

Syllabus: MBB-980H: What Disease Teaches about Cognition
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SPRING 2021

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This course is designed for students in any of the MBB programs who have an interest in the structural and functional neuroanatomy of cognition, emotion and behavior. The approach will center on observations of and experiments with impairments in cognition, emotion and behavior after brain injury or with brain disease. This is NOT a medical school level course, but the lessons can be valuable for further study in medicine, neuropsychology, experimental psychology and even fields such as neuroeconomics. Valuable prerequisite courses might come those fields. Prior exposure to basic neuroanatomy would be most useful and provide a basis for extracting more from this course, but it is not required.

The major goals of the course are: 1) Understanding basic structural and functional brain anatomy and the overlap of cognition on anatomy; 2) the patterns of impairment produced by different brain diseases and injuries; 3) the limitations and strengths of inferring brain-behavior principles from studying impairments in disease; 4) the limitations and strengths of the various approaches to investigation of brain disease effects on behavior – single case reports, cohort investigations, identification and selection of study populations, use of normal controls or impaired control or no control populations, dangers of big data studies and others.

Beginning January 26th through about March 2nd, the course will focus on neuroanatomy and the issues to consider when making inferences about cognition, the brain and disease. We will dissect a human brain, demonstrate important anatomical landmarks in intact brain and gross sections while providing parallel demonstrations with modern structural imaging. The goal is to facilitate development of a strong 3D mental image of brain structure. Throughout this stepwise exposure we will return to normal and impaired functional correlates and will review some classic ideas on lesion based maps of brain organization.

For part of the session on Tuesday March 2nd, there will be an examination that will count no more than 10% to the final grade. It is a quality check: did the class learn the anatomy and limits of lesion studies that we hoped for? If those aspects are not clear, the assignments of the 2nd half will be harder to accomplish.

Over the next 6 or 7 weeks we will discuss specific phenomena of impaired cognition through reading and analysis of papers on a variety of topics. We will post a small library of papers – some famous, most not – some very good, some not so much. Each week a pair of students will present a discussion and analysis of two related papers on

a topic of their choosing. Through serial and collective choices the class will end up deciding the topics that are most interesting to them; not every possible topic will be covered. The students can structure their presentations however they wish. This approach has worked very well in past years, and most of the presentations have been very good, some really spectacular. These presentations will be the largest contributor to the final grade, each student in a pair graded individually. Participation in discussions of other students' presentations is also figured into the final grade to a limited extent: some students like to talk, others not so much. These presentations and your in class contributions throughout the semester will count for 80% of your grade. For the final examination we will provide a short list of papers on topics not selected during the term. Each student will write an analysis – up to 5 pages in length - of one of those papers using a standard manuscript review approach much as you will have done for the presentations. We will suggest and provide a rubric and template for this exercise . This exam will count for the remaining 10% of your grade.

There are no required texts. We will post anatomical-clinical summaries early in the course. The Harvard library system has several neuroanatomy atlases on line. For example,

<http://www.r2library.com.ezpprod1.hul.harvard.edu/Resource/Title/0071408126>

A google search for “Temporal lobe” produced 34,000,000 hits in 0.61 seconds. On the first page are tens of pictures, diagrams, links to several excellent reviews of function. Between these resources, students will have access to all the information imaginable to follow and extend anatomy and brain imaging discussions. For students for whom this course is absolutely the first exposure to neuroanatomy, **Gould and Brueckner: Sidman’s Neuroanatomy** may be useful. It is a structured learning text covering all basic anatomy. For students who are committed to a career in any of the research or clinical cognitive neurosciences, we recommend **Heilman and Valenstein: Clinical Neuropsychology**. It is organized around clinical dimensions and issues but incorporates a comprehensive view of cognitive neuroscience.

We will provide a few landmark studies for review.

Optimal class size is 12; the class limit is 14. Because of the format of the second half of the course, there must be an even number of students.

The final goal is to enjoy learning about this topic and learning how to think critically about brain organization in general.