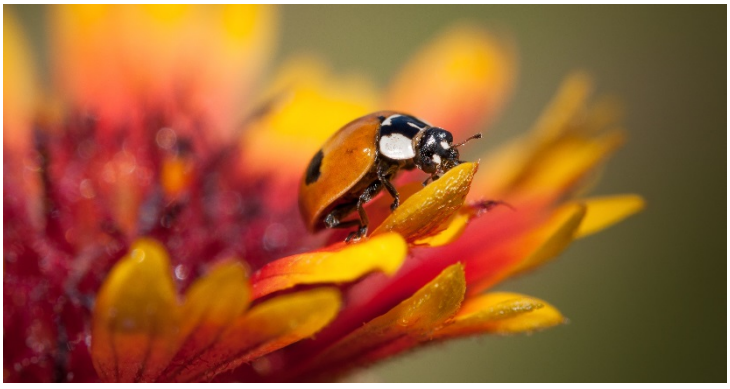
Faculty of Agriculture and Life Sciences

Honours Projects 2017/2018



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.	Beef finishing systems using fodder beet	Dr Jim Gibbs Jim.Gibbs@lincoln.ac.nz
3.	Comparing farm systems –diverse pastures versus N fertiliser rate	Prof Pablo Gregorini Pablo.Gregorini@lincoln.ac.nz
4.	Dairy wintering systems and feed efficiency	Prof Pablo Gregorini Pablo.Gregorini@lincoln.ac.nz
5.	Do roadside and riverine habitats provide for native invertebrates in the MacKenzie Basin?	Assoc Prof Adrian Paterson Adrian.Paterson@lincoln.ac.nz
6.	Dry rot of forage brassicas	Assoc Prof Eirian Jones Eirian.Jones@lincoln.ac.nz
7	Earthworm: Friend or foe in the battle against nutrient leaching	Dr Henry Chau Henry.Chau@lincoln.ac.nz
8.	Effects of plantain on kidney function in sheep	Assoc Prof Graham Barrell Graham.Barrell@lincoln.ac.nz
9.	Electro-spinning nanofibers for ocular drug delivery	Assoc Prof Craig Bunt Craig.Bunt@lincoln.ac.nz
10.	Establishment of plantain into existing pastures	Dr Racheal Bryant Racheal.Bryant@lincoln.ac.nz
11.	Fodder beet Agronomy	Dr Jim Gibbs Jim.Gibbs@lincoln.ac.nz
12.	Novel methods of parasite control	Dr Andy Greer Andrew.Greer@lincoln.ac.nz
13.	Protecting New Zealand from new pests with a biosecurity network and app	Dr Jon Sullivan Jon.Sullivan@lincoln.ac.nz

No.	Project Title	Supervisor and email
14.	Reference model for body condition scoring	Dr Andy Greer Andrew.Greer@lincoln.ac.nz
15.	Remote sensing technology for grazing behaviour	Dr Andy Greer Andrew.Greer@lincoln.ac.nz
16.	RFID-based monitoring of feed intake	Dr Andy Greer Andrew.Greer@lincoln.ac.nz
17.	Social behaviour amongst dairy cows – influence of shelter on bullying behaviour	Dr Racheal Bryant Racheal.Bryant@lincoln.ac.nz
12.	Tan Spot of wheat	Assoc Prof Eirian Jones Eirian.Jones@lincoln.ac.nz
19.	Was a predator proof fence bad for Riccarton Bush insects?	Dr Jon Sullivan Jon.Sullivan@lincoln.ac.nz
20.	Why were the Christchurch earthquakes good for southern blue butterflies?	Dr Jon Sullivan Jon.Sullivan@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: Associate Professor Eirian Jones & Dr Seona Casonato

   Email: Eirian.Jones@lincoln.ac.nz

2. **Beef Finishing Systems using Fodder Beet.**

   A growing international market for younger, forage finished beef has fuelled the use of fodder beet grazing systems in NZ. A novel finding of existing research in these systems has been protein nutrition efficiency, and this honours project will explore an area of rumen function in beet fed steers responsible for this efficiency.

   Supervisor: Dr Jim Gibbs

   Email: Jim.Gibbs@lincoln.ac.nz

3. **Comparing farm systems –diverse pastures versus N fertiliser rate**

   There is a need to reduce nitrate leaching from our farm practises and recent research has shown promise in the use of diverse pastures containing chicory and plantain. Diverse pastures have demonstrated similar or better DM yields and similar or better milk production. Previous results are short term studies, this project will compare agronomic and milk yield results from farmlets at Ashley dene. A farmlet that consists of diverse pastures will be compared with farmlets that consist of conventional ryegrass and clover pastures. However, the control farmlets will be operated as either high (300 kg N/ha/y) or low (150 kg N/ha/yr) N farmlets. This study will be a farm systems study which uses

real data and modelling to compare farm types.
Supervisors: Professor Pablo Gregorini and Dr Racheal Bryant
Email: Pablo.Gregorini@lincoln.ac.nz

4. Dairy wintering systems and feed efficiency

In many seasonal supply dairy farm systems, cows are wintered away from the milking platform and fed high yielding, good quality crops. During this time, cows require nutrients for maintenance, pregnancy and liveweight gain. Both the feeding regime and physiological state of the animal can influence how efficiently feeds are utilised for maintenance and production. In this study, winter feeding regimes will be compared to determine the effects on feed utilisation. The research will take place at the Ashley Dene Research and Development Station between June and August and will incorporate aspects of nutrition and dairy farm systems.
Supervisors: Professor Pablo Gregorini and Dr Racheal Bryant
Email: Pablo.Gregorini@lincoln.ac.nz

5. Do roadside and riverine habitats provide corridors for native invertebrates in the MacKenzie Basin?

The Mackenzie Basin is witnessing significant land surface modification through irrigation and dairy conversion. The number and scope of applications to irrigate and cultivate land filed with the Mackenzie District council is increasing. The Department of Conservation often presents ecological evidence during hearings for land modification in the basin. There is a lack empirical data on both the minimum area and composition of habitat necessary for representative native invertebrates to survive in an increasingly fragmented and contrasting ecosystem. This project would examine the extent to which semi-modified roadside and river margin habitats are (or are not) sufficient to provide corridors of ecological connectivity throughout the basin, including areas of intensified dairying. The study would need to establish repeated measures at ecologically depauperate sites adjacent to areas of cultivation and irrigation as well as ecologically intact areas
Supervisors: Associate Professor Adrian Paterson and Mike Bowie
Email: Adrian.Paterson@lincoln.ac.nz

6. 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: Associate Professor Eirian Jones
Email: Eirian.Jones@lincoln.ac.nz

7. 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, Professor Nicholas Dickinson & Dr Wei Hu (PFR)
Email: Henry.Chau@lincoln.ac.nz

8. 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

9. Electro-spinning nanofibers for ocular drug delivery

The anatomy of the eye presents significant challenges for drug delivery to the lens; high removal and low dose volume can often only be addressed by the use of multiple administration of eye drops. Dosage forms that increase residence time on the eye following administration might help to improve drug delivery and reduce the frequency of eye drop applications. Adhesion to the mucous layer of the lens is one approach to reducing dose removal and increasing dose administered. Biocompatible mucoadhesive nanofibers containing either a sparingly soluble drub (dexamethasone) or soluble drug (pilocarpine hydrochloride) will be prepared by electro-spinning. The nanofibers will be characterised; drug loading, drug release, scanning light and electron microscopy, tensile properties and mucoadhesion.

The project will provide an introduction to formulation science, ocular drug delivery, and pharmaceutical dosage form characterisation.

Supervisor: Associate Professor Craig Bunt
Email: Craig.Bunt@lincoln.ac.nz

10. Establishment of plantain into existing pastures

The use of plantain has been suggested 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 is an agronomy study conducted at the Lincoln University Research Dairy Farm.

Supervisors: Dr Racheal Bryant
Email: Racheal.Bryant@lincoln.ac.nz

11. Fodder beet Agronomy

Grazing fodder beet has removed the requirement for a planting pattern suitable for mechanical harvesting. Alternative planting patterns may affect grazing palatability and nutrient use efficiency. This honours project will explore the variation in beet plant nutrient storage with different planting patterns.

Supervisor: Dr Jim Gibbs

Email: Jim.Gibbs@lincoln.ac.nz

12. 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

13. Protecting New Zealand from new pests with a biosecurity network and app

One of the most effective way of protecting New Zealand from new pests is to detect incursions early and eradicate. Early detection requires effective monitoring, and the Ministry for Primary Industries' Biosecurity 2025 strategy has the aspirational target of building a biosecurity team of 4.7 million. Throughout 2018, as part of a Bioheritage National Science Challenge project in collaboration with Scion, MPI, and regional councils, we will be trialling a new biosecurity network and biosecurity reporting app for reporting new incursions to New Zealand. This network will be focused first on selected primary industries and weed control groups throughout NZ. There is an opportunity for a student interested in biosecurity science and/or social science to run an honours project alongside this work to better assess the effectiveness and potential for a distributed network of observers throughout the country to detect new pests

Supervisor: Dr Jon Sullivan

Email: Jon.Sullivan@lincoln.ac.nz

14. 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

15. 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

16. 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

17. Social behaviour amongst dairy cows – influence of shelter on bullying behaviour

Managing animal welfare of livestock includes minimising stress and maximising comfort. Livestock such as dairy cows have a strong hierarchy which is reinforced through interaction between members of the herd. Cows can become competitive and aggressive for resources such as feed, water, space and shelter and this increases stress on cows from the top to the bottom of the hierarchy. Providing shelter is regarded as means of improving cow welfare, but there may be other variables we have not considered. This project will investigate novel ways of using shelter to influence social behaviour of cows in autumn. This is an animal study conducted at the Lincoln University Research Dairy Farm

Supervisors: Dr Racheal Bryant and Professor Pablo Gregorini
Email: Racheal.Bryant@lincoln.ac.nz

18. 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 occurring? 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: Associate Professor Eirian Jones, Dr Seona Casonato & Dr Natalia Guazzone-Cripps
Email: Eirian.Jones@lincoln.ac.nz

19. Was a predator proof fence bad for Riccarton Bush insects?

Predator proof fences are an increasingly popular and high profile method for excluding mammalian pests from small areas of conservation land. Native birds certainly benefit. In 2004, a fence was completed around Riccarton Bush, the old growth kahikatea forest in the heart of Christchurch. In 2013, Lincoln University M.Sc. student Denise Ford repeated a 2003 survey of moths,

beetles, and fungus gnats in Riccarton Bush and surrounding garden and restoration sites. What we expected to find was an increase in insect diversity and abundance in the bush due to the removal of rodents, hedgehogs, and possums. We expected to see a most pronounced increase in the largest species, most vulnerable to predation, and the poorest dispersing and most specialist species that remain restricted to Riccarton Bush. In her thesis, Denise had a detailed look at the moths. To our surprise, we found the reverse trends. Overall, there was a significant decline in moth diversity in the bush but not in the surrounding garden and restoration sites. The largest and least well-dispersing species declined the most. We need to repeat this survey to assess whether 2013 was an unusual year or whether there has been a decline in Riccarton Bush insects since the predator proof fence. Numbers of insectivorous birds like blackbirds and thrushes have increased substantially since the fence and may well be a bigger problem for native insects that the mammals were. This honours project would suit a student interested in building their skills in conservation and entomology.

Supervisor: Dr Jon Sullivan
Email: Jon.Sullivan@lincoln.ac.nz

20. Why were the Christchurch earthquakes good for southern blue butterflies?

The devastating earthquakes of 2010 and 2011 led to the clearance of houses from a large area of eastern Christchurch. Our second year Field Ecology Methods class (ECOL293) surveyed the biodiversity of that area in 2016 and again in 2017, comparing it to intact suburban Christchurch. To our surprise, we found that the endemic southern blue butterfly, usually rare to absent from urban Christchurch, was abundant in some of the areas cleared of houses. On average its abundance was 20–30 times higher in the residential red zone areas with removed houses compared with the rest of the city. We would like to know why. One simple possibility is that the reduced frequency of lawn mowing in the residential red zone was enough to allow caterpillars to complete development on clovers, one of their host plants. If that was the case, reducing mowing frequency in parts of the city would be all that is required to bring this endemic butterfly back into the city permanently. It may not be that simple. This would be an useful honours project for someone interested in building their skills and reputation in urban ecology, entomology, and in the management of indigenous biodiversity in urban and rural habitats.

Supervisor: Dr Jon Sullivan
Email: Jon.Sullivan@lincoln.ac.nz