This module will give students an advanced understanding of how the brain enables us to remember the personal events and episodes that shape our lives. We will examine how studies from different fields including behavioural neuroscience, animal behaviour, cognitive psychology and neuroimaging are combined to examine the neural basis of this psychological process.

The aim of the course is to encourage you to think independently and critically evaluate research in this field. A further aim is to demonstrate how studies examining different levels of explanation from genes and single cells to groups of behaving animals and humans can be used to address the same theoretical question. This multidisciplinary approach is a real strength of the field and throughout the course we will see numerous examples of studies that when considered alone are interesting but when combined with studies tackling the issue from another perspective produce compelling support for theory.

At the end of this document I have included a list of transferable and generic skills that will be practised and demonstrated during the course.

Course structure

The course will be split between seminar and lecture format. For seminars students will present articles and then we will have small group discussions to examine questions related to the articles. At the end of each session I will briefly summarise the main points, put the articles in context of the wider field and explain any particularly complicated concepts or methods that you will need to understand for the following week.

The majority of the articles I have chosen are cutting edge research that use modern neuroscience techniques to examine brain function. I will meet with the presenting students the week before their presentation to go over the main points of the paper and make sure that they understand the technical details. I will also give general advice about presenting skills.

It is vital that all students read all of the papers that will be presented each week before the session. I would encourage you to do this actively. As you are reading think about whether the paper addresses the question it sets out to. Are the methods appropriate? Are there any problems with the design such as inappropriate control conditions? As we go through the course I will guide you to think critically and ask questions about the studies we are covering. Also, remember that critical evaluation does not always need to be negative. If
there are real strengths to a study then these deserve discussion as well. Make notes as you read and when you have finished reading an article make sure to summarise your thoughts so that you will be prepared for discussions. To help you with this I have included a reading sheet that you can fill in for each paper and bring to class to help summarise your thoughts and aid class discussion.

Assessment

The assessment for the module will be in 2 parts:

1. 25% - An initial essay (2000 words) to be uploaded to MMS by 9AM on Sunday 24th October.
   
   Question for first assessment:
   
   Explain with reference to the neural mechanisms that support spatial memory and navigation why we get lost.

2. 75% - 3 essay titles will be emailed to the class at 9 am on the morning of the assessment (in the exam period – yet to be decided) and students should write two 1000 word essays to answer two of them. These two 1000 word essays should be uploaded to MMS by 5pm on the same day.

Feedback

The assessments are designed so that you can gain benefit from the feedback on the first assessment when completing the second. I will give written feedback (uploaded to MMS) on the initial 2000 word essay two weeks after they are handed in (6th November 5pm). Feedback for the second essays will be available the following semester.

Reading list:

The articles for each week’s lecture are listed below and can be downloaded from the reading list which can be found via Moodle or MMS. The link to the reading list is here:

PS4089 reading list
Course Outline:

September 13\textsuperscript{th} Week 1: Episodic memory – why is it important?

The first week is largely an introduction to the area. I will introduce the key concepts behind episodic memory and set in context why it is important that we understand its neural basis. I will go on to briefly introduce the areas that we will cover throughout the semester and discuss how the module will be run.

Required Reading:
The readings for this week are review articles aimed to give you an overview of the neural system and psychological process we will be concentrating on. As well as providing a useful introduction these articles will be very useful for revision as we will have covered a lot of the material in these articles in detail by the end of the course.


Additional Reading:


Suggested (and not compulsory!) viewing:

MEMENTO - \url{http://www.imdb.com/title/tt0209144/} Available for loan from the library.

Memento is an excellent film about a character who has anterograde amnesia and consequently cannot form new episodic memories. It is remarkably accurate in its depiction of this disability. It is, of course, fiction and does have some violent scenes so please be aware of this if you choose to watch it. It is not assessed in any way.

September 20\textsuperscript{th} Week 2: Animal models of episodic memory

To understand how the brain enables us to remember things that have happened to us we need to examine the neural systems that support episodic memory. This is predominantly done in two ways; monitoring the system in organisms that are carrying out memory tasks or by manipulating the system and asking how these manipulations affect episodic memory. Many of these manipulations involve invasive techniques and as such can usually only be performed on animals. However, is it even possible to study episodic memory in animals?

Required Reading:


Additional Reading:

September 27th Week 3: The hippocampus as a cognitive map?

Since the study of HM we have known that episodic memory is dependent on the hippocampus. Patients with lesions of the hippocampus do not encode new episodic memories. However, we also know that the hippocampus is needed for spatial memory. Does the hippocampus encode spatial memory, episodic memory or both?

Required Reading:

Additional Reading:

October 4th Week 4: How do we remember what happened to us? Do we use the same systems for what and where?

Episodic memories include information about specific features in the environment. How does the brain encode these features? Is the hippocampus involved in this process?

Required Reading:

Additional Reading:
October 11th Week 5: Finding your way, is this the same as knowing where you are?

When navigating between two places we can use a number of different methods. We can follow a map. We can use a compass and walk in a certain direction. We can keep track of how far we have gone with an odometer or pedometer. As discussed in second year lectures we all have the ability to do these things in our head. However, is the ability to keep track of our position in space by monitoring direction and distance travelled (path integration) the same as the ability to have an internal representation of external space (a cognitive map)?

Required Reading:


Additional Reading:


October 20th Week 6: Independent learning week

October 25th Week 7: Do we remember when things happened?

The original definition of episodic memory specifically states that memory for events should include a temporal component; when did the event happen? However, is there any evidence that we have a real understanding of time and how would this be encoded by the brain?

Required Reading:


**November 1st Week 8: Context as a cue to episodic memory**

Many people have difficulty remembering exact dates for events but what other cues or features of an event may be used to distinguish them from other events in our lives?

**Required Reading:**


**Additional Reading:**


**November 8th Week 9: Do we use the same system to imagine the future that we use to remember the past?**

It has been suggested that the ability to mentally travel in time is the underlying mechanism that allows us to re-experience events from our past and also to imagine ourselves in the future. Are these psychological processes based on the same neural systems?

**Reading:**


**Additional Reading:**


**November 15th Week 10: Disentangling the processes that contribute to episodic memory**

The human experience of memory is not unitary. When retrieving information about the past, we can sometimes bring to mind details as though we are reliving our memories. Other times, our recollective experience is much more sparse. There is substantial evidence to suggest that these two
different experiences rely on separable cognitive processes, recollection (R) and familiarity (F). Receiver operating characteristics (ROCs) allow us to visualise the separate contributions of R and F to memory performance. Measures obtained from ROCs yield dissociable brain regions that support each process.

**Required Reading:**


**Required Tweaking:**

ROCDemonstration.xlsx spreadsheet.

Modify the values across the various sheet to see how different parameters affect the shapes of the ROCs. This will give you an insight into how contributions from different recollective experiences influence the shape of an ROC.

**Additional Reading:**


**November 22nd Week 11: Ageing and episodic memory**

Episodic memory is the first cognitive process to decline in Alzheimer’s disease. The inability to form new episodic memories is extremely debilitating and means that most patients with dementia need 24 hour care. Understanding the changes in the neural systems that degenerate to produce these deficits is key to understanding the disorders and attempting to produce therapeutic strategies.

**Required Reading:**


Title/Authors:

Hypotheses:

Methods:

Main results:

Conclusions:

Critique:

Think about; were the hypotheses clearly laid out? Were the methods appropriate? Are the results clear? Are the analyses appropriate and are all relevant analyses performed? Do the data support the conclusion?
Graduate Attributes (Transferable and Generic Skills)

The School of Psychology and Neuroscience offers opportunities in all of its modules to obtain, practice and demonstrate many of the core skills below. Across the whole programme of modules you will be able to draw on concrete examples (i.e. evidence) for all of these skills in order to promote yourself to prospective employers and others.

In PS4089 we have particular strengths for opportunities to:

1. Demonstrate original thought
2. Construct a coherent argument or debate by demonstrating logical processing of (complex) information and deductive reasoning
3. Apply critical analysis, evaluation and synthesis to solve complex problems
4. Test hypotheses, theories, methods and evidence within their proper contexts
5. Reason from the particular to the general
6. Identify relevant techniques and concepts to solve advanced and complex problems
7. Demonstrate use of an appropriate range of resources to the task at hand
8. Evaluate relevant best practices for the task at hand
9. Engage directly with current research, developments and skills in the discipline
10. Engage with primary and secondary material and differentiate between them
11. Demonstrate active learning
12. Demonstrate reflective learning, including the ability to engage with and learn from feedback
13. Demonstrate creativity and curiosity
14. Demonstrate independence of thought and reasoning
15. Demonstrate skills in time management, self-discipline and self-motivation
16. Demonstrate skills in close textual and comparative analysis
17. Demonstrate skills in close analysis of visual material
18. Demonstrate advanced IT skills
19. Demonstrate quantitative and qualitative methods of analysis
20. Demonstrate expertise in the use of statistical software packages for recording, manipulation & analysis of data
21. Convey statistical results & methods in a manner understandable to the lay-person via written or oral reports
22. Work independently
23. Work as part of a team
24. Communicate with clarity and accuracy, orally (including presentation) and in writing
25. Engage with the views and opinions of others
26. Present work and findings in a professional manner, with attention to detail
27. Learn and use research skills