

Fall semester - advanced undergraduate seminar course

- **Synaptic plasticity and memory, from molecules to behavior.**
- Reading and understanding scientific literature.
- Hippocampal synaptic plasticity and episodic memory.

Today

- Outline of the course
- Introduction of participants
- “Cognitive maps”
- Reading and writing scientific papers
- Introduction to the study of learning and memory

Outline of the course

- The course consists of weekly meetings during which primary research papers will be discussed. These papers will be introduced in the previous meeting and should be read prior to the class. Each week one or two questions will be distributed with the papers. Brief answers to the questions should be emailed to the instructor by Monday evening prior to discussion of the papers. The classes are designed to promote discussion of the papers. Students will be expected to be able to explain the material in the papers.
- The course has a pass / fail grade. To pass, students are expected to attend class, demonstrate fluency in the course material, submit answers to the guiding questions and complete the following assignments:
- Convert a cake recipe to scientific article format.
- Use literature searching software to find research that builds on material discussed in class.
- Write a short essay describing the problem that is solved by a specific set of experiments in the literature.

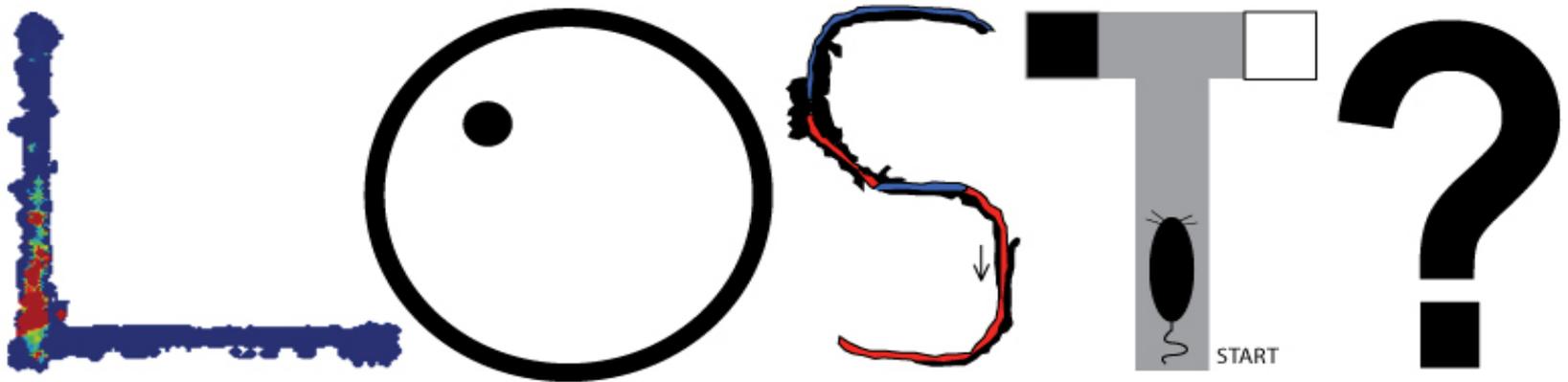
“Cognitive maps”

- What are they?
- How do we know they exist?
- How do we study them?

Cognitive map:

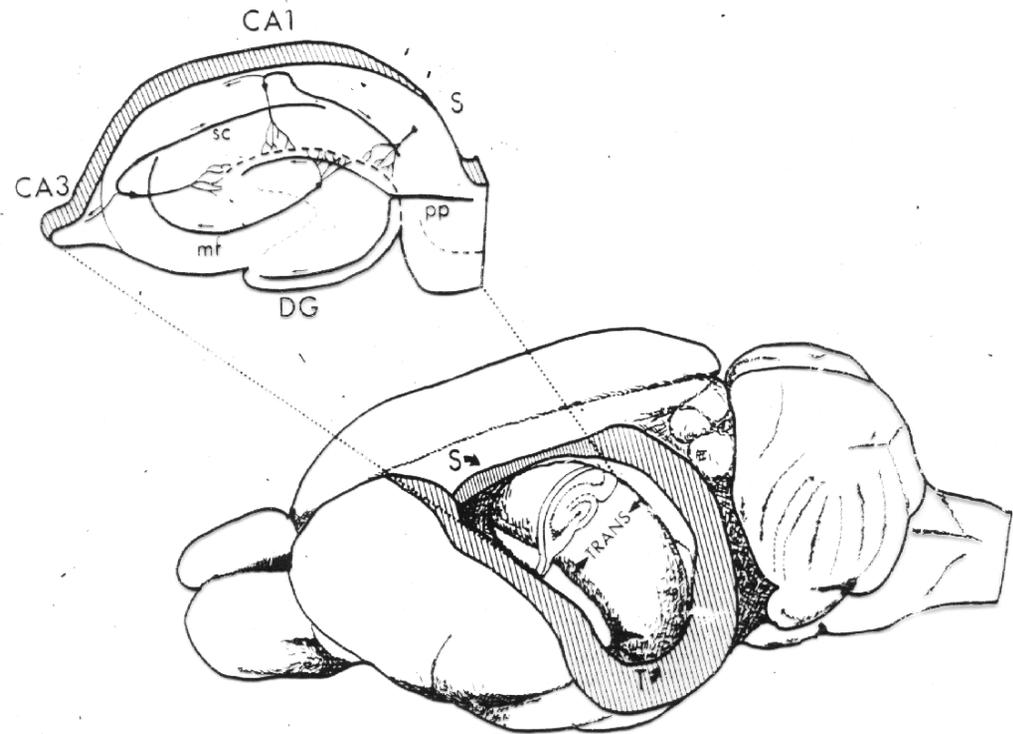
- An internal representation of the outside world.
- May overlap with "episodic memory" – a memory of events in place and time.

How we study “Cognitive maps”



The hippocampus is a brain structure necessary for the formation of episodic memory and cognitive maps

Much of the course will focus on the role of the Hippocampus in forming episodic Memory and cognitive maps.



Reading and writing scientific papers

- Why do scientific papers have a specific format? – what is primary literature?
- The IMRAD format
- Assignment

IMRAD

- Introduction – What question (problem) was studied?
- (Materials and) Methods – How was the problem studied?
- Results – What were the findings?
- Discussion – What do these findings mean?

Introduction

- Supply sufficient background information to allow the reader to understand the present study without needing to refer to previous publications.
- Present tense – suggests existing knowledge.
- 1. The nature and scope of the problem investigated.
- 2. Review of the literature to orient the reader.
- 3. Statement of the method
- 4. Statement of the principal results
- 5. Statement of the principal conclusions (no surprises for later).

Adapted from: Day, Robert A. *How to Write and Publish a Scientific Paper*. 5th ed. Phoenix, AZ: Oryx Press, 1998. ISBN: 9781573561655.

Materials and methods

- Past tense!
- 3rd person
- Describe and defend the experimental design.
- Provide enough details to repeat the experiment.

Results

- The point of the paper!
- Present the data in past tense.
- We will spend most of the course reviewing results of published papers.

Discussion

- Present tense – it has now been shown!
- Presents the principals, relationships and generalizations shown by the results.
- Points out exceptions or lack of correlation.
- Demonstrates the relationship between the new data and previously published work.
- Implications and applications.
- Conclusions.
- Summary of the evidence for each conclusion.

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Abstract

- A “mini-paper”
- Contains all of the IMRAD components
- Is limited to 250-300 words

- Is often the only part of the paper that gets read!

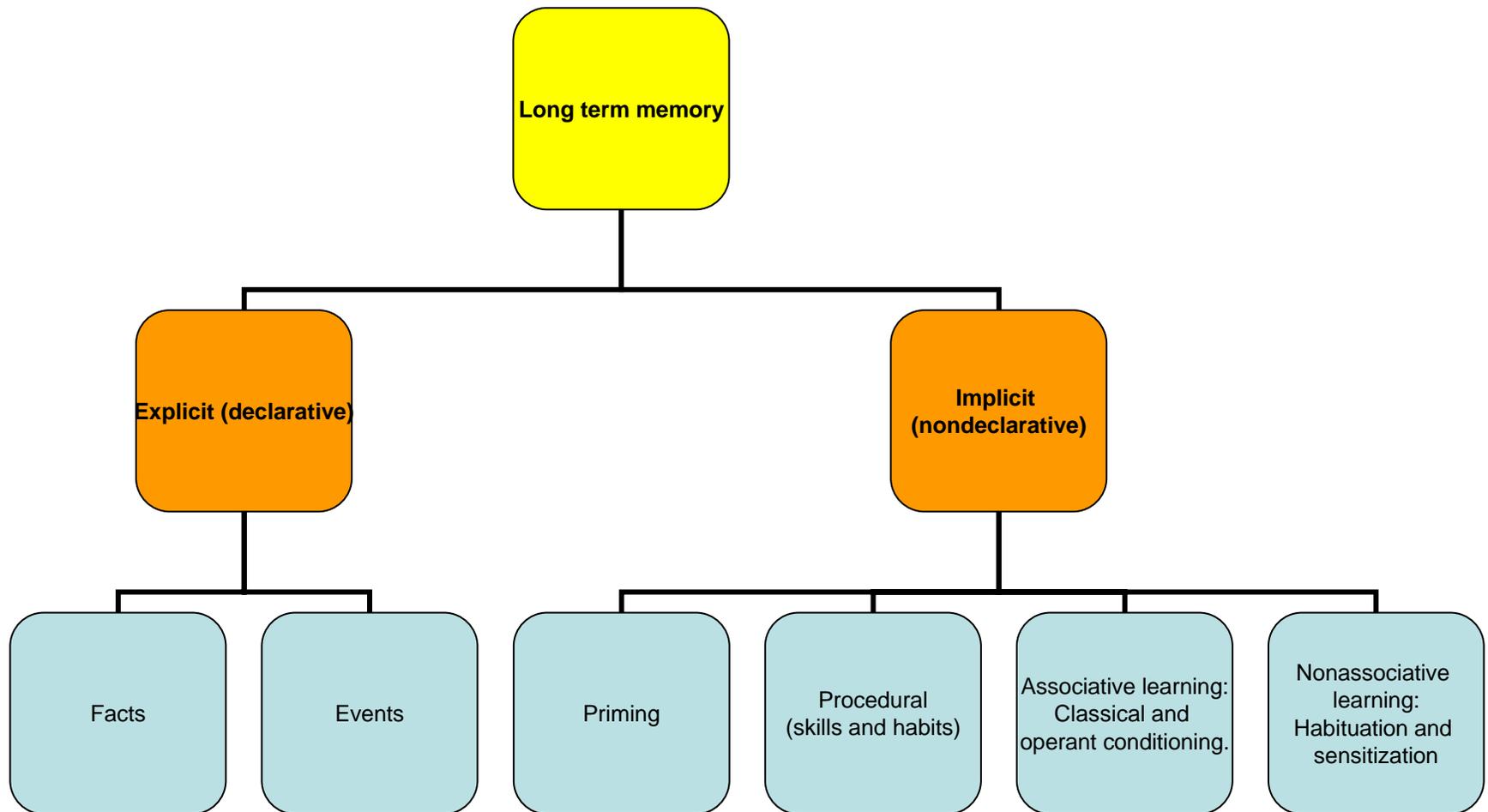
Assignment

- Recipe for cookies.
- Change the cookbook format to scientific format.
- Short introduction, detailed M&M, results – one line, discussion – not relevant.
- Email to me by next Monday night.

Introduction to the study of learning and memory

- Definition of learning?
- ‘relatively permanent change in behavior which occurs as a result of experience’ (Tarpy 1975 in Dudai 1989).
- An experience-dependent generation of enduring internal representations, and / or experience dependent lasting modifications in such representations. Injury, disease and drugs are excluded. (Dudai 1989).
- Memory – the **retention** of experience-dependent internal representations over time.
- Retrieval – use of the memory in neuronal and behavioral operations.

Different kinds of memory



Classical conditioning

- Unconditioned stimulus – US (food)
- Conditioned stimulus – CS (Bell)
- Conditioned response – CR (Salivation)

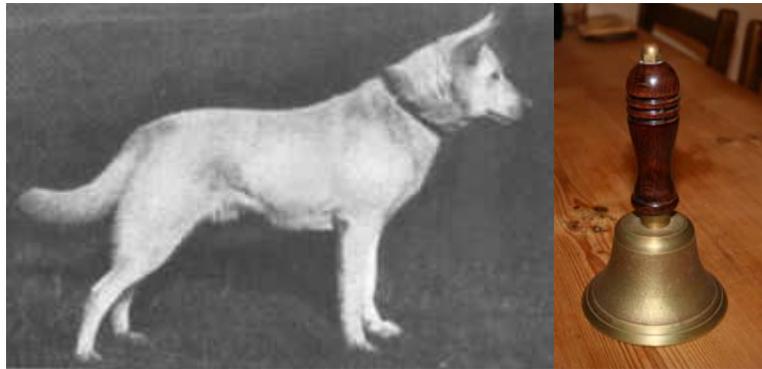
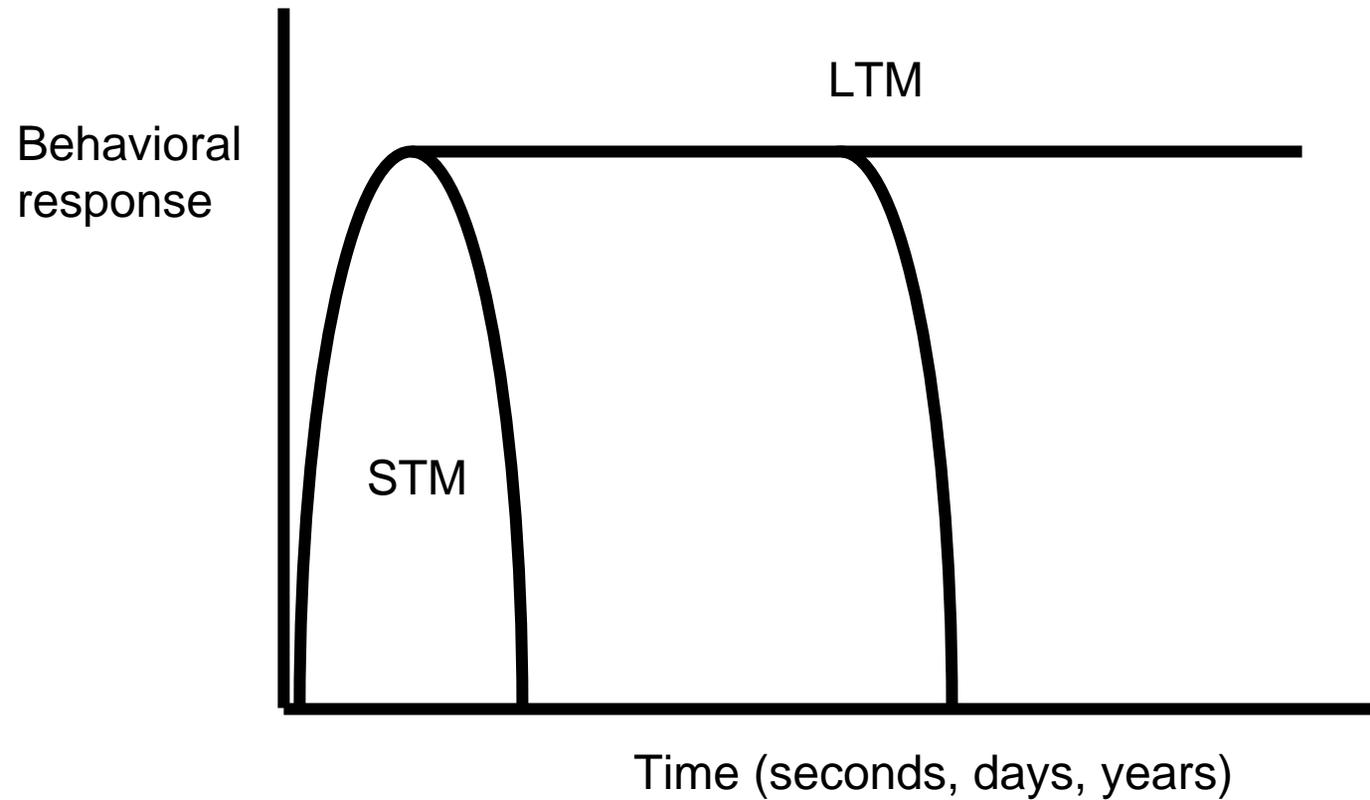


Photo of bell courtesy of ndrwfkg - <http://flickr.com/people/ndrwfkg/>
Photo of dog taken from Wikimedia Commons <http://commons.wikimedia.org>

The duration of memory



Reading assignment

- Focus on “fly paper”
- What was the purpose of the experiment described in figure 3?

Background literature

- Principles of neural science / edited by Eric R. Kandel, James H. Schwartz, Thomas M. Jessell
- Neuroscience : exploring the brain / Mark F. Bear, Barry W. Connors, Michael A. Paradiso.

Questions?