

## **2020/1 - BIO-4002B EVOLUTION, BEHAVIOUR AND ECOLOGY**

Spring Semester, Level 4 module  
(Maximum 160 Students)

UCU: 20

Organiser: Dr Harriet Jones

(UG) MODULE - 40% PASS ON AGGREGATE

Module Type: Examination with Coursework or Project

Timetable Slot:G1, H2, D3\, G2+, A2/

Why do trees grow tall? Why do male birds have long bright feathers? Why do people cooperate? Why does sex exist? Why do we grow old and die? These and other questions in biology can be understood if we learn how to think in terms of natural selection and adaptation. This module introduces the main concepts in evolutionary theory, from the original ideas introduced by Darwin to the modern developments, and uses these concepts to understand a wide range of topics in behaviour and ecology. We start from evolution and discuss how Darwin arrived at the idea of natural selection, its critiques and how to address them; we then study the basics of Mendelian genetics and population genetics and learn how to check if a population is evolving; we discuss adaptation and optimisation in biology; then we move to specific issues like the evolution of reproductive systems and life cycles, the evolution of stable sex-ratios and coevolution between species; we discuss the concept of selfish genes and how it helps us think in terms of adaptation; we study the methods used to understand long-term evolution and speciation; and we conclude the first part with ideas from evolutionary medicine to understand why we get sick, and human evolution and social behaviour. In the second part of the module we focus to ecology: we discuss the general concepts of abiotic limits, resources and models of intraspecific competition and logistic growth; we learn the basic concepts of demography and population growth, interspecific competition, predation, predator-prey dynamics, and we discuss at length mutualism and cooperation in nature; finally we talk about the nature of the English countryside and issues in conservation biology and ecosystem services. In the third part we focus on behaviour: after a general introduction on the key concepts in the study of animal behaviour we discuss cooperation among non-kin and the concept of kin selection and kin conflict; we review animal communication and models of sexual selection and sexual conflict.

## **2020/1 - BIO-4015B CELL BIOLOGY AND PHYSIOLOGY**

Spring Semester, Level 4 module  
(Maximum 200 Students)

UCU: 20

Organiser: Dr Laura Wagstaff

(UG) MODULE - 40% PASS ON AGGREGATE

Module Type: Examination with Coursework or Project

Timetable Slot:BB

Exam Paper(hrs):

Exam Period:SPR-02

This module will provide an understanding of the key aspects of cell biology and how these relate to the physiology of living systems. It will highlight how these principles are key to understanding some of the physiological processes, as well as the central role of homeostasis in human physiology. It will also explore the function of some of the major organ systems of

the human body.

### **2020/1 - BIO-4016B BIOCHEMISTRY AND CELL BIOLOGY**

Spring Semester, Level 4 module

(Maximum 75 Students)

UCU: 20

Organiser: Dr Anthony Blake

(UG) MODULE - 40% PASS ON AGGREGATE

Module Type: Examination with Coursework or Project

Timetable Slot:E

Exam Paper(hrs):

Exam Period:SPR-02

This module will provide an introduction to fundamental aspects of biochemistry and cell biology. The essential roles played by proteins and enzymes in signalling, transport and metabolism will be considered in terms of their structures. You will discover how living cells are visualised and the nature of cell membranes and organelles.

### **2020/1 - BIO-5003B MOLECULAR BIOLOGY**

Spring Semester, Level 5 module

(Maximum 130 Students)

UCU: 20

Organiser: Dr Gabriella Kelemen

(UG) MODULE - 40% PASS ON AGGREGATE

Module Type: Examination with Coursework or Project

Timetable Slot:C, H3/, G2/, H1, B3

Exam Paper(hrs):2

**BEFORE TAKING THIS MODULE YOU MUST TAKE BIO-4013Y**

You will be given a background to the fundamental principles of molecular biology, in particular the nature of the relationship between genetic information and the synthesis, and three dimensional structures, of macromolecules. You will also gain practical experience of some of the techniques used for the experimental manipulation of genetic material, and the necessary theoretical framework. The module also includes an introduction to bioinformatics, the computer-assisted analysis of DNA and protein sequence information.

### **2020/1 - BIO-5005B CELL BIOLOGY**

Spring Semester, Level 5 module

(Maximum 200 Students)

UCU: 20

Organiser: Dr Jelena Gavrilovic

(UG) MODULE - 40% PASS ON AGGREGATE

Module Type: Examination with Coursework or Project

Timetable Slot:G1/-H2, D3\, F3, A2/, G2\

Exam Paper(hrs):2

**BEFORE TAKING THIS MODULE YOU MUST TAKE BIO-4013Y**

This module explores the molecular organisation of cells and the regulation of cellular changes, with some emphasis on medical cell biology. Dynamic properties of cell signalling, growth factor function and aspects of cancer biology and immunology. Regulation of the internal cell environment (information flow, cell growth, division and motility), the relationship of the cell to its extracellular matrix and the determination of cell phenotype. Aspects of cell death, developmental biology, mechanisms of tissue renewal and repair. It is suggested that students taking this module should also take BIO-5003B (Molecular Biology) or BIO-5009A (Genetics).

### **2020/1 - BIO-5008B EVOLUTIONARY BIOLOGY**

Spring Semester, Level 5 module  
(Maximum 90 Students)

UCU: 20

Organiser: Professor David Richardson

(UG) MODULE - 40% PASS ON AGGREGATE

Module Type: Examination with Coursework or Project

Timetable Slot: E1-H3\, F1/

Exam Paper(hrs):2

This module investigates the principles of evolutionary biology, covering various sub-disciplines, i.e. adaptive evolution, population ecology, molecular and population genetics, speciation, biogeography, systematics, and finishing with an overview of Biodiversity. This module will enable you to understand, analyse and evaluate the fundamentals of evolutionary biology and be able to synthesise the various components into an overall appreciation of how evolution works. Key topics and recent research will be used to highlight advances in the field and inspire thought. Weekly interactive workshops will explore a number of the conceptual issues in depth through discussions, modelling and problem solving. Although there are no pre-requisites in terms of specific modules, students will need a basic understanding of Evolution and Genetics to undertake this module.

### **2020/1 - BIO-5010B BEHAVIOURAL ECOLOGY**

Spring Semester, Level 5 module  
(Maximum 85 Students)

UCU: 20

Organiser: Professor Matthew Gage

(UG) MODULE - 40% PASS ON AGGREGATE

Module Type: Examination with Coursework or Project

Timetable Slot: A2\, B1/, D1-H1

**BEFORE TAKING THIS MODULE YOU MUST TAKE BIO-4002B**

We will explore how evolution and ecology shape animal behaviour, examining how important traits have evolved to maximise survival and reproduction in the natural environment. Darwinian principles provide the theoretical framework, and we will explore key concepts of selfishness, altruism, conflict, survival, optimality, reproduction, parental care and death. Relevant research will be used to lead our understanding of the ultimate function of key traits. In parallel with the lectures, students design, conduct, analyse and

present their own research project, working in a group to collect original data in order to answer a question about the adaptive significance of behaviour.

### **2020/1 - BIO-5014B COMMUNITY, ECOSYSTEM AND MACRO-ECOLOGY**

Spring Semester, Level 5 module

(Maximum 90 Students)

UCU: 20

Organiser: Dr Richard Davies

(UG) MODULE - 40% PASS ON AGGREGATE

Module Type: Examination with Coursework or Project

Timetable Slot:H3/, G2/, C1/-B3

Exam Paper(hrs):2

This module introduces you to major concepts and definitions in community ecology, macro-ecology and biogeography. You will use these to explore how communities are structured in relation to local-scale to regional-scale processes, how they function and respond to perturbations at different scales, and result in emergent macro- to global-scale patterns of biodiversity distribution. Throughout the module, there is an emphasis on the relevance of theory and fundamental science to understanding the current environmental and biodiversity crisis. Anthropogenic impacts on natural communities through land-use, species exploitation, non-native species, and climate change, are a recurrent theme underpinning the examples you will draw upon.

### **2020/1 - BIO-5015B MICROBIOLOGY**

Spring Semester, Level 5 module

(Maximum 150 Students)

UCU: 20

Organiser: Professor Jonathan Todd

(UG) MODULE - 40% PASS ON AGGREGATE

Module Type: Examination with Coursework or Project

Timetable Slot:E2+, B2, D2, A1-F1\, E2/-C3-A3

Exam Paper(hrs):4

BEFORE TAKING THIS MODULE YOU MUST TAKE BIO-4013Y OR TAKE BIO-4001A

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A broad module covering all aspects of the biology of microorganisms, providing key knowledge for specialist modules. Detailed description is given about the cell biology of bacteria, fungi and protists together with microbial physiology, genetics and environmental and applied microbiology. The biology of disease-causing microorganisms (bacteria, viruses) and prions is also covered. Practical work provides hands-on experience of important microbiological techniques, and expands on concepts introduced in lectures. The module should appeal to biology students across a wide range of disciplines and interests.

### **2020/1 - BIO-6005B MICROBIAL CELL BIOLOGY**

Spring Semester, Level 6 module  
(Maximum 20 Students)

UCU: 20 Organiser: Dr David Lea-Smith

(UG) MODULE - 40% PASS ON AGGREGATE

Module Type: Examination with Coursework or Project

Timetable Slot:E2+-C3, B2, A1/

Exam Paper(hrs):2 Exam Period:SPR-02

BEFORE TAKING THIS MODULE YOU MUST TAKE BIO-5003B OR TAKE BIO-5015B OR TAKE BIO-2B02 OR TAKE BIO-2B28

This module will provide you with a detailed understanding of cutting-edge developments in microbial cell biology. You will cover essential techniques used to carry out modern day molecular microbiology. These techniques will be further explained to you in the context of work done on model microbial systems in research conducted on the Norwich Research Park (NRP). The module is taught to you by world-leading research scientists from the NRP and focuses on the structure and analysis of bacterial genomes, the bacterial cytoskeleton, sub-cellular localisation, cell shape and cell division and intercellular communication between bacteria and higher organisms. You will also have research-led seminars delivered by NRP PhD students.

### **2020/1 - BIO-6006B CELL BIOLOGY AND MECHANISMS OF DISEASE**

Spring Semester, Level 6 module  
(Maximum 50 Students)

UCU: 20 Organiser: Dr Mette Mogensen

(UG) MODULE - 40% PASS ON AGGREGATE

Module Type: Examination with Coursework or Project

Timetable Slot:D2, E2/, F1\

Exam Paper(hrs):3

BEFORE TAKING THIS MODULE YOU MUST TAKE BIO-5005B OR TAKE BIO-2B06

Do you want to learn about the key topics within cell biology and understand how these relate to human diseases? You will learn about the structure and function of cells in health and disease through a combination of practical demonstrations, where you will experience some of the imaging techniques used in the study of Cell Biology. You will also participate in a workshop, where you will learn how to design experiments. This module will provide you with a solid understanding of aspects of cell structure, function and related diseases concerning: ubiquitination; the cytoskeleton; cell division; cell signalling in motility and wound healing; the extracellular matrix; growth factors and proliferation; cell differentiation and adult stem cells and apoptosis.

### **2020/1 - BIO-6007B MOLECULAR PLANT-MICROBE INTERACTIONS**

Spring Semester, Level 6 module  
(Maximum 0 Students)

UCU: 20 Organiser: Professor Matthew Hutchings

(UG) MODULE - 40% PASS ON AGGREGATE

Module Type: Examination with Coursework or Project

Timetable Slot:C1/, G2/, C2, D3\

Exam Paper(hrs):2

Plants interact with a range of microbes with consequences that are both beneficial (e.g. nitrogen-fixing symbioses between legumes and Rhizobium, and the wide ranging mycorrhizal interactions between plants and fungi) and harmful (with many diseases being caused by viruses, fungi and oomycetes). You will explore the ways in which the microbes recognise and invade host plants and the responses of plants to symbiotic and pathogenic microbes. The module is taught by scientists from the John Innes Centre, Sainsbury Laboratory, and UEA.

### **2020/1 - BIO-6008B EVOLUTIONARY BIOLOGY AND CONSERVATION GENETICS**

Spring Semester, Level 6 module

(Maximum 40 Students)

UCU: 20

Organiser: Professor Cock Van Oosterhout

(UG) MODULE - 40% PASS ON AGGREGATE

Module Type: Examination with Coursework or Project

Timetable Slot:C, B3, G2/, H3/

Exam Paper(hrs):3

You will gain a deep understanding about conservation genetics / genomics based on an evolutionary / population-genetic framework, thereby covering contemporary issues in conservation biology, evolution, population biology, genetics, organismal phylogeny, Next Generation Sequencing, and molecular ecology. This is an advanced course in evolutionary biology / conservation genetics that will benefit you if you plan to continue with a postgraduate degree in ecology, genetics, conservation, or evolution. It is also ideal if you are wishing to deepen your knowledge in 1st and 2nd year conservation / evolution / genetics modules. A background in evolution, genetics, and/or molecular biology is highly recommended.

### **2020/1 - BIO-6010B INFECTION AND IMMUNITY**

Spring Semester, Level 6 module

(Maximum 140 Students)

UCU: 20

Organiser: Dr Gary Rowley

(UG) MODULE - 40% PASS ON AGGREGATE

Module Type: Examination with Coursework or Project

Timetable Slot:F3, G2\+

Exam Paper(hrs):3

**BEFORE TAKING THIS MODULE YOU MUST TAKE BIO-5015B OR TAKE BIO-5005B OR TAKE BIO-2B28 OR TAKE BIO-2B06**

This module provides a detailed coverage of the biology of selected infectious microorganisms, in the context of host and responses to pathogens. The properties of organs, cells and molecules of the immune system are described, along with the mechanism of antibody diversity generation, and the exploitation of the immune response for vaccine development. Examples of pathogens are used to illustrate major virulence strategies.

### **2020/1 - BIO-6011B SOCIAL EVOLUTION**

Spring Semester, Level 6 module  
(Maximum 40 Students)

UCU: 20    Organiser: Professor Andrew Bourke

(UG) MODULE - 40% PASS ON AGGREGATE

Module Type: Examination with Coursework or Project

Timetable Slot:D3/, A2\, D1

Exam Paper(hrs):2

**BEFORE TAKING THIS MODULE YOU MUST TAKE BIO-5008B OR TAKE BIO-5010B OR TAKE BIO-2B10 OR TAKE BIO-2B18**

Life is organised hierarchically. Genes aggregate in cells, cells aggregate in organisms, and organisms aggregate in societies. Each step in the formation of this hierarchy is termed a major evolutionary transition. Because common principles of social evolution underlie each transition, the study of altruism and cooperation in nature has broadened out to embrace the fundamental hierarchical structure common to all life. This module investigates this new vision of social evolution. It explores how principles of social evolution underlying each transition illuminate our understanding of life's diversity and organisation, using examples ranging from selfish genetic elements to social insects and mammals.

### **2020/1 - BIO-6021B TRANSLATIONAL BIOMEDICINE**

Spring Semester, Level 6 module  
(Maximum 80 Students)

UCU: 20    Organiser: Dr Mark Williams

(UG) MODULE - 40% PASS ON AGGREGATE

Module Type: Examination with Coursework or Project

Timetable Slot:C2/, H3/, G2/

Exam Paper(hrs):3

This module addresses the molecular and cellular aberrations that lead to the diseased state. Comprehension of the underlying mechanisms is vital to the research and development of drugs that intervene in disease processes. For each disease considered, an overview of tissue pathology will be followed by an analysis of the epidemiological and basic research studies associated with the submission of a drug into clinical trials. Translation of gene editing and stem cell transplantation to the clinical will also be an important aspect of the module.

### **2020/1 - BIO-6025B PLANT BIOTECHNOLOGY FOR SUSTAINABLE FOOD PRODUCTION**

Spring Semester, Level 6 module  
(Maximum 25 Students)

UCU: 20

Organiser: Dr Colwyn Thomas

(UG) MODULE - 40% PASS ON AGGREGATE

Module Type: Examination with Coursework or Project

Timetable Slot:H3\, E1\, F1/

Exam Paper(hrs):2

Exam Period:SPR-02

Plant biotechnology can play an important role in providing crop varieties with increased disease resistance, better P and N (Phosphorous and Nitrogen) use efficiency, and higher nutritional value. It includes not just genetic modification, but any technology to obtain desirable traits in plants, such as mutagenesis and marker-assisted selection. The identification of important traits from wild germplasm and existing cultivars, and their introduction into elite cultivars has been achieved primarily using conventional plant breeding methods. This module will identify the major challenges for sustainable crop production, and highlight the role of plant biotechnology and current plant breeding strategies.