Honours Potential Projects
For students commencing 2016
Honours

Studying Honours offers a chance to develop your research and professional skills guided by staff who are passionate about research and the development of new researchers. An Honours year provides (i) the satisfaction of advanced study, (ii) a close supervision relationship with an academic, (iii) the ability to engage in specialised and extended research, (iv) enhanced job opportunities and (v) a pathway to a postgraduate research degree such as a Masters by Research or PhD.

What is Honours?
Study at Honours level represents the highest level of training in an undergraduate degree within the Australian tertiary education system. Honours is an extra year of study, usually following immediately on from a pass degree, that combines aspects of undergraduate study with those of postgraduate research. It introduces advanced research training through the completion of a thesis or a creative or practice-based research project.

An Honours degree is available only to students who have attained a specified level of academic achievement in a particular program of study, involves both coursework and advanced research training, and usually has an extra year of university study devoted to it.

Why do Honours?
Undertaking an Honours year will allow you to get your first real glimpse of what being an academic involves. You will devise your own thesis/research project which will involve you developing your own research questions and conducting original investigation, analysis and reporting to complete your project. Completing an Honours degree brings many rewards. These include:

- obtaining a much deeper understanding of your academic discipline
- working one-on-one with your supervisor and receiving instruction on the finer points of reading, writing and critical thinking, and
- developing a sense of collegiality with a select group of Honours students who will be your peers, and with whom you will share all the excitement, interests, aspirations, and insights that come with an intensive period of study.

Students undertake Honours for a variety of reasons including preparation for a research degree, improving their employment opportunities or simply a passion for advanced learning in their discipline.

Honours can be taken in the School of BEES in the following disciplines: Biological Science, Botany, Ecology, Environmental Science, Human or Physical Geography, Geography, Geology, Marine Science, and Zoology.

Surveys of recent graduates of UNSW consistently reveal that the employment prospects of honours graduates are markedly superior to those with pass degrees, which suggests that employers, including those outside the biological field, value the extra training of the honours year.
Selecting a project and supervisor

You are encouraged to start thinking about potential projects and to contact potential supervisors as early as possible once you have decided to do Honours. This is because entry is dependent on satisfactory arrangements being made regarding a research project, the availability of facilities within the school, and the agreement of a staff member to supervise your work. The best approach is to discuss your interests with a range of staff members, ask them what types of projects they have on offer and then make a decision.

Staff research interests may be found on either the Academic or Visiting Academic staff pages on the BEES website.

This will be your first opportunity to conduct independent research, but also remember that the honours year is still an intense training period. Pick a project that provides a wealth of data and/or opportunity for experimentation, within a realistic budget. Projects that are not fully aligned with your early passions (e.g. behaviour of dolphins or fresh Antarctic geology cores) may nevertheless provide the most enlightening experiences!

EXTERNAL SUPERVISION

You may also seek co-supervision outside the School, by those that may have stimulated your interest during guest lectures, such as those from many government organisations (EPA, DLWC, Australian Museum, Royal Botanic Gardens, NSW Fisheries etc). By all means approach these people similarly (ie e-mail CV), but you will need an academic supervisor within BEES that must take on the academic responsibility of your project. There is always the risk that externally supervised students may ‘fall between the cracks’.

Funds for your research project are limited, and are usually sourced from the supervisor's own research funds. The School of BEES provides a small amount of monetary support to cover phone calls, faxes, photocopying etc.
Honours Generic Schedule and Timetable

During the Honours year you will be developing an original research project of your own, under the close guidance of your supervisor. At the outset of the year (regardless of whether you start in Semester 1 or 2), Honours students get together to go over some useful Professional Skills for the year and for your career beyond Honours. While this work is not graded, you do need to attend all sessions and get a satisfactory mark to pass your Honours year.

Professional skills will be run during O-week (S1 or S2 starters) and Week 1 (S2 only). Please note that attendance to these sessions is compulsory.

Below is an example of the Course Schedule you can expect as part of your Professional Skills training (please note specific aspects of this schedule may change from year to year).

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<td>O-week, S1 or S2</td>
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<td>Intro to course &amp; questions&lt;br.Library skills&lt;br&gt;Break&lt;br&gt;Writing workshop 1&lt;br&gt;Lunch break&lt;br&gt;WHS-desk-based (incl. MC assessable task)&lt;br&gt;WHS Field/lab component***</td>
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<td>Presentation skills&lt;br&gt;Break&lt;br&gt;Ethics 1&lt;br&gt;Lunch break&lt;br&gt;Writing workshop 2&lt;br&gt;Ethics 2</td>
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<td>Writing workshop 3&lt;br&gt;Break&lt;br&gt;Writing workshop 4&lt;br&gt;Lunch break&lt;br&gt;Student project intro seminars&lt;br&gt;Break&lt;br&gt;Student project intro seminars&lt;br&gt;Social session</td>
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Semester 2 - Career Advice
(All students to take once a year, S1 and S2 Honours cohorts combined)

| Week 1, S2 only       | Mon | Writing a winning Job Application: Resume, Cover letter & selection criteria documents<br>Lunch break<br>Ace the interview! Effective interview preparation<br>Break<br>Network for success: building your professional network<br>Break<br>BEES Alumni Panel & social networking session |
|                      | Wed | Careers in Research: PhD and beyond (voluntary session) |

Deadlines for Honours assignments:

- Research Proposal: 12pm, Thursday week 9 of your first session
- Final Thesis: 12pm, Thursday week 13 of your second session
- Final oral presentation: week 15 of your second session
### For a session 1 start

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### For a session 2 start

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### Student to do (prior to starting Hons)

- Find a supervisor and enrol via BEES office
- Agree meeting schedule with supervisor, select topic
- Preparatory background reading
- Confirm course requirements (eg field trip times)

### Student to do (session start)

- Participate in week 0+1 introductions and prof skills
- Hand in problem statement
- Review timeline with supervisor
- Supervisor to confirm 2 examiners with hons coordinator
- Refine scope
- Draft project proposal
- Revise proposal w/ supervisor comments
- Hand in proposal document
- Continue on research and finalise thesis document
- Review supervisor feedback, edit, print
- Submit final thesis
- (If relevant) discuss and apply for APA scholarship
- Do final presentation
Potential Honours Project

Caves – the final frontier?

CLIMATE

Contact: Professor Andy Baker a.baker@unsw.edu.au

Supervisor/s: Professor Andy Baker

Synopsis: Where can you go, without leaving Earth, and be the first person to ever go there? There are few such places, but caves are one of those. Because of their challenges to access, it means that many aspects of cave science are also novel and research worthy.

Climate
How does cave climate relate to that on the surface, and how does this then affect cave ecology and karst processes? Cave climate is surprisingly hard to measure, given the relatively harsh conditions of high humidity and carbon dioxide concentrations.

Aims: Meteorologically inclined Honours students are welcome to join projects that seek to investigate the relationship between cave and surface temperature, the mystery of why cave air carbon dioxide concentrations are so high, or the challenges of measuring cave air humidity and evaporation.
Potential Honours Project

Caves – the final frontier?

Contact: Professor Andy Baker a.baker@unsw.edu.au

Supervisor/s: Professor Andy Baker

Synopsis: Where can you go, without leaving Earth, and be the first person to ever go there? There are few such places, but caves are one of those. Because of their challenges to access, it means that many aspects of cave science are also novel and research worthy.

Environmental history
Stalagmites contain records of past environments, including groundwater availability, vegetation and climate.

Aims: We have a suite of analytical equipment available to Honours projects for the analysis of stalagmites to obtain records of past environmental history from isotopes, organic matter and inorganic geochemistry. With the Curnoe group, we are also interested in the interpretation of these records in relation to archaeological evidence.
Outlined below are some potential research questions and active areas of research in the Bonser lab. I am also happy to discuss alternate research areas.

1) The evolutionary ecology of sex in plants • Does sexual reproduction in clonally reproducing plants allow plants to escape their parasites? Do plants under high parasite loads have high allocation to sexual reproduction even in environmental conditions where sexual reproduction should not be favoured?
   • What are the environmental factors favouring the different reproductive strategies in species capable of both sexual and clonal reproduction?

2) The evolutionary dynamics of species invasions • Species rapidly invading new habitats tend to have small populations with few potential mates at their range edges. Are range edge populations of invasive species more likely to invest in traits ensuring successful reproduction even at the cost of lower fitness? Are range edge populations more likely to be capable of self fertilisation or more likely to invest in clonal reproduction?
   • How quickly do plants at the edge of an expanding range edge adapt their new environments? Does migration from potentially maladapted individuals from core populations help or hinder invasion rates?

Other current research:
   • Understanding plant adaptive strategies and life histories across regional and continental environmental gradients
   • Plant tolerance to herbivory and parasitism
   • The ecological significance of plant form and function
   • Adaptive plasticity and plant responses to changing environments

Contact Associate Professor Stephen Bonser (s.bonser@unsw.edu.au)
Impact of ‘Bondi Rescue’ on beach safety awareness

Supervisor/s: Associate Professor Rob Brander

Synopsis: ‘Bondi Rescue’ is a very popular Australian-based reality television show following the day to day activities of the lifeguards at world famous Bondi Beach. Now in its tenth season (I think), the series has a global reach.

Much of the footage involves lifeguards rescuing people from rip currents, helping injured people from impact injuries due to dangerous waves, surfboards or other people, as well as treatment for jellyfish stings. However, rip current rescues tend to be the dominant theme throughout the show.

This project will involve conducting a video content analysis of all the complete seasons of Bondi Rescue to create a database related to beach safety characteristics. It will also involve creating an online survey via Survey Monkey that will be disseminated through social media. Interviews with the lifeguards can also be done.

The project will involve statistical analysis of survey data using Excel and SPSS and the student must be prepared to watch a lot of Bondi Rescue!

Aims: How much impact has the show had on domestic Australian and international visitors awareness of beach hazards and safety when visiting Australian beaches in general? Are people more inclined to seek out beaches with lifeguards and swim between the flags? Are they more aware of the rip current hazard? How effective has the show been in actually providing an understanding and educational value towards beach hazards? This has serious questions about the value of reality television as an educational tool.
Potential Honours Project

Global rip current spacing and wave climate

Supervisor/s:  Associate Professor Rob Brander

Synopsis:  Rip currents are the major hazard facing recreational beachgoers accounting for hundreds, if not thousands, of drowning fatalities globally each year. The most common type of rip current globally is a ‘fixed’ rip current which occupies a deep channel between shallow sandbars. Typically these rip currents are associated with intermediate beach states, usually the transverse bar rip beach state. One characteristic of fixed rip currents is that they tend to be semi-regularly spaced along the beach. How far apart rip currents are is an important question for coastal scientists as spacing has an important role on sediment transport and beach state evolution. Spacing also has safety implications for lifeguards and bathers. Yet, our understanding of rip current spacing is poor although it is clearly related to prevailing wave climate (wave height, period, direction).

Past studies of rip current spacing have relied on sporadic aerial photo coverage of selected beaches and information available in the academic rip current literature. However, the advent of Google Earth provides coverage of the entire global coastline, and more importantly, provides historical time series of satellite imagery. This project will involve a trip around the beaches of the world with Google Earth, selecting beaches with pronounced transverse bar rip current spacing with different wave climates.

Aims:  The aim is to determine if an empirical relationship does indeed exist between rip current spacing and wave climate. This project will involve creating a global rip current spacing database and the student should have, or be able to acquire, competency at statistical analysis dealing with comparing groups of data.
Interviews of rip current survivors: surviving the panic

Supervisor/s: Associate Professor Rob Brander

Synopsis: Rip currents are the major hazard facing recreational beachgoers accounting for hundreds, if not thousands, of drowning fatalities globally each year. In Australia, an average of 21 people drown in rip currents each year and over ten thousand are rescued. Recently there has been an interest in examining the social science aspect of rip current rescues, specifically who is getting rescued, why, and how?

A recently completed Australian Research Council Linkage Project between UNSW BEES and Surf Life Saving Australia published several papers examining the experiences of rip current survivors based on the results of online and hardcopy surveys. The study also conducted 75 in-depth interviews with rip current survivors that have yet to be fully analysed.

Interviews provide a fascinating and powerful research tool for examining scientific problems, in this case the risk of drowning by rip currents. There are numerous themes that can come out of analysis the rip current interviews, but perhaps the most important one is panic. The panic response tends to dominate when someone gets caught in rip currents and trying to manage and negate this response is now a major goal of Surf Life Saving Australia and beach safety organisations around the world.

Aims: This project aims to provide a better understanding of the panic response of people caught in rip currents in order to assist the development of improved rip current safety education material in the future. Students will gain experience using statistical software in relation to analyzing and coding interview transcripts.

Contact: Associate Professor Rob Brander (rbrander@unsw.edu.au)
Impact of Wave Climate on a small pocket beach, McKenzies Bay, Sydney

Supervisor/s:
Associate Professor Rob Brander

Synopsis:
McKenzies Beach is a small ephemeral pocket beach in Sydney’s Eastern suburbs situated between Bondi and Tamarama Beaches. Sometimes it’s there, sometimes it’s not. Sometimes it’s there for years, sometimes it can disappear for a decade. When the beach is there, it provides a valuable recreational amenity. So what conditions are associated with the formation of a beach at McKenzies and what conditions cause it to disappear?

This study will involve a range of techniques to determine when a beach has existed at McKenzies. This will involve analysis of historical aerial photographs and use of Google Earth imagery, but primarily it will involve some sleuthing – accessing archival information about the beach, talking to locals, and seeking out photographs of the beach.

Fieldwork will include a topographic survey of McKenzies using a Total Station and RTK-GPS backpack. Students should have, or be able to acquire, some familiarity with GIS software that will enable them to analyse imagery.

Aims:
To determine the timing of when a beach exists at McKenzies and when it disappears and then potentially correlate this data with the long term wave climate statistics that are easily accessible from the Manly Hydraulics Laboratory. Recent studies have shown that beaches in the Sydney region can be influenced by ENSO cycles. Is this the case for McKenzies? What conditions make McKenzies appear and disappear?
**Potential Honours Project**

**Historical Analysis of Shoreline Change at Stanwell Park, NSW**

**Supervisor/s:** Associate Professor Rob Brander

**Synopsis:**
Stanwell Park is a moderate energy intermediate beach exposed to the prevailing Sydney wave climate and is characterized by two intermittent tidal creek entrances and a vegetated dune system. Locals claim that dune revegetation practices over the years have reduced the amount of sand available to the beach, dramatically altering both the surf zone morphology and beach width. Bald Hill is a prominent and popular lookout which provides excellent oblique coverage of the extent of Stanwell Park.

This project involves an understanding of beach morphology and has significant coastal management implications. It will involve familiarity (either pre- or gained) of GIS-based software to rectify oblique imagery and calculate geospatial positions on the beach. Fieldwork will involve a total station survey of visual landmarks. The student should have competent skills at computer based analysis.

**Aims:**
This study involves sourcing historical images (of which there are many) taken from Bald Hill, as well as existing aerial photos and satellite images from Google Earth to conduct a long term study of shoreline position, surf zone morphology and dune extent on Stanwell Park beach. The aim is to see whether dune revegetation has indeed had an impact on the beach.
Supervisor/s: Associate Professor Rob Brander

Synopsis:
Every year thousands of students come to Australian universities (including UNSW) for a semester on the Study Abroad program. Most of these students will visit our beaches at some point. Tragically, it is not uncommon for study abroad students to drown at beaches during their study period, not just in Australia, but in locations overseas. This project involves developing an online survey via Survey Monkey to target incoming Study Abroad students before they arrive in Australia. Information obtained will include demographics, beach visitation, swimming ability, beach behaviour and knowledge of beach safety and hazards. The results of the study will help inform universities about the type of educational material that should be developed to educate incoming students about beach hazards.

Similarly, many international students come to UNSW to do a degree.

This project will involve obtaining data from Survey Monkey and then doing data analysis using Excel and SPSS. Interviews of students may also be involved.

Aims:
To determine how much Study Abroad students coming to Australia understand about our beaches and beach safety? Furthermore, the project seeks to understand how much international students know about beaches and beach safety? A survey of incoming students awareness and perceptions of Australia's beaches and beach hazards is also important as international students are also a high risk drowning group.
Potential Honours Project

Surfer rescues in the United States

Contact: Associate Professor Rob Brander (rbrander@unsw.edu.au)

Supervisor/s: Associate Professor Rob Brander

Synopsis:

Every year, lifeguards on surf beaches around the world make thousands of rescues of bathers in distress. However, most of the world’s beaches are unpatrolled by lifeguards and even those that are, are usually done so only seasonally and cover only small sections of the beach. So who is available to rescue someone in trouble when no bystanders are around?

Surfers tend to be found on many unpatrolled surf beaches and outside of patrolled areas on beaches when lifeguards are present. They also tend to surf outside of lifeguard patrolling times. A recent UNSW honours study found that Australian surfers make a significant amount of rescues, on par with the number conducted by volunteer surf lifesavers. Most of these rescues are associated with rip currents and most surfers believed that they had saved a life. Two-thirds of the surfers were happy to have helped. Clearly surfers provide a valuable information, and largely unrecognized role in saving lives on Australian beaches.

However, it may be that surfers in different countries conduct rescues for different reasons and due to different hazards. The incidence of surfer rescues may be higher or lower and vary by region.

Aims:

This project involves modifying the online Survey Monkey survey used to capture Australia data to the United States Context. The United States has multiple surfing coastlines including Hawaii, the West Coast, Gulf Coast, East Coast and Great Lakes. How important are surfer rescues in these environments and what are the causes of these rescues? The topic of surfer rescues is one of significant global interest by the beach safety industry. This topic will be of international significance and will involve analyzing data collected through Survey Monkey using Excel and SPSS. Based on past experience, surfers want to tell their stories and data collection will be quick.
Honours projects in the SEX LAB

Sex changes everything, particularly in evolutionary biology. Our research lab studies sexual reproduction and its consequences for behaviour and life histories. Most of our work involves insect, mouse or human subjects. Here are a few areas where opportunities exist for strong honours projects.

**Human attractiveness and evolutionary psychology**
- Age-dependent changes in mating behaviour.
- Studying human sexual preferences using computer animation.
- Why do men and women lie about their sex lives?
- The role of food prices in the obesity crisis.
- Differences among countries and societies in obesity, reproduction, violence, marriage etc.
- How does economics affect what we find attractive?
- Why do we over-spend on luxury goods?
- Why are there so many different types of body shape?
- What are the consequences of biased sex ratios?
- What is the function of the beard?
- How does sexual and romantic jealousy arise?

**Mate choice and life-histories**
- Physiological and longevity costs of mating and mate choice.
- How do attractive males affect the fitness of their mates?
- The factors influencing female competition for mates.

**Reproductive investment and ageing in mice**
- Fitness consequences of delayed / hastened sexual maturity.
- How does reproductive investment affect longevity in mice?
- Oxidative stress and male quality in wild house mice.

**Evolutionary biology of ageing/performance**
- Sex, diet and ageing in field crickets.
- Parent-of-origin effects on longevity and ageing.
- Fat accumulation and the fitness consequences of obesity.

**Measuring selection on complex suites of traits**
- Selection on hormone profiles, anatomy and behaviour in rodents.
- Seasonal changes in selection on spiders in the wild.
- Selection in any other suitable organism.
**Potential Honours Project**

**Plastic Debris: City to Surf**

**Contact:** Dr Mark Browne m.browne@unsw.edu.au

**Supervisor/s:** Dr Mark Browne and Professor Emma Johnston

**Synopsis:**

By 2050, an estimated 33 billion tonnes of plastic will be added to our planet. Very little plastic is recycled and it degrades slowly, accumulating in all environments from the poles to the equator. The ensuing pollution is widespread but more extreme in coastal areas with large human populations and increasing as populations grow. Plastic debris causes over 80% of the observed impacts to the ecosystem, however, the sources and pathways of plastic debris into marine habitats are poorly understood. This is problematic because governments are therefore uncertain about how to manage the problem (e.g. plastic bag bans, container deposit schemes, etc). Although rainfall washes discarded litter from urban areas, through drains, into marine habitats, the pathway has not been rigorously quantified.

**Aims:**

This project in Sydney Harbour will be the first to combine field experiments (mensurative and manipulative) with forensic techniques (vibrational spectroscopy) to rigorously quantify the pathway of plastic litter from streets to storm-drains to marine habitats, before, during and after rainfall.
Supervisor/s: Professor Gerry Cassis

Synopsis: The insect suborder Heteroptera is one of the more remarkable extant higher taxa, with over 40,000 described species. Moreover, the group is mostly undescribed, with another 60,000 species thought to exist in nature. This is most obvious on Australia, with only a quarter of the species known. Through extensive fieldwork over 1000 new species have been collected by the Cassis' lab and need systematic and phylogenetic investigation. Research projects involve the determination of species boundaries, through empirical investigations of morphology and molecular data partitions.

For more information, contact Professor Cassis

Aims: All projects involve the investigation of phylogenetic relationships of organisms, through the use of parsimony and Bayesian techniques. The phylogenetic topologies will be used to further investigate:
1) Host plant coevolution;
2) Historical biogeography;
3) Morphological character trait evolution.
Origin and diversification of sucking mouthparts in bugs and the evolution of host plant usage

Supervisor/s: Professor Gerry Cassis and Dr Malte Ebach

Synopsis:
Insects comprise over 60% of all species on Earth, and more than half of them are associated with vascular plants. Although the great majority of herbivorous insects have biting mouthparts, major clades of the insect order Hemiptera have evolved sucking mouthparts to target plant organs and avoid secondary metabolites. Our knowledge of how and when the phenotypic transformation of sucking mouthparts evolved from biting mouthparts is conjectural.

This project will involve research on extant and fossil taxa, and will require the application of paleoentomological and phylogenetic methods. It will involve investigation of key fossils held at the Australian Museum.

Aims:
To address this question an investigation of Upper Permian and Triassic fossil bugs will be undertaken and analysed phylogenetically, within the context of a bug Supertree in development in the Cassis lab. This will address if there are character states of sucking mouthparts that are phylogenetically correlated with subclades of bugs and any shift in host plant usage.
**Supervisor/s:** Dr Malte Ebach

**Synopsis:**
As palaeontologists are using more modern systematic methods, a greater number of cladograms and spatial information are being generated.

**Aims:**
This project aims to synthesise this information into a series of palaeogeographical reconstructions that attempt to explain the biotic and geological evolution of the Devonian shoreline of eastern Australia using both vertebrate and invertebrate fossil groups as well palaeogeography. The project will use phylogenetic and biogeographical techniques.
Potential Honours Project

Comparative biogeography - How Great is the Great Dividing Range?

Contact: Dr Malte Ebach (m.ebach@unsw.edu.au)

**Supervisor/s:**
Dr Malte Ebach

**Synopsis:**
Spanning 400 kilometres from Cape York to the Grampians, the Great Divide is the largest geographical barrier in Australia that separates the wet coastal floras and faunas from the dry interior.

How old is the Great Divide and how long has it been a biogeographical barrier?

**Aims:**
By using bioregionalisation and phylogenetic methods it will be possible to date the age of the barrier and identify the main groups of plants and animals that are affected by the Great Divide. Comparing these results with palaeo-reconstructions it is possible to understand the evolution of biota in Eastern Australia.
The ecological role of antibiotic producing bacteria

**Contact:** email: s.egan@unsw.edu.au or Ph: 9385 8569

**Supervisor/s:** Dr Suhelen Egan

**Synopsis:** Antibiotics from natural sources are an essential part of modern medicine, however their function in the environment is poorly understood. In this project we perform manipulation experiments combined with a range of –omic technologies (e.g. deep sequencing of phylogenetic marker genes, genomics, transcriptomics etc) to define how antibiotic-producing bacteria from marine macroalgae determine ecological interactions. This project addresses the fundamental question of the impact of antibiotics in natural systems and the role of antibiotic-producing bacteria in safeguarding macroorganisms against environmental stress. For further reading see Egan et al 2013 FEMS Microbiology Reviews 37:462.

**Aims:**

This honours project aims to determine the role of naturally occurring antibiotic-producing bacteria in the establishment of microbial communities on a model seaweed host (i.e. the green macroalgae Ulva sp.). Specifically students will:

a) use established methods to manipulate the microbiome of Ulva with and without the presence of key bacterial species.

b) use next generation sequencing technologies to assess changes in the microbial communities that are associated with the presence of antibiotic producing bacteria

c) assess the impact of microbial manipulation on Ulva health
Potential projects in the Arid Ecology Lab

My research focuses on developing an understanding of the inter-relationships between soils, animals and plants in arid and semi-arid rangelands. My interests are varied, ranging from more practical issues such as woodland management and rangeland monitoring, to the engineering effects of animals in deserts. Below are some examples of current projects. If you would like to discuss a potential honours project, email (d.eldridge@unsw.edu.au) or phone (9385 2194) me to arrange a meeting.

<table>
<thead>
<tr>
<th>Does encroachment alter foraging by ants?</th>
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<td>Encroachment of shrubs into grasslands is a global phenomenon. The increase in shrubs alters the spatial distribution of plant communities, altering soil surface characteristics, and may therefore have potential effects on soil-resident invertebrates. Little is known about how the change from grassland to shrubland might affect the foraging activity of ants and therefore the potential for dispersal of plant seeds. This study will examine seed removal rates of ant-dispersed species in shrublands and grasslands by different ant communities in order to enhance our knowledge of potential changes associated with shrub encroachment.</td>
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<th>Facilitation and competition in the semi-arid woodlands</th>
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<td>Facilitation is an important ecological process whereby woody plants (nurse plants) enhance the growth and survival of their understorey (protégé) species. This study will test the notion that plant richness and productivity change in relation to a gradient out from the trunk of large trees, and that plant functional type explains a large amount of variation in response of protégé species to canopy location under different nurse species.</td>
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<th>Logs as abiotic nurses</th>
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<td>Much has been written about plant-plant interactions in arid and semi-arid systems, but relatively little is known about how abiotic structures such as logs, rocks and depressions might affect the growth and survival of vascular plants. This study will examine the effects of abiotic structures such as logs on the growth and survival of plants and will combine field-based manipulations with glasshouse studies of plant responses to abiotic structures.</td>
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<tr>
<td>Location: Scotia Sanctuary, in conjunction with Australian Wildlife Conservancy.</td>
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Animal disturbances and Island Biogeography Theory

Soil foraging animals are an important driver of heterogeneity in arid and semiarid systems. Disturbances such as foraging pits, rabbit warrens, resting sites of kangaroos and scratchings formed by echidnas are common forms of disturbance. Once stabilised, these disturbances form fertile patches, which accumulate seeds and support a range of annual plants species. This study will test the notion that larger disturbances support a greater diversity of plant species (consistent with expectations under IBT). It will be supported by manipulative experiments whereby disturbances of various size and shape will be constructed and the response of annual plants assessed.

Location: Yathong Nature Reserve or Buronga

Effect of thinning in Callitris glaucophylla woodlands

Dense stands of white cypress pine (Callitris glaucophylla) are claimed to suppress the growth of vascular plants by competing for water, nutrients and light. A limited number of studies have assessed the effect of thinking on understorey communities. This study will combine measures of soil health (microbial respiration, infiltration, soil surface morphology, litter decomposition) with an assessment of plant dynamics to test the effectiveness of Callitris thinning on diversity and function.

Location: Forbes in conjunction with Forests NSW.

Recovery of ecosystem function on ripped rabbit warrens

The European Rabbit (Oryctolagus cuniculus) is Australia’s number one vertebrate pest. In the past 20 years, land managers in western NSW have spent millions of dollars controlling rabbits. The most effective method is to destroy their warrens, usually by mechanical ripping. This study will test whether rabbit ripping has altered the ability of soils to accept infiltration. It will examine 1) changes in infiltration along a disturbance gradient, 2) the spatial distribution of infiltration among different rabbit warrens, and 3) compare these data with warrants that have not been treated.

Location: arid and semi-arid NSW
**Biological soil crust dynamics in relation to shrub encroachment**

Biological soil crusts dominated by mosses, lichens and cyanobacteria are common components of arid area soils. These crusts protect the soil against erosion, produce carbon and nitrogen, and provide a habitat for soil organisms. Little is known about the distribution of biological soil crusts when grasslands are invaded by shrubs. This study will examine how biological soil crust communities change in relation to increasing shrub density and how this might be affected by grazing.

*Location: Buronga and Mallee Cliffs National Park in conjunction with OEH*

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**Decomposition of litter in a semi-arid woodland: biotic- or abiotic-driven?**

Breakdown of litter in deserts is thought to be largely due to abiotic processes such as wind and water, given the low rainfall which drives biological processes. We hypothesise that litter deposited on the soil surface will contribute little to soil carbon and nitrogen pools compared with litter trapped below-ground (in animal diggings, under logs etc), which will break down at a faster rate and be incorporated into soil organic pools. A litter bag experiment will be used to track the breakdown of three types of litter in three different microsites (surface, below-ground, below shrubs). The study will determine breakdown of a plant components over time.

*Location: Yathong Nature Reserve*

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**Effects of shrubs on soil water movement**

Increases in densities of woody shrubs such as *Dodonaea* and *Eremophila* in former grasslands are likely to have substantial ecosystem effects on water flow. Little is known about the direct and indirect effects of shrubs on water flow, and this study will use Structural Equation Modeling to separate these direct and indirect effects of shrubs on water flow and soil respiration. Field work will be supported by laboratory measures of soil respiration.

*Location: Western New South Wales*
Does overgrazing influence facilitation of plants beneath shrubs?

The balance of competitive and facilitative processes in semi-arid woodlands can be driven strongly by grazing effects. It is hypothesized that under extreme levels of grazing pressure the facilitative effect of shrubs through anti-herbivore mechanisms far outweighs any competitive effects. This however has been tested in a limited number of environments. This study will use an established shrub density–grazing experiment in south-western NSW, and field-based measures will be supported by glasshouse study of seed emergence from the soil seed bank.

*Location: Buronga and Mallee Cliffs National Park in conjunction with OEH.*
Supervisor/s:
Associate Professor Jason Evans (jason.evans@unsw.edu.au)

Synopsis:
Large bushfires often leave huge areas of forest blackened and denuded of leaves and undergrowth. These changes in surface albedo and roughness impact the local climate, but how large are these impacts?

Aims:
This project will use high resolution regional climate model simulations and satellite observations of albedo and vegetation cover to quantify this affect.
Potential Honours Project

The future of bushfires in Australia

Contact: A/Professor Jason Evans (jason.evans@unsw.edu.au)

Supervisor/s: Associate Professor Jason Evans

Synopsis: With increasing greenhouse gases the world is warming and precipitation is being redistributed. How will this affect bushfires in south-east Australia?

Aims: This project will analyse regional climate simulations to quantify projected changes in fire weather conditions with particular interest in phenomena that can produce extreme fires (such as Foehn winds).
A Magnitude 9.1 earthquake off the west coast of northern Sumatra, Indonesia on December 26, 2004 generated a massive tsunami that killed over 230,000 people in fourteen different countries. This re-introduced the devastation of such events to a modern world that had really had it fairly easy since the huge 1960 Magnitude 9.5 earthquake and tsunami in Chile. Since then we have had a significantly raised awareness of this hazard and have seen large tsunamis in 2009 (South Pacific), 2010 (Chile) and 2011 (Japan).

2014 marks the 10th anniversary of the Indian Ocean tsunami and it comes at a time when people are starting to forget how bad it was, many students do not really know much about it. We have recently unearthed hundreds of tsunami survivor interviews from work carried out soon after the event in 2005 along the Indonesian coast. These data have never been analysed and are actually the ONLY dataset available from this time and place. As such this is a hugely significant resource that is available for analysis and interpretation as a social geography study.
Environmental Justice in Australia - Who's kids get to breathe toxic air

Contact: Dr Donna Green (donna.green@unsw.edu.au)

Supervisor/s: Dr Donna Green

Synopsis: This interdisciplinary project will consider the federal government’s national pollutant inventory estimates of toxic emissions (such as lead) from smelters and refineries in Australia, and how they might disproportionately impact human health.

Aims: Using an environmental justice framework, this project will examine the distribution of toxic emissions and relate them to the socio-economic conditions of the communities located nearby.
Potential Honours Project

Facilitation Cascades

Supervisor/s: Associate Professors Paul Gribben

Synopsis: A long history of the study of negative interactions such as competition and predation underlies their importance for structuring ecological communities. However, positive interactions among species also have important consequences for biodiversity. For example, habitat-forming species facilitate other species, including other habitat-formers, which may promote additional species. Although these facilitation cascades are increasingly described we still know little about the mechanisms that underpin them. Importantly, current research almost completely ignores the potential for negative feedbacks: a primary habitat-former may experience negative feedbacks if it gets heavily colonised by a secondary habitat-former.

Aims: Honours projects will explore the mechanisms underpinning facilitation cascades and feedbacks among the major players. One potential system occurs in Lake Macquarie where seagrass appears to facilitate razor clams which further promote giant sea-hares.

Contact: A/Professor Paul Gribben p.gribben@unsw.edu.au
Potential Honours Project

Spread and impact of marine invaders

Supervisor/s: Associate Professors Paul Gribben

Synopsis: Australia has some of the nastiest marine invaders around. My students work on a variety of invasive species including crabs, gastropods and macrophytes. Current projects for students could address the processes promoting the establishment and spread of invasive species, the ecological and evolutionary responses of native species to invaders, and the higher abundance and life-history traits invaders often have in their exotic compared to native ranges. Students have the opportunity to research throughout Australia and internationally. Come and see me to develop a project if marine invasions interest you.

Aims:
## Potential Honours Project

### Investigating air pollution impacts from hazard reduction burns

**Supervisor/s:** Dr Melissa Hart

**Contact:** Dr Melissa Hart  melissa.hart@unsw.edu.au

**Synopsis:**

Air pollution events associated with bushfires have been associated with extreme health impacts, including increased hospital admissions and death. The NSW 2021 Plan aims to increase the annual average area treated by hazard reduction activities by 45%, by 2016, in order to limit bushfire activity. Hazard reduction burns are vital to reduce the severity of bushfires. However, if undertaken during unfavourable meteorological conditions, they too have the capacity to trigger extreme air pollution events.

This project will explore the meteorological processes behind extreme air pollution episodes associated with hazard reduction burns, whilst conversely identifying those meteorological conditions that are conducive to minimal impacts on air quality (pollutant concentration and visibility) during hazard reduction burning.

**Aims:**

This project will explore the meteorological processes behind extreme air pollution episodes associated with hazard reduction burns, whilst conversely identifying those meteorological conditions that are conducive to minimal impacts on air quality (pollutant concentration and visibility) during hazard reduction burning.
Supervisor/s: Associate Professor Rob Brander

Synopsis: Stanwell Park is a moderate energy intermediate beach exposed to the prevailing Sydney wave climate and is characterized by two intermittent tidal creek entrances and a vegetated dune system. Locals claim that dune revegetation practices over the years has reduced the amount of sand available to the beach, dramatically altering both the surf zone morphology and beach width. Bald Hill is a prominent and popular lookout which provides excellent oblique coverage of the extent of Stanwell Park.

This project involves an understanding of beach morphology and has significant coastal management implications. It will involve familiarity (either pre- or gained) of GIS-based software to rectify oblique imagery and calculate geospatial positions on the beach. Fieldwork will involve a total station survey of visual landmarks. The student should have competent skills at computer based analysis.

Aims: This study involves sourcing historical images (of which there are many) taken from Bald Hill, as well as existing aerial photos and satellite images from Google Earth to conduct a long term study of shoreline position, surf zone morphology and dune extent on Stanwell Park beach. The aim is to see whether dune revegetation has indeed had an impact on the beach.
Potential Honours Project

Artificial structures and ecosystem functioning

Supervisor/s: Prof Emma Johnston, Dr Katherine Dafforn, Dr Mariana Mayer Pinto

Synopsis: Anthropogenic modification of habitats is considered to be one of the primary causes of the current loss of biodiversity. In coastal cities, habitats are often modified by the addition of artificial structures. Structures such as seawalls, jetties, breakwaters, groynes and dykes are becoming ubiquitous in coastal landscapes and are built at the expense of natural habitats. In Sydney Harbour, more than 50% of estuarine coastlines are modified by artificial structures, such as seawalls and pilings. These structures support novel ecosystems unlike any that exist naturally, but there is very little understanding of how they alter ecosystem function or contribute to important ecosystem services, such as primary productivity and fish abundance.

Aims: This project will investigate the effects of urban sprawl on marine biodiversity and functioning.

Contact: Professor Emma Johnston (e.johnstone@unsw.edu.au)
Potential Honours Project

“Green” engineering of marine infrastructure

Contact: Professor Emma Johnston (e.johnstone@unsw.edu.au)

Supervisor/s: Prof Emma Johnston, Dr Katherine Dafforn, Dr Mariana Mayer Pinto

Synopsis:

Marine urban development is accelerating as a result of the expansion of coastal cities and human adaptations to threats such as storm surge and sea level rise. While there is a substantial history of green engineering on land, the practice of combining ecological principles with the planning, design and operation of urban infrastructure in the sea is surprisingly rare. Most marine artificial structures lack the innovative design solutions required to mitigate their ecological impacts and provide essential ecosystem services such as pollution abatement.

Aims:

This project will investigate practical design solutions to mitigate ecological impacts of artificial structures and maximise potential benefits.
Potential Honours Project

Marine Debris

Contact: Professor Emma Johnston (e.johnstone@unsw.edu.au)

**Supervisor/s:** Prof Emma Johnston, Dr Katherine Dafforn, Dr Mariana Mayer Pinto

**Synopsis:**
The United Nations recently listed plastic contamination as one of the three emerging environmental threats of the century. 80% of the debris in the ocean is made of plastic. Despite the prevalence of this contaminant in the environment, no study has yet to quantify the distribution and effects of macro- and microplastics in Sydney Harbour. Different types of plastics are predicted to float or aggregate and sink to the seafloor. Floating plastic can cause entanglement and suffocation for organisms in the water column or act as a vector for invasive species. Deposited plastic can absorb and concentrate pollutants, deleteriously change sediment chemistry (causing hypoxia) and alter the physical structure of the sediment.

**Aims:**
This project will investigate the distribution and impacts of marine debris in Sydney Harbour.
Potential Honours Project

Multiple stressors

Contact: Professor Emma Johnston (e.johnstone@unsw.edu.au)

Supervisor/s: Prof Emma Johnston, Dr Katherine Dafforn, Dr Mariana Mayer Pinto

Synopsis: Human activities have degraded extensive areas of coastal habitats. Anthropogenic disturbances associated with urban development and tourism, waste disposal, fishing and harbour and marina operations are only some of the activities contributing to the degradation of coastal habitats. Such disturbances are causing a continuous loss of diversity, which can, in turn, affect the functioning of ecosystems and have negative impacts on the services that these systems provide. Abiotic and biotic stressors (i.e. temperature, contaminants and disruptions and changes in biological interactions) usually interact to produce combined impacts on biodiversity and ecosystem functioning. Stressors may have additive, non-additive, synergistic or antagonistic effects.

Aims: To reliably predict and effectively manage the effects of these stressors on natural systems, we need to understand how multiple stressors interact. The main objective of this project is to determine the interactive effects of multiple stressors, such as the addition of nutrients and metals, associated with artificial structures on the diversity of organisms and ecosystem functioning.
Potential Honours Project

**Stormwater and ecosystem processes**

Contact:  Professor Emma Johnston (e.johnstone@unsw.edu.au)

**Supervisor/s:** Prof Emma Johnston, Dr Katherine Dafforn, Dr Mariana Mayer Pinto

**Synopsis:** Urban waterways in Australia are dominant, iconic features of all our major cities, and as such are highly valued. They are also highly impacted. These ecosystems are exposed to multiple stressors such as legacy contaminants in sediments and ongoing inputs of nutrients and metals via stormwater. We know little about the effects of existing and new contaminants on the rates of ecological processes in aquatic sediments, such as primary production and nitrogen cycling.

**Aims:** This project will investigate changes to sediment processes and biogeochemical cycles under dry conditions (<5 mm rainfall/day) and after a stormwater event (>50 mm rainfall in 24hrs).
Supervisor/s: Dr Neil Jordan

Synopsis: Fundamental information on predator activity and behaviour in livestock-dominated areas is an essential step in predicting and preventing human-wildlife conflict. While much is known of large-carnivore ecology within protected areas, collecting equivalent data from (potential and actual) conflict animals is challenging due to the inherent wariness of these individual animals and a lack of tolerance from livestock owners. Using existing data from remote GPS and activity-logging collars fitted to members of the African large carnivore guild (African wild dog, lion, cheetah, spotted hyaena) at the livestock-wildlife interface in northern Botswana, this (desk-based) project will compare the activity patterns of large carnivores in livestock-dominated versus wildlife-dominated areas.

Aims: This project will compare the activity patterns of large carnivores in livestock-dominated versus wildlife-dominated areas using an existing database of GPS and activity data from collars fitted to members of the African large carnivore guild. Possible avenues of research include evaluation and comparison of daily step-lengths, activity patterns and, potentially, remote identification of kill-sites (by identifying signatures in GPS and activity data from observed kill-sites). The student will gain skills in data extraction, processing, basic GIS (likely using R), and statistical analysis.
Honours Projects in the Kasumovic Lab

The research in our lab focuses on examining how individuals maximize fitness in a varying environment. Although the environment can vary in numerous different factors, we generally focus on the social environment, examining how variation in the quantity and quality of rivals and mates affects developmental and mating decisions.

The projects range from computer based research, to field and/or lab work and use several different species.

**Life-history Trade-offs**

Early developmental decisions have enormous consequences on later life performance. We use crickets to examine how developmental plasticity in response to social environments leads to trade-offs between physiology, behaviour, performance in competitive and mating scenarios, and longevity.

**How past experience affects future contest success**

In many animals, previous contest outcomes affect future success—winners are more likely to win again, while losers are more likely to lose. We explore how prior experience moderates individual behaviour, and the factors that cause these winner/loser effects.

**Understanding the function of spider silk**

We examine different aspects of spider silk performance including: (i) a comparative Nuclear Magnetic Resonance analysis of different spider silks, (ii) Gel Permeation Chromatography and Dynamic Mechanical Analyses to correlate protein expression with mechanical properties in different spider silks, (iii) comparative mechanics of sticky and non-sticky spider silks, (iv) visibility-performance trade-offs in spider webs and silks, (v) the nutritional costs of silk production.

**How is learning affected by brain investment**

Our recent research in gene expression demonstrates that there are differences in early brain investment during development in response to the early social environment. We examine how this early investment affects later life performance in ecologically relevant scenarios to understand investment in learning.

**Video games, self-perception and preference**

Video games offer humans the opportunity to gauge their own competitive quality relative to others. This project involves examining the effects of real-world social interactions on video game preferences and will use evolutionary theory to explain gender differences and the drivers of video game preferences.

Please contact me at m.kasumovic@unsw.edu.au if you are interested in any of these projects or have ideas of your own you would like to discuss.

http://www.michaelkasumovic.com
Potential Honours Project

Projects with Bryce Kelly

Supervisor/s: Associate Professor Bryce Kelly

- Mapping methane and carbon dioxide in the groundwater and air throughout the Maules Creek catchment (field work in summer)
- Quantifying groundwater recharge beneath native vegetation and irrigated crops in the Border Rivers district (field work in summer)
- Measuring native vegetation plant water use using sap flow metres, Royal National Park
- Evaluating mangrove swamp biological activity using cellulose digestion and gas emissions, Towra Point, Botany Bay
- Climatic and anthropogenic water stress contributions to eucalyptus dieback in the Namoi Catchment
- Quantifying the greenhouse gas footprint of coal seam gas
- Measuring the greenhouse gas footprint of open cut coal mines
- Predicting environmental watering impacts on wetland greenhouse gas contributions

Contact: A/Professor Bryce Kelly (bryce.kelly@unsw.edu.au)
Potential Honours Project

The response of small mammals to variation in climatic conditions

Contact: Dr Keith Leggett (k.leggett@unsw.edu.au)

Supervisor/s: Dr Keith Leggett

Synopsis:
This study will look at fluctuations in small mammal populations in response to climatic conditions. 2010 and 2011 were above-average rainfall years and subsequently increased vegetation and small mammal abundance.

We are looking for students with a keen interest in conservation and ecology. This study will involve pitfall and Elliot trapping for two 10-day periods over two months at UNSW’s Arid Zone Research Station, Fowlers Gap NSW. There are four $5000 student scholarships available to fund research-related costs.

Aims:
This project will investigate two areas that have been subjected to differing grazing pressures: (a) regenerating habitat inside a rabbit and large-mammal exclosure, and (b) adjacent degraded farmland still heavily grazed by sheep and feral goats.
Potential Honours Project

How well can we predict future abrupt warming events?

Contact: Katrin Meissner (k.meissner@unsw.edu.au)

Supervisor/s: Associate Professor Katrin Meissner

Synopsis:
Our state-of-the-art climate models predict a relatively smooth increase in temperature for the coming century. However, there is growing evidence that the stability of these models might be overestimated.

The student will gain valuable experience in using Linux/UNIX, scripting (Fortran, Matlab), and familiarity with climate models of intermediate complexity and palaeo proxy data.

Aims:
In order to ascertain the robustness of climate models, we must first gain a more thorough understanding of past abrupt warming events. This project will enhance our understanding of these events by comparing climate model simulations to past climate records, such as isotopic records from marine sediments and ice cores.
Potential Honours Project

Using volunteer observations and remote sensing products to track changes in wetland extent.

Contact: Professor Graciela Metternicht (g.metternicht@unsw.edu.au)

**Supervisor/s:** Professor Graciela Metternicht and Dr Eren Turak (OEH)

**Synopsis:**
This project will complement a three-year citizen science project conducted by the NSW Office of Environment and Heritage in collaboration with the Earth Watch Institute which aims to develop methods and tools that enable public participation in wetland monitoring as part of the Monitoring Evaluation and Reporting program in OEH.

Under that citizen science project a protocol is being developed that will allow volunteers to use smart phone apps to record their observations on the position of the boundary of the wetland fringing zone vegetation and wetted area.

**Aims:**
The honours project at UNSW would explore how the volunteer observations can be used to validate and train remote sensing products (e.g. high-resolution Global Land Cover) to generate time series of automated wetland maps. It is expected that such maps will allow OEH and other users to accurately track change in wetland extent annually across NSW in a cost effective manner. There is also scope to explore global applications that address the needs of the Global Wetlands Observing System (GWOS), Group on Earth Biodiversity Observation Network (GEO BON) and the Ramsar Convention.
PLANT ECOLOGY in the BIG ECOLOGY LAB

There are two main projects are available in the plant ecology lab:

1) How the spinifex got its hole.

Spinifex grasses (mainly *Triodia* spp.) cover over a quarter of Australia, dominating much of the arid and semi-arid region (Allan & Southgate 2002). Spinifex begins life as a hummock grass, but as it matures the hummocks die back in the middle, leaving a distinctive ring of living tissue that expands outwards as the plants age. Although there has been much research on the ecology of spinifex, particularly on its fire ecology and its importance as a habitat for invertebrates, mammals and reptiles (e.g. Rice & Westoby 1999, Daly et al. 2008, Haslem et al. 2011), we still do not know why spinifex has its distinctive growth form. In this project, you would test a new hypothesis (come and talk to Angela for details). This project would involve some fieldwork and some glasshouse experiments.

2) Global patterns in plant traits

There are heaps of really interesting questions to be asked about global patterns in the ways plants grow and reproduce. Come and talk to Angela about specific hypotheses we could test.

I am also very open to your ideas for projects – come and talk.

BEES Contact: Angela Moles (a.moles@unsw.edu.au)
Supervisor/s: Dr Terry Ord

Synopsis: The study of island biogeography has examined the properties of islands - such as size and isolation - and how they affect ecological processes such as colonisation and species diversity. While island biogeography theory originally focused on explaining processes affecting the formation of faunal and floral assemblages on oceanic islands, its concepts are equally applicable to any situation in which patches of habitat are isolated from potential source populations by environments that are substantially different from those of the source and habitat patches.

In this project, the honours student will focus on two island sizes (large versus small) placed with replication at two different island distances from a colonising source population (near versus far). These habitat "islands" have been purposely built in open pasture adjacent to remnant forest at a site in the NSW Central Tablelands.

Aims: The study will not only test the effects of the size of the habitat fragments and their distance from a colonising source population, but also the impacts of various environmental disturbances applied as part of the experimental design and the dispersal of organisms among habitat patches.
Supervisor/s: Dr Terry Ord

Synopsis:

Eastern water dragons have an extensive range throughout the Australian eastern seaboard. Male lizards use push-ups displays to establish and maintain territories. The structure or 'syntax' of these displays is important for species recognition and conveying other information about physical condition to territorial rivals and potential mates.

There are several field sites at a variety of locations around Sydney. This project is ideally suited for a midyear (S2) start to take full advantage of the summer field season.

Aims:

One possible project might use robot lizards to 'playback' changes in display to lizards in the field (e.g., water dragons are common in the bushland around Sydney Harbour).

Another project might investigate whether different populations differ in aspects of their territorial display and study the consequences of this display divergence for reproductive isolation between populations (a precursor for potential speciation).
Potential Honours Project

Social network of ant societies

Contact: Dr Terry Ord (t.ord@unsw.edu.au)

Supervisor/s: Dr Terry Ord

Synopsis: Walking through the Australian bush, it is quite common to come across large ant nests connected by busy highways cutting through the grass and undergrowth. We know surprisingly little about these networks or how they change from year to year.

With a combination of GPS and new mathematical tools developed by network analysts it is possible to map ant nests and measure their size and the level of traffic flow between nests.

Aims: The project would investigate how ant communities in each nest interact, whether some nests are central to the overall network, and how new nests become established in the network.

The field site for this project is near Mudgee in the Central Tablelands. A driver’s license and access to a car would be an advantage. The project is ideally suited to a midyear (S2) start to take full advantage of the summer field season.
Potential Honours Project

Species recognition cues in the territorial displays of Caribbean Anolis lizards

Supervisor/s: Dr Terry Ord

Synopsis:

Animals that use social signals to communicate with one another often differ in the way those social signals appear among different species. When the function of social signals is the same among those species, the question remains as to why different species should evolve signals with different designs. A key hypothesis behind much of the communicative diversity we see in the natural world is species recognition: different species evolve species-typical signal designs to ensure communication is directed at the proper individual - conspecifics - otherwise animals waste time and energy attempting to communicate with individuals from the wrong species.

Aims:

In this project, the honours student will use a massive library of video footage of many different Caribbean Anolis lizards performing territorial visual displays to test whether signals differ in their design primarily in response to species recognition.
**Potential Honours Project**

**Heatwaves, how do we know when we've had one?**

**Contact:** Dr Sarah Perkins (sarah.perkins@unsw.edu.au)

**Supervisor/s:** Dr Sarah Perkins and Professor Andy Pitman

**Synopsis:**

The heatwave definition commonly used in Australia consists of two factors, an acclimatisation factor and a significance factor, the combination of which measures whether a collection of days are anomalously hot.

Although both components are important in measuring heatwave events, there is little understanding behind which is the dominant factor.

**Aims:**

This honours project will explore how both factors contribute to the overall heatwave definition, and how they change on seasonal scales, and in relation to climate change.
Potential Honours Project

Climate feedback and extremes, what can soil moisture tell us?

Contact: Prof Andy Pitman a.pitman@unsw.edu.au

**Supervisor/s:** Prof Andy Pitman and Dr Ruth Lorenz

**Synopsis:**

For this project you will investigate the influence of soil moisture variability and trends on Australian climate and climate extremes and compare relevant processes in present climate to projections into the future.

Knowledge of any programming (R, NCL, Matlab, Python etc.) is an advantage

**Aims:**

The student would learn to handle and visualise big data from multiple climate models and increase the knowledge about land-climate feedbacks over Australia.
Comparing the sensitivity of the water and energy exchange of forest and grassland to climate change

**Supervisor/s:** Professor Andy Pitman and Dr Shaoxiu Ma

**Synopsis:**
The carbon sequestration function of grassland and forest within different climate scenarios has been extensively investigated in the past a few decades. However, the difference of water and energy exchange of grassland and forest in response to climate change are not clear even through observed evidence proved that the grassland and forest response to climate change differently in Europe. It is well known that the soil moisture and precipitation regime has strong correlation with extreme heat waves.

**Aims:**
The present study proposes to study the water and energy exchange difference of grassland and forest under different precipitation regimes as a case of climate change. The simulation results would be compared with precipitation manipulation experimental observations. Student requirements: Background knowledge of plant physiology, ideally also familiar with at least one of the data analysis languages such as R or Python.
Potential Honours Project
The land surface and atmosphere - BFF or frenemies?

Supervisor/s: Professor Andy Pitman and Dr Jatin Kala

Synopsis: Single column models (SCM's) are a valuable tool to investigate climate feedbacks, which would otherwise be computationally restrictive within a fully coupled global circulation model.

The student will gain valuable experience using Linux/UNIX, compiling code, scripting (NCL and/or Python), as well as gain familiarity with the ACCESS-SCM modeling system.

Aims: This project will make use of the SCM version of the ACCESS GCM (https://wiki.csiro.au/display/ACCESS/Home) to investigate land-atmosphere feedbacks between CABLE (the land surface model in ACCESS) and the UM (the atmospheric component of ACCESS), by carrying out a wide range of parameter sensitivity experiments.

Contact: Andy Pitman a.pitman@unsw.edu.au
Potential Honours Project
What habitat traits best predict coastal biodiversity?

Supervisor/s: Associate Professors Alistair Poore and Paul Gribben

Synopsis: Habitat forming species (e.g., seagrass, macroalgae, mangroves, corals) play a very important role in supporting diverse and productive animal communities in coastal marine ecosystems. In order to predict how changes to these habitats (e.g., species loss, structural change) can affect marine communities, it is important to understand what characteristics of these habitats are most important for supporting their associated animal communities. Habitat forming organisms vary in physical structure both across and within species, and we will use a trait-based approach to quantify habitat structure and its relationships with animal communities.

Aims: Using the macroalgal beds in the Sydney region, the project aims to:
- Identify habitat traits that are likely to be important for associated animal communities (e.g., canopy height, surface area, branching complexity)
- Quantity inter- and intra-specific variation in traits important for habitat provisioning (both univariate and multivariate). This will test the idea that individual traits matter more than the identity of the habitat former.
- Test how well properties of the animal community (species richness, abundance, biomass etc) can be predicted by habitat traits.
Potential Honours Project

Maternal effects in a native dragon lizard

Contact: Dr Lisa Schwanz (lschwanz@unsw.edu.au)

Supervisor/s: Dr Lisa Schwanz

Synopsis:
During reproduction, a mother’s physiology or environment often have an impact on the phenotype of her offspring. These ‘maternal effects’ may be detrimental and unavoidable, or they may represent adaptations to increase maternal and offspring fitness. Understanding how the maternal environment affects offspring will aid in understanding the ecology and evolution of organisms in response to altered habitats or climate change. For example, can maternal effects in response to temperature prepare offspring for a warmer world?

This project will examine maternal effects in a native dragon lizard in response to one of the most important environmental components for reptiles – temperature.

The student will gain skills in animal research, animal handling, behavioural observations, and potentially physiological techniques.

Aims:
Building on an ongoing experiment using captive Jacky dragons, Amphibolurus muricatus, the project will examine how maternal basking opportunities impact the traits of their hatchling offspring. The hatchling traits examined by the student may include: 1) basking behavior, 2) morphology and growth, 3) locomotor performance, 4) stress response, and 5) personality.
Potential Honours Project

Stress in reptiles

Contact: Dr Lisa Schwanz (l.schwanz@unsw.edu.au)

Supervisor/s: Dr Lisa Schwanz

Synopsis: Animals have a natural physiological stress response that helps them cope with the challenges of the world. In environments with many man-made disturbances, animals often experience increased physiological stress, which can disrupt important processes such as reproduction. This project will validate and examine stress response in a native lizard species.

This project combines work with live animals and laboratory work to examine stress hormones in lizards, under co-supervision of Dr. Rebecca Hobbs of the Taronga Conservation Society Australia.

The student will gain skills in animal research, standard laboratory hormone assays, experimental design, and potentially field work.

Aims: The project will consist of 1) examining stress hormones in the blood of captive Jacky lizards (Amphibolurus muricatus), 2) providing a validation of non-invasive methods of measuring stress in reptiles using faeces, 3) 1-2 additional elements of the student’s choice, which could include expanding the research to additional reptile taxa, conducting thermal or stress experiments with captive animals, or conducting field work to examine stress in wild animals.
Dr Lisa Schwanz

Reptiles are ectotherms that must behaviorally thermoregulate to acquire heat from the environment and avoid heat when air temperatures rise. But how well can reptiles cope with changes in their habitat or the climate, both of which change the thermal opportunities in their environment?

This project requires a student interested in 1) learning quantitative skills necessary to measure thermoregulation, 2) handling large amounts of data, 3) learning basic programming skills in R or MATLAB, and 4) working with live animals. The student will gain skills in analyzing large datasets, programming (R or MATLAB), animal research, and experimental design.

This project will examine how air temperature, habitat quality and basking opportunities influence thermoregulatory behavior in lizards (the Jacky dragon, Amphibolurus muricatus). The main component of the research is to analyze a large dataset already collected on lizard thermoregulation from animals held in semi-natural enclosures (see picture below of a jacky dragon wearing a temperature datalogger). Thus, the project will be data-rich. A second component of the research would involve experiments of the student’s design on lizard thermoregulation using captive animals.
Supervisor/s:  
Associate Professor Wendy Shaw

Synopsis:  
This exciting action-based development project is in its final stages with lots of quantitative data ready for analysis. There is also data from a previous project on PNG coffee growing and the impact of coffee green scale, which is an insect pest. So, if you are interested in coffee and sustaining small-holder livelihoods in the production of top grade organic coffee (the coffee growers in PNG live near subsistence), and would like to see some RESULTS, come and have a chat with me.

Aims:  
There is a lot of flexibility in this project, and anything you’d be interested in, that is related, will also be considered.
Potential Honours Project

Human–Animal Bonds between Zoo Professionals and Animals

Contact: Associate Professor Wendy Shaw

Supervisor/s: Associate Professor Wendy Shaw

Synopsis: For most people the most intimate human-animal relationship (HAR) we have is with a companion animal (ie pets). This fascinating project is looking closely at humans to try to answer questions about these HAR.

Aims: This project asks why some zoo keepers experience bonds with the animals in their care, and others do not, and whether the bonds they have with zoo animals are similar to the bonds with companion animals/pets. Some data exists already, but much more is being generated so zoo-based fieldwork will be included!
Honours projects with Professor Sherwin

Forecasting and managing biodiversity
We have discovered a new approach to assessing and forecasting genetic biodiversity - the first substantial use of information theory to forecast genetic information (Molecular Ecology 15:2857). You would apply this theory to a wide range of existing datasets in genetic and community biodiversity, using data from koalas, dolphins, flies, trees and various other species, and be encouraged to further develop this theory.

Genetics of Native Pest Insects
Honours projects are available in the genetics of Macadamia Lacebugs and Queensland Fruit Flies. Projects include mining our recently-sequenced genome of Queensland Fruit Fly for genes that might affect management or species identity, and genetic identification of species for control purposes.

Can small populations withstand selective pressures?
A consortium of mathematicians and biologists at UNSW has produced new theory about the way that small endangered populations might rapidly recover their responsiveness to selection, because of recombination. You would mine online genetic databases to assess the performance of this theory.

Forecasting demography of bottlenose dolphins
With partners from Murdoch University we are studying ecology, threats, and genetics of Bunbury (WA) bottlenose dolphins. The PhD student at UNSW will use these data in existing or novel programs, to evaluate population viability with different management and threats. The work involves integration between demographic, ecological, and genetical approaches.

Contact Professor Bill Sherwin (w.sherwin@unsw.edu.au)
Potential Honours Project

Gliding through the clouds

Contact: Professor Steve Sherwood (s.sherwood@unsw.edu.au)

Supervisor/s: Professor Steve Sherwood

Synopsis: Growing cumulus clouds are made of small rising thermals, but most current cloud theories ignore this. Our group is simulating them on computers by solving the Navier-Stokes equations but we need data to help understand and be sure these simulations are accurate.

Aims: This project will use data collected by glider pilots, a rarely-used resource, to quantitatively test our understanding of thermals and their role in cloud formation.
**Potential Honours Project**

**Bacteria-sponge symbiosis**

**Contact:**  t.thomas@unsw.edu.au

**Supervisor/s:**  Assoc. Prof. Torsten Thomas

**Synopsis:**
Sponges are an important part of the benthic ecosystem, where they are involved in nutrient uptake and conversion. These metabolic processes are performed in the sponge by complex communities of microbial symbionts. The diversity of these symbiont communities is well understood, however we lack an understanding of how the symbionts respond to environmental change and how this affects the health and performance of the sponge host.

**Aims:**
In this project we aim to:

a) understand the functional properties of specific sponge symbionts

b) define how symbiont composition and function change under environmental stress

c) develop an integrated view (holobiont view) of symbiont-sponge interactions

To address these aims, we will use experimental ecology (e.g. manipulative experiments) and field observations in combination with –omics-based technologies and bioinformatics to characterise symbiont communities.
Effect of charcoal on microbial processes in agricultural soil

**Supervisor/s:** Assoc. Prof. Torsten Thomas

**Synopsis:** Charcoal or biochar is an emerging supplement to agricultural soil and several studies have shown its benefits in terms of plant yield and greenhouse gas emission. How charcoal exerts its positive effect is largely unknown, but there is evidence that it changes the composition and function of the soil's microbial communities.

**Aims:** In this project will use high-throughput sequencing to characterise the diversity of soil microorganisms and high-resolution analytical technique to define their interactions with charcoal particles. Outcome of the project will help to develop charcoal as new tool for sustainable and improved agriculture.

**Contact:** t.thomas@unsw.edu.au
Potential Honours Project

Coastal microbial observatories

Contact:  t.thomas@unsw.edu.au

Supervisor/s:  Assoc. Prof. Torsten Thomas

Synopsis: While the distribution and dynamics of macroscopic organisms in the marine environment has been well studied for many decades, similar observation are lacking behind for microorganisms. This has been mainly due to technical limitations, however recent development in high-throughput sequencing and bioinformatics allow us now to “observe” microorganisms in the natural environment in unprecedented scale and detail. Microorganisms are broadly known to have essential roles in global biogeochemical cycles, such as carbon dioxide and nitrogen fixation and remineralisation of organic matter. However the microbial diversity as well as its spatial and temporal dynamic that underpin these functions are poorly understood.

Aims: This project aims to define the temporal and spatial dynamic of microbial communities in the water column, sediments and associated with corals, seaweeds, sponges and seagrasses. With the support of Bioplatforms Australia and in collaboration with researchers from the University of Technology Sydney, Macquarie University, the Australian Institute of Marine Science and Edith Cowan University, Perth, we are establishing a large-scale coastal, microbial observatory program. Specific aspects of the work will include environmental sampling, analysis of microbial data and correlation analysis between environmental and microbial parameter. An outcome will be one of the most comprehensive description of microbial diversity and function in the coastal environment and a deep understanding of how microbial systems response to environmental change and in turn influence ecosystem function.
**Synopsis:**

In conjunction with the Geological Survey of New South Wales and a vintner in the Upper Hunter Valley, I have the honour of being able to provide a very nice little geological mapping project for a BSc Honours degree here at UNSW to anyone that is interested.

The project is ready to run for second semester but may also be commenced in first semester of next year if no one takes it earlier. Located in the Lochinvar Dome near Mount Sharp in the Hunter Valley, this project has the potential to be very cruisy, part sponsored by a very good local wine grower!

**Aims:**

Comprising field geological mapping, the study will focus on the volcanology of Carboniferous arc rhyolites and their relationship to folds and lateral stratigraphic variations in the overlying Sydney Basin. In addition to mapping of facies and stratigraphic variations, and structures, petrology, geochemistry of the volcanics will play a significant role in this project, and U-Pb geochronology may also play a part in unraveling this story.
Potential Honours Project

Origin of Archean paleoplacer gold and pyrite, Pilbara Western Australia

Contact: martin.vankranendonk@unsw.edu.au

Supervisor/s: Prof Martin Van Kranendonk, A/Prof David Cohen

Synopsis:
The Meso- to Neoarchean (3.0-2.7 Ga) is known for its extensive and often rich deposits of gold in paleoplacer deposits. The best known, and most richly endowed, of these is the Witwatersrand deposits of South Africa, but equivalents occur in the 2.76 Ga rocks of the Fortescue Group from the Pilbara region of Western Australia. Gold is associated with detrital “buckshot” pyrite, as well as carbonaceous material and there are many studies suggesting a link between microbial activity and gold precipitation. This study will involve a detailed examination of the mineral suite, pyrite textures, and gold textures from an extensive drillcore sample suite collected from previously unstudied Pilbara deposits. As with the South African equivalents, the Pilbara deposits are characterized by abundant “buckshot” pyrite.

Aims:
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Adriana Vergés - available Honours projects in Marine Ecology

Are you interested and passionate about marine conservation and ecology? Would you like to contribute to our understanding of how climate change influences communities such as kelp forests, seagrass meadows and coral reefs? Would you like to receive interdisciplinary training in ecology, microbiology and/or oceanography? If you answered yes to any of the questions above, please do get in touch to discuss potential Honours projects.

Below are some active areas of research suitable for Honours projects, but I am open to discussing alternative research areas and particularly welcome student-driven projects.

Ocean warming and the ‘tropicalisation’ of temperate reefs

This project investigates the causes of climate-mediated declines in cold water algal forests. These algae are the trees of our underwater world and support major fisheries and coastal recreation. This project will support innovative multidisciplinary training of postgraduate students in experimental marine ecology, advanced molecular microbiology and physical oceanography. **Lead collaborators:** Prof Peter Steinberg, Dr Erik van Sebille (Imperial College UK), Dr Suhelen Egan, A/ Prof Torsten Thomas.

Restoration of missing underwater forests in Sydney

Crayweed (*Phyllospora comosa*) forms extensive underwater algal forests in SE Australia, where it underpins diverse marine communities and supports economically important species such as rock lobster and abalone. Crayweed went extinct from the Sydney coastline in the 1980s and we have recently managed to successfully restore self-propagating populations of crayweed in Sydney reefs at small scales. This project now aims to “scale up” restoration efforts and assess the importance of genetic diversity, the identity of source populations and proximity to urban areas and storm-water outfalls to restoration success, as well as establishing whether rehabilitation enhances populations of commercially important species. **Lead collaborators:** Dr Ezequiel Marzinelli, Dr Alexandra Campbell, Prof Peter Steinberg, Dr Melinda Coleman (NSW DPI).

A holobiont approach to marine plant-herbivore interactions

Marine herbivory is of great importance in modulating the health of entire marine ecosystems. For instance, high levels of fish herbivory are fundamental to the maintenance of healthy coral reefs, and low levels of invertebrate herbivory are essential for the persistence of algal forests in temperate reefs. This project moves beyond traditional plant- or animal-centric views to investigate how marine plant-herbivore interactions are mediated by microbes. **Lead collaborators:** Dr Suhelen Egan, A/ Prof Torsten Thomas, A/ Prof Alistair Poore.

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