Psychology 4521 – Critical Thinking
New Avenues for Understanding Mind
(Section 6)
Fall, 2000

Time: MWF 10:00-10:50
Location: Muenzinger D439
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Objective: This course is designed so that students will gain a familiarity with the array of techniques, some their in infancy and others well-developed, that are used to undercover how the brain is responsible for creating the mind. In so doing, students will be asked to critically evaluate the power and limitations of each technique. They will be asked to consider exactly what types of questions each method can be used to answer and what types of questions they are ill-suited to tackle. Students will evaluate how well these techniques can aid in discovery in basic science as well as their application to understanding the nature of clinical syndromes and disorders. Hence, the emphasis will be on evaluating how to ask an important question and determining what tools and approach are needed to pursue that question.

Format: The format of this class is some lecture as well as discussion. Because discussion is an essential component of this class, it is critical that you attend class, do the required readings **before** the class period and come prepared to discuss them.

Textbook:
Posner, M.I. & Raichle, M.E. (1997) *Images of Mind.* New York: Freeman & Co.
(This book will be used to provide background information – listed as "P&R" in the reading assignments)

Requirements: ***Class participation and six 2-3 page typed double-spaced papers.*** Each paper will outline the student's perspective/ideas with regards to one of the 12 questions discussed during the semester. Each paper will count for 12 points (6 papers at 12 points each = 72 points). This paper is due on the last class session devoted to that question. Late papers will NOT be accepted (e.g., a paper on Question 3 must be received by Sept. 22nd. After that date, a paper on Question 3 cannot be written). Students can choose which of the twelve questions they wish to address in their six papers. Class attendance and participation will count for the remaining 28 points, for a total of 100 points. Students whose point total is 90 and above will receive an A, 80 and above will receive a B, 70 and above will receive a C, 60 and above will receive a D, and below 60 will receive an F.

Students with disabilities who may need academic accommodations should discuss options with me during the first two weeks of class.

August 28th - Introduction	
Question 1: Does the brain segregrate information about location vs. form? *The lesion method*	
Aug. 30th Sept. 1st ~~Sept. 4th~~ Sept. 6th Sept. 8th	Mishkin, M., Ungerleider, L.G. & Macko, K.A.(1983). Object vision and spatial vision: Two cortical pathways. *Trends in Neurosciences,6,* 414-417. Smith, M.L., & Milner, B. (1981). The role of the right hippocampus in the recall of spatial location. *Neuropsychologia, 19,* 781-793. P&R, Chapter 1
Question 2: How are similar objects differentiated by the brain? *Single-cell recording*	
Sept. 11th Sept. 13th Sept. 15th	Engel, A.K., Konig, P., Kreiter, A.K., Schillen, T.B., & Singer, W. (1992). Temporal coding in the visual cortex: new vistas on integration in the nervous systems. *Trends in Neurosciences, 15*, 219-226. Gross, C.G. (2000). Coding for visual categories in the human brain. *Nature Neuroscience, 3,* 855-856. P&R, pg. 67-81
Question3: How does the brain know when you've made a mistake? *Electroencephalography/Event-related potentials (EEG/ERP)*	
Sept. 18th Sept. 20th Sept. 22nd	Gehring,W.J., Goss, B., Coles, M.G., Meyer, D.E. et al. (1993). A neural system of error detection and compensation. *Psychological Science, 4,* 385-390. Dehaene, S., Posner, M.I., & Tucker, D.M. (1994). Localization of a neural system for error detection and compensation. *Psychological Science, 5,* 303-305. P&R, pg. 132-140

Question 4: Why do certain drugs help schizophrenia? *Positron Emission Tomography (PET)*	
Sept. 25th* Sept. 27th Sept. 29th	Okuba, Y., Suhara, T., Suzki, K., Inoue, O., et al., (1997) Decreased prefrontal dopamine D1 receptors in schizophrenia revealed by PET. *Nature, 385,* 634-637. Lidow, M.S., Graham, V.W. & Goldman-Rakic, P.S. (1998). The cerebral cortex: a case for a common site of action of antipsychotics. *Trends in Pharmacological Sciences, 19*, 136-140. P&R, pg 54-66,212-217
Question 5: How does the brain pay attention to certain information while ignoring other information? *Functional Magnetic Resonance Imaging (fMRI)*	
Oct. 2nd Oct. 4th ~~Oct. 6th~~ Oct. 9th Oct. 11th Oct. 13th	Wojciulik, E., Kanwisher, N., Driver, J. (1998). Covert visual attention modulates face-specific activity in the human fusiform gyrus: fMRI study. *Journal of Neurophysiology. 79,* 1574-1578. Martinez, A. Anllo-Vento, L. Sereno, M. I. Frank, L. R. Buxton, R. B. Dubowitz, D. J. Wong, E. C. Hinrichs, H. Heinze, H. J. Hillyard, S. A. (1999). Involvement of striate and extrastriate visual cortical areas in spatial attention. *Nature Neuroscience. 2,* 364-369. Banich, M.T. et al. (in press). FMRI studies of Stroop tasks reveal unique roles of anterior and posterior brain systems in attentional seleciton. *Journal of Cognitive Neuroscience.* P&R, Chapter 7, 228-231
Question 6: Is there more than one way to read a word? *Connectionist modelling*	
Oct. 16th Oct. 18th Oct. 20th	Hinton, G.E. (1992). How neural networks learn from experience. *Scientific American,* 145-151. Seidenberg, M.S. (1993). A connectionist modeling approach to word recognition and dyslexia. *Psychological Science, 4,* 299-304. P&R, Chapter 5
Question 7: Do both hemispheres of the brain have the same memory system? *Optical imaging*	
Oct. 23rd Oct. 25th Oct. 27th	Gratton, G. & Fabiani, M. (1998). Dynamic brain imaging: Event-related optical signal (EROS) measures of time course and localization of cognitive-related activity. *Psychnomic Bulletin & Review, 5,* 535-563. Gratton, G. (1998). The contralateral organization of visual memory: A theoretical concept and a research tool. *Psychophysiology, 35,* 638-647.
Question 8: Is "space" bigger for the right hemisphere than the left? *Transcranial magnetic stimulation*	

Oct. 30th Nov. 1st Nov. 3rd	Pascual-Leone, A., Walsh, V., & Rothwell, J. (2000). Transcranial magnetic stimulation in cognitive neuroscience – virtual lesion, chronometry and functional connectivity. *Current Opinion in Neurobiology, 10,* 232-237. Oliveri, M., Rossini, P.M., Traversa, R., Cicinelli, P., et al. (1999). Left frontal transcranial magnetic stimulation reduces contralesional extinction in patients with unilateral right brain damage. *Brain, 122,* 1731-1739.

Question 9: Is a language, a language, a language? (i.e., Do brain systems vary across different languages?) *Convering operations*	
Nov. 6th * Nov. 8th Nov. 10th	Neville, H.J., & Bavelier, D. (1998). Neural organization and plasticity of language. *Current Opinion in Neurobiology, 8,* 254-258. Hicock, G., Bellugi, U., & Klima, E.S. (1998). What's right about the neural organization of sign language? A perspective on recent neuroimaging studies. *Trends in Cognitive Science, 2,* 465-468.
Question 10: How does the brain conceptualize complicated movements? *Convering operations*	
Nov. 13th Nov. 15th Nov. 17th	Jeannerod,M., Decety, J. & Michel, F. (1994) Impairment of grasping movements following a bilateral posterior parietal lesion. *Neuropsychologia, 32,* 369-380. (Lesion method) Iacoboni, M. Woods, R.P., Brass, M. Mekkering, J., Mazziotta, J.C., Rizzolatti, G. (1999). Cortical mechanisms of human imitation. *Science, 286,* 2526-2528. (fMRI) Desmurget, M., Epstein, C.M., Turner, R.S., Prablanc, C., Alexander, G.E., & Grafton, S.T. (1999). Role of the posterior parietal cortex in updating reaching movements to a visual target. *Nature Neuroscience, 2,* 563-567 (TMS)
Question 11: Are faces special because the brain treats them differently than other objects? *Convering operations*	
Nov. 20th Nov. 22nd ~~Nov. 24th~~ Nov. 27th Nov. 29th Dec. 1st	McNeil, J.E. & Warrington, E.K. (1993). Prosopagnosia: A face-specific deficit. *The Quarterly Journal of Experimental Psychology, 46A,* 1-10. (Lesion method) Allison, T., Ginter, H., McCarthy, G., Nobre, A., Puce, A., Luby, M. & Spencer, D.D. (1994). Face recognition in human extrastriate cortex. *Journal of Neurophysiology, 2,* 821-825. (ERPs) Perrett, D.I., Hietanen, J.K., Oram, M.W., & Benson, P.J. (1992). Organization and functions of cells responsive to faces in the temporal cortex.*Philosophical Transactions of the Royal Society of London, 335,*23-30. Gauthier, I., Tarr, M.H., Anderson, A.W., Skudlarski, P. & Gore J.C. (1999). Activation of the middle fusiform 'face area' increases with expertise in recognizing novel objects. *Nature Neuroscience, 6,* 568-573. (fMRI)

Question 12: How does the brain hold information "on-line"? *Convering operations*	
Dec. 4th Dec. 6th Dec. 8th Dec. 11th Dec. 13th	Funahashi, S., Bruce, C.J. & Goldman-Rakic, P.S. (1989). Mnemonic coding of visual space in the monkey's dorsolateral prefrontal cortex. *Journal of Neurophysiology, 61,* 1-19. (single-cell) Wagner, A.D. (1999). Working memory contributions to human learning and remembering. *Neuron, 22*, 19-22. (neuroimaging) Kimberg, D. Y., D'Esposito, M., Farah, M. J. (1997). Cognitive functions in the prefrontal cortex--Working memory and executive control. *Current Directions in Psychological Science*, *6*, 185-192. (modelling) Chao, L.L. & Knight, R.T. (1998). Contribution of human prefrontal cortex to delay performance. *Journal of Cognitive Neuroscience, 10,* 167-177. (ERPs)