



## **Department of Psychology**

# **NST Part IB Experimental Psychology**

**PBS Tripos Part IIA:**

**PBS 4: Biological and Cognitive Psychology**

**PBS 5: Experimental Psychology**

**Philosophy Tripos Part IB:**

**Paper 8: Experimental Psychology**

## **Course Guide and Schedule of Lectures**

### **Academic Year 2015 - 2016**

*Revised 24.2.16 GJD*

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# Introduction

Welcome to the Department of Psychology!

The NST IB Experimental Psychology course is probably your first exposure to psychology as a scientific discipline. We will introduce you to Experimental Psychology with a lecture examining its historical roots, its philosophical basis and the methods used in modern Experimental Psychology. You will then learn about topics in perception which are not very far removed from the sciences most of you have studied before (biology and physics most notably) and then gradually introduce you to the mental and brain processes involved in attention, learning and memory, language, action, awareness, thinking and reasoning, cognitive and social development, the psychology of social groups, and atypical psychology.

Although we feel that this is the best way of introducing you to Experimental Psychology, a number of you may well be surprised by the 'openness' of the subject. There *are* plenty of 'hard facts' in psychology but there are also many theories, some of them, indeed, of a highly speculative nature. This is because, even after more than 100 years of its scientific study, many of the capacities of the mind and the brain remain mysterious. For the new student of psychology this can be both exciting and daunting.

Although we refer to this course as NST IB, the course is *also* offered to students in other Triposes (e.g., PBS and Philosophy). PBS students can choose to either offer the full course (PBS 5), or a cut-down version named Biological and Cognitive Psychology (PBS 4). **All requirements, including practical class reports and examinations, are identical for all students taking the full course (PBS 5).** Those taking PBS 4 will attend none of the practical classes and certain lectures only, detailed at the end of this course guide, to prepare for the Paper 1 examination.

This booklet contains useful information about the course, including a description of the lectures we offer together with the related practical classes, and details of the examination. The booklet also includes useful practical information about the Department.

# **Aims and Objectives of the Part IB Course**

## **Aims**

The academic aims of this course are as follows:

- To introduce students to a broad range of key topics in Experimental Psychology and to provide the opportunity to learn about experimental procedures in Psychology through practical classes.
- To prepare students for the Part II Psychology course.

## **Learning Outcomes**

At the end of the course students should possess:

- Elementary skills of arguing towards theoretical conclusions about mental and brain processes from empirical evidence, and a knowledge base from which to argue.
- An appreciation of the principles of behavioural experimentation, acquired through participation in practical classes (and from videos and films).
- The ability to write a report of a psychology experiment, developed through writing practical reports.
- An elementary understanding of experimental methodology, design, and statistical analysis.

## **Professional Outcomes**

This course provides one step toward obtaining a professionally recognised qualification in Psychology. For full details of the study requirements for receiving a recognised qualification, see our web page at <http://www.psychol.cam.ac.uk/prospective-students/ugadmissions/bps>

## **Structure of the Course**

The course is taught by means of three lectures per week (Tue, Thu, Sat 11am), in combination with up to two practical classes. A detailed summary of each lecture and practical class is given in the final part of this booklet.

Topics covered in the first term include: sensory processes and perception with special emphasis on vision and hearing; attention, consciousness and the control of action; and learning, memory and motivation. The remainder of the course covers language processing; cognitive and social development; intelligence (and its measurement); reasoning and decision-making; social psychology; and atypical psychology.

During the practical classes, students will learn research techniques and skills necessary for measuring brain and behavior, the importance of experimental design including the difficult problem of appropriate control conditions and the relationship between experimental hypotheses, experimental design and statistical analysis. Students are required to write reports on five of these classes (see below).

## **Practical Class Registration**

Your College should ask you to register at the Senate House for practical classes at the beginning of the Michaelmas Term. PBS Tripos students are assigned practical classes before the start of term.

## **Supervisions**

Typically, students receive a weekly supervision on this course. Supervisions are the responsibility of College Directors of Studies (DoS). Your DoS will appoint one or more supervisors who will advise students about the topics for supervisions and preparation for the examinations.

## **Advice to Students**

Students are strongly advised to familiarize themselves with the format of the examination papers (see below) and the types of questions by referring to the examination papers from previous years.

The course is divided into five main themes for the purpose of teaching and learning, and are as follows:

- Perception and Cognitive Psychology – how we perceive, remember, learn, reason, speak and control our actions
- Biological Psychology – how the brain works, how it can be affected by drugs, the effects of hormones, and biological models and treatment of mental disorders
- Developmental Psychology – how humans develop physically, mentally and socially during childhood and adolescence
- Social Psychology – how human behaviour and cognition are affected by social context, including the study of reasoning and decision-making
- Individual Differences – how we try to measure differences in personality or intelligence, and understand atypical cognitive processes associated with mental illness

These themes do not always coincide precisely with the topics areas for the examination sections (which are described in detail below). Lectures will often contain information relevant to more than one section in the examination. The marking criteria used in the School of Biology give particular credit to answers that integrate a variety of relevant sources of information.

# Assessment

Assessment for the full course is through:

- Two unseen three-hour written papers (40% of the total mark each)
- A written practical of an hour and a half (20% of the total mark)
- Five practical class reports (each failure to pass one of the five required reports will result in the deduction of 1.5 marks from the total examination mark)

PBS Tripos students offering PBS 4 are assessed by a three-hour written paper only. This is Paper 1 (see below).

## Papers 1 and 2

The written papers (Paper 1 and Paper 2) consist of three sections, each assessing a certain topic area from the course. In each section, candidates will be required to provide: (1) short accounts of two topics from a choice of four, and (2) one essay from a choice of two. The essay carries two thirds of the marks in each section. The sections of these papers address the following topics:

	Paper 1	Paper 2
<u>Section A</u>	Perception & Cognitive Psychology <i>But not Audition Lectures</i>	Perception & Cognitive Psychology
<u>Section B</u>	Biological Psychology	Developmental Psychology
<u>Section C</u>	Atypical Psychology & Reasoning	Social Psychology and Intelligence & IQ

**NB:** Paper 1 draws from lectures listed at the end of this document.

## Written Practical

The written practical is divided into two sections, A and B. In Section A, candidates will respond to a compulsory statistics question requiring data analysis. In Section B, candidates will be required to answer one question from a choice of at least three on designing an experiment.

Further information on examinations together with past papers, arrangements for reports of Part IB practicals and guidelines for written reports can be found on the following webpage:

<http://www.library.psychol.cam.ac.uk/part-ib-teach-res>

## Practical reports

Students are required to submit reports for five of the practical classes, each drawn from one of the themes of the course. A *satisfactory* report is required for *each of the following practical classes*:

1. Biological Psychology

Dr Dalley

Neural Measurement

2. Cognitive Psychology

Dr Beckinschtein

Behavioural Measurement 1

3. Developmental Psychology

Prof Goswami

Cognitive Developmental Tasks

4. Individual Differences

Dr Plaisted-Grant

Psychometric assessment: Ability testing

5. Social Psychology

Dr Schnall

Social Psychology

Reports are marked as either (a) satisfactory, (b) failed, or (c) revision required (these reports have an indication of how they must be improved to be satisfactory; the student may submit a revised report for re-marking.)

The deadline dates for all reports that may be submitted will be posted outside the Practical-Classroom at the beginning of Michaelmas term.

Details of the preparation, submission and evaluation of these reports will be given in each relevant practical class. You may also ask your Supervisors for more guidance about your reports.

# Student Input to Teaching and Course Management

## Questionnaires

At the middle and end of each term you will receive an email announcing a web-based questionnaire concerning the course. You are strongly invited to give your feedback, as your comments and views are instrumental for evaluating the quality of our lectures and implementing any changes that would improve the quality of the course. You will also be invited to complete a final questionnaire at the end of the year.

Please click on the link in the email and complete the short questionnaire, rating and commenting on various aspects of the course and associated supervisions. Please note that your reply is entirely confidential and no one can identify the author of a particular comment.

## Staff/Student Committee

Each year, we need student volunteers taking our NST IB course to join the staff/student committee. The main purpose of this Committee is to raise and discuss any issues about our courses and Departmental arrangements for students. The Committee consists of the Department's Director of Undergraduate Education, academics responsible for each course the Department contributes to, and student representatives from these courses.

The Committee normally meets towards the end of the Michaelmas Term and at start of the Lent and Easter Terms, when questionnaire feedback on the previous term's lecture courses is available. Comments from the Committee are discussed at the subsequent Departmental meetings.

The Secretary of the Committee is Ms Kate Stacey ([ks298@cam.ac.uk](mailto:ks298@cam.ac.uk)). Anyone wishing to have an item of business discussed should contact her or the appropriate student representatives.

## Other Channels

Students are encouraged to bring suggestions about the teaching or management of the Part IB Course to the Department's attention via:

- the Head of Department (Prof Trevor Robbins, [twr2@cam.ac.uk](mailto:twr2@cam.ac.uk))
- the Secretary of the Department (Ms Kate Stacey, [ks298@cam.ac.uk](mailto:ks298@cam.ac.uk))
- the Part IB Course Organiser (Dr Greg Davis, [gjd1000@cam.ac.uk](mailto:gjd1000@cam.ac.uk))
- the Director of Undergraduate Teaching (Dr Kate Plaisted-Grant, [kcp1000@cam.ac.uk](mailto:kcp1000@cam.ac.uk))
- their Directors of Studies.

This provides another route by which your reactions to our courses can influence our future provision.



## Students from outside Natural Sciences

We are strongly committed to offering our Experimental Psychology Part IB course to students from a variety of disciplines. However, a certain level of mathematical and scientific knowledge is assumed in our teaching.

The majority of the students participating in our course do so after completing Part IA Natural Sciences, which provides sufficient mathematical and scientific background for our course. Students from other Triposes are strongly encouraged to refresh their knowledge on these topics in advance of the course.

The Department runs a virtual learning site to help students refresh their knowledge in mathematical and scientific concepts in order to support them taking this paper within other Triposes. The site contains text book learning, audiovisual teaching and practice questions:

<https://camtools.cam.ac.uk/site.html?siteid=a4ac3f3c-1f69-41e3-0031-71490de22796>

If you are not already enrolled in this site, please contact our librarian, Diane FitzMaurice ([df226@cam.ac.uk](mailto:df226@cam.ac.uk)).

# The Department of Psychology

## General

One of the oldest psychology departments in the country, we celebrated the centenary of our establishment in 1997. We accommodate many Post-Doctoral Research Scientists and Postgraduate Research Students who serve as supervisors for lecture courses.

The Department occupies three adjacent buildings on the Downing Site and a building on the New Museums Site (Department of Psychology, Free School Lane, CB2 3RQ). The main Psychological Laboratory building (CB2 3EB) was built for the Department in the 1950s. Its first two floors house most of the facilities used by students: our lecture theatre, our practical classroom with a Macintosh network, a well-stocked library (and helpful Librarian), technical workshops, and two common rooms for Part II Students (containing photocopiers, a snack machine and drinks machines, and computers) in addition to Reception and some staff offices. The remaining floors contain offices and laboratories.

Immediately to the west is the Craik-Marshall building where further laboratories and offices occupy the ground and the top floors. There is also the Kenneth Craik seminar room on the ground floor. Immediately to the south is the William Hardy building, of which we occupy most of the ground, second and third floors. The Centre for Speech and Language is located on the second floor of the William Hardy building

The Department houses the University of Cambridge Behavioural and Clinical Neuroscience Institute (BCNI) recently funded by a consortium grant from the Medical Research Council and Wellcome Trust.

The Centre for Family Research and the Cambridge Laboratory for Research into Autism are located in the Old Cavendish Building, Free School Lane (CB2 3RQ).

We are fortunate in having nearby on Chaucer Road (CB2 7EF) the MRC Cognition and Brain Sciences Unit (CBU), which is a major research centre for cognitive psychology and cognitive neuroscience. Some of its members provide lectures and supervisions for our courses. The Department also has links with the Department of Psychiatry at Addenbrooke's Hospital on Hills Road (CB2 0QQ) and its Autism Research Centre on Trumpington Road (CB2 8AH).

## Department Contact Details

Address: Department of Psychology  
University of Cambridge  
Downing Site  
Cambridge  
CB2 3EB

Tel: 01223 333 550  
Fax: 01223 333 564  
Website: [www.psychol.cam.ac.uk](http://www.psychol.cam.ac.uk)

## Library

The Library website is an essential source of information about the Department Library and the services it provides ([www.library.psychol.cam.ac.uk](http://www.library.psychol.cam.ac.uk)). There are guides to other useful libraries in Cambridge and the information services offered via the University Library website ([www.lib.cam.ac.uk](http://www.lib.cam.ac.uk)). Our Librarian (Ms Diane FitzMaurice: e-mail [df226@cam.ac.uk](mailto:df226@cam.ac.uk)) will be pleased to assist you if needed.

All classified books are available for loan but journals are for use in the library only. However, almost all journal articles are available to students on-line. Please note that a record must be made of all items removed from the library even for a short period.

### **Photocopying, Scanning and Printing**

There is a scanner /printer/ photocopier available for your use. The machine is situated in the Student Computer Room, next door to the Library. The printer charges printing jobs to your Desktop Services Common Balance at a cost of 7p per page. The machine can also be used to scan items and either email them or save them to a USB data stick.

## **Health and Safety in the Department**

The Head of Department is responsible for health and safety provision. You should ensure that you familiarise yourself with the various fire exits and routes to them: all are clearly signed. For areas that you do not visit frequently (e.g. a supervisor's office) the members of the Department that you are visiting will be happy to show you the emergency exits if you ask. In the event of the fire alarms sounding, you should leave the building immediately by the nearest safe exit and assemble outside the Department of Geography. Do not delay to collect your belongings and do not use the lift.

If you are unfortunate enough to have an accident in the Department, a first-aider can be contacted via Reception (telephone 33550). If Reception is closed, contact should be made with the security control room (31818). Any accident must be reported to the Departmental Office (Room 100). In case of serious emergency, telephone 1999 for the Emergency Services.

If you have any general concerns about safety in the Department, please contact the Departmental Safety Officer, Dr Jeff Dalley ([jwd20@cam.ac.uk](mailto:jwd20@cam.ac.uk)).

## Michaelmas Term - Lectures

Lists of suggested readings are provided for each lecture series. Asterisks denote texts suitable for reading before the course begins. Texts marked with + provide useful reference sources for one or more lectures. The handouts distributed during the lectures will provide further readings on particular topics.

### Introduction

Prof T Robbins

**1 Historical background to Experimental Psychology:** Wundt introspection and structuralism, compared to William James, functionalism, behaviourist psychology and reductionism. The rise of cognitive psychology. Modern approaches to the study of consciousness: the relationship between cognitive psychology and cognitive neuroscience.

### Visual Perception

Dr G Davis

#### Recommended Reading:

Coren, S., Ward, L.M., Enns, J.T. (2004). Sensation and Perception 6<sup>th</sup> edition. Harcourt Brace; Fort Worth, Texas.

Snowden, R. Thompson, P. & Troscianko, T. (2012). Basic Vision, 2<sup>nd</sup> edition. Oxford University Press.

Goldstein, E. B. (2013). Sensation and Perception. Wadsworth, 9<sup>th</sup> edition.

Gregory, R. L. (1977). Eye and Brain. 5<sup>th</sup> edition. OUP. \*

#### **2 Vision1: Vision basics: the eye, adaptation and colour vision (Dr G Davis)**

Introduces students to the lectures on human vision, outlining key structures and function of the human eye, the importance and basic nature of adaptation (light and dark adaptation, in particular), and mechanisms of colour vision.

Mather, G. (2006) Foundations of Perception Chs 1+12

Snowden, R, Thompson, P & Troscianko, T. (2012) Basic Vision Chs 1+5

#### **3 Vision 2: Contrast, Tuning, Univariance, Adaptive Independence & Orientation (Dr G Davis)**

Introduces students to (i) perception of contrast as a fundamental feature of coding in visual neurons, (ii) ambiguity in neural signals and the need for groups of neurons to cooperatively code visual features (ii) Principles of Univariance and Adaptive Independence, and (iv) the perception of orientation.

Snowden, Thompson & Troscianko, Basic Vision Chs. 2, 4, 5.

#### **4 Vision 3: Spatial frequency, depth, motion (Dr G Davis)**

Describes (i) the need to perceive edges at different spatial scales, and neural channels involved in spatial frequency perception (ii) cues that vision uses to estimate the depth of objects from a two dimensional retinal image and (iii) mechanisms for perceiving motion. Visual input is often ambiguous with regard to the nature of events and objects in the environment. Vision incorporates 'heuristics': 'rules of thumb' about the world to disambiguate this information.

Snowden, Thompson & Troscianko, Basic Vision Chs. 4, 6, 7.

#### **5 Vision 4: Interocular Transfer and Perceptual Constancy (Dr G Davis)**

Introduces students to (i) the measurement of 'interocular transfer' of adaptation, (ii) mechanisms and examples of perceptual constancy.

Goldstein, E. B. (2013). Sensation and Perception. Wadsworth, 9<sup>th</sup> edition Ch. 19.

#### **6 Vision 5: Completion, cortex and conscious vision (Dr G Davis)**

Covers (i) examples of filling-in of 'missing' information in the input due to the blind-spot and camouflage, (ii) the visual brain - a description of some of the brain's visual processing areas (iii) a brief introduction to conscious vision.

Snowden, Thompson & Troscianko (2012) Basic Vision. Chapters 3, 5 & 6.

## **Selective Attention**

**Dr G Davis**

#### **Recommended Reading:**

Snowden, Thompson & Troscianko, Ch. 9.

Pashler, H. (1998). Attention. Psychology Press.

Styles, E. A. (2006). The Psychology of Attention, 2<sup>nd</sup> edition. Psychology Press.

#### **7 Selective Attention 1 (Dr G Davis)**

Historical perspectives and conceptual issues. The need for selection. Inattention blindness. Spatial orienting. The flanker paradigm and spotlight/zoom Lens metaphors.

#### **8 Selective Attention 2 (Dr G Davis)**

Visual Search and Feature-Integration Theory; Attention to auditory stimuli. Attention to objects. Late versus early selection. Single unit recordings from primate visual cortex.

# Audition

Dr A Welchman

## Recommended Reading:

Goldstein, E. B. (2014). Sensation and Perception. 6<sup>th</sup> or later edition. Wadsworth.

Moore, B. C. J. (2012). An Introduction to the Psychology of Hearing, 6<sup>th</sup> edition. Emerald.

Plack, C. J. (2013). The Sense of Hearing, 2<sup>nd</sup> edition. Erlbaum, Mahwah, New Jersey.

Schnupp, J., Nelken I., & King, A. (2012). Auditory Neuroscience: Making Sense of Sound. MIT Press.

Speaks, C. E. (1999). Introduction to Sound, 3<sup>rd</sup> edition. Singular Publishing Group.

## 9 Audition 1: What's that noise? (Dr A Welchman)

Where does sound come from? How does this information reach the ear? How do we measure and characterize sound? How do physical vibrations get translated into nerve impulses?  
Goldstein Chapter 11; Moore Chapter 1.

## 10 Audition 2: Heat, light, sounds and linear systems (Dr A Welchman)

How can complex sounds be broken down into simpler elements? How does linear systems theory help us understand the processing of elemental stimuli and allow us to make predictions for complex sounds? How can we measure and assess the filtering properties of the human auditory system? What are the practical benefits from this approach?  
Moore Chapters 1, 3; Plack chapters 2, 5.

## 11 Audition 3 Perceiving sound (Dr A Welchman)

How does the basilar membrane in the cochlea respond to sound? How do the hair cells of the inner ear encode and relay sound information? How is information encoded by the cochlea used to determine pitch and loudness?  
Moore Chapter 4; Plack, Chapter 7

## 12 Audition 4: Where did that come from? (Dr A Welchman)

How does encoded sound information progress from the cochlea to the cortex? How do we use binaural signals (from the two ears) to localize sounds? What is the role of monaural information?  
Moore Chapter 7; Plack Chapter 9

## 13 Audition 5: Seeing through the ears (Dr A Welchman)

How do sight and sound interact to determine what we perceive? What are the principles that govern interactions between our senses? How can we characterize the brain's processing of information within and between sensory modalities?  
Ernst & Bühlhoff (2004) Trends in Cognitive Sciences 8, 162-169.

# Learning, Memory and Motivation

Dr K Plaisted-Grant & Prof L Saksida

## Recommended Reading:

Pearce, J. (2008) *Animal Cognition and Learning: An Introduction*, 3<sup>rd</sup> edition. Hillsdale, New Jersey: Lawrence Erlbaum\*

Anderson, J. R. (2000) *Learning and Memory*, 2<sup>nd</sup> edition. Wiley: New York.

Gluck, M. A. et al. (2012) *Learning and Memory*. 2<sup>nd</sup> edition. Worth: New York.

Gazzaniga, M. S., Ivry, R. B., Mangun, G. R. (2014). *Cognitive Neuroscience: The Biology of the Mind*, 4<sup>th</sup> edition. W.W. Norton.

## 14 Learning, Memory and Motivation 1 (Dr K Plaisted-Grant)

Predictive learning: biological preparedness, neurobiological dissociations; Pavlovian conditioning: dopamine and reinforcement; the Rescorla Wagner rule.

## 15 Learning, Memory and Motivation 2 (Dr K Plaisted-Grant)

Conditioned inhibition and blocking. Temporal contiguity; Surprise and prediction error; Preventative and superlearning;

## 16 Learning, Memory and Motivation 3 (Dr K Plaisted-Grant)

Latent inhibition, attention and learning. Generalisation: perceptual learning and category learning

## 17 Learning, Memory and Motivation 4 (Dr K Plaisted-Grant)

Instrumental conditioning, habits and goal directed learning. The role of motivation and incentive learning.

## 18 Learning, Memory and Motivation 5 (Prof L Saksida)

Medial temporal lobe amnesia; Declarative memory; Non-declarative memory; Consolidation and retrograde amnesia.

## 19 Learning, Memory and Motivation 6 (Prof L Saksida)

Memory retrieval: semantic memory, episodic memory (remembering and knowing, recall and recognition, encoding specificity); Forgetting

# Higher Cognition

Dr T Bekinschtein

## Recommended Reading:

Eysenck, M. & Keane, M. (2010). Cognitive Psychology: A Student's Handbook, 6<sup>th</sup> edition. Psychology Press\*+

Baddeley, A. (1997). Human Memory: Theory and Practice, Revised edition. Psychology Press\*+

Ward, J. (2010). The Student's Guide to Cognitive Neuroscience, 2<sup>nd</sup> edition. Psychology Press\*+

Posner, M. (1989). Foundations of Cognitive Science. MIT Press\*

## 20 Higher Cognition 1: Memory Systems (Dr T Bekinschtein)

The multi-store model of memory: sensory, short-term and long-term stores. An introduction to short-term memory and its characteristics. Experimental evidence distinguishing short-term and long-term memories. Criticisms of the multi-store model and Baddeley's theory of working memory.

## 21 Higher Cognition 2: Working Memory (Dr T Bekinschtein)

The evidence for different types of working memory. Verbal and spatial working memory systems: the phonological loop and visuospatial sketchpad. The episodic buffer and central executive.

## 22 Higher Cognition 3: Executive Functions (Dr T Bekinschtein)

Fractionating the central executive into cognitive functions such as control, organisation, planning, sequencing and monitoring. Disorders of executive function (e.g., following frontal lobe damage). The supervisory attentional system.

## 23 Higher Cognition 4: Consciousness 1 (Dr T Bekinschtein)

Levels of consciousness, coma, disorders, detection of wakefulness, parsing of physiology underlying arousal and attention. Pharmacological modulation of executive functions and consciousness.

## 24 Higher Cognition 5: Consciousness 2 (Dr T Bekinschtein)

Conscious access, blinding consciousness techniques, implications of sub and supraliminal cognition, theories of integrated cognition.



## Michaelmas Term - Practicals

### **1 Psychophysics and stimulus detection (Dr W Matthews)**

This practical will investigate how well we can detect changes in the magnitude of a stimulus, methods used to measure subjective magnitudes, and the probabilistic nature of sensation. We will also describe attempts to provide 'laws' (similar to the laws describing the physical world) that describe how stimulus discriminability changes with stimulus magnitude (Weber's Law), or the relationship between subjective and physical magnitudes (Fechner's law and Steven's power law).

### **2 Visual Thresholds and Adaptation I (Prof J Mollon & Dr A Welchman)**

Using an optical system, we measure the thresholds for brief flashes on steady background fields of increasing luminance. In our first experiment, the test and background are of the same wavelength and we investigate how well Weber's Law holds over a range of luminances. Also shown in this practical are demonstrations of the change of visual time constants with adaptation and the independent adaptation of different classes of cone. (*Note: The instruction sheet for this practical, and the next one, will be available the previous week. Please read over it in advance. Students from PPS or Philosophy are invited to go through it with their supervisors*)

### **3 Visual Thresholds and Adaptation II (Prof J Mollon & Dr A Welchman)**

This practical can be written up for the Biological Psychology Section (Bio 1)  
In our second experiment, we ask to what extent Weber's Law holds independently for the different classes of retinal cone. Important concepts for interpreting your data are: Trichromacy; the Principle of Univariance; and the Principle of Adaptive Independence. For the theoretical background to this practical, see Barlow and Mollon (1989) *The Senses*, pp 165-172. A more advanced treatment (which may recommend itself to physicists) is that by Marriott (1962) in H. Davson *The Eye*, Vol 2, Ch. 17.

### **4 Neurobiology (Dr J Dalley)**

In this session we will examine the functional neuroanatomy of the human brain. The main objective of this practical class is to introduce the essential organising principles of the human brain and its key functional divisions, including the fronto-parietal attentional network, the limbic system, the visual system, and the basal ganglia. The focus of this session is functional systems in the brain not fine-grain connectivity and will involve computer-based exercises, a 20-min video and a guided tour of the human brain in 3D.

### **5 Signal Detection Theory (Dr D Szucs)**

The probability of a subject reporting detection of a near-threshold stimulus is influenced by non-sensory factors including motivation, instructions and payoffs. This practical will show how we can apply signal detection theory, a simple mathematical model of noisy decision making, to this type of situation, and how this allows us to measure sensory discriminability separately

### **6 Neural Measurement (Dr J Dalley)**

#### **This practical must be written up and submitted for assessment**

This practical continues our tour of the human brain from the perspective of human brain imaging, specifically magnetic resonance imaging (MRI) and positron emission tomography (PET) and considers how these imaging modalities can be used to infer functional brain activity in humans. The basic principles of MRI, fMRI and PET will be described using

examples from recent imaging studies, all of which will be relevant to your lectures and course work. The primary aim of this practical is to gain an appreciation of contemporary brain imaging techniques and to understand how they can be applied to investigate functional brain activity in humans.

### **8 Prediction Error Learning (Prof L Saksida)**

This practical provides students with the opportunity to explore the predictions of a simple associative model of learning, based upon the concept of prediction error. Students will simulate simple experiments on a computer implementation of the model.

### **9 Assessing Memory (Prof L Saksida)**

This practical class demonstrates important principles in assessing human learning and memory. As some students will be acting as participants, details of the procedures will not be announced before the practical sessions.

### **10 Behavioural Measurement 1 (Dr T Bekinschtein)**

#### **This practical must be written up and submitted for assessment**

This practical illustrates some of the classic methods for measuring mental processes, including measuring reaction times and errors in responses. It explores how reaction time and error data may be used to infer the nature of mental processes. In a formal, randomized experiment, using the classroom computer system, undergraduates judge the identity of a form that is rotated by varying amounts from its standard orientation.

### **11 Behavioural Measurement 2 (Dr T Bekinschtein)**

**Details to be announced**

# Lent Term – Lectures

## Language and the Brain

Dr M Bozic

### Recommended Reading:

Harley, T.A. (2013). *The Psychology of Language: From Data to Theory*, 4<sup>th</sup> edition. Psychology Press.

Gazzaniga, M.S., Ivry, R.B., Mangun, G.R. (2014). *Cognitive Neuroscience: The Biology of the Mind*, 4<sup>th</sup> edition. W.W. Norton. (Chapter 11)

### 1 Language and the Brain 1: Introduction

Major themes and issues in language research. Methods used to study language processing. Language building blocks (phonemes, syllables, morphemes, words). Serial vs interactive models of language processing. Preliminaries about language in the brain.

### 2 Language and the Brain 2: Reading

Properties of written language; components of the written word recognition process. Eye movements associated with reading. Recognition of letters and letter clusters. The representation and retrieval of information about word orthography. Grapheme to phoneme conversion. Access to meaning. Dual route and triangle models of reading. Reading in the brain; the neural recycling hypothesis.

### 3 Language and the Brain 3: Spoken word recognition

Properties of the spoken signal. Word segmentation: the problem of detecting when spoken words begin and end; strategies for speech segmentation. Lexical selection and the cohort model. Access to meaning; the role of context in spoken word recognition. Speech processing in the brain.

### 4 Language and the Brain 4: Sentence processing

The nature of syntax and sentence parsing. Main cognitive theories of sentence parsing. Major sentence parsing cues: the role of regularities, syntactic structure, lexical features, prosodic cues, semantic and world knowledge in sentence comprehension. Syntactic processing in the brain.

### 5 Language and the Brain 5: Second language acquisition and bilingualism

Factors affecting the acquisition of a second language. The effects of bilingualism on other aspects of cognitive processing. Cognitive model of bilingual word comprehension. Neural correlates of bilingualism and the role of age of acquisition. Mechanisms for selecting the right word in the right language. Non-linguistic consequences of bilingualism.

### 6 Language and the Brain 6: Language and Communication

Language in the wider context of multimodal communication. The role of gesturing. Use of pauses, intonation, and prosody for communicative purposes. Conversation convergence. Speech-vision integration. The neural correlates of communication; the hypothesis about neural coupling.

# Developmental Psychology

Prof U Goswami

## Recommended Reading:

- Goswami, U. (2014). *Child Psychology: A Very Short Introduction*. Oxford: OUP.  
 Goswami, U. (2008). *Cognitive Development: The Learning Brain*. Hove: Psychology Press.  
 Slater, A. & Bremner, J.G. (2011). *An Introduction to Developmental Psychology*. Oxford: Blackwell.  
 Donaldson, M. (1978). *Children's Minds*. London: Fontana Press.

## 7 Developmental Psychology 1

**Theories of Development.** I describe different theoretical approaches to understanding child development and assess them in the light of recent advances in understanding the brain.

## 8 Developmental Psychology 2

**Perception and Cognition in Infancy.** I describe sensory development and attention; cross-modal perception; enumeration of objects; early memory; and whether infants know that the external world continues to exist when not being perceived, as assessed by reactions to anomalous events and by searching.

## 9 Developmental Psychology 3

**Social Cognitive Development in Infancy.** I discuss infant imitation; imitation and the 'like me' hypothesis; reading emotional states; joint visual attention; perceiving the goal-directedness of others' actions; the development of attachment of child to mother and assessing the quality of attachment; and individual differences in relation to quality of attachment.

## 10 Developmental Psychology 4

**Language Acquisition.** I give a brief overview of language acquisition, a core cognitive system that makes us uniquely human – or does it? Traditionally, language acquisition was studied separately from cognitive development. It seemed such a remarkable feat for the infant brain that a special human capacity must be at work (a "language acquisition device"). However, more recent research shows that this distinction is probably false.

## 11 Developmental Psychology 5

**Social and Cognitive Development in Childhood 1.** Research on learning, memory and social behavior in young children will be sampled. It will be demonstrated that the processes of learning and memory in children, and of social processes such as ingroup versus outgroup behavior, are very similar to these processes in adults. What differs is the knowledge base.

## 12 Developmental Psychology 6

**Social and Cognitive Development in Childhood 2.** This lecture will consider the development of inductive and deductive reasoning, and the development of the kinds of logical reasoning studied by Piaget. It will also touch briefly on moral development.

# Reasoning and Decision Making

Dr W Matthews

## Recommended Reading:

Manktelow, K. I. (2012). Thinking and Reasoning. Psychology Press. Chapters 1, 3–4, 8–10.

Eysenck, M. & Keane, M. (2010). Cognitive Psychology: A Student's Handbook, 6<sup>th</sup> edition. Psychology Press. Chapters 12, 13, 14.

(Eysenck, M. W. (2001). Principles of Cognitive Psychology. Psychology Press, Chapters 9 & 10, covers similar material)

Gazzaniga, M. S., Ivry, R. B., Mangun, G. R. (2014). Cognitive Neuroscience: The Biology of the Mind, 4<sup>th</sup> edition. W.W. Norton. Chapters 10, 13.

## 13 Reasoning and Decision Making 1: Problem Solving and Reasoning

These four lectures will consider some higher-level cognitive processes that enable us to solve problems and decide what to do in the complex everyday environment. In lecture 1, we will focus on problem solving (breaking down a problem into subgoals; insight and the 'aha' experience), and reasoning (to what extent does human thought adhere to the rules of logic?).

## 14 Reasoning and Decision Making 2: Judging Probabilities

Are humans rational? One way to approach this question is to ask whether humans think according to a normative model, such as logic or probability theory. In this lecture, we will look at some common flaws in the way humans estimate probabilities. Rather than analysing a problem or decision in depth, humans may instead use quick and simple heuristics.

## 15 Reasoning and Decision Making 3: Decision-Making

The normative approach to decision-making involves economic terms like 'expected value' and 'expected utility'. The term 'Homo economicus' describes an individual who always makes decisions that maximize expected utility. We will see some examples of how people deviate from these predictions, such as the framing effect.

## 16 Reasoning and Decision Making 4: Emotions and Decision-Making

This lecture will look at the role of emotions in decision-making, including Damasio's 'somatic marker hypothesis' based on the effects of damage to the orbitofrontal cortex.

# Intelligence Testing

Dr K Plaisted-Grant

## Recommended Reading:

Mackintosh, N. (2010). IQ and Human Intelligence, 2<sup>nd</sup> edition. Oxford University Press.

Kline, P. (1991). Intelligence: The Psychometric View. Routledge.

Cooper, C. (1999). Intelligence and Abilities. Psychology Press.

Deary, I. (2001). Intelligence: A Very Short Introduction. Oxford University Press.

## 17 Intelligence and IQ 1

History of intelligence testing. Intelligence tests as a practical solution to an applied problem. Definition and measurement of IQ. Principles of test construction. Reliability and validity of IQ tests.

## 18 Intelligence and IQ 2

The concept of heritability and procedures for estimating heritability, twin studies and adoption studies. Test bias and culture-fair tests; sex differences in intelligence.

# Atypical Psychology

Dr A Remington & Dr A Ruigrok

## Recommended Reading:

Kring, A. M., Johnson, S. L., Davison, G. C. (2012). Abnormal Psychology, 12<sup>th</sup> edition. Wiley.

In most of the lectures, videos of real patients are shown to illustrate diagnosis.

## 19 Atypical Psychology 1: Autism Spectrum Conditions

This lecture describes the diagnosis of autism, sometimes considered to be the most severe of the childhood psychiatric conditions because it can leave the individual unable to socialize. Since humans are essentially a social primate species, such a deficit affects a central characteristic of typical human behaviour. Autism also involves areas of strength, not just areas of disability, and cognitive theories are examined for their power to explain both the strengths and deficits in autism spectrum conditions (ASC). The neurobiology of ASC, from genes to neural structure and function, is also reviewed.

## 20 Atypical Psychology 2: Schizophrenia

This lecture describes the key symptoms of this condition, including hallucinations and delusions, in order to clarify how it is identified. Schizophrenia is one of the psychoses, and contrasts with the neuroses (phobias, obsessive compulsive disorder, and depression) covered in later lectures. Major aetiological factors of schizophrenia, both genetic and environmental, are reviewed, in the context of earlier psychogenic theories. Research into schizophrenia forces us to consider the notion of rationality, of how we form accurate beliefs about the world, and what can lead an individual to become 'out of touch with reality'.

### **21 Atypical Psychology 3: Phobias**

This lecture covers the classification of anxiety disorders and then focuses on specific phobias. The contrast between this kind of atypical reaction, in which an individual has *insight* into the irrationality of their excessive behaviour (fearing an object or event that poses no danger) and schizophrenia, in which the individual has no insight into their own irrationality, is considered. Learning theories and cognitive theories are considered, along with the data relevant to each, along with their implications for treatment.

### **22 Atypical Psychology 4: Obsessive Compulsive Disorder**

This is another anxiety disorder. Whereas in phobias the individual simply avoids a class of stimuli because of anxiety these trigger, in OCD the individual experiences anxiety as a result of intrusive and unwanted thoughts or images, and feels compelled to carry out actions to rid themselves of the unwanted thoughts. OCD forces us to question where thoughts normally come from and why most people can dismiss unwanted thoughts whilst patients with OCD cannot. As with phobias, learning and cognitive theories are considered, together with their implications for treatment. The neurobiology of OCD is also reviewed.

### **23 Atypical Psychology 5: Depression**

Anxiety disorders are one of the major affective conditions, and depression is the other, causing extreme low mood. It is of major importance not only because it affects 1 in 5 adult women and 1 in 10 adult men, but also because it carries with it the risk of suicide. This lecture reviews learning and cognitive theories, and the neurobiology of depression. Both psychological and pharmacological treatments are also outlined in the context of aetiological theories. The role of 'life events' (such as bereavement) and particularly disruptions to early attachment (including neglect and abuse) are covered at Part 2.

### **24 Atypical Psychology 6: Anorexia Nervosa**

This is the major eating disorder, and is almost exclusively a female condition. Defined largely in terms of body weight, it raises social questions about whether we should medicalize a person's body shape and weight, or whether our body weight is a matter of personal choice and individual civil liberty. The risk of death from anorexia leads to the conclusion that this condition is appropriately viewed as a medical condition. Anorexia is contrasted with the other major eating disorder, Bulimia Nervosa. Social, psychological and biological factors associated with anorexia are reviewed. The fact that this is a condition of the industrialized world, and is more prevalent in certain social groups, might lead one to suspect that this has a strongly environmental and social determinant, yet neurobiology is proving to be just as important.

## **Lent Term - Practicals**

### **1 Statistics: Fundamentals of Measurement, Analysis and Experimental Design (Dr K Ruggeri)**

For the statistics component of IB, we expect that from A-Level and NST 1A you will have mathematical competence that includes the following: basic algebra; graphs and histograms; probability; descriptive statistics including measures of central tendency and variability; concepts of hypothesis testing and significance. These will be recapped briefly during the IB course and help will be available should you have problems.

This class gives an overview of the logic of null hypothesis testing, which is at the core of statistical inference methods, and insight into other approaches to how psychologists approach quantitative studies. It will also include principles of establishing research questions and designing studies in order to test them.

## **2 Behavioural Measurement 3 (Dr M Bozic)**

The practical is aimed at demonstrating priming, a classical method for investigating the mechanisms of language processing. It focuses on the effects of prior exposure on the recognition of written words. Students will take part a short experiment, followed by a basic data analysis and a discussion of experimental design in psycholinguistics, including control of word variables, participants' strategic approaches to the task, and sources of response variability. The results will be discussed in the context of relevant theories, aiming to demonstrate how priming data can inform language processing models, in both behavioural and neural domain.

## **3 Statistics: Parametric difference Tests – the Z- and t tests (Dr K Ruggeri)**

The normal distribution, sampling, means, and variances. Parametric difference tests: the one-sample *t* test; two-sample *t* tests with related samples; two-sample *t* tests with unrelated samples.

## **4 Statistics: Correlation and Regression (Dr K Ruggeri)**

Correlation and regression: the techniques and applicability of correlation and regression.

## **5 Cognitive Developmental Tasks (Prof U Goswami)**

### **This practical must be written up and submitted for assessment**

Students will be shown methods for assessing cognitive development in infants and young children. The class view video presentations of children between the ages of 14 months and 7 years performing on tasks of object permanence, theory of mind, and conservation.

## **6 Measuring effects of arousal on performance (Dr T Bekinschtein)**

Details to be announced

## **7 Statistics: The Chi-Square Test & Non-parametric analyses Dr K Ruggeri)**

The  $\chi^2$  test: goodness-of-fit and contingency tests. Non-parametric and Bayesian alternatives to analyses already presented.

## **8 Psychometric assessment: Intelligence (Ms J Tobias-Webb & Dr K C Plaisted-Grant)**

### **This practical must be written up and submitted for assessment**

This practical teaches the methods and pitfalls of measuring differences between individuals, using neuropsychological tests of various cognitive abilities

## **9 Psychometric assessment: Personality (TBC)**

Details to be announced



## Easter Term - Lectures

### Social Psychology

Dr S Schnall

#### Recommended Reading:

Gilovich, T., Keltner, D., & Nisbett, R. (2013). *Social Psychology*, 3<sup>rd</sup> edition. New York: W. W. Norton.

The content of individual lectures will be provided in due course. Topics will include: Introduction to social psychology: historical perspectives; social psychology as science; classic studies on obedience, cognitive dissonance, and actor-observer effects; emerging perspectives in social psychology, challenges to research, methodological and statistical advancements, and the ecological fallacy; theories and studies on why people are prosocial. Focus will be on cooperation, compassion, and altruism; quick judgements about others on the basis of thin slices of behaviour; quick communication through nonverbal signatures; effects of nonverbal behaviour on the actor; Theories of well-being. Emerging debates about the dark side of too much happiness. Experimental evidence for interventions that can increase well-being.

***Details of the 6 Social Psychology lectures to be confirmed.***

## Easter Term - Practicals

### 1 Statistics Revision Class (Dr K Ruggeri)

Example-based review of statistical methods covered in the IB course. Worked-example review of past examination questions on statistics and experimental design.

### 2 Social Psychology (Dr S Schnall)

#### **This practical must be written up and submitted for assessment**

We shall be using some classic paradigms in Social Psychology to assess the extent to which psychological processing of the individual can be affected by group processes.

### 3 Ethical Issues in Experimental Psychology (Prof T Bussey)

In this practical class we will examine fundamental ethical issues relevant for conducting experiments in psychology. We will discuss the right of experiment participants and the ethical code that experimenters are required to follow. Several examples will be analyzed in class. Students will also learn about the ethical requirements they are expected to follow when they carry out experiments.

## **Examination Paper 1 draws from information in the lectures listed below**

**Note: These are the lectures that students taking PBS Part IIA PBS 4 (as well as those taking PBS Part IIA PBS5 and NST1b Experimental Psychology) will be expected to have attended:**

### **Michaelmas Term**

Prof Robbins	Introduction to the study of Experimental Psychology
Dr Davis	Visual Perception 1
Dr Davis	Visual perception 2
Dr Davis	Visual perception 3
Dr Davis	Visual perception 4
Dr Davis	Visual perception 5
Dr Davis	Attention 1
Dr Davis	Attention 2
Dr Cheke	Learning and Memory 1
Dr Cheke	Learning and Memory 2
Dr Cheke	Learning and Memory 3
Dr Plaisted-Grant	Learning and Memory 4
Prof Saksida	Learning and Memory 5
Prof Saksida	Learning and Memory 6
Dr Bekinschtein	Higher Cognition 1
Dr Bekinschtein	Higher Cognition 2
Dr Bekinschtein	Higher Cognition 3
Dr Bekinschtein	Higher Cognition 4
Dr Bekinschtein	Higher Cognition 5

### **Lent Term**

Dr Bozic	Language and the Brain 1
Dr Bozic	Language and the Brain 2
Dr Bozic	Language and the Brain 3
Dr Bozic	Language and the Brain 4
Dr Bozic	Language and the Brain 5
Dr Bozic	Language and the Brain 6
Dr Matthews	Reasoning and Decision Making 1
Dr Matthews	Reasoning and Decision Making 2
Dr Matthews	Reasoning and Decision Making 3
Dr Matthews	Reasoning and Decision Making 4
Dr Remington & Dr Ruigrok	Atypical Psychology 1
Dr Remington & Dr Ruigrok	Atypical Psychology 2
Dr Remington & Dr Ruigrok	Atypical Psychology 3
Dr Remington & Dr Ruigrok	Atypical Psychology 4
Dr Remington & Dr Ruigrok	Atypical Psychology 5
Dr Remington & Dr Ruigrok	Atypical Psychology 6