NST PART IB
CELL & DEVELOPMENTAL BIOLOGY

COURSE GUIDE 2017-18

Departments of Biochemistry, Genetics, Plant Sciences, & Zoology
Natural Sciences Tripos Part IB: Cell and Developmental Biology

Aims

The Cell and Developmental Biology course is taught by the Departments of Biochemistry, Genetics, Plant Sciences and Zoology. It can be taken in combination with any other subject in Part IB of the Natural Sciences Tripos, except Materials Science with which it clashes in the Lecture Timetable. The CDB course is a natural follow up to IA Biology of Cells, building as it does on the knowledge of elementary cell biology provided by the first year course. CDB goes much further into the topic, introducing you to the major ideas and current experimental approaches to cell and developmental biology, and in the process will illustrate how molecular approaches complement classical cell biology in finding out the details of how cells carry out their basic processes. The course aims to consolidate and extend your basic knowledge of how cells work, how they interact and how they differentiate. Cell and developmental biology is a rapidly advancing field, and the course will illustrate the excitement of these advances.

CDB provides a framework for further specialised study of molecular, cellular and developmental biology in the third year, including Part II Genetics, Plant Sciences, Zoology, Biochemistry (for which it is a qualifying course as an alternative to IB BMB), and Physiology Neuroscience & Behaviour (PNB). It is also an excellent foundation for the majority of Part II biological subjects.

Objectives

By the end of the course, you should have a knowledge of:

- The cell biology of all major groups of organisms, including microorganisms, plants and animals
- The structure and function of cellular organelles including nuclei, endomembrane system, mitochondria and chloroplasts
- How genome organisation differs in the major groups of organisms
- The complex interactions between nucleus and cytoplasm that determine how cells function
- Basic concepts of how cells become specialised into different types in complex organisms
- How the cytoskeleton is organised and its role in cellular function

You should also have an understanding of:

- the different experimental approaches used for the study of cell structure and function
- how these approaches can be applied to specific problems in cell biology
- how to carry out and interpret simple experiments in cell biology

The course syllabus is defined by the lecture content, but since this can only cover the essentials of the subject, you are encouraged to explore topics further by reading at least some of the references provided in each of the lecture handouts. As well as providing useful material for discussion in College supervisions, this additional reading will help in writing supervision essays and in the examinations at the end of the year.

Learning outcomes

At the end of Part IB Cell and Developmental Biology, you should have developed a knowledge of the major ideas and current experimental approaches in cell biology and developmental biology and should be able to progress to Part II courses in Biological Sciences, including Biochemistry, Genetics, Neuroscience, Pathology, Plant Sciences and Zoology.

Detailed course information is provided at the Cell and Developmental Biology web site: 
http://www.bio.cam.ac.uk/undergraduate/courses/cdb
Natural Sciences Tripos Part IB: Cell and Developmental Biology

LECTURE TIMETABLE 2017 - 18

Lectures are Tue, Thu, Sat at 10am, Biffen Lecture Theatre, Department of Genetics
If more than 160 register for the course, lectures will be held in Zoology Lecture Theatre

Michaelmas Term 2017

<table>
<thead>
<tr>
<th>Lectures</th>
<th>Dates</th>
<th>Lecturer</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 6</td>
<td>Oct 5, 7, 10, 12, 14, 17</td>
<td>Dr T Krude</td>
<td>Molecular Biology of the Cell Nucleus I</td>
</tr>
<tr>
<td>7 - 9</td>
<td>Oct 19, 21, 24</td>
<td>Prof E Miska</td>
<td>Molecular Biology of the Cell Nucleus II</td>
</tr>
<tr>
<td>10 - 12</td>
<td>Oct 26, 28, 31</td>
<td>Dr D Summers</td>
<td>Genetic systems of Prokaryotes</td>
</tr>
<tr>
<td>13 - 15</td>
<td>Nov 2, 4, 7</td>
<td>Prof A Martinez-Arias</td>
<td>Gene Expression &amp; Cell Decisions</td>
</tr>
<tr>
<td>16 - 19</td>
<td>Nov 9, 11, 14, 16</td>
<td>Dr Juan Mata</td>
<td>Yeast as a Model Organism</td>
</tr>
<tr>
<td>20 - 24</td>
<td>Nov 18, 21, 23, 25, 28</td>
<td>Dr C O’Kane</td>
<td>Genome Organisation and Function</td>
</tr>
</tbody>
</table>

Lent Term 2018

<table>
<thead>
<tr>
<th>Lectures</th>
<th>Dates</th>
<th>Lecturer</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 - 30</td>
<td>Jan 16, 18, 20, 23 25, 27</td>
<td>Prof A Smith</td>
<td>Chloroplasts and Mitochondria</td>
</tr>
<tr>
<td>31 - 34</td>
<td>Jan 30, Feb 1 3, 6</td>
<td>Dr M Segal</td>
<td>Cytoskeleton &amp; Mitotic Cell Division</td>
</tr>
<tr>
<td>35 - 38</td>
<td>Feb 8, 10 13, 15</td>
<td>Prof P Dupree</td>
<td>Membrane Trafficking</td>
</tr>
<tr>
<td>39 - 40</td>
<td>Feb 17, 20</td>
<td>Prof A Webb</td>
<td>Intercellular Communication I</td>
</tr>
<tr>
<td>41 - 42</td>
<td>Feb 22, 24</td>
<td>Dr H Baylis</td>
<td>Intercellular Communication II</td>
</tr>
<tr>
<td>43 - 48</td>
<td>Feb 27, Mar 1, 3, 6, 8, 10</td>
<td>Dr T Weil</td>
<td>Invertebrate Development</td>
</tr>
<tr>
<td>49 - 50</td>
<td>Mar 13, 15</td>
<td>Dr A Philpott</td>
<td>Vertebrate Development (continued after Easter!)</td>
</tr>
</tbody>
</table>

Easter Term 2018

<table>
<thead>
<tr>
<th>Lectures</th>
<th>Dates</th>
<th>Lecturer</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>51 - 54</td>
<td>Apr 24, 26, 28, May 1</td>
<td>Dr A Philpott</td>
<td>Vertebrate Development (continuation from Lent!)</td>
</tr>
<tr>
<td>55 - 60</td>
<td>May 3, 5, 8, 10, 12, 15</td>
<td>Dr J Haseloff</td>
<td>Plant Development</td>
</tr>
</tbody>
</table>
# PRACTICAL TIMETABLE 2017 - 18

Practicals are Fri or Tues, CDB wing, Elementary laboratory, Department of Zoology
There are staggered start times for all practicals to allow for clashes with morning lectures.

## Michaelmas Term 2017

<table>
<thead>
<tr>
<th>Weeks</th>
<th>Dates</th>
<th>Organiser</th>
<th>Practical Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-3</td>
<td>Oct 6/10, 13/17, 20/24</td>
<td>Dr T Krude</td>
<td>Extraction of Nuclear Proteins and Assay of DNA Topoisomerase Activity &amp; Nucleosome Assembly</td>
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<tr>
<td></td>
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<td></td>
<td>Analysis of Nuclear &amp; Cytoplasmic Proteins, Chromatin Structure, &amp; Cytoplasmic RNA</td>
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<tr>
<td>4</td>
<td>Oct 27/31</td>
<td>Prof A Martinez-Arias Dr. D Turner</td>
<td>Studying gene expression with fluorescence</td>
</tr>
<tr>
<td>5-6</td>
<td>Nov 3/7, 10/14</td>
<td>Dr N Zhang</td>
<td>Analysis of Yeast Transformation</td>
</tr>
<tr>
<td>7-8</td>
<td>Nov 17/21, 24/28</td>
<td>Dr C O’Kane</td>
<td>Mobilisation of a transposable element for targeted expression in <em>Drosophila</em></td>
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## Lent Term 2018

<table>
<thead>
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<th>Practical Title</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Jan 19/23</td>
<td>Dr G Rustici</td>
<td>Uses of genomic databases&lt;br&gt;<em>In Bioinformatics Training Facility, Craik-Marshall Bldg</em></td>
</tr>
<tr>
<td>2-3</td>
<td>Jan 26/30; Feb 2/6</td>
<td>Prof P Mehrshahi</td>
<td>Organelle Inheritance in <em>Chlamydomonas</em></td>
</tr>
<tr>
<td>4</td>
<td>Feb 9/13</td>
<td>Dr M Segal</td>
<td>Cytoskeleton - demonstration</td>
</tr>
<tr>
<td>5</td>
<td>Feb 16/20</td>
<td>Prof P Dupree</td>
<td>Membrane Trafficking in Eukaryotic Cells</td>
</tr>
<tr>
<td>6</td>
<td>Feb 23/27</td>
<td>Dr H Baylis</td>
<td>Second Messenger Systems and Signalling in Real Time (<em>Demonstration</em>)</td>
</tr>
<tr>
<td>7-8</td>
<td>Mar 2/6, 9/13</td>
<td>Dr T Weil &amp; Dr M Landgraf</td>
<td>Early Patterning in <em>Drosophila</em> Embryos</td>
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## Easter Term 2018

<table>
<thead>
<tr>
<th>Weeks</th>
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<th>Practical Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>Apr 27/May 1; May 4/8</td>
<td>Dr J Haseloff</td>
<td>Effect of Morphogens on Cell Differentiation in Jerusalem Artichoke&lt;br&gt;(<em>in Plant Sciences</em>)</td>
</tr>
</tbody>
</table>
Libraries and Booklist

Using textbooks: Four major textbooks are listed below. These cover the course material at about the right level - sometimes higher and sometimes lower. You should as a matter of course read any relevant chapters in these textbooks.

College libraries should hold most of your needs for books in this subject, and you are advised to use these as your first resource.

Departmental libraries

The four departments that contribute to this course all have libraries, with special collections of books for Part I courses. All the libraries allow you read and work there, but some have restrictions on what you may borrow and for how long.

If you wish to use these libraries, the proper course is to introduce yourself to the Librarian, who will explain the rules to you and show you where to find the relevant books.

Booklist:

Recommended books for College libraries.

1. Books that cover most areas of the course:

   
   
   

2. Books recommended for specific areas of the course and for further reading:

   
   
   * Molecular and Genome Evolution Graur, D. MacMillan Palgrave; 2015 ISBN 9781605354699, hardcover, £64.99
   
   


**Using references to articles:**

Most lecturers will also refer you to journal articles that are relevant to the subject. These have much relevant material that can improve your understanding of the material taught. The aim of this reading is to improve your understanding of the material taught, not to add further large amounts of factual information.

We encourage you to read as many of these articles as possible, but they often contain much more material than you need to know, or cover it at a level higher than you need to know. It is therefore worth learning how to identify and select the most useful material (a worthwhile skill in its own right!). It's a bit like riding a bike: the best way to learn is to practise! Your supervisors will be able to help you to do this.

**Moodle**

Online resources are provided through the Moodle site. You will automatically be subscribed to this site as part of the NST subject choice procedures but if you join the course after the start of term, send an email to Roz McKenzie (rm305@cam.ac.uk) requesting that you are added to the course. You will need to use your Raven ID and password to log onto Moodle, which you will also be able to access during the vacation.

Supervisors may request access to both the main course Moodle site, and a Supervisors’ site that has some additional material such as solutions to Written Practical Problems.
Information about the Examination

You will be assessed by examination in the Easter Term. The theory papers count for 35% each of the total marks, and the practical paper counts for 30%.

**Theory Papers**: Two 3-hour written papers:

**Paper 1** is an essay paper based directly on the lecture material. There are three sections:

- **Section A**: Genes and the Nucleus, based on the Michaelmas term's lectures
- **Section B**: Cell Function, based on the Lent Term lectures on Organelle Biogenesis, Cytoskeleton, Membrane Traffic, Intercellular Communication
- **Section C**: Development, based on the Lent Term and Easter Term Developmental Biology Lectures

Candidates are required to answer four questions, including at least one from each section. Each essay will carry equal weight.

**Paper 2** is a paper consisting of two sections given equal marks.

- **Section A**: Eight short answer questions on the whole course
- **Section B**: More general integrative essay questions, or essay questions that explicitly require material from more than one block of lectures. Candidates must answer two questions out of at least five set.

**Written Practical Paper (3 hours)**:

This is a Written Practical paper. Candidates must answer eight questions, out of nine set. These require analysis and interpretation of experimental data, and understanding of the methods used to obtain them, based on the experiments performed and information presented in the practical course, including the Demonstration Practicals. The examiners envisage that each question should take on average around 15 minutes to answer, thereby leaving candidates a generous amount of time in which to read the paper, should they so wish.

**Past Examination Papers**

Electronic copies of the papers can be accessed on the CDB Moodle site.

Supervisors can also access solutions to analytical or problem-type answers to previous year’s Practical Papers, via the Supervisors’ site. These solutions are not confidential and may be shared with students. However, we do not provide solutions directly to students, to allow supervisors to set these questions for supervisions, without their supervisees having access to the solutions beforehand.

**What the examiners are looking for**

We are looking for evidence of a good, intellectually critical understanding of the course material, based on experimental evidence. Ways in which you can convince the examiners that you have acquired this include the following:
Some detailed factual information is a minimal requirement, but it has most impact if it is integrated strongly into an overall context, and presented in a way that builds up an intellectually coherent view of the topic.

Cell and Developmental Biology is an experimental subject. You therefore get credit for basing any models or assertions you present on the experimental logic that allows them to be made, as far as is possible, using the knowledge acquired from lectures and recommended reading.

Write legibly. Make sure you understand the question asked, and answer it, not the question you would like to have been asked. Organise your time so that you do justice to all the areas of knowledge you write about. In data analysis or problem questions, explain your logic - even if you don't get the right answer, you will get some credit for using the right logic.

**Plagiarism** (see Moodle site for more detailed explanation)

The following statement has been issued by the Faculty Board of Biology.

In general, plagiarism can be defined as:

**The unacknowledged use of the work of others as if this were your own original work.**

In the context of an examination, this amounts to:

**Passing off the work of others as your own to gain unfair advantage.**

Such use of unfair means will not be tolerated by the University; if detected, the penalty may be severe and may lead to disciplinary proceedings being taken against you.
Course Management and Student Feedback

The course is run by a Management Committee, consisting of the lecturers in the course. The committee decides broadly on the content of lectures and practicals, and has the responsibility for organising and delivering these. The day-to-day running of the course is devolved to a small section of the Committee, who act as course organisers (see below). This group meets with student representatives (chosen by you) and lecturers at the end of every term (the Consultative Committee) to look at the results of questionnaire returns and find out your views about the course.

The course is revised on a yearly basis in the light of comments made by you in questionnaires (distributed with lecture handouts) and by your representatives on the Consultative Committee which meets each Term.

Minutes of Consultative Committees and Analysis of Student Questionnaires

The minutes of Consultative Committee meetings and analysis of student questionnaires can be accessed from the Cell and Developmental Biology Moodle site.

Dates of meetings of the Consultative Committee for 2017 – 18

Meetings are held on Tuesdays and will start at 4pm on the following dates: 28 Nov 2017, 13 Mar 2018 and 12 June 2018.

Course Organising Committee 2017 – 2018

Dr Cahir O’Kane, Genetics, Chair; Dr Juan Mata, Biochemistry; Prof Jim Haseloff, Plant Sciences; Dr Tim Weil, Zoology.

Contact information:

If you have any questions or comments concerning the course, please contact the appropriate person:

<table>
<thead>
<tr>
<th>Contact</th>
<th>Name</th>
<th>Email</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chair of Management Committee</td>
<td>Dr Cahir O’Kane, Genetics</td>
<td><a href="mailto:cdb@gen.cam.ac.uk">cdb@gen.cam.ac.uk</a></td>
<td>Academic issues relating to the course, e.g. the organisation/timetabling of lectures and practicals.</td>
</tr>
<tr>
<td>Teaching Administrator</td>
<td>Roz McKenzie, Genetics</td>
<td><a href="mailto:rm305@cam.ac.uk">rm305@cam.ac.uk</a></td>
<td>Organisation of meetings of the Consultative &amp; Management Committees</td>
</tr>
<tr>
<td>Practical Laboratory Technician</td>
<td>Jacek Zalewski, Zoology</td>
<td><a href="mailto:jz328@cam.ac.uk">jz328@cam.ac.uk</a></td>
<td>Organisation of the practical laboratory</td>
</tr>
</tbody>
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