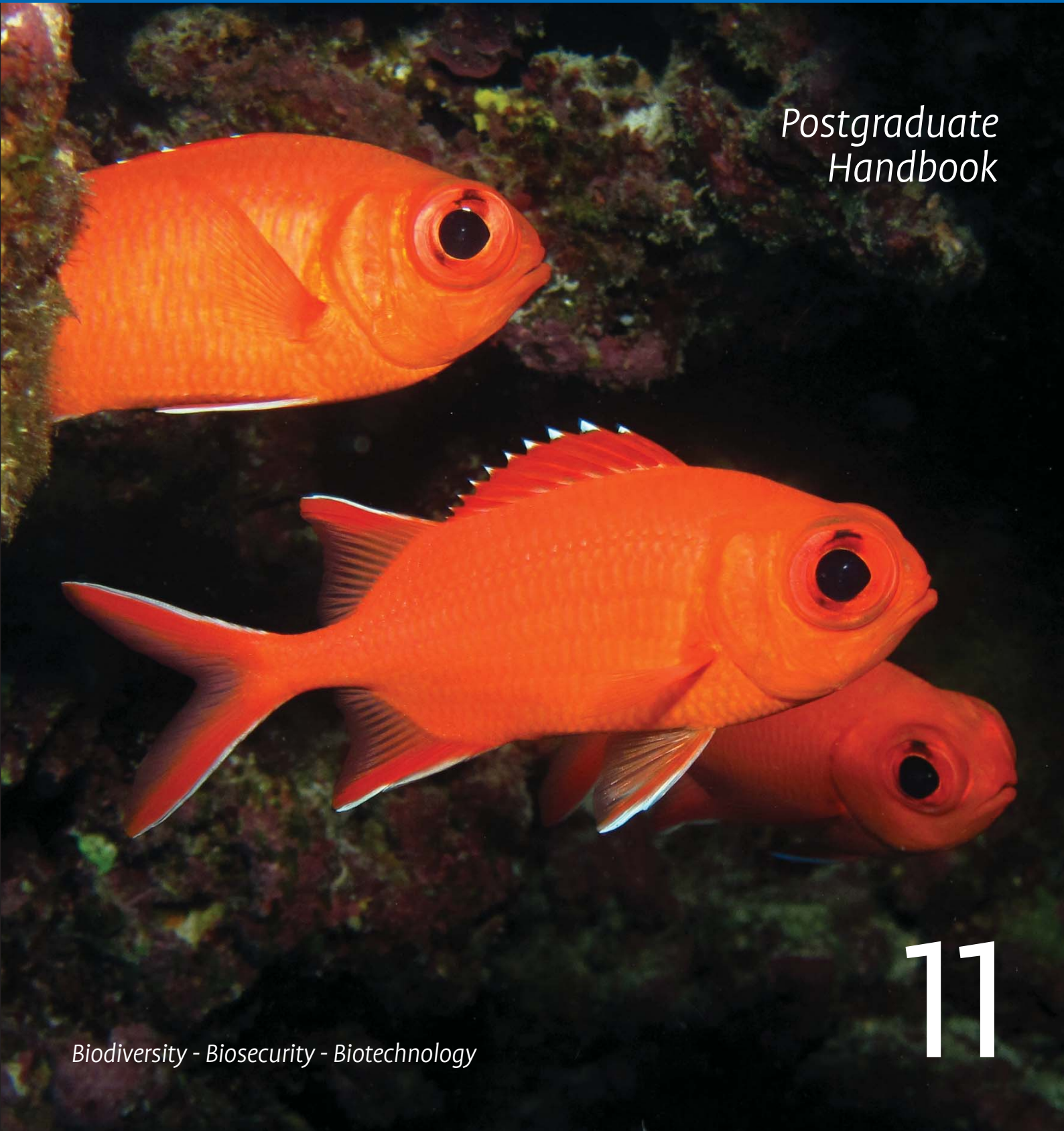


Biological Sciences

Postgraduate
Handbook



Welcome



Welcome to Biology at UC.

Biology literally means the study of living things. Biologists study animals, plants and microbes in many different ways and at various scales from biological molecules and cells to individual organisms, populations, and even ecosystems.

Our courses will help prepare you for a career in biology, be it in biodiversity, biosecurity or biotechnology. You will find our courses exciting, challenging, and up-to-the minute as our lecturers are all actively engaged in research in some aspect of the Biological Sciences.

It has been suggested that the 21st Century will belong to the biologist. We have incredibly powerful tools available now to us - from the laboratory tools of the molecular biologist to the computer tools employed by those engaged in modelling the processes occurring in ecosystems.

This handbook is provided to help you plan a course of study in Biology. If you have further questions please contact us.

Professor Paula Jameson
Head of School

Cover Image:

Whitetip Soldierfish (Myripristis vittata) are common reef fish in Tonga where sea mount reef ecology and coastal fisheries are being studied by marine ecologist Dr Sharyn Goldstien. This research underpins teaching in marine ecology and conservation biology. For information on postgraduate study options in this area contact Dr Goldstien directly (see page 12) or our Postgraduate Coordinators (page 18).

Disclaimer

While every effort has been taken to ensure the information contained in this Biological Sciences Handbook is accurate and up-to-date, the contents are periodically subject to change and review. The University of Canterbury makes no guarantees as to the accuracy of the information contained in this publication.

For formal course regulations and prescriptions, please see the University of Canterbury Calendar.

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Biology at UC

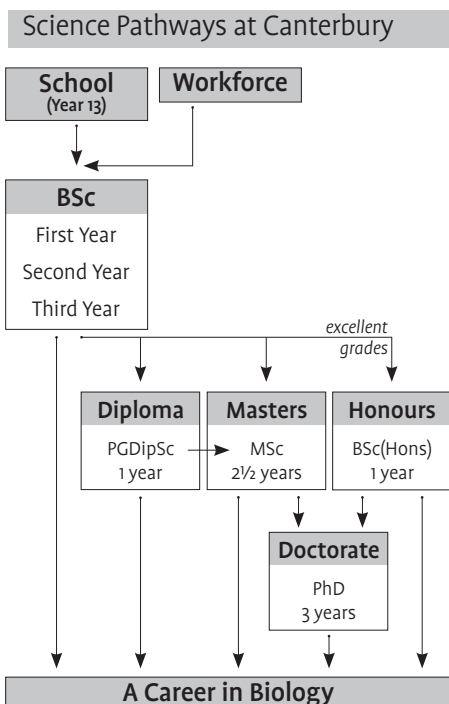
The University of Canterbury is a major centre for biological research in New Zealand.

Staff and research students in the School are engaged in research in three areas of biology that are vital to humankind:

- **Biodiversity** – defining, sustaining and rehabilitating the diversity of life contained in New Zealand's natural and managed ecosystems.
- **Biosecurity/Biosafety** – protecting our native biota from threats imposed by invasive organisms; understanding the potential impacts of genetic technologies on our environment
- **Biotechnology** – the application of biological understanding to provide products that benefit society and support sustainable economic development.

Biology is taught by the School of Biological Sciences. We offer 22 postgraduate courses in biology and biochemistry. They are taught by academic staff who have expertise in diverse areas of biology ranging from genetics, biochemistry and molecular biology to ecology, conservation biology and biotechnology. Biology courses also support multidisciplinary studies such as Health Studies, Environmental Science, Biosecurity, Conservation Biology and Management and Antarctic Studies – Biology at UC offers something for everyone!

The diagram below shows the different paths that may be followed to complete undergraduate and postgraduate studies in biology.



Work is primarily undertaken within the School of Biological Sciences, although there are opportunities for collaboration with other departments (e.g. Geography, Forestry, Chemistry, Mass Communication and Journalism) and with external agencies such as the nine Crown Research Institutions such as Plant and Food Research; Landcare Research; Institute of Environmental Science Research (ESR). Good links are also held with other research institutes such as the Christchurch School of Medicine, Fonterra and Cawthron Institute.

New Zealand provides special opportunities to study biodiversity and biology of plants and animals that are found nowhere else in the world. It still retains part of its environment in a relatively undisturbed condition.

From the Biosecurity aspect New Zealand is an important place for the study of invasions by foreign plants and animals into native ecosystems and a wide range of other pure and applied environmental studies.

With modern equipment including confocal and electron microscopy, DNA sequencing and mass spectroscopy we are well positioned for biotechnology research.

The linkage of field work back to labs is an integral part of the Canterbury experience at postgraduate level. Field-focused students benefit from advanced lab techniques; lab-focused students have a real world context for their work. To achieve this, teaching and research programmes embrace novel combinations of new technologies and more traditional disciplinary approaches. In this way student experiences of unique New Zealand environments bounce back to the latest developments in lab-based technologies.

Local field sites are often spectacular and the university operates five field stations around the South Island, including Kaikoura and Cass. Other recent research sites have included Lake Ohau (Central Otago), Nelson Lakes National Park, Franz Joseph glacier, Fiordland and Little Barrier Island.

The University is located within New Zealand, but this does not restrict you to conducting research locally. Recent international research by our staff and students has been undertaken as far afield as Iceland, Tonga, Panama, Kenya, The Chatham Islands, Antarctica and Nigeria to name a few.

Local Students

The University of Canterbury awards a number of postgraduate scholarships and prizes each year in order to help postgraduates conduct MSc or PhD research. A copy of these awards can be obtained from the Scholarships Office, Registry, or on-line from: www.canterbury.ac.nz/scholarships/

Note that the closing date is mid October. Financial support for MSc and PhD students can sometimes be obtained from sources outside the University, e.g. in a research contract with a government agency. You can discuss this possibility with your supervisor or the Head of School.

International Students

If you are an overseas student interested in undertaking a postgraduate degree in biological sciences at the University of Canterbury, you should write initially to the international office (email: international@canterbury.ac.nz). They will need to know your past academic record, and the names and addresses of at least two scientists or university teachers who can provide information about your suitability for postgraduate research. A sound knowledge of written and spoken English is essential. The International Office provides details about enrolment and the University, you can contact them on-line at: www.canterbury.ac.nz/international.shtml

For overseas students there are a number of scholarships and grants available (such as Commonwealth Scholarships). Information about them is available from the Scholarships Office, University of Canterbury, from the above website or from your own University. Canterbury Doctoral and Masters Scholarships are open to overseas students, but cover tuition fees only at the New Zealand student rate. All PhD students pay tuition fees at the NZ rate.

Laboratory Demonstrating

MSc and PhD students are strongly encouraged to demonstrate and instruct in laboratory classes for which they receive payment (rates determined yearly).

Graduate Profiles

Our postgraduate program is designed to build upon your basic undergraduate training and to give you recognisable practical skills in research science. Our graduates gain diverse jobs all over the world, from remote villages to capital cities. A degree from Canterbury is seen by the world as a quality degree and opens many doors.... where will you go?



Jane Allison
BSc(Hons)
PhD, BioPhysics

On the basis of excellent Bursary marks, Jane was granted direct entry into second year science at Canterbury. A summer scholarship stimulated her interest in protein biochemistry, culminating in a first class Honours degree in Biochemistry. She was subsequently awarded a Woolf Fisher scholarship, allowing her to study towards a PhD at Cambridge University. Between honours and studying at Cambridge, Jane worked as a research assistant at Canterbury, in the areas of protein biochemistry and fire ecology. For her PhD research, Jane took a 'systems biology' approach to biochemistry. This involved applying hypotheses that were previously restricted to ecology, such as self-organisation, thereby providing a fresh perspective to biochemistry. Specifically, she focused on protein folding, an area that has both medical and theoretical implications, as she believes that ideas of self-organisation may be the key to understanding this elusive process. Jane is now undertaking a Post Doc in Zurich, Switzerland in computer-aided chemistry.

Jason Aaron
BSc, PGDipSc
Science Teacher

After completing a Bachelor of Science in Biology with interests in the areas of animal behaviour, marine ecology and terrestrial ecology, Jason spent a year studying towards a Post Graduate Diploma in Environmental Science. He then attended UC's College of Education where he gained a Graduate Diploma in Teaching and Learning. Jason is currently working in a full time position at Rangiora High School where he teaches junior Science and senior Biology. Jason retains close ties with the University by co-organising and running a 3 day field course for Year 13 students at the Edward Percival Field Station in Kaikoura.



Sarah Coxon
BSc(Hons)
PhD Student

Having had an interest in all things marine since a young age, it wasn't a hard decision to study a BSc at Canterbury majoring in Biological Sciences. I soon developed a keen interest in physiology, so after completing my undergraduate degree in 2007, I entered the Honours programme, with research focussing on respiratory physiology in hagfish. After being awarded the Brownlee Scholarship, I started my PhD majoring in Zoology. My research involves investigating the effects of exercise on the physiology of fish (mostly snapper), including swimming performance, cardiorespiratory physiology, metabolism and blood and muscle biochemistry. In particular, we are looking at this work in the context of trawling fisheries, to understand how the stress and exercise experienced by fish during trawling affects the quality of fish flesh.



Matt Galbraith
PhD
Research Scientist

Matt completed a double major in Biochemistry + Cellular and Molecular Biology in 1999. After a summer studentship in the genetics's lab he began full-time research towards a PhD in 2001 studying the functions of newly identified genes for the biosynthesis of an antibiotic. After graduating with a PhD he worked in the Molecular Microbiology group at what was then Crop & Food Research before heading to the UK at the end of 2005.

In the UK he worked briefly for the National Blood Service and the Institute of Cancer Research before joining the School of Biomedical Sciences at the University of Nottingham for a 3 year Postdoctoral Fellowship. This was a move away from bacterial genetics/ molecular microbiology into eukaryotic/human transcription regulation and cellular signalling. Matt is now at the University of Colorado at Boulder in the USA continuing aspects of this work.



Postgraduate Degrees

Postgraduate degrees taken by students include a Bachelor of Science (Honours), a Postgraduate Diploma, a Master of Science, or a Doctor of Philosophy.

Any student who wishes to enrol for a research degree should contact an academic staff member of the School for further information and advice. Also visit our website (www.biol.canterbury.ac.nz).

A *Postgraduate Prospectus* is also available from the University website, www.canterbury.ac.nz

Bachelor of Science (Hons)

The BSc(Hons) is a one-year programme designed for very able students with a B+ average in 200- and 300- level biology and science courses. To enrol in Honours you need to be eligible to graduate with a BSc (360 points) and have the required pre-requisites for your chosen subject major.

Students take four 400-level seminar papers and undertake a research project. For more information on the pre-requisites required please refer to the *University Calendar* or contact the Student Advisor, College of Science.

Postgraduate Diploma of Science

The Postgraduate Diploma of Science is a one-year course equivalent to the first year of a Master of Science degree. Students take four seminar papers at 400-level, but they do not carry out research. Students can begin a PGDipSc if they have achieved a B- average for 300-level biology and science courses.

Students enrolled in a PGDipSc degree may transfer into part II of an MSc providing they achieve a B average or better in their four papers and have submitted a research proposal.

Master of Science

A Master of Science degree is a two and a half year course. During the first year (Part I), students take four specialised seminar papers (just as for BSc (Hons) and PGDipSc) and they also develop a research project proposal. During the following 16 months (Part II), students carry out the research project which they write up as a thesis. Students can begin Part I of an MSc degree after a BSc if they have achieved a B average in 200- and 300-level biology and science courses. They can continue to

Part II providing a B average is obtained in Part I.

Part-time study because of employment, family, health or other reasons may be possible but is not automatic, you need to apply.

Where students have performed with excellence, and provided certain standards have been met, including completion within a set time limit, masters's degrees can be awarded with either honours or distinction.

Students who are making excellent progress on their research can apply to transfer to a PhD.

Doctor of Philosophy

A PhD is a research degree that typically requires three, but no more than four years of study.

Students may begin a PhD if they have achieved at least second class honours division 1 for a BSc (Hons) or MSc.

A PhD involves extensive, sustained and original research and study on a subject of your choice, with the results being presented in a thesis. Your work will contribute to intellectual knowledge in your field. It is the highest academic qualification available and is a mark of intellectual ability, self-discipline and commitment. A PhD prepares you for an academic career in your chosen subject.

Part-time candidates must normally complete their thesis within seven years.

For more information on studying towards a PhD at the University of Canterbury including application forms go to www.canterbury.ac.nz/courses/grad_postgrad/phd.shtml

Undergraduate Stream	Postgraduate Major
Animal Behaviour	Ecology or Zoology or Evolutionary Biology*
Animal Physiology	Zoology
Any Science Background	Environmental Science
Biochemistry	Biochemistry
Biotechnology	Biotechnology or Cellular & Molecular Biology or Microbiology
Biosecurity	Plant Biology or Ecology or Zoology or Evolutionary Biology*
Cell Biology	Cellular & Molecular Biology or Microbiology
Ecology	Ecology
Environmental Science	Environmental Science
Evolutionary Biology	Plant Biology or Ecology or Zoology or Evolutionary Biology*
Genetics	Cellular & Molecular Biology or Evolutionary Biology* or Zoology
Microbiology	Microbiology
Plant Biology	Biotechnology or Plant Biology

* subject to NZVCC CUAP approval due December 2010

Subject Majors

Postgraduate study (BSc (Hons), PGDipSc, MSc, PhD) in Biological Sciences is organised into a number of subject majors and you should identify with one of these when you enrol (though discuss this with the Fourth-Year Coordinator before you finalise things). If you are studying for a BSc (Hons), PGDipSc or MSc you will need to take **four papers** in your first year. Some majors are quite liberal in what you are allowed to take, while others have distinct requirements and these are listed below. Prerequisites (**P**) are also shown. Details of the actual papers are given later in this handbook. Whatever papers you do decide on, you should discuss your choice with the Head of School or Fourth Year Coordinator to ensure that you have an appropriate combination.

Biochemistry

There is no separate Biochemistry Department at Canterbury. However, there is a full programme of biochemistry, integrated into the Department of Chemistry and the School of Biological Sciences.

Students taking postgraduate papers need to include at least 0.75 EFTS from:

BCHM 401, 403, 405, 406, 410, 411, 412

BIOL 430, 434, 435, 436

CHEM 402, 405, 408, 411, 412

P: 90 points in 300-level courses: 75 points from BCHM 301 (BIOL 331), BCHM 302 (CHEM 325) and BCHM 381; and additional points from CHEM 321, CHEM 322, CHEM 324, CHEM 362, CHEM 381, BIOL 313, BIOL 330, BIOL 351 or BIOL 352.

Biotechnology

This is an applied subject major encompassing work on plants and their uses in biotechnology.

Students taking postgraduate papers must take the compulsory paper BIOL 491 (Plant Biotechnology) plus at least two others selected from BIOL 430–435, BIOL 453, BIOL 492, BIOL 493. The fourth course should be selected with the approval of the School of Biological Sciences Fourth Year Coordinator.

P: (1) BIOL 252 or BIOL254 and BIOL255; and
(2) BIOL 352; and
(3) one course selected from BIOL 313, BIOL 330, BIOL 331.

Note: students are normally expected to have taken BIOL 309

Cellular and Molecular Biology

Cellular and Molecular Biology and Genetics are strongly represented in Biological Sciences at Canterbury. This area overlaps with other majors

such as Biochemistry, Microbiology, Physiology, and increasingly, Ecology and Environmental Science.

Students taking postgraduate papers need to include at least three of BIOL 430 - 436, BIOL 491, BIOL 493. The fourth course should be selected with the approval of the School of Biological Sciences Fourth Year Coordinator.

P: Three courses from BCHM 301, BIOL 313, BIOL 330, BIOL 331, BIOL 351, BIOL 352.

Note: students are normally expected to have taken BIOL 309

Ecology

Our Ecology major is designed for students wishing to focus on any combination of ecology, behaviour or evolutionary biology with an emphasis on field research.

Students taking postgraduate papers need to select them, with the approval of the School of Biological Sciences Fourth Year Coordinator, from BIOL 421, BIOL 453, BIOL 470–479, BIOL 490, ENVR 410 - 411, FORE 616.

P: (1) 60 points from BIOL 370 - 379; and
(2) BIOL 309 or BIOL 301 or equivalent (e.g. GEOG 309 or PSYC 206).

Environmental Science

Environmental Science is a multidisciplinary major encompassing many departments across the campus. Its aim is to equip students with an understanding of environmental science, its application and its use as a management tool. Students taking postgraduate papers must take the compulsory papers ENVR 410 & 411, plus three other papers selected, with the approval of the Coordinator of Environmental Sciences (Assoc Prof Islay Marsden), from a wide range of topics within the Faculties of Science and Engineering.

P: 90 points in appropriate 300-level courses in Science, Engineering and Forestry approved by the Environmental Sciences Coordinator

Evolutionary Biology*

This is a broad major designed for students wishing to focus on any aspect of evolutionary biology, including (but not limited to) molecular evolution, evolutionary or population genetics, phylogenetics, behaviour, microbial evolution, and evolutionary ecology. Students taking postgraduate papers must select four courses, including at least two of BIOL 421, BIOL 430, BIOL 431, BIOL 470, BIOL 478. The remaining courses should be selected with the approval of the School of Biological Sciences Fourth Year Coordinator.

P: (1) BIOL 271; and
(2) 60 points from 300-level BIOL courses including at least one of BIOL330, BIOL332, BIOL371, BIOL373; and
(3) BIOL 309 or equivalent (e.g. GEOG 309 or PSYC 206).

* Subject to NZVCC CUAP approval due December 2010

Microbiology

This is a broad subject, covering research into prokaryote organisms, but also including those eukaryotes regarded as “microbes”, particularly the fungi. Research spans from core genetics to ecological microbiology.

Students taking postgraduate papers need to include BIOL 492 and BIOL 493 plus a further two courses selected with the approval of the School of Biological Sciences Fourth Year Coordinator.

P: (1) BIOL 313; and
(2) one course selected from BIOL 331, BCHM 301, BIOL 330.

Note: students are normally expected to have taken BIOL 309

Plant Biology

This is a “general” major, designed to encompass any postgraduate work dealing with plants.

Students taking postgraduate papers need to select four courses, with the approval of the School of Biological Sciences Fourth Year Coordinator, from BIOL 421, BIOL 430–432, BIOL 434–436, BIOL 453, BIOL 471 - 474, BIOL 476, BIOL 478, BIOL 490 - 493.

P: 90 points (for BSc(Hons) or MSc) or 60 points (for PGDipSc) from 300-level BIOL courses.

Note: students are normally expected to have taken BIOL 309

Zoology

This is a “general” major, encompassing any work carried out on animals.

Students taking postgraduate papers need to select four courses, with the approval of School of Biological Sciences Fourth Year Coordinator, from BIOL 421, BIOL 430–432, BIOL 434–436, BIOL 451, BIOL470–474, BIOL 476, BIOL 479, BIOL 490.

P: 90 points (for BSc(Hons) or MSc) or 60 points (for PGDipSc) from 300-level BIOL courses.

Note: students are normally expected to have taken BIOL 309

Supervisors



Students planning to enrol for MSc and PhD degrees will be aware that these are primarily research degrees and thus require a research topic and a supervisor. For many students this is seen as a daunting challenge with many perceived difficulties. However, it is not as challenging as it might at first seem.

At any stage of your University career, but particularly during your final undergraduate year, you will have developed an interest in a particular research area. The most important action that you can take is to approach staff members with interests in that area and discuss possible research projects. All staff members welcome such approaches, either face to face, or via email.

Staff often have project ideas which have funding available. These can then be developed into project proposals by research students. Alternatively research projects may develop from discussions with academic staff around a research topic of mutual interest.

Once you have teamed up with a supervisor regular meetings will enable you to develop the ways and means of tackling the research investigation. The meetings are also useful for sorting out logistical problems such as use of equipment and laboratory facilities.

Your research will be overseen by a thesis committee - a diverse group of academics, including your supervisor, familiar not only with your research topic but able to provide advice on experimental and academic problems. Apart from frequent contact with your supervisors, your research progress will be monitored by the submission of six-monthly progress reports to the Postgraduate Studies Committee within the School.

If you are enrolling as a masters student, much of your first year of study will be taken up with attending classes. However, you need to find a supervisor and develop a research topic as early as possible, so that you can submit a research proposal by the beginning of semester 2.

A supervisor can only take on a limited number of students at a time, so it is never too early to contact potential supervisors. This allows you time to consider your options and secure the supervisor you would like.

Recent Research Topics

Students in the School of Biological Sciences undertake research covering many areas of biology. Listed below are a selection of Masters and Doctoral theses produced in the School during 2006-10.

Consequences of dispersal failure: kereru and large seeds in New Zealand.

Algal preferences in the masking behaviour of the spider crab, *Notomithrax ursus*.

The benthic ecology and food web dynamics of Te Waihora (Lake Ellesmere).

The fate and effects of sewage-derived pharmaceuticals in soil.

New Zealand fur seals in the Kaikoura region: colony dynamics, maternal investment and health.

Statistical genetics and molecular evolution of major histocompatibility complex.

Isothiocyanate induction of apoptosis in cells overexpressing Bcl-2.

The effect of population bottleneck size on parasitic load and immunocompetence of introduced birds in New Zealand.

The roles of integrin-like proteins, tyrosine phosphorylation and F-actin in hyphal tip growth.

Effect of Bcl-2 on the cellular response to oxidative stress.

Mother-pup recognition behaviour, pup vocal signatures and allosuckling in the New Zealand fur seal, *Arctocephalus forsteri*.

Demography of early life stages of habitat-forming intertidal furoid algae.

Effect of hormonal interaction on desensitization of the adrenocorticotropin response to arginine vasopressin in ovine anterior pituitary cells.

Antarctic fish: thermal specialists or adaptable generalists?

Gastrointestinal physiology of chinook salmon, *Oncorhynchus tshawytscha* (Walbaum) with Gastric Dilatation Air Sacculitis (GDAS)

Phylogeography of the *Cellana* limpets of New Zealand: investigating barriers to marine dispersal and historical biogeography.

The influence of faecal scent marks on the behaviour of the white rhinoceros (*Ceratotherium simum simum*).

Population bottlenecks and the risk of parasitic and microbiological infections in the endangered saddleback (*Philesturnus carunculatus*) and South Island robin (*Petroica a. australis*).

Distribution and biology of the marine invasive bivalve *Theora lubrica* (Semelidae).

Response of TPH-1 cells to oxidative damage induced by AAPH.

A study of superoxide dismutase activity and superoxide production in kiwifruit.

The role of F-actin in hyphal branching.

Biological interactions during ion exchange removal of ammonia from terrestrial and marine waste water.

A study of the activity and characteristics of superoxide dismutase in the male reproductive parts of petunia.

Genetic population structure of four taxa of aquatic insect at three hierarchical spatial scales.

Ecological effects of *Ulva lactuca* L. in Avon-Heathcote Estuary.

A study of intra-ring checking and xylogenesis in *Pinus radiata* D. Don.

The conservation ecology of Canterbury mudfish (*Neochanna burrowsius*).

Anterior and lateral thalamic lesions in object-odour paired associate learning.

Protein-bound DOPA formation in human plasma.

Characterisation of proteolytic activity in kiwifruit with special emphasis on aminopeptidase activity.

The effects of land management practices on dairy streams in Canterbury.

Conservation management of the dry plains grasslands at McLeans Island, Canterbury.

Cooperation and conflict: sociality in salticid spiders.

Microbial cellulose : influence of growth surface submersion on production rate and water holding capacity and structural investigations of the drying process.

Pre- and post recruitment processes determining dominance by mussels on intertidal reefs in southern New Zealand.

An examination of the relationship between NO₂, ABA and auxin in lateral root initiation and root elongation in tomato.

The effects of forestry management practices on microbial community properties.

Behavioural plasticity of life history traits in the New Zealand avifauna.

The reproductive ecology and biology of the pill-box crab: *Halicarcinus cookii* (Brachyura: Hymenosomatidae) Filhol, 1885.

Occurrence and characterisation of superoxide dismutases in the female reproductive structures of petunia.

The roles of F-actin and integrin-like proteins in hyphal tip growth. The effects of disturbance and deer herbivory on plant invasions.

Life-history traits and potential causes of clutch-size decline in the introduced song thrush (*Turdus philomelos*) in New Zealand.

Investigations into the effects of lactoferrin on microbial ecology, using *Helicobacter pylori* as a model organism.

Phylogenetic and phylogeographic study of the New Zealand endemic sea tunicate *Cnemidocarpa nisiotis*.

Urbanisation influences on freshwater fish distribution and remediation of migratory barriers.

Disrupting the quaternary structure of DHDPS as a new approach to antibiotic design.

Influence of oxygen supply on metabolism and energetics in fish muscles.

Incorporating glucose oxidase activity into amyloid fibrils.

Involvement of novel cardiac peptides in healthy and ischemic hearts.

Comparative genomics of microsatellite abundance: a critical analysis of methods and definitions.

Tools for managing threatened species: improving the effectiveness of whio conservation.

Genetic variation in New Zealand abalone, *Haliotis iris*.

Riverscape-mediated effects of introduced trout on non-diadromous galaxiid fishes in New Zealand.

Mechanism and inhibition of hypochlorous acid-mediated cell death in human monocyte-derived macrophages.

400-Level Course Descriptions

Note: If too few students enrol in a course it may not be run.

BIOL 421 Evolutionary Systematics

Coordinator: Dr Pieter Pelsler

This course deals with the fundamentals of determining the nature and extent of global biodiversity, dealing with issues such as the integration of morphological and biochemical data in systematics and the expression of systematic hypotheses in taxonomy.

Recommended preparatory course(s): BIOL 215, and BIOL 371

BIOL 430/BCHM 406 Genomics

Coordinator: Dr Anthony Poole

This course covers the principles of genome analysis (genomics) drawing upon the wealth of information being generated by genome mapping and sequencing projects. Seminar topics will examine how the application of modern molecular genetic techniques, coupled with comparative evolutionary analyses, are improving our understanding of biological systems.

Recommended preparatory course(s): BIOL 330 (or 300-level BCHM)

BIOL 431 Genetics

Coordinator: Dr Marie Hale

This course addresses some major issues in population genetics, conservation genetics and evolutionary genetics including genetic consequences of inbreeding, the importance of functional variation for evolutionary potential and the genetic paradoxes surrounding invasive species.

Recommended preparatory course(s): BIOL 330 or BIOL332 or BIOL371

BIOL 432 Cell Biology

Coordinator: Dr Ashley Garrill

This course critically examines recent advances in cell biology. The focus ranges from fundamental cellular and molecular biology to consideration of cellular mechanisms within the context of physiological or pathological processes.

Recommended preparatory course(s): BIOL 351 or BIOL 331/BCHM 301

BIOL 434/BCHM 405 Molecular Biology For Biosecurity

Coordinator: Prof Jack Heinemann

This course considers the multi-disciplinary problems of biosecurity/biosafety using genetics,

biochemistry and ecology as guides to risk assessment. Suitable for students interested in basic as well as applied molecular biology.

Recommended preparatory course(s): BIOL 330

BIOL 435/BCHM 403 Protein Science

Coordinator: Prof Juliet Gerrard

An advanced treatment of protein science, covering structure, function, applications, and the inter-relationships between these. Assessment places a focus on professional scientific communication skills.

Recommended preparatory course(s): BIOL 331/ BCHM 301

BIOL 436/BCHM 401 Medical Biochemistry

Coordinator: Dr Steven Gieseg

The course covers biochemical aspects of selected human diseases. These may include free radical mediated disease processes, cystic fibrosis, neurodegeneration and antioxidant changes during exercise.

Recommended preparatory course(s): BIOL 331/ BCHM 301 or BIOL 351

BIOL 451 Environmental Animal Physiology

Coordinator: Prof Bill Davison

The course evaluates the physiological adaptations that allow animal life to survive in diverse environments. We will look at the strengths and weaknesses of the comparative approach and its relationship to phylogeny. Topics that may be addressed include osmoregulatory physiology and water balance, thermoregulation, metabolic rates, exercise, acid-base regulation and cardiovascular physiology.

Recommended preparatory course(s): BIOL 353 or BIOL 354

BIOL 453 Plant Environmental Physiology

Coordinator: Prof Matthew Turnbull

The course considers resource utilisation in natural and managed ecosystems, plant physiology in variable environments (stress physiology), the use of stable isotopes in ecological research, terrestrial ecosystem processes and the responses of plants to global environmental change.

Recommended preparatory course(s): BIOL 252 or BIOL 255

BIOL 470 Behaviour

Coordinator: Assoc Prof Jim Briskie

Current topics in the study of animal behaviour with an emphasis on empirical tests of theoretical issues. Topics include sexual selection, foraging strategies, parental care and parasitism, problem solving and animal cognition.

Recommended preparatory course(s): BIOL 377, BIOL 378, BIOL 371 and/or BIOL 373

BIOL 471 Community Ecology

Coordinator: Dr Jason Tylianakis

This course covers theoretical and applied issues in community ecology, with emphasis on terrestrial ecosystems. Major themes include food web ecology, local vs. regional determinants of community structure, species interactions in diverse assemblages, and the role of species in ecosystem functioning.

Recommended preparatory course(s): BIOL377, BIOL378 or BIOL 375

BIOL 472 Freshwater Ecology

Coordinator: Assoc Prof Jon Harding

This course aims to give students an understanding of current issues in freshwater ecology with particular reference to ecological theory, and the application of research to topical management and conservation issues in New Zealand.

Recommended preparatory course(s): BIOL 375

BIOL 473 Marine Biology

Coordinator: Assoc Prof Islay Marsden

This course focuses on current issues in Marine Biology. It includes experimental approaches to marine ecology, estuarine biology, ecophysiology and marine pollution.

Recommended preparatory course(s): BIOL 212 or BIOL 374

BIOL 474 Conservation Biology

Coordinator: Prof Dave Kelly

This course covers aspects of biology that are useful in applied conservation situations. In other words, what parts of science can help to preserve biodiversity? Topics covered include: what is rarity; extinction rates past and present; limiting factors in endangered species management; adaptive management using NZ birds as case studies; species concepts and conservation; genetics of threatened species; reserve design in theory and practice; conservation and climate change.

Recommended preparatory course(s): BIOL 374 or BIOL 375 (BIOL 372), BIOL 377, BIOL 378, BIOL 379



BIOL 491 Plant Biotechnology

Coordinator: Dr David Leung

This course examines recent advances in plant biology research and, wherever appropriate, their implications for biotechnological applications. Examples of possible topics for tutorials include sugar signals, carbohydrate metabolism and developmental regulation in plants, phytoremediation, jasmonic acid and wounding response in plants.

Recommended preparatory course(s): BIOL 352

BIOL 492 Environmental Microbiology

Coordinator: Assoc Prof Laurie Greenfield

This course deals with aspects of microbiology of direct concern to humanity such as oil pollution, breakdown of GM plants in soils, and functions of marine planktonic cyanobacteria in biogeochemical cycles.

Recommended preparatory course(s): BIOL 313

BIOL 493 Applied Microbiology

Coordinator: Dr Arvind Varsani

Selected topics in applied and environmental microbiology, molecular microbiology, microbial genetics and virology.

Recommended preparatory course(s): BIOL 313

SEAF 401 The Seafood Sector: the Management and Science behind Fisheries and Aquaculture

Coordinator: Dr John Pirker

This interdisciplinary course addresses major needs concerning the seafood sector and its management including the New Zealand Quota Management System, indigenous fisheries, fisheries economics, environmental issues including biosecurity and fisheries ecosystems, seafood products and their marketing. Perspectives on New Zealand's seafood sector will also be provided by leaders in the seafood sector.

Recommended preparatory course(s): None

BIOL 476 Coastal Marine Processes

Coordinator: Prof David Schiel

The course includes a critical assessment of experimental design in marine ecology, ecological processes affecting the structure of nearshore communities, nearshore ecology particularly of rocky reefs, and connectivity of processes from oceanic to onshore.

Recommended preparatory course(s): BIOL 374 and BIOL 309 (or equivalent statistics)

BIOL 478 Evolutionary Ecology

Coordinator: Dr Hazel Chapman

This course covers ecology and evolutionary biology with an emphasis on plants.

Possible topics covered include plant/animal mutualisms (pollination and frugivory), plant pathogens, competition, biological control, invasion biology, life history strategies, breeding systems, speciation, hybridization and invasions, and genes in populations.

Recommended preparatory course(s): BIOL 377, BIOL 378 or BIOL 371

BIOL 479 Global Change Biology

Coordinator: Dr Paul Broady

This course will address selected major issues concerning the role of biological processes in the Earth System and the impact on these of human activities. Discussion will include carbon and nutrient cycling in marine and terrestrial ecosystems, the impacts of past climate change on biota, the significance of biodiversity loss on ecosystem processes and strategies to mitigate climate change.

Recommended preparatory course(s): More than one of BIOL 214 or BIOL 252 or BIOL 377, BIOL 378 or BIOL 374

BIOL 490 Aquaculture

Coordinator: Prof David Schiel

The aim of this course is to give a general overview of aquaculture including case studies of many species, impacts on the environment, water quality issues, stock improvement, stress and disease in cultured species. The course is aimed at those who have an interest in the science of aquaculture and the interface of science with the industry of culturing marine and aquatic organisms for food.

Recommended preparatory course(s): BIOL 354 or BIOL 374

Staff

During 2011 Biological Sciences is undergoing extensive office renovations. Staff office locations are likely to change, for up-to-date information visit our website or contact the school office.

Academic Staff - continuing

Assoc Prof Jim Briskie

Room 361 Ext. 6030
Ecology and behaviour of birds. Sperm competition.

Dr Paul Broady

Room 522 Physics Ext. 6525
Ecology and taxonomy of freshwater and terrestrial algae, especially cyanobacteria.

Dr Hazel Chapman

Room 458 Ext. 7659
African montane forests. Evolution. Molecular variation & rare plants, genetic variation and biological control, apomixis.

Dr David Collings

Room 460 Ext. 4662
Functional organisation of plant cells. Use of advanced methods in light microscopy, confocal imaging of living cells expressing green fluorescent protein (GFP) and of immunolabelled material.

Prof Bill Davison

Room 426 Ext. 6029
Biology of fish: exercise physiology; muscle anatomy & physiology, temperature physiology, temperature effects; salmon biology. Antarctic biology.

Dr Ren Dobson

Room 464
Unravelling enzyme structure, function, evolution and design. In particular, enzymes that are drug targets and those involved in allosteric regulation.

Dr Ashley Garrill

Room 435 Ext. 7644
Membrane transport proteins (pumps, carriers & channels). Mechanosensitive ion channels and their potential as drug target sites. Pathogenic fungi. Turgor regulation.

Prof Juliet Gerrard

Room 464 Ext. 7302
Structure, function & reactivity of proteins; application of protein science to medicine, agriculture, food science and biomaterial design.

Dr Steven Gieseg

Room 433b Ext. 7049
Free radical biochemistry. Heart disease. The role of protein & lipid oxidation in disease pathogenesis. Macrophage biochemistry. Testing novel antioxidants. Radical damage in fish.

Dr Chris Glover

Room 234 Ext. 6025
Environmental physiology of aquatic organisms; epithelial transport of ions, nutrients and toxicants; aquatic toxicology; seafood safety.

Dr Sharyn Goldstien

Room 449A Ext. 45646
Marine ecology and evolution in New Zealand and the Pacific; population connectivity, marine bioinvasions and dispersal.

Assoc Prof Laurie Greenfield

Room 363 Ext. 6797
Soil microbiology, degradation of natural & synthetic compounds. Antarctic biology.

Dr Marie Hale

Room 430 Ext. 6739
Study of evolution at the level of local populations and applying this knowledge to conservation issues.

Assoc Prof Jon Harding

Room 233 Ext. 4988
Stream and freshwater ecology. Land use, mining, forestry and hydro-electric development. Conservation.

Prof Jack Heinemann

Room 226 Ext. 6926
Molecular biology, horizontal gene transfer and mismatch repair, antibiotic resistance, gene ecology and biosafety.

Prof Robert Jackson

Room 367 Ext. 6064
Animal cognition (perception, search images, selective attention, problem solving, decision making), communication systems, conditional predatory strategies, predator-prey co-evolution and aggressive mimicry.

Prof Paula Jameson

Room 438 Ext. 6860
Head of School. Physiological and molecular plant biology; plant biotechnology; plant hormone biology.

Prof Dave Kelly

Room 462 Ext. 6782
Ecology. Mistletoe reproductive biology, plant-animal interactions, seed predation, pollination, biological control, conservation.

Dr David Leung

Room 445 Ext. 6650
Plant physiology. Tissue culture of ornamental, medicinal & woody plants. Molecular biology & genetic engineering of plants. Seed physiology & biochemistry.

Assoc Prof Islay Marsden

Room 234 Ext. 6041
Physiological ecology of marine invertebrates, esp. Crustacea & bivalve molluscs. Distribution of tidal organisms & energy balance.

Dr Drusilla Mason

Room 238 Ext. 6050
Cellular & molecular endocrinology, particularly molecular mechanism of transmembrane & intracellular signalling in health and disease.



Staff can be contacted directly by email using the format:
firstname.surname@canterbury.ac.nz

Assoc Prof Angus McIntosh

Room 235 Ext. 6061

Community ecology of streams. Impact of introduced species on freshwater communities. Behaviour & ecology of native fish.

Dr Ximena Nelson

Room 359 Ext. 4050

Animal communication and animal cognition, animal sensory systems interact with behaviour.

Dr Pieter Pelser

Room 433a Ext. 45605

Plant Systematics and Director UC Herbarium

Dr John Pirker

Room 429c Ext. 3050

Marine Biology, Data Analysis.

Dr Anthony Poole

Room 466 Ext. 3863

Molecular Evolution, evolutionary and comparative genetics/genomics.

Prof David Schiel

Room 229 Ext. 6031

Marine intertidal & subtidal ecology; aquaculture. Larval fish ecology.

Dr Tammy Steeves

Room 441 Ext. 7074

Conservation and evolutionary genetics including population differentiation and speciation in shorebirds and seabirds.

Dr Daniel Stouffer

New in 2011

structure and properties of ecological networks, in particular food webs. Complex systems with a focus on using rigorous statistical methods to uncover and validate patterns.

Prof Matthew Turnbull

Room 419 Ext. 7040

Environmental plant physiology. Ecophysiology of resource acquisition in natural & managed ecosystems. Responses of plants to extremes of environment. Global change biology.

Dr Jason Tylinakis

Room 437 Ext. 6735

Effects of land use on biodiversity and ecosystem services. Effects of floral resource subsidies on tri-trophic (parasitoid/herbivore/plant) interactions. Ecological aspects of biological control.

Dr Arvind Varsani

Room 439 Ext. 4667

Virus recombination and evolution; Isolation and characterisation of novel DNA viruses

Academic Staff - fixed term

Mr Keith Baronian Microbiology

Emeritus Prof Brian Butterfield Biodiversity

Dr Jennifer Gillette

Prof Richard Holdaway Palaeo-ecology

Dr F Grant Pearce Biochemistry

Dr Krithika Yogeewaran

Post Doctoral Staff and Research Fellows

Dr Jargan Billakanti Biomolecular Interactions

Dr Justine Cottam Biomolecular Interactions

Dr Fiona Cross Animal Behaviour

Dr Mike Hickford Marine Ecology

Dr Shelley Hoover Terrestrial Ecology

Dr Peter McHugh Freshwater Ecology

Dr Jon O'Brien Freshwater Ecology

Dr Esme Robinson Animal Physiology

Dr Jason Song Plant Physiology

Celine Valery Biomolecular Interactions

Dr Madhu Vasudevamurthy Biomolecular Interactions

Administrative Staff

Mrs Lyn de Groot

Room 438 Ext. 6860

School Administrator

Ms Nicki Judson

Room 440 Ext. 6732

Administrative Assistant

Mrs Liz Fitzgerald

Room 440 Ext. 6071

Administrative Assistant (part-time)

Mrs Penny Moore

Room 355 Ext. 7799

Student Communication and Web Administrator

Technical Staff

Points of contact for postgrads

Mr Neil Andrews (Room 360)

Scanning Electron Microscopy

Mr Rennie Bishop (Room B188)

Aquarium, Vivarium, Collecting,

Behaviour, Boating

Mr Graeme Bull (Room 231)

Histology

Mr Dave Conder (Glasshouses)

Glasshouse complex, Vehicles

Mr Selwyn Cox (Room 429)

Technical Manager, Finance, Contracts/ Timesheets, Payments

Mr Nick Etheridge (Room 348)

Metalwork, Plastics and Woodwork, Mechanical Servicing

Mr Thomas Evans (Room TBA)

Biochemistry

Mrs Claire Galilee (Room 231)

Gene Ecology, Evolution, Spirit/Bone Collection & Entomology

Mr Craig Galilee (Room 231)

DNA Sequencing, Microbiology & Autoclave

Ms Reijel Gardiner (Room 508 Physics)

Plant Morphology, Herbarium, Taxonomy and Phycology

Mrs Jackie Healy (Room 472)

Molecular Biology & Biochemistry Suite

Mr Manfred Ingerfeld (Room 349)

Plant Cell Biology, Transmission Electron Microscopy & Confocal Microscopy

Ms Jenny Ladley (Room 472)

Terrestrial Ecology, Cass Weather-station

Mrs Nicole Lauren-Manuera (Room 429a)

Purchasing, Plant Biotechnology, Growth Rooms

Mrs Jan McKenzie (Room 231)

Microscopy, Video Imaging, Marine Ecology, Liaison

Ms Linda Morris (Room 231)

Freshwater Ecology, Cell Biology, Technical Teaching Coordinator

Mr Gavin Robinson (Room 231)

Animal Physiology, New Building Project Coordinator, Technical Services Coordinator

Mr John Scott (Room 424)

Information Technology & Desktop Support

Mrs Maggie Tisch (Room 231)

Genetics, Free Radical Biochemistry

Mr Matt Walters (Room 355)

Digital Imaging, Science Communication, Web

Mr Alan Woods (Room 345)

Electrical and Instrumentation

Mr Graeme Young (Room 424)

Information Technology & Desktop Support

School Facilities

The School of Biological Sciences has modern, well-equipped teaching and research laboratories.

We have access to transmission and scanning electron microscopes equipped for X-ray microanalysis and have full preparation facilities. Our new confocal microscope is now operational.

There is an extensive computer network with links to the University IT Department and the Internet. New bioinformatics capabilities are available based around state of the art databases and grid computing (BeSTGRID). The university also operates an IBM Blue Gene super computer. It is the most powerful supercomputer in the Oceania region. The School also makes use of the Kiwi Advanced Research And Education Network (KAREN), a next generation telecommunications link to enable leading edge e-research and communication.

The School houses specialist facilities for maintaining animals including a closed-system seawater aquarium room; Antarctic aquarium; freshwater aquaria and laboratory facilities including electric fishing equipment; culture and maintenance rooms for terrestrial animals; environmental chambers with controlled light and temperature.

Animal physiological laboratories contain research equipment for neurophysiology, ion and water regulatory physiology, cardiac, respiratory and exercise physiology.

Behaviour laboratories have state of the art computer systems for vocalisation and signal analysis. There are facilities for various kinds of microscopy, and an insect reference collection.

Molecular genetics and molecular biology research laboratories are fully equipped for DNA, RNA and protein analysis, recombinant DNA techniques, real-time PCR and microinjection of macromolecules into cells. We also house the Canterbury Sequencing Facility.

The School participates in the Biomolecular Interaction Centre (BIC). This is a "virtual centre" to concentrate regional infrastructure around an area of niche specialisation and drive cross-disciplinary research in the area of biotechnology, particularly in medical and veterinary applications and nanotechnology.

Research laboratories have facilities for histology, tissue culture and in vitro investigation of regulation of peptide hormone secretion (including equipment for static culture, cell perfusion, radioimmunoassay and immunocytochemistry).

The biochemistry laboratories are equipped with electrophoretic equipment, scanning spectrophotometers, a fluorimeter, speed vac, and fully automated HPLC for analysis of lipids, proteins and bioactive molecules.

Ecology laboratories are equipped to measure environmental parameters at the macro and micro levels. There is an extensive range of field equipment for marine, freshwater and terrestrial habitats, including boats, vehicles, collecting equipment and environmental monitoring instrumentation.

Environmental chambers are available for propagating whole plants, plant tissue cultures and microbes. On campus there is a glasshouse complex including experimental gardens and a herbarium.

Biotechnology and plant physiology laboratories have research equipment for transgenic plant production and radio tracer research. Some of these facilities are used by biochemistry laboratories which contain sophisticated

chromatography systems and ultracentrifuges for detailed studies on macromolecular structure and enzyme function.

Microbiology laboratories have equipment to study the genetics, physiology and biochemistry of a range of diverse microbes including Antarctic microbes and cryptograms.

Ultrastructural laboratories specialise in wood and plant fine structure and include an image analysis facility.

Technical services include:

- Electronics and mechanical workshops
- Electron and confocal laser microscopy expertise
- Field collection expertise
- Glasshouse complex, controlled growth facilities
- Plant and animal histology expertise
- Plastics fabrication and instrumentation servicing
- Digital imaging and science communication expertise, image analysis facility



Just completed is a new state of the art biology research building. This is an exciting time for research in Biology and the new facility will greatly enhance our ability to carry out leading edge research.

Field Stations

Teaching and research activities in the School of Biological Sciences are greatly assisted by field stations at the sites below. Many undergraduate courses involve a fieldwork component based either at Cass or Kaikoura. Fieldtrips allow students to apply techniques and test hypotheses they have learnt about in lectures and also interact with staff in a more informal setting.



Edward Percival Field Station, Kaikoura

Situated virtually on the shore, with panoramic views of sea and mountains, the field station has residential facilities for staff and students and laboratory facilities for maintaining live animals for study. Many second and third year biology students attend a week's intensive field course at Kaikoura to learn field techniques, whilst observing animals and plants in their natural surrounding and studying their relationships with other organisms.

The George Knox Research Laboratory was opened in 1986 and provides accommodation for research students and visiting scientists. The building includes a large general research laboratory, library, computer facilities, a smaller workroom and tank rooms as well as a large covered general working area. Facilities for research are currently being expanded.

The Field Station has a full-time station manager, Mr Jack van Berkel. He also manages the other field stations around the South Island.

Cass Field Station, Mid Canterbury

The mountain biology field station is situated at Cass, 105 km west of Christchurch in the mountains of the Waimakariri Basin. Undergraduates on field trips are housed in a modern 42-bed building with associated laboratory facilities. An 8-bed flat with a laboratory is available for small parties engaged in research.

The Cass area provides a very wide range of environments – montane grasslands, scrub, riverbed, scree, beech forest, swamp, bog, lake, stream and alpine habitats can all be reached by day trips on foot. In addition, day trips by vehicle can be made to the subalpine and alpine habitats of the Craigieburn Range or Arthurs Pass on the main divide of the Southern Alps, and to lowland and montane mixed podocarp-broadleaved forests of Westland.

Antarctica

In collaboration with Gateway Antarctica, staff and postgraduate students of the School currently make regular summer visits to work on mosses, lichens, microbes including algae, soils, fish, birds and seals. These studies can be extended at the University using specialised cold room facilities.

Nigeria

A new field station has been built in the mountainous region of Eastern Nigeria. The field station is run by the Nigerian Montane Forest Project, led by Dr Hazel Chapman, and is available for use by staff and students from UC as well as Nigerian and International Universities.

Biology Connections

As well as working at our field stations, many students and staff conduct their research at sites throughout the country and even internationally.

Recent field sites have included Lake Ohau (Central Otago), Nelson Lakes National Park, the Canterbury foothills, Franz Joseph glacier, Little Barrier Island, Kaikoura, Craigieburn, Fiordland, Okarito (West Coast), the United States, Nigeria, Kenya, Australia, Iceland, and more!

Staff and postgraduate students also make regular summer visits to Antarctica to work on mosses, lichens, microbes, algae, soils, fish, birds and seals. These studies can continue back at the University using specialised cold facilities.

Members of the School also interact with scientists at other Universities and research organisations, and research students sometimes work jointly with these groups.

Collaborations include:

- Landcare Research
- National Institute of Water and Atmospheric Research (NIWA)
- NZ Institute for Plant & Food Research
- Institute of Environmental Science and Research (ESR)
- AgResearch
- Department of Conservation
- Christchurch Medical School
- Environment Canterbury
- Christchurch City Council
- Cawthron Institute

Growth and Innovation Pilot Initiative (GIPI)

Canterbury University is a partner in a major biotechnology Growth and Innovation Pilot Initiative (GIPI) project. This offers selected postgraduate students the opportunity to boost their value to future employers by attending a seminar series given by people who have successfully commercialised biotechnology research. The course gives an excellent insight into what is likely to most suit you in the future. Under GIPI there is also the possibility of taking a great idea from your research project and turning it into a commercial reality.

Research Institute

Biomolecular Interaction Centre (BIC)

The research centre based at the University of Canterbury was founded in 2007 from funding from the Innovation and Development Fund from the Tertiary Education Commission (TEC). The primary investment of \$1.85 million was used to purchase of a suite of state-of-the-art equipment that was supplied by Bio-Rad Laboratories.

The University of Canterbury BIC researchers are in partnership with researchers at Lincoln and Otago Universities, Plant and Food Research Ltd and Environmental Science and Research.

Research Centres

Aquaculture & Marine Ecology

The Centre of Excellence in Aquaculture and Marine Ecology (shortened to CEAME) was set up in 1996. Recognising that many of the skills they wished to hire were not available in New Zealand, NIWA initiated CEAME as part of their strategic planning. NIWA wished to help their own staff pass on their enthusiasm, skills and knowledge as legacies to another generation of scientists. The objectives of CEAME are to promote and enhance excellence in aquaculture and marine ecological research, to attract the best students nationally and internationally, to train students at the post-graduate level by sharing and using the joint expertise of University and NIWA personnel, to attract funding to support student training and research, to provide opportunities for students to do research along side of NIWA scientists in established and new programmes, and to increase collaborative linkages between NIWA and the University of Canterbury.

CEAME has evolved over recent years to include a broad range of disciplines including mathematics and engineering, and includes funding both for personal support through scholarships and operational support for field-based work.

The hallmark of these projects has been solving environmental problems, usually with a linkage to industry. The emphasis, however, has been in attacking these problems within the larger conceptual and theoretical issues of marine science. Several of the student projects have been related to the large "Sustainability of Cultured Fisheries" programme of NIWA, which has not only the very practical goal of determining the extent to which aquaculture can be expanded in the Marlborough Sounds without deleterious effects, but also in understanding how nutrients flow through a nearshore marine system. The enclosed nature of the Marlborough Sounds is an ideal environment to analyse such ecosystem

processes and allows CEAME to train students in oceanographic techniques without the expensive vessels and gear required for work in the open ocean.

The research being done by students in CEAME is being fed into the ecological modelling done by others, which is proving to be a significant advantage of the "Centre" approach. As the projects expand, such as recent additions in salmonid population genetics, ecological modelling and fluid dynamics, there has been an expansion of supervisory affiliates from NIWA and the University.

The Centre for Integrated Research in Biosafety (INBI)

The Centre for Integrated Research in Biosafety is a multi-disciplinary centre devoted to career-minded researchers in the biological, physical and social sciences, philosophies, law, engineering and cultural studies. The primary mission of the Institute is produce graduates and professionals equipped to contribute to the global demand for research in biosafety/biosecurity. The purpose of the Institute is to create an atmosphere of scholarship and new research at the nexus of biotechnology and society. Currently, our research focus is on the nature of biotechnology risk assessment (scientific and social), how the larger community and the community of scientists communicate, how science responds to the questions and concerns of citizens, especially those whose interest is not commercial or strategic but purely public good, and on providing answers to these questions.

INBI offers students the opportunity to connect with other researchers throughout New Zealand. Our links with the United Nations Environment Programme, the Norwegian Institute of Gene Ecology and a network of biosafety-minded researchers around the world can assist you in building an international career. For example, we have an exchange programme with the University of Tromsø that allows Norwegian students to study in New Zealand and New Zealanders to study in Norway.

The Centre is active in risk assessment research relevant to the release of genetically engineered organisms into the environment and human food chain. The outlet for this research is consultation with various government agencies, the International Biosafety Course and the developing GE Biosafety Forecast Service. Our activities are purely for the public good; the centre holds no contracts that would, or could be seen to, compromise its communication of risk.

Career Opportunities

Graduates with bachelors degrees (BSc, BSc(Hons)) are employed as agricultural workers, biological and physical scientists/technicians, teachers, scientific sales representatives, environmental health officers, bacteriologists and zoologists.

Employers include research institutions, regional councils, dairy companies, secondary schools, tertiary institutions, department of health, area health boards, pharmaceutical companies, medical laboratories, and meat companies.

Potential Employers

School Biology Teacher - general science, biology, science advisors.

University Teaching and Research- technicians, research assistants, lecturers

Crown Research Institutes

Industrial Research Ltd (IRL)- microbiology, biochemistry, electron microscopy, genetics

Scion (Formerly Forest Research) - ecology, taxonomy, morphology, wood anatomy, wildlife biology, entomology, biochemistry, plant physiology, microbiology, genetics

Institute of Geological & Nuclear Sciences (GNS) - palynology, palaeobotany, geobotany

New Zealand Pastoral Agriculture Research Institute Ltd (AgResearch) - genetics, animal behaviour, animal physiology, plant physiology, genomics, biochemistry, microbiology, ecology, entomology

Landcare Research NZ Ltd - land inventory, wildlife biology, ecology, microbiology, entomology, biochemistry, conservation, plant physiology, pollution, taxonomy, evolution, genetics

NZ Institute for Plant & Food Research Ltd - plant physiology, biochemistry, biotechnology, genetics, microbiology

The Horticulture and Food Crown Research Institute of NZ Ltd (HortResearch) - plant physiology, biochemistry, biotechnology, microbiology, electron microscopy, genetics

National Institute of Water & Atmosphere Ltd (NIWA) - fisheries biology & ecology, biology of marine & freshwater organisms, oceanography, pollution, water quality, limnology, biophysics, genetics

Institute of Environmental Science and Research Ltd (ESR) - microbiology, biochemistry, environmental quality, electron microscopy, geonomics, forensics

Research Associations

Fonterra (Formerly New Zealand Dairy Research Institute)

New Zealand Logging Industry Research Association

Meat Industry Research Institute of New Zealand

Leather and Shoe Research Association of New Zealand

Cawthron Institute - genetics, plant physiology & biochemistry, resource management, ecology, microbiology, freshwater & estuarine biology, biological survey

Aquaculture - salmon farms, mussel farms, management

Ministries

Ministry for the Environment - resource management policy development, ecology, new organisms in New Zealand

Ministry of Forestry - ecology, taxonomy, morphology, wood anatomy, plant pathology, mycorrhizae, timber decay control, electron microscopy, wildlife biology, entomology

Ministry of Fisheries

Ministry of Research, Science and Technology - science policy development

Other

Canterbury District Health Board - cancer research & cytogenetics unit, Christchurch - molecular/cytogenetics, mutagenesis, microbiology, immunology, physiology, histology, biochemistry
Christchurch Clinical School - clinical endocrinology, endocrine biochemistry, endocrine physiology (both in vivo and in vitro studies)

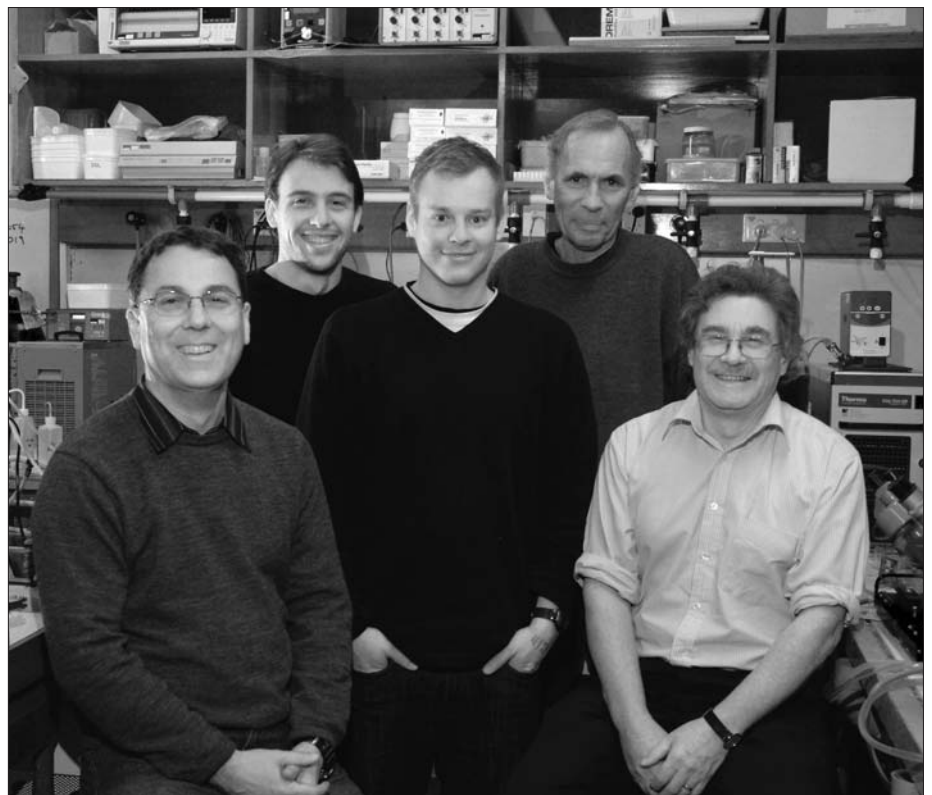
Invermay, & Ruakura - genetic studies, animal behaviour, animal physiology & biochemistry

Regional Councils (Water Boards) - ecology, environmental monitoring and assessment, land inventory, resource management, phycology, microbiology

Department of Conservation - genetics, marine ecology, wildlife biology, ornithology, entomology, resource management, freshwater biology, plant ecology, conservation

Museums - ecology, taxonomy, entomology, ornithology, invertebrate zoology

Biological consultants; Pharmaceutical companies; Industrial microbiology; Fish and game councils; Salmon farms; Dairy research; Meat industries; Food industries; -plus many more.



Contact Information

Please contact us if you have further questions regarding our courses or research, questions for individual staff members can be sent via email using the format firstname.surname@canterbury.ac.nz.

Head of School

Professor Paula Jameson

Enquiries

Phone: +64 3 364 2500

Fax: +64 3 364 2590

E-mail: biology@canterbury.ac.nz

Web: www.biol.canterbury.ac.nz

Postal Address: School of Biological Sciences
University of Canterbury
Private Bag 4800
Christchurch
New Zealand

Postgraduate Coordinators

Dr Marie Hale (Fourth Year Coordinator)

marie.hale@canterbury.ac.nz

Room 430 Ext. 6739

Prof Bill Davison (Deputy Head of School)

bill.davison@canterbury.ac.nz

Room 426 Ext. 6029

Assoc Prof Jon Harding (Chair of Postgraduate Studies)

jon.harding@canterbury.ac.nz

Room 233 Ext. 4988

Student Advisor, College of Science

The Student Advisor is available to provide accurate and timely academic advice and assistance on course options and/or degree programmes in science subjects.

Ms Tracey Robinson

+64 3 364 2987 ext 3132

tracey.robinson@canterbury.ac.nz

University of Canterbury Contact Centre

For more information about study options or an enrolment pack get in touch with the Contact Centre on:

Freephone: 0800 VARSITY
(0800 827 748) in New Zealand

Or phone: +64 3 364 2555

Email: enrol@canterbury.ac.nz

Web: www.canterbury.ac.nz

Help & Advice

If you have any problems, you are always welcome to approach any staff member for help.

Many staff members list office hours when you are welcome to stop by and ask questions. Otherwise, you may arrange an appointment by asking them after class or by ringing or e-mailing them.

Please remember that staff members are always willing to help with genuine problems, but they won't know you have a problem unless you tell them!

Course changes and advice

If you would like advice about planning a course schedule to match your interests and career goals or you would like to change courses, please contact the Student Advisor, College of Science or a Postgraduate Coordinator.

You might also wish to speak with one of the following staff about your particular area of interest:

Animal Physiology Prof Bill Davison

Biochemistry Dr Andy Pratt (Chemistry)

Biotechnology Dr David Leung

Cell Biology Dr Ashley Garrill

Ecology and Behaviour Assoc Prof Angus McIntosh

Genetics and Evolution Dr Marie Hale

Microbiology Dr Arvind Varsani

Plant Physiology Prof Matthew Turbull

Degree & course information

For degree requirements, course restrictions and prerequisites and point allocations, please refer to the University Calendar. For the times and locations of specific lectures, laboratories and examinations, please refer to the Enrolment Handbook or the School's website: www.biol.canterbury.ac.nz

Course content

For information on course content, check our website, as many of our courses have additional information, assignments, rules and requirements on-line. You may also see the course coordinator listed in this guide for each course.

Problems or complaints

If you are having trouble in one or more of your courses, please discuss your problems with your lecturer. They may be able to provide help, or direct you to other places in the School or University that you can seek support. If you do not feel comfortable approaching your lecturer, or you have a specific complaint about the lecturer, please see the Head of School or a Postgraduate Supervisor.

Appendix 1: Qualifying Standards

Program	Entry Qualification	Progress Part 1 to 2 Qualification	Weighting of Papers vs Thesis
B Sc (Hons)	Normally B+ average for 200- & 300- level BIOL & Science courses (GPA= 6) + RP.		4 : 1
MSc Consecutive Part 1 & 2	Normally B average for 200- & 300-level BIOL & Science courses (GPA = 5).	B average for 400-level papers (GPA = 5) + RP.	2 : 3
MSc Concurrent Part 1 & 2	Normally B+ average for 200- & 300- level BIOL & Science courses (GPA= 6) + RP.	Maintenance of B+ average for 400 level papers expected (GPA = 6).	2 : 3
MSc by Thesis Only (Part 2)	B average for 400-level papers (GPA = 5) or equivalent for non-CU students + RP.		0 : 1
PGDS	Normally B- average for 300-level BIOL & Science courses (GPA = 4).	B average for 400-level papers (GPA = 5) + RP.	2 : 3 or 0 : 1 if PGDS awarded.
Changing from MSc to PhD	Completed Part 1, at least 6 months in MSc Part 2, full written account of progress so far + RP.		0 : 1
PhD	BSc (Hons) First (GPA=7-9) or Two-One (GPA=6); MSc First (GPA=7-9) or Two-one (GPA=6) + RP.		0 : 1

GPA – Grade point average; **Part 1** – Papers; **Part 2** – Thesis; **RP** – An acceptable Research Proposal.

Note: Normally the papers chosen must be closely related to & prepare the student for the project/thesis research.

Note: The due date for the BSc (Hons) project is November 1, except as modified when a student takes papers other than BIOL.

Note: To be eligible for Honours the Masters thesis must be completed in 16 months (fulltime). Minimum/Maximum duration of Part 2 is 12/24 months (fulltime).

Note: The minimum/maximum duration of a fulltime PhD is 24/48 months.

Note: A student, who has completed Part 1, and transfers to a PhD, may apply for award of PGDS.

Note: Commencement date for MSc Part 2 is March 1st or August 1st for the consecutive option; for students only offering Part 2 the start date can be at any time, but if not at normal enrolment times (see above) a start date must be registered (see below for the form). If there is a break between Part 1 & Part 2 and enrolment is not done at March 1st or August 1st then a start date must be registered (see below for the form).

Note: For the MSc concurrent option the start date for the thesis is the same as for Part 1. The due date for the thesis is 28 months (i.e. 12 [Part 1] + 16 [Part 2]) from start date.

Note: For transfer from MSc to PhD the commencement date will normally be back-dated to the date at which the MSc was started.

Note: Progress reports in SBS are normally required every 6 months. Due dates are the first Monday in April and first Monday in October.

Note: A student must be enrolled when they hand in their thesis. Thus any extensions of the due date incur more fees!

Note: Application forms for MSc extension, transfer, suspension, part time and start date are to be found at www.science.canterbury.ac.nz/students/forms.html

Appendix 2: Determining the Class of Honours

	BSc(Hons)		MSc (Parts 1 & 2)		MSc (Part 2 Only)		PGDS	
Courses	4 400-level papers + research project equally weighted (20% each)		4 400-level papers + thesis weighted in accordance with MSc Schedule 2 (see Table below)		Thesis			
Class	Letter Grade	GPA	Letter Grade	GPA	Letter Grade	GPA	Letter Grade	GPA
1 st	A+, A, A-	7- 9	A+, A, A-	7-9				
2 nd Div 1	B+	6-6.99	B+	6-6.99				
2 nd Div 2	B, B-	4-5.99	B, B-	4-5.99				
3 rd	C, C+	2-3.99	C, C+	2-3.99				
Distinction					A+, A, A-	7-9	A+, A, A-	7-9
Merit					B+	6-6.99	B+	6-6.99

GPA – Grade Point Average; **Part 1** – Papers; **Part 2** – Thesis.

Note: Percent (Grade): 84.5+ (A+), 79.5-84.4 (A), 74.5-79.4 (A-), 69.5-74.4 (B+), 64.5-69.4 (B), 59.5-64.4 (B-), 54.5-59.4 (C+), 49.5-54.4 (C), 39.5-49.4 (D), <39.5 (E).

Note: Grade (GP value): A+ (9), A (8), A- (7), B+ (6), B (5), B- (4), C+ (3), C (2), C- (1), D (0), E (-1). GPA values are based on the sum of GP x Course Weight (CW) and they include all passed, failed and repeated courses. GPA values cannot be rounded.

Note: To be eligible for MSc Honours a student must offer both Part 1 & Part 2 and complete the thesis within 16 months. Minimum/maximum duration of Part 2 is 12/24 months.

Note: If a student is awarded PGDS for the papers then their MSc result is determined only by the thesis and they are not eligible for Honours, but they are eligible for Merit/Distinction.

Note: For BSc(Hons) all courses (including the project) must be passed at the first attempt, unless performance has been impaired by illness or other circumstances, in which case the student may be permitted to undergo assessment a second time. For PGDS & MSc all papers must also be passed at the first attempt, unless there was impairment (see above), but if no more than one paper is failed, a pass in the year as a whole may be recommended, provided that a GPA of at least 4 (B-) is attained including the failed course. However it should be noted that normally a B- would be insufficient to allow progress from Part 1 to Part 2.

The School of Biological Sciences is housed in the Biology building (B prefix) and the adjacent von Haast building.



School of Biological Sciences

Tel: 364 2500, Fax: 364 2590

Email: biology@canterbury.ac.nz

www.biol.canterbury.ac.nz

University of Canterbury

Te Whare Wānanga o Waitaha

Private Bag 4800, Christchurch 8140, New Zealand

Tel: 3667001, Fax: 364 2999

www.canterbury.ac.nz