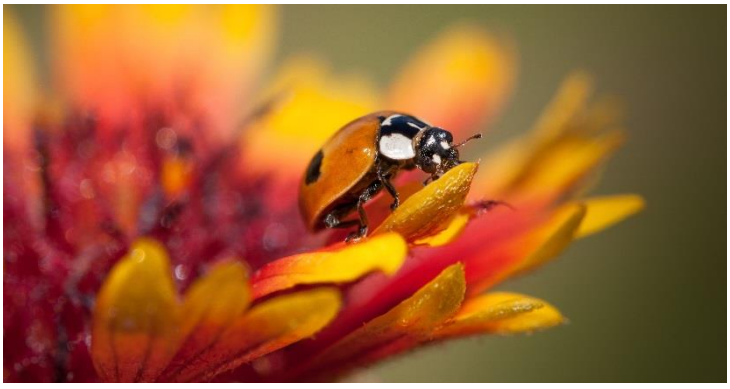
Faculty of Agriculture and Life Sciences

Honours Projects
2016/2017



Lincoln University
Te Whare Wānaka o Aoraki
CHRISTCHURCH-NEW ZEALAND

Contents

Introduction

Possible projects available to Honours candidates are set out in this booklet.

The supervising staff member's name is specified. You are encouraged to discuss the specific projects with these people. Students with their own possible projects or students who find none of the listed ones attract them are invited to discuss possibilities with the staff member whose interests are most closely aligned to their own (see the Faculty website – http://www.lincoln.ac.nz/Lincoln-Home/About-Lincoln/Faculties-and-Divisions/Faculty-of-Agriculture-and-Life-Sciences/ (under Related Links)

Many elective subjects are taught by the staff within the Faculty. There is a wide range of opportunities for combining these subjects and those from other Faculties, into a suitable course of study. There are also opportunities for the development of special topic subjects for Honours candidates.

Aims

Dissertations are aimed towards individual research and study. Such an approach provides for student initiative in developing a research idea through the initial proposal, review of literature, design of experiments, conduct of experiments, analysis of results and their discussion. This will provide an assessment of the student's ability to conduct independent research and communicate results to other students and staff.

Objectives

At the completion of a dissertation a student should be able to:

- break down a problem into key questions.
- develop those questions into a research proposal.
- read and critically assess literature on the chosen research topic.
- write a research proposal.
- plan and conduct appropriate research work.
- analyse results according to accepted statistical procedures.
- write up the results in a form that encompasses the above and discusses the significance of the results compared with other studies.
- communicate progress and results through written and verbal methods.

Dissertations are assessed by the supervisor and an independent examiner, who is normally an academic staff member of Lincoln University.

These are the projects received to date. Please consult the Faculty website for others that may have been added subsequently.

http://www.lincoln.ac.nz/Lincoln-Home/About-Lincoln/Faculties-and-Divisions/Faculty-of-Agriculture-and-Life-Sciences/ (under Related Links)

Enrolment
Please refer to the university website
http://www.lincoln.ac.nz/Study/Qualifications/?QualGroup=honours

Application checklist:

- You need English as a first language or provide documentation of your English Language proficiency
- Birth certificate or passport, certified copies only
- Academic transcripts, official copies or certified copies of all tertiary education qualifications either completed or partially completed
- The name of the area you're applying for honours in (e.g. Ecology) and a statement of research interest

To apply online go to: https://mylinc.nz

Special note: If after Bachelor degree study you receive a letter of invitation from Lincoln University to study Honours, **you are still required to complete an application form prior to registration.**

List of Projects

No.	Project Title	Supervisor and email
1.	Baiting for Phytophthora pathogens from waterways	Assoc Prof Eirian Jones Eirian.Jones@lincoln.ac.nz
2.	Can drones be used to improve decision making for agricultural production?	Assoc Prof Hannah Buckley Hannah.Buckley@lincoln.ac.nz
3.	Dry rot of forage brassicas	Assoc Prof Eirian Jones Eirian.Jones@lincoln.ac.nz
4.	Earthworm: Friend or foe in the battle against nutrient leaching	Dr Henry Chau Henry.Chau@lincoln.ac.nz
5.	Ecology and behaviour of Banks Peninsula Tui	Dr Laura Molles Laura.Molles@lincoln.ac.nz
6.	Effect of summer grazing management on sward dynamics in autumn and winter	Dr Racheal Bryant Racheal.Bryant@lincoln.ac.nz
7.	Effects of plantain on kidney function in sheep	Assoc Prof Graham Barrell Graham.Barrell@lincoln.ac.nz
8.	Entomophagy: Insects as food for people – the New Zealand context	Dr Rob Cruickshank Robert.Cruickshank@lincoln.ac.nz
9.	Establishment of plantain or Italian ryegrass into existing pastures	Dr Racheal Bryant Racheal.Bryant@lincoln.ac.nz
10.	Flammability of New Zealand plants	Dr Tim Curran Timothy.Curran@lincoln.ac.nz
11.	Long-term changes in Westland Petrel colonies	Assoc Prof Adrian Paterson Adrian.Paterson@lincoln.ac.nz
12.	Managing soil fertility in Cd contaminated agricultural soils	Dr Niklas Lehto Niklas.Lehto@lincoln.ac.nz
13.	Measuring temporal change in sand dune ecosystems	Assoc Prof Hannah Buckley Hannah.Buckley@lincoln.ac.nz
14.	Novel methods of parasite control	Dr Andy Greer Andrew.Greer@lincoln.ac.nz

No.	Project Title	Supervisor and email
15.	Pasture mixture formulation	Dr Alistair Black Alistair.Black@lincoln.ac.nz
16.	Perennial lupin valuation	Dr Alistair Black Alistair.Black@lincoln.ac.nz
17.	Reference model for body condition scoring	Dr Andy Greer Andrew.Greer@lincoln.ac.nz
18.	Remote sensing technology for grazing behaviour	Dr Andy Greer Andrew.Greer@lincoln.ac.nz
19.	RFID-based monitoring of feed intake	Dr Andy Greer Andrew.Greer@lincoln.ac.nz
20.	Souvenirs or heirlooms? Is the New Zealand biota Gondwanan, Zealandian or Australian?	Assoc Prof Adrian Paterson Adrian.Paterson@lincoln.ac.nz
21.	Tan Spot of wheat	Assoc Prof Eirian Jones Eirian.Jones@lincoln.ac.nz
22.	The effect on red meat quality of novel processing technology	Assoc Prof Jim Morton James.Morton@lincoln.ac.nz
23.	Trace metal contamination in urban waterways	Dr Niklas Lehto Niklas.Lehto@lincoln.ac.nz
24.	Using drone imagery to assess animal habitats	Assoc Prof Hannah Buckley Hannah.Buckley@lincoln.ac.nz
25.	Winter stand-off pads, impacts on animal welfare and nutrient losses	Dr Racheal Bryant Racheal.Bryant@lincoln.ac.nz

Details of each project available are as follows:

1. **Baiting for *Phytophthora* pathogens from waterways**

   Phytophthora species are major pathogens of a range of crops and native ecosystems worldwide. The genus *Phytophthora* belongs to the Kingdom Straminipila, and require water for their asexual cycle and to aid their dispersal. This project aims to investigate the recovery and distribution of *Phytophthora* species recovered from Canterbury water ways. *Phytophthora* strains will be isolated from water samples taken from rivers/streams from different land uses, ranging from native bush to cropping, horticulture and pasture farm land. Baiting and/or molecular community analysis (PCR-DGGE) will be used to determine the *Phytophthora* diversity in water samples. The project will provide information on potential native *Phytophthora* species, the diversity of native versus introduced *Phytophthora* species associated with different land uses and the potential pathways for spread of these pathogens.

   Supervisors: Assoc Prof Eirian Jones & Assoc Prof Hayley Ridgway
   Email: Eirian.Jones@lincoln.ac.nz

2. **Can drones be used to improve decision making for agricultural production?**

   Precision agriculture requires detailed knowledge of spatial and temporal variation in the farm ecosystem. Drones are a promising option for obtaining such information, but we need to be able to extract useful data from drone imagery that can be used in decision making for land management. Using the Altus DeltaLRX drone with high-resolution multispectral and thermal sensors that has recently been purchased by Lincoln University, this research project will address the extent to which we can use high-resolution imagery to measure relevant data on farms, such as fine-scale variation in pasture composition, fine-scale topographic variation, and the occurrence and spread of agricultural weeds, pests and diseases. Multiple projects are available and will be tailored to your interests. GIS and data analysis skills are not a necessary prerequisite, but your willingness to learn is essential.

   Supervisors: Assoc Prof Hannah Buckley, Dr Brad Case & Dr Stuart Charters
   Email: Hannah.Buckley@lincoln.ac.nz

3. Dry rot of forage brassicas

Dry rot of brassicas is an important disease of forage brassicas in New Zealand reducing crop yield and quality. Recent research in the group had identified the disease is caused by the pathogens *Leptosphaeria maculans* and *L. biglobosa*. However, information regarding the disease cycle and control strategies is limited. Some of the aspects that could be studied include investigating the disease cycle, structure of the New Zealand pathogen population, control strategies including fungicides and susceptibility of different cultivars.

Supervisor: Dr Eirian Jones

Email: Eirian.Jones@lincoln.ac.nz

4. Earthworm: Friend or foe in the battle against nutrient leaching

New Zealand has over 200 known species of earthworms with the majority of them being native and endemic. It is well known that earthworms have direct benefits to agriculture. Earthworms help to form healthy soils, their burrows improve the aeration and drainage in soils, and their movement transports nutrients to plant roots. They incorporate organic matter, leaves, sticks, stones and other material into the soil, and their casts are rich in essential nutrients for plants. One key contentious issue about earthworms is the improvement of aeration and drainage due to earthworm burrows can also generate preferential flow paths, which can fast tract nutrients and contaminants towards groundwater. Increasing earthworm populations in a soil to improve the chemical fertility and aeration in soils, might also increase the flow of water and nutrients through soils. This would in turn create more risk for nutrient losses in the systems. Earthworms are known to increase the macroporosity (large pores), however little is known if this pores are continuous and connected (governs the flow of water in soil). In addition, little is known about how soil management might alter channels created by earthworms. The main aim of this research is to determine, if earth worms channels generate preferential flow and increase the likelihood of nutrient leaching in our New Zealand soils.

Supervisors: Dr Henry Chau, Prof Nicholas Dickinson & Dr Wei Hu (PFR)

Email: Henry.Chau@lincoln.ac.nz

5. Ecology and behaviour of Banks Peninsula Tui

In 2009 and 2010, 72 tui were translocated from Maud Island in the Marlborough Sounds to Hinewai Reserve on Banks Peninsula. Sightings of released birds and their offspring are regularly reported from all over the Peninsula, particularly in the Akaroa area where many birds frequent sugar-water feeders. There are several options for projects focused on this population, including:

- Estimation of survival rates, age structure and population size based on re-sighting data
- Exploring the relationship between bellbirds and tui (distribution, abundance, interactions)
- Vocal diversity and temporal change in song patterns
- Social behaviour and feeder use

Some topics will require independent field work; this will generally consist of day trips to Banks Peninsula and the extent of field work required will depend on the topic. Undertaking a project with a field component requires good people skills, as the reintroduction and monitoring projects have strong community involvement and the birds are often found on private property. Some projects will also require the student to become proficient in specialised analysis techniques, such as use of MARK, GIS and/or sound analysis software.

Supervisor: Dr Laura Molles

Email: Laura.Molles@lincoln.ac.nz

6. Effect of summer grazing management on sward dynamics in autumn and winter

During feed surplus in late spring and summer dairy farmers adopt a range of grazing strategies to both ensure DM intake of their stock and high utilisation of pasture grown. Some of these strategies include adopting a high pasture cover to encourage more rapid regrowth of pastures and the use of mowing to ensure high quality of the regrowth. There is little information on the longer term impacts of high pasture cover and mowing on tiller dynamics and botanical composition of pastures in autumn and winter. The purpose of this study is to compare the effects of grazing management in spring and summer on sward dynamics in autumn and winter. The study will be conducted at the Lincoln University Research Dairy Farm

Supervisors: Dr Racheal Bryant & Dr Alastair Black

Email: Racheal.Bryant@lincoln.ac.nz

7. Effects of plantain on kidney function in sheep

Recently, New Zealand pastures have been diversified by the addition of various herb species such as plantain and chicory. This due to perceived benefits of more diversified pastures. Plantain has been added due to its high palatability and mineral content. However, due to other compounds found within plantain, there may be effects that have not been researched. One such effect is the claim that plantain acts as a diuretic. There is very little information about how plantain acts as a diuretic or how much of an effect it has on the animal. However, a diuretic may have implications for reducing the impact of stock urine on the environment. If it is shown to have an effect, a cultivar of plantain may be developed to increase urine output and thus reduce the concentration of urine nitrogen in sheep and cows. This may help to prevent leaching of nitrate into ground water. The proposed studies will be conducted in association with PGG Wrightson Seeds.

Supervisor: Associate Professor Graham Barrell

Email: Graham.Barrell@lincoln.ac.nz

8. Entomophagy: Insects as food for people – the New Zealand context

Insects have been a common feature of the human diet in many countries and cultures around the world since the evolution of the human species. However, in more recent history, insect-eating has become rare, even reviled, in most developed countries. As pointed out recently by the Food and Agriculture Organisation of the United Nations, this is a shame because insects provide an easy local supply of animal protein that is arguably much more environmentally sustainable than other forms of agriculture. Over the past few years, interest in this topic has been increasing around the developed world. New Zealand is an interesting case with cultural use of insects as food by Māori, and the popularity of "wild foods" festivals, contrasting with the perception more usual in developed countries that eating insects is revolting or disgusting in some way (despite the fact that most New Zealanders are happy to eat shrimps, prawns, crabs, lobsters, crayfish, etc., which are phylogenetically similar to insects). We are looking for an honours student who is interested in exploring this topic. Your research project might include assessing the nutritional qualities of a range of New Zealand insects, piloting methods for mass rearing of particular insect species, developing methods for processing insects into food products that are acceptable to consumers, or investigating the attitudes of New Zealanders to the concept of insects as food. This will be a highly interdisciplinary project involving a mix of

entomology, agriculture, food science, social science, and commerce, and would particularly suit a student interested in combining some or all of these different disciplines in creative ways to address the global challenge of feeding a growing population in a healthy and environmentally sustainable way.

Supervisors: Dr Rob Cruickshank & Professor Charles Brennan
Email: Robert.Cruickshank@lincoln.ac.nz

9. Establishment of plantain or Italian ryegrass into existing pastures

The use of forages plantain and Italian ryegrass have been suggested as promising options to reduce nitrate leaching either through improved utilisation of soil mineral N or through improved N partitioning in the animal. However, cost of establishment of new pastures containing these species can reduce adoption of this technology. Alternative methods of establishment, into existing pastures, which reduce costs will be investigated in this study. This study will be conducted at the Lincoln University Research Dairy Farm.

Supervisors: Dr Racheal Bryant & Dr Alastair Black
Email: Racheal.Bryant@lincoln.ac.nz

10. Flammability of New Zealand plants

Fire is one of the most pervasive and important disturbances worldwide. While less widespread and generally infrequent in New Zealand forest ecosystems, fires do occur, and are predicted to become more extensive and frequent due to global climate change.

To understand the ecological effects of fire it is important to determine the flammability of plant species; that is, their capacity to burn. Most studies of flammability have been conducted on small plant fragments in the laboratory limiting their relevance in determining the flammability of whole shoots. However, the recent development of a low-cost device for measuring shoot flammability in the field will allow for more consistent, widespread and rapid collection of such data.

There are two projects associated with this research: 1) Quantifying flammability and serotiny in lodgepole pine to test current theories of the role of fire in plant evolution; and 2) Traits associated with flammability in NZ plants.

1) Evolution of flammability and serotiny in lodgepole pine

Very recent research in other parts of the world has shown that fire has been a selective force on plants for over 120 million years. It has been suggested

that some species in fire-prone environments have evolved to be more flammable, as this causes damage or mortality to neighboring plants and opens up space for seedlings of the flammable species. However, it is yet to be confirmed that flammability traits are heritable. Another important fire-adaptive trait is serotiny, the storage of seed in the canopy until release after a fire. Serotiny has been shown to be correlated with flammability in *Banksia* and *Pinus*, but these studies have not quantified either trait. This project will quantify both flammability and serotiny in lodgepole pine (*Pinus contorta*) to test these current ideas on plant evolution. It will involve field work to collect samples and laboratory work to burn *Pinus* shoots and measure genetic variation in *Pinus* populations that have been planted or have naturalized around NZ.

2) Traits associated with flammability

Despite the fact that fire risk is expected to increase in NZ with global climate change there have been few attempts to quantify the flammability of NZ plant species. There have been some attempts to rank the flammability of New Zealand trees and shrubs based on questionnaire surveys of fire managers, but these results have yet to be confirmed by rigorous scientific testing. The first stage of this project will be to measure flammability on a range of NZ plants. This information will be of great utility to NZ fire management agencies.

While it is important to measure the flammability of as many species as possible to determine how vegetation may be affected by global climate change, it is unlikely that this is feasible in the short term to allow parameterization in dynamic global vegetation models. Consequently, alternative approaches are needed, such as determining which easily measured plant functional traits are correlated to flammability and using these 'easy' traits to model vegetation change. The second stage of this project will be to determine which morphological, physical and chemical traits of species are correlated with flammability. This project will involve extensive field work to collect samples, followed by laboratory work to measure flammability (by burning shoots) and other plant traits.

There is also scope within this project to calibrate the device for measuring shoot flammability with assessments of the flammability of larger plant parts, including tree branches or whole shrubs. Such experiments would be conducted in collaboration with the Fire Engineering Department at the University of Canterbury. *(In collaboration with Dr Adrian Paterson)*

Supervisor: Dr Tim Curran

Email: Timothy.Curran@lincoln.ac.nz

11. Long-term changes in Westland Petrel colonies

The Westland Petrel is a threatened seabird species that has colonies around Punakaiki on the West Coast. These birds have been monitored for the last 25 years. During this time there have been a number of environmental changes that have affected nesting and colony placement. We would work with Dr Susan Waugh (Te Papa) who has conducted this research. Potential projects would have access to three decades of research with the chance to do more as this species is a winter breeder. There are several topics that could be focussed on from colony changes over time, effect of environmental change on colony structure, role of nonbreeders at colonies to aspects of the diet of Westland Petrels. This is a great opportunity to doing meaningful research on a conservation issue with a very experienced researcher at an amazing field site.

Supervisor: Associate Professor Adrian Paterson
Email: Adrian.Paterson@lincoln.ac.nz

12. Managing soil fertility in Cd contaminated agricultural soils.

The New Zealand economy relies heavily on the primary production sector and the use of phosphate fertilisers to maintain yields. Cadmium (Cd) is a toxic trace metal that occurs naturally in the phosphate rock used to produce these fertilisers. Continued application of the fertilizer has resulted in an accumulation of Cd in NZ soils and there is increasing evidence to indicate that it is being taken up from the soils by plants and entering the food products. Occasional non-compliances with Cd food standards has already been noted in NZ for spinach, wheat and potatoes and for animal kidneys (saleable offal products). If Cd accumulation continues, there may be an emerging public health risk and the possibility of economic loss through non-tariff trade barriers and damage to NZ's image in overseas markets.

In this project, the student will participate in ongoing field trials and targeted greenhouse plant growth experiments looking at practical means of reducing the bioavailability of Cd in NZ agricultural soils. Through the use of lime and compost at different rates, we aim to achieve good agricultural production while limiting the bioavailability of this toxic trace metal. The student will gain knowledge and experience in overseeing and planning soil management practices for sustainable food production in a modern agricultural soil environment. This important and timely project will involve a combination of laboratory- and fieldwork and is best suited to an ambitious student, who

wishes to develop insight into elemental cycling in soils and skills in the laboratory and critical data analysis.

Supervisors: Dr Niklas Lehto & Associate Professor Brett Robinson
Email: Niklas.Lehto@lincoln.ac.nz

13. Measuring temporal change in sand dune ecosystems

Finding efficient ways to measure change in ecosystem function is a key goal for applied ecology. Drones can be used to obtain images of relatively large areas, reducing investment in costly field work. Using the Altus DeltaLRX drone with high-resolution multispectral and thermal sensors that has recently been purchased by Lincoln University, this research project will address how well we can use changes in drone imagery over time in dune ecosystems to assess changes in ecologically-important variables such as plant community composition, dune morphology, weed invasions and the effects of management interventions such as spraying and restoration planting. Multiple projects are available and will be tailored to your interests. GIS and data analysis skills are not a necessary prerequisite, but a willingness to learn is essential.

Supervisors: Assoc Prof Hannah Buckley, Dr Brad Case & Dr Stuart Charters
Email: Hannah.Buckley@lincoln.ac.nz

14. Novel methods of parasite control

Gastro-intestinal parasites cause a major constraint to animal production systems. Management of this disease has typically relied on targeting the population within the host animal with the use of anthelmintic compounds. However, alternative approaches for parasite control to compliment anthelmintic use are still required, including targeting the free-living stage of the parasite life cycle. Recently we have observed beneficial effects of the use of acid fertilisers to reduce parasite larval development. This project will continue to explore these effects with the aim of identifying the key active components in vitro and development of field-based methods to reduce parasite contamination.

Supervisor: Dr Andy Greer
Email: Andrew.Greer@lincoln.ac.nz

15. Pasture mixture formulation

Proprietary pasture seed mixes usually include two or more forage cultivars, but the reasons behind the number and balance of cultivars included in these seed mixes are often unclear. In this project the student will measure the dry

matter yield and metabolisable energy of a wide range of cultivars and their mixes in small plots at Lincoln University. The student will then use a modelling approach to disentangle the effects of cultivar type, richness and relative abundance on mixture performance, and formulate optimum seed mixes of the different cultivars.

Supervisor: Dr Alistair Black
Email: Alistair.Black@lincoln.ac.nz

16. Perennial lupin valuation

Perennial lupin is being evaluated as an alternative to common pasture legumes for extensive grasslands. In this project the student will compare the sheep live weight gain, dry matter production and water use of perennial lupin/cocksfoot and lucerne pastures in their fourth year after planting, under dryland conditions at Lincoln University. Emphasis will be placed on explaining differences in persistence between the two pasture types.

Supervisor: Dr Alistair Black
Email: Alistair.Black@lincoln.ac.nz

17. Reference model for body condition scoring

The aim of this project is to provide anatomically accurate models of the lumbar region of sheep to develop and evaluate its suitability as a training tool. Using a combination of 3D printing, production of silicon skin and muscle layers this project will develop life-like models of the lumbar region for varying body condition scores. Once developed, the use of the reference model as a training tool for body condition scoring in sheep will be evaluated.

Supervisor: Dr Andy Greer
Email: Andrew.Greer@lincoln.ac.nz

18. Remote sensing technology for grazing behaviour

Recent technological advances have led to the development of ear-tag sensors that can detect grazing behaviour, rumination time and activity of cattle. In addition to aiding fertility management of flocks and herds, this technology has the potential to assist with collection of data for farm management decisions regarding allocation and intake as well as identification of ill-thrift. However, to date the use of these tags has only been validated in cattle, whereas they have potential uses for other species of livestock as well. The aim of this project is to validate the ability of remote-sensing tags to accurately

detect the grazing behaviour of cattle and other species including sheep and deer and assess whether sub-clinical ill thrift symptoms could be detected.
Supervisors: Dr Andy Greer & Dr Racheal Bryant
Email: Andrew.Greer@lincoln.ac.nz

19. RFID-based monitoring of feed intake

Supplementation of sheep with nuts is increasing in popularity as sheep systems become more intensive. However, while mob mean nut consumption can easily be calculated, there are few measures of the individual variation of nut consumption. Radio-frequency identification (RFID) tags enable individual animal information to be collected effortlessly when combined with an appropriately placed reader and may be able to be utilised to determine the nut consumption on an individual animal basis. This project will involve a combination of controlled pen-studies where the time spent consuming the nut will be related to nut consumption leading to field-based studies where the reader is used in combination with nut feeders.
Supervisor: Dr Andy Greer
Email: Andrew.Greer@lincoln.ac.nz

20. Souvenirs or heirlooms? Is the New Zealand biota Gondwanan, Zealandian or Australian?

There has been a great deal of debate about the origin of the New Zealand biota. Great emphasis has been placed on the Gondwanan break-up and the Zealandia and Gondwanaland origin of New Zealand species. Such an origin would suggest lineages had been isolated for tens of millions of years in New Zealand. The late-Oligocene drowning (around 23 million years ago) removed most of the New Zealand land area as well as many New Zealand lineages. This event suggests that post-drowning dispersal from Australia may explain the presence of modern New Zealand lineages. Over the last decade at least 100 studies have been published that provide data on biological diversity. This project would gather together information from these studies in order to understand the impact of our Gondwanan and dispersal history. Meta-analyses of data from these studies will be allow us to better understand the factors that drive the biogeographical history of the New Zealand biota.
Supervisor: Associate Professor Adrian Paterson
Email: Adrian.Paterson@lincoln.ac.nz

21. Tan Spot of wheat

Tan spot is an emerging disease of wheat in New Zealand, with the pathogen *Pyrenophora tritici-repentis* being found to infect wheat throughout the wheat growing area in the South Island. However the New Zealand population of *P. tritici-repentis* is highly clonal, and lacks genetic diversity which is in contrast to tan spot populations overseas. Could New Zealand populations lack genetic diversity due to sexual reproduction only infrequently occuring? This project aims to address this question by determining the ability of New Zealand isolates to produce the sexual reproductive structures (pseudothecia) under laboratory conditions and within the field and whether viable sexual spores (ascospores) occur. There may also be potential to investigate the effectiveness of fungicides to inhibit spore germination of New Zealand isolates.

Supervisors: Assoc Prof Eirian Jones, Dr Seona Casonato & Dr Natalia Guazzone-Cripps

Email: Eirian.Jones@lincoln.ac.nz

22. The effect on red meat quality of novel processing technology

Tenderness is one of the most important eating qualities of red meat and a major determinant of price. There has been a continual interest in using new technologies to improve the tenderness of low value cuts of meat. Some of these techniques operate by mechanically breaking up the structure of the meat and other by enhancing the natural tenderizing effect of the endogenous proteolytic enzymes. These two approaches can lead to different effects on the meat quality including texture, colour and stability.

This project will explore the effect of novel technology on the enzymes involved in meat quality particularly the calpains and the key enzymes in glycolysis. This will involve a variety of protein techniques including zymography and Western blotting and possibly mass spectrometry or electron microscopy. There will also be a meat quality component which will include tenderness and colour determination and may lead to sensory analysis.

Supervisors: Associate Professor Jim Morton and Dr Hannah Lee

Email: James.Morton@lincoln.ac.nz

23. Trace metal contamination in urban waterways

The Avon/Ötakaro and Heathcote/Opawaho Rivers run through heavily urbanised parts of Christchurch city and receive drainage from many different sources, including heavily industrialized areas. This water can contain a variety

of different contaminants including heavy metals, nutrients and newly emerging contaminants, such as Rare Earth Elements (REEs). The two rivers discharge into Avon-Heathcote Estuary/Ihutai and this is the receiving environment for many of these contaminants.

Trace metals, such as Cd, Pb, Zn, Cu, Cr, As and REEs can travel in the water column as a variety of different dissolved or solid species (e.g. adsorbed onto inorganic colloids in suspended sediment). The means by which these contaminants move in the waterways is critical for being able develop mitigation measures for dealing with them, but detailed information on the spatial and temporal drivers of this partitioning behaviour is sorely lacking

In this project, the student will work within an existing scheme of research carrying out analyses on the main urban waterways in Christchurch and in the laboratory at Lincoln University. They will develop expertise in sample collection and analytical techniques for characterising the behaviour of target contaminants in this environment. The project is particularly suited to students who wish to gain experience in working with water resources.

Supervisors: Dr Niklas Lehto & Associate Professor Brett Robinson
Email: Niklas.Lehto@lincoln.ac.nz

24. Using drone imagery to assess animal habitats

Drone imagery has proven useful in characterising animal habitats across a wide range of spatial scales. Using the Altus DeltaLRX drone with high-resolution multispectral and thermal sensors that has recently been purchased by Lincoln University, this project is a collaboration with the Department of Conservation to test the use of fine-scale drone imagery in distinguishing variation New Zealand forest habitats that is important for birds, such as the orange-fronted parakeet (*Cyanoramphus malherbi*). Results from this research will be used to aid the conservation management of New Zealand forest birds. Multiple projects are available and will be tailored to your interests. GIS and data analysis skills are not a necessary prerequisite, but a willingness to learn is essential.

Supervisors: Assoc Prof Hannah Buckley, Dr Brad Case & Dr Stuart Charters
Email: Hannah.Buckley@lincoln.ac.nz

25. Winter stand-off pads, impacts on animal welfare and nutrient losses

In Canterbury risk of nitrate leaching from dairy production systems is highest during the winter period. As urination is a key driver of N loading onto soils, stand-off pads are being used to mitigate N losses by removing cows from paddocks and capturing nutrients. While the foreseeable environmental advantages show huge benefits the economic and sociological perspective must also be considered. As such, different bedding materials which range in cost will be compared and their impacts on animal welfare will be quantified. Urine behaviour and urinary N excretion will be determined using sensors to ascertain the impact of stand-off pads on urinary N loss in the winter farm system. This study will be conducted at Ashley Dene.

Supervisors: Dr Racheal Bryant & Dr Omar Al Marashdeh

Email: Racheal.Bryant@lincoln.ac.nz