Physiology & Pharmacology

Physiology and Pharmacology studies how living organisms work, and how chemical compounds, endogenous or exogenous, interact with them to affect their function. They are the basic sciences underlying modern medicine and research aimed at understanding human health and disease. The joint honours programme allows students to study two tightly related and complementary disciplines, for which understanding of one is required for, and enhances, understanding of the other. They are the basic sciences underlying modern medicine and research aimed at understanding human health and disease.

UCL Biosciences is one of the largest multi-disciplinary research environments in the UK with over 120 research active laboratories. State-of-the-art research facilities enhance the research environment and provide students with the possibility of acquiring research skills. Within the division of Biosciences, the Physiology and Pharmacology IBSc is administered and taught by the Neuroscience, Physiology and Pharmacology (NPP) Research Department. The research interests of the Department (NPP Research) are mainly centred on the nervous system, but not limited to it. Research activity spans areas ranging from the molecular study of drug receptors, ion channels, transporters and intracellular signalling, to signalling at the cellular level, including the study of neurotransmitter action in the peripheral and central nervous system, to information processing in the nervous system, especially the auditory and visual systems. Reflecting the excellence of research carried out in the Department, the final year courses available to IBSc students make extensive use of material drawn from contemporary scientific literature and aim at familiarizing students with critical thinking and the scientific method.

AIMS

We aim to:

- Recruit high calibre students.
- Stimulate the student’s interest in the subject.
- Inform the students of the basic facts on which their knowledge can be built.
- Promote the capacity for self-education.
- Develop the ability to evaluate critically both theories and evidence.
- Provide teaching that is informed by research.
- Produce graduates well equipped for advanced study and research.
- Provide the opportunity for in-depth study in a defined area of medical science.

OBJECTIVES

Graduates of Physiology and Pharmacology will have acquired the skills to:

- Compile and critically evaluate information (study skills).
- Use a range of common laboratory techniques competently and safely, as part of a team or individually.
- Plan, carry out and compile a detailed report on a piece of original research that they have personally conducted (specific subject knowledge, research skills, report writing).
- Demonstrate the development of skills necessary to work both as individuals and as part of a team, e.g. time management, decision making, sharing of resources, cooperation with others, autonomous learning.
- Have detailed knowledge of the specialist areas they have chosen.
PROGRAMME STRUCTURE

The Physiology and Pharmacology BSc Programme is closely linked to the third year BSc Programme for Science students. Students select modules to complete 4 units in total, including at least 1 taught unit (which can include 0.5 units) from courses offered by the NPP Physiology (PHOL) group and 1 taught unit from the NPP Pharmacology (PHAR) group. These include one compulsory course which can be taken in either Pharmacology (Molecular Pharmacology, PHAR3003) or Physiology (Cell Signalling in Health and Disease, PHOL3004).

In addition to taught courses, students will carry out either a laboratory- (1.5 units) or a library- (1 unit) based project on a topic of their choice. A member of academic staff, working in the field, provides supervision for the project. With permission, students can do projects supervised by staff from other Faculty of Life Science Departments or with other Faculties within UCL if a project is offered.

All students must have achieved an overall mark of at least 60% in the 2nd year to do a laboratory project. Admission to laboratory projects will remain at the discretion of the Project Tutor (PHAR projects: Prof Talvinder Sihra, PHOL projects: Dr Jonathan Fry).

Modules run within the common timetable structure. Most modules have in-course assessments (practical reports, essays, online tests etc), usually amounting to 20 - 30% of the total. Exams fall in the main examining period (May).

COMMON TIMETABLE STRUCTURE

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<thead>
<tr>
<th>Time</th>
<th>Monday</th>
<th>Tuesday</th>
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<tr>
<td>9am – 11am</td>
<td>Block A</td>
<td>Block B</td>
<td>Block C</td>
<td>Block D</td>
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<td>11am – 1pm</td>
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<tr>
<td>1pm – 2pm</td>
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<td>2pm – 6pm</td>
<td>Block F</td>
<td>Block G</td>
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*The lunch break may be used by some modules for teaching which cannot timetabled otherwise.

The “custom” timetable feature at http://www.ucl.ac.uk/timetable is a good place to start planning which modules to select, and to check if they clash.
MODULES CURRENTLY AVAILABLE FOR IBSC PHYSIOLOGY & PHARMACOLOGY STUDENTS

As long as the rules previously detailed are adhered to, students can also choose modules offered by other Departments (timetable, capacity and tutors permitting).

The FLS Module Database (https://www.ucl.ac.uk/lifesciences-faculty-php/courses/search.php) stores updated information on all modules run in the Faculty of Life Sciences and you should consult this database when making your module choices.

Please note: Some modules in the Faculty of Life Sciences are heavily subscribed, and are therefore capped. The FLS Module Database entry indicates, for each module, whether it is capped, and if it is, the selection criteria applied. Some modules also have specific prerequisites for registration, which are also detailed on the Module database. Modules which accept a restricted number of students are indicated in the listings below.

PHARMACOLOGY MODULES

**PHAR3001 / PHAR3002: Neuropharmacology**
1 / 0.5 unit

*Module organiser: Prof. Anthony Dickenson*

*Term 1 Blocks A, D & H (H only for PHAR3001)*

In recent years many developments, such as the use of levo dopa in Parkinsonism, the manipulation of excitation in epilepsy and the discovery of endogenous opioids, have brought basic neuropharmacology and the successful treatment of disorders of the C.N.S. much closer together. It is likely that future prospects for drug therapy in neurology and psychiatry will depend very much on a better understanding of neurotransmitter function and manipulation. This neuropharmacology module tries to provide a basis for such an understanding. Students taking the whole unit (PHAR3001) will perform individual or group projects on the release and electrophysiological and behavioural effects of neurotransmitters and their modification by drugs.

*Module assessment (PHAR3001):* Unseen three-hour written examination 50%; 1 essay 10%; 4 practicals 40%.

*Module assessment (PHAR3002):* Unseen three-hour written examination 80%; Essay 20%. (PHAR3002 does not include the practical work)

**Restrictions:** only a limited number of students can be accepted. Please check FLS Module Database.

**PHAR3003: Molecular Pharmacology**
0.5 unit

*Module organiser: Prof. Alasdair Gibb*

*Term 1 Blocks C & F*

The module deals with the quantitative principles that underlie the study of the action of drugs at receptors beginning with the physical chemical principles which underlie drug-receptor interactions. The molecular nature of receptors is considered in detail and a critical and quantitative approach to the analysis and interpretation of pharmacological data is developed.

Intercalating students will do the practical on agonists and antagonists and the radioligand binding data analysis exercise. The module includes tutorials and workshops to help with algebra revision, writing of practical reports and quantitative data analysis.

*Module assessment:* Unseen three-hour written examination 75%; 2 practicals 25%.
**PHAR3004: Receptor Mechanisms**

0.5 unit  
**Module organiser:** Prof. Alasdair Gibb  
**Term 1 Blocks B & I** (second half of Term 1, following PHAR3003, which is a prerequisite)

This module is about the mechanisms involved in the generation of a response following receptor activation, either by a natural hormone or neurotransmitter or by drug action, and how drugs may interfere with receptor-mediated responses. Mechanisms involving ligand-gated ion channels, voltage-dependent calcium channels and potassium channels, G-proteins, second messengers (e.g. inositol phosphates, diacylglycerol) and cellular kinases and phosphatases are then considered in detail, together with the role of calcium. A final section draws these themes together by examining integrated cell responses such as the control of the release of insulin from the pancreas.

**Module assessment:** Essay 15%; Unseen three hour written examination 85%

**Note:** Students are not permitted to take both PHAR3004 and PHOL3004

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**PHAR3005 OR PHAR3031: Immunopharmacology**

1 or 0.5 unit  
**Module organiser:** Dr. Dean Willis  
**Term 2 Blocks B & I** (PHAR3031 without Tues morning timeslot)

As our knowledge of human disease increases it is becoming evident that inflammation plays a significant part in many pathologies. The diseases in which inflammation has a major role, not only includes the classical inflammatory diseases, such as asthma, arthritis, allergies and the auto-immune pathologies, but also atherosclerosis, ischemic-reperfusion injury, sepsis/multiply organ failure and COPD. Inflammation is also an important component of metabolic diseases, with evidence suggesting a link between diabetes obesity and inflammation, is an important of tumor genesis and is the underlying mechanism by which transplants are rejected. This module provides in-depth coverage of the core mechanism by which inflammation is initiated and maintained and discusses the state of the current and future research trends in its treatment.

**Module assessment (PHAR3005):** Unseen three-hour written examination 65%; Group project 25%; Data analysis (1000 words) 10%

**Module assessment (PHAR3031):** Unseen two-hour written examination 75%; 1 essay of 3000 words 25%

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**PHAR3006: Drug Design and Development**

0.5 unit  
**Module organiser:** Dr. Dean Willis  
**Term 1 Blocks B & I**

This module is about the discovery of new drugs. Students will consider the ways of identifying novel compounds for development and the processes which take place before such compounds are released onto the market following its introduction into clinical practice. The module includes an opportunity for project work on the development of a specific drug, a practical class on the effects of drugs on gastric secretion in human volunteers, seminars on ethics committee operation and on drug licensing and a one-day visit to the drug industry.

**Module assessment:** Unseen three-hour written examination 75%; 1 practical/poster presentation 25%

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**PHAR3008: Psychopharmacology**

0.5 unit  
**Module organiser:** Dr Jonathan Fry
Term 2 Block C
This module presents what is known about the actions of drugs that affect mood and behaviour, both from studies in humans and from animal models used to evaluate psychoactive drug actions. Disorders of mood and behaviour to be covered include addiction, depression & anxiety, post-traumatic stress disorder, obsessive compulsive disorder and schizophrenia. There will also be consideration of recreational drugs and of drugs used as cognitive enhancers and in the treatment of disorders of affiliative behaviour, feeding behaviour and sexual/reproductive behaviour. All these topics will build on knowledge acquired in the second year and in the third year PHAR3001/3002 modules.

**Module assessment:** Unseen three-hour written examination 100%

**PHAR3009:** Pharmacology Library Project
1 unit
**Module organiser:** Prof. Talvinder Sihra
**Term 1 or 2 Blocks – Any**
To conduct a project, utilizing library resources, on a subject/topic offered by a member of staff in the Department of Neuroscience, Physiology and Pharmacology or associated departments. See [https://www.ucl.ac.uk/biosciences/departments/npp/study/npp-projects](https://www.ucl.ac.uk/biosciences/departments/npp/study/npp-projects) for list of titles and further information.

**Module assessment:** Dissertation 70%; poster 30%

**PHAR3010:** Pharmacology Laboratory Project
1.5 units
**Module organiser:** Prof. Talvinder Sihra
**Term 1 or 2 Blocks - Any**
To conduct an original project, involving experimental work, in one of the laboratories of the Department of Neuroscience, Physiology and Pharmacology or associated departments. See [https://www.ucl.ac.uk/biosciences/departments/npp/study/npp-projects](https://www.ucl.ac.uk/biosciences/departments/npp/study/npp-projects) for list of titles and further information.

**Module assessment:** Dissertation 70%; laboratory performance 15%; poster 15.00%

**Pre-requisites:** Students will be required to obtain an average of at least 60% in their second year exams.

**PHAR3011:** Synaptic Pharmacology
0.5 unit
**Module organisers:** Prof. Talvinder Sihra and Prof. Stuart Cull-Candy
**Term 2 Blocks A & H**
The way in which synapses, and the receptors and ion channels present therein, function is central to our understanding of a major component of modern Pharmacology and is an extremely active area of basic and applied research.

**Module assessment:** Unseen three-hour written examination 90%; 2 essays 10%.

**PHYSIOLOGY MODULES**

**PHOL3001:** Respiration in Health and Disease
0.5 unit
**Module organiser:** Prof. Alex Gourine
**Term 2 Blocks A & G**
This module examines the control of breathing particularly in humans, in a wide range of physiological and pathophysiological conditions including exercise, altitude, sleep and
asthma. The relationship between respiratory function, structural anatomy and pathological states are explored.

**Module assessment:** Oral Presentation (10 minutes) 20%; Summary of Oral Presentation (One page) 5%; Unseen two-hour written examination 75%.

**PHOL3002: The Heart and Circulation**
1 unit
**Module organiser:** Prof. Lucie Clapp
**Term 1 Blocks A & H**
The module builds upon your primary knowledge of the heart and circulation. Essential aspects of cardiac and vascular physiology will be considered. This will enable you to grasp a number of areas of experimental, applied and pathophysiology.

**Module assessment:** Organ Bath Pharmacology Prac 5.00%, Poster presentation (15 minutes) 15.00%, Unseen three-hour written examination 60.00%, Essay (3,000 words) 20.00%.

**PHOL3004: Cell Signalling in Health and Disease**
1 unit
**Module organiser:** Dr. Julie Pitcher
**Term 1 Blocks C & G and Term 2 Blocks D & I**
All cell processes are regulated by signalling pathways. The correct regulation of cell processes is critical for the development and homeostasis of animals whereas dysregulation of these processes results in diseases as diverse as diabetes, schizophrenia and cancer. Taking advantage of the outstanding research environment at UCL, this module will consist of a series of lectures and associated journal clubs presented by research scientists of international renown. The lecturers will discuss the signalling pathways that regulate distinct cell processes such as such as proliferation, cell-cell communication, motility, differentiation, fertilisation and cell death. Each researcher will focus on their own research strengths to present an overview of the field, followed by a presentation of work from their own laboratory. The associated journal club will discuss a recent innovative piece of work related to the research area.

**Module assessment:** Two essays 15 %; One orally assessed coursework 7.5%; One written coursework/problem paper 7.5%; Unseen three-hour written examination 70%.

**Note:** Students are not permitted to take both PHAR3004 and PHOL3004

**Restrictions:** only a limited number of students can be accepted. Please check FLS Module Database.

**PHOL3006: Cellular Basis of Brain Function**
1 unit
**Module organisers:** Prof. Angus Silver, Prof. Jonathan Ashmore & Dr. Beverley Clark
**Term 1 Blocks A & H**
The course covers the description of brain function from Molecule, to Cell and to System levels. The detailed topics include: 1) Methods, ion channels, channelopathies, transporters and ischaemia; 2) Synaptic transmission, plasticity, integration and dendrites; 3) Metabolism, microcircuits, coding, sensory processing, neural networks and the control of behaviour. This structure is designed to provide a thorough grounding in the cellular mechanisms of brain function in health and disease.

**Module assessment:** Two essays 16%; Unseen three-hour written examination 75%; Two practical write ups 9%.

**Prerequisites:** This course involves reading and evaluation of the latest neuroscience literature and a strong grounding in neurophysiology is considered an important prerequisite. Some background in the physical sciences to at least A-level would be an advantage:
understanding quantitative approaches and arguments are critical in some parts of the course. IBSc students will be given preference by their harmonised MBBS mark.

**PHOL3011**: Autonomic and Central Control of Cardiorespiratory Function  
0.5 units  
Module organiser: Dr. Ian Edwards  
Term 2 Block B & H  
This module will look at the autonomic control of the cardiovascular and respiratory systems. The module will cover the anatomy of the autonomic nervous system (introducing the relevant peripheral and central areas that are involved in homeostatic control), the sympathetic nervous system and the parasympathetic nervous system (specifically how they interact to control the activity of the cardiovascular system), the central respiratory network and how it establishes normal breathing patterns, and finally how the activity in these pathways changes in response to exercise and disease. This will be accompanied by a mini-project comparing the sympathetic/parasympathetic balance in different exercise paradigms.  
**Module assessment**: Project report (2,000 words) 20.00%, Laboratory worksheets 10.00%, Unseen three-hour written examination 70.00%.  
**Restrictions**: only a limited number of students can be accepted. Please check FLS Module Database.

**PHOL3016**: Cell Polarity and Disease  
1 unit  
Module organisers: Prof. Shamshad Cockcroft and Dr. Anselm Zdebik  
Term 1 Block E & I  
Epithelial cells form sheets that cover the surface of the body and line the internal organs and perform vectorial functions. The module aims to provide an understanding of epithelia tissues by describing: how the polarization of epithelia is maintained; the mechanisms underlying the regulated directional transport of ions, nutrients and water across epithelia; normal physiological function of the renal, gastro-intestinal and respiratory systems.  
**Module assessment**: Unseen three-hour written examination 70%; Seminar presentation 10%; two essays 10%; Invigilated Paper Review 10%.

**PHOL3902**: Literature Project in Physiology  
1 unit  
Module organiser: Dr. Jonathan Fry  
Term 1 or 2 Blocks - Any  
A literature-based project allowing final year students to conduct physiological research, utilizing library resources, on a subject/topic offered by a member of staff in the Division of Biosciences or associated departments. See [https://www.ucl.ac.uk/biosciences/departments/npp/study/npp-projects](https://www.ucl.ac.uk/biosciences/departments/npp/study/npp-projects) for further information.  
**Module assessment**: Poster presentation 30%; report 70%.

**PHOL3904**: Laboratory Project in Physiology  
1.5 units  
Module organiser: Dr. Jonathan Fry  
Term 1 or 2 Blocks - Any  
A research based project which allows final year students to conduct some original research in the laboratory of a member of academic staff or in one of the laboratories of one of our associated Institutes or, with the approval of the Project Tutor, in the laboratory of a non-associated Institution. See [https://www.ucl.ac.uk/biosciences/departments/npp/study/npp-projects](https://www.ucl.ac.uk/biosciences/departments/npp/study/npp-projects) for further information.
Module assessment: poster presentation 15%; Report 70%; Laboratory performance 15%
Pre-requisites: Students will be required to obtain an average of at least 60% in their second-year exams.

NEUROSCIENCE MODULES

**NEUR3003: Metabolic Neuroscience**
0.5 unit
Module organiser: Dr. Stefan Trapp
Term 2 Block E
The lectures in this module cover metabolic neuroscience research at an advanced level. They provide a thorough understanding of the physiology of metabolic regulation based on current ongoing research in this area. The lectures cover metabolic disease and discuss current and novel treatment strategies. Finally, emphasis is placed on the key technical approaches applied in metabolic neuroscience and their critical evaluation, as addressed in the journal club. **Module assessment:** Oral presentation 15.00%, Unseen three-hour written examination 70.00%, Review article (2,000 words) 15.00%.
**Note:** this module can count as a PHOL module
Restrictions: only a limited number of students can be accepted. Please check FLS Module Database.

**NEUR3018: Neural Basis of Motivation and Learning**
0.5 unit
Module organiser: Dr. Francesca Cacucci
Term 1 Block D
The module is centered around the group of neural structures traditionally described as the limbic system which are involved in learning, memory, emotion, motivation and navigation. They include the amygdala, septum, hippocampus, and prefrontal cortex. The module consists of a set of lectures on the anatomy, physiology and role in behaviour of these structures, as well as the molecular, cellular and genetic basis for their involvement in these behaviours. In addition, tutorials will be given on specific topics raised in the lectures. **Module assessment:** Unseen three-hour written examination 80.00%, Essay (3,000 words) 20.00%.

**NEUR3031: Control of Movement**
0.5 unit
Module organiser: Prof. Christopher Yeo
Term 2 Block A
The module begins by considering the anatomy and physiology of essential components of the motor system; muscles and the motor unit; proprioception; spinal integration; ascending and descending pathways in the spinal cord; motor cortex; basal ganglia and cerebellum. The integrated action of these systems in locomotion, voluntary movements and eye movements is considered. The module includes tutorials with target papers through the course and concludes with analyses of motor learning and modelling of motor control. **Module assessment:** Unseen three-hour written examination 100%

**NEUR3041: Neural Computation**
0.5 unit
Module organiser: Prof. Neil Burgess
Term 1 Block E
This module examines how behaviour results from the properties of neurons and synapses in the brain. Some simple computational models of how networks of neurons can be used to perform useful functions are introduced and applied to help understand several examples of the neural bases of behaviour in humans and animals. Topics covered will include the role of synaptic plasticity in learning and memory, the coding of information by the firing rate and time of firing of neurons, the neural bases of memory, coordination of action, audition, olfaction, and conscious awareness. Neural systems studies will include the motor, parietal and frontal cortices, the hippocampus, cerebellum and the spine.

Module assessment: Unseen three-hour written examination 90%; One Essay (2,000 words) 10%.
Restrictions: only a limited number of students can be accepted. Please check FLS Module Database.

NEUR3045: Visual Neuroscience
0.5 unit
Module organiser: Prof. Andrew Stockman

Term 2 Block G
This module will teach visual neuroscience from a broad, interdisciplinary point of view. Our modern understanding of vision and visual processing depends not only on the more traditional fields of anatomy, physiology and psychophysics, which remain centrally important, but also on the fields of genetics, molecular and cellular biology, ophthalmology, neurology, cognitive neuroscience and brain imaging. In this module, we will present visual neuroscience as a multidisciplinary, yet integrated field of study. This half unit also makes up part of the full unit module NEUR3001 “Advanced Visual Neuroscience”.

Module assessment: Unseen two-hour written examination 80%; Oral presentation 20%.

MODULES IN OTHER DEPARTMENTS
See individual webpages for details and timetable information. Modules not listed here may also be included, following discussion and approval by degree tutor and module organiser.

ANAT3042: Pain
0.5 unit
Module organiser: Prof. Steve Hunt

Term 2 Block D
This module aims to present an integrated approach to pain. Through a series of 18 lectures, students will be presented with information about the basic mechanisms of pain and its clinical manifestations. Students will also be introduced to current ideas about therapy and management and to the problems inherent in measurements of pain. A series of seminars based on reading topics will be held at the end of the module.

Module assessment: Unseen three-hour written examination 80 %; 1 Essay 20%.
Restrictions: only a limited number of students can be accepted. Please check FLS Module Database.

Note: this module can count either as a PHOL or as a PHAR module

ANAT3029 / ANAT3028: The Neurobiology of Neurodegenerative Disease
1 / 0.5 unit
Module organiser: Prof. Stephen Davies
Term 1 Block E
The last few years have seen a remarkable increase in our understanding of the basic biological mechanisms underlying human neurodegenerative diseases. Identification of the mutations in tau, underlying many familial forms of dementia and of the mutations in α-synuclein and parkin, found in familial cases of Parkinson’s disease, has provided a molecular basis for these two classes of disease. Similarly the discovery of neuronal intranuclear inclusions containing proteins with expanded poly-glutamine sequences again provides a unifying pathogenic mechanism for 10 triplet-repeat expansion diseases (best illustrated by Huntington’s disease). It therefore seems that a common feature of all these diseases is the intracellular accumulation of fibrous protein aggregates within neurons (and/or glial cells?) which leads to neurodegeneration. This module will discuss this novel hypothesis in the light of contemporary research and provide a foundation for our current understanding of neurodegenerative diseases.

**Module assessment (ANAT3029):** Unseen three-hour written examination 50%; One essay (6,000 words) 50%.

**Module assessment (ANAT3028):** Unseen three-hour written examination 100%.

**Restrictions:** only a limited number of students can be accepted. Please check FLS Module Database.

**ANAT3051: Neuroesthetics**

0.5 unit

**Module organiser:** Prof Semir Zeki

**Term 1 Block A**

There have been major advances over the past 15 years in studies of the neural mechanisms underlying subjective experiences, such as the experience of beauty, love, desire, and hate as well as the neural mechanisms underlying the making of judgments and taking of decisions, whether monetary, aesthetic or otherwise. This has been paralleled by further developments in studies of sensory cortex, and especially visual cortex, and the way in which visual inputs are translated to enable affective responses and experiences. Indeed the picture of the primate visual brain we have today is significantly different from the one we had even five years ago. To obtain a comprehensive account of the biology of subjective mental states, reliance on neurobiology alone is not sufficient. Major contributions, though ones that have not yet infiltrated into neurobiology, have been made in this area in the humanities. Underpinning all else is the approach to a fundamental function of the brain, namely the acquisition of knowledge. But knowledge, how we acquire it and how certain we are of what we know, is one of the basic problems of philosophy, and any approach to understanding this problem neurobiologically would be incomplete and inadequate without discussing past philosophical contributions, especially those of Plato and Immanuel Kant. There are equally important contributions from the humanities to understanding aesthetic experiences. These range from discussions on aesthetics and theories of Form in Plato, Aristotle, Immanuel Kant, Arthur Schopenhauer and others in philosophy, of Clive Bell in art criticism and art history, and the output and writings of artists such as Paul Cézanne, Pablo Picasso, Georges Braque, Kazimir Malevich and Piet Mondrian among others. In their artistic output and their writings, these artists have asked questions that are common to neurobiology and to art. The neurobiologist thus stands to gain important insights from a more careful study of their work. In addition, the question of creativity in general has been addressed more comprehensively in literary works – including the works of Honoré de Balzac and Emile Zola - than in any scientific texts. Finally, there is much evidence pertaining to the brain’s concept of love that is derivable from a study of the World literature of love, not from scientific texts. The neurobiologist approaching the question of subjective mental states and subjective experiences therefore must, in addition to having a good grounding in neurobiology and the methods used to understand the workings of the brain, draw on all these sources, even if some may not be deemed to be ‘scientific’ in the traditional sense. It is sufficient that they give powerful insights into the design of experiments, as is well exemplified especially in studies of the neural correlates of the
experience of beauty. **Module assessment:** Unseen two-hour written examination 100%.

**CELL3050:** Advanced Molecular Cell Biology  
0.5 unit  
**Module organisers:** Dr. Jonathan Chubb & Prof. Geraint Thomas  
**Term 1 Blocks E and F**  
Introduction to concepts and problems in selected topics of current cell biology  
Understanding the methods by which data are obtained and their limitations To study original scientific literature relevant to cell function To develop skills to judge the quality and validity of literature.  
**Module assessment:** Unseen three-hour written examination 75%, Essay (1,500 words) 12.5%, Paper presentation (15 minutes) 12.5%.

**CELL3105:** Clocks, Sleep and Biological Time  
0.5 unit  
**Module organiser:** Prof. David Whitmore  
**Term 2 Block C**  
The aim of this module is to examine the importance of time, and oscillations, in a range of biological problems. The central theme will be the circadian or daily clock. We will look at what is currently known about the clock mechanisms (what makes the clock 'tick') in a range of animal systems, from Drosophila to the mouse. This will include the genetic-molecular aspects of the clock, as well as some biochemistry and neurobiology. We will also examine how the clock regulates physiological events, such as seasonal reproduction, and human sleep-activity rhythms. The importance of light and the retina in setting the clock will be discussed (Prof. Foster, Imperial). The module will then go on to examine a range of other biological timing events, such as the somite clock in embryology (Prof. Stern), rapid biochemical oscillations (TBC), oscillations in the brain (Prof. O'Keefe) and some basic mathematical aspects of oscillations (Prof. Wolpert). The relevance of time, from seconds to years, and how these oscillations influence cells and animals will be discussed.  
**Module assessment:** Unseen three-hour written examination 100.00%.

**CELL3002:** Functional Genetics of Model Systems  
0.5 unit  
**Module organiser:** Dr Jason Rihel  
**Term 2 Block G**  
The aim of this module is to provide in depth coverage of new concepts in the molecular genetics of animal model systems, including nematode worms, fruit flies, zebrafish and mouse. Following a refresher on model organism biology and basic genetics, the topics covered will include genetic screening, modern gene mapping techniques, advanced recombinant technology and genome editing, as well as emerging concepts such as chemical genetics and optogenetics. Drawing mainly on recent examples from the primary literature, emphasis will be placed on the use of molecular genetics to tackle wide-ranging questions, from basic biological principles in development and neuroscience to the dissection of disease.  
**Module assessment:** One essay (2,000 words) 30%, Unseen two-hour written examination 70%

**CELL3006:** Dynamic Biological Systems  
0.5 unit
Module organiser: Dr Philip Lewis
Term 2 Block F & H
All biological interactions, whether they take place on a molecular, organism or ecosystem scale, are part of complex dynamical systems. Understanding the behaviour of these systems lies at the heart of many key challenges in biological research. In this module you will learn techniques from mathematics, engineering and computer science, that enable you to construct, implement and analyse interaction networks using the Python programming language.

Prerequisites: A-level Maths or equivalent is desirable.

Module assessment: Scientific report one (2,500 words) 20%, Scientific report two (2,500 words) 20%, Departmental test two (2 hours) 20%, Departmental test one (2 hours) 20%, Departmental test three (1.5 hours) 20%

BIOC3013: Cancer Biology
0.5 unit
Module organiser: Prof. M. Katan-Muller
Term 2 Block A (& F)
This course focuses on the mechanism of cancer generation and progression and on the most advanced treatments. Starting with a background integrating genetic, cellular and molecular aspects, it covers recent cancer research leading to a general conceptual framework for the development of this disease. The course also provides insights and illustrations from specific cancer types and concludes with a variety of established and emerging treatments. The overall aim of this course is to provide a strong background for careers related to basic cancer research, experimental medicine and drug discovery.

Module Assessment: Coursework 30%. Unseen two-hour written examination 70%.

Restrictions: only a limited number of students can be accepted. Please check FLS Module Database.

BIOS3016: Genes to Disease (formerly BIOC3016)
0.5 unit
Module organiser: Prof. K. Srai
Term 1 Block B
This course is suitable for intercalating medical students, third year BSc students including those studying biochemistry, natural sciences, biomedical sciences and neuroscience and MRes students. It is important to have a basic understanding of genetics, biochemistry and cell biology. This half course unit will focus on the disease mechanisms and role of genetic abnormalities in a variety of neurodegenerative diseases. Neurodegenerative diseases are a very important cause of morbidity and mortality and with an ageing population they are becoming more prevalent. This course will explore the potential role that genetics play in these diseases and a description of the mutations that have been identified. It will cover our current understanding of the impact of the various disease related mutations at the biochemical, cell and molecular biological levels with an emphasis upon their relationship to the underlying pathology. Subjects covered include: genetics, linkage analysis and genetic heterogeneity, molecular basis of disease, patterns of inheritance and mutation mechanisms. The aetiology and disease mechanisms of Parkinson's, Alzheimer's, Prion, Huntington's, hereditary spastic paraparesis, motor neuron, Friedreich's ataxia, peripheral neuropathy and mitochondrial DNA diseases will be explored. Various general themes will also be developed including: the role of genetic models to study the diseases, the importance of protein aggregation, mitochondrial pathology, free radical damage, metals and the use of stem cells to study and treat the diseases.

Module Assessment: Unseen two-hour written examination 70%; ICA reference evaluation (1,800 words) 15%; ICA Journal Club presentation (8 minutes) 15%.
Restrictions: only a limited number of students can be accepted. Please check FLS Module Database.

**BIOC3017: Cellular and Molecular Aspects of Cardiovascular Disease**

0.5 unit  
**Module organiser:** Prof. K Srai  
**Term 2 Block C&F**


Module Assessment: Unseen two-hour written examination 70%; ICA reference evaluation (1,800 words) 15%; ICA Journal Club presentation (8 minutes) 15%.

Restrictions: only a limited number of students can be accepted. Please check FLS Module Database.

**BIOL3017: Biology of Aging**

0.5 unit  
**Module organiser:** Dr. D Gems  
**Term 1 Block B (&G)**

Course surveys the biology of ageing (biogerontology). It covers evolutionary and mechanistic theories of ageing; comparative biology of ageing; the new model organism genetics of lifespan (eg C. elegans, Drosophila); methods in ageing research (eg microarray analysis); the biology of caloric restriction; cellular senescence, telomeres and cancer; ageing-related disease; the biology of insulin signalling, energy handling and associated diseases (eg diabetes and obesity); stem cells and tissue engineering; prospects for treatments for ageing; and social and ethical issues relating to research on ageing.

Module Assessment: 3 tutorials, including 2 essays of 1500-2000 words each 20%. Unseen two-hour written examination 80%.

**PSYC3209: Cognitive Neuroscience**

0.5 unit  
**Module organiser:** Dr. L. Otten  
**Term 2 Block H**

Experts in the field of cognitive neuroscience present a series of lectures on the neural underpinnings of mental functions. The first part of the module concentrates on explaining what cognitive neuroscience is, what it intends to study, and how it goes about studying it. Conceptual issues about relating mental functions onto physical brain activity will be discussed, along with different techniques that are currently available to measure brain function. The second part of the module concentrates on discussing what is currently known about how particular cognitive functions (e.g. attention, memory, and emotion) are supported by the brain. In addition to the lectures, the module relies on a number of assigned readings. These readings are taken from a key textbook (Gazzaniga, M.S., "Cognitive Neuroscience: Biology of the Mind") and scientific journals. At the end of the module, students will be able to critically read and evaluate research in the area of cognitive neuroscience and be able to appreciate what can, and cannot, be inferred from the methods available to study brain function.
**Module Assessment:** Unseen three-hour written examination 100%

**Prerequisites:** Non-Psychology students must visit this link (information for non-Psychology students) to establish whether they can take this module, and follow instructions on how to register: [http://www.ucl.ac.uk/pals/current-students/undergraduates/subsidiary-psychology](http://www.ucl.ac.uk/pals/current-students/undergraduates/subsidiary-psychology)

**PSYC3207: Human Learning and Memory**

0.5 unit

**Module organiser:** Prof. D. Shanks

**Term 1 Block B**

The module covers major current topics in the study of human learning and memory, including: short-term memory and brain plasticity; encoding processes; consolidation; implicit learning; reliability of long-term memory; memory and the self; metamemory, forgetting and retrieval; aging and dementia; transfer-appropriate processing; memory systems and the neuroscience of memory.

**Module Assessment:** Unseen three-hour written examination 50%; Peer Wise 5%; Written essay (2,500 words) 45%.

**Prerequisites:** Non-Psychology students must visit this link (information for non-Psychology students) to establish whether they can take this module, and follow instructions on how to register: [http://www.ucl.ac.uk/pals/current-students/undergraduates/subsidiary-psychology](http://www.ucl.ac.uk/pals/current-students/undergraduates/subsidiary-psychology)

**PERIGP10: Essentials of Anaesthesia**

0.5 unit

**Module organiser:** Prof. R. Stephens

**Term 2 Mondays**

**Prerequisites:** None

Topics covered:
- Awareness under anaesthesia + monitoring consciousness/depth of anaesthesia
- How we use drugs to manipulate the patient's physiology
- Theories about the causes of postoperative complications
- How to gather understand and use evidence
- Considerations about 'risk'
- Relevant cardiovascular, respiratory and neuro-physiology.

The module details listed here may be subject to change. Please contact the Module Organiser for confirmation and further details.

FOR FURTHER INFORMATION PLEASE CONTACT

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https://www.ucl.ac.uk/biosciences/study/undergraduate/physphama-ibsc

For Further information about Biosciences Modules:
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