

MSc(BioSci)/Hons Research Projects - School of BioSciences - 2020

This file lists supervisors offering projects for the **Master of Science (BioSciences)** and **Bachelor of Science (Honours)** in BioSciences, grouped into one or more Research Themes. For more information go to <https://biosciences.unimelb.edu.au/study/supervisor-project-directory>.

Plant Functional Genomics

The Roessner research group is interested in understanding how Australian crops, such as cereals and legumes, adapt and tolerate challenging environmental conditions including water and nutrient deficiencies, salinity, heat or cold. We apply systems biology approaches such as genomics, transcriptomics, lipidomics and metabolomics to compare the biochemical responses of crop plants with contrasting tolerance levels to identify novel adaptation and tolerance mechanisms.

Supervisors

Dr Berin Boughton	Spatial metabolomics and proteomics
Prof. Ute Roessner	Abiotic stress adaptation and tolerance
Dr Robert Walker	Plant, Soil & Microbe Interactions

Plant Biology

Life is dependent on plants: as the only organisms able to make their own food, these primary producers are vital to the world's ecosystems. From food, medicines, clothing and the air we breathe, we could not exist without them. Indeed, all of the research that occurs within the School of BioSciences is built upon the foundation of plant functions. Research groups in Plant Biology study a broad range of topics including:

- Plant diversity, classification, biogeography and conservation
- Plant growth and development
- Plant cell wall biosynthesis and cell-cell communication
- Plant nutrition and genetic engineering of crops to improve human nutrition (biofortification)
- Plant breeding systems and self incompatibility
- Plant defence against herbivory; plant secondary metabolites including cyanogenic compounds and the oils of eucalypts
- Plant interactions with fungal pathogens
- Evolution of plant, algal and protozoan cells, e.g., evolution of endosymbionts, the malaria parasite with its remnant chloroplast, and bio-mineralisation and bioadhesion of algal cell walls.

Students working in the plant biology field are eligible for support in the form of the generous scholarships and awards from the [Botany Foundation](#).

Supervisors

Dr Joanne Birch	Plant Evolution
A/Prof. Andrew Drinnan	Plant development, morphology, anatomy, architecture and evolution
Dr Berit Ebert	Metabolomics and proteomics
Dr Jason Goodger	Plant natural products
Dr Mike Haydon	Plant cell signalling
Prof. Joshua Heazlewood	Plant biochemistry
A/Prof. Alex Johnson	Plant and food biotechnology
Dr Edwin Lampugnani	Plant Evolution and Development
A/Prof. Ed Newbigin	Pollen biology
Dr Allison van de Meene	Plant cell biology using high-end microscopy techniques

Mycology and Plant Pathology

The fungi are a large group of over a million estimated microscopic and macroscopic species. They play fundamental roles in ecology, industry, and plant and animal diseases. The mycology and plant pathology focuses in the School are on both crop and human diseases, as well as investigation of fungal diversity. We apply molecular and field-based approaches to identify genes essential for disease, molecular mechanisms involved in virulence, genes and mechanisms involved in fungicide resistance and management strategies to minimise the deleterious impact of fungal diseases.

Supervisors

Dr Alexander Idnurm	Fungal biology
Dr Angela van de Wouw	Plant pathogen interactions

Microbiology

Microbes are both vital and problematic. Without them our world couldn't exist, but some cause us monumental grief. Understanding microbes helps us manage our environment, stay healthy and look after our crops, livestock and food supplies. Genetic tools have given us powerful means to understand these invisible organisms that impact our lives in myriad ways.

Supervisors

Prof. Alex Andrianopoulos	Microbial and developmental genetics
Dr Alexander Idnurm	Fungal biology
Dr Kathryn McNamara	Evolutionary ecology
Prof. Madeleine van Oppen	Marine ecology and evolution
Dr Heroen Verbruggen	Marine genomics and microbiology
Dr Robert Walker	Plant, Soil & Microbe Interactions

Melbourne Integrative Genomics

The groups based within Melbourne Integrate Genomics all apply various computational and experimental approaches to understand how genes shape living organisms, at large scale. Research includes the development of robust gene regulatory models with applications in synthetic biology, studies of human evolution at both the genetic and the experimental level, and tackling computational and statistical problems in population genetics, including helping to understand the complex HLA and KIR gene systems and the genomic basis of complex human traits.

Supervisors

Prof. David Balding	Statistical genomics
Dr Irene Gallego Romero	Human evolution, genomics and stem cells
Prof. Stephen Leslie	Statistical and population genetics
Dr Michael Stumpf	Theoretical systems biology

Developmental and Cellular Genetics

The living cell possesses extraordinary capabilities that allow it to sense and respond to its environment, metabolise nutrients required for growth and division and undergo changes in cell shape and function. All of these processes are under the control of the hereditary instructions or genes it expresses, from among the thousands in its genome.

Supervisors

Prof. Alex Andrianopoulos	Microbial and developmental genetics
Prof. Phil Batterham	Neurogenetics, behaviour and systems biology in insects
Dr Michael Duffy	Malaria pathogenesis and nuclear biology
Dr John Golz	Developmental regulation and Translational research
Dr Mike Haydon	Plant cell signalling
Dr Patricia Jusuf	Neural development and regeneration
Dr Michael Murray	Developmental genetics of Drosophila
Dr Trent Perry	Insecticide biology, Neurogenetics, Parasitic biology of the blowfly
Dr Heroen Verbruggen	Marine genomics and microbiology

Conservation and Climate Change

The Conservation and Climate Change Group applies ecological and evolutionary principles to the field of wildlife, conservation and applied biology across a wide range of land animals (including mammals, birds, reptiles, amphibians, a wide range of invertebrates, and some plant groups). Particular interests include the management of native and invasive species; habitat use and ecology of mammals and reptiles; first-principles modelling of individual, population, and evolutionary dynamics; application of genomic techniques to biodiversity management; and terrestrial animals as bioindicators of environmental disturbance.

Supervisors

Dr Melissa Carew	Freshwater biological monitoring
A/Prof. Rob Day	Marine ecology, aquaculture, fisheries, climate change effects on marine animals
Dr Alex Fournier-Level	Adaptive evolution
Prof. Ary Hoffmann	Pest and environmental adaptation
A/Prof. Michael Kearney	Ecology and Evolution
Dr John Morrongiello	Marine and freshwater ecology

Evolution and Behaviour

The Evolution and Behaviour Group examines the behaviour and evolution of land animals at several levels, from genes to populations. Research on behaviour includes: visual signalling in birds, reptiles and insects; acoustic signalling in birds and amphibians; and chemical signalling in insects. Research in evolutionary biology investigates the evolutionary process that produced the diversity of life we see today. This includes the study of macro-evolutionary patterns of phenotypic diversity, phylogeny and taxonomy; biogeography and patterns of speciation; the origin, structure and maintenance of hybrid zones; sexual selection, including female choice and sperm competition; the evolution of co-operation in birds and invertebrates; and inter-specific relationships.

Supervisors

Dr Simon Baxter	Applied pest control; Pest biology
Prof. Mark Elgar	Evolutionary ecology
Dr Luke Holman	Evolutionary ecology
Dr Therésa Jones	Behavioural ecology
Dr Kathryn McNamara	Evolutionary ecology
Dr Iliana Medina Guzman	Evolutionary ecology
Prof. Raoul Mulder	Behavioural ecology
Dr Karen Rowe	Ecology and conservation using museum collections and acoustics
A/Prof. Devi Stuart-Fox	Evolutionary ecology
A/Prof. Paul Umina	Invertebrate ecology

Marine Biology

Marine biologists in the School of BioSciences work on a diversity of topics across marine organisms, their conservation and management. We conduct our research in temperate and tropical marine environments, from estuaries to the deep sea.

Together we investigate the:

- Behaviour, ecology, evolution and biodiversity of marine organisms;
- Effects of human disturbance on habitats, species and communities;
- Technologies to improve the productivity of aquaculture and its environmental performance;
- Adaptation of aquaculture and fishery management for climate change;
- Ecological aspects of marine protected areas and fisheries management.

Supervisors

A/Prof. Anthony Boxshall	Marine ecology, coastal climate adaptation and environmental sciences
A/Prof. Rob Day	Marine ecology, aquaculture, fisheries, climate change effects on marine animals
A/Prof. Tim Dempster	Marine ecology and aquaculture
Prof. Greg Jenkins	Marine ecology
Prof. Mick Keough	Marine Ecology
Dr Rebecca Morris	marine ecology and coastal climate adaptation
Dr John Morrongiello	Marine and freshwater ecology
Dr Allyson O'Brien	Marine pollution, ecology, and environmental management
Dr Nick Robinson	Aquaculture breeding and genetics
Prof. Steve Swearer	Marine ecology, evolution, and environmental
Prof. Madeleine van Oppen	Marine ecology and evolution
Dr Fletcher Warren-Myers	Marine ecology and aquaculture

Quantitative and Applied Ecology

The Quantitative and Applied Ecology Group work across a wide spectrum of organisms and environments. Our research focus includes; environmental decision making, ecosystem management, conservation biology, and community and population ecology. The group also forms part of larger research centres: The ARC Centre of Excellence for Environmental Decisions (CEED) and the Threatened Species Recovery (TSR) hub of the National Environmental Science Program (NESP).

Supervisors

Dr Natalie Briscoe	Ecology and Global Change Biology
Dr David Duncan	integrity of native ecosystems in human dominated landscapes
Dr Gurutzeta Guillera-Arroita	Quantitative ecology
Dr Jose Lahoz-Monfort	Ecological modelling
Prof. Michael McCarthy	Ecology
Dr Darren Southwell	Adaptive management and optimal monitoring of threatened species
A/Prof. Paul Umina	Invertebrate ecology
A/Prof. Peter Veski	Vegetation ecology and management / CEED
Dr Matt West	Applied ecology
Dr Bonnie Wintle	Conservation ecology / CEED
Dr Jian Yen	Linking Theory and Data in Ecology

Population and Quantitative Genetics

The Population and Quantitative Genetics Group investigate the causes and consequences of genetic variation in natural populations. A broad range of statistical techniques such as Genome-Wide Association and Genomic Selection methods are used to explore the pattern and effect of molecular variation at the whole genome level. Biological models of interest include humans, plants and insects with an emphasis on biological questions related to human health and agriculture.

Supervisors

Dr Charles Robin	Insect population genetics and molecular evolution
Dr Kevin Rowe	Evolutionary ecology
Dr Kathryn Tiedje	Improving disease surveillance of malaria
Dr Andrew Weeks	Conservation biology

Reproduction and Development

The Reproduction and Development Groups study the very beginnings of life and factors that influence the growth and health of the embryo, foetus and offspring. Basic and biomedical research of mammalian systems focuses on the genetics and molecular control of early embryo development, sexual differentiation, environmental disruptors of development, stem cell biology, comparative genomics and reproductive physiology. Reproduction is the science of the transmission of life!

Supervisors

Dr Mary Familiari	Developmental biology
Dr Jane Fenelon	Reproductive and developmental biology
Dr Stephen Frankenberg	Mammalian early development and stem cells
Prof. David Gardner	Reproductive biology
Dr Mark Green	Reproductive biology
Dr Alexandra Harvey	Embryonic stem cells
Prof. Geoffrey McFadden	Malaria and endosymbiosis
Prof. Andrew Pask	Comparative genomics of development and disease
Prof. Marilyn Renfree	Reproductive and developmental biology
Dr Gerard Tarulli	Development of reproductive tissues

Molecular, Cellular and Developmental Biology

Research groups within the Molecular, Cellular and Developmental Biology (MCDB) domain use genetic, biochemical, molecular and cellular approaches to investigate and manipulate fundamental biological processes across species that span the tree of life. Researchers study a broad range of species from viruses and bacteria to plants and animals. We share research strengths in plant biology, genetics and reproduction. We are united though the use of molecular approaches but have varied applications and model species which create a rich and interdisciplinary environment with a broad diversity of course and research offerings to students.

Supervisors

Prof. Alex Andrianopoulos	Microbial and developmental genetics
Prof. David Balding	Statistical genomics
Prof. Phil Batterham	Neurogenetics, behaviour and systems biology in insects
Dr Berin Boughton	Spatial metabolomics and proteomics
Dr Michael Duffy	Malaria pathogenesis and nuclear biology
Dr Berit Ebert	Metabolomics and proteomics
Dr Mary Familiari	Developmental biology
Dr Jane Fenelon	Reproductive and developmental biology
Dr Alex Fournier-Level	Adaptive evolution
Dr Stephen Frankenberg	Mammalian early development and stem cells
Dr Irene Gallego Romero	Human evolution, genomics and stem cells
Prof. David Gardner	Reproductive biology
Dr John Golz	Developmental regulation and Translational research
Dr Jason Goodger	Plant natural products
Dr Mark Green	Reproductive biology
Dr Alexandra Harvey	Embryonic stem cells
Dr Mike Haydon	Plant cell signalling
Prof. Joshua Heazlewood	Plant biochemistry
Dr Alexander Idnurm	Fungal biology
A/Prof. Alex Johnson	Plant and food biotechnology
Dr Patricia Jusuf	Neural development and regeneration
Dr Edwin Lampugnani	Plant Evolution and Development
Prof. Stephen Leslie	Statistical and population genetics
Prof. Geoffrey McFadden	Malaria and endosymbiosis
Dr Michael Murray	Developmental genetics of Drosophila
A/Prof. Ed Newbigin	Pollen biology
Prof. Andrew Pask	Comparative genomics of development and disease
Dr Trent Perry	Insecticide biology, Neurogenetics, Parasitic biology of the blowfly
Prof. Marilyn Renfree	Reproductive and developmental biology
Dr Charles Robin	Insect population genetics and molecular evolution
Prof. Ute Roessner	Abiotic stress adaptation and tolerance
Dr Kevin Rowe	Evolutionary ecology
Dr Michael Stumpf	Theoretical systems biology
Dr Gerard Tarulli	Development of reproductive tissues
Dr Kathryn Tiedje	Improving disease surveillance of malaria
Dr Allison van de Meene	Plant cell biology using high-end microscopy techniques
Dr Angela van de Wouw	Plant pathogen interactions
Dr Heroen Verbruggen	Marine genomics and microbiology
Dr Robert Walker	Plant, Soil & Microbe Interactions

Ecology and Evolutionary Biology

Research groups in the Ecology and Evolutionary Biology Domain address both fundamental and applied questions spanning the breadth of the two disciplines. Our research includes quantitative risk assessment, ecological and species distribution modelling, vegetation mapping, integrative pest and disease management, conservation biology, marine and fisheries management, and behavioural ecology. We ask questions at different levels of organization from individuals through to assemblages and study a broad array of organisms that span aquatic and terrestrial ecosystems.

Supervisors

Dr Simon Baxter	Applied pest control; Pest biology
Dr Joanne Birch	Plant Evolution
A/Prof. Anthony Boxshall	Marine ecology, coastal climate adaptation and environmental sciences
Dr Natalie Briscoe	Ecology and Global Change Biology
Dr Melissa Carew	Freshwater biological monitoring
A/Prof. Rob Day	Marine ecology, aquaculture, fisheries, climate change effects on marine animals
A/Prof. Tim Dempster	Marine ecology and aquaculture
A/Prof. Andrew Drinnan	Plant development, morphology, anatomy, architecture and evolution
Dr David Duncan	integrity of native ecosystems in human dominated landscapes
Prof. Mark Elgar	Evolutionary ecology
Dr Gurutzeta Guillera-Arroita	Quantitative ecology
Prof. Ary Hoffmann	Pest and environmental adaptation
Dr Luke Holman	Evolutionary ecology
Prof. Greg Jenkins	Marine ecology
Dr Therésa Jones	Behavioural ecology
A/Prof. Michael Kearney	Ecology and Evolution
Prof. Mick Keough	Marine Ecology
Dr Jose Lahoz-Monfort	Ecological modelling
Prof. Michael McCarthy	Ecology
Dr Kathryn McNamara	Evolutionary ecology
Dr Iliana Medina Guzman	Evolutionary ecology
Dr Rebecca Morris	marine ecology and coastal climate adaptation
Dr John Morrongiello	Marine and freshwater ecology
Prof. Raoul Mulder	Behavioural ecology
Dr Allyson O'Brien	Marine pollution, ecology, and environmental management
Dr Ben Phillips	Evolutionary ecology
Dr Nick Robinson	Aquaculture breeding and genetics
Dr Karen Rowe	Ecology and conservation using museum collections and acoustics
Dr Darren Southwell	Adaptive management and optimal monitoring of threatened species
A/Prof. Devi Stuart-Fox	Evolutionary ecology
Prof. Steve Swearer	Marine ecology, evolution, and environmental
A/Prof. Paul Umina	Invertebrate ecology
Prof. Madeleine van Oppen	Marine ecology and evolution
A/Prof. Peter Vesk	Vegetation ecology and management / CEED
Dr Fletcher Warren-Myers	Marine ecology and aquaculture
Dr Andrew Weeks	Conservation biology
Dr Matt West	Applied ecology
Dr Bonnie Wintle	Conservation ecology / CEED
Dr Jian Yen	Linking Theory and Data in Ecology

Prof. Alex Andrianopoulos - Microbial and developmental genetics

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Research Interests:

- Understanding the molecular genetic mechanisms that regulate cellular morphogenesis and virulence in the human pathogen *Talaromyces marneffei*.
- Understanding the molecular genetic mechanisms that regulate development in the eukaryotic model organism *Aspergillus nidulans*

Potential Projects:

- Genomic approaches to identifying and characterising genes important for infection
- Dissecting the molecular and cellular aspects of host-pathogen interactions
- Molecular genetic characterisation of transcriptional factors, and their circuits, controlling development



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Prof. David Balding - Statistical genomics

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Research Interests:

- Computational/statistical problems in population
- Evolutionary, medical and forensic genetics

Potential Projects:

- The population history of indigenous Australians: what can the available genetic data tell us?



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Prof. Phil Batterham - Neurogenetics, behaviour and systems biology in insects

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Research Interests:

- Role of insecticides in the demise of non-pest insect populations

Potential Projects:

- The molecular and cellular impact of insecticides in insects
- The impact of insecticides on insect behaviour and fitness
- The impact of insecticides on thermotolerance and immunity in insects



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Dr Simon Baxter - Applied pest control; Pest biology

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Research Interests:

- Genetic technology to improve insect pest control
- Evolution and spread of insecticide resistance
- Whole genome sequencing of insect pests
- Identifying mutations that influence adaptation

Potential Projects:

- Insect sex determination and sex chromosomes
- Evolution of insecticide resistance in Australian moths
- Bacillus thuringiensis insecticidal toxin receptor function
- CRISPR based gene drives



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Dr Joanne Birch - Plant Evolution

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Research Interests:

- Systematics of flowering plants
- Biogeography of Australasian and Pacific plant lineages
- Genome evolution in Australian monocotyledons
- Evolution of ecological and morphological diversity in Australian monocotyledons
- Integrative taxonomic approaches to species delimitation
- Molecular species delimitation methods

Potential Projects:

- Systematics and biogeography of Australasian monocotyledons
- Recovering relationships of Australasian Asteliaceae using whole chloroplast sequence data
- Evolution of genome size in Australian Asparagales
- Phylogeography of Caesia or Corynotheca species complexes



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Dr Berin Boughton - Spatial metabolomics and proteomics

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Research Interests:

Spatial metabolomics and proteomics applied to plant, animal and insect systems using Mass Spectrometry Imaging (MSI)

- Mass Spectrometry Imaging
- Eco-metabolomics
- Plant defence and adaptation
- Host-parasite interactions
- Endometriosis
-

Potential Projects:

- MSI Instrument and Method Development: Methods to spatially resolve isomers in living systems using UV photo dissociation gas phase chemistry, Development of high spatial resolution metabolite imaging using transmission geometry MALDI-MSI
- How does salt, drought and cold affect the expression and spatial distribution of proteins in cereal crops? (With Prof Ute Roessner)
- How does malaria affect metabolism during early life stages in the mosquito vector? (With Dr Dean Goodman and Prof Geoff McFadden)
- How does Industrial Hemp respond to fungal infection and can we prime the plant defence system to resist infection? (With Dr Rob Walker)
- What is the localised metabolic and proteomic profile of endometriosis? (With Dr Sarah Holdsworth-Carson)



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A/Prof. Anthony Boxshall - Marine ecology, coastal climate adaptation and environmental sciences

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Research Interests:

- Integrating environmental research into practice in Government
- Environmental impacts (plastics, faecal matter and other pollutants)
- Marine and Coastal adaptation to climate change.
- Ecological engineering and habitat restoration.
- Citizen science.
- Science Communication.

Potential Projects:

- Ecological impacts of microplastics in Port Phillip Bay. This project will involve collecting field data on microplastic fibres and running laboratory experiments to test if they accumulate in fish and invertebrates. (with Dr Allyson O'Brien and Prof. Mick Keough)
- Assessing the social acceptance of using nature-based coastal defence structures in Victoria (with Dr Beth Strain).
- I am interested in co-supervision for other MSc projects that have a demonstrable potential impact into policy, management, planning or regulation. My involvement will be focused on the integration of research outcomes into Government practice.



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Dr Natalie Briscoe - Ecology and Global Change Biology

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Research Interests:

- Climatic constraints and adaptation
- Species distribution modelling
- Ecophysiology
- Thermal ecology
- Conservation biology

Potential Projects:

- Investigating risk of heat stress in the greater stick-nest rat
- How does intra-specific trait variation affect species distributions?



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Dr Melissa Carew - Freshwater biological monitoring

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Research Interests:

- Aquatic macroinvertebrates
- Ecological impacts of aquatic pollution
- DNA barcoding
- Application of next-generation sequencing
- Environmental monitoring
- Molecular taxonomy
- Molecular ecology

Potential Projects:

- Using DNA barcodes to investigate the macroinvertebrate diversity and ecology in catchments
- Detecting environmental impacts on macroinvertebrates in the Yarra River using next-gen sequencing



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A/Prof. Rob Day - Marine ecology, aquaculture, fisheries, climate change effects on marine animals

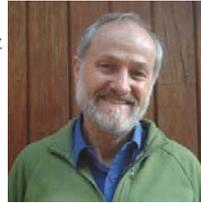
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Research Interests:

- Abalone aquaculture: growth, stress and immune function
- Climate change effects on aquaculture species
- Shark and shark fisheries population dynamics and management
- Reproductive biology of Sharks (With Dr Terry Walker)
- Evolutionary change due to domestication in aquaculture

Potential Projects:

- How abalone respiration is affected by Climate Change. No-one has yet studied abalone respiration under flow! As flow moves water over the gills, this project will break new ground, internationally. We will use the new method to investigate climate change effects.
- How Climate Change may affect abalone feeding, behaviour, and immunity. A 2nd student would partner to set up temperature and pH treatments, and look at behaviour, feeding, and immune function, with expert advice from Dr Sabine Roussel in France. We look forward also to student exchanges between France and our lab.
- Changes in behaviour and other traits between wild and farm abalone. Farm abalone have been selected for farm conditions. But the changes in many traits are unknown. This project would explore changes such as escape responses to predators, compared to wild abalone, again with advice from Sabine Roussel.



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A/Prof. Tim Dempster - Marine ecology and aquaculture

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Research Interests:

The lab works on many topics within sustainable aquaculture and fisheries, and more broadly in aquatic and terrestrial ecology. Within aquaculture, we try to solve the environmental and animal welfare problems aquaculture creates by working both inside and outside aquaculture systems.

- Environmental impacts
- Animal behaviour
- Host-parasite interactions
- Aquaculture technology

Potential Projects:

- Ecological effects of aquaculture in marine ecosystems (travel to Norway for research)
- Marine ecosystem rehabilitation using aquaculture techniques and technologies
- Parasite control and prevention in aquaculture (travel to Norway for research)



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A/Prof. Andrew Drinnan - Plant development, morphology, anatomy, architecture and evolution

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Research Interests:

I investigate the morphology and development of plants to model of plant architecture and evolution. Projects are available on all groups from liverworts to flowering plants. You will gain a wide range of core botanical knowledge and skills, including plant diversity and relationships, plant anatomy and developmental morphology, plant evolution, and microscopy techniques.

- Development and evolution of non-flowering land plants
- Floral development
- Plant anatomy and morphology
- Palaeobotany and the study of fossil plants

Potential Projects:

- Projects are available on all groups from liverworts to flowering plants



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Dr Michael Duffy - Malaria pathogenesis and nuclear biology

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Research Interests:

- The malaria parasite *Plasmodium falciparum* employs novel chromatin proteins to regulate gene expression in its pared back genome, some of these proteins are possible drug targets. *P. falciparum* also employs a diverse armoury of variant surface proteins to hide from immunity, but only some of these proteins cause severe disease and possibly they could be used in a life-saving vaccine.

Potential Projects:

- Drug targets: Characterising mutated chromatin proteins in parasites for their effect on parasite growth and gene regulation
- Developing novel assays for screening compounds that inhibit malaria parasite gene regulatory proteins
- Vaccines: Identifying full length genes encoding variant antigens that have vaccine potential.
- Determining whether variant antigens elicit the broadly reactive antibody responses required for a vaccine.



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Dr David Duncan - integrity of native ecosystems in human dominated landscapes

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Research Interests:

I am an applied plant ecologist interested in the integrity of native ecosystems in human dominated landscapes. Consequently, my research involves plant reproductive biology, native vegetation management, ecological restoration, monitoring design and the evaluation of conservation interventions.

- Native vegetation management
- Evaluation of environmental interventions and programs
- Monitoring design
- Pollination ecology
- Restoration ecology
- Ecological modelling

Potential Projects:

- Adaptive management of threatened ecological communities
- Determining reproductive age limits in long-lived *Allocasuarina luehmannii*
- Population viability analysis for keystone habitat species
- Expert opinions of native vegetation offsets; trading size and quality
- Vertebrate herbivore impacts on threatened species and communities



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Dr Berit Ebert - Metabolomics and proteomics

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Research Interests:

- glycosylation
- plant cell wall
- membrane transporters
- glycosyltransferases
- subcellular partitioning
- endomembrane & Golgi apparatus
- protein-protein interactions
- cell wall analytics

Potential Projects:

- Investigating the functions of glycosyltransferases involved in cell wall biosynthesis
- Studying Golgi transporter mutants required for glycan biosynthesis
- Determining protein-protein interactions required for cell wall biosynthesis
- Using live cell imaging to study the localization of Golgi-localized proteins



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Prof. Mark Elgar - Evolutionary ecology

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Research Interests:

- Animal behaviour
- Chemical communication
- Mating strategies
- Sexual conflict
- Social behaviour
- Signals and inter-specific mutualisms

Potential Projects:

- Anti-aphrodisiac signals in beetle mating systems
- Role of familiarity in nest defence in ants
- Significance of amino acids in ant dietary preferences
- Impact of air pollution on insect chemical sensory perception



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Dr Mary Familiari - Developmental biology

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Research Interests:

We use techniques of cell and molecular biology to investigate the early development of possum embryos, gonad development (mouse and human) and the effects of pollution on human placental.

Potential Projects:

- Effect of air pollution particles on human placental function
- Biomarker discovery for human ovarian integrity and function



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Dr Jane Fenelon - Reproductive and developmental biology

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Research Interests:

My research focuses on two main research areas: embryonic diapause as a model for embryo-uterine communication and echidna development and reproduction

- Embryonic diapause
- Uterine-embryo signalling
- Embryo development
- Echidna embryology
- Echidna sexual development and differentiation
- Comparative reproduction.

Potential Projects:

- Early embryonic and post-natal development of the echidna
- Embryonic diapause and uterine-embryo communication



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Dr Alex Fournier-Level - Adaptive evolution

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Research Interests:

My group focuses on adaptive evolution, primarily in natural plant populations. We are particularly interested in adaptation to climate change and evolution of resistance to herbicide/insecticide

Potential Projects:

- **Parallel evolution: the many roads leading to Rome.** A genome contains thousands of genes that can all mutate in multiple ways, but yet we observe very recurrent patterns of evolution in a handful of key genes. Using the best curated data on the genomics of life history, we are interested in studying recurrent but independent evolution so that genome-wide association can detect the extent of parallel evolution.
- **From home court advantage to home court consistence.** Local adaptation whereby a local strain has evolved an adaptive advantage in widespread. However, in times of uncertainty about future climates, we are interested in understanding how organisms can introduce some variation in their traits to explore different evolutionary strategy. In particular, we want to test if individuals tend to show more random trait variation when exposed to climates that are more foreign to them.



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Dr Stephen Frankenberg - Mammalian early development and stem cells

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Research Interests:

- Marsupial stem cells and germ cells
- Evolution of reproduction and development in vertebrates
- Gene editing technologies with application to conservation
- Genomics

Potential Projects:

- Conferring resistance to cane toad toxin in the northern quoll by gene editing



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Dr Irene Gallego Romero - Human evolution, genomics and stem cells

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Research Interests:

- Human evolution
- Pluripotent stem cells as model for human evolutionary biology
- great ape diversity
- The peopling of Island Southeast Asia and Remote Oceania
- Archaic hominin introgression

Potential Projects:

- Genetic diversity in public chimpanzee data sets: truly representative of the species?
- Dissecting the molecular basis of human adaptation to high altitude in the Andes and the Himalayas
- How robust are gene regulatory networks between populations?
- Developing a comprehensive chimpanzee transcriptome
- Mapping differences protein-protein interactions across three islands in Indonesia
- Investigating the portability of polygenic risk scores across populations (cosupervised with Dr David Ascher)
- Genetic mechanisms behind torpor in the mountain pygmy possum (cosupervised with Dr Andrew Weeks)



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Prof. David Gardner - Reproductive biology

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Research Interests:

- Human IVF
- Preimplantation embryo culture
- Nutrition
- Metabolism
- Embryo viability
- Biomarkers
- Epigenetics
- Metabolic function
- Metaboloepigenetics
- Cryobiology

Potential Projects:

- The role of antioxidants in regulating human sperm function and viability
- Analysis of preimplantation embryo development through time-lapse microscopy and algorithms
- Vitrification of human ovarian tissue and oocytes
- Regulation of embryo and fetal development by growth factors and cytokines
- Role of antioxidants in maintaining the function of embryonic stem cells



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Dr John Golz - Developmental regulation and Translational research

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Research Interests:

Our group uses a combination of genetics, molecular, and cellular biology to investigate seed development. Specifically, we are interested in knowing how cell types are specified during the early stages of embryogenesis and in identifying the genetic pathways regulating cellular differentiation in the protective layers surrounding the developing embryo - the seed coat. We are interested in improving genetic transformation technology for the rapid characterisation of agronomically important genes in crop plants. This technology will then be applied to the modification of seed size and fatty acid content in crop plants such as the superfood chia.

Potential Projects:

- Investigating seed size control in plants
- Developing transformation and gene editing technologies for Chia
- Role of cell wall modifying genes in the developing seed coat
- Metabolic control of post-translational modifications in embryo development (with the Haydon group)



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Dr Jason Goodger - Plant natural products

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Research Interests:

- Bioprospecting pharmaceuticals from Australian plants
- Plant-animal interactions mediated by plant chemicals

Potential Projects:

- Pharmaceutical flavonoids from Eucalyptus: the beginnings of a new industry. In collaboration with Gretals Australia Pty Ltd
- Commercial eucalyptus oil plantations: growing super trees for the future. In collaboration with FGB Natural Products

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Dr Mark Green - Reproductive biology

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Research Interests:

- Assisted reproductive technologies
- Environmental endocrine disruptors
- Developmental origins of adult disease
- Oocyte quality
- Embryo development
- Sperm microfluidics
- Mitochondrial function
- In vitro fertilisation
- Phenotype of IVF children
- Health of cloned animals
- Sex ratio
- Anti-oxidants and reproduction

Potential Projects:

- Determining the effects of endocrine disruptors and pollutants on embryo development and metabolism, as well as sperm quality
- Investigating the effects of exposure to endocrine disruptors on human fertility and health
- In vitro culture supplements to improve oocyte maturation systems for human and animal embryo culture



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Dr Gurutzeta Guillera-Arroita - Quantitative ecology

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Research Interests:

- Ecological modelling
- Ecological statistics
- Species distribution modelling
- Community modelling
- Wildlife monitoring
- Imperfect detection
- Optimal survey design

Potential Projects:

- Identifying optimal approaches for plant abundance estimation



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Dr Alexandra Harvey - Embryonic stem cells

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Research Interests:

- Extracellular environment
- The legacy of culture on cell function
- Metabolism, mitochondria, cell signalling, oxygen regulation, redox, endocrine disrupting chemicals, neural differentiation, epigenetics

Potential Projects:

- Defining the impact of culture on induced pluripotent stem cell quality and metabolism
- Redox regulation of uncoupling proteins in embryonic stem cells



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Dr Mike Haydon - Plant cell signalling

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Research Interests:

We use genetics, chemical genetics and molecular biology to understand cell signalling networks in plants. We consider these pathways in the context of light sensing and photosynthesis to define their contribution to plant physiology and development. Our research covers cell signalling, cell wall biology, circadian biology and plant physiology.

Potential Projects:

- Post-transcriptional regulation of the circadian clock by nutrients and metabolism
- Role of circadian rhythms for shelf-life of vegetables
- Probing sugar signalling pathways with kinase inhibitors
- Translational regulation of the circadian clock by uORFs



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Prof. Joshua Heazlewood - Plant biochemistry

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Research Interests:

- cell walls
- mass spectrometry
- proteomics
- bioinformatics
- membrane transport
- subcellular partitioning
- metabolism
- endomembrane
- Golgi apparatus

Potential Projects:

- Analysis of Golgi transporters delivering substrates for plant cell walls
- Characterization of GPI anchor proteins from plants by tandem mass spectrometry
- Bioinformatic analysis and data visualization of plant protein data
- Identification of N-glycan binding proteins from plants by tandem mass spectrometry



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Prof. Ary Hoffmann - Pest and environmental adaptation

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Research Interests:

- Environmental stress adaptation
- Integrated management of agricultural pests
- Novel approaches for suppressing arboviral disease vectors

Potential Projects:

- Exploring bacterial symbionts for agricultural pest control
- Understanding environmental effects of antibiotics on Wolbachia infected mosquitoes



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Dr Luke Holman - Evolutionary ecology

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Research Interests:

- Evolutionary ecology
- Sexual selection/conflict
- Social evolution
- Evolutionary constraints
- Animal signals
- Selfish genes
- Phenotypic plasticity
- Theoretical models

Potential Projects:

- Measuring intragenomic conflict using quantitative genetics in insects
- Experimental evolution in insects - removing selection on one sex to see how the other evolves
- Searching for queen pheromones in Australian social insects



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Dr Alexander Idnurm - Fungal biology

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Research Interests:

- Host-pathogen interactions
- Plant pathology
- Medical mycology
- Evolution of mating-type determination

Potential Projects:

- Identification of virulence factors in *Leptosphaeria maculans* or *Cryptococcus neoformans*
- Genetics of ballistospore formation and release in basidiomycete fungi
- Molecular tool development in fungi relevant to the grains industry
- Mechanisms of antifungal drug resistance



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Prof. Greg Jenkins - Marine ecology

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Research Interests:

- Fish ecology
- Connectivity
- Recruitment variability
- Fish-habitat relationships
- Early life history of fish
- Environmental impacts
- Seagrass ecology
- Environmental risk assessment
- Biophysical modelling

Potential Projects:

- Effects of suspended sediments and other environmental impacts on marine fish ecology and behaviour
- Planktonic food-chain pathways to larval fish feeding and recruitment variability
- Ecology of reef fish in Port Phillip Bay



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A/Prof. Alex Johnson - Plant and food biotechnology

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Research Interests:

- Plant nutrition
- Genetic engineering
- Plant cell and molecular biology
- Biofortification

Potential Projects:

- Genome editing of rice to improve nutrition
- Allelic diversity of genes essential for micronutrient transport in wheat
- Field trials of genetically modified wheat with iron-enriched grain



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Dr Therésa Jones - Behavioural ecology

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Research Interests:

- Invertebrate mating systems
- Sexual selection
- Ecological light pollution

Potential Projects:

- Behavioural responses to multi-modal pollutants



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Dr Patricia Jusuf - Neural development and regeneration

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Research Interests:

Using the zebrafish model to understand gene networks during vertebrate development with a focus on visual neuroscience; and pro-regenerative signals that drive adult nerve cell regeneration

Potential Projects:

- Role of genes governing neural subtype specification during development
- Characterising regenerative processes in models of visual disorders
- Studying visual endophenotypes to understand complex neurological function



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A/Prof. Michael Kearney - Ecology and Evolution

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Research Interests:

- Climatic constraints and adaptation
- Niche and distribution modelling
- Life history
- Biophysical ecology
- Ecophysiology
- Metabolic theory
- Biogeography
- Parthenogenesis

Potential Projects:

- Climatic adaptation and habitat restoration in grasshoppers
- Ecology and life history of wolf spiders
- Ecological consequences of parthenogenesis (all-female reproduction)



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Prof. Mick Keough - Marine Ecology

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Research Interests:

- Resilience of invertebrate communities to natural and anthropogenic disturbances
- Evolutionary biology of invertebrate larvae

Potential Projects:

- Resilience of nearshore ecological communities to disturbance
- Can marine invertebrates adjust their reproductive behaviour in response to environmental stress?



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Dr Jose Lahoz-Monfort - Ecological modelling

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Research Interests:

- Ecological modelling
- Statistical ecology
- Conservation technology
- Species distribution modelling
- Wildlife monitoring
- Demography and population dynamics.

Potential Projects:

- Testing the detection performance of a novel low-cost open-source acoustic sensor



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Dr Edwin Lampugnani - Plant Evolution and Development

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Research Interests:

I use two genetic model systems from opposite ends of the evolutionary spectrum of land plants, the flowering plant *Arabidopsis* and the liverwort *Marchantia*, to better understand the molecular mechanisms of polysaccharide synthesis.

- Plant Evolution and Development
- Plant cell wall synthesis
- Protein-protein interactions
- Intracellular trafficking
- Live cell imaging

Potential Projects:

- How did vascular tissues evolve in plants?
- Cloning and characterisation of genes encoding polysaccharide synthases
- Using CRISPR technology to modify plant cell walls
- Determining evolutionarily conserved protein-protein interactions in cell wall synthesis



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Prof. Stephen Leslie - Statistical and population genetics

[Back to top](#) | [Melbourne Integrative Genomics](#) | [Molecular, Cellular and Developmental Biology](#)

Research Interests:

Developing methods for, and applying them to, studies of population structure and immunogenetics including:

- methods for detecting and controlling for population structure
- human population structure and population history
- indigenous genomics
- imputation of HLA alleles and other complex loci
- the population genetics of HLA
- disease studies, including GWAS and beyond
- autoimmune diseases
- indigenous genomics
- imputation of HLA alleles and other complex loci
- the population genetics of HLA
- disease studies, including GWAS and beyond
- autoimmune diseases

Potential Projects:

- Project on statistical and population genetics



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Prof. Michael McCarthy - Ecology

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Research Interests:

- Ecological modelling
- Environmental decisions
- Fire ecology
- Imperfect detection

Potential Projects:

- Models to improve environmental management decisions
- Factors driving imperfect detection in ecological monitoring
- Modelling to improve fire management for biodiversity
- Testing environmental decision theory



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Prof. Geoffrey McFadden - Malaria and endosymbiosis

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Research Interests:

The McFadden Lab identifies new drug targets in the malaria parasite and seeks strategies to control the ever increasing problem of drug resistance. We work with human and rodent malaria models and have a complete life cycle facility in which we infect mosquitoes to study transmission of the disease from vertebrate to vertebrate via insects.



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Potential Projects:

- Learning parasite molecular genetics, high end microscopy, and potentially some insect or mouse work for suitable students

Dr Kathryn McNamara - Evolutionary ecology

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Research Interests:

- Sexual selection/conflict
- Chemical communication
- Invertebrate immunology



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Potential Projects:

- The costs of immunity on sexually selected traits
- The gut microbiome and sexually selected trait
- The effect of diet on chemical signalling

Dr Iliana Medina Guzman - Evolutionary ecology

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Research Interests:

Our group uses a combination of field based experiments, laboratory experiments, and comparative analyses to understand the evolution of behaviours and ecological strategies in animals.

- Behavioural and evolutionary ecology
- Macroevolution
- Avian brood parasitism



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Potential Projects:

- The evolution of enclosed nests in Australia
- Genetic differentiation in an Australian aposematic bug
- Toxicity and colour evolution in aposematic bug

Dr Rebecca Morris - marine ecology and coastal climate adaptation

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Research Interests:

Applying ecological engineering techniques to develop novel methods for shoreline protection using a diversity of restored or created coastal habitats (e.g., mangroves, saltmarsh, seagrass, kelp and shellfish reefs).

Potential Projects:

- Creating windows of opportunity in mangrove restoration
- Developing novel biodegradable materials for use in living shorelines and restoration (with Dr Rackel San Nicolas, Infrastructure Engineering)
- The missing ecosystem service: assessing wave attenuation of kelp beds
- Spatial prioritisation of nature-based coastal defence under climate change (with Dr Rebecca Runtung, School of Geography)
- Ecological data to inform shellfish reef living shorelines



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Dr John Morrongiello - Marine and freshwater ecology

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Research Interests:

- Climate change impact & adaptation
- Evolutionary & behavioural ecology
- Sustainable fisheries
- River regulation and habitat restoration
- Life histories

Potential Projects:

- Fishing and climate change impacts on fish growth (with Prof Steve Swearer)
- Connectivity, demography and stock size of Victorian pipis



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Prof. Raoul Mulder - Behavioural ecology

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Research Interests:

- Animal behaviour
- Social behaviour
- Mating systems
- Sexual selection
- Cooperation
- Communication anthropogenic impacts

Potential Projects:

- Ecology and evolution of animal personalities
- Impacts of anthropogenic noise and light on sleep and communication
- Movement ecology of urban wildlife



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Dr Michael Murray - Developmental genetics of Drosophila

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Research Interests:

My lab studies the genetic regulation of morphogenesis with a focus on epithelial plasticity: the ability of cells to change from stationary epithelial cells to migratory cells and back again. These mechanisms play crucial roles during development, cancer and wound-healing.

- Genetic regulation of epithelial-mesenchymal plasticity (EMT/MET) during Drosophila development
- molecular mechanisms of epithelial polarisation in Drosophila and mammalian cells
- Netrins and wound healing
- Modelling cancer metastasis in the fly
- Hox gene regulation of epithelial morphogenesis.



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Potential Projects:

- The role of Netrins in wound healing and epithelial closure in Drosophila
- Regulation of enteroblast migration and MET in the adult fly gut

A/Prof. Ed Newbigin - Pollen biology

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Research Interests:

- Plant cell wall synthesis
- Plant breeding systems
- Self-incompatibility



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Potential Projects:

- Cell wall synthesis in pollen tubes
- Self-incompatibility in wild radish

Dr Allyson O'Brien - Marine pollution, ecology, and environmental management

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Research Interests:

- Multiple stressors in urban estuaries
- Marine pollution
- eDNA metabarcoding
- Citizen science

Potential Projects:

- Ecological impacts of microplastics in Port Phillip Bay. This project will involve collecting field data on microplastics fibres and conducting laboratory experiments to test if they accumulate in fish and invertebrates. (with Anthony Boxshall and Mick Keough)
- Multiple stressor impacts caused by built infrastructure. Field and laboratory work investigating interactive effects of stressors caused by built infrastructure including toxicants, artificial light, and habitat complexity (with Rebecca Morris)



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Prof. Andrew Pask - Comparative genomics of development and disease

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Research Interests:

- Urogenital development
- Marsupial genomics
- Genome evolution and function
- Endocrine disruption
- Bioinformatics, Epigenetics, Developmental biology

Potential Projects:

- Effects of endocrine disruption on genome biology in mammals
- Developmental biology and genomics of the fat-tailed dunnart
- The role of long non-coding RNAs in the regulation of urethral closure and urogenital diseases



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Dr Trent Perry - Insecticide biology, Neurogenetics, Parasitic biology of the blowfly

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Research Interests:

The focus of our research is to understand, safeguard and improve insect control strategies. Using both model and pest insects, we apply a mixture of genetics, 'omics' and molecular techniques such as CRISPR to interrogate;

- **Insecticide biology**
- determining how insecticides work, what the responses of insects are to acute and chronic exposures and how insects might become resistant
- **Neurogenetics**
- examining nicotinic acetylcholine receptor assembly and trafficking, how specific mutations impact receptor function and the role of these receptors in insect behaviour and development
- **Parasitic biology of the Australian sheep blowfly, *Lucilia cuprina***
- understanding how flies detect their hosts, establish myiasis (flystrike) and evade host responses.

Potential Projects:

- Genetic analysis of neuronal circuits impacted by insecticides
- Structural and functional studies on the nAChR subunits using domain swapping and CRISPR
- Parasitic biology of the Australian sheep blowfly, *Lucilia cuprina*;



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Dr Ben Phillips - Evolutionary ecology

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Research Interests:

- Ecological modelling
- Invasive species
- Animal behaviour
- Host-parasite interactions
- Daphnia reptiles, amphibians

Potential Projects:

- Not taking projects for 2020



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Prof. Marilyn Renfree - Reproductive and developmental biology

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Research Interests:

Our group studies reproduction and development in health and disease using marsupials and monotremes as biomedical models.

- Reproductive biology of marsupials and monotremes
- Developmental biology
- Sex determination
- Sexual differentiation
- Endocrine disruption
- Epigenetics
- Genomic imprinting
- Embryonic diapause
- Lactation and growth
- Limb development
- Innate immunity
- Comparative genomics.

Potential Projects:

- Control of growth and development in marsupials: a model for obesity
- Regulatory mechanisms of testicular and ovarian development and the role of long non-coding RNAs
- Gene and hormonal control of appendage (e.g. limbs and phallus) differentiation
- Marsupials as models for disorders of sexual development including sex reversal and hypospadias
- Early embryonic and post-natal development of the echidna
- Genomic imprinting and epigenetic control of germ cell reprogramming during early development



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Dr Charles Robin - Insect population genetics and molecular evolution

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Research Interests:

What is the role of adaptation in the shaping variation within and between species? We focus on insecticide resistance as our microevolutionary model, and the comparative genomics of enzymes from various insects in inter-species comparisons. Our applied aim is to control pests with methods that do not have adverse impacts on biodiversity eg. gene drives, RNAi or specific enzyme inhibitors

Potential Projects:

- Gene drives for insect control
- Characterizing potential targets for novel insecticides
- Pest insect genomics, population genetics and genetic manipulation
- Genome wide associations with novel insecticides
- Biotechnology applications of insect enzymes



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Dr Nick Robinson - Aquaculture breeding and genetics

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Research Interests:

- Design of genetic improvement programs
- Gene mapping
- Genomics
- Epigenetics
- Genomic selection
- Stress
- Disease resistance

Potential Projects:

- Nutritional programming to steer the development of Atlantic salmon fillet quality
- Mapping genes affecting disease and stress resistance in fish and shellfish
- Genomic selection to improve the disease resistance of fish and shellfish
- Development of integrated aquaculture in Africa



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Prof. Ute Roessner - Abiotic stress adaptation and tolerance

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Research Interests:

- Cereal crops
- Functional genomics
- Metabolomics
- Analytical biochemistry
- Root functions
- Water use efficiency
- Nutrient use efficiency

Potential Projects:

- Define the molecular basis of Root-Soil-Microbe interactions
- Understanding the importance of plasma membrane compositions of roots under adverse environments
- Define the biochemical basis of signalling networks between roots and shoots



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Dr Karen Rowe - Ecology and conservation using museum collections and acoustics

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Research Interests:

Research in my lab covers a range of projects and taxonomic groups (primarily birds) and relies heavily on museum collections, field notes, biodiversity surveys, and fieldwork. Current topics include the use of bioacoustics to improve our understanding of species' distributions in the present as well as how they change over time, threatened species monitoring, and emerging infectious diseases

Potential Projects:

- Acoustic monitoring of vocally-active species
- The influence of anthropogenic noise on singing activity in birds
- The use of soundscapes to quantify species richness in biodiversity hotspots
- Emerging infectious diseases of Indo-Australian birds
- Understanding historical change in the distribution of Victorian threatened species



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Dr Kevin Rowe - Evolutionary ecology

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Research Interests:

Discovering species and documenting their ecology, distribution and diversity (taxonomy and natural history). Resolving the evolutionary history of species and their adaptive radiations (phylogenetic systematics). Understanding the geographic context of speciation (biogeography). Quantifying phenotypic evolution and convergence (morphology). Exploring the evolution of genomes and biodiversity (molecular evolution). Testing and mitigating human impacts on biodiversity (conservation biology). Developing museum collections through fieldwork and biological inventories (field biology). Mostly rats!

Potential Projects:

- Distribution and population monitoring of the endangered Smoky Mouse in Victoria (field based)
- Climate change and decline of the threatened Broad-toothed Rat in Victoria (field based)
- Population structure and genetic diversity of the endangered Smoky Mouse (lab based)
- Morphological evolution, biogeography and diversification of Muridae (field and lab based)
- Microbiomes and diet metabarcoding of Indonesian rodents (field and lab based)
- Comparative biogeography of Indonesian rodents (field and lab based)



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Dr Darren Southwell - Adaptive management and optimal monitoring of threatened species

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Research Interests:

- Optimal monitoring
- Adaptive management
- Metapopulations
- Population dynamics
- Structured decision-making
- Ecological modelling

Potential Projects:

- Relationships between predator activity, predator density and Malleefowl breeding activity



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A/Prof. Devi Stuart-Fox - Evolutionary ecology

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Research Interests:

- Behavioural and sensory ecology
- Animal coloration: mechanism, function and evolution
- Macro-ecological patterns of colour diversity

Potential Projects:

- Mimicry complexes in beetles
- Mechanisms producing iridescent and metallic colours in beetles
- Links between colour pattern diversity and climate in beetles and butterflies. Co-supervised with Dr. Iliana Medina.
- Camouflage in metallic and mirror-like beetles. Co-supervised with Dr. Amanda Franklin.



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Dr Michael Stumpf - Theoretical systems biology

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Research Interests:

- Regulatory and signalling networks
- Multiscale models of biological systems
- Mechanistic models for cellular machines, evolutionary theory and statistical inference

Potential Projects:

- Project on theoretical systems biology



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Prof. Steve Swearer - Marine ecology, evolution, and environmental

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Research Interests:

- Fish and fisheries ecology
- Eco-evolutionary dynamics
- Aquaculture
- Ecological engineering and habitat restoration
- Ecotoxicology
- Marine and coastal biogeochemistry

Potential Projects:

- Maximizing the benefits of aquatic habitat restoration for animals
- Unravelling the biomolecular and biochemical mechanisms of fish otolith and eye lens formation and growth (with Dr Oliver Thomas and Dr Berin Boughton)
- Assessing ecosystem service co-benefits of nature-based coastal defence (with Dr Becki Morris)
- Fishing and climate change impacts on fish growth (with Dr John Morrongiello)



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Dr Gerard Tarulli - Development of reproductive tissues

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Research Interests:

My research investigates the role of sex steroid hormones in the development of reproductive organs, in particular the phallus, mammary gland and gonads. I study how cells communicate with one another to execute these complex developmental processes.

- Reproduction and development
- Marsupials
- Biomedical models
- Health
- Disease
- Sex determination
- Sexual differentiation
- Epigenetics
- Molecular and hormonal regulation
- Gonad and phallus
- Echidna development
- Embryonic diapause
- Genomic imprinting
- Placenta
- Germ cells
- Comparative genomics
- Transcriptomics
- Innate immunity
- Limb development



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Potential Projects:

- How do sex steroids control phallus development?

Dr Kathryn Tiedje - Improving disease surveillance of malaria

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Research Interests:

Our group combines genomics, computational biology, and molecular epidemiology approaches to population-based studies of malaria to better improve disease surveillance. Using high quality field study data and current genomic technologies we are interested in investigating the role that *Plasmodium falciparum* genetic diversity plays in modulating the dynamics of infection, in influencing susceptibility to disease, and in regulating transmission from humans to mosquitoes.

Potential Projects:



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- Investigating genetic polymorphisms and antigenic diversity of *P. falciparum* from a longitudinal cohort study in West Africa
- Monitoring the effects of malaria control programmes on the genetic epidemiology of the *P. falciparum* reservoir

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A/Prof. Paul Umina - Invertebrate ecology

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Research Interests:

Our research focuses on sustainable pest control and insecticide resistance. Working closely with industry, we help develop new tools to combat insect pests, preserve biodiversity and improve biosecurity efforts.

- Sustainable agriculture
- Integrated pest management
- Insecticide resistance
- Invasion ecology
- Biocontrol

Potential Projects:

- Insect pests and novel approaches for sustainable control
- Insecticide resistance: mechanisms, modelling and monitoring
- Genetics and ecology of beneficial insects in agricultural eco-systems



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Dr Allison van de Meene - Plant cell biology using high-end microscopy techniques

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Research Interests:

- Cell walls
- Intracellular trafficking
- Secretion and recycling
- Live cell imaging
- Electron microscopy & tomography

Potential Projects:

- Using live cell and electron microscopy imaging to investigate trafficking and the cell wall
- Understanding heterogeneity in cell walls and extracellular matrices in plants and algae
- Investigation of probes for correlative imaging



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Dr Angela van de Wouw - Plant pathogen interactions

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Research Interests:

- Evolution of plant resistance and pathogen virulence
- Canola (*Brassica napus*) pathogens

Potential Projects:

- Determining the impact of plant selection on pathogen evolution
- Identification of antifungal drug resistance mechanisms



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Prof. Madeleine van Oppen - Marine ecology and evolution

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Research Interests:

- Coral microbial symbiosis
- Climate change adaptation and acclimatisation
- Assisted evolution in reef-building corals/coral reef restoration

Potential Projects:

- Engineering algal symbionts that increase coral climate resilience (experimental evolution, genetic engineering)
- Development of a bacterial probiotic that enhances coral bleaching tolerance



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Dr Heroen Verbruggen - Marine genomics and microbiology

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Research Interests:

- Environmental microbiology
- Comparative genomics
- Marine algae
- Bioinformatics
- Evolutionary biology

Potential Projects:

- Evolutionary genomics of algae
- Symbiosis and holobiont functioning using metagenomics
- Deriving biodiversity knowledge from metagenome data
- Reconstructing the algal Tree of Life
- Integration of diverse data sources to understand speciation and biodiversity



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A/Prof. Peter Vesk - Vegetation ecology and management / CEED

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Research Interests:

- Plant ecology
- Plant functional traits
- Native vegetation management
- Ecological modelling

Potential Projects:

- Predicting tree species responses to environment and drought with traits
- Trait-based models of Eucalypt species distribution
- Post fire growth in shrubs and relations with traits



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Dr Robert Walker - Plant, Soil & Microbe Interactions

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Research Interests:

- Plant-microbe interactions
- Microbial phosphate cycling
- Plant growth promoting rhizobacteria
- Rhizobia-legume interactions
- Geomicrobiology

Potential Projects:

- Development of superior phosphate solubilising plant growth promoting rhizobacteria
- Investigating the role of clay degrading microbes in phosphate solubilisation
- Using mass spectrometry to identify signal molecule exchange between bacteria and plants under phosphate starvation



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Dr Fletcher Warren-Myers - Marine ecology and aquaculture

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Research Interests:

- Mass marking techniques for fisheries
- Aquaculture technology

Potential Projects:

- Refining roe production for sea urchin aquaculture



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Dr Andrew Weeks - Conservation biology

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Research Interests:

- Population genetics
- Ecological genetics
- Host-parasite interactions
- Environmental DNA

Potential Projects:

- Genetic rescue in Victorian eastern barred bandicoots
- Bioinformatics of genetic rescue; detecting signatures of inbreeding, outbreeding and local adaptation in the mountain pygmy possum
- Environmental DNA as a novel method for estimating freshwater biodiversity



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Dr Matt West - Applied ecology

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Research Interests:

- Threatened species conservation and management
- Wildlife population dynamics
- Disease ecology including host-reservoir interactions
- Captive breeding and reintroduction
- Ecological modelling
- Frogs, Fish and Fungus (Chytrid) plus things that fly (birds and bats)

Potential Projects:

- Manipulating environmental and trophic interactions to reduce disease risk for threatened frogs.
- Using sound recorders to understand wildlife (frog and bird) populations. This project is supported by Industry.
- Developing improved (non-invasive) strategies to monitor threatened amphibians during mark-recapture programs.
- How far can frogs hop? Understanding movement and dispersal to inform management of threatened frogs.
- Why do frogs produce an odour? This research may be undertaken with Zoo Industry partners



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Dr Bonnie Wintle - Conservation ecology / CEED

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Research Interests:

- Meta-science ('the science of science')
- Reliability and generalisability of research
- Judgement and decision making
- Expert elicitation
- Environmental science (biosecurity, risk assessment)
- Plant ecology

Potential Projects:

- Surveying researchers' attitudes / understanding / opinions about issues in meta-science (e.g. replicability and generalisability of scientific findings, open science).
- Systematic review: How variable is evidence to support particular conservation decisions?



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Dr Jian Yen - Linking Theory and Data in Ecology

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Research Interests:

- Theoretical ecology
- Mathematical modelling
- Population dynamics
- Community ecology
- Size- and trait-based ecology
- Macroecology

Potential Projects:

- Developing size- or trait-based macroecological theories
- Comparing size-based population models from fisheries and forestry
- Modelling size structure in aquatic and terrestrial systems
- Developing functional measures of beta diversity



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