn Ponds

Contact details: b.holland@deakin.edu.au

Research area description:

Dr Holland is a researcher in the Deakin BioFactory, working with industry partners to develop solutions for handling food waste, agricultural waste, and marine by-products. Our work focusses on building the circular economy by reducing waste going to landfill, developing new approaches to transform and process organic waste and transforming under-utilised marine biomass into bioproducts.

Current project opportunities include converting food waste to aquafeed, fibres and fertilizers; developing low-cost alternative biofuels; and converting marine waste into nutritional supplements. Our research will provide opportunities to gain hands-on experience in analytical chemistry, green chemistry and/or bioprocessing.

Specific projects on offer:

Current project opportunities include converting food waste to aquafeed, fibres and fertilizers; developing low-cost alternative biofuels; and converting marine waste into nutritional supplements. Our research will provide opportunities to gain hands-on experience in analytical chemistry, green chemistry and/or bioprocessing.

Dr Ghazanfar Khan

Campus: Waurn Ponds

Contact details: g.khan@deakin.edu.au Ph: (03) 52278474

Research area description:

My research focuses on plant functional genetics and genomics, particularly on how plants adapt to different nutrient regimes and withstand environmental stresses amidst climate fluctuations. Because plants are rooted in place and unable to flee from unfavourable conditions, they exhibit a fascinating ability to adjust to changing environments through complex molecular pathways. Our lab aims to understand the molecular mechanisms underpinning plant responses to nutrient deficiencies and various abiotic stresses. Understanding and harnessing these adaptive strategies not only deepens our knowledge of plant biology but also promises to enhance crop resilience and productivity in a rapidly changing environment. The projects will provide learning opportunities in genetic engineering, bioinformatics and advanced molecular biology methods.

Specific projects on offer:

1) Characterizing a genetic mutant impaired in nitrogen uptake to understand the molecular mechanisms of nitrogen transport.
2) Genetically engineer herbicide tolerance in canola to explore novel weed management strategies.
3) Developing a bioluminescent sentinel plant for diagnosing disease and stress.

Prof Marcel Klaassen

Campus: Waurn Ponds

Contact details: marcel.klaassen@deakin.edu.au

Research area description:

I have a broad research interest including theoretical, experimental, and observational ecological and eco-physiological studies on numerous animal, plant, and microbe taxa. Currently, my focus is primarily on the population dynamics, migration, and disease ecology of birds, notably ducks and long-distance migratory shorebirds. To get a good impression of my (latest) research and what type of research you could do with me during your Honours, please have a look at my publication record at https://scholar.google.com.au/citations?user=OrKqLoAAAAAJ&hl=en. When you are working with me you are guaranteed of (1) regular field work catching, banding, sampling shorebirds and ducks, (2) the possibility to acquire some great analytical skills, and (3) good data sets providing the potential to write a stellar honours' thesis and possibly even a publication. We will jointly decide on your Honours project based on your interests and ambitions, my expertise, and the possibilities that my study systems offer.

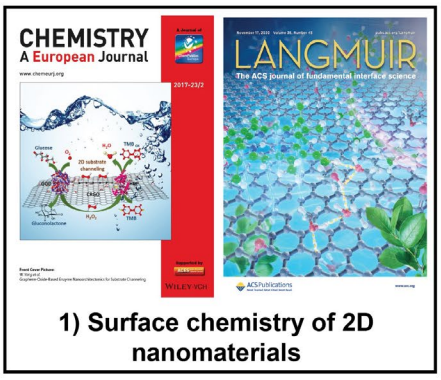
Dr Motilal Mathesh

Campus: Waurn Ponds

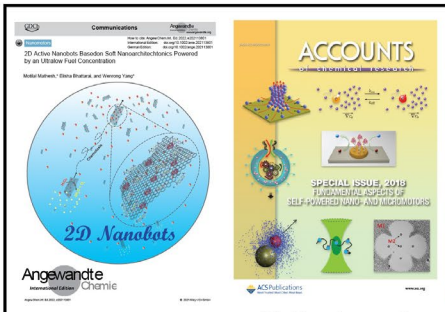
Contact details: m.matheshshanmugam@deakin.edu.au Ph: (03) 52272014

Research area description:

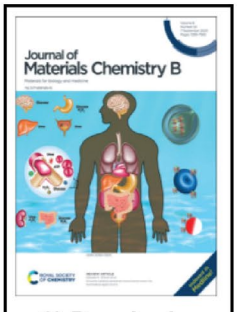
My research area focuses on synthesis and fabrication of nanomaterials and use them for nanomotor application. In 2016, Nobel prize in chemistry was awarded to "molecular motors" that has gained increased traction on nanomotors henceforth. The nanomotors fabricated in our group are powered by enzymes that could have potential biomedical, plant nanobiotechnology and environmental remediation applications. Apart from this my research area also focuses on mechanochemistry for synthesizing organic frameworks and studying them to increase enzyme stability.



1) Surface chemistry of 2D nanomaterials



2) Design of novel nanomotors



3) Developing nanomotors

Specific projects on offer:

1) Fabrication of enzyme powered biodegradable nanomotors.
2) Nanomotors for site-specific delivery to plant cell organelles.
3) Biodegradable nanomotors for biomedical applications.
4) Mechanochemistry to synthesize organic frameworks.

Dr Matthew McKenzie

Campus: Waurn Ponds

Contact details: m.mckenzie@deakin.edu.au **Ph:** (03) 52273015

Research area description:

Defects in mitochondrial function can cause human mitochondrial disease, affecting approximately 1 in every 4,500 people. My research is investigating how defects in mitochondrial sugar and fat metabolism cause mitochondrial disease, as well as new ways to treat affected patients. In my lab we use CRISPR/Cas9 gene editing techniques to create 'knockout' human cell lines, which we then use to investigate how inherited genetic defects disrupt mitochondrial metabolism to cause disease. We do this using a wide range of cutting-edge techniques, including molecular cloning and native gel electrophoresis. My team is also testing new compounds that can increase mitochondrial mass by activating mitochondrial biogenesis, with the potential to develop these compounds into novel therapies for treating mitochondrial disease.

Alterations of mitochondrial metabolism are also associated with cancer, and we are investigating how to modulate mitochondrial function to specifically kill cancer cells. Using different cancer cell lines that we have in the lab, we are examining how we can increase oxidative stress to trigger cell death and inhibit cancer proliferation.

Dr Hoang Chinh Nguyen

Campus: Waurn Ponds

Contact details: **hoang.n@deakin.edu.au** Ph: 0433 808 546

Research area description:

Dr Nguyen' research interest mainly encompasses organic recycling, biomass utilization, bioprocessing, green process development, and process optimization for the production of wide range of bioproducts. He has contributed significantly towards global advancements in sustainable bioproduct productions and chemical engineering industries. He has established novel green processes for the conversion of biomass into sustainable bioproducts (e.g., biofuel, bioactive products, bioplastic, and biofertilizer) and developed several applications using deep eutectic solvent, ultrasound, microwaves, and enzymes as a green alternative treatment process for extraction of various natural compounds. These established processes eliminate or minimize the use of harmful chemicals, thus reducing environmental pollution. In addition, he leads several industry-funded projects to develop advanced technologies for producing high value bioproducts.

Specific projects on offer:

1) Product development from seaweed (bioplastic, biomaterial for wound healing/drug delivery, etc)
2) Extraction, fractionation, characterisation, and bioactivity evaluation of bioactive compounds from seaweeds and other organic materials.

Assoc Prof Fred Pfeffer

Campus: Waurn Ponds

Contact details: fred.pfeffer@deakin.edu.au Ph: (03) 52271439

Research area description:

My research interests range from supramolecular and forensic chemistry to organic and medicinal chemistry with a key theme being understanding molecular level interactions and interconversions. This enhanced fundamental knowledge is relevant to a number of fields including (i) the development of new materials—including porous materials (ii) recognition and sensing (iii) imaging of biomolecular systems and (iv) medicinal chemistry. I am happy

to discuss a modified project if you have an idea you would like to explore.

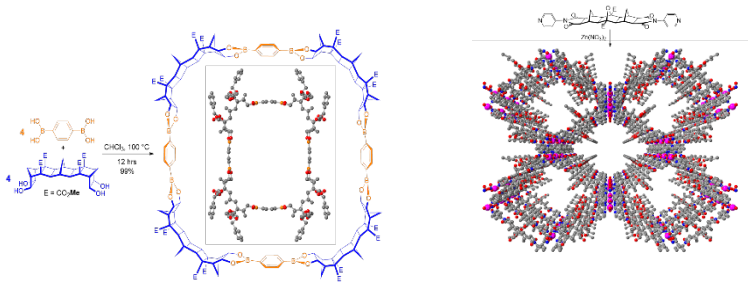
A key theme in my research is the use of large conformationally **preorganised molecular frameworks** to assemble larger architectures (including covalent frameworks, covalent cages, coordination polymers and metal organic frameworks) that can selectively interact with other species. [eg. *Chem. Eur J*., **2016**, p 10791].

A second theme is the development of high yielding methodology to access a broad range of **naphthalimide based fluorophores** [eg. *Chem. Commun.* **2017**, p 12298, *Chem. Commun*., **2020**, p 6866]. These fluorescent molecules have been customised for cellular imaging and this project has current ARC funding.

Students gain valuable "hands on" organic chemistry skills, and also become proficient in the characterisation of new chemical entites (in particular the use of NMR spectroscopy and mass spectrometry). For naphthalimides the photophysical properties of these fluorophores are also evaluated. All projects involve collaboration with a number of research groups in Australia and/or overseas.

Specific projects on offer:

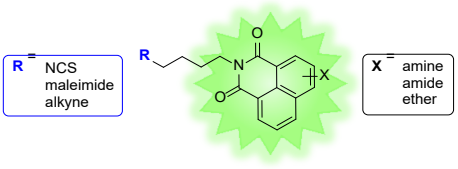
1) **Assembling large architectures (with Melbourne University)**
   Successful synthesis of large macrocycles and cages has been successfully accomplished using boronic esters formed from norbornane diols. These linkages are unique to our research and are remarkably stable. Similarly, a range of coordination polymers and MOFs have also recently been developed based on carefully functionalised norbornane frameworks. These extended porous structures have potential applications in fields such as gas capture storage and sieving as well as catalysis. In this project you will construct new ligands to construct novel architectures and investigate their properties. Use of the Australian Synchrotron may be required for crystallographic characterisation.



2) **Forensic Chemistry (with Victoria Police Forensic Services Department)**
   A project involving either the masking of (i) amphetamines or (ii) nitazines/fentanyl synthetic opiods.
   A recent trend in the illicit trafficking of controlled substances involves chemical masking. These masked compounds are not currently detected by common detection protocols.

3) **Functionalised naphthalimides for fluorescent imaging. (With Adelaide University)**

   In this project custom functionalisation of naphthalimide fluorophores will be pursued. A number of groups, commonly used in the literature for (i) 'tagging' of biomolecules and (ii) ensuring subcellular localisation, will be incorporated and the of the resultant probe evaluated in cells by collaborators..



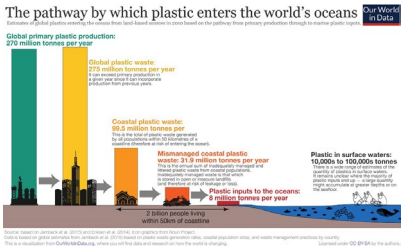
Dr Aaron Schultz

Campus: Waurn Ponds

Contact details: aaron.schultz@deakin.edu.au

Research area description:

My multidisciplinary research program is split into three main areas:



1) **Environmental and human toxicology** – this research program investigates pollution levels (metals, microplastics, nanomaterials and agrichemicals) in freshwater and marine environments, and assesses the behaviour, transformation, fate, bioavailability and toxicity risk of pollutants to aquatic and terrestrial organisms. A variety of model systems and organisms are used to assess the toxicity risks of pollutants including zebrafish embryos, bivalves, freshwater planaria and human cell lines. Marine and freshwater sampling, standard toxicity assays, microscopy,bioassays, cell biology, and molecular biology methods are used in this important project.

2) **Aquatic animal physiology** – this program includes the study of solute transport mechanisms involved in osmoregulation, acid-base balance, and nutrient uptake in aquatic animals. A variety of physiology, immunohistochemistry, microscopy, and molecular biology approaches are used in this project.

3) **3Nanomedicine and bio-scaffolds** - Nanomaterial's exhibit special properties at the nanometer scale (<100 nm) that dramatically increases their surface area, binding properties, and charge distribution. Researchers are exploiting these properties to develop and improve nanomaterials for use in medicine such as nanocarriers or developing bio-scaffolds. This is a collaborative project with researchers in the School of Medicine who developed biocompatible BioNanoGels that can be used as a carrier for classic antibiotics (e.g., rifampicin) used against chronic infection. The project provides an opportunity to develop key skills in nanomaterial and bio gel characterization, cell biology, and/or microscopy.

Specific research projects on offer:

1) **Environmental toxicology:** Investigating the presence and toxicity risk of contaminants of emerging concern (micro/nano-plastics, nanomaterials and/or agrichemicals) to freshwater and marine ecosystems. Please see two recent articles published by our group in this area: https://doi.org/10.1016/j.impact.2022.100387 or https://doi.org/10.1039/D1EN00659B

   Associate Supervisors: A/Prof Beata Ujvari (beata.ujvari@deakin.edu.au) and A/Prof Damien Callahan (damien.callahan@deakin.edu.au).

2) **Cardiovascular toxicity of pollutants (e.g. microplastics and nanomaterials) in aquatic animals.**
   Please see the new Environmental Science: Nano Hot Article published by our group in this research area: https://doi.org/10.1039/D0EN00229A.
   Associate Supervisors: Prof. John Donald (john.donald@deakin.edu.au) and A/Prof. Luis Afonso (luis.afonso@deakin.edu.au)

3) **Tracking the passage, fate, transformation, and toxicity risk of microplastics through the gut of the aquatic host.**
   Associate Supervisors: Dr Andrew Oxley (andrew.oxley@deakin.edu.au), A/Prof. Luis Afonso (luis.afonso@deakin.edu.au) and A/Prof Alessandra Sutti (alessandra.sutti@deakin.edu.au).

4) **Use of BioNanoGels as carriers for antimicrobial therapeutics**. This project will investigate optimal drug loading and release from the BioNanoGels under various simulated peri-wound chronic infection conditions.

   Associate Supervisors: A/Prof Richard Williams (richard.williams@deakin.edu.au), Dr Ayushi Priyam (a.priyam@deakin.edu.au) and A/Prof Fred Pfeffer (fred.pfeffer@deakin.edu.au).

Assoc Prof Cenk Suphioglu

Campus: Waurn Ponds

Contact details: cenk.suphioglu@deakin.edu.au

1) **Effect of eye drops on cultured human corneal cells *in vitro.***

Allergy is a chronic disease affecting up to 40-50% of the population worldwide and costing more than $7 billion per annum in Australia alone. Exposure to environmental antigens through contact with the skin, airways or gastrointestinal track can trigger an immediate hypersensitive (Type I) response among genetically predisposed individuals, which may prove fatal with anaphylaxis. Air borne allergens (i.e. pollens, spores, animal dander and house dust mites) can also contact the eyes and get presented to the immune system in that way. Indeed, allergens can be seen as irritants and are responsible for itchy eyes, giving rise to keratoconus, which is a condition where the normally spherical cornea thins and bulges into a cone-like shape and therefore results in distorted vision that may lead to blindness. To help alleviate such itchy eyes, which is also used to alleviate dry eyes, there are a number of different eye drops on the market, which can be purchased over the counter. However, the effect of such eye drops, or the preservatives used in their formulation, on the health and integrity of the cornea at the cellular and molecular level remains unknown, and forms the **overall aim** of this Honours project.

In this project, the Honours student will grow human corneal cells in culture in the presence and absence of commonly used eye drops (with and without preservatives) to determine their effects on the corneal cell viability, as well as its proteome with the tools of proteomics.

Associate Supervisors of this project will involve Dr Serap Azizoglu and Dr Moneisha Gokhale from Deakin Optometry, School of Medicine.

2) Importance of grass pollen rupture in epidemic thunderstorm asthma (ETSA).

Airborne grass pollen and fungal spores are ubiquitous and are important triggers of allergic diseases such as allergic rhinitis and allergic asthma, impacting socially and economically to the quality of life. We have shown that grass pollen can rupture during a thunderstorm and thus release hundreds of highly allergenic micronic particles that have the capacity to penetrate the lower airways to trigger allergic asthma known as Thunderstorm Asthma (TA). Such TAs can be responsible for epidemic events known as Epidemic Thunderstorm Asthma (ETSA), which can be life threatening. Indeed, on 21 November of 2016, thousands of Melbournians, who are grass pollen allergic, required emergency medical attention and 10 people died as a result of ETSA. Although we know that grass pollen rupture is responsible for the severity of ETSA, we are not sure on which meteorological aspects of the thunderstorm is responsible for the grass pollen rupture, which forms as the ***overall aim*** of this project.

In this project, the student will be sampling the air for intact and ruptured grass pollen, as well as fungal spores, using the facilities at Deakin AIRwatch at the Waurn Ponds campus during the grass pollen season (i.e. from September to December) and correlating the findings with different meterological factors (supplied by our collaborators from the Bureau of Meteorology) and local acute asthma presentations (supplied by our collaborators from Barwon Health). Such findings will allow us to pin point the specific weather events that contribute to severe grass pollen rupture and thus give rise to ETSA events and thereby significantly improve our ETSA forecasting and warning systems.

Dr Bianca Szkuta

Campus: Waurn Ponds

Contact details: b.szkuta@deakin.edu.au **Ph: 03 52273132**

Research area description:

DNA analysis is recognised in law courts as being underpinned by robust science. This means that rather than asking "whose DNA is it?" the judiciary in criminal cases now focus on "how did the DNA get there?". To answer this, the variables that affect the rate of human DNA transfer, how long DNA remains in the environment, how much DNA exists in the environment at any given time and how DNA relevant to a crime is best recovered, need to be explored. To that end, our group performs research that will equip forensic science practitioners with the data they

require to provide the courts and investigators with the most accurate interpretation of evidence particular to a given case. To understand the research that we do, further reading has been provided below. Please reach out to discuss ideas for projects if this interests you.

R.A.H. van Oorschot, et al. (2019), DNA transfer in forensic science: A review, Forensic Science International: Genetics 38, 140-166.

R.A.H. van Oorschot, et al. (2021), DNA transfer in forensic science: recent progress towards meeting challenges, Genes 12(11), 1766.

Dr Lawrence Webb

Campus: Waurn Ponds

Contact details: Lawrence.webb@deakin.edu.au Ph: 0433240654

Research area description:

I focus on developing robust analytical techniques such as gas chromatography, high performance liquid chromatography and mass spectrometry and applying them in a range of biological, chemical and forensic fields. Current areas of work are listed below, offering hands on experience on advanced analytical instrumentation and potential industry collaboration.

Specific projects on offer

1) **Understanding the molecular drivers behind flystrike**
   Flystrike is a major issue for the Australian sheep industry and has a significant impact on sheep welfare. We are currently taking a multidisciplinary approach to tackle this problem, combining entomological, biological and chemical expertise to understand the molecular drivers behind the attraction of fly species to sheep. A range of research projects are available in areas of analytical chemistry and molecular biology.
2) **Characterisation of the lipopolysaccharide of C. burnetii and associated glycoconjugate vaccine**
   The bacteria Coxiella burnetii is the causative agent of the disease Q-Fever. We have recently developed a new vaccine against this bacterium by using a membrane-based lipopolysaccharide. There is scope in this work to further characterise the lipopolysaccharide and glycoconjugate vaccine using liquid chromatography and mass spectrometry and work alongside the project team as the vaccine advances towards clinical trials.

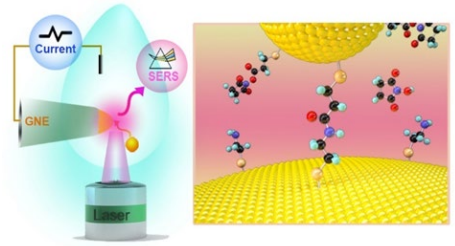
Assoc Prof Wenrong Yang

Campus: Waurn Ponds

Contact details: wenrong.yang@deakin.edu.au Ph: (03) 522729232

Research area description:

Our research team specialises in the use of self-assembled monolayers, biomolecules and nanomaterials to functionalize the surface at the molecular level for the development of new biosensing technologies. The research group is typically about 10 people in size with post-docs, Ph.D. students, M.Sc. students, honours students and visitors. We create a supportive research environment where all researchers work in the group on related projects with junior researchers being assisted by post-docs and senior Ph.D. students as well as Dr. Wenrong Yang. Since our research involves a range of techniques, all researchers acquire a broad range of skills but typically focus on one or two techniques.



Selected Recent Publications

1) Liu J. *et.al. Acc. Chem. Res*. 2021, 53 (3), 644-653
2) Zhang Y. *et. al. ACS Nano*., 2016, 10, 5096–5103.
3) Mathesh M. *et. al. ACS Catal*. 2016, 6, 7, 4760–4768
4) Liu Z. *et. al. ACS Nano* 2019, 13, 2, 1394–1402
5) Kong N. *et. al . J. Am. Chem. Soc.* 2021, 143, 26, 9781–9790
6) Ramakrishna, TRB *et. al. Langmuir* 2020, 36 (45), 13575-13582
7) Wang J. *et.al. J. Electroanal Chem.*, 2021, 895, 115419
8) Thakkar S. *et.al.*, *Water Research,* 2021, 188, 116538

Specific projects on offer:

1) Electrochemical detection of small molecules.
2) Nanoparticle based biosensors for ultrasensitive detection.
3) The immobilisation of biocatalyst on surfaces (with Dr. Motilal Mathesh and Professor Colin Barrow, Deakin University)
4) Nanostructured surfaces for understanding fundamental catalytic processes (with Professor Ian Chen, Deakin University).
5) Electrochemical engineering of interfacial chemical reactions at the single-molecule level (with Dr. Fred Pfeffer, Deakin University and Dr Jin He, Florida International University, USA).

Warrnambool Projects

Dr Alecia Bellgrove

Campus: Warrnambool

Contact details: alecia.bellgrove@deakin.edu.au **Ph: 03 55633099**

Research area description

Alecia has ~30 y of research experience focusing on seaweeds, their ecology and early life-history biology, sustainable seaweed aquaculture production, biochemical quality assessment and application. The *DeakinSeaweed Research Group's* research broadly addresses three key themes: 1) Informing sustainable seaweed aquaculture, 2) Ecology of seaweed-based ecosystems, and their protection and restoration of the ecosystem services they provide, into the future and 3) Educating the marine science and aquaculture leaders of the future. Embedded within all these themes is engagement and reciprocal collaboration with Indigenous communities and revitalisation of Indigenous seaweed knowledges. From 2025, there are additional opportunities to work with local Aboriginal communities to revitalise Indigenous seagrass knowledges.

Students interested in any of these broad areas or specific topics below are encouraged to reach out to discuss with Alecia from late November 2024 (after her long-service leave) or potential associate supervisors prior to that.

Specific project available

1) **Development of cultivation protocols for low-arsenic Australian *hijiki* analogues**
(External supervisor: Dr Cecilia Biancacci).

Sargassum fusiforme, known as ***hijiki*** in Japan, has long been considered a valuable traditional medicinal seaweed in Asian countries, in addition to being a highly popular food. However, due to the high inorganic arsenic content reported in *S. fusiforme*, exportation to Europe, Australia and elsewhere is restricted. Australia has globally significant seaweed diversity and relatively unpolluted coastal waters, with particularly high diversity within the fucoid brown algal family Sargassaceae. We have recently identified two Australian sargassaceous species that possess favourable taste, palatability and nutritional profiles but have low-arsenic toxicity and could therefore provide valuable ***hijiki*** (*Sargassum fusiforme*) analogues. This project will begin to investigate viable aquaculture protocols for one, or both, Australian species, involving field collections (with potential for snorkeling) and laboratory-based experiments. This project has potential to continue into a PhD involving collaboration with Japanese researchers.

2) **Using archival data to understand historic seagrass beds in Australia**
(Associate supervisors: Dr Mary Young, Dr Oli Dalby, Zoë Brittain)
This project will use historic archival materials, such as diaries, newspapers and other publications to explore historic mentions of seagrass throughout Australia. This data will then be mapped against existing knowledge of historic seagrass beds using GIS, to build an understanding of current seagrass beds and to inform ongoing seagrass management and restoration efforts. This project will be largely desktop-based, but there may be opportunities to join related seagrass field projects to enhance relevant skill development

3) **Giant kelp holdfast communities**: biodiversity in a changing climate
(Associate supervisor: Dr Jacqui Pocklington)
Giant Kelp (*Macrocystis pyrifera*) is an important habitat-forming species on the Great Southern Reef. However, this species has dramatically declined in abundance and range in south-eastern Australia in response to climate change and over-fishing. This project will 1) document the communities associated with the large holdfasts of this kelp in southwest Victoria (involving lab work and taxonomic identification) and 2) collate and analyse records of giant kelp sightings from the citizen-science project *Mission Macrocystis* to better understand the potential threat of anthropogenic stressors (like climate change and over-fishing) on the biodiversity. There may be additional opportunities for snorkelling to collect field observational data.

Dr Patricia Corbett

Campus: Warrnambool

Contact details: p.corbett@deakin.edu.au

Research area description: Contamination of the marine environment including metals, persistent organic pollutants and microplastics are a global issue. The Deakin Marine Ecotoxicology Research group explores key ecosystem components response to anthropogenic environmental stressors. Research includes investigating evidence of bioaccumulation, impacts and mechanisms of effect as well as the development of animal health indices.

Dr Marta Ribo

Campus: Warrnambool
Contact details: Dr Daniel Ierodiaconou **daniel.ierodiaconou@deakin.edu.au**

Specific projects available

1) ***Seabed geomorphology classification of the Bass Strait coast***
Supervisors: Dr Marta Ribó, Associate Professor Dr Daniel Ierodiaconou (Deakin University), Dr Rachel Nanson (Geoscience Australia)

Maps of seabed geomorphology provide fundamental information to support the sustainable management and planning of marine and coastal areas, and the use of standardised geomorphic terminology ensures the consistency between mapping regions and practitioners. The International Seabed Geomorphology Mapping Working Group (ISGM-WG) recently released a seabed geomorphology classification system designed for application to bathymetry and subsurface seabed datasets. We have a potential project to

apply this classification system to characterise and classify the variety of fine-scale features that are observed in several high-resolution bathymetry datasets collected by the Deakin Marine Mapping group from the Bass Strait coast.
This project will apply a suite of semi-automated geographic information system (GIS) tools to map and characterise the geometric attributes of the seabed, using the different multibeam datasets and the ISGM-WG approach. The aim of this research is to characterise the geomorphology of the seabed and to better understand the distribution and diversity of key seabed habitats in the Bass Strait coast.
We invite students with a keen interest in GIS mapping, seabed geomorphology and habitats, to get in touch with our team to discuss this research opportunity.

2) ***Quantifying the anchoring footprint on the Victorian coast***
Supervisors: Dr Marta Ribó, Associate Professor Dr Daniel Ierodiaconou (Deakin University), Dr Sally Watson (NIWA)

Anchor use in port regions has significantly changed the structure of the seafloor, with downstream impacts on benthic habitats and ecosystem functions. Sediment mixing and overturn by anchoring is comparable to benthic trawling, a well-known driver of seafloor habitat destruction. Recent research has shown that high-tonnage ship anchors excavate the seabed by up to 80 cm and the associated impacts are preserved for at least 4 years. This research suggests anchoring could be more detrimental than trawling, occurring more frequently, with deeper seabed penetration and concentrated in shallow seas and coastal embayments.
This project will use high-resolution bathymetry data to identify the morphological signatures and characterise the anchoring footprint within the anchorage regions throughout the Victorian coast. Determining the physical footprint will be coupled with the ship tracking data (i.e., AIS Automatic Identification System data) where possible, to quantify the area and volume of sediment disturbance by anchoring practices, and link physical footprints on the seafloor to anchoring by specific vessels. This project will help to determine the extent of the physical impact of anchoring on the seafloor throughout the Victorian coast.

Queenscliff Projects

Prof Timothy Clark

Campus: Queenscliff

Contact details: t.clark@deakin.edu.au Ph: (03) 92446035

Research area description:
Timothy Clark's lab uses eco-physiological approaches to understand the impacts of climate change on aquatic animals. Current projects use experimental manipulations of temperature and oxygen to understand how future environments may impact the growth and metabolism of fish. Specific areas of interest are:

1. What roles do oxygen uptake (at the gills) and oxygen use (at the body's tissues) play in regulating the observed "shrinking" of fishes with climate warming?
2. How do inter-individual differences in behaviour and metabolism determine which fish grow faster than other individuals of the same species?

Dr Kay Critchell

Campus: Queenscliff

Contact details: k.critchell@deakin.edu.au Ph: (03) 52773722

Research area description:
Working at the interface of physics and biology to understand the processes involved in the distributions of

organisms and pollutants. The Marine Biophysical and Spatial Modelling Group use tools such as dispersal modelling using Python and R programming, GIS, and spatial statistics in R programming to understand when and where biological and physical processes occur as well as the impact the processes have on the environment to inform management action. This work can be applied to environmental risk, pollution accumulation, fisheries, and spatial management prioritisations.

Specific project on offer:

1) The role of self-recruitment processes in urchin barren formation.
2) Modelling the plastic pellet spill along the Warrnambool coast – associate advisor Assoc Prof Julie Mondon
3) How do ocean currents influence hatchling turtle drift at sea? – associate advisor Prof Graeme Hays
4) Impact of ocean current on large swimming animals such as turtles and whales – associate advisor Prof Graeme Hays

Prof Tim Dempster

Campus: Queenscliff

Contact details: t.dempster@deakin.edu.au Ph: 0450457327

Research area description:

The SALTT lab has a focus on developing innovative sustainable aquaculture practices. In recent years, we have been at the forefront of developing culture protocols for the upcoming Australian sea urchin and abalone aquaculture industry. Some of our current research focusses on improving the productivity of sea urchin roe through roe-enhancement and on establishing a breeding program for sea urchins in Victoria.
Applicants should be interested in hands-on experimental work on aquatic animals. They should have the ability to work independently, responsibly and be willing to be based in the Queenscliff campus for multiple days a week. Applicants will learn desirable skills in experimental design and animal husbandry, enhancing their employability in the field of marine ecology/aquaculture.

Specific projects on offer:

A range of projects are on offer, but we are happy to discuss other project ideas that align to our group's expertise

1) Controlling the reproductive cycle of the Australian purple sea urchin
2) Improving the grow-out of sea urchin Juveniles
3) Improving settlement rates in sea urchin aquaculture

Dr Prue Francis

Campus: Queenscliff

Contact details: prue.francis@deakin.edu.au Ph: (03) 55633026

Research area description:

1) **Seaweed cultivation for restoration and farming applications:** we have an established seaweed cultivation laboratory at the Queenscliff Marine Science Centre where we have ongoing projects looking at future proofing kelp forests in Victoria and optimizing cultivation conditions for various seaweed species specific for farming applications. Our projects usually involve field-based collections (with snorkeling!) and lab-based experiments. If you love seaweed, this is the project for you! Projects will be based at Queenscliff Marine Science Centre.
2) **Improving ocean literacy in Australia:** Australia's coastal and marine habitats are threatened by climate change and rapid and unsustainable development. One step to ensure we are sustaining healthy marine systems, is to raise awareness of the ocean and create an ocean literate society. Our research group is exploring ways to improve ocean literacy in Australia by trialing innovative solutions. We work with many marine education providers and schools around Australia and Honours projects can be tailored to work collaboratively with our current collaborators. This project will be based at Queenscliff Marine Science Centre and will be focused on marine education, marine social science and science communication.

Dr Ty Matthews

Campus: Queenscliff

Contact details: ty.matthews@deakin.edu.au Ph:(03) 55633516

Research area description:

I am an aquatic ecologist based at the Queenscliff Marine Centre who works in marine, estuarine and freshwater ecosystems. I am particularly interested in how varying flow regimes influence aquatic plants and animals and in assessing ecological restoration efforts. I am willing to discuss a range of project ideas with students that are of particular interest to them. Other broad project areas of interest include the ecology of estuarine fish and invertebrates and also sandy beach ecology.

I often collaborate with researchers from the Centre of Rural and Regional Futures (CeRRF - Professor Rebecca Lester and her team) and environmental consultants (Austral Research and Consulting & Australian Private Fisheries Resources) on a range of joint freshwater and estuarine projects. This provides additional opportunities and networking for Honours students that are interested in working with me.

Students working with me who have chosen a marine project will be predominantly based at the Deakin University Queenscliff Marine Science Centre (DUQMSC). Those working on freshwater projects are likely to be based on the Waurn Ponds campus working with the CeRRF team.

Dr Michael Salini

Campus: Queenscliff

Contact details: m.salini@deakin.edu.au Ph: 0418622177

Research area description:

My research area focuses on aquatic animal nutrition, in particular the metabolism of proteins and lipids in the diet. I work closely with the aquaculture industry to achieve strategic nutritional objectives. I believe that the balance between input material quality (ingredients) and biological interactions (*in vivo*) is the key to successful feed formulation. I have industrial experience in aquafeed production, commercial research, and product development. At Deakin University, I am responsible for the new strategic research projects investigating the specific nutritional requirements of abalone. This is relevant to Victorian farms and the broader international community. Globally, abalone production is around 250,000t per annum and is a high value species when compared to most fish and prawns. They are a worthy model for *in vivo* experiments; however, growth is slow. There is considerable scope to provide high-performance diets to the industry that offer exceptional return on investment, but rapid methods of assessment are required.

Specific projects on offer:

- Investigating fortnightly feed intake as a proxy marker of growth performance as experiments are typically long duration (>3 months). The aim of this project would be to test if for discrete intake differences within a short time frame using specific formulations and additive products.

Assoc Prof Craig Sherman

Campus: Queenscliff

Contact details: craig.sherman@deakin.edu.au

Specific projects on offer:

1) Developing the tools for seagrass restoration.

Start date: February or July

Project description

As key ecosystem engineers, seagrasses provide a range of important ecosystem services including nutrient cycling, carbon sequestration, coastal protection, and providing a structurally complex habitat to a variety of vertebrate and invertebrate species. Given these important roles, there has been increasing concern about the rapid decline seagrass populations are now experiencing globally. Several potential projects are available that offers students the opportunity to develop skills and training in undertaking ecological restoration research. Depending on specific

project aims, students may undertake field-based trials, mesocosm experiments, habitat mapping, GIS analysis and genetics.

2) Assessing the genetic structure and mating system of an invasive marine pest.

Start date*:* February or July

Project description:

Marine pest species are being introduced around the globe at unprecedented rates and represent a significant threat to biodiversity and the environment. The recent detection of several populations of the globally invasive ascidian *Didemnum vexillum* in Australia is of significant concern as it has the potential to rapidly spread and impact native marine communities. Effective management of introduced populations and preventing further introduction requires an understanding of where this species was introduced from, levels of genetic diversity and patterns of spread. Introduced populations are often founded by a small number of individuals, causing the population to go through a genetic bottleneck. This means introduced populations may contain low levels of genetic diversity, which may initially constrain the spread of the populations and limit the geographic range they can occupy. This has implication not only on levels of genetic diversity of introduced populations, but also influences the mating systems (importance of sexual and asexual reproduction) of these populations and therefore their mechanisms of spread. This project will explore the genetic structure of invasive populations to better understand the origin of introductions, levels of genetic diversity within the invasive range and how this species is spreading in Australian waters.

3) Determining the chemical basis of detection of an invasive predator by scallops.

Associate or External Supervisors and their contact details: Xavier Conlan (Deakin University)

Start date: February or July

Project description:

The introduction of non-native species provides an excellent opportunity to study rapid evolutionary change. This is because invasive species have to adapt to a range of novel conditions, while native species often have to evolve novel responses to invasive predators. The Northern Pacific sea star is ranked as one of the top ten most potentially damaging invasive species. It is a ferocious marine predator of marine bivalves and other invertebrates and can have a devastating effect on the biodiversity of native marine communities. Recent work has demonstrated that native scallops in populations exposed to the Northern Pacific sea star show predator avoidance behaviours, while populations with no exposure to this invasive predator show no anti-predator behaviours. This project will explore the chemical basis of this anti-predator behavior and identify the key chemical species involved in predator detection. Students will undertake fieldwork to collect samples and laboratory analysis including a multidimensional approach to detection chemistry with the aid of Mass spectrometry, 2D-HPLC and chemiluminescence detection.

Dr C. Samantha Sherman

Campus: Queenscliff

Contact details: ssherman@deakin.edu.au

Research area description:

My research focuses on shark and ray conservation through their ecology and management. My main focus is on tropical coral reefs using Baited Remote Underwater Video System (BRUVS) footage to understand diversity, abundance, and distribution of species. I am also interested in fisheries management of sharks and rays, both in Australia and on a global scale.

Specific projects on offer:

Open to discussions regarding shark and ray management in fisheries.

Dr Fletcher Warren-Myers

Campus: Queenscliff

Contact details: fletcher.w@deakin.edu.au **Ph:** 0420243730

Research area description:

My research areas centre around developing and testing innovative methods or tools to help improve aquaculture systems. For example, testing the feasibility of submerged sea cage farming for salmon; developing ranching techniques for aquaculture production of sea urchins; to using sentinel fish for monitoring fish welfare in sea cages.

The project outlined below would best suit someone who is interested in a practical hands-on research experience on a commercial aquaculture farm. If you enjoy a challenge and would like to work closely with a land-based aquaculture industry, then please contact me via email or phone to arrange a meeting to discuss.

Specific projects on offer:

Evaluating seaweed biofiltration of land-based aquaculture water

Most flowthrough onshore aquaculture production systems produce wastewater with variably high nutrient loads which require filtering, before being released back into the environment. Cultivation of some seaweed species in the outflow channels of aquaculture systems can be a successful biofiltering method for wastewater remediation before release. This honours project will focus on evaluating whether cultivation of a local Victorian species of seaweed (Ulva) can be effective as a biofilter in the outflow ponds in an abalone farm and improve the quality of wastewater released.

CSIRO Australian Centre for Disease Preparedness Project

Dr Matthew McKenzie

Location: CSIRO Australian Centre for Disease Preparedness, Geelong, Victoria 3220

Contact details: m.mckenzie@deakin.edu.au **Ph: +61 3 5227 3015**

Research area description:

The Dangerous Pathogens team is focused on studying zoonotic viruses that pose significant risks to human and animal health within the high-containment laboratories at the Australian Centre for Disease Preparedness (ACDP). The research we undertake aims to prepare, predict and prevent viral outbreaks by detecting emerging viruses, characterising their pathogenicity and developing/assessing effective countermeasures.

Specific projects on offer:

1) **Building the filovirus surveillance toolkit.**
   External supervisors: Glenn Marsh and Josh Deerain.
   The Filoviridae are a growing group of zoonotic viruses which encompass some of the most substantial spillover threats including Ebola virus. There is increasing data to support the circulation of at least one bat-borne filovirus within the Australian region, however further development of our current panel of diagnostic assays is required to detect and characterise these emerging viruses. This project will use a variety of traditional molecular virology techniques including cloning, serological assays, RT-qPCR and cell culture to optimise our current surveillance capabilities whilst also retrospective screening our stored historical bat samples for the elusive "Australian filovirus".

2) **Characterisation of a novel bat pararubulavirus identified in Pteropus bat urine.**
   External supervisors: Jenn Barr and Sarah Edwards
   Bats are known to harbour many viruses of human and animal concern, including filoviruses, henipaviruses and coronaviruses. Many novel bat viruses are discovered within bat urine collected underneath Pteropus bat colonies, and our team has isolated several novel bat pararubulaviruses, with only molecular characterisation being done. This project will utilise a broad range of skills including cell culture, various virological techniques, RT-qPCR sequencing analysis and immunofluorescence assays to further characterise these viruses - all conducted within the high-containment Biosafety Level 3 laboratory. This project will help us better understand the novel viruses circulating in bats and the biological risk these viruses pose to humans and/or animals.

3) **Host cell protein essential for Arenavirus replication.**
   External supervisor: Glenn Marsh and Alberto Amarilla Ortiz.
   The Arenaviruses are a family of viruses that infect rodents and occasionally humans. At least eight arenaviruses are known to cause human disease. The diseases derived from arenaviruses range in severity from asymptomatic to haemorrhagic fever syndromes. The current lack of a licensed vaccine and limited therapeutic options for the arenavirus make it arguably among the most neglected virus groups. This project will utilise a CRISPR library screen and a low pathogenic Arenavirus to identify human host proteins that are essential for virus replication in cells. Characterisation of the mechanism of the inhibition of virus replication may lead to the identified targets being used as druggable targets to prevent Arenavirus disease.