Honours 2018
Which question will you tackle?

School of Life and Environmental Sciences
Investigate life
Which question will you tackle?

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Why do honours?

If you are looking to improve your career prospects, open the door to further academic study, or simply indulge a passion, then honours is your next step.

For some students, an honours year is an introduction to further academic research with many using it as a pathway to undertake a PhD.

For others, it is a stepping stone to an interesting career in science and an opportunity to extend your knowledge on a topic of interest.

Today’s job market for scientific positions is very competitive. In fact, many entry level positions now require an honours degree.

Our honours graduates find employment in a wide variety of fields – including federal and state government departments and agencies and non-government organisations within medical, environmental and conservation areas. They tell us that the skills they learned in verbal and written communication and critical analysis of issues along with their broader scientific knowledge have been crucial to them in their work.

Others enter environmental consultancy companies, pharmaceutical companies, zoos, museums, hospitals or research institutions such as the Commonwealth Scientific and Industrial Research Organisation (CSIRO).

Honours is a challenging year, but students look back on it as a very rewarding period in their life.

Course objectives

- train students to carry out independent research.
- enable students to develop a specialist understanding of one area of science.
- integrate specialist knowledge into a broad appreciation of life and environmental sciences.
- enable students to use skills in research methodology and philosophy.
- continue to engender and encourage enthusiasm and curiosity in science.

If you are looking to improve your career prospects, open the door to further academic study, or simply indulge a passion, then honours is your next step.
“For my honours project I explored how the nitrifying bacteria in compost affect the growth of the common button mushroom Agaricus bisporus. It has been very interesting to observe how microorganisms behave in their natural environment as opposed to inside the laboratory.”

Shang-Yu Shueh
Microbiology Honours student 2017
How to Qualify for Honours

**Qualify for honours**

The Faculty of Science requires that to enrol in an honours unit of study you must have satisfied all the requirements for a pass degree and be considered by the School and the Faculty to have the required knowledge and aptitude to undertake an honours course.

To qualify for honours you also must have provisional acceptance of project supervision by at least one academic in the School of Life and Environmental Sciences.

Specific additional academic requirements for biology honours are:

- a minimum of 24 credit points of senior units of study relating to the intended honours area in biology;
- a minimum SCIWAM (science weighted average mark) of 65 for all intermediate and senior units of study attempted.

Specific additional academic requirements for biochemistry and microbiology honours are:

- a minimum of 24 completed credit points of senior units of study relating to the intended honours area in biochemistry or microbiology;
- either a credit average in 48 credit points of relevant intermediate and senior units of study or a SCIWAM of at least 65.

**Graduates from other Australian Universities:** The minimum requirement for acceptance into the honours program is SCIWAM of 65. The Faculty of Science will calculate your SCIWAM after you have applied. Otherwise, the requirements for application are the same as for graduates from the University of Sydney.

**International students:** the International Office will assess your academic record and advise whether it is equivalent to a pass degree from the University of Sydney, at the level required for entry into honours.

**Apply for honours**

**Step 1:** Find a project and supervisor. After securing a project and supervisor you must complete TWO application forms, one for the Faculty of Science and one for the School of Life and Environmental Sciences.

**Step 2:** Submit the School online application form

- sydney.edu.au/science/life-environment/study/honours
Step 3: For domestic students submit the Faculty of Science honours application;

For internal (currently enrolled) international students, submit the Faculty of Science honours application and also submit an international undergraduate student application form to the International Office for visa processing. Part-time enrolment is not available for international students.

For external international students, contact the appropriate Honours Coordinator (details on page 9 and 11 of this guide) before applying through the International Office. You will need to provide evidence in your application form that you have secured an academic contact/supervisor. You must complete an international undergraduate student application form and lodge this from at the International Office. Part-time enrolment is not available for international students.

Application deadlines

For semester 1, 2018 applications, the last day for lodging your Step 2 application with the School is 29 November 2017.

The last day for lodging your Step 3 application with the Faculty is 30 November 2017. The Faculty will contact you in mid December 2017 to confirm your offer.

Deadlines for semester 2, 2018 applications are yet to be determined. Please check the website
- sydney.edu.au/science/life-environment/study/honours

The closing date for University of Sydney honours scholarships is January 2018 (exact date to be confirmed).
- sydney.edu.au/scholarships/prospective/honours
How to Qualify for Honours

Choose a supervisor

Talk to them!

- Firstly, read through the following pages to find supervisors whose research interests you. Check out the projects online too as there may be more detail or additional project options.
- Email or phone supervisors whose research interests you to set up a meeting.
- Next, come prepared with some questions about their research programs, and be prepared to answer questions about your interests and future plans.
- Finally, speak to more than one potential supervisor. A personality match between supervisor and student is almost as important as a matched interest in an area of science!

Meet academics and current students

Join us at the ‘Meet a supervisor’ event on Tuesday 12 September 2017 from 4:30pm - 6pm at Maclaurin Hall, The Main Quadrangle. Chat with academics and current students in this informal setting and enjoy some drinks and nibbles.

For your chance to ask specific questions of the honours coordinators, come along to the information sessions:

- The biology session is on Monday 11 September 2017 from 1-2pm in Heydon-Laurence Lecture Theatre 217 (A08).
- The biochemistry and microbiology session is on Wednesday 13 September 2017 from 1-2pm in Lecture Room 471 at the Molecular Bioscience Building (G08).
“Honours was a fantastic year! For me, it was a great opportunity to work in a remote part of Australia on some really cool wildlife. It was also a very rewarding experience in which I learnt so much, not just about my specific topic area, but it also gave me greater insight into the research process and what it involves.”

Tamara Potter
Biology Honours Student 2016/17
Outline

Honours students in biology are required to:

- undertake a major research project under the supervision of an academic member of staff;
- write a thesis based on this research;
- present an introductory and final seminar describing their work;
- undertake research skills training, including how to design experiments and perform appropriate statistical analyses
- attend weekly school seminars

Assessment

A majority of your final mark, 80%, comes from your thesis. Your thesis is comprised of original research which through the guidance of your supervisor you have developed, carried out, and written up. Your thesis will be assessed by three academics, usually within the life and environmental sciences.

The coursework component is the smallest component, comprising only 20% of the final mark. This includes your research and development proposal (7.5%), experimental design assessment (5%) and opinion article (7.5%).

Calendar

You can begin honours in either semester, but be aware that honours starts before the regular semester. You should discuss which semester you should start honours with your supervisor, as many projects have field work that can only be done during certain times of the year.

Starting dates will be confirmed when you get your letter of offer.

- Early February (Semester 1 entry) or Late July (Semester 2 entry): Honours commences with an orientation day (mandatory). Please note: there are compulsory workshops on several days for the first six weeks.
- Early March (or late August): submission of written project proposal
- Late February (or mid-August): project proposal oral presentation
- Early April (or mid-September): submission of opinion article
- Mid-August (or mid-February): end of experimental work
- Mid-September (or mid-March): final seminar
- Mid-October (or mid-April): submission of thesis
Course codes

Biology honours:
BIOL4012, BIOL4013, BIOL4014, BIOL4015 and BIOL4016

Coordinator

Professor Ashley Ward
Room 324, Heydon-Laurence Building (A08)
The University of Sydney
E ashley.ward@sydney.edu.au
T (02) 9351 4778
Course details – biochemistry and microbiology

Outline

Honours students in biochemistry and microbiology are inducted into a joint program.

Students are required to:
- undertake a major research project under the supervision of an academic member of staff;
- write a thesis based on this research;
- present an introductory and final seminar describing their work;
- undertake research skills training involving six tutorials and an examination; and
- attend the weekly school seminar

Assessment

Your research thesis (65%) is expected to be approximately 50 pages in length (<12,000 words). You will also undertake a short (20–30 minute) oral examination to defend your research.

You will present a final seminar (10%) of approximately 20 minutes describing the aims of your project, the results you obtained, and the significance of the results in the context of the published literature.

The research skills training task (25%) consists of approximately six 2-hour tutorials run by the honours committee in small groups of six to ten students. In these tutorials, each student will be assigned a scientific paper and will run a discussion amongst the group on that manuscript. You will be assessed on your presentation as well as your participation in the group discussions. In the final examination, you receive a scientific paper and are required to write an appraisal of that paper, highlighting your opinions of the research described.

Calendar

- Early February: honours commences. Please note: orientation day is compulsory for all students and will include information on laboratory safety, computer usage and safety within the school.
- Mid-February: submission of written project proposal
- Late February: project proposal oral presentation
- Late April until early June: coursework tutorials and examination
- Late July: progress presentation
- Mid-October: submission of thesis
- Late October: final oral presentation and oral examination
Course codes

Biochemistry honours:
BCHM4011, BCHM4012, BCHM4013 and BCHM4014

Microbiology honours:
MICR4011, MICR4012, MICR4013 and MICR4014

Coordinator

Associate Professor Andrew Holmes
Level 4 East, Charles Perkins Centre
Bldg D17
The University of Sydney
T +61 2 9351 2530
E andrew.holmes@sydney.edu.au
Academic directory
Find your supervisor here

You will work with world-class scientists and scientific infrastructure. You will learn a multitude of new skills, and discover how excellent research is done.

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**Microbiology**

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# Biochemistry

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Supervisors and projects
Which question will you tackle?

Dr Alyson Ashe
alyson.ashe@sydney.edu.au
Honours stream: Biochemistry

Research interests
We study epigenetic regulation of gene expression – the interplay between the environment that an organism encounters during its lifetime, and the expression patterns of its genes. Importantly, these environmental signals can sometimes get passed between generations (Darwin was wrong!), and we are trying to understand how this occurs.

Projects
- What genes are required for epigenetic inheritance?
- Epigenetics and viral resistance

Professor Peter Banks
peter.banks@sydney.edu.au
Honours stream: Biology

Research interests
My research focuses on the behavioural ecology of Australian wildlife and aims to develop ecologically-based solutions to conservation problems. I am interested in invasive species, urban wildlife and the ecology of chemical communication. I work mainly with mammals, including bats, and most of our work is field based and involves manipulative experiments.

Projects
- How do exotic predators deal with novel foods?
- The ecology of ticks and their hosts at the urban-bushland interface
Professor Madeleine Beekman
madeleine.beekman@sydney.edu.au
Honours stream: Biology

Research interests
The ‘Bee lab’ is interested in behavioural ecology, behavioural genetics and molecular genetics of social insects and slime molds. We study honey bees (particularly Thai and African ones) and Australian native stingless bees. We are particularly interested in cheating behaviour: when workers start laying eggs or changing caste. We also study population genetics of invasive ants and bees, and use the slime mold to address general evolutionary questions.

Projects
− If you want to know more about the specific projects the lab offers, have a look at our website

Dr Kim Bell-Anderson
kim.bellanderson@sydney.edu.au
Honours stream: Biochemistry

Research interests
Kim’s lab investigates how nutrients and energy are metabolised and their impact on health and disease in animal models. The aims of this research are to increase understanding of the mechanisms underpinning the regulation of insulin action by nutrition. Ultimately we need to optimise nutrition for health to prevent and reduce the burden of chronic disease.

Projects
− How nutrients regulate insulin sensitivity
− The effect of the glycemic index on energy metabolism and glucose homeostasis
Professor Jennie Brand-Miller

jennie.brandmiller@sydney.edu.au
Honours stream: Biochemistry

Research interests
Carbohydrates – friend or foe? Our group’s research on food carbohydrates has provided evidence that foods with a high glycaemic index (GI) increase the risk of chronic diseases, thereby challenging conventional views on healthy diets. This has raised the current profile and reach of nutrition science, and its potential future impact.

Projects
− Salivary amylase gene (AMY1) copy number and the amount of starch digested in a meal
− Salivary amylase gene (AMY1) copy number and satiety/appetite responses to foods (co-supervised with Dr Fiona Atkinson)

Professor Maria Byrne

maria.byrne@sydney.edu.au
Honours stream: Biology

Research interests
I have a wide interest in the biology of marine invertebrates. My research is focused in two interlinked areas, global change biology and marine invertebrate evolution to determine the response of marine biota to global change and to understand mechanisms underlying evolution in the sea.

Projects
− Evolution and development
− The impact of climate change stressors on marine invertebrates
Associate Professor Mary Byrne

mary.byrene@sydney.edu.au
Honours stream: Biochemistry

Research interests
We are interested in identifying and understanding gene networks involved in regulating plant shoot development. Our research uses the model species Arabidopsis thaliana. The enormous genetic and genomic tools and resources available in Arabidopsis enable use of a broad range of approaches to investigate details of developmental biology.

Projects
- Transcription factor regulation of leaf development
- Evolution of transcription factor genes

Professor Iain Campbell

iain.campbell@sydney.edu.au
Honours stream: Biochemistry

Research interests
Learning how cytokines function in the brain to cause inflammation and disease remains an important puzzle to solve and is a major goal of our research. We seek to understand the precise signal transduction mechanisms employed by different cytokines to alter the gene expression program and phenotype of cells within the central nervous system and how this leads to neurological disease.

Projects
- Analysis of IL-6/gp130 cytokine signalling and actions in brain astroglia and microglia
Professor Dee Carter  
dee.carter@sydney.edu.au  
Honours stream: Microbiology or Biochemistry

Research interests  
Fungi have a huge impact on our health, food and environment. We are interested in how fungi adapt to changes, making them more able to cause harm and resist treatment, and in new approaches to treat fungal diseases.

Projects  
- The use of antimicrobial honey to treat fungal infections  
- Micro-cell variants in Cryptococcus and their role in infection

Professor Min Chen  
min.chen@sydney.edu.au  
Honours stream: Biochemistry or Biology

Research interests  
In 2010, the most red-shifted chlorophyll, chlorophyll f, was reported, which gives the potential for extending the limits of natural photosynthesis. The projects will aim to better understand the molecular mechanisms of photosynthesis driven by novel chlorophylls and seek to improve photosynthetic efficiency and biomass production.

Projects  
- Chlorophyll biosynthetic pathway, a pathway leading to potential application for increasing crop yield
Dr Nicholas Coleman

nicholas.coleman@sydney.edu.au
Honours stream: Microbiology or Biochemistry

Research interests
Environmental microbiology, biotechnology, synthetic biology, bacterial evolution. Our lab takes inspiration from the incredible power of microorganisms to catalyse useful reactions. We are interested in the interface between microbes and anthropogenic chemicals; this includes studies of pollutant biodegradation, biocatalysis, and the movement of antibiotic resistance genes.

Projects
- Development of biocatalysts for green synthesis of epoxides
- Engineering bacteria for enhanced biodegradation of organochlorines
- Synthetic biology: Creation of an ethylene biosensor

Associate Professor Ross Coleman

ross.coleman@sydney.edu.au
Honours stream: Biology

Research interests
The Coastal and Marine Ecosystems group uses experimental and modelling approaches to understand the basis of animal distributions and interactions in coastal systems and how these interact with oceanic phenomena. My research looks at how and why biodiversity is spatially structured, and how organisms may behave or modify their physiology as to reduce the chances of being eaten.

Projects
- Wound-induced defence in seaweed
- Biodiversity and geomorphology of rocky shores under climate change
Professor Arthur Conigrave  
arthur.conigrave@sydney.edu.au  
Honours stream: Biochemistry  

Research interests  
Our research focuses on the molecular and cellular mechanisms that underlie nutrient sensing with a particular interest in nutrient-sensing G-protein coupled receptors including amino acid/calcium-sensing receptors and amino acid/glucose/fructose-sensing receptors that coordinate responses to nutrients.  

Our work involves cell culture, molecular engineering, transfection and transduction of vectors and plasmids, protein detection and purification, analysis of protein interactions, biochemical pathway analyses and phenotypic characterisation of transgenic mouse models.

Professor Stuart Cordwell  
stuart.cordwell@sydney.edu.au  
Honours stream: Biochemistry or Microbiology  

Research interests  
The tools of proteomics have become essential in the study of health and disease in the post-genome era. Our group is primarily interested in understanding disease processes with the aim of discovering new protein- and peptide-based targets for the diagnosis of disease, as well as novel vaccines and better therapies. We investigate two broad biological systems; bacterial pathogens and ischemic heart disease.

Projects  
- The role of N-linked protein glycosylation in bacterial pathogenesis  
- Crosslinking mass spectrometry to define protein complexes in bacterial disease  
- Post-translational modifications in cardiovascular disease
Associate Professor Mathew Crowther

mathew.crowther@sydney.edu.au
Honours stream: Biology

Research interests
My research involves the ecology and evolution of native and introduced fauna, using a combination of field, laboratory and statistical approaches.

Projects
- What environmental factors determine the distribution, density and movement of koalas on a fragmented landscape
- What chemicals in cat fur cause a fear response in rodents (with Prof Iain McGregor, Psychology)
- Do native and introduced rodents show the same fear response to cat odours? (with Prof Iain McGregor, Psychology)

Dr Mark de Bruyn

mark.debruyn@sydney.edu.au
Honours stream: Biology

Research interests
I am a population geneticist focussing on molecular ecology, with an interest in the development and application of novel tools, such as environmental DNA, ancient DNA and wildlife forensics, for biodiversity science. I work across taxonomic groups, but have a keen interest in freshwater systems.

Projects
- Developing environmental DNA tools for rapid bio-assessment
- Has past climate change caused ‘reverse speciation’ in freshwater fishes?
- Assembling a phylogenetic framework for the Australia biota
Associate Professor Gareth Denyer
gareth.denyer@sydney.edu.au
Honours stream: Biochemistry

Research interests
Obesity causes disease through the secretion of cytokines from adipocytes and macrophages in adipose tissue. We discovered that the expression of inflammatory genes in adipocytes has a memory, with prior exposure causing larger responses. Our aim is to understand the ramifications of this phenomenon and define its underlying molecular mechanisms.

Projects
- Epigenetic regulation of adipocyte inflammatory gene expression
- Do human adipocytes show transcriptional memory?

Professor Chris Dickman
chris.dickman@sydney.edu.au
Honours stream: Biology

Research interests
The major focus of the Terrestrial Ecology Lab is to explore the factors that influence the distribution and abundance of terrestrial vertebrates. This research is inherently fascinating because it allows us to uncover and explain the causes of many intriguing patterns of vertebrate distributions in the Australian fauna. It is also of practical importance because so many species have declined or become extinct with the advent of European settlement, and there is a clear imperative to prevent further losses.
Dr Bradley Evans

bradley.evans@sydney.edu.au
Honours stream: Biology

Research interests
I have expertise in modelling and sensing natural (native) and semi-natural (i.e. agricultural) environments using both ground based sensors, airborne (planes and drones) and satellites. My research focuses on understanding the ecophysiology, climate and environmental constraints affecting biophysical models of plant growth and water use.

Projects
- High-resolution estimation of above ground biomass and plant productivity
- Using drones on farms to improve productivity
**Dr Thomas Ferenci**

tom.ferenci@sydney.edu.au
Honours stream: Microbiology or Biochemistry

**Research interests**
We study fundamental aspects of adaptation in bacterial populations. The molecular changes in evolving bacteria are investigated with the aim of defining the multiple mechanisms (especially mutational processes and fitness solutions) that lead to bacterial adaptation.

**Projects**
- Mutation rates and mutation spectra in a continuous culture (chemostat) model system
- The role of trade-offs in evolution and the molecular basis of trade-off geometries

**Dr Sandro Fernandes Ataide**
sandro.ataide@sydney.edu.au
Honours stream: Biochemistry

**Research interests**
We use biophysical tools to investigate the structure and function of RNA-protein complexes and how they regulate cellular process. Especially, we are interested in how non-coding RNAs mediate epigenetic regulation in cancer and other related diseases. Our goal is to harness their functions for biomedical and biotechnological purpose.

**Projects**
- Structural basis of how DNMT3a interacts with IncRNAs
- Exploiting the bacterial SRP receptor as a drug target
Associate Professor William Figueira

will.figueira@sydney.edu.au
Honours stream: Biology

Research interests
The focus of research within my lab is the population ecology of marine fishes and includes a variety of projects from demographic studies to climate change and management. My group has an emphasis on quantitative analytical methods and we work in temperate and tropical environments using a variety of in-situ data collection techniques.

Projects
- Understanding the processes of seasonal persistence of tropical marine fishes
- Understanding linkages between environment and growth in settlement stage fishes
- 3D mapping of benthic marine systems and evaluating the role of structural complexity on the dynamics of biodiversity in these systems

Associate Professor Neville Firth

neville.firth@sydney.edu.au
Honours stream: Microbiology or Biochemistry

Research interests
Strains of Staphylococcus aureus that are resistant to antibiotics are a significant medical problem. My laboratory investigates the roles of mobile genetic elements in the evolution of antimicrobial resistance, with a focus on the molecular biology of plasmids that facilitate the acquisition, maintenance and dissemination of resistance genes in staphylococci.

Projects
- Genetics of S. aureus conjugative multiresistance plasmids
Professor Ruth Hall

ruth.hall@sydney.edu.au
Honours stream: Microbiology or Biochemistry

Research interests
Projects in the Hall laboratory focus on the mechanisms that lead to accumulation of resistance to many different antibiotics in Gram-negative bacteria such as Acinetobacter, Escherichia coli, and Klebsiella. In particular, we study where resistance genes come from and how they are brought into and maintained in human pathogens.

Projects
- Becoming pan resistant - evolution of Acinetobacter baumannii multi-resistant clones
- Role of plasmids in the accumulation of resistance genes to generate pan resistance
- What distinguishes transposition of IS26 from other IS?

Dr Dale Hancock

dale.h Hancock@sydney.edu.au
Honours stream: Biochemistry

Research interests
I am interested in microRNAs and their role in gene expression, particularly in the context of obesity. It has long been known that gene expression is regulated both by transcriptional and post-transcriptional mechanisms and there is now increasing experimental evidence suggesting microRNAs play a major role in the control of mRNA stability and translatability.
Associate Professor Marcus Heisler

marcus.heisler@sydney.edu.au

Honours stream: Biochemistry

Research interests

Our research focus is on developmental patterning in plants using the model species Arabidopsis thaliana. In particular, we are interested in how plants create their wonderful symmetrical arrangements of leaves and flowers and how particular organ shapes are formed. Our approach is to analyse development dynamically at cellular resolution using confocal microscopy and by using fine scale perturbations to dissect intercellular signalling pathways. See: www.heislerlab.com

Projects

- Dissecting cell-cell communication underlying cell polarity coordination
- Investigating a developmental organiser involved in leaf morphogenesis

Associate Professor Murray Henwood

murray.henwood@sydney.edu.au

Honours stream: Biology

Research interests

Our research focuses on the molecular and cellular In the Plant Systematics Laboratory, our research is concerned with the recognition and documentation of patterns of variation in time and space within all elements of the Australian flora. To achieve these goals we use a variety of techniques and data-sources including fossils, geographic distributions, morphology and anatomy, and nucleotide sequences.

Projects

- Southern connections: understanding the role of Gondwana in the divergence and radiation of the ivies (Araliaceae)
Which question will you tackle? Supervisors and projects
Dr Catherine Herbert
catherine.herbert@sydney.edu.au
Honours stream: Biology

Research interests
My research team investigates key biological processes influencing the management of marsupial populations. We focus on having a solid foundation of knowledge to facilitate evidence-based wildlife management, with two key themes: (1) Understanding baseline population parameters and the basis of human-wildlife conflicts; and (2) Understanding how wildlife management approaches affect individual animals and broader population dynamics.

Projects
- Wildlife rehabilitation, “stress” and survival in brushtail possums
- Understanding factors influencing the survival of hand-reared brushtail possums post-release
- Understanding the movement behaviour of kangaroos and wallabies within the context of rapid urbanisation in Western Sydney

Professor Simon Ho
simon.ho@sydney.edu.au
Honours stream: Biology

Research interests
I am a computational evolutionary biologist and my research is based on analyses of genetic data to answer evolutionary questions. This usually involves the study of molecular clocks, evolutionary rates and timescales, and phylogenetic methods. My work spans a broad range of taxa, including vertebrates, insects, fungi, plants, and viruses.

Projects
- Rates of molecular evolution across the Tree of Life
- Phylogenomic estimation of evolutionary timescales
Associate Professor Dieter Hochuli

dieter.hochuli@sydney.edu.au
Honours stream: Biology

Research interests
My research focuses on insect-plant interactions, community ecology and conservation biology. Much of my work examines the ecology of urban environments and their biodiversity, identifying responses to landscape degradation and ecosystem stressors, as well as how to enhance greenspace in cities. I’m interested in projects scaling responses from individuals to landscapes in a range of systems.

Projects
− The ecology of greenspace in cities
− Are urban ecosystems hostile environments for biodiversity?
− How does biodiversity adapt to life in the city?

Dr Markus Hofer

markus.hofer@sydney.edu.au
Honours stream: Biochemistry

Research interests
Inflammation plays a central role in most central nervous system disorders. It protects the brain from infection and drives neurological diseases. My laboratory investigates factors that cause and modulate inflammation in the brain. Using mouse models, we explore how viruses and host mediators modulate neurological diseases.

Projects
− Understanding the pathogenesis of Zika virus infection using a mouse model
− The effects of deficient interferon signalling on the host response against viruses
Associate Professor Andrew Holmes

andrew.holmes@sydney.edu.au
Honours stream: Microbiology or Biochemistry

Research interests
Our gut microbiome has an enormous impact on our health through its contribution to digestion and interaction with the enteric endocrine, lymphoid and nervous systems. A dysfunctional host-microbiome interaction is a factor in many diseases including obesity, diabetes and inflammatory disorders.

Projects
- Quantifying the microbiome impact on nutrition and immune function
- Computer simulation of the diet-microbe-health interaction axis

Professor David James

david.james@sydney.edu.au
Honours stream: Biochemistry

Research interests
Our overarching goal is to understand how genes interact with the environment to cause metabolic diseases like Type 2 diabetes. Using cellular and animal models we conduct both unbiased systems biology type studies as well as targeted functional analyses of protein function in living cells. We use a broad spectrum of technologies spanning mass spectrometry, live cell imaging and bioinformatics.

Projects
- Mapping new functions of insulin and exercise
- The interaction between diet and the genome in flies and mice
- Studying the mechanism of insulin resistance
Dr Melkam Kebede
melkam.kebede@sydney.edu.au
Honours stream: Biochemistry

Research interests
There is a loss of pancreatic β-cell function in type 2 diabetes. This is characterised by reduction in glucose-stimulated insulin secretion. In β-cells, insulin is packaged and stored in secretory granules (SGs). Upon stimulation, these granules mobilize and fuse with the plasma membrane (PM), delivering insulin to the bloodstream. Our lab is interested in understanding the molecular composition of insulin SGs and how they control secretion properties under normal and disease conditions.

Projects
- Characterising insulin secretory granules as a function of age under normal conditions
- Characterising insulin secretory granules as a function of age under conditions of metabolic stress

Associate Professor Brian Jones
brian.jones@sydney.edu.au
Honours stream: Biology

Research interests
From understanding the basis of gene function to producing designer life forms, the breakthrough CRISPR/Cas and related technologies have opened a new world of possibilities. We are exploring ways to improve CRISPR/Cas function and are using it to manipulate one of the fundamental processes in biology, reproductive development in plants.

Projects
- Optimising gene knockout in embryonic cells
- Reproductive cell-specific CRISPR/Cas function
Associate Professor Michael Kertesz
michael.kertesz@sydney.edu.au
Honours stream: Microbiology

Research interests
As a molecular microbial ecologist, my interests target questions of functional microbial interactions, especially in soil and rhizosphere environments. Soil and roots constitute a highly dynamic and complex ecosystem and understanding who is doing what, when and with whom can yield a host of new insights, many of which have practical implications for sustainable agriculture.

Projects
- Bacterial sulfatase stimulation by plants
- Fungal-bacteria interactions in mushroom cultivation
Dr Ann Kwan
ann.kwan@sydney.edu.au
Honours stream: Biochemistry

Research interests
Increasingly, major progresses in biology and medicine are only possible through a combined effort from different fields. My laboratory is focused on solving important biological problems using a cross-disciplinary approach that range from molecular biology, cell culture, protein chemistry, biophysics, structure biology, modelling, microscopy, surface measurements and metabolomics.

Projects
- Engineering proteins and nanoparticles for drug delivery and coating applications
- Characterising and developing inhibitors to proteins implicated in periodontal diseases
- Investigating the effects on cellular signalling and communication with novel cancer and other therapies

Dr Mark Larance
mark.larance@sydney.edu.au
Honours stream: Biochemistry

Research interests
In animals, short periods of nutrient deprivation, such as intermittent fasting, have been shown to provide benefits with regard to cancer risk and ageing. I aim to identify how this is occurring at the protein-level, determine how intermittent fasting can improve metabolic health and improve the nutrient deprivation regimes for implementation in humans, for the prevention and treatment of cancer.

Projects
- Proteomic analysis of polysome complexes in liver tissue
**Dr Tanya Latty**

tanya.latty@sydney.edu.au
Honours stream: Biology

**Research interests**
We are insect ecologists focused on: 1) Swarm intelligence in bees, ants and slime moulds and 2) insect pollination ecology, especially in urban and rural agriculture. We also have projects available on slime mould behaviour, the response of ant colonies to disasters, and insects as food for livestock/humans.

**Projects**
- Ants as engineers: how do meat ants build efficient roadways?
- Bee hotels: important conservation tools or parasite-riddled death traps?

**Dr Osu Lilje**
osu.lilje@sydney.edu.au
Honours stream: Microbiology or Biology

**Research interests**
My research interest focuses on microbial ecology and how the eukaryotic microorganisms respond to changes in the environment. My research involves aseptic culture work, in vitro modelling, microscopy, environmental sampling, molecular analysis, conceptual and statistical modelling and molecular techniques such as next generation sequencing.

**Projects**
- Characterising isolated Labyrinthula, potential protistan pathogens of seagrasses
- Do environmental and anthropogenic factors influence aquatic microbial diversity?
Associate Professor Nathan Lo
nathan.lo@sydney.edu.au
Honours stream: Biology

Research interests
We are interested in the nexus between evolution, ecology, and genetics/molecular biology. We study evolution at a broad range of temporal scales and in diverse taxa. We use a variety of computational and molecular techniques, focussing on genomic data.

Projects
- Bird strike at Australian airports: characterisation of diet in relevant bird taxa using metagenomics
- How predictable is evolution? Investigating parallel genetic evolution in bacterial symbionts of native Australian cockroaches

Professor Joel Mackay
joel.mackay@sydney.edu.au
Honours stream: Biochemistry

Research interests
How are genes switched on and off? We are exploring the mechanisms underlying transcriptional and epigenetic gene regulation and trying to design new molecules to modulate gene expression, with a focus on cancer. Projects may involve the following methods: mammalian cell culture, DNA, mass spectrometry, cloning, protein expression and purification, protein biochemistry, structural biology.

Projects
- How does the Nucleosome Remodelling and Deacetylase complex remodel chromatin?
- Can we design targeted epigenetic modifier enzymes using CRISPR/Cas9 fusion proteins?
- Using custom protein microarrays to interrogate the mechanisms of gene regulation
Professor Jacqui Matthews

jacqueline.matthews@sydney.edu.au
Honours stream: Biochemistry

Research interests
The LIM-only (LMO) proteins play essential roles in normal development and disease. All of these proteins form multiprotein complexes that regulate gene expression, and we use predominantly in vitro techniques (molecular biology, protein engineering and chemistry, structural characterisation) to work out how complexes assemble, what they look like and how to modulate complex formation to treat disease.

Projects
- LMO2 - blood cell development/ T-cell leukemia
- LMO4 - brain development/ in breast cancer

Associate Professor Clare McArthur

clare.mcarthur@sydney.edu.au
Honours stream: Biology

Research interests
My research explores the ecological interactions of herbivores with plants and predators: how herbivores solve the key foraging problem of eating without being eaten, how plants defend when they can’t escape and how the fear of predators modifies these interactions. These projects can be applied to conservation and management of both herbivores and plants.

Projects
- Quantify how mammalian herbivores such as swamp wallabies use odour and visual cues of plants when searching for food in complex natural landscapes (with Professor Peter Banks)
**Associate Professor Greg Neely**

greg.neely@sydney.edu.au  
Honours stream: Biochemistry

**Research interests**
Our lab is focused on functional annotation of the genome. Our objective is to identify genes and coding mutations that participate in major age-related and neurological diseases. We combine human genomics data with functional validation in vivo to identify new genes that contribute to human neurological disease.

**Projects**
- Lifespan extension while preserving brain function
- How does diet alter taste perception?
- Environmental factors that suppress synaptic function

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**Dr Timothy Newsome**
timothy.newsome@sydney.edu.au  
Honours stream: Microbiology or Biochemistry

**Research interests**
What viral pathogens have learnt about their host’s biology is written down in their genomes, a toolbox used to prise open their hosts, subvert signalling pathways and assemble viral progeny. Our research seeks to understand how viruses spread in a multicellular host and the role of viral infection on the host cytoskeleton and cell behaviour. We use viral genetics, biochemistry, cell biological analyses and advanced light microscopy to gain insight into these processes.

**Projects**
- Viral co-option of cancer signalling pathways to promote virus spread
- Virus transport mediated by microtubule motor complexes and the actin cytoskeleton
- Cell migration as an enhancer of cell-to-cell transmission of viral progeny
Dr Hannah Nicholas

hannah.nicholas@sydney.edu.au
Honours stream: Biochemistry

Research interests
We study neuronal development and aging using the nematode Caenorhabditis elegans as a model system. With fluorescent reporters we track the growth of neurons during development and monitor age-related neuronal changes in order to understand the mechanisms by which these processes are regulated.

Projects
- Investigating the roles of transcriptional repressor CTBP-1 in neuronal development
- Studying neuronal aging using proteomics
- Developing tools to monitor proteostasis in vivo during aging

Professor Ben Oldroyd

benjamin.oldroyd@sydney.edu.au
Honours stream: Biology

Research interests
The ‘Bee lab’ is interested in behavioural ecology, behavioural genetics and molecular genetics of social insects and slime molds. We study honey bees (particularly Thai and African ones) and Australian native stingless bees. We are particularly interested in cheating behaviour: when workers start laying eggs or changing caste. We also study population genetics of invasive ants and bees, and use the slime mold to address general evolutionary questions.

Projects
- If you want to know more about the specific projects the lab offers, have a look at our website.
Dr Benjamin Parker

benjamin.parker@sydney.edu.au
Honours stream: Biochemistry

Research interests
My research aims to elucidate the pathways perturbed during metabolic stress. We use systems biology to understand how metabolic pathways are regulated during development, how they become dysregulated during disease, and how we can control pathways to prevent and/or treat disease.

Projects
- Mapping signal transduction pathways in exercise and type-2 diabetes
- Quantifying protein post-translational modifications during muscle development

Associate Professor Rosanne Quinnell

rosanne.quinnell@sydney.edu.au
Honours stream: Biology

Research interests
My main research area is in science education. I am interested in how students learn to practice science and I have a particular interest in student numeracy and in eLearning. I have been investigating student numeracy using several theoretical frameworks including the Thresholds Concepts Framework and Mindfulness with colleagues in School of Mathematics and Statistics and at UNSW.

Projects
- Please contact me to discuss a project in either science education or plant science
**Professor David Raubenheimer**

david.raubenheimer@sydney.edu.au  
Honours stream: Biology

**Research interests**
I am a comparative nutritional ecologist, with a particular interest in the ways that nutrients influence the behaviour, physiology, life history and fitness of animals. My work spans species from insects to fish, birds, rodents and large mammals, including non-human primates (monkeys, lemurs and gorillas) and humans, and includes both field and lab studies.

**Projects**
- Foraging strategies of the Kakapo parrots
- Sex differences in foraging strategies in Australasian gannets in New Zealand

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**Dr Mark Read**

mark.read@sydney.edu.au
Honours stream: Microbiology or Biochemistry

**Research interests**
Biology now faces the challenge of “big data”, requiring new analyses to understand high-throughput data. We use machine learning to predict clinical outcomes for patients, and personalise their treatments accordingly. We use modelling to integrate data sets, and perform experiments impossible in the real world – we can even break the laws of physics to answer a question.

**Projects**
- How do we manipulate the gut microbiome through diet?
- How do immune cells hunt for pathogens?
Professor Peter Reeves

peter.reeves@sydney.edu.au
Honours stream: Microbiology or Biochemistry

Research interests
Genetics and biosynthesis of bacterial surface antigens, critical for both pathogenesis and host immune response. These antigens are extremely variable even within species. Projects involve combinations of mutation, cloning, gene knockouts, and gene replacement, followed by expression and function studies. Aim is better understanding antigen diversity and its role.

Projects
- Functional analysis of selected genes/proteins for O-antigen synthesis in one of the pathogenic enteric bacteria

Dr Jenny Saleeba

jenny.saleeba@sydney.edu.au
Honours stream: Biochemistry

Research interests
My philosophy is that scientific progress at the molecular level comes into its own when small molecular changes affect the phenotype of the whole organism. For this reason, we investigate the effect that small genetic changes have on the whole organism and the way in which phenotypic differences are encoded by the genome.

Projects
- Genetics of complex traits
- Genetics of root branching in Arabidopsis thaliana
Professor Frank Seebacher

frank.seebacher@sydney.edu.au
Honours stream: Biology

Research interests
I am interested in how environmental change and variability affect the physiology of animals, and thereby movement, behaviour, and ecology. I use techniques ranging from molecular to whole-animal observations. For recent projects, have a look at my publications on Google Scholar or Web of Science, and contact me if you are interested in doing an honours project in this field.

Professor Richard Shine

rick.shine@sydney.edu.au
Honours stream: Biology

Research interests
I study the ecology and evolution of reptiles and amphibians – partly because they are so damn interesting, and partly because we need to understand these creatures if we are to have any hope of conserving their populations. My studies span the range from tropical snakes and invasive cane toads, through to endangered snakes and lizards in New South Wales.

Projects
- Rapid evolution in cane toads
- Novel approaches to cane toad control
**Professor Steve Simpson**

stephen.simpson@sydney.edu.au  
Honours stream: Biology

**Research interests**

My group works at the interface of physiology, ecology, and behaviour. As well as discovering the mechanisms that induce swarming in locusts, we have developed state-space models for nutrition. The Geometric Framework arose from experiments on insects, but is now being applied in a wide variety of contexts, including human health and aquaculture.

**Projects**

- Locust ecology and physiology
- Investigation into the protein appetite signal in humans
- Evolution of sociality

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**Dr Samantha Solon-Biet**

samantha.biet@sydney.edu.au  
Honours stream: Biochemistry

**Research interests**

Diets low in protein and high in carbohydrate delays ageing and extends lifespan in mice. Exactly how this occurs is unclear. My work investigates the underlying nutrient signalling pathways that drive these responses with the goal of using nutritional interventions to delay the onset age-related disease and extend healthy lifespan.

**Projects**

- Is reducing branched chain amino acid intake the key to improving metabolic health?
Dr Charmaine Tam
charmaine.tam@sydney.edu.au
Honours stream: Biology

Research interests
My research focuses on understanding the physiology behind the development of obesity and type 2 diabetes and spans preclinical studies in mice to cross-sectional and interventional studies in humans.

Projects
- Effects of yo-yo dieting on energy metabolism and adipose tissue function

Associate Professor Charlotte Taylor
charlotte.taylor@sydney.edu.au
Honours stream: Biology

Research interests
My research focuses on an integration of urban ecology, scientific literacy and biodiversity education. My students work across a wide range of topics, from the ecology of urban birds (parrots, mynas and noisy miners) to the ecological literacy of kindergarten children and pre-service teachers.

Projects
- Urban biodiversity and resource availability
- Eco-literacy – how do you think like a biologist?
Professor Mike Thompson
mike.thompson@sydney.edu.au
Honours stream: Biology

Research interests
We are primarily interested in studying the evolution of viviparity (live birth). In collaboration with other staff in the School and elsewhere, we use a variety of methods to address specific questions in reproduction, including microscopy, immunohistochemistry, molecular biology and various physiological methods in lizards, fishes, marsupials and some invertebrates.

Projects
- Cellular preparation of the uterus for pregnancy
- Mechanisms of nutrient transport across the placenta

Dr Murray Thomson
murray.thomson@sydney.edu.au
Honours stream: Biochemistry or Biology

Research interests
Stress and reproduction in animals can be investigated using diverse approaches including behavioural studies, physiology, cell biology and microscopy. Most of my recent research focuses on the marine isopod Cirolana harfordi that, gives live birth, is a social animal and represents the evolutionary transition from sea to land.

Projects
- Social and amphibious behavior of the marine crustacean Cirolana harfordi
- How Cirolana harfordi deals with the stress of salinity changes
Dr Jibran Wali

jibran.wali@sydney.edu.au
Honours stream: Biochemistry

Research interests
My research focuses on how dietary macronutrients affect metabolism and how this links to obesity, insulin resistance and type-2 diabetes. In particular, I am investigating the impact of consuming different types of carbohydrates (starch, sucrose, glucose, fructose and dietary fibre) on adiposity, insulin sensitivity, glucose homeostasis and metabolic hormone concentrations.

Projects
- Effects of glucose vs fructose intake on metabolic homeostasis
- Does dietary fibre improve metabolic health by increasing FGF21 hormone signalling?

Professor Ashley Ward

ashley.ward@sydney.edu.au
Honours stream: Biology

Research interests
I’m interested in all aspects of animal behaviour. I have supervised a diverse range of honours topics: cleaner wrasse behaviour on the reef, courtship behaviour and mate choice decisions, the physiology that underlies behaviour, and, predator-prey interactions. My main research is focussed on collective behaviour in animals, how animal groups work and how the function.

Projects
- How the many become one: collective behaviour in natural systems
- Learning and information use in animal groups
Professor Glenda Wardle

Research interests
My research explores why plants, animals, populations and ecosystems vary and how this contributes to their persistence. I especially love arid ecology and using experiments and models in clever ways to advance the knowledge we have to manage and conserve the ecosystems that support us.

Projects
- Study the population biology of Plantago lanceolata as part of a global team
- Experimentally test how adding nutrients or imposing drought changes the species composition and ecosystem processes of arid grasslands

Associate Professor Charles Warren

Research interests
My lab investigates how plants function and interact with soil. The scope of this research includes the roles of plants and soil microbes in processes at the ecosystem scale, for example, ecosystem cycles of carbon, nitrogen and phosphorus.

Projects
- Diversity and co-existence of plant species, is it related to strategies of nitrogen uptake?
- Co-evolution of plant and microbial strategies for dealing with P deficiency
Dr Camilla Whittington

Honours stream: Biology

Research interests
We study evolutionary innovations including viviparity (live birth/pregnancy), which has evolved convergently hundreds of times in both vertebrates and invertebrates. We use genetics/genomics, histology, morphology and physiology to study the reproductive biology of lizards, fish, marsupials, and invertebrates. Please see our website for more information.

Projects
- Fundamental biology of pregnancy in sharks or lizards
- Physiology of male pregnancy in seahorses
- Evolution of viviparity in cockroaches

Professor Anthony Weiss

Honours stream: Biochemistry

Research interests
We are building elastic tissue components in the Charles Perkins Centre. Our biomaterials have been used in four human clinical trials. We now seek Honours students interested in participating in making the next generation of elastic biomaterials for organ and tissue augmentation and repair.

Projects
- Cell: molecule interplay in the assembly of human elastic tissue
- Accelerated wound repair for human burn patients
- 3D artery constructs
Which question will you tackle? Supervisors and projects
Additional information

Local students

- Read about the available projects and arrange to meet with potential supervisors
- Submit your online Honours and Graduate Diploma Projects Application Form by the closing dates listed on page 5.
- Submit your online Faculty of Science Honours Application Form to the Faculty of Science by the closing date listed on page 5.

International students

- Read about the available projects and arrange to meet with potential supervisors
- Submit your online Honours and Graduate Diploma Projects Application Form with your choice of three supervisors by the closing dates listed on page 5.
- Submit an International Undergraduate Student Application Form to the International Student Office for visa processing.
- Submit your online Faculty of Science Honours Application Form to the Faculty of Science by the closing date listed on page 5.

Contact

Richard Withers
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The University of Sydney
E soles.education@sydney.edu.au
T (02) 9114 1535
“Honours gave me experience in problem solving, project management and analytics. Plus it improved my communication skills and I had a blast!”

Jessica Higgs (Honours graduate)
Why do Honours with us?

Our school is made up of world class researchers and experienced and effective mentors. You will find a broad range of research projects available to meet your specific interests spanning biochemistry, ecology, microbiology, animal behaviour, genetics and evolution. Finally, our honours alumni find employment in a wide variety of fields - with an Honours degree in life and environmental sciences behind you, the choice is yours!

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