



School of BioSciences

Beyond Third Year – MSc/Hons Research 2019 Project Information

The primary research-training program offered by the School of BioSciences is a two-year postgraduate degree - the Master of Science (Biosciences). This consists of a research component combined with a selection of coursework subjects that include professional development skills. The MSc degree provides a pathway to the workforce or to a PhD. The School also offers a one-year undergraduate Honours degree, which combines a research component with coursework.

How to find a project and supervisor:

Come to the **BioSciences MSc/Hons Information Session (11:30am -2pm on Friday September 14th September 2018 in G26/G27 BioSciences 1, followed by a chat over lunch (12:45pm 2pm) with staff and current students.**

You should review the specialisations within the school and decide on an area of research that interests you. Groups are listed below - there are a number of supervisors within each group who can provide supervision. While supervisors have been placed into broad research themes, all engage in interdisciplinary approaches across multiple themes. Before contacting a potential supervisor, look at the type of research they do either via the School's web pages <http://www.biosciences.unimelb.edu.au/>, or by looking at their recent publications on Google Scholar – <http://scholar.google.com.au/> (simply search for the supervisor's name).

Prior to or after the information session, approach potential supervisors in research areas that interest you and discuss projects on offer. When you email a potential supervisor, please include a transcript of your academic record (you can print out your current record from SIS). Arrange a time to meet them in person. Most supervisors within the School of BioSciences take on only one or two students per year, so our intake is competitive and places are limited.

Take time to discuss available projects; it is important that you choose an area of research that interests you. Once you have identified projects, fill out the MSc/Hons supervision form and include this in your MSc/Hons application and for most rapid admission have the supervisors sign the form. It may be some potential supervisors cannot make a commitment at this time point. You may therefore include several potential supervisors. Successful applicants will be notified in December, and all applicants will be advised of the outcomes of their applications by the end of January 2018. In some cases, particularly if external partners are involved, negotiations for projects can continue and additional offers will be made until the end of February. Some supervisors may also offer a project that has a mid-year start date, as this better suits the fieldwork requirement for the research.

Masters Coordinators 2019:

Dr Alexander Idnurm: alexander.idnurm@unimelb.edu.au

Dr Heroen Verbruggen: heroen.verbruggen@unimelb.edu.au

Honours Coordinator 2019:

Dr Mike Haydon: m.haydon@unimelb.edu

Research in the School of BioSciences

Plant Sciences

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 Science 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 sciences field are eligible for support in the form of the generous scholarships and awards from the Botany Foundation (<http://science.unimelb.edu.au/engage/giving-to-science/botany-foundation>).

Genetics, Genomics and Development

The study of gene regulation, disease and the genetics of organisms and populations is revolutionising the research fields of development, reproduction, biotechnology and medicine.

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.

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!

Cardiovascular Physiology

The Cardiovascular Physiology Group studies how blood vessels are damaged in cardiovascular disease and investigates new treatments for vascular dysfunction. Diseases of interest include; acute heart failure, hypertension in pregnancy and diabetes.

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.

Microbial Genetics

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.

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.

Ecology, Evolution and Environmental Sciences

Sustainable use and management of environments requires knowledge of the relationships between living organisms and their environment, what processes are fundamental to

ecosystems, and how these and other factors affect the persistence of species and plant communities.

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.

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.

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;
- Productivity of aquaculture and technologies to improve its environmental performance; and
- Ecological aspects of marine protected areas and fisheries management.

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 hub of the [National Environmental Science Program \(NESP\)](#).

Plant Functional Genomics

Assoc. Prof. Ute Roessner (u.roessner@unimelb.edu.au)

Profile: <http://scholar.google.com.au/citations?user=aTmdqpYAAAAJ&hl=en>

Research interests:

Abiotic stress adaptation and tolerance in

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



Potential MSc 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

Dr Berin Boughton (baboug@unimelb.edu.au)

Profile: https://scholar.google.com.au/citations?user=iiUH6_0AAAAJ&hl=en

Research interests:

Imaging Mass Spectrometry (IMS); mass spectrometry (MS), matrix assisted laser desorption ionisation (MALDI), ultra-high mass resolution Fourier Transform ion cyclotron resonance MS, spatial metabolomics, metabolomics, eco-metabolomics, host-parasite interactions, plant secondary metabolites, bio-organic chemistry.



Potential MSc projects:

- Development of novel matrices for Imaging Mass Spectrometry
- Spatial measurement of plant metabolites
- Understanding host-parasite interactions *in situ* using imaging mass spectrometry

Plant Biology

Dr Ed Newbigin (edwardjn@unimelb.edu.au)

Profile: [click here](#)

Research interests:

Pollen biology

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

Potential MSc projects:

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



Dr Joanne Birch (joanne.birch@unimelb.edu.au)

Profile: <https://jlbirch.wordpress.com/>

Research interests:

Plant evolution

- 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 MSc projects:

- Systematics and biogeography of native Australian grasses
- Delimitation of taxonomic boundaries for monocotyledon species complexes
- Evolution of genome size in Australian Asparagales
- Use of bait-capture techniques to obtain nuclear exons for phylogenetic study of Australasian Asparagales

Dr Jason Goodger (jgoodger@unimelb.edu.au)

Profile: [click here](#)

Research interests:

Plant natural products

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

Potential MSc 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. www.fgb.com.au



Prof. Staffan Persson (staffan.persson@unimelb.edu.au)

Profile:

<https://scholar.google.com.au/citations?user=D1UEC0cAAAAJ&hl=en&oi=ao>

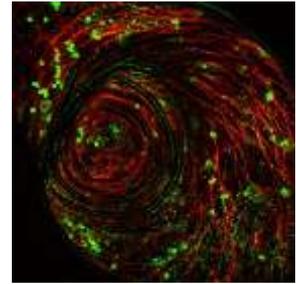
Research interests:

Plant cell biology

- Plant cell walls
- Protein trafficking
- Cytoskeleton
- How plants produce cellulose

Potential MSc projects:

- How do plants maintain their growth on saline soil?
- How do the cell membrane and the cytoskeleton interact?
- Can we predict proteins that partake in the production of cellulose?
- How do plants construct their vascular tissue?



Assoc. Prof. Joshua Heazlewood (jheazlewood@unimelb.edu.au)

Profile: <https://scholar.google.com/citations?user=2aq3NPUAAAAJ>

Research interests:

Plant biochemistry; cell walls, mass spectrometry, proteomics, bioinformatics, membrane transport, subcellular partitioning, metabolism, endomembrane, Golgi apparatus

Potential MSc 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



Dr Heather E. McFarlane (heather.mcfarlane@unimelb.edu.au)

Profile: <https://scholar.google.ca/citations?user=kXiC3xgAAAAJ&hl=en>

Research interests:

Plant cell biology

- Cell walls
- Intracellular trafficking
- Secretion
- Recycling
- Cell wall integrity signalling
- Organelle identity
- Electron microscopy
- Live cell imaging
- Protein-protein interactions

Potential MSc projects:

- Determining evolutionarily conserved protein-protein interactions in cell wall synthesis.



- Genetic screen using automated fluorescence microscopy for cell wall signalling mutants.
- Tracking cell wall synthesis enzymes using live cell imaging and electron microscopy.

Dr Edwin R. Lampugnani (Edwin.Lampugnani@unimelb.edu.au)

Profile: <https://scholar.google.com.au/citations?user=jg2dHBkAAAAJ&hl=en>

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 MSc 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.

Assoc. Prof. Alex Johnson (johnsa@unimelb.edu.au)

Profile: <https://alexjohnsonlab.com>

Research interests:

Plant and food biotechnology

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



Potential MSc 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

Dr. Berit Ebert (berit.ebert@unimelb.edu.au)

Profile: <https://scholar.google.com.au/citations?user=NlYr9JYAAAAJ&hl=en>

Research interests:

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



Potential MSc projects:

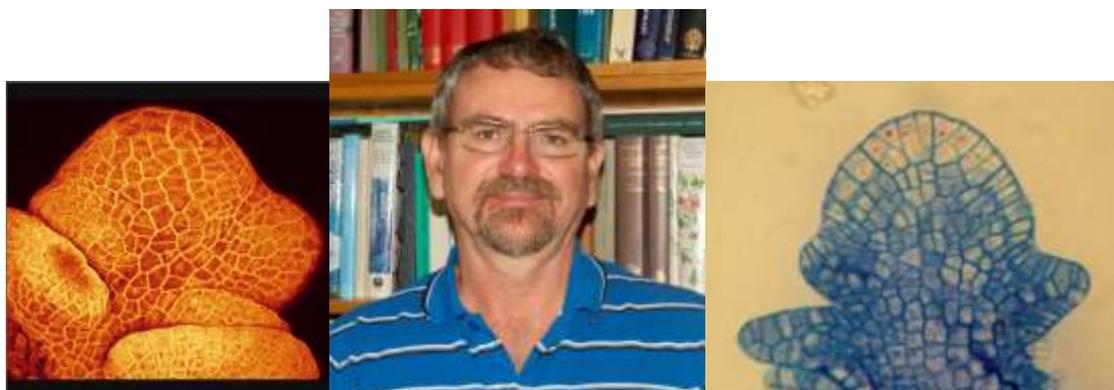
- Investigating the functions of glycosyltransferases involved in cell wall biosynthesis
- Studying Golgi transporter mutants required for glycan biosynthesis
- Determining protein-protein interactions required for cell wall biosynthesis
- Using live cell imaging to study the localization of Golgi-localized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

Dr Andrew Drinnan (and@unimelb.edu.au)

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.

Research interests

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



Dr Alexander Idnurm (alexander.idnurm@unimelb.edu.au)

Profile: <https://scholar.google.com.au/citations?user=rizOUBgAAAAJ&hl=en>

Research interests:

Fungal biology

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



Potential MSc projects:

- Identification of virulence factors in *Leptosphaeria maculans* or *Cryptococcus neoformans*
- Genetics of ballistospore formation and release in basidiomycete fungi
- Gene manipulations in skin-associated *Malassezia* species
- Characterisation of genes essential for fungal viability
- Australia's unrealised biodiversity: discovery of new species in the kingdom fungi (with Tom May, Royal Botanic Gardens)

Dr Angela Van de Wouw (apvdw2@unimelb.edu.au)

Profile: <https://scholar.google.com.au/citations?user=zrBziuEAAAAJ&hl=en>

Research interests:

Plant pathogen interactions

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

Potential MSc projects:

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



Note: for these projects the first year is based in Parkville (75 points course work / 25 points research) and second year full time research (100 points) based at Grains Innovation Park in Horsham.

Prof. David Balding (dbalding@unimelb.edu.au)

Profile: <https://scholar.google.com.au/citations?user=9bqHVEsAAAAJ&hl=en>

Research interests:

Statistical genomics

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

Potential MSc projects:

- (Co-supervised with Dr Ashley Farlow) The population history of indigenous Australians: what can the available genetic data tell us?



Prof. Stephen Leslie (stephen.leslie@unimelb.edu.au)

Profile: <http://sysgen.unimelb.edu.au/research/statistical-genetics-leslie>

Research interests:

Statistical and population genetics

- 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



Dr Irene Gallego Romero (irene.gallego@unimelb.edu.au)

Profile: <https://scholar.google.com.au/citations?user=1hptO8sAAAAJ&hl=en>

Research interests:

- Functional genomics
- Human evolutionary genetics
- Pluripotent stem cells as model systems for non-model mammals

Potential MSc projects:

- Developing a comprehensive chimpanzee transcriptome



- Testing methods to identify quantitative trait loci from RNA sequencing datasets
- Functional dissection of an adaptive human enhancer region

Prof. Michael Stumpf (mstumpf@unimelb.edu.au)

Profile: <https://scholar.google.com/citations?user=zaRea8AAAAAJ&hl=en>

Research interests:

Theoretical systems biology

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



Heroen Verbruggen (heroen.verbruggen@unimelb.edu.au)

Profile: <http://phycoweb.net>

Research interests:

Marine genomics and microbiology

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

Potential MSc projects:

- Coral reef CaCO₃ dissolution by microbes in the coral skeleton
- Evolutionary genomics of green algae
- Host-microbiome interactions and evolution of endosymbiosis
- Reconstructing the algal Tree of Life



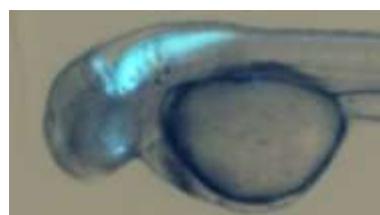
Developmental and Cellular Genetics

Dr Patricia Jusuf (patricia.jusuf@unimelb.edu.au)

Profile: <https://scholar.google.com.au/citations?user=RW6SvYoAAAAJ&hl=en>
<http://blogs.unimelb.edu.au/jusuflab/>

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 regeneration.



Potential MSc projects:

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

Dr Mike Haydon (m.haydon@unimelb.edu.au)

Profile: <http://blogs.unimelb.edu.au/haydonlab/>

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 MSc projects:

- Extracellular signals from the cell wall in light sensing
- Ethylene signalling in the circadian clock
- Post-transcriptional control by sugars in the circadian clock
- Metabolic control of post-translational modifications in embryo development (with John Golz)

Dr John Golz (jgolz@unimelb.edu.au)

Profile: <http://blogs.unimelb.edu.au/golzlab/>

Research interests:

Developmental regulation: Our group uses a combination of genetics, molecular, and cellular biology to investigate embryonic patterning in the model plant *Arabidopsis*. We are also studying genes involved in seed coat development, particularly those associated with cell wall modification.



Applied research: We are interested in developing new approaches for the rapid characterisation of agronomically important genes in crop plants and using transgenic approaches to modify seed size.

Potential MSc projects:

- Investigating the molecular basis of seed size control
- Metabolic control of post-translational modifications in embryo development
- Role of cell wall modifying genes in the developing seed coat
- In vivo function of YAB transcription factors

Prof. Phil Batterham (p.batterham@unimelb.edu.au)

Profile: <https://scholar.google.com.au/citations?hl=en&user=-OdTXHUAAAAAJ>



Research interests:

Neurogenetics

- Nicotinic acetylcholine receptor structure and function
- Receptor trafficking
- Insect behavior

Systems biology

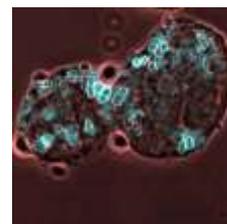
- Role of metabolic enzymes and transporters in particular tissues in the response to insecticides

Potential MSc projects:

- Analysing the impact of insecticides on metabolism
- Using CRISPR gene editing to examine the role of genes in insecticide metabolism
- Using CRISPR gene editing to examine the function of multidrug resistance genes

Prof. Alex Andrianopoulos (alex.a@unimelb.edu.au)

Profile: <http://tinyurl.com/alexgene> or <http://tinyurl.com/alexmicrobe>

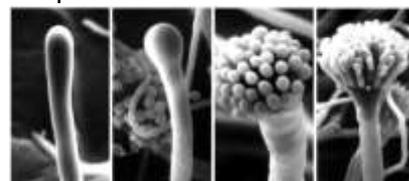


Research interests:

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

Potential MSc 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.



Specific projects in these broad areas can be discussed to develop the final project.

Dr Trent Perry (trentp@unimelb.edu.au)

Profile: <http://scholar.google.com.au/citations?user=fDTaKtQAAAAJ&hl=en>

Research interests:**Insecticide biology**

- Insecticide mode of action
- Mechanisms of resistance
- Acute and chronic toxicology

Neurogenetics

- Nicotinic acetylcholine receptor structure and function
insect behaviour
- Receptor trafficking

Parasitic biology of *Lucilia cuprina*

- Identifying genes critical to parasitic stages of the Australian Sheep Blowfly. Improving the *L. cuprina* genome resources through annotation of gene families.

Potential MSc projects:

- Analysing roles of nAChRs in insect behaviour, learning and memory
- Structure/function studies on the nAChR subunits using domain swapping and CRISPR
- Examining genes underlying parasitism of sheep by the Australian Sheep blowfly



Dr Rachel Burt (rachel.burt@mcri.edu.au)

Profile: www.mcri.edu.au/users/dr-rachel-burt

Research interests:

Auditory genetics: Our group is using a combination of genetics, molecular, and cellular biology to understand the basis of hearing impairment and to inform the development of better diagnostic tools and preventative medicines for deafness and hearing loss

Potential MSc projects:

- Gene discovery for deafness
- Defining the regulation of auditory apoptosis
- Preventing the auditory apoptosis that leads to acquired hearing impairment



Dr Michael Duffy (mduffy@unimelb.edu.au)

Profile: <https://scholar.google.com.au/citations?hl=en&user=MIYKKSAAAAJ>

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 MSc 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
 - Characterising the cytoadhesive function of the malaria parasite's pathogenic, variant antigens.
 - Determining whether variant antigens elicit the broadly reactive antibody responses required for a vaccine.

Dr Michael Murray (murraym@unimelb.edu.au)

Profile: <https://scholar.google.com.au/citations?user=YGINztAAAAAJ&hl=en>

Research interests:

Genetic regulation of epithelial-mesenchymal (EMT) and mesenchymal-epithelial transitions (MET) event in *Drosophila melanogaster*. Role of microtubules in epithelial polarisation during *Drosophila* development and mammalian cell culture; Modelling cancer metastasis in the fly; Regulatory networks acting downstream of Hox genes during epithelial morphogenesis.



Potential MSc projects:

- Regulation of epithelial plasticity by Netrins in *Drosophila* development
- Maintenance of epithelial homeostasis in the adult *Drosophila* midgut
- Regulation of transcription via the intracellular domain of the Netrin receptor, Frazzled

Conservation and Climate Change

Prof Ary Hoffmann (ary@unimelb.edu.au)

Profile: <https://scholar.google.no/citations?user=Y2jPDU4AAAAJ&hl=en>

Research interests:

Wolbachia endosymbionts for controlling mosquito borne diseases

- Climate change adaptation in a range of environments, management of invertebrate pests



Potential MSc projects (in conjunction with other researchers):

- Identifying new endosymbiont strains for disease control.
- Investigating novel genetic approaches to conserving threatened and keystone species
- Characterizing the role of summer diapause in adaptation to climate extremes.
- Investigating the impact of agricultural chemicals on beneficial natural enemies

Prof. Roger Cousens (rcousens@unimelb.edu.au)

Profile: http://scholar.google.com.au/citations?user=BrqpG_oAAAAJ



Research interests:

Plant population biology

- Invasion ecology
- Evolutionary ecology of invasive plants
- Impacts of weeds on coastal systems

Potential MSc projects:

- Where is home? Analysis of genome sequence data from native and introduced ranges of sea-rocket
- What does herbicide resistance cost a plant? The influence of study design on relative fitness estimates

Assoc. Prof. Michael Kearney (mrke@unimelb.edu.au)

Profile: <https://scholar.google.com.au/citations?user=syZcRdgAAAAJ&hl=en>

Research interests:

Ecology and Evolution

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



Potential MSc projects:

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

Dr Ben Phillips (phillipsb@unimelb.edu.au)

Profile: <https://scholar.google.com.au/citations?user=Kk1JhPwAAAAJ&hl=en>

Research interests:

Evolutionary ecology

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



Potential MSc projects:

- Evolution on invasion fronts (empirical and/or modelling work)
- Daphnia as a model system for understanding evolution during invasions, and the evolution of disease.
- The role of Toxoplasmosis in mammal declines: strain diversity and distribution of *Toxoplasma* in Australia

Dr Paul Umina (pumina@unimelb.edu.au)

Profile: <http://www.findanexpert.unimelb.edu.au/display/person141077>

Research interests:

Invertebrate ecology

- Sustainable agriculture
- Integrated pest management, insecticide resistance
- Invasion ecology
- Biocontrol



Potential MSc 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

Dr Melissa Carew (mecarew@unimelb.edu.au)

Profile: <http://pearg.com/researchers/carewm>

Research interests:

Freshwater biological monitoring

- Aquatic macroinvertebrates
- Ecological impacts of aquatic pollution
- DNA barcoding
- Application of next-generation sequencing (NGS) for environmental monitoring
- Molecular taxonomy
- Molecular ecology



Potential MSc projects (in conjunction with Prof. Ary Hoffmann and Melbourne Water)

- Using DNA barcodes to investigate the macroinvertebrate diversity and ecology in catchments
- Investigating the molecular ecology of macroinvertebrate species in the Yarra River using next generation sequencing to detect environmental impacts.

Dr Alex Fournier-Level (afournier@unimelb.edu.au)

Profile: adaptive-evolution.org

Research Interest:

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 Msc 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.

Dr Matt West (matthew.west@unimelb.edu.au)**Research interests:****Applied ecology**

- Threatened species conservation and management
- Wildlife population dynamics
- Disease ecology including host-reservoir interactions
- Captive breeding and management
- Ecological modelling
- Amphibians, Fish and Chytrid Fungus

**Potential MSc projects:**

- Using novel technologies and cost-efficient strategies to understand fauna management requirements. This project will compare the use of low-cost acoustic recorders, citizen science and on-ground intensive survey approaches to detect and evaluate frog and bird management requirements. (Industry Supported Project).
- Trophic interactions that influence disease prevalence
- Manipulating wetland chemistry to reduce disease risk for amphibian populations.
- Developing new non-invasive technologies to monitor amphibians during mark-recapture programs.

Evolution and Behaviour

Dr Luke Holman (luke.holman@anu.edu.au)

Profile: <https://scholar.google.com.au/citations?user=9WXgCXUAAAAJ&hl=en>

Research interests:

Evolutionary ecology

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

Potential MSc 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



Dr Therésa Jones (theresa@unimelb.edu.au)

Profile: <https://urbanlightlab.com/>

Research interests:

Behavioural ecology

- Invertebrate mating systems
- Sexual selection
- Ecological light pollution

Potential MSc projects:

- Behavioural responses to multi-modal pollutants (co-supervised with Dr Rob Hale)



Prof. Raoul Mulder (r.mulder@unimelb.edu.au)

Profile: https://scholar.google.com.au/citations?user=Y_gfg0MAAAAJ

Research interests:

Behavioural ecology

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



Potential MSc projects:

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

Prof. Mark Elgar (m.elgar@unimelb.edu.au)

Profile: <https://scholar.google.com/citations?user=aawRWmIAAAAJ&hl=en>

Research interests:

Evolutionary ecology

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



Potential MSc 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

Assoc. Prof. Devi Stuart-Fox (d.stuart-fox@unimelb.edu.au)

Profile: <http://scholar.google.com.au/citations?user=IY72IMEAAAAJ&hl=en>

Research interests:

Evolutionary biology

- Behavioural and evolutionary ecology
- Sensory ecology
- Speciation
- Macro-evolutionary patterns



Potential MSc projects:

- Mimicry complexes in beetles
- Beetle sensitivity to unseen near-infrared light
- Use of light for thermoregulation in avian eggs. Co-supervised with Dr. Iliana Medina.

Dr Iliana Medina (iliana.medina@unimelb.edu.au)

Profile: <https://scholar.google.com.au/citations?user=qZ3eclwAAAAJ&hl=en>

Research interests:

Evolutionary biology

- Behavioural and evolutionary ecology
- Macroevolution
- Avian brood parasitism



Potential MSc projects:

- Macroeolution of warning coloration
- Use of light for thermoregulation in avian eggs
-

Dr Oliver Griffith (oliver.griffith@unimelb.edu.au)

Profile: www.oligriffith.com

Research interests:

My research aims to build new understanding about the evolution of complex life. Specifically, research projects aim to identify what genetic, developmental, and morphological processes underpin the evolution of new organs in animals. The main system in which I work is the evolution of pregnancy and placentation in reptiles and mammals. Research is multi-disciplinary and involves fieldwork/animal handling, molecular biology, and genomic techniques to address questions fundamental to the origin and evolution of new complex structures. Research is funded through the Australian Research Council.



Potential Hons/MSc projects:

- Identifying the role of maternal-fetal signalling in the evolution of a lizard placenta
- Understanding the role of inflammation in marsupial pregnancy and eutherian implantation
- Other research questions that address the evolution of pregnancy

Dr Karen Rowe (karowe@museum.vic.gov.au)

Profiles: <https://scholar.google.com/citations?user=uwOyaZ8AAAAJ&hl=en>
<http://karenmcrowe.weebly.com/>

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 MSc 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



Museum Victoria

Kelly Merrin (Research Associate, Museum Victoria;
kellymerrin@hotmail.com)

Jo Taylor (Acting Head Natural Sciences Collections, Museum
Victoria; jtaylor@museum.vic.gov.au)

Devi Stuart-Fox (School of BioSciences, University of
Melbourne; d.stuart-fox@unimelb.edu.au)



Potential MSc projects:

Have you ever wanted to name your own animal species?

Isopod crustaceans (aka slaters, woodlice or butchy boys) are relatively familiar to anyone who has ever played in their backyard garden. Many of us even kept them as pets as children! Surprisingly to some, there are many more species of isopods inhabiting our marine environment occupying all habitats and displaying a variety of often bizarre and highly adapted body forms. Although there are hundreds of species described from the oceans off southern Australia, some groups remain largely unknown to science.

One such group is the Santiidae (sub-order Asellota), a family of tiny (<3 mm) shallow water isopods. This family, made up of 31 species across five genera, have currently only two species formally described from Australian waters (both from north Queensland). Specimens from southern Australian waters housed in Museum Victoria collections, show that our coastline has a rich and diverse fauna of this family but to date the species known to be new to science are undescribed.

This masters research is a systematics and phylogenetics based project which focuses on two areas: one, looking at what genera and species of Santiidae are found in southern Australian waters, with the ultimate goal of naming and publishing new species descriptions; and two, using morphological data and modern phylogenetic techniques to test the monophyly of the five classically determined genera of the Santiidae, and to determine whether the Australian species belong to a local radiation or are represented in many clades.

Part of your time will be spent working on specimens under the guidance of expert taxonomists at Museum Victoria, in Carlton. A close attention to detail and the use of dissecting and compound microscopes are required.

Marine Biology

Dr John Morrongiello (john.morrongiello@unimelb.edu.au)

Profile: <http://morrongiellolab.com>

Research interests:

Marine and freshwater ecology

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

Potential MSc projects:

- How are fisheries selective, and what does this mean for harvested populations?
- Connectivity and demography in Victorian pipis
- Understanding the drivers of long-term biological change in Port Phillip Bay (modelling)
- From individual growth to population productivity in fish
- Animal colour variation in the wild: causes and consequences
- Reproductive investment in variable and/or unpredictable environments- what is the role of bet-hedging?



Prof. Mick Keough (mjkeough@unimelb.edu.au)

Profile: <https://scholar.google.com/citations?user=XTbVdscAAAAJ&hl=en>

Research interests:

Marine ecology

- Resilience and responses to disturbance
- Recruitment of invertebrates and seagrasses
- Evolutionary biology of invertebrate larvae
- Environmental impacts

Potential MSc projects:

- Resilience of nearshore ecological communities to disturbance
- Detecting ecological impacts of pollution in bays and estuaries
- How do invertebrate larvae respond to stress?



Prof. Steve Swearer (sswearer@unimelb.edu.au)

Profile: <https://sswearer.wordpress.com>

Research interests:

Marine ecology, evolution, and environmental sciences

- Fish and fisheries ecology
- Eco-evolutionary dynamics



- Aquaculture
- Ecological engineering and habitat restoration
- Ecotoxicology
- Marine and coastal biogeochemistry

Potential MSc projects:

- Maximizing the benefits of habitat restoration for animals (with Dr Rob Hale)
- Unravelling the biomolecular and biochemical mechanisms of fish otolith formation and growth (with Dr Patricia Jusuf and Dr Blaine Roberts)
- Hybrid solutions for mangrove restoration (with Dr Beth Strain, Dr Becki Morris and Dr Ben Fest)
- Management of overabundant native urchins (with Dr Beth Strain, Dr Becki Morris, Assoc Prof Tim Dempster)

Dr Beth Strain (beth.strain@unimelb.edu.au)

Profile: <https://scholar.google.com.au/citations?user=Fj1hMfAAAAAJ&hl=en>

Research interests:

Marine ecology, evolution, and environmental sciences

- Effects of multiple stressors
- Benefits and limitations of MPAs
- Urban and restoration ecology



Potential MSc projects:

- Assessing the social acceptance of using nature-based coastal defence structures in Victoria.
This project will involve social science research including collecting survey data from coastal communities around Victoria
- Determining the role of MPAs in protecting rocky and coral reefs from anthropogenic stressors (fishing, pollution and climate change)
This project will involve collecting data on coral and algal functional traits. Depending on the candidate some data will also be collected via SCUBA surveys.

Prof. Madeleine van Oppen (madeleine.van@unimelb.edu.au)

Profile: <https://scholar.google.com.au/citations?user=VTjKnHMAAAAJ&hl=en>

Research interests:

Marine ecology and evolution

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



Potential MSc projects:

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

Prof. Greg Jenkins (gjenkins@unimelb.edu.au)

Profile: <https://scholar.google.com.au/citations?user=Kbip3jQAAAAJ&hl=en>

Research interests:

Marine ecology

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



Potential MSc 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

Assoc. Prof. Tim Dempster (dempster@unimelb.edu.au)

Profile: <http://blogs.unimelb.edu.au/saltt/>

Research interests:

Marine ecology and aquaculture

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



Potential MSc 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)

Dr Fletcher Warren-Myers (fletcher.warren@unimelb.edu.au)

Profile: <https://scholar.google.com.au/citations?user=6zDDfScAAAAJ&hl=en>

Research interests:

Marine ecology and aquaculture

- Mass marking techniques for fisheries
- Aquaculture technology

Potential MSc projects:

- Refining roe production for sea urchin aquaculture



Dr Nick Robinson (robinson.n1@unimelb.edu.au)

Profile: <http://scholar.google.com.au/citations?user=N-a3xX8AAAAJ&hl=en>

Research interests:

Aquaculture breeding and genetics

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

Potential MSc 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



Assoc. Prof. Rob Day (r.day@unimelb.edu.au)

Profile: <https://robdayabalone.wordpress.com>

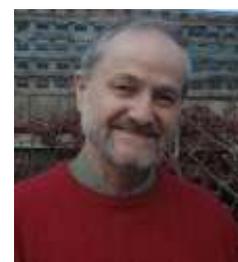
Research interests:

Marine ecology, evolution, and environmental sciences

- Abalone aquaculture: growth, stress and immune function
- Climate change effects on aquaculture species
- Fish and fisheries population dynamics and management
- Reproductive biology of Sharks (With Dr Terry Walker)

Potential MSc projects:

- How abalone respiration is affected by increased temperature and lower pH (No-one has yet measured abalone respiration correctly, under flow. This project will use new equipment to investigate climate change effects)
- Changes in behaviour and other traits between wild and farm abalone (With Dr Sabine Roussel from France: this project would explore such changes as escape responses to predators)



Quantitative and Applied Ecology

Prof. Michael McCarthy (mamcca@unimelb.edu.au)

Profile: <http://mickresearch.wordpress.com>

Research interests:

Ecology

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

Potential MSc 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



Assoc. Prof. Peter Vesk (pvesk@unimelb.edu.au)

Profile: [Pete's website](#)

Research Interests:

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



Potential MSc projects:

- What drives Testing trait-based models of Eucalypt species distribution

Dr Reid Tingley (reid.tingley@unimelb.edu.au)

Profile: <https://rtingley.wordpress.com/about/>

Research interests:

Invasion biology

- Herpetology
- Biodiversity monitoring
- Species distribution modelling
- Conservation decision making



Potential MSc projects:

- Tadpole ecophysiology
- Macroecology and extinction risk of reptiles
- Understanding the impact and spread of exotic amphibians

Dr José Lahoz-Monfort (jlahoz@unimelb.edu.au)

Profile: <http://joselahozresearch.wordpress.com>

Research interests:

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



Potential MSc projects:

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

Dr Nick Golding (nicholas.golding@unimelb.edu.au)

Profile: <https://scholar.google.com.au/citations?user=peoal7wAAAAJ&hl=en>

Research interests:

- Ecological modelling
- Statistical ecology
- Species distribution modelling
- Machine learning
- Vector-borne diseases
- Population dynamics
- Scientific software



Potential MSc projects:

- Using machine learning to predict species distributions on a massive scale
- Mapping the population dynamics of tsetse flies to control sleeping sickness

- Jointly modelling distributions of multiple species using individual-level data

Dr Gurutzeta Guillera-Arroita (gguillera@unimelb.edu.au)

Profile: <https://gguilleraresearch.wordpress.com>

Research interests:

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



Potential MSc projects:

- Identifying optimal approaches for plant abundance estimation

Dr Bronwyn Hradsky (bronwyn.hradsky@unimelb.edu.au)

Profile: www.wildzoologist.wordpress.com

Research interests:

- Fire ecology
- Native mammals
- Invasive predators
- Simulation modelling
- Habitat selection
- Conservation biology

Potential MSc projects

- Understanding the drivers of bandicoot and potoroo distributions in wet forests
- Quantifying the effects of landscape-scale fox control on red foxes and feral cats

Assoc. Prof. Jane Elith (j.elith@unimelb.edu.au)

Profile: <https://janeresearch.wordpress.com/>

Research interests:

- Species distribution models particularly how they work and perform; also the range of applications.

Potential MSc projects:

- Using citizen science data to understand the distribution of fungi



Dr David Duncan (david.duncan@unimelb.edu.au)

Profile: <https://daviddotduncan.wordpress.com/>

Research interests:

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



Potential MSc projects:

- Determining reproductive age limits in long-lived *Allocasuarina luehmannii*

Dr Jian Yen (jian.yen@unimelb.edu.au)

Profile: <https://jdyen.wordpress.com/>

Research interests:

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



Potential MSc 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

Dr Libby Rumpff (lrumpff@unimelb.edu.au)

Profile: <https://rumpffresearch.wordpress.com/>

Research Interests:

- Structured decision-making
- Native vegetation management
- Adaptive management
- Risk assessment
- Expert elicitation
- Restoration ecology
- Ecological modelling



Potential MSc projects:

- Exploring relationships between expert opinion and field data to support fire management decisions

Dr Darren Southwell (darren.southwell@unimelb.edu.au)

Profile: <https://dsouthwellresearch.wordpress.com/>

Research interests:

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



Potential MSc projects:

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

Dr Heini Kujala (heini.kujala@unimelb.edu.au)

Profile: <https://hkujalaresearch.wordpress.com/>

Research interests:

- Spatial conservation planning
- Climate change impacts of species and their protection
- Uncertainty in conservation decision making
- Spatial optimization
- Species distribution modelling
- Population viability in fragmented landscapes



Potential MSc projects:

- Using population viability models to test the performance of alternative reserve network structures
- How do changes in costs drive spatial conservation plans?
- Uncertainties in biodiversity models and their influence on conservation decisions

Dr Luke Kelly (ltkelly@unimelb.edu.au)

Profile: <https://ltkellyresearch.com/>

Research interests:

- Fire ecology
- Spatial ecology
- Small mammals
- Reptiles
- Birds
- Biogeography
- Environmental decision making



Potential MSc projects:

- Spatial ecology of pygmy-possums, carnivorous marsupials and endangered rodents in mallee landscapes.
- Threatened plant and animal ecology in Victoria's foothill forests.
- Fire ecology and habitat change in arid and temperate ecosystems.

Dr Cindy Hauser (chauser@unimelb.edu.au)

Profile: <https://cindyhauser.wordpress.com/>

Research Interests:

- Survey and monitoring design
- Imperfect detection
- Adaptive management
- Structured decision-making
- Ecological modelling



Potential MSc projects:

- Using managers' data to understand hawkweed invasion and improve management

Population and Quantitative Genetics

Dr Charles Robin (crobin@unimelb.edu.au)

Profile: www.specifly.org

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 MSc 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

Dr Andrew Weeks (aweeks@unimelb.edu.au)

Profile: <https://scholar.google.com.au/citations?user=CZb8XQQAAAAJ&hl=en>

Research interests:

Conservation biology

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



Potential MSc 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

Dr Kathryn Tiedje (kathryn.tiedje@unimelb.edu.au)

Profile: <https://scholar.google.com.au/citations?user=Tx-9vR0AAAAJ&hl=en>

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 MSc projects:

- 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

Prof. David K. Gardner (david.gardner@unimelb.edu.au)

Profile: <https://scholar.google.com.au/citations?user=vNj-urYAAAAJ&hl=en&oi=ao>

Research Interests:

Reproductive biology

- Human IVF
- Preimplantation embryo culture
- Nutrition and Metabolism
- Diagnosis of embryo viability and development of biomarkers
- Regulation of epigenetics through metabolic function
- Metaboloepigenetics
- Cryobiology



Potential MSc projects on embryos:

- 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

Potential MSc projects on embryonic stem cells:

- Role of antioxidants in maintaining the function of embryonic stem cells

Prof. Marilyn B Renfree (m.renfree@unimelb.edu.au)

Profile: <http://renfreeshawlab.biosciences.uom.org.au/>

Research interests:

Reproduction and development using marsupials as biomedical models in health and disease includes:

- Sex determination
- Sexual differentiation
- Epigenetics
- Molecular and hormonal regulation of gonad and phallus development
- Embryonic diapause
- Genomic imprinting in the placenta and germ cells
- Comparative genomics and transcriptomics
- Innate immunity in developing young



- Limb development.

Reproduction and Development in Monotremes

- The development of the echidna: from egg to puggle

Potential PhD/Honours projects:

- Marsupials a models for disorders of sexual development including sex reversal, phallus development and hypospadias
- Effects of environmental disruptors on gonadal and phallus differentiation
- Early embryonic and post-natal development of the echidna
- Genomic imprinting and epigenetic control of germ cell reprogramming during early development.
- Inflammation in marsupial pregnancy
- Control of growth and development in marsupials: a model for obesity



Neonatal tammar and newly d3 hatched echidna puggle

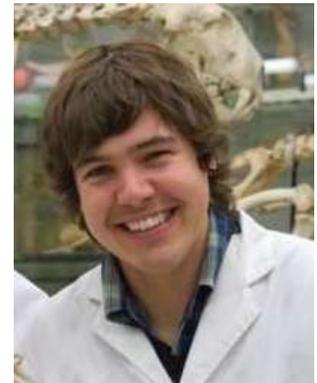
Assoc. Prof. Andrew Pask (a.pask@unimelb.edu.au)

Profile: <https://scholar.google.com.au/citations?user=4ONkuEsAAAAJ&hl=en>

Research interests:

Comparative genomics of development and disease

- Urogenital development
- Marsupial genomics
- Genome evolution and function
- Endocrine disruption
- Bioinformatics, epigenetics, developmental biology



Potential MSc 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

Dr Mary Familiari (m.familiari@unimelb.edu.au)

Profile: <http://familiarilab.biosciences.uom.org.au>

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 MSc projects:

- Effect of air pollution particles on placental function
- The role of Tob proteins in gonadogenesis



Dr Alexandra Harvey (ajharvey@unimelb.edu.au)

Profile: <https://scholar.google.com.au/citations?hl=en&user=HeoTMx8AAAAJ>

Research interests:

Embryonic stem cells

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

Potential MSc projects:

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



Dr Mark Green (mark.green@unimelb.edu.au)

Profile: <http://greenlab.biosciences.uom.org.au/>
<https://scholar.google.com.au/citations?user=SH7YaysAAAAJ&hl=en>

Research interests:

Reproductive biology

- Assisted reproductive technologies (ART)
- Environmental endocrine disruptors
- Developmental origins of adult disease (DOHaD)
- 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 MSc projects:

- Determining the effects of endocrine disruptors and pollutants on embryo development and metabolism, as well as sperm quality.
- Development of microfluidic technologies to sort motile sperm for commercial application in human fertility and sperm clinics.
- Quantifying telomere length in naturally conceived and cloned animals as a proxy for reproductive health and ageing.

MALARIA AND ENDOSYMBIOSIS

Prof. Geoffrey McFadden (g.mcfadden@unimelb.edu.au)

Profile: <https://scholar.google.com.au/citations?user=pwd82ucAAAAJ&hl=en>

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.



Projects for MSc of BSc Hons

Candidates would involve learning parasite molecular genetics, high end microscopy, and potentially some insect or mouse work for suitable students. The group is led by Prof Geoff McFadden, an ARC Laureate Fellow and supported by a dedicated team who can mentor trainees.