The cornerstone of current progress in understanding the mind, the brain, and the relationship between the two is the study of human and animal cognition. This course will provide an in-depth survey and analysis of behavioral observations, theoretical accounts, computational models, patient data, electrophysiological studies, and imaging results on mental capacities such as attention, object representation and recognition, memory, cognitive development, and language.

**Undergraduates CAN take the course with an instructor's permission.** Prerequisite (or preferred background) includes an introduction to experimental psychology, neuroscience, cognitive science, computational vision, biomedical engineering, etc.

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### General Information

#### Time and Location

Thursday 4:00 – 6:00 pm, in Broad 200

#### Instructors

Shin Shimojo:  sshimojo@its.caltech.edu  x3324  
Fiona Cowie:  cowie@hss.caltech.edu  x3606

#### Teaching Assistants

Neil Halelamien:  neilh@caltech.edu  x2025  
Office Hours:  TBA, in Broad 64  
Signe Bray:  signe@caltech.edu  x8991  
Office Hours:  TBA, in Broad 64

Class wiki (contains downloadable readings, accessible only to Caltech IPs):


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### Textbooks

(Relevant chapters will be made available)

Grading Policy

Faculty members and postdoctoral fellows are welcome to participate in the class discussions and presentations. Undergraduate and graduate students who are taking the class for credit should keep in mind the following exercises upon which their final grade will be determined.

Class Format:
Each class is devoted to a single topic (with few exceptions). Class will begin with a 30-40 minute lecture from one of the instructors. The rest of the class will consist of student presentations (typically two) and discussion.

Class Presentations and Attendance:
Each participant will be responsible for presenting and leading the discussion on material in a topic of their choice from the offered topics. Materials will be one or more of the papers listed as that topic's readings. The organizational meeting will include a survey of individual preferences for class presentations and every effort will be made to allot participants their top choice. Student presentations will count toward 30% of the final grade. These presentations will be peer evaluated. Presenters will be based on the mean of these peer evaluations.

Homework:
Each participant should choose one of the two topics for each two-week period, read relevant papers (starting from the reading list), and write a review paper within the length of 5 single-space pages. Thus all together, four review papers are required (the deadline will be in 1 week after the two weeks). 10% x 4 = 40% of the final grade will be based on these review papers. Please make sure that you come to class on time.

Term Paper:
Each participant should select a topic from among those listed topics and write a 10-15 page term paper. Topics may include proposed psychophysics studies, ongoing research projects, or meta-analysis/review of a specific area. Students should discuss their proposals with the moderator for that topic and submit a one page term paper proposal by a specified date (to be announced later). Near the end of the term students will be asked to present on their term paper. 30% of the final grade will be based on the term paper which is due on June 3rd.

No midterm or final exam.

Schedule and Readings

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>April 3</td>
<td>Class Introduction, Crossmodal Perception, Language (Lecture by van Wassenhove)</td>
</tr>
<tr>
<td>April 10:</td>
<td>Attention and Memory (Shimojo)</td>
</tr>
<tr>
<td>April 17:</td>
<td>Visual Representation and Recognition (Shimojo)</td>
</tr>
<tr>
<td>April 24:</td>
<td>Face and Expression (Shimojo)</td>
</tr>
<tr>
<td>May 1:</td>
<td>Development of Cognition (Shimojo)</td>
</tr>
<tr>
<td>May 8:</td>
<td>fMRI Studies of Learning and Reward (Bray)</td>
</tr>
<tr>
<td>May 15:</td>
<td>Using TMS to Influence Vision and Cognition (Halelamien)</td>
</tr>
<tr>
<td>May 22:</td>
<td>Niche Construction (Cowie)</td>
</tr>
<tr>
<td>May 29:</td>
<td>Situated Cognition and Extended Mind (Cowie)</td>
</tr>
</tbody>
</table>
List of topics and reading list
Readings may be downloaded from the CNS wiki (only accessible from Caltech IP addresses) at this address: http://wiki.cns.caltech.edu/wiki/index.php/CNS176

Crossmodal Perception, Language

Attention and Memory (Lecture by Shimojo)
- Matlin (textbook): Chapters 3 (Perceptual processes II: Attention and Consciousness), 4 (Working Memory), and 5 (Long-Term Memory).

Visual Representation and Recognition (Lecture by Shimojo)
- Matlin (textbook): Chapter 2 (Perceptual Processes I: Visual and Auditory Recognition)
- O'Regan, J.K. et al. (1999) Change-blindness as a result of 'mudsplashes'. Nature 398, 34 Scientific Correspondence.

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**Face and Expression (Lecture by Shimojo)**

- Kosslyn & Osherson (textbook): Chapter 3 (Farah, M.J. Dissociable systems for recognition: a cognitive neuropsychology approach)
- Matlin (textbook), Chapter 2 (Perceptual Processes I: Visual and Auditory Recognition)

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**Development of Cognition (Lecture by Shimojo)**

- Matlin (textbook), Chapters 13 (Cognitive Development Throughout the Lifespan).

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**fMRI Studies of Learning and Reward (Lecture by Bray)**

Using TMS to Influence Vision and Cognition (Lecture by Halelamien)

- Pascual-Leone, A. & Walsh, V. (2001) Fast backprojections from the motion to the primary visual area necessary for visual awareness. Science 292, 510-512

Niche Construction (Lecture by Cowie)

- Laland, KN, Sterelny, K (2006) Seven reasons (not) to neglect niche construction EVOLUTION, 60 (9): 1751-1762 SEP 2006

Niche construction and human cognitive evolution


Situation Cognition and Extended Mind (Lecture by Cowie)

**Background: The Language of Thought Hypothesis, Dynamical Systems Theory**
- van Gelder, T. What might cognition be, if not computation? Journal of Philosophy, 92, 345-381, 1995

**Situated Cognition: The Extended Mind**
• Clark, Andy (2006) Language, embodiment, and the cognitive niche *TRENDS in Cognitive Sciences* Vol.10 No.8

**Critiques**

**Response**
• Clark, A. ‘Curing Cognitive Hiccups.’ (draft)