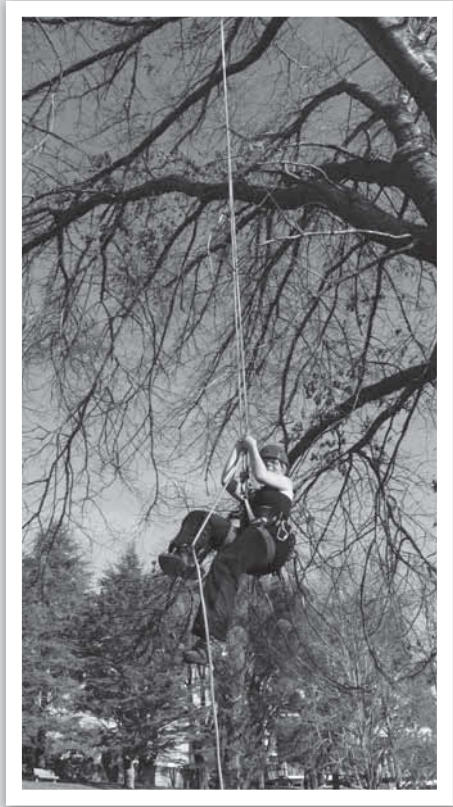


BIOLOGICAL SCIENCES



CONTACT DETAILS

www.bio.waikato.ac.nz

Department of Biological Sciences
University of Waikato
Private Bag 3105
Hamilton 3240
New Zealand
Email: biology@waikato.ac.nz

Executive Officer

Gillian Duffy
Room: E2.20A
Phone +64 7 858 5138
Fax +64 7 838 4324

Departmental Administrator

Gloria Edwards
Room: E2.20
Phone +64 7 838 4022
Fax +64 7 838 4324

Administrative Assistant

Vicki Smith
Room: E2.20
Phone: +64 7 838 4148
Fax: +64 7 838 4324

INTRODUCTION

The Department of Biological Sciences provides research and postgraduate study opportunities where all research students acquire basic research skills and a knowledge of techniques, as well as training in specialist disciplines. All students will obtain a wide experience of practical and field research.

Research programmes exist across a wide range of disciplines, supported by the primary research interests of staff. Research areas include:

- » Animal behaviour
- » Animal physiology
- » Antarctic ecosystems
- » Biochemistry
- » Botany
- » Cellular and molecular biology
- » Freshwater ecosystems
- » Genetics
- » Marine ecosystems
- » Microbiology
- » Science education
- » Terrestrial ecosystems
- » Thermophiles
- » Zoology.

Research projects in the Department are supported by multi-million dollar investments from national and local government, many of which have significant iwi and other community involvement. These include lakes management, freshwater ecology, urban restoration, medical microbiology and Antarctic ecosystems. This funding also supports a variety of student and collaborative projects, together with scholarships and postgraduate opportunities.

Research units and facilities within the Department include the Waikato Stable Isotope Unit, the Honey Research Unit, the Waikato DNA Sequencing Facility, the Centre for Biodiversity & Ecology Research, the Thermophile & Microbial Biochemistry & Biotechnology Unit, and the University of Waikato Herbarium (WAIK).

In the Tertiary Education Commission's 2006 Performance-Based Research Fund evaluations, Waikato University was ranked first in New Zealand for the quality of its research in molecular, cellular and whole organism biology, and in ecology, evolution and behaviour.

ACADEMIC STAFF

Associate Professor Brendan Hicks – Chairperson

BSc, MSc(Hons) *Auckland*, PhD *Oregon State*

Email: b.hicks@waikato.ac.nz

Research interests: Ecology and habitats of freshwater fish; pest control; and stable isotopes in food webs.

Associate Professor Vic Arcus

BSc, MSc *Waikato*, PhD *Cambridge*

Email: varcus@waikato.ac.nz

Research interests: Molecular biology; structural biology; and protein engineering.

Dr Steven Bird

BSc(Hons), PhD *Aberdeen*

Email: s.bird@waikato.ac.nz

Research interests: Molecular immunology, genetic evolution of immune system communication in vertebrates, immune genes as markers of fish health, development of antibodies to immune genes in vertebrates.

Dr Alison Campbell

BSc(Hons), PhD *Massey*, TTC

Email: a.campbell@waikato.ac.nz

Research interests: The disparate fields of animal behaviour and science education, with a particular interest in students' understanding of the language of science; gaps in student knowledge (and how to bridge them); and attitudes to the theory of evolution.

Professor Craig Cary

BSc *Florida Tech*, MSc *San Diego State*, PhD *UC San Diego*

Email: c.cary@waikato.ac.nz

Research interests: Comparative physiology; biochemistry and ecology of microbial communities, with a focus on free-living syntrophic bacterial associations in extreme environments including hydrothermal vents and Antarctic soils; the use of high through-put genomic and molecular approaches to resolve biochemical adaptations to life in these extreme geochemical environments; interfacing new bioinformatic capabilities with genomic technologies in the metagenome analysis of complex microbial communities; and thermal stability of eurythermal proteins.

Professor Bruce Clarkson

BSc, MSc(Hons), DPhil *Waikato*

Email: b.clarkson@waikato.ac.nz

Research interests: Vegetation dynamics; autecology of threatened flora; and restoration ecology.

Dr Michael Clearwater

BSc, MSc(Hons) *Auckland*, PhD *Edin*

Email: m.clearwater@waikato.ac.nz

Research interests: Plant biology, plant physiology, plant physiological ecology, plant water relations, xylem and phloem transport, photosynthesis, tree biology, horticulture, fruit production, kiwifruit, avocado, sap flow and forest ecology.

Dr Kevin Collier

BSc *Waikato*, PhD *Canterbury*

Email: kcollier@waikato.ac.nz

Research interests: Interactions between land use and stream macroinvertebrate communities; restoration of urban streams; development of indicators for monitoring aquatic ecosystem health; and the ecology of large rivers.

Dr Ray Cursons

BSc(Hons), MSc, PhD *Massey*
 Email: r.cursons@waikato.ac.nz

Research interests: Host and pathogen relationships; inflammation; innate immune markers; and mastitis.

Professor Roy Daniel

BSc(Hons), PhD *Leicester*, FRSNZ, FNZIC
 Email: r.daniel@waikato.ac.nz

Research interests: The biochemistry, microbiology, and biotechnological applications of extremely thermophilic bacteria. Within these areas, major current topics are: a) the inter-relationship of enzyme activity, stability, and dynamics; b) the effect of temperature on enzymes; and c) properties and applications of stable enzymes, especially proteases.

Dr Ian Duggan

BSc, MSc, PhD *Waikato*
 Email: i.duggan@waikato.ac.nz

Research interests: Invasion biology and zooplankton ecology, particularly the exploration of biological invasion vectors responsible for transportation of species at global or finer scales. Such investigations are useful for prediction and prevention of invasions of non-indigenous species.

Dr Chris Eames

BSc, MSc, PhD *Waikato*
 Email: c.eames@waikato.ac.nz

Research interests: Environmental education; biotechnology education; learning in science and technology through cooperative education work placements; tertiary science/biology education; and science and technology human capital development.

Professor Roberta Farrell

BSc *Missouri*, MSc, PhD *Illinois*, CNZM, FRSNZ, FIAWS
 Email: r.farrell@waikato.ac.nz

Research interests: Mycology; biotechnology applications to wood, microbial and enzyme production; Antarctic fungi and historic huts deterioration.

Dr Chrissen Gemmill

BSc *California*, PhD *Colorado*
 Email: c.gemmill@waikato.ac.nz

Research interests: Molecular systematics; conservation and restoration genetics; and biogeography of endemic Pacific plants, in particular plants of New Zealand and New Caledonia.

Professor David Hamilton

BSc, PhD *Otago*
 Email: d.hamilton@waikato.ac.nz

Research interests: Modelling of water quality in lakes and reservoirs: sediment–water interactions, and wind resuspension of bottom sediments; and bloom forming algae, particularly cyanobacteria. Research on the Rotorua Lakes is supported through the Environment Bay of Plenty Chair in Lakes Management and Restoration.

Associate Professor Ian Hogg

BSc(Hons) *Toronto*, MAppSc *Canberra*, PhD *Toronto*
 Email: i.hogg@waikato.ac.nz

Research interests: Ecology and consequences of environmental change/disturbance. In particular, the biodiversity of Antarctic invertebrates; genetic diversity and conservation of natural populations; freshwater and estuarine ecology; global climate change and environmental stress.

ACADEMIC STAFF

Dr C M King

BSc(Hons) *Liverpool*, DPhil *Oxford*, PhD *Waikato*

Email: c.king@waikato.ac.nz

Research interests: Biology of carnivores, especially stoats and weasels; the ecology of small mammals, especially rodents and mustelids; the philosophy and management of nature conservation in national parks in New Zealand and Africa; and historical and contemporary relationships between science and theology.

Dr Daniel C Laughlin

BSc *Calvin College*, MSc *Penn State University*, PhD *Northern Arizona University*

Email: d.laughlin@waikato.ac.nz

Research interests: Plant community ecology; comparative plant ecology and trait-based community assembly; ecosystem ecology and restoration; and fire ecology.

Associate Professor Nick Ling

BSc, MSc(Hons), PhD *Auckland*

Email: nling@waikato.ac.nz

Research interests: Comparative physiology, particularly of fishes; ecotoxicology of fish and invertebrates; and physiology of vertebrate muscle.

Dr Chris Lusk

Bsc, MSc *Massey*, PhD *Auckland*

Email: clusk@waikato.ac.nz

Research interests: Forest ecology; plant functional ecology; forest dynamics; plant species sorting on environmental gradients; and forest ecosystem processes.

Dr Ryan Martinus

BSc, MSc *Waikato*, PhD *Massey*

Email: r.martinus@waikato.ac.nz

Research interests: Understanding relationships between mitochondrial stress and cellular inflammation in a) brain (ageing and neurodegeneration), b) pancreatic islet cells (diabetes) and c) reproductive processes (male fertility).

Associate Professor Ian McDonald

BSc(Hons) *Ulster*, PhD *Liverpool*

Email: i.mcdonald@waikato.ac.nz

Research interests: Microbiology, molecular biology and biochemistry of atmospheric trace gas degrading bacteria; microbial ecology of methane, methyl halide and carbon monoxide utilising bacteria; and microbial ecology in extreme environments, including the Antarctic and New Zealand geothermal environments.

Professor Peter Molan, MBE

BSc(Hons) *Wales*, PhD *Liverpool*

Email: pmolan@waikato.ac.nz

Research interests: Antimicrobial, anti-inflammatory and antioxidant properties of honey; clinical and veterinary uses of honey; and development of honey-based wound dressing materials.

Professor Hugh Morgan

BSc(Hons) *Wales*, MSc(Hons) *Strathclyde*, PhD *Geulph*

Email: h.morgan@waikato.ac.nz

Research interests: Ecology and physiology of extremely thermophilic bacteria, and fermentations of glycolytic anaerobes; polymer hydrolysis in thermophilic environments; and Lignocellulose hydrolysis by Huhu grubs.

Dr Pawel K Olszewski

MSc *Warsaw*, PhD *Minnesota/Cracow (joint programme)*

Email: pawel@waikato.ac.nz

Research interests: Regulation of appetite and body weight; brain circuits that control hunger, satiety and feeding reward; and pharmacological agents that modify food intake.

Dr Linda Peters

BSc(Hons) *Victoria*, PhD *Waikato*

Email: lpeters@waikato.ac.nz

Research interests: Human molecular genetics and bioinformatics; in particular, identifying genetic changes that contribute to common hereditary disorders in New Zealand.

Dr Conrad Pilditch

BSc, MSc *Otago*, PhD *Dalhousie*

Email: c.pilditch@waikato.ac.nz

Research interests: Marine benthic ecology and oceanography, in particular how water movement affects benthic community dynamics through sediment transport, recruitment and food supply, ecology of suspension-feeders and bivalve aquaculture.

Professor Joe Waas

BSc(Hons) *Trent*, PhD *Canterbury*

Email: waasur@waikato.ac.nz

Research interests: Behaviour and ecology of birds, fish and mammals including studies of

- a) animal communication, b) the biology of aggression, c) animal welfare,
- d) social factors influencing reproductive physiology, e) conservation biology,
- f) social recognition systems and g) the ontogeny of social behaviour.

Dr Wei Ye

BEng *Tsinghua*, MSc *Chinese Academy for Preventive Medicine*, PhD *ANU*

Email: weiy@waikato.ac.nz

Research interests: Climate change impact studies; integrated computer model system development for environmental impact assessment; and hydrological modelling.

PAPERS

All 500 Level papers are delivered subject to demand.

BIOL502-12B (HAM) – Research Methods and Skills

15 Points

This paper focuses on essential research skills for the biological sciences, including literature reviews, proposal writing and seminar presentations. It is a **compulsory** paper for students enrolled in MSc and MSc(Tech) degrees in Biological Sciences.

Convenor(s): Associate Professor Ian Hogg
 Prerequisite(s): BSc
 Restriction(s): BIOL501 and EARTH501
 Assessment: Internal assessment/examination ratio: 1 : 0

BIOL503-12A (HAM) – Data Analysis and Experimental Design

15 Points

This paper will cover aspects of research design for experiments, and methods for analysis of ecological data using univariate and multivariate statistical techniques.

Convenor(s): Dr Ian Duggan
 Prerequisite(s): BSc
 Restriction(s): BIOL501
 Assessment: Internal assessment/examination ratio: 1 : 0

BIOL560-12A (HAM) – Freshwater Ecology

15 Points

A critical examination of issues eg pollution, conservation, and utilisation, that freshwater ecosystems face and methods to mitigate potentially competing interests.

Convenor(s): Associate Professor Ian Hogg
 Prerequisite(s): BSc, BIOL313 or equivalent
 Restriction(s): BIOL513
 Assessment: Internal assessment/examination ratio: 3 : 7

BIOL561-12B (HAM) – Modelling Aquatic Ecosystems

15 Points

This paper examines the different types of models that may be applicable in aquatic ecosystem modelling, including statistical, empirical, and process-based models. The key steps to setting up a model application are covered as well as the limitations and pitfalls of each type of model. Applications of the models are demonstrated for different lake ecosystems, with students having an opportunity to apply the models to questions of relevance to aquatic ecosystem managers.

Convenor(s): Professor David Hamilton
 Prerequisite(s): BSc, BIOL313 or equivalent third year ecology unit
 Assessment: Internal assessment/examination ratio: 1 : 0

BIOL562-12A (HAM) – Marine Ecology

15 Points

This paper focuses on a variety of contemporary issues in marine ecology and biological oceanography including: fisheries biology and management, recruitment, ecology of disturbances, benthic-pelagic coupling, aquaculture and primary production.

Convenor(s): Dr Conrad Pilditch
 Prerequisite(s): BSc, BIOL314 or equivalent
 Restriction(s): BIOL514
 Assessment: Internal assessment/examination ratio: 3 : 7

BIOL563-12B (HAM) – Aquatic Field Methods*15 Points*

This paper focuses on sampling methods, as well as experimental design and data analyses related to biological field studies in marine and freshwater sciences.

Convenor(s): Associate Professor Ian Hogg
Prerequisite(s): BSc, BIOL313 or BIOL314 or equivalent
Corequisite(s): BIOL560 or BIOL562
Assessment: Internal assessment/examination ratio: 1 : 1

BIOL564-12B (HAM) – Ecosystem Sustainability*15 Points*

Aspects of health, vitality, resilience and restoration of ecosystems. Topics covered include restoration principles, theory and practice; lake restoration; river and stream restoration; wetland restoration; and forest restoration.

Convenor(s): Professor Bruce Clarkson
Prerequisite(s): BSc, BIOL312 or BIOL325 or equivalent
Corequisite(s): BIOL570
Restriction(s): BIOL515
Assessment: Internal assessment/examination ratio: 1 : 4

BIOL565-12A (HAM) – Molecular Ecology*15 Points*

This paper is open to students interested in molecular ecology, systematics, and environmental molecular biology. Topics covered include conservation and evolutionary genetics, molecular ecology, and phylogenetics.

Convenor(s): Professor Craig Cary
Prerequisite(s): BSc, at least one of the following papers: BIOL310, BIOL312, BIOL313, BIOL326, BIOL338, BIOL341 or equivalent
Restriction(s): BIOL522
Assessment: Internal assessment/examination ratio: 3 : 7

BIOL570-12A (HAM) – Plant Ecology*15 Points*

Autecology of plants and the structure and functioning of plant communities. Topics covered include ecological genetics; weed biology; population demography and regeneration dynamics; vegetation change (succession); and vegetation survey and analysis.

Convenor(s): Professor Bruce Clarkson
Prerequisite(s): BSc, BIOL312, BIOL313 or BIOL325 or equivalent
Corequisite(s): BIOL571
Restriction(s): BIOL521
Assessment: Internal assessment/examination ratio: 3 : 7

BIOL571-12B (HAM) – Plant Function*15 Points*

Contemporary topics in plant environmental physiology, with an emphasis on the functioning of plants at the physiological, whole plant and ecological level. Topics will include the acquisition of carbon and water by plants and limitations to plant productivity in natural and managed environments.

Convenor(s): Dr Mike Clearwater
Prerequisite(s): BSc, BIOL312 or BIOL325 or equivalent
Corequisite(s): BIOL570
Restriction(s): BIOL521
Assessment: Internal assessment/examination ratio: 3 : 7

PAPERS

BIOL572-12B (HAM) – Animal Behaviour

15 Points

The purpose of this paper is to provide students with an understanding of contemporary approaches to the study of animal behaviour, exploring recent literature on (1) the function of behaviour, (2) the evolutionary history of behaviour, (3) the development of behaviour, and (4) the mechanisms of behaviour. Special attention will be devoted to developing an appreciation of experimental design and fostering an ability to think critically about ethological research questions.

Convenor(s): Professor Joseph Wass
 Prerequisite(s): BSc, BIOL333 or equivalent
 Restriction(s): BIOL533
 Assessment: Internal assessment/examination ratio: 2 : 3

BIOL573-12A (HAM) – Animal Biology and Conservation

15 Points

The purpose of this paper is to explore the key general principles of zoology, with special reference to the evolutionary history and conservation of animal life.

Convenor(s): Dr C. Kim King
 Prerequisite(s): BSc, BIOL201, BIOL338 or equivalent, BIOL333 would be an advantage
 Restriction(s): BIOL533
 Assessment: Internal assessment/examination ratio: 2 : 3

BIOL574-12A (HAM) – Mammalian Physiology

15 Points

This paper examines selected topics in the physiology of humans and other mammals. Students will develop an understanding of physiological control systems and the integration of mammalian structure and function.

Convenor(s): Associate Professor Nicholas Ling, Dr Pawel Olszewski
 Prerequisite(s): BSc, BIOL335 (or external equivalent)
 Restriction(s): BIOL535
 Assessment: Internal assessment/examination ratio: 1 : 4

BIOL575-12B (HAM) – Applied Topics in Physiology

15 Points

This paper examines selected topics in the applied physiology of mammals, especially reproduction and lactation, in association with researchers in industry. Students will develop an understanding of the application of physiological knowledge and principles to commercial and medical technologies.

Convenor(s): Associate Professor Nicholas Ling, Dr Pawel Olszewski and contributors from external organisations
 Prerequisite(s): BSc, BIOL335 (or external equivalent)
 Restriction(s): BIOL535
 Assessment: Internal assessment/examination ratio: 1 : 4

BIOL576-12A (HAM) – Animal Ecophysiology

15 Points

This paper provides an introduction to specified topics in animal environmental physiology. Critical evaluation of selected readings from the scientific literature will provide a theoretical framework for the specified topics and an introduction to recent research in those fields. Students will develop an understanding of how animals are challenged by and adapt to challenging or extreme environments.

Convenor(s): Associate Professor Nicholas Ling
 Prerequisite(s): BSc, BIOL335 or BIOL338 (or external equivalent)
 Restriction(s): BIOL538
 Assessment: Internal assessment/examination ratio: 1 : 4

BIOL577-12B (HAM) – Aquatic Toxicology*15 Points*

This paper provides an introduction to specified topics in aquatic toxicology including toxicology analysis and bioaccumulation. Critical evaluation of selected readings from the scientific literature will provide a theoretical framework for the specified topics and an introduction to recent research in those fields. Students will develop an understanding of ecological impacts of water-borne contaminants and methods for the bioassay of toxicant effects.

Convenor(s): Associate Professor Nicholas Ling and contributors from NIWA
Prerequisite(s): BSc, BIOL313 or BIOL314 (or external equivalent)
Restriction(s): BIOL538
Assessment: Internal assessment/examination ratio: 1 : 1

BIOL580-12A (HAM) – Human and Applied Microbiology*15 Points*

Lantibiotic structure and function; microbial communities in the human gut; prospects and problems with microbial biofuels.

Convenor(s): Professor Hugh Morgan
Prerequisite(s): BSc, BIOL341 or equivalent
Restriction(s): BIOL541
Assessment: Internal assessment/examination ratio: 1 : 0

BIOL581-12B (HAM) – Microbial Ecology*15 Points*

Molecular microbial ecology, stable isotopes in microbial ecology, metagenomics, biogeography, and other current topics in microbial ecology.

Convenor(s): Associate Professor Ian McDonald
Prerequisite(s): BSc, BIOL341 or equivalent
Restriction(s): BIOL541
Assessment: Internal assessment/examination ratio: 1 : 0

BIOL582-12A (HAM) – Biomolecular Structure & Function*15 Points*

An in-depth examination of biomolecular structure and function using selected examples from the biochemistry literature.

Convenor(s): Associate Professor Vic Arcus
Prerequisite(s): BSc, BIOL351, CHEM301 or equivalent
Restriction(s): BIOL551
Assessment: Internal assessment/examination ratio: 1 : 4

BIOL583-12B (HAM) – Molecular Biochemistry and Metabolism*15 Points*

An in-depth examination of molecular biochemistry and metabolism using selected examples from biochemistry literature.

Convenor(s): Dr Ryan Martinus
Prerequisite(s): BSc, BIOL351, CHEM301 or equivalent
Restriction(s): BIOL551
Assessment: Internal assessment/examination ratio: 1 : 4

PAPERS

BIOL584-12A(HAM) – Molecular Genetics

15 Points

This course explores how molecular biology and bioinformatic research contribute to our understanding of molecular genetics. Subjects covered in this course will include molecular technologies, comparative genomics and evolution, epigenetics, genetic diversity, genetic diseases, pharmacogenomics and personalised medicine.

Convenor(s): *Dr Ray Cursons*
 Prerequisite(s): *BSc, BIOL310 or equivalent*
 Restriction(s): *BIOL510*
 Assessment: *Internal assessment/examination ratio: 0 : 1*

BIOL585-12B (HAM) – Human Genetics

15 Points

This course explores the genetics of human evolution, adaptation and disease. The topics will extend from classical population genetics into contemporary areas of molecular biology and bioinformatics. Particular attention will be paid to key genetic changes that occurred during hominid evolution, polymorphic variations and disease susceptibility in humans and the role of somatic mutations in cancer.

Convenor(s): *Dr Linda Peters*
 Prerequisite(s): *BSc, BIOL310 or equivalent*
 Restriction(s): *BIOL510*
 Assessment: *Internal assessment/examination ratio: 0 : 1*

BIOL588-12A/B (HAM) – Special Topic

15 Points

Guided individual study on an aspect of Biological Sciences. By arrangement, and with the approval of the chairperson of Biological Sciences.

Convenor(s): *Associate Professor Ian Hogg*
 Prerequisite(s): *BSc or equivalent*
 Restriction(s): *BIOL555*
 Assessment: *Internal assessment/examination ratio: 1 : 0*

BIOL590-12C/D (HAM) – Directed Study

30 Points

May involve a literature review, the preparation of a proposal or a preliminary investigation. Generally a research paper will be required, but there will be no formal examination.

Convenor(s): *To be advised*
 Assessment: *Internal assessment/examination ratio: 1 : 0*

COMP555-12A (HAM) – Bioinformatics

15 Points

For a full description, see the *Faculty of Computing & Mathematical Sciences Handbook*.

Dissertations and Theses for MSc and MSc(Tech)

POINTS	CODE	TITLE
30	BIOL591-12C (HAM)	Dissertation (1 paper)
60	BIOL592-12C (HAM)	Dissertation (2 papers)
90	BIOL593-12C (HAM)	Biological Sciences Thesis (3 papers)
120	BIOL594-12C (HAM)	Biological Sciences Thesis (4 papers)
150	BIOL595-12C (HAM)	Biological Sciences Thesis (5 papers)

General Notes

Students normally complete 120 points of taught course work in their first MSc year, and thesis research worth 120 points in their second MSc year.

Completion within two years of full-time study is required to be eligible for an MSc with honours.