

SYLLABUS: INTRODUCTION TO COGNITIVE NEUROSCIENCE

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Time: Class meets: Mon, Wed 2:00-3:50 PM. **Room:** WPH B27

Final Exam: Friday, Dec. 12, 2-4 PM

Required Text + Journal Articles (Denoted by *). Other articles (no *) are for background edification and the content not covered in class will not be explicitly tested.

Text: **Gazzaniga, M.S., Ivry, R. B., & Mangun, G. R. (2014). *Cognitive Neuroscience: The Biology of Mind*. Fourth Edition.** New York, N.Y.: WWNorton. [ISBN: 978-0-393-92795-5] **[GIM]**.

Journal articles can be downloaded (in Adobe Acrobat) from the course Blackboard site. Some readings will be added during the semester.

Evaluation: Evaluation will be based on three midterms (20% each and a cumulative final examination (40%). All the exams will be multiple choice. Approximately half of the exam will be composed of questions from class lectures.

Extra credit (Experimental Participation): Students can earn up to 3% extra credit by participating in the Psychology Department's Subject Pool at the rate of 1% for each "hour's" worth of participation. (Some short web questionnaire studies only yield .5 hour's credit.) To obtain this credit, for each experiment or questionnaire, you are to assume some intellectual "ownership" of the experience by writing a brief reflection, e.g. a paragraph or two. Such reflections could be informed criticism (given the goals of the study as obtained through the feedback, questions posed to the experimenters, etc.) or a description of how the study might be related to course concepts.

Extra credit (Class Participation): (up to 3%) will be awarded for class comments or questions that serve to illuminate the discussion or informed criticism (but not mere attendance). Good answers on those rare occasions when someone is called upon randomly also qualify but bad/inattentive answers can cause a negative credit. (Texting in class can elevate the likelihood of being called upon.)

Topics: Roughly corresponding to weeks. *There will be some reordering/rescheduling of topics and possibilities of additions/subtractions of readings.*

1. Aug 25 & 27th: Introduction: Modularity. Brain Development. Cortical visual pathways. Broadbent's Flowchart Model of Attention.

*GIM Chapters 1 Brief History. (Skim.)

*GIM Chapter 2 Structure and Function of the Nervous System. (You will not be tested on the specifics of the molecular biology, e.g., of the cell membrane, ion channels, and neurotransmitters on pp. 28-36 but do understand the general principles).

Cherniak, C. (1994). Component placement optimization in the brain. *Journal of Neuroscience*, 14, 2418-2427. (For background and edification. Not explicitly tested beyond what is discussed in lecture.)

Sept 1: Labor Day. No Class.

2. Sept 3 & 8: Sensation and Perception. Early sensory processing. How to get the world into the head. Methodologies.

*GIM Chapter 4. Methods of Cognitive Neuroscience. Rather than discuss methods as a group in class, we will consider them as they arise in particular experiments.

*GIM Chapter 5. Sensation and Perception.

Kobatake, E., & Tanaka, K. (1994). Neuronal selectivities to complex object features in the ventral visual pathway of the macaque cerebral cortex. *Journal of Neurophysiology*, 71, 856-867.

3. Sept 10, 15, & 17: Higher Level Vision I: Object Recognition. Representation. Nonaccidental Properties. Invariances.

*GIM Object Recognition. Chapter 6.

*Hayworth, K. J., & Biederman, I. (2006). Neural evidence for intermediate representations in object recognition. *Vision Research*, 46, 4024-4031.

Kriegeskorte, N. et al. Matching categorical object representations in inferior temporal cortex of man and monkey. *Neuron*, 60, 1126-1141.

*Biederman, I. (1995). Visual object recognition. In S. M. Kosslyn and D. N. Osherson (Eds.). *An Invitation to Cognitive Science*, 2nd edition, Volume 2, *Visual Cognition*. MIT Press. Chapter 4, pp. 121-165.

4. Sept 22 & 24. Higher Level Vision II: Faces, Subordinate-Level Recognition; Scenes; Prosopagnosia vs. Phonagnosia

*Biederman, I., & Kalocsai, P. (1997). Neurocomputational bases of object and face recognition. *Philosophical Transactions of the Royal Society London: Biological Sciences*, 352, 1203-1219. (Background)

5. Sept 29 First Midterm (20%).

6. Oct 1 and 6. Attention & Consciousness. Automaticity. Spatial vs. verbal representations.

*GIM. Chapter. 7. Attention

*GIM. Chapter 4. Hemispheric Specialization

*GIM. Chapter 14. Consciousness.

*Sheinberg, D. L., & Logothetis, N. (1997). The role of temporal cortical areas in perceptual organization. *PNAS*, 94, 3408-3413.

7. Oct 8. Action

*GIM. Chapter 8. Action

8. Oct 13 & 15: Learning and Memory: Clive Wearing. Medial temporal Lobe system.

*GIM Chapter 9. Memory. pp. 281-284; 618-620.

9. Oct 20. Second Midterm**10. Oct 22 & 27: Emotion**

*GIM. Chapter 10. Emotion.

*Biederman, I., & Vessel, E. A. (2006). Perceptual pleasure and the brain. *American Scientist*, 94, 247-253.

Amir, O., Biederman, I., Wang, Z., & Xu, X. (2013). Ha Ha vs. Aha! A direct comparison of humor to non-humorous insight for determining the neural correlates of mirth. *Cerebral Cortex*, 62, 35-43. Link: <http://cercor.oxfordjournals.org/cgi/reprint/bht343?ijkey=QodzmzncQc755UY&keytype=ref>

11. Oct 29 & Nov 3: Language. Speech Perception. Reading. Syntax.

*GIM. Chapter 11. Language.

*Sahin, N. T., Pinker, S., Cash, S. S., Schomer, D., Halgren, E. (2009). Sequential processing of lexical, grammatical, and phonological processing within Broca's area. *Science*, 326, 445-449.

12. Nov 5 & 10: Cognitive Control. Working Memory.

*GIM. Chapter 12. Cognitive Control.

*Freedman, D. J., Riesenhuber, M., Poggio, T., & Miller, E. K. (2003). A Comparison of Primate Prefrontal and Inferior Temporal Cortices during Visual Categorization. *Journal of Neuroscience*, 23, 5235-5246.

13. Nov. 12 & 17: Social Cognition, *GIM. Chapter 13. Social Cognition.

*Spunt, R. P., Falk, E. B., Lieberman, M. (2010). Dissociable neural systems support retrieval of *how* and *why* action knowledge. *Psychological Science*, 21, 1593-1598.

14. Nov. 19: Third Midterm (20%)**15. Nov 24.. Individual Differences: Working Memory and Intelligence; Behavioral Genetics. Personality, and Morality**

*Bouchard, T., Lykken, D.T., McGue, M., Segal, N. L., & Tellegen, A. (1990). Sources of human psychological differences: The Minnesota study of twins reared apart. *Science*, 250, 223-228.

*Haidt, J. (2007). The new synthesis in moral psychology. *Science*, 316, 998-1002.

Nov 26 No class. Thanksgiving.**16. Dec 3. Last Class. Evolutionary Psychology: Bonding, Love, Sex, Mother-Infant Competition, Murder, Optimal Mating Strategies.**

*Donalson, Z. R., & Young, L. J. (2008). Oxytocin, Vasopressin, and the neurogenetics of sociality. *Science*, 322, 900-904.

Raine, A. (2013). *The Anatomy of Violence: The Biological Roots of Crime*. Pantheon.

Tuesday, December 18th, 2-4 PM, FINAL EXAM (40%)

Students requesting academic accommodations based on a disability are required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP when adequate documentation is filed. Please be sure the letter is delivered to me as early in the semester as possible. Their phone number is (213) 740-0776.