ADVANCED TOPICS IN COGNITIVE NEUROSCIENCE: LANGUAGE, READING & COGNITION,
SPRING 2014
26:830:512
Tuesdays & Thursdays, 2:30 – 3:50 pm, Smith 371A (Fishbowl)

Office Hours: Tuesdays 4 – 5:30, or by appointment. 337 Smith Hall. The best way to reach me is by email (william.graves@rutgers.edu) or in person right after class.

Course Overview: This graduate course offers students a chance to delve deeply into several aspects of the cognitive neuroscience literature on language and reading. Topics are presented in a globally sequential manner. Before one can speak or read about a concept, it must first be presented to the senses. Hence we start with object recognition. Once perceived, ideas related to the object can then be retrieved. This step includes semantic processing. What happens next depends on whether the object is, for example, a picture, word, or group of words. Along the way, we will consider variations on these processes, such as what happens when they fail.

Learning Objectives: Upon successful completion of this course, students should be able to

- Identify tractable research topics related to the cognitive neuroscience of language
- Develop a research proposal from initial topic through to a final draft
- Perform constructive peer review on scientific proposals
- Respond to and incorporate peer reviews into a research proposal
- Critically evaluate hypotheses and theoretical models in the cognitive neuroscience of language with respect to experimental results

Course Website: The current version of the syllabus and the readings will be available on Blackboard, http://blackboard.newark.rutgers.edu.

Course Requirements:

(1) In each class session (excepting the first), a student will present and lead discussion of the assigned article. This does not mean that student must talk the entire time. Rather, he or she will, for example, elicit questions from the other students and seek clarification where needed. Students NOT leading the discussion must submit at least one discussion topic or question on the reading by email to the discussion leader and copy to william.graves@rutgers.edu. This must be done by 11:59 PM on the day before class.
(2) Class participation will be weighted heavily. At minimum you must be present to participate in discussions, so attendance is mandatory. The best way to prepare for discussion is to read the article to be presented. To get the most out of this course, we will need insightful, cooperative discussion.
(3) The final project will be an NIH (National Institutes of Health) NRSA (National Research Service Award)-style grant application. This was selected to be maximally relevant to actual scientific career skills. It will be due in stages according to the schedule below, and can be related to any topic covered in the course.

Assessment:

Your final grade will be calculated as follows:

Discussion topic/question email	10%	
Class attendance	10%	
Contribution to class discussion	10%	
Total participation:	30%	

NRSA-style grant:		*Due Date:*
Specific aims	5%	Rough aims, 2/11; Final aims, 2/27
First draft	15%	Monday, 3/24, 9 am
Two peer reviews	15%	Monday, 4/14, 9 am
Class presentation	5%	Thursday, 5/1, in class
Response to reviews	5%	Thursday, 5/8, 5 pm
Final draft	25%	Thursday, 5/8, 5 pm
Total project:	70%	

Grading scale:
A: 100-90 B+: 89-86 B: 85-80 C+: 79-76 C: 75-70 D: 69-62

Academic Integrity:
Students are expected to **do your own work at all times.** Those caught cheating, or who give the appearance of cheating, will be dismissed from class. The University and I take cheating very seriously. Students caught cheating may be suspended or expelled. To help you avoid this situation, please familiarize yourself with the University policy on academic integrity outlined here: http://academicintegrity.rutgers.edu.

Notes:
- The deadline to drop a course without penalty is **January 30, 2014**.
- The deadline to withdraw from a course with a W grade is **March 31, 2014**.
- If you need accommodation for a learning disability, I will need to see an official Letter of Accommodation from Disability Services (http://robeson.rutgers.edu/studentlife/disability.html). This helps me know the best way to help you.

Schedule of Topics and Readings

Jan 23 Introductions and course overview

28 Object Recognition (1)
Background reading:
Biederman, I. (1987) "Recognition-by-components: A theory of human image understanding" *Psychological Review*, 94:115-147.
To present:
Kriegeskorte, et al. (2008) "Matching categorical object representations in inferior temporal cortex of man and monkey" *Neuron*, 60:1126-1141.

30 Object Recognition (2)
Background reading:

Humphreys, G. W. & Riddoch, M. J. (2006) "Features, objects, action: The cognitive neuropsychology of visual object processing" *Cognitive Neuropsychology*, 23:156-183.

To present:

Tranel, D., et al. (1997) "A neural basis for the retrieval of conceptual knowledge" *Neuropsychologia*, 35: 1319-1327.

Feb 4 Semantic Processing: Amodal Cognition (1)

Background reading:

Ober, B. A. & Shenaut, G. K. (2006) "Semantic memory" In Traxler, M. J. & Gernsbacher, M. A. (eds.) *Handbook of Psycholinguistics*, 403-453.

To present:

Mahon, B. Z., et al. (2009) "Category-specific organization in the human brain does not require visual experience" *Neuron*, 63: 397-405.

Feb 6 Semantic Processing: Amodal Cognition (2)

Background reading:

McClelland, J. L. & Rogers, T. T. (2003) "The parallel distributed processing approach to semantic cognition" *Nature Reviews Neuroscience*, 4: 310-322.

To present:

Mitchell, T. M., et al. (2008) "Predicting human brain activity associated with the meanings of nouns" *Science*, 320: 1191-1195.

11 Semantic Processing: Embodied Cognition (1)

NOTE: Rough specific aims due in class

Background reading:

Damasio, A. R. (1989) "The brain binds entities and events by multiregional activation from convergence zones" *Neural Computation*, 1: 123-132.

To present:

Hauk, O., et al. (2004) "Somatotopic representation of action words in human motor and premotor cortex" *Neuron*, 41: 301-307.

13 Semantic Processing: Embodied Cognition (2)

Background reading:

Patterson, K., et al. (2007) "Where do you know what you know? The representation of semantic knowledge in the human brain" *Nature Reviews Neuroscience*, 8: 976-988.

To present:

Binder, J. R., et al. (2009) "Where is the semantic system: A critical review and meta-analysis of 120 functional neuroimaging studies" *Cerebral Cortex*, 19: 2767-2796.

18 Object/Picture Naming (1)

Background reading:

Levelt, W. J. M. (2001) "Spoken word production: A theory of lexical access" *Proceedings of the National Academy of Sciences USA*, 98: 13464-13471.

To present:

Damasio, H., et al. (1996) "A neural basis for lexical retrieval" *Nature*, 380: 499-505.

25 Object/Picture Naming (2)

Background reading:

Indefrey, P. & Levelt, W. J. M. (2004) "The spatial and temporal signatures of word production components" *Cognition*, 92: 101-144.

To present:

Graves, W. W., et al. (2007) "A neural signature of phonological access: Distinguishing the effects of word frequency from familiarity and length in overt picture naming" *Journal of Cognitive Neuroscience*, 19: 617-631.

NOTE: Final specific aims due in class

27 Phonological Processing

Background reading:

Binder, J. R., et al. (2000) "Human temporal lobe activation by speech and nonspeech sounds" *Cerebral Cortex*, 10: 512-528.

To present:

Graves, W. W., et al. (2008) "The left posterior superior temporal gyrus participates specifically in accessing lexical phonology" *Journal of Cognitive Neuroscience*, 20: 1698-1710.

Mar 4 Orthographic Processing

Background reading:

McClelland, J. L. & Rummelhart, D. E. (1981) "An interactive activation model of context effects in letter perception: Part 1. An account of basic findings" *Psychological Review*, 88: 375-407.

To present:

Binder et al. (2006) "Tuning of the human left fusiform gyrus to sublexical orthographic structure" *NeuroImage*, 33: 739-748.

6 Word Recognition

Background reading:

Balota, D. A., et al. (2006) "Visual word recognition: The journey from features to meaning (a travel update)" In Traxler, M. & Gernsbacher, M. A. (eds.) *Handbook of Psycholinguistics*, 285-375.

To present:

Binder, J. R., et al. (2005) "Distinct brain systems for processing concrete and abstract concepts" *Journal of Cognitive Neuroscience*, 17: 905-917.

11 Reading Aloud/Word Naming (1)

Background reading:

Balota, D. A., et al. (2004) "Visual word recognition of single-syllable words" *Journal of Experimental Psychology: General*, 133: 283-316.

To present:

Graves, W. W., et al. (2010) "Neural systems for reading aloud: A multiparametric approach" *Cerebral Cortex*, 20: 1799-1815.

13 Reading Aloud/Word Naming (2)

Background reading:

Woollams, A. M., et al. (2007) "SD-Squared: On the association between semantic dementia and surface dyslexia" *Psychological Review*, 114: 316-339.

To present:

Brambati, S. M., et al. (2009) "Reading disorders in primary progressive aphasia: A behavioral and neuroimaging study" *Neuropsychologia*, 47: 1893-1900.

18 & 20, No Class, Spring Recess

NOTE: First draft of project due Monday, Mar 24, 9 am

25 Linguistics (1)

Background reading:

Hauser et al. (2002) "The faculty of language: What is it, who has it, and how did it evolve?" *Science*, 298: 1569-1579.

To present:

Senghas, A., et al. (2004) "Children creating core properties of language: Evidence from an emerging sign language in Nicaragua" *Science*, 305: 1779-1782.

27 Linguistics (2)

Background reading:

Christiansen, M. H. & Chater, N. (1999) "Toward a connectionist model of recursion in human linguistic performance" *Cognitive Science*, 23: 157-205.

To present:

Gentner, T. Q., et al. (2006) "Recursive syntactic pattern learning by songbirds" *Nature*, 440: 1204-1207.

Apr 1 Aphasia (1)

Background reading:

Damasio, A. R. (1992) "Medical progress: Aphasia" *New England Journal of Medicine*, 326: 531-539.

To present:

Blasi, V., et al. (2002) "Word retrieval learning modulates right frontal cortex in patients with left frontal damage" *Neuron*, 36: 159-170.

3 Aphasia (2)

Background reading:

Dell, G. S., et al. (1997) "Lexical access in aphasic and nonaphasic speakers" *Psychological Review*, 104: 801-838.

To present:

Ueno, T., et al. (2011) "Lichtheim 2: Synthesizing aphasia and the neural basis of language in a neurocomputational model of the dual dorsal-ventral language pathways" *Neuron*, 72: 385-396.

8 No Class , CNS Meeting

10 Conceptual Combination

Background reading:

Wisniewski, E. (1997) "When concepts combine" *Psychonomic Bulletin & Review*, 4: 167-183.

To present:

Graves, W. W., et al. (2010) "Neural correlates of implicit and explicit combinatorial semantic processing" *NeuroImage*, 53: 638-646.

NOTE: Peer reviews due Monday, Apr 14, 9 am

15 Sentence Processing (1)

Background reading:

Lau, E. F., et al. (2008) "A cortical network for semantics: (de)constructing the N400" *Nature Reviews Neuroscience*, 9: 920-933.

To present:

Humphries, C., et al. (2006) "Syntactic and semantic modulation of neural activity during auditory sentence comprehension" *Journal of Cognitive Neuroscience*, 18: 665-679.

17 Sentence Processing (2)

Background reading:

Vigneau, M., et al. (2006) "Meta-analyzing left hemisphere language areas: Phonology, semantics, and sentence processing" *NeuroImage*, 30: 1414-1432.

To present:

Wilson, S. M., et al. (2011) "Syntactic processing depends on dorsal language tracts" *Neuron*, 72: 397-403.

22 Discourse Processing

Background reading:

Zwaan, R. A. & Rapp, D. N. (2006) "Discourse comprehension" In Traxler, M. & Gernsbacher, M. A. (eds.) *Handbook of Psycholinguistics*, 725-764.

To present:

Barbey, A. K., et al. (2014) "Neural mechanisms of discourse comprehension: A human lesion study" *Brain*, 137: 277-287.

24 Non-literal Language Processing

Background reading:

Giora, R. (1997) "Understanding figurative and literal language: The graded salience hypothesis" *Cognitive Linguistics*, 8: 183-206.

To present:

Rapp, A. M., et al. (2012) "Where in the brain is nonliteral language? A coordinate-based meta-analysis of functional magnetic resonance imaging studies" *NeuroImage*, 63: 600-610.

29 Bilingualism

Background reading:

Schwartz, A. I. & Kroll, J. F. (2006) "Language processing in bilingual speakers" In Traxler, M. & Gernsbacher, M. A. (eds.) *Handbook of Psycholinguistics*, 967-999.

To present:

Crinion, J., et al. (2006) "Language control in the bilingual brain" *Science*, 312: 1537-1540.

May 1 Class Presentations

Final Project/Response to Reviews due: Thursday, May 8, 5 pm