Prof. Irving Biederman University of Southern California
Psychology 440 Fall 2017

SYLLABUS: INTRODUCTION TO COGNITIVE NEUROSCIENCE

IB's Office: HNB 316, Ext. 0-6094, bieder@usc.edu
Contact hours: By appointment. Email me. You will find me quite responsive.
Time: Class meets: Mon, Wed 2:00-3:50 PM. **Room**: HNB 100 (Auditorium)
We will have a 10-min break at 3 PM.
Required Text* + *Journal Articles. Articles (w/out *) are for background edification and 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: **978-0-393-91348-4**] **[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 three midterms (20% each) and a cumulative final examination (40%). All the exams will be multiple choice and will tend to assess conceptual understanding rather than rote memorization. Approximately 60-70% of the exam will be composed of questions from class lectures. We will try to have an early evening review session prior to each exam.

If you miss an exam: There is no definite penalty but a probabilistic one: If you have taken all three midterms and you are near a grade cutoff (e.g., by 3 or 4 points in your average grade), you will get the higher grade. If you miss a midterm, you will get the lower grade. (You have to take the final.) Unless you are running a high A, there is a fair chance that missing an exam will cost you a grade, e.g., from an A- to a B+. We cannot evaluate the adequacy of excuses for `

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 poor class decorum, e.g., Irrelevant or distracting behavior (e.g., social networking; texting; viewing non-class related material; talking, etc.) will result in *negative* participation credit.

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

1. **Aug 21**: **Introduction: Modularity**. **Brain Development. Cortex. Dorsal & Ventral visual pathways. Broadbent's Flowchart Model of Attention. How to study effectively.**
   *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.)

2. Aug. 23: Sensation and Perception. Early sensory processing. How to get the world into the head. Methodologies.

*GIM Chapter 3. Methods of Cognitive Neuroscience. Rather than discuss methods as a separate topic we will consider them as they arise in particular experiments at topics over the course of the semester.

*GIM Chapter 5. Sensation and Perception.

3. August 28th: Guest Lecture. Justin Wood: Visual Development

3. August 30th: Guest Lecture: Jason Zevin. Psycholinguistics

***GIM. Pp. 471-473. The anatomy of language.** Broca's and Wernicke's Aphasia.

Dick, F., Saygin, A.P., Pitzalis, S., Galati, G., Bentrovato, S., D'Amico, S., Wilson, S., Bates, E. and Pizzamiglio, G. (2007). What is involved and what is necessary for complex linguistic and non-linguistic auditory processing: evidence from fMRI and lesion data. Journal of Cognitive Neuroscience, 19, 1-18.

3. Sept 4: Labor Day. No Class

4. Sept 6, 11, & 13: Higher Level Vision I: Object Recognition. RSVP. Time parameters. 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. Sept 18 & 20. Higher Level Vision II: Gabor Filtering; 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)

6. Sept 25 First Midterm (20%).

7. Sept 27 & Oct. 2. Attention & Consciousness. Automaticity. Spatial vs. verbal representations.

*GIM. Chapter. 7. Attention

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

8. Oct 4. Action

*GIM. Chapter 8. Action

9. Oct 9 & 11: Learning and Memory: Clive Wearing. Medial temporal Lobe system.

*GIM Chapter 9. Memory.

9. Oct 16 & 18: 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.

10. Oct. 23: 2nd Midterm (20%).

11 Oct 25 & Oct 30: Language. Speech Perception. Reading. Syntax.

*GIM. Chapter 11. Language.

Frankland, S. M., & Greene, J. D. (2015). An architecture for encoding sentence meaning in left mid-superior temporal cortex. *PNAS*, Pp. 1-6. (Early Edition.)

12. Nov 1 & 6: **Cognitive Control. Working Memory. Judgment & Decision Making**

*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. 8 & 13: Social Cognition, Personality, and Morality

*GIM. Chapter 13. Social Cognition.

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

14. Nov. 15: Third Midterm (20%)

14. Nov 20: **Individual Differences: Working Memory and Intelligence; Behavioral Genetics.**

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.

Makel, M. C. et al. (2016). When lightning strikes twice: Profoundly gifted, profoundly accomplished. *Psychological Science.* DOI: 10.1177/0956797616644735

Nov. 22. No Class. Thanksgiving.

15. Nov. 27 & 29 (Last Class): Individual Differences (continued). Evolutionary Psychology: **Bonding, Love, Sex, Mother-Infant Competition, Murder, Optimal**

Mating Strategies for Accomplished Women.

Friday, December 8th, 2-4 PM, CUMULATIVE 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.