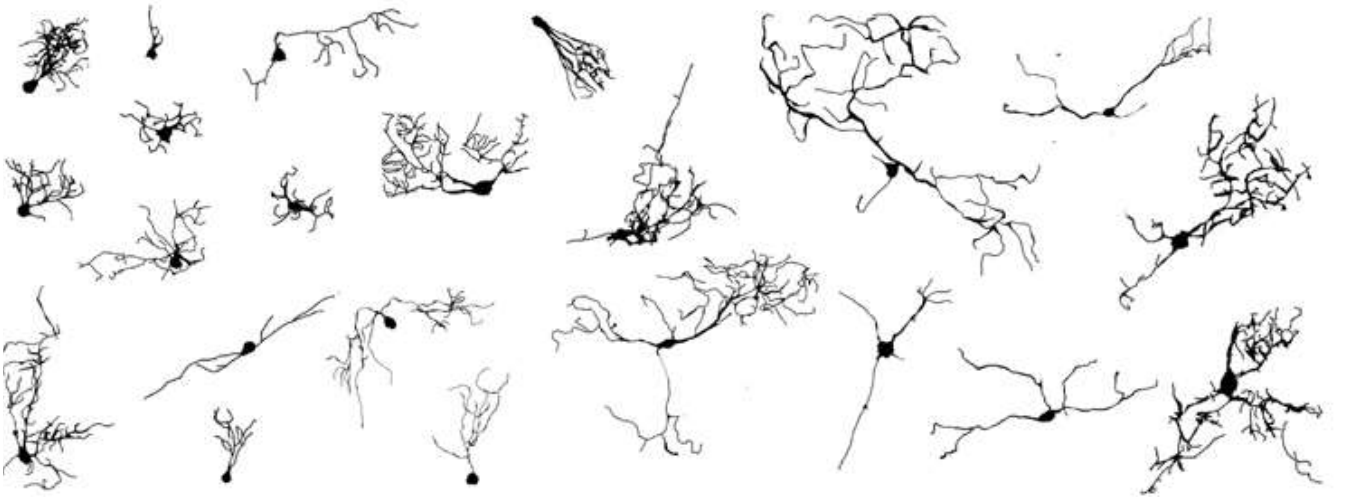
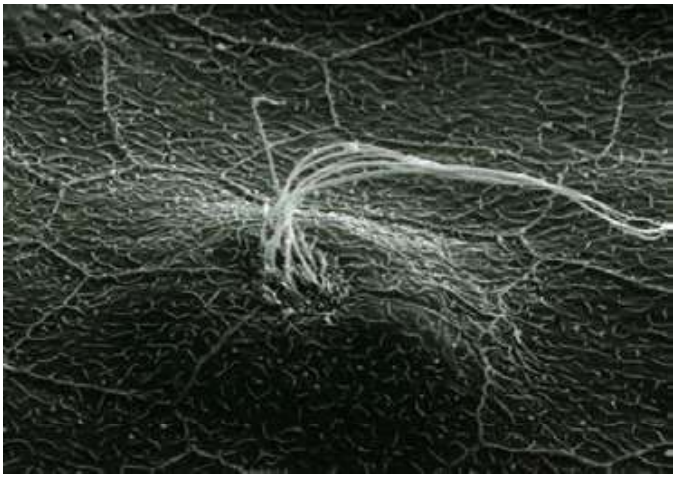
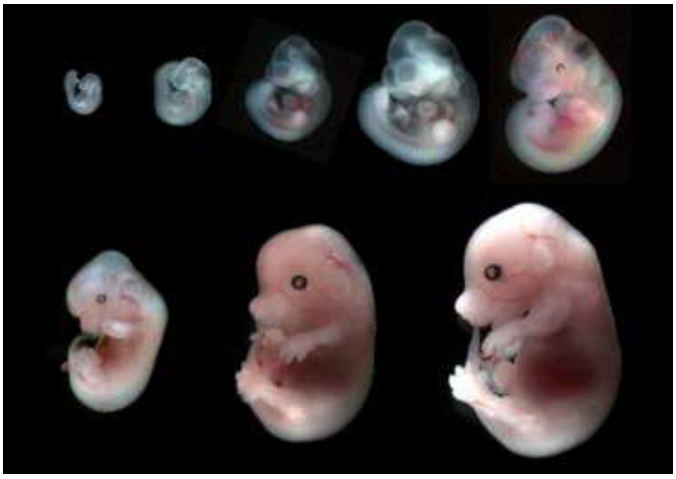
pdn part II

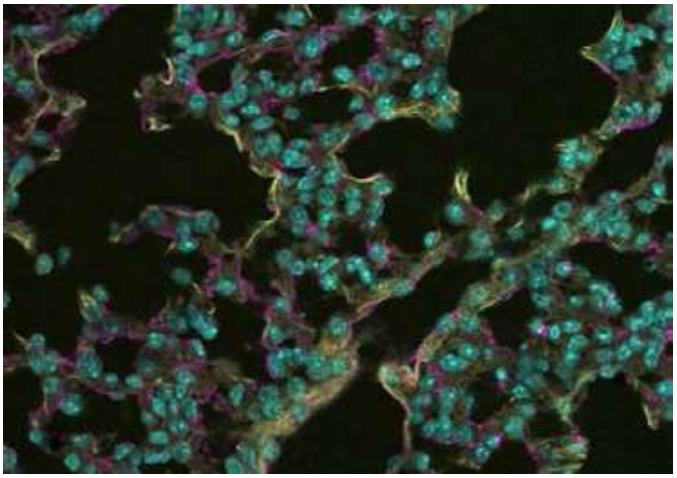
Department of Physiology,
Development and Neuroscience

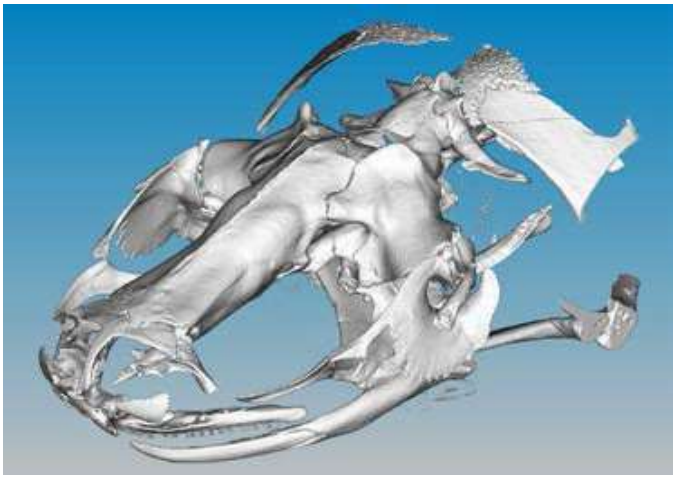
2024 - 2025











UNIVERSITY OF CAMBRIDGE

PART II PHYSIOLOGY, DEVELOPMENT AND NEUROSCIENCE 2024-2025

NST PART II PHYSIOLOGY, DEVELOPMENT AND NEUROSCIENCE

Course Organisers: Prof Amanda Sferruzzi-Perri & Dr Hannah Clarke (sabbatical until Mich 24)

DEVELOPMENT AND REPRODUCTIVE BIOLOGY
Theme Organiser: Prof Nick Brown

INTEGRATIVE PHYSIOLOGY
Theme Organiser: Dr James Fraser

NEUROSCIENCE
Theme Organiser: Prof Angela Roberts

General enquiries:
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Part II Administrator and Course Organisers: email: part2-admin@pdn.cam.ac.uk
Department of Physiology, Development and Neuroscience website:
http://www.pdn.cam.ac.uk/

Part II Physiology, Development and Neuroscience website:
http://www.pdn.cam.ac.uk/teaching/part2/index.shtml

Contents

INTRODUCTION

Part II in Physiology, Development and Neuroscience offers a broad range of teaching and project opportunities covering the full spectrum of interests within the Department. Our Part II teaching is organised into modules to offer the greatest possible flexibility allowing students to design a course to match their own interests.

The Department of Physiology, Development and Neuroscience is concerned with material central to the life sciences. It addresses questions about the way that cells, tissues and organs develop and function in people and animals. Physiology, Development and Neuroscience are broad but interlinked subjects with many different areas of specialisation. A good grounding in these subjects opens the way to a wide variety of careers: these range from those where you use your knowledge directly, to those in which the understanding you will acquire of complex organisms is put to work less directly, such as in managing equally complex human organisations.

The knowledge and skills gained on this Part II course will particularly provide a valuable basis for the practice of human and veterinary clinical medicine, where a critical understanding of scientific advances is essential in designing and evaluating new treatments. Many parts of the course concentrate on important research areas where recent discoveries have changed our perception of disease and have posed new questions to be answered. The modules are organised into three themes, allowing you to spend the whole of your third year studying in depth Development & Reproductive Biology, Integrative Physiology or Neuroscience. Alternatively, those seeking a broader overview can select to follow a more general course, combining modules across these themes.

One major benefit of studying Part II Physiology, Development and Neuroscience will be in gaining an in-depth knowledge of key core areas of the life sciences. You will also gain important knowledge and skills that graduates in any subject should these days have. These skills include:

- critically assessing information you read or hear
- keeping accurate records
- writing reports and reviews, and effectively presenting and communicating your ideas
- efficiently using libraries and information databases
- selecting appropriate statistical procedures to verify hypotheses
- using modern computer software

Teaching of the course involves most members of staff of the Department of Physiology, Development & Neuroscience and is supplemented by invited specialists from across the University and from the Babraham Institute, Cancer Research UK, Gurdon Institute, the Medical Research Council Laboratory of Molecular Biology and Addenbrookes and Papworth hospitals. We also offer a growing number of modules taught in collaboration with other Departments, allowing us to call upon the broadest range of expertise within the University.

Taking Part II in Physiology, Development & Neuroscience gives you the many advantages of a home base on the Downing Site. You will immediately feel an important contributing part of the vibrant research community. The social cohesion with your fellow Part II students will be enjoyable and valuable throughout the year and your academic and other questions can be informally dealt with when you happen to meet members of staff about the Department. You will be appointed a Departmental Advisor who will be available to discuss your progress and help support you in your studies. The friendly and supportive Part II administrator will become well known to you and will be your first port of call for queries. The Department has numerous resources available to you through the year, including a well-stocked library, where you will be able to find many of the books and journals you need in a single place. The Department also maintains computers and printers which you will be able to access.

The scope of the course

You will probably already have an overview of some or all of physiology, development and neuroscience from your Part I courses and we will therefore build upon these basics by offering an in-depth course in which we will not attempt to cover the whole of these subjects. We offer teaching on topics of current interest that we discuss to a much higher level than in Part I. This means that you can devote your time to those areas you find particularly interesting. While we expect that the majority will have done the Part IA and IB courses in physiology, neurobiology or developmental and/or reproductive biology, we will also welcome those who have done only one of these courses, as well as those who approach physiology, development and neuroscience from other directions, such as biochemistry, genetics or animal biology.

The organisation of the course

All project students study four modules. The course offers a wide choice from fifteen PDN* modules that are described in the following pages. The modules are divided into three themes: Development & Reproductive Biology, Integrative Physiology and Neuroscience. Some students will want to study one theme; however, others enjoy the opportunity to follow a more general course, combining modules across themes. You are given a free choice as to how you distribute those four modules over the two terms (for example: two in Michaelmas and two in Lent or three in Michaelmas and one in Lent etc.) but be aware that some modules have restricted numbers, and some combinations are not possible (see module descriptions from page 8).

*Students may replace up to two PDN modules with a 'shared neuroscience' module offered by Psychology or Zoology. These have very limited availability and are arranged before term begins (see page 7).

In your detailed reading you will want to concentrate on the topics that particularly interest you. In the examination there will be one paper per module. Much of your formal teaching will take place during the morning, with the exception of some shared modules. Many modules also offer one- or two -hour workshops, journal clubs or seminars in the afternoons. These give opportunities for a more interactive style of teaching that many students enjoy and find helpful in consolidating the lecture material. Most afternoons, during Michaelmas and Lent terms, are free for project work and private study. The Easter Term is kept largely free from formal commitments to allow time for reading and for discussion.

The Projects

All project students do either an experimental research project or a theory-based project, under the supervision of an appropriate member of staff. Laboratory-based research projects are limited in number and allocation cannot be guaranteed to all students who wish to do these. The findings are written-up in the form of an 8,500-word report. You may choose the topic of your project from those provided by members of staff and will have the opportunity to discuss the projects with the relevant staff members before you submit your choices. You will have the opportunity to present your progress to the Department as a poster presentation. The times that you work on your project can be negotiated with your supervisor to some extent so that you will have time available for other work and outside interests, but in general, students are expected to spend about 16 hours a week on their project. The titles of a number of recent research projects are listed towards the end of this booklet, as are some of the publications arising from projects involving previous Part II students.

PART II PHYSIOLOGY, DEVELOPMENT AND NEUROSCIENCE: *A strategic analysis*

Our aims

- To provide a broad multidisciplinary course in Physiology, Development & Neuroscience.
- To teach you a variety of scientific skills that will equip you for future careers in a wide range of areas: health sciences (e.g., the pharmaceutical industry and environmental physiology), medicine and veterinary medicine, research in the life sciences and related disciplines, teaching, publishing and management.

How we expect to achieve them

- By offering a modular course of lectures, workshops, seminars, informal discussions and research projects, supplemented by personal contact with members of the academic staff.
- By training you in the use of practical and conceptual tools required in many sub-disciplines: from molecular biology, through membrane and cellular physiology, to the study of systems physiology and the disorders of physiology associated with disease.
- By providing constructive feedback on your progress through personal discussion and assessment of project work.

What you can expect by the end of the course

The ability to:

- Think and write critically and creatively about what you have read, learnt and discovered.
- Analyse, both qualitatively and quantitatively, data collected from research projects.
- Use available resources to conduct research into scientific problems, e.g., libraries and computer databases, together with academic and technical expertise.
- Assess and implement practical techniques necessary to solve a particular scientific problem.
- Communicate with expert and non-expert audiences through presentations, project reports and essays.

WHAT TO DO IF YOU ARE INTERESTED IN PART II PDN:

Two application forms must be completed:

1. **The PDN Departmental Application:** If you want to take the Part II Physiology, Development and Neuroscience course it is essential that you complete an internal application form, via this Google Form:

   https://forms.gle/sjFTPe592ChXyhQ37

   We cannot allocate you a place if this form is not completed.

2. **The University NST Application:** Formal application to take the course **must** also be made to the NST Tripos Part II allocations team after consultation with your Director of Studies. Details of how to do this can be found on the Natural Sciences webpage: https://www.natsci.tripos.cam.ac.uk/students/third/ii-subject-allocation

   You should make all your Part II applications by 17th May 2024.

A copy of this brochure and the PDN application form link are also available on our Departmental website: https://www.pdn.cam.ac.uk/undergraduate/part-ii-courses

PART II PDN COMMON COURSES: FOR ALL PDN STUDENTS

There are some skills, which we think that everyone doing Part II PDN needs to acquire, regardless of their area of specialisation. For this reason, a number of teaching sessions open to all PDN students are offered.

Some of these sessions will be available to view as a recording prior to the start of the course and others will be held during the year.

Topics to be included:

- Reading and evaluating a scientific paper
- How to write a Part II essay
- Reference management
- Statistics and data analysis
- How to tackle experimental design questions
- Poster & figure making
- Project write-up guidance
- Information regarding the Part II PDN examinations

NOTE:

This booklet describing the Part II Physiology, Development and Neuroscience course was produced in late January. Some small details are likely to change. Some lecturers may change because of timetabling or leave commitments.

PART II BBS: OPTIONS IN PDN

The Part II BBS course is for students who want a course based entirely on lecture and library work, with no practical component. Students take a major subject (consisting of 4 PDN* modules) and a minor subject (1 module) and write a dissertation.

MAJOR SUBJECT 415: Physiology, Development and Neuroscience
Maximum 25 places

Course Organisers for PDN: Prof Amanda Sferruzzi-Perri (ans48@cam.ac.uk) & Dr Hannah Clarke (hfc23@cam.ac.uk) (currently on Sabbatical until Michaelmas Term 2024)

BBS students must take 4 of the 15 PDN* modules as their major subject, under the auspices of Part II PDN. Some modules have restricted numbers, and some combinations are not possible (see module descriptions from page 7 onwards).

*Students may replace up to two PDN modules with a 'shared neuroscience' module offered by Psychology or Zoology. These have very limited availability and are arranged before term begins.

MINOR SUBJECTS

Many of the PDN modules are also offered as BBS minor subjects. Major subject 415 may be taken with any one of these minor subjects, provided that the minor is different to the four major modules, and they do not clash in the timetable.

Michaelmas Term options within PDN:

138: Module N1 Developmental Neurobiology (5 places)

152: Module N3 Neuroscience: Circuits and Systems (5 places)

153: Module N4 Cellular and Molecular Neuroscience (5 places)

141: Module P1 Cellular Physiology (5 places)

Lent Term options within PDN:

111: Module N6 Higher Order Brain Function and Dysfunction (15 places)

142: Module P2 Development and Stem Cells (5 places)

143: Module P8 Systems and Clinical Physiology (5 places)

PDN Major subject (415) may also be taken with other minor subjects that do not clash, including:

128: Bioinformatics, run in Lent by Genetics as a minor subject, but also available as PDN major module P5 (see pg 13)

137: Surgical and Radiological Anatomy (SaRA), run by PDN but only as a two-term BBS minor subject (see pg 16 for minor 137).

SUMMARY OF PART II PDN THEMES AND MODULES

Development and Reproductive Biology	Integrative Physiology	Neuroscience
Michaelmas term		
N1 Developmental Neurobiology *(shared with Part II Zoology*) P3 Fetal and Placental Physiology P4 Early Development & Patterning: Genetic and Cellular Mechanisms *(shared with Part II Genetics and Zoology*) P9 Cell Assembly and Interactions *(shared with Part II Zoology)*	P1 Cellular Physiology P3 Fetal and Placental Physiology	N1 Developmental Neurobiology (*shared with Part II Zoology*) N2 Experimental Tools for the Neuroscientist and how they are Shaping Scientific Discovery N3 Neuroscience: Circuits and Systems N4 Cellular and Molecular Neuroscience
Lent term		
P2 Development and Stem Cells P6 Development: Cell Differentiation & Organogenesis *(shared with Part II Zoology)* P7 Pathophysiology of Cancer	P2 Development and Stem Cells P5 Bioinformatics *(shared with Part II BBS Genetics)* P7 Pathophysiology of cancer P8 Systems and Clinical Physiology	N6 Higher Order Brain Function and Dysfunction N9 Modulation, Plasticity and Behaviour

SHARED NEUROSCIENCE MODULES

We are able to offer some of our PDN Project and PDN-BBS (major 415) students the opportunity to select up to two of their four module choices from a selection of shared neuroscience modules offered by other departments in the School of Biological Sciences.

Spaces on these modules are very limited and we expect demand to be high. Please express your interest via our PDN application form. If you are offered a place on a module via this arrangement, it will replace one of your four PDN module choices.

Michaelmas Term:

ZM5: Evolution and Behaviour: Genes and individuals (5 places, Zoology)

PS3: Brain Mechanisms of Emotional Regulation and Motivation (7 places, Psychology)
(PS3 cannot be taken with P1 or P4)

Lent Term:

ZL3: Evolution and Behaviour: Populations and Societies (5 places, Zoology)
(ZL3 cannot be taken with P5/minor 128 Bioinformatics)

PS2: Memory (7 places, Psychology)
(PS2 cannot be taken with P7)

Please refer to the hosting department brochures for details of their modules.
If oversubscribed places will be allocated at random.

THE PDN COURSE MODULES

The themes to which individual modules belong are indicated as follows: (D) Development and Reproductive Biology, (P) Integrative Physiology, (N) Neuroscience.

Michaelmas Term Modules

Module N1: Developmental Neurobiology (D, N)

(Inter-departmental module with Zoology)

Module organiser: Prof. Clare Baker (cvhb1@cam.ac.uk)

This module addresses how the nervous system is assembled during embryonic development. Although we now understand a considerable amount about the processes involved, many fascinating questions remain.

We begin by discussing the formation of the vertebrate neural tube (future brain and spinal cord), and how this is patterned to generate distinct neuronal and glial cell fates in different regions, including the cerebral cortex. We also consider the evolution of the cerebral cortex. We discuss the formation of the peripheral nervous system from the migratory neural crest and cranial neurogenic placodes (good models for understanding the control of cell migration and fate-choice). Once neurons have formed, they extend axons to their targets to 'wire up' the nervous system: the process of axon guidance is considered in detail. We explore how axons make and refine the synapses that will generate functional neural circuits, and discuss how circuit designs lead to function.

This is an interdepartmental course (with Zoology), given by researchers in the Departments of PDN, Genetics, Zoology, and the MRC Laboratory of Molecular Biology.

It is best suited for students who have studied some neurobiology in Part IB, either in MedST/VetST or in NST, but others will be able to take it if they are prepared to do some background reading.

Module N2: Experimental Tools for the Neuroscientist and how they are Shaping Scientific Discovery (N)

Module organiser: Prof Angela Roberts (acr4@cam.ac.uk)
This module **cannot** be taken with Cell Assembly and Interactions (P9)

This module will consider the current generation of experimental tools available to the neuroscientist and how their application is contributing to our understanding of brain organisation and function. The range of state-of-the-art technologies and approaches will include opto- and chemo-genetics, multichannel recording, single and multiphoton calcium imaging, multimodal MRI, computational modelling and brain organoids. Not only will you learn about the neurobiological foundations of each experimental tool, but also how it is transforming our understanding of neuroscientific topics ranging from sensory perception and motor control to memory and higher-order decision making. Teaching will be a mixture of traditional lectures, interactive sessions and student-led presentations. Along the way, you will gain core generic skills of scientific presentation, scientific debate and critical reading of primary scientific papers. By the

end of the module, we hope you will have a comprehensive overview of the landscape of neuroscientific research and how the different techniques and experimental approaches provide insight into brain function across multiple levels of analysis from molecules and cells at single synapses to local and large-scale neural networks.

This module complements any of the other neuroscience modules. It is recommended especially for those neuroscientists wishing to take the 'neuroscience theme' in PDN, taking four neuroscience modules alongside a two-term neuroscience research project. It replaces the workshops for 'neuroscience theme' students that we have run in PDN for many years.

Module N3: Neuroscience: Circuits and Systems (N)

Module organiser: Dr David Parker (djp27@cam.ac.uk)

We know a lot about the brain in terms of its molecular and cellular properties and the role of different brain regions in behaviour. What we lack is insight into how molecular and cellular properties interact to generate cognitive functions and behaviours. This is widely considered to be the major problem facing neuroscience. This is illustrated by the recent billion Euro Human Brain Project and the ongoing billion Dollar US BRAIN initiative, projects that promise(d) to address this question.

This module will consider various aspects of conceptual and experimental approaches to circuit/system understanding. Lectures start with an introduction to neural circuits/systems and their analysis. This will be followed by consideration of connectomic analyses of the wiring of neural circuits underlying sensory and motor function in Drosophila. Lectures will then focus on the molecular and cellular properties of the neural circuits underlying reproductive functions in mammals and cerebellum circuits that influence motor learning and behaviour. Neural systems will then be considered, with lectures on visual system pathways and the role of the vestibular system in perception and spatial navigation. The module will finish with an introduction to artificial neural networks and their role in system and circuit understanding.

In addition to the 20 hours of lectures, the module will include 4 hours of interactive debates on general features of circuit/system functions and their analysis. Topics might include the relative merits of experimental approaches (e.g., imaging compared to electrophysiology, will the 'photon replace the electron'); the relative merits of experimental and computational approaches; and how can we link neuronal, circuit, and system function.

This module complements any of the neuroscience modules. P1 provides complementary cellular detail, and P8 a complementary systems perspective.

Module N4: Cellular and Molecular Neuroscience (N)

Module organiser: Prof Ole Paulsen (op210@cam.ac.uk)
This module **cannot** be taken with Cellular Physiology (P1)

While many approaches can be used to study the structure and function of nervous systems, any deep mechanistic understanding must include an appreciation of the cellular properties of different types of neurons and glia, as well as their interactions and the molecules involved. This module aims to give students an understanding of important principles in contemporary neuroscience at cellular and molecular levels. The lectures will cover voltage-dependent ion channels and their role in electrical signalling, ligand-gated ion channels and their role in synaptic

transmission, intracellular signalling in neuromodulation and synaptic plasticity, sensory transduction mechanisms, and cellular techniques applied to circuit neuroscience.

This module aims to provide insights that will be useful in the other PDN neuroscience modules. N4 complements any of the other neuroscience Modules.

Module P1: Cellular Physiology (P)

Module organiser: Dr Christof Schwiening (cjs30@cam.ac.uk)
This module **cannot** be taken with Cellular and Molecular Neuroscience (N4)

Cells detect and respond to changes in their external environment through a cornucopia of signalling pathways. Many of the pathways involve complex biochemical reactions, but some are more amenable to study by the physiologist – in particular membrane potential, calcium and pH. Thus, in this module we look at cellular signalling from a Physiological viewpoint rather than 'stamp collecting' all of the signalling pathways. The three main signalling mechanisms we have selected here are used by both excitable and in-excitable cells to transmit information from the cell surface to effector systems. We start the module by looking at the basic ionic regulation mechanisms that allow signalling to exist including sodium and calcium regulation. We then move to looking at the ion channels that allow calcium into cells. This is followed by a series of lectures on intracellular calcium signalling.

This year we are including a lecture on endoplasmic reticulum interactions with the mitochondria which can sculpt calcium signals. The calcium signals also result in pH microdomains, which are also potential intracellular 'second' messengers. We then focus on the membrane and consider how ligands can result in potential changes and how these potential changes can be modified by signalling pathways. We end the series of lectures by bringing together membrane potential changes and calcium signalling with lectures on skeletal muscle and meta plasticity.

The module contains a series of workshop/seminars on mathematical modelling, molecular techniques, fluorescence measurements and microelectrode techniques.

Module P3: Fetal and Placental Physiology (D, P)

Module organiser: Prof Dino Giussani (dag26@cam.ac.uk)

The study of the fetus and placenta is a unique aspect of physiology with relevance for basic and clinical sciences. This module will explore a wide range of topics, including the normal development of the fetus and placenta, adaptations to the intrauterine environment, responses to challenges in utero, mechanisms of parturition and the transition at birth. The scientific basis underlying the aetiology of miscarriage, preeclampsia and sudden infant death syndrome, and the consequences of prematurity, maternal obesity and intrauterine growth retardation will be discussed.

In addition, the course will give insight to current ideas on the developmental programming of health and disease.

Modules that complement P3 are: P2 for a developmental focus, P4/P6 for students interested in cellular/morphological changes and P7/P8 for a wider physiology or pathophysiology theme.

Module P4: Early Development & Patterning: Genetic and Cellular Mechanisms (D)
(Inter-departmental module with Genetics and Zoology)

Module organiser: Dr Richard Adams (rja46@cam.ac.uk)

This newly updated course is the first of two complementary modules (with P6), which can also be taken on their own. The module works well in combination with all other PDN modules.

This module will cover how the early embryo develops from a fertilized egg to form the body plan. It will focus on our understanding of how gene regulatory and signalling interactions drive cell fate decision making within cells and combine this with our understand of how dynamic cell behaviours drive the shaping of tissues through morphogenesis. You will therefore learn about the key principles of embryonic development, taking examples from a range of early developmental events such as cell fate determination, germline development, gastrulation, segmentation, and somitogenesis in both invertebrate and vertebrate systems. In doing so, you will also be introduced to a range of modern techniques applicable to the study of development including molecular, genetic and imaging technologies.

An emphasis across the module is in comparing the mechanisms across a broad range of experimental organisms and processes, in order to highlight the essential principles of developmental biology.

This interdepartmental course (with Genetics and Zoology) will consist of three lectures per week.

Module P9: Cell Assembly and Interactions (D)
(Inter-departmental module with Zoology)

Module organiser: Dr Milka Sarris (ms543@cam.ac.uk)
This module **cannot** be taken with Experimental Tools for the Neuroscientist (N2)

Cells are highly organised and dynamic structures. In this module we will explore how the architecture of the cell is constructed and how cells interact with each other and their environment in order to fulfil their myriad roles in animals. Our current knowledge of these vital topics will be presented in depth, with a focus on the molecular mechanisms that regulate cell behaviour. We examine how cells use basic cell biological mechanisms in their complex activities within animals, including cellular behaviour during development and how cellular activities provide key physiological functions in the adult. We study how cells become polarized and adhere together to form higher order multicellular assemblies, how membrane compartments are constructed, and the dynamics of transfer between them. We will discuss current ideas about how cells were created during evolution, and how eukaryotic cells arose from prokaryotes. We will explore how cells sense and respond to the mechanical properties of their surroundings and the key role of the cytoskeleton in determining cell shape, organisation and movement.

We switch focus to the nucleus and how the genome architecture determines gene expression and discuss how cells maintain protein homeostasis, and the important process of autophagy in cellular physiology. Thus, we provide a comprehensive picture of different fundamental cellular processes and introduce a broad range of techniques to visualise and study these processes in live cells, in vitro and in intact animals.

This is an interdepartmental course (with Zoology). In addition to lectures there are several interactive sessions (such as journal clubs) in which there will be discussions of key papers, experimental techniques and major concepts in the field. P9 works well with the other ‘Developmental and Reproductive Biology (‘D’) Theme’ modules.

Lent Term Modules

Module N6: Higher Order Function and Dysfunction (N)

Module organiser: Prof Angela Roberts (acr4@cam.ac.uk)

This module considers the neurobiological basis of a range of higher-order functions in the brain including (i) perception, recognition and decision making in the visual domain, (ii) executive function and (iii) positive and negative emotions and their regulation. These are the product primarily of the functioning of high-order association cortices found in the temporal, frontal and parietal lobes. They will be discussed in relation to findings from a range of experimental approaches in humans and animals including non-human primates and rodents. For example, vision is a main source of information for primates, and our life greatly depends on the ability to recognise behaviourally relevant objects. on of negative and positive emotion. Here, emphasis will be placed on the contribution the prefrontal cortex makes to the top down regulation of subcortical circuits known to induce appetitive approach and negative avoidance behaviour. Throughout this module use of state-of-the-art technology to measure and intervene in brain function will be highlighted alongside the translational potential of studies in animals to inform our understanding of higher-order functions and dysfunctions in humans.

This Module works best when taken with any of the other neuroscience Modules.

Module N9: Modulation, Plasticity, and Behaviour (N)

Module organiser: Dr Sue Jones (sj251@cam.ac.uk)

A fascinating feature of the nervous system is neuronal plasticity: the ability for neurons and their connections to be modified in response to specific patterns of activity in an ever-changing external or internal environment. Alongside neuronal plasticity, the modulatory effects of neurochemicals provide additional flexibility in the response repertoire of neurons. In the mature mammalian brain, neuronal plasticity and modulation enables complex neural networks to remain dynamic and adaptive.

Two key questions in modern neuroscience are: what are the mechanisms of neuronal plasticity, and how do neuronal plasticity and modulation contribute to behaviour? This module will focus on both of these questions and will explore examples of plasticity and modulation in defined neuronal systems, ranging from endocrine modulation of hypothalamic circuits in the context of sexual maturation and behaviour, to the plasticity of neurons in brain reward pathways and how this is hijacked by drugs of abuse, and the neuronal plasticity in sensory, motor and cognitive networks. Contemporary as well as traditional research methods for investigating neuronal plasticity and modulation will be considered, including opto- and chemogenetic approaches, imaging and electrophysiology. The first lecture will include an introduction to different forms of cellular and synaptic plasticity and modulation.

This Module works best when taken with any of the other neuroscience Modules.

Module P2: Development and Stem Cells: Embryonic and Extra-embryonic Tissues (D, P)

Module organisers: Dr Erica Watson (edw23@cam.ac.uk) and Prof Magda Zernicka-Goetz (mz205@cam.ac.uk)

The transformation of a fertilised egg into a human embryo encompasses a series of fundamental cellular events. During this process the initial totipotent egg generates stem cells that, progressively become restricted to different fates. The first differentiation event is a separation between extra-embryonic trophectoderm and the pluripotent inner cell mass, and the second, within the inner cell mass, between the embryonic epiblast and the extra-embryonic primitive endoderm. In this module we will explore how these cell fate decisions are taken and what stem cell niches, transcriptional networks, and epigenetic modifications reinforce them. We will explore how we can build embryo ourselves using stem cells growing in vitro. We will also consider subsequent formation and functions of the extra-embryonic lineages, and how interactions between the trophectoderm and the maternal tissues and metabolism lead to implantation and establishment of a successful pregnancy.

The module will start by examining the development of cell polarisation and the effects of subsequent symmetrical and asymmetrical cell division and cell position in creating unique cell populations in the mouse and human embryos. The subsequent differentiation of the inner cell mass, the concept of embryonic stem cells and their therapeutic potential in regenerative medicine will then be explored, with comparisons being made between the mouse and human. We will then investigate how the extra-embryonic lineages interact with the maternal tissues to establish a human pregnancy. This will include consideration of endometrial receptivity, implantation, decidualisation and the factors that regulate trophoblast development, including interactions with the maternal immune system and, metabolism, and microbiome. Correlates will be drawn between normal pregnancies and the common complications, including miscarriage and preeclampsia, in which extra-embryonic tissue formation and function is impaired.

The technologies that researchers use in the lab to study mammalian development will be touched upon including: stem cell derivation, synthetic embryos, organoids, epigenome analysis, and animal models. The module will involve a mix of lectures and journal clubs.

Useful combination modules include: P3 Fetal and placental physiology (M), P4 Early Development & Patterning: Genetic and Cellular Mechanisms (M), P6 Development: Cell differentiation and organogenesis (L).

Module P5: Bioinformatics (P)
maximum of 46 students
Module organiser: Dr Alexia Cardona (ac812@cam.ac.uk)
(Inter-departmental module by Dept. of Genetics)

Bioinformatics is an interdisciplinary field that uses computational approaches to process biological data. With the biological and biomedical sciences becoming more data-driven than ever before, bioinformatics is central to these areas. The Bioinformatics module introduces the fundamental bioinformatic concepts and methodologies used to analyse biological data. It is structured around 2 main blocks: data science, omics and approaches to analysis of biological data.

The course is specially designed for students coming from the biological and biomedical sciences. It provides introductory data foundation sessions that introduce students to programming, data visualisation and manipulation skills that will be used throughout the course. Topics are introduced

through a set of lectures that introduce theoretical concepts, and practicals which provide hands-on practice using real biological datasets.

More information can be found at https://bioinfotraining.bio.cam.ac.uk/undergraduate

Module P6: Development: Cell Differentiation and Organogenesis (D)
(Inter-departmental module with Zoology)

Module organiser: Dr Emma Rawlins (elr21@cam.ac.uk)

This course is the second of two complementary Developmental Biology modules (with P4) that can also be taken on their own. This module examines a second phase of embryonic development, following the initial steps of defining axes, major cell layers, and broad pattern domains (covered in P4). P6 works well with any of the other developmental and cell biology modules, particularly P2 Development and stem cells, P4 Early development and patterning and P9 Cell assembly and interactions. It can also complement P3 Fetal and placental physiology.

A series of topics will be presented, each using particular tissues or organs to highlight individual developmental mechanisms. Thus, the diverse mechanisms to make tubular organs will be used to highlight the importance of cell polarity and cell shape changes, and used as a framework for discussing key techniques in the study of developmental biology; the development of the heart will be used to discuss the transcriptional programmes that drive differentiation, and to highlight different strategies for organ morphogenesis; the importance of stem cells in the formation and maintenance of organs will be discussed using a variety of examples, including oesophagus and intestine; the formation of the vertebral column illuminates mechanisms of cell allocation and morphogenesis, including the role of mechanics; and limb development illustrates how patterning mechanisms are coordinated with cell proliferation.

A mixture of examples from simpler invertebrate models and vertebrates will show how developmental mechanisms have diversified with increasing cell number. We will also discuss human diseases that impact on the development of these organs, and how our understanding of organogenesis provides the foundation for regenerative medicine approaches to the treatment of these diseases.

This interdepartmental course (with Zoology) will consist of three lectures per week, and seven interactive sessions (such as journal clubs) in which we will aim to discuss key references and the concepts presented in the lectures.

Module P7: Pathophysiology of Cancer (D, P)

Module organisers: Prof Hugh Robinson (hpcr@cam.ac.uk)

We will examine cancer and malignant progression of solid tumours as examples of how to integrate a physiological approach to disease, giving consideration to modern genetic tools and techniques as well as to the unique physiological challenges of malignancy. We will also discuss how this impacts therapeutic choices and drug development. Consideration will be given to how research on pathophysiology is influenced by modern understandings of systems biology and physiology. The course will include lectures and interactive question and answer sessions of selected relevant articles. The course is suited to both NST and MVST students and works well with all other modules.

Module P8: Systems and Clinical Physiology (P)

Module organiser: Prof Stewart Sage (sos10@cam.ac.uk)

Systems physiology is central to the practice of scientific medicine. This module gives students a more detailed view of some aspects of systems physiology and includes some clinically oriented material that is of particular importance to the practising doctor. Cardiovascular topics include cardiac arrhythmias and the genetics and energetics of heart failure. Renal physiology covers autoregulation of renal blood flow and glomerular filtration rate, acute kidney injury and chronic renal failure. Several areas of endocrine physiology are explored in the form of pancreatic islet and gut hormones, brain control of food intake, the pathophysiology of obesity and the physiology and pathophysiology of bone.

The lecturers giving this course are from the Department of Medicine and the Institute of Metabolic Science as well as PDN.

This module is reasonably self-contained and can be taken in combination with any other modules. There is a small amount of overlap with some of the material covered in other P modules, including P1, P3 and P7, but it is not necessary to take any of these modules in order to understand the material in P8.

PDN MODULE FOR BBS STUDENTS ONLY

Minor 137: Surgical and Radiological Anatomy
Maximum of 30 students

Organiser: Prof Cecilia Brassett (hacteach@pdn.cam.ac.uk)

This course introduces students to areas of anatomy that are especially relevant to surgical and radiological procedures. The need for a good working knowledge of anatomy in surgical and radiological practice is of course paramount in clinical safety. Applicants for Core Surgical Training and Specialty Radiology Training may improve their scores in the "Experience in and commitment to specialty" component by having chosen to take a relevant module such as this course. Students also choose one practical activity from the following options: attendance at operating theatre sessions; diagnostic and/or interventional radiology session; or preparation of an anatomical prosection (for Natural Sciences students). Assessment includes a 1-hour Single Best Answer MCQs paper, a written report (2,500-3,000 words) and oral presentation on the practical session. Lecturers are current consultant radiologists and surgeons. Veterinary students are very welcome, as the lectures are still relevant, and they can obtain placements at the Vet School.

Further details can be found in the Surgical and Radiological Anatomy Subject Fair Moodle page https://www.vle.cam.ac.uk/course/view.php?id=213951&section=10

Course Booklet: https://www.biology.cam.ac.uk/files/sara_booklet_24-25_updated_120224.pdf

SOME TOPICS OF RECENT RESEARCH PROJECTS

Two-term Experimental Projects 2023-24	
Supervisor	**Experimental Project Title**
Albert Cardona	The connectome of the fly model of Parkinson's disease
Allan Herbison, Szilvia Vas	Brainstem noradrenergic innervation of the hypothalamic arcuate kisspeptin neurons
Amanda Sferruzzi-Perri, Cindy Zhang	Interaction of maternal obesity and inflammation in altering growth pathways in maternal, fetal and offspring liver
Amanda Sferruzzi-Perri, Jonas Zaugg	Impacts of parental obesity in determining pregnancy outcomes
Andras Lakatos	Elucidation of early synapse pathology in human ALS/FTD neural organoid models
Andrew Murray	Consequences of obesity during pregnancy for cardiac and placental metabolism (x2 projects within this title)
Angela Roberts, Christian Wood	Investigating the effect of a mild stress event on social affiliative behaviour in marmosets
Angela Roberts, Christian Wood	Characterising the functional and anatomical connections of the dorsolateral prefrontal cortex in marmosets
Cecilia Brassett, Roger Gray, Daniele Borsetto	Determining landmarks on 3D reconstructions of microCTs of the temporal bone to improve safety of translabyrinthine surgery for vestibular schwannoma
Cecilia Brassett, Chandra Pasapula	Does Anterior Talofibular Ligament integrity influence Deep Deltoid Ligament integrity in flatfoot? A cadaveric study of the 'Deltoid Paradox'
Cecilia Brassett, Harry Lyall, Andrew Grainger, John Dowell	Morphological variations of Lister's tubercle and its relationship to the extensor pollicis longus tendon
Cecilia Brassett, John Somner, Tony Vivian	Investigation of superior oblique tendon anatomy with respect to surgical approaches and development of novel approaches to simplify surgery
Christof Schwiening	Use of pulse arrival time as a surrogate of arterial blood pressure (x2 projects within this title)
Christof Schwiening	Can aerobic fitness be predicted from mixed mode exercise?
Clare Baker, Christine Hirschberger	Insights into vertebrate sensory cell-type development and evolution from studying electroreceptor development in weakly electric teleost fish embryos.
David H. Rowitch	Development of novel pharmaceutical therapeutics and novel MR-active and fluorescent contrast agents for glioblastoma treatment through investigation of glial responses to hypoxia and iron metabolism
David Keays, Thomas Cushion	Modeling Cortical Malformation with human stem cells
Eleanor Raffan	Genome-Wide Association Studies in Canine Breeds: Investigating Genetic Links to Obesity-Related Phenotype
Eleanor Raffan, Valdas Noreika	Studying inter-species communication with EEG in dogs and humans
Elena Scarpa	Investigating cell division under mechanical compression in vivo using the Zebrafish embryo.
Elisa Galliano	Heterogeneity of interneuronal populations in the olfactory bulb across a mouse's lifetime
Emma Rawlins, John Russell	Modelling human lung development in vitro
Erica Watson	Exploring placenta phenotypes that result from disrupting one-carbon metabolism
Erica Watson	Folate beyond neural tube closure
Fengtong Ji (Xiong lab)	Physical Regulation of the Body-Axis Elongation of Chick Embryos Using Magnetic Nanorobots

Fengzhu Xiong, Ana Hernandez	Investigation of the influence of Extracellular matrix proteins (ECM) on Neuromesodermal progenitor (NMP) cells in chicken embryos.
Golnar Kolahgar	How to maintain and renew intestinal stem cells? (x2 projects within this title)
Hugh Matthews	Modulation of the stretch reflex in athletes (x2 projects within this title)
Hugh Matthews, Chris Huang	Modelling electrodiffusion of calcium ions at the skeletal muscle triad.
Hugh Matthews, Chris Huang	Effects of modified cellular Ca2+ homeostasis on Na+ current activation in mouse skeletal muscle.
Hugh Robinson	Electrophysiology of Neuroendocrine Prostate Cancer Cells
James Fraser	Understanding the determinants of nerve conduction recovery cycles (x2 projects within this title)
Jasper Poort, Natsumi Homma	Investigating differences in distribution of GABAergic interneuron subtypes between primary and association cortex
Jessica Taylor (Richard Gilbertson lab)	Characterising the Tumour Immune Microenvironment of Group 3 MYC-amplified Medulloblastoma in response to Acute Focal Radiotherapy
Julija Krupic, Hinze Ho	Can mice solve double alternation task in their home cage
Kathy Niakan, Nicola Reynolds	Role of transcription factors in the transition from naïve to primed state in human ES cells
Keita Tamura	Wire-less approach to studying neuronal circuits in behaving animals
Kristian Franze, Sudipta Mukherjee	Investigating the effect of tissue mechanics on cell fate in the developing Xenopus brain.
Matt Mason	Functional morphology of the manubrium mallei: variation in the handle of the hammer among mammals
Matt Mason	Structure and function of the marsupial ear
Mekayla Storer	Investigating the role of the extracellular matrix and mechanical cues in regulating digit tip regeneration
Milka Sarris	Dynamics of ATP signalling during neutrophil tissue damage responses
Omar Mahroo	Investigating human retinal signals in vivo using the electroretinogram (x2 projects within this title)
Richard Adams	3D computer graphics for Neuroanatomy Teaching
Richard Tyser	Exploring the lineage potential of human cardiac progenitors in vitro
Steve Edgley	Higher order human motor conditioning
Steve Edgley	The eyeblink model of human higher-order conditioning
Sumru Bayin	Changes in the microenvironment upon injury to the brain
Susan Ozanne and Laura Dearden	Regulation of miRNAs in the fetal hypothalamus by exposure to maternal obesity
Thorsten Boroviak, Christopher Penfold, Clara Munger	Characterisation of the extracellular matrix landscape in primate peri-implantation development
William Colledge, Sue Jones	Optimising RNAscope to detect potential sex differences in OXTR expression in kisspeptin medial amygdala neurones
Albert Cardona	The connectome of the fly model of Parkinson's disease
Allan Herbison, Szilvia Vas	Brainstem noradrenergic innervation of the hypothalamic arcuate kisspeptin neurons
Amanda Sferruzzi-Perri, Cindy Zhang	Interaction of maternal obesity and inflammation in altering growth pathways in maternal, fetal and offspring liver
Amanda Sferruzzi-Perri, Jonas Zaugg	Impacts of parental obesity in determining pregnancy outcomes
Andras Lakatos	Elucidation of early synapse pathology in human ALS/FTD neural organoid models
Andrew Murray	Consequences of obesity during pregnancy for cardiac and placental metabolism (x2 projects within this title)

Two-term Theory Projects 2023-2024	
Supervisor	**Theory Project Title**
David Bainbridge	Do non-human primates possess von Economo neurons, and what are the implications of this for human neurological and mental disorders?
David Bainbridge	Is There a Therapeutic Rationale for the Use of Vilobelimab, an Antibody Which Binds Complement Component 5a, in Preeclampsia?
Riccardo Beltramo	Electric shock paradigms in rodents in the context of PTSD
Richard Adams	3D computer graphics for Neuroanatomy Teaching
Wolfram Schultz	The different functions of neurophysiological dopamine signals

BBS Dissertations 2023-2024	
Supervisor	**Dissertation Title**
Amanda Sferruzzi-Perri	How do complications of pregnancy affect future maternal health?
Andrew Murray	Is the diabetic heart destined to fail?
Angela Roberts	Neuromodulation of prefrontal cortex as a therapeutic strategy
Angela Roberts	Insights into the psychological and neural mechanisms underlying current cognitive-behavioural therapies for treating psychiatric disorders
Christof Schwiening	Why does the Tanda equation predict marathon performance?
Clare Buckley	What can biophysics tell us about morphogenesis and disease?
Courtney Hanna	Functions of extra-embryonic tissues in early embryogenesis
Courtney Hanna	Mechanisms underpinning the placenta-heart axis in development
David Bainbridge	Do dietary animal and plant proteins differ in their effectiveness in reducing sarcopenia, and does this have implications for minimising sarcopenia in postmenopausal women?
David Bainbridge	Is conventional oestrogen-progesterone hormone replacement therapy sufficient for the treatment of hypoactive sexual desire disorder in all menopausal women?
David Parker	Are stereotypies in horses a physical manifestation of equine autism spectrum disorder?
David Parker	Translational Neuroscience
David Parker	The Neural Circuitry Behind Dreams
Emma Rawlins	To what extent can heart organoid models replace the use of animals in fundamental cardiac developmental research
Erica Watson	Does folic acid over-supplementation during pregnancy effect fetal development?
Hugh Matthews	Do antidepressants increase the risk of cardiac arrhythmia?
Julija Krupic	Spatial deficits in normal ageing and Alzheimer's disease
Keita Tamura	A strategy to probe causal impacts of neuronal activity in association cortex
Matt Mason	Exploring the fluctuations of healthy BMI between different populations
Mekayla Storer	The potential of regenerative medicine: are we there yet?
Narain Moorjani	Analysing the efficacy of surgical cardiac valve repair and replacement compared to transcatheter approaches
Sepideh Keshavarzi	The Role of Vestibular and Visual Systems in Neural Coding of Space and Self-Motion
Stewart Sage	Mechanisms of platelet activation by SARS-CoV-2
Stewart Sage	STIM1, Orai1, TRPC1 and Store-Operated Calcium Entry
Sue Jones	Young onset Parkinson’s disease
Sue Ozanne	Unveiling the Placental Impacts: Exploring Maternal Overnutrition, Obesity, and Gestational Diabetes on Fetal and Maternal Health
Sumru Bayin	Neural stem cells during development and regeneration

RECENT PUBLICATIONS RESULTING FROM PART II RESEARCH PROJECTS

Recent published papers resulting from, or including work from, Part II projects (with student's name in bold):

Batavanis, M.A., Marway, P., Brassett, C. & Adams, R. (2022). Developing a digital 3D model of the middle ear from micro-CT scans for anatomy teaching. *Clinical Anatomy,* DOI: 10.1002/ca.23836.

Burford, C.M., Cornwall, H.L., **Farr, M.R.B.**, **Santoni, C.M.**, Mason, M.J. (2023) Development and anatomy of the human middle ear. In: Goycoolea, M.V., Selaimen da Costa, S., de Souza, C., Paparella, M.M. (eds) Textbook of Otitis Media, pp.29-48. Springer, Cham.

Chadda, K.R., Blakey, E.E., Huang, C.L-H. & Jeevaratnam, K. (2022). Long COVID-19 and postural orthostatic tachycardia syndrome-is dysautonomia to be blamed? Frontiers in Cardiovascular Medicine, section Cardiac Rhythmology. 9:860198. doi: 10.3389/fcvm.2022.860198

Garrud TAC, Teulings NEWD, Niu Y, **Skeffington KL**, Beck C, Itani N, **Conlon FG**, Botting KJ, Nicholas LM, Tong W, Derks JB, Ozanne SE, Giussani DA (2023). Molecular mechanisms underlying adverse effects of dexamethasone and betamethasone in the developing cardiovascular system. FASEB J. 37(6): e22887. doi: 10.1096/fj.202200676RR.

Griffiths, B., Thirunavukarasu, A., Jarvis, G., Brassett, C. & Sarkies, N. (2023) Novel investigation of the dimensions of the optic canal using 3D reconstructions from micro-CT scans. *Clinical Anatomy*, DOI 10.1002/ca.24044.

Guo, Y., Sparks, J., Brown, J. & Brassett, C. (2023) Novel factors affecting barrier function at the oesophagogastric junction. *Clinical Anatomy*, DOI: 10.1002/ca.24131.

Han S.Y, Morris P.G, Kim J.C, **Guru S**, Pardo-Navarro M, Yeo S-H, McQuillan H.J, Herbison A.E (2022) Mechanism of kisspeptin neuron synchronization for pulsatile hormone secretion in male mice. Cell Reports in press

Hilton JR, **Simpson SR**, Sherman ER, Raby-Smith W, Azvine K, **Arribas M, Zou J,** Deiana S, Hengerer B, Cahill EN (2023) Reactivity to conditioned threat cues is distinct from exploratory drive in the elevated plus-maze. European Journal of Neuroscience. doi: https://doi.org/10.1101/2022.03.21.485161

Hutchinson, L., Lambert, S., Brassett, C. & Grainger, A. (2023). Developing a novel ultrasound protocol to measure movement of the subscapularis tendon in shoulder abduction. *Clinical Anatomy*, DOI: 10.1002/ca.24131.

Hutchinson, L., Omer, T., Pizzimenti, M., Grainger, A., Brassett, C. & Lambert, S. (2023) Cadaveric study investigating variation in the nerve supply of subscapularis in relation to its morphology. *Clinical Anatomy*, DOI 10.1002/ca.24044.

Kane AD, Herrera EA, Niu Y, Camm EJ, Allison BJ, Tijsseling D, Lusby C, Derks JB, **Brain KL**, Bronckers IM, Cross CM, Berends L, Giussani DA (2023). Combined Statin and Glucocorticoid Therapy for the Safer Treatment of Preterm Birth. Hypertension 80(4):837-851.

Lakshmi, A., Grainger, A., Brassett, C. & Lyall, H. (2023) Anatomical variations in extensor tendons of the thumb: a study using cadaveric dissection and ultrasound scanning. *Clinical Anatomy*, DOI 10.1002/ca.24044.

Leavy, A., Salahudin, D., Dowell, J. & Brassett, C. (2023) What factors might be useful in predicting the degree of overlap of latissimus dorsi on the inferior scapula? *Clinical Anatomy*, DOI: 10.1002/ca.24131.

Lim, A., Biosse-Duplan, G., Gregory, A., Mahbubani, K., Riche, F., Brassett, C, & Scott, J. (2022) Optimal location for fibular osteotomy to provide maximal compression to the tibia in the management of delayed union and hypertrophic non-union of the fibia. Injury 53(4), 1532-1538.

Lopez, A, **Gorb, A**, Palha, N, Fleming, A, Rubinsztein D.C. (2022). A New Zebrafish Model to Measure Neuronal α-Synuclein Clearance In Vivo. Genes (Basel) 13(5):868. DOI: 10.3390/genes13050868

Lopez-Tello J, Jimenez-Martinez MA, Salazar-Petres E, **Patel R,** George AL, Kay RG, Sferruzzi-Perri AN (2022) Physiological changes in the mouse renal system in response to pregnancy. Int. J. Mol. Sci.23: 6287.

Lopez-Tello J., Yong H.E.J., Sandovici, I., Dowsett G.K.C., Christoforou, E.R., Salazar-Petres, E., **Boyland, R.**, Napso, T., Yeo, G.S H., Lam B.Y.H., Constancia, M.,Sferruzzi-Perri, A.N. (2023) Fetal manipulation of maternal metabolism is a critical function of the imprinted Igf2 gene. Cell Metab. 2023 Jul 11;35(7):1195-1208.e6. doi: 10.1016/j.cmet.2023.06.007

Maghsoudi, D., West, C., Brassett, C. & Chitnavis, J. (2022) Are there common intraosseous patterns of vascularity in the knee? *Clinical Anatomy,* DOI: 10.1002/ca.23836

Manoharan, S.M., Gray, R., Hamilton, J. & Mason, M.J. (2022) Internal vascular channel architecture in human auditory ossicles. Journal of Anatomy 241:245-258.

Maxwell, L., Nava, T., Norrish, A., Pizzimenti, M., Brassett, C. & Pasapula, C. (2023) Locking vs. non-locking plate fixation in comminuted talar neck fractures: A biomechanical comparison using cadaveric specimens. *Clinical Anatomy*, DOI 10.1002/ca.24044.

Minařík M, Modrell MS, Gillis JA, Campbell AS, **Fuller I**, Lyne R, Micklem G, Gela D, Pšenička M, Baker CVH. 2023. Identification of multiple transcription factor genes potentially involved in the development of electrosensory versus mechanosensory lateral line organs. bioRxiv doi: https://doi.org/10.1101/2023.04.14.536701.

Mohideen, F., El-Khoury, M., Mouritsen-Luxhøj, C., Townend, R., **Choo, A., Wong, E.**, Jarvis, G., Gregory, A., Brown, J., & Brassett, C. (2022) Morphological analysis of the ileocaecal junction and associated clinical implications. *Clinical Anatomy*, DOI:10.1002/ca.23836.

O'Brien, K. A., Gu, W., Houck, J.A., Holzner, L.M.W., Yung, H.W., Armstrong, J.L., Sowton, A.P., **Baxter**, **R.,** Darwin, P.M., Toledo-Jaldin, L., Lazo-Vega, L.V., Moreno-Aramayo, A.E., Miranda-Garrido, V., Shortt, J.A., Matarazzo, C.J., Yasini, H., Burton, G.J., Moore, L.G., Simonson, T.S., Murray, A.J., Julian, C.G. (2023). Genomic selection signals in Andean highlanders reveal adaptive placental metabolic phenotypes that are disrupted in preeclampsia. Hypertension, In Press.

Morris, J. A., **Bardsley, O**. J., Salvage, S. C., Jackson, A. P., Matthews, H. R, & Huang, C. L.-H. (2023). Nernst-Planck-Gaussian modelling of electrodiffusional recovery from ephaptic excitation between mammalian cardiomyocytes. Frontiers in Physiology, section Cardiac Electrophysiology. 14:1280151. doi: 10.3389/fphys.2023.1280151, Manuscript ID: 1280151.

Salahudin, D., Leavy, A., Dowell, J. & Brassett, C. (2023) How much variation exists in the size and morphology of the thoracolumbar fascia? Clinical Anatomy, DOI: 10.1002/ca.24131.

Sherman ER, **Thomas JJ**, Cahill EN (2022) Review: The bed nucleus of the stria terminalis in threat detection: task choice and rodent experience. Emerging Topics in Life Sciences. https://doi.org/10.1042/ETLS20220002

Smith, A., Brassett, C., Gooding, C., Abood, A. & Norrish, A. (2022) Vastus lateralis versus rectus femoris muscle flaps for recalcitrant hip joint infection: An anatomical study comparing the effectiveness of acetabular dead space control. Clinical Anatomy, 35(7), 961-973.

Tandon, A., Brassett, C. & Wong, K.Y. (2023) Investigating the lumbar artery perforator flap using cadaveric dissection and Doppler ultrasound assessment: An alternative flap for autologous breast reconstruction. *Clinical Anatomy*, DOI 10.1002/ca.24044.

Tong W, Ganguly E, Villalobos-Labra R, Quon A, Spaans F, Giussani DA, Davidge ST (2023). Sex-Specific Differences in the Placental Unfolded Protein Response in a Rodent Model of Gestational Hypoxia. Reprod Sci. 30(6):1994-1997.

West, C., Maghsoudi, D., Wilson, B., Jarvis, G., Brassett, C. & Chitnavis, J. (2022). Detailing vasculature of the infrapatellar fat pad and implications for knee surgery. *Clinical Anatomy*, DOI: 10.1002/ca.23836.

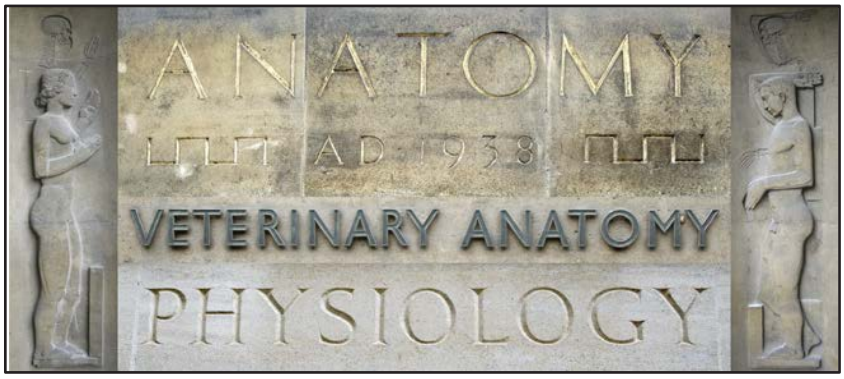
Young R, Lewandowska D, Long E, Wooding FBP, De Blasio MJ, Davies KL, Camm EJ, Sangild PT, Fowden AL & Forhead AJ (2023) Hypothyroidism impairs development of the gastrointestinal tract in the ovine fetus. Frontiers in Physiology 14: 1124938. doi: 10.3389/fphys.2023.1124938.

PROVISIONAL PART II PDN TIMETABLE 2024/25

MICH	*Monday*	*Tuesday*	*Wednesday*	*Thursday*	*Friday*
9-10	**N4** Cellular Neuroscience		**N4** Cellular Neuroscience **P1** Cell.Physiology	**N1** Developmental Neurobiology	**N4** Cellular Neuroscience
10-11	**N1** Developmental Neurobiology	**P1** Cellular Physiology	**N3** Circuits and Systems	**P3** Fetal & Placental Physiology	**N1** Developmental Neurobiology
11-12	**P4** Early Dev and Patterning	**N3** Circuits and Systems	**P4** Early Dev. and Patterning	**N3** Circuits and Systems	**P4** Early Dev. and Patterning
12-1	**P3** Fetal & Placental Physiology			**P1** Cell Physiology	**P3** Fetal & Placental Physiology
1-2					
2-3	**N3** Circuits and Systems (2-4 optional)	**P4** Early Dev and Patterning (2-4 optional)		**N1** Developmental Neurobiology (2-3 optional)	**N4** Cellular Neuroscience (2-4 optional)
3-4	**N3** Circuits and Systems (2-4 optional)	**P4** Early Dev and Patterning (2-4 optional)	**N2 Experimental Tools** (3-5)	**P9** Journal Club (3-5 optional) **N2 Experimental Tools**	**N4** Cellular Neuroscience (2-4 optional)
4-5	**P9** Cell Assembly & Interactions *Adrian Seminar*		**N2 Experimental Tools** (3-5) **P9** Cell Assembly & Interactions	**P9** Journal Club (3-5 optional) *Foster Club Talk*	**P9** Cell Assembly & Interactions

LENT	*Monday*	*Tuesday*	*Wednesday*	*Thursday*	*Friday*
9-10		**N9** Modulation, Plasticity & Behaviour			**N9** Modulation, Plasticity & Behaviour
10-11	**P7** Cancer Pathophysiology		**N9** Modulation, Plasticity & Behaviour	**N6** Higher Order Brain Function and Dysfunction	**P7** Cancer Pathophysiology
11-12	**P8** Systems Physiology	**N6** Higher Order Brain Function and Dysfunction	**P8** Systems Physiology	**P2** Journal Club *(some weeks only)*	**P8** Systems Physiology
12-1	**N6** Higher Order Brain Function and Dysfunction	**P2** Development & Stem Cells	**P2** Development & Stem Cells	**P2** Development & Stem Cells	
1-2					
2-3	**P6** Dev: Cell Differentiation & Organogenesis	**P6** Journal Club (2-4 optional)	**P6** Dev: Cell Differentiation & Organogenesis	**P7** Cancer Pathophysiology	**P6** Dev: Cell Differentiation & Organogenesis
3-4	**P5** Bioinformatics (3-5)	**P6** Journal Club (2-4 optional) **P5** Bioinformatics (3-5)		**P7** Cancer Pathophysiology (optional)	
4-5	**P5** Bioinformatics (3-5) *Adrian Seminar*	**P5** Bioinformatics (3-5)		**P5** Bioinformatics *Foster Club Talk*	

Applicants MUST submit an application both to the Department via the Google Form via the Part II section of the PDN website, AND via the formal NST route via Microsoft Forms.



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