PSYD60F 1996

Cognitive Neuroscience

Instructor

N. W. Milgram
Room S-637
phone 287-7402
lab phone 287-7461
fax 416-287-7642
email milgram@psych.toronto.edu or
milgram@psych.utoronto.ca

Monday 11:00 - 1:00 Room R-3212

Course Topics.

Cognitive neuroscience seeks to understand the neurobiological basis of higher mental processes. In this course, we will cover four topics: (1) memory, (2) thought, (3)language, and (4) attention.

The first topic, memory, will be primarily concerned with the neural representation of experience; that is, how are memories organized in the nervous system. To a certain extent, this section is an extension of material covered in PSYC61S - that dealt with the organization of memory systems.

Next, we will focus on thought. The questions of concern include. What is it? How can we study it? How does thought change over the course of evolution? What is the neurobiological basis of basis of thought.

The section on language will contrast the classical connectionist model of language processes with the more recent approach that emphasizes modularity and parallel distributed processing.

Grading (tentative - to be finalized before Sept 20)

1. Class participation 10%
2. Class presentations 15%
3. Term paper 35%
4. Exams (3) 40%

Course Material

Students will be responsible for:

1. Assigned readings
2. Material covered in classroom discussions
3. Presentations given by other students

Student presentations.

Each student will give one classroom presentation. The format used will be decided on in the first class. One possibility is for the presentation to be a summary of a very recent published article. If the class chooses this option, the presentations will be expected to summarize the article and to discuss the importance of the article within a more general framework. Each presentation would be expected to be a maximum of 20 minutes in length.

The second option is to get a short (up to 45 minutes) seminar selected from one of the following topics. The presentations should focus on characterizing the disorder from both a cognitive and neurobiological perspective. These topics are important to cognitive neuroscience because of what they tell us about normal brain function.

Acromatopsia
Amusia
Amnesia syndromes (can include more than one presentation)
Autism
Downs syndrome
Dyslexia (acquired)
Hemispatial neglect
Infantile amnesia
Schizophrenia
Stuttering and Stammering
Synesthesia
Williams disorder

Term paper.

The term paper will be a review article on a topic of your choice on a topic that relates the content of this course. (The topics presented for the student seminars are acceptable.) Prior approval must be obtained, however.

The term paper must be based on reading of original research and should follow the format of the Publication Manual of the American Psychological Association. The length excluding references *must not* exceed 15 double spaced pages.

Grading will be based on organization, clarity, thoroughness of literature search, and originally of the content.

Readings.

The following is a partial list of assigned readings. Additional readings will be assigned later in the course.

Ashcraft, M.H. (1993). A personal case history of transient anomia. Brain and Language, 44-57.

Bottini, G., Paulescu, E., Sterzl, R., Warburton, E., Wise, R.J.S., Vallar, G., Frackowiak, R.S.J., & Frith, C.D. (1995). Modulation of conscious experience by peripheral sensory stimuli. Nature, 376, 778-781.

Calvin, W.H. (1994). The emergence of intelligence. *Scientific American*, 271, 100-108

Jefferys, J.G.F., Traub, R.D., & Whittington, M.A. (1996). Neuronal networks for induced '40 Hz' rhythms. *Trends in Neurosciences*, 19, 202-208.

Klein, D., Zatorre, R.J., Milner, B., Meyer, E., & Evans, A.C. (1994). Left putamenal activation when speaking a second language: evidence from PET. Neuroreport: Cognitive Neuroscience and Neuropsychology, 5, 2295-227.

Kinomura, S., Larsson, J., Gulyás, B., & Roland, P.E. (1996). Activation by attention of the human reticular formation and thalamic intralaminar nuclei. Science, 271, 512-515.

Milgram, N.W. An introduction to neuroscience. Chapter 19. Thought, language and attention.

Moran, J., & Desimone, R. (1985). Selective attention gates visual processing in the extrastriate cortex. *Science*, 229, 782-784.

Nyberg, L., McIntosh, A.R., Houle, S., Nilsson, L.-G., & Tulving, E. (1996). Activation of medial temporal structures during episodic memory retrieval. Nature, 380, 715-717.

Ojemann, G.A. (1991). Cortical organization of language. Journal of Neuroscience, 11, 2281-2287.

Posner, M.I. (1994). Attention: the mechanisms of consciousness. Proceedings of the National Academy of Sciences, U.S.A., 91, 7398-7403.

Posner, M.I., & Dehaene, S. (1994). Attentional networks. Trends in Neurosciences, 17, 75-79.

Povinelli, D.J., & Preuss, T.M. (1995). Theory of mind: evolutionary history of a cognitive specialization. *Trends in Neurosciences*, 18, 418-424.

Sergeant, J. (1994). Brain-imaging studies of cognitive functions. *Trends in Neurosciences*, 17, 221-227.

Singer, W. (1993). Synchronization of cortical activity and its putative role in information processing and learning. Annual Review of Physiology, 55, 349-374.

Sirigu, A., Duhamel, J., Cohen, L., Pillon, B., Dubois, B., & Agid, Y. (1996). The mental representation of hand movements after parietal cortex damage. Science, 273, 1564-1568.

Strogatz, S.H., & Stewart, I. (1993). Coupled oscillators and biological synchronization. *Scientific American*, 269, 102-109.

Ungerleider, L.G. (1995) Functional brain imaging studies of cortical mechanisms for memory. *Science*, 270, 769-775.

Petersen, S.E., & Fiez, J.A. (1993). The processing of single words studied with positron emission tomography. *Annual Review of Neuroscience*, 16, 509-530.

Schedule

September 9 - Introduction:
- (1) - What is cognitive neuroscience
- (2) - Research techniques

Reading assigned for the week: Ungerleider (1995)
Sergeant (1994)

September 16 -
Topics:
- (1) Techniques used in cognitive neuroscience
- (2) Organization of memory

September 23 -
Discussion topics:
- (1) Memory mechanisms
- (2) Thought - representations - theory of mind

Assigned readings -
- Bottini et al. (1995)
- Povinelli & Preuss, (1995)
- Nyberg et al. (1996)
- Chapter notes -pp 1-20

Presentations:
- Neil Mladenoff - Amnesia syndromes

September 30-
Exam 1 - 10 % of total grade
- (1) All material covered in class.
- (2) Presentation by Mladenoff and assigned reading
- (3) Readings assigned for Weeks 1-3

Discussion topics:
- Neurobiology of Thought -

Presentations:
- G. Shaw -Infantile amnesia
- Namita Thapar - Autism

Assigned readings -

Deadwyler & Hampson (1995).
Strogatz & Stewart (1993)
Jeffreys, Traub and Whittington (1996).

Recommended reading -

Singer (1993)

October 7

Discussion topics:

Neurobiology of thought

Presentations:

Lara Chebdaro - synesthesia
Marosh Manduch - Williams syndrome

Assigned readings -

Calvin (1994)
Leiner, Leiner and Dow

October 14

Discussion topics:

Language - the classical connectionist model
hemispheric asymmetries

Presentations:

Safina Aulakh - stuttering and stammering
Lescia Tremblay - Blindsight

Assigned readings -

Geschwind (1979)

October 21

Discussion topics:

Language - current views

Presentations

Rubi Basin - Achromatopsia

Assigned readings:

Ojemann (1991)
Damasio and Damasio (1992)

October 28

Exam 2 - 15 % of total grade.

On material covered from September 30.

Discussion topics:

Language

Presentations:

Stacy McGlauglin, Dyslexia-acquired

Assigned readings

Klein et al. (1994)

November 4

Discussion topics:

(1) Attentional processes
(2) Alerting systems

Presentations:

Pam Heighway, Amusia

Assigned reading:

Posner & Dahaene (1994)

Recommended readings:

Posner (1994)

November 11

Discussion topics:

Attention - selective modulation of sensory and motor processing

Presentations:

Michael Speer - schizophrenia

Assigned readings:

November 18

Discussion topics:

Attention -endogenous processes

Presentations:

David Feld - Hemineglect

Assigned readings:

Moran and Desimone (1985)

November 25

Discussion topics:

Attention

Assigned readings:

Sirigu et al. (1996)

December 2

Exam 3 - 10 % of total grade.