Natural Sciences Tripos
Biochemistry Part II and Part III
2017-2019
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Biochemistry - What is it and where does it lead?

Biochemistry is the study of living organisms at the chemical, molecular and cellular levels. Its underpinning concepts and experimental approaches are fundamental to the whole range of present day biological sciences. Participation in the Biochemistry courses is diverse, including both Natural Science and Medical & Veterinary Science students. Part II and Part III Biochemistry are thorough preparations for a future science-based career, not just in Biochemistry itself but also in the broader areas of molecular and medical biosciences as well as territories that might be traditionally filed under Plant Sciences, Genetics, Developmental Biology, Microbiology, Parasitology, Pathology, Pharmacology, Virology and Zoology. As the core discipline for molecular and medical biosciences, a foundation in Biochemistry offers you the maximum choice and flexibility to specialise in any of these areas as your scientific training progresses.

Even so, many of our students do not plan to become academic or industrial researchers. They study Biochemistry because they find the molecular approach to the study of life intellectually stimulating and illuminating, and because they know that the rigorous training they receive makes them very attractive to a range of occupations. Our recent graduates include investment analysts, science writers, industrial managers, intellectual property and patent lawyers, school teachers, civil servants, diplomats and members of regulatory bodies and non-governmental organizations (NGOs).

The purpose of this brochure is to provide you with information about the Part II and Part III Biochemistry courses. In addition to the information in this brochure, members of staff of the Biochemistry Department are happy to answer queries from prospective Part II and Part III Biochemists at any time. Perhaps the most convenient way is to speak to the academic staff in charge of an NST Part IB practical class but anyone should feel free to contact Christine Thulborn our Teaching and Examinations Administrator by e-mail (examtchg@bioc.cam.ac.uk).

In addition, there will be a FACULTY BOARD OF BIOLOGY Part II Subjects Fair held on Friday, 17th March 2017, from 3.00 pm to 4.45 pm, in the Pathology Teaching Laboratory in the Department of Pathology at which Biochemistry Department staff members and current students will be happy to answer your questions.

“Biochemistry Part II/III is definitely the most sociable and fun Natural Science options. I’ve enjoyed so many fun times with these people and the tea and scones are awesome!”

Past Biochemistry Student
Biochemistry offers Part II and Part III courses in the Natural Sciences Tripos. Students currently in their second year who want to specialise in Biochemistry have a choice between a one-year Part II, leading to a BA, or two years of study in which the Part II is followed by Part III and leads to both BA and MSci degrees. Medical and Veterinary students who are considering a career in medical research after qualifying will find the Part II course an excellent foundation and they may also continue to the Part III course if they wish, by slightly delaying entry to clinical school.

The objective of Part II is to provide advanced training in biochemistry, cell biology and molecular biology through lectures, classes, discussion groups and research projects that will enable those wishing to pursue research. Part II Biochemistry is also superb training for those interested in other careers that require advanced analytical skills, creativity and versatility, whether they be in industry, journalism, finance, law, teaching or government.

The Part II core lecture course is supplemented by Methods and Skills classes encompassing key methodologies such as bioinformatics and molecular imaging, together with real research experience through an eight-week research project. The type of practical work involved in such projects is diverse, ranging from bench work to computer-based projects and bioinformatics. Teaching of transferable laboratory and communication skills (such as record keeping, statistical data analysis, database searching, graphic illustration, seminar presentation and report writing) is embedded in the course. Note also that we place an emphasis, through our prepared essay, on communication between Scientists and Society.

IA Chemistry or equivalent is an adequate chemical background for Part II Biochemistry. Special arrangements are in place to ensure that medics and vets who choose Part II Biochemistry begin on an equal footing with natural scientists (see later section on “Medical and Veterinary Students”).

The Part III Biochemistry programme expands on the Part II course and is primarily geared to students who plan to pursue a research career. It includes a two-term research project together with continuing advanced teaching in lectures, seminars and discussion groups.

In addition to Part III Biochemistry, we also offer a Part III course in Systems Biology (http://www.cam.ac.uk/about/natscitrilos/p3/sb.html).
Part IB students often ask about the requirement to do Part III Biochemistry should they plan to do research in the Department. Completion of Part III is not an obligate requirement for entry to the Ph.D. programme in the Department. However, it is fair to assume that students undertaking the extra year are likely to be better prepared. Other Universities are also aware of the extra scientific training and skills that a fourth year provides. Nonetheless, official departmental policy offers three routes leading from Part II in Biochemistry to a Ph.D.

1) To do Part III and then a Ph.D. Depending on the programme, your Ph.D. funding might be for 3 or 4 years. In the latter case, the first year may be composed of rotations around different laboratories.

2) To do Part II and then do a 4-year Ph.D.

3) To do Part II and then do a 3-year Ph.D.

The Department favours routes 1 and 2, seeing route 3 as intrinsically less desirable (although we do not rule it out completely).

There is no interview and no specific entry form for NST Part II Biochemistry. In the Easter Term, in consultation with your DoS, you should apply online through CamSIS. Information on how to register for Part III will be made available to all in the Part II class.

There is a limit of 40 places on the Part II course, of whom a maximum of 30 can continue on to the Part III course. There is no minimum qualifying standard for entry into Part II, other than obtaining Honours in NST Part IB or MVST Part IB. However, continuing to Part III requires a II.i or better in NST II Biochemistry. Students who do not fulfil those criteria may exceptionally be considered as a special case by the Faculty Board and should contact the Teaching and Examinations Administrator (examtchg@bioc.cam.ac.uk) in the first instance. Full details can be found at: http://www.natsci.trpos.cam.ac.uk/students/fourth.

“Part III Biochem definitely gives you an experience of what life as a researcher/Ph.D. student will be like while still enjoying benefits of being an undergrad! “

Past Biochemistry Student
Selection Procedures for Part II

For Natural Scientists, we take your 3 subject scores in NST IB, add in your Biochemistry IB mark again (i.e. give double weighting to your performance in Biochemistry) and prepare a ranked order of merit based on the 3 subjects plus Biochemistry mark. For students taking CDB but not Biochemistry in NST IB, we treat your CDB mark in the same way as the Biochemistry mark.

For Medical and Veterinary students, we take your IB performance (total) and adjust it to give a total out of 300 (i.e. bring it in line with the NST total), then your performance in MVST IA MIMS is added in and the revised total (out of 400) is produced.

NST Part II Biological & Biomedical Sciences: Biochemistry

The Department offers a major subject called "Biochemistry" in NST Part II Biological and Biomedical Sciences (NST Part II BBS). This subject requires students to attend all the lectures (approximately 60 plus methods and skills classes) in the Biochemistry Michaelmas Term course for NST Part II students and in the Lent Term (approximately 36). There is no formal didactic teaching in the Easter term. The course is also supported by weekly group supervisions (see below). For these supervisions students join with NST Part II and Part III students. Entry to the course is limited to seven students. The Biochemistry major subject part of the BBS course is examined in four written papers covering the modules of the Michaelmas and Lent terms, and one ‘data handling’ paper dealing with the analysis and assessment of biochemical data and hypotheses.

As well as the Biochemistry MAJOR subject, students also take a 1-paper MINOR subject in NST Part II BBS, provided by another Department. (For allowable minor subjects see http://www.biology.cam.ac.uk/undergrads/nst/bbs/subject-combinations.)

Both subjects offer dissertation topics. According to the Regulations for NST Part II BBS, students must write a dissertation that “must not exceed 6,000 words, excluding appendices, tables, figures, footnotes and bibliography.” The dissertation is not a report of laboratory work and the Biochemistry Major subject has no experimental work included. Course organisers will tell you when and where the dissertation titles will be released; this should be no later than the first day of the full Michaelmas term. Your dissertation should be prepared in accordance with the Guidelines for the dissertation issued by the Faculty Board, which can be found at http://www.biology.cam.ac.uk/undergrads/nst/bbs/dissertations.
Outline of the Part II Biochemistry Course: 2017-2018

Part II Michaelmas Term 2017

**Module A: Structural & Chemical Biology (24 Lectures)**
This module outlines how modern techniques of structural and chemical biology are being used to solve biological problems. Topics draw on multiple aspects of macromolecular biochemistry including nucleic acid structures and interactions, signalling proteins and membrane proteins. Finally, new approaches to studying enzyme kinetics are discussed together with how the knowledge so gained can be used in drug discovery and protein design.

**Module B: From Genome to Proteome (24 Lectures)**
This module, which is shared with Zoology as their module M7, examines all the steps involved in regulating eukaryotic gene expression, from chromatin accessibility through to translation and mRNA turnover.

**Module C: Stem – The Dynamic Cell (12 lectures)**
The first half of this module is a common cell biology "stem" focused on the dynamics of proteins and membrane-bound organelles in eukaryotic cells. This is followed in the Lent Term by a choice of two branches, one concerned with exploitation of plants and microorganisms for renewable materials and energy provision and the other covering molecular microbiology and infectious disease.

**Essential Methods and Skills Classes**
These feature key methods such as bioinformatics and molecular imaging. Also included are data handling sessions using past examination papers as core material to study approaches to data analysis and interpretation. Teaching of transferable laboratory and communication skills (such as graphic illustration, record keeping, data analysis, database searching and essay and report writing) are embedded in the course.

**Weekly Biochemical Supervision Sessions**
These comprise weekly meetings of groups of ~8-10 students and three to five members of staff. The discussion groups provide a forum for both Part II and Part III NST students and for Part II BBS students to present and discuss topics of interest from the course and the literature and to monitor research project progress. Advice and training in examination skills, data analysis and oral presentation will be given. The discussion groups also provide an opportunity for interactions between third and fourth year students.
Journal Clubs
These comprise advanced sessions embedded in the weekly supervision groups where Part II and Part III students analyse a published paper in depth with the guidance of members of the department.

Prepared Essays
An extended critical essay (no more than 3,000 words) on a "Science that affects Society" topic chosen from a list provided by the Department in the Michaelmas Term. Examples from recent years are:

1. Discuss current scientific theories of the origin of life.
2. Is the mouse a good model for studying human disease?
3. There was a major outbreak of Zika virus infections in 2016. How might a biological understanding of the virus and its transmission help in preventing or containing future outbreaks?

Part II Lent Term 2018

Module C: Branch 1: Bioenergy – the exploitation of plants and microorganisms (12 lectures)
This course elaborates how photosynthesis in plants and algae may be harnessed for renewable material and energy production, either directly, using photovoltaic systems, or indirectly through production of oils or other forms of biomass such as cell walls. The module also looks at conversion of biomass to other fuels, high value products and at novel biofuel sources, such as algae.

OR...

Module C: Branch 2: Molecular Microbiology of Infectious Disease (12 lectures)
This course focuses on prokaryotes as agents of animal and plant pathogenesis and as sources of antibiotics. Examples of antibiotic biosynthesis and resistance mechanisms, and the mechanisms and impacts of drug resistance gene dissemination are discussed; molecular aspects of protozoan infectious disease are also covered.

Module D: Cell Cycle, Signalling and Cancer (24 lectures)
This module is shared with Zoology as their L7. It addresses how the processes of cell proliferation, survival, repair, differentiation, metabolism, movement and migration are regulated in normal cells and tissues and how such regulation is corrupted in cancers.
Research Project
Students undertake a research project lasting eight weeks offered by members of the Department (see examples below). Projects may also be undertaken at other Cambridge locations such as the Gurdon Institute for Cancer and Developmental Biology, the Systems Biology Institute, the Cambridge Institute for Medical Research, the Department of Clinical Biochemistry (Institute of Metabolic Science), the Department of Veterinary Medicine, the MRC Dunn Human Nutrition Unit, the MRC Laboratory of Molecular Biology, the Hutchison/MRC Research Centre, the Unilever Cambridge Centre for Molecular Informatics and the Department of Chemical Engineering and Biotechnology.

Students may suggest their own projects at such a location but must submit it for approval by the Course and Project Organisers. The project may be based on bench experiments or be computer based, such as bioinformatics, protein structure prediction or an in-depth analysis of current literature on a current topic (e.g. the safety of genetically engineered food). Our goal is for each member of the Part II class to work on the type of project he/she wishes.

Weekly Biochemical Supervision Sessions
These comprise eight weekly meetings continuing on from the Michaelmas Term.

Essential Methods and Skills Classes
A continuation from the Michaelmas Term.

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<th>Part II Easter Term 2018</th>
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Weekly Biochemical Supervision Sessions
This comprises one meeting continuing on from the Lent Term.

Revision and Examinations
The Part II examination consists of five written papers, each of 3 hours. Papers 1-4 examine modules A, B, C and D, each requiring three essays. Paper 5 examines data handling and analysis of biochemical data.

Early in the Lent Term, students are also required to hand in a prepared essay on a "Science that affects Society" topic of not more than 3,000 words in length selected from titles proposed by the examiners (see above). In the Easter Term students are required to submit a dissertation of not more than 5,000 words in length describing their work on their research project. (http://www.bioc.cam.ac.uk/teaching/partii/prospectivept2students.html)

Successful students graduate with a BA (3 year students) or continue to Part III (4 year students)
Research Projects in Part II

The research project entails each Part II student working closely with one of the research groups in the Department, usually under the supervision of a member of staff and a senior graduate student or postdoctoral worker. Projects may also be undertaken at other institutes in Cambridge (see above).

Research projects are one of the most popular features of the course and, despite the limited time available, discoveries are often made that lead to publications. Importantly, research projects give students a very good sense for whether they feel the life of a graduate student would be rewarding; some find that, while they are happy with theoretical biology, reading reviews and papers and the writing essays, when it comes to lab work they are all thumbs. Conversely, some students who had no previous intention of pursuing a career in scientific research get hooked on research as a result of their research project experience. Projects are allocated towards the end of Michaelmas Term. Students are able to select preferred research areas in which they would like to do their project and every effort is made to assign students to one of their chosen themes.

The following list gives representative examples of recent Part II research projects:

- Preferential extension of A-form DNA by yeast DNA polymerase alpha.
- The dose-dependent effect of oncogenic K-ras on tumourigenesis.
- RNA processing in the *Plasmodium falciparum* apicoplast.
- Functional and mutational investigation of RBPMS, a potential alternative splicing master regulator.
- Is LGR5 expression essential for APC-deficient colorectal cancer cells?
- Expressing the leucine rich repeat domain of LRRK2.
- Aromatic residues in the fourth transmembrane α-helix of GABAp.
- Tailbacks on the axonal highway: the role of C83 and C99 in axonal transport.
- Surface protein sorting in *Trypanosome theileri* is independent of hydrodynamic forces.
- JAK/STAT signaling in reprogramming to the naive state.
- Investigating the role of cold shock protein D in *Pseudomonas aeruginosa*.
- Understanding rapid stabilisation of p53 upon c-Myc activation by MS.
- Haptophyte-derived ERAD-like machinery was adopted by dinoflagellates via tertiary endosymbiosis.
Research Project
Research Projects, which run through two terms and are supervised by a member of staff, are chosen from an extensive list. See section on Research Projects below.

Advanced Lecture Module
Students choose a 12-lecture module on either:

Molecular Recognition and Interaction
Lectures present case studies within broad themes of protein-protein recognition (e.g. in molecular signalling), protein-nucleic acid recognition (e.g. in the RNA degradosome and DNA repair) and protein-small molecule recognition (e.g. in molecular assembly lines and drug screening).

OR...

Cell Fate
Lectures describe how cell fate is determined from cradle to grave, including pluripotency, differentiation, ageing, neurodegeneration and cell death, with emphasis on stem cells and the brain and how we can change cell fate.

Part III Biochemistry Seminar Series on Scientific Method and Experimental Design
Topics cover the choice and use of model organisms, genome projects, microarrays, proteomics, RNAi, interactomics and measurement of interactions, recombinant protein expression and imaging. Methodology seminars alternate with seminars on landmark papers in biochemistry. This series showcases examples of creative and brilliant science, provides a sense of why current knowledge has accumulated as it has, and of what limitations are imposed by available technology. Each session, led by a member of faculty or an invited expert, addresses a landmark paper (or small group of papers) that represents a significant conceptual or practical leap forward. Papers may be historic (such as the hypothesis and subsequent experimental verification of the lac operon) or more contemporary (such as the discovery of genetic interference by double-stranded RNAs). Groups of students research and make presentations to the class as a whole on various aspects of the paper being considered, including the state of knowledge before publication of the landmark paper and its subsequent impact on the scientific landscape.

Weekly General Supervisions
These are on similar lines to those described earlier for the Part II year.
Research Project
Continuation from Michaelmas Term.

Advanced Lecture Module:
Choose a 12-lecture module on either:

Contemporary Cancer Studies
This module uses a combination of lectures and workshop-style discussions to focus on recent advances in our understanding of cancer as a microevolutionary process driven by accumulation of mutations in regulatory processes that govern cell proliferation, survival, differentiation, invasion and metabolism, and as a pathology of dysfunctional tissues as well as aberrant cells.

OR...

The Biochemistry and Biophysics of Neuronal and Metabolic Disorders
The module addresses how molecular and systems approaches can further our understanding of diseases that perturb metabolic integration, cardiovascular function and neurotransmitter and hormonal signalling. Contexts will include neurological disorders, diabetes, obesity, cardiac rhythm disturbance, and thrombotic disease.

Seminar Series on Scientific Method and Experimental Design
Continuation from Michaelmas Term.

Weekly General Supervisions
Continuation from Michaelmas Term.
Research Project
Submit Dissertation.

Weekly General Supervisions
This comprises one meeting continuing on from the Lent Term.

Revision and Examinations
The Part III Examination comprises two written papers and a research project report of not more than 8,000 words. All students have a *viva voce* on their project report with one of the examiners and another member of staff.

Paper 1 (3 hours) examines the advanced lecture modules, requiring two essays covering the chosen Michaelmas Term module and two essays covering the chosen Lent Term module.

Paper 2 (3 1/4 hours) is divided into Sections I and II that carry equal marks drawing on the overall scope of the Journal Clubs embedded in the group supervisions and the Seminar Series on Scientific Method and Experimental Design. Section I will require the critical evaluation of a short biochemical research article in response to a series of compulsory questions embedded in the text. Section II will contain three essay questions of an integrative nature.

Successful students graduate with both BA & MSci degrees.
The research project, which counts for 50% of the final mark, entails each Part III student working closely with one of the research teams in the Department, usually under the supervision of a member of faculty or senior postdoctoral worker. A project lasting 17 weeks is chosen from a list offered by members of the Department (see examples below). Projects may also be undertaken at other locations in Cambridge such as the Gurdon Research Institute, the Systems Biology Centre, Cambridge Institute for Medical Research, Department of Clinical Biochemistry (Institute of Metabolic Science), Department of Veterinary Medicine, MRC Dunn Human Nutrition Unit, MRC Molecular Biology Laboratory, Hutchison/MRC Research Centre, Unilever Cambridge Centre for Molecular Informatics or the Department of Chemical Engineering and Biotechnology. Students may suggest their own project at such a location and submit it for approval by the Course and Projects Organisers.

For many of the Part III class the project is the highlight of their course as well as providing a real insight into the world of research. At the Part III Research Symposium, at the beginning of Lent Term, each student presents a 20 minute interim report and answers questions on her/his project. Design and execution of these high quality presentations is an excellent training for postgraduate and business careers. The Part III students give a final presentation on their projects to their supervision groups at the start of Easter Term.

The following list gives examples of recent Part III research projects:

- Identification of novel regulators of carbapenem, prodigiosin and gas vesicle production in *Serratia* ATCC39006.
- Structural and functional characterisation of 3'ETS(leuZ), a small RNA regulator in *E. coli*.
- Improving sample preparation for Cryo-EM using self-assembled DNA nanostructures.
- Directed evolution of enzymes incorporating InDels in targeted regions.
- Structural characterisation of intermediates in the catalytic cycle of bovine ATP synthase.
- Targeting *M. tuberculosis* MabA with a fragment based approach.
- Cellular and molecular analysis of primase in DNA replication.
- Computational insights into mechanisms of drug resistance in melanoma.
- How do yeast respond to stress? Characterising the *S. pombe* MSR1 protein.
- Towards the identification of factors influencing the formation of cancerous chromosomal translocations.
- Characterisation of a putative small molecule receptor in *T. brucei*.
- HIV-1 packaging examined by novel techniques.
The following is a list (with the students’ names in bold) of recent publications that have arisen out of student projects in Part II and Part III:


The Biochemistry Department strongly encourages prospective Part II students to seek laboratory-based work experience in the summer vacation at the end of their second year. In addition to providing additional practical experience, such experience offers students the opportunity, at a relatively early stage in their training, of sampling biochemical research in an environment outside the teaching laboratory. In this way students experience research in a meaningful setting, while (hopefully) making a useful contribution to the research enterprise of the host laboratory. The Department has noted that students who have taken such summer laboratory jobs are typically better motivated and significantly more skilled than their peers. Laboratory experience de-mystifies research and allows students to assess their own passion and aptitude for research, and to make valuable contacts.

To assist students in finding suitable laboratories they are encouraged to contact the Part II Course Organiser (e-mail: examtchg@bioc.cam.ac.uk) who acts as placements adviser. For students seeking summer work experience in the UK there are several funding schemes and details of these have already been made available to you through Moodle.
Eligibility & Background for the Part II and Part III Biochemistry Courses

Natural Science Students

Natural scientists who specialise in Biochemistry come from varied backgrounds and many have combined mainly physical or mainly biological sciences in Part IA and Part IB of the Tripos. Intending Biochemists will have done the IB subject Biochemistry & Molecular Biology (BMB), and/or Cell and Developmental Biology (CDB). Applicants for Part II who have studied neither CDB nor BMB may ask to be considered as a special case.

If you opt to study Part II Biochemistry alone, in the three-year course, there will be no minimum qualifying standard, other than obtaining Honours in Part IB of the Natural Sciences Tripos.

Medical and Veterinary Students

For many reasons, the Part II Biochemistry course is an attractive third year option for medics and vets.

The Part II course includes several specialised biomedical modules such as “Molecular Microbiology of Infectious Disease” and “Cell Cycle, Signalling and Cancer”. From the listing of staff research interests in the list below you will see there are very strong medical research themes in the Department. In addition, the availability of Part II research projects at selected sites outside the Biochemistry Department allows MVST students to source their projects for themselves in the Clinical Medicine or Veterinary Schools (such projects are subject to approval by the Course and Projects Organisers.) The Department is aware that the Molecules in Medical Science course in MVST IA and Biochemistry & Molecular Biology in NST IB differ somewhat in content and emphasis. You should remember, however, that other MVST IB subjects have a molecular bioscience component that will be useful background for NST Part IIs, including Biochemistry. To ensure that medics and vets are at no disadvantage in Part II Biochemistry the Department of Biochemistry has made the following provisions:

1) All medical and veterinary students taking Part II are supplied with a complete set of IB lecture notes via Moodle.

2) All medical and veterinary students taking Part II are offered 'updating' supervisions with Biochemistry IB lecturers, if they wish.
The Department

The Department of Biochemistry in Cambridge is a large one, its researchers investigating a wide range of topics that fall under the nine main headings shown below. The Department is also the home for Protein and Nucleic Acid Chemistry (PNAC) Facility, the Cambridge Centre for Proteomics, DNA Sequencing (housing the latest 454 sequencing technology), Biophysics, X-ray crystallographic and NMR Facilities. Fuller details of the research programmes of individual faculty members and groups may be obtained from the web site http://www.bioc.cam.ac.uk/people/uto which can be found on the main Department web-site at http://www.bioc.cam.ac.uk.

### Chemical Biology & Drug Design

**Professor Tom Blundell**  
Structural biology, bioinformatics and drug discovery

**Dr Bill Broadhurst**  
Structural dynamics of modular polyketide synthases

**Professor Florian Hollfelder**  
Mechanism in chemistry and biology

**Dr Marko Hyvönen**  
Specificity, regulation and inhibition of protein-protein interactions in cellular signaling

**Professor Peter Leadlay**  
Molecular assembly lines and combinatorial biosynthesis

**Dr Helen Mott**  
Structural biology of small G proteins and their downstream effectors

**Dr Darerca Owen**  
Peptide-based inhibitors of small G proteins regulated signalling pathways

**Dr Luca Pellegrini**  
Molecular mechanisms of genome duplication and stability

### Disease Biology

**Professor Kevin Brindle**  
Molecular imaging in cancer

**Professor Guy Brown**  
Neuroinflammation, mitochondria and cell death
Dr Marc de la Roche  Oncogenic Wnt signalling in cancer
Professor Gerard Evan  Determining the molecular basis of cancer
Professor Richard Farndale  Collagen receptors and collagen binding proteins
Dr Andrew Grace  Molecular pathophysiology of cardiac arrhythmias
Dr Stephanie Jung  Platelet collagen receptor GPVI- dimer—a specific target in ischaemic heart disease and stroke
Dr Svetlana Khoronenkova  DNA repair and neurodegenerative diseases
Dr Trevor Littlewood  Oncogenic signalling in cancer
Dr Rick Livesey  Mammalian neural stem cell biology, fundamental and applied
Professor Sarah Lummis  Molecular characterisation of neurotransmitter-gated ion channels
Dr Luca Pellegrini  Molecular mechanisms of genome duplication and stability
Dr Simone Weyand  Membrane protein structure, function and cellular activities

DNA and Chromatin Biology

Professor Tom Blundell  Structural biology, bioinformatics and drug discovery
Dr Brian Hendrich  Transcriptional control of stem cell fate
Professor Steve Jackson  Maintenance of genome stability
Dr Svetlana Khoronenkova  DNA repair and neurodegenerative diseases

Professor Ernest Laue  Structural studies of chromatin assembly/disassembly

Dr Luca Pellegrini  Molecular mechanisms of genome duplication and stability

Professor Jean Thomas  Chromatin and gene regulatory proteins

Dr Ross Waller  Cell evolution – novel chromatin biology, remodelling of the cytoskeleton for parasitism, and organellogenesis in diverse eukaryotes

Dr Philip Zegerman  Regulated replication initiation in genome stability and development

Molecular Microbiology

Professor Mark Carrington  Molecular cell biology of trypanosomes

Professor Chris Howe  Biochemistry of photosynthesis; molecular evolution of photosynthetic microorganisms and Plasmodium

Dr James Locke  Quantitative understanding of how cells respond to environmental signals

Dr Ellen Nisbet  Molecular evolution - from algae to malaria

Professor George Salmond  Molecular microbiology: bacterial quorum sensing, virulence, protein secretion, antibiotic regulation, gas vesicles and flotation, toxin-antitoxin systems and bacteriophage abortive infection

Dr Ross Waller  Cell evolution – novel chromatin biology, remodelling of the cytoskeleton for parasitism, and organellogenesis in diverse eukaryotes

Dr Martin Welch  Regulation of virulence and biofilm formation by pathogenic bacteria
# Plant Biochemistry and Bioenergy

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<tr>
<th>Name</th>
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<tbody>
<tr>
<td>Professor Paul Dupree</td>
<td>The extracellular matrix in plants – understanding cell wall biosynthesis</td>
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<tr>
<td>Professor Chris Howe</td>
<td>Biochemistry of photosynthesis; molecular evolution of photosynthetic microorganisms and Plasmodium</td>
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<tr>
<td>Dr Ellen Nisbet</td>
<td>Molecular evolution - from algae to malaria</td>
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# RNA Biology

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<th>Name</th>
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<tr>
<td>Professor Ben Luisi</td>
<td>Crystallographic and functional studies of regulatory assemblies</td>
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<td>Dr Juan Mata</td>
<td>Posttranscriptional regulatory networks</td>
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<td>Dr Deidre Scadden</td>
<td>Investigating the fate of hyper-edited dsRNA</td>
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<td>Professor Chris Smith</td>
<td>Regulation of alternative pre-mRNA splicing</td>
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<td>Dr Nancy Standart</td>
<td>Post-transcriptional regulation of gene expression</td>
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# Signalling and Trafficking

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<th>Name</th>
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<tr>
<td>Professor Tom Blundell</td>
<td>Structural biology, bioinformatics and drug discovery</td>
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<td>Professor Guy Brown</td>
<td>Neuroinflammation, mitochondria and cell death</td>
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<td>Dr Jenny Gallop</td>
<td>Membrane-triggered actin polymerization: molecular mechanisms and morphogenesis</td>
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<tr>
<td>Professor Nick Gay</td>
<td>Structural biology of cellular signalling by Toll/Interleukin 1 transmembrane receptors</td>
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<tr>
<td>Dr Marko Hyvönen</td>
<td>Specificity, regulation and inhibition of protein-protein interactions in cellular signalling</td>
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Dr Tony Jackson  
Ion channels and plasma membrane proteins

Dr Stephanie Jung  
Platelet collagen receptor GPVI-dimer— a specific target in ischaemic heart disease and stroke

Professor Sarah Lummis  
Molecular characterization of neurotransmitter-gated ion channels

Dr Helen Mott  
Structural biology of small G proteins and their downstream effectors

Dr Daniel Nietlispach  
Integral membrane proteins: structure, dynamics and function

Dr Darerca Owen  
G proteins and their effectors as therapeutic targets in invasion and metastasis

Dr Simone Weyand  
Membrane protein structure, function and cellular activities

**Stem Cell Biology**

Dr Brian Hendrich  
Transcriptional control of stem cell fate

Dr Rick Livesey  
Mammalian neural stem cell biology, fundamental and applied

Dr José Silva  
Biology of induced pluripotency

Professor Austin Smith  
Embryo stem cell biology

**Systems Biology**

Dr Jasmin Fisher  
Executable Biology

Professor Jules Griffin  
Lipid profiling and signalling
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<th>Name</th>
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<tr>
<td>Professor Kathryn Lilley</td>
<td>Cambridge Centre for Proteomics</td>
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<td>Dr James Locke</td>
<td>Quantitative understanding of how cells respond to environmental signals</td>
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<td>Professor Steve Oliver</td>
<td>Functional genomics and systems biology</td>
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<tr>
<td>Dr Markus Ralser</td>
<td>The regulatory function of the metabolic network</td>
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<tr>
<td>Dr Nianshu Zhang</td>
<td>Cellular ageing studies in yeast</td>
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</tbody>
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The Biochemistry Library

The Biochemistry Departmental Library is well stocked with journals and books, including textbooks acquired specifically for the Part II/III course. The Library also acts as a depository for Part II/III dissertations. The Department is also equipped with numerous designated Part II/III networked computers, linked to printers. These are located in the library and widely distributed throughout the research areas.

Members of staff of the Biochemistry Department are happy to answer any queries from prospective Part II and Part III Biochemists at any time. Perhaps the most convenient way is to speak to the academic staff in charge of a NST IB practical class but anyone may contact Christine Thulborn our Teaching & Examinations Administrator, by email (examtch@bioc.cam.ac.uk).
Part II and III Brochure 2017-2019
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