

SYLLABUS: COGNITIVE NEUROSCIENCE (1/4/15)

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

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

*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 might be added during the semester.

Evaluation: Evaluation will be based on two exams, each worth 40%. A large pool of possible exam questions will be made available at least a week prior to each exam. Approximately 80% of the exams will be directly taken from this pool. Most of the pool will be questions covered in the class Powerpoints/lectures. Questions can be answered in approx. a paragraph and can include diagrams. The remaining 20% of the evaluation will be based on class comments or questions that serve to illuminate the discussion or informed criticism (but not mere attendance) as well as a brief (~10-20 min) Powerpoint discussion on how course concepts relate to their own research or a problem of interest.

Topics: Roughly corresponding to weeks. *There will be some reordering/rescheduling of topics and possibilities of additions/subtractions of readings.* The last hour of each meeting will often be devoted to overview discussions.

1. Jan 11th: 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. (We will not cover 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 covered beyond what is discussed in lecture.)

2. Jan 18th. No Class. MLK day.

3. Jan 25th. Sensation and Perception. Early sensory processing. How to get the world into the head. Methodologies. Start of Higher Level Vision I.

GIM Chapter 4. Methods of Cognitive Neuroscience. Rather than consider methodology in isolation, we will primarily consider methods when considering

specific substantive domains such as perception, memory, etc. where methodological issues can be better appreciated.

*GIM Chapter 5. Sensation and Perception.

4. (Start on Jan 26th) 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. 121-165.5.

5. Feb 1: Higher Level Vision I: Continued

6. Feb 8th: 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)

7. Feb 15th. No class. President's Day.

8. Feb 22rd. 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.

8. Feb 29th. Action

*GIM. Chapter 8. Action

9. Mar 7th: Learning and Memory: Clive Wearing. Medial temporal Lobe system.

*GIM Chapter 9. Memory.

10. Mar 14. Spring Recess. No Class.

**11. Mar 21rd Learning & Memory (Continued)
First Midterm 40%**

12. Mar 28th: 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>

13. April 4th: Language. Speech Perception. Reading. Syntax.

*GIM. Chapter 11. Language.

*Frankland, S. M., & Greene, J.D. (2014). *PNAS*, www.pnas.org/cgi/doi/10.1073/pnas.1421236112

14. April 11: Cognitive Control. Working Memory. Individual Differences: Intelligence; Morality. Behavioral Genetics.

*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.

*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.

15. April 18): Social Cognition. Personality, and Morality. Evolutionary Psychology: Bonding, Love, Sex, Mother-Infant Competition, Murder, Optimal Mating Strategies.

*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.

Second Midterm 40%

16. April 25. Catch up. Student Presentations.

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.