PSYC 380  Cognitive Neuroscience

Course Description

This course will explore the vast and rapidly growing world of Cognitive Neuroscience through a selection of articles dealing with the background and contemporary studies of major topics. Cognitive Neuroscience as an area of research within the neurosciences has been expanding since the advent of imaging technologies in the 1980s. I want to present both the accomplishments as well as the controversies (and there are many!) in the field.

As you will see, Cognitive Neuroscience (like real estate) is all about “location, location, location!” Thus, we will begin by talking about how one goes about localizing something like “memory” to particular brain areas. Following this, we will discuss the major tool of current Cognitive Neuroscience: imaging (more specifically, functional MRI). After these introductory topics, we will be exploring a number of major areas of research within Cognitive Neuroscience. These are complex cognitive functions that particular researchers will say they are examining (for example, “object recognition”, or “imagery”, or “memory”), although we will see that it is actually very hard to draw hard and fast lines between any of them, either in terms of cognitive operations or in terms of brain areas required. We will then examine two topics that cut across these areas of research: the changing role of the cerebellum, and the role of development. Finally, we will end by discussing the “mother of all brain functions”, consciousness, which we know so little about that I’ve chosen to skip any empirical articles and just read some papers that present interesting ideas.

My hope is that you’ll come away from this course with a solid background in most of the major areas of research in Cognitive Neuroscience. There are two major areas that I’ve chosen to minimize: Emotion and Language. For Emotion, a separate biobehavioral graduate seminar is offered. For Language, the Cognitive Neuroscience course offered by the Department of Communication Sciences (CMSI 281) is oriented towards communication processes, including speech and language.

Optional Background Text:


Course Requirements

Each class meeting will center around PowerPoint presentations followed by discussion of the articles. Each article will have one of you as presenter. Although everyone will have read the articles beforehand (☺), many of them are somewhat technical. My hope is that presenting them will reinforce what you’ve read, point out misunderstandings, and stimulate discussion. I think lively discussion of the issues raised by the articles will be key to making this a fun class. As such, I’d like each person to prepare at least 2 questions and/or thoughts regarding the readings, to be sent to me before the end of the Sunday before class. The preference is for these to deal with conceptual issues but they could also deal with methodological issues. Sometimes, your instructor (i.e., me) may not know the answer to one of your questions (imagine!) but he promises to find out by the next class. I’d like you to use these as the basis for discussion.

For a final project, you will write a 10 page mock pre-doctoral NRSA. The topic is open, as long as it includes Cognitive Neuroscience methodology and/or concepts. I’ll be happy to discuss with each of you individually particular ideas you have regarding this assignment. The due date for the final paper is Friday, December 9.

Course Outline:

**Aug 29 -- Introduction**

**Sept 5 – no class; Labor Day**

**Sept 12 -- Localization of Complex Cognitive Functions in the Human Brain**

  **Historical Background**


Current Views


Sept 19 -- Imaging the Living Human Brain

Historical Background

Current Views


Sept 26 -- Perception I: Object Recognition

Historical Background

Current Review

Recent Studies


Oct 3 -- Perception II: Mental Imagery

Historical Background

Current Views

**Recent Studies**


---

**Oct 10 -- Memory I: Declarative (Explicit) Memory: Episodic and Semantic Memory**

**Historical Background**


**Current Views**


**Recent Studies**


---

**Oct 17 -- Memory II: Declarative (Explicit) Memory: Role of the Medial Temporal Lobes**

**Historical Background**


**Current Views**


**Recent Studies**


---

**Oct 24 -- Memory III: Nondeclarative (Implicit) Memory**

**Historical Background**


**Current Views**


**Recent Studies**
Oct 31 -- Attention

**Historical Background**

**Current Views**

**Recent Studies**

Nov 7 -- Executive Functions and the Frontal Lobes

**Current Views**

**Recent Studies**
Dreher, J-C., & Grafman, J. (2003). Dissociating the roles of the anterior cingulate and lateral prefrontal cortices in performing two tasks simultaneously or successively. *Cerebral Cortex, 13*, 329-339.

Nov 14 – no class; Society for Neuroscience meeting

Nov 21 -- The Cerebellum and Cognition

**Historical Background**

**Current Views**

Recent Studies

Nov 28 – Developmental Cognitive Neuroscience

Current Views

Recent Studies

Dec 5 -- Consciousness