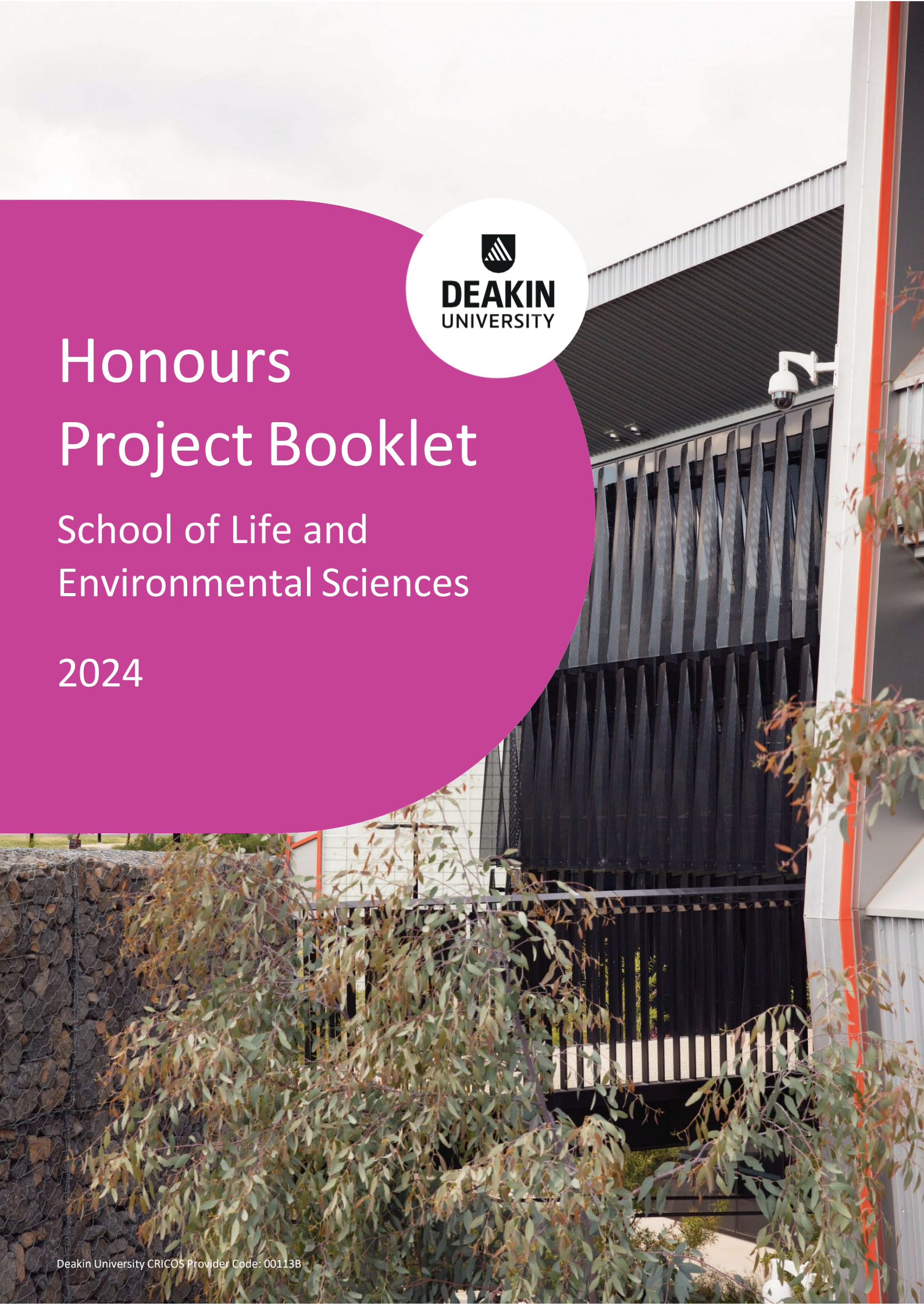

Honours Project Booklet

School of Life and Environmental Sciences

2024

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 29 January 2024** with thesis submission in early November. Semester 2 Honours commence on **Monday 1 July 2024** with thesis submission the following April 2025. You must be available to commence Honours on the specified start dates.

Applications

The first step in securing a place in the program for 2024 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 8 January 2024** for the Semester 1, 2024 intake and **Monday 10 June 2024** for the Semester 2, 2024 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

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

Research area description:
I am interested in how our experiences, values, and relationships with nonhuman animals shapes science, the environment, and society. My research focusses on how concern for animals informs environmental values and practice, how to build understanding of animal perspective, and critical assessments of animal use in science (lab, field, and education).

My research takes a social science approach, so 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 the themes above, please get in touch and we can chat about it.

Specific projects on offer:

1) Compassionate conservation – Investigating the values and practices of conservation and wildlife management and their impacts on animals. Developing ways of approaching conservation that account of individual animal interests and community level protection.
2) Animal use in research – Quantifying, describing, and communicating animal use in wildlife and laboratory science.
3) Climate communications and animal agriculture – Investigating the representations of animal agriculture in climate communications.
4) Perceptions of cultivated meat – Understanding community and industry perceptions of emerging cultivated

meat technologies, their products, and their potential role in animal and environmental protection.

5) Video games and/or VR for nature and animals - Testing the impact of video games and VR experiences on people's perceptions of nature and animals.

Possible projects in collaboration with other academics:

1) Animal use as a barrier to participation in science – Investigating whether a culture of animal use impacts science students' intention to pursue a career in science.

2) Nearby nature - Understanding local green spaces use and users by measuring community expectations, levels of use, preferences, and evaluation of green spaces in Melbourne LGAs

Assoc Prof Raylene Cooke

Campus: Burwood

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

Research area description:
I lead the Deakin University Powerful Owl Research Team (DUPORT) and this 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) Determining the spatial ecology of powerful owls using GPS technologies.
2) Determining the diet of powerful owls through the analysis of regurgitated pellets collected from beneath their roosting sites.
3) Investigating the characteristics of nest sites used by powerful owls in different land-use types.
4) Investigating the abundance of possums and gliders in different land-use types.
5) Assessing the effectiveness of quail-callers in attracting stubble quail. This project will be based in the western district of Victoria, requiring a student who can drive and spend periods away from campus.

Dr Bernhard Dichtl

Campus: Burwood

Contact details: bernhard@deakin.edu.au

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 and communities 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, including impact of interactions between chytrid fungus and drought on frogs, between feral ungulates and fire on small mammals, and between feral predators and fire on reptiles. Also, applying new technology to monitor wildlife through citizen science, movement ecology of Indian elephants and human-wildlife conflict; Indian forest management impacts on birds; terrestrial environmental DNA for frog and reptile conservation; drones and AI-image processing to monitor wildlife; application of artificial refuges after fire.

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:**
    a. *Aprasia parapulchella* (pink-tailed worm-lizard) monitoring protocols using eDNA (Feb, or mid year start)
    b. ***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.
    c. ***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 Zoos Victoria, 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 eDNA experiment: the impact of substrate type on wolf snake eDNA detectability (rock/bark/soil)
    5.2 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!
    5.3 Project trialling ectothermic reptile-detecting cameras (thanks Don!). We are struggling to find time to set these up and would love to trial them with wolf snakes in controlled experiments.
    5.4 Wolf snake tracking using GPS logger – bit of work to understand what the question here would be. Tracking device and one logger here on site and EW baseline SRS could be potentially used as the test area.
    5.5 Effectiveness of 'hood' design on a fence, on keeping wolf snakes out.
    5.6 Trialling what materials Listers gecko's can't stick to. We haven't yet worked this out.
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 **Reconnecting landscapes through the matrix. A test using invertebrates.** Co-supervised by Nick Porch, Stephanie Pulsford. This project addresses wildlife movement through agricultural landscapes, using an existing collection of invertebrates. It involves converting a large invertebrate collection into data, undertaking statistical analysis then writing up. For the right student, this project has the potential to lead to one or more publications, and a great early start to your career.

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) Identify the crop types used by colonial nesting water birds for foraging using tracking data and satellite imagery
2) A field-based investigation into the impact of an emerging disease (*Saprolegnia* infection) on caddisflies and their ability to reproduce
3) 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*.
4) Investigating the egg laying preferences of caddisflies
5) A field based investigation on the impact of electromagnetic fields emitted by water quality monitoring equipment on platypus behaviour
6) Other field, laboratory or modelling projects investigating aspects of caddisfly species coexistence, stream restoration on farms and responses to 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 planning, resilience, sustainable livelihood, displacement and resettlement as well as post-disaster recovery. My research interests also include the values and concepts of land to the traditional landowners, especially for the tangible and intangible values of land. This knowledge is crucial because we will better understand the trade-offs landowners face and help design better private land conservation programs. I welcome inquiries from students who are interested in understanding environmental sustainability from the social science perspective. We will work 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.

Specific project on offer:
Co-Supervisor: Dr Martino Malerba

Australian Farm Dam Project: Australia's 1.76 million farm dams release between 3.4 and 7 million tonnes CO2-equivalent per year. The project aims to develop low-cost strategies for managing farm dams to minimize their carbon footprint. We will evaluate for the first time the values landholders attach to farm dams. Surveys and interviews will be taken to better understand landholders' motivations, barriers, and their satisfaction and retention in private land conservation programs. The new knowledge will help design a large-scale farm dam restoration program on private land that aligns with landholders' priorities and traditional knowledge.

Assoc Prof Kelly Miller

Campus: Burwood

Contact details: kelly.miller@deakin.edu.au

Research area description:
Projects focusing on sustainable behaviours and the human dimensions of wildlife/environmental management (e.g. human values, attitudes, perceptions) are available and will be developed around the student's specific interests e.g. wildlife, conservation, sustainability, environmental protection. Previous Honours projects have focused on wildlife/wildlife management e.g. bird feeding, threatened species, wildlife tourism; habitat management/conservation e.g. gardening practices, park/reserve visitation; and environmental education in a range of contexts.

Specific projects on offer:

1) Virtual reality in ecotourism. An exploration of the use of VR in ecotourism and environmental education (Co-supervisors: Dr Adam Cardilini, Dr Prue Francis)
2) Empowering citizen scientists in coastal monitoring. An evaluation of educational outcomes from a community-based drone study (Co-supervisor: Associate Professor Dan Ierodiaconou)
3) Social research in wildlife conservation with Zoos Victoria. (Co-supervisor: Associate Professor Bill Borrie, External supervisor: Emily McLeod, Zoos Victoria)
4) Nearby nature. Understanding local green spaces use and users by measuring community expectations, levels of use, preferences and evaluation of green spaces in Melbourne LGAs (Co-supervisors: Dr Adam Cardilini, Associate Professor Bill Borrie)
5) The mysterious ambassador: using microbats to engage the public in wildlife conservation in urban areas (Supervisor: Dr Kaori Yokochi, with collaborators: Associate Professor Kelly Miller, Associate Professor Bill Borrie, Dr Adam Cardilini, local governments). We seek to explore the use of understudied, often

   misunderstood species as ambassadors to achieve improved conservation and value placed upon local biodiversity.

Dr Nicholas Porch

Campus: Burwood

Contact details: nporch@deakin.edu.au; Ph: 9251 7620

Research area description:
I am especially looking for someone to work of a recently funded (Hermon Slade Foundation) research project: **Conservation biogeography of the endangered invertebrate fauna of the SE Australian montane archipelago.** This project would involve summer fieldwork in the SE. Australia alps and research on patterns of species richness and endemism in the highly threatened and poorly known montane invertebrate fauna.

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.

Specific projects on offer:

1) **Disentangling the impact of rabbits on threatened species: a foraging perspective.** This project follows up a previous Honours students work looking at the impact of rabbits on threatened species and seeks to identify how rabbits influence prey availability, for southern brown and eastern barred bandicoots.

   a. Co-supervisors: Dr. Nicholas Porch

2) **Understanding the socio-spatial structure of Southern Brushtail Rock Wallabies.** This project seeks to increase our understanding of the ecology of southern brushtail rock wallabies, a critically endangered species for which very little is known. A key knowledge gap in this species' recovery efforts is the social structure of populations and how these might be best translocated into new populations.

   a. Essential: Strong commitment and dedication to fieldwork, working autonomously and remotely, at times for long hours.

   b. Co-supervisors: Dr. Roan Plotz (Victoria University); A/Prof Mike Weston (Deakin University)

3) **Monitoring species use of a newly fenced reserve. Establishing baseline data and optimizing monitoring.** This project will monitor a newly fenced reserve in central Victoria to establish what species already exist at the site and identify influential variables as to their presence. This data will also be used to identify the most appropriate long-term monitoring strategy.

   a. Co-supervisors: Dr. Roan Plotz (Victoria University)

4) **Understanding the foraging ecology of eastern barred bandicoots across its introduced and historical range.** This project will investigate the variability in bandicoot diet across five separate populations of this endangered species, including at least two populations within its historical range, and three populations in its translocated range.

   a. Co-supervisors: Dr. Nicholas Porch, Prof Euan Ritchie, Dr. Amy Coetsee, Dr. Duncan Sutherland, Aviya Naccarella

5) **Flight Initiation Distances in the world's mammals.**

   a. Co-supervisors: A/Prof Mike Weston, Dr. Kaori Yokochi, Dr. Roan Plotz (Victoria University)

Prof Euan Ritchie

Campus: Burwood

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

Research area description:
Our research group, the Applied Ecology and Conservation Research group (https://euanritchie.org/), is focused on addressing a range of issues that apply to wildlife management, environmental policy, and biodiversity conservation, including: fire ecology; invasive species; landscape ecology; mammal ecology; predator-prey interactions; species reintroductions, and urban ecology.

Specific projects on offer:
We have a range of exciting and well-supported honours projects on offer in 2024 and in collaboration with our government and industry partners.

1) Arboreal mammal and bird use of chainsaw and other artificial hollows (Wombat State Forest, East

Gippsland or Echuca-Moama).

2) Assessing the conservation value of roadside habitats for arboreal mammals (Strathbogie Ranges) using spotlight surveys and drones.

Please note, we are always happy and encourage prospective students to discuss other project ideas that they may have that align with our group's broad interests and expertise.

Assoc Prof Matthew Symonds

Campus: Burwood

Contact details: matthew.symonds@deakin.edu.au; Ph: 9251 7437

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: 9244 6897

Research area description:
The research performed in my laboratory is broad and always at the intersection between electrochemistry and molecular biology. Examples may include electrosynthesis, electrochemical biosensors and immunosensors, and the study of the interaction of pharmacologically active molecules with cell membranes.

Dr Stacey Trevathan-Tackett

Campus: Burwood

Contact details: s.trevathantackett@deakin.edu.au

Research area description:
Coastal wetland ecosystems provide important ecosystem services, including building biodiversity, filtering toxins and removing greenhouse gases from the atmosphere. However, continued coastal degradation and loss pose a serious threat to these valuable ecosystems. Novel restoration methods are being developed and implemented to restore the coastal wetlands, including saltmarshes. However, revegetation after removing threats and pressures may not always be successful due to harsh environmental conditions or isolation from healthy plant populations. Active restoration methods, such as seeding or transplanting, may enhance revegetation success.

Specific projects on offer:

This project will perform greenhouse experiments on common saltmarsh species to investigate the conditions that promote seed and seedling establishment in coastal wetlands.

We are seeking applicants with good attention to detail and the ability to work independently and collaboratively. Experience with design and data analysis are also desirable. This project will suit a student that is passionate about helping the environment, keen to learn new skills, and can demonstrate a high level of commitment to the project.

This project will also be supervised by Dr Aydin Enez and Dr Anthony Rendall.

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: 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.

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Dr Liz Weldon

Campus: Burwood

Contact details: l.weldon@deakin.edu.au

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

Major themes:

1) Geoconservation:
    - Raise awareness of the significance of our geoheritage and geodiversity.
    - Develop regionally and culturally appropriate quantitative methodology to assess geosites and geoheritage for geoconservation.
    - Research suitable for both Honours and Master of Sustainability students.
2) Palaeontology:
    - Taxonomic studies or quantitative analysis of marine macro-invertebrates applied to palaeobiogeography or palaeoecology.
    - The projects can be developed with Museum Victoria.
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 Dr Desley Whisson.
6) Vertebrate Palaeontology, Late Pleistocene, Victoria:
    - to describe the fauna from a specific locality and compare it to other proximal Late Pleistocene localities in Victoria;
    - to interpret the host sediment and vertebrate taphonomy to infer the environment of deposition;
    - to relate the palaeoenvironment and timing of fossil deposition to the geomorphological development of fan and delta deposits;
    - Co-supervisor Tim Ziegler, Melbourne Museum

Dr Desley Whisson

Campus: Burwood

Contact details: dwhisson@deakin.edu.au

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. A few potential projects are listed below but other projects can be developed to match your interests.

Specific projects on offer:

1) Impacts of fire on the Broad-toothed Rat in the Victorian Alpine Region (S2 start)
2) The influence of habitat fragmentation on patch occupancy by Yellow-bellied Gliders (co-supervisor Anthony Rendall)
3) Habitat use by the Yellow-bellied Glider in the Otways (co-supervisor Anthony Rendall)
4) The relative significance of health issues in koala population dynamics in Victoria

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 (2008-2023). This research offers a great opportunity to do lots of fieldwork and get valuable project management skills and set yourself up with the skill base for a career in wildlife ecology and fire ecology. A driver's license and a commitment to being in the Grampians for up to 8 weeks is essential.

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. Contribute to our long-term data on 36 sites and investigate the role of fire and rainfall in driving small mammal populations. Great project for those wanting heaps of field experience and project management.
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. Use camera trapping to find elusive and difficult to detect critical weight range mammals. This project aims to help further our understanding of potoroo and bandicoot habitats in the Grampians which will directly contribute to PVs landscape management.
3) Assessing the effectiveness of quail-callers in attracting stubble quail. This project will be based in the western district of Victoria, requiring a student who can drive and spend periods away from campus.
4) Does thermal imaging offer a more accurate way of determining the density of arboreal mammals compared to spotlighting? This project will focus largely on urban and urban fringe bushland patches and aims to establish if thermal imaging can out perform traditional spotlighting approaches for establishing the density of arboreal mammals.

Assoc Prof Mike Weston

Campus: Burwood

Contact details: mweston@deakin.edu.au

Research area description:

Conservation, human-wildlife interactions, solutions.

Specific projects on offer:

1) Flight Initiation Distance of world's mammals – investigating mammals' behavioural response 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. Current driver's license and capacity to conduct field work required. Co-supervised by Dr Kaori Yokochi, Dr Anthony Rendall, and Dr Roan Plotz (Victoria University).
2) Shorebird conservation, especially supporting the conservation management of resident shorebirds under pressure from human use of habitats and other stressors e.g., invasive predators. Current driver's license and capacity to conduct field work required. Co-supervisors will include Dr Grainne Maguire (BirdLife Australia).

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.

Specific projects on offer:
Testing seedling germination response to spring fuel-reduction burns in the Anglesea Heathy woodland.
co supervisor with Ms Tara Lewis

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 (and sometimes birds), 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 roads on possums (including investigation of wildlife crossing structures), impacts of light pollution on insectivorous bat ('microbat') communities in Melbourne, impact of rodenticides on possums, and birds' and mammals' behavioural changes due to anthropogenic factors.

Specific projects on offer:

1) **Flight Initiation Distance of world's mamm**als (S1 or S2 start) – investigating the mammals' behavioural response 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 topics in mind already (e.g., impacts of light/ noise, comparing common observation protocols), but bringing your own ideas is also encouraged. A current driver's licence is required. Co-supervised by A/Prof Mike Weston, Dr Anthony Rendall, and Dr Roan Plotz (Victoria University).
2) **Microbats**
    a. Comparison of commonly used bat detectors and analysis protocols to assess their compatibility **(S1 start unless part-time) – a 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).**
    b. Other microbat research you can think of! I'd especially be interested in impacts of urbanisation/ anthropogenic changes on the microbat communities.
3) **Road x coastal squeeze: Use of existing infrastructure as crossing structure by small mammals in Otways** (S2 start, subject to funding) – Current driver's licence and ability to conduct fieldwork in Otways for a few nights at a time are required. Co-supervised by Dr Barbara Wilson, Dr Marissa Parrott (Zoos Vic).
4) 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.

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Dr Angela Ziebell

Campus: Burwood

Contact details: a.ziebell@deakin.edu.au **Ph:** +61 3 924 46240

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:** +61 3 924 46240

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) 5227 2096

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) 5563 3461
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.

Prof Colin Barrow

Campus: Waurn Ponds

Contact details: colin.barrow@deakin.edu.au Ph: (03) 5227 1318

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 Philp Barton

Campus: Waurn Ponds

Contact details: p.barton@deakin.edu.au Ph 03 5227 8191

Research area description:
I lead the *Insect Lab* at Deakin University and conduct multidisciplinary research on insect biodiversity and its role in decomposition and ecosystems. Key research themes include:

Specific projects on offer:

1) **Global insect biodiversity and conservation**. Insect biodiversity is overwhelming, complex, and critically important to ecosystems and the world around us. A key challenge in this area is knowing how we might manage landscapes to conserve insects and the ecosystem services they provide. The *Insect Lab* collaborates widely to address this important issue.
2) **Insects and forensics.** The decomposition of human and animal remains is subject to many sources of variation, and this can affect our understanding of the time of death. We work with a number of forensic scientists to examine decomposition processes and the insects colonising human and pig remains.
3) **Decomposition Theory and Synthesis.** Dead animal biomass is often overlooked as a resource in ecosystems. Our research in this area has consolidated global understanding of carrion in ecosystems, generated new theory, and identified exciting research directions for this topic.

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.

Prof Kate Buchanan

Campus: Waurn Ponds

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

Research area description:

I work on a range of songbirds and am interested in how early developmental conditions impact development. I am particularly interested in whether early life programs adult physiology and behaviour for the environments in which they live. In 2024 we have several Honours options which are loosely focused on two different study systems (chickens and zebra finches) on-going in the group. First, we are particularly interested in how circadian rhythms of light/dark and temperature affect embryonic birds in terms of their growth, physiology, and behaviour. Second, we're interested in cryptic acoustic communication in avian nests. Finally extending our interests in analysing hormone signals in birds, we have a project looking at the quantification of maternal hormones in eggs. Whilst there are projects which may start either in February or July, seasonal restrictions exist on working with breeding birds and in most cases the student must be based in Geelong, excepting the final project (below), where the student could be based on either campus.

Specific projects on offer:

1) 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. In this project there will be the opportunity to gather your own data, as well as making use of existing samples, depending on your interest in learning techniques and working with live animals.
2) Do environmental cycles during early development affect microbiome establishment in commercial poultry? Using existing samples and in collaboration with Dr Andrew Oxley, the student will assess the potential for cycles of light/dark and temperature to influence the gut microflora in hatching chickens and the consequences for growth and development.
3) Neural control of vocal behaviour in zebra finches. In collaboration with the Max Planck, Germany we are using remote neurotelemetry and electrophysiological techniques to examine neural control of vocal behaviour in zebra finches. We are interested in determining whether we can demonstrate neural responses to subtle signals within the nest of an opportunistic breeder. This project will involve training in bioacoustic analyses to determine whether embryos can communicate with their parents prior to hatching.
4) Measuring corticosterone in avian eggs. Corticosterone is the principle avian stress hormone, and it is deposited to the egg yolk at egg formation, influencing embryonic development. Measuring deposition levels is challenging given the high fat content of the yolk, as well as the presence of other hormones. Students are invited for a project co-supervised by Dr Damien Callahan (Burwood) to assess whether Liquid Chromatography Mass Spectrometry allows for more effective quantification of yolk hormones in bird eggs than enzyme immunoassay.

Dr Adam Cardilini

Campus: Waurn Ponds & Burwood

Contact details: adam.cardilini@deakin.edu.au

Research area description:

I am interested in how our experiences, values, and relationships with nonhuman animals shapes science, the environment, and society. My research focusses on how concern for animals informs environmental values and practice, how to build understanding of animal perspective, and critical assessments of animal use in science

(lab, field, and education).

My research takes a social science approach, so 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 the themes above, please get in touch and we can chat about it.

Specific projects on offer:

1) Compassionate conservation – Investigating the values and practices of conservation and wildlife management and their impacts on animals. Developing ways of approaching conservation that account of individual animal interests and community level protection.
2) Animal use in research – Quantifying, describing, and communicating animal use in wildlife and laboratory science.
3) Climate communications and animal agriculture – Investigating the representations of animal agriculture in climate communications.
4) Perceptions of cultivated meat – Understanding community and industry perceptions of emerging cultivated meat technologies, their products, and their potential role in animal and environmental protection.
5) Video games and/or VR for nature and animals - Testing the impact of video games and VR experiences on people's perceptions of nature and animals.

Possible projects in collaboration with other academics:

1) Animal use as a barrier to participation in science – Investigating whether a culture of animal use impacts science students' intention to pursue a career in science.

2) Nearby nature - Understanding local green spaces use and users by measuring community expectations, levels of use, preferences, and evaluation of green spaces in Melbourne LGAs

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) Balancing stability and reactivity in second generation photoredox catalysts.
2) Luminescent metalloligands for building supramolecular assemblies.
3) Synthesis of new metal complexes for multi-coloured electrochemiluminescence (collaborating with Prof. Paul Francis).

4) Amphiphilic transition metal luminophores for chemical sensing in water (collaborating with Dr. David Hayne, IFM).

Prof Paul Francis

Campus: Waurn Ponds

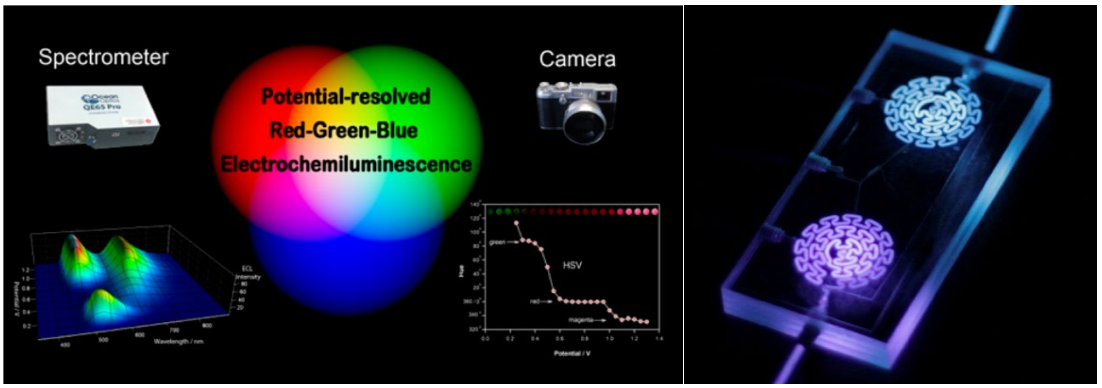
Contact details: paul.francis@deakin.edu.au; ph: 5227 1294

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.

We also explore the use of light as a source of energy for chemical synthesis. The growing awareness of the environmental impact of chemical processes has spurred research in 'green' chemistry. We use analytical and spectroscopic techniques to understand the mechanisms of photocatalysis, to develop new routes to synthesise important molecules.

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 or SLE361 Inorganic Chemistry in their undergraduate course.



Specific projects on offer:

1) ***Multi-colour 'Switchable' Electrochemiluminescence for Rapid Multiplexed Detection***. Molecules that emit different coloured light can be selectively switched-on or switched-off by applying different electrochemical potentials. This provides opportunities for simultaneous (multiplexed) ECL detection events for time-critical analytical applications.

2) ***New Reactors and 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 the photodetector. This project involves the fabrication of new analytical components using high-precision machining and 3D printing processes, and their evaluation using various analytically

important CL reactions.

3) ***Synthesis of New Metal Complexes for Photoredox Catalysis or Electrochemiluminescence***. In collaboration with Dr Tim Connell, we will prepare and evaluate metal complexes with specific attributes (ground/excited state redox potentials, absorption and emission wavelengths, stability, solubility in specific solvents, etc.) to understand their underlying mechanisms, and create new avenues for chemical synthesis and detection.

4) ***'Redox-Mediated' Electrochemiluminescence***. The $[Ru(bpy)_3]^{2+}$ luminophore and tri-*n*-propylamine (TPrA) co-reactant are considered the 'gold standard' for ECL and are used in all commercial ECL instruments. Our research group has discovered a new reaction pathway that can enhance this ECL reaction by an order of magnitude. This project examines how this pathway can exploited for unprecedented sensitivity in ECL detection.

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.

Prof Luke Henderson

Campus: Waurn Ponds

Contact details: luke.henderson@deakin.edu.au; Ph: 5227 2767

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.

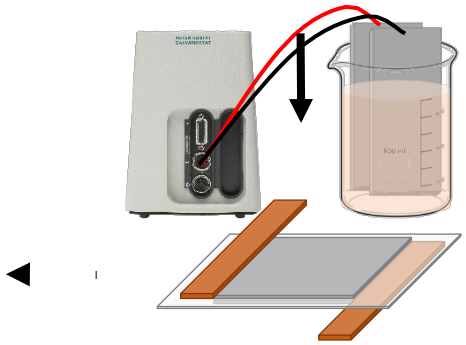
We have also begun new research areas in the use of recycled materials as high value adhesives, polymers, and functional electrode materials for industrial applications. This ranges from inverse vulcanized alkenes, through to waste silk and textiles for redeployment in biomedical and structural material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

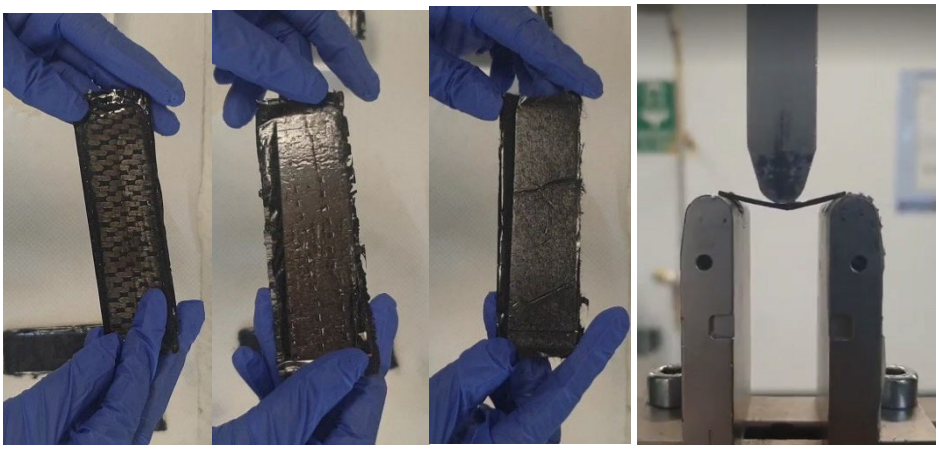


Figure 1. Carbon fibre laminate composites using S-DCPD polymer (left). Flexural testing of S-DCPD composite material (right).

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.

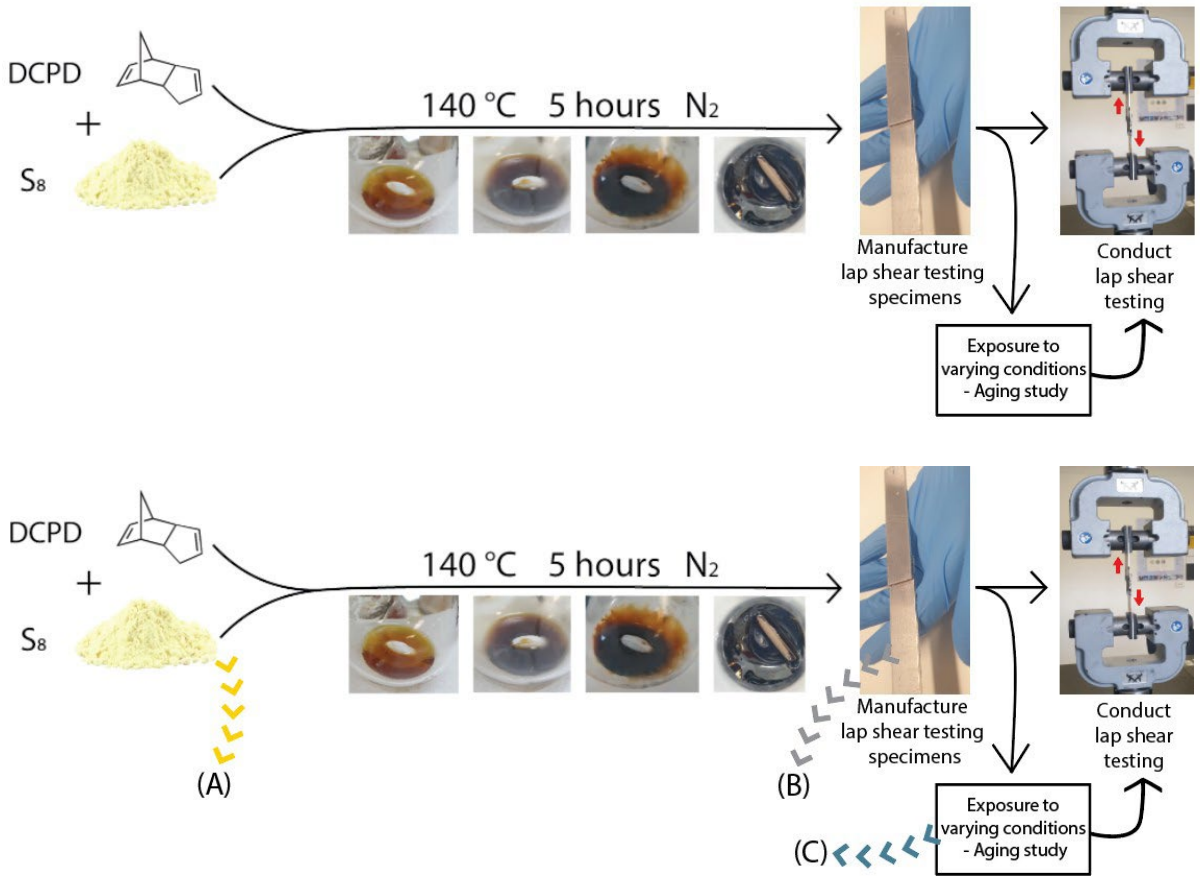
(B) Surface modification of conductive surfaces for improved adhesion

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.

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 Matthew McKenzie

Campus: Waurn Ponds

Contact details: m.mckenzie@deakin.edu.au

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**

Research area description:
Dr Nguyen' research interest mainly encompasses organic recycling, biomass utilization, bioprocessing, green process development, and process optimization. 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 red seaweeds**
Red seaweeds are a rich source of protein, sulphated polysaccharides, cellulose, and other components, that can be further used in many industries including food/feed, textiles, and packaging. There is potential to separate these components, such as sulphated polysaccharides for pharmaceutical use or developing more specific bio-composite formulations such as bioplastics. The separation strategy would also enable other components to be utilised for other products creating a biorefinery approach for residue utilisation (e.g., protein for aquafeed and cellulose for textile additives). Therefore, this project aims to test the feasibility of developing multiple products through advanced separation focused on protein for aquafeed, carrageenan for bioplastics, and cellulose for textile additives.

2) **Fractionation, characterization, and biological activity of polysaccharides from green seaweeds**
Green seaweeds are potential source of bioactive polysaccharides that can be further used in food and pharmaceutical industries. This project aims to optimize the extraction conditions for maximizing the recovery of bioactive polysaccharides from green seaweed. The extracted polysaccharides will be then fractionated to obtain different fractions. Finally, these fractions will be characterized and studied for their biological activities (e.g., antioxidant, anti-inflammatory, and anticancer activities). In addition, the extracted components will be used for the preparation of hydrogel for wound healing.

Dr Andrew Oxley

Campus: Waurn Ponds

Contact details: andrew.oxley@deakin.edu.au Ph: 5227 3670

Research area description:

We are developing tools for studying microbiome changes in response to infectious disease to identify biomarkers that can be used to assess animal health and infection status. An enhanced understanding of the microbiome might lead to novel methods to diagnose infections rapidly and accurately, allowing for quicker interventions and treatment.

Co-supervisor: Dr Annaleise Wilson annaleise.wilson@csiro.au (CSIRO) or +61 5227 5750

Specific projects on offer:

For this Honours project, we are looking for a student to investigate gut microbiome changes associated with *Mycobacterium avium* subsp. *paratuberculosis* infection (Johne's Disease) in dairy cattle. The highly contagious disease, which leads to wasting and eventual death in affected animals, is a significant biosecurity risk and welfare concern in Australia. The student will be supported to learn and apply bioinformatics techniques to analyse the microbiome taxonomy, diversity and functionality and identify biomarkers associated with infection. The students will be based at the CSIRO Australian Centre for Disease Preparedness.

Assoc Prof Fred Pfeffer

Campus: Waurn Ponds

Contact details: fred.pfeffer@deakin.edu.au Ph: 5227 1439

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 (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, cages and metal organic frameworks) that can selectively interact with other species. In collaboration with Professor Guido Clever (Dortmund) the customised interior of such a cage was used for six-point binding of an octahedral guest [*Chem. Eur J.*, **2016**, p 10791].

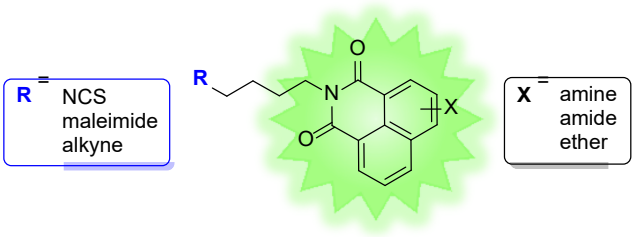
A highlight of recent research is the development of high yielding methodology to access a broad range of **naphthalimide based fluorophores** [*Chem. Commun.* **2017**, p 12298, *Chem. Commun*., **2020**, p 6866]. Highly fluorescent molecules are valuable commodities for biologists as they allow the tracking of biomolecules of interest and this project has ARC funding for 2022-2024.

Students gain valuable "hands on" organic chemistry skills, in particular the use of NMR spectroscopy and mass spectrometry to characterise molecules. 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) Functionalised naphthalimides for fluorescent imaging. (With UniSA)

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



2)Forensic Chemistry (with VicPol)

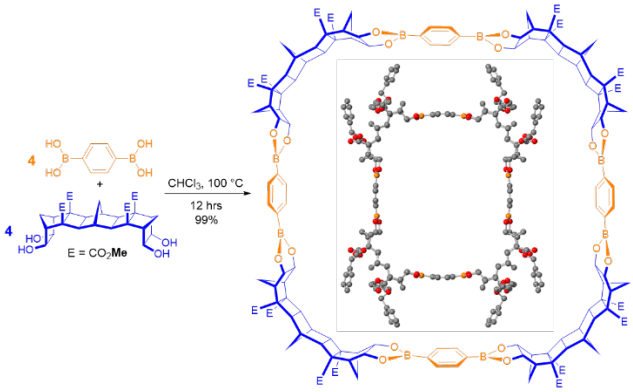
A project involving either (i) investigating masked amphetamines or (ii) chemical warfare detection systems will be available.

A recent trend in the illicit trafficking of controlled substances involves chemical masking. These masked compounds are not identified by common detection protocols.

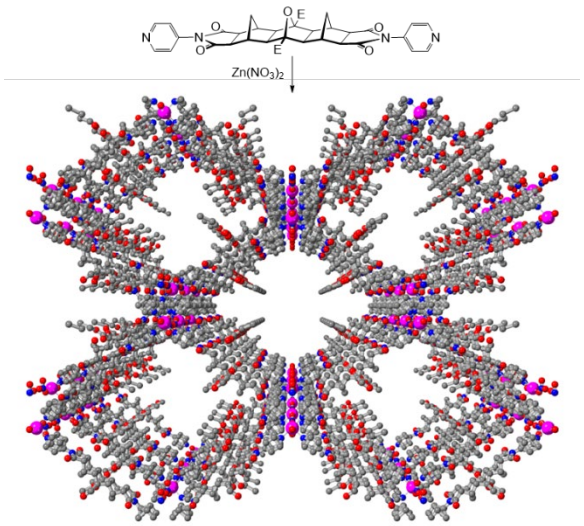
Sarin and related agents are some of the most toxic compounds known. Designing detection systems and model compounds to understand their behaviour is essential for frontline safety.

3) Molecular assembly 1: Covalent systems (with Melbourne and Adelaide universities)

We have recently obtained X-ray data confirming the synthesis of the large macrocycle shown. These covalent assemblies contain boronic esters that are made from norbornane diols and these linkages are unique to our research and are remarkably stable. Two projects are available and in the first you will explore a range of commercially available boronic esters to make new covalent assemblies (COFs). The second involves incorporating function to the esters (eg urea) such that further assembly of the macrocycles themselves can take place.



4) Molecular assembly 2: Metallosupramolecular systems (with Melbourne university, UNSW and Australian Synchrotron)



Dr Aaron Schultz

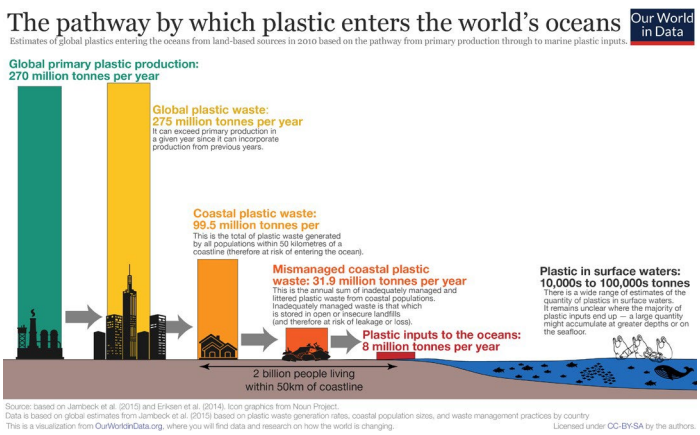
Campus: Waurn Ponds

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 bioscopy, bioassays,



cell biology, and molecular biology methods ae 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) Nanomedicine - 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).

5) **Biological screening of novel new cancer therapeutics (e.g. HDAC6 selective HDAC inhibitors) using zebrafish embryos.**
   Associate supervisor: 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 Lawrence Webb

Campus: Waurn Ponds

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

Research area description:
My research focusses on developing 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 examples of this include the characterization of novel bacterial sugars, the determination of “lifelong” PFAS chemicals, and the identification of medicinally important tropane alkaloids. Various projects are available, all offering hands on experience on advanced analytical instrumentation.

Specific projects on offer

1) **Characterisation of O-Specific polysaccharide from *Coxiella burnetii.*** The bacteria *Coxiella burnetii* is

the causative agent of Q-Fever. We have recently developed a new vaccine against this bacterium by using a membrane based polysaccharide. This project will use advanced analytical chemistry to further characterize the polysaccharide used in the vaccine.

2) **Development of novel separation techniques for monosaccharides**. Sugars are responsible for a huge range of biological functions. Analysis of sugars can be challenging due to their high polarity and subtle differences in their structures. This project will investigate and develop novel purification and separation techniques used to analysis these important compounds.

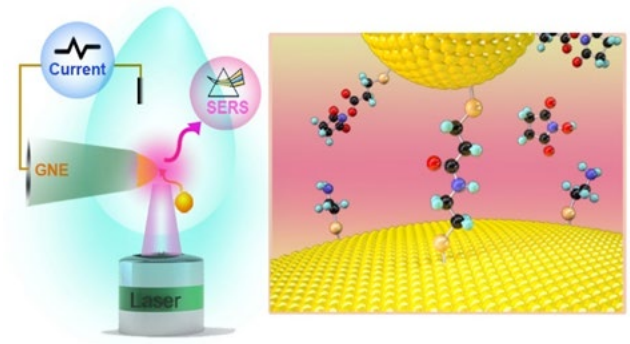
3) **Implementation of smart growth cabinets.** Growth cabinets are used in research to provide a controlled environment to study plants however the technology of these cabinets has not been advanced for decades. In collaboration with the School of Engineering, we have recently developed a new concept for "smart" growth cabinets with a focus on improved data management and artificial intelligence. This project will work alongside this diverse team to further develop these cabinets with a range of possible applications including plant biology, forensics and environmental sciences.

Assoc Prof Wenrong Yang

Campus: Waurn Ponds

Contact details: wenrong.yang@deakin.edu.au **Ph: 03522729232**

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 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.

Specific projects on offer:

Persistent Organic Pollutant (POP) body burden analysis of the Little Penguin (*Eudyptula minor*) from Middle Island, Warrnambool. Co-supervisor: Associate Professor Julie Mondon.

Dr Adam Miller

Campus: Warrnambool

Contact details: adam.miller@deakin.edu.au

Research area description:

The **ECOGENETICS LAB**'s research program focusses on a range of fundamental and applied questions relating to the ecology and evolution of native and invasive species. The team is particularly interested in research that provides insights into the evolutionary processes that shape patterns of biodiversity, environmental resilience, and the ability of species and ecosystems to adapt to environmental change. We have a range of projects happening in the field of conservation genetics and wildlife monitoring, environmental stress and adaptation research, pest control and biosecurity, fisheries genetics, and ecological restoration. Three potential 2024 Honours projects are provided below, but students are encouraged to contact us to discuss other options (please visit: https://www.ecogeneticslab.com/)

Specific projects on offer:

1. **Conservation genomics of Australian White Sharks**
   Supervisors: Adam Miller, Paul Butcher (Department of Primary Industries NSW) and Charlie Huveneers (Flinders University)
   Campus: Warrnambool

   The white shark (*Carcharodon carcharias*) is one of the world's largest marine apex predators and is essential to the structure and function of temperate and sub-tropical marine ecosystems. However, the species has suffered significant declines in recent decades and effective conservation efforts are needed to protect them and the ecosystems they support. This will require addressing critical knowledge gaps associated with *C. carcharias* biology and ecology that currently complicate the management process. Our team have a range of projects underway in direct partnership with leading

shark experts Paul Butcher and Charlie Huveneers from using genomic technologies to explore white spatial (habitat use) and trophic ecology (diets and feeding behaviours) and demography (population structure, size and connectedness). We encourage students with a keen interest in shark biology and ecology to get in touch with our team to discuss research opportunities. These projects allow students to develop skills and knowledge in the area of marine conservation genomics and include exciting fieldwork opportunities.

2. **Assessing the resilience of marine foundation species to climate change**
Supervisors: Adam Miller, Prue Francis, Craig Sherman, Mary Young
Campus: Warrnambool and Waurn Ponds

The speed and magnitude of environmental shifts associated with climate change poses a significant challenge for marine biodiversity conservation. Rising ocean temperatures, increasing acidification, and changing ocean currents are major environmental threats. Species living close to their physiological limits are of particular concern and will become increasingly dependent on their ability to overcome environmental change via dispersal, physical tolerance and evolutionary adaptation. Understanding the environmental resilience of 'keystone' and 'foundation' species is of critical importance, given their response to environmental change will have the greatest impact on community dynamics and structure, and ultimately ecosystem function. The availability of such information will provide the necessary basis for marine conservation planning at local and regional scales. We have several potential and ongoing projects investigating the adaptive capacity of marine foundation species including kelps, seagrasses and mangroves. These projects involve the integration of genomic data and quantitative data generated from controlled laboratory and field experiments to assess the potential roles of gene flow, plasticity, and genetic adaptation in helping marine foundation species adapt to future changes in the physical ocean climate. These projects will involve a combination of exciting field and laboratory-based activities.

3. **Assessing the success of spiny crayfish translocations in the Murray River**
Supervisors: Adam Miller, Nick Whiterod (Nature Glenelg Trust), Chris Austin
Campus: Warrnambool

Crayfish belonging to the genus Euastacus are endemic to Australia and considered the most threatened freshwater crayfish genus in the world. The most widely distributed species in the genus, Murray crayfish *Euastacus armatus*, spans habitats across the southern Murray–Darling Basin (MDB) and has experienced substantial declines in abundance and range due fisheries over-exploitation, habitat degradation and disturbance, and river regulation by impoundments and weirs. Most recently, *E. armatus* populations in the southern MDB have suffered significant declines as a result of a severe hypoxic blackwater event. This event completely depleted crayfish populations across 150-200km of the species range in the Barmah and Echuca area, and translocation efforts have been underway to recover these populations. Animals for translocation have been sourced from multiple locations varying in habitat where animals may be locally adapted, raising the question as to whether animals from mismatched habitats have been successful in establishing in introduced habitats. This project will use population genomic tools to contrast the genetic profiles animals used in the translocation programs with those of animals that are now being captured at the release locations several years on since release. This study will help inform future translocation programs aimed at rescuing species population from risks of extinction and the importance of genetic considerations when undertaking translocation activities. This project will allow students to develop skills and knowledge in the area of marine conservation genomics and will include exciting fieldwork opportunities.

Assoc Prof Julie Mondon

Campus: Warrnambool

Contact details: julie.mondon@deakin.edu.au

Co-supervisor: Dr Patricia Corbett

Specific projects on offer:

1) Impact of diesel spills on marine invertebrates
2) Impact of elevated temperature and contaminant exposure on marine invertebrates

Queenscliff Projects

Assoc Prof Timothy Clark

Campus: Queenscliff

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

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.

Dr Kay Critchell

Campus: Queenscliff

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

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) Best practice for monitoring litter at a large geographic scale using community science.
2) Physical oceanography of the self-recruitment process at small scales
3) Modelling the plastic pellet spill along the Warrnambool coast – associate advisor Assoc Prof Julie Mondon

Dr Prue Francis

Campus: Queenscliff

Contact details: prue.francis@deakin.edu.au Ph: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 co-supervised with Dr Paul Carnell and Dr Jacqui Pocklington and will be based at Queenscliff.
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: tym@deakin.edu.au

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.

Specific project on offer:

I am currently seeking a student who is interested in assessing the stocking success of estuary perch in Victorian lakes and rivers. This project will provide students with an opportunity to meet staff from the Victorian Fisheries Authority (VFA).

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

Associate or External Supervisors and their contact details: Rhys Coleman (Melbourne Water).

Start date: February or July

Specific projects on offer:

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. This project will develop restoration and recovery methodology for intertidal seagrass meadows in Western Port, Australia. The project will use a combination of field-based trials and nursery experiments to develop the appropriate methodologies needed for seagrass restoration in Western Port. This project offers opportunities to develop skills in field ecology, GIS, drone mapping and genetics.

Title: **Assessing the use of environmental DNA (eDNA) for detecting invasive marine species.**

Principal Supervisor: Craig Sherman and Adam Miller

Principal Supervisor contact details: craig.sherman@deakin.edu.au and a.miller@deakin.edu.au

Associate or External Supervisors and their contact details: Richard Stafford-Bell (Department of Economic Development, Jobs, Transport and Resources)

Start date: February or July

Project description:

Environmental DNA (eDNA) refers to DNA that is collected and extracted from environmental samples such as water or soil, rather than directly sampling the DNA from the organisms. The eDNA results from cellular material continuously being lost from organisms into the environment and typically lasts for several hours to several weeks. This approach can be used to identify potentially invasive species and their geographical ranges, and is emerging as a crucial tool for biodiversity and pest species management. The project will involve the collection of eDNA samples and use quantitative real-time PCR (qPCR) to detect invasive pest species. The student will have the opportunity to spend time in the field and laboratory and will develop important skills in field sampling, DNA extraction and qPCR. The student will also have the opportunity to make valuable industry contacts within the Department of Economic Development, Jobs, Transport and Resources and Parks Victoria.

Title: The effect of global climate change on seed survival and germination success of seagrass meadows.

Principal Supervisor: Dr Craig Sherman

Principal Supervisor contact details: email: csherman@deakin.edu.au

Associate or External Supervisors and their contact details: Dr Tim Smith (JCU), Paul York (JCU).

Start date: February or July

Project description:

Sea surface temperatures have been increasing due to the effects of global climate change and are already having significant impacts on marine life. Rising temperatures can directly affect the metabolism, life cycle, and behaviour of marine organisms and their ability to cope and adapt with rising water temperatures will determine the long-term viability of these species. Seagrasses are important ecosystem engineers, providing habitat to a range of species, nutrient cycling, sediment stabilisation, and reducing coastal erosion. Their reproductive cycles are highly seasonal and temperature dependent, yet we know little about how increasing temperature may affect their reproductive output and recruitment. Seagrasses produce seeds that often accumulate in a soil-stored seedbank. This project will look at the effect of climate change and adaption of *Zostera muelleri* seeds along a latitudinal gradient on the east coast of Australia to determine germination success of seeds under different temperatures. This information will provide crucial data on the ability of seagrass seeds to germinate under future climate change scenarios and the long-term viability of Australian seagrass populations. The student will be involved in field collections and mesocosm experiments based at the Queenscliff marine research station.

Title: Determining the chemical basis of detection of an invasive predator by scallops.

Principal Supervisor: Dr Craig Sherman

Principal Supervisor contact details: email: csherman@deakin.edu.au

Associate or External Supervisors and their contact details: Adam Miller (Deakin University), 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:

1) **Has Australia's management of sharks and rays in commercial fisheries improved in the past 10 years?** In this project, the student will re-assess the efficacy of shark and ray management in Australian commercial fisheries. The first assessment was completed in 2013/14, therefore, we will be able to look at progress (or lack thereof) over the past ten years.
2) **Community composition of reef species in Southeast Asia:** This project can be discussed and changed based on the interests of the student. The project will use BRUVS footage from up to 10 countries collected by the Global FinPrint project to answer a question about coral reef species ecology. Note that this project will likely not be focused on sharks and rays, but other reef species or overall.

CSIRO Australian Centre for Disease Preparedness Project

Dr Marcell Klaassen

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

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

Co-Supervisors Dr Anjana Karawita (CSIRO) Anjana.karawita@csiro.au, A/Prof Roslyn Hickson (CSIRO)

Research area description:
Our project focuses on revolutionising antiviral drug discovery through advanced genomics techniques. By leveraging the power of genomics, we aim to identify novel antiviral peptides that can effectively target and inhibit viral infections.

Viruses pose a significant threat to global health, necessitating the rapid development of innovative treatments. Traditional drug discovery methods are often time-consuming and less precise. Our approach involves analysing the

genomic sequences of various viruses to pinpoint conserved regions in viral proteins essential for their replication. We can identify potential peptide candidates that can disrupt viral processes with high specificity.

Harnessing genomics expedites the identification process and enhances the accuracy of peptide selection. These peptides could interfere with viral entry, replication, or assembly, thus offering a multifaceted approach to combating infections. Our project bridges the gap between genomics and therapeutics, offering a promising avenue for designing next-generation antiviral drugs.

Overall, our research holds the potential to significantly impact public health by accelerating the development of antiviral treatments. Through innovative genomics-driven strategies, we strive to contribute to the ongoing battle against viral infections and improve the quality of life for individuals worldwide.
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Specific project on offer:
"Utilising genomics for novel antiviral peptide identification, accelerating drug discovery by targeting viral proteins. Combating infections with precision.

Dr Matthew McKenzie

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

Contact details: m.mckenzie@deakin.edu.au

Co-Supervisors Dr Pawan Parajuli Pawan.Parajuli@csiro.au and Dr Sinead Williams sinead.williams@csiro.au

Research area description:
Our group uses *ex vivo* human lung models as a physiologically relevant model to better understand the host response and pathogenesis of viral and bacterial respiratory infections. We also use these models for screening of candidate drugs.

Specific project on offer:

1) **Study on regulation of quorum sensing genes by *Pseudomonas aeruginosa* and *Staphylococcus aureus* in *ex vivo* human airway model of cystic fibrosis.**
Pseudomonas aeruginosa and *Staphylococcus aureus* are the most common infections in the cystic fibrosis (CF) lungs. The treatment of these infections is limited due to the ability of the bacteria to form a complex structure called biofilms. Quorum sensing (QS) is a method that is widely utilized by bacteria to detect chemical signals and coordinate gene expression including the regulation of virulence factors and biofilm formation. This project aims to identify the regulation of QS genes in *P. aeruginosa* and *S. aureus* involved in biofilm formation using the *ex vivo* airway epithelium of normal and CF. Throughout this project, student will have the opportunity to develop skills in bacteriology including bacterial growth and biofilm assays, primary cell culture in air-liquid interface, RNA isolation and gene expression analysis using RT-qPCR techniques.

Griffith NSW Projects

Assoc Prof Wendy Quayle

Site: Griffith

Contact details: w.quayle@deakin.edu.au **Mob. O417436775**

Research area description:
Research in sustainable irrigation for commercial rice and cotton crops, including improving nutrient and water management in rice production systems through monitoring and measurement of greenhouse gas emissions, water quality, water use, plant development and soil properties.

Specific project on offer:

Baseline greenhouse gas emissions according to water management in Australian rice production systems. January 2024 – April 2025.

Location: Centre for Regional and Rural Futures, Griffith, NSW. The student will be expected to base themselves in Griffith for a minimum of a continuous duration of 4 months (and longer if possible). Some basic accommodation expenses may be available.

A driving license is preferable and a keenness to work outdoors in sometimes challenging weather conditions on commercial Riverina rice farms.

Introduction

Rice cultivation is a major source of global methane emissions, estimated to contribute 11% of overall anthropogenic methane emissions. Conventionally, rice is grown under continuously flooded conditions for most of the cropping season which promotes the process of methanogenesis. Alternative irrigation strategies which limit the presence of a permanent water layer in the field have been recently introduced primarily for water saving purposes, particularly in years when there is water scarcity. However, water management practices that limit methane production are generally prone to concurrently enhance the emissions of the more potent greenhouse gas, nitrous oxide. This project will use state of the art field-based greenhouse gas measurement techniques for an investigation to evaluate variation in the methane and nitrous oxide emissions and their specific contribution to the global warming potential of water management practices in a commercial rice production system. The data will contribute to a larger Australian rice industry project being led by CeRRF, Griffith researchers, designed to baseline current emissions so that carbon can be accounted for through the rice value chain.

Methods

Water regime treatments are imposed and monitored in 2 full size irrigation bays comprised of conventional direct drill and strategic ponding. Four round chamber bases (300 mm) will be placed in each treatment: and will remain in place throughout the growing season. These bases will be used as location points for which measurements of all three GHG using a Licor N2O/CH4 analyser and 'smart chamber' will be collected. Data is acquired (2 x/week) using the laser-based analysers instantly at the field without the need for vials or remote analysis. Extensions are added as the crop grows. Thermocouple temperature loggers will be placed inside the chamber to monitor headspace temperature and flood water temperature. As a contingency, 4 manual chambers will also be installed. As necessary, gas samples, (20ml) will be collected into evacuated 12 ml vials at 0, 30, 60, minutes after chamber placement and analysed at an offsite laboratory by gas chromatography. Direct data acquisition using the Licor system, or manual gas samples will be collected twice weekly from October to April for a total minimum of 50 sampling dates over the ~180 day growing period. The sampling will be subdivided into three main phenological stages with a minimum of 15 sampling events per stage: from germination to PI, PI-flowering, flowering to senescence with sampling extending to up to 2 weeks post-harvest as significant fluxes can occur at this time. All gas sampling events will be taken around mid-day to minimize variability due to diurnal variation. Greenhouse fluxes will be calculated from the linear increase in gas concentration with time with interpolation across days. Water regime will be monitored continuously. Managed by automated stops linked by wifi to soil matric potential and temperature sensors and on-site weather station for precipitation and calculation of evapotranspiration.
Soil texture, pH, TOC, mineral N, TN, CEC (average baseline soil characteristics) will be determined in each irrigation bay. Soil cores (12) will be collected across 0.5 ha comprising the gas sampling area and sub-sectioned on site to 0-30 cm and 30-60 cm increments. The 12 samples will be integrated and analysed by standard methods. Surface soil samples (0-10 cm) will be taken weekly in the vicinity of the chambers for available organic carbon and mineral N and relationships between these parameters, soil matric potential sensors and greenhouse gases will be explored. Plant phenological development will be recorded including variety, dates of sowing, tillering, PI, flowering, harvest. Biomass cuts (3 x 1 m) will be taken at harvest and grain will be separated to estimate yield.
Statistical effect of water management on cumulative fluxes of N2O, CH4 and CO2 emissions, GWP and yield normalised emissions will be determined using statistics programmes.