SCHOOL OF ENVIRONMENTAL AND RURAL SCIENCE

Honours Projects 2019

For majors

Agronomy, Animal Science, Botany , Ecology, Environmental Science, Geoscience, Zoology

BSc Honours

Contact Dr Susan Wilson

(swilso24@une.edu.au)

Contents

Agronomy

Contact Chris Guppy (cguppy@une.edu.au) or supervisor

Supervisors: Dr. Chris Guppy and Dr Richard Flavel

Phone: 02 6773 3567; email: **cguppy@une.edu.au**, rflavel3@une.edu.au

Students with in an interest in soil fertility, crop nutrition, plant nutrition, horticulture, or farming systems resource use efficiency or nutrient cycling can see me for ideas on topics. A few are listed below

Current research topics include:

- Mitigation of aluminium toxicity using silicon
- Effect of C4 grass species on the availability of soil P to pasture legumes
- Rhizosphere chemistry affecting the availability of insoluble soil P and K to cereal roots
- Deep placement of P fertilizer in pasture systems
- Root proliferation responses of legumes to patches of P in soil
- Are root proliferation responses of cereal roots to ammonium application linked to increased P dissolution?
- Does prolonged flooding result in increased K and P dissolution in Vertosol soils?
- Peanut root system responses to banded P in sandy soils
- Micro-CT scanning of root responses to various plant chemicals in collaboration with industry

Supervisor: Dr Oliver Knox Phone: 02 6773 2946; email: oknox@une.edu.au

I have a broad interest in cropping systems and their associated soil biology. Much of my current work has a focus on cotton based production systems.

I have an interest in how root tips, via processes mediated by their border cells, interact with pathogens and their environment. These cells are unique plant cells and understanding how and what they do is important. There is constantly a range of projects available looking at how these cells behave when stressed or altered.

Soil microbiology drives the planets terrestrial systems and much of what we do looks at these processes. We've a desire to work out how our sampling methods affect this biology and would be keen for a student to look at how oils used with coring rigs affect the soil microbes.

Soil health is a great engagement tool to use with growers, but how well do the systems we have for assessing it fit the wider farm landscape. There is an opportunity to spend some time in Narrabri, possibly on a CSIRO/CRDC Summer scholarship with Drs Tim Weaver, Guna Nachimuthu and me looking at how soil health assessments fit agricultural soils. The plan would be to look at different fields under different rotational phases and see how the VESS and Northern Rivers soil health assessment schemes rank various fields and to see if these scores relate to productivity records on the farm.

Supervisor: Dr. Guy Roth Phone: 02 6792 5340 ; email: guyroth@roth.net.au

Guy is based out at Narrabri where he runs his own private research and development business focussing on crop agronomy and environmental management for farms. He is a former Rural Science student. It is likely a scholarship could be provided for the projects. An Armidale co supervisor would be arranged.

Supervisor: Prof Brian Sindel

Phone: 02 6773 3747; email: **bsindel@une.edu.au**

Students with in an interest in weed ecology and management can see me for ideas or if you have your own ideas. I have a few projects on seed production and viability in fireweed (*Senecio madagascariensis*), using X rays to measure soil weed seed banks, assessing weed impacts (e.g. thistles) in pastures, and the effects of weed seed shape and morphology on weed dynamics.

Supervisor: Dr Paul Kristiansen

Phone: 02 6773 2962; email: paul.kristiansen@une.edu.au

Contact me if you are interested in exploring invasive weeds, soil fertility management, supply chain development and farmer behaviour. In addition to the project listed below, I'm happy to develop projects in areas of interest to students.

Supervisors: Brian Sindel, Paul Kristiansen

Macquarie Island weeds projects


Poa annua and *Stellaria media* are invasive weeds of sub-Antarctic Islands (e.g. Macquarie Island), impacting on native biodiversity. Given high conservation values, and threats from disturbance & climate change, the development of targeted control measures for invasive species is vital. These weeds and *Cerastium fontanum* may be included in research projects.

Germination ecology of* Poa annua *or* Stellaria media *in sub-Antarctic conditions

Description: Little is known about the seed ecology and soil seed bank of *Poa annua* and *Stellaria media*. This project will generate results that may be used to develop effective, low-impact control options for *P. annua* or *S. media* in the sub-Antarctic, and has broader implications for Antarctic conservation.

Control of* Poa annua *and/or* Stellaria media *in cold climates

Description: The efficacy of herbicides against *Poa annua* and /or *Stellaria media* in cold conditions has received limited study in Australia. As prolific weeds in many parts of the world, a better understanding of the efficacy of different herbicides will assist in developing effective, low-impact management strategies to manage these weeds. Other sub-Antarctic weeds and native plants may also be studied.

Weed management in vegetable production systems

We have a range of potential projects related to weed management in vegetable production systems. Topics include:

* weed seed bank assessment and management

* herbicide resistance of weeds in vegetable farming systems

* impact of strategic tillage, seasonal rotations, cover crops, cultural practices (planting, fertilising, irrigating) and hand weeding on weed infestations in vegetable production

* economic evaluation of specific weed control methods as well

Animal Science

Contact Sam Clark (sam.clark@une.edu.au) or supervisor

There are a variety of Honours projects available in Animal Science. This is just a sample of the projects that have been put forward by potential supervisors. If you have other interests please contact sam.clark@une.edu.au or the potential supervisor to discuss your ideas.

Sheep and Wool

Supervisor: Emma Doyle

Email: edoyle3@une.edu.au

Ph. 02 6773 3094

Possible Research Projects

We have a close link with Australian Wool Testing Authority and they are always willing to provide UNE students with an Honours project that can be conducted in the summer break and will also employ students to conduct the project. If you are interested we can contact AWTA to discuss project options.

Potential research areas, but not limited to;

- Sheep parasitology
- Barbervax application in sheep
- Sheep nutrition and supplementation
- Lactation length and weaner production
- Behavioural patterns in prolonged lambing events
- Lamb survival and ewe condition (collaboration with NSW DPI)
- Liver fluke in sheep and cattle

A number of Australian Wool EducationTrust Honours scholarships will be available for 2018 ($7,000 each). Applications available at www.woolwise.com close end of November 2017. Consult your supervisor to apply. These will be awarded in any discipline linked to sheep and wool production.

Animal welfare and behavior

Project – Does group size affect group behavior and the synchronicity of behaviours in housed sheep?

Supervisors: Dr Amy Tait and Dr Fran Cowley

Email: ltait2@une.edu.au

Grazing sheep tend to act as a flock but does a group of housed sheep all eat, sleep and ruminate at the same time? And does the size of the group affect these group behaviours?

Project – Effects of photoperiod on the welfare and behaviour of sheep and cattle

Supervisors: Dr Amy Tait and Dr Fran Cowley

Email: ltait2@une.edu.au

When sheep or cattle are housed indoors, does the artificial lighting regime affect their behavior and their welfare?

Project – Biochemistry, physical characteristics and ammonia emissions of livestock manure pads

Supervisors: Dr Amy Tait and Dr Janelle Wilkes

Email: ltait2@une.edu.au

This project will investigate the biochemistry of ammonia production and volatilisation from manure pads of confined sheep and cattle, and the deterioration of the physical structure of the manure pad under different environmental conditions.

Projects - Various projects are available to assess how free-range laying hens behave indoors and outdoors and how range access may impact their welfare.

For further information contact: Dr Dana Campbell, dana.campbell@csiro.au and Peta Taylor (02 6773 1808; ptaylo37@une.edu.au).

Early interventions and range use of free-range laying hens

Supervisors: Dr Dana Campbell and Dr Caroline Lee (CSIRO)

Email: Caroline.Lee@csiro.au; Dana.Campbell@csiro.au

Free-range egg productions systems are increasing within Australia in response to consumer demands for more 'natural housing'. But scientific research is needed to determine how these systems affect hen behaviour and welfare. Modifying the environment that chicks are raised in is a possible method of influencing their adaptation to the free-range system as adults. Honours Projects in this area will use video recordings and RFID technology to study daily range visitation frequency, duration on the range and behaviours exhibited on the range by adult laying hens during peak egg production. Comparisons will be made between hens that were exposed to a variable environment

during development (novel objects, sounds, light patterns) versus hens that were reared in standard housing conditions.

Two projects that will look at behavioural indicators of positive affective state in laying hens. Contact - Peta Taylor (ptaylo37@une.edu.au)

Meat Science:

No specific projects in mind but happy to discuss possibilities associated with aspects of Meat science.

Supervisor: Dr Peter McGilchrist: pmcgilc2@une.edu.au

Animal Nutrition

A wide variety of animal nutrition research occurs at UNE in both livestock and poultry. To discuss possible honours projects contact.

Ruminant Nutrition: Prof Roger Hegarty roger.hegarty@une.edu.au or Dr Fran Cowley fcowley@une.edu.au

Poultry Nutrition: Prof Bob Swick rswick@une.edu.au

Project: Assessment of key issues and constraints in the Australian feedlot industry

Supervisor: Fran Cowley Contact: **fcowley@une.edu.au**

Animal Health

No specific projects in mind but happy to discuss possibilities associated with aspects of animal health.

Prof Steve Walkden-Brown **swalkden@une.edu.au**

Animal Breeding and Genetics

The team in animal breeding and genetics offers a wide range of options for students wanting to undertake an honours project. We currently work in key areas relating to animal breeding these include:

The design and evaluation of livestock breeding programs

The development and analysis of breeding objectives and selection indexes

The analysis of data to produce breeding values

The use of genomic technologies in animal breeding

Testing the validity of breeding values

If you have any questions or would just like to chat about completing an honours project in Animal breeding and genetics, please contact Dr Sam Clark sam.clark@une.edu.au , or Professor Julius van der Werf jvanderw@une.edu.au .

AGBU projects - The Animal Genetics and Breeding Unit (AGBU) is a joint venture of NSW Department of Primary Industries and University of New England. AGBU is a team of approximately 20 researchers and professional staff who develop genetic evaluation systems for livestock industries. Researchers at AGBU work closely with industry and students can tackle a range of research topics relevant for commercial breeding programs. All projects would use data from current research or industry breeding programs from sheep, beef cattle pigs and trees.

PARG – Precision Agriculture

Supervisor: Dr Jamie Barwick and Associate Professor Andrew Robson

Phone: 0428 694 239 or email: jbarwic2@une.edu.au

Students with and interest precision agriculture, ag-tech, precision livestock technologies and practices or remote sensing in horticulture, tree crops or pastures can see Jamie or Andrew for ideas on topics. Some topics include:

1) Detection of lambing and pre-lambing behaviour in ewes using GPS tracking technologies and behaviour monitoring systems(Collaborative Project with NSW DPI);

2) Investigation of water and fertiliser use efficiency in crops using soil EM38 sensors and plant vigour sensors

3) Applications of GPS tracking and behaviour monitoring systems in livestock production for disease prediction.

4) UAV based pasture assessment technologies for precision fertiliser management in grazing systems

5) Calibration of active optical sensors for pasture biomass assessment, both quantity and quality

Botany

Contact Professor Jeremy Bruhl (jbruhl@une.edu.au) or supervisor

Students interested in undertaking Honours in **Botany/Plant Systematics/Plant Taxonomy should contact Jeremy Bruhl**.

Students will have access to the N.C.W. Beadle Herbarium, the Herbarium database (NEdb), and our kit for collecting and preparing plant specimen vouchers.

Projects in *Acacia*, Asteraceae, Cyperaceae, *Eucalyptus*, *Comesperma*, Phyllanthaceae are particularly welcome. Most projects involve one or more of the following:

- Resolving taxonomic questions about species: what are the species (often resulting in the student being able to co-author the description of new species).
- Resolving phylogenetic relationships: what are the evolutionary relationships of a group of species
- Understanding character homology: what is the variation in particular characters across a study group. This could be combined with production of an interactive identification dataset.

Depending on the topic and approaches co-supervisors may include people from another institution (e.g. Australian National Herbarium or the National Herbarium of NSW) or from within UNE (e.g. Dr Rose Andrew, Prof. Caroline Gross) as best fits the needs of the project.

Dr Nigel Warwick :nwarwick@une.edu.au **. Plant stress physiology, plant function and ecological anatomy**

I have a number of projects with a focus on plant stress physiology, plant function and ecological anatomy. These include but are not limited to:

- Developmental physiology and genetics of durum wheat looking at effects of dwarfing genes on yield and floret fertility and reserve carbohydrate distribution
- Effect of canopy temperature depression on yield in durum wheats
- Role of inhibitors in glumes of progenitors of the A and B genomes of durum wheat and their effect on pre-harvest sprouting
- Wood and bark anatomy and water transport and carbon dynamics in *Acacia* spp. and *Callitris glaucophylla*
- Phyllode and leaf functional anatomy of *Acacia* spp. and *Callitris glaucophylla* in relation to climate

Ecology

Contacts: Romina Rader and Rose Andrew (rrader@une.edu.au; randre20@une.edu.au) or supervisor

Supervisor: Rose Andrew rose.andrew@une.edu.au

Bees and trees: who pollinates gum trees?

Do you know how many different types of insects visit eucalypt flowers? Neither do we! We are looking for potential students with an interest in plants and pollinators to help us answer that question. By observing insect visitors to eucalypt flowers we hope to understand what types of insects are acting as pollinators, how good they are at their jobs, and how far they might travel to do their work. If this sounds fun to you, please contact Rose Andrew (rose.andrew@une.edu.au) and Jasmine Janes (jjanes@une.edu.au) for more information.

Modelling gum tree speciation with whole-genome data

Whole-genome sequence data provides the best possible resolution of the evolutionary history of closely related organisms. This project asks when woodland eucalypt species, such as Yellow Box (*Eucalyptus melliodora*) and Fuzzy Box (*E. conica*), diverged, and how population size and gene flow has changed throughout their history. We are applying the newest computational techniques to whole-genome sequence data. If this sounds exciting to you, please contact Rose Andrew (rose.andrew@une.edu.au).

Rader Community Ecology Lab – contact Romina Rader

Lab web page: www. raderlab.com

How effective are wild insects in pollinating our favourite fruits?

Regions where work will be carried out: Coffs Harbour, Stanthorpe, Griffith (NSW), Katherine and Darwin (NT), Bowen and Mareeba (QLD).
Supervisor: Romina Rader (rrader@une.edu.au)

Wild pollinators, such as flies, beetles and butterflies, currently provide "free" pollination to a wide range of crops, and several studies across the world have even shown that wild pollinators can improve crop yields and fruit quality. Wild pollinators support farm productivity by allowing plants to produce fruits and seeds, especially when honeybee numbers are insufficient or unfavourable weather conditions prevent honeybees from flying.

This project will investigate the contribution and effectiveness of wild insect pollinators in pollinating several high value fruit crops around Australia.

Candidates will be required to conduct field work for extended periods in various locations. All field trip equipment and accommodation while in the field will be provided.

Partnerships

This project is a partnership between the University of New England and several horticultural industries.

Facilitation or competition between crop and wild flowers on a local scale.

Wild floral communities flowering simultaneously with crops could either facilitate pollination of crops or compete with crop flowers for pollinators depending on the pollinator species and its floral preference.

This project will investigate if pollinators alter their potential as crop pollinators depending on the available alternative floral resources and if this differ between different pollinator species. This will be investigated by surveying flower visits by the two most common pollinators (honeybees and stingless bees) before the bloom start (when only wild flowers are available) and during blueberry bloom in settings with few to many alternative floral resources. The alternative floral resources will be common weeds that often are available in the crop system."

Supervisor: Romina Rader (rrader@une.edu.au) and Ulrika Samnegard

The amazing world of flies and their role in food production

Regions where work will be carried out: Tasmania, NSW, QLD or WA

Supervisor: Romina Rader (rrader@une.edu.au)

Flies are often abundant in crops, and are more effective pollinators than bees in some crops and regions. They have the added advantage that they can often reproduce many generations very quickly and larvae of many species do not require floral resources, but instead feed on dung, carrion and other nutrient rich resources. In some cases, the larvae of some fly pollinators also feed on pests. While there is growing interest in the pollination of crops by flies, we currently lack the knowledge and large scale field trials to assess the potential to manage their presence in crops and to rear them in large numbers whilst also ensuring human health risks are low.

This project will identify 2-5 effective fly pollinators of pollinator-dependent horticultural and vegetable seed crops with the aim of conducting research to quantify their potential to be managed for field crop pollination and mass reared for greenhouse and/or field crop pollination. We will review the current literature and knowledge available to determine which common species of fly taxa are currently being used and/or have the potential to be mass reared as fly pollinators and run field and greenhouse trials to quantify their efficiency, and investigate the options for management of the proposed taxa under open and enclosed conditions.

The project will provide the knowledge base to improve pollination efficiency and future security for a wide range of horticultural, pollination dependent crop species by:

(i) Quantifying the effectiveness of 2-5 fly pollinating species for a range of crops;

(ii) Test a range of different diets to sustain and manage wild flies for pollination services

Project details

All field trip equipment and accommodation while in the field will be provided.

Partnerships: This project is a partnership between the University of New England and several vegetable seed companies.

How effective are introduced bumblebees at pollinating native plants and crops in Tasmania?
Supervisor: Romina Rader (rrader@une.edu.au)

Tasmania is the only Australian state where the bumblebee (*Bombus terrestris*) has become established. It was first observed in 1992 and since then, the bumble bee has become a common flower visitor throughout most regions of Tasmania. While thought to be a significant pollen vector of many invasive weeds, bumblebees are also thought to be good crop pollinators by the horticultural industry.

A current inquiry is examining the risks and opportunities associated with their use, which is currently banned under the Environment and Biodiversity Conservation Act. Little data is available to support such a decision.

This project aims to investigate which flowers are pollinated by bumblebees and how common and effective they are in one or more horticultural crops including apples, raspberries and blueberries.

Partnerships

This project is a partnership between the University of New England and several industry groups.

Supervisors: Romina Rader, Caroline Gross and Manu Saunders (UNE)

Predicting local biodiversity extinction rates in different patch types Contact Person: Romina Rader (rrader@une.edu.au),

Land use change is frequently associated with biodiversity loss and altered species composition. Non-random species losses occur because of specific trait–environment relationships and may reflect differential extinction or colonization rates, differences in dispersal ability and/or differential habitat quality. These changes in community composition have flow-on effects to ecosystem functioning and ecosystem service delivery.

This project will conduct field work and/or various modelling approaches to develop indicators of ecosystem sustainability. Indicators of ecological sustainability require various layers of biological data to be collected and synthesized in a time-efficient manner and specific to particular ecosystems to help us understand the condition of biodiversity and the factors that affect it.

- This work will be conducted in conjunction with Office and Environment and Heritage (Michael Drielsma) and CSIRO (Kristen Williams)

Developing new methods to determine the impact of pollen viability in a changing climate.

Temperature is one of the major environment factors affecting the growth, reproductive development and yields of many crops. This project will focus on how temperature can affect the viability of pollen and germination of pollen tubes using Chickpea as a model crop. The podding window of chickpeas generally starts when the average day temperatures exceed 15 degrees. This rule of thumb is set by pollen viability. Increasing the cold tolerance of varieties represents a significant breeding target and has the potential to significantly increase yields of this valuable crop. To understand the relationship between pollen viability and pollen tube growth, we propose using a range of cool technologies such as micro CT 3D imaging and SEM to better understand the mechanisms by which pollen viability can impact crop production.

Supervisors:

Romina Rader UNE- https://www.une.edu.au/staff-profiles/ers/rrader and www. raderlab.com

Richard Flavel UNE http://www.une.edu.au/staff-profiles/ers/rflavel3

Behaviour-Based Computer Vision and Machine Learning for Pollinator Recognition

Animals moving in familiar environments often follow habitual routes to navigate between important locations, such as nest and feeding sites. While searching for food resources at broad spatial scales, animals often travel in particular patterns or pathways. The proposed project aims to identify pollinators by drawing upon subtle differences in their foraging behaviour while approaching flowers and foraging within and between flower patches. Methods to do this could include video technology, stochastic models, heuristic algorithms and machine learning. Candidates with an interest and background in computer science, physics, mathematics and statistics, entomology, ecology or related fields are encouraged to apply.

Potential Supervisors:

- Romina Rader and Toby Smith (ERS)
- Greg Falzon, William Billingsley and Timothy Schaerf (S&T)

Potential supervisor - Dr Manu Saunders

Email: manu.saunders@une.edu.au; Website: https://ecologyisnotadirtyword.com/

GENERAL TOPICS:

- Insect community ecology
- Plant-pollinator networks
- Landscape ecology
- Ecosystem services in agricultural landscapes
- Science communication

Project ideas:

1. Are biodiversity records biased toward regions with high human population density? This project will be desktop-based, using publicly available datasets (e.g. Atlas of Living Australia). Occurrence records of biodiversity across Australia will be collated and correlated with human population density and proportion of protected areas. **Co-supervisor: Dr Cara Miller, S&T** cmille28@une.edu.au
2. Do insects carry environmental yeasts that benefit fruit production? This project will involve field work collecting insects in local vineyards and orchards and laboratory work to culture yeasts off the insects. Cultured yeasts will be compared to yeast strains found on fruit and plants. **Co-supervisor: Dr Gal Winter, S&T** gwinterz@une.edu.au

If you have another project idea related to any of the general topics listed above, please contact me.

Also see Rader Community Ecology Lab page for potential projects co-supervised with Dr Romina Rader.

Laboratory of Applied Zoology and Ecological Restoration (LAZER)

Contact Dr Debbie Bower dbower3@une.edu.au

The research completed by the Laboratory of Applied Zoology and Ecological Restoration (LAZER) strives to understand and mitigate threats to wildlife through experimental and empirical ecology, and community engagement. Our research helps manage land and water for biodiversity and enable ecosystem function in a state of continuing environmental change. Our study systems occur within the New England Tablelands, Murray-Darling Basin and Papua New Guinea and we focus on vertebrates, particularly reptiles and amphibians, as our models.

Available projects:

1) Testing the capacity of urban environments to compensate habitat for freshwater species: Using freshwater turtles as a model, this project will test how variation in eastern-long neck turtle abundance influences local freshwater systems. It will be a hands on project with a lot of field work and requires a student who appreciates the joys of checking rusty traps, identifying aquatic invertebrates and applying statistical analyses to complex data sets.

2) Determine how land management impacts vertebrates of New England: Populations of threatened frog species occurring in New England National Park may respond to local land uses in predictable ways. This project will test how logging influences in the abundance and composition of rainforest stream frogs along transects in the forest. The work will be heavily field-based and requires an outgoing student who is comfortable wading through streams in the bush at night and running statistical analyses by day – heaven!

3) Acoustic ecology of Papua New Guineas frogs: New Guinea is the world's largest tropical island and provides a home to 6% of the world's frog species. The acoustic reproductive communication of frogs provides a valuable tool to develop methods for remote monitoring. This project is well suited to students that are comfortable with complex software and desktop research – if attention to detail and computer programming are your thing – get involved.

Environmental Science

Contact Susan Wilson (swilso24@une.edu.au) or supervisor

Pollution Science Research Group - search Pollution Science@une


Supervisors: Dr Susan Wilson. swilso24@une.edu.au; Dr Matt Tighe. mtighe2@une.edu.au

Pollution and contamination results in lost productivity, hazards to humans and the environment and billions of dollars spent on clean up. In the New England area we have over 3000 contaminated derelict mine sites with a range of metal pollutant dispersing to the wider environment. In Newcastle, NSW, water can't be used for drinking because it is contaminated with persistent fire-fighting foam chemicals. In agricultural areas overuse of pesticides effects ecosystem service organisms, production animals and humans utilising the services. Even sites not used for hundreds of years such as ancient archaeology sites may harbour a legacy of contaminant liability. These are just some of the issues our group is working on. We aim to quantify the form and fate and behaviour of contaminants to fully understand effects and then to work out methods that can be applied to effectively manage and remediate to soils.

If a student has an interest in a particular area this can be discussed but alternatively, a number of projects and project areas available are described below.

- Biogeochemical cycling of Arsenic and Antimony
- Rehabilitation strategies at mine sites: amendments to manage leaching, phytoremediation, plant based management strategies, risks associated with arsenic and antimony in soils.
- Municipal waste composts, biochar and other amendments applied to soils – safe reuse in agriculture and rehabilitation.
- Fate and persistence of herbicides on high conservation islands
- Archaeological contamination and the timeline of bioavailability
- Contaminant monitoring and analysis – using speciation analysis to quantify risk
- Bioavailability and risk – PAHs and other organic xenobiotics
- Remediation of contaminated soils

Project 1. Mapping and quantifying the sources of derelict mine contamination within the Commissioners Waters catchment with a focus on Sb and As.

This project has external funding from NSW Derelict Mines. The outcomes of the project will direct Derelict Mines actions for remediation and rehabilitation.

Project 2. Can plants be used to clean up contaminated soil? The role of Australian plants in hyperaccumulation.

In this trial the student will grow a range of plants known to translocate high concentrations of arsenic, in soils also contaminated with antimony, to assess whether any Australia plants could be used in As/Sb soil remediation. This will occur in collaboration with University of Canberra

Project 3. Biomonitoring bivalves: Defining antimony and arsenic ecotoxicity and bioavailability in contaminated freshwater systems.

This project, based in the highly contaminated Macleay River catchment of NSW, will evaluate whether freshwater bivalves can be used as biomonitors for Sb and As toxicity in aquatic systems. Exposure–dose–response relationships for these key sentinel species will be established using laboratory and *in situ* experiments.

Project 4. Predicting Antimony and Arsenic cross catchment movement in a contaminated catchment

This project will quantify the spatial and temporal dispersion of As and Sb contamination from the Macleay River Estuary and transfer to adjacent coastal areas using sampling and a modelling framework to improve the management of contamination in coastal alluvial rivers.

Project 4. The uptake of metalloids by homegrown vegetables – risk for foodchain movement

In this trial the student will grow a range of vegetables in contaminated soils and assess the risk for foodchain accumulation.

Terrestrial Carbon Research Group

https://www.une.edu.au/about-une/academic-schools/school-of-environmental-and-rural-science/research/plant-soil-and-environment-systems/terrestrial-carbon-research-group

Contact: Associate Professor Brian Wilson brian.wilson@uen.edu.au

Project 1. Impact of nutrient import by seabirds to soil processes on offshore islands on NSW.

Supervisor: Assoc Prof Brian Wilson

Between 2005-2009 offshore Islands in NSW were the focus of a programme to eradicate mice, rats and rabbits which had been introduced as a consequence of human habitation. The ecology of the islands since 2009 has therefore progressed along a quite different trajectory. One of the key changes on the islands has been the re-establishment of large seabird colonies.

These seabirds import very substantial quantities of oceanic derived nutrient to the islands and this is having a very significant effect on ecological (and particularly soil) processes.

This project will assess the quantities, distribution and importance of these nutrient additions on the island ecosystems and the impacts on ecosystem function with a view to informing future management of the islands for optimum ecological outcomes.

Collaborators: NSW NPWS. Location: Broughton Island Group, NSW

Project 2. Impact of "ecosystem engineering" by seabird colonies on soil physical properties on offshore islands of NSW.

Supervisor: Assoc Prof Brian Wilson

Between 2005-2009 offshore Islands in NSW were the focus of a programme to eradicate mice, rats and rabbits which had been introduced as a consequence of human habitation. The ecology of the islands since 2009 has therefore progressed along a quite different trajectory. One of the key changes on the islands has been the re-establishment of large seabird colonies.

Seabirds, particularly shearwaters, are burrowing birds that displace large quantities of soil as part of their annual breeding cycle. This has the effect of "ecologically engineering" the landscape on a regular basis.This project will investigate the quantities of soil displaced annually and the effect of this on soil physical, chemical and biological properties with a view to informing NPWS regarding ongoing management of the island ecosystem.

Collaborators: NSW NPWS, U Wollongong. Location: Broughton Island Group, NSW

Project 3. Soil organic matter and biological response to restoration of native vegetation

Supervisor: Assoc Prof Brian Wilson

Across NSW, re-establishment of native tree and shrubs in “environmental plantings” has been promoted as a method to restore land, improve environmental quality and re-establish habitat for above-ground fauna.

Work investigating the environmental benefits derived from native tree/shrub plantings in Australian landscapes has largely focused on above-ground features: habitat provision, biodiversity, biomass-carbon and these benefits are well established. The effects on the below-ground (soil) ecosystem are less clear although it is believed that the biodiversity of organisms in the soil is orders of magnitude larger than that found above-ground.

Using an established chronosequence of environmental plantings across NSW, this project will examine the effects of environmental plantings on soil organic matter cycling and soil biology. It will provide information to inform the promotion and use of environmental plantings as a means of improving terrestrial environments.

Collaborators: NSW NPWS, NSW LLS. Location: Armidale – Wagga, NSW.

Project 4) Soil response to rehabilitation of alpine and sub-alpine sites of the Snowy Hydro Scheme

Supervisor: Assoc Prof Brian Wilson

The Snowy Hydro Scheme was one of the most significant civil engineering projects in Australian. The project, a major engineering success, resulted in a range of sites with significant ecological disturbance. The NSW National Parks and Wildlife Service (NPWS) now have responsibility for restoring and rehabilitating these sites. Although native vegetation can be restored on disturbed sites, it is not clear how and at what rate ecological (and particularly soil) function can be restored at these sites and therefore at what stage rehabilitation can be considered to be successfully achieved.

This project will assess soil condition at a range of Snowy Hydro sites of different age and treatment types with the aim of assessing the success or otherwise of rehabilitation efforts in restoring soil function.

Collaborators: NSW National Parks and Wildlife Service. Location: Kosciuszko National Park

Project 5. Vulnerability of alpine, sub-alpine and montane forest soils in NSW to climate change

Supervisor: Assoc Prof Brian Wilson

Ecosystems of the alpine and sub-alpine zones of NSW are the most vulnerable to projected climate change with progressive warming and drying of these environments leading to likely significant change in these systems. Although much work has been conducted to examine and model the effects of climate change on above-ground ecosystems, limited work has considered the effect of climate change on the soil resource.

This project will utilize a range of alpine, sub-alpine and montane forest sites to examine the vulnerability of soils and particularly the soil organic matter cycle, to climate change. The impacts of climate change on the nature and extent of these soils and their character will be assessed to guide planning and management of these ecosystems into the future.

Collaborators: NSW NPWS. Location: New England National Park, Kosciuszko National Park, Mt Kaputar National Park etc.

Soil Biology

Dr Oliver Knox oknox@une.edu.au

These projects may come with CRDC support

Axonchium, the soil nematode we know nothing about!

The student will get to know soil nematode recovery techniques and subsequent culturing methods. We have identified an Axonchium species, which is probably a new species, but this genera is characterised by a lack of visible mouth parts. There is debate in the literature as to what it eats elsewhere in the world, but with this nematode becoming more prevalent in cotton and grains cropping areas it would be useful to address this. So if you are interested in working with a potentially new species and addressing what this genera feeds on then this is for you.

***Does how we recover soils alter the microbial community*?**

We routinely core in order to take soil samples, but often we have to use surfactants to aid in the core recovery. These surfactants apparently have limited impact on the Carbon we find in the recovered soils, but what possible impacts do they have on the soil microbiology? We are seeking a student who would address this through a series of soil exposure and respiration measurements using a number of techniques.

Soil Health and Land Management

Lisa Lobry de Bruyn llobryde@une.edu.au

In order for farmers to maintain or improve soil health through their management they need to access and use good quality, local soil information, including identification of soil types and their soil health status (here using available soil testing as a proxy). Tracking of soil health status, at the local level, largely falls to farmers. Despite recurrent language, in policy and other documents, suggesting farmers' monitoring of soil health is necessary to guide decision-making and land management practices, the reality of their practice, is relatively unknown. It appears that we have assumed what motivates farmers to soil test but have not asked them. This project would work with landholders undertaking soil testing workshops on soil testing and interpretation of their own soil test results, and examine what they do with the soil data they collect and how it influences their land management decisions.

Skills: analysing surveys, undertaking a qualitative analysis and follow-up interviews. Data is currently being collected , Human Research Ethics application already undertaken,

Macquarie Island weeds projects

Supervisors: Brian Sindel, Paul Kristiansen

Macquarie Island weeds projects


Poa annua and *Stellaria media* are invasive weeds of sub-Antarctic Islands (e.g. Macquarie Island), impacting on native biodiversity. Given high conservation values, and threats from disturbance & climate change, the development of targeted control measures for invasive species is vital. These weeds and *Cerastium fontanum* may be included in research projects.

Germination ecology of* Poa annua *or* Stellaria media *in sub-Antarctic conditions

Description: Little is known about the seed ecology and soil seed bank of *Poa annua* and *Stellaria media*. This project will generate results that may be used to develop effective, low-impact control options for *P. annua* or *S. media* in the sub-Antarctic, and has broader implications for Antarctic conservation.

Control of Poa annua and/or Stellaria media in cold climates

Description: The efficacy of herbicides against *Poa annua* and /or *Stellaria media* in cold conditions has received limited study in Australia. As prolific weeds in many parts of the world, a better understanding of the efficacy of different herbicides will assist in developing effective, low-impact management strategies to manage these weeds. Other sub-Antarctic weeds and native plants may also be studied.

Geoscience

Contact Luke Milan (lmilan@une.edu.au) or supervisor

Geology Staff: Dr Luke Milan (tectonics, field mapping, geochronology, structural and metamorphic geology)

Dr Nancy Vickery: (Field mapping, Mineralisation, Geophysics and GIS mapping, Sedimentology, Petrography)

Dr Ed Saunders: (Field Mapping, Geochemistry, Igneous Petrology)

PROJECTS

1. **Nature of the boundary between the Girrakool and Sandon Beds.**
   Keywords: sedimentology; geophysics; geochemistry; mapping
   Abstract: Local project involving mapping the contact between two regionally significant sedimentary sequences to understand tectonic processes and nature of the sedimentary rocks
   Contact: Nancy Vickery

2. **Kempsey beds, South West Rocks**
   Keywords: Field Mapping; sedimentology; geochemistry; detrital zircon geochronology,
   Abstract: South West rocks area. A field and lab project investigating the timing and provenance of this unit.
   Contact: Luke Milan. Ed Saunders

3. **Wandsworth Volcanics**
   Keywords: mapping; geochemistry, petrography, airborne geophysics, stratigraphy, volcanology
   Abstract: Several projects exist in areas of significant outcrop of the Wandsworth Volcanic Group. Recent geophysical surveys by the NSWGS have highlighted variation and stratigraphy within this poorly understood package of rocks. The projects would involve geological mapping and geophysical interpretation, petrography and geochemistry.
   Contact: Luke Milan

4. **Palaeogene to Neogene sequence in the Inverell to Glen Innes district**
   Keywords: Palaeogene, Neogene, mapping, alluvial deposits, basalt geochemistry, sapphire exploration
   Abstract: The Palaeogene sedimentary sequence that immediately underlies the Palaeogene to Neogene volcanics in this district have not been mapped. There is a close spatial relationship between the earlier volcanic eruptives from the Maybole Volcano and sapphires. Further to this, geophysics, in particular radiometrics, highlight significant variation in the sequence that may help in the discovery of alluvial sapphire deposits. Geochemistry on early eruptive products including the Red Breccia host for sapphires.
   Contact: Nancy Vickery

5. **Amphibolites of the Wongwibinda Metamorphic Complex**
   Keywords: Whole rock geochemistry, geological mapping, petrology, thermobarometry
   Abstract: See Luke for detailed abstract. Update on earlier research conducted in the 1970s and 1980s. Recent mapping has indicated more exposure of these rocks.
   Contact: Luke Milan

6. **Pegmatites in the Wongwibinda Metamorphic Complex**
   Keywords: Geochronology, petrology, geochemistry, geological mapping
   Abstract: See Luke for detailed abstract. Based on recent geological mapping.

Contact: Luke Milan

7. **Mantle and Lower Crustal Xenoliths**
   Keywords: granulites, peridotites, pyroxenites, in basalts petrography, insitu mineral geochemistry, other analytical work
   Abstract: Investigate xenoliths to determine features of the upper mantle in the NEO, investigate the influence of subduction, noting occurrence of minerals such as apatite, amphibole.
   Contact: Ed Saunders, Luke Milan

8. **Kensington Formation**
   Keywords: Field mapping, stratigraphy, sedimentology, provenance studies, detrital geochronology.
   Abstract: Mapping and stratigraphy of this Early Permian Sequence. Provenance studies and
   Contact: Luke Milan, Bob Brown, Nancy Vickery,

9. **Gorge country mapping and structural geology projects**
   Keywords: structural geology, geochemistry, sedimentology, possible northern edge of the Halls Peak mineralisation.
   Abstract: Structural geology and mapping, focussing on basement rocks. Mapping along ridgelines and gorges.
   Contact: Ed Saunders, Luke Milan, Paul Ashley

10. **Nowendoc area: GSB and basement rocks**
    Keywords: geological mapping, igneous petrology, metamorphism, structural geology
    Abstract: Geological mapping of region around Nowendoc area focussing on the GSB and associated rocks plus adjacent basement. Possibility of several mapping projects.
    Contact: Luke Milan, Ed Saunders, Paul Ashley

11. **Baryulgil region**
    Keywords: Field Mapping; tectonics; ophiolites; geochemistry, geophysics
    Abstract: Geological mapping in an area where the geology is poorly understood. Recent geophysics over the area indicates complexity and need for further investigation
    Contact: Luke Milan, Ed Saunders

12. **Great Serpentinite Belt**
    Keywords: Serpentinite, magnetics, mapping, structural geology
    Abstract: Little detailed mapping of the Great Serpentinite Belt has been undertaken since geophysical surveys were flown by the GSNSW in the late 1990s-2000s. Potential exists for several mapping projects to understand the nature of the serpentinite and precursor rocks
    Contact: Luke Milan, Ed Saunders, Paul Ashley

13. **Carboniferous arc evolution**
    Keywords: Carboniferous felsic volcanics, zircon ages, zircon provenance, petrology, whole rock geochemistry, geological mapping
    Abstract: Tracking the evolution of the Carboniferous arc over time Field Sampling, laboratory work. Collaborative project with Macquarie University.
    Contact: Luke Milan, Ed Saunders.

14. **Correlation of the Namoi Formation**
    Keywords: volcanics, mapping

Abstract: Carboniferous volcanics Namoi Formation, comparison of the west and east Namoi. Cobbadah fault: is it a fault or not? Geophysics and mapping.
Contact: Nancy Vickery, Bob Brown

15. **Mostyn Vale and Keepit boundary**
Keywords: volcanics, mapping
Abstract: Geological mapping project in the Tamworth Belt focussing on sedimentology, tectonics.
Contact: Nancy Vickery, Bob Brown

16. **Nature, geometry and distribution of the olisoliths in the Mostyn Vale Formation, Tamworth Belt**
Keywords: Geological mapping; sedimentology, geochemistry
Abstract: The Mostyn Vale Formation contains a large number of andesitic olistoliths that are thought to have calved from the island arc during the Devonian. The nature, geometry and distribution of these blocks have yet to be mapped in detail. By using the size and extent of these blocks, we can reconstruct what the arc looked at this time and can position the margin of the arc at this time by measuring the size of the blocks (largest most likely nearest to the paleoarc shoreline).
Contact: Nancy Vickery, Bob Brown

17. **Laytons range conglomerate**
Keywords: Field Mapping, sedimentology, mapping, geochemistry
Abstract: Jurassic molasse unit. Rebuilding the NEO from the basal deposits of the Clarence Morton Basin. Clast population, provenance, gold and chromite placer deposits.
Contact: Luke Milan, Bob Brown, Paul Ashley

18. **Towallum basalts**
Keywords: Field mapping, tectonics, basalt geochemistry
Abstract: Tectonically how does this basalt fit in with the Clarence Morton basin? Geochemistry of the basalt. 226 Ma.
Contact: Ed Saunders

19. **Nymbodia district mapping**
Keywords: Field Mapping, Nymboida coal measures, sedimentology, petrology
Abstract: Southern end of the Clarence Moreton Basin. Possible drill core inspection at Londonderry. Project involves geological mapping on the margins of the basin to understand sedimentology and tectonics
Contact: Luke Milan and Bob Brown

Mineralisation

20. **Gilgai granite (MSC. OR Hons.)**
Keywords: geological mapping, geophysical interpretation, petrography and granite related mineralisation.
Abstract: The Gilgai granite is a highly mineralised, late Permian granitoid located near Inverell. It has a close spatial and temporal relationship to the Tingha Monzogranite, a member of the Uralla Supersuite. Geophysical surveys over these granitoids indicate a complex relationship between the two and highlight the heterogeneous magnetic character of the Gilgai Granite. Detailed geological mapping is required to understand the nature of this relationship plus bring understanding to the mineralisation in the area. This project potentially offers support by the NSWGS. Project could be offered at Masters level or as two hons projects
Contact: Nancy Vickery

21. **Webbs Silver mine/Collisons**
Keywords: granite related polymetallic mineralisation, mapping, hydrothermal alteration, petrology

Abstract: Investigate mineralisation at Collisons, possible access to drill core through Silver Mines, alteration and mineralisation, geological mapping.
Contact: Nancy Vickery, Paul Ashley

22. Hillgrove Clarke's Gully prospect
Keywords: antimony, petrology, structure, alteration, granite geochemistry, environmental geochemistry (baseline data gathering of data pre-mining)
Abstract: Investigation of the Sb-rich Clarke's Gully project currently operated by Braken Resources. Possibility of two projects, one environmental and one related to mineralisation.
Contact: Nancy Vickery, Paul Ashley, Luke Milan

23. Hillgrove-related environmental geochemistry projects
Keywords:
Abstract:
Contact: Paul Ashley

24. Cobar basin geology/mineralisation
Keywords: geological mapping, petrology, sedimentology, mineralisation, structural geology, volcanics
Abstract: a number of projects are available that include a diverse range of basement geology investigations, includes sedimentology, volcanic terranes. Central parts of the Cobar Basin and Mt Boppy region, investigate nature of mineralisation, VHMS or replacement-style mineralisation
Contact: Bob Brown, Nancy Vickery

Palaeoscience (major in geoscience, zoology or ecology)

These projects will be undertaken in majors ecology, zoology or geoscience depending on student background and project.

Contact John Paterson (jpater20@une.edu.au) or supervisor

Supervisor: Prof. John Paterson (jpater20@une.edu.au)

Profile webpage: http://www.une.edu.au/staff-profiles/ers/jpater20

Project: Hunting for predatory holes in the Cambrian fossil record: Drill holes within the shells of the 520 million-year-old microfossil *Micrina etheridgei from South Australia*

Abstract: Holes in the shells of Cambrian organisms present strong evidence for the early evolution of drilling predation. However, such holes are apparently rare and this rarity has hindered the understanding of important predator-prey interactions in the Cambrian. A large collection of *Micrina etheridgei* specimens that have been acid-etched from Cambrian limestones of South Australia, and currently housed at UNE, can be studied to: (a) document the features of the holes preserved in the shells, and attempt to identify the predator and elucidate its behaviour; and (b) show how this species responded to drilling predation over a short period of geologic time.

Supervisor: Dr Rudy Lerosey-Aubril (rlerosey@une.edu.au)

Profile webpages:
http://www.une.edu.au/staff-profiles/ers/rlerosey
http://univ-lyon1.academia.edu/RudyLeroseyAubril/About
https://www.researchgate.net/profile/Rudy_Lerosey-Aubril

Project 1: Ecology and evolution of palaeoscolecid worms: new data from the Cambrian of Canada, France, and USA

Keywords: Palaeoscolecida, Cambrian explosion, palaeobiology, palaeoecology, evolution

Project 2: Diversity and ecology of sponges and cnidarians in the late Cambrian Weeks Formation Lagerstätte (Utah, USA)

Keywords: Poriferans, cnidarians, Cambrian explosion, palaeoecology, palaeoenvironment, evolution

Zoology

Contact Tommy Leung (tleung6@une.edu.au) or supervisor

Insect Ecology Supervisor: nigel.andrew@une.edu.au

http://insectecology.une.edu.au/

Project 1. Future Keepers: Assessing effects of thermal stress and differential resource limitation on ecosystem function provider's project. Work with an international team of researchers on a high profile research project incorporating citizen science, biodiversity and physiological research across Australia.

See http://insectecology.une.edu.au/research.html

Key Reference: "The Tragedy of the Unexamined Cat." Unpublished manuscript – ask Nigel.

Key Reference: Tulloch, A. I. T., Possingham, H. P., Joseph, L. N., Szabo, J., & Martin, T. G. (2013). Realising the full potential of citizen science monitoring programs. Biological Conservation, 165, 128–138. doi:10.1016/j.biocon.2013.05.025

Project 2. Response of Australian Grassland Invertebrates to a Changing Climate. Invertebrates were collected from grasslands across a range of climates in NSW and Victoria to assess the influence of climate on species composition. Hymenoptera, Hemiptera and Coleoptera have been extracted from *Themeda triandra* samples ready to be identified further and potentially have their morphology assessed. Other orders may also be extracted from the samples for further analysis. There are also samples from other grass species that can also be sampled. **All labwork**

Key References: Gibb, H., Stoklosa, J., Warton, D.I., Brown, A.D., Andrew, N.R. & Cunningham, S.A. 2015 Does morphology predict trophic position and habitat use of ant species and assemblages? Oecologia 177, 519-531. and Yates, M.L., Andrew, N.R., Binns, M. & Gibb, H. 2014 Morphological traits: predictable responses to macrohabitats across a 300 km scale. PeerJ 2, e271.

Project 3. Ants along environmental gradients: the influence of climate and plant phylogeny. Invertebrates were collected along an environmental gradient from the coast into semi-arid NSW from a range of Acacia host plant encompassing their phylogeny. This project will also be labwork based identifying species as well as morphological traits of ants..

Key References: Yates ML, Andrew NR, Binns M, Gibb H (2014) Morphological traits: predictable responses to macrohabitats across a 300 km scale. *PeerJ* 2:e271. doi: 10.7717/peerj.271

Bairstow KA, Clarke KL, McGeoch MA, Andrew NR (2010) Leaf miner and plant galler species richness on *Acacia*: relative importance of plant traits and climate. *Oecologia* 163:437-448. doi: 10.1007/s00442-010-1606-4

Project 4. What is the impact of temperature and nutrition on ant physiology? This will be a field and lab based assessment of common ant species around New England assessing impact of higher temperatures and nutrient addition to ants in the field, and experimental manipulation of ants in the lab in small lab colonies.

Key references: Diamond, S.E., Penick, C.A., Pelini, S.L., Ellison, A.M., Gotelli, N.J., Sanders, N.J. & Dunn, R.R. (2013) Using physiology to predict the responses of ants to climatic warming. *Integrative and Comparative Biology,* 53, 965-974. doi: 10.1093/icb/ict085; Stuble, K.L., Pelini, S.L., Diamond, S.E., Fowler, D.A., Dunn, R.R. & Sanders, N.J. (2013) Foraging by forest ants under experimental climatic warming: A test at two sites. *Ecology and Evolution,* 3, 482-491. Diamond, S.E., Nichols, L.M., McCoy, N., Hirsch, C., Pelini, S.L., Sanders, N.J., Ellison, A.M., Gotelli, N.J. & Dunn, R.R. (2012) A physiological trait-based approach to predicting the responses of species to experimental climate warming. *Ecology,* 93, 2305-2312. Andrew, N.R., Hart, R.A., Jung, M.-P., Hemmings, Z. & Terblanche, J.S. (2013) Can temperate insects take the heat? A case study of the physiological and behavioural responses in a common ant, *Iridomyrmex purpureus* (Formicidae), with potential climate change. *Journal of Insect Physiology,* 59, 870-880. doi: 10.1016/j.jinsphys.2013.06.003

Project 5. Evaluating rearing of Black Soldier Fly larvae to produce designer food for pig and poultry.
Monogastrics such as pig and poultry require high protein feed of a special amino acid composition. We are looking for sustainable alternatives to current protein sources and rearing Black Soldier Fly larvae on different substrate will allow to provide poultry and pigs will provide such a solution. This project will investigate the possibilities and limitations to produce Black Soldier Fly nutraceuticals in Australia. The research will be carried out in conjunction with PhD student Jessica de Souza Vilela

Project 6. Phasmids and ants

Phasmids are renowned for their morphological convergence with plants. Their striking resemblance to leaves and twigs has gained them notoriety as charismatic invertebrates and classic examples of the evolution of mimicry. Not only do the adults resemble twigs and leaves, but their eggs also resemble tree seeds and are dispersed by ants.

This research project investigates how phasmids utilise chemical signals to attract ants to their eggs, and how ants behave towards these chemicals. This project will involve carrying out experiments investigating ant behaviour and conducting laboratory sampling for chemical analyses. This project provides an opportunity to learn about insect husbandry, data collection, experimental design and sampling protocols.

For more information contact James O'Hanlon at johanlon@une.edu.au

Project 7. Monitoring the Purple Copper Butterfly and its ant host

The Purple Copper Butterfly *Paralucia spinifera* is known to occur on the Central Tablelands of NSW in an area bounded approximately by Oberon, Hartley and Bathhurst. It is believed to be restricted by the distribution of the attendant ant species and the larval host plant.

This research project investigates the occurrence of the purple copper adult and larval life stages at a range of key sites, as well as its tending ant species *Anonychomyra itinerans*. The project will involve field surveys and experimental manipulations. The research will be in collaboration with NSW Office of Environment and Heritage. It is part of a larger project the Insect Ecology Lab is undertaking: Saving our Species conservation project monitoring plan – Site based management to secure *Paralucia spinifera* in the wild in NSW for 100 years and improve its conservation status under the Threatened Species Conservation Act.

There are other projects happening with ants, dung beetles, agricultural pests and beneficial insects among others. Please get in touch with Nigel for more details.

nigel.andrew@une.edu.au Also go to http://insectecology.une.edu.au/ for more details on the lab

Behavioural Ecology Lab – Supervisor: Paul McDonald

Some potential projects below, but happy to discuss specific project ideas relevant to individual student interests on animal behaviour broadly, or focal systems such as Bell's Turtle or Noisy Miners: paul.mcdonald@une.edu.au

For more detail see: https://abel.une.edu.au/

Noisy Miners:

Do Noisy Miners eavesdrop on other species? Many species give alarm calls that indicate danger, but do miners bother listening to others? More broadly, this will provide information on how animals see (or hear) to understand their surroundings, and the types of information that is salient to prey species.

Why are miner chicks so loud? Despite begging being a dangerous thing to do as it may attract predators to nests, miner chicks are *incredibly* loud. Why, and how, does colony structure and connectivity influence begging to overcome these risks?

Do miners avoid responding to a hopeless alarm caller? Animals have access to lots of information in their environment, but who to listen to? This project would examine whether birds pay more attention to a reliable signaller, and conversely ignore those with poor accuracy. This has implications for communication broadly and understanding sociality.

How does body condition influence social hierarchy? Understanding who does what in a social system is an important step in determining the factors that shape cooperative behaviour. One understudied facet is condition, ie how much fat reserves an individual has. This project will challenge birds of different condition in a series of experiments to better understand the trade-offs between risk, condition, and helping behaviour.

Some noisy miner projects are linked to Environmental Trust funding, collaborations with University of Queensland and Australian Museum, working on Local Land Services and Armidale-Dumaresq Council land.

Pigeons:

Crested pigeon behaviour and habits: Perhaps one of our most common birds, yet we know very little about this species. This project will use camera traps and supplemental food to examine pigeon abundance and behaviour to better understand these birds and their movements.

Ducks:

What would a wood duck do? Again, one of our most commonly seen ducks, yet we know little about these birds. Building on the results of a 6 month long GPS tracking study, this project looks to find out more about this species in the local area around Armidale, from its movements to breeding behaviour.

Supervisors: Fritz Geiser, Chris Wacker, Gemma Morrow, Gerhard Körtner
Zoology: Centre for Behavioural and Physiological Ecology

Research Interests:
Ecological physiology, comparative physiology and biochemistry, hibernation and torpor, thermal biology and energetics, chronobiology, membrane structure and function, lipids, foraging biology mammalogy, ornithology, herpetology.

Potential projects:

- Torpor in marsupials, monotremes, native rodents, bats or birds
- Thermal energetics of birds, mammals and reptiles
- Foraging and thermal biology of free-ranging mammals, birds and reptiles
- Reproductive & developmental biology in relation to thermal energetics in mammals and birds
- Does obesity in mice affect heat loss?

References/Recent publications:

Geiser F, Körtner G, Maddocks TA, Brigham MR (2006) Torpor in Australian birds. Proceedings, 23rd International Ornithological Congress, Acta Zoologica Sinica. 52S: 405-408

Geiser F (2007) Yearlong hibernation in a marsupial mammal. Naturwissenschaften 94: 941-944

Geiser F (2013) Hibernation. Current Biology 23: R188-R193.

Geiser F, Stawski C, Wacker CB, Nowack J (2017) Phoenix from the ashes: fire, torpor and the evolution of mammalian endothermy. Frontiers in Physiology 8: 842

Körtner G, Geiser F (2009) The key to winter survival: daily torpor in a small arid zone marsupial. Naturwissenschaften 96: 525-530

Körtner G, Pavey CR, Geiser F (2007) Spatial ecology of the mulgara (Marsupialia: Dasyuridae) in arid Australia: impact of fire history. Journal of Zoology 273: 350-357

Morrow G, Nicol SC (2009) Cool sex? Hibernation and reproduction overlap in the echidna. PLoS ONE 4(6): e6070

Nowack J, Rojas AD, Körtner G, Geiser F (2015) Snoozing through the storm: torpor use during a natural disaster. Scientific Reports 5: 11243, DOI: 10.1038/srep11243

Nowack J, Cooper CE, Geiser F (2016) Cool echidnas survive the fire. Proceedings of the Royal Society B 283: 20160382

Ruf T, Geiser F (2015) Daily torpor and hibernation in birds and mammals. Biological Reviews 90: 891-926

Stawski C, Geiser F (2010) Fat and fed: frequent use of summer torpor in a subtropical bat. Naturwissenschaften 97: 29-35

Wacker CB, McAllan BM, Körtner G, Geiser F (2017) The role of basking in the development of endothermy and torpor in a marsupial. Journal of Comparative Physiology B 187: 1029-1038

Willis CKR, Brigham RM, Geiser F (2006) Deep, prolonged torpor by pregnant, free-ranging bats. Naturwissenschaften 93: 80-83

Supervisor: Stuart Cairns

Distance sampling projects

- Estimating kangaroo abundance from line transect surveys of faecal pellets

template references: Marques, F. F. C. *et al. (*2001). *Journal of Applied Ecology* 38, 349-363

- Using distance sampling methods to estimating the density distribution of arboreal marsupial abundances

template reference: de Tores, P. J. & Elscot, S. (2010). *Wildlife Research* 37, 512-523

- Adaptive line transect sampling and the density distribution of bull ant (*Myrmecia* spp.) nests

template reference: Pollard, J. H. & Buckland, S. T. (2004). Adaptive distance sampling surveys. In *Advanced Distance Sampling* (eds. Buckland, S. T. *et al*.) pp. 229-259.

General macropod projects

- The changing distributions of eastern grey (*Macropus giganteus*) and western grey (*M. fuliginosus*) kangaroos in the western division of New South Wales

template reference: Caughley, G., B. Brown, P. Dostine, & D. Grice. (1984). The grey kangaroo overlap zone. *Australian Wildlife Research* 11, 1–10.

Resource utilisation and foraging behaviour

- Patch foraging in a common herbivore the Wood Duck (*Chenonetta jubata*)

template reference: van der Wal, R. (1998). On the relation between herbivore foraging efficiency and plant standing crop: an experiment with barnacle geese. Oikos 82, 123-130.

Note: All these projects are inherently quantitative and really only students who feel that want to develop further whatever knowledge and understanding they have of the use of statistical methods in ecology.

Supervisor: Dr Tommy Leung, tleung6@une.edu.au

Evolutionary ecology of host-parasite interactions, Evolutionary significance of parasite life history, Comparative analysis of parasite macroecology, Components and interactions within parasite communities