School of Biology

Head of School

Professor D Paterson

Degree Programmes

M.Phil.:	Neuroscience & Behavioural Biology
M.Res.:	Environmental Biology
	Environmental Biology Conversion for Mathematical, Physical and Molecular Sciences
	Structural Proteomics.

Programme Requirements

Environmental Biology

M.Res.: BL5015, BL5018, BL5019, BL5021, ID5001, MT5752, MT5753 and 3 of the following: BL5009, BL5010, BL5011, BL5012, BL5013, MT5751

Environmental Biology Conversion for Mathematical, Physical and Molecular Sciences

M.Res.: BL5015, BL5018, BL5019, BL5008, MN5020, MT5752, MT5753 and 3 of the following: BL5009, BL5010, BL5011, BL5012, BL5013, MT5751

Neuroscience & Behavioural Biology

M.Phil.: This programme is offered by direct entry to the second year of an MPhil only. Entry is restricted to candidates with a good first degree (2.1 or equivalent) in a relevant discipline (which should normally have included significant elements of both neuroscience and behavioural biology approached from the perspectives of Biology and/or Psychology).

The programme comprises 30 credits taken from 4000 or 5000 level modules offered by the Schools of Biology and Psychology (modules in other Schools which are relevant to the area of the research topic may be taken at the discretion of the Head of School), plus a 40,000 word research thesis.

Structural Proteomics

M.Res.: BL5050, BL5051, BL5052, BL5053, BL5054, ID5005

Modules
InterDisciplinary (ID) Modules

This School co-ordinates and contributes to an inter-disciplinary module – **ID5001 Enterprise, Creativity and Innovation.** This appears in the Interdisciplinary Section of the Catalogue (Section 13) as well as below.

BL5008 Basic Concepts in Ecology and Evolution

Credits: 15.0 Semester: 1 (3 weeks)

Programme(s): Compulsory module for M.Res. in Environmental Biology Conversion for Mathematical, Physical and Molecular Sciences Postgraduate Taught Programme.

Description: The central objective of the module will be to provide an overview of the elements of ecology and evolution that apply directly to environmental issues. The ecology section (6 lectures) will address single-species populations and their growth, competition and its consequences, and predation and related processes. The evolution section (6 lectures) will address variation and its genetic basis, selection, sociality, and sex. This will enable students to achieve a synthesis between their previous training and modern approaches to ecology and evolution, as a prelude to the more specialist topics in later modules.

Class Hour: To be arranged.

Teaching: Four lectures and one tutorial each week for 3 weeks.

Assessment: Continuous Assessment = 40%, One-and-a-half Hour Examination = 60%

BL5009 Plant Responses to their Environment

Credits: 10.0 Semester: 1 (2 weeks)

Programme(s): Optional module for M.Res. in Environmental Biology and M.Res. in Environmental Biology Conversion for Mathematical, Physical and Molecular Sciences Postgraduate Taught Programmes.

Description: This module examines the ways in which plants interact with their physical, chemical and biological environments, and how human beings influence these interactions. Examples of responses at the cellular and molecular level will be examined within the wider context of the response of the whole organism to different environmental conditions, and particular emphasis will be placed on formulation of hypotheses and on experimental methods. The aim is to provide the student with a knowledge of fundamental plant processes and of how the environment influences plant growth in 'nature' and in agricultural systems.

Class Hour: To be arranged.

Teaching: Three lectures, one tutorial and one practical each week for 2 weeks.

Assessment: Continuous Assessment = 40%, One-and-a-half Hour Examination = 60%

BL5010 Marine Ecology and Physiology

Credits: 10.0 Semester: 1 (2 weeks)

Programme(s): Optional module for M.Res. in Environmental Biology and M.Res. in Environmental Biology Conversion for Mathematical, Physical and Molecular Sciences Postgraduate Taught Programmes.

Description: This module will investigate how simple Newtonian mechanics and consideration of scale can explain many important phenomena at the level of cells, tissues, whole animals and the large scale properties of ecosystems. The lecturers will illustrate the principles with respect to their own research on muscle growth and locomotion, ion and water transporting epithelia, the distribution and behaviour of pelagic organisms and larval recruitment. This theme allows the introduction of central ecological and physiological issues in a context relevant to the previous experience of the participants.

Class Hour: To be arranged.

Teaching: Three lectures, one tutorial each week for 2 weeks and one practical class.

Assessment: Continuous Assessment = 40%, One-and-a-half Hour Examination = 60%

BL5011 Conservation Biology

Credits: 10.0 Semester: 2 (2 weeks)

Programme(s): Optional module for M.Res. in Environmental Biology and M.Res. in Environmental Biology Conversion for Mathematical, Physical and Molecular Sciences Postgraduate Taught Programmes.

Description: This module will cover the measurement of biodiversity, the meaning of biodiversity, factors determining extinction risk for local populations, and the effect of spatial variation on biodiversity. Practical sessions will include an introduction to diversity measurement (including sampling issues, computer packages and interpretation of output), population viability analysis, and the use of "environmental futures" to guide research strategies.

Class Hour: To be arranged.

Teaching: Five lectures each week for two weeks, one tutorial, one practical class and one workshop.

Assessment: Continuous Assessment = 40%, 2 Hour Examination = 60%

BL5012 Environmental Genomics

Credits: 10.0 Semester: 2 (2 weeks)

Programme(s): Optional module for M.Res. in Environmental Biology and M.Res. in Environmental Biology Conversion for Mathematical, Physical and Molecular Sciences Postgraduate Taught Programmes.

Description: In general terms, this module will consider how a knowledge of the organisation and expression of an organism's genome can (a) inform our understanding of its relationship with its environment and (b) facilitate advanced approaches to environmental monitoring. Specifically, the module will describe current approaches to genome analysis, and will present examples to illustrate the application of modern genomic and proteomic techniques to aspects of microbial ecology, host/parasite interactions and plant evolution.

Class Hour: To be arranged.

Teaching: Three lectures, one tutorial each week for two weeks and one practical class.

Assessment: Continuous Assessment = 40%, One-and-a-half Hour Examination = 60%

BL5013 Environmental Microbiology and Ecotoxicology

Credits: 10.0 Semester: 2 (2 weeks)

Programme(s): Optional module for M.Res. in Environmental Biology and M.Res. in Environmental Biology Conversion for Mathematical, Physical and Molecular Sciences Postgraduate Taught Programmes.

Description: This module will provide a foundation for understanding the principles underpinning environmental microbiology and exotoxicology. Students will be introduced to the physico-chemical parameters which regulate microbial growth in natural environments and the strategies that microorganisms have evolved which enable them to grow in extreme environments. Having gained an overview of the key processes regulating microbial growth, the focus will shift to the consideration of specific case studies. These will include the biogeochemical cycling of nitrogen and sulfur and how an understanding of these processes can be exploited to control eutrophication and bioremediate contaminated soils and water. The final element of this module will be to introduce principles of ecotoxicology and provide an understanding of the origins, significance, and fate and management strategies for the control and removal of environmental pollutants.

Class Hour: To be arranged.

Teaching: Three lectures, one tutorial each week for 2 weeks and one practical class.

Assessment: Continuous Assessment = 40%, One-and-a-half Hour Examination = 60%

BL5015 Essential scientific skills and legislation

Credits: 0 Semester: 1 (1 week)

Programme(s): Compulsory module for M.Res. in Environmental Biology and M.Res. in Environmental Biology Conversion for Mathematical, Physical and Molecular Sciences Postgraduate Taught Programmes.

Description: The module is designed to provide an introduction to fundamental research requirements including core laboratory and fieldwork skills to enable safe research in both laboratory and the field. Seminars and lectures will cover the University Safety Policy, Risk Assessment, Fire Safety, COSSH Regulations and relevant legislation for performing research in the UK.

Class Hour: To be arranged.

Teaching: One lecture and one seminar.

Assessment: Continuous Assessment = 100%

BL5018 Case Studies in Environmental Biology

Credits: 20.0 Semester: 1 & 2 (8 weeks)

Programme(s): Compulsory module for M.Res. in Environmental Biology and M.Res. in Environmental Biology Conversion for Mathematical, Physical and Molecular Sciences Postgraduate Taught Programmes.

Description: Students will study a series of Case Studies in Environmental Biology linked to the specialist knowledge modules studied in the first semester. Each case study will consist of a lecture component linked to a workshop in which a specific scientific topic will be analyzed. The workshops will include use of database design and management, the use of the internet to run desktop experiments using public databases, field studies and laboratory studies where appropriate. Students will prepare talks, posters and internet based presentations as a means of communicating the outcomes of the workshops to the 'general public'. Concurrent to each case study there will be a seminar programme consisting of student presentations critically evaluating specific research papers.

Class Hour: To be arranged.

Teaching: One lecture, one seminar each week for 8 weeks and additional workshops.

Assessment: Continuous Assessment = 100%

BL5019 Research Project

Credits: 55.0 Semester: Summer

Programme(s): Compulsory module for M.Res. in Environmental Biology and M.Res. in Environmental Biology Conversion for Mathematical, Physical and Molecular Sciences Postgraduate Taught Programmes.

Description: The project will involve the study of a defined problem within the area of environmental biology appropriate to the modules studied by each student. This will involve the design of experiments; the gathering collation and analysis of data; and the discussion of results on their own and in the light of existing literature. The project will be written up in the form of a research dissertation or where appropriate the report may be in the form of a manuscript suitable for submission to a Journal.

Teaching: To be arranged.

Assessment: Continuous Assessment = 100%

BL5021 Basic Concepts in Mathematical and Statistical Analysis

Credits: 15.0 Semester: 1 (3 weeks)

Programme(s): Compulsory module for M.Res. in Environmental Biology Conversion for Mathematical, Physical and Molecular Sciences Postgraduate Taught Programmes.

Description: This module will provide students with the basic skills and knowledge required for subsequent compulsory modules on Ecological Dynamics and Statistical Modelling. It will demonstrate the unifying concepts underlying all mathematical and statistical modelling of biological systems, and familiarise students with basic notation, model formulation and probability theory. This will be achieved through a series of tightly linked lectures, practicals, tutorials and workbooks. In the course of the module, students will develop increasingly complex and realistic models which will then be confronted with data from a particular ecological system.

Class Hour: To be arranged.

Teaching: Three lectures, two tutorials and three practical classes.

Assessment: Continuous Assessment = 75%, 1 Hour Examination = 25%

BL5050 Proteomics and Molecular Biology

Credits: 15.0 Semester: 1

Programme(s): Compulsory Module for M.Res. in Structural Proteomics

Description: The module will introduce students to modern techniques used in molecular biology and proteomics research. These include gene cloning, gene expression using a variety of expression hosts, and protein purification methodologies. Techniques of proteomics include 2D gel electrophoresis and the use of mass spectrometry and bioinformatics for protein identification. The lectures are complemented by web-based practicals exploring and using a wide variety of bioinformatic resources, and practicals on cloning and protein purification.

Class Hour: To be arranged.

Teaching: Two lectures, one fortnightly tutorial, one full day practical class every three weeks.

Assessment: Continuous Assessment = 34%, 3 Hour Examination = 66%

BL5051 Structural Biology and Biophysics

Credits: 15.0 Semester: 1

Programme(s): Compulsory Module for M.Res. in Structural Proteomics

Description: The module will introduce students to modern techniques used in structural biology: X-ray crystallography, NMR and cryo-electron microscopy. Other complimentary spectroscopic methods used to characterise protein function and kinetics will also be explored, as will calorimetry as a means to obtain thermodynamic information. The use of robotics in high throughput structural biology will be discussed. Recent advances in optical manipulation and microscopy will be presented. A mixture of lectures, demonstrations and practicals will be used to illustrate and investigate the various methods.

Class Hour: To be arranged.

Teaching: Two lectures, one fortnightly tutorial, one full day practical class every three weeks.

Assessment: Continuous Assessment = 34%, 3 Hour Examination = 66%

BL5052 Structural Proteomics: Practical Skills

Credits: 30.0 Semester: 1

Programme(s): Compulsory Module for M.Res. in Structural Proteomics

Description: Three extended practicals will be undertaken. The first will involve proteomics techniques: the use of 2-D gel electrophoresis, mass spectrometry and bioinformatics to identify proteins. The second will use molecular graphics to investigate protein structure and molecular modelling. The third will involve designing a web site.

Class Hour: To be arranged.

Teaching: Three-day practical class every three weeks.

Assessment: Continuous Assessment = 100%

BL5053 Structural Proteomics Project I

Credits: 55.0 Semester: 2

Programme(s): Compulsory Module for M.Res. in Structural Proteomics

Description: An extended research project will be carried out in a research laboratory within the Centre for Biomolecular Sciences or School of Physics. This will involve the design of experiments; the gathering, collation and analysis of data; and the discussion of results on their own and in the light of existing literature. The project will be written up in the form of a research dissertation and presented in a research seminar format.

Class Hour: To be arranged.

Assessment: Continuous Assessment = 100%

BL5054 Structural Proteomics Project II

Credits: 55.0 Semester: Summer

Programme(s): Compulsory Module for M.Res. in Structural Proteomics

Description: An extended research project will be carried out in a research laboratory within the Centre for Biomolecular Sciences or School of Physics. This will involve the design of experiments; the gathering, collation and analysis of data; and the discussion of results on their own and in the light of existing literature. The project will be written up in the form of a research dissertation and presented in a research seminar format.

Class Hour: To be arranged.

Assessment: Continuous Assessment = 100%

ID5001 Enterprise, Creativity and Innovation (20)

Credits: 20.0 Semester: 1

Programme(s): Either ID5001 or ID5005 is **Compulsory module** for M.Res in Environmental Biology, M.Res. in Environmental Biology Conversion for Mathematical, Physical and Molecular Sciences, and M.Res in Structural Proteomics Postgraduate Taught Programmes.

Optionally available to all Postgraduate Taught Programmes, subject to approval of Course Director/Coordinator within individual Schools.

Description: Engendering a culture of enterprise, this module integrates the theory of entrepreneurship with the practical application of new business creation and development. A combination of real-life case studies and seminars from serial entrepreneurs and other business professionals will assist candidates to access their latent creativity and innovation for idea generation. Together, this will enable students to demonstrate a sound understanding of all aspects of the commercialisation process, including the significance and protection of intellectual property rights. This will play a vital role within the group project of producing a business plan/proof of concept application/research project.

Class Hour: To be arranged.

Teaching: 8 lectures and seminars over 10 weeks.

Assessment: Continuous Assessment = 100%

ID5005 Enterprise, Creativity and Innovation (10)

Credits: 10.0 Semester: 1

Programme(s): Either ID5001 or ID5005 is **Compulsory module** for M.Res in Environmental Biology, M.Res. in Environmental Biology Conversion for Mathematical, Physical and Molecular Sciences, and M.Res. in Structural Proteomics Postgraduate Taught Programmes.

Optionally available to all Postgraduate Taught Programmes, subject to approval of Course Director/Coordinator within individual Schools.

Description: In this module students will acquire a critical understanding of the concepts and theories that help to understand enterprise and the processes of entrepreneurship and leadership. Through these two elements students will enhance their ability to generate ideas through creative thinking and cognitive-mapping as well as understand the significance and protection of intellectual property rights. This will enable them to better instigate, facilitate and practice in a rigorous approach to entrepreneurship and executive creativity. Teaching media will include formal lectures, case study analysis, team-based workgroups and visiting speakers.

Class Hour: 2.00 – 5.00 pm Wednesday.

Teaching: One lecture and one seminar per week over 7 weeks.

Assessment: Continuous Assessment = 100%

MT5751 Estimating Animal Abundance

Credits: 10.0 Semester: 2 (2 weeks)

Programme(s): Optional module for M.Res. in Environmental Biology and M.Res. in Environmental Biology Conversion for Mathematical, Physical and Molecular Sciences Postgraduate Taught Programmes.

Description: The module will introduce students to the main types of survey method for wildlife populations. It will cover simple methods in some detail and provide students with a conceptual framework for building understanding of more advanced methods. By the end of the course, students will be able to identify an appropriate assessment method for a given population, be able to design a simple survey to assess the population, and perform simple analyses of survey data. Students will get experience in using the methods via computer practical sessions involving design and analyses of surveys conducted by computer simulation.

Class Hour: To be arranged.

Teaching: Four lectures, one tutorial and two practical classes each week for 2 weeks.

Assessment: Continuous Assessment = 40%, 2 Hour Examination = 60%

MT5752 Modelling Ecological Dynamics

Credits: 20.0 Semester: 2 (4 weeks)

Prerequisite: BL5021 or substantial quantitative training

Programme(s): Compulsory module for M.Res. in Environmental Biology and M.Res. in Environmental Biology Conversion for Mathematical, Physical and Molecular Sciences Postgraduate Taught Programmes.

Description: This module is designed to provide practical training in the construction and use of mathematical models of ecological dynamic systems. The module will start by covering basic dynamical concepts and mathematical tools, and will then cover modelling of individuals, single species populations, interacting populations and ecosystems. At all stages students will be expected to build and analyse models, with a combination of pencil and paper and computer software.

Class Hour: To be arranged.

Teaching: Four lectures, one tutorial and three practicals each week for 4 weeks.

Assessment: Continuous Assessment = 40%, 2 Hour Examination = 60%

MT5753 Statistical Modelling

Credits: 20.0 Semester: 1 (4 weeks)

Programme(s): Compulsory module for M.Res. in Environmental Biology and M. Res. in Environmental Biology Conversion for Mathematical, Physical and Molecular Sciences Postgraduate Taught Programmes.

Description: This module will introduce the main ideas of linear and generalised linear statistical modelling and will provide training in applied statistical modelling. The module structure is as follows: what statistical models are and what they are for; distributions, point and interval estimation and hypothesis testing; simple linear regression models for normal data; multiple regression; multiple regression with qualitative explanatory variables; less linear models for non-normal data; generalized linear models. Lectures will be built around the book "An Introduction to Statistical Modelling" (Krzanowski, 1998), which closely matches what we believe to be an ideal course structure.

Class Hour: To be arranged.

Teaching: Four lectures, one tutorial and three practicals each week for 4 weeks.

Assessment: Continuous Assessment = 40%, 2 Hour Examination = 60%

MT5754 Mini Project 1

Credits: 20.0 Semester: 2 (4 weeks)

Prerequisite: MT5752 or the equivalent course out-with St Andrews

Programme(s): Optional module for M.Res. in Environmental Biology and M. Res. in Environmental Biology Conversion for Mathematical, Physical and Molecular Sciences Postgraduate Taught Programmes.

Description: This module is an alternative to students who have already studied MT5752 (Modelling Ecological Dynamics) as part of their undergraduate training or have gained an equivalent level of training out-with St Andrews. The module will allow the student to apply the skills and knowledge previously acquired in a short mini project appropriate to the taught module. The mini project will be designed to have the same workload as the equivalent taught module.

Class Hour: To be arranged.

Teaching: Individual projects planned with the appropriate Module Co-ordinator and meetings arranged as required.

Assessment: Continuous Assessment = 100%

MT5755 Mini Project 2

Credits: 20.0 Semester: 1 (4 weeks)

Prerequisite: MT5753 or the equivalent course out-with St Andrews

Programme(s): Optional module for M.Res. in Environmental Biology and M. Res. in Environmental Biology Conversion for Mathematical, Physical and Molecular Sciences Postgraduate Taught Programmes.

Description: This module is an alternative to students who have already studied MT5753 (Statistical Modelling) as part of their undergraduate training or have gained an equivalent level of training out-with St Andrews. The module will allow the student to apply the skills and knowledge previously acquired in a short mini project appropriate to the taught module. The mini project will be designed to have the same workload as the equivalent taught module.

Class Hour: To be arranged.

Teaching: Individual projects planned with the appropriate Module Co-ordinator and meetings arranged as required.

Assessment: Continuous Assessment = 100%