

SYLLABUS: COGNITIVE NEUROSCIENCE

IB's Office: HNB 316, Ext. 0-6094, bieder@usc.edu.

Time: Class meets: Monday 2:00-5:50 PM. **Room:** HNB 120F

Required Text: **Gazzaniga, M.S., Ivry, R. B., & Mangun, G. R. (2009). *Cognitive Neuroscience: The Biology of Mind*. Third Edition.** New York, N.Y.: WWNorton.
[ISBN: 978-0-393-92795-5] **[GIM]**

Journal articles, which are for background edification, can be downloaded (in Adobe Acrobat) from the course Blackboard site.

Evaluation: Evaluation will be based on class participation and a homework or two (5%), a midterm (45%) and a cumulative final examination (50%). A large pool of possible exam questions will be made available prior to each exam. Approximately 70% of the exam will be composed of questions from this pool. It is possible that the final exam will be multiple choice and fill ins.

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

1. Jan 14: Introduction: Modularity. Brain Development. Cortical visual pathways. Broadbent's Flowchart Model of Attention.

*GIM Chapters 1 Brief History. (Skim.)

*GIM Chapter 2 Cellular Mechanisms. (You will not be tested on the molecular biology, e.g., of the cell membrane, ion channels, and neurotransmitters, and the math modeling of electrical activity).

*GIM Chapter 3 Neuroanatomy and Development

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

2. Jan 21 No class. MLK Day

3. Jan 28: Sensation and Perception. Early sensory processing. How to get the visual world into the head. Methodologies.

*GIM Chapter 4. Methods of Cognitive Neuroscience

*GIM Chapter 5. Sensation and Perception.

4. Feb 4. Higher Level Vision I: Object Recognition.

*GIM Object Recognition. Chapter 6.

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

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.

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. Feb 11. Higher Level Vision II: Face And Subordinate-Level Recognition; Scenes

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. Feb 18. No Class. President's Day

6. Feb 25 Attention & Consciousness.

*GIM. Chapter. 12. Attention & Consciousness

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

Bar, M., & Biederman, I. (1999). Localizing the cortical region mediating visual awareness of object identity. *Proceedings of the National Academy of Sciences*, 96, 1790-1793.

7. March 4 Learning and Memory: Clive Wearing. Medial temporal system.

*GIM. Chapter 8. Learning and Memory.

Polyn, S. M., & Kahana, M. J. (2008). Memory search and the neural representation of context. *Trends in Cognitive Science*, 12, 24-30.

8. Mar 11: Midterm Exam

9. Mar 18: No Class. Spring Recess.

10. Mar 25: Language. Speech Perception. Reading. Syntax.

*GIM. Chapter 10. 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.

Duff, M. C., Gupta, R., Hengst, J. A., Tranel, D., & Cohen, N. J. (2011). The Use of Definite References Signals Declarative Memory : Evidence From Patients With Hippocampal Amnesia. *Psychological Science*, 22, 666-673.

11. April 1: The Control of Action. Hemispheric Specialization.

*GIM. Chapter 7. The Control of Action.

*GIM. Chapter 11 Hemispheric Specialization.

12. Apr 8: Emotion. (Guest Lecture)

*Chapter 9. Emotion.

13. Apr 15: Nov 10: Working Memory and Cognitive Control; Intelligence; Infovers

*GIM. Chapter 13.

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.

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.

Thompson, P. M., et al. (2001) Genetic influences on brain structure. *Nature Neuroscience*, 4, 1253-1258.

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

14. Apr 22. Social Cognition and Behavioral Genetics. Individual Differences, Personality, Intelligence, and Morality.

*GIM. Chapters 14. 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.

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

15. Apr 29. Last Class. Evolutionary Psychology: Bonding, Love, Sex, Mother-Infant Competition, Murder. Catch up.

*GIM. Chapter 15. Evolutionary Perspectives.

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

Final Exam Monday, May 13. 2-4 PM. HNB 107

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.