Undergraduate research within the Department of Psychology 2017-18

A guide for PBS Tripos Part IIB students and NST Part II psychology students

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Introduction

Part IIB students in the Psychological and Behavioural Sciences Tripos and NST or MVST Part II students taking Psychology must all conduct their own research to be written up in a substantial piece of work. This work is referred to as the research project, that will be written up as a research report (also known as a research dissertation in PBS – although this term is best avoided because it risks confusion with the optional dissertations taken by some NST students.)

The NST and PBS projects are very similar and run in parallel. Students often work in pairs, and one sometimes one member of the pair is taking PBS and the other is taking NST. In general, this document treats the projects interchangeably; differences between the two courses are noted where appropriate.

Aims of your research

Your research project provides you with an opportunity to conduct some hands-on research. Students are encouraged to make suggestions about experimental design and to conduct their own independent reading of relevant material. Some projects may require you to master new experimental techniques, and supervisors will provide you with initial guidance after which you should aim to work more independently. Although your supervisors will be available to provide guidance, you will be expected to set up and organize the experiments, collect the data and conduct the statistical analyses of data yourself. Courses are organised to cover the statistics necessary for analysing project data. While many projects are collaborations between a pair of students, you must submit an independent dissertation/report of the study. A sample of successful past projects will be available for inspection in the Departmental Library.

For PBS students, and NST students who have taken Part IB Experimental Psychology and the Psychology option of Part II Psychology, receiving a passing mark for your research and gaining a least a second class honours will mean that you will be eligible for graduate membership in the British Psychological Society. This will allow you to pursue certain forms of postgraduate training in psychology.

Research projects sometimes make substantive contributions to knowledge, and every year some result in publications, sometimes in very prestigious journals.

The project as a component of your final year

For PBS Part IIB students, PBS 7: Research Dissertation is worth 25% of your overall final class.

For NST/MVST Part II students, the Research Project is worth 20% of your overall class.

Project allocation

A list of projects offered by the department is circulated in the summer. Students are encouraged to read the project descriptions and talk to prospective
supervisors to discover more about what each project involves. Students then submit a ranked list of preferences and are assigned to a project in August. Project allocation is based on the dual aims of maximizing student satisfaction and balancing staff workload.

**Note:** As of 2016-2017, students should **not make unsolicited approaches to supervisors prior to receiving the project booklet in the summer.**

**Supervisions**

Projects **differ enormously** in the nature and timing of their workload. Some will involve substantial early data collection – perhaps even starting over the summer vacation. Others will take much longer to set up, but might be run relatively quickly. Some will involve length and very complex data analysis; others will require only straightforward “off the shelf” statistical methods.

It is **best not to make comparisons with other projects students**; rather, you should discuss the time-course and practicalities of your project with your supervisor.

You can expect in general the following support from your supervisor:

- Your supervisor will provide you with initial references to preliminary readings, and encourage you to conduct further independent library research.
- Guidance will be given to you regarding the technical aspects of your research and your supervisor will be available for consultation during term time.
- Your supervisor will provide guidance on statistical analysis of your data, although you are expected to conduct the actual analysis yourself.
- Your supervisor will be available to discuss your ideas about the structure and content of your report.
- Supervisors can provide feedback on **one draft of the Methods and Results sections of your report.** They **cannot provide feedback on any other sections and can only provide one round of feedback.** Please respect this rule and do not put supervisors or other academics in an awkward position by asking for more than one round of feedback or soliciting feedback from other supervisors.

**Lectures**

Separate lectures will be given for how to write up your dissertation/report. A series of lectures will also be given on statistical analysis and how to design your research. These lectures will not be directly assessed, but are important for you to attend so as to assist you in your research.

**Sponsorship, Insurance, and Ethical approval**

Most research projects require University sponsorship, insurance, and ethical approval. Students should check with their supervisor to establish whether these are in place for their project. Sponsorship and insurance will usually have been arranged beforehand, but it is worth checking. Ethical approval may or may not
be in place. The Department of Psychology Ethics Committee can approve projects which pose little or no ethical issues. It meets once per term and during the summer, electronic applications must be submitted three days in advance of when the Committee meets in order to be reviewed. More information on the remit and application process of the Ethics Committee can be found here:

http://www.psychol.cam.ac.uk/ethics_committee

Projects which are not suitable to be reviewed by the Department of Psychology Ethics Committee should instead gain ethical approval by the School of Biological Sciences Psychology Research Ethics Committee. The Committee typically requires 6-8 weeks to process an application, sometimes as long as 12 weeks:

http://www.bio.cam.ac.uk/psyres

For projects involving experimental animals you are not allowed to perform scientific procedures, but you will have these performed for you where necessary by scientists with the necessary Home Office licenses. You will, however, be required to attend a very short induction course and be screened by Occupational Health for possible allergens etc. These requirements are not time-consuming.

Students should discuss with their supervisors what ethical issues their research may have and whether approval has already been granted, and submit an application to the relevant Committee as soon as possible where necessary.

**Plagiarism**

Concerns about plagiarism are taken very seriously and students should ensure that they are familiar with [the Faculty of Biology's guidance](http://www.bio.cam.ac.uk/psyres).

Cases of suspected plagiarism may be submitted to the Turnitin UK text-matching program, as may a random sample of reports. Cases of suspected unfair practice including plagiarism, potential data fabrication, or collusion will be investigated by the Chair of Part II Exams on a case-by-case basis. This investigatory meeting may involve examiners, supervisors, College Tutors or the University Proctors. Following the investigatory meeting, the Chair may recommend that penalties be applied to the final mark. All penalties to be applied will be agreed at the final Examiners’ meeting. Students should read the [University’s Statement on Plagiarism](http://www.bio.cam.ac.uk/psyres).

When submitting reports, students will sign a cover sheet detailing their work. The form will also confirm that students have read the guidance on plagiarism, they understand what plagiarism is, and that they consent for their work to be submitted to Turnitin that checks for originality. Further information can be found on the survey linked to above, and from the Teaching Administrator.
Word limit

The project report shall not exceed 7,000 words, including footnotes but excluding any tables, captions, figures, bibliography, and appendices. This means that the title page, abstract, and any table of contents page are included in the word count.

The word count and the word limit should be written on the coversheet for your report at submission. As a general rule, any content that the Examiners must read in order to assess your work should be included in the main body and not in an appendix; overuse of appendices may be penalised if it impairs the understanding of your work. Indeed, most reports do not need any appendices.

Acknowledgements

You do not need to include an “Acknowledgements” section. However, you will need to complete a coversheet that confirms that the work is original, and that states your contribution to the project; this sheet will be disseminated by email and Moodle prior to the deadline. In addition, the origins of any data that you analyse must be clear in the main text (e.g., if you are analysing an existing data-set rather than data that you collected, then the origins of those data must be explicitly-stated in the report).

Layout

- Reports will usually comprise the following sections: Abstract; Introduction; Methods; Results; Discussion; References.
- Use 12-point font and double-spacing for the main text. (Single-spacing is acceptable for footnotes, captions, and reference list).
- Margins: Allow an ample margin (e.g., one inch) on both sides of the page.
- Pagination: Print on one side only, and number the pages serially from 1.
- Abbreviations: At the first mention give the full name and its acronym or abbreviation in brackets. It is often useful to include a list of the acronyms and abbreviations you use.
- Acknowledgements: Any statement of acknowledgements should appear before the start of the examinable text.
- The word-count should be printed on the front of the report
- All work should be proofread; examiners will penalise work with many grammatical or typographical errors.
- The student’s name or any other identifying information should be excluded from the text. Any identifiable information found in a submitted text will be censored by hand, which will affect the professional presentation of the dissertation.

References and bibliographies

Proper referencing is an important part of scholarship and academic writing. Examiners often follow up a selection of references and will be irritated if they cannot find what they are looking for.

Referencing – both in-text and in the reference list/bibliography -- should follow APA format. Some word processing programmes (e.g., Endnote for later versions
of Microsoft Word) format references automatically from a bibliographical database in a variety of accepted conventions, including APA format. These can be extremely useful, particularly if you update your database each time you read new material.


Useful guides to APA referencing can be found here: [https://owlenglish.purdue.edu/owl/resource/560/01/](https://owlenglish.purdue.edu/owl/resource/560/01/). The following might also be useful: [http://apastyle.org/](http://apastyle.org/)

**Submission**

1. **Two** hard copies of the dissertation must be submitted to the Teaching Secretary Ms Louise White, on the first floor of the Department of Psychology main building on the Downing Site, by:

   NST/MVST Students: **12.00 noon on Thursday 3rd May**
   PBS Students: **12.00 noon on Friday 4th May**

2. The hard copies must be accompanied by a coversheet that confirms originality and student contribution.

3. An electronic copy **(not in PDF format)** of the dissertation/report must also be sent to ResearchProjectSubmit@cam.ac.uk

**Penalties for late work**

All work must be submitted by 12.00 noon on the advertised deadline. **Both the hard copies and electronic copy must be received by 12.00 noon in order for the work to be considered as “submitted”**.

For students on the NST Tripos, the details of penalties for late submission are described in the NST Exam Regulations. The same policies will apply to PBS students. **Note that work that is submitted late, without having an extension granted, risks being scored zero**.

Students who have good reason to request an extension (e.g., serious health problem, major family difficulty) should contact their College as soon as possible, as all requests must be sent from the Director of Studies or the College’s Senior Tutor to the Secretary of the Board of Examinations. All requests must be accompanied by appropriate evidence. You should ensure that you allow appropriate time to print and present your work before the deadline. Problems with computers or printing facilities will not be accepted as reasons for late submission, and all work must be bound (stapled or in a hole-punched binder).
**Assessment**

Dissertations/reports are marked by academics sharing the field of research you have explored.

PBS 7: Research Dissertation is worth 25% of the overall class for that year, the same as for all other papers PBS Part IIB students take. The Part II Research Project mark is scaled so as to be worth 20% of the overall year for NST/MVST students.

**Marking Criteria:**

All reports are marked according to the following criteria:

<table>
<thead>
<tr>
<th>Mark</th>
<th>Description</th>
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<tbody>
<tr>
<td>80-100</td>
<td>A report which displays all of the qualities of a first-class report and demonstrates exceptional initiative, originality, and/or insight.</td>
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<tr>
<td>70-79</td>
<td>An excellent report that draws on a wide range of relevant empirical and theoretical work to motivate the research question, provides a clear, complete, and accurate statement of the Methods and Results, and offers insightful and/or original interpretations, conclusions, and future directions. Very high accuracy; near-faultless writing and presentation.</td>
</tr>
<tr>
<td>60-69</td>
<td>A good report that covers relevant background material and articulates a coherent research question, whose Methods and Results are generally clear, and which offers sensible interpretations/conclusions/future directions. The selection of a mark from the top of this range should reflect the presence of elements of excellence that characterize first-class work; selecting a mark from the lower end would reflect elements of weaknesses that typify 2:2 work.</td>
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<tr>
<td>50-59</td>
<td>An adequate but limited report that provides some context for the research, explains what was done and what was found, and attempts to interpret the findings. Work falling in this band may be characterized by persistent minor ambiguities, inaccuracies, or irrelevances that run through most or all sections, or by generally good performance that is let down by one or two major shortcomings (e.g., a poor Discussion).</td>
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<tr>
<td>40-49</td>
<td>A weak report that has all of the elements expected (e.g., a review of relevant prior work, a statement of what was done and what was found, and some attempt at interpreting the results) but which suffers from frequent omissions/inaccuracies/failures to communicate, or is generally adequate but undermined one or more major shortcomings.</td>
</tr>
<tr>
<td>21-39</td>
<td>A consistently poor piece of work. Some relevant material/elements are present but there are major and consistent omissions/inaccuracies/irrelevances/failures to communicate.</td>
</tr>
<tr>
<td>1-20</td>
<td>A report that either shows a complete failure of understanding of the subject, or is radically incomplete.</td>
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</table>
Further information
For any queries regarding choosing a project or what is expected of you, contact, in the first instance, your Director of Studies/Coordinating Supervisor.

Questions may also be addressed, by email, to teaching@psychol.cam.ac.uk, marked for attention of Course Organiser, Dr Greg Davis.

Useful links:
Department of Psychology Library
www.library.psychol.cam.ac.uk

PBS Tripos Part IIB Moodle Site
www.vle.cam.ac.uk/course/view.php?id=83931

NST Part II Moodle Site
www.vle.cam.ac.uk/course/view.php?id=68321

PBS Tripos Part IIB webpage
www.pbs.tripos.cam.ac.uk/current/year3
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<td>Amy Milton</td>
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<td>BM1</td>
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<td>BM2</td>
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<td>DB2</td>
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<td>DB3</td>
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<td>GD1</td>
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<td>Telltale Glances: Tracking rapid saccades to reveal hidden attention to suppressed object representations</td>
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<td>GD2</td>
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<td>GD3</td>
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<td>Reversible commissurectomy?</td>
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<td>JM5</td>
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<tr>
<td>JR1</td>
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<td>Individual differences in essentialism as a predictor of left-right views on immigration</td>
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<td>KPG1</td>
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<td>LT1</td>
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<td>MB1</td>
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<td>MB2</td>
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<td>Playing the averages: does remembering summary statistics free up memory resources?</td>
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<td>PB6</td>
<td>Paul Bays</td>
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<td>SBC1</td>
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<td>Pregnancy history in mothers of a child with autism.</td>
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<td>SBC2</td>
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<td>Puberty history in mothers of a child with autism.</td>
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<td>SBC3</td>
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<td>SS1</td>
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<td>SVDL4</td>
<td>Sander Van der Linden</td>
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<td>Tristan Bekinschtein</td>
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<td>Assessing the contribution of dopamine D1/D2 receptors to reinforcement sensitivity and cognitive flexibility in mice</td>
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<td>Trevor Robbins</td>
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<td>Usha Goswami</td>
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Title: (AM1) Destabilising instrumental memories

Permanent academic with ultimate responsibility for the project:
Name: Amy Milton
Department: Psychology
Location: Main Building
Email: alm46@cam.ac.uk

Number of students who can work on this project:
Minimum: 2 Maximum: 2

Project Description:
It was once widely believed that memories, once consolidated, were permanently stored within the brain. However, the rediscovery of memory reconsolidation, the process by which memories are restabilised within the brain following their destabilisation at retrieval, indicates otherwise (Lewis, 1979; Nader, 2003). It has been shown in a number of behavioural tasks that even old, well-established memories can be made susceptible to disruption upon retrieval, and that their reconsolidation depends upon gene transcription, translational regulation and ultimately protein synthesis. However, one type of memory that has not yet been shown to require reconsolidation following retrieval is instrumental memory: memories that concern responses made in the environment (see Dickinson, 1994, for review). A previous report (Hernandez & Kelley, 2004) suggested that instrumental memories do not undergo reconsolidation, but there are several methodological issues that may underlie the lack of memory disruption observed in that study. More recent data (Exton-McGuinness et al., 2014) indicate that instrumental memories do undergo reconsolidation, but only under conditions in which the reinforcement schedule is changed during memory reactivation. We have pilot data replicating and extending this finding, potentially indicating that conditions that favour the expression of goal-directed, rather than habitual memories, lead to memory destabilisation. The aim of this project is to test the robustness of our pilot data, extend these with some additional test conditions, and to determine whether weakening the instrumental memory by impairing its reconsolidation returns it to a goal-directed state, using outcome devaluation procedures. The students who undertake this project would gain experience of behavioural testing with rats. Consistency is very important in behavioural testing – the animals need to run at the same time every day – and so the pair of students should be able to arrange this between themselves, and also work at the weekends if necessary. Acceptance on this project would also be subject to obtaining clearance to work with animals from Occupational Health.

References:
Title: (BM1) The loudness of time-varying sounds that differ at the two ears

Permanent academic with ultimate responsibility for the project:
Name: Prof. Brian C.J. Moore  
Department: Psychology  
Location: Main building, room 301  
Email: bcjm@cam.ac.uk

Primary contact/day-to-day supervisor (if different from the above):
Name: Dr. Josef Schlittenlacher  
Department: Psychology  
Location: Main building room 304  
Email: js2251@cam.ac.uk

Number of students who can work on this project:  
Minimum: 1 Maximum: 2

Project Description:
Some models for predicting the loudness of sounds as perceived by human listeners are based on the assumption that loudness simply sums across ears. However, Moore and Glasberg (2007) proposed a model incorporating the concept of binaural inhibition, based on the idea that a signal in one ear can reduce the loudness evoked in the other ear. The model of Moore and Glasberg (2007), which has recently been adopted as an ISO standard (ISO 532-2, 2017), is applicable only to steady sounds. Recently, the model has been extended to deal with time-varying sounds, such as speech and music (Moore et al., 2016).
So far, the model has been tested by using amplitude-modulated sinusoidal carriers who pattern of amplitude modulation differs at the two ears. The model was able to account for the results fairly well. However, further tests of the model are needed using other types of sounds, for example speech-like noises whose pattern of amplitude modulation differs at the two ears or complex sounds with dynamically changing spectra that differ at the two ears. The proposed project would involve obtaining loudness judgements for such sounds. It is anticipated that the results would lead to a published journal article.

References:
Title: (BM2) Evaluation of a fast method for estimating auditory filter shape

Permanent academic with ultimate responsibility for the project:
Name: Prof. Brian C.J. Moore
Department: Psychology
Location: Main building, room 301
Email: bcjm@cam.ac.uk

Primary contact/day-to-day supervisor (if different from the above):
Name: Dr. Josef Schlittenlacher
Department: Psychology
Location: Main building room 304
Email: js2251@cam.ac.uk

Number of students who can work on this project:
Minimum: 1 Maximum: 2

Project Description:
A popular method for quantifying the frequency selectivity of the auditory system is the “notched-noise” method for determining the auditory filter shape at a specific frequency (Patterson, 1976; Glasberg and Moore, 1990). This method involves the detection of a sinusoidal signal in the presence of noise with a spectral notch around the signal frequency. The width of the notch is systematically varied.

The traditional notched-noise method is time consuming. However, there is interest in having a rapid measure of frequency selectivity for use in clinical applications. This project will explore the use of a novel adaptation of the notched-noise method based on “machine learning”. The basic idea is that the specific stimuli for a particular trial are chosen to maximise the likely gain in information provided by that trial, based upon a computational model of the auditory system of the listener. The method should be quicker than the traditional method. The project would compare the machine-learning method with the traditional method to assess their relative speed and accuracy.

References:
Title: (BM3) Can a low-frequency tone produce modulation masking at high frequencies?

Permanent academic with ultimate responsibility for the project:
Name: Prof. Brian C.J. Moore
Department: Psychology
Location: Main building, room 301
Email: bcjm@cam.ac.uk

Primary contact/day-to-day supervisor (if different from the above):
Name: Dr. Josef Schlittenlacher
Department: Psychology
Location: Main building room 304
Email: js2251@cam.ac.uk

Number of students who can work on this project:
Minimum: 1 Maximum: 2

Project Description:
People with hearing loss often complain that they find it hard to discriminate sounds (including speech) in the presence of low-frequency sounds, like car noise or noise from air-conditioning. This may simply reflect the “spread of excitation” from low frequencies towards higher frequencies, which becomes more pronounced in hearing-impaired people (Glasberg and Moore, 1986). However, it may also partly reflect an effect called “modulation masking” (MM). MM is an effect whereby the detection or discrimination of amplitude modulation (AM) at a specific rate (say 50 Hz) is adversely affected by AM at nearby rates (Houtgast, 1989). The discrimination of the patterns of AM in speech is crucial for speech intelligibility, and may be adversely affected by AM in background sounds (Stone et al., 2012).

A low-frequency sound, such as a 50-Hz tone, produce bursts of spikes in the auditory nerve at 20-ms intervals. This pattern of nerve spikes is similar to that produced by a high-frequency tone with AM at a 50-Hz rate. It is possible, therefore, that a steady 50-Hz tone will produce MM.

The proposed experiment would involve measuring the ability to detect AM of a sinusoidal carrier with a carrier frequency of, say, 2000 Hz, in the presence of a 50-Hz tone. The AM depth required for the AM to be detected will be measured as a function of AM rate, using rates below, at and above 50 Hz. If the 50-Hz tone produces MM, this would be revealed by AM detection thresholds that are higher for AM rates near 50 Hz than for lower or higher rates. Results will be compared for normal-hearing and hearing-impaired subjects, to assess whether MM is greater for the latter.

References:
Title: (CH1) Learning about people from characters with Autism: 
Sesame Street and Interpersonal Behaviour

Permanent academic with ultimate responsibility for the project:
Name: Professor Claire Hughes
Department: Centre for Family Research
Location: New Museums Site
Email: ch288@cam.ac.uk

Primary contact/day-to-day supervisor (if different from the above):
Name: Gabrielle McHarg (PhD student)
Department: Centre for Family Research
Location: New Museums Site
Email: ggm25@cam.ac.uk

Number of students who can work on this project:
Minimum: 2 Maximum: 2

Project Description:
This research compares children’s interpersonal interactions after watching highly 
prosocial television (Sesame Street clips including a character with Autism),
avademic television (Sesame Street clips including counting, colour identification,
and other such content), and neutral television (Sesame Street clips including neither
highly prosocial content nor academic content). This project will involve contacting
and visiting nursery classrooms to show the clips and to observe interpersonal
interactions (including interactions with children with disabilities). This will be best
achieved with a pair of researchers observing the same children with a slightly
different outcome variable in mind for his/her final project. Research into characters
with disabilities and how they influence behaviour is novel and important in the
current technological landscape.

References:
children's social interactions: A meta-analysis. Media Psychology, 7(3), 301-
322.
Street" and" Mister Rogers' Neighborhood" on children's social behavior in the
preschool. Child Development, 138-144.
future of children, 18(1), 87-118.
Title: (DB1) Transcriptomic correlates of compulsive drug seeking behaviour

Permanent academic with ultimate responsibility for the project:
Name: David Belin / Barry Everitt
Department: Psychology
Location: Main building
Email: bdb26@cam.ac.uk / bje10@cam.ac.uk

Primary contact/day-to-day supervisor (if different from the above):
Name: David Belin       Email: bdb26@cam.ac.uk

Number of students who can work on these projects:
Minimum: 2  Maximum: 4

Project Description:
All individuals exposed to addictive drugs do not necessarily lose control over their recreational use and develop compulsive drug seeking habits, the hallmark of addiction. Capitalising on novel models of individual vulnerability to develop compulsive heroin and cocaine seeking in rats this project aims to investigate the cellular mechanisms taking place in the corticostriatal circuitry that support this vulnerability. Using a combination of contemporary molecular biology techniques, including in situ hybridisation, RNAscope and western-blot the candidates will investigate the level of expression of the mRNA and proteins of candidate genes in the different structures of the corticostriatal circuits potentially involved in the development of compulsive drug seeking. This project will require the candidates extensively to use in silico analysis tools and image analysis softwares. A strong impetus will be put on functional neuroanatomy, experimental design and statistical analysis, including dimensional analyses such as multiple and factorial regression analyses.

References:
Title: (DB2) Transcriptomic correlates of compulsive behaviour and its potentiation by Atomoxetine

Permanent academic with ultimate responsibility for the project:
Name: David Belin / Barry Everitt
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Location: Main building
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Primary contact/day-to-day supervisor (if different from the above):
Name: David Belin
Department: Psychology
Location: Main Building
Email: bdb26@cam.ac.uk

Number of students who can work on these projects:
Minimum: 2 Maximum: 4

Project Description:
All individuals exposed to aversive situations develop adaptive coping strategies. However, some vulnerable individuals will eventually lose control over these coping strategies that have become habitual, thereby developing compulsivity. We have recently identified impulsivity as an endophenotype of vulnerability to compulsivity which is dependent on noradrenergic mechanisms.

Using RT-qPCR and RNAscope, the candidates will investigate transcriptomic correlates of individual vulnerability to develop compulsive behaviour, as measured in a schedule-induced polydipsia procedure, and investigate the cellular substrates by which Atomoxetine, a selective noradrenaline reuptake inhibitor, affects compulsivity. This project will require the candidates to use in silico analysis tools and image analysis softwares.

A strong impetus will be put on functional neuroanatomy, experimental design and statistical analysis, including dimensional analyses such as multiple and factorial regression analyses.

References:
Title: (DB3) Cellular and molecular correlates of the influence of deep brain stimulation of the nucleus accumbens core on the transition from impulsivity to compulsivity: focus on the anterior insula

Permanent academic with ultimate responsibility for the project:
Name: David Belin / Barry Everitt
Department: Psychology
Location: Main building
Email: bdb26@cam.ac.uk / bje10@cam.ac.uk

Primary contact/day-to-day supervisor (if different from the above):
Name: David Belin
Department: Psychology
Location: Main Building
Email: bdb26@cam.ac.uk

Number of students who can work on these projects:
Minimum: 2 Maximum: 4

Project Description:
Impulsivity represents an endophenotype of vulnerability to develop compulsive disorders such as drug addiction and Obsessive Compulsive Disorder (OCD). However, the neural mechanisms whereby impulsivity contributes to an increased vulnerability to develop compulsive behaviours remain unknown, thereby preventing the development of new effective therapeutic strategies. We have recently demonstrated that Deep Brain Stimulation of the nucleus accumbens core prevents, in highly impulsive rats, the development of compulsive behaviour, as measured in a schedule polydipsia procedure (SIP). However, the neural basis of the effect of such invasive manipulation of the ventral striatum, at the level of the functionally associated corticostriatal circuitry, remains unknown.

Using RT-qPCR and RNAscope, the candidates will investigate transcriptomic correlates of the influence of deep brain stimulation of the nucleus accumbens core on the development of compulsivity. The investigations will focus on the anterior and posterior insula, as well as the amygdala. This project will require the candidates extensively to use in silico analysis tools and image analysis softwares.

A strong impetus will be put on functional neuroanatomy, experimental design and statistical analysis, including dimensional analyses such as multiple and factorial regression analyses.

References:
Title: *(DB4)* Neural, cellular and molecular basis of interoception in the rat

Permanent academic with ultimate responsibility for the project:
Name: David Belin / Barry Everitt  
Department: Psychology  
Location: Main building  
Email: bdb26@cam.ac.uk / bje10@cam.ac.uk

Primary contact/day-to-day supervisor (if different from the above):
Name: David Belin  
Department: Psychology  
Location: Main Building  
Email: bdb26@cam.ac.uk

Number of students who can work on these projects:  
Minimum: 2 Maximum: 4

Project Description:
In Humans, interoceptive mechanisms contribute to subjective states thereby influencing executive functions. However, the underlying neurobiological mechanisms, known to involve the insula, remain poorly understood. Similarly, the neurobiological mechanisms whereby lower species, such as rats, interpret and utilise interoceptive states to direct their behaviour remain unknown. This project aims behaviourally to characterise whether interoceptive cues are sufficient to guide instrumental responding as measured in a drug discrimination paradigm and, at the neural level, to identify if interoceptive control over behaviour is associated with cellular adaptations within the insular cortex. We have recently demonstrated that rats can discriminate sympathomimetic drugs that only act on the periphery.

Using RT-qPCR and western-blot analyses on samples obtained from these behavioural experiments, the candidates will investigate level of expression of mRNAs and proteins of candidate genes in the insula and functionally associated structures that are associated with interoceptive control over behaviour.

This project will require the candidates extensively to use in silico analysis tools and image analysis softwares.

References:
Title: (DG1) Inhibiting the pathway from values to violence: Assessing the impact of interventions

Permanent academic with ultimate responsibility for the project:
Name: David Good
Department: Psychology
Location: William Hardy Building
Email: dg25@cam.ac.uk

Number of students who can work on this project
Minimum: 1 Maximum: 4

Project description
Our group has developed an intervention which inhibits the pathway from extreme values to violence. The intervention has been run in a number of locations including London via “Being Muslim Being British”, Scottish Young Offender Insitutions via “ISEE! Scotland” and with collaborators in Sweden Finland Bosnia and Pakistan. It draws on Suedfeld’s Theory of Integrative Complexity but also has roots in Social Identity Theory. At this stage we can offer the opportunity to work on the secondary analysis (via the IC Coding procedure for which training will be provided) of assessment materials resulting from various interventions, with the possibility of being involved in an intervention. We are currently working on alternative measures and experimental tests of elements of the interventions and these may be available for student projects in the autumn.

References:
Title: (DS1) Do demographic differences in neurodevelopmental and neuropsychiatric disorders depend on the specific diagnostic tests used?

Permanent academic with ultimate responsibility for the project:
Name: Denes Szucs
Department: Psychology
Location: Craik Marshall Building
Email: ds377@cam.ac.uk

Primary contact/day-to-day supervisor (if different from the above):
Name: Emma Carey
Department: Psychology
Location: Craik Marshall Building
Email: ec475@cam.ac.uk

Number of students who can work on this project:
Minimum: 1 Maximum: 4

Project Description:
Many neurodevelopmental and neuropsychiatric disorders are diagnosed to different degrees depending on individual demographics. For example, ADHD is diagnosed more frequently in boys and men (Rucklidge, 2010), whereas depression and anxiety are diagnosed more often in girls and women (Albert, 2015; McLean, Asnaani, Litz & Hofmann, 2011). Some conditions also show an effect of race and/or ethnicity – for example, according to one study, black Caribbean individuals have a 9-times elevated risk for developing schizophrenia as compared with white British individuals (Pinto, Ashworth & Jones, 2008).

For many of these conditions, there are multiple diagnostic tests used. We are interested in whether diagnostic tests have an impact on the demographics who are diagnosed with certain conditions; for example, in developmental dyscalculia it has been shown that different diagnostic criteria may determine whether or not dyscalculia is more prevalent in girls (Devine, Soltesz, Nobes, Goswami and Szucs, 2013). We are currently investigating whether the specific test used affects demographics of those diagnosed with autism, so it will not be possible to investigate autism in this project. However, there is scope for you to look at any other neuropsychiatric or neurodevelopmental disorder which you are interested in, so long as there is sufficient research available to conduct a meta-analysis (and that the research does not already exist).

This would involve, with guidance, conducting a literature search to identify relevant papers using each diagnostic test for the condition of interest, and then extracting the statistics representing demographic make-up of the population who are diagnosed compared with those who were tested. Please note that this project would not involve working with participants directly, and would instead involve meta-analysis of previously collected data. This would be a standalone project rather than fitting into another lab project; this gives you a lot of flexibility over the project. If you have specific ideas and would like to confirm whether this would be possible, please contact us for more information prior to project selection.

References:


Title: (DS2) Insight into maths: eye-tracker study

Permanent academic with ultimate responsibility for the project:
Name: Denes Szucs
Department: Psychology
Location: Craik Marshall Building
Email: ds377@cam.ac.uk

Primary contact/day-to-day supervisor (if different from the above):
Name: Dr Sara Caviola
Department: Psychology
Location: Craik Marshall Building
Email: sc2014@cam.ac.uk

Number of students who can work on this project:
Minimum: 1 Maximum: 4

Project description:
Mathematics likely builds on several cognitive abilities, such as working memory, executive functions, general reasoning, etc. At the same time, the performance in mathematical tasks is often conditioned by emotional aspects (i.e., feelings of apprehension and worry, generally defined by the literature with the term ‘math anxiety’). Thus, the main objective of the project is to extend the knowledge in this field, by investigating these underlying cognitive and emotional processes during the execution of mental arithmetic.
Moreover, we aim to assess individual differences in mathematics performance by recording participants’ eye gazes.
The experimental tasks will require participants to perform mental calculations, embedded in a dual-task design, that will be presented on a computer screen. During this phase, eye-movements will also be recorded.
Students will be involved in all the steps of the experimental design, from the literature review, the subsequent stimuli creation, the data analysis and so on. They will be asked to test at least 20 participants each. Mathematical achievement tests and other standardized measures—that will be discussed together—could also be implemented in the project.

References:
Title: (DS3) Understanding expert math ability

Permanent academic with ultimate responsibility for the project:
Name: Denes Szucs
Department: Psychology
Location: Craik Marshall Building
Email: ds377@cam.ac.uk

Primary contact/day-to-day supervisor (if different from the above):
Name: Dr Lincoln Colling
Department: Psychology
Location: Craik Marshall Building
Email: ljc65@cam.ac.uk

Number of students who can work on this project:
Minimum: 1 Maximum: 4

Project Description:
Math ability relies on an extended network of cognitive skills. Studies of normal and impaired mathematical development in children and adults have consistently pointed to the role of visuospatial working memory (VSWM) as a particularly important hub in this cognitive network. Recent research has also shown that, in children, higher levels of math expertise may be associated with very high VSWM capacity. However, to date it remains unclear whether adults with very high levels of expertise in mathematics might have specialised working memory systems. Rather than merely measuring working memory capacity—that is, the number of items that people can hold in memory—recent work in our lab has sought to investigate how precisely people can store fine-grained information. This work has shown that mathematicians, relative to psychologists and engineers, might have working memory systems that are specialised for storing fine-grained spatial information, with no differences found for visual information like colours. The current project will look to replicate and extend this finding by examining whether those working in academic fields that rely on manipulating fine-grain spatial information show similar specialisation in their working memory abilities.

References:
Being able to suppress awareness of particular objects or features is a key life skill, likely fundamental to many aspects of self-control. A growing consensus holds that when instructed to suppress attention to an object, our attention becomes irresistibly drawn to it. This phenomenon, termed the 'Attentional White Bear' effect suggests that our self control must work in a 'Search and Destroy' manner, first locating the object to be ignored, then moving our attention away from its location (refs 1-2). In our recent work (ref 3, Daffron & Davis, 2015) we have challenged this consensus using a novel search task. However, our evidence has only been indirect - the key study that could topple the consensus view requires passive tracking of rapid saccades. The current project will do this. The consensus view and our own have directly opposing predictions – either that initial saccades should always be toward the ignored object, or, instead, toward the other object in the display.

References:


Title: (GD2) ‘Targetless’ search – a novel approach to overcoming human limitations on detection of rare targets.

Permanent academic with ultimate responsibility for the project:
Name: Greg Davis
Department: Psychology
Location: 307, Main Building
Email: gjd1000@cam.ac.uk

Number of students who can work on this project:
Minimum: 2 Maximum: 3

Project Description:
When observers are tasked with searching for multiple types of objects, they will reliably detect common targets, but perform poorly on rare ones (refs 1-3). This ‘blind spot’ for rare targets constrains human performance in some of the most crucial tasks humans perform, including search of medical X-rays for tumours, or X-rayed baggage for threats at airports. Funded by the UK Department for Transport, we have begun recently developed a novel ‘Targetless’ approach to search that seems to alleviate poor detection of rare targets. However, we have yet to conduct the key experiments to isolate effects of prevalence from other nuisance variables. This project will do so.

References:
Title: (GD3) Additive Unconscious influences on Free Choices

Permanent academic with ultimate responsibility for the project:
Name: Greg Davis
Department: Psychology
Location: 307, Main Building
Email: gjd1000@cam.ac.uk

Number of students who can work on this project:
Minimum: 2 Maximum: 2

Project Description:
When observers are asked to make a series of free, arbitrary choices, those choices can be influenced by unconsciously perceived stimuli, via stimulus-response associations formed during the experiment (e.g., refs 1-2). Such effects have the potential to challenge our fundamental intuitions about free choices and conscious control over behaviour. However, while they may be statistically reliable, these effects are universally small – swaying free choices by only around 5%. This project will combine two different unconscious cues, within the same trials, to boost unconscious influences.

References:

Title: (JD1) Deciphering the neural basis of behaviour using high-field magnetic resonance imaging

Permanent academic with ultimate responsibility for the project:
Name: Professor Jeff Dalley
Department: Psychology
Location: Main Building: room 215
Email: jwd20@cam.ac.uk

Primary contact/day-to-day supervisors (if different from the above):
Name: Dr Bianca Jupp and Peter Zhukovsky
Department: Psychology
Location: Main Building: 216 and 209
Email: bj251@cam.ac.uk; pz249@cam.ac.uk

Number of students who can work on this project:
Minimum: 1 Maximum: 2

Project Description:
Using a newly-acquired 9.4T MRI scanner, located in a state-of-the-art imaging facility, this project will investigate structural and functional correlates of a number of behavioural traits present in individuals addicted to drugs. As a first step we will acquire structural (diffusion tensor imaging, DTI; voxel-based morphometry, VBM) and functional (fMRI, MR spectroscopy) scans from a large cohort of adult outbred rats. Next, we will segregate the cohort on the basis of a number of discrete, partially-overlapping behavioural traits, including impulsivity, anxiety, novelty preference, sign versus goal-tracking, decision-making, reward sensitivity and stimulus-response learning. Finally, following a second MR scan, we will investigate gene expression and various gene products (receptors, synthetic enzymes, transporters) in multiple brain regions (e.g. prefrontal cortex, striatum, hippocampus, amygdala, and mid-brain) and inter-relate these with the various behavioural traits. As this is a large-scale interdisciplinary project, with several inter-locking objectives, students can elect to work on one aspect of the study they find most stimulating.

References:

Title: (JD2) Neural circuit analysis of impulsivity using Designer Receptors Exclusively activated by Designer Drugs (DREADDs)

Permanent academic with ultimate responsibility for the project:
Name: Professor Jeff Dalley
Department: Psychology
Location: Main Building: room 215
Email: jwd20@cam.ac.uk

Primary contact/day-to-day supervisors (if different from the above):
Name: Dr Johan Alsiö and Chiara Toschi
Department: Psychology
Location: Main Building: 401 and 209
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Number of students who can work on this project:
Minimum: 1 Maximum: 2

Project Description:
Impulsivity is a complex behavioural trait present in humans and other animals. It is also a feature of such brain disorders as attention-deficit/hyperactivity disorder (ADHD), schizophrenia, Parkinson’s disease, depression, and drug addiction. Understanding the neural mechanisms of impulsivity is therefore expected to facilitate the development of new therapies for a range of disorders. This project aims to investigate the role of the mesolimbic dopamine (DA) system in one form of impulsivity – namely premature responding in a task used widely to assess sustained visual attention in rats. The main objective of this research is to understand the unique contribution of DA-ergic neurons innervating the shell and core sub-regions of the nucleus accumbens (NAcb), collectively major terminal regions of the mesolimbic DA system. This will be achieved by expressing engineered receptors, DREADDs, specifically in midbrain DA neurons projecting to the NAcb core and shell. This manipulation will allow DA-ergic inputs to the NAcb core and shell to be selectively activated and silenced while rats perform an attentional/impulsivity task.

References:
Title: (JD3) Exploring the roles of the direct and indirect pathways in visual-discrimination serial reversal learning

Permanent academic with ultimate responsibility for the project:
Name: Professor Jeff Dalley
Department: Psychology
Location: Main Building: room 215
Email: jwd20@cam.ac.uk

Primary contact/day-to-day supervisors (if different from the above):
Name: Dr Johan Alsiö and Júlia Sala Bayo
Department: Psychology
Location: Main Building: 401
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Number of students who can work on this project:
Minimum: 1 Maximum: 2

Project Description:
Many disorders of the brain have been linked to deficits in cognitive flexibility, including schizophrenia, obsessive-compulsive disorder, drug addiction and Parkinson’s disease. This rigid form of decision-making can be studied in experimental animals using reversal learning tasks where subjects learn a simple discrimination (A+ B-) and subsequently must switch in response to a sudden change in contingency (B+ A-). The cost of switching is typically assessed by the number of perseverative responses to the previously correct stimulus (i.e. A+). Work over many years has implicated orbitofrontal-striatal circuitry in this behaviour together with modulatory contributions from serotonin and dopamine. This project aims to understand the nature of dynamic interactions between the direct and indirect pathways in the striatum and how they relate to reversal learning performance. To achieve this we will use a range of contemporary techniques to dissociate the direct and indirect pathways, including intracerebral administration of selective dopaminergic agents and virally-mediated approaches (e.g. DREADDs) to selectively activate and silence these pathways.

References:

Title: (JM1) Pavlovian conditioning of the pupillary dilation response.

Permanent academic with ultimate responsibility for the project:
Name: J. D. Mollon
Department: Psychology
Location: Craik-Marshall Building, Room 305
Email: jm123@cam.ac.uk

Joint supervisor:
Name: Marina Danilova
Department: Psychology
Location: Craik-Marshall Building, Room 305
Email: mvd1000@cam.ac.uk

Number of students who can work on this project:
Minimum: 1 Maximum: 2

Project Description:
This is a project that would be enjoyed by a student who enjoys working with actual apparatus and who is interested in basic processes of learning and of vision.
In the Russian Federation, in almost every first-year course in physiology, there is a demonstration of Pavlovian conditioning of pupillary dilation. One eye is patched throughout the procedure. The other eye views a bright screen. For a period of a few seconds, an occluder is introduced in front of the open eye (this is the UCS). Just before the onset of the occlusion, an auditory signal (the CS) is turned on and it is continued during the occlusion. This pairing is repeated for a number of trials and then the CS is presented alone.
The natural response of the pupil of the eye to a reduction in light is dilation. Apparently the conditioned response is readily obtained. In a rapid search, however, we can find no experimental study of the conditioned dilation response in the last thirty years – in either the English or the Russian literature. There are plenty of reports of conditioning pupillary responses to shock, but little on the much more specific response to light decrements. And in the antique literature (e.g. Young, 1958) the possibility of conditioning the pupillary light response is actually doubted and it is suggested that still earlier experimenters deceived themselves by classing as CRs the normal fluctuations of the pupil.
The proposed project would use modern apparatus to track the pupillary response at high temporal resolution. Computer control, and averaging across trials, would eliminate experimenter effects. There are plenty of questions to ask: Is there really an autonomic reflex that is not susceptible to Pavlovian conditioning? Why have practical classes settled on the dilation response to light decrement rather than the constriction response to increments – which might seem the more obvious response to choose? Is the detailed form of the CR the same as that of the UCR? Does the wavelength composition of the stimulating light have an effect (i.e. does it matter whether the UCS is mediated by the melanopsin-containing ganglion cells of the retina)?

References:
Title: (JM2) Seeing motion out of the corner of the eye.

Permanent academic with ultimate responsibility for the project:
Name: J. D. Mollon
Department: Psychology
Location: Craik-Marshall Building, Room 305
Email: jm123@cam.ac.uk

Joint supervisor:
Name: Marina Danilova
Department: Psychology
Location: Craik-Marshall Building, Room 305
Email: mvd1000@cam.ac.uk

Number of students who can work on this project:
Minimum: 1 Maximum: 2

Project Description:
This is a project that would suit a student who is taking the Part II Vision course and who is already a Matlab programmer or would like to learn this valuable skill (we can provide instruction).
In the retina of lower mammals, ganglion cells were classically found that responded to stimuli moving in a particular direction. The preferred directions of different cells are clustered around the four cardinal directions (up, down, forward, backward), and some beautiful modern research has shown that each subtype of cells is genetically pre-specified. Textbooks still suggest, however, that in primates the analysis of direction of motion is delayed until the cortex. But in fact cells with the morphology of the directionally-selective type are found in primates, as are the ‘starburst’ amacrine cells that in mice and rabbits provide the mechanism of directional selectivity at the retinal level.
A part of the retina that might be expected to enjoy directional selectivity is at the very edge, near the ora serrata, which corresponds to 90 degrees from the line of sight. Here there is a mysterious ‘cone rim’ where rod photoreceptors are absent (see To et al, 2011). In fact, the cone rim, and not the fovea, accounts for the majority of cones in the retina. In the corresponding region of the visual field, we have shown that observers can detect only moving stimuli and that contrast thresholds are minimal close to the cardinal directions.
We now propose an adaptation experiment to test the hypothesis that there are detectors only for four cardinal directions in the human periphery. Our paradigm is based on an analogy with a celebrated experiment in colour vision, by Krauskopf, Williams and Heeley. The observer will be adapted with stimuli moving to and fro along a particular cardinal axis or along an intermediate axis. Sensitivity to different directions of motion will then be probed with brief liminal stimuli. By analogy with Krauskopf’s experiment, we might find that adaptation to a cardinal axis left the opposite axis unaffected, but that adaptation to an intermediate axis elevated thresholds in all directions – because both axes had been reduced in sensitivity by the adapting stimulus.

References:
1. Sabbah et al (2017) A gravitational code for motion along the gravitational and body axes. Nature, 546, 492 (June 22) [A major new paper, very relevant to the physiology; but advanced reading]
Title: (JM3) Reversible commissurectomy?

Permanent academic with ultimate responsibility for the project:
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Joint supervisor:
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Number of students who can work on this project:
Minimum: 1 Maximum: 2

Project Description:
There is an extensive, and very messy, literature on hemifield differences in normal subjects. Stimuli requiring, say, spatial or linguistic processing are presented to the left or right of fixation in the hope of revealing the superiority of one or other hemisphere for a particular type of processing. Positive results in such experiments tend to be labile, and may be due to attentional biases introduced by the task. The chief problem is that processing of the stimuli cannot be confined to one hemisphere simply by the expedient of presenting them to one or other hemifield: the vast tract of the corpus callosum links the two posterior hemispheres and it is always likely that stimulus representations are transferred rapidly to the hemisphere that is more competent to analyse them.

The Russian physiologists, Glezer and Nevskaya, in St Petersburg, some years ago published a psychophysical method by which they claim to disconnect functionally the two hemispheres. Simultaneously with presentation of a brief target stimulus to one hemifield, a masking array of similar stimuli is presented to the other hemifield. An after-coming mask is then presented to both fields. They have used this technique in a perceptual learning task where different subsets of figures are presented to the two hemifields during training. Glezer and Nevskaya report that there is no transfer of training between hemispheres under these conditions, whereas training does occur in the absence of the hemifield masks.

The neglected Glezer-Nevskaya technique deserves to be tried out with an explicitly verbal task. How competent would the right hemisphere prove to be when the left hemisphere was concurrently occupied by an array of similar material? A standard lexical-decision task might recommend itself, but other verbal or non-verbal tasks could be tried. In the case of a lexical-decision task, the material presented to the contralateral field would consist of randomly scattered words and non-words drawn from the same database. It would be appropriate to measure both speed and accuracy. The materials would be presented on a computer-controlled display using a graphics system that allows exact timing. The project would suit a student who has some experience of MatLab programming or would like to learn this valuable skill (We can offer instruction).

References:
1. Davidson and Hugdahl (1995) Brain Asymmetry [for background only]
Title: (JM4) Motion perception and the cerebral bus

Permanent academic with ultimate responsibility for the project:
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Joint supervisor:
Name: Marina Danilova
Department: Psychology
Location: Craik-Marshall Building, Room 305
Email: mvd1000@cam.ac.uk

Number of students who can work on this project:
Minimum: 1 Maximum: 1

Project Description:
This is a psychophysical project, but lying behind it is a fundamental question about how the brain works. We ask an empirical question that few investigators have asked: How precisely can participants compare stimuli that are presented in well-separated regions of the visual field? In the case of spatial frequency, we find that discrimination thresholds are the same, whether the stimuli are juxtaposed or lie in opposite hemifields at a separation of 10 degrees of visual angle. This project would ask the same question about the participant’s ability to discriminate the direction of motion of a briefly exposed field of random dots.

Lying behind the empirical question is that of how the comparison is performed. We argue that discrimination cannot depend on dedicated comparator neurons for every pair of points in the field and for every attribute of the visual stimulus: calculation shows that the required volume of white matter would be too great. We argue for a ‘cerebral bus’, able to carry abstract representations of stimuli, representations that vary from moment to moment, as on the man-built internet.

This project would recommend itself to a student who is taking the Part II courses in Vision and in Visual Cognition and who last year took PBS5 or NST IB Experimental Psychology or MVST IB. Dr. Danilova will program the experiment, but instruction in programming could be offered to a student who wanted to learn this skill. In this type of psychophysical research, it is appropriate to gather detailed parametric measurements for a small number of participants (say, six) rather than gather superficial data from a larger number.

References:
Title: (JM5) An unsolved mystery from the history of astronomy

Permanent academic with ultimate responsibility for the project:
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Number of students who can work on this:  
Minimum: 1 Maximum: 2

Project Description:
This is a project that might interest a student who is interested in astronomy and who would enjoy working with optics and doing some simple programming. The origin of experimental psychology is often traced to an incident in 1796 at the Royal Observatory. The Astronomer Royal, Maskelyne, dismissed his young assistant, David Kinnebrook, on the grounds that Kinnebrook differed from him by 800 milliseconds in judging stellar transits – that is, in estimating the moment a given star passed the meridian wire in the Greenwich telescope. The discrepancy was important, because the running of the Greenwich clock depended on the transit judgments; on the clock depended all estimates of longitude; and on estimates of longitude depended the British Empire. The 1796 incident led to the first studies of reaction time, and to the chronographs that were essential to the early years of experimental psychology. But the events of 1796 remain mysterious to this day. The transit instrument consisted of a telescope of eight-foot focal length with 5 vertical wires mounted in the image plane, the central wire corresponding to the north-south meridian. As the star approached each wire, the observer noted the position of the second-hand of the transit clock. He then began counting the beats of the clock, and noted the distance of the star from the wire on the beat before the transit and its distance from the wire on the beat after the transit. He mentally translated the ratio of the two spatial intervals into a temporal ratio, so estimating the moment of transit. The discrepancy between Maskelyne and Kinnebrook has often been attributed to the attentional phenomenon of ‘prior entry’: events occurring on a channel to which we are attending are perceived as happening earlier than those occurring on channels to which we are not attending. Modern experiments confirm the existence of prior entry for discrete events, but the subjective displacements are of the order of only 50-100 msec – and too small to explain the huge difference between Maskelyne and Kinnebrook. As a first step to solving the historical mystery, it is proposed to simulate as closely as possible the task of making transit judgements, using a mocked up telescope and presenting artificial stars moving across the screen of a computer monitor. The first variable to manipulate would be the direction of the subject’s attention. But it will also be of interest to see if modern subjects show the tendency of Kinnebrook (and one earlier assistant) to displace their perception of the beat to coincide with the occultation of the star.

References:
1. Boring, E. G. History of Experimental Psychology, ch 8 (‘The Personal Equation’)  
Title: (JR1) Individual differences in essentialism as a predictor of left-right views on immigration

Permanent academic with ultimate responsibility for the project:
Name: Jason Rentfrow
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Location: Downing Site
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Number of students who can work on this project:
Minimum: 1 Maximum: 2

Project Description:
Psychological essentialism, is a tendency to reason as if certain categories (male vs female for example) have an inherent and fixed basis. This 'bias towards essentialism' has been argued to be a universal human trait, that is evident across many cultures, and develops early in childhood. At the same time however, there is clear individual variability among adults in the extent to which they make more or less 'essentialist' inferences. This individual variability in the bias towards essentialism, has also been linked to (and hypothesised as a driver of) differences in certain political beliefs. For example, there is clear evidence that more right wing views towards capital punishment are correlated with the extent to which people make more essentialist inferences. Recent work from Australia has also suggested that individual differences in one's bias towards essentialism also act as a strong predictor of one's attitudes towards immigration. Pilot work from UCL has suggested that individual differences in essentialism might correlate with (and potentially help to explain) differences in views towards immigration in the UK (and that this might have been a predictor of people's attitudes to Brexit). This project will seek to test more rigorously the relationship between views towards immigration and biases towards essentialism with a multi-site project between Cambridge, UCL, Bath and Royal Holloway. The research will focus on collecting a representative sample of UK voters, how they voted in the EU referendum, their views on essentialism and their views towards immigration.

References:
Title: (JR2) Individual differences in musical preferences

Permanent academic with ultimate responsibility for the project:
Name: Jason Rentfrow
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Location: Downing Site
Email: pjr39@cam.ac.uk

Number of students who can work on this project:
Minimum: 1 Maximum: 2

Project Description:
Music is important to many people, but we know little about how and why people listen to music. This project will make use of existing data and offer the opportunity to collect primary data to examine individual differences in musical preferences. Students comfortable working with Excel, SPSS, STATA, or other statistical packages will be well-suited for this project. In addition to analysing existing data, students will be able to design follow-up surveys to be administered online. No experience creating Internet-based surveys is necessary for the project.

References:
Title: (JR3) Individual differences in place preferences

Permanent academic with ultimate responsibility for the project:
Name: Jason Rentfrow
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Number of students who can work on this project:
Minimum: 1 Maximum: 2

Project Description:
Where we live matters - the neighbourhoods and cities in which we live provide the backdrop against which so many of life’s important events occur. It’s therefore no surprise that many people invest a considerable amount of time and money trying to choose the right place to live. And yet, we don’t know much about the psychology behind place preferences, or why people are drawn to certain types of places and avoid others. This project will explore this general topic. Students comfortable working with Excel, SPSS, STATA, or other statistical packages will be well-suited for this project. In addition to analysing existing data, students will be able to design follow-up surveys to be administered online. No experience creating Internet-based surveys is necessary for the project.

References:
Title: (JS1) Exploring encoding contributions to age-related episodic memory declines

Permanent academic with ultimate responsibility for the project:
Name: Dr Jon Simons  
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Location: Behavioural and Clinical Neuroscience Institute  
Email: jss30@cam.ac.uk

Primary contact/day-to-day supervisor (if different from the above):
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Department: Psychology  
Location: Behavioural and Clinical Neuroscience Institute  
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Number of students who can work on this project:
Minimum: 1 Maximum: 2

Project Description:
Healthy ageing is associated with decreases in episodic memory function. In particular, ageing is thought to compromise the quality, and specificity at which information can be encoded to, and retrieved from memory. One potential factor contributing to these memory deficits in older age may be age-differences in visual exploration and attention during memory formation, compromising the efficient acquisition of detailed memory representations.

The proposed project seeks to investigate this question by examining age-differences in eye movements during memory encoding, and their relation to subsequent memory performance in both younger and older adults. Specifically, the project will employ eye-tracking in combination with a novel continuous memory task in order to dissociate the effects of encoding-differences on quantitative (i.e. the probability of successful memory retrieval) and qualitative (i.e. the fidelity, or precision of retrieved memories) aspects of memory retrieval.

The project is suitable for 2 students working together. The students will contribute to basic experimental design, participant recruitment and testing, and data analysis. The project can be started immediately.

If you are interested in the project, please contact Dr Jon Simons (jss30@cam.ac.uk).

References:
Permanent academic with ultimate responsibility for the project:
Name: Dr Jon Simons
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Primary contact/day-to-day supervisor (if different from the above):
Name: Dr Jane Garrison
Department: Psychology
Location: BCNI
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Number of students who can work on this project:
Minimum: 2 Maximum: 6

Project description:
Source memory paradigms can be separated into those that involve the recollection of whether information was previously internally or externally generated (‘reality monitoring’), those that involve the recall of different actions that have been performed by the subject (‘internal source monitoring’), and those involving recall of details of externally derived information (‘external source monitoring’). Reality monitoring deficits have been linked to hallucinations in schizophrenia, in which information which has been internally generated is experienced as externally perceived (Simons et al., 2017). Patients with hallucinations show a behavioural deficit in reality monitoring tasks, together with dysfunction in medial anterior PFC, the prefrontal region associated with this monitoring function. However, there is conflicting evidence as to whether similarly reduced reality monitoring ability exists in the many healthy individuals who sometimes see or hear things that are not real. An experimental study is proposed to investigate the internal, external and reality source monitoring abilities of healthy individuals, and relate these to their tendency to experience perceptions that are not real, as measured by questionnaire. Correlations between accuracy on the three source monitoring tasks, as well as the level of externalisation bias in the reality monitoring task and the perceptual experience score, will be used to assess whether healthy individuals who sometimes experience such perceptions have reduced reality monitoring ability.

The project is suitable for two students working together. The students will contribute to basic experiment design, participant testing, and data analysis. Computer programming is not required, although familiarity with computers would be useful. The project can be started immediately. If you are interested, please contact Dr Jon Simons (jss30@cam.ac.uk).

References:
Title: (JS3) Predictors of episodic memory performance in healthy ageing

Permanent academic with ultimate responsibility for the project:
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Minimum: 1 Maximum: 2

Project Description:
Episodic memory is particularly vulnerable to ageing. Not only are older adults more susceptible to forgetting but they also exhibit increased rates of false memories, for example when they incorrectly identify a novel item as previously seen. Such memory errors are especially common when study and test items share several perceptual features. Recent research has shown that two factors can account for such memory errors. First, older adults are less able to strategically recall details of a study episode and are therefore more likely to rely on a feeling of familiarity. Second, older adults have less detailed representations of the studied item compared to younger adults.

The proposed project will expand on a recently published paper (Trelle et al., 2017; see below) by employing an individual differences approach to determine how these two factors underlie individual differences in memory performance. This will be achieved by manipulating the memory task format to control the demand on strategic retrieval and by relating memory performance to scores on perceptual discrimination tasks and neuropsychological measures of executive functions.

Two students can work on this project. Students’ responsibilities include testing older adults on behavioural and neuropsychological tests, and carrying out data analysis. Students are also encouraged to contribute to experimental design but are not required to program any tasks (although they are welcome to should they choose to do so).

If you are interested, please contact Dr Jon Simons (jss30@cam.ac.uk).

References:
Title: (KPG1) Are you feeling my pain? An empathy study in individuals with Mirror-touch Synaesthesia

Permanent academic with ultimate responsibility for the project:
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Primary contact/day-to-day supervisor (if different from the above):
Name: Dr Idalmis Santiesteban
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Number of students who can work on this project
Minimum: 1 Maximum: 1

Project Description:
Background:
The ability to empathise with others is crucial for successful social interactions. In the empathy literature, it has been recognised that the control of self-other processes is essential in order to elicit an empathic response [1]. For example, understanding the affective state of another person requires an overlap between self (the observer) and other (the sufferer). However, when responding empathically, the observer needs to distinguish between his/her own affective state and that of the other because staying in the ‘overlap mode’ would result in personal distress [1]. For most of us such self-other distinction takes place effortlessly, allowing us to show an empathic response to the person in need. However, for some atypical groups, such as individuals with mirror-touch synaesthesia (MTS – see below), the ability to distinguish between self and others in social interactions appears to be impaired.

Individuals with mirror-touch synaesthesia (MTS) experience touch when observing another person being touched. My previous work has shown atypical self-other processing in these individuals [1] when inhibiting the tendency to imitate others. Furthermore, anecdotal evidence suggests that they find it difficult to cope with the suffering of others and to respond empathically to those in need.

Based on the above, this project aims to gain a better understanding of the empathic abilities of individuals MTS. Are they able to share the pain of others but unable to distance themselves from that pain and therefore unable to show an empathic response? How could this knowledge influence our current understanding of empathy and of self-other processes within this essential social ability?

Methodology:
The study will employ a novel behavioural paradigm that will allow teasing apart self-other processing in the empathy domain. Participants will watch a series of short videos of a person talking about an emotional (negative or neutral) experience. As they watch each video, they will then be asked to rate online
how the video makes them feel (with rating scores ranging from 0 = emotionally neutral to 10 = extremely upset). Following their own rating, participants will be asked to rate how they think the person in the video feels (same rating scale). This latter score will be compared to the actual ratings from the person in the video, which would have been previously recorded. Finally participants will be asked to say how they would respond to the person in the video if they were talking to them now. The answers to this question will be video recorded for further analysis and will be used as an index of appropriate empathic response.

References:

About the Project Supervisor:
Dr Santiesteban’s research interest is social neuroscience. Her doctoral work investigated the control of self-other representations in visual perspective taking, the inhibition of imitation and theory of mind. She is currently a Research Fellow at the Psychology Department, funded by an ESRC Future Research Leaders Award. Her current projects attempt to gain a better insight into the neurocognitive mechanisms of self-other processing in empathy and theory of mind. This work focuses on two approaches: 1) investigating when self-other processing goes awry in atypical groups such as autism spectrum disorders and mirror-touch synaesthesia, and 2) determining the impact of brain stimulation on connectivity patterns of brain networks supporting social cognition. She is also interested in understanding the extent to which social abilities rely on domain-general vs. uniquely social processing.
Title: (KPG2) Does it feel the same to you as it does to me?
Emotional Egocentricity Bias in individuals with Mirror-touch Synaesthesia

Permanent academic with ultimate responsibility for the project:
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Number of students who can work on this project
Minimum: 1 Maximum: 1

Project Description:
Background:
Individuals with mirror-touch synaesthesia (MTS) experience touch when observing another person being touched [1]. Our previous work has shown atypical self-other processing in these individuals when inhibiting the tendency to imitate others [2]. In particular, the boundaries of self and other seem to be blurred, as they appear to struggle when required to inhibit representations of the ‘other’. Another line of research with neurotypical adults has shown an egocentricity bias when processing emotions [3], i.e. we seem to attribute our own feelings and emotions to others. The same research has identified the right supramarginal gyrus as playing a key role in the regulation of emotional egocentricity.
This project will explore the ability to control self-other representations in a group of individuals with MTS and in neurotypical adults using both behavioural and brain stimulation methodologies. It will aim to: a) replicate our previous findings of impaired imitation inhibition in MTS, b) explore whether emotional egocentricity bias in MTS individuals differs from that of controls, and c) investigate the effect of transcranial direct current stimulation (tDCS) of the supramarginal gyrus in the control of self-other processes.

Methodology:
The study will employ both behavioural testing and tDCS. TDCS is a safe, non-invasive brain stimulation technique that is widely used in both clinical and basic neuroscience research. It can be used to modulate neural populations beneath targeted brain areas in order to suppress or facilitate performance. First, participants will complete a battery of computer tasks to confirm the presence of MTS followed by the experimental tasks under no stimulation condition. Then they will be invited to the lab on a future date for the tDCS session. They will be assigned to the anodal (excitatory) tDCS or cathodal (inhibitory) tDCS conditions. Stimulation will be delivered prior to performing the experimental computer tasks a second time.
References:

About the Project Supervisor:
Dr Santiesteban’s research interest is social neuroscience. Her doctoral work investigated the control of self-other representations in visual perspective taking, the inhibition of imitation and theory of mind. She is currently a Research Fellow at the Psychology Department, funded by an ESRC Future Research Leaders Award. Her current projects attempt to gain a better insight into the neurocognitive mechanisms of self-other processing in empathy and theory of mind. This work focuses on two approaches: 1) investigating when self-other processing goes awry in atypical groups such as autism spectrum disorders and mirror-touch synaesthesia, and 2) determining the impact of brain stimulation on connectivity patterns of brain networks supporting social cognition. She is also interested in understanding the extent to which social abilities rely on domain-general vs. uniquely social processing.
Title: (LT1) Building hierarchies or working the odds? 
How we understand sentences.

Permanent academic with ultimate responsibility for the project:
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Number of students who can work on this project:
Minimum: 1 Maximum: 2

Project Description:
When we hear or read a sentence, it is likely to be unique. The combination of words you are hearing or reading is unlikely to have been encountered together before. Even so, we understand the sentence perfectly well. How we do this has long been a matter of controversy in linguistics, psycholinguistics and cognitive neuroscience. Do we use the statistical knowledge that we have acquired through a lifetime experience with our native language as the primary means of understanding language? Or do we engage a system of linguistic rules? Do we draw on general knowledge systems, or do we use a specialist innate language system? In this project students will test these opposing hypotheses.

In the Centre for Speech, Language and the brain [CSLB] we have collected brain imaging data from a combined magnetoencephalography(MEG)/electroencephalography(EEG) experiment on spoken language comprehension. Combined MEG/EEG enables us to determine, with millisecond precision, when different kinds of computations occur in the brain, as well as providing information about where in the brain they occur.

The brain data will be analysed using measures collected from a behavioural study.

Students will develop two measures of sentence processing: one relating to linguistic rules and based on Chomsky’s operation of Merge from his Minimalist Program, and the other based on a statistical probabilistic big-data approach to calculating sentence complexity, using usage based corpus data. These measures will then be used in the analysis of the EEG data, in particular looking at evoked responses, such as the P600 which is associated with syntactic processing. If we engage linguistic rules, we anticipate that Merge measures of sentence hierarchy will produce significant effects.

If, instead, we process sentences using a more probabilistic approach, the statistical approach will be significant.

Students should have a high level of computing skills as analysing ERPs and obtaining data from corpora requires the use of computing packages such as Matlab.

References:


Title: (LT2) Meaning flexibility or a rabbit’s a rabbit for all that?

Permanent academic with ultimate responsibility for the project:
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Primary contact/day-to-day supervisor (if different from the above):
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Location: Centre for Speech, Language and the Brain
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Number of students who can work on this project: Minimum: 1 Maximum: 2

Project Description:
What comes to mind when we hear a word like rabbit? Does our understanding of words change in sentences that contain different kinds of verbs? Is the meaning of rabbit the same when we hear John cooked the rabbit, John held the rabbit or John saw the rabbit? How does this compare with the word rabbit in neutral sentence like The next word is rabbit? To what extent are word meanings flexible and influenced by context?
When we encounter a verb in a sentence, we automatically generate a number of expectations depending on the meaning of the verb. For example, for the sentence “John ate the ...”, we expect what follows to be something edible. If instead the sentence begins “John held the ...”, we expect what follows to be about size. These semantic constraints on the nouns that follow verbs are called ‘semantic selection restrictions’. This project explores the types of semantic constraints associated with verbs and the extent to which these restrictions constrain the semantics of the words that occur after the verb.
Students will conduct a two stage experiment. The first stage will involve working on big-data to define the semantic selection restrictions of verbs using corpus statistics. The second will involve designing a behavioural experiment using sets of sentences in which the strength and the nature of the constraints that derive from the verbs are determined by the corpus data obtained in stage 1.
The results from the two stages will be combined to examine whether or not the semantic representation that is activated when we hear a word is always the same or whether the prior context constrains the activated semantics. The latter result would be important in showing that meanings are flexible and adaptive to the context in which words occur.

References:
Title: (LT3) The role of brain and lifestyle factors in maintaining good cognition across the adult lifespan

Project Supervisors: Dr Kamen Tsvetanov Dr Billi Randall & Prof. Lorraine Tyler
Email address: kamen@csl.psychol.cam.ac.uk Telephone: 01223 7666556
Location: Centre for Speech, Language and the Brain, Room 208, 2nd floor, Sir William Hardy Building, Downing Site

Number of students: 1

Project Description:
Age-related changes in cognitive functions are thought to be inevitable. However, the hallmark of aging is its variability – while some people maintain good cognitive function across their lifespans, others do not. Understanding why some people maintain some cognitive functions while others do not is a key issue in the neuroscience of aging.
Core cognitive functions are underpinned by coordinated sets of brainwide interacting neural networks. The relationship between these networks changes with age and is typically associated with cognitive changes. The proposed research aims to determine the role of (a) brain structural changes [white and grey matter] and (b) lifestyle and demographic variables in preserving key network relationships and robust cognition.
This project involves analysing data that has already been collected on the CamCan cohort [www.cam-can.org], a population-derived sample of 700 people aged 18-88 years with a uniquely rich combination of lifestyle and demographic data, cognitive tests and extensive functional and structural imaging data across a wide range of cognitive domains [Shafto et al, 2015], together with an accelerated longitudinal testing component. In-depth brain network analyses across core cognitive functions in this well-characterised sample will make it possible to extract population-relevant conclusions about the key factors underpinning successful cognitive aging and delayed onset of cognitive frailty.
In this project the student will construct measures from the cohort data of a wide variety of demographic variables, including mental well-being, maintenance of active life style, good supportive relationships, activity, lifestyle satisfaction etc (Ng et al., 2009). The student will be responsible for formulating and testing hypotheses about the relationship between a selected set of demographic variables to brain and cognitive preservation, which will be informed through programming-oriented environment (e.g. Matlab/R software) of regression analysis and data reduction techniques such as principal component analysis.

Suggested reading:
Title: (MB1) What links snow to dough: Investigating the processing mechanisms for spoken complex words

Permanent academic with ultimate responsibility for the project:
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Department: Psychology
Location: William Hardy Building
Email: mb383@cam.ac.uk

Number of students who can work on this project:
Minimum: 1 Maximum: 2

Project Description:
The structure of complex words like snowed, built by combining the stem snow with a suffix –ed, determines the way they are processed by the listener. Data show that the suffix gets segmented from the stem, which is interpreted as showing that these complex words are represented decompositionally in our mental lexicon (Bozic et al, 2010). Lots of this evidence comes from priming studies, in which words like snowed facilitate the recognition of the stem snow, suggesting that both words map onto the same underlying representation (Allen & Badecker, 2002).

This study tests whether this decomposition is grammatical or phonological in nature, using a paradigm called rhyme priming. Rhyme priming refers to facilitation due to the notion of rhyme: e.g., faster responses to a word truck after the presentation of duck than after the presentation of the non-rhyming dart (Slowiazcek et al, 2000). Recent data using this paradigm (Bacovcin et al, 2017) showed that regularly inflected words like snowed facilitate the recognition of dough because snowed is decomposed into snow + ed, and snow and dough rhyme. We will investigate whether the same applies to the irregularly inflected words like sank, which are equally grammatically complex to snowed, but cannot be phonologically segmented into a stem + suffix structure. If sank facilitates the recognition of ink (which rhymes with sink), this can be attributed to grammatical processing of the past tense form sank; if not, it will be evidence for phonologically-based decomposition. Students involved in this project will perform (with help) all aspects of this study, from creating the stimuli to experimental design, data collection, analysis and interpretation.

References:
Title: (MB2) Effects of sentential context on early visual word recognition

Permanent academic with ultimate responsibility for the project:
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Department: Psychology
Location: William Hardy Building
Email: mb383@cam.ac.uk

Number of students who can work on this project:
Minimum: 1 Maximum: 2

Project Description:
There is extensive evidence pointing to a bottom-up, automatic segmentation of written words into their constituent units (farm-er, wit-ness, e.g., Rastle et al, 2004); however, less is known about the role of top-down contextual information in modulating this analysis. In a recent paper based on a Part II project (Whiting et al, 2017), the standard masked priming paradigm was adapted to include an overt semantic prime (e.g., CROP-farmer–farm, JURY–witness-wit), in order to examine whether semantic context influences the automatic segmentation of complex words. In particular, we asked how the context affects processing of semantically opaque forms (witness), where the embedded stem (wit) is incompatible with the meaning of the whole form. Results showed no segmentation for opaque forms in the presence of a semantic prime, indicating top-down modulation of this early analysis.

The current study will follow up on these findings by presenting complex words within a sentential context, providing stronger semantic constraints and bringing the paradigm closer to natural reading. The sentence context will be either related or unrelated to the complex word, and we will test how this affects priming magnitudes and interaction between bottom-up vs. top-down information. Students involved in this project will perform (with help) all aspects of this study, from creating the stimuli to experimental design, data collection, analysis and interpretation.

References:

Title: (MB3) Bottom-up vs top-down in written word recognition

Permanent academic with ultimate responsibility for the project:
Name: Mirjana Bozic
Department: Psychology
Location: William Hardy Building
Email: mb383@cam.ac.uk

Number of students who can work on this project:
Minimum: 1 Maximum: 2

Project Description:
Experimental evidence shows that complex written words undergo an early blind segmentation into their constituent parts (farm-er, wit-ness, e.g., Rastle et al, 2004). Most of these results come from the masked priming paradigm, where briefly presented complex words like farmer or witness have been shown to facilitate recognition of their constituent units (farm, wit). However, the strong claim that this segmentation is purely bottom-up and automatic has been challenged by the findings that it can be modulated by top-down contextual constraints (Whiting et al, 2017). By adapting the masked priming paradigm to include an overt semantic prime (JURY–wit-ness-wit), Whiting et al (2017) showed that words like witness no longer facilitate their constituent stem wit when preceded by the semantic context of jury.

The current experiment will investigate the locus and the mechanisms of this top-down modulation. Building on the previous literature (Marslen-Wilson et al, 2008), we will reverse the order of presentation of the complex form and its stem (e.g., MIND–wit-witness) and then manipulate the relationship between the 3 words to create a range of possible loci of the effects. Data will provide significant new input to the long-standing debate on the interaction between the bottom-up and top-down processes in written word recognition. Students involved in this project will perform (with help) all aspects of this study, from creating the stimuli to experimental design, data collection, analysis and interpretation.

References:

Title: (MB4) Lexical representations in bilinguals

Permanent academic with ultimate responsibility for the project:
Name: Mirjana Bozic  
Department: Psychology  
Location: William Hardy Building  
Email: mb383@cam.ac.uk

Number of students who can work on this project:  
Minimum: 2  
Maximum: 2

Project Description:
The structure of lexical representations in bilinguals has been a matter of long-standing debate, with some authors arguing that only cognate translations (e.g. *bakker–baker*, for a Dutch–English bilingual) have completely overlapping semantic representations (e.g., de Groot, 1992). Yet, other data show that non-cognates can also prime the recognition of their translation equivalents at very brief prime durations (29–43 ms), suggesting fully shared semantic representations (e.g., Grainger & Frenck-Mestre, 1988). Grainger & Frenck-Mestre also reported stronger priming in a semantic categorisation task compared with lexical decision task, further suggesting that translation priming is mediated by semantic representations and not the result of form-level links between translation equivalents.

We will further explore this hypothesis using a novel masked priming paradigm (Whiting et al, 2017). Translation pairs of prime-target words (e.g., *cloche–bell*) will be paired with an additional semantically-related word in the same language as the target (e.g., *RING-cloche–bell*). By manipulating the degree of relatedness between the three words, we will create a range of contexts in which to explore how semantic links across languages affect word recognition. Students involved in this project will perform (with help) all aspects of this study, from creating the stimuli to experimental design, data collection, analysis and interpretation.

References:


Title: (ML1) Are option posing questions used in association with different credibility challenging strategies to potentially discredit a child’s in court testimony?

Permanent academic with ultimate responsibility for the project:
Name: Michael Lamb
Department:
Location:
Email: mel37@cam.ac.uk

Primary contact/day-to-day supervisor (if different from the above):
Name: Hayden Henderson
Department: Psychology
Location: Cambridge
Email: hmh45@cam.ac.uk

Number of students who can work on this:
Minimum: 1 Maximum: 1

Project Description:
I would like to look in detail at the way that option posing questions; in particular, ‘Do you remember’ questions are used in the courtroom in the place of other, more explicit forms, of suggestive questioning. Using transcripts from a child’s in court testimony, I will investigate whether different credibility challenging strategies are associated with the differential use of these option posing question styles. To do this I would explore the way that these questions link to four broad strategies used to discredit complainants; which are credibility challenges, reliability challenges, plausibility challenges and consistency challenges. I would analyse the percentage of times these option posing questions are used in association with one of these four credibility challenging strategies, in order to understand if there is a correlation between option posing questions and attempting to discredit a child’s testimony.
Title: (ML2) ‘Children’s Abilities to Respond to Implicit Directive Prompts during Court Questioning’

Permanent academic with ultimate responsibility for the project:
Name: Michael Lamb
Department: Psychology
Location: Cambridge
Email: mel@cam.ac.uk

Primary contact/day-to-day supervisor (if different from the above):
Name: Hayden Henderson
Department: Psychology
Location: Cambridge
Email: hmh45@cam.ac.uk

Number of students who can work on this project:
Minimum: 1 Maximum: 1

Project Description:
In my project, I will explore the impact of question complexity on the eyewitness testimonies of children in a courtroom context. Namely, I will discuss yes/no/what (YN/W) questions that take the grammatical shape of a Y/N question but also ask, directly or indirectly, for a missing piece of information. We will compare children’s ability to respond to these questions across different ages. I will be using coded courtroom transcripts in my project. The findings from this project will be very informative in showing not only that younger children and older children have different linguistic abilities, but also that considerations need to be made in court in order to treat them fairly.
Title: (ML3) Victim-Blaming and Humanisation: a study investigating the effect of different attorney strategies on mock juror’s verdicts in a child sexual assault case

Permanent academic with ultimate responsibility for the project:
Name: Professor Michael Lamb
Department: Psychology
Location: Cambridge
Email: mel@cam.ac.uk

Primary contact/day-to-day supervisor (if different from the above):
Name: Hayden Henderson
Department: Psychology
Location: Cambridge
Email: hmh45@cam.ac.uk

Number of students who can work on this project:
Minimum: 1 Maximum: 1

Project Description:
This project will investigate the use of victim-blaming and humanisation of the defendant in the context of a child sexual abuse case. Previous research has investigated the use of ‘moral disengagement’ strategies by lawyers in death penalty cases (Greene, 2016), where these strategies appear to increase the likelihood of a jury sentencing the defendant to death. The present study aims to apply a similar logic to child sexual abuse cases: to investigate whether the presence of victim blaming and/or humanisation of the defendant significantly affects mock jurors’ verdicts. Participants will be given a case vignette, which they will be required to read before being asked to complete a questionnaire and inventory. We also aim to investigate whether mock jurors’ perceptions of the victim and defendant will be affected by these attorney strategies, and so some questions will focus on aspects such as the ‘likeability’ and ‘honesty’ of both the victim and defendant. We are also interested in whether manipulating the gender of the victim significantly alters jurors’ perceptions. The study will thus employ a 2 (gender of victim) x 4 (presence and type of attorney strategies) between-subjects design.

The research findings will sit within a wider field of research into courtroom proceedings (Golding, Fryman, Marsil, & Yozwiak, 2003; McCauley & Parker, 2001; Ross, Dunning, Toglia, & Ceci, 1990); offering important implications for how attorneys operate and portray both child victims and defendants. The study will take place using Amazon Mechanical Turk and should not be labour-intensive. For this reason, the project will only require the involvement of one undergraduate.

References:

Title: (NC1) Causal learning in a non-verbal task with adult humans

Permanent academic with ultimate responsibility for the project:
Name: Prof Nicola Clayton
Department: Psychology
Location: Department of Psychology, Downing site, CB2 3EB
Email: nsc22@cam.ac.uk

Primary contact/day-to-day supervisor (if different from the above):
Name: Dr Sarah Jelbert
Department: Psychology / Sub-department of Animal Behaviour
Location: Department of Psychology, Downing site, CB2 3EB, & Sub-department of Animal Behaviour, Madingley, CB23 8AA
Email: saj48@cam.ac.uk

Number of students who can work on this project:
Minimum: 1 Maximum: 2

Project Description:
A number of non-human animals, such as the great apes, parrots and corvids, appear to possess sophisticated cognitive abilities (Emery & Clayton, 2004; Seed & Byrne, 2010). One problem-solving task which has been regularly used to study cognition in these species is the trap-tube. Here, a food reward is placed in a transparent tube and the animal must use a stick tool to retrieve it, avoiding one or more traps along the bottom of the tube where the reward could become stuck (e.g. Taylor et al. 2009). Several animals can learn to avoid pushing the reward into the traps over time; however, it is often unclear exactly what the animal learnt in order to solve the task. For example, when chimpanzees were given a trap-tube upside-down so that the trap was on the top surface (and therefore the reward couldn’t fall in and become stuck), chimpanzees still avoided the trap, suggesting that they learnt a simple strategy to avoid the trap, but hadn’t learnt a causal rule about how the trap worked. Yet, surprisingly, when adult humans were tested on a comparable task, the adults also avoided the trap when it was presented upside-down (Silva, Page & Silva, 2005). Adult humans appear to possess certain biases which guide their choices on problem-solving tasks, in addition to an understanding of causal rules. Testing adults on tasks designed for animals can therefore provide us with a framework to interpret animals’ responses.

This study will investigate causal learning in adult humans. It will involve presenting adult participants with a variety of non-verbal puzzle boxes – similar in design to the trap-tube – where the participant must judge which of several stimuli they believe caused a particular effect. Participants can be undergraduates, and tests can be conducted in the Department of Psychology, Downing site. The aims of this project are (1) to investigate the biases and strategies that influence adult humans’ judgements about causes and effects, and (2) to provide a set of benchmark results to which the performance of non-human animals can later be compared.

If multiple students choose this project they will collaborate on preparation and data collection. Students can choose whether to test participants individually or together, but will work independently to analyse the data and write up the study.

References:
Title: (NC2) Does mental time travel serve a communicative function?

Permanent academic with ultimate responsibility for the project:
Name: Nicola Clayton
Department: Psychology
Location: Downing Site, Experimental Psychology
Email: nsc22@cam.ac.uk

Primary contact/day-to-day supervisor (if different from the above):
Name: Steven Samuel
Department: Psychology
Location: Downing Site, Experimental Psychology, Room 102
Email: ss2391@cam.ac.uk

Number of students who can work on this project:
Minimum: 1 Maximum: 2

Project Description:
A recent and well-received paper in Behavioural and Brain Sciences (Mahr & Csibra, in press) contends that episodic memory serves mainly as a tool for human communication. When we attest to having experienced an event, and can ‘re-experience’ it by means of reconstructing the moment the event occurred, we provide a particularly personal type of evidence for our assertion: i.e., I can recall it as if I was there, so my account is reliable. Mahr and Csibra contend that we have episodic memory so that we can attach this authority to our communication in the present, and that by doing so we effectively tie our reputations to our own masts, and are seen by others to be doing so. Essentially, therefore, invoking our episodic memory is to use a special kind of evidence, and we would be punished by our peers for using this episodic evidence incorrectly or falsely by our social group.
This project will involve testing 60 adults (online study) on a task designed to test this assertion. We will use the English constructions ‘I remember [verb + ing]’ and ‘I [past verb]’ to show participants that a person either invokes their episodic memory (e.g. ‘I remember posting the letter’) or does not (e.g. ‘I posted the letter’). Crucially, we will present the participants with stories where the protagonist in question never actually completed the task (i.e. she never posted the letter). The crucial question is whether participants will rate the protagonist who did not post the letter but uses the episodic memory construction as less reliable, trustworthy, or ‘good’ a person than someone who does not, even though in both cases the assertion is equally false. The results will inform us as to whether episodic memory, as manifest in our use of language, provokes more negative feelings towards someone who is not telling the truth. The ability to speak a language other than English is useful but not necessary. It may be that we can run the study also in this language, should it have a similar distinction between the ‘episodic past’ and ‘simple past’, in order to better control for any factors specific to the English constructions being tested.

References: (References are for in-press articles, and are available from the primary contact (ss2391) on request):
Title: (NC3) Egocentric Bias in Auditory Judgments

Permanent academic with ultimate responsibility for the project:
Name: Nicola Clayton
Department: Psychology
Location: Downing Site, Experimental Psychology
Email: nsc22@cam.ac.uk

Primary contact/day-to-day supervisor (if different from the above):
Name: Steven Samuel
Department: Psychology
Location: Downing Site, Experimental Psychology, Room 102
Email: ss2391@cam.ac.uk

Number of students who can work on this project:
Minimum: 2 Maximum: 2

Project Description:
This project investigates the question of whether a participant’s judgements of what someone else can hear are biased by what they can hear. This task requires the participant to indicate when a protagonist can no longer hear music played through a pair of headphones that the participant is wearing. The participant will have to adjust the volume on the headphones they are wearing until they think a protagonist can no longer hear the music. Before making their adjustments, the participant will be given experience of what can be heard when someone else is wearing the headphones. Critically, the participant must account for the difference between what they can hear and what the protagonist can hear. The volume at which the participant believes the protagonist will no longer be able to hear the music will be a measure of the degree of the participant’s bias. As a control, participants will also perform the task in a condition where, instead of a person, a microphone may or may not ‘pick up’ the sound from the headphones. This will tell us whether egocentric bias is stronger in cases where people are making judgments about other people, as compared to when they are making judgments about an object that also ‘hears’.

During the experiment itself, one student will play the role of the protagonist, and the other student will oversee the conduct of the experiment, such as ensuring responses are made according to instructions. We will test 30 adults (with normal hearing) and assign a number to the volume they select as being unable to be heard by the protagonist/microphone. This will allow us to calculate the distance between the selected volume and the volume at which the protagonist would actually be unable to hear. If participants are biased by being able to hear when the protagonist/microphone does not pick up a signal they are expected to choose to reduce their music to lower volumes than necessary. Such a result would suggest that egocentric biases are not restricted to visual perspective taking.

References: (one reference is currently under review, and is available from the primary contact (ss2391) upon request):
Title: (NC4) Simulating human and spatial perspectives: Is there a difference?

Permanent academic with ultimate responsibility for the project:
Name: Nicola Clayton
Department: Psychology
Location: Downing Site, Experimental Psychology
Email: nsc22@cam.ac.uk

Primary contact/day-to-day supervisor (if different from the above):
Name: Steven Samuel
Department: Psychology
Location: Downing Site, Experimental Psychology, Room 102
Email: ss2391@cam.ac.uk

Number of students who can work on this project:
Minimum: 1 Maximum: 2

Project Description:
We recently gave adult participants a perspective-taking task in which they needed to locate a target in a 2x2 grid, while ignoring a distractor. The target and distractor were both digits, which look different according to the perspective they are seen from (e.g., 6 might be the target and 9 the distractor). Crucially, the target had to be located from an avatar’s visual perspective (90°, 180°, or 270°), but the participant was nevertheless required to make a response to the target’s location based on where the participant herself sees the object. That is, participants located which object they needed to find by taking the avatar’s point of view, but then had to indicate its location from their own perspective. This might entail pressing a top-right button when the avatar is on the participant’s right and sees the target in its bottom-right corner. We found that participants sometimes erroneously responded by indicating an empty square in the grid (in the prior example, this meant the participant erroneously indicated the bottom-right square in the grid). On every occasion that this occurred, the empty square was always the one that would have been the correct response had the participant been instructed to respond as if they saw the grid from the avatar’s perspective. We have interpreted this result as suggesting that participants had difficulty disengaging from the avatar’s perspective and re-engaging their own in the period between locating the target and making the response. The results also suggest that we ‘simulate’ the avatar’s perspective, at least when we need to take into account how something looks (level 2 perspective taking).

This project will involve testing 30 adults on a modified version of the task, replacing the avatar with a non-human symbol (an asterisk). We will investigate whether participants have more trouble disengaging from the avatar’s perspective when they are instructed to see the asterisk as if it were a person with a perspective, as compared to when the participant is instructed to see that asterisk simply as indicating the ‘bottom’ of the screen. Whereas the first condition implicates a role for perspective taking in the sense of ‘mentalising’, or ‘theory of mind’, the second minimises any such overt perspectival connotations. The results will inform us as to whether we might have specialised cognitive machinery for ‘mental’ perspective taking as compared to more ‘spatial’ perspective taking, and whether it is this ‘mentalising’ component that makes disengaging from the alternative perspective difficult.
References:
Title: (PB1) The cost of surprise: Do surprising events lead to redistribution of working memory resources?

Permanent academic with ultimate responsibility for the project:
Name: Paul Bays
Department: Psychology
Location: Craik-Marshall Building, Room 210
Email: pmb20@cam.ac.uk

Primary contact/day-to-day supervisor (if different from the above):
Name: Sebastian Schneegans  Department: Psychology
Location: Craik-Marshall Building, Room 209
Email: ss2361@cam.ac.uk

Number of students who can work on this project:
Minimum: 1 Maximum: 2

Project Description:
Unexpected events grab attention and increase arousal. We have found in previous work that this surprise effect also influences the quality of memory: If a visual stimulus is surprising, the features of that stimulus can be recalled more precisely than the features of non-surprising control stimuli. This is true even if the feature to be remembered is unrelated to the stimulus aspect that elicits surprise.

In the present project, we want to test whether the improved recall for surprising stimuli comes at a cost for other items simultaneously held in memory. Such a cost has been observed in previous tasks when subjects are incentivized to memorize a specific item more precisely, and is consistent with a view of working memory capacity as a continuous resource that can be flexibly distributed among items (Bays & Husain, 2008; Ma et al, 2014; Rajsic et al, 2016). However a recent study has suggested some memory benefits can arise without costs (Myers et al, in press). We will use a working memory task with memory sample stimuli and additional filler stimuli appearing in a fixed sequence. Occasionally, one stimulus will violate this sequence. By comparing the effects that this surprising event has for memory performance when it occurs for different stimuli, we can determine whether the surprise leads to redistribution of resources, or to an increase of total memory resources.

Students will plan and run the psychophysical experiment, use an eye tracker to record participants’ eye movements during the study, and perform statistical analysis of the results.

References:
Project Title: (PB2) Role of location in feature binding at different memory delays

Permanent academic with ultimate responsibility for the project:
Name: Paul Bays
Department: Psychology
Location: Craik-Marshall Building, Room 210
Email: pmb20@cam.ac.uk

Primary contact/day-to-day supervisor (if different from the above):
Name: Sebastian Schneegans
Department: Psychology
Location: Craik-Marshall Building, Room 209
Email: ss2361@cam.ac.uk

Number of students who can work on this project:
Minimum: 1 Maximum: 2

Project Description:
In this project, students will use a psychophysical experiment to address the problem of feature binding in visual working memory. If you have to memorize a display containing a green square and a red circle, how do you remember that the colour red belongs to the circle rather than the square? We previously approached this question using a cued report task (Bays et al., 2009). Subjects had to memorize an array of coloured oriented bars, and after a brief delay had to report the orientation and location of one bar cued by its colour. We found specific correlations between report errors for orientation and location, leading to the conclusion that the colour and the orientation of an object are bound to each other only via their shared location (Schneegans & Bays 2017). These findings are compatible with previous results from change detection tasks (Treisman & Zhang, 2006; Logie et al., 2011), which showed that scrambling object locations greatly impairs change detection performance at short delay durations. However, these studies also found that the effect of spatial scrambling largely disappears if longer delay periods are used. This project will investigate whether similar effects of varying the delay duration can also be found in the cued report task. This will yield insights into the mechanism underlying feature binding in visual working memory. The students will be responsible for making modifications to the existing experimental design, collecting data and analysing it. They will gain experience in designing and executing psychophysical studies and in the use of eye tracking systems.

References:
Title: (PB3) Playing the averages: does remembering summary statistics free up memory resources?

Permanent academic with ultimate responsibility for the project:
Name: Paul Bays
Department: Psychology
Location: Craik-Marshal Building, Room 210
Email: pmb20@cam.ac.uk

Primary contact/day-to-day supervisor (if different from the above):
Name: Robert Taylor
Department: Psychology
Location: Craik-Marshal Building, Room 209
Email: rtt23@cam.ac.uk

Number of students who can work on this project:
Minimum: 1 Maximum: 2

Project Description:
When presented with a number of objects to remember, is it necessary that we store specific details about each and every item? Often, objects that share overlapping features – for example, two circles that are similar in colour – create redundancies in visual input, so how should similar items be stored in memory? One hypothesis is that we average objects that are perceptually similar, thereby reducing several features down to a single average feature value (e.g., Brady & Alvarez, 2015; Brady & Tenebaum, 2013). However, the flexible resource hypothesis states that visual working memory is freely distributed amongst all objects in an environment (Bays & Husain, 2008; Ma et al., 2014). How well objects are remembered depends upon how much resource they receive; when there are many things to remember, less detail can be stored about individual items.

This project will investigate the extent to which observers average object features and how various degrees of redundancy in a visual array affect item precision. If averaging reduces the demand on storing specific information about some items, this ought to free up resources to store non-averaged features and promote better recall of these items. Students will test this hypothesis by measuring the precision of recall for groups of coloured disks compared to single disks. Students will gain experience in designing and running experiments, which will include eye-tracking, as well as drawing insights from fitting models of visual working memory to data.

References:
Title: (PB4) The influence of long-term memory for feature associations on working memory fidelity.

Permanent academic with ultimate responsibility for the project:
Name: Paul Bays
Department: Psychology
Location: Craik-Marshal Building, Room 210
Email: pmb20@cam.ac.uk

Primary contact/day-to-day supervisor (if different from the above):
Name: Robert Taylor
Department: Psychology
Location: Craik-Marshal Building, Room 209
Email: rtt23@cam.ac.uk

Number of students who can work on this project:
Minimum: 1 Maximum: 2

Project Description:
How do regularities in our environment affect our memory? In this project we will examine how building associations in long-term memory (LTM) between visual features affects how well we store and remember information in short-term, or working, memory (WM). For example, knowing that two colours are more likely to be shown together leads to a demonstrable improvement in how well those colours are recalled. Knowledge of these regularities seemingly reduces the demand on visual working memory and allows information to be stored more efficiently (see Brady et al., 2009). Currently, this has only been demonstrated using single visual features and procedures requiring forced-choice responses that do not provide any indication about how precisely items were stored. The aim of this project is to examine how remembering combinations of different visual features (e.g., colour and orientation) affects feature recall. An important consideration is whether developing feature associations establishes a representation that can be outsourced to long-term memory. If this is the case, it ought to place less of a demand on our limited working memory resources (Bays & Husain, 2008) and improve general recall performance. Students involved in this project will compare conditions of a memory task where there are consistent regularities between visual features with conditions where no feature association exists, and use a continuous report paradigm to measure recall precision. They will gain experience with eye tracking technology and also fitting models of visual working memory to measure precision across experimental conditions (Bays et al, 2009), as well as being involved in experimental design and data collection.

References:
Title: (PB5) The time-course of forgetting in visual working memory

Permanent academic with ultimate responsibility for the project:
Name: Paul Bays
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Location: Craik-Marshall building 210
Email: pmb20@cam.ac.uk

Primary contact/day-to-day supervisor (if different from the above):
Name: David Aagten-Murphy
Department: Psychology
Location: Craik-Marshall building 209
Email: djm237@cam.ac.uk

Number of students who can work on this project:
Minimum: 1 Maximum: 2

Project Description:
Although the concept of forgetting, that a memory gets progressively less accurate the longer we try to remember it, seems intuitive, the mechanisms underlying it are highly controversial. Two key theories have emerged, each attempting to explain how the passage of time influences the fidelity of our visual memory. The first, memory decay, suggests that forgetting happens simply due to noise within neural systems, which leads to the progressive degradation of memory representations with time (Ricker, Spiegel & Cowan, 2014). The second, temporal interference, suggests instead that interference between different stimuli in memory causes the reduction in remembering (Souza & Oberauer, 2015).

An important observation is that the precision of objects held in visual working memory appears to decline more rapidly when the total number of items in memory is higher (Pertzov et al, 2016). This suggests that working memory maintenance depends on a limited resource distributed between items (Bays et al, 2009). The aim of this project is to examine how these resources are allocated to sequentially presented objects, specifically focussing on whether resources are dynamically redistributed amongst remembered objects as each object is presented. Visual items (coloured disks) will be presented in sequence with varying inter-item intervals, and then recall of one item will be tested (by clicking on a colour wheel). The project will distinguish memory decay and temporal interference theories of forgetting in visual working memory. Additionally, it will represent one of the first investigations into how resources are allocated in sequential displays (and what implication this allocation has on already remembered objects). For example, does recall precision depend only on the length of time from when a stimulus appears to when it is tested? Or does the proportion of time that it is the only object held in memory influence how precisely it is subsequently recalled?

Students will gain experience in planning, executing and analysing psychophysical experiments. Additionally, they will be introduced to the use of mixture models for quantifying working memory performance (see Bays et al, 2009) and learn how eye-tracking technology can be used to supplement behavioural experiments.

References:


Title: *(PB6) The role of visual working memory in maintaining stable perception across eye-movements*

**Permanent academic with ultimate responsibility for the project:**
Name: Paul Bays  
Department: Psychology  
Location: Craik-Marshall building 210  
Email: pmb20@cam.ac.uk

**Primary contact/day-to-day supervisor (if different from the above):**
Name: David Aagten-Murphy  
Department: Psychology  
Location: Craik-Marshall building 209  
Email: djm237@cam.ac.uk

**Number of students who can work on this project:**
Minimum: 1 Maximum: 2

**Project Description:**
In everyday life, we make frequent eye-movements to examine different objects in our surroundings. Although these movements allow us to take in more visual information about our environment, they also pose problems for visual processing as they require that our perception of the world must be built from discrete “snapshots” taken in the moments when the eyes are still (Cavanagh et al., 2010). It has been proposed that visual memory plays an important role in allowing us to combine information about the same object from multiple gaze locations. Generally, these accounts suggest that the visual image after an eye-movement is compared with a memory trace of the world before the movement (Bays & Husain, 2007). If they match, then information stored in visual memory can be combined with the current visual input to provide a more detailed and accurate perception (Oostwoud Wijdenes et al., 2015). However, if the visual information is too dissimilar then the memory trace and the current input should be kept segregated, as this indicates that a change has taken place in the environment.

A key feature of working memory is that the precision of our memory representations decreases as the number of items remembered increases. In this project, students will test the visual memory hypothesis by investigating how the number of stimuli in memory influences the perception of objects viewed before and after an eye movement. Participants will be asked to memorize varying numbers of coloured disks then make a rapid eye movement. We will use eye tracking technology to detect the eye movement and change the colours of the disks during the time their eye is moving. Participants will need to report both the colour of a disk before they moved their eyes and whether they noticed a change in the colour across their eye-movement. We predict that, when the change is small enough that it isn’t detected, the colour seen after the eye movement will influence participant’s reports (Oostwoud Wijdenes et al., 2015). We further predict that this influence will increase as the number of items in memory increases, demonstrating that visual memory is critical for updating information across eye movements.

By undertaking this project students will gain experience in planning, executing and analysing psychophysical experiments, and in the use of eye-tracking technology.

**References:**


Title: (SBC1) Pregnancy history in mothers of a child with autism.

SUPERVISORS: PROF SIMON BARON-COHEN, DR CARRIE ALLISON and PAULA SMITH (and Dr Alexa Pohl as an occasional advisor via Skype)

Number of students:

Project Description:
Autism Spectrum Conditions ("autism") are characterised by impairments in reciprocal social interaction and communication, alongside repetitive behaviours and narrow interests (American Psychiatric Association, 2013). In the majority of cases of the exact aetiology of autism remains unknown, but large population-based studies have provided insights into the possible role of prenatal and other factors during pregnancy and birth in the aetiology of autism (Modabbernia et al. 2017 ). For example, maternal infection during pregnancy (Brown, 2012), maternal gestational diabetes (Gardener, Spiegelman, & Buka, 2009), low birth weight and small-for-gestational age (Gardener et al., 2009; Gardener, Spiegelman, & Buka, 2011) and neonatal Apgar score (Glasson et al., 2004) have all been cited as potential risk factors. The Autism Research Centre conducted a health and development questionnaire that collected data online about the health and pregnancy histories of mothers who went on to have a child with autism, as well as individuals without a child with autism. There is an opportunity for a Part II project to analyse this dataset. We have a sample of mothers of children with autism and mothers of children without autism who have completed this questionnaire, along with other tests such as the Autism Spectrum Quotient (AQ) (Baron-Cohen, Wheelwright, Skinner, Martin, & Clubley, 2001). This project would suit a pair of students working together. Term 1: Download the questionnaire data from the Autism Research Centre website at www.autismresearchcentre.com and analyse it. Term 2: Write up the project.

References:
Title: (SBC2) Puberty history in mothers of a child with autism.

SUPERVISORS: PROF SIMON BARON-COHEN, DR CARRIE ALLISON, DR AMBER RUIGROK and PAULA SMITH

Number of students:

Project Description:
Autism Spectrum Conditions ("autism") are characterised by impairments in reciprocal social interaction and communication, alongside repetitive behaviours and narrow interests (American Psychiatric Association, 2013). In most cases of the exact aetiology of autism remains unknown, but large population-based studies have provided insights into the possible role of prenatal factors such as levels of prenatal sex steroid hormones, which are elevated in autistic boys (Baron-Cohen et al., 2015). Steroid hormones and related pathologies are also elevated in males and females with autism throughout development (El-Baz, et al., 2014; Ingudomnukul et al., 2007; Majewsk et al., 2014; Pohl et al., 2014; although see Croonenberghs et al., 2010). Females with high autistic traits or an autism diagnosis also reported a later age at menarche, indicating that puberty may be delayed in autism (Herguner et al., 2016; Knickmeyer et al., 2006; Whitehouse et al., 2011). The Autism Research Centre conducted a health and development questionnaire that collected data online about the health of males and females with and without autism. There is an opportunity for a Part II project to analyse this dataset. We have a sample of males with and without autism and females with and females without autism who have completed this questionnaire, along with other tests such as the Autism Spectrum Quotient (AQ)(Baron-Cohen, Wheelwright, Skinner, Martin, & Clubley, 2001). This project would suit a pair of students working together. Term 1: Download the questionnaire data from the Autism Research Centre website at www.autismresearchcentre.com and analyse it. Term 2: Write up the project.

References:
Title: (SBC3) Autism risk factors.

SUPERVISORS: PROF SIMON BARON-COHEN, DR CARRIE ALLISON and PAULA SMITH

Number of students:

Project Description:
Autism Spectrum Conditions (“autism”) are characterised by impairments in reciprocal social interaction and communication, alongside repetitive behaviours and narrow interests (American Psychiatric Association, 2013). In the majority of cases of the exact aetiology of autism remains unknown. Twin studies have provided a unique platform to study the relative contribution of genetic and (shared and non-shared) factors to the variability of a certain trait or disorder (Kim & Leventhal, 2015; Lichtenstein, Carlstrom, Rastam, Gillberg, & Anckarsater, 2010; Ronald & Hoekstra, 2011; Rosenberg et al., 2009), with recent estimates yielding concordance rates of <50%, with lower concordance for dizygotic twins. This suggests that both genes and environment play roles in the development of autism. Large population-based studies have provided insights into the possible role of environmental risk factors in the aetiology of autism (see Modabbernia et al. 2017 for a review). These include (but are not limited to): advanced paternal and/or maternal reproductive age (Sandin et al., 2012; Sandin et al., 2016); maternal infection during pregnancy (Brown, 2012); maternal gestational diabetes (Gardener, Spiegelman, & Buka, 2009); low birth weight and small-for-gestational age (Gardener et al., 2009; Gardener, Spiegelman, & Buka, 2011); parental Science, Technology, Engineering and Mathematics (STEM) aptitude (Roelfsema et al., 2012). We have developed a new questionnaire that enquires about potential risk factors in the aetiology of autism. There is an opportunity for a Part II project to refine the questionnaire before it goes online for data collection at www.autismresearchcentre.com. This project would suit a pair of students working together. Term 1: (1) Refine the questionnaire items and submit ethical amendments. (2) Collect data. Term 2: Analyse the data and write up the project.

References:
Lichtenstein, P., Carlstrom, E., Rastam, M., Gillberg, C., & Anckarsater, H. (2010). The genetics of autism spectrum disorders and related neuropsychiatric...


Title: (SG1) Trans parent families

Permanent academic with ultimate responsibility for the project:
Name: Susan Golombok
Department: Centre for Family Research, Department of Psychology
Location: Centre for Family Research
Email: seg42@cam.ac.uk

Primary contact/day-to-day supervisor (if different from the above):
Name: Susan Imrie
Department: Centre for Family Research, Department of Psychology
Location: Centre for Family Research
Email: si275@cam.ac.uk

Number of students who can work on this project:
Minimum: 1 Maximum: 2

Project Description:
The aim of the student project is to explore the experiences of trans parent families. The student final year project forms part of a larger project which will be the first to examine children’s and parents’ experiences in families headed by trans parent(s). The larger project explores the quality of parent-child relationships, family life, families’ experiences of a parent’s transition, and parents’ and children’s wider social experiences (e.g. peer relationships, school environment). The study will also look at parent and child psychological adjustment. There will be some flexibility for the student project to focus in on the area most of interest to the student.
Data will be collected through semi-structured interviews with parents and children (aged 4-18), observational measures of parent-child interactions, questionnaires and child measures which explore children’s understandings of their family. Families will be visited at home (usually by a pair of researchers), so some evening or weekend data collection will be required.
Students involved in the project should have an interest in family research, be open-minded towards different family forms and have the ability to interact sensitively and professionally with families. Previous experience working with children would be desirable. Please contact si275@cam.ac.uk for more information if interested.

References:
Title: (SG2) An examination of the motivations and experiences of people travelling abroad for surrogacy

Permanent academic with ultimate responsibility for the project:
Name: Professor Susan Golombok
Department: Centre for Family Research
Location: New Museums Site
Email: seg42@cam.ac.uk

Primary contact/day-to-day supervisor (if different from the above):
Name: Dr Vasanti Jadva
Department: Centre for Family Research
Location: New Museums Site
Email: vj227@cam.ac.uk

Number of students who can work on this project:
Minimum: 1 Maximum: 2

Project Description:
Participants were recruited through a leading fertility lawyer to examine the differences in people’s experiences of going abroad for surrogacy compared to staying in the UK. An online survey was completed by 1) those considering surrogacy (N = 38) those who were expecting a child at the time of the study (N = 33), and 3) those who had already become parents through surrogacy (N= 132). The survey comprised of open ended and multiple choice questions about motivations for surrogacy, experiences of pregnancy and birth, details about the surrogate, whether they were in current contact with the surrogate and whether they intended to tell others (including the child) about the surrogacy birth. Working on this project will involve coding open-ended responses and analysing data on a subset of the sample. Please contact vj227@cam.ac.uk for more information if interested.

References:


Title: (SG3) Domestic engineers: an exploration of stay-at-home father families in the UK

Permanent academic with ultimate responsibility for the project:
Name: Professor Susan Golombok
Department: Centre for Family Research
Location: New Museums Site
Email: seg42@cam.ac.uk

Primary contact/day-to-day supervisor (if different from the above):
Name: Kitty Jones (PhD student)
Department: Centre for Family Research
Location: New Museums Site
Email: seg42@cam.ac.uk

Number of students who can work on this project:
Minimum: 1 Maximum: 2

Project Description:
The research compares stay-at-home father families to stay-at-home mother families and families where both parents work. Interviews are conducted with mothers, fathers and children aged 3-6 years old. Observational and questionnaire data are also collected. The study explores both the impact of gender on quality of parenting and the level of involvement a parent has in their child’s life on parenting quality. There would be opportunities for joining research visits to assist data collection, as well as helping with data entry.
Please contact cmj44@cam.ac.uk for more information if interested.

References:
Title: (SS1) Consumer Decision Making

Permanent academic with ultimate responsibility for the project:
Name: Dr. Simone Schnall
Department: Psychology
Location: Downing Site, 406
Email: ss877@cam.ac.uk

Number of students who can work on this project:
Minimum: 2 Maximum: 4

Project Description:
The topic of this project is decision making in different contexts. The aim is to investigate how (predicting decision making) and why (finding mediators/moderators) people make different decisions depending on given contexts. In particular, we will examine the extent to which people’s current bodily state or their social and emotional situation will drive their decisions. One domain that will be investigated is economic decision making, for which participants will indicate the desirability of consumer goods (Xu, Schwarz & Wyer, 2015) or of snack foods (Becker, Degroot & Marschak, 1964) either by providing subjective liking judgments, or by assigning a price. Another domain that will be investigated is the consumption of snack foods (e.g., M&Ms), similar to work previously conducted by this research group (Krpan & Schnall, 2014). The research will be conducted using lab experiments and/or online surveys (i.e., Qualtrics).

References:
Project Title: (SS2) Hunger and Desire to Affiliate

Permanent academic with ultimate responsibility for the project:
Name: Dr. Simone Schnall
Department: Psychology
Location: Downing Site, 406
Email: ss877@cam.ac.uk

Number of students who can work on this project:
Minimum: 2 Maximum: 4

Project Description:
Hungry people seek out food, but recent work also suggests compensatory behaviour can occur across non-relevant domains. For example, satiety in men has been shown to increase the sexual attractiveness of slimmer women relative to heavier women (Nelson & Morrison, 2005). Hunger also leads to increased seeking of material resources (Xu et al, 2015). We will test whether hunger or thirst also leads to a desire to affiliate with others, and form social connections. Hunger or thirst will be induced and we will test whether hungry participants show an increased desire to form social connections and of seeking out social relationships, for example, in the form of memory for social information (as in Gardner et al., 2000).

References:
Title: (SS3) Moral Value and Compensatory Processes

Permanent academic with ultimate responsibility for the project:
Name: Dr. Simone Schnall
Department: Psychology
Location: Downing Site, 406
Email: ss877@cam.ac.uk

Number of students who can work on this project:
Minimum: 2 Maximum: 4

Project Description:
People can derive value in the moral domain through various routes, and they compensate for a threat to moral value by engaging in processes to re-establish moral value, a process known as moral licensing and moral cleansing. For example, when people affirm core values of the self they are less likely to engage in prosocial behaviour, as if being reassured of their own value licenses them to refrain from further moral behaviour (Sachdeva, Iliev, & Medin, 2009). Overall, people tend to adapt their behaviour to reach a moral equilibrium (Monin & Miller, 2001). This project will explore the extent to which compensatory processes extend beyond the moral domain, and include value and resources more generally. More specifically, it is hypothesised that resources in one domain (e.g., moral value, financial means, social support, availability of glucose) can compensate for a lack of resources in another domain.

References:
Title: (SVDL1) Gender Prejudice and Stereotyping

Permanent academic with ultimate responsibility for the project:
Name: Dr. Sander van der Linden
Department: Psychology
Location: Free School Lane (New Museums Site)
Email: sander.vanderlinden@psychol.cam.ac.uk

Primary contact/day-to-day supervisor (if different from the above):
Name: Karly Drabot
Department: Psychology
Location: Free School Lane (NMS)
Email: kd363@cam.ac.uk

Number of students who can work on this project:
Minimum: 1 Maximum: 2

Project Description:
Research investigating the intersections of race and gender in experiencing prejudice and discrimination is often inconsistent. On one hand, the theory of ‘double jeopardy’ was introduced by Beale (1979) to explain dual discrimination faced by racial-minority women. Indeed, the Centre for American Progress (2016) stated that, “the wider wage gap for women of color raises questions about the combined effects of gender, race, and ethnicity on discrimination, which economists believe is part of the unexplained portion of the gender wage gap.” Alternatively, the Subordinate Male Target Hypothesis, derived from Social Dominance Theory, suggests that ethnic-minority males are subjected to more severe discrimination than ethnic-minority females. Given that both theoretical perspectives have supporting evidence, it may be more nuanced than previously suggested: perhaps double jeopardy best explains prejudice and discrimination experienced in male-dominant areas (e.g., STEM) and/or positions (e.g., leadership), while the subordinate-male target hypothesis is supported in female-typed domains (e.g., healthcare) and/or positions (e.g., frontline), or vice versa. This project will involve a meta-analysis of the current research as well as an online survey to clarify the combined effects of race and gender on stereotyping, prejudice, and discrimination in employment.

References:
Title: (SVDL2) The Psychology of Environmental Decision-making

Permanent academic with ultimate responsibility for the project:
Name: Dr. Sander van der Linden
Department: Psychology
Location: Free School Lane (New Museums Site)
Email: sander.vanderlinden@psychol.cam.ac.uk

Primary contact/day-to-day supervisor (if different from the above):
Name: Dr. Anne Marthe van der Bles
Department: Psychology
Location: Free School Lane (NMS)
Email: (not issued yet, new postdoc)

Number of students who can work on this project:
Minimum: 1 Maximum: 2

Project Description:
Why is it so psychologically challenging for people to think about and cooperate in large-scale social dilemmas such as climate change? What makes people care about the environment and the future of the planet? This project will evaluate the social-psychological determinants of pro-environmental values, norms, attitudes, and behaviors, including experimental interventions that investigate what makes people more or less likely to act sustainably. Research will involve analysing (cross-cultural) data from nationally representative online surveys to test theories about pro-environmental cognition and decision-making as well as conduct new online survey and experimental work.

References:
Title: **Post-Truth: (SVDL3) Inoculating the Public Against Fake News**

**Permanent academic with ultimate responsibility for the project:**
Name: Dr. Sander van der Linden  
Department: Psychology  
Location: Free School Lane (New Museums Site)  
Email: sander.vanderlinden@psychol.cam.ac.uk

**Primary contact/day-to-day supervisor (if different from the above):**
Name: Dr. Anne Marthe van der Bles  
Department: Psychology  
Location: Free School Lane (NMS)  
Email: (not issued yet, new postdoc)

**Number of students who can work on this project:**
Minimum: 1  
Maximum: 2

**Project Description:**
“Post-truth” was named word of the year by the Oxford dictionaries in 2016 signalling that the status of “facts” has been called into question. The rise of fake news is making it difficult for individuals to form evidence-based judgments and decisions about important societal issues. Key questions therefore include; How does misinformation propagate in the population? And is it possible to pre-emptively “inoculate” or protect people from the spread of fake news? Dubbed by the media as a “vaccine” against fake news, this project will evaluate the efficacy of inoculation theory as an approach to building resistance against persuasion. Research will include online and lab-based evaluation of belief and norm-based messages to better understand the influence of fake news.

**References:**
Title: (SVL4) The Gateway Belief Model (GBM) of Judgment Formation

Permanent academic with ultimate responsibility for the project:
Name: Dr. Sander van der Linden
Department: Psychology
Location: Free School Lane (New Museums Site)
Email: sander.vanderlinden@psychol.cam.ac.uk

Number of students who can work on this project:
Minimum: 1 Maximum: 2

Project Description:
How do people form judgments about (contested) social and scientific issues? The Gateway Belief Model (GBM) by van der Linden et al. (2015) theorizes a two-stage process of opinion change. When forming judgments about debated and uncertain societal issues such as climate change, gun control, GMO’s, and vaccine safety, people are motivated to take consensus cues into account, particularly among experts (Stage I). This perception of normative group-agreement then serves as a “gateway” cognition to key personal beliefs about an issue (Stage II), which in turn, predicts behavioral and policy-support. This project will involve conducting a meta-analysis to summarize and quantify all the evidence to date for the Gateway Belief Model (GBM) of judgment formation.

References:
(TBE1) How arousal modulates cognitive control: an EEG study on inhibitory capacity while falling asleep

**Permanent academic with ultimate responsibility for the project:**
Name: Tristan Bekinschtein  
Department: Psychology  
Location: Craik-Marshall/BCNI  
Email: tb419

**Primary contact/day-to-day supervisor (if different from the above):**
Name: Alejandro Ezquerro  
Department: Psychology  
Location: Craik-Marshall/BCNI  
Email: ae392

**Number of students who can work on this project:**
Minimum: 1 Maximum: 2

**Project Description:**
Attention, arousal and cognitive performance varies along the days based on wakefulness changes (arousal/responsiveness, circadian rhythms, sleep cycle, and homeostasis) but these are scarcely taken into account in cognitive neuroscience. As part of a large program of research, we aim to Cognitive control performance during the process of falling asleep in normal human volunteers. In a collaboration with Simon Van Gaal (Amsterdam) we have characterised the fragmentation of cognition of auditory conflictive cues and found that performance significantly drops with increasing drowsiness when working memory is needed but direct conflict processing does not follow this pattern. This preliminary result forms the bases for a data acquisition and analysis project to understand the neural underpinnings of how we take decisions and how adapt to conflictive information. Students involved in this project will have the opportunity to participate in all stages of this study, data collection, analyses and interpretation/discussion. They will gain first-hand experience in the use of the latest technologies in cognitive neuroscience, critical to our understanding of consciousness, decision making and cognitive control.

**References:**
Here is a precursor of our work in the lab on spatial attention  

And a recently accepted abstract for a Talk of this project to be presented in icno2017.org

Andres Canales-Johnson  
All authors & affiliationAndres Canales-Johnson, University of Amsterdam Lola Beerendonk,  

Alertness level differentially modulate behavioural and neural markers of conflict and conflict adaptation.
Instantaneous conflict as well as across-trial conflict adaptation, two sub processes of cognitive control, can occur in the absence of conflict awareness. Conflict monitoring thus does not seem to depend on content of consciousness, but it remains unclear at which extent it relies on the level of consciousness. Here we use the transition from wakefulness to sleep as a model for studying the behavioral and neural markers of conflict under different levels of alertness. We used an auditory task in which participants listened to the words 'left' or 'right' presented either to the left or right ear while transitioning towards sleep. Participants had to press a button matching the meaning of the word (i.e. 'left' or 'right') with the corresponding hand (left or right), ignoring the location where the stimuli were presented. We hypothesized that instantaneous conflict is the result of an automatic process and would therefore be independent of conscious level. Contrarily, since conflict adaptation requires the integration of information over time, we expected it to depend on the level of consciousness. Regarding conflict processing, our results revealed longer reaction times and higher frontal theta-band power in incongruent trials (e.g. 'left' word coming from the right ear) compared to congruent trials (e.g. 'right' word coming from the right ear) during awake and drowsy states. However, these behavioural and neural markers were only observed during the awake state in the case of conflict adaptation. These results suggest that alertness levels differentially modulate the processing of conflictive information in the brain.
Title: (TBE2) Does left-handedness confer resistance to spatial bias?

Permanent academic with ultimate responsibility for the project:
Name: Tristan Bekinschtein
Department: Psychology
Location: Craik-Marshall/BCNI
Email: tb419

Primary contact/day-to-day supervisor (if different from the above):
Name: Sridhar Jagannathan and Corinne Bareham
Department: Psychology
Location: Craik-Marshall/HSB
Email: srj34 and cab90

Number of students who can work on this project:
Minimum:1 Maximum:2

Project Description:
How cognitive processing is altered when we fall asleep? Can it be used to characterize cognition? In order to characterize how different executive functions are impacted by the transition from awake to drowsy states, we have measured brain activity (EEG) while individuals were listening to and responding with button presses to a series of sounds while falling asleep. Such tasks allow us to investigate the ways in which the mental abilities we employ while awake, such as paying attention and decision making, change as we fall into natural unconsciousness, and how its recover when we get back to be fully conscious. We recently demonstrated that drowsiness, indexed using EEG, was associated with left-inattention but left-handers seemed to be resistant to this inattention imbalance. We aim to confirmed and extend this first finding in a new group of healthy non-right-handers using a new analyses methods in EEG and behavioural modelling. Students involved in this project will participate in all stages of this study, from data collection but mainly analysis of behavioural and neuroimaging data. They will gain first-hand experience in the use of the latest technologies in cognitive neuroscience, critical to our understanding of consciousness.

References:
https://www.nature.com/articles/srep09162
Does left-handedness confer resistance to spatial bias?
Corinne A. Bareham, Tristan A. Bekinschtein, Sophie K. Scott & Tom Manly Scientific Reports 5, Article number: 9162 (2015)
Title: (TBE3) Probing attention during meditation: a cognitive neuroscience approach

Permanent academic with ultimate responsibility for the project:
Name: Tristan Bekinschtein
Department: Psychology
Location: Craik-Marshall/BCNI
Email: tb419

Primary contact/day-to-day supervisor (if different from the above):
Name: Barbara Jachs
Department: Psychology
Location: Craik-Marshall/BCNI
Email: bj273

Number of students who can work on this project:
Minimum:1 Maximum:2

Project Description:
The study of neural basis consciousness is one of the most pressing problems in modern science. Current research strategies neglect one fundamental aspect of it: the variety of phenomenological experience that comes to existence only through consciousness. How does conscious effort during meditation can bring about changes in subjective experiences? In a row of EEG experiments, we will be investigating how subjective experience, on a moment-to-moment basis, relates to theoretically-driven neurophysiological measures of consciousness and awareness. We aim to characterize the dimensions of experiences during meditation in both experts and newly trained meditators, in light of current frameworks of consciousness. This ambitious project will provide important insights on how conscious endogenous brain activity maps into measurable state changes in the neural substrates of consciousness. The student will participate from data acquisition in behavioural and EEG tasks and analyses and interpretation of attention-based tasks during and out of meditative states.
Title: (TBE4) How arousal modulates auditory attention: an EEG study on attention to rhythms while falling asleep

Permanent academic with ultimate responsibility for the project:
Name: Tristan Bekinschtein
Department: Psychology
Location: Craik-Marshall/BCNI
Email: tb419

Primary contact/day-to-day supervisor (if different from the above):
Name: Alex Williams
Department: Psychology
Location: Craik-Marshall/BCNI
Email: aw2343

Number of students who can work on this:
Minimum: 1 Maximum: 2

Project Description:
When presented with a musical rhythm, the listener imposes a hierarchical structure of event saliency on the auditory sequence. Events at the time of the perceived underlying beat of the sequence are assigned greater salience. While fluctuations in conscious vigilance (sleepiness) disrupt regularity perception in some cases, perception of a highly salient recurring auditory accent can occur even when attention is actively diverted from the sequence. This second experiment aims at exploring cortical prediction error signals for unexpected omissions and disruptions of a regular auditory accent in highly beat-salient rhythms. Interestingly, preliminary results show early event-related responses to only the standard, highly salient auditory accents were enhanced during drowsiness. This interaction of consciousness and regularity perception suggests that regular percepts are enhanced at sleep onset, whilst variable sensory inputs are processed similarly at sleep onset as during disrupted attention. The project aims at confirming and extending these results with a new experiment by testing EEG in normal subjects in a falling asleep task. Students will be involved in data acquisition, analysis and interpretation of results.

References:
Here is a precursor of our work in the lab on spatial attention in drowsiness

And on auditory attention
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2635770/
Title: (TBU1) Assessing the contribution of dopamine D1/D2 receptors to reinforcement sensitivity and cognitive flexibility in mice

Permanent academic with ultimate responsibility for the project:
Name: Timothy Bussey
Department: Department of Psychology
Location:
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Primary contact/day-to-day supervisor (if different from the above):
Name: Benjamin Phillips
Department: Department of Psychology
Location:
Email: bp342@cam.ac.uk

Number of students who can work on this:
Minimum: 1 Maximum: 2

Project Description:
Multiple psychopathologies including depression, addiction and OCD are characterised by cognitive inflexibility, whereby individuals are unable to adaptively update patterns of behaviour to respond to changes in the environment. In the lab we have developed touchscreen tasks for the assessment of cognitive flexibility in rodents and are investigating the neural mechanisms that support task performance. In particular, we are interested in how changes in sensitivity to wins and losses modulate cognitive flexibility. This project will involve training and testing mice and rats on a recently adapted spatial probabilistic reversal learning task (PRL), which requires emission of multiple consecutive optimal responses whilst disregarding spurious feedback (Bari et al., 2010). Previous studies have implicated both dopamine and serotonin in the regulation of reinforcement and cognitive flexibility (Brigman et al., 2010; Evers et al., 2005; Frank et al., 2004). In this project, we will specifically investigate the contribution of dopamine D1 and D2 receptor subtypes to performance of the task. Mice and rats will be trained to a high level of performance on a touchscreen-based spatial PRL procedure. Subsequently, all animals will be treated with pharmacological agents known to selectively increase or decrease activity at D1 or D2 receptors including the D2-selective agents quinpirole and aripiprazole (Abilify) and the D1-receptor antagonist SCH 23390. Data will be analysed to determine if these manipulations alter sensitivity to wins and losses with consequent effects on cognitive flexibility.
References:
Title: (TR1) Top-down control of cognition and behaviour: 
The role of frontostriatal circuitry in cognitive flexibility in the rat

Permanent academic with ultimate responsibility for the project:
Name: Prof. Trevor W. Robbins
Department: Psychology
Email: twr2@cam.ac.uk

Primary contact/day-to-day supervisor (if different from the above):
Name: Dr. Johan Alsiö
Department: Psychology
Location: Main Building Psychology, room 416
Email: ja476@cam.ac.uk

Number of students who can work on this project:
Minimum: 2 Maximum: 4

Project Description:
Brain imaging in human patients has identified altered frontostriatal connectivity and associated cognitive impairment, e.g. behavioural rigidity in touchscreen tasks of cognitive flexibility, in mental disorders such as drug addiction (Ersche et al. 2011) and obsessive-compulsive disorder (Vaghi et al. 2017). Much of our knowledge of the neural circuits involved in cognitive flexibility comes from animal research in which chemicals have been infused locally into the ‘nodes’ of the complex neural network required for flexible learning, e.g. the orbitofrontal cortex (OFC) or the medial striatum, to inactivate the brain region as a whole either transiently or permanently in rodents trained in reversal learning tasks (Chudasama & Robbins 2003; Alsiö et al. 2015). However, to improve our understanding of these circuits and their function in the healthy brain, or dysfunction in mental disorders, we need to be able interrogate the networks, not the nodes. In this project, we will evaluate permanent or transient inactivation of the neural projections from the OFC or medial prefrontal cortex (mPFC) to the ventromedial striatum (VMS) in the rat on reversal learning, using retrograde viral vectors for gene transfer to target neurons based on their anatomical projection fields. We specifically hypothesize that inactivation of the (medial) OFC→VMS pathway will alleviate cognitive rigidity, promoting flexible behaviour in the rat. The students involved in this project will train the animal subjects in our highly translational touchscreen-based cognitive tasks (Mar et al. 2013) and measure the impact of OFC→VMS and mPFC→VMS blockade on reversal learning; collecting, analysing, interpreting and presenting behavioural data under supervision by senior researchers in the Robbins group. The project also involves validating the viral gene transfer procedure for circuit interrogation using immunohistochemical methodology.

References:

2: Chudasama Y, Robbins TW. Dissociable contributions of the orbitofrontal and infralimbic cortex to pavlovian autoshaping and discrimination reversal learning:


Title: (TR2) Cognition and apathy in normal pressure hydrocephalus

Permanent academic with ultimate responsibility for the project:
Name: Professor Trevor W. Robbins and Professor Barbara J. Sahakian
Department: Department of Psychology (TWR)/ Department of Psychiatry (BJS)
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Email: twr2@hermes.cam.ac.uk/ bjs1001@medschl.cam.ac.uk

Primary contact/day-to-day supervisor (if different from the above):
Name: Dr George Savulich and Katie Peterson
Department: Department of Psychiatry/ Department of Clinical Neurosciences
Location: Herchel Smith Building for Brain and Mind Sciences, Forvie Site, Addenbrooke’s Hospital CB2 0SZ
Email: gjs46@medschl.cam.ac.uk/ kap45@medschl.cam.ac.uk

Number of students who can work on this project:
Minimum: 1 Maximum: 1

Project Description:
Normal pressure hydrocephalus (NPH) is characterised by a build-up of cerebrospinal fluid (CSF) in the brain, despite apparently normal CSF pressure at lumbar puncture [1]. Symptoms include gait disturbance, urinary incontinence and progressive dementia characterised by deficits in memory, visuospatial abilities, psychomotor speed and executive function [2]. In addition, apathy (impaired motivation and goal-directed behaviour) is also commonly reported in NPH (presenting in up to 86% of patients) [3,4,5], yet the significance of this symptom has not been elucidated. The aim of this project is to explore the relationship between cognition and apathy in NPH using previously collected, anonymised neuropsychological test data. With supervision, the student could explore several key questions:

- **Anosognosia in NPH** – investigating potential discrepancy between self-rated vs. informant-ratings of apathy (i.e. are discrepancy scores associated with greater cognitive impairment?)

- **Characterising apathy in NPH** – which aspects of apathy (e.g. emotional, cognitive, behavioural) do patients with NPH present with, determined via the raw self-rated Apathy Evaluation Scale scores.

- **Analysis of Mini-Mental State Examination (MMSE) sub-domain scores** – which sub-tasks within the MMSE do patients with NPH tend to perform poorly on, and is performance on these components associated with other clinical measures (i.e. disease severity; self- or carer-rated apathy; executive/frontal components; CANTAB Paired Associates Learning/Spatial Working Memory)?

The project would suit a student interested in pursuing neurology or clinical psychology.

References:


Title: (UG1) Baby Rhythm – Do Infants move their Eyes in time with Speech?

Permanent academic with ultimate responsibility for the project:
Name: Professor Usha Goswami
Department: Psychology
Location: Craik Marshall Building room 312
Email: ucg10@cam.ac.uk

Primary contact/day-to-day supervisor (if different from the above):
Name: Dr Perrine Brusini
Department: Psychology
Location: Craik Marshall Building room 315
Email: pb669@cam.ac.uk

Number of students who can work on this project:
Minimum: 1 Maximum: 2

Project Description:
We have been recording eye tracking data from young infants below 7 months of age as they listen to sung nursery rhymes and to other rhythmic stimuli like drumbeats, using an eye tracker system. However, for our youngest infants, the eye tracking sensors have not always been triggered during recordings. In this project, students will devise ways of analysing infant eye movements by watching and scoring videos that we made of the paradigm, and will devise (with support from Perrine) a means of analysing the accuracy of the temporal alignment of these eye movements with predetermined markers in the input signal (e.g. visual occurrence of a drumbeat, head movement while singing the nursery rhyme). We will be looking for individual differences in the accuracy of eye movements, and whether infant eye movements are reliably aligned to visual features of the input such as head and cheek movements.

References:
Leong, V., Kalashnikova, M., Burnham, D. & Goswami, U. (2017). The temporal modulation structure of infant-directed speech. Open Mind. doi: 10.1162/OPMI_a_00008
Title: (UG2) Baby Rhythm –
Do Infants move Rhythmically in time with Speech?

Permanent academic with ultimate responsibility for the project:
Name: Professor Usha Goswami
Department: Psychology
Location: Craik Marshall Building room 312
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Primary contact/day-to-day supervisor (if different from the above):
Name: Dr Adam Attaheri
Department: Psychology
Location: Craik Marshall Building room 315
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Number of students who can work on this project:
Minimum: 1 Maximum: 2

Project Description:
We have been recording movement data from young infants below 7 months of age as they listen to sung nursery rhymes and to other rhythmic stimuli like drumbeats, using a motion capture system. However, for our youngest infants, the motion capture sensors have not always been triggered. In this project, students will devise ways of analysing infant movements by watching and scoring videos that we made of the paradigm for a group of infants, and will devise (with support from Adam) a means of analysing the accuracy of the temporal alignment of these movements with predetermined markers in the input signal (e.g. occurrence of a drumbeat, word on beat in the nursery rhyme). We will be looking for individual differences in the accuracy of rhythmic movement, and whether some movements (e.g. arm waving) are more reliably aligned to the input than others (e.g., kicking).

References:
Leong, V., Kalashnikova, M., Burnham, D. & Goswami, U. (2017). The temporal modulation structure of infant-directed speech. Open Mind. doi: 10.1162/OPMI_a_00008
Title: (UG3) Sound Localisation Accuracy in Developmental Dyslexia

Permanent academic with ultimate responsibility for the project:
Name: Professor Usha Goswami
Department: Psychology
Location: Craik Marshall Building room 312
Email: ucg10@cam.ac.uk

Primary contact/day-to-day supervisor (if different from the above):
Name: Dr Sheila Flanagan  Department: Psychology
Location: Craik Marshall Building room 316  Email: saf31@cam.ac.uk

Number of students who can work on this project:
Minimum: 1 Maximum: 2

Project Description:
Research into dyslexia has revealed auditory processing difficulties focused on amplitude envelope sensitivity. The envelope is the overall shape of a sound and is usually described as having an onset part, a steady state and an offset. The envelope is crucial in the auditory scene as it influences, amongst other things, the perception of amplitude, duration, pitch, timbre, and localisation. Research using functional magnetic resonance imaging suggests that the human auditory system is sensitive to the envelope of a sound and this sensitivity is organised as a hierarchical filter bank with preferential processing of an amplitude modulated frequency in the lower brain-stem at around 250 Hz, 30 – 250 Hz in the inferior colliculus, 16 Hz in the medial geniculate body, 8 Hz in the primary auditory cortex, and 4 – 8 Hz for secondary auditory cortical regions. Goswami’s Temporal Sampling theory of the phonological impairments in dyslexia suggests impaired neural entrainment at these lower frequencies, represented in the highest cortical regions.
To identify the location and movement of sound objects, people usually rely on binaural cues such as inter-aural level and inter-aural time differences. The ongoing inter-aural time difference of the sound envelope reaching the two ears can be used to judge its location in the horizontal plane. There have been reports that children with developmental dyslexia also have difficulty with judging the direction that sounds are coming from. In this project students will measure the response to sound onsets and sound movement in the horizontal plane in dyslexic and control adult participants. Task design will be supported by Sheila.

References:
Title: (UG4) Baby Rhythm – Can Infants Track Visual Rhythmic Information?

Permanent academic with ultimate responsibility for the project:
Name: Professor Usha Goswami
Department: Psychology
Location: Craik Marshall Building room 312
Email: ucg10@cam.ac.uk

Primary contact/day-to-day supervisor (if different from the above):
Name: Dr Perrine Brusini
Department: Psychology
Location: Craik Marshall Building room 315
Email: pb669@cam.ac.uk

Number of students who can work on this project:
Minimum: 1 Maximum: 2

Project Description:
We have been recording eye tracking data from young infants as they watch a smiley face move randomly on a computer screen at different rhythmic rates, using an eye tracker system. However, manual analysis of the data is required for the younger infants, as the eye tracker does not always record their eyes effectively. In this project, students will devise ways of analysing infant eye movements as they track the 1 Hz and 2 Hz movement of smiley faces (with support from Perrine). We think 1 Hz and 2 Hz visual pursuit is related to language development. This project will require scrutiny of individual data in order to devise a means of analysing the accuracy of the visual pursuit. We will be looking for individual differences in the accuracy of eye movements, and whether infant eye movements are reliably tracking the smiley stimulus.

References:
Leong, V., Kalashnikova, M., Burnham, D. & Goswami, U. (2017). The temporal modulation structure of infant-directed speech. Open Mind. doi: 10.1162/OPMI_a_00008
Title: (WS1) Risk, Reward, and Delay

Permanent academic with ultimate responsibility for the project:
Name: William Skylark
Department: Psychology
Location: Main Building
Email: wjm22@cam.ac.uk

Number of students who can work on this project:
Minimum: 1 Maximum: 2

Project Description:
Would you pay £2 play a gamble that offers a 50% chance of winning £5? Would you rather receive £5 now or £20 in 6 months’ time? These kind of risky and intertemporal choices are central to our socioeconomic activity, and are extensively studied by psychologists and economists. In the “real world”, risks, rewards, and delays are often correlated. Recent evidence suggests that people are aware of these associations and use them to infer likely probabilities for outcomes whose probability is not known.
This project will examine the beliefs that people hold about the associations between probabilities, rewards, and delay. Participants will be given simple decision tasks using pen and paper exercises or computer-based presentation (with the option for large-scale on-line testing) and will be asked to estimate risks, outcomes, and timescales, and to make choices between options that differ in these variables. There will be scope to conduct a series of studies that build on initial findings and emerging student interests.
Feel free to get in touch if you would like more information.

References:
Title: (WS2) A new approach to risk communication

Permanent academic with ultimate responsibility for the project:
Name: William Skylark
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Primary contact/day-to-day supervisor (if different from the above):
Name: George Farmer
Department: Psychology
Location: Room 420
Email: gdf22@cam.ac.uk

Number of students who can work on this project:
Minimum:1
Maximum:2

Project Description:
While people are known to be risk averse and exhibit many biases in their decision-making, a relatively new paradigm has emerged in which people appear to behave optimally. Using touch screens to display targets with penalties and rewards, researchers can construct lotteries in which the probability of success or failure is a function of your own accuracy in making a rapid pointing gesture. Under these conditions people tend to aim for the optimal point - the point that maximises their reward. In this project we will examine whether we can exploit these findings in order develop a new way to communicate risk – potentially allowing people to make better decisions in financial, medical and other domains.

References:
Title: (WS3) Probing the Gambler’s Fallacy

Permanent academic with ultimate responsibility for the project:
Name: William Skylark
Department: Psychology
Location: Main Building
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Primary contact/day-to-day supervisor (if different from the above):
Name: George Farmer
Department: Psych
Location: Room 420
Email: gdf22@cam.ac.uk

Number of students who can work on this project:
Minimum: 1 Maximum: 2

Project Description:
The Gambler’s Fallacy refers to the often strongly held intuition that a fair coin is more likely to come up heads after a long run of tails, or that a roulette wheel is more likely to come up black after a long run of reds. This belief affects real-world gambling behaviour, but also reveals something fundamental about how we perceive randomness (and therefore structure) in our environment. In this project we will explore whether this belief is actually a sensible inference given the limited experience people have of genuine random sequences. You will design an experiment and collect data either online or in the lab.
Feel free to get in touch if you would like more information.

References:
Title: (WS4) Understanding human time perception

Permanent academic with ultimate responsibility for the project:
Name: William Skylark
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Location: Main Building
Email: wjm22@cam.ac.uk

Number of students who can work on this project:
Minimum: 1 Maximum: 2

Project description:
How long have you spent reading this sentence? We routinely judge time, yet our duration judgments are influenced by all manner of non-temporal information. For example, the apparent duration of visual experiences depend on an object’s size, brightness, and motion (Eagleman & Pariyadhath, 2009; Matthews & Meck, 2014). These effects provide fundamental insights into the basis for temporal judgments, and have practical implications -- for example, the credibility of eyewitness testimony depends on the witness’ judgment of how long they saw the alleged perpetrator.

This project will investigate human time perception. There are several possible lines of enquiry that a student might pursue, depending on their interest and experience. The work will use behavioural testing, possibly combined with eye-tracking. Possible directions include: investigating the extent to which effects found in laboratory studies generalize to “real world”/naturalistic situations; examining the link between subjective time and decision-making; using image statistics and gaze-tracking to predict time judgments; and probing the complex links between repetition, expectation, and the sense of time.

Feel free to get in touch if you have any questions.

References:
Title: (ZK1) Comparing Infants’ and Adults’ Strategies for Learning Statistical Structure in Language

Permanent academic with ultimate responsibility for the project:
Name: Zoe Kourtzi
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Primary contact/day-to-day supervisor (if different from the above):
Name: Dr Victoria Leong
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Location: Craik Marshall Building
Email: vvec2@cam.ac.uk

Number of students who can work on this project:
Minimum: 2 Maximum: 4

Project Description:
From an early age, human infants already display a high level of competence for statistical learning (Saffran et al., 1996), and are able to extract transitional probabilities and hierarchical temporal structure with ease. These statistical extraction skills are crucial particularly for early language learning, as infants must uncover the phonological (speech sound) building blocks of their native language from human speech - a complex signal that has a rich hierarchical spectro-temporal architecture (Leong & Goswami, 2015). When learning statistical structure, adults may engage in two different earning strategies that differentially involve structure learning vs. memorising. This project will explore whether infants use the same learning strategies as adults to extract statistical structure from spoken language. As an adult-like form of explicit memory emerges by around 8-10 months of age, we will compare the strategies used by younger 6-month-old infants before the emergence of explicit memory, and that of older 12-month-old infants after the emergence of explicit memory. A control group of adults will also be tested. Each of the 3 groups of participants (n=20 per group) will perform an age-appropriate artificial grammar learning task (e.g. a preferential looking paradigm for infants), as well as behavioural assays for memory and attention. We will assess individual learning strategies, how they differ between infants and adults and how they may relate to other cognitive abilities.

References:
Title: (ZK2) Individual variability in learning ability

Permanent academic with ultimate responsibility for the project:
Name: Zoe Kourtzi
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Location: Craik Marshall Building
Email: zk240@cam.ac.uk

Number of students who can work on this project:
Minimum: 1
Maximum: 2

Project Description:
Experience shapes performance on a variety of tasks, but why are some people better at learning than others? This project will aim to systematically investigate individual variability in learning ability in young adults. The main goal of the work is to evaluate the role of learning in decisions when external noise in the physical input results in high uncertainty in the observers’ ability to make decisions (i.e. discriminate targets in cluttered scenes). We will develop a battery of tests based on established experimental paradigms that measure cognitive abilities (e.g. attention, memory, reasoning) and evaluate the role of these functions in individual variability in learning performance. We will aim to identify prototypical learning profiles that may differ across individuals and understand how cognitive abilities relate to individual variability.

References:
Project Title: (ZK3) Learning to generalise

Permanent academic with ultimate responsibility for the project:
Name: Zoe Kourtzi
Department: Psychology
Location: Craik Marshall Building
Email: zk240@cam.ac.uk

Number of students who can work on this project:
Minimum: 1 Maximum: 2

Project Description:
It is well known that practice makes perfect, but how do we generalise knowledge from previous experience to new situations? The aim of this project is to investigate whether training generalises beyond the context of the trained task or skill to support our ability for flexible behaviour. First, we will test whether learning in the context of perceptual tasks improves performance in cognitive skills (i.e. working memory, attention), providing evidence that learning of underlying structures and principles promotes flexible cognition. Second, we will examine whether training on cognitive control skills (i.e. working memory, attention) improves performance not only on these tasks but also facilitates our ability for learning (i.e. infer perceptual structures in novel settings).

References:

References:
Title: (ZK4) Learning profiles across the lifespan and in early dementia

Permanent academic with ultimate responsibility for the project:
Name: Zoe Kourtzi
Department: Psychology
Location: Craik Marshall Building
Email: zk240@cam.ac.uk

Number of students who can work on this project:
Minimum: 1 Maximum: 2

Project Description:
Experience and learning are key factors for human development known to shape cognitive abilities in the young adult human brain (1-3). However, the mechanisms of brain training that sustain cognitive abilities and help maintenance of function in ageing remain largely unknown. Understanding the role of learning in making perceptual decisions (e.g. identifying a friend in the crowd) across the lifespan is complicated by between-individual variability caused by differences in learning strategies and styles, as well as memory impairments in early dementia. The aim of this project is to derive profiles for ‘high’ or ‘low’ performers based on their learning efficiency. In particular, we will test whether variability in cognitive functions (i.e. memory, attention, reasoning), learning performance independent of age.

References: