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1. Introduction to the Neuroscience Programme

Welcome to the Neuroscience Programme! If you are at the beginning of your three years at King’s studying this subject, you are in an exciting place. The Neuroscience BSc degree programme is continually evolving in the light of advances in the neuroscience field, and reflecting the rapid rate of conceptual and technological development. As an expanding research area, Neuroscience contains many topical issues of wide relevance for today’s society. The programme is certainly challenging, but we hope it is also very rewarding. Our students achieve excellent results, and we think that you will find the programme fascinating, as well as equipping you for a variety of career paths.

To begin with, some aspects of undertaking a degree are daunting, especially in a University with a large number of students taking a wide variety of degrees. The modules you will take encompass a number of subject areas; locating learning resources and developing an effective method of learning across these subjects will take time. You will continue to develop your strategy for studying as an ongoing process throughout your three year degree. In this booklet, and on our website (http://www.kcl.ac.uk/biohealth/study/departments/neuroscience/), we aim to tell you everything you need to know about how to enjoy and benefit from the experience of doing a Neuroscience degree. If you can’t find the information you need, or need advice of any kind, please contact one of the Programme leaders (section 1.1) or your personal tutor.

What is Neuroscience?

Neuroscience is a vibrant and emerging discipline which seeks to understand the most complex organ in the body, the nervous system. One ultimate goal is to understand the biological basis of consciousness and behaviour, and this will only be achieved by using a multi-pronged approach, studying individual nerve cells as well as the emergent properties of groups of neurons and neural networks. For this reason, neuroscience needs to harness the power of many experimental disciplines, drawing together knowledge from diverse avenues, encompassing molecular biology up to the psychological study of mind. Acquiring this broad knowledge base is particularly important for us to develop an understanding of neurological and psychiatric disorders, which are assuming increasing importance within an ageing population. Discoveries in these areas will pave the way the development of effective therapies and treatment.

Neuroscience teaching at King’s is research-led and is constantly updated in the light of recent discoveries. King’s contains several research centres at the international forefront of Neuroscience, such as the MRC Centre for Neurodevelopmental Disorders, the Department of Developmental Neurobiology, the Wolfson Centre for Age-related Diseases (CARD) and the Centre for Neurodegeneration and Brain Injury at Institute of Psychiatry, Psychology & Neuroscience (IoPPN). Here, research employs a large range of model systems and techniques such as bioinformatics, electrophysiology, molecular neurobiology, cells and systems neuroscience, neuroimaging and a range of psychological tests and paradigms. In the third year, if you need the requirements, you will have the opportunity to do a hands-on, original piece of Neuroscience research, based either on the Guy’s Campus or at IoPPN at Denmark Hill. During this project you will learn about all aspects of the conduct of research, and will become part of a research laboratory. If you opt not to do an extended research project, you can instead choose a library project and combine this with a range of other modules, including a Neuroscience Lab Practical module, and Project Design in Neuroscience, which teaches you how to write a grant proposal.
What are the aims and objectives of the Neuroscience Programme?

The aim of the programme is to produce students with an integrated knowledge base in Neuroscience, and an extensive skills set. You will develop analytical and critical thinking and the ability to understand and communicate complex ideas and concepts via a number of different media. You will understand the development, structure and function of the nervous system, from the anatomical composition of neural pathways, to the physiology of function and the pharmacological principles underlying neuronal function at the single cell level. This will enable you to build an understanding of how neuronal circuits generate behaviour, and of theories of the relationship between brain and mind. Insight will be given into the environmental and genetic factors which combine to give rise to the pathologies of neurological diseases. Through knowledge about contemporary research into mechanisms at the cellular and molecular level, you will develop ideas about how therapies may be devised to promote repair and regeneration of the diseased and damaged nervous system.

How do I navigate through the degree programme?

In the first year (Common Year One; CYO), you will take a common set of modules together with students from other programs. These modules provide an extensive knowledge base in topics such as form and function, biochemistry, molecular biology and pharmacology. The module 4BBY1030 - Cell Biology and Neuroscience - will cover issues of specific relevance to the Neuroscience BSc. Although at times you may feel that the material you learn in some modules is not of direct relevance to the nervous system, the module contains all of the fundamental ideas and principles which will underpin all your Neuroscience learning in the second and third year. You need to be patient to see how these foundations will be important to build your more specific Neuroscience knowledge in later years. A series of introductory sessions in Neuroscience at the beginning of the first year will introduce you to topics in this field which will be developed later. Tutorials are also taken with other Neuroscience students, allowing you to discuss the module content with tutors and your classmates. Our student-led Neuroscience Society (section 2.1) can also put you in touch with Neuroscience students from other years, and provide events and forums for discussions on Neuroscience subjects.

The second year includes a major Neuroscience module (5BBA2081) with anatomical and physiological aspects, and a module on Neuroscience and the Mind (5AAN5001). These modules are integrated to give you an overview of the disciplines of Neuroscience, and to equip you with the knowledge to progress to the third year.

In the third year, you can choose one of three main directions.

In Option 1, students undertake a major practical research project – The Neuroscience Lab-based Project (6BBYN306), on topics spanning Development, Systems Neuroscience, Neurodegeneration and Nervous System Repair. N.B. in order to undertake this Lab-based Project, you must have achieved a 60% average in your end of Year 2 exams. With the Lab-based project, you must take the accompanying module in Principles of Neurobiological Research (6BBYN307). You can then combine this with either Developmental Neurobiology (6BBA3008) or Perspectives on Pain and Neural Disease (6BBYN302), and either Cellular and Systems Neuroscience (6BBYN304) or Mechanisms of Development (6BBYA3121).

Option 2 is in Neuropsychology, and also includes a substantial lab project, and a combination of modules spanning Systems and Cognitive Neuroscience.

Option 3 is based around a library project, with a large number of possible combinations of accompanying modules, including a Neuroscience Lab Practical module, and one on Project Design in Neuroscience. Decisions about which of these routes to take do not need to be made until later in the second year, and plenty of advice is available about which option would suit you best.
What am I expected to know?

Skills and outcomes
The skills which you are expected to have developed by the end of the programme are:

- To integrate cellular and systems approaches to the functioning of the intact nervous system
- Intellectual skills in researching and synthesising data and concepts
- An understanding of the practice of hypothesis-driven neuroscience research
- The ability to express ideas clearly in written, spoken or poster form
- Practical laboratory skills
- The ability to analyse data qualitatively and quantitatively
- The ability to work independently or in small groups to a defined goal

It is useful to bear in mind these goals as you progress through the programme, and to make an early start on your study strategy.

We very much hope that you will enjoy our Neuroscience Teaching Program.

Jon Robbins            Uwe Drescher
Head of Neuroscience Education  Deputy Head of Neuroscience Education

September 2017

Full details of the programme are available in the Undergraduate Student Handbook and full learning and teaching details are available in the Study Skills Handbook. Both are available from KEATS (https://keats.kcl.ac.uk/course/view.php?id=50620).
How to get information

The school pages on KEATS are updated regularly with all the information you will need throughout your degree (https://keats.kcl.ac.uk/course/index.php?categoryid=1374). The lecture resources for each module are posted on these pages, and throughout the Common Year One programme it is important to check these pages regularly for timetable updates. These pages will also contain information throughout the year regarding enrolment, course advising, examinations, and summer studentships. The School and College regulations are also available here, so if you have a query you should check first on these pages.

There is also a Neuroscience section of KEATS which contains module materials (https://keats.kcl.ac.uk/course/index.php?categoryid=1577).

If you can’t find the information you need, or need advice about any issue, then please contact one of the people below. You should also let us know if you are having trouble contacting any other members of academic staff, tutors, lecturers etc.

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Head of Department of Neuroscience (Education)
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Telephone: 020 7848 6365

Mr Tom Lee
Departmental Administrator
Email: tom.lee@kcl.ac.uk
Location: Academic Centre, 1st Floor, Henriette Raphael Building
Tel: 020 7848 8051
2. Essential information, contacts and guidance

Please note that it is important to refer to the Undergraduate Student Handbook for information [https://keats.kcl.ac.uk/course/view.php?id=50620](https://keats.kcl.ac.uk/course/view.php?id=50620). Here you can find information on what to do if you miss an assessment, or if your studies are affected by illness or personal issues. There is also information on who to turn to if you are having academic, health, financial or any other problems. The information below is a brief summary only, and further information for most of the material covered below can be found in the Handbook.

**Module Advising**

There are two module advising sessions each academic year, one taking place at the beginning of semester 1, and the other taking place at the end of semester 2. These sessions are a chance to discuss module options with your programme advisor before making your selections. See also [https://keats.kcl.ac.uk/course/index.php?categoryid=1577](https://keats.kcl.ac.uk/course/index.php?categoryid=1577).

**Personal Tutor**

At the beginning of your degree programme you will be allocated a personal tutor who will stay with you throughout your degree. Your personal tutor is the first person to turn to if you have an academic, financial, health or any other problem that may affect your progress. Remember also that you should flag up such issues as early as possible and discuss them with your personal tutor. This will make it easier to ensure that you receive appropriate help and advice. Your Personal Tutor is also likely to be your most important referee when applying for jobs, so make sure they are kept up-to-date with your plans, interests and achievements by regular contact. Make sure you know your personal tutor’s phone number and email address, and that you inform them if you are unable to attend organised tutorials.

**Timetables**

Detailed Common Year One (CYO) timetables will be available from KEATS during the first week. You need to check this regularly as changes may be made throughout the year. In subsequent years, timetables will be available from the module pages on KEATS.

**Lecture capture**

Currently, lecture capture technology is available in all lecture theatres at the Guy’s and Waterloo campuses, and in most of the classrooms. Lectures will be recorded, but sessions that include significant student participation (e.g. tutorials) will generally not be recorded. Our experience from the last years is that in exceptional circumstances, lecture capture fails. In these cases the corresponding lecture/s from last year will be uploaded. However, some lectures in this years’ course are being taught for the first time. We encourage you therefore strongly to attend the lectures in person. [https://keats.kcl.ac.uk/pluginfile.php/2018445/mod_resource/content/1/student-guidance-for-lecture-capture.pdf](https://keats.kcl.ac.uk/pluginfile.php/2018445/mod_resource/content/1/student-guidance-for-lecture-capture.pdf)

**Tutorial groups**

Tutorial groups for years 1 and 2 (typically 6-7 students) will be assigned at the start of the programme. For each module that you do, you will be assigned a tutor to help you with academic queries relevant to that module. This is separate from your personal tutor. In year 3, tutorial group size and composition will vary from module to module depending on your choice of stream.
Health, personal problems and your studies

It is a requirement of King's College London that all students take or submit their assessments at times prescribed by King's. However, it is acknowledged that exceptionally - through illness or other good cause - you may not be unable to meet these requirements. In such instances academic regulations allow students to submit details of their mitigating circumstances for consideration by Assessment Sub-boards. The boards will use the information submitted to determine whether the mitigating circumstances provided by the student are an acceptable reason for missing an assessment for example.
Therefore, use the Mitigating Circumstances Form form (MCF) where your illness or other circumstances mean that you will be/unable to take an assessment. This includes both in-module assessments and end of year examinations. You should read the Mitigating Circumstances guidance - prior to completing the Mitigating Circumstances Form.  
( http://www.kcl.ac.uk/aboutkings/quality/academic/assessment/mitcir.aspx )
Hardcopies of all forms are available from the Academic Centre.

Examination timetables

Examination timetables can be found on the College Examination Office website:  
(http://www.kcl.ac.uk/campuslife/services/examinations/exams/timetable.aspx )
Personalised timetables will be available from your Online Student Record. These must be checked for clashes or other difficulties and any problems should be reported to the Examinations Office, James Clerk Maxwell Building, Waterloo Campus, as soon as possible. Any amendments to the timetable will be issued as needed. It is your responsibility to make sure that you check the timetables in person and are aware of any alteration to the examination arrangements. Academic Centre staff will not provide details over the telephone.

Welfare

The Student Advice and International Student Support Service offers free, confidential advice, guidance and representation on a range of practical issues, for both current and prospective students and staff. The wide range of issues dealt with include student finance, money management and debt advice, social security and disability benefits, housing rights, consumer law and immigration issues. Contact details for each campus are available on the website or in the Undergraduate Student Handbook:  

Personal problems and counselling

Counsellors work within Student Services and in the Counselling, Welfare and Health Centres on the main campuses at Strand, Waterloo, Guy's and Denmark Hill. Their aim is to enable you to make the most of the opportunities offered at the College by helping you cope with any problems or difficulties of a personal or emotional nature that may arise, whether or not they affect your studies. All the help offered is strictly in confidence. Should you feel confused, isolated, anxious or unhappy, you may find that talking about it helps.

Neuroscience research talks

Students are encouraged to attend seminars given by external speakers about their research that are organised as part of the day-to-day practice of Research Departments and Centres. These are advertised widely throughout the campus. For example,

the seminar series of the Centre for Developmental Neurobiology  
(https://devneuro.org/cdn/index.php )
http://www.kcl.ac.uk/ioppn/depts/devneuro/newsevents/seminarseries.aspx

the seminar series at the Centre for Age-Related Diseases
Furthermore, an undergraduate Neuroscience Society hosts talks of a more general kind and is a forum for discussion and social activities across all years.  
http://devneuro.org/neureka/  
https://neureka.seminars.wordpress.com  

**Neuroscience Society – ‘NeuroSoc’**

KCL NeuroSoc was founded in 2005 with the aim of uniting students across KCL with a passion for neuroscience, and encouraging discussion, dissemination of ideas and engagement of students with Neuroscience and its allied disciplines. Our goal is to provide a platform for learning, the pursuit of original research and the development of career opportunities in the field.

Their core activities include regular academic events and meetings to engage and inspire students with cutting-edge Neuroscience developments, as well as social events to provide a forum through which ideas can be expressed and where contacts can be established between students of different years, giving a sense of continuity within the department. They welcome all students to volunteer with NeuroAid, a charity organisation set up by KCL NeuroSoc. Additionally, they will organize several lectures and debates and will work closely alongside the Neuroscience Department in order to support and engage all students.

A key interest of NeuroSoc is to provide a forum through which common experiences and queries can be expressed. For example, they discuss study techniques, prospective careers, internship options and laboratory research experience. They also hope to welcome new neuroscience students and to provide advice for their coming years and experiences.

The highly successful and popular KCL NeuroSoc annual symposium has become a highlight of the neuroscience calendar. Drawing on the successes of last year’s student-led symposium (see poster above), KCL NeuroSoc are in the stages of planning the 2017 KCL Neuroscience Society Symposium, focusing on neuroplasticity and the changes that take place in the brain from a molecular and cellular level to a cognitive and behavioural level.

Follow us on Facebook (https://www.facebook.com/groups/kclneurosoc) to stay up-to-date with our events!
Careers

It is never too early in your degree programme to begin finding out about possible careers. Information on the College Careers Service can be found on the website (www.kcl.ac.uk/careers) and there is also information in the Undergraduate Student Handbook. They also have a Facebook page which is a great way to keep updated with their events, plus any vacancies that may interest you (http://www.facebook.com/kingslifesciencecareers). There are also some events planned specifically for Neuroscience students throughout the year which you will be contacted about. For instance, there will be informal lectures about ‘MSc’s at King’s’ on Oct 4th 2016, 12 pm (Gowland Hopkins Lecture Theatre) and on ‘How to apply for PhDs’ on Tues Oct 18th, 12pm (Anatomy Lecture Theatre) given by the Head of Neuroscience Education, Jon Robbins.

There are a wide variety of careers available for Neuroscience graduates, as public and private organisations are in search of employees with the mix of practical, numerical, analytical and communication skills which you will develop. The majority of Neuroscience BSc graduates go on to further degrees of some kind, typically MSc or PhD degrees. A range of Neuroscience-related MSc programmes are run by Institute of Psychiatry, Psychology & Neuroscience, and are accessible via the KCL website. Some of the jobs which our graduates go on to include scientific or clinical research and clinical trials, health-allied jobs, academic publishing, journalism, teaching, patent law and the financial sector. The information below is taken from data collected on behalf of HESA as part of the annual Destinations of Leavers of Higher Education (DLHE) survey. The data below is collected from graduates in 2013 (surveyed in January 2014).

Survey response from 2013 graduates | King’s UG BSc Neuroscience
---|---
Total responses | 35 students
**Status**
In full time work | 29%
Studying | 51%
Other | 17%
Unemployed | 3%

**Destinations of graduates 2013**
The following lists the full time job titles and employing organisations of the graduate cohort

<table>
<thead>
<tr>
<th>Job Title</th>
<th>Employing Organisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales Consultant</td>
<td>Nestle</td>
</tr>
<tr>
<td>Compliance Officer</td>
<td>Total Assist Health Care Group</td>
</tr>
<tr>
<td>Biophysics Teacher/Tutor</td>
<td>A-Plus</td>
</tr>
<tr>
<td>Lab Assistant</td>
<td>Harris Academy</td>
</tr>
<tr>
<td>Trainee Dental Nurse</td>
<td>Obex Dental Practice</td>
</tr>
<tr>
<td>Researcher</td>
<td>Sharpstream Life Sciences</td>
</tr>
</tbody>
</table>

**Courses of Further Study**

<table>
<thead>
<tr>
<th>Course</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSci Neuroscience</td>
<td>MSc Neuroscience</td>
</tr>
<tr>
<td>MSc Psychiatric Research</td>
<td>MSc Neuroimaging</td>
</tr>
<tr>
<td>MSc Psychology</td>
<td>MSc Epilepsy</td>
</tr>
<tr>
<td>MSc Bioengineering</td>
<td>Dentistry</td>
</tr>
<tr>
<td>MRes Neuroscience</td>
<td>Pharmacy</td>
</tr>
<tr>
<td>MSc Clinical Neuroscience</td>
<td>Medicine</td>
</tr>
</tbody>
</table>
3. Skills development and module content

Three pathways to a Neuroscience BSc

In year 1 (levels 4) all modules are compulsory. In year 2 (level 5), six modules are compulsory, and you can choose in semester B between ‘Molecular and Cellular Neuroscience’ (5BBYN201), a module focussing on molecular-biological techniques, and ‘Advanced topics in philosophy of mind’ (SAAN5002). In year 3 (level 6), students can choose one of three options leading to a Neuroscience BSc qualification. Students must achieve 120 credits at level 4 (year 1), 120 credits at level 5 (year 2) and 120 credits at level 6 (year 3).

Option 1
Library-based

<table>
<thead>
<tr>
<th>15 credits</th>
<th>Library Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>75 credits of Neuroscience modules</td>
<td></td>
</tr>
<tr>
<td>Up to 30 credits other modules</td>
<td></td>
</tr>
</tbody>
</table>

Option 2
Research-Intensive Stream

| 45 credits Lab-based Project in Neuroscience, focussing on a Developmental, Cells/Systems or Brain Disorder topic |
| 75 credits of set modules |

Option 3
Neuroscience & Neuropsychology

| 30 credits Project |
| 90 credits of set modules |

Contact person for the Third year Options:

Option 1: Prof Paul Francis: paul.francis@kcl.ac.uk

Option 2: Dr Isabella Gavazzi: isabella.gavazzi@kcl.ac.uk

Option 3: Dr Qazi Rahman: qazi.rahman@kcl.ac.uk
3.1 Year One

Common Year One

Students on the majority of “non-professional” BSc programmes in the School of Biomedical Sciences study a common curriculum in their first year. This is designed to give a solid foundation in core biomedical sciences, together with an introduction to key transferable skills.

The Common Year One curriculum consists of 120 credits spread across 7 modules. Modules studied and their credit values are:

- 4BBY1013 Biochemistry (15 credits)
- 4BBY1020 Chemistry for the Biosciences (15 credits)
- 4BBY1030 Cell Biology and Neuroscience (15 credits)
- 4BBY1040 Fundamentals of Pharmacology (15 credits)
- 4BBY1050 Skills for the Biosciences (15 credits)
- 4BBY1060 Human Form and Function (30 credits)
- 4BBY1070 Genetics and Molecular Biology (15 credits)

https://keats.kcl.ac.uk/course/index.php?categoryid=2710

4BBY1030 Cell Biology and Neuroscience (15 credits)

Credits 15
Days Mon, Tue, Wed, Thu, Fri

Module organizer John Pizzey john.pizzey@kcl.ac.uk
Co-organizer Isabella Gavazzi isabella.gavazzi@kcl.ac.uk

Educational aims
To give students the opportunity to understand the key underlying principles of cell biology and neuroscience. This will integrate with other Common Year One modules (CYO) and will provide a foundation for other second year modules, e.g. Cell Biology A/B and Neuroscience.

At the end of the module students should be able to

- Understand the structure of the Cell.
- Appreciate the fundamentals of Neuroscience.
- Be familiar with cellular functions such as the cell cycle, cell signalling etc.
- Have acquired basic cell biology practical experience.

Teaching hours

Lectures 22
Practicals 12
Tutorials 3
PSWs 4
Private Study 109
First Year Neuroscience Sessions

Organizer
Dr Anna Battaglia
Senior Lecturer in the Anatomy Department

Neuroscience tutorials specifically tailored for students on the Neuroscience programme will be run throughout Year 1. Details will be published in the first year timetable.

1) The first tutorial is an Introduction to Neuroscience; it will also explain the relevance of common Y1 disciplines for a Neuroscience course of study. Different possible levels of study of Neuroscience will be presented (e.g. from the behaviour to genetics). It also includes a basic overview of how the nervous system works.

2) The second tutorial will cover how findings in Neuroscience research enable us to better understand human behaviour. It will be explained that the scientific task involves the identification of the role that different brain regions and specific neural networks play in the production of behaviour and mental events described as mind. Critical thinking will be developed in whole-class discussions.

3) The third tutorial is an academic writing skills workshop where students will be presented with useful tips on how to write in a critical and analytical way during the course of their studies; the students will have to write a short paragraph on a chosen Neuroscience topic and scripts will be exchanged between peers and assessed.

3) The third tutorial will focus on Brain pathologies such as Alzheimer’s and Parkinson’s disease. The students will read an abstract, introduction and discussion sections of a relevant research paper in the classroom and will do a comprehension exercise in small groups.

4) The fourth tutorial will discuss Imaging in Neuroscience and the impact this type of research has on our knowledge of higher cognitive functions. The principles of how functional Magnetic Resonance Imaging (fMRI) will be explained. Selected Neuroscience research areas employing this technique will be presented (e.g. affective disorders, pain). Discussion of the advantages and disadvantages of the technique will follow.

These tutorials will feature the presentation of magazine/journal articles covering several aspects of an issue related to Neuroscience. Comparison between how the media portrait some issues vs. the original scientific article will be made in class. To get the most out of the tutorials you will be expected to contribute to class discussion with your peers and the module organizer.
3.2 Year Two

Year Two consists of five compulsory core modules (15 credits each at level 5; 105 credits) that prepare Neuroscience students for subject specialisation and research in Year Three. Additionally, students choose between the modules ‘Molecular and Cellular Neuroscience (5BBYN201) and ‘Neuroscience and the mind’ (5AAN5001). Both courses run on Fridays.

Please note that the information on the modules below was correct in Sept 2017, but changes may take place during the degree programme. This information is intended as a guide only to your degree programme, and you should always check the most up to date information provided by the module organizers at the start of term, and via the online Timetable and Synopsis available when you select your modules.

5BBA2040 Psychology 1

Credits 15
Term 2, Wed

Module Co-organizers
Eleanor Dommett
eleanor.dommett@kcl.ac.uk
Yannis Paloyelis
yannis.paloyelis@kcl.ac.uk

Educational Aims
Psychology is the scientific study of mental processes and human behaviour. The aim of the module is to introduce students to the discipline of psychology and to provide an opportunity to discuss and evaluate the principal psychological findings and theories. A wide range of perspectives will be examined but the main emphasis will be on cognitive, developmental, social and clinical psychology. Specific topics will include perception, learning, memory, emotion, attachment, personality, obedience and prejudice.

Learning Outcomes
At the end of the module students should be able to: discuss the different methods for studying mental processes and human behaviour that have emerged in psychology; describe and evaluate the main psychological findings and theories on the topics of perception, learning, memory, emotion, attachment, personality, obedience and prejudice.

Teaching Hours
Lectures-11
Seminars and Tutorials-11
Private study-128

5BBA2081 Neuroscience

Credits 30
Term 1 & 2, Thursdays

Module organizer
John Pizzey
john.pizzey@kcl.ac.uk
co-organizer
Clemens Kiecker
clemens@kiecker@kcl.ac.uk
Educational Aims
The module aims to provide an understanding of the principles of neuroscience with emphasis on the structure and function of the human nervous system. The module integrates disciplines of neuroanatomy, neuropharmacology, neurophysiology and neuropsychology.

Learning Outcomes
The module covers the structure and function of the nervous system. It covers: microscopic and macroscopic anatomy of the nervous system and its coverings and the arrangement of the spinal cord and brain into functional morphological systems; neuronal physiology; reflexes and the physiological basis for the function of the sensory and motor systems. It also addresses the pharmacology of transmitters and drugs affecting the nervous system. An introduction to behavioural psychology is also provided.

Teaching Hours
- Lectures-54
- Seminars and Tutorials-4
- Practicals / LabWork-30
- Private study-212

5BBA2300 Essentials of Embryology

Credits 15
Term 1, Tue

Module Organizer       Esther Bell       esther.bell@kcl.ac.uk
co-organiser          Malcolm Logan    malcolm.logan@kcl.ac.uk

Educational Aims
The principal aim of this module is to provide students with an introduction to the key concepts and issues that are central to modern developmental biology. The intention is to provide the student with a basic appreciation of the subject, which can then be explored in more detail in 3rd year modules such as Developmental Neurobiology (6BBA3008).

Learning outcomes
By the end of the module the student will have achieved the following:
1. An appreciation and understanding of the key questions currently being addressed in the field of embryology.
2. A knowledge of the principle techniques, both modern and “classical”, and model systems and organisms being used to address those questions.
3. An introduction to how basic research findings have improved our understanding of the basis of human diseases and developmental syndromes.

Teaching Hours
- 16 subject lectures and 1 revision lecture
- 2 tutorials
- 1 workshop
- 1 laboratory-based practical
- Private study
5BBB0230 Gene Cloning and Expression A

Credits 15
Term 1, Wed

Module Organizer  David Chambers  david.2.chambers@kcl.ac.uk

Educational Aims
To provide an understanding of how genes are expressed in eukaryotes and to provide an understanding of the key molecular biology techniques.

Learning Outcomes
At the end of this module students should be able to:
• explain how genes are expressed in eukaryotes.
• discuss the ways in which the expression of eukaryotic genes is regulated.
• describe the theoretical basis of key molecular biology techniques.

Teaching Hours
Lectures-22
Seminars and Tutorials-18
Private Study-110

5BBYN201 Molecular and Cellular Neuroscience

Credits 15
Term 2, Friday

Module Organizer  Robert Hindges  robert.hindges@kcl.ac.uk
Co-organizer    Setsuko Sahara   setsuko.sahara@kcl.ac.uk

Students choose between this module and ‘Neuroscience of the Mind’ (5AAN5001).

Educational Aims
➢ Define some of the key concepts in molecular and cellular neuroscience
➢ Allow students to gain technical understanding and practical skills in state-of-the-art molecular and cellular neuroscience research
➢ Allow students to gain confidence in a research laboratory setting

Learning Outcomes
By the end of this module the students should be able to
➢ Be confident in carrying out calculations related to laboratory work
➢ Understand the basic cell biology of neurons and relate it to their function
➢ Identify some of the key molecular mechanisms in neurons
➢ Show analytical skills and critical thinking in evaluating research studies and research literature in molecular and cellular neuroscience
➢ Carry out basic molecular and cell biology techniques
➢ Use a range of standard laboratory equipment
Understand the principles of genome editing and the necessary practical steps to apply this technology in a research project

Accurately record experimental procedures and findings in a laboratory notebook

Communicate research findings in the form of an oral presentation

**Teaching Hours**
- Lectures: 8
- Practicals: 38
- Seminars/Tutorials: 6
- Private Study: 98

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**5BBM0218 Physiology & Pharmacology of the CNS**

Credits: 15
Term: Term 2, Tues

**Module Organizer 1**
Sarah Salvage
sarah.salvage@kcl.ac.uk

**Educational Aims**
A module of lectures, workshops and on-line learning concentrating on physiological and pharmacological aspects of central nervous function in mammals.

**Learning Outcomes**
The module is designed to give an understanding of how electrical and chemical communication at synapses occurs and of how the functioning of neural circuits can be modified by transmission of information and drugs. The major neurotransmitter systems will be considered in relation to normal and abnormal function and how drugs are used therapeutically.

**Teaching Hours**
- Lectures: 29
- Seminars and Tutorials: 5
- Data Handling Workshops: 2
- Private Study: 114

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**5AAN5001 Neuroscience and the Mind**

Credits: 15
Term: Term 1, Fri

**Module Organizer**
Ellen Fridland
ellen.fridland@kcl.ac.uk

Students choose between this module and ‘Molecular and Cellular Neuroscience’ (5BBYN201).

**Educational Aims**
This course will encourage students to think critically about the relationship between neuroscience and the philosophy of mind. Students will be challenged to draw connections between empirical findings and both traditional philosophical questions and theoretical questions within the brain sciences. Students will be challenged to develop a rigorous, analytic thinking and writing style in order to investigate topics in the
philosophy of mind. We will focus on ideas that illuminate and challenge our pre-theoretic notions of the mind.

**Learning Outcomes**

- Students will be able to describe and discuss philosophical approaches to a variety of topics raised in contemporary debates about the mind.
- Students will be able to construct and reconstruct philosophical arguments.
- Students will be able to assess philosophical arguments for validity and soundness.
- Students will learn to raise and answer objections to philosophical arguments.
- Students will become familiar with various theories that attempt to solve the mind-body problem and the challenges associated with each of them.
- Students will come to understand why consciousness is thought to be a problem for a scientific theory of the mind.

**Teaching Hours**

Lectures-
Seminars and Tutorials-
Private Study-

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5AAN5002 Advanced Topics in the Philosophy of Mind

**Credits** 15
Term 2, Fri

**Module Organizer**  Ellen Fridland  ellen.fridland@kcl.ac.uk

**Educational Aims**

This course will build on the philosophical foundations established in module 5AAN5001 ‘Neuroscience and the Mind’. Students will continue to develop analytic skills of reasoning and argumentation. Students will think in some depth about the connection between empirical evidence and longstanding philosophical questions, such as free will and the problem of other minds. Students will be challenged to think critically about how evidence is related to theory, especially insofar as neuroscientific findings of unconscious mental processing preceding conscious intentions and mirror neurons are meant to support particular philosophical theories.

**Learning Outcomes**

- Students will learn to appreciate the significance of neuroscientific and psychological approaches to understanding philosophical problems.
- Students will gain an understanding of the relationship between particular empirical findings in neuroscience and relevant philosophical questions.
- Students will be able to construct and reconstruct philosophical arguments.
- Students will be able to assess philosophical arguments for validity and soundness.
- Students will learn to raise and answer objections to philosophical arguments.
- Students will learn to write in a clear and rigorous fashion.
- Students will gain an understanding of the philosophical problem of free will and its connection to neuroscience.
- Students will gain an understanding of the problem of other minds and how solving this problem is connected to evidence from neuroscience and psychology.
### Teaching Hours
- Lectures- 
- Seminars and Tutorials- 
- Private Study-

### How am I assessed in Year Two?

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<tr>
<th>Assessment</th>
<th>Psychology</th>
<th>Neuroscience</th>
<th>Essentials of embryology</th>
<th>Gene cloning &amp; expression</th>
<th>Physiol. &amp; Pharmacology</th>
<th>Neuroscience &amp; the Mind</th>
<th>Advanced topics in the philosophy of the mind</th>
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### 3.3 Year Three

In year three, you choose one of three options that have a different balance of laboratory, library and lecture based teaching (see also summary on page 12). Please note that in order to qualify for the Research-intensive option which includes the Lab-based Project in Neuroscience, you need to achieve a 60% average in your end of Year 2 exams.

[Please note that the information on the modules below was correct in September 2017, but you should check via the online Timetable and Synopsis]

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6BBYN301 - Project Design in Neuroscience

Credits: 30
Term 2, Mon

Module Organizer  Manolis Fanto  manolis.fanto@kcl.ac.uk
Co-organizer  Setsuko Sahara  setsuko.sahara@kcl.ac.uk

Educational Aims: To allow students to develop a detailed understanding of the conduct of research in Neuroscience: to design a hypothesis, devise an experimental strategy, and to write a research project proposal.

Learning Outcomes:
At the end of this module students should be able to:
- Assemble and discuss issues from the scientific literature
- Construct and refine a hypothesis
- Formulate an experimental strategy
- Evaluate which experimental outcomes should be measured and how they will be analysed
- Construct a feasible timeline for an experimental project
- Design a schedule and budget for a research project
- Write a grant proposal and deliver a short oral presentation

Teaching Hours
Lectures-4
Seminars and Tutorials-10
Private Study-236
Other-50

6BBYN302 – Perspectives in Pain and Nervous System Disorders

Credits: 30
Term 1, Thurs, Fri

Module Organizer  Anna Battaglia  anna.battaglia@kcl.ac.uk
Co-organizer  Isabella Gavazzi  isabella.gavazzi@kcl.ac.uk

Educational Aims:
- Enable the students to evaluate different perspectives/approaches employed in the research on pain and human nervous system disorders, providing them with a sample of neurological and psychiatric disorders, drawn primarily from research at King’s College London
- Enable the students to research independently and to be able to debate controversial issues with their peers
- At the end of the module, students should be able to discuss critically strengths and weaknesses of selected published literature on human nervous system disorders, and should be able to present reviews of the research literature as oral or written presentations
- To achieve an understanding of the complexity of research in human nervous system disorders and the necessity of an interdisciplinary approach to tackle such complexity
to develop a research-level approach towards understanding current issues in nervous system disorders.

**Learning Outcomes:** By the end of this module the students will:

- Learn about the physiological mechanisms of nociception and pathological mechanisms leading to chronic pain syndromes
- Become familiar with the role of genetics and epigenetics in pain sensitivity
- Evaluate the strengths and weaknesses of imaging in the study of pain
- Evaluate the role of microglia in chronic pain
- Discuss the neurobiology of placebo effects in analgesia
- Evaluate the importance of opioids
- Appreciate the complexities of research into neurodegenerative diseases and the variety of exploratory interpretations available in the literature
- Describe the modern understanding of the neurobiology of epilepsy and current pharmacological treatment options
- Become familiar with the current research on multiple sclerosis
- Discuss glial pathology and identify the underrated importance of glia in the nervous system from a functional point of view
- Conceptualize autism and dyslexia as neurodevelopmental disorders
- Interpret the contemporary high prevalence of affective disorders under the light of a multidisciplinary approach (neuroscience/psychology/psychiatry).
- Evaluate past and contemporary theories of schizophrenia

**Teaching Hours**
Lectures-35
Seminars and Tutorials-25
Private Study-240

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**6BBYN303 – Experimental Topics in Neuroscience**

**Credits:** 15
Term 2, Mondays

**Module Organizer**  
Martin Meyer  
martin.meyer@kcl.ac.uk

**Co-organizer**  
Elizabeth Bradbury  
elizabeth.bradbury@kcl.ac.uk

**Educational Aims:**
- to equip students with a range of laboratory-based practical skills and techniques used in contemporary neuroscience research.
- to develop their theoretical knowledge of neuroscience experimental approaches, including data collection and analysis.

**Learning Outcomes:**
- Understand the theory behind a range of techniques used in neuroscience research
- Follow a protocol to perform an experiment
- Develop the practical skills necessary to carry out the experiment
- Interpret experimental results critically
- Present experimental results in the form of written reports
➢ Present a laboratory notebook recording experiments and reflecting on their outcomes

**Teaching Hours**
Seminars and Tutorials 2
Practical labwork 56
Private study 92

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**6BBYN304 Cellular and Systems Neuroscience**

**Credits** 30
Term 1, Mon and Tues

**Module Organizer**
Uwe Drescher  uwe.drescher@kcl.ac.uk

**co-organizer**
Frank Hirth  frank.hirth@kcl.ac.uk

**Educational Aims**
➢ To integrate cellular and systems approaches to the functioning of the intact nervous system.
➢ to hypothesize from areas of research debate and develop arguments on topical issues
➢ to measure strengths and weaknesses of published research with respect to the functioning of the nervous system
➢ to compose reviews of the published research literature as both oral and written accounts
➢ to explain and argue for the necessity of an inter-disciplinary approach within identified aspects of cutting-edge neuroscience research.

**Learning Outcomes**
By the end of this module the students should be able to
➢ relate the cell biology of the different compartments of the synapse to strategies for neuronal communication
➢ compare the various cellular mechanisms by which neurons integrate their inputs and regulate their outputs
➢ discuss how neuronal cell biology underlies the nervous system’s ability to transduce and process sensory information
➢ assess how systems neuroscience approaches the representation of sensory information at different levels of the nervous system
➢ evaluate the processing strategies underlying motor control and the associated sensorimotor transformation
➢ define and assess the importance of neuronal plasticity
➢ understand the importance of computational neuroscience for addressing research questions
➢ estimate the implications for neuroscience in health and disease of considering the neuron from the perspectives of both cell and circuit

**Teaching Hours**
Lectures-31
Seminars and Tutorials-9
Private Study-260
6BBYN305 Neuroscience Literature-based Research Project

Credits 15

Module Organizer  
Paul Francis  paul.francis@kcl.ac.uk
co-organizer  
Joseph Bateman  joseph_matthew.bateman@kcl.ac.uk

Educational Aims
To give students the opportunity to use their knowledge and understanding of Neuroscience in order to undertake a literature-based project based on a relevant area of current research. Each student, on the basis of current research literature, will review in detail an area of neuroscience as agreed with their supervisor. The module aims to promote specific information and research-related skills, namely reading and critical evaluation of original scientific research, and summarize arguments with reference to the scientific literature.

Learning Outcomes
By the end of the module, students are expected to be able to

- Read and summarize scientific papers with confidence
- Plan and write a long essay/report employing the appropriate format and making use of bibliographic software
- Understand and explain experimental data
- Evaluate different ideas and scientific controversies in a balanced and concise way
- Use library and internet resources to obtain information
- Work independently to achieve these aims

Teaching hours
One-to-one tutorials with supervisor: 6 h
private study: 144 h

6BBYN306 Laboratory-based Project in Neuroscience

Credits 45
Term 2

Module Organizer  
Isabella Gavazzi  isabella.gavazzi@kcl.ac.uk

Important note
In order to take this module, you must have achieved a 60% average in your end of Year 2 exams. This module must also be taken in combination with the accompanying module in research methods 6BBYN307.

Educational Aims
The aim of the module is to: enable students to understand the formulation of a hypothesis and the basics of experimental data; train students to conduct research in a functioning laboratory, and enable them to perform specific techniques and generate data; develop students’ ability to document, tabulate and analyse data; encourage critical thinking and analysis of the literature and
set research in the context of the field; develop students' ability to present their results in written form (write-ups) and as a research seminar.

Learning Outcomes
By the end of the module students should be able to
- critically evaluate experimental design
- assess relevant research literature
- plan and conduct experiments independently
- master a range of experimental techniques
- reflect on experimental outcomes and adjustment of experimental conditions
- accurately collect, tabulate and analyse data
- evaluate experimental data and form conclusions.

Teaching hours
Lectures-2
Seminars-16
Lab work-300
Private study-132

6BBYN307 Principles of Neurobiological Research

Credits 15
Term 1, Weds

Module Organizer
Wendy Noble wendy.noble@kcl.ac.uk
Co-organizer
Uwe Drescher uwe.drescher@kcl.ac.uk

Why do this module?
This module is a preparation for the practical part of your BSc study (6BBYN306) which takes place primarily in Term B, and is taken in combination with this module.

Educational Aims
The aim of this module is to give students a broad overview of the process of research, insights into common model systems and techniques used to study and visualize the brain. Students will also be taught data handling and statistics, and will be given the opportunity to discuss and debate topics of importance to the wider neuroscientific community. This module is a preparation for the practical part of your BSc study (6BBYN306) which takes primarily in Term B, where you will work on specific neurobiological research project. Most sessions in the module are organised into two parts - in the first part a topic is presented as a lecture by a scientist with specialist knowledge in that area, while in a second part of the session the same topic will be introduced on a practical level, often including laboratory demonstrations.

Learning Outcomes
By the end of the module students
- Gained an understanding of the key animal model systems and applications of important in vitro techniques used in neurobiological research
- Developed a solid basis for data handling and using statistics in neurobiological research
- Developed an understanding of how to study synapse function
- Been introduced to the main principles of electrophysiology
Gained familiarity with advanced imaging techniques used to visualise the nervous system
Discussed and debated topics of interest to the general neuroscientific community

Teaching Hours
Seminars and Tutorials - 21
Demonstrations and Practicals - 13
Private Study - 116

6BBYN309 – Memory mechanisms in health and disease

Credits: 15
Term 1, Mondays - pm

Module Organizer     Peter Giese     peter.giese@kcl.ac.uk
Co-organizer          Deepak Srivastava deepak.srivastava@kcl.ac.uk

Aims
➢ to understand that there are different learning and memory processes
➢ to understand that mechanisms underlying learning and memory processes need to be investigated at different levels of complexity considering behavioural, anatomical, cellular network, cellular and molecular processes.
➢ to understand rodent behavioural investigations, brain imaging analyses, in vivo electrophysiological recordings, optogenetic approaches, retrograde tracing techniques, electrophysiological and morphological analyses of synapses, pharmacological and molecular biological manipulations.
➢ to understand that different mechanisms mediate memory acquisition, consolidation, storage, reconsolidation, retrieval and extinction of memory
➢ to learn about different plasticity mechanisms in the brain including neurogenesis, synaptogenesis, long-term potentiation, long-term depression
➢ to learn about mechanisms that cause memory dysfunction in normal ageing, Alzheimer’s disease and other cognitive disorders
➢ to learn about pharmacological approaches for cognitive enhancement

Learning outcomes
➢ a thorough understanding of experimental approaches that study how memory is formed, stored, maintained and modified
➢ a deep understanding of mechanisms of synaptic plasticity and neurogenesis and knowing how these plasticities relate to learning and memory processes
➢ an understanding how memory processes are impaired in diseases, such as Alzheimer’s disease
➢ be able to apply the acquired knowledge of how memory mechanisms are studied to understanding how mechanisms of behaviours are analysed
➢ be able to critically analyse and present primary memory research data and assess its validity

Teaching Hours
Lectures -17
Journal clubs, oral presentations, and revision -12
Private study -121
6BBYN3010 Imaging the Brain, Reading the Mind

Credits 15
Term 1, Tuesday

Module Organizer
Yannis Paloyelis
Yannis.Paloyelis@kcl.ac.uk

Educational Aims
This module provides an introduction to the functional imaging of the brain. It aims to provide students with an overview of the technologies being used to understand the function of the living brain and the range of questions that can be addressed. Students will develop the required knowledge and skills to understand and critically evaluate functional neuroimaging research, and begin formulating their own questions.

Learning Outcomes
By the end of this module the students should be able to:

- Describe the main methods used to image the living brain from humans to smaller animals
- Describe what functional neuroimaging technologies actually measure, and how this relates to brain function and the mind
- Discuss the relative merits of the various neuroimaging technologies and the type of questions they can address
- Critically assess existing applications of functional neuroimaging and separate robust scientific evidence from the hype
- Formulate their own questions that could be addressed using functional neuroimaging

Teaching Hours
Lectures 30
Seminars and Tutorials 8
Workshops 6
Private Study 106

6BBA3008 Developmental Neurobiology

Credits 30
Term 1, Thurs and Fri

Module Organizers
Darren Williams
darren.williams@kcl.ac.uk
Clemens Kiecker
clemens.kiecker@kcl.ac.uk

Why do this module?
The mission of developmental neurobiologists is to advance our understanding of the human brain by studying how undifferentiated cells develop into a profoundly complex organ. The approaches we use take advantage of the fact that much of the brain’s final complexity is encoded in the genome as a set of relatively simple building instructions. We believe that an understanding of the molecular
basis of normal brain development is of considerable value in its own right, but it is also needed to increase our ability to understand abnormalities and disorders, whether of development or degeneration, and to identify mechanisms that facilitate regeneration. Detailed knowledge of the normal steps leading to the differentiation of individual neuronal cell types is also required for the future of therapeutically stem cell research. Understanding the generative instructions for brain development will allow us to devise regenerative programs for cell replacement and axonal re-growth.

**Educational Aims**
The goal of this module is to help you obtain a deep knowledge of the mechanisms that underlie the development of the nervous system.

**Learning Outcomes**
On successful completion of this module you should be able to;
- Summarize how secreted signalling molecules and transcription factors collaborate to pattern the major axes of the nervous system
- Explain in detail how the growth cones of neurons interpret gradients of molecules to navigate to their targets
- Compare and contrast the anatomical organization and development of different neuronal systems
- Explain the role that pre-patterning and cell-cell interactions, play in the development of neural circuits
- Describe specific examples where our knowledge of developmental mechanisms can be used to understand or treat neural disorders
- Argue cogently why one model organism is better suited to study a particular developmental mechanism that another

**Teaching Hours**
Lectures-44
Seminars and Tutorials-24
Private Study-232

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**6BBA3320 Behavioural Sciences**

Term 1, Weds
Credits 15

**Module Organizer** Anna Battaglia anna.battaglia@kcl.ac.uk
Co-organizer TBA

**Educational Aims**
The aim of the module is to provide an inter-disciplinary perspective for understanding human behaviour. Specific topics will include gender differences, language acquisition, altruism, aggression, mental illness and addiction. Evidence from a range of perspectives will be considered including genetic, psychological, neuroscientific and animal studies. The main emphasis will be on the comparison between biological and environmental explanations and how these can complement each other
Learning Outcomes
At the end of the module students should be able to:

➢ describe and evaluate the evidence for biological and environmental influences on
  o gender differences
  o language acquisition
  o altruism
  o aggression
  o mental illness
  o addiction

➢ discuss and integrate different perspectives for understanding human behaviour including
  genetic, psychological, neurobiological

➢ critically evaluate evidence derived from animal studies.

Teaching Hours
Lectures 33
Seminars & Class discussions 10
Private Study-107

6BBL0366 Neuroendocrinology

Credits 15
Term 2, Tues

Module Organizer               Gavin Bewick               gavin.bewick@kcl.ac.uk
Co-organizer                   Clive Coen                clive.coen@kcl.ac.uk

Educational Aims
The module provides a comprehensive and up-to-date coverage of theoretical and practical aspects
of the inter-relationships between the CNS and the endocrine system in the mammal. The module
will build on and provide integration of a variety of concepts introduced in the Neuroscience (BA2081),
Physiology and Pharmacology of the CNS (BL0213) and Endocrinology and Reproduction (BL0210) modules in the second year.

Learning Outcomes
Topics covered are

➢ neurosecretion
➢ relationships between the hypothalamus and the pituitary
➢ pineal gland and melatonin; endocrine rhythms
➢ clinical aspects of neuroendocrinology
➢ neuropeptides and neurohormones in the brain
➢ hormones and behaviour.

Each student is expected to contribute to a symposium of recent research in neuroendocrinology.
The module involves staff from the Departments of Physiology and Anatomy & Human Sciences, as
well as visiting lecturers from outside King's.

Teaching Hours
Lectures-26
Seminars And Tutorials-16
Private Study-108
6BBM0329 Cellular Basis of Drug Dependence

Credits 30
Term 1, Thurs and Fri

Module Organizer  Stewart Paterson  stewart.paterson@kcl.ac.uk
Co-organizer  Lawrence Moon  lawrence.moon@kcl.ac.uk

Educational Aims
By the end of the module, students should understand the terminology associated with the study of drug dependence, the cellular mechanisms of the acute effects of drugs of abuse and the cellular adaptations that occur with their chronic use.

Learning Outcomes
- Cellular aspects of pharmacology, particularly those relevant to an understanding of drug receptors and the ways in which activation of these produce biochemical changes in the cell
- Pharmacological, biochemical and electrophysiological methods for investigation of receptor-mediated changes in cell function are compared and integrated to provide a coherent picture of cell function and its modification by drugs and natural chemical messengers.
- In the second half, adaptation is considered at the level of receptor coupling and second messengers in relation to tolerance and dependence
- The latest theories of psychological dependence and physical dependence on drugs such as depressants, stimulants and hallucinogens will be discussed.

Teaching Hours
Lectures-50
Seminars and Tutorials-2
Private study-248

6BBM0331 Pharmacology of Neurological and Psychiatric Disorders

Credits 15
Term 2, Thurs

Module Organizer  Susan Duty  susan.duty@kcl.ac.uk
Co-organizer  Kirsty Banner  kirsty.banner@kcl.ac.uk

Why do this module?
If you are keen to learn more about how the drugs used to treat neurological or psychiatric conditions work and what new approaches are in the pipeline to improve upon existing therapies then you should find this module appealing.

Educational Aims
- Allow students to gain up-to-date information about the pharmacology and pathophysiology of selected neurological and psychiatric conditions
• Allow students to develop deeper understanding of certain topics through self-directed learning on novel aspects relevant to the field.
• Allow students to further develop their publication database searching skills and ability to interpret scientific articles.
• Provide opportunity for students to enhance team working skills.
• Allow students to develop their skills in building sound scientific arguments and engaging in open debate.
• Provide further experience in writing scientific-style essays during the examination.

Learning Outcomes
Upon successful completion of the module students will be able to:

➤ Demonstrate a specialized knowledge of the current and emerging pharmacology of selected areas of neurological and psychiatric conditions, such as depression and anxiety, schizophrenia, Parkinson’s and Alzheimer’s diseases, stroke, pain and migraine.
➤ Conduct critical evaluation of scientific papers related to the treatment of neurological and psychiatric condition.
➤ Apply the knowledge gained from taught elements of the module and their own reading to identify potential solutions for the treatment of neurological or psychiatric conditions.
➤ Manage their own learning through use of a wide variety of learning resources
➤ Work well as part of a team to construct a sound scientific argument in favour or against an assigned aspect of stroke.
➤ Write a well-constructed scientific essay that demonstrates clear understanding.

Teaching Hours
Lectures-28
Seminars and Tutorials-3
Private Study-119

6BBA3121 Mechanisms of Development

Credits 30
Terms 1 & 2, Mon

Module Organizer     Fiona Wardle     fiona.wardle@kcl.ac.uk
Co-organizer         Anthony Graham    anthony.graham@kcl.ac.uk

Aims
Developmental Biology seeks to understand the mechanisms through which a simple embryo is transformed into a complex organism. The aim of this course is to provide you with a detailed understanding of how developmental proceeds. The course will examine key events during development, progressing from early through to later stages, and will critically assess the most up to date research to provide you with a clear idea of how animals form. The emphasis throughout the course is not on old-fashioned descriptive embryology but on the genes and molecular pathways that underpin development. It is a surprising feature of our current understanding of these molecular pathways that they are common to flies, fish, birds and mammals. Thus a gene that plays
a critical role in the development of a fly is also likely to play a key role in human development. To reflect this commonality Developmental processes have been intensely studied in a number of different model systems. The course deals with these organisms as well as highlighting particular genetic pathways and individual organ systems. An understanding of how development progresses normally is also important for our understanding of the basis of birth defects and for how animal have been altered during evolution.

Learning outcomes
On successful completion of this module you should be able to:

• explain the key developmental events from early pattering to later organogenesis
• argue for the importance of positional cues and inductive interactions in directing vertebrate development
• compare and contrast results derived from different experimental strategies and integrate these to arrive at an understanding of how a given developmental event is directed
• argue for the relative advantages and disadvantages of using model organisms to understand development
• explain the importance of the key signalling pathways and transcription factors in directing developmental events
• compare and contrast different developing systems and evaluate the relative importance of signalling pathways and transcription factors in each specific system
• argue that development is a progressive and generative process with each step being built upon preceding events
• explain how developmental processes can go awry and lead to birth defects
• explain how developmental processes can be modified during evolution

The main components of the module are:
• 22 subject lectures (2 hours each)
• 6 interactive tutorials (2 hours each)
• 2 laboratory-based practicals (2 hours each)
• 1 Poster session (1.5 hours)
• Private study

6BBYK302 Cognitive Neuropsychology

Credits 30
Term 1 & 2, Weds

Module Organizer Qazi Rahman qazi.rahman@kcl.ac.uk
Co-organizer

Educational Aims
The programme aims to provide an in depth understanding of the function of the central nervous system in normal and disease states.

Learning Outcomes
Cognitive Neuropsychology is the study of the brain-behaviour relationships. The module outlines various cognitive functions including learning and memory, attention and perception, language processing, working memory and executive functioning during both normal and pathological disease states across the lifespan. It aims to provide students with a thorough grounding in the basic issues of cognitive neuropsychology. Normal cognitive functioning is used as a way to understand the interaction of brain structure and function across the lifespan and aids in the understanding of brain insult and pathology. Pathological processes discussed during the module include, but are not limited to, learning disabilities, AIDS, dementia complex, amnesia, Korsakoff syndrome, dementia, agnosia, neglect, as well as auditory and vestibular disorders. Issues such as social cognition, emotion and theory of mind are also discussed as they relate to the study of brain behaviour. A number of case studies will be described in detail and some will be presented on videotape. A selection of neuropsychological tests will be available for examination. In addition there will be an opportunity for students wishing to conduct a cognitive neuropsychological project to study normal and/or patient populations in more depth.

**Teaching Hours**
Lectures-57
Seminars and Tutorials-0
Private Study-216
Other-15

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**6BBYK307- Research Project / Research Methods and Statistics in Neuropsychology**

**Credits** 30
Term 1 & 2, Mon

Module organiser Sam Norton sam.norton@kcl.ac.uk
co-organizer Qazi Rahman qazi.rahman@kcl.ac.uk

(Core module of the neuroscience and neuropsychology stream)

This module comprises two components, (1) a research project (80%), (2) other assignments (20%).

**Research Project***
There will be a wide range of projects from which students can choose. Any student wishing to carry out a study which is outside the scope of the listed projects, will need to plan this in detail with a supervisor well in advance of the start of the course to ensure time to obtain ethical permission for the study. The main data collection and statistical analyses are completed during the first and second terms, and the dissertation completed by the end of the second term. The 6,000-word dissertation counts for 80% of the module mark.

**Research Methods and Statistics***
This is a compulsory course that aims to provide students with a thorough grounding in the fundamentals of research methodologies and statistical analyses. The course not only prepares students for their project work but also equips them with transferable research skills that will be invaluable when conducting research in their future careers, irrespective of the area of medicine in which research is conducted.

The course puts into place all the theoretical material required for understanding statistical methods, and also focuses on practical skills in data analysis, interpretation and writing up results. There will be an assignment which counts for 20% of the final module mark.
Students will receive training in the SPSS application. This is the most widely used statistics package in clinical and psychological research and is installed in the computer pool rooms at New Hunt’s House.

The overall aim of the intercalated BSc in Psychology is to provide students with an in-depth, critical understanding of research, theory and empirical findings in core areas of psychology. Thus, in addition to acquiring detailed empirical knowledge in each area, the key objectives are to ensure that by the end of the year, each student will:
(1) Understand the range of theories and research methods in core areas of psychology
(2) Be able to evaluate critically published psychological research findings and choose between competing explanations, using psychological theory
(3) Have completed and written up a piece of empirical research, using an appropriate methodology and statistical analysis.

**Teaching Hours**
Lectures-16
Seminars and tutorials-20
Private study and project work-264
How am I assessed in Year Three?

The pattern of assessment will depend on which modules you take, as shown below.

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<th>Assessment</th>
<th>Developmental Neurobiology</th>
<th>Behavioural Science</th>
<th>Neuroscience literature project</th>
<th>Neuroendocrinology</th>
<th>Cellular and Systems Neuroscience</th>
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Laboratory-based Project in Neuroscience – some of the projects in 2015-16

The following table details the projects available during the 2015 – 2016 academic year, and the research centres involved. The repertoire of project titles and supervisors who take on students varies from year to year. However, this list provides an indication of the scope and range of research topics.

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<thead>
<tr>
<th>Centre for Developmental Neurobiology, Guy’s Campus</th>
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<tr>
<td>Queelim Ch’ng</td>
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<td>Uwe Drescher</td>
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<td>Corinne Houart</td>
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<td>Jon Clarke</td>
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<td>Setsuko Sahara</td>
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Randall Institute, Guy’s Campus

| Claudia Linker | Study of neural crest migration and differentiation |

Dental Institute, Guy’s Campus

| Jeremy Green | How cell polarity affects WNT signalling in epithelia |
| Karen Liu    | Differentiation potential of neural crest stem cells |
| Andrea Streit| Cell fate decisions in the inner ear: gene networks and epigenetics |
Wolfson CARD, Guy’s Campus

Liz Bradbury  Modifying glial scar extracellular matrix to promote regeneration and repair after spinal cord injury

Paul Francis  The biochemistry of dementia

Steve McMahon  Labelling sensory neurons with viral vectors

Marzia Malcangio  Non-neuronal mechanisms of chronic pain and itch

Kevin O’Byrne  An integrative neuroscience approach to stress-induced reproductive dysfunction

Jon Robbins  Ion permeation through sodium channel in Xenopus nerves

Pat Doherty  Identification of agents that activate or modulate endocannabinoid signaling

Reggie Docherty  Detection of TTX-sensitive persistent sodium currents in isolated sciatic nerve

Andy Grant  Contribution of TRP channels to dental pain

Karen Steel  Characterization of a spontaneous mutation causing low frequency hearing loss in mice

Peter McNaughton  Ion channels responsible for sensation of warmth and body temperature

Institute of Psychiatry, Denmark Hill

Philip Holland & Peter Goadsby  The brainstem and migraine

Jack Price  Stress and neurodevelopmental disorders; investigations with a stem cell model

Alessio Delogu  Characterization of subcortical inhibitory neurons involved in sleep regulation

Angela Hodges  Rare variants in inflammatory pathways in Alzheimer’s disease

Manolis Fanto  Neurodegeneration in Drosophila

Sandrine Thuret  Adult neurogenesis and depression

Petroula Proitsi  Analysis of metabolomic data of an Alzheimer’s disease cohort
Neuroscience Literature Project - Previous Titles

This information is given as a guide to the range of topics taken by previous students. Each student will carry out an original project of their own choosing.

- Protein tyrosine phosphatases as novel therapeutic targets for axon regeneration
- Biochemistry of dementia
- Blood-brain barrier
- Brain regulation of social interaction in rodents
- Depression, happiness and hate - the circuitry of mood
- Novel ways of driving endogenous neuro-repair in Parkinson’s disease
- Molecular mechanisms underlying axon guidance
- Peripheral neuropathy
- Molecular regulation of neural progenitor migration
- Reproductive Neuroendocrinology
- Drug addiction, opioids and cannabinoids
- Pain, spinal signal processing
- Neurobiology of placebo effects
- Cellular and molecular mechanisms of itch
- Influence of sex/gender on pain responses or spinal processing of pain
- Drosophila as a model for neurodegenerative disease
- Autism spectrum disorder
- Regulation of bladder activity via urothelium-neuron signaling
- Combining rehabilitation and training paradigms with regenerative medicine to develop optimal therapies for restoring function after spinal cord injury
- Nanotechnology and Neuroscience: Studying Neurones in the 21st Century
- Kallmann Syndrome
- the nature vs nurture in homosexuality debate
- Development of the vertebrate visual system
- Genetic causes of septo-optic dysplasia
- Gut brain interactions and the regulation of hypothalamic appetite circuitry
- Pain associated with neurodegenerative disease
- non-motor symptoms of Parkinson’s disease
- Mechanisms of chronic pain
- Topics in pain mechanisms
- Molecular and cellular mechanisms of neurodegeneration.
- Alzheimer's disease or nerve regeneration
- Molecular mechanisms of neural induction
- Molecular mechanisms of circuit formation in the vertebrate retina
- Molecular mechanisms underlying development of the visual system
- Synaptic plasticity
4. Alternative Options for Study

4.1 Study Abroad

There are varied and numerous opportunities to spend time abroad. You may be thinking about your employment prospects; you may not have been able to finance a gap year and feel you missed out on the chance to travel; you may be seeking to see your chosen subject of study in a new light and from a different perspective; you may be wanting to improve your language learning: whatever your reason, studying abroad could be the thing for you.

King's non-EU and Erasmus exchange programs provide you with the opportunity to study abroad at some of the world's premier institutions for a year, or a term, as a fully integrated part of your degree. In addition, King's students are also eligible to participate in summer schools around the world and to complete international internships.

There are study abroad opportunities in America, Europe, Australia and Asia. For more information on eligibility, application procedure and contacts, please refer to the Kings website http://www.kcl.ac.uk/study/abroad/index.aspx

4.2 Extramural Year

At King's, you can gain work experience in industry as part of your degree. The Extramural Year Programme is an exciting way to enhance your career and gain practical experience in the scientific workplace. You will meet new friends and contacts too!

Extramural Year Programme placements can be taken either in the UK or overseas. You can work in a pharmaceutical company, a government research establishment or academic research institute.

Previous students went to:

- Eli Lilly and Company Limited, Surrey, UK
- The Rockefeller University, New York, USA
- Centre for Neuroimaging Sciences, Denmark Hill, London
- University California Berkley, Celltech, USA

The programme is open to all students on non-professional three year degree programmes and is taken between the second and third years of study.

Information on how to apply will be given at programme advising, and there will be a talk organised for first years in March. Neuroscience students can either apply for the Pharmacology EMY programme, or the Biochemistry EMY programme.
5. Neuroscience MSci

The MSci can be applied for via UCAS or once you are doing the Neuroscience BSc you can transfer into it in Year 3 if you achieve the requirements. The MSci offers a 4th year at level 7, equivalent to an MSc level, where you will do an advanced level project design and methods module, an advanced level laboratory project, and an optional module from the Neuroscience MSc. This is particularly designed for students who wish to go on to do a PhD.

From the MSci booklet 2016/7:

Programme aims and learning outcomes

The aim of this module is for you to carry out an original neuroscience research project in an active research laboratory, addressing a novel research question. First, you and your supervisor will outline a hypothesis on the basis of the current research literature. You will then carry out supervised experimental work to test your hypothesis, and collate and analyse your data to write up as a dissertation. You will receive training in contemporary scientific techniques and guidance in all aspects of the project. During the project, you will also fully participate in the life of the laboratory, including interaction with other lab members as well as attendance at lab meetings and departmental/campus seminars.

Through your dissertation and a seminar presentation on your project you will learn to communicate scientific findings and ideas effectively. The accompanying module 7BBYN402 Project Design & Research Methods is designed to complement the project by giving you (i) an appropriate background in scientific methods and literature and (ii) information on a range of relevant topics such as model systems, molecular biology and statistics. The elective taught module 7PAMNNBX will be chosen in collaboration with your project supervisor and will help to form the theoretical basis of your knowledge in your research area.

Learning outcomes

By the end of the module, you should:

1. have an advanced understanding of experimental techniques and perform them independently, negotiate and solve problems, co-operate with other laboratory members;
2. have an advanced understanding how to conduct scientific research, including formulation of hypotheses, devising experiments, collation and analysis of experimental data;
3. be able to evaluate your research findings in the context of your chosen research field at an advanced level;
4. be able to describe and present scientific research findings in a scientific style in both written form (with correct annotation and referencing) and as a seminar presentation.
6. Learning and teaching

**Assessment and Feedback on your work**

You will complete a variety of assessed work and assignments during your degree. Assessments can either be ‘formative’ – helping you to improve, but not counting towards your degree, or ‘summative’ counting towards your final marks. The Neuroscience teaching staff are committed to providing timely and formative feedback. Feedback should be provided on all assessed exercises, such as essays, journal clubs, posters and oral presentations. Indications of when to expect the feedback will be provided in the module booklet for each specific module, where specific feedback sessions will often be included. In some cases it may be possible to give indicative scores (A-E) before exam results and formal assessments have been ratified by the Exam Board. It is important to note that feedback can take various forms, and may vary in the level of detail provided depending on the exercise. Feedback can be in the form of verbal report on how the class performed as a whole or as individual written or spoken comments on a particular piece of work. Feedback will try to point you towards means of improving future performance rather than emphasising specific flaws in assessed work. *It is your responsibility to understand the nature of feedback and to attend sessions where it is delivered.* Every year a proportion of students do not collect their essays or attend feedback sessions. Given the importance of utilizing feedback to improve your performance, you must take your own role in assessment and feedback seriously.

**Citing the Literature**

Science depends on evidence not just what you think - therefore citing the evidence is critical. The School has agreed two standard reference styles; author-date and numeric approaches, all students are expected to use the agreed guide from now on. The guide is available from the Library Subject Guide pages:

http://libguides.kcl.ac.uk/content.php?pid=510262&sid=4200312

**Module work deadlines**

Most module work has a set deadline. Remember that the deadline is the last time you may hand it in. You do not get penalised for handing in early. Note that around the deadline the printers and the Academic Centre gets very busy. If you hand your module work before the deadline it will be marked as normal (out of 100%). If the module work is handed in up to 24 hour after the deadline the work will be marked but the maximum mark will be capped to a pass (40%), after 24 hours you will get zero (0%).

If you have good reason for not doing the module work, or if you have good reason for an extension, fill in a mitigating circumstances form ( MCF ) as soon as possible, and *submit your MCF within 7 days of any missed assessment.*

( http://www.kcl.ac.uk/aboutkings/quality/academic/assessment/mitcir.aspx ). Hard copies of the form are also available from the Academic Centre.

**Reassessment (all students)**

Students who fail a module will have to re-sit the exam at the next available opportunity. If you fail the module at the first attempt your re-sit mark will be capped at the module’s pass mark (40%), and you will have to achieve a mark of at least 40% in order to pass, as in-course assessment cannot be carried forward.

If you are awarded a replacement exam, meaning that you are sitting the exam for the first time at the next opportunity, your coursework mark will be carried forward and your mark for the module will not be capped.
Your responsibilities

Stepping up from school to University will pose a series of different challenges. Teaching strategies will be very different from the classroom and will vary both by level and according to style of the individual lecturer. It is impossible to memorise the very large amounts of information that you will encounter during your degree. Therefore it is important to work on your study techniques, interrogate your knowledge and revise topics little and often. Using study tools such as mind maps/concept mapping will also help to find links between subjects. Ultimately you will develop a high degree of conceptual thinking and problem solving skills during your degree, and these abilities will be more important than learning specific knowledge. There are much greater expectations for independent, private study at University than at school.

Lectures and effective listening

Being in a lecture theatre with anything up to 350 others is likely to be something that many students experience for the first time on entering higher education. At school, classes were comparatively small; it was probably possible to engage with the teacher and to have one's queries dealt with "on the spot". In a large group lecture, however, it is easy to feel lost (and, usually mistakenly, to think that one is the only person to feel that way!). But this is the way in which much teaching takes place within the medical and dental schools and so the question arises: How can we get the best from lectures? Some answers are provided below.

1. Be prepared for the lecture - do some pre-reading, if possible or at least, look at the objectives to see what points are to be covered. You will then be able to listen actively for those points in the lecture itself. You could also think about how the topic fits in with the rest of the module and with the other material covered.

2. During the lecture, the lecturer will determine, to a degree, the activities in which the learners can engage. However, you, as a learner, still have some control over what you think, do and write. You should, therefore, choose to be active by:
   - Writing down your own thoughts/ideas
   - Asking questions of the lecturer (during/after lecture)
   - Asking questions of yourself
   - Trying to answer the questions posed by the lecturer
   - Doing any calculations, solving problems set, etc.
   - Discussing with students near you if/when directed to do so by the teacher

You should also listen to and heed the lecturer's directions - for example, if he or she says that you need not write something down.

Remember - if any points are unclear, most lecturers are happy to answer questions after the lecture.

Note-making. Most people take (as opposed to make) notes in lectures; many try to write everything down, which is neither possible nor appropriate. The concern most commonly expressed is that students are not sure what is important (and therefore worth writing down) so they try to write down all that is said. Try to use the objectives to establish what it is that you are expected to get from a session and let them guide you to what is significant.
**Reading effectively**

In many of your modules, periods will be timetabled as ‘private study.’ You may use the time to read further on the topics covered in lectures using the recommended textbooks. At lectures, you will often be given references to journal articles, and reading these will extend your understanding of the subject. As essays are set, you will certainly need to explore many different information sources to produce an assignment which demonstrates that you have ‘read around’ the topic and are not just regurgitating lecture notes. The following suggestions will help you make the most of your study time.

**Know what you’re looking for**

The crucial first step in any search for information is to be clear about what you want to know and why. Think around the topic and formulate a *search question*, which expresses what you want to discover.

Whether you have been allocated a research topic, or are pursuing an interest of your own, make sure you understand the basic principles of the subject first, before plunging straight into the minutiae of specialist research papers or getting lost on the World Wide Web.

**Planning your time**

Not too surprisingly, time-management seems to be an area of difficulty for a great many students throughout higher education. For many, the varied social life is like nothing they have known previously and new opportunities for sports and cultural activities seem too good to miss. But what of academic work - how, given the number of hours in the day and days in the week, is it going to be possible to do justice to one's studies whilst, at the same time, participating in the other things that are on offer? Organisation of time is a very personal matter and what works well for one individual may not work for another.

However, in what follows below, are given some suggestions to help you to make the best use of the time available to you.

- Don't put off getting down to work. This is perhaps the most important piece of advice on time management for students. It is very tempting, at the start of a module, to allow oneself a few weeks "to settle in" before getting down to serious study, but this is can be a grave mistake (ask any senior student!). It really is essential to strike a balance between study and non-study and to keep up right from the very start. Two hours, or so, each evening spent going over your lecture notes will help you to keep on top of the work - and stop it getting on top of you!

- Recognise your own personal work rhythm - there will be certain times in the day when you work well, others when work is more of an effort and still others when you cannot work at all. Try to organise your work habits so that you tackle the most difficult tasks when you are at your best, you will still be able to deal with tasks that are easier and/or more interesting (less demanding) when your best has passed. Do routine "chores" (and make time to rest) during those periods when you simply cannot work.

- Don't allow yourself to spend time thinking about work - thinking about work, but not getting on and doing it, is wasteful of time and miserable, too. Tackle the task - complete it if you can - and then allow yourself some quality time as a reward for your efforts.
• Identify those activities that have a high payoff in terms of learning and invest time in them, rather than in activities that give a low return. Spend time in summarising your notes or quizzing your friends rather than in passively copying notes from a textbook.

• Set yourself deadlines. If you have more than one piece of work to complete by a certain date, decide which you will complete first and when that should be. It can also be helpful to break down any one task into its various components and to set deadlines for the completion of each of these, such that the final deadline can be met. If you have difficulties in keeping to deadlines, you might consider telling friends about them—if other people know of your plans, you will be more likely to stick to them yourself.

• Make use of a study time-table, whether this be for the day, week or term. Identify when you will be studying, and, very importantly, when you will be taking time off from your work. Whilst it is essential to set aside some time for relaxation and for pursuing non-academic activities, this should not be allowed to encroach upon your study time. A timetable should help you to allocate your time in a balanced way.

• Do not put off doing work until vacations as you will inevitably find, then, that there are competing demands on your time. You may need, for example, to catch up with studies missed through illness or to work to earn money.

**Tutorials**

Tutorials can offer you, as a student, the chance to:

• Consolidate your learning from various sources
• Have misunderstandings clarified
• Practice the communication skills which will be important to you in your professional life
• Experience the ways in which a group can work and learn together

Whilst tutors might organise their tutorials in slightly different ways, it is nevertheless true to say that any tutorial is only as good as the efforts made by the student group. Therefore, to get the most from tutorials, you should:

*Prepare yourself beforehand* - go over what has been covered so far, store up any questions that you may wish to ask. Also, find out whether there is a specific agenda for the tutorial.

*Attend regularly.* If the composition of the group always changes from one meeting to the next, the group will never develop to the point where it can achieve anything.

*Be prepared and willing to participate.* Try not to let shyness hold you back – remember that your colleagues may well be feeling awkward, too. Also, if you can become used to answering questions in tutorials, viva (oral) examinations may seem less daunting.

Be willing to speak and to offer ideas, but also, *be prepared to listen.* Allow and encourage your colleagues to make their points, be supportive if they make mistakes. Remember that we can all learn through mistakes - both our own and those of others!

*Keep a "log"* of what you have covered in tutorials - it may not be possible or appropriate to make notes during the session, but you could always produce a summary afterwards.
Give your tutor feedback - tell him or her if you have found something particularly helpful, for example.
Help your tutor to help you!

Practical classes, laboratory work and Health and Safety

Practical work is all about "learning by doing", but it should not be thought of as entirely separate from theoretical work. The material that you cover in theory sessions should inform your practical work and the practical should help you to better understand the theory. Sometimes, in a written examination, you may be asked to analyse and interpret data in much the way that you will have done in practical classes. Make the most of practical classes by:

- Finding out, in advance, what is to be covered and doing any necessary preparation, reading, etc.
- Making sure that you understand what is required of you
  - in terms of carrying out the practical work
  - in terms of producing a report

If you are not sure, do ask!

Make notes in a rough note book (rather than on an odd scrap of paper) as you do the practical work; write down all your observations as you proceed, don't rely on memory

Write up the practical report whilst in class, if at all possible. If this is not possible, you should aim to write up later on the same day. This is to ensure that you will still have a clear memory for the exercise, but this is also good time management.

Don't allow a "backlog" of practical write-ups to accumulate. Not only will you start to confuse one practical with another, but you could find yourself writing up practical reports when you really need to be doing something else -like preparing for exams!
7. Neuroscience Resources

Guide to textbooks: Year 1

The following is intended to give you a brief guide to the kinds of recommended textbooks that you will use throughout your degree, but DO NOT take this to mean that you should buy any of these textbooks. You MUST check the information given to you at the start of each module before deciding which books, if any, you should buy. The module organizer will also be able to give you further information on each textbook which may help you decide. Please note that these textbooks were correct in August 2010, but changes may take place before you reach your second and third year modules.

4BBY1013 Biochemistry

http://global.oup.com/uk/orc/biosciences/molbiol/elliott_elliott4e/
This companion websites has practice MCQ questions for students.

4BBY1020 Chemistry for the Biosciences

This companion websites has practice MCQ questions for students.

4BBY1030 Cell Biology and Neuroscience

  You may find the introductory chapters of this book particularly helpful if you do not have one of A-level Chemistry or Biology, or need a quick revision.

- Molecular Biology of the Cell
  by B. Alberts et al.  
  [Garland Science]

- Principles of Neurobiology
  by Liqun Luo (1st ed. 2015) [Garland]

4BBY1040 Fundamentals of Pharmacology

[ in library and available as e-book ]

4BBY1050 Skills for Biosciences


4BBY1060 Human Form and Function

4BBY1070 Genetics and Molecular Biology

Essentials of Genetics (8th Edition) William S. Klug, Michael R. Cummings, Charlotte A. Spencer and Michael A. Palladino. Published by Pearson. Early editions of this text book found in the college libraries can also be used.

Guide to textbooks: Year 2

The following is intended to give you a brief guide to the kinds of recommended textbooks that you will use throughout your degree, but DO NOT take this to mean that you should buy any of these textbooks. You MUST check the information given to you at the start of each module before deciding which books, if any, you should buy. The module organizer will also be able to give you further information on each textbook which may help you decide. Please note that these textbooks were correct in August 2010, but changes may take place before you reach your second and third year modules.

Psychology


Neuroscience

Principles of Neurobiology by Liqun Luo (1st ed. 2015) [Garland]
Neuroscience: exploring the brain (Bear, Connors and Paradiso, 3rd Ed, 2006)
Lieberman’s Neuroanatomy Made Easy, Neuroscience at a Glance (R.A. Barker & S. Barasi - Blackwell)

Essentials of Embryology

Gilbert, W Developmental Biology 7th edition, Sinauer Associates

Gene Cloning and Expression


Physiology and Pharmacology of the CNS

‘Bear, Connors and Paradiso, Neuroscience: Exploring the brain’ (2002), Lippincott Williams and Wilkins
Guide to textbooks: Year 3

In year 3, individual lecturers will generally provide limited recommended reading lists for each of their sessions. These will typically consist of journal review articles and primary research at level 6. There are a small number of textbooks although they will tend to cover a wide range of content, targeted sometimes at postgraduate study.

Please note that these textbooks were correct in August 2017, but changes may take place before you reach your second and third year modules. The following is intended to give you a brief guide to the kinds of recommended textbooks that you will use in your third year, but DO NOT take this to mean that you should buy any of these textbooks. You MUST check the information given to you at the start of each module before deciding which books, if any, you should buy. The module organizer will also be able to give you further information on each textbook which may help you decide.

- **Principles of Neurobiology**  
  by Liqun Luo (1st ed. 2015) [Garland]

- **Principles of Neural Science**  
  by E. Kandel, J. Schwartz, T. Jessell, S. Siegelbaum and A. Hudspeth  
  (5th ed. 2013) [McGraw-Hill]

- **Neuroscience**  
  by Dale Purves, George J. Augustine, David Fitzpatrick, William C. Hall, Anthony-Samuel LaMantia, Leonard E. White  
  [Sinauer Associates; 5th edition]

- **Development of the Nervous System**  
  by Dan Sanes, Thomas Reh and William Harris  
  [Elsevier - Academic Press]

- **Fundamental Neuroscience**  
  by M Zigmond, F. Bloom, S. Landis, J. Roberts and L. Squire  
  [Academic Press]

- **Molecular Biology of the Cell**  
  by B. Alberts et al.  
  [Garland Science]

Other Resources

Neuroscience and other relevant societies and professional bodies

Society for Neuroscience (SfN)  
(http://www.sfn.org/)

The British Neuroscience Association  
(http://www.bna.org.uk/)

Federation of European Neuroscience (FENS)  
(http://www.fens.org/)
Anatomical Society (Anat Soc)
(http://www.anatsoc.org.uk/)

Physiological Society of Great Britain (Phys Soc)
(http://www.physoc.org/)

**Other Neuroscience resources (Free if accessed from a King's URL)**

Neurosciences on the Net - a directory of Neuroscience resources
http://www.neuroguide.com/

TED - Technology, Entertainment, Design website with library of 20 minute talks on a wide variety of topics including Neuroscience
http://www.ted.com/talks

Athena SWAN - organisation promoting gender equality and women's careers in science
http://www.athenaswan.org.uk

Brain Science Podcasts from the Guardian
http://brainsciencpodcast.wordpress.com/

Wikipedia entry on Neuroscience
http://en.wikipedia.org/wiki/Neuroscience

Neuroscience for Kids
http://faculty.washington.edu/chudler/neurok.html

Nature Reviews - Neuroscience
http://www.nature.com/nrn/index.html

Annual Review of Neuroscience
http://arjournals.annualreviews.org/loi/neuro

Trends in Neurosciences
http://www.cell.com/trends/neurosciences/home

**Suggested Introductory Reading**

“*The Man who Mistook his Wife for a Hat*” and “*An Anthropologist from Mars*” – Oliver Sacks

“*The Mismeasure of Man*” - Steven Jay Gould

“*Descartes’ Error*” – Antonio Damasio

“*The Language Instinct*” – Steven Pinker

“*The Private Life of the Brain*” (Penguin Press Science) by Susan Greenfield
8. Student voice

Student feedback to staff
At the end of each module you will be asked to give some feedback on the module but constructive criticism is welcome throughout the year. For example, please tell the lecturer at the time if they cannot be heard, or if the text of the slides cannot be read. Also let the lecturer know afterwards if you feel they did not cover some of the objectives for that lecture.
Module organisers would also be pleased to hear any comments (good or bad) about their module, and will try to resolve any genuine grievances or difficulties as soon as possible. Less urgent concerns can be raised at the meetings of the Department of Neuroscience Staff-Student Liaison Committee (see below).

Module feedback and evaluation
The module feedback form is used to gather structured, anonymous, aggregate data on the delivery of the module. Data from module feedback questionnaires helps module organizers, Departments and Schools to gain insight into a number of things, including: the quality of module teaching; the success of new initiatives; curriculum development; and the effectiveness of learning resources. This allows the Department and School to take immediate action where necessary, and facilitates the sharing of good practice. Students, by giving honest feedback in a structured and systematic way, are contributing data that will be used to review, design and develop modules and programs, and will be benefitting themselves, directly or indirectly, as well as the next student cohort.

Actions taken in response to student feedback
Action taken in response to feedback on a module can be seen on the module’s web-pages.

Module evaluation and student complaints
Module evaluation is anonymous and so you should not use it to pursue complaints to which you wish to have an official acknowledgement and response to, as King’s will not consider anonymous complaints. If you wish to complain about any aspect of the delivery of a module or your programme, you should use the King’s Complaints Procedure:
http://www.kcl.ac.uk/aboutkings/orgstructure/ps/acservices/conduct/complaints.aspx

Staff-Student Liaison Committees
There are Staff-Student Liaison Committees (SSLC) for each programme plus a Common Year One SSLC, all of which meet at least once each semester. All SSLCs have student programme representatives who will raise issues of interest to students, including during the discussion of summary reports of module evaluation. More information will be provided by your Department and the minutes of previous SSLC meetings can be found online:
https://keats.kcl.ac.uk/mod/subpage/view.php?id=1929383

Student representation
If you are interested in being a student representative for your programme or department, you can email the Students’ Union on representation@kclsu.org or see their Student Representation page:
https://www.kclsu.org/representingyou/studentreps/ If you want to know who your student reps are you can email the Students Union at representation@kclsu.org or see https://keats.kcl.ac.uk/course/view.php?id=50623
9. The Student Experience

There are also video testimonials available from the Neuroscience Department website:
http://www.kcl.ac.uk/biohealthstudy/departments/neuroscience/study/videos.aspx

Rukksana Fauzel recently graduated from Kings College. She writes...
"Neuroscience is an incredibly challenging and complex subject. There are modules you will love and some not so much, but you later realise that the modules are in fact complimentary to one another in understanding the overall brain functioning. Some topics you will encounter are genetics, cell biology, pharmacology, neuroanatomy as well as psychology and philosophy of the mind! By far, second year was the most enjoyable due to this diversity! Graduating in BSc Neuroscience from King's College London means you have not only gained an accredited academic qualification from a top university, but many transferable skills and knowledge of self that will prove to be invaluable in your future career and life decisions. If I were to cherry-pick some of the most memorable moments, I would mention the fluster of common year one students packed into Greenwood Lecture Theatre, along with fortnightly practicals and assignments, in second year the neuroanatomy and neurophysiology practicals when we applied our neuroscientific knowledge to laboratory and clinical situations and missioning to the Strand campus every Monday afternoon for mind-boggling philosophy classes, lastly in final year the nerve-wracking poster presentations, library project dissertation and intense assignment deadlines - all sprinkled with a healthy dose of extra-curricular activities :) My one piece of advice would be to exploit all forms of support during your studies, maintain regular contact with your personal tutor and lecturers, King's has many services available for academic, learning, emotional, mental and physical difficulties and the help is there, you just have to ask!"

Fatima Jafri recently graduated from Kings College. She writes...
"The great thing about neuroscience at King’s is the sheer variety of modules offered within the degree. The common year one programme was very helpful as it laid the foundations for further specialisation into neuroscience. Modules in the second year ranged from “hardcore” neuroscience, i.e. neuropharmacology, neuroanatomy, etc, to psychology and philosophy of the mind. This provided us with a broad understanding of neuroscience. One of the most interesting aspects of the module was the chance to undertake a research project in the final year. Actually taking part in current neuroscientific research was exciting and a great learning curve. I had the opportunity to work alongside eminent researchers within the field of developmental neurobiology, and my lab project focussed on the developmental mechanisms involved in outgrowth of the eyes from the brain. From this research I gained many skills which have a universal advantage: time management, planning experiments and problem solving. I have greatly enjoyed studying neuroscience at King’s, it is a dynamic programme which offers students the chance to delve into almost every aspect of neuroscience, complemented with the guidance of lecturers and lab project supervisors who are at the forefront of neuroscience."
Chung Looi recently graduated from Kings College. She writes...

Studying Neuroscience at King’s was an extremely challenging and rewarding experience. Learning from experts and being under the tutelage of active researchers in the field had truly enabled me to have a deeper grasp of the subject. I find the module engaging as I enjoy learning about the brain and the mind in different perspectives, ranging from the molecular level to the study of human behaviour. My favourite modules include Psychology, Behavioral Science and Philosophy of the Mind, all of which diversified my knowledge in the subject area and strengthened my interest in the relationship of the human brain and behaviour. Overall, I have really enjoyed my years at King’s and I take pride in having achieved a respectable degree in Neuroscience from one of the world’s top universities!

Sara Ahmed recently graduated from Kings College. She writes...

"After attending an open day, I chose King’s for its prestigious reputation and friendly environment which it has lived up to without a doubt. Location was an important factor in my choice and as King’s is situated beside the Thames in a culturally rich part of London, I never find myself short of fun and interesting places to visit in my spare time.

I have really enjoyed the Neuroscience module so far. Common year one has provided me with an excellent foundation for entering second year which proved to be testing yet fulfilling, investigating the brain in precise detail. Second year has allowed me to study many different aspects of Neuroscience including Psychology and Philosophy which I have found to be thought provoking and allowed me to think outside of the box. The Professors and tutors of this module have been highly supportive and approachable and I am also grateful for the many Neuroscience themed careers talks that have been held to help guide my future career choice.

I would definitely recommend King’s and Neuroscience to anyone looking to get the most out of student life whilst studying a thoroughly stimulating module."

Mitzi van Harreveld recently graduated from Kings College. She writes...

“The BSc Neuroscience degree at King’s College London will always give you a good grounding no matter what you go on to do afterwards. The combination of in depth biology and chemistry focusing on the nervous system combined with a healthy dose of psychology and philosophy of the mind gives a fantastic balanced view of the contemporary, up-and-coming subject. A lot still remains to be discovered in the field, making it a dynamic and wholesome subject. It will leave you well prepared to go on to any path if you are still uncertain of what you wish to follow as a career and will leave any employee knowing you are an able learner. Having completed two years of the three year program I already feel my thinking and approach to learning has evolved as well as my view on the mind and human behaviour. I whole-heartedly recommend the module to anyone who has an interest in science. After all, the brain is the only thing which can study itself.”

Ottilie Sedgwick recently graduated from Kings College. She writes...

"If you’re a Neuroscience student at King’s, there is one thing you can be sure of- there will definitely be something that interests you. From neuroanatomy to the philosophy of the mind, this module covers it all. I have found that I’m not only learning about the physiology and anatomy of our nervous system, but also contemplating how and why we use it. This has meant I have been able to decide exactly which parts of the subject I enjoy, and has been extremely useful in helping to decide my plans for the future. King’s College is a fantastic place to learn, the personal tutor system means I feel supported in all aspects of my university life, and there is always an answer to any question just a quick email away. Student feedback really does make a difference, so you can truly feel you are being listened to. Our libraries and student union are second to none, and where better to be a
student than arguably the best city in the world? My experience at King’s so far has been nothing but positive, and I look forward to entering my third year to enhance my knowledge within this absolutely fascinating area.”

**Summer Studentship Experiences**

*Claudia Kathe wrote about her student placement at the Neurorestoration division. She writes....*

“After the 2nd year of my Neuroscience degree I decided to do a summer placement in one of the laboratories at King’s College because I wanted to experience daily laboratory work. I was interested in how far the techniques we learned about in lectures are used in a real lab. I chose the Neurorestoration division at Guy’s Campus. Spinal cord repair after injury was always something which fascinated me. My lab was perfect for me as it studies an exogenous enzyme, which supposedly promotes axon regeneration in the central nervous system, in different animal models. I had the opportunity to watch and perform behavior tests with rats and mice. I observed electrophysiology experiments and learned many different histology techniques. I realized that a study is a very long and sometimes tricky process. However, a good result is very satisfying and encouraging. My placement was very valuable and I decided to do my 3rd year project in the same laboratory.”

*Danielle Whiting recently completed her summer studentship placement. She writes...*

“This summer I was given an amazing opportunity to carry out a research project looking at the development of the sternum in mice. The lab I worked in is looking at a particular pathway, which when disrupted gives the mice a malformed sternum. However before this can be investigated we needed to see how the sternum forms in wild type mice. To do this we looked at the histology of mice at different stages in development and then went on to do in situ looking at various expression patterns. Throughout my career I know that I will need to continue reading research papers and keep up to date with the latest developments. This has given me a fantastic insight into how scientists work to do this research and produce the papers.”

*Mitzi van Harreveld recently spent some time in the USA working in neuroscience labs. She writes....*

“During my last summer holiday at King’s I worked in two separate labs at an intern. I was sure I wanted to continue my studies but was unsure in which direction and where, so the experience helped me to make a more informed decision. I spent some weeks at the Firestein laboratory in Columbia University, New York, working on calcium imaging of mice olfactory neurons. I also spent some weeks at the Zhao lab in Johns Hopkins University, Baltimore, working on real time PCR of the ANO2 protein. Both are worldwide leading labs, particularly in the area of olfaction. Stuart Firestein and Haiquing Zhao are both fantastic to work with as leading researchers as well as people. The opportunity added a little more reality to my perspective and truly helped me in taking steps to apply for further study. I got to speak to and work with countless leading figures at length in person, notably the Nobel Prize-winning Richard Axel. I was also curious about the American university system and the opportunities that were available for me there. Going there in person and talking to numerous people with firsthand experience definitely broadened my horizon. Meeting the presidents of other undergraduate neuroscience societies gave me links that I hope will help King’s College students continue to coordinate with neuroscience students across the globe.”

*Ayodeji Adeyinka recently completed her summer studentship placement. She writes...*

This summer I had the opportunity to take part in a 6 week summer studentship, working alongside a PhD student in the MRC centre for Developmental Neurobiology. The aim of the project was to find out the role of α2-chimaerin in the guidance of oculomotor neurons, using the zebrafish as an animal model. During my time spent at the MRC centre, I was able to learn new techniques - for instance; how to stain axons using antibodies (immunolabelling), and subsequently viewing these
stained axons and their branches using a two-photon microscope. I also injected the mutant and wild-type forms of α2-chimaerin into zebra fish embryos. The injections enabled us find out how these two different forms of α2-chimaerin affected axon growth during Zebrafish development. I found the overall experience very informative as it gave me an insight into what it takes to work in the lab. It was also a very useful experience because it has also given me a head start in terms of the techniques that I will need for my final year lab project.

**Juliana Moura has spent 2 summers in the MRC Centre for Developmental Neurobiology and 1 summer in the Centre for Neuroimaging Science. She writes...**

During the Neuroscience module at King’s I had the opportunity to get hands-on research right from the beginning. The practical understanding I gained of the module modules were invaluable. I have found that neither achieving the top grades nor attending lectures rewarded me with the knowledge and skills I gained during my summer work experience at the bench. Being in the MRC Centre for Developmental Neurobiology gave me valuable opportunity for networking and opened up a whole future of possibilities in science. My module would not have been as useful or enjoyable without this research experience and I strongly recommend students to take it.

### Student Experience of Lab-based Projects

**Amelie Hole did her lab project on trafficking of tau protein, in Diane Hanger’s lab at Institute of Psychiatry. She writes...**

"For my lab project I investigated the effects of phosphorylation on the membrane trafficking of tau. It involved culturing cells and using western blotting to view the proportions of phosphorylated tau in the membrane and cytosolic fractions I collected. As with any lab project at first there is a lot to take in, but after repeating the protocols I soon got used to them. After good teaching at the beginning I worked fairly autonomously, but my supervisor was always nearby if I needed help and everyone in the lab was really friendly and happy to answer questions. Attending the twice-weekly lab meetings was useful to understand how my project fitted in with those being carried out by others. My project topic was interesting particularly due to its connections to Alzheimer’s disease and writing up the dissertation helped me read scientific papers more critically and develop an analytical style. Luckily the commute to Denmark Hill was also not as bad as I had previously expected!"

**Oluwadamilola Soile did her lab project on the development of the visual system, in Robert Hindges lab in the MRC Centre for Developmental Neurobiology. She writes...**

"One of the main reasons I decided to intercalate from medicine and undertake a BSc in Developmental Neurobiology, was to take advantage of the opportunity to do a research project in the world class laboratories available at King’s. My lab project was based in the field of axon guidance, more specifically the role of axon branching in axon guidance in the visual system. I was initially very concerned about my level of competence in a laboratory environment as I had not undertaken any experimental work of any kind for many years. However, it is a great environment in which to learn and I received lots of assistance from many different individuals. Members of the Hindges Lab in particular, where I undertook my research project, were extremely supportive and encouraging. I enjoyed the challenging nature of the project and learning to think outside the box in order to overcome any difficulties and technical obstacles encountered. The project has also greatly enhanced my presentation skills, as I was required to regularly present progress reports on the project during weekly lab meetings and do a formal presentation towards the end of my project. Overall it was an invaluable experience that provided me with the opportunity to meet and study under well known and highly respected scientists and learn a plethora of new skills and techniques. Most importantly it has greatly increased my confidence and has opened the door to the possibility of doing research work in the future."
10. Who teaches Neuroscience?
Below listed are neuroscience staff acting as module (co) organizers. Further info can be found on the teaching and research web pages.

**Staff list**

**Dr Jon Robbins**  
Head of Department of Neuroscience Education  
Email: jon.robbins@kcl.ac.uk  
Tel: 020 7848 6191

Most of my teaching is in the neuropharmacology area, in particular cellular and molecular aspects of nervous system function. I run a final year module for the Pharmacology and Therapeutics Department called Cell and Molecular Pharmacology. I am based in the Wolfson Centre for Age Related Diseases. My research interests are cell signaling in the nervous system in both neurons and glia. I use a wide range of electrophysiological, optical and molecular approaches to study signaling, both within cells (i.e. second messenger systems) and between cells, neurotransmission. My most recent research is developing a way to get neurons to interact with semiconductor devices.

**Dr Anna Battaglia**  
Organizer 6BBYN302 Perspectives in Pain and Nervous System Disorders; 6BBA3320 Behavioural Science  
Email: anna.battaglia@kcl.ac.uk  
Tel: 020 7848 6233

I am currently a Senior Lecturer in the Department of Anatomy in the FoLSM, King’s College London. I am a neurobiologist with many years of international experience. I have been working at KCL initially as a Wellcome Trust Research Fellow with Dr. Isabella Gavazzi, studying pain modulation in the Central Nervous System (2001-2007).  
My research interests include: Chronic pain, Eph Receptors and ephrins, Biopsychosocial models of chronic pain; pedagogy and critical thinking in HE.  
I am extremely passionate about developing new ideas in the pedagogy of Neuroscience and of scientific disciplines in general and principally motivate young students. I am currently the organizer in collaboration with Dr Gavazzi of Perspectives on Pain and Nervous System Disorders; students on the module are required to become actively involved in their learning presenting in Journal Clubs, debating and discussing their posters. I am also the organizer of Behavioural Science where topics such as Gender Differences, Aggression and Mental Health are covered in an interactive way with the whole classroom participating in discussions. I organize the “Pain Scenario” for MBBS2 students on the Neurobiology of Pain and on the interdisciplinary management of chronic pain syndromes, with the aim to fill a gap in the undergraduate medical education; I am the lead for the Neuroscience, Behaviour and Social Science block in the new medical curriculum MBBS2020.

**Dr Esther Bell**
Molecular Mechanisms of Ectodermal Specification

We are interested in understanding the molecular mechanisms of ectodermal specification in \textit{Xenopus leavis}. We investigate how the ectoderm is induced and what it gives rise to, in particular how neural tissue is specified. The development of the nervous system is a complex process, of which the underlying mechanisms are slowly beginning to be elucidated. Before neural tissue is induced in the embryo, signals are required to inhibit the ectoderm from becoming epidermis so that it will become neural. Inhibitory signals from the dorsal blastopore lip (the Organizer) of the \textit{Xenopus} embryo at gastrula stages will induce neural tissue. It has been demonstrated that in fact inhibition of BMP signals is sufficient to induce tissue with anterior telencephalic neural character. We are interested in how this process occurs, and if there are differences between cell-autonomous and non-cell-autonomous neural inducers with respect to their downstream targets. Our group investigates these early molecular events in order to understand how these processes occur.

\textbf{Dr Eleanor Dommett}  
Organizer: 5BBA2040 Psychology 1  
eleanor.dommett@kcl.ac.uk

My main research interest is in the neurobiological basis of ADHD and the use of psychostimulant drugs. I am also interested in neuro education.

\textbf{Prof Uwe Drescher}  
Deputy Head of Department of Neuroscience Education

Organizer  6BBYN304 Cellular and Systems Neuroscience  
Co-organizer  6BBYN307 Principles of Neurobiological Research  
Email: uwe.drescher@kcl.ac.uk  
Tel: 020 7848 6411

I am running the ‘Cellular and Systems Neuroscience’ module for 3\textsuperscript{rd} year neuroscience students for a number of years now. Here we teach basic neuroscience aiming to communicate latest findings in neuroscientific research. We have introduced a couple of new lectures including place and grid cells, the interaction between the nervous system and the immune system, and a series of lectures on computational neuroscience which will be foreseeable essential for a career in neuroscience. My research aims are a molecular understanding of topographic map formation in the visual system using conditional knock-out approaches in mouse, and the chick system for in vitro studies, in particular focussing here on the control of presynapse formation by autophagy. Recently we have established behavioural assays in zebrafish aimed to establish a new avenue towards understanding autism spectrum disorders. Zebrafish mutants of candidate autism genes such as neurexin1a were generated by genome editing using CRISPR/cas9.

\textbf{Dr Susan Duty}  
Organizer 6BBM0331 Pharmacology of Neurological and Psychiatric Disorders  
susan.duty@kcl.ac.uk
My education contribution lies primarily within the field of neuropharmacology, in particular how drugs can be used to manipulate neurotransmission and to help provide treatment for neurological disorders. My research team focus on finding new approaches for the improved treatment of Parkinson’s disease. Current strategies under investigation including targeting metabotropic glutamate receptors and replenishing depleted levels of neurotrophic factors, especially using targeted drug repurposing approaches. It is hoped such strategies will help combat the progressive neurodegeneration that underlies this disease. We are also interested in the non-motor signs of Parkinson’s and are currently studying the pathophysiology and treatment of pain which affects many people with this condition. We use a range of molecular, cellular and whole system approaches to address these issues. For more details please visit my webpage at: http://www.kcl.ac.uk/ioppn/depts/wolfson/research/Duty-Lab/Duty-Lab.aspx

Undergraduate Programme Officer
Email: neuroscience-admin@kcl.ac.uk
Tel: 020 848 6365

Dr Manolis Fanto
Organizer: 6BBYN301 Project Design in Neuroscience
Email: manolis.fanto@kcl.ac.uk
Tel: 0207 848 0911

My lab is based at the Maurice Wohl Clinical Neuroscience Institute and our research revolves around the question of how we keep our nervous system functional in adult age and how that fails in neurodegenerative pathologies. We deal with intracellular mechanisms of neuronal and glial homeostasis like autophagy and with the neurone-glia interactions that are required for organism life and function. We use a multi-system approach that integrates the fruit fly Drosophila melanogaster with mouse models and mammalian cell cultures.

Prof. Paul Francis
Organizer 6BBYN305 Neuroscience Literature-based research project

The research of this group focuses on the relationship between neurochemical changes in the brains of patients with Alzheimer’s disease and their particular symptoms. Thus we have shown that, in addition to the well-known relationship between acetylcholine and cognitive decline, there is a relationship between this system and non-cognitive, behavioural changes seen in patients with Alzheimer’s disease. This then provides a scientific rationale for the clinical improvement in this domain following treatment with acetylcholinesterase inhibitors (AChE).

Dr Ellen Fridland
Organizer 5AAN5000 Neuroscience and the Mind
Email: ellen.fridland@kcl.ac.uk
Tel: 020 848 2049

Dr Fridland works in empirically-informed, naturalistic philosophy of mind. Her research focuses primarily on three areas, all related to skill: foundational issues concerning the nature of skill, ability, and control, functional issues concerning the role of skill in cognitive development, and the
application of skill-based theories to considerations of moral cognition, character formation and transformation, and personal identity. She is also interested in the nature of cognition, embodiment, and Buddhist theories of perception and epistemology.

Dr Isabella Gavazzi  
Senior Tutor;  
Organizer 6BBYN306 Laboratory-based Project in Neuroscience  
Co-organizer 6BBYN302 Perspectives in Pain and Nervous system disorders  
Co-organizer 4BBY1030 Cell Biology and Neuroscience  
Email: isabella.gavazzi@kcl.ac.uk  
Tel: 020 7848 6739

My laboratory recently identified an entirely novel role for the ephrinB/EphB system as modulators of synaptic efficacy in the spinal cord, contributing to sensory abnormalities in persistent pain states. Chronic pain syndromes are a clinical problem of considerable importance. Despite the rapid growth of the area of pain research over the past two decades, the molecular and cellular mechanisms that underlie chronic pain states are still incompletely understood, and this incompleteness limits the range of therapeutic strategies that can be adopted. We have used a combination of biochemical, anatomical, behavioural and electrophysiological techniques on rats and transgenic mice to understand in more detail the role of the Eph/ephrin system in chronic pain, using several well characterised laboratory models of inflammatory and neuropathic pain. This work was funded by the Wellcome Trust, the BBSRC and the ISRT.

Prof. Peter Giese  
Email: karl.giese@kcl.ac.uk  
Tel: 020 7848 5402

Our team is studying mechanisms underlying hippocampus- and amygdala-dependent memory processes with the long-term aim to develop insights for treatments for memory dysfunctions in psychiatric illnesses. For our experiments we are using mice, which allows combining state-of-the-art molecular experiments with behavioural studies.

Dr Robert Hindges  
Organizer 5BYN2001 Molecular and Cellular Neuroscience  
Organizer MSc Neuroscience, Developmental Neurobiology Module  
Email: robert.hindges@kcl.ac.uk  
Tel: 020 7848 8157

A fundamental issue during brain development is the correct formation of connections. Accuracy of these events is critical for the correct functioning of the brain, including processes involved in memory, learning, perception and behaviour. We are interested in the molecular mechanisms underlying this establishment of neural connectivity during development and its maintenance at later stages in life. Our research focuses on genes involved in the control of axon pathfinding and the formation of synaptic interactions between specific subpopulations of neurons. For this we use both mouse and zebrafish genetic systems, combined with genome editing and modern in vivo imaging technologies. We believe that our general understanding of circuit assembly and maintenance will give us also important insights into the molecular processes linked to psychological disorders.
Dr Frank Hirth  
Co-organizer: 6BBYN304 Cells and Systems Neuroscience  
Email: frank.hirth@kcl.ac.uk  
Tel: 020 7848 0786

Current research in the lab addresses two fundamental questions: How is genetic information converted into neural circuits and behaviour? How are these processes affected in disorders of the brain? To address these questions in a systematic way in vivo, we are using the fruit fly *Drosophila* as a model system and investigate how neural lineages form neural circuit elements mediating adaptive motor behaviour.

Dr Clemens Kiecker  
Chair of Neuroscience Assessment Sub-Board  
Admissions Tutor; Course Advisor;  
Organizer MSc Neuroscience  
Co-organizer 6BBA3008 Developmental Neurobiology  
Co-organizer 6BBA3121 Mechanisms of Development  
Email: clemens.kiecker@kcl.ac.uk  
Tel: 020 7848 6556  

My main research interest is the embryogenesis of the forebrain, arguably the most complex subdivision of the vertebrate brain. I use gain- and loss-of-function approaches in chick embryos to establish genetic networks that regulate cell fate specification in specific areas of the forebrain (current regions of interest are the thalamus, hypothalamus and pineal organ). One of the key questions that I investigate is: what makes cells competent to respond to a molecular signal in a context-dependent manner? Moreover, I use gene expression analysis in different vertebrate species (birds, fish, reptiles, rodents) for comparative purposes.

I believe that one of the privileges of being in academia is to be able to be both a teacher (who conveys enthusiasm for scientific research to students) and a life-long student (of nature). I am passionate about excellence in teaching and my favourite teaching areas are embryology and (neuro)anatomy, as the former discipline holds the key to properly understand the latter.

Stuart Knight (Biochemistry)  
Module organizer 5B8B0230 Gene cloning and expression A  
stuart.knight@kcl.ac.uk

I am the organizer of the second year Gene Cloning & Expression module. I did my first degree in Biochemistry and I will be teaching the general area of Molecular Biology including a key set of techniques in Molecular Neuroscience. This module covers the theoretical side of gene expression and also how the understanding and enzymology of these processes can be used in the laboratory. The material from the lectures is coupled to online exercises and tutorials. My research interests include the molecular basis of human disease in particular Autosomal Dominant Polycystic Kidney Disease and Premature Ageing Syndromes.
We are interested in how information about the visual scene is represented in the brain and how this information used to drive behaviour. We are also interested in the genetic and activity-dependent mechanisms that drive assembly of visual circuits. To address these questions we are using zebrafish as a model organism. The brain of larval zebrafish is small, containing less than 100,000 neurons, but nevertheless supports a rich repertoire of visually-driven behaviours. Furthermore, because larvae are translucent the entire volume of the brain can be imaged non-invasively and with single-neuron resolution. We use in vivo imaging to study the structure and function of networks underlying visual behaviours at multiple spatial scales- from individual neurons to the entire brain.

Our work focuses on investigating the molecular mechanisms underlying the development and progression of neurodegenerative diseases such as Alzheimer’s disease and related dementias. We have particular interests in how tau causes synaptic and neuronal dysfunction and the role of astrocytes in mediating synaptotoxicity in dementia. We use a diverse range of model systems to examine key proteins and pathways implicated in neurodegeneration and to conduct pre-clinical studies with potential therapeutic agents.

I worked in the Unit for Addictive Drugs (URAD) in Aberdeen for 11 years with Professor Hans Kosterlitz looking at the pharmacology & physiology of the endogenous opioid system. I was mainly involved in the identification and characterisation of the different opioid receptors and the identification of specific agonists and antagonists for these receptors. My main interests are still the endogenous opioid and cannabinoid systems and the mechanisms involved in pain control. Since taking over the running of 6BBM0329, I have become more interested
in the mechanisms responsible for the actions of drugs of abuse and why people can become addicted to such drugs.

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**Dr Yannis Paloyelis**  
Organizer: 6BBYN310 Imaging the Brain, Reading the mind  
Co-Organiser: 5BBA2040 Psychology 1  
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I joined the IoPPN in 2006 to study for an 1+3 MSc/PhD at the MRC Social Genetic and Developmental Psychiatry Centre. In my PhD I integrated psychology, genetics and neuroimaging to understand the processes underpinning reward processing deficits, impulsivity and reading difficulties in ADHD.  
Switching fields, I joined the Neuroimaging department in 2011 for a postdoc to study the influence of social factors on pain, where I stumbled across oxytocin. The attraction was immediate and a lasting relationship was formed. I received an ESRC/MRC Future Research Leaders grant that allowed me to delve deeper into the oxytocin system in the human brain. My research focuses on understanding the oxytocin system in the human brain and its contribution to decision making and neuropsychiatric disorders.

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**Dr John Pizzey**  
Admissions Tutor Neuroscience  
Staff-Student-Liaison Committee  
Organizer 5BBA2081 Neuroscience  
4BBY1030 Cell Biology and Neuroscience  
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Research includes understanding the molecular mechanisms responsible for axonal regeneration in the peripheral vertebrate nervous system. Similarly, understanding why the adult CNS cannot regenerate. Delivery of genes into the adult CNS in an attempt to improve its regenerative capacity. Research also includes elucidating the role of the transcription factor GATA-6 in mammalian cardiogenesis.

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**Qazi Rahman**  
Organizer 6BBYK302 Cognitive Neuropsychology  
6BXX307 Research Project in Psychology

My research interests include the psychobiology of human sexual orientation; lesbian, gay, bisexual and transgender (LGBT) mental health; neurocognitive sex differences; evolutionary theory; public understanding of science and psychology.

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**Dr Setsuko Sahara**  
Co-organizer 6BBYN301 Project Design in Neuroscience  
Co-organizer 5BBYN001 Molecular and Cellular Neuroscience  
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We are focusing on the development of the mammalian neocortex, which is the control centre of our behavior, thought and intellectual abilities. Our research focuses on cortical development, in particular the developmental switch of progenitors from self-renewing to neurogenic and gliogenic fates, and the fate determination processes of progenitors that generate various types of neurons and glia that make up the complex neural circuits of the brain. Decoding the mechanisms regulating the self-renewal capacity and competency of cortical progenitors is crucial to understanding: 1) how our brains undergo healthy development and what happens to the brain in psychiatric disorders, and 2) how we could develop novel strategies to regenerate damaged nervous system.

Dr Sarah Salvage  
Co-organizer: SBBM0218 Physiology & Pharmacology of the Central Nervous System  
Email: sarah.salvage@kcl.ac.uk  
Tel: 020 7848 6018

My research investigates the cause and treatment of neurodegenerative diseases, in particular, Parkinson’s disease. Specific interests are the search for novel neuroprotective agents to slow the progression of the disease, the investigation of novel symptomatic treatments with reduced incidence of dyskinesia. I am also Deputy Director of the National Parkinson Foundation (Miami, Florida) International Centre of Excellence.

Dr Deepak Sristava  
Email: deepak.sristava@kcl.ac.uk  
Co-organizer 6BBYN309 Memory mechanisms in health and disease

Work in the Srivastava lab is centred on elucidating the complex molecular mechanisms underlying neuromodulatory control of neuronal connectivity in the cortex. Recently we have focused on the precise mechanisms that allow brain-synthesized estrogens to alter the number, shape and strength of connections between cortical neurons, thereby modulating the responsiveness of neurons to subsequent stimuli.

As aberrant alterations in neuronal circuitry is a fundamental property of many neurodevelopmental disorders including schizophrenia, understanding the mechanisms that control changes in connectivity is crucial in furthering our understanding of these disease states as well as for the development of novel therapeutic strategies.

Brenda Williams  
Programme Leader, MSc Neuroscience Distance Learning  
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Neural stem/progenitor cell biology, neuron-glial interactions, Neuronal ceroid lipofuscinosi

Darren Williams  
Organizer 6BBA3008 Developmental Neurobiology  
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When a maggot is transformed into a fly there is a dramatic deconstruction of the body and nervous system that is followed by a period of reconstruction. Our lab exploits the extreme biology of
*Drosophila* metamorphosis to uncover novel cellular and molecular mechanisms of neurodevelopment. We are interested how the anatomy and function of lineally related neurons are acquired and how the shape of individual neurons can be sculpted at both the cellular and subcellular level. Studying flies can help us identify both evolutionary conserved mechanisms (homologies) and novel convergent ways of solving the same problem (analogies). Together these help inform us about design principles of nervous systems.